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AN INDIAN EPHEMERIS

A.D. 700 TO A.D. 1799

SHOWING

THE DAILY SOLAR AND LUNAR RECKONING ACCORDING
TO THE PRINCIPAL SYSTEMS CURRENT IN INDIA
WITH THEIR ENGLISH EQUIVALENTS

ALSO

THE ENDING MOMENTS OF TITHIS AND NAKSHATRAS

AND

THE YEARS IN DIFFERENT ERAS, A.D., HJRA, ŚAKA, VIKRAMA,
KALIYUGA, KOLLAM, ETC., WITH A PERPETUAL PLANETARY
ALMANAC AND OTHER AUXILIARY TABLES

BY

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M.A., B.L. (MADRAS), LL.B. (LONDON), FELLOW OF THE UNIVERSITY
OF MADRAS, AUTHOR OF "INDIAN CHRONOLOGY"

Published under the Authority of the Government of Madras

VOL. I—PART I GENERAL PRINCIPLES AND TABLES

A revised and enlarged edition of "Indian Chronology, 1911."

MADRAS

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P R E F A C E.

THE “Indian Ephemeris, A.D. 700—A.D. 2000,” in eight * volumes, of which the first seven (A.D. 700—A.D. 1799) are now presented to the public, the last and eighth volume (A.D. 1800—A.D. 2000) having been published, by anticipation in 1915, is the outcome of the principles and methods expounded in the author’s *Indian Chronology* (1911) for the computation of eras, tithis, nakshatras, etc. These principles and methods are re-stated, for convenience of reference, in the first volume of this work, which is practically a revised and enlarged edition of *Indian Chronology*, and is being separately published as such.

2. Its object is to show, for one thousand three hundred years, i.e., from 1st January A.D. 700 to 31st December A.D. 1999, (1) the eras in use at present in different parts of India, Śaka, Vikrama, Kaliyuga, Kollam, Bengal San, Northern and Southern Cyclic years, Hijra and A.D.; (2) the solar month and day of the Tamil and Malayālam calendars; (3) the solar months according to the *rāśis* or constellations of the zodiac; (4) the tithi for each day with its ending moment to two places of decimals, equivalent to half ghaṭikas; and (5) the nakshatra, with its ending moment; (6) the lunar months and *pakshas* in use all over India and the neighbouring countries; (7) the Muhammadan months and days of the Muhammadan months; and (8) eclipses, solar and lunar. For every one of these items the English month and day and week-day are given regularly throughout. It also contains a full exposition of a practical and at the same time accurate method of ascertaining the actual as well as the mean position of the planets, Mars, Mercury, Jupiter, Venus and Saturn for any date and at any epoch.

3. The author, having hit upon a method of calculating by a simple process, but accurately, to four places of decimals, all the elements required for the computation of a tithi (i.e., the mean ending moment of each tithi, and the appropriate sun’s and moon’s equations of the centre as well as all the elements required for nakshatras (i.e., the mean ending moment of each nakshatra and the appropriate moon’s equation of the centre) successively for each day, for any number of years, past or future, offered to the Government of Madras to produce (1) an ephemeris in the present form for the whole of the period for which such information would ordinarily be required by epigraphists, i.e., from A.D. 700 to A.D. 1799, and (2) an ephemeris from A.D. 1800 to A.D. 2000 for current use in Government offices. Government accepted both the offers, undertaking to pay part of the cost of compiling the former ephemeris in manuscript and to purchase 1,500 copies of the latter work which was published at the author’s expense; they subsequently decided to purchase the copyright of the first edition of the *Ephemeris* A.D. 700 to A.D. 1799, and the present publication is the result of that arrangement. The author tenders his thanks to the Government of Madras for their kind patronage of both parts of the work.

4. It is a result, and at the same time an index, of the unique character of the Indian calendar system, that the only satisfactory solution of the many difficulties

* The work, as originally designed, was to have been issued in seven volumes, including the volume for A.D. 1800 to A.D. 2000; but the addition of the present introductory volume has resulted in the division of Volume I into two parts, of which the first part is the present volume, and the second is the Ephemeris for A.D. 700 to A.D. 799, to which are prefixed (1) an explanation of the process used in the compilation of the Ephemeris, and (2) a set of illustrative dates from South Indian inscriptions. The entire work is therefore actually issued in eight volumes as stated in the text.

presented by it to the historian, the chronologist and the epigraphist, lies in the development of a day to day ephemeris such as is now presented ; and any attempt to enable the historian or epigraphist to be his own computer of tithis and nakshatras seems predestined to failure. The historian has not often the aptitude requisite for undertaking such computations : and he has still less often the time necessary for making a number of alternative calculations before selecting the one that rigorously or most nearly satisfies all his data.

5. To the historian, then, of India, this ephemeris, the first of its kind, is dedicated. One wonders why the Hindus, who are so scrupulous as to the computation of the passing moment, should not have thought in the past of maintaining some kind of a continuous ephemeris like the *Fasti* of Ancient Rome, for verifying the allusions to the lapse of time which are to be met with in literary, and more especially in lithic, records. But history, far from being a favoured pursuit in India, was, until we come to Muhammadan times, almost an avoided subject. It is probably due to this absence of the historical faculty in our ancient men of letters that no expeditious method was ever devised for verifying calendrical details over long periods of time, and that such methods as have come down to us are of the most primitive and tedious description.* An Indian compiler of a panchanga or almanac devotes three months to the preparation of a calendar for the next twelve months and according to this method it would take over twice a hundred years to make a calendar for a thousand years. By a method which is fully explained in pages 2-5 of Part II of Volume I of the present work, the author found it practicable to compile in one day the material required for a ten years' Indian ephemeris : and since the whole of the first or preliminary compilation was effected by means of printed slips, the chances of arithmetical errors affecting the processes of addition and multiplication were also excluded by this method.

6. Few epigraphists will regret the omission from this ephemeris of the *yoگا* and *ahas* which are always included in a panchanga ; but many may be disposed to question the wisdom of excluding from it the period previous to A.D. 700. The paucity of verifiable Indian dates before the eighth century A.D. was the main consideration in fixing A.D. 700 as the superior limit of the ephemeris. Dr. Fleet found that for the centuries between A.D. 500 and A.D. 800 there were not more than 14 verifiable week-day dates in all the inscriptions discovered in the various parts of India and the neighbouring countries where the Indian calendar has ever been in use. He very properly, therefore, inferred from this circumstance that the week-day must have been introduced into India somewhere about the fifth century A.D. and gradually brought into common use by the eighth century. It is now conjectured by many investigators, including the present writer, that week-days *may* have been known to the Indian peoples some centuries before the fifth century A.D. : but the paucity of actual week-day dates in Indian literature and in Indian inscriptions between the fifth and eighth centuries A.D. is a fact ; and it did not seem worth while, for the sake of these few dates, to add two more volumes and the cost of producing them to the bulk and expense of the present publication. The discovery of a new week-day date in any of these early centuries, when the week

* To the same cause is due the singular lack of ability (commented on in Chapter V of Volume I of this work), on the part of literary men with undoubted general information, like the annotator of *Paripādai*, to grasp the historical import of a date referred to by its astronomical details. Likewise it is a mystery why in other cases such annotators, while supplying details sufficient to identify a date, failed to give the date itself. In the body of, and in appendices to, this work, reference is made to three such dates, to be found respectively in *Silappadhikāram*, *Jivakachintāmani* and *Paripādai*.

was as it were on its trial in India, would be so interesting an event that expert attention could not fail to be directed to it. The author has, in the first volume of this work and the tables appended thereto, furnished methods of computing such dates to any desired degree of accuracy according to any one of four siddhāntas, the Sūrya siddhānta, the first Ārya siddhānta, the Brahma siddhānta and the Siddhānta Śiromaṇi.

7. In preparing a second edition of the author's *Indian Chronology* (1911) for the first volume of the present publication, numerous changes were found necessary, some in the direction of simplifying, and others in that of amplifying, that work. Of late years the attention of the public has been drawn to the desirability of occasionally employing Indian systems other than the Sūrya siddhānta in verifying Indian dates. The author has, therefore, now not only amplified his original Sūrya siddhānta Eye-table, but also devised similar eye-tables for the first Ārya siddhānta, the Brahma siddhānta and the Siddhānta Śiromaṇi. For the reason stated on page 77 of Volume I of this work it did not seem necessary to deal specially with the second Ārya siddhānta.

8. Secondly, the investigation of ancient planetary records, called horoscopes, will, it is confidently hoped, be furthered by the large amount of space devoted to the subject in the present work ; in fact, certain aspects of it, such as the planetary eye-tables and the perpetual planetary almanac, are for the first time now presented to the public and at least one problem of first-rate importance in Tamil literary chronology has been successfully solved by their means.

9. Several readers of *Indian Chronology* in its first edition having complained of the absence of a popular and at the same time compendious exposition of the leading principles of the Indian calendar, the author has endeavoured to supply the want by means of Chapter II of Volume I of the present work, "Exposition of the eye-tables" which, with the eye-tables themselves and the illustrative problems prefixed to them, will be found a small but self-contained treatise on the subject.

10. The tables in the first volume of this work have been regrouped for the present edition and reduced in number to six, the most important being Tables II, III, IV and V. The author had entertained an idea that upon the appearance of his ephemeris for A.D. 700 to A.D. 2000, Table II (which was table X in the first edition) could be dispensed with and a considerable amount of space thereby saved : he has since found, however, that for applying the *other* siddhāntas to the computation of tithis, nakshatras and yogas, Table II is indispensable and he has been obliged to retain it accordingly. Eclipses, solar and lunar, are dealt with in Chapter V, section v and in Table IV-L, from a practical point of view, viz., to the extent necessary to enable the student to satisfy himself whether an eclipse was possible or probable on dates anterior to the earliest year for which *Oppolzer's Kanon der Finsternisse* is available, 1207 B.C.

11. Several papers by the author which students of Indian Chronology occasionally ask for, but which hitherto either were not printed or were available only in private circulation, have now been included in the appendix ; and a copious list of South Indian dates, fully verified and arranged in order of dynasties, is prefixed to Part II of Volume I of this work, by way of illustrating the practical use of the Ephemeris in historical investigation. Among papers now printed for the first time is Paper No. (i) appended to Volume I, Part I on the Vedāṅga Jyotiṣa,

containing the substance of the Sir Subrahmanya Ayyar lectures delivered by the author in 1916 at the request of the Madras University.

12. In the preface to the first edition of *Indian Chronology* (March 1911) the author expressed his obligations to previous writers, particularly to Professor HERMANN JACOBI (of Bonn and Heidelberg), who is unquestionably the greatest authority on the subject. The exact connexion between this work and Professor Jacobi's Tables in *Epigraphia Indica* is brought out in Chapter IV "Construction of Tables." The rules on page 3, paragraph 12, regarding the commencement of the civil solar month in various parts of India were taken from the *Indian Calendar* by Messrs. R. SEWELL and S. B. DIKSHT; in the present edition the author has also used Dr. Schram's calculations of the śodhya as reproduced in Mr. R. SEWELL's *Indian Chronography*.

MADRAS,
January 1922.

L. D. SWAMIKANNU.

AN INDIAN EPHEMERIS, A.D. 700 TO A.D. 1799.

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AN INDIAN EPHEMERIS

(A.D. 700 TO A.D. 1799)

VOLUME I.—PART I.

CHAPTER I.—PRELIMINARY NOTIONS.

SECTION i.—*The siddhāntas.*

Every Indian calendar or panchānga follows a particular siddhānta or system of astronomical constants. Varāhamihira, an astronomer of the sixth century A.D., has described five principal siddhāntas in his *Panchasiddhāntikā* (Ed. Thibaut, with English translation), and Dr. J. Burgess, at p. 722 of J.R.A.S. (1893) enumerates eight principal siddhāntas. The siddhāntas which have so far been investigated in detail are, (1) the Sūrya siddhānta, (2) the first Ārya siddhānta, (3) the second Ārya siddhānta, (4) the Brahma siddhānta, and (5) the Siddhānta Śiromani. It is a mistake to suppose that one siddhānta differs from another as the Ptolemaic system differs from the Copernican. On the contrary the basic principles of all the siddhāntas are the same and they differ from one another only in the astronomical constants or lengths of the fundamental periods used in computation. The slight variations among the siddhāntas, which affect the computation of tithis, nakshatras and yogas, are made manifest by means of the different Eye-tables in the present volume, pages 153 to 194 and the footnotes on pages 200 to 279. The following calculations show that in the most important period A.D. 900—A.D. 1400, which we may call the period of epigraphic chronology, or briefly the epigraphical period, the extreme variations seldom exceed the tenth part of a day :—

English equivalent of the moment of occurrence of mean new moon at the beginning of Vaiśākha lunar month in	Sūrya siddhānta.	First Ārya siddhānta.	Brahma siddhānta.	Siddhānta Śiromani.
A.D. 400 	April 10·3304	April 10·3145	April 10·3252	April 10·3730
A.D. 900 	April 2·4862	April 2·4871	April 2·4446	April 2·4093
A.D. 1400 	March* 25·6421	March* 25·6734	March 25 5640	March 25 6255
A.D. 1900 	April 29·3285	April 29·3903	April 29 2140	April 29 2824

2. *Sūrya siddhānta*.—Of the several siddhāntas referred to above, the Sūrya siddhānta is the one system which has found universal acceptance in India, and it has been adopted by almanac-makers through the length and breadth of the Indian Continent for at least a thousand years past; so that, in verifying any date in an Indian inscription, copper-plate, or literary work during this period, the principles of the Sūrya siddhānta have to be applied in the first instance, and only if they fail, has the applicability of any other siddhānta to be considered. In Southern India alone, and even there, only in respect of sankrāntis, i.e., the commencement of solar months, the first Ārya siddhānta, a system generally referred to the fifth century A.D., has been in use for a long time past. Elsewhere, and for all other purposes, the Sūrya siddhānta may be said to be in use, and to have been in use, universally, throughout India.

3. Since panchāngas, based on the Sūrya siddhānta, are still the most popular ones in India, it may be affirmed that the Indian people, as a whole, are satisfied with its results to-day, just as they were satisfied with them a thousand years ago. New moons and full moons and the sun's tropical longitude, as well as eclipses, may still be calculated, with a very fair amount of precision, with the

* This was not the Vaiśākha new moon by the Sūrya and Ārya siddhāntas, but for the present purpose this discrepancy may be neglected.

sole help of tables based on the venerable Indian system of the *Sūrya siddhānta*. As a system of pure chronology, too, it has probably not its equal anywhere in the world. Chronology is based on astronomy; but while astronomy is studied in the laboratories and observatories of mathematicians, chronology is meant to be applied and used everywhere. The chronological system of the *Sūrya siddhānta*, though complicated in appearance, and incrustated with astrology, in which the author has no belief whatsoever, is yet, when released from its accidental encumbrances, sufficiently simple, and its terms and methods have, by dint of use, been rendered familiar to the Indian people at large. If for no other reason, at least for the sake of its antiquity and on account of its use in the interpretation of ancient Indian dates and in the reconstruction of Indian history no less than in the regulation of present day practice over a great part of India, such an ephemeris as the present one, based mainly on the *Sūrya siddhānta*, deserves to be on record.

SECTION ii.—*Main features of present method.*

4. According to the author's method, the turning points of the solar and lunar reckonings of time are (1) the moment of commencement of the Indian solar year, and (2) the moment of occurrence of the first new moon in the solar year. Both moments *might* be reckoned from 0 Kaliyuga which for *Sūrya siddhānta* was the midnight between 17th and 18th February 3102 B.C., and for other siddhāntas the moment of mean or Lanka sunrise (6 a.m.) on 18th February 3102 B.C. The moment of 0 Kaliyuga was also a moment of new moon, that is, the mean longitude of both sun and moon was then 0° . But for the purposes of the present system, the commencement of the year 0 Kaliyuga has to be taken back, by 2·1707 days in the case of the *Sūrya siddhānta* and by a similar period in the case of each of the other siddhāntas. This period is called the *śodhya*, which is defined as the interval between the moment when the sun reaches 0° true longitude and the moment, rather more than two days later, when he reaches 0° mean longitude every year. The *śodhya* is dealt with fully in paragraphs 198 to 213 below, and the tables appended thereto. It will be seen from the different Eye-tables that even where there is no other difference between two siddhāntas (e.g., between Brahma siddhānta and Siddhānta Śiromaṇi), the difference in respect of the *śodhya* makes two tables necessary for computing the commencement of the solar year and the first new moon in each solar year. See also paragraph 191 below.

5. The interval between the commencement of a solar year and the first new moon in the solar year is a most important datum in the author's method, since on this interval depend (1) the time of occurrence of subsequent new moons in the year, (2) the incidence of *adhika* and *kshaya* months, (3) the exact interval between the ending moment of a particular tithi and the ending moment of its attendant *nakshatra* or *yoga* and (4) the calculation of solar and lunar anomalies for tithis.

6. Another important respect in which the author's method differs from all the others hitherto published for computing tithis, nakshatras and yogas, is the series of anomaly and equation tables (Eye-table, sections e to i, pages 171—194) for the sun and the moon under the various siddhāntas, whereby the absolute ending moment of a tithi, a nakshatra or a yoga, is arrived at by means of a single addition to, or subtraction from, the mean ending moment, instead of by a series of approximations. How this is effected will be explained in Chapter IV on the construction of the tables, Section iii, pages 74 to 81.

SECTION iii.—*Luni-solar character of the Indian year.*

7. Like the lunar calendar of the Jews, and unlike that of the Muhammadans, the Indian calendar may be described as luni-solar, since such of its periods of time, as are regulated by the movements of the moon, are also tied to divisions of the solar year. A lunar tithi is not counted at all unless the *sun* rises upon it. A tithi, nakshatra, or yoga may begin, or end, at any moment of the day, but the tithi, nakshatra, or yoga pertaining to a day is that which is current *at sunrise*. A lunar month has its name determined by, though not always

etymologically derived from, the next following *solar* sankrānti: if there are two lunar months equally entitled to have their name determined by a particular solar sankrānti, they both receive the same name and one, the first, is called *adhika*. On the other hand, if a new moon is followed by two sankrāntis before it is followed by another new moon, the lunar month which would ordinarily have had its name determined by the second of the two sankrāntis is suppressed and is said to be *kshaya*, that is, in defect. Lastly the lunar year, beginning with the lunar month Chaitra, is named after the *next solar year*. These considerations suffice to prove that the Hindu lunar year is properly a luni-solar year.

8. Lunar periods of time are characterized by an element of certainty or rather of palpable evidence, not found in solar periods, and in another sense the actual moments of lunar phases are marked by much greater uncertainty than solar sankrāntis. We shall consider each of these propositions.

9. *Palpable evidence of lunar periods.*—We cannot visibly perceive in the heavens the fact that the sun has completed any definite stage in his annual course: but new moon, when the moon's longitude is the same as the sun's, is a patent fact: so are full moon and each quarter of the lunar month. There cannot be a difference of a whole day between the moment of new moon in one part of the country, and the same moment in another part, just as there might be in the commencement of a solar month (paragraph 14 below). If an inscription states that a certain tithi fell on a Monday, and by calculating backwards we trace the tithi to a Saturday, we may be quite certain that there is some error in the inscription.

10. On the other hand, there are greater fluctuations in the moon's than in the sun's movements, in the sense that the actual time of new moon may be as much as 14 hours before, or 14 hours after, the time of *mean* new moon. Two calculations are therefore necessary to determine the time at which the moon reaches any particular stage of her course: we must first ascertain the *mean* time, which is simply the expected time, taking an average over very long periods; and then we must calculate the *actual* time by means of a correction of the mean time according to the moon's and sun's *anomaly* at the particular moment. Both these operations can be performed very easily and very accurately, that is to say, in exact accordance with the siddhāntas, by means of the Eye-tables in the present work. The correction is called in modern astronomy a correction for the sun's and moon's *equation of the centre*. There are also one or two other minor corrections recognized in modern astronomy, but the siddhāntas do not make them.

SECTION IV.—Commencement of the solar month or sankrānti.

11. The astronomical commencement of a solar month is the moment of *sankrānti*, i.e., the moment when the sun enters a constellation of the zodiac. To ascertain the moment of sankrānti, we must add up two figures, namely, (1) the day and fraction of day of the English month entered in Table II or in the head lines of the Ephemeris against "Commencement of the solar year," and (2) the days and fraction of day entered in the Eye-table, section a or in the book-marker as the collective duration of days up to the month of which we wish to know the sankrānti or moment of commencement.

12. Though the moment of a sankrānti is the same all over India for the same siddhānta, the commencement of the corresponding month for *civil* purposes is not necessarily the same all over India. The following rules on the subject are adopted from Messrs. *Sevell and Dikshit's* "Indian Calendar":—

(1) In Orissa the solar month of the *Aṃli* and *Vilāyati* eras begins on the day of sankrānti, at whatever moment of the day the latter may happen. Accordingly in Orissa, the solar months begin on the sankrānti days.

(2) In Bengal, when the fraction of the day at which the sankrānti happens does not exceed 45 ghaṭikas (midnight) the solar month begins on the next day; and when the sankrānti occurs after 45 ghaṭikas, the solar month begins on the next day but one. Accordingly the Bengal months corresponding to *Āni* A.D. 1910 (Bengal solar *Āshāḍha*) and to Malayālam *Dhanu* A.D. 1910 (Bengal

solar *Pausha*) commenced on 15th June and 16th December 1910 respectively and not on 14th June and 15th December 1910 (the days of the *sankrānti*), while Bengal solar *Māgha* in A.D. 1910–11 did not commence till 15th January 1911 (i.e., two days after the *sankrānti*).

(3) In Southern India, in the Tamil country, when the fraction of the day at which the *sankrānti* occurs does not exceed 30 *ghaṭikas* (i.e., when the *sankrānti* occurs, roughly, before sunset) the solar month begins on the same day. That is why, for instance, the beginning of Tamil *Āni*, A.D. 1910, coincided with the day of the *sankrānti*, 14th June 1910. When the *sankrānti* occurs after 30 *ghaṭikas*, the solar month begins on the next day. Examples will be found on any page of the *Ephemeris*. The authors of the “*Indian Calendar*” also state that in Malabar, when the *sankrānti* occurs after 18 *ghaṭikas*, the solar month commences on the next day.

SECTION V.—*The day of the solar month.*

13. This citation, so familiar in the European calendar, is unknown in India, in the epigraphical period, except in Southern India, and even there it occurs only in a small number of cases. When it does occur, it is a valuable means of verification, provided we know the particular *siddhānta* to be applied : because the combination of a particular solar day of a month with a *vāra* or week-day, a particular *tithi* and a particular *nakshatra*, may not recur for a century or possibly for four centuries. On the other hand, if we laid too much stress on the solar day of the month, and were wrong in the assumption of the *siddhānta*, our result might be wide of the mark by a century or two. This risk of error has been amply illustrated in a recent pamphlet* which shows that a whole series of Chōla and Pāṇḍya dates could be transposed by a century by merely supposing the Brahma *siddhānta* to have been followed, instead of the Ārya *siddhānta* and that another similar transposition could be effected by following the “*Orissa rule*” for the commencement of a *sankrānti* (vide paragraph 12 *supra*) instead of the “*Tamil rule*.” The author of that brochure, however, overlooked the important consideration that if in even one of a series of such dates mutually connected in time, there was a reference to a śaka date, which confirmed the Ārya *siddhānta* and the “*Tamil rule*” hypothesis, then it must follow that no other *siddhānta* and no other “*rule for sankrāntis*” can be applied to the whole series.

14. Owing to various causes, principally the differences in the length of the solar year, in the sun’s *śodhya*, in the sun’s anomaly table, and in the “*Sankrānti rule*,” the day of solar month by a particular *siddhānta* is often (and in the case of the Brahma *siddhānta*, regularly, during the epigraphical period) discrepant by a whole day from the result arrived at by using another *siddhānta*, and if both *siddhānta* and the *sankrānti* rule (paragraph 12) were varied simultaneously, a difference of two days in the result could be produced. But not only does the bewildering array of *siddhāntas* and *sankrānti* rules *not* cause in practice a multiplicity of solutions and a general uncertainty of dates,—the thesis propounded in the pamphlet just referred to,—but the application of the Ārya *siddhānta* and the “*Tamil rule*” to the whole series of dates receives more ample confirmation than before by the mention of śaka dates in some of the inscriptions which by internal evidence are mutually connected in time. (See the Pāṇḍya dates in Part II of Volume 1).

15. It must not also be overlooked that palæographical tests are in almost every case absolutely indispensable to verify a date, and where the period is such that a difference of 100 years makes a difference in the kind of script in use (as was the case, for instance, in A.D. 1100 compared with A.D. 1200 for Tamil script), the astronomical verification should be kept within the bounds of palæography and not stray into any century *ad libitum*.

SECTION VI.—*The week-day.*

16. The week-day is the crucial test in the vast majority of verifiable Indian dates and in the absence of a week-day, an Indian date is usually pronounced

* “*Some śaka dates in Indian inscriptions*” by Mr. Venkatacharya of the Mysore Archaeological Department 1916

unverifiable* unless there is an eclipse in the date. To “verify” a date is to show that it is equivalent to a particular day, month and year consistently with all its details, or with the greater number of its details, and that it would be inconsistent with any other day *during a certain number of years*. For instance, a date, such as “Monday, 8th tithi in the bright fortnight,” with mention of month, or “Monday, 8th tithi and nakshatra Anurādhā,” without mention of month, can be verified as a rule only for a period of 3, 7 or 10 years, because after this period it will recur with the same details. If in such a case the year also is given, it may be possible to show that all the details are consistent with the given year and not with any other year for the next 3, 7 or 10 years, so that it becomes probable that the year given in the date is correctly cited. Where we have a date that merely gives a tithi, a nakshatra, and a year, without the week-day, we say that the date cannot be verified, i.e., *proved* free from the probability of error, because every year must contain such a tithi and such a nakshatra somewhere, and we cannot assert with any degree of confidence that the year-date is free from error. Numerous examples of verifiable and unverifiable dates are given in the introduction to the second part of volume I of the Ephemeris.

17. The week-day appears to have been frequently relied on in inscriptions to distinguish the day on which a tithi or nakshatra commenced from the day on which it came to an end.

SECTION VII.—*The tithi or nakshatra of a day and of a moment.*

18. Over the greater part of India, a day is known normally as the day of an eighth, ninth or any other *tithi*, or of Aśvini, Bharani, or any other *nakshatra*, rather than as the eighth, ninth or any other day of a solar month as in Europe. The tithi or nakshatra which is identified with a day is that tithi or nakshatra which was current at sunrise on the day in question, and though a tithi or nakshatra may have ended the next minute after sunrise, and the next tithi or the next nakshatra may have been current for the whole of the remaining day, it is the tithi or nakshatra current *at* sunrise which gives its name to the day in *ordinary* Indian parlance.

19. Nevertheless it is the case that in numerous well-attested inscriptions, the tithi or nakshatra quoted is not that which was current at sunrise on the day in question but that which commenced at some part of the day and would be current at sunrise only on the *next* day. Such a citation may be distinguished as the day of *commencement* of a tithi or nakshatra or “the following day’s tithi” or “the following day’s nakshatra” (usually abbreviated by the present writer as *f.d.t.* or *f.d.n.*).

SECTION VIII.—*The civil day and its English equivalent.*

20. Indian time is kept in ghaṭikas (Tamil nāligai), or sixtieth parts of a day, each *ghaṭika* being equivalent to 24 minutes of English time ($\frac{1}{2}$ of an hour), and in *palas* (Tamil *vinādis*) or sixtieth parts of a *ghaṭika*, each *pala* being equivalent to 24 seconds of English time. The *ghaṭikas* and *palas* are reckoned, not from midnight to midnight as in English time, but from sunrise to sunrise. Now, as the moment of sunrise depends on the latitude and longitude of each place, there should, strictly speaking, be as many *panchāngas* as there are places in India. Indian astronomers get over this difficulty by calculating time in the first instance according to one central latitude and longitude, and then applying the necessary corrections in order to deduce the time for other places. The central latitude is the equator and the central longitude is that of Ujjain ($75^{\circ} 40' 6''$ east of Greenwich) where there was an ancient observatory. To combine the central latitude and the central longitude, they imagined an island called Lankā in the Indian Ocean, situated on the equator and having the same longitude as Ujjain. This Lankā is, of course, not Ceylon.

21. The civil day (with its multiple, the week) is the one measure of time that is common to European and Indian reckoning, everything else (year, month, ghaṭikas, palas, hours, minutes, seconds) being different in the two systems. Accordingly, the civil day and decimals of a day have been adopted throughout the present work for expressing all manner of Indian dates as well as for working out

* For the verification of an eclipse without a week-day when the positions of five planets are recorded, see Chapter V, section ii, paragraphs 247 to 271 below.

ending moments of *tithis*, etc., and also for verifying the correspondence of English and Indian dates. Any decimal of a day can be converted readily into Indian *ghaṭikas* and *palas* (Tamil, *nāligais* and *vināḍis*) or English hours, minutes, and seconds by means of the Eye-table **r** or Table VI or the book-marker inserted in each volume of the Ephemeris. To assist the reader in very exact computation, the fractions expressing minutes have been carried far enough in Table VI to show the recurring places. If, for instance, we wish to know how many hours, minutes, and seconds are equivalent to $\cdot 40490$ of a day, we turn to Table VI and find that $\cdot 40486$ of a day is equal to 9 hours 43 minutes. The remainder of the decimal fraction is $\cdot 00004$ which, the same table informs us, is between 3 and 5 seconds. So the answer is 9 hours 43 minutes 4 seconds. The same decimal fraction is equivalent in Indian time (as we may see from Table VI) to 24 *ghaṭikas*, 18 *palas*.

SECTION IX.—*Mean and actual moment of phenomena.*

22. The most ordinary problem in the Indian calendar is, to determine when a particular astronomical phenomenon was completed, e.g., an elongation of the moon from the sun measured in arcs of 12 degrees each and shortly called a *tithi*; the reaching of a longitude of so many degrees by the moon, called a *nakshatra*; the completion of so many degrees of longitude by the sun and moon, supposed to travel in opposite directions, called a *yoga*; or the actual completion of so many degrees by the sun, called a *sankrānti*, when the number of degrees is computed by *rāsīs*, i.e., in multiples of 30 degrees. There is no *direct* means, known to ancient or modern astronomy, of computing these ending moments, as they are called, because at no two successive moments does any heavenly body move at the same rate or pace. Nevertheless the “anomalies,” as they are hence called, can be tabulated, because, taking long periods into consideration, the mean period of revolution of a heavenly body, e.g., the moon or any of the planets, is fairly, and for all practical purposes rigorously constant, and we have only to attach to each “anomaly” its own “equation,” or, variation from the mean. In other words, the answer to the question, what is the actual position of a heavenly body at any moment?—is furnished by the algebraical sum of the *mean position* and the *equation*, corresponding to the *anomaly* at that moment. It will be seen, however, from what follows that the Indian calendar aims at determining more than this: it requires not only the phase or phenomenon completed at a given moment, for which purpose we would have to add merely the mean phase of a moment *plus* the *equation* of the *anomaly* at that moment, but it requires the *ending moment of every phase*, for which purpose the ordinary anomaly tables have to be manipulated in a particular way. The exact method how this is done will be explained later (paragraphs 195, 196, p. 76), but it was thought as well to draw attention to this peculiarity of procedure in computing the details of the Indian calendar.

SECTION X.—*Explanation of headings and columns in the ephemeris.*

23. *Method of verification and abbreviations.*—The chief abbreviations used in the ephemeris are (1) the indication of ending moments of *tithis* and *nakshatras* as decimals of a day, instead of by *ghaṭikas* and *palas*, or hours and minutes; (2) the substitution of numbers for names of *nakshatras*. A key to the latter set of abbreviations will be found at the bottom of each page, while a key to the former has been inserted in each copy of the work as a detachable book-marker as well as on the inner side of the cover. For the rest, all the Indian and Muhammadan details corresponding to an English date are given *in its immediate neighbourhood*. Thus in the twenty days commencing with Tuesday 12th December A.D. 836 and ending with Sunday 31st December, there are several changes of Hindu and Muhammadan months, there is one day without its own *tithi*, one day without its own *nakshatra*, and one day with two *tithis*. All these changes and facts are visible at a glance without having to be gleaned with much trouble, from the top, bottom and sides of the page, as in an ordinary Indian *pañchāṅga*. Thus on Tuesday 2nd December A.D. 836, it is clearly indicated that it was the 20th day of *Dhanu* or *Mārgaṣīrṣa* month of Anala year, and *bahula pañcadaśī* or *amavāsya* of Lunar *Mārgaṣīrṣa* ending at $\cdot 12$ ($= 7$ *ghaṭikas* or 3 hours after mean sunrise),

a day of nakshatra "Purva Āshāḍha" (No. 20) ending at 58 of day (= 35 ghaṭikas, or 14 hours after mean sunrise), and lastly the 28th day of *Zi-l-hijja* month of Hijra 221. It is equally clear that Friday 22nd December was the first day of *Makara* or *Tai* month of the same year *Anala*. The change from the last day of Hijra 221 to the first day of Hijra 222 on Thursday 14th December A.D. 836 is marked with equal clearness.

24. *Cyclic and other years.*—The headings at the top of each page comprise (1) the symbols for solar and lunar eclipse and the abbreviations for *Amāvāsyā* and *Purnimā*, (2) the numbers of years in the different eras, (3) the names of samvatsaras or cyclic years in Northern and Southern India, and (4) the commencement of the Indian year according to *Sūrya* and *Ārya siddhāntas*, according to the *Kollam* year, and according to *Hijra*. The *Kollam* year is a current one, like the A.D. year, while all the other Hindu years, Śaka, Vikrama, Bengal san and Kaliyuga, are expired years. It should be noted that the Kaliyuga years quoted in the ordinary South Indian pañchāngas are current and will be found to exceed in each case the Kaliyuga year marked in this book by one. A similar remark applies to Bengal san. The names of solar samvatsaras, *Prabhava*, *Vibhava*, etc., are quoted not only at the top of each page, but above the name of each Tamil month. Thus it has been possible to give in this book, for each English date, the Tamil (or Malayālam), Telugu (or Kanarese) and Muhammadan equivalents with as much fulness as in the ordinary pocket diaries. For example, against Tuesday 21st March A.D. 836, one may read off in this book, as in a pocket diary, "*Anala Samvat, Chittirai 1*" or "*Metam 1*," "*Anala Samvat Adhika Chaitra Bahula Panchadaśī*, Nakshatra Revati, and Hijra 221 Rabi-ul-awwal 28."

25. *Solar and lunar reckonings.*—The various calendar systems in use in India may be divided into two main groups as shown in this book, namely, the solar reckoning, comprising the English, Tamil, Malayālam, Oriya and Bengali reckonings; and the lunar reckoning, used all over India, and including the Muhammadan and Jewish reckonings. The Indian calendar is sometimes styled luni-solar, because its lunar months and years cannot recede by more than 29 days from the corresponding solar months and years, whereas the Muhammadan or Hijra year recedes by 10 or 11 days every year and will therefore be found to commence in all months of the Indian and English years.

26. *Column headed "Month and day."*—Solar months in India are generally named in Sanskrit after the rāśis or signs of the zodiac, "Mesha," "Rishabha," etc., but in Tamil they are also known by another set of names, more or less modified from names of nakshatras or lunar months, namely, "Chittirai," "Vaikāśi," etc. Both sets of names, "Mēsha-Chittirai," "Rishabha-Vaikāśi," "Mithuna-Āni," etc., are quoted in this column. The days of the solar month are reckoned according to an ancient Tamil practice, from the sankrānti of the *Ārya siddhānta*. The rules for determining the commencement of the solar month, according to the Tamil, Malayālam, Oriya and Bengali systems, with examples, have been given in paragraph 12 *supra*. A difference of a whole day or of two days would ordinarily be found between Tamil days of solar months and the corresponding Bengali days.

27. The number of days in a Tamil month is not the same every year. Thus Chittirai has ordinarily 31 days, but may occasionally have 30. The fact, alluded to by the ancient commentator of *Śilapadikāram*, that Chittirai, in the year when the events described in that poem occurred, had only 30 * days, and commenced on a Sunday, a day of "Svāti" nakshatra, enables us, although the commentator has omitted to mention the year, to infer that the year in question was A.D. 756 and no other. Days of the solar month are now commonly quoted in the Tamil country, but we do not meet them before the beginning of the eighth century A.D. We learn from the ancient Tamil poem *Tolkāppiyam* that a day at that epoch was ordinarily called, as it still frequently is, after its nakshatra. The practice of calling days by their tithi numbers apparently came into use at a subsequent date in the Tamil country, though elsewhere in India the calling of a

* In volume I of this *Ephemeris*, the Chittirai month of the year A.D. 756 is shown as having had the full 31 days; but the author has shown elsewhere (vide Paper III in the Appendix) that according to the system then current it was quite possible for Chittirai to have had only 30 days.

day by its tithi number is an ancient, in fact, a Vedic practice. Week-days do not seem to have been in common use in the Tamil country much before the beginning of the eighth century A.D. Elsewhere in India, week-days have been traced to the fifth century A.D., but not much beyond. It is a curious circumstance, and one deserving of careful study, that a date in India, one thousand and four-hundred years ago was known by the same week-day as the corresponding day in Europe.

28. *Nakshatras and tithis*.—Every Hindu feast, fast and festival (except *saukrāntis*) is connected with either a tithi or a nakshatra or both (Chapter III, Section xix, pp. 55–69). A mean tithi extends over .98 of a day, while a mean nakshatra extends over 1.01 days; but the solar and lunar anomalies may make a tithi longer or shorter by .58 of a day as a maximum, while the lunar anomaly may similarly affect a nakshatra to the extent of .38 of a day. Hence the irregular lengths, in time, of tithis and nakshatras, which make the Indian system so complicated in appearance, but which constitute at the same time a most valuable check in chronological studies. Hence also the curious fact that what ought to be a normal state of things, namely, each day having a single tithi and a single nakshatra, is very seldom noticed on the successive days of a whole month. Such a phenomenon occurred throughout the month of Vaisākha, Wednesday 26th March to Friday 25th April A.D. 822 and again, throughout the month of Phālguna, Saturday 26th February to Monday 28th March A.D. 830. The curious reader may pursue the game with the help of this book. It follows from what has just been stated that in the course of a lunar month 2 tithis or 2 nakshatras may ordinarily be found either to occur on the same day or to cover parts of 3 days, the middle day in the latter case being without a tithi, or without a nakshatra of its own. Cases of the same day having two tithis as well as two nakshatras, as on *Kārttika*, *bahula* 11 and 12 (Wednesday 30th October A.D. 709), and other cases (e.g., Saturday 27th June A.D. 705) in which a day had neither a tithi nor a nakshatra of its own can be easily traced with the aid of this work.

29. In this connexion reference may be made to the hallucination that a lunar fortnight with only 13 days does not occur except once in a 1,000 years. In the *Mahābhārata* (*Bhīṣma parva*, 3, 32) it is recounted by Vyāsa in the course of his conversation with Dhṛitarāṣṭra that he has known of lunar fortnights consisting of 14, 15 or 16 days, but never of one consisting of 13 days, but that since such a one is in prospect or has occurred, there will be a great slaughter of human beings. Other Śāstras, quoted by Dr. Fleet in *Indian Antiquary*, Vol. XVI, for March 1887, reiterate this omen, and it is stated in one of the quotations (commentary on the *Mukūrta Gaṇapati*) that the phenomenon occurs only once in 1,000 years. If this was the case, it would be at least a remarkable coincidence that the recent great European War (A.D. 1914–1918) should have broken out absolutely at the middle of a fortnight consisting of 13 days. The fortnight from *sukla pratipad*, Friday 24th July, to *pūrṇimā*, Tuesday 4th August A.D. 1914, as will be seen from the “Ephemeris A.D. 1800—A.D. 2000,” comprised only 13 days from *pratipad* to *panchadaśī* owing to the occurrence twice, i.e., on the first and on the last day of the paksha, of two tithis on a single day. But it is not true that the phenomenon takes place only once in a thousand years. In the absence of a compilation like this Ephemeris, it might be difficult to check the statement, but anybody can satisfy himself from this Ephemeris that the phenomenon occurred in 1805, 1813, 1830, 1847, 1849 (after 36 years as in the *Mahābhārata*, *Mausala parva*, 11, 18, and with *grasthodaya* and *grasthāsthama* also as in the *Mahābhārata*), 1861, 1864, 1872, 1878, 1880, 1892, 1900, 1903, 1914, 1917, 1920 and will occur in 1928, 1931, etc. Such instances will be found also in the earlier parts of the present work, see for example the years 702, 705, 719, 724, 741, 744, 752, 755, 758, 772 and 775. Comment is needless after noting so many recurrences. The occurrence of such a fortnight in July 1914 was known in January 1914 when the new year’s panchāngas were published; nevertheless, no one then predicted that a great war was coming on in July: the “prediction” came after the event.

30. *Adhika and Kshaya months*.—Occasionally, that is seven times in 19 years, a lunar month is repeated twice in the course of the same year. For

instance, in one year A.D. 836 there are two Chaitras, one reckoned from Monday 21st February to Tuesday 21st March, and the other from Wednesday 22nd March to Wednesday 19th April. The first month in such cases has the prefix *adhika* (= additional), and the second the prefix *nija* (= proper). Both prefixes are duly and clearly marked in the Ephemeris. More rarely also, a lunar month is suppressed altogether, and in such cases is known as *kshaya* (= suppressed). Thus in A.D. 770, the month *Pausha*, which ought to have occurred in December-January, was suppressed. The omission of a *kshaya* month is noted by N.B. at the foot of the page where required. The rules for determining the date of occurrence of additional and suppressed months are clearly given in paragraphs 89 to 91 below.

81. *Nakshatras and ending moments of nakshatras.**—A complete list of Indian nakshatras, with the corresponding fixed stars, as identified by different authorities, is given in Chapter III, paragraph 101. The practice of reckoning time by nakshatras is peculiar to India and China, and has existed in each of these countries from very ancient times. In India, in Vedic times, a lunar month had no other name than that of the nakshatra in which the moon of that month became full. To this day, *Chaitra* is the month in which the moon becomes full when occupying “Chitrā” nakshatra, and so on for the other months. The concurrence of certain tithis with certain nakshatras is thus fixed within narrow limits for every month in the year, and the student of inscriptions should be familiar with the table of concurrence (see the *Eye-table*, section s, pp. 140, 146, 152 below.)

32. *Note on broken periods.*—It is very important that the reader, dealing with the Indian or any other calendar, should know thoroughly how to reckon broken periods. It is generally a question of addition or subtraction, but unless one goes through the process with reflection, there is always a danger of adding or subtracting 1 too much.

To take the simplest case, how many days are there from Friday in one week to Tuesday in the next? Most people would use their fingers in such a case and answer “4” or “5” according as they began the reckoning with Friday or with Saturday. Now, such uncertainty is fatal to exact reckoning, and we should therefore follow certain rules whereby we may avoid all uncertainty.

First of all, we should note that such a question is intelligible only with reference to the *next subdivision of the broken period*: that is, in this case the meaning of the question is, how many days are there from a particular hour on Friday to the same hour on Tuesday. This makes the answer quite certain. From 6 a.m. on Friday to 6 a.m. on Tuesday following, there are 4 days: and the proper way to answer the question is to convert Friday and Tuesday into week-day figures 6 and 3, and to add a whole period (7) to 3 before deducting 6. Thus $7+3=10$; from 10 take 6, and we have the answer, 4 days. Some exercise is necessary in order to do even these simple week-day problems correctly.

The rule about *adding a whole period* when we have to reckon from a fraction of one period to a fraction of the next is very important. How many days are there from 23rd October in one year to 15th March in the next, the second being a leap year? If we refer to the *Eye-table q* we shall find that 23rd October is the 206th day from 1st April; and 15th March (where we have had to pass 29th February) is the 350th day. Deduct 206 from 350. Answer, 144 days.

To take another case, suppose we are required to deduct the longitude of Jupiter from the longitude of the sun, it being given that the former is 300 degrees and the latter 29 degrees. To answer this question we must first add 360 degrees (the whole period in this case) to 29, and then from the total 389 subtract 300; answer, 89 degrees.

If the 1st of a Tamil month be the 15th July, what will be the 7th of the Tamil month? In such cases we must *make the same addition to or the same deduction from the one side as we make in regard to the other*. In the example before us, the addition to be made is 6, and the answer, 21st July.

If the 1st of Tamil month be the 15th July, what will be the 29th of the Tamil month? We add 28 to each side. Therefore the answer is $15+28=43$ rd July, from which we deduct the whole of the completed period (July =) 31 days. Final answer, 43 minus 31 = 12th August.

* The Nakshatras were primarily certain constellations serving as permanent land marks in the ecliptic but in later Indian Astronomy they have come to mean certain fixed measures of space (generally $13\frac{1}{2}$ degrees) in the ecliptic.

CHAPTER II.—EXPOSITION OF THE EYE-TABLES.

THE WHOLE SYSTEM OF COMPUTATION EXPOUNDED BY MEANS OF THE EYE-TABLE.

33. The student desirous of acquiring the ability to compute with exactitude any tithi, nakshatra, yoga or vāra will find *all* the material necessary for him in the Eye-table of the particular siddhānta which he wishes to study, whether Sūrya, first Ārya, Brahma, or Śirōmani. The first six pages of each Eye-table 153 to 170, contain all that is necessary for obtaining any of these results correct to two places of decimals, while pages 171 to 194 give expanded tables of equations which will enable the student to obtain results correct to four places of decimals, viz., down to *palas* in the Indian scale of time; illustrative examples are also prefixed to each Eye-table. For the reason stated in paragraph 198 below, no separate Eye-table is necessary for the second Ārya siddhānta.

34. It will be seen that each Eye-table is divided into 26 parts, **a** to **z**, lettered serially in the margin of the table (**z**, however, stands first, as explained below, for a mnemonical reason), and the following explanation adheres to this order. To facilitate reference, a loose copy of the principal Eye-table, that of the Sūrya siddhānta is supplied with this work.

EYE-TABLE, SECTION **Z**.—*The signs of the zodiac.*

35. This section which is placed at the head of each Eye-table does not contain any calculated tabular matter, and is styled **z** firstly, to arrest attention, and secondly, because it refers to signs of the *zodiac*.

36. *Order of signs of zodiac or rāsīs and longitude of commencement of each sign or rāśi.*—The twelve signs of the zodiac or *rāsīs*, whose names are preserved in the Malayalam names of months, were borrowed by the Hindus from a western source, Chaldean or Greek, as is apparent from the procedure of Varāhamihira who names each sign first in Greek (Kriya, Tauro, Jimuthro, Kankri, etc.), and then in Sanskrit (Mesha, Rishabha, etc.). The longitudes of the *rāsīs* are reckoned in Indian astronomy from a fixed point in the heavens, generally identified as **z** *Zēta Piscium*, whereas in European astronomy, the 0° point of longitude is reckoned from the meeting point (which is liable to variation from year to year) of the celestial equator and the ecliptic. In European astronomy this meeting point is conventionally called the first point of Aries, but it is not now in the *constellation* Aries, because every year, owing to the precession of equinoxes, the first point of Aries moves back 50 seconds of an arc along the ecliptic. About A.D. 532 the first point of Aries of European astronomy was identical with the 0° longitude of Indian astronomy, but since then, the former has receded every year, till now there is a difference of 23° between the first point of Aries (European astronomy) and the 0° longitude of Indian astronomy, *vide* paragraph 229 below. For his present purposes, the student need not trouble himself with the difference between the two reckonings of celestial longitude, but he will understand that when, for instance, the planet Jupiter is said to be 15° in *Kanyā*, the meaning is that the longitude of Jupiter is 150° + 15°, or 165°.

37. The Eye-table shows how the solar months receive different names in Bengal, in the Tamil country, and in Malabar, which are the principal tracts of the country (other than Orissa) where solar months are, or have been, ordinarily used.

EYE-TABLE, SECTION **a**.—*Moment of sankrānti in days of solar year and decimals of a day.*

38. The moment when the sun enters a *rāśi*, i.e., when his longitude is 0°, 30°, 60°, etc., is called a *sankrānti*, an epoch with which Hindu festivals are often associated. The first sankrānti or Mēsha sankrānti is the most important of all, being the beginning of the Indian solar year. In the European calendar

the year begins at midnight between the 31st December and the 1st January, and each month has a fixed number of days, 31 or 30 or 29 or 28 as the case may be. The Indian solar year may begin at any moment of the day. This moment, to five places of decimals, is given for each century year in section **k** of each Eye-table and it is given for every A.D. year in Table II, pp. 184 to 263. In the same manner each month may begin at any moment of the day and the duration of a month cannot be expressed as a whole number of days, but can only be stated as so many days and a fraction, which is given in section **a** of the Eye-table. Nor is this all. The actual duration of a month under each siddhānta varies, theoretically, according to the epoch: for instance the duration of Mesha month was not the same under the Sūrya siddhānta in A.D. 500 as it is now. For each epoch the duration has to be calculated according to a method which is explained in Chapter IV below, page 83. Still the variation, even over a period of 2,000 years, is not very material and we generally apply to the whole period the durations of months calculated for a particular epoch. The durations of months given in the Sūrya siddhānta Eye-table were calculated by the late Sankara Balakrishna Dikshit for the epoch A.D. 1137 and have been verified by the present writer for A.D. 1165 as shown in Chapter IV, paragraph 201. The durations of the months according to Brahma siddhānta are different from those according to Siddhānta Śirōmani, because the sōdhyas in the two siddhāntas are different.

EYE-TABLE, SECTION **a**—*continued*. *English date corresponding to each sankrānti*
A.D. 1900.

39. Under this heading the Eye-table gives the correspondence of the sankrāntis, according to each siddhānta, to the days of English months. Thus it is stated in the Eye-table that the Mēsha sankrānti in the year 1900 A.D. corresponded, according to the Brahma siddhānta and the Siddhānta Śirōmani, to April 11, and according to the Sūrya siddhānta and the Ārya siddhānta to April 12. Similar differences will be found between the two sets of siddhāntas in the remaining months of the year 1900. If the reader runs his eye down column **k** in the Eye-table, he will find that, whereas in A.D. 400 the Mēsha sankrānti, or commencement of the Indian solar year, according to the Brahma siddhānta as well as the Siddhānta Śirōmani, fell on March 16, the same sankrānti in the year 1700 A.D., even before the application of the Gregorian reform of the calendar began to affect the variations between the Indian and the European calendar, fell on March 27, a difference of 11 days for 1,300 years. This is a result of the Indian calendar being regulated, not by the tropical year, like the European calendar, but by the sidereal year. The exact equivalent in English month and day, of any particular sankrānti according to any particular siddhānta can be calculated in the least possible time by means of the Eye-table, as shown in the illustrative examples, but the present intimation in Section **a** of the Eye-table is merely intended to show how in practice the beginnings of Indian solar months run in relation to the beginnings of European calendar months.

EYE-TABLE, SECTION **a**—*continued*. *Lunar month; each month commences before the*
sankrānti noted in next column.

40. This line of the Eye-table gives the names of the 12 lunar months, Chaitra, Vaiśākha, Jyēsthā, etc. Except in Southern India and in Bengal, the ordinary civil reckoning over the whole of the Indian continent is by lunar months; and even in the excepted provinces, the calculation of days according to the lunar month has to be made much more often than the reckoning according to solar months. To understand the lunar reckoning in all its details is to understand in its entirety the Indian calendar system. Not very much by way of a detailed explanation of the lunar month can be attempted in this place, but it is necessary to note one or two points that are indispensable to a proper understanding of the subject at this stage. The first point is, that in the ordinary scheme of 12 solar and 12 lunar months in a year, each lunar month is regarded as commencing before the date on which a particular solar month begins and receives

its name from that circumstance. For instance, the lunar month called Chaitra must occur within 29·53 days before the Mēsha sankrānti, or the commencement of Mēsha solar month; the lunar month Vaiśākha must occur within the same interval of 29·53 days before the Rishabha sankrānti, or commencement of the Rishabha solar month: and passing to a later month, the 7th lunar month Kārttika must occur within an interval of 29·53 days before the Vriśchika sankrānti, or commencement of the Vriśchika solar month. Now the ordinary interval between any solar sankrānti and the next is 30 or 31 days as in the European calendar, but the ordinary interval between the commencement of a lunar month and the commencement of the next lunar month is only 29·53 days; so that it must sometimes happen that more than one lunar month commences in the interval between two solar sankrāntis or, which is the same thing, between the commencements of two solar months. Following the principle first laid down, in the words italicized above, both the lunar months occurring in such a case in the interval between two solar sankrāntis receive the same name, the first being called *adhika* or intercalary, and the second *nija*, or true. Intercalary lunar months are to be found in many calendars other than the Indian, but the Indian calendar has for many centuries rigorously enforced the principle stated above in determining the naming of intercalary or *adhika* lunar months. As an *adhika* lunar month is of frequent occurrence, seven such months being due in the course of 19 years, it follows that the solar month, which is ordinarily an item neglected in civil reckoning over the greater part of India, is nevertheless indispensable in order to ascertain whether there will be an *adhika* month in a particular year. And since the intervals between the same solar months are not the same according to the different siddhāntas, it also follows that when there is an *adhika* month according to one siddhānta, there may not be an *adhika* month under another siddhānta. In the list of lunar months furnished in the section of the Eye-table now under consideration, No. 13 Chaitra is shown as a recurring month, but this is simply given as an example and, in practice, any lunar month may in turn be an *adhika* or intercalated month.

EYE-TABLE, SECTION **b**.—*Increase in days (1) of lunar month, and (2) of sun's anomaly.*

41. This line of the Eye-table merely gives multiples from 1 to 13 of 29·5306 days for each lunar month. The use of this line will be understood when we come to calculate the sun's anomaly at a particular moment (paragraph 54, page 17 below).

EYE-TABLE, SECTION **c**.—*Increase of moon's anomaly when the interval between Mēsha sankrānti and the first new moon in the solar year is 0·00 day.*

42. The length of the synodical month, or the interval between one new moon and the next is 29·5306 days, whereas the length of the moon's anomalistic month or the month which determines the irregularities in the moon's motions, is 27 5546 days. The difference between these two periods is 1·976 days and this difference increases from month to month. The moon's anomaly at the commencement of each solar year is obtained by adding the quantities in sections **m** and **p** of the Eye-table. This anomaly is then increased by the interval between the commencement of the solar year and the first new moon in the solar year, for which purpose we add the quantities in sections **l** and **o** in the Eye-table as shown in the illustrative examples. We have now got to the moon's anomaly at the first new moon in a solar year. If to this quantity we add one of the quantities in section **c** of the Eye-table, we get the moon's anomaly at the commencement of the various lunar months in a given year. Section **c** of the Eye-table is, therefore, an important datum for calculating the lunar anomaly, and we shall duly make use of it for that purpose later on page 17.

EYE-TABLE, SECTION **d**.—*Tithi equivalent in days.*

43. In the Indian calendar system the days are ordinarily reckoned, not from midnight to midnight as in the European calendar, but from sunrise to sunrise;

and further, the lunar month of 29·53 days is divided into 30 tithis, so that each tithi is not exactly one day, but ·9843 of a day. A tithi may end at any part of a day and in theory, in order to know what is the tithi at any moment of the day, it is necessary also to know what tithi came to an end that day and when it came to an end, and what tithi is running at the moment in question. In practice, however, and for most purposes of civil reckoning, the tithi for a day is fixed by that tithi which was current at sunrise of that day and no account is taken of any other tithi that may commence during the day, except for astrological purposes. But the complications connected with tithis do not end here. It has already been observed that the Indian calendar takes account not only of mean periods of time which, properly speaking, should be the sole basis of civil reckoning and which, in all probability, did exclusively govern the Indian calendar in ancient times, but also of the *actual* ending moment of a tithi, a month, a year and so on. This minute concern about actual ending moments is peculiar to the Indian calendar and necessitates constant reference to a panchānga or Ephemeris in which the ending moments have been previously calculated.

44. The ending moment of a tithi is the moment at which the moon is removed from the sun by an exact multiple of 12 degrees. The moment when the moon is exactly 12 degrees distant from the sun, called in European astronomy an elongation of 12 degrees, is the ending moment of the first tithi; similarly the second tithi ends when the moon is exactly 24 degrees from the sun, and full moon is the moment when the moon is 180 degrees from the sun, i.e., when it is exactly opposite to the sun in the heavens. The determination of the moment when the moon is in each of these several positions is a tedious astronomical process which, in modern astronomy, can be accomplished only by means of a nautical almanac; nautical almanacs are in fact being used extensively by Indian panchāngam-makers of the present day who follow the so-called Drig-ganita system which, however, is no system at all of *Indian* astronomy, but is a conventional name for a system based on a European or American nautical almanac. The exact *modern* astronomical process for determining a tithi would require the employment of quite a large number of equations, some of them very minute and very complicated in character; but the Indian calendar has for a long time used for the determination of tithis only two equations, viz., one depending on the moon's anomaly and the other on the sun's anomaly. Both these equations are also used for yogas, and one of them, the moon's equation, is used for nakshatras. Similar equations, called the annual parallax and the anomalistic equation, are used to determine the exact position of planets in Indian astronomy (Table IV).

EYE-TABLE, SECTIONS e, f, g.—*Moon's equation of the centre and moon's anomaly in days and decimals of a day.*

45. In these portions of the Eye-table we are confronted directly with the equations of the moon last mentioned. These equations are expressed to two decimal places from ·00 to ·41 in the case of tithis; from ·00 to ·38 in the case of nakshatras; and from ·00 to ·35 in the case of yogas. If these equations were carried to four places of decimals, as they must be when we wish to ascertain the ending moments of tithis, nakshatras and yogas in palas as well as ghatikas, we would need much more extended tables, which are given in a later portion of the Eye-table (pages 171 to 194 below). For practical purposes, even of accurate calculation, in Indian epigraphy and in Indian history, we do not need to use more than two places of decimals of a day, and that is why the Ephemeris gives the ending moments of tithis and nakshatras to two decimal places.

46. In order to know what equation to apply towards the determination of the ending moment of a particular tithi, nakshatra, or yoga, we must know the anomaly of the moon at that moment. The anomaly of the moon is first of all given for the commencement of each solar year (vide sections **m** and **p** of the Eye-table) and to this quantity we add the successive periods of time which will bring us to any given moment in the year for which we wish to know the tithi, nakshatra, or yoga. In other methods for the verification of the Indian calendar, it is usual to express the anomaly of the moon or of the sun as so

many degrees from perigee or apogee. In order to simplify calculation, however, **all anomalies** are expressed in the present work in days and fractions of a day 360 degrees being equal to one anomalistic month of 27·5545 days in the case of the moon, and one anomalistic year of 365·26 days in the case of the sun. The reckoning of the anomalies in the present work is always from perigee. The anomaly of the moon at any given moment having been ascertained in days, we have to find from sections **e, f** or **g**, of the Eye-table the corresponding equation, with its appropriate sign, and apply it according to the rules given in the illustrative examples.

EYE-TABLE, SECTIONS **h, i**.—*Sun's equation of the centre and sun's anomaly in days of the solar year, for tithis and yogas.*

47. For tithis and for yogas we require the sun's equation as well as the moon's, and sections **h** and **i** of the Eye-table give us these equations. As the sun's equation does not vary, except in the third place of decimals, for a whole day, the anomalies at pages 154, 160, 166 are given generally in whole days of the year, except where the equation is at a minimum or at a maximum, in which case the exact fraction of the day for which the minimum or maximum is appropriate is also indicated. In the extended anomaly and equation tables which are printed at pages 177, 178, 185, 186, 193 and 194 below, sun's anomalies are given to two places of decimals of a day, and sun's equations to four places of decimals of a day.

48. The 0 day of the sun's anomaly is properly speaking the day and moment of the day in a year when the sun is at perigee exactly (Special Sun-Table I, page 78 below, cols. 6, 12 and 18). Now the sun's anomalistic position on any given day of the year is practically the same, whatever year may be under consideration, and therefore, the sun's equation tables in the present work merely give for each day of the solar year the corresponding equation, viz., the equation of the anomaly corresponding to the day. In the Ārya siddhānta this assumption is quite correct; in the Sūrya siddhānta it is very nearly correct; but in the Brahma siddhānta and the Siddhānta Śirōmaṇi, while the table of anomalies and equations is the same, a correction in the number of days of the sun's anomaly has occasionally to be made, as indicated in the illustrative examples under the Siddhānta Śirōmaṇi Eye-table. The explanation of these variations belongs properly to a more advanced portion of the present work. (See Chapter IV, paragraphs 189 to 191, page 75 below.)

EYE-TABLE, SECTION **j**.—*Perpetual week-day almanac for the European calendar.*

49. The week-day is the meeting ground of the Indian and European calendars, and whatever date we may be engaged in investigating, it is generally useful, and almost invariably indispensable, to know what was the week-day of that date. This information has to be found as quickly as possible, but at the same time accurately. The Indian method for ascertaining the week-day is the primitive one of dividing by 7 the ahargana or number of days which have elapsed since 0 Kaliyuga. Many good methods have been designed and published in modern times for ascertaining week-days, and Eye-table **j** has been selected as being the best of them. It consists in the addition of four figures, viz. (1) a constant for the century, (2) a constant for the odd years in a century, (3) a constant for the month, and (4) the day of the month. The example given in section **j** of the Eye-table, viz., "Find the week-day of 26th January 1844" will illustrate the ordinary use of this perpetual almanac for A.D. years. For a B.C. year, e.g., the 15th of March 44 B.C., since B.C. years are reckoned backwards, we must first of all turn the B.C. year into the forward year of a particular century. In this case 44 B.C. is the 57th year of the century beginning with 101 B.C. [Centuries B.C. always begin with 101, 201, 301, etc., and not with 100, 200, 300, etc.] Then we proceed to find the constant for the century 101 B.C. which is 0 and add the constant for the year 57, for March, and lastly 15, i.e., $1 + 2 + 15 = 18$. This, divided by 7, leaves as remainder 4, so that we know that the week-day of 15th March 44 B.C. was a Wednesday.

50. An important warning has, however, to be given in regard to week-days in B.C. years. So far as is at present known, the only people who observed week-days in B.C. years were (1) the Assyrians, Babylonians and Egyptians whose week-days do not, however, figure in any known history, (2) the Chaldeans who practised astrology in the Grecian and Roman States and (3) the Jews who appear at a very early time to have borrowed the week-day reckoning from the Chaldean peoples with whom they were associated. The Romans and Greeks, throughout the period of the classical literature which has come down to us, do not seem to have had any practical knowledge of the week-day, except that they knew that the Sabbath or seventh day of the week was a day of rest among the Jews. One solitary* reference to a planetary week-day, and that by the Latin poet Tibullus who was a student of astrology, is all the evidence that occurs in any context showing that the Romans of the first century A.D. possessed an acquaintance with week-days. The Romans as a rule observed the *nundinae* or every 9th day as a market day, and their month was divided into three unequal portions by the Kalends, Nones and Ides. At what epoch the Hindus became acquainted with the week-day is an interesting but obscure point; but since it came to them from a Graeco-Roman source, during Christian times, and subsequent to Ptolemy's date (middle of second century A.D.), as we know from Indian inscriptions and other early references to the week-day in Indian literature, and also from the very few week-days which have come to light in Indian inscriptions and records between the fifth and eighth centuries A.D., we may presume that the week-day was not in common use in India before the eighth century A.D. and not at all in use before the fifth century A.D. In the rather keen controversy on this subject, which is one of constant recurrence in Indian journals and newspapers, it is of importance to bear in mind that, while the original planetary week-day was an instrument of Chaldean astrology and as such known to Greek and Roman students of astrology in the century preceding the Christian era, the practical use of the week-day for civil reckoning was probably due to the exigencies of early Christian usage, which found in the week-day a convenient means of naming several important days in the Christian liturgical year, such as Holy Thursday, Good Friday, Holy Saturday and Easter Sunday. The earliest references to the week-day, as an item of civil reckoning, are, in fact, to be found in a well-known passage of the Christian Apologist and Martyr, St. Justin, in the first quarter of the second century A.D. We next find the week-day mentioned, as an institution currently familiar, but of recent origin, by Dio Cassius, a Greek historian of the early Roman Empire, about A.D. 225. Dio Cassius also gives an explanation of the order of week-days, which is identical with the explanation given by the Indian astronomer Varāhamihira. By the time of Constantine the Great (beginning of the fourth century A.D.) we find the week-day in common use in the Roman Empire for describing Christian feasts and festivals. This was precisely the epoch at which the Guptas were in power in India, the epoch at which Greek ideas of astronomy, mathematics and medicine flowed freely into India, and the epoch probably at which the week-day began for the first time to make its appearance in India. Between the time, however, of the first appearance of an idea like that of the week-day in any country and its coming into general use, there was bound to be a fairly long interval of possibly two or three centuries; and we may note that so late as the tenth and eleventh centuries A.D., inscriptions in Ceylon are still wanting in week-days. The practical conclusion to be drawn from these various data is that it is vain to look for an allusion to a week-day in any literature, Eastern or Western, in any century B.C. and that any alleged find of such an allusion must be examined very critically. It is characteristic that the very first reference in any history, sacred or profane, in which the week-day

* Dr. J. N. Farquhar Editor of the "Religious Life of India" and other series, has drawn the author's attention to a *graffito* or writing on a wall discovered in the remains of Pompeii (which was buried on 24th August A.D. 79 by a volcanic eruption), and quoted in Schiaparelli's *Astronomy in the Old Testament* (1905), p. 186. The *graffito* is supposed to have been the work of a Roman slave and consists of six lines scratched in the following order: *Saturni, Solis, Lunae, Martis, Jovis, Veneris*, each line consisting of the name of a week-day in Latin. The omission of [Dies] *Mercurii* (Wednesday) in this enumeration is curious. The writer may have been one of the students of astrology who, as presumed in the text *supra*, were acquainted with week-days in the first century A.D. and he may have written down the week-days on a wall to assist his memory, and at the same time failed to recall one day. The discovery shows that week-days were known in the third quarter of the first century A.D., but it by no means proves that the week-day was then used as an item of civil reckoning of time. The place assigned to *Dies Saturni*, following the Chaldean order, is significant and points presumably to the astrological character of the *graffito*.

has played a part in chronological investigation, is in connexion with the exact date of the Last Supper and the Crucifixion of Christ. By means of the week-days, occurring in the Gospel narratives of the New Testament, we know that these events must have happened in one of three years, A.D. 29, A.D. 30, or A.D. 33, although it will always remain a disputed point in which of the three years these events happened. *Encycl. Brit.*, 11th edition, Art., “*Bible Chronology, New Testament.*”

51. A *Nota Bene* in section **j** of the Eye-table draws attention to the dates when the Old Style of reckoning ceased in the different parts of Europe, as well as to the date, 14th September 1752, when the New Style was adopted by Act of Parliament in the United Kingdom.

EYE-TABLE, SECTIONS **k, l, m, n, o, p**.

52 These sections of the Eye-table furnish three items of information which must form the first step in any Indian chronological reckoning according to the author's method. For any such reckoning we want to know (1) the exact moment when a solar year commenced, for which purpose we consult section **k**, adding to a figure in that section a quantity in section **n** when necessary; (2) the exact moment of the first new moon in the particular solar year with which we are concerned; this is given in section **l** of the Eye-table, to which we add, when necessary, a quantity in section **o**, deducting again, when necessary, once or twice 29·5306 days; (3) the moon's anomaly at the commencement of the solar year, as given in section **m**, to which a quantity from section **p** should be added for odd years in a century. In applying sections **m** and **p**, however, it should be remembered that the moon's anomaly, to be at all useful, must also be reckoned up to the first new moon in the solar year, for which purpose the quantities in sections **l, o, m** and **p** should be added together. Just as sections **k, l** and **m** give certain information for the first year in a century, sections **n, o** and **p** give the same information for all the odd years of a century.

A PRACTICAL ILLUSTRATION OF THE EYE-TABLE.

53. This is a convenient stage at which we may introduce a simple example illustrating the most usual processes of reckoning in the Indian calendar. The earliest example, so far as is now known, of a well-authenticated week-day in Indian inscriptions is the Eran Pillar Gupta Inscription, which quotes “Thursday” as the week-day of the “12th tithi in the bright half of the lunar month of Āshādha” in a year corresponding to A.D. 484. We shall now show how the Eye-table, studied thus far, enables us to calculate the exact English equivalent of this date and also to verify the fact that it was a Thursday. We make the calculation according to the Sūrya siddhānta Eye-table which in all probability was the siddhānta (in an early form) that was used in the actual reckoning recorded in the inscription. The reader will save himself a good deal of future trouble by carrying out carefully the processes indicated below. Section **k** of the Eye-table tells us that in A.D. 400 the solar year commenced on March 17·48569. Section **n** further shows that for 84 odd years of the century the fraction to be added for determining the commencement of the solar year is ·73554. We know, therefore, that in the year A.D. 484 the Indian solar year commenced, according to the Sūrya siddhānta, on March 17·48569 + ·73554 = March 18·22123. Similarly, sections **l** and **o** tell us that in the year A.D. 400 the first new moon in the solar year was removed from the commencement of the year by 23·84466 days; to which we add, from section **o**, the interval of the first new moon in the solar year corresponding to 84 years which is 0·54533 of a day. The two quantities being added, we infer that in A.D. 484 the interval between the commencement of the solar year and the first new moon in the same solar year was 23·84466 + 0·54533 = 24·38999 days. The same process, performed with the aid of sections **m** and **p**, informs us that in the year 484 A.D. the moon's anomaly at the commencement of the solar year was 21·75228 + 13·46585 = 45·21813 days. Consequently the moon's anomaly at the first new moon in the same solar year must have been 45·21813 + 24·38999 = 59·60812 days. Subtracting from this, two full anomalistic months (Eye-table **d**) 55·1092 days, we have, as the age of the moon's anomaly at the first new moon in the solar year A.D. 484, 4·499 days.

54. We have now to carry on these reckonings to the 12th tithi of Āshādha month, for which purpose we have to add (1) 59·0612 days according to section **b** of the Eye-table for Āshādha month, (2) 11·8122 days for the ending moment of the 12th tithi according to section **d** of the Eye-table, and (3) 3·952 days (section **c** of the Eye-table) *plus* 11·8122 days for the increase of the moon's anomaly from first new moon in the solar year to the 12th tithi in Āshādha month. The English equivalent of the date of the mean tithi we are in search of is given by March 18·22123 (the commencement of the Indian solar year A.D. 484-85—sections **k** and **n**) *plus* 24·38999 days (interval between commencement of solar year and first new moon in solar year—sections **l** and **o**) *plus* 70·8734 days (interval between first new moon in solar year and 12th tithi of bright half of Āshādha month—sections **b** and **d**) = March 113·4·46, which by section **q** of the Eye-table is equal to 4846 day on June 21 A.D. 484. The sun's anomaly at the ending moment of the mean tithi that we are in search of is given by 24·3899 days (interval between the commencement of the solar year and first new moon—columns **l** and **o**) *plus* 70·8734 days (interval between first new moon in solar year and end of 12th tithi of bright half of Āshādha month—section **y** or sections **b** and **d**) = 95·2633 days. According to the extended (four decimal places) sun's anomaly table in the Sūrya siddhanta Eye-table, section **h** (p. 177), the equation for a sun's anomaly of 95·26 days is —·0454 day. The moon's anomaly at the mean ending moment of the 12th tithi of the bright fortnight of Āshādha month is given by 4·199 days (the quantity already arrived at for the moon's anomaly at the first new moon in the solar year according to sections **l**, **m**, **o** and **p**), *plus* 15·764 days (the increase of moon's anomaly up to Āshādha śukla or bright fortnight, 12th tithi—columns **c** and **d** of Eye-table) = 20·263 days. Before using this moon's anomaly we have to add to it algebraically the sun's equation already arrived at for the day in question, viz., —·0454 day, and we obtain, as the net moon's anomaly for the given moment, 20·218 days. With this result we go into the moon's anomaly and equation table (four places of decimals) in the Sūrya siddhanta Eye-table, section **e** (p. 172), and find that the moon's equation for 20·218 days is +·4138 day. We now add algebraically the sun's and moon's equations obtained from the anomaly tables, viz., —·0454 day + ·4138 day, to the ending moment of the mean tithi in English time already arrived at, viz., March 113·4·46. The net result is March 113·4846 + ·4138 —·0454 = March 113·8530. We know from section **q** of the Eye-table that March 93 is equal to June 1, so that March 113 is equal to June 21. We know also from section **r** of the Eye-table that ·500 of a day is equal to 51 ghaṭikas and ·0030 of a day is equal to 11 palas; so that ·8530 of a day is equal to 51 ghaṭikas and 11 palas. According to section **j** of the Eye-table, the week-day of June 21, A.D. 484, is given by the formula $(2 + 0 + 3 + 21 \div 7)$ 26 ÷ 7; the remainder in this division being 5, we know that the week-day was the 5th day of the week, or Thursday. We conclude that the ending moment of the 12th tithi of the bright fortnight of lunar Āshādha month in the year A.D. 484-85, referred to in the Iran Pillar Inscription, was Thursday, 21st June A.D. 484, 51 ghaṭikas and 11 palas after mean sunrise. The week-day is found to be correct and we know the exact English month and date corresponding to the tithi in question. All these processes may be shortened a good deal when the student is familiar with the different portions of the Eye-table, but the example, thus given in detail, will satisfy him that it is possible, without any high mathematical powers, to arrive at the absolute ending moment of a tithi, correct to four places of decimals, with the aid of the Eye-table only. It may be noted, also, that the ending moment of this particular tithi, according to the different siddhāntas, has been worked out most carefully by an eminent Indian authority, the late Mr. Sankara Balakrishna Dikshit in the Introduction to Dr. J. F. Fleet's *Gupta Inscriptions* (p. 157), and the result above arrived at is exactly that reached by Mr. Dikshit at the end of a much longer process which he has only partially indicated, whereas by the present method the student is able to reach the same result finally by a known method of simple calculation. Mr. Dikshit also calculated the ending moment of the same tithi according to other siddhāntas and his results given below may be verified by the student according

to the different Eye-tables furnished in this work. They will be fully expounded in Chapter IV of this work (paragraphs 208 and 209, page 87 below).

Ending Moments of the 12th tithi, bright fortnight of Āshāḍha in A.D. 484—85—

(1) Sūrya siddhānta: A.D. 484 June 21, 51 ghatikas 11 palas after mean sunrise.

(2) First Ārya siddhānta: A.D. 484, June 21, 49 ghatikas 48 palas after mean sunrise.

(3) Brahma siddhānta: A.D. 484, June 21, 50 ghatikas 15 palas after mean sunrise.

(4) Siddhānta Śirōmani: A.D. 484, June 21, 53 ghatikas 21 palas after mean sunrise.

EYE-TABLE, SECTION **q.—Days counted from March 1 and days counted from April 1.**

55. The reader who has attentively followed the explanation of sections **k**, **l**, **m**, **n**, **o**, **p**, and the illustrations given thereunder will have seen the practical use of section **q** of the Eye-table. In arriving at the English equivalent of any Indian date, we have to count days from the commencement of the solar year. Running the eye down section **k** of any of the Eye-tables, the reader will notice that, while at the beginning of Kaliyuga the Indian solar year began on the 15th of February, by the time we come to A.D. 400, which is practically the earliest date that can possibly be verified according to the details of the Indian calendar, the Indian solar year now (i.e., in A.D. 400) commences on (1) 17th March, according to the Sūrya and Ārya siddhāntas and (2) 16th March, according to the Brahma Siddhānta and Siddhānta Śirōmani. The commencement of the Indian solar year is then retarded at the rate of one day for every century until 1752, when the introduction of the New Style into the British calendar carries forward the English equivalent by 11 days at once; and from A.D. 1753 forwards, down to our time, the Indian solar year has always commenced in April. Now section **q** of the Eye-table enables us to calculate readily the English month and date corresponding to a certain number of days counted from 1st March or 1st April respectively. Example:—Given that an Indian solar year commenced on the 18th of March and that the ending moment of a particular tithi was 345·5 days from the commencement of the Indian solar year; required to know the English date. Answer:—March 18 + 345·5 = March 363·5. By section **q** of the Eye-table, March 338 = February 1; therefore March 363·5 which is 338 + 25·5 = February 1 + 25·5 = February 26·5 of the following English calendar year. In reckoning days from April 1, we have to remember that in a leap year April 336 is equal to March 1 of the following year as shown in section **q** of the Eye-table, whereas in an ordinary year April 335 is equal to March 1 of the following year. This means of course that, if there is a leap year in the year following April 1, that is in the next calendar year, then April 336 is equal to March 1 of the following year.

EYE-TABLE, SECTION **r.—Ghatikas and palas.**

56. This section gives the ghatikas and palas corresponding to the decimal parts of a day. The section is so constructed that any decimal part of a day, down to four decimal places, can be interpreted as an exact number of ghatikas and palas so as to give the exact equivalent in Indian time. An example of this has already been given by translating ·8530 of a day into ghatikas and palas (51 ghatikas 11 palas). It should be noted that the division of the day into 24 hours has been known in India only since the introduction of the Greek (Ptolemaic) system of astronomy and astrology, that is, since about the 5th century A.D. and that Indian time is always expressed sexagesimally, i.e., in ghatikas, each ghatika being the sixtieth part of a day, and palas, each pala being the sixtieth part of a ghatika. The occurrence of an allusion to “hora” either as a lagna or as the 24th part of a day furnishes, as was noted by the late Dr. Burgess in his contribution to the *Journal of the Royal Asiatic Society* (1893), intrinsic evidence that the work must be subsequent to the introduction of the Ptolemaic astronomy into India. A practical application of this observation is furnished by

the reference to the *hora* in the text of the ancient Tamil Grammar, the *Tolkāppiyam*, *Poruḷatikāram*, *Kalaviyal*, verse 135.

மறைந்த வொழுக்கத் தோரையு நாளுந்
அறந்த வொழுக்கங் கிழவோர்க்கில்லை.

Translation.

“In *Kalaviyal*, i.e., the pre-Āryan marriage rule, the man is not obliged to abstain during prescribed days and hours or lagnas (as in the Āryan rule).”

The occurrence of an allusion to the *hora* in this text shows that notwithstanding all that has been stated to the contrary, this part of the *Tolkāppiyam* could not have been composed much before the sixth century A.D.

Table VI in this work may be referred to when the reader wishes to convert any fraction of day, without loss of time, either into ghaṭikas and palas or into hours, minutes and seconds, and *vice versa*.

EYE-TABLE, SECTIONS **s, t, u**.—*Nakshatras*.

57. These sections of the Eye-table give all the information that is necessary, in addition to what has been set out already, to enable us to calculate the ending moments of nakshatras. The scheme of nakshatras is different in the Sūrya and Ārya siddhāntas from what it is by the Brahma siddhānta and Siddhānta Śirōmani. In the two former siddhāntas the nakshatras have equal spaces of 13 degrees 20 minutes each, whereas in the Brahma siddhānta and Siddhānta Śirōmani the nakshatra intervals are either one day, or half a day, or one and a half days, and in one case (Abhijit) one-third of a day. But the principle by which the ending moments of nakshatras are calculated is the same under all the siddhāntas ; that is, each nakshatra is normally attendant on a particular tithi, and the ending moment of a nakshatra cannot be separated from the ending moment of the tithi on which it is attendant by more than a certain maximum interval. Accordingly, in section **s** of the Eye-table, under each lunar month, are given the shortest intervals between the new moon of that month and the ending moments of the various nakshatras belonging to that month. What the actual interval will be in a given year will depend on the use we make of sections **t** and **u** of the Eye-table. There is a fixed relation between the distance of the first new moon in the solar year from the commencement of that year and the interval by which the ending moment of any nakshatra during that year can be prolonged beyond the normal moment of occurrence of the nakshatra shown in section **s** of the Eye-table. In the year A.D. 1921–22 the first new moon in the solar year was 24·23 days distant from the commencement of the solar year. Supposing we want the mean ending moment at which nakshatra Uttara Phālgunī (No. 12 nakshatra) ended in Phālgunā month in the year 1921–22 ; section **t** of the Eye-table tells us that when the first new moon is 24 days distant from the commencement of the solar year, the nakshatra intervals throughout the year are prolonged by 0·41 day. Section **u** of the same table tells us that for ·23 of a day *added* to the 21 days we should *subtract* ·02 of a day from 0·41, that is for this particular year the nakshatra intervals shown in table **s** were all prolonged by 0·39 day. Consequently the ending moment of Uttara Phālgunī nakshatra in Phālgunā month A.D. 1921–22, which, according to table **s**, should occur 15·33 days after the new moon beginning Phālgunā month, occurred in the year 1921–22 after an interval of $15·33 + 0·39 = 15·72$ days from the new moon beginning Phālgunā month. From Table II of this work, p. 276, we know that the new moon beginning Phālgunā month in the year 1921–22 occurred on Sunday, February 26·59 ; so that the nakshatra Uttara Phālgunī in that month ended on February $26·59 + 15·72 =$ February 42·31 = March 14·31, A.D. 1922. This was the ending moment of the *mean* nakshatra according to Sūrya siddhānta. If we wish to know the *actual* ending moment of the nakshatra, the easiest method is to ascertain the anomaly of the moon corresponding to 15·72 days from the new moon beginning Phālgunā month. The nakshatra equation of the moon's anomaly of this moment is given by the appropriate table of nakshatra equations of the moon in the Eye-table,

section f, pp. 157, 158. The exact process of arriving at the actual ending moment of a nakshatra is not given here because it will be generally found advisable to use the abridged process which is indicated in the illustrative examples under each Eye-table.

EYE-TABLE, SECTIONS V, W and X.—*Shortest interval in days from new moon to ending moment of each yoga.*

58. This is the last portion of the Eye-table proper and shows how the ending moment of a *yoga* is to be calculated. The principle is the same as for nakshatras, i.e., there is a normal moment of occurrence for each *yoga*, determined with reference to the new moon which commences each lunar month; to this normal moment of occurrence we have to add the period of retardation determined by sections W and X of the Eye-table—only the retardations are longer in the case of *yogas* than in the case of nakshatras, the maximum being 4.11 days under *yogas* against a maximum of 2.21 days under nakshatras.

The *yoga* is not a very important element for the purposes of the epigraphist and the chronologist. The references to it in inscriptions and literary records are not many and are confined to the later centuries for which we generally have other means of verification in Vikrama and Śaka years. The *yoga* itself is an artificial conception in Indian astronomy, a *yoga* being supposed to be the joint space which would be travelled by the sun and the moon in a given period of time, supposing that these bodies travelled in opposite directions instead of, as they actually do, in the same direction. Consequently, just as the tithi or the natural elongation of the moon is the difference between the positions attained by the moon and sun at a given moment in the heavens, the *yoga* or the artificial combination of the two motions is the fictitious space which would be described by the sun and the moon if they were travelling from new moon to new moon in opposite directions instead of in the same direction. In the supposed case the sun and the moon together would do the 360 degrees of the ecliptic in 25.42 days, and the length of the *yoga* month is therefore 25.42 days. These 25.42 days are distributed among 27 *yogas* just as the nakshatra month of 27.33 days is distributed among 27 nakshatras, and the ending moment of each *yoga* is determined accordingly. A reference to a *yoga* in a literary work or an inscription necessarily implies that the framer of the record fixed the position of the *yoga* with reference to a panchāṅga, for he could not possibly have found a *yoga* by reference to the actual position of the sun and the moon in the actual heavens except by a circuitous process of calculation; and hence the investigation of *yogas* is a matter of altogether secondary importance in historical and chronological research.

EYE-TABLE, SECTION Y.

59. For purposes of reference, since it will be frequently required in connexion with Table II, a section Y is added to each Eye-table, showing (1) the collective duration in days from the first new moon in the solar year up to the ending moment of each tithi in every lunar month, and (2) the increase of the moon's anomaly up to the end of each mean tithi; this increase has to be added to the moon's anomaly at the first new moon in the solar year. It should be remembered, when using this section Y, that an *adhika* month adds one to the number of lunar months in a year and that for instance in a year in which Āshāḍha is *adhika*, the collective duration up to the end of a tithi in Bhādrapada month should be looked for under Śrāvana in section Y.

The reader should accustom himself to think of lunar months as well as of nakshatras by their number; and in a year in which No. 4 month is *adhika*, Śrāvana which is ordinarily No. 5 month will become No. 6 and information regarding tithis and nakshatras in that month should be looked for in sections Y and S under ordinary No. 6 month (Bhādrapada). This is why every month column in the tables of nakshatras and *yogas* (sections S and V) is headed "ordinarily."

Whether a particular year contains an *adhika* month and what that month is, can always be readily ascertained from Table II (pp. 200 to 279).

CHAPTER III.—EXPOSITION OF THE ELEMENTS OF INDIAN CHRONOLOGY.

SECTION i.—*The synodical month and the Indian solar year.*

60. *Astronomical constants.*—A regular treatise on astronomy always closes with a chapter on astronomical constants, viz., those elements of calculation which are of use in predicting astronomical events. A treatise on astronomical computation must begin, not end, with astronomical constants.

61. *First astronomical constant*—*The moon's synodical month or lunation.*—The first astronomical constant in Hindu astronomy is the moon's synodical month of $29\frac{1}{2}$ days. The exact length of this period, according to the *Sūrya siddhānta*,* is 29·530587946 days. The ancient Hindu astronomers purposely calculated this period to what we should now call nine places of decimals in order that there might be no error even after thousands of years. The period fixed by modern astronomy does not differ from the above in the first six decimal places, and as ·0000008, the actual difference, is $\frac{1}{125000}$ of a second, it follows that the difference between European and Indian astronomy in 5,000 years or 61,844 synodical months may amount to 4,260 seconds or a little over 1 hour and 11 minutes. In practice the difference between the European and the Indian computation of new moons is very much less.

62. *What is a synodical month?*—A synodical month or lunation is the interval between one new moon and another. It is not the period in which the moon travels once round the earth, but the period in which the moon gains one complete revolution over the apparent or visible motion of the sun.

The moment of new moon is the moment when sun and moon have the same longitude, i.e., are at the same distance measured from a fixed point in the heavens. When once this moment is past, the moon resumes her journey at the rate of about 13 degrees a day and the sun resumes his at the rate of about one degree a day. It follows that the moon gains twelve degrees over the sun in a day and therefore she gains 360 degrees in about 30 days.

The synodical month, then, is the period during which the moon gains 360 degrees over the sun, and its exact length is 29·530587946 days.

63. *The solar year.*—The next astronomical constant to be noticed in Indian astronomy is the solar year, the length of which, according to the *Sūrya siddhānta*, is 365·258756481 days. The length of the year, according to modern astronomy, is 365·2422408 days. The Julian calendar assumed a year of 365·25 days, i.e., ·00776 of a day in excess of the correct figure. To rectify this error, Pope Gregory XIII in 1582 ordered the dropping out of 10 days and the British Parliament in 1752† similarly dropped out 11 days, and to avoid a recurrence of the error, we now drop out three leap years out of every hundred. The year of 365·2422408 days is, however, a *tropical* year, whereas the Hindu astronomical year is an *anomalistic*‡ year, and we should really compare the Hindu year with the modern *anomalistic* year, which we seldom hear of in practice, but the correct length of which is 365·2596296 days, being an excess of ·001 day over the Hindu year. This no doubt makes a difference of several days in the course of four or five thousand years, but as the Hindu year is essentially lunar and not solar, not much practical inconvenience is caused by the difference.

64. A *tropical* year is that which brings the *seasons* round at the same time of the year, whereas an *anomalistic* year is that which brings back the sun's *anomaly*,

* The *Sūrya siddhānta*, the best known system of India astronomy, is believed to have been current in its present form since the eleventh century A.D. and is the standard for all India. Several other *siddhāntas* are extant, but only one of them, the first *Ārya siddhānta*, is of any practical importance in Southern India.

† This was the occasion when the NEW STYLE was introduced.

‡ Strictly speaking, a *sidereal* year, but the designation *anomalistic* year is more suitable at this stage in order to lead up to the sun's *anomaly*—for explanation see page 78, paragraph 178.

i.e., the rate at which he moves round the earth. This rate varies according as the sun is near to, or removed from, his perigee, i.e., the point when he is nearest the earth, and once a year the sun returns, as it were, to his old pace. This varying pace of the sun is very important for calculating the moment of new moon, as well as for calculating the moment of sunrise, and this is probably why the Hindu astronomers reckon the course of the sun by the anomalistic, instead of by the tropical, year.

65. *The decursus of the Hindu solar reckoning.*—The Sūrya siddhānta reckoning begins from the midnight between 17th and 18th February 3102 B.C., which is commonly called the beginning of Kaliyuga. On the morning of 18th February 3101 B.C., that is one year later, one complete Hindu solar year had run out by 6.13 a.m., i.e., at .25875 of the day. As however the Hindu day is always reckoned from sunrise, mean sunrise for the whole of India being at 6 a.m., the first year is according to this siddhānta reckoned to have been completed at 13 minutes (or exactly .00876 of a day) Indian time of the day, on 18th February 3101 B.C. At this moment the year 1 of Hindu chronology began. The Hindus generally reckon completed or expired years, and not current years, as the European calendar does; and the first mean solar year of the Hindu chronology, which began on 18th February 3102 B.C., is, according to Hindu reckoning, the mean solar year 0. By adding 3101 to an English calendar year A.D. we arrive at the corresponding (expired) year of Kaliyuga. Thus the year A.D. 1910 is K.Y. 5011. For a B.C. year, the K.Y. equivalent is obtained by subtracting it from 3102, not 3101.

66. *Correspondence between A.D. and K.Y. years.*—If we reckon 365.258756481 days for every Indian year, commencing from midnight between 17 and 18 February 3102 B.C. we shall find that the commencement of 3101 K.Y. fell on 16th March, 1 B.C., at .15379 of the day. The Sūrya siddhānta, however, anticipates the commencement of Kaliyuga 3101 by 2.1706944 days because the true Indian solar year 0 Kaliyuga really began 2.1707 days before the moment above assigned for its commencement. This correction is called *sodhya*. It thus happens that K.Y. 3101 commenced in 1 B.C. on 13th March at .9831 of the day after mean sunrise (6 a.m.). From this point table II in this work will carry us on regularly through every year up to A.D. 2000.

SECTION II.—Fixing the moment of mean new moon.

67. At the first moment of K.Y.* 0, according to the Sūrya siddhānta, the sun and moon had the same mean longitude, that is, the moon was *new* at that instant. At the first moment of K.Y. 1, 365.258756481 days would have passed, that is 12 synodical months, and in addition 10.891701129 days. That is, at the first moment of K.Y. 1, the moon was not new as she was at the first moment of K.Y. 0, but she was 10.89170 days old: and the first mean new moon in K.Y. 1 occurred on 29.530587946 minus 10.891701129 days = 18.638886817 days after the commencement of K.Y. 1. In this way in every Hindu year the first mean new moon would occur 18.63889 days later than in the previous year. In the year K.Y. 2 a mean new moon occurred 2×18.63889 days = 37.27778 days later than the commencement of the year, but as this period exceeds a synodical month, the first mean new moon in K.Y. 2 really occurred 37.27778 less 29.53059, that is, 7.74719 days after the commencement of the year K.Y. 2. The day of occurrence of the first mean new moon for 100 years after 0 K.Y. is given in the Eye-table, section O and we see from that table that in 100 K.Y. (mean solar year) the first mean new moon occurred 3.46164 days after the commencement of the year.

68. In 1 B.C., as may be seen from the Sūrya siddhānta Eye-table, section 1, the first mean new moon of the Hindu solar year occurred almost exactly 10 days (properly 10 days less .0019 of a day) after the commencement of the solar year.

* i.e., at midnight between 17th and 18th February, 3102 B.C., the moment of commencement of mean Indian solar year 0. This moment was, for all purposes, except one, the commencement of Kaliyuga according to Sūrya siddhānta; it was also the moment when all the planets, including the sun and moon, were at 0° mean longitude. The excepted purpose is the commencement of the true Indian solar year, referred to in paragraph 66.

The process of calculating the first new moon in any solar year has been explained in paragraph 53 supra.

SECTION iii. - *Sun's and moon's anomaly and actual moment of new moon.*

69. Although mean new moon occurs every 29·53059 days, the actual new moon does not recur so regularly. About the time when the moon is due to become new, she may be fast, or she may be slow, and we have to take this circumstance into consideration. Hindu astronomers have devised a table of the moon's anomaly which enables us to calculate exactly by how many degrees the moon is in advance of, or behind, her mean position at new moon or at any other time. The ordinary tables of the moon's anomaly and equation of the centre, as these constants are called, will be found in Professor Jacobi's standard article on the subject in Vol. I of the *Epigraphia Indica* and are reproduced in special tables II and III, pages 79 to 81 below. For the sake of practical convenience, the present method converts degrees into time and further calculates the anomaly for each ·001 of the equation, and the result is Eye-table, sections e, f, g.

70. The moon's anomaly (as explained at page 16) is determined for centuries and odd years in the same way as the *mean* moment of the first new moon is determined for every solar year. The moon completes an anomalistic month, that is, returns to a particular place round the earth in 27·5546 days, and every year the moon's anomaly increases by $365·25875 - 13 \times 27·5546 = 7·04826$ days. In 100 years the anomaly increases by 16·03078 days.

71. In A.D. 1600, a correction, or *bīja*, introduced by the Hindu astronomer Gāṇeśa Daivajña, came into operation. The effect of this *bīja* is to raise the annual increase of the moon's anomaly from 7·04896 days to 7·04898 days or by two seconds of time every year, and also to diminish the length of the anomalistic month from 27·5546 to 27·55459797 or by ·000002 days, i.e., $\frac{1}{5}$ of a second every month.

72. These figures enable us to calculate the moon's anomaly at any moment, it being assumed by Indian astronomers that at the commencement of the *true* (not mean) Indian solar year Kaliyuga 0, the age of the moon's anomaly, reckoned from perigee, was 4·7797 days by Sūrya siddhānta and first Ārya siddhānta (which is ordinarily referred to in this work as *the* Ārya siddhānta) and 1·9988 days by Brahma siddhānta and Siddhānta Śiromaṇi.

73. Similar remarks apply to the sun, though of course the figures are different. As stated already at page 14, the Indian calendar assumes *in practice* that on a given date of the Indian solar year, the 0 day or the 10th day or the 100th day or the 300th day the sun's anomaly is the same, whatever year we may be dealing with, that is, if the sun's anomalistic equation can be expressed by — ·05 of a day for purposes of tithis at the 100th day of a particular year, the sun will have the same anomaly and the same anomalistic equation for tithis at the 100th day of any other year. This is also the *theory* of the first Ārya siddhānta, which is called *the* Ārya siddhānta in this work; and which lays down that at 0 Kaliyuga, i.e., at the commencement of the *mean* solar year Kaliyuga 0, the position of the sun's apogee was 78° that is, and that this is the case in all years; that is, when the sun has done $\frac{78}{360} \times 365·2568$ days or 79·1388 days of his course reckoned from the commencement of the *mean* solar year, or $79·1388 + 2·1467$ days (the addition is the *śodhya*) from the commencement of the *true* solar year, he is at apogee, i.e., his anomalistic equation is then 0. Accordingly the Ārya siddhānta Eye-table in the present work states that at 81·29 days of the solar year the sun's anomalistic equation is 0·000: only it converts the subsequent equations into time according to the purpose for which the equation is required, i.e., whether for tithi or for yoga.

74. The other siddhāntas attribute a slow motion to the sun's perigee, that is they do not admit *in theory* that the sun's pace is absolutely the same at the beginning of every Indian solar year, whether mean or true, but that it varies slightly from century to century. These variations are set out in a special table

which will be explained when we come to the construction of tables (page 78 below). In practice, the anomaly tables of the sun presented in sections **g**, **h** and **i** of the Eye-table for each siddhānta are good for at least a thousand years and we have to remember that neither the Brahma siddhānta nor the Siddhānta Śiromani, the only two systems in which the motion of the sun's apogee is at all considerable, had been current for quite a thousand years when we reach the end of the epigraphical period (A.D. 1600).

75. Each anomaly table in the Eye-table, sections **e** to **i** (pages 171 to 194), is divided into four equal portions, two having additive equations and two subtractive. Each equation, as given in the table, consists of three decimal places, the first two being given in vertical columns and the third in a horizontal column. The horizontal column is not necessary when all we want to know is how many hours or how many ghatikas after sunrise a new moon or other tithi occurred, or a nakshatra or a yoga ended and consequently, the horizontal place of the equation, namely, its third decimal place, is omitted in the abridged Eye-table, sections **e** to **i**. On the other hand, when such a course is necessary for very accurate work, a *fourth* figure may be added to the third shown in the horizontal column by noting the difference between two successive anomalies and taking a proportional part of the difference between the corresponding equations. Thus, supposing we want the equation for a moon's anomaly of 6·04 days: the anomalies and equations next to those we want are—

☾'s An. 6·031 d. ...	☾'s An. 6·069 d. ...	Diff. ·038 d.
Eqn. —·397 d. ...	Eq. —·398 d. ...	Diff. ·001 d.

The anomaly under consideration 6·04 days = 6·031 + ·009: the last figure is one-fourth of the difference between 6·031 and 6·069. Therefore the fourth decimal place to be added to the equation —·397 is one-fourth of 10, i.e., 2. Answer —·3972.

We should note that sometimes the *lesser anomaly has the higher equation*. Thus; supposing we require the equation for ☾'s An. 21·46 d. We note the following as the nearest anomalies:—

☾'s An. 21·447 d. ...	☾'s An. 21·485 d. ...	Diff. ·039 d.
Eqn. + ·399 d. ...	Eq. + ·398 d. ...	Diff. ·001 d.

Our anomaly is more than 21·447 by ·013, which is one-third of the difference ·039. We therefore *deduct* one-third of 10 or 3 from the fourth decimal place of the equation + ·399 and obtain as the result + ·3987.

The same observations apply to solar anomalies.

76. For ordinary results, we do not require a fourth place in the equation, and we can take the nearest three place equation that we can find in the Eye-table, sections **e** to **i** and thus, by means of a simple sum in addition or subtraction, discover, without a moment's trouble, the actual from the mean moment of a tithi, nakshatra or yoga. Even then we shall be far more accurate than by any of the other rough and ready methods now in use. For stages of the anomaly, both solar and lunar, which increase or decrease very slowly and where the proportional parts are not obvious, the fourth decimal place of the equation is also given in the extended anomaly tables, pages 171 to 194.

SECTION IV.—*The solar months.*

77. The solar months of the Indian calendar are named in the opening section of the Eye-table. The Tamil names of months are practically the same as the Bengali names, but the first Bengali month *Vaisākha* gives the name to the second Tamil month and so on, the last Bengali month *Chaitra* being the first Tamil month *Chittirai*.

Also, the Malayalam names of months are generally the same as those of the signs of the zodiac: the first two are called *Mēṭam* and *Eṭavam* instead of *Mēṣam* and *Rishabham*.

But whether in the Tamil country or in Malabar or in Bengal, the measure of the solar months is the same. Like the solar year, each solar month ends at a *fraction of the day*, that is, at the moment when the next *sankrānti* takes place. For purposes of computation, the *sankrānti*, as well as the month to which it gives its name, is reckoned from the very moment at which the previous month ends. But in practice in the Tamil country, when *sankrānti* takes place after sunset, the next month begins next day; and when the *sankrānti* occurs before sunset, *that* is the first day of the next month, and the old month loses a day. Other *sankrānti* rules are observed in other parts of India. (See paragraph 12 *supra*.)

78. The solar months in the Indian calendar, which have 30 days each, are placed at fairly regular intervals, and the months with 31 days each, as also those with 29 days each, are arranged continuously. Thus the series is :

30	30
31	29
31	29
31	29
31	29
	29
	30

which is fairly symmetrical. Owing, however, to the working of the rule about *sankrāntis* before and after sunset, a month may have occasionally an extra day, and solar months with 32 days are not infrequent, as may be seen from the Ephemeris.

SECTION V.—*Lunar months in relation to solar months.*

79. The lunar months are the *doors* to the Indian calendar, but the solar months are the *hinges* on which the doors move. Every lunar month takes its name in Bengal from the solar month in which it occurs, and in the Tamil country from the *next* solar month after that in which it occurs.

80. Thus the lunar Vaiśākha *must* begin sometime in the solar Vaiśākha (Bengal) or sometime in the solar Chittirai (Tamil). The lunar month being only 29·53 days in length, there may be two new moons between the beginning and end of a solar month, and in this case *both* receive the same name, the first being called *adhika* or intercalary and the second *Nija* or true. The second is called “true” because it immediately precedes a *sankrānti*. *Adhika* months occur ordinarily once in three years, as may be seen from Table II (pages 200—279).

81. More rarely, that is about once or twice a century, a solar month may begin and end and no lunar month begin in the course of it and then some lunar month must be suppressed as there is no hinge on which this particular door can turn. The suppressed lunar month is said to be *kshaya** or in defect.

82. We will now take three examples illustrating the different kinds of lunar years—(1) the year A.D. 1910–11 consisting of twelve lunar months, corresponding to as many solar months; (2) the year A.D. 1909–10 consisting of thirteen lunar months, which include an *adhika*, i.e., an extra or *intercalary* lunar month; (3) the year 1 B.C. or A.D. 0 consisting of thirteen lunar months, exhibiting two intercalary or *adhika* lunar months and one suppressed or *kshaya* lunar month: for whenever there is a *kshaya* month, there will ordinarily be two *adhika* months in the course of 12 months.

83. For the first we select the Indian year K.Y. 5011, A.D. 1910–11 and which is within our own time; for the second we select the year previous to it K.Y. 5010, A.D. 1909–10 also within our time; and for the third, because there has been no suppressed month since A.D. 1822, and there will be none till A.D. 1963, we select the first year of the Christian era, K.Y. 3101, 1 B.C., which is also the very first year entered in Table II (page 200) and will be made much use of, as a fixed year, in Chapter V on planetary chronology; unfortunately, as we shall notice in paragraph 310, page 127 below, 1 B.C. has *per se* little chronological interest except as a century year, because in all probability it was *not* the year when Christ was born; nevertheless it is an interesting year standing as it does at the parting of the ways.

* Beginners find great difficulty in understanding *adhika* and *kshaya* months, because the idea is so utterly unlike anything in any other calendar; the examples given on the next and following pages are therefore purposely made somewhat prolix.

Scheme of months in K.Y. 5011, A.D. 1910-11—Sūrya siddhānta.

Lunar months.	A.D. date and fraction of day of mean new moon.	Day and fraction of day of solar year when mean new moon occurred, also sun's anomaly for new moon.	Day and fraction of day of solar year when sankrānti occurred; names of solar months commencing at each sankrānti. S M. = Solar month.	Moon's anomaly at moment of each mean new moon. (To the C's An. at first new moon of solar year add 1·976 days for each lunar month.)
	A.D. 1910. Indian solar year commences Ap 13 2080. (Tab II).		K.Y. 5011. Mēsha sankrānti Vaiśākha S.M.; Chittirai and Mēṣam S.M.; Solar year begins	
1. Vaiśākha ...	May 9 1214.	25·9134 (Tab II.)	30 9353 Rishabha sank Jyeshtha S.M.; Vaiśāśi or Eṭavam S.M.	0·534 (Table II.)
2. Jyeshtha ...	June 7·6520.	55·4440	62 3555 Mithuna sank. Āshādha S.M.; Āni S.M.	2·510
3. Āshādha ...	July 7·1826.	84·9746	94·0003 Karkāṭaka sank Śrāvapa S.M., Ādi S.M.	4·486
4. Śrāvapa ...	Aug 5·7132.	114·5052	125 4755 Simha sank. Bhādrapada S.M.; Āvapa S.M.	6·462
5. Bhādrapada.	Sep. 4 2137.	144·0857	156·4942. Kanyū sank. Āśvina S.M., Puraṭṭāśi S.M.	8·438
6. Āśvina	Oct. 3 7743.	173·5663	186 9355. Tulā sank Kārttika S.M. (Beng); Aippaśi S.M.	10·414
7. Kārttika ...	Nov. 2·3049.	203 0969	216 8289 Vriśchika sank. Mārgasirsha S.M., Kārttigai S.M.	12·390
8. Mārgasirsha.	Dec. 1·8355.	232·6275	246 3192. Dhanus sank. Pauśha S.M., Mārgaśi S.M.	14·366
9. Pauśha	Dec 31 3661.	262 1581	276·6369. Makara sank Māgha S.M., Tai S.M.	16·342
10. Māgha ...	A.D. 1911. Jan 29 8967.	291·6887	305 0850. Kumbha sank. Phālguna S.M., Māsi S.M.	18·318
11. Phālguna ...	Feb 28 4273.	321·2198	384 9053. Mina sank. Chaitra S.M., Paunguni S.M.	20 294
12. Chaitra ...	Mar. 29 9579.	350 7499	365 2587. Mēsha sank. Vaiśākha S.M., Chittirai S.M.	22·270

N.B.—The main point to which the reader's attention should be directed in this scheme is that the lunar month following a new moon has its name determined by the fact of its occurring *before* a particular sankrānti. Thus, a lunar month commencing at any time between 0 day of the solar year and the 30·9353 day is called **Vaiśākha**; similarly, a lunar month commencing at any time between 156·4942 days and 186 9355 days of the solar year is called **Āśvina** and so forth. The lunar month commencing before the Mēsha sankrānti is called **Chaitra**.

84. The solar year K.Y. 5011, A.D. 1910, which was a normal year, opened, as does every year, with the *Mēsha sankrānti* or arrival of the sun at the point from which Indian celestial longitudes are reckoned. We have already seen how this moment is determined, namely, by the successive addition of 365·25876 days to the first moment of the year *Kaliyuga* 0, less the *sōdhya* of 2·1707 days. The *Mēsha sankrānti* determines nearly all kinds of solar years in use in India, and it also determines directly the lunar year, since the first lunar month *Chaitra* is defined

to be that whose commencement precedes the *Mēsha sankrānti* and the first day of the lunar year is that on which *Chaitra Śukla* pratipad or the first tithi of the bright fortnight of Chaitra was current at sunrise. In the scheme of months in Table II and elsewhere the reader will observe that the lunar month *Chaitra* stands last, but this is only for purposes of computation, and, after all, the lunar month *Chaitra* belongs to a previous solar year, and so it may be shown last among the lunar months of that year.

The moment of *Mēsha sankrānti* marks the commencement of the solar month *Vaiśākha* in Bengal, of the solar month *Chittirai* in the Tamil country, and of the solar month *Mētam* in Malabar, Travancore and Cochin.

Each month begins and ends with a sankrānti, and the second and other sankrāntis are named in the order of the constellations of the zodiac, *Rishabha*, *Mithuna*, etc.

85. There is no difficulty about the lunar months in A.D. 1910–11, since the new moons and sankrāntis then occurred *alternately*, each *door* having its own *hinge* to turn on. It will be a useful exercise to calculate the actual moment of occurrence of each new moon for which purpose the anomalies are noted in columns 3 and 5.

Scheme of months in the year A.D. 1909–10, K.Y. 5010.

Lunar months.	A.D. date and fraction of day of mean new moon.	Day and fraction of day of solar year when mean new moon occurred, also sun's anomaly for new moon. Add successively, for each new moon after the first, 29 53058 days	Day and fraction of day of solar year when sankrānti occurred, names of solar months commencing at each sankrānti S.M. = Solar month	Moon's anomaly at moment of each mean new moon.	Sum of sun's and moon's equations (by Eye-table, sections e and h).
	A.D. 1909. Indian solar year commences. Ap 12·2492 (Tab. II).		K.Y. 5010. <i>Mēsha</i> sankrānti <i>Vaiśākha</i> S.M., <i>Chittirai</i> or <i>Mētam</i> S.M.; Solar year begins.		
1. <i>Vaiśākha</i> .	Apr. 20·2238	7·2745 (Tab. II)	30·9353 <i>Rishabha</i> sank. <i>Jyeshtha</i> S.M.; <i>Vaigāsi</i> or <i>Eṭavam</i> S.M.	2·401 (Tab. II).	
2. <i>Jyeshtha</i> .	May 19 7543	36 8051	62·3555. <i>Mithuna</i> sank. <i>Āshāḍha</i> S.M., <i>Ani</i> S.M.	4 377	
3. <i>Āshāḍha</i> .	June 18·2849	66 3357	94·0003. <i>Karkāṭaka</i> sank. <i>Śrāvana</i> S.M., <i>Āṇi</i> S.M.	6·853	
4 } <i>Śrāvana</i> {	July 17·8155	95·8668	125·4755	8·329	
5 }	Aug. 16·3461	125·3970 — 4481	<i>Simha</i> sank <i>Bhādra-pada</i> S.M.; <i>Āṇi</i> S.M.	10·305 — 1250 (☉'s Eq.)	— 1250 — 3281
		*124 9451		10·180	— 4481
6. <i>Bhādra-pada</i> .	Sep. 14·8767	154·9275	156·4942. <i>Kauṣṭhī</i> sank <i>Āśvina</i> S.M., <i>Purāṭṭāsi</i> S.M.	12 281	
7. <i>Āśvina</i> ...	Oct. 14·4073	184·4581	186·9355. <i>Tulā</i> sank <i>Kārttika</i> S.M. (Beng.), <i>Aip-pasi</i> S.M. (Tam.).	14·257	
8. <i>Kārttika</i>	Nov. 12·9379	213·8886	216·8289. <i>Vriśchika</i> sank. <i>Mārgaśīrsha</i> S.M.; <i>Kārttigai</i> S.M. (Tam.).	16·233	
9. <i>Mārgaśīrsha</i> .	Dec. 12·4685	243·5192	246·3192 <i>Dhanu</i> sank. <i>Pauṣa</i> S.M., <i>Mārgaṣi</i> S.M.	18·209	

* Actual moment of occurrence of new moon after allowing for equation in last column.

Scheme of months in the year A.D. 1909-10, K.Y. 5010—cont.

Lunar months.	A.D. date and fraction of day of mean new moon.	Day and fraction of day of solar year when mean new moon occurred, also sun's anomaly for new moon. Add successively, for each new moon after the first, 29·53058 days.	Day and fraction of day of solar year when sankrānti occurred; names of solar months commencing at each sankrānti. S.M. = Solar month.	Moon's anomaly at moment of each mean new moon.	Sum of sun's and moon's equations (by Eye-table, sections e and h).
	A.D. 1910.		K.Y. 5010.		
10. Pausha ...	Jan. 10·9990	278·0498	275·6369 Makura sank. Māgha S.M.; Tai S.M.	20·185	
11. Māgha ...	Feb. 9·5296	302·5804	305·0850. Kumbha sank Phāl-guna S.M., Māsa S.M.	22·161	
12. Phālguna ...	Mar 11·0602	332·1110	334·9053 Mina sank. Chaitra S.M., Panguni S.M.	24·137	
13. Chaitra	Apr. 9·5908	361·6416	365·2587 Meesha sank Vaisākha S.M., Chittirai S.M.	26·113	

86. In this year, as in 1910-11, the lunar months, up to Śrāvana, alternate with the solar months; but between the *sankrāntis* due at 94·30003 days and 125·4755 days of the solar year, we have two mean new moons at 95·8663 days and 125·3970 days, respectively. No anomaly can carry the first of these two new moons to a moment earlier than 95·28 days of the solar year. We may satisfy ourselves by computation of the anomalies, as shown above, that the second new moon really preceded the sankrānti which occurred at 125·4755 days. In such a case both the new moons receive the same name (here *Śrāvana*), the first is called *adhika Śrāvana* and the second *nija Śrāvana*. After this, the numerical order of the lunar months is disturbed, for the sixth new moon is called Bhādrapada, whereas in 1910-11, the fifth is Bhādrapada, and the remaining new moons, including Bhādrapada, alternate with the remaining sankrāntis, the total number of new moons for the year being 13 instead of 12.

87. We now pass to the third example.

Scheme of months for 1 B.C., K.Y. 3101.

Lunar months.	Date of mean new moon by Christian era and fraction of day.	Day of solar year when mean new moon occurred, also sun's anomaly. Add successively, for each new moon after the first, 29·53058 days.	Day of solar year when sankrānti occurred, also dates of commencement and end of solar months. S.M. = Solar month.	Moon's anomaly at moment of new moon.	Sun's and moon's equations (by Eye-table, sections e and h).
	1 B.C. Indian solar year commences Mar 13·9831 (Table II.)		K.Y. 3101. Meesha sankrānti Vaisākha S.M.; Chittirai or Meṭam S.M.		
1. Vaisākha ...	Mar 23·98	9·99810	30·93523. Risabha sank. Jyeshtha S.M.; Vaisākhi or Eṭavam S.M.	22·736	
2. Jyeshtha ...	Apr. 22·51	39·52869	62·3555. Mithuna sank. Aśāḍha S.M.; Āni S.M.	24·712	

Scheme of months for 1 B.C., K.Y. 3101—cont.

Lunar months.	Date of mean new moon by Christian era and fraction of day.	Day of solar year when mean new moon occurred; also sun's anomaly. Add successively, for each new moon after the first, 29 53054 days.	Day of solar year when sankrānti occurred, also dates of commencement and end of solar months S M. = Solar month.	Moon's anomaly at moment of new moon.	Sun's and moon's equations (by Eye-table, sections c and h).
	1 B.C. Indian solar year commences Mar. 13·9831 (Table II, page 24) cont.		K.Y. 3101—cont		
3. Āshāḍha ...	May 22·04	69 05928	94 0008 Karkatāka sank. Śrāvana S.M.; Ādi S.M.	26 688	
4. Śrāvaṇa ...	June 20·57	98·58986	125 4755. Simha sank. Bhādrapada S.M.; Āvaṇi S.M.	1·109	
5. Bhādrapada.	July 20 10	128·12045	156 4942 Kanyā sank. Āśvina S.M.; Purāṭṭāsī S.M.	3·085	
6. } Āśvina {	Aug. 18·63	157·65104	186·9355	5·061	
7. }	Sep 17·16	187·18163 — 5842 * 186 5974	Tulā sank. Kārttika S.M.; Aippaśī S.M.	7·037 — 1724	— 1725 } — 4117 }
8. Kārttika ...	Oct. 16 69	216·71221 — 5155 * 216 1967	216 8289 Vriśchika sank. Mārgaśīrsha S.M.; Kārttigai (Tam.) S.M.	6·865 9·013 — 1290	— 5842 } — 1290 } — 3865 }
9. Mārgaśīrsha.	Nov. 15·23	246·24280 — 3223 * 245·9205	246·8192 Dhanu sank. Pausa S.M.; Mārgaśī S.M.	10 989 — 0522 10·987	— 0522 } — 2701 }
Pausa ..	(Kshaya)	...	275 6369. Makara sank. Māgha S.M.; Tai S.M.		— 3223
10. Māgha ...	Dec. 14·176	275·77839 — 0414 * 275 7319	305·0850 Kumbha sank. Phālguna S.M.; Māśī S.M.	2·965 + 0892 18·004	+ 0392 } — 0806 }
11. Phālguna ...	Jan. 13·29	305·80398 + 2515 305 5555	334·9053 Mina sank. Chaitra S.M.; Panguni S.M.	14 941 + 1195 15·060	+ 1195 } + 1320 }
12. } Chaitra {	Feb. 11·82	334·83457 * + 4727 335·8073		16·917 + 1687 17·085	+ 1687 } + 3040 }
13. }	Mar 13·35	364·86515	365·2587 Mesha sank. Vaiśākha S.M.; Chittirai or Mēṭam S.M.	18 893	+ 4727

In this year there is nothing specially worthy of note till we reach *Āśvina*: but for that month there is an *adhika Āśvina* just as we have an *adhika Śrāvaṇa* in A.D. 1909. There is a peculiarity about *nija Āśvina* in the year 1 B.C., which we must note carefully. The mean *nija Āśvina* at 187·1816 days is not before the sankrānti at 186·9355 days, but the actual new moon, after calculation of anomalies, is found to be at 186·5974, i.e., before 186·9355 days and is therefore *nija Āśvina*, not Kārttika. Generally speaking, when a *nija* or *adhika* month is within ·6 day on either side of a sankrānti, calculation, or at least a consideration, of the anomalies is necessary before we can determine its true character.

88. Passing *Āśvina* in the year 1 B.C. we find that each of the subsequent mean new moons is within ·6 day of a sankrānti, and we must therefore calculate

* Day and fraction of day marking exact moment of actual new moon after allowing for equations in last

the anomalies in order to be quite sure whether each new moon is on this or that side of a sankrānti. Having made these calculations, we find that between two sankrāntis, at 246·3192 days and 275·6369 days, there is no new moon, although there is a new moon just under six ghaṭikas (·095 days) *after* the second sankrānti. Had this new moon preceded the sankrānti ever so little, instead of following it, or had our method been inaccurate at this stage to the extent of 2 hours, the consequences we are about to state would not have followed. As it is, there is no new moon between the two sankrāntis at 246·3192 days and 275·6369 days and therefore the lunar month which has no hinge to turn on is shut ; this fact is expressed by saying that *Pausha* lunar month is *kshaya* or suppressed.

89. How do we know that the lunar month to be suppressed is *Pausha* and not any other ? Because that is the first new moon which we are unable to place *before* a sankrānti. We find that *Māgha* and *Phālguna* are each followed by a sankrānti, though a long way off, and between the sankrāntis at 334·9053 days and 365·2587 days there are again two new moons, that is to say, two Chaitras, the first of these being *adhika* and the second *nija*. Here also we note that appearances are deceptive, for the mean new moon at 334·8346 is apparently a *Phālguna*, but the calculation of the anomalies shows it to be an *adhika Chaitra*.

90. Generally (1) a *kshaya* month is preceded and followed, though not immediately, by an *adhika* month ; (2) there are, as a rule, only one or two *kshaya* months in a century ; (3) the *kshaya* months must be calculated from the mean moment by means of anomalies before we can prove them to be *kshaya* ; and (4) in the *Sūrya* and *Ārya* siddhāntas only one of three months, *Mārgaśīrsha*, *Pausha*, and *Māgha*, can be *kshaya*, because these are the three lunar months which turn on solar months of 29 days each.

The following table enables us to know an *adhika* month or a *kshaya* month in the *Sūrya* siddhānta calendar by mere inspection of the date of occurrence of the first new moon in a solar year. Similar tables can be constructed for the *Ārya* and *Brahma* siddhāntas and the *Siddhānta Śiromapi* with the aid of the figures showing the duration of the solar months according to each siddhānta :—

Names of lunar months (1)	Ending days of solar months. (2)	Periods of lunar months. (3)	Limits of adhika and kshaya months (4)
			The lunar month noted in column 1 will be an <i>adhika</i> month if first new moon in solar year occurs
Vaiśākha	30·83528 d.	29·53059 d.	before 1·40469 d.
Jyeshṭha	62·35555 d.	59·06117 d.	„ 3·29438 d.
Āṣāḍha	94·00028 d.	88·59176 d.	„ 5·40851 d.
Śrāvaṇa	125·47555 d.	118·12235 d.	„ 7·35320 d.
Bhādrapada	156·49417 d.	14·65293 d.	„ 8·84122 d.
Āśvina	186·93555 d.	177·18353 d.	„ 9·75201 d.
Karttika	216·62888 d.	206·71411 d.	„ 10·11475 d.
			The lunar month noted in column 1 will be <i>kshaya</i> if first new moon in solar year occurs
Mārgaśīrsha ...	246·31916 d.	236·24470 d.	after 10·07446 d. and before 10·11475 d.
Pausha ...	275·63694 d.	265·77529 d.	after 9·86164 d. and before 10·07447 d.
Māgha	305·08490 d.	295·30588 d.	after 9·77910 d. and before 9·86164 d.
			The lunar month noted in column 1 will be <i>adhika</i> if first new moon in solar year occurs
Phālguna ...	334·90527 d.	324·83647 d.	after 9·77912 d. and before 10·06880 d.
Chaitra ...	365·25875 d.	354·36705 d.	after 10·06880 d. and before 10·89170 d.

N.B.—All the figures in column (4) are obtained by subtracting the corresponding figures in column (3) from those in column (2).

91. We see that if the first new moon in a solar year occurs before 1·40469 days (the difference between 30·93528 and 29·53059) of the solar year, there will be a second new moon before the end of the first solar month. Reasoning in the same manner, we see that if the first new moon in a solar year occurs after 1·40469 days, but before 3·29438 days of the solar year, there will be two new moons between the commencement of the first and second solar months, that is, there will be an *adhika* as well as a *nija Jyeshthā*. Similar reasoning will enable us to connect the possibility of occurrence of the several *adhika* and *kshaya* months with the occurrence of the first new moon before or between the days mentioned in the fourth column. It will be a useful exercise for the reader to try and reason out for himself each line of this table. For determining *mean* intercalations and *mean* suppression, the table can be used as it stands; and taken with suitable anomalies, it is a safe and reliable guide for ascertaining true *adhika* and true *kshaya* months. The author believes that this is the first time that so simple a method has been indicated for recognizing *adhika* and *kshaya* months.

SECTION VI.—*Tithis*.

92. *Tithis* are in use over the whole of India for religious purposes and over the greater part of it for civil purposes also. To understand *tithis* thoroughly is to have mastered the system of the Hindu calendar. *Tithis* are as old as the Vedas.

93. A lunation or synodical month is divided into thirty *tithis* or lunar days of equal mean length. The names of *tithis* are familiar to all Hindus, but they are given for convenience of reference in Table I (V), page 198. The first fifteen *tithis*, corresponding to the bright half of the month, are called *śukla paksha*; and the second fifteen are called *krishna paksha* or *bahula paksha*. The last or 30th *tithi* is new moon or *Amāvāsyā*, and it is called sometimes by the name of the month of which it marks the end, and sometimes by the name of the following month. Thus the moment of *Amāvāsyā* which marks the beginning of *Vaiśākha* and which in this work is called the “*Vaiśākha* new moon” is the same as the ending moment of the 30th *tithi* of *Chaitra* and is usually called *Chaitra Amāvāsyā*. In an inscription* “*Vaiśākha Amāvāsaya*” usually means the *Amāvāsyā* at the end of *Vaiśākha*, but for convenience of computation, the first new moon in the solar year is in this work called the *Vaiśākha* new moon while the 30th *tithi* of *Vaiśākha* is called the *Jyeshthā* new moon, and so on with the rest of the lunar months.

94. To find the mean ending moment of a particular *tithi*, it is only necessary to add the corresponding duration in days, according to Eye-table Y, to the moment of the first new moon in the solar year, remembering that when a year contains an *adhika* month, as shown in Table II, the numbers of the months following the *adhika* month are changed.

Thus, to find the mean ending moment of the 18th *tithi* of *Māgha* lunar month, called *krishna* or *badi* (contraction for *bahula divasa*) *tritīyā* in K.Y. 5010, A.D. 1909–10, we proceed as follows:—

Moment of commencement of solar year A.D. 1910 (Table II)	...	April	12·9492
First new moon in solar year (Table II)	..	...	7·2745

As the year 1909–10 contains an *adhika Śrāvana* month according to Table II, we take for the total duration up to *Māgha badi* 3, the duration of the corresponding *tithi* in the next ordinary month, i.e., *Phālguna badi* 3 according to Eye-table Y

313·02426d

(Total) April 333·2479 = February 27·2479 in the following year (by Eye-table, section q).

The *mean tithi* in question ended at ·2479 of the 27th day of February, A.D. 1910.

* That is, on the *amānta* system or the system of reckoning lunar months from new moon to new moon. There is also another system prevalent in certain parts of India, of reckoning the lunar months from full moon to full moon, hence called the *pūrṇimānta* system. On this system, which in all probability was more widely current formerly than it is now, the new moon is at the middle of a lunar month and the two halves of each month are properly designated its two *pakshas* or wings, one on either side of new moon. Also, the new moon at the end of the *amānta* *Chaitra* lunar month, for instance, would, on the *pūrṇimānta* system, be properly called the “*Vaiśākha* new moon.” As explained elsewhere, it is sometimes a difficult question whether a lunar month, referred to in an inscription, is to be understood in the *amānta* or in the *pūrṇimānta* sense. See section xvii of this Chapter, page 52.

Actual ending moment of a tithi.

95. Sections **e** and **h** of the Eye-table contain all that is necessary for determining the actual ending moment of a tithi, provided we know from Table II, (1) the mean ending moment and (2) the moon's anomaly at that moment. These quantities (1) and (2) can be extracted from the Eye-table, sections **k** to **p**, as shown in the illustrative examples under each Eye-table, but it is far easier to obtain them from Table II. Table II was designed originally for the *Sūrya siddhānta* (the pages relating to A.D. 500 to A.D. 1,000 having been designed for the *Ārya siddhānta*); but the very slight corrections necessary for determining the mean ending moments of tithis (and consequently of nakshatras and yogas), by the other siddhāntas are shown at the foot of each page of Table II.

96. The shortest method of ascertaining the actual ending moment of a tithi when Table II as well as the Eye-table is used, is as follows :—

Required the actual ending moment of śukla chaturthī (fourth tithi in bright fortnight) in lunar *Kārttika* month in A.D. 1910-11.—

Sūrya siddhānta.

		Sun's anomaly in days.	Moon's anomaly in days.
(Table II)			
Commencement of solar year, 1910-11	Ap. 13·2080	..	...
First new moon in solar year, 1910-11	25·9134	25·9134	0·535
Duration in days from first new moon to Kārttigai su. 4 (Eye-table, Section y)	181·1209	181·1209	15 793
April	220·2423	207·0343	16·328
Equation of sun's anomaly for 207·03 days	...	...	—·1477 —·1477
			16·180
Equation of moon's anomaly for 16·180 days	...	...	...
	+·0873	Sum of q's and q's equations	+·2350
	April 220·3295		

By Eye-table, section **q**, April 220 = November 6; and by Eye-table, section **r**, ·3296 of a day = 19 ghatikas, 47 palas. We conclude that the tithi in question ended at 19 ghatikas 47 palas after mean sunrise on 6th November, A.D. 1910. The "Indian Ephemeris, A.D. 1800—2000" gives the ending moment as ·34 of the day. When two places of decimals are sufficient for the ending moment the "shortest method" for tithis, indicated in illustrative examples under Eye-table may be used.

†
SECTION VII.—*Nakshatras.*

97. The system of quoting dates by nakshatras is as old as that of quoting by tithis and has prevailed in India from Vedic times. There are twenty-seven nakshatras or lunar mansions through which the moon passes in her monthly journey through the stars. In the *Sūrya siddhānta* the moon is supposed to spend an equal amount of time in each of the 27 nakshatras; and as the total period of the moon's journey through the stars occupies 27·32166 days, it follows that the mean duration of each nakshatra is $\frac{27·32166}{27} = 1·01191$ days, i.e., 1 day and nearly 18 minutes. Thus, if we know the mean ending moment of a particular nakshatra, all we have to do to find out the mean ending moment of the next nakshatra, or, for that matter, of any other nakshatra, is to add as many times 1·0119 days as there are nakshatras between the ending moment which we know and the ending moment which we wish to find out. This process is carried out in Eye-table **s**. Having found this ending moment, we have next to add or subtract the moon's

equation of time according to her anomaly at the ending moment of the nakshatra. We should remember that the sun's anomaly and the sun's equation of time do not enter into the calculation of the ending moment of nakshatras, because we are now concerned with the moon's own journey among the stars and not with the distance gained by her over the sun.

Actual ending moment of a nakshatra.

98. Sections **s**, **t** and **u** of the Eye-table, together with section **f** of the same table contain all that is necessary for determining the actual ending moment of any nakshatra, provided we know the mean ending moment of the previous new moon and the anomaly of the moon at that moment. The ordinary working is as follows, and it should be carefully noted:—

Required the ending moment of nakshatra Mūla (No. 19 Nak.) in lunar Kārttika month, A.D. 1910

ŚRYA SIDDHĀNTA.

	Days	's anomaly
(Table II) Commencement of Indian solar year, 1910-11	April 13-2080	0-535
First new moon in solar year	25-9134	11-856
(Eye-table y) days up to Kārttika new moon	177-1835	
Place of nakshatra Mūla in ordinary Kārttika, according to Eye-table, section s , is 3-9263 days after new moon. For every year, we have to make a nakshatra correction according to sections t and u of the Eye-table, corresponding to the interval of the first new moon in the solar year. This interval in the year 1910-11 A.D. being 25-9134 days (by Table II,) section u of the Eye-table gives us, as the correction corresponding to 9134, 06807 + 00025 = 06832, i.e., the correction for 91 <i>plus</i> the correction for 0034. This correction 06832 should be subtracted from the correction for 25 days according to section t , i.e., 0-33888. Now 0-33888 <i>minus</i> 06832 = -27056. This quantity has to be added to the general nakshatra interval according to section s , 3-9263 days. Now 3-9263 + 2706 = 4-1969		
	4-1969	4-1969
Total...	April 220-5018	16-5880
The moon's anomaly for the mean ending moment of the nakshatra being 16-588 days, the equation for this anomaly by the Eye-table, section f is + 2465		
		+ 2465

Total April 220-7483

April 220 being by Eye-table, section **q**, November 6, and 7483 of a day being by Eye-table, section **r**, 44 ghatikas and 55 palas, we conclude that Mūla nakshatra in lunar Kārttika month in A.D. 1910-11 ended at 44 ghatikas 55 palas after mean sunrise on 6 November 1910. The ending moment according to "Indian Ephemeris" for 1800—2000 A.D. is 75 on 6 November 1910.

99. Nakshatras are very important in South Indian epigraphy and we shall next work out a somewhat complicated problem of ordinary occurrence, namely—

"Required to find, by Ārya siddhānta, the nakshatra, and the date of the Tamil solar month, on bahula 8th tithi (day of commencement) in Ādi month, A.D. 756."

This particular problem possesses an intrinsic interest on account of its probable connexion with the "Alal kādai" or "Burning of Madura" in Kōvalan's famous story told in the Tamil classic *Śilappadikāram*. (See paper iii in Appendix).

In nakshatra problems we should first examine the first new moon in the solar year. By Table II the first new moon in solar year A.D. 756-57 occurred at 11-92 days of the solar year. We shall want the nakshatra correction corresponding to this period and might find it at once. By Eye-table, sections **t**, **u**, the nakshatra correction for 14-92 days = 1-16 - 07 = 1-09 days. Ādi or Karkātaka solar month lasts (by Ārya siddhānta, Eye-table, section **a**) from 93-93 days to 125-401

days of the solar year. The lunar month which must begin in this period, when there is no adhika month is Āshādha (see Eye-table, section **b**) ; and Āshādha in this particular year would begin $59\cdot06 + 14\cdot92 = 73\cdot98$ days later than the solar year. The interval from Āshādha new moon to end of bahula 7th tithi is the duration of 22 tithis or 21·66 days (Eye-table, section **d**) and about the end of these 21·66 days there would be according to Eye-table, section **s**, No. 27 Rēvatī nakshatra ($20\cdot86 +$ nakshatra correction already ascertained 1·09 days or 21·95 days in all). The day of solar year would then be $73\cdot98 + 21\cdot95 = 95\cdot93$ days (up to the end of Revatī nakshatra in Āshādha month). But we also see that before the end of Ādi month which only begins at 93·93 days there may be another Rēvatī nakshatra. If so, that would be in Srāvana lunar month, in which, however, about the end of bahula 7th tithi or 21·66 days, nakshatra No. 2, Bharanī whose interval in this particular month is 20·67 days increased (for A.D. 756–57) by the nakshatra correction, 1·09 days, to 21·76 days, will have come to an end. We work, according to the shortest method exemplified in the Eye-table for the ending moment of 7th bahula tithi and No. 2 Bharanī nakshatra.

(Col 1)	(Col 2)	(Col 3)	(Col 4)	(Col 5)	(Col 6)
(Table II) Ending moment of Śrāvana new moon tithi, A.D. 756–57	For ending moment of tithi (6) July 2·09	First new moon, solar year	DAYS 14·92	DAYS ...	For ending moment of nakshatra
☉'s equation for 125 17 days = – 01	Mean tithi end 21·66	Anomaly of first new moon in solar year		10·82	New moon (6) July 2·09
☾'s equation for 11 85 days (Col. 5) – 012 (☉'s equation) or 11 84 days = – 19		Add for Śrāvana, bahula 7 (Eye-table, section y)	110 25	0 03	Nakshatra interval. 21·76
Sum of ☉'s and ☾'s equations for tithis = – 01 – 19 = – 20	Tithi equation. 20	Difference between ending moment of ba 7 tithi and No 2 nakshatra (see above) 21 76 – 21 66	125 17	11·85	Nakshatra equation (Col 1) – 17
☾'s nakshatra equation for 11 95 days = – 17	Actual end (6) July 23·55	Anomaly of moon at ending moment of No 2 nakshatra		= + 10	(6) July 23·68
				11 95	

From Table II, we note that the Indian solar year A.D. 756–57 began on March 20·58 to which we add for beginning of Ādi:

March 20·58
" 98·98

March 114·51 = June 22.

According to the sankrānti rule observed in the Tamil country Ādi must have begun not on June 22 but on June 23.

Since we have reached July 23 by the end of both nakshatra and tithi, we say that July 23 = June 53 = June 23 + 30, or 31st of Ādi, provided that Ādi lasted so long in the year in question.

In A.D. 756–57, the Simha or Āvani sankrānti would commence on March 20·58 + 125·40 = March 145·98 = July 23·98 (Eye-table, section **q**) ; by sankranti rule, Simha month would in these circumstances begin only on 24 July : so that the 23 July A.D. 756 when ŚRĀVAṆA BAHUḌA 7 and Nakshatra BHARAṆĪ came to end at ·55 and ·68 respectively of the day, was a FRIDAY and the 31ST AND LAST DAY OF ĀDI.

100. Besides the system (followed in Sūrya and Ārya siddhāntas) of the division of the moon's path among the stars into 27 equal nakshatra spaces, there are two others, called Garga's system and Brahma's system, by which the sidereal month of 27·32166 days is divided into 27 convenient but unequal stages. Table I, page 199, gives the collective duration of the nakshatras according to the unequal systems, and the ending moment of each nakshatra according to either of these systems can be found by adding the corresponding collective duration to the ending moment of the last nakshatra Rēvatī, which should be first determined. For Brahma siddhānta this process is carried out in the Eye-table of that siddhānta, section **s**.

101. The following table shows the identification of the nakshatras with fixed stars by various authorities :—

Nakshatras.

Order and names of nakshatras.	Collective duration of Nakshatras (equal space).	Deities presiding over nakshatras.	Identified by BURGESS with	Identified by COLFROOKE with	Identified by BENTLEY with
	DAYS				
1 Āsvini	1 01	Āsvina ...	Beta Arietis ..	Alpha Arietis ..	Gamma or Beta Arietis.
2 Bharani	2 02	Yama ..	Alpha Muscae ..	Musca ..	35 Arietis.
3 Kṛttikā (Tam. Kīrttigai).	3 04	Agni ..	23 Tauri	Pr Tauri	Acyone (Ueta Pleiadum).
4 Rohiṇī	4 05	Pinjūpati ..	Al-Dabaran, Alpha Tauri.	Alpha Tauri ..	Aldebaran.
5 Mṛgaśīrā (Tam. Mīrugaiṣirām).	5 06	Soma ..	Lambda Orionis ..	Lambda Orionis ..	113, 116, 117 Tauri.
6 Ardra (Tam. Arudra or Tiruvādirai).	6 07	Rudra ..	Alpha Orionis (P) ..	Alpha Orionis ..	183 Tauri.
7 Punarvasu	7 08	Aditi ...	Beta Geminorum...	Beta Geminorum ..	Pollux
8 Pushyā (Tam. Pusam).	8 09	Bṛhaspati ..	Delta Cancri ..	Delta Cancri ..	Delta Cancri.
9 Āśleshā (Tam. Āyilyam).	9 11	Sarpāh ...	Epsilon Hydri ..	Alpha, 1 and 2 Cancri.	49, 50 Cancri.
10 Maghā (Tam. Magham).	10 12	Pitarah ...	Regulus ..	Alpha Leonis ...	Regulus.
11 Pūrva Phalgunī (Tam. Pūram).	11 13	Bhaga ..	Delta Leonis ..	Delta Leonis ..	70, 71 Leonis
12 Uttara Phalgunī (Tam. Uṭṭiram).	12 14	Aryaman ..	Al-Sarfa, Beta Leonis.	Beta Leonis ..	Beta Leonis
13 Hasta (Tam. Hastam).	13 15	Savitṛi ..	Gamma or Delta Corvi.	Gamma or Delta Corvi.	7, 8 Corvi.
14 Chitrā (Tam. Chittirai).	14 17	Tvaṣṭṛi ..	Spica Virginis ...	Alpha Virginis ..	Spica
15 Svāti	15 18	Vāyu ..	Arcturus ..	Alpha Bootes ..	Arcturus.
16 Viśākṣhā (Tam. Viśākam).	16 19	Indrāgni ...	Iota Libræ ..	Alpha or Chi Libræ	24, Libræ.
17 Anurādhā (Tam. Anusham).	17 20	Mitra ...	Delta Scorpionis ...	Delta Scorpionis ..	Beta Scorpionis.
18 Jyeshthā (Tam. Keṭṭai).	18 21	Indra ..	Antares ..	Alpha Scorpionis ..	Antares.
19 Mūla (Tam. Mūlam).	19 23	Nirṛiti ..	Lambda Scorpionis.	Lambda Scorpionis.	34, 35 Scorpionis.
20 Pūrva Āśvādhā (Tam. Pūrādām).	20 24	Āpaḥ ..	Delta Sagittarii ...	Delta Sagittarii ..	Delta Sagittarii.
21 Uttara Āśvādhā (Tam. Uṭṭirādām).	21 25	Viśvedevūh ..	Sigma Sagittarii ..	Tau Sagittarii ...	Phi Sagittarii.
21-A. Abhijit*	...	Brahma ..	Al-Nasr Al-waqi', Vega	Alpha Lyre ..	Vega.
22 Śravana (Tam. Tiruvōṇam).	22 26	Viṣṇu ...	Al-Nasr Al-tāhī, Alpha Aquilæ.	Alpha Aquilæ ...	Alpha Aquilæ.
23 Sraviṣṭhā or Dhaniṣṭhā (Tam. Avittam).	23 27	Vasavah ...	Beta Delphini ..	Alpha Delphini ..	Beta Delphini
24 Śatabhiṣaj or Śatātārakā (Tam. Sadāyam).	24 29	Varuṇa ...	Lambda Aquarii ..	Lambda Aquarii ..	Lambda Aquarii.
25 Pūrva Bhādrapadā (Tam. Pūrāṭṭādi).	25 30	Aja Ekapād ...	Alpha Pegasi ...	Alpha Pegasi ...	Alpha Pegasi
26 Uttara Bhādrapadā (Tam. Uṭṭarāṭṭādi)	26 31	Ahīrbudhnyā.	Gamma Pegasi or Alpha Andromedæ.	Alpha Andromedæ ..	Gamma Pegasi.
27 Revati	27 32	Pushan ...	Zeta Piscium ...	Zeta Piscium ...	Zeta Piscium.

* Abhijit is not reckoned when only 27 nakshatras are spoken of.

SECTION VIII.—Yogas.

102. As explained in paragraph 58, page 19 *supra*, a yoga is the time during which the sun and moon together accomplish 13 degrees 20 minutes of space. There are thus 27 yogas which together make 360°. The names of all the yogas

are given in Eye-table, section v, from which it will be seen that the collective duration of 27 yogas is 25·42020708 days by Sūrya siddhānta and by Brahma siddhānta, 25·42020574 days.

103. Unlike tithis and nakshatras, yogas do not represent the stages of the actual motion of any heavenly body or of a set of heavenly bodies. They are in fact the result of a mathematical rather than of an astronomical conception. If we draw a line



where $b a$ represents the motion of the moon in a given time and $c b$ the motion of the sun in the same time, it follows that $c a - c b$ is the moon's elongation or the space gained by the moon over the sun in the given time. If we regard separately the spaces travelled by the sun and the moon in this time, we might say that together they have done $c a + c b$. This $c a + c b$, then, is the *yoga*, while $c a - c b$ is the *tithi*. To derive the *yoga* from the *tithi*, we may make use of the formula

$$c a - c b + 2 c b = \text{yoga}.$$

where $c a$ and $c b$ are respectively the moon's and sun's longitude, but in the present method it is far simpler to follow the Eye-table method shown below : —

Actual ending moment of a yoga.

104. Sections **V**, **W**, **X** of the Eye-table, together with sections **e** and **g** of the same table contain all that is necessary for determining the actual ending moment of a *yoga*, provided we know the mean ending moment of the previous new moon and the sun's and moon's anomaly at that moment, for which purpose we may use again the Eye-table, as shown in the illustrative examples appended to each Eye-table; but it is easier to extract the quantities we require from Table II as follows :—

Required the ending moment of *yoga Siddhi* (No. 16 *yoga*) in lunar *Kārttika* month in A.D. 1910-11.

The normal interval of *yoga siddhi* (No. 16) in the month in question is 12·0136 days after *Kārttika* new moon. For the year 1910-11 we have to lengthen this interval by a correction which depends on the interval of the first new moon in the solar year (25·9134 days by Table II). Exactly as we did in the case of a *nakshatra* (page 33 supra) we find from Eye-table, sections **W** and **X** the correction corresponding to 25·9134 days, i.e.,

$$0\cdot63061 - \left\{ \begin{array}{l} \cdot12666 \\ + \cdot00047 \\ - \cdot12619 \\ + \cdot5044 \end{array} \right. \begin{array}{l} 12619 \\ 12619 \end{array}$$

Adding ·5044 to the normal *yoga* interval 12·0136, we have 12·5180. With this result we proceed as we did for a *nakshatra*, remembering that sun's and moon's anomalies and equations are both necessary for *yogas*.

(Table II).	—	Sun's anomaly in days.	Moon's anomaly in days.	Equations.
Commencement of solar year 1910-11.	Ap. 13·2080	...	...	...
First new moon in solar year 1910-11.	25·9134	25·9134	0·535	...
Duration in days from first new moon to Kārttika new moon (Eye-table y)	177·1835 216·3049	177·1835 203·0969	11·856 14·391	...
		Sun's anomalistic equation for 203·10 days.	+·1323	☉'s +·1323
		Moon's <i>yoga</i> equation for	14·523 days	☾'s +·0661
Sum of ☉'s and ☾'s eqn.	+·1984			
	April 216·5033	...	...	+ 1984

By Eye-table section **q**, April 216 = November, 2; and by Eye-table section **r** 5033 of a day = 30 ghaṭikas 12 palas. We conclude that yoga Siddhi in lunar Kārttika month in A.D. 1910-11 ended at 30 ghaṭikas 12 palas after mean sunrise on the 2nd November A.D. 1910.

105. Yogas in their astronomical sense are not very much in use at present, but certain astrological *yogas* (Amritayoga, Siddhayoga, Marāyoga) are much more in use, being based on combinations of nakshatras with certain week-days. These so-called *yogas* are not alluded to in the epigraphical period.

Apart from inscriptions dated in the Vikrama era, where *yogas* proper are freely cited, one hears of the *yoga* proper in such auspicious combinations as the following:—

Kapilashashthī, i.e., the combination of Bhādrapada kṛṣṇa śaṣṭhī (in a year in which either Bhādrapada or some previous lunar month is *adhika*) with nakshatra *Rohiṇī* and yoga *Vyātīpātā* on a Tuesday. The combination is proverbially rare and supposed to be very difficult to foresee, but it can be easily predicted by means of the present method. Look in Table II for Bhādrapada mean new moon (in a year having this or some previous month as *adhika*) falling on a Wednesday, mean ending moment being less than 50, and calculate *Rohiṇī* nakshatra and *Vyātīpātā* yoga for that month. Of course the tithi, the nakshatra, or the yoga may fall on Monday or Wednesday, and then there will be no *Kapilashashthī*.

N.B.—In A.D. 17, A.D. 193, A.D. 396, A.D. 440 A.D. 1513 there were *Kapilashashthīs*: none between A.D. 1840 and A.D. 2000. Let the student try A.D. 1736 and A.D. 1787.

Ardhodaya yoga, i.e., a combination on a *Sunday* by day-time, of nakshatra *Rohiṇī*, yoga *Vyātīpātā*, and *Māgha Amāvāsyā* (i.e., the *Amāvāsyā* at the end of lunar *Māghā*).

Champa Shashthī, i.e., a combination on a *Sunday* or *Tuesday* of *Mārgaśīrṣa* śukla śaṣṭhī with nakshatra *Satabhishaj* and yoga *Vaidhṛtī*.

Mahāmahā Varuṇī, i.e., a combination of *Phālguna* kṛṣṇa trayodaśī with *Saturday* and nakshatra *Satabhishaj* and yoga *Śubha*.

Daśaharī, i.e., a combination in the forenoon of *Jyēṣṭha* śukla daśamī with *Wednesday* (or *Tuesday*) and nakshatra *Hasta* and yoga *Vyātīpātā*.

Mahāsivarātri, i.e., *Māgha* kṛṣṇa chaturdaśī combining at *midnight* with *Sunday* or *Tuesday*, nakshatra *Śravaṇa* and yoga *Śiva*.

SECTION IX.—Karanas.

106. The list of *karanas* is given in Table I. Every tithi is divided into two *karanas*, and the ending moment of the second of every set of two *karanas* coincides with the ending moment of a tithi. For the other *karana* all we have to do is to add half a tithi, 49217 day, to the last mean tithi, as well as to the corresponding solar and lunar anomalies and calculate from these data the absolute ending moment of the *karana* thus:—

		Sun's anomaly in days.	Moon's anomaly in days
On 27 February 1910 the mean tithi (18th) ended at	7479 day.	320.30	12.324
For the 37th <i>karana</i> (<i>Bava</i>) add ..	4922	49	492
Total ..	7401 day.	320.79, G's Eqn. + 1501.	12.816 + 150 = 12.966.
G's Equation—0840 ..			
Sum of the equations + 1501—0840= ..	+ 0661		
	8062 day, i.e., the <i>karana</i> <i>Bava</i> ended at 48 ghaṭikas 22 palas on 27 February 1910.		

107. Properly speaking, two *karanas* ought to be shown in the panchāṅga, corresponding to every tithi: but the panchāṅgas in practice mark only that *karana* whose ending moment is 30 ghaṭikas or less from sunrise. If the tithi itself ends at 30 ghaṭikas or less from sunrise, the same ending moment is entered in the panchāṅgas against both tithi and *karana*. In the above case, i.e., on 27 February 1910, the 36th *karana* *Viṣṭi* (called *Bhadra* in the Tamil country) will be found marked in the panchāṅgas as having the same ending moment as the tithi.

SECTION x.—*Ahas*.

108. Having discussed the five component parts of a panchānga proper, viz., *vāra*, *tithi*, *nakshatra*, *yoga* and *karana*, it remains to notice two other entries usually found in a line with the first five, viz., the *ahas* and the *tyājyam*.

109. The *ahas* or duration of daylight is simply the normal period of daylight in India, viz., twelve hours or 30 ghaṭikas, with the corrections for sunrise and sunset, deduced according to the rules to be presently laid down. Thus, if on a particular day the sun rose at 5-25 a.m. and set at 6-20 p.m. the *ahas* would be 12 hours + 35' + 20' = 12 hours 55 minutes, or 32 ghaṭikas 18 palas.

SECTION xi.—*Tyājyam*.

110. The *tyājyam* (lit., portion to be abandoned for purposes of business) is a definite portion of the total duration of each *nakshatra*, which portion is considered inauspicious. If the *tyājyam*, always reckoned from the first moment of each *nakshatra*, ends by day, it is called a day-tyājyam, and if it ends by night, it is called a night-tyājyam, and in the latter case it is usual to deduct the *ahas* and state that the *tyājyam* ends so many ghaṭikas and palas after sunset.

111. The following are the fractional parts which are *tyājyam* for the several *nakshatras* :—

	<i>Tyājyam</i>		<i>Tyājyam</i>
1 <i>Āśvinī</i> (five-sixths)	5/6	15 <i>Svātī</i> (seven-thirtieths)	7/30
2 <i>Bharanī</i> (two fifths)	2/5	16 <i>Viśakhā</i> (seven-thirtieths)	7/30
3 <i>Krittikā</i> (one-half)	1/2	(Tam. <i>Viśākam</i>)	
(Tam. <i>Kiruttigai</i>)		17 <i>Anurādhā</i> (one-sixth)	1/6
4 <i>Rohinī</i> (two-thirds)	2/3	(Tam. <i>Anusham</i>)	
5 <i>Mṛigaśiras</i> (seven-thirtieths)	7/30	18 <i>Jyeshthā</i> (seven-thirtieths)	7/30
(Tam. <i>Mirugasirām</i>)		(Tam. <i>Kēṭṭai</i>)	
6 <i>Ārdrā</i> (seven-twentieths)	7/20	19 <i>Mūlā</i> (one-third)	1/3
(Tam. <i>Ārudra</i> or <i>Tiruvadirai</i>)		(Tam. <i>Mūlam</i>)	
7 <i>Punarvasū</i> (one-half)	1/2	20 <i>Pūrva-Āśādhā</i> (two-fifths)	2/5
8 <i>Pushyā</i> (one-third)	1/3	(Tam. <i>Pūrāḍam</i>)	
(Tam. <i>Pūsam</i>)		21 <i>Uttara Āśādhā</i> (one-third)	1/3
9 <i>Āśleshā</i> (eight-fifteenths)	8/15	(Tam. <i>Uttirāḍam</i>)	
(Tam. <i>Ayilyam</i>)		22 <i>Śrāvāṇa</i> (one-sixth)	1/6
10 <i>Maghā</i> (one-half)	1/2	(Tam. <i>Tiruvōṇam</i>)	
(Tam. <i>Magham</i>)		23 <i>Śrāviṣṭhā</i> or <i>Dhanishthā</i> (one-sixth).	1/6
11 <i>Pūrva Phalgunī</i> (one-third)	1/3	(Tam. <i>Aviṭṭam</i>)	
(Tam. <i>Pūram</i>)		24 <i>Satabhishaj</i> or <i>Satātāraka</i> (three-tenths)	3/10
12 <i>Uttara Phalgunī</i> (three-tenths)	3/10	(Tam. <i>Sadayam</i>)	
(Tam. <i>Uttaram</i>)		25 <i>Pūrva-Bhādrapadā</i> (four fifteenths)	4/15
13 <i>Hastā</i> (eleven-thirtieths)	11/30	(Tam. <i>Pūratṭadi</i>)	
(Tam. <i>Hastam</i>)		26 <i>Uttara Bhādrapadā</i> (two-fifths)	2/5
14 <i>Chitra</i> (fourteen-fifteenths)	14/15	(Tam. <i>Uttirattadi</i>)	
(Tam. <i>Chittirai</i>)		27 <i>Revatī</i> (one-half)	1/2

N.B.—Authorities differ as to the *tyājyam* for certain of the *nakshatras*; for instance, Mr Śrīaṅṭi, the well-known publisher of *Drigganitapāṇchangas*, has informed the author that his *tyājyams* for *nakshatras* Nos. 13, 14, and 19 are 7/15, 1/3, and 1/3 (instead of 8/15, 1/3, and 1/3), respectively.

112. The method of working out the *tyājyam* is simple. We take the total duration of each *nakshatra* from the ending moment of the previous *nakshatra* up to its own ending moment and cut off the *tyājyam*.

Thus, 12 July 1910, *nakshatra* ended *Uttara Phalgunī* at Madras at 51 ghaṭikas 50 palas.

On 13 July 1910, the next *nakshatra* *Hastā* ended in the same latitude at 56 ghaṭikas 30 palas.

The total duration of the *nakshatra* *Hastā* was, therefore, 64 ghaṭikas 40 palas.

The *tyājyam* for *Hastā* is $\frac{11}{30}$.

Now, $\frac{11}{30}$ of 64 ghaṭikas 40 palas = $11 \times (2 \text{ ghaṭikas } 9 \text{ palas}) = 23 \text{ ghaṭikas } 39 \text{ palas}$.

∴ The *tyājyam* for nakshatra Hasta ended on 12 July 1910, 51 ghatikas 50 palas + 23 ghatikas 39 palas = 13 July 1910, 15 ghatikas 29 palas, which was a day *tyājyam*.

Again, on 20 July 1910, nakshatra Mūla No. 19, ended at 31 ghatikas 56 palas. On 21 July 1910, nakshatra Pūrva Āshādhā No. 20, ended at 35 ghatikas 36 palas.

∴ Total duration of Pūrva Āshādhā was 63 ghatikas 40 palas, of which the *tyājyam* was $\frac{2}{5}$, i.e., $2 \times (12 \text{ ghatikas } 44 \text{ palas}) = 25 \text{ ghatikas } 28 \text{ palas}$.

∴ *Tyājyam* for Mūla ended on 20 July 1910 at 57 ghatikas 24 palas; which, being night-time, we deduct the *ahas*, 31 ghatikas 27 palas (arrived at in accordance with subsequent rules regarding sunrise and sunset);

∴ *Tyājyam* ended at 25 ghatikas 57 palas after sunset on 20 July 1910, and was a night *tyājyam*.

SECTION XII.—Sunrise.

113. Time is reckoned in Indian astronomy, in the first instance, from Lankā^{*} sunrise, and corrections are then applied so as to arrive at the time reckoned from local sunrise. These corrections are three in number:—

- (1) A correction for terrestrial longitude;
- (2) A correction for equation of time;
- (3) A correction for the sun's tropical longitude.

114. To understand the nature of these corrections, we shall give in popular language the astronomical theory of local time, as applied by Indian astronomers.

(1) *Correction for terrestrial longitude*.—If the sun moved uniformly along the celestial equator, all places on earth would have sunrise at exactly 6 a.m., local time. On this supposition local time for any moment of the day could be deducted from Lankā time by adding or subtracting four times as many minutes of time as there are degrees of longitude between Lanka (or Ujjain) and the given place. The longitude of Ujjain being 76° East of Greenwich, any place whose longitude is more than 76° from Greenwich has a positive correction, and any place whose longitude is less than 76° has a negative correction for terrestrial longitude. For example: the longitude of Madras being 80½° east of Greenwich, i.e., 4½° more than Ujjain, local time at Madras is obtained from Lankā time by adding $4\frac{1}{2}^\circ \times 4' = 18$ minutes of time.

N.B.—A meridian of terrestrial longitude makes a revolution of 360° in 24 hours, that is, it revolves 1° in $(24 \times 60 \div 360 =) 4$ minutes. This interval of 4 minutes may be called the *time-difference* corresponding to a degree of terrestrial longitude.

The *time-difference* or correction for terrestrial longitude for nearly 200 important places in India (their importance being gauged by their population according to the Census Report of 1911) is given at the end of Table III. The correction is given in seconds of time which can be converted into *palas* or *vinādis* by simply dividing the correction by 24.

(2) *Correction for equation of time*.—The sun does not move uniformly throughout the year. Hence, for each day of the solar year, we have to apply a correction which depends on the day's equation of the centre. The correction for each day of the solar year on account of the equation of time may be expressed in seconds of time.

(3) *Correction for the sun's tropical longitude*.—The sun does not move along the equator, as in our first supposition, but along the ecliptic; and therefore it is only at the points where the ecliptic cuts the equator, i.e., at the moments of vernal and autumnal equinox that the first supposition holds good. At other times of the year, a correction has to be applied, depending on the sun's tropical longitude, i.e., on his distance from either equinox measured along the ecliptic.

* Lankā is an imaginary island supposed to be situated on the equator on the meridian of Ujjain, the Indian Greenwich—*vide* paragraph 20, page 5 *supra*.

115. Now, how are we to determine the sun's tropical longitude? The longitude that is given by the day of the Indian solar year is a sidereal longitude, i.e., the longitude of the sun measured from a fixed point of the ecliptic, which fixed point was the true vernal equinox about A.D. 500 or Kaliyuga 3600. Every year since then, the vernal equinox has been moving further and further away from that fixed point, and the sun's tropical longitude for any year subsequent to Kaliyuga 3600 must be found by adding to his sidereal longitude 3 degrees for every subsequent period of 200 years.* In this portion of the treatise degrees are always converted into days, and for the purpose of Sūrya siddhānta tithis, the tropical longitude for any day in any year is determined by *adding to the day of the solar year 1 day for every 64 years expired since Kaliyuga 3740 (A.D. 639)*. Other siddhāntas give the precession as 1 day for every 60 years, which is more correct than 1 day for every 64 years.

By reckoning 3740 Kaliyuga and not 3600 Kaliyuga as the date of coincidence of the sidereal and tropical longitude, we eliminate the śodhya of 2·1707 days (Sūrya siddhānta) ; otherwise we would have to deduct the śodhya from the day of the solar year in order to arrive at the sidereal longitude and then add to the sidereal longitude so arrived at as many days as there were periods of 64 years since 3600 Kaliyuga. ($2·1707 \times 64 = 139·9248$, which is nearly 140.)

116. We mentioned the śodhya in a general way in paragraph 66 *supra*, and shall revert to it more fully in paragraphs 189 *et seq.* Meanwhile we may interpret the śodhya in the following manner. The sun's equation of the centre, according to Table IV-A on 0 day of the solar year, is + 2·1378 degrees, which, by Table IV-C is the sun's motion for 2·17 days. In other words, when the mean sun is at 0 day of the solar year, the actual sun has already done 2·17 days journey of his annual course. Therefore, whenever we wish to express in days the sidereal longitude of the sun, i.e., his distance from the position he occupied on 0 day of the mean solar year, we deduct the śodhya of 2·1707 days from the day of the solar year we are at.

117. For the year A.D. 1279 the tropical longitude is found by adding to the day of the solar year $\frac{1279 - 639}{64} = \frac{640}{64}$, i.e., exactly 10 days, and this addition holds good strictly for 64 years, i.e., for 32 years before and 32 years after A.D. 1279 or from A.D. 1247 to A.D. 1311. For 30 important places in India, including one for every degree of North Latitude between 8° and 35°, the total of all the three corrections for the year A.D. 1279 is given in Table III for each day of the solar year. In this table the correction for tropical longitude which applies to the year A.D. 1279 may be assumed to apply to the whole of the epigraphical period of 400 years from A.D. 1000 to 1400 (vide paragraph 1) instead of only to the period of 32 years before and after A.D. 1279. There is no great error in this assumption, but of course direct calculation may be made, if the reader so pleases, for each case under examination. Further, the same table gives the equivalence of English and Indian solar dates for all solar years which commenced on the 25th March ; for other years we must make a *deduction* or *addition* according as the Indian solar year in question commenced *after* or *before* 25th March.

118. With these elementary notions on time, we are ready to work out quite accurately (according to the siddhāntas) any problem in local time. We shall work out, by way of illustrations, the somewhat formidable array of problems which are presented in Professor Jacobi's learned article in Volume II of the *Epigraphia Indica*.

(i) Kaliyuga 4128 ; 4 Bhādrapada (Bengal solar month) ; place RATNAGIRI (17° N. Lat.).

Correction (1) for terrestrial longitude ; — 34 vināḍis. (We do not use this correction.)

* This is the correction for precession of equinoxes. The addition to be made to Indian sidereal longitudes on account of the precession of equinoxes is given in degrees in paragraph 229, page 94, under chapter V. " Planetary Chronology " for various epochs from A.D. 582 to A.D. 2051.

Correction (2), equation of time: for 4 Bhādrapada, i.e., the 129th day of solar year, in 17° lat. + 425 seconds.

Correction (3), tropical longitude for Kaliyuga 4128, 4 Bhādrapada: the number of days to be added to 129 is $\frac{4128-3740}{64} = \frac{388}{64} = 6$.

Now, 129 + 6 being 135, it follows that correction (3) is that for the 135th day, 17° N. Lat., i.e., + 746 seconds.

Total of the corrections (2) and (3) is + 425 + 746 = + 1171 seconds = $\frac{1171}{24}$ or 49 vinādis.

N.B.—Corrections (2) + (3) are sufficient for determining local sunrise: in this case the result “+ 49 vinādis” means that on the day in question the sun rose at Ratnagiri 49 vinādis or 20 minutes before 6 a.m. [Result arrived at by Professor Jacobi, 50 vinādis which is also 20 minutes of time.]

(ii) Kaliyuga 4325, 4 Mārgaśīrsha (Bengal solar month), SRINAGAR, latitude 34°. Correction (1): — 8 vinādis (We do not use this correction.)

Correction (2): + 437 seconds (220th day).

Correction (3): For 220 + $\frac{4325-3740}{64} = 220 + \frac{585}{64} = 220 + 9 = 229$ days, the correction is = 2248 seconds.

Total of corrections (2) and (3): + 437 — 2248 sec. = — 1811 seconds = — 75 vinādis. [Professor Jacobi arrives at the result — 74 vinādis.]

(iii) Kaliyuga 4128; 7 Jyēshṭha (Bengal solar month); ALIGARH, latitude 28°.

Correction (1), + 14 vinādis. (We do not use this correction.)

Correction (2), — 291 seconds (37th day).
Correction (3), + 2576 seconds (43rd day).
Total of corrections (2) + (3): + 2285'' = 95 vinādis (94 vinādis according to Professor Jacobi).

(iv) Kaliyuga 3585; Āshāḍha *sukla* 12 (lunar month), ERAN, 24° N. Lat.

See paragraph 207, page 86 below.

119. The reader should note carefully when the total of all the *three* corrections should be used and when the total of corrections (1) and (3) will suffice. When we merely want to know by how many seconds *local* sunrise preceded or followed 6 a.m., we should simply add up the second and third corrections, for here there is no need to consider the effect of terrestrial longitude. If the total correction is positive, sunrise precedes 6 a.m.; if the total correction is negative, sunrise is later than 6 a.m. The first three examples above illustrate this aspect of the problem.

When we want to know how many seconds should be added or deducted from the ending moment of a *tithi* or *nakshatra*, of which we already know the Lankā time, i.e., the time relatively to Lankā sunrise, we should sum up all *three* corrections, and if the sum is positive we should add it to Lankā time, while if the sum is negative it should be subtracted from Lankā time.

SECTION xiii.—Lagna.

120. Closely analogous to the calculation of sunrise is that of the *lagna*, i.e., the portion of the ecliptic which appears at the eastern horizon at a *particular moment of the day*. At other times we might require to know the moment of the day when a *particular portion of the ecliptic* will be *lagna*. An example of the first kind of problem is—

“What is the lagna at the moment of a person’s birth”?

N.B.—The portion of the ecliptic which is *lagna* or “cut” at the horizon at any given moment is ordinarily referred to as “the *lagna*.”

An example of the second problem is—

“At what moment of a day, suitable for marriage, will a particular sign of the zodiac be lagna, so that the hour as well as the day most suitable for marriage may be determined”?

The best exposition of the lagna is that given by Professor Jacobi at pages 189, 190 of the *Indian Antiquary* for 1900, Volume XXIX. A slight adaptation of Professor Jacobi's rules will be necessary to suit our sunrise Table III.

121. The Rules are—

- (1) Calculate the time-difference for the interval of space between the sun and the portion of the ecliptic which is lagna.
- (2) Apply the necessary corrections for tropical longitude.

122. *Problem I.*—At how many *ghaṭikas* and *palas* after sunrise was the 165th degree of the ecliptic (i.e., the 15th degree of the sign *Kanyā*,—vide Eye-Table z) *lagna* on the 6th *Jyēshtha* (Bengal solar month) in Kaliyuga 4000, Latitude 20° North? By Eye-table a the end of 6th solar *Jyēshtha* was $30.93 + 6 = 36.93$ days or nearly 37 days from the first moment of the solar year A.D. 899—900.

Now, the sidereal longitude at sunrise on any day of the solar year is found from Tables IV-C and IV-D thus—

Sun's actual Long. for 37 days of the solar year (Table IV-C)	34.32° + 1.49 = 35.82°
Deduct Sun's Long. for 60 day (Table IV-D)	59°
	35.23°

N.B.—We deduct 60 on account of the commencement of the solar year according to Table II *Sūrya siddhānta*.

For the present purpose we take the nearest whole degree, i.e., 35 degrees.

The interval in space between 35° and 165° = 130°.

Now 360 degrees of the ecliptic rise above the horizon in 1 day or 60 *ghaṭikas*.

$$\therefore 130 \text{ degrees} \quad \dots \quad \dots \quad \frac{130 \times 60}{360} = 21 \frac{2}{3} \text{ ghaṭikas}$$

$$= 21 \text{ ghaṭikas } 40 \text{ palas.}$$

In other words, the 165th degree of the ecliptic was *lagna* about 21 *ghaṭikas* 40 *palas* after sunrise on the day in question.

123. Next, we proceed to apply the corrections for tropical longitude.

The difference between the tropical and sidereal longitude of the sun for the year Kaliyuga 4000 = $\frac{4000-3740}{64} = 4$ days. Now $36.93 \text{ days} + 4 \text{ days} = 40.93 \text{ days}$.

The correction for the tropical longitude of the sun is that pertaining to the 41st day in Table III, under latitude 20°, i.e., +1865 seconds.

For the correction for tropical longitude of the lagna, i.e., sidereal 165° of the ecliptic in Kaliyuga 4000 we have to determine the day when the mean sun accomplishes 165° of the ecliptic, which is determined as follows from Tables IV-C and IV-D:—

(Table IV-C) 169 days —	164.43°
(Table IV-D) 5° day —	57°
169.58 days —	165°

We add 4 days to 169.58 days for tropical longitude in the year Kaliyuga 4000. Total 173.58 or 174 days.

The correction for tropical longitude corresponding (in Kaliyuga 4000) to sidereal 165°, or tropical 174 days, is + 151 seconds.

We add this correction *with the sign reversed* to the first:—

$$+1865 - 151 = 1714 \text{ seconds} = 72 \text{ palas.}$$

Adding this correction to the approximation first arrived at, we have

21 ghaṭikas 40 palas.
+ 1 ghaṭika 12 palas
22 ghaṭikas 52 palas.

This was the moment (according to Professor Jacobi, *loc. cit.*) when the 165th degree of the ecliptic was *lagna* on the day in question.

N.B.—*Firstly*, we had to convert 165° of the ecliptic into days in order to apply Table III, which expresses the various portions of the ecliptic as days of the solar year.

Secondly, we reversed the sign of the correction in the case of the *lagna* because what we wanted was the difference between the corrections on account of the tropical longitude of the sun and of the *lagna* respectively.

124. *Second Problem.*—“What portion of the ecliptic was *lagna* on the same day at 20 ghaṭikas after sunrise?”

We have seen that sunrise on the solar 6th Jyēshthā corresponds to 35° sidereal longitude.

Now, a time-difference of 20 ghaṭikas answers to an interval in space of $20 \times \frac{360}{60} = 120$ degrees.

∴ The portion of the ecliptic which was *lagna* at 20 ghaṭikas after sunrise was (*roughly*) $120^\circ + 35^\circ = 155^\circ$ or the 5th degree of the 6th sign *Kanyā* (vide Eye-table for the longitude corresponding to the different rāśis).

This is enough for all ordinary calculations of *lagna*.

If we wish to be quite accurate, we proceed as follows. The correction for tropical longitude of the sun on the day in question was, as we have seen, +1865 seconds.

The correction for the tropical longitude of the *lagna*, i.e., 155° of the ecliptic must be found by applying Tables IV-C and IV-D.

(Table IV-C) 159 days = 154° 57'

(Table IV-D) 44 day = 13°

159·44 days = 155° 00'
Add for tropical longitude 4 days

163·44 days.

The correction for tropical longitude pertaining to the 20th degree of latitude and the 163rd day (in Kaliyuga 4000) is (by Table III) +333 seconds.

We add this *with sign reversed* to the first correction:

$+1865 - 333 = +1532 = 64$ palas.

In other words, on the day in question, the 155th degree of the ecliptic was *lagna* at 20 ghaṭikas *plus* 64 palas.

We want, however, the degree of the ecliptic which was *lagna* at exactly 20 ghaṭikas after sunrise.

125. The annexed small table adapted from Prof. Jacobi's Table of *uldayāsus* in Vol. I, *Ep. Ind.*, enables us to accomplish this stage of the problem.

We learn from this table that in the 20th degree of latitude the 6th sign of the zodiac (*Kanyā*, with which we are concerned) takes 257 seconds to rise *one* degree above the horizon.

∴ 64 palas or 1532 seconds are taken to rise $\frac{1532}{257} = 5.9611^\circ$

or (by Table VI) 5 degrees 57 minutes 40 seconds,

or nearly 5 degrees 58 minutes.

In other words, we should deduct 5 degrees 58 minutes from 155° in order to know which portion of the ecliptic was *lagna* at exactly 20 ghaṭikas after sunrise on the day in question.

The portion in question was 155° *minus* 5 degrees 58 minutes = 149 degrees 2 minutes, which is exactly the result arrived at by Professor Jacobi.

Time (in seconds) taken by a degree of the ecliptic to rise above the horizon.

DEGREES OF TERRESTRIAL LATITUDE FROM 8° TO 35°.

Signs of the zodiac.	Degrees of ecliptic.			8°	9°	10°	11°	12°	13°	14°	15°	16°	17°	18°	19°	20°	21°
I	0°—30°	XII	330°—360°	210	208	206	204	202	201	199	197	195	194	192	190	188	186
II	30—60	XI	300—330	229	227	226	224	223	221	220	218	217	215	214	212	211	209
III	60—90	X	270—300	253	253	252	252	251	251	250	250	249	248	248	247	246	244
IV	90—120	IX	240—270	283	283	284	284	285	286	286	287	287	288	289	289	270	270
V	120—150	VIII	210—240	260	251	258	254	256	257	259	260	262	263	265	266	268	269
VI	150—180	VII	180—210	238	238	239	241	243	244	246	248	250	252	254	255	257	259
Signs of the zodiac.	Degrees of ecliptic.			22°	23°	24°	25°	26°	27°	28°	29°	30°	31°	32°	33°	34°	35°
I	0°—30°	XII	330°—360°	184	182	180	178	176	174	172	170	168	165	163	161	159	157
II	30—60	XI	300—330	208	206	205	203	201	199	197	196	194	192	190	188	186	184
III	60—90	X	270—300	245	244	244	243	242	241	240	239	238	238	237	237	237	236
IV	90—120	IX	240—270	271	273	273	274	274	275	275	276	277	277	278	278	279	280
V	120—150	VIII	210—240	270	272	274	276	278	279	281	283	285	287	289	291	293	295
VI	150—180	VII	180—210	261	263	265	267	269	271	273	275	278	280	282	284	286	288

126. The operation of determining the *lagna* of a particular moment (e.g., the moment of a birth), or the moment when a particular degree of the zodiac will be *lagna* (say, to make an auspicious marriage) has to be performed occasionally not only by the astrologer, but also by the enquirer who wishes to verify a statement in a time-record as to *lagna*. The rules on this subject given above are adapted from Prof. Jacobi's original article in the *Indian Antiquary*. For rapid working the following formulæ may be found useful. Let—

A = Sun's longitude at 6 a.m. (Lanka).

B = interval in decimals of a day between local sunrise and actual local time of birth or other moment. This interval may, for practical purposes, be taken also as the change of sun's longitude corresponding to that interval; see N.B. to process (7) in first example below.

a = seconds per degree of rise (according to table supra).

T.L.S. = correction in seconds (Table III) for tropical longitude of sun at actual local sunrise.

T.L.L. = correction in seconds (Table III) for tropical longitude of approximate degree of *lagna*.

The approximate degree, which is *lagna*, = $(A - B) + (B \times 360^\circ)$ or $(A + 359 B)$ degrees.

The formula $A + 359 B$, process (11) below, is convenient for readily ascertaining the approximate *lagna*; and when the figure so obtained is well within a *rāsi*, it will be unnecessary to proceed further. For exact calculation, and when *lagna* is on the borders of a *rāsi*, we have,

$$\text{Actual lagna} = A + 359 B - \frac{\text{T.L.S.} - \text{T.L.L.}}{a}$$

In order to render quite easy the performance of this operation, we shall exhibit, in detail and by means of an example, the 16 processes of which the operation consists. We propose to find the *lagna* of a child born at Madras at 12 noon (Standard or Indian Railway time) on 1st April 1915.

Process.

(1) Interval from actual local sunrise to moment of birth.

Application.

(1) The time (12 noon, standard time) should be reduced by 9 minutes for all dates subsequent to 1st July 1906, the date of introduction of *Indian standard*, or *Railway time* which is in advance of *Madras mean astronomical time* by 9 minutes. The mean astronomical time of birth was 11 hours 51 minutes after midnight; or 5 hours 51 minutes or 2437 of a day after mean Madras sunrise. To this should be added, by Table III (for lat. 13°) minus 422 seconds for equation of time plus 351 seconds for tropical longitude = -71 seconds = -0.007 of a day. (N.B.—In order to find the tropical longitude

*Process.**Application.*

(2) Interval from Lanka sunrise to moment of birth.

(3) Change of sun's longitude corresponding to (1) "interval from actual sunrise to moment of birth"; use Table IV-D.

(4) Change of sun's longitude corresponding to (2) "interval from lankā sunrise to moment of birth", use Table IV-D.

(5) Days and fraction of a day (Lanka time) elapsed in solar year up to moment of birth.

(6) Longitude of sun at moment of birth.

N.B.—This is the *absolute* longitude of the sun for the moment of birth and does not depend on Lankā or any other time, though it is deduced by means of Lankā time

(7) Longitude of sun at actual local sunrise.

To obtain this, we simply subtract (3) from (6); or we shall have equally correct results by subtracting (1) from (6).

N.B.—We see that we might equally well take (1) instead of (3), and in general a fraction of a day less than unity may be used equally well as the change of sun's longitude corresponding to that fraction of day, since the sun's motion per day is nearly 1° .

(8) Add to (7) as many minutes of an arc as there are years since A.D. 532 and deduct 360° if necessary. This is the addition for luni-solar precession—see Paper (ii) in Appendix; also paragraph 229, page 94 below. The exact figure according to paragraph 229 is 22.5° , but the difference between this and 23.05° , viz., $.5^\circ$ does not affect process (9).

for any day of the solar year for the present time, from A.D. 1840 to A.D. 1920—we should add 20 days to the number of elapsed days in the solar year and find under the given latitude in Table III the correction for tropical longitude appropriate to the resulting number of days.) The interval from actual Madras sunrise up to moment of birth was therefore 5 hours 51 minutes less 71 seconds = $.2430$ of a day.

This is obtained by subtracting from 5 hours 51 minutes (the given interval), the time difference due to Ujjain longitude of Madras, i.e., 18 minutes; (2) will then be 5 hours 33 minutes = $.2312$ of a day.

The change of sun's longitude corresponding to $.2430$ of a day is (by Table IV-D of this work) $.2365 + .0030 = .2395$ of a degree.

The change of sun's longitude corresponding to $.2312$ of a day is (by Table IV-D) $.2267 + .0012 = .2279$ of a degree.

N.B. Processes (3) and (4) may generally be dispensed with. See *N.B.* to (7) below.

Take the given day of the English year (1st April) as reckoned from previous 1st April (Eye-table, section q) and deduct the day and fraction of day in April when the solar year 1914–15 commenced, according to Table II, i.e., April 12.2430. The given English day, April 1st, A.D. 1915, is, by Eye-table q, the 366th day reckoned from previous 1st April. Now, 366.2312 minus 13.2430 days = 352.9882 days.

By Table IV-C, the mean longitude of sun for 352 days of the solar year is 344.7927°

Equation of centre for 352 days

of the solar year = $+ 2.1717^\circ$

Longitude of sun corresponding

to .98 of day = $.9659^\circ$

Longitude of sun corresponding to .0082

of day = $.0081^\circ$

Longitude of sun corresponding

to 352.9882 days = 347.9884°

$$347.9 \text{ minus } .2^\circ = 347.70.$$

$$1,915 - 532 = 1,383 \text{ minutes} = 23 \text{ degrees } 3 \text{ minutes} = 23.05^\circ.$$

$$347.7^\circ + 23.05 = 370.75^\circ$$

$$- 360^\circ$$

$$10.75^\circ$$

*Process.**Application.*

(9) Convert (8) into days by Table IV E. Deduct 365·26 days *if necessary*.

10 degrees = 10·15 days.
·75 degree = ·76 day

(10) Correction for tropical longitude of sun (Table III) appropriate to latitude of given place (Madras, lat. 13°) and days arrived at in (9)

10·8° = 10·91 days.

+ 428 seconds of time,

(11) Approximate lagna.—

Add the figure in (6) to 359 times the figure in (3) and deduct 360 *if necessary*.

347 9° + 359 × ·2395° = 433·9°
— 360°
73·9°

(12) Add to (11) same quantity as in (8) and convert result into days by Table IV-E. Deduct 365·26 days *if necessary*.

73·9° + 23·05° = 96·95° = 98·37 days (by Table IV-E, for

90 degrees = 91·32 days.
6 degrees = 6·00 days.
·95° or 57 min. = ·96 day.

97·0° = 98·37 days.

(13) Correction for tropical longitude of approximate lagna (Table III) appropriate to latitude of given place (Madras, lat. 13°) and days arrived at in (12).

+ 1,217 seconds.

+ 428 — 1,217 — — 789 seconds.

Sign of zodiac corresponding to 97·0° of tropical longitude is IV.

(14) From (10) deduct (13) algebraically.

(15) Divide (14) by figure under latitude of given place in the table on page 44 and against sign of zodiac corresponding to degrees in (12).

The figure against sign IV and under lat. 13° in the table on page 44 *supra* is 266 seconds.

Now — 789 — — 3 (approximately).
266 — —

73·9° — (— 3°) = 76·9° or 17° in Mithuna rāsi.

(16) Actual lagna is (11) minus (15) subtracted *algebraically*.

The above example is suited to a case in which the moment of birth is recorded in Indian Standard Time. But supposing the birth we are considering took place at 12 noon, Standard Time, on 1st April 1915 at *Vizagapatam*, where the same time is kept as at Madras, then in order to complete process (1) above, i.e., to ascertain the interval between actual local sunrise and time of birth, we should increase or decrease the interval by the difference in time between the Ujjain longitude of Madras and that of Vizagapatam as given in Table III. The interval will then be diminished by 1,804 — 1,072 = 732 seconds = 12 minutes, 12 seconds = (by Table VI) ·0084 of a day.

If, on the other hand, strict Indian usage has been followed (which is nowhere done at present, except by extra careful astrologers), and the moment of birth has been recorded as so many ghalikas and palas after *actual local sunrise*, this is the very thing we want for process (1), and we need not trouble to calculate it.

127. We shall now indicate the processes for the converse problem of ascertaining the rising moment of a lagna, considered suitable for an act depending on the human will, say, the performance of a marriage, the undertaking of a journey, the taking charge of a house or an appointment, etc. The processes are only ten in number. Suppose we want to fix a suitable hour so as to have a marriage, etc., performed at Vellore (lat. 13°, time diff. + 808 seconds) on 15th May 1915, in the middle of Simha lagna (135° sidereal longitude), then we proceed as follows:—

(1) Find longitude of sun at Lanka mean sunrise on the given day.

26° + 2 × 9·8° + 1·6° + 4° = 26·6° + 1·96° + 1·6° + 4° = 30·56°.

Proceed as in the first example.

(2) Find out by how much local sunrise precedes or follows Ujjain sunrise. (Table III, lat. 13°, 33rd day for equation of time; 33 + 20 or 53rd day for tropical longitude.)

May 15th is the 33rd day of the Indian solar year at the present epoch. According to Table III the total correction for any moment at Vellore is — 348 + 1,592 + 808

*Process.**Application.*

seconds = 2,052 seconds = 34 minutes 12 seconds = + 0240 of a day. That is local sunrise precedes Lanka mean sunrise by 0240 of a day.

N.B.—In section 119 *supra* it is stated that “when we merely want to know by how many seconds local sunrise preceded or followed 6 a.m., we should simply add up the second and third corrections.” By 6 a.m. in this passage is meant (according to strict Indian usage) local 6 a.m., i.e. 6 a.m. by a clock keeping mean astronomical time for the locality in question. (There is no such clock at present, except at astronomical observatories.) In the present case we want to know more, we want to know by how many seconds or minutes sunrise at Vellore on 15th May 1915 preceded or followed *Ujjain or Lanka* 6 a.m. We have in this case to take into account the first correction also, namely, that for terrestrial longitude, and we have done so in the above working. Again we took in the present case the correction for tropical longitude corresponding to the 53rd day of the year. The correct day, as shown in process (8) below, is the 52nd, but the difference will not lead to any appreciable error.

(3) Deduct (2) from (1) *algebraically* ... $30.56^{\circ} - (+ 0.24^{\circ}) = 30.52^{\circ}$.

This is the longitude of the sun at actual local sunrise at Vellore on 15th May 1915.

(4) Deduct (3) from proposed lagna, increasing the latter, *if necessary*, by 360° . $135^{\circ} \text{ minus } 30.52^{\circ} = 104.48$

(5) Time of approximate lagna. Divide 104.48
 $360 = .2902$ of a day.

= 17 ghatikas 25 palas, or 6 hours 58 minutes after local sunrise at Vellore.

(6) Increase (3) by 23.1° for tropical longitude as in process (8) in the first example, and convert into days by Table IV-E. $30.52^{\circ} + 23.1^{\circ} = 53.62$ degrees.
50 degrees = 50.73 days.
3 " = 3.0 days.
.6 " = .61 day.

53.6 degrees = 54.34 days.

(7) Increase (4) by 23.1° for tropical longitude of proposed lagna and convert into days by Table IV-E.

$104.48^{\circ} + 23.1^{\circ} = 127.6^{\circ}$.

100 degrees = 101.5 days.

20 " = 20.3 "

7 " = 7.1 "

6 " = .6 day.

127.6 degrees = 129.5 days.

+ 1,610 seconds.

+ 518 seconds.

(8) Find from Table III for given latitude (Vellore 13°) the correction for tropical longitude appropriate to (6).

(9) Find from Table III for given latitude (Vellore 13°) the correction for tropical longitude of lagna, i.e. (7).

(10) The actual moment of rising of the proposed lagna is {(9) minus (7)} added algebraically to (5).

(5) (9) — (7)
6 hrs. 58 min. + 518 sec. — 1,610 sec.
= 6 hrs. 58 min. less 1,092 sec.
= 6 hrs. 58 min. less 18 min. 12 sec.
= 6 hrs. 39 min. 48 sec.
= .2776 of a day (Table VI).

By Table VI, this fraction = 16 ghatikas 39 palas after local sunrise at Vellore. This was the moment suitable, *ceteris paribus*, for a marriage to be celebrated under *Simha* lagna (135°) at Vellore on 15th May 1915.

SECTION XIV.—*Sunset.*

128. The considerations to which we have introduced the reader in dealing with sunrise and lagna will enable him to deal also with *sunset*, which is only the supplement (in the language of geometry) of *sunrise*.

Supposing the sun is at a point of the ecliptic whose tropical longitude is 100° , then we have to consider at sunrise how long, relatively to the mean sun on the equator, the mean sun on the ecliptic takes to rise 100° , and at sunset we have to consider how long, relatively to the mean sun on the equator, the mean sun on the ecliptic takes to fall 80° .

129. Accordingly, to determine the moment of sunset by local time, we should take the sum of (1) the correction for equation of time, which is the same or

nearly the same as for sunrise, and (2) the correction for tropical longitude, which will be the supplement of the tropical longitude for sunrise. The supplement of an angle is the difference between it and 180°. In our sunrise tables, degrees are expressed as days and by Tables IV-C and IV-D $180^{\circ}=184.80$ days or in round figures 185 days.

130. What we have to do, therefore, to determine the second correction for sunset is to find the difference between the day of the solar year under consideration and 185 days, and take the correction for tropical longitude for the day so arrived at. If the solar day we are considering exceeds 185 days, the sign of the tropical longitude for the difference will remain unchanged: otherwise the sign should be reversed. This correction should then be added to the equation of time in order to determine the interval between sunset and 6 p.m. local time, while the total so arrived at should be added again to correction (1) adverted to in paragraph 113, i.e., the correction for terrestrial longitude, in order to arrive at the interval between 6 p.m. *Lankā* time and *local* sunset.

131. In the absence of any other standard authorities on the subject, we may compare our calculations of sunset for A.D. 1910-11 with those given in the Kumbakōnam Mutt Panchāngam, edited by Mr. Viśwanātha Śrauti, B.A.

Latitude 11° N. (Tanjore).

Date by European Calendar as well as by Tamil solar year <i>Nadharana</i> A.D. 1910	Days of solar year according to Table III	Equation of time in seconds by Tab. III under Lat. 11° for the day for solar year entered in col. (2)	Supplement to trop. longitude in days (i.e., difference between col. (2) increased by 20 and 185 days).	Correction for trop. longitude according to Tab. III for the supplemental day arrived at in column (4) (sign to be reversed if necessary)	Sum of corrections arrived at in columns (3) and (5).	Moment of sunset according to col. (6).	Sunset according to Mr. Śrauti's panchāngam for 1910
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
						P M	P M
Chittirai 1 (Ap. 13)	1	- 435"	164th day	- 22"	- 457"=- 7'	6-7	6-7
Vaigūṣi 2 (May 15)	32	- 352"	133rd day	- 312"	- 664"=- 11'	6-11	6-11
Āṇi 3 (Je 16)	65	- 147"	100th day	- 986"	- 1133"=- 19'	6-19	6-19
Āḍi 3 (Jl. 18)	97	+ 163"	68th day	- 1469"	- 1306"=- 22'	6-22	6-23
Āvani 4 (Au. 19)	129	+ 411"	36th day	- 1168"	- 757"=- 12'	6-13	6-14
Puraṭṭāsi 5 (S. 20)	161	+ 515"	4th day	- 144"	+ 371"=+ 6'	5-54	5-55
Aippaṣi 6 (O 22)	192	+ 494"	27th day (212-185=27)	+ 965"	+ 1463"=+ 24'	5-36	5-36
Kānttigai 8 (N. 23)	224	+ 353"	59th day	+ 1523"	+ 1876"=+ 31'	5-29	5-30
Mārgaṣi 3 (D. 17)	219	+ 140"	84th day	+ 1278"	+ 1418"=+ 23'	5-37	5-37
Tai 21 (F. 3) A.D. 1911 . .	296	- 268"	133rd day	+ 312"	+ 44"=+ 1'	5-59	6-1
Panguni 2 (Mr 15) A.D. 1911	337	- 421"	172nd day	+ 12"	- 409"=- 7'	6-7	6-8

132. We observe (1) that sufficiently accurate results can be obtained by taking whole days instead of days and fractions of days in columns 2 and 4 *supra*; in other words, it is not necessary to calculate the day of the solar year with exactitude as we did for Problem I under "*Lagna*," (2) that a *positive* correction in column 6 re-appears in column 7 as a *deduction* from 6 p.m., while a *negative* correction in column 6 re-appears in column 7 as an addition to 6 p.m.

Supposing a birth took place 2 hours after sunset on 13th April 1910, the moment of birth would be 6 p.m. + 2 hours + 7' = 8-7 p.m. In this case sunset was 6-7 p.m. On the other hand, if a birth took place 2 hours after sunset on 23rd November 1910, then the correction for sunset being + 31', the local time at which the birth took place would be 6 p.m. + 2 hrs.-31' = 7-29 p.m. In this case sunset was at 5-29 p.m.

SECTION XV.—*Eclipses.*

133. Eclipses are a most valuable and unerring historical record, and eclipses are freely cited in Indian historical documents. Accordingly, the date of occurrence of solar and lunar eclipses has been indicated in Table II and throughout this Ephemeris by means of the symbol $\bullet$ for solar eclipses and $\circ$ for lunar eclipses. A solar eclipse can occur only at new moon and a lunar eclipse can occur only at full moon, and as full moons are not specially indicated in Table II, every lunar eclipse is there shown merely as occurring in a particular lunar month. The actual date of a lunar eclipse can be found by working out the exact ending moment of the full-moon tithi, i.e., *pañchadasī* or *paurnamī*. For this, of course, it will be necessary to add the collective duration of fifteen tithis, i.e., 14·76 days (Eye-table), to the mean moment of new moon and also to the moon's and sun's anomaly at that moment and add to, or subtract from, the mean moment of full moon the sum of the sun's and moon's equations. (See examples worked out in section 96 and Eye-table.) In the body of the Ephemeris, every eclipse, whether solar or lunar, is marked against the very day on which it occurred.

134. We may preface our observations on eclipses by the following passages from a well-known French work, first published in the 18th century, and still regarded as a standard authority on chronology, "*L'art de vérifier les dates*":—

"The magnitude of an eclipse is indicated in digits. A digit is the twelfth part of the diameter of a heavenly body: accordingly, an eclipse of four digits is one where the third part of the diameter of a heavenly body is in shadow; if one half of the diameter is in shadow, the eclipse is said to be of six digits; and if the whole of the diameter is in shadow, the eclipse is said to be of twelve digits. Further, in a total eclipse, if the part which is least in shadow is removed from the edge of the shadow by as much as two digits, these two digits are added to the twelve, and the eclipse is said to be one of fourteen digits.

135. "The duration of an eclipse of the moon is proportional to its magnitude; but it does not depend on this factor alone. We may say, in general, that a total eclipse of the moon will last at least $3\frac{1}{2}$ hours, and at most 4 hours and a few minutes. A partial eclipse above six digits may last as much as $3\frac{1}{4}$ hours or as little as $2\frac{1}{2}$ hours; it seldom goes beyond these limits. An eclipse of between three and six digits lasts between two and three hours. The duration corresponding to two digits is $1\frac{1}{2}$ hours; to one digit, one hour; to half a digit, $\frac{3}{4}$ of an hour. The duration of total obscurity in a total eclipse is from $1\frac{1}{2}$ to 2 hours.

136. "The moon has no light of her own, but reflects that received by her from the sun. Consequently, when in an eclipse the earth passes between the moon and the sun, and cuts off the rays of the sun from the moon, the latter can shed no more light on Paris than on Peking or on Constantinople. An eclipse of the moon, therefore, commences at all points of the earth at the same instant and lasts everywhere for the same length of time. All that we need see is whether the time of a lunar eclipse falls between local sunset and sunrise, as otherwise the eclipse will not be visible.

137. "On the other hand, the sun is a self-luminous body: the moon is very much smaller than the earth: she is, in fact, a mere point in comparison with the sun. From these well-known facts it follows that in a solar eclipse, the moon passing between the earth and the sun, cannot cut off the rays of the sun from all parts of the earth, at the same instant. She casts her shadow in succession on different parts of the earth, and even the successive passage of the moon's shadow covers during a single eclipse only a small total extent of the earth's surface. Thus, journeying from west to east, a solar eclipse may first strike Spain, then France, then Germany, and then in succession the eastern countries as far as the farthest east of Asia, but the whole time Africa may remain untouched by the moon's shadow."

138. The extent of the earth's surface, affected by a solar eclipse, is therefore a matter of calculation: and an exact calculation is by no means easy to introduce into a popular work of this kind.

The book entitled *l'art de vérifier les dates* gives (1) *all* lunar eclipses and (2) *all* solar eclipses visible anywhere in the civilized world known to history, marking, by a series of ingenious conventions, the path of each solar eclipse, the regions where it is visible and the latitudes where it is central (*a*) under the fifth meridian, i.e., on the Coast of West Africa, 15° of longitude west of Paris, (*b*) under the meridian where it is noon at the moment of true conjunction, and (*c*) under the 155th meridian, i.e., in 142° longitude east of Greenwich. Other useful details, given under each eclipse, in the same valuable work, need not be reproduced here, as nothing short of a translation of the whole chapter on eclipses would give the reader an adequate idea of its contents.

139. Table II and the body of the Ephemeris exhibit *all* lunar eclipses, and it is easy for the reader to calculate the ending moment of the full moon tithi, which will enable him to know whether the eclipse could have been seen in India at the place under consideration. Likewise *all* solar eclipses have been given as in the French work, from A.D. 1 to A.D. 300, and after the latter date as a rule, eclipses which, according to the same authority, could not have been visible in India are not mentioned.

140. The points where the moon's orbit crosses the ecliptic are called the *nodes* and in order that an eclipse may occur, the opposition at the time of a lunar eclipse, or the conjunction at the time of a solar eclipse, must happen at or near a node. The sun's distance from either node is therefore an important factor in determining whether an eclipse is or is not possible at a particular new or full moon. Sun's longitude Tables IV-C, IV-D and IV-E and Rāhu tables (IV-K) for centuries and odd years will enable the reader to calculate the sun's distance from either node (Rāhu is simply the Indian name for the moon's ascending node) at any moment from 1 B.C. to A.D. 2000, and by applying the following canons (adapted from Professor Jacobi's article in Volume I of *Epigraphia Indica*) he may determine whether a solar or a lunar eclipse is certain, doubtful, or impossible at a particular new or full moon respectively.

Solar and lunar eclipses as determined by sun's distance from node at new and full moon —

If sun's distance from node at new moon is

Between 0° and $16.2'$, or between 163.8° and 180°	A SOLAR ECLIPSE IS	}	Certain.
Between 16.3° and 18.9° , or between 163.7° and 161.1°			Doubtful.
Between $1.0'$ and 161.0°			Impossible.

If sun's distance from node at full moon is

Between 0° and 10.44° , or between 169.56° and 180°	A LUNAR ECLIPSE IS	}	Certain.
Between 10.45° and 13.86° , or between 169.55° and 166.14°			Doubtful.
Between 13.87° and 166.13°			Impossible.

These canons are exhaustively dealt with in Chapter V, Section v, pages 134 to 150 and in Table IV-L of this work.

N B — For all solar and lunar eclipses in the years B.C. 1207 to A.D. 2000, the standard work of reference is *Oppolzer's Kanon der Finsternisse* (*Order of eclipses*) and it may be safely asserted that there are no trustworthy references in any literature in the world to eclipses of an earlier date than B.C. 1207. An attempt to expound the manner in which eclipses are calculated is, therefore, of little practical use in chronological investigation when the answer to the questions whether an eclipse was possible, and in which regions of the earth a solar eclipse was visible, may be easily obtained from Oppolzer. But occasionally one has to satisfy the public curiosity as to whether there was an eclipse on a date earlier than B.C. 1207. To the extent necessary to satisfy such curiosity, the author has furnished in Chapter V, Section v (pages 134 to 150) and in Table IV-L of the present work certain cycles of recurrence of eclipses, not hitherto generally noticed, whereby the occurrence of an eclipse in a past year, however remote, may be verified by the application of certain simple tests.

SECTION XVI.—*Jovian cycles, years and months.*

Note.—For the exact calculation of Jupiter's mean or actual place at any moment see Tables V-A and V-B and the explanation of them in Chapter V *infra*.

141. A Jovian year is the period taken by Jupiter to pass through a sign of the zodiac, 30 degrees and it is somewhat less than an Indian solar year. A Jupiter's

cycle of 60 Jovian years is often met with in Indian chronology as a mode of reckoning time. Each of the years in the cycle receives a name corresponding to the name of one of the years in Table I, but while the so-called Jupiter's cycle in Table I, as used to this day in Southern India, is merely a cycle of 60 Indian solar years, the Jupiter's cycle, properly so called, which has been in use in Northern India and which is also given in Table I, is a cycle of real Jovian years.

142. Altogether three different meanings might be attached to the citation of a year of Jupiter's cycle:—

(1) A year of the southern cycle (Table I), which is merely a solar year with a Jovian name.

(2) A year of the northern cycle (Table I), which is the Jovian year actually completed at the *beginning* of a solar year.

(3) A year of the northern cycle (Table I), being the Jovian year actually completed at the actual *moment* we are dealing with.

The context alone must enable us to conjecture which of these meanings is to be attached to a citation of a Jovian year.

143. Also, where the second of the three modes of citation is followed, it is evident that if any other Jovian year has had its beginning *as well as its end* in the course of a solar year, that Jovian year will be *lost* or suppressed.

Hence it is that certain Jovian years are actually suppressed in the northern system of reckoning. The suppressed years are shown by blanks (.....) in Table I, northern cycle.

144. *Fourth mode of citation* (4).—There is a fourth mode of citation of Jovian years which we often find in Malayalam inscriptions, and that is to cite, instead of one year out of every sixty, one year out of every twelve. In twelve Jovian years the planet Jupiter passes through the twelve signs of the zodiac and each sign corresponds to one of the twelve years of Jupiter's revolution. In a case in which Jupiter had completed nine Jovian years *, he would be described as being in the 10th sign of the zodiac, i.e., in *Makara*.

145. *Fifth mode of citation* (5).—In this the twelve Jovian years receive the names of the twelve lunar months, *Kārttika* being the first and *Āśvina* the 12th. The Jovian years † (properly, months) are distinguished from lunar months by the prefix *Mahā*. Thus, *Mahā-Kārttika*, *Mahā-Mārgasīra*, etc.

146. *Sixth mode of citation* (6).—This is the heliacal rising system, in which the Jovian cycle begins with the heliacal rising of Jupiter, i.e., his re-appearance after a conjunction with the sun. The system is exhaustively dealt with by Mr. Dikshit in his introduction to Volume III of Dr. Fleet's *Corpus Inscriptionum Indicarum*, and all the citations of this kind, hitherto found in inscriptions, are there collected.

147. Readers in Southern India will be mainly interested in the 1st and 4th modes of citation, of which the latter is otherwise called the "mean-sign system" † and which is met with in Travancore inscriptions, e.g., those discussed by Dr. Schram in *Indian Antiquary*, Volume XXV (1896), pages 9—11; and by Professor Kielhorn at pages 53, 174 *ibid*.

We shall cite an example: "Kollam 390, Jupiter in Kumbha, and the sun 18 days old in Mīna, THURSDAY, Pushya nakshatra, 10th lunar day."

Kollam 390 is equivalent to $A.D. 390 + 824 = A.D. 1214$ (Indian solar year).

Eighteen days in Kumbha month means 352 days of the solar year—

	Degrees.
By Table IV Jupiter's mean longitude at beginning of A.D. 1200	was 220 10
" " for 14 years	is 64 86
" " for 352 days	is 29 25
Total ...	314 21

* "Jovian year" does not mean the period of revolution of Jupiter's orbit (which is a little less than 12 solar years) but one-twelfth of that period, which is roughly equivalent to a solar year.

† In chapter V of this work which is devoted to planetary chronology, the reader will find a direct method of calculating either the mean or the actual sign or rāsi occupied by Jupiter at any moment.

Now 314° is the 14th degree of Kumbha rāsi. Therefore Jupiter is rightly described as having occupied Kumbha on the date in question. If we want Jupiter's actual geocentric place on this date we refer to Table V-A where we are informed that it was the same as on the corresponding solar day of A.D. 1819 less 2° ; and according to Table V-B this position was 316° .

SECTION xvii.—*The Varttamāna, Pūrṇimānta, Amānta and Kārttikādi systems of citation.*

148. The ordinary or normal mode of citing an Indian date is by means of *gata* or 'expired' years, *amānta* months (or months beginning with the first tithi after new moon or *Amāvāsyā*), and *Chaitrādi* years (or lunar years beginning with *Chaitra*). The lunar year can begin with *Chaitra* only when the solar year begins with Mēsha Sankrānti. Therefore a reckoning by *Chaitrādi* lunar years is the same as reckoning by Mēshādi solar years.

149. Exceptional modes of citation, used at certain epochs of history, or still used in certain parts of India, are:—

Varttamāna, or current years, opposed to *gata* (expired); *Pūrṇimānta* months, beginning with the tithi after full moon; and *Kārttikādi* lunar years (or "southern" years) beginning with the lunar month *Kārttika*.

150. In the *Pūrṇimānta* system, each month beginning with a full moon is named after the next *amānta* month, but takes in the dark fortnight preceding each new moon. It is to this system that we owe the name *paksha*, lit. a wing, the dark and bright fortnights being the wings on either side of a new moon.

151. In the *Kārttikādi* lunar year system, the year beginning with lunar *Kārttika* takes the number of the Mēshādi solar year then running, and has in common with it the five months, Lunar *Kārttika* to Lunar *Phālguna*.

Canons—

I. A dark fortnight in n th *Amānta* month is in $(n + 1)$ th *Pūrṇimānta* month.

II. Any month or tithi in N th year, expired, is in $(N + 1)$ th year *current*.

III. Any of the months named in the margin in N th year *Chaitrādi*, expired, is ascribed to the

(a) $(N - 1)$ th year *Kārttikādi*, expired, or to

(b) N th year, *Kārttikādi*, current.

N.B.—Conversely, any of the above months in n th year *Kārttikādi*, expired, is ascribed to $(n + 1)$ th year *Chaitrādi*, expired.

For clearness' sake, we will present these three rules under three aspects, one of which, when we are in doubt, every problem before us must assume.

First aspect.—If we have before us a dark fortnight or *bahula* tithi of the n th month in the N th year, known to be an expired year, but do not know whether the system is *amānta* or *pūrṇimānta*, we must search for the tithi both in the n th and the $(n - 1)$ th month in our ordinary (*Amānta*) tables.

Second aspect.—If we have before us a dark fortnight or *bahula* tithi of the n th month in the N th year, and do not know whether the month is *amānta* or *pūrṇimānta*, nor whether the year is expired or current, we must, in using our tables, look for the tithi—

- (1) in the n th month, N th year, expired;
- (2) in the $(n - 1)$ th month, N th year, expired;
- (3) in the n th month, $(N - 1)$ th year, expired; and
- (4) in the $(n - 1)$ th month, $(N - 1)$ th year, expired.

Third aspect.—If we have before us a dark fortnight or *bahula* tithi of the n th month (from *Chaitra* to *Aśvina*, inclusive) in the N th year and do not know whether the month is *amānta* or *pūrṇimānta*, or whether the year is

itra.
shṭha.
āḍha.
vapa.
drapada.
ina.

expired or current, *Chaitrādi* or *Kārttikādi*, we must, in using our tables, look for the tithi—

- (1) in the n th month, N th year, expired ;
- (2) in the $(n - 1)$ th month, N th year, expired ;
- (3) in the n th month, $(N - 1)$ th year, expired ;
- (4) in the $(n - 1)$ th month, $(N - 1)$ th year, expired ;
- (5) in the n th month, $(N + 1)$ th year, expired ; and
- (6) in the $(n - 1)$ th month, $(N + 1)$ th year, expired.

N.B.—For bright fortnight or *sukla* dates in any month, no search need be made in any case in the $(n - 1)$ th month ; and whether for bright or dark fortnight dates in the months of *Kārttika* to *Phālguna* inclusive, no search need be made in any case in $(N + 1)$ th year, expired.

Readers who prefer Professor Kielhorn's mode of stating the same rules will find them in *Indian Antiquary*, Volume XIX, page 22, or at page 402 of *Epigraphia Indica*, Volume I. Any rules must be somewhat perplexing at first sight and should be carefully reasoned out by those interested in such investigations.

152. The lunar year beginning with lunar Chaitra of any solar year n is itself $(n + 1)$. Thus, Chaitra 1265 may mean :—

(a) Lunar Chaitra at the end of current solar 1264, i.e., at the end of expired solar 1263.

(b) Lunar Chaitra at the end of expired solar 1264 and before the beginning of solar 1265 (expired).

(c) Lunar Chaitra at the end of expired solar 1265 and before the beginning of solar 1266 (expired)

This ambiguity is independent of the difference between *Chaitrādi* and *Kārttikādi* systems, and is peculiar to the lunar month Chaitra.

SECTION XVIII.—*The eras now in use or met with in inscriptions.*

153. In the following summary of Indian eras, adapted from Cunningham and other authorities, we give in each case the formula whereby a year of each era, "expired" or "current" as the case may be, may be obtained from the A.D. year, also noting where the era is or was in use, and whether it is *amānta* or *pūrṇimānta*, *Chaitrādi* or *Kārttikādi* and so forth.

(1) *Kaliyuga* (expired year = 3102 minus B.C. year ; A.D. year + 3101). Used all over India as a solar (*Mēshādi*) and luni-solar (*Chaitrādi*) year. The years in this era, with A.D., Śaka, and Vikrama equivalents, are indicated in *Eye-table k* from 3102 B.C. to A.D. 2000 ; and they are regularly given in the *Ephemeris* from A.D. 700 to A.D. 1999.

(2) *Saptarishi* (current year = A.D. year + 76). Mostly *current* and mostly *pūrṇimānta* and *Chaitrādi*. At present in use in Kāshmir and formerly in Multan and elsewhere. Quoted generally in cycles of 100 years. Thus A.D. 1910 = Saptarshi 1986, current, quoted only as "86 Saptarshi, current." *

(3) *Vikrama era* (expired year = A.D. year + 57). Extensively used at present in Guzerat and all over Northern India, except Bengal : *Kārttikādi Amānta* in Guzerat, hence called *Southern Vikrama* ; *Chaitrādi* and *Pūrṇimānta* in North India, hence called *Northern Vikrama*. Other names, "Malava era" ; and also simply "Samvat." The Vikrama years, expired, from A.D. 500 to A.D. 2000 are regularly shown in Table II, and from A.D. 700 to A.D. 1999 in the *Ephemeris*.

(4) *Śaka era* (expired year = A.D. year minus 78). Extensively used in India both in the past, and at present. - *Mēshādi* (for solar year) and *Chaitrādi* (for luni-solar year) : generally *amānta*, but *pūrṇimānta* in Northern India. Śaka equivalents of Kaliyuga and Vikrama years, expired, from A.D. 500 to A.D. 2000, are regularly given in Table II, and from A.D. 700 to A.D. 1999 in the *Ephemeris*. Current śaka years are often quoted in inscriptions, in which case the formula is, current śaka = A.D. year minus 77.

* The *saptarishis* are supposed (by an astronomical fiction) to occupy each *nakshatra* for 100 years ; in other words they go round the circle of the *nakshatras* in 2,700 years. This convention is merely equivalent to our reckoning by centuries. Thus when Varāhamihira, quoting from Garga, says that the *rishtis* were in *Magha* (*nakshatra* No. 10) during the reign of Yudhishtira, he means that the epoch was removed by 7 centuries from another when the *rishtis* were in *Krittikā* *nakshatra*, and if we suppose that the astronomical fiction of the longitudes of all heavenly bodies being 0° at 0 day in 0 year *Kaliyuga*, was applied to the *saptarishis* also, and that their 0 longitude was in *Krittika* (which was an ancient reckoning), the epoch referred to by Varāhamihira would be circa 2500 B.C. to 2400 B.C., and Varahamihira's year-date for Yudhishtira's reign is actually A.D. 78 — 2526 years = 2448 B.C. See Paper (v) in the appendix "Astronomical references in the *Mahābhārata*."

(5) *Kollam era* (current year = A.D. year *minus* 824). Used in Malabar, Cochin, and Travancore since A.D. 825. Begins in North Malabar with solar *Kanyā* and in South Malabar with *Chingam* (Simha); always *solar* and *current*. English equivalents for all Kollam years are regularly given in the Ephemeris.

(6) *Bengali san* (or *sen*) (current year = A.D. year *minus* 593). *Mēshādi*, *current solar year*. Now in use in Bengal. For A.D. 700 to A.D. 1999, B. san equivalents are regularly given in the Ephemeris, but they are given as expired years; and to find the current Bengal san, add one to the Ephemeris number.

(7) *Chedi* or *Kalachuri era* (current year = A.D. year *minus* 247), *current*, *Āśvinādi*, *pūrṇimānta*.

A.D. 300 = Chedi 53 current.	A.D. 800 = Chedi 553 current.
" 400 = " 153 "	" 900 = " 653 "
" 500 = " 253 "	" 1000 = " 753 "
" 600 = " 353 "	" 1100 = " 853 "
" 700 = " 453 "	" 1200 = " 953 "

Not now in use, but was in use under the Kalachuri kings in Western and Central India.

(8) *Gupta* (current year = A.D. year *minus* 319).

A.D. 400 = Gupta 81 current.	A.D. 600 = Gupta 281 current.
" 500 = " 181 "	" 700 = " 381 "

Not now in use. Was in use in Central India and Nepal in the centuries above indicated as *current*, *Chaitrādi*, *pūrṇimānta*.

(9) *Valābhi era* (current year = A.D. year *minus* 318). *Current*, *Kārttikādi*, *amānta*, or *pūrṇimānta*.

A.D. 400 = Valābhi 82 current.	A.D. 900 = Valābhi 582 current
" 500 = " 182 "	" 1000 = " 682 "
" 600 = " 282 "	" 1100 = " 782 "
" 700 = " 382 "	" 1200 = " 882 "
" 800 = " 482 "	" 1300 = " 982 "

Not now in use. Was in use in Kāthiavād and neighbourhood in centuries above indicated.

(10) *Vilāyati year* (current year = A.D. year *minus* 592). *Kanyādi*, *solar*, *current*.

Now in use in Orissa. Months begin invariably *on* the day of sankrānti instead of the next or the third day after.

This era bears to the Bengali san pretty much the same relation that the Valābhi bore to the Gupta era.

(11) *Amli year* (current year = A.D. year *minus* 592). *Luni-solar*, *current*. Lunar year changes in *Bhādrapāda śukla 12th*, i.e., some days before, or some days after, *Kanyā* sankrānti. Otherwise the same as *Vilāyati*. Current in Orissa. Probably bears the same relation to *Vilāyati* that the luni-solar year in the Telugu country bears to the solar year of the Tamil country (i.e., only new year day is different in each case).

(12) *Fasli year* (luni-solar) in Bengal, and N.W. India (current year = A.D. year *minus* 592); *pūrṇimānta* and *lunar Āśvinādi* (i.e., it begins on pūrṇimānta Āśvina, bahula pratipad); luni-solar year for Bengal, just as the Bengal san is the solar year for the same tract of country. Like all luni-solar years, the *fasli* takes the number of the next solar san. Thus, A.D. 1900 was, Bengal san 1307 current, but the luni-solar *fasli* beginning on *Āśvina kṛishṇa pratipad* of A.D. 1900 takes the number of the next Bengal san, i.e., 1308 current. Hence the formula for Bengal *fasli* is "current A.D. year *minus* 592."

(13) *Dakhan fasli* (current year = A.D. year *minus* 593) was up to A.D. 1556 when its number was 963, a Hijra year, but from that year forward it has been kept as a solar year (identical in number with Bengal san), beginning, in parts of Bombay, when the sun enters the nakshatra *Mṛigaśīras*,* i.e. (now) about 7th or 8th June. The months, their periods of beginning, and number of days are the same as in the Muhammadan calendar.

(14) The *Madras fasli year* is an *agricultural, solar, tropical year*, beginning on 1st July and having no divisions of its own into months and days. Its formula is

* By Eye-table the sun enters nakshatra *Mṛigaśīras* when his longitude is 53° 20'. The number of days corresponding to this (by Table IV-C) = 56. When the solar year commences (as it did in A.D. 1911) on 13th April, the sun's entry into *Mṛigaśīras* nakshatra would be on 56 + 13 = 69 days from 1st April, i.e., on 8th June.

“Current fasli = A.D. year *minus* 590.” The agricultural or revenue year from 1st July 1910 to 30th June 1911 might be expressed quite as well by the expression “Revenue year 1910–11” as by the expression “Fasli 1320.” The former expression would convey better sense to most people, and the expression “Fasli year,” the use of which a blind tradition has consecrated in Madras, serves no other purpose than to confuse any one who is not a village accountant or a Tahsildar. It is a chronological anomaly and will no doubt gradually drop out of use.

(15) The Mahratta *Sūr-san*, *shahūr-san* or *Arābi-san* (current year = A.D. year *minus* 599) was extensively used under the Mahratta supremacy, and is still occasionally met with. Begins, like the Dakhan fasli, when the sun enters the nakshatra Mrigāśiras.*

(16) *Harshakāla era* (current year = A.D. year *minus* 606). Was current in Muttra (*Mathura*) in Kanauj, Nepal. Harsha 94 current = A.D. 700, and so on.

(17) *Nevar era* (used in Nepal from A.D. 878 to A.D. 1768), *expired*, *Kārttikādi*, *Amānta*.
 Formula “Nevar expired = A.D. year *minus* 879.”

Nevar 21, expired = A.D. 900.
 Nevar 821, expired = A.D. 1700.

(18) *Chalukya era* (expired year = A.D. year *minus* 1076). This was in use only from A.D. 1079 to A.D. 1162. It followed the śaka months and pakshas. Chalukya 24 expired = A.D. 1100.

(19) *Lakshmana Śena era*: (expired year = A.D. year *minus* 1108, according to present day almanacs). Now in use in Tirhut and Mithila, but along with the śaka or Vikrama era.

Dr. Kielhorn concludes that the formula for this era was (from A.D. 1194 to A.D. 1551). “Expired Lakshmana Śena year = A.D. year *minus* 1113.” According to this formula A.D. 1200 would be equivalent to Lak. Śena 81, expired. The years of this era were *expired*, *Kārttikādi*, *amānta*.

(20) *Mahratta Raja śaka era* (current year = A.D. year *minus* 1673) was established on the accession of Śivāji: the number of the year used to change every *Jyeshtha śukla trayodaśī*, which was the tithi or date of Śivāji’s accession. Otherwise same as southern luni-solar *amānta śaka* years.

(21) *Tārīkhi-i-Ilāhi* (= mighty or divine era), dating from the accession of Akbar (14th February 1556), fell into disuse *temp.* Shah Johan. Days and months were solar, without intercalations.

SECTION XIX.—*Tithis in relation to festivals and vice versa.*

154. *Day on which a festival is celebrated.*—As a *tithi* generally covers a portion of two days, it sometimes happens that though for civil purposes the tithi of a day is that which is current at sunrise, yet, for religious purposes, the tithi may have to be celebrated on the previous day when it begins. When a tithi is appointed for the celebration of a feast or fast, to be kept at forenoon, midday, late afternoon, midnight, etc., it is obvious that the feast or fast must be observed on the day when the tithi covers the prescribed part of the day. The day for such purposes is divided, first of all, into five portions *between sunrise and sunset*.

(1) *Prātaḥkāla*, or early forenoon, 6 ghaṭikas from sunrise.

(2) *Sangava*, or forenoon, 6 to 12 ghaṭikas from sunrise.

(3) *Madhyāhna*, or midday, 12 to 18 ghaṭikas from sunrise.

(4) *Aparāhna*, or afternoon, 18 to 24 ghaṭikas from sunrise.

(5) *Sāyāhna*, or late afternoon, 24 to 30 ghaṭikas from sunrise.

(a) The 4 ghaṭikas before sunrise are called *arunodaya* or rise of dawn.

(b) The 6 ghaṭikas after sunset are called *pradosha* or evening.

(c) The 2 ghaṭikas in the middle of the night are called *niśitha*, midnight.

(d) A festival marked as *pūrvavidha* is celebrated on the first day of the tithi, not on the second. A festival celebrated on the second day on which a tithi is current is said to be *pāravidha*.

N.B.—Tithi dvayam.—Two tithis meeting, i.e., one commencing and the other ending, between 18 and 24 ghaṭikas after sunrise, when a similar meeting does not take place next day.

* By Eye-table the sun enters nakshatra Mrigāśiras when his longitude is 53° 20'. The number of days corresponding to this (by Table IV-C) = 56. When the solar year commences (as it did in A.D. 1911) on 13th April, the sun’s entry into Mrigāśiras nakshatra would be on 56 + 13 = 69 days from 1st April, i.e., on 8th June.

155. *Festivals connected with nakshatras as well as tithis.*—On the nakshatra Śravishtā (No. 23) in lunar Śravana, the ceremony of Upākarma (Āvaṇi Avittam, is celebrated. Eye-table, section 8 shows that this festival would ordinarily fall about full moon in Śravana. In the same manner, all festivals associated with particular *nakshatras* may be equally well connected with particular *tithis*. In Southern India, however, it is usual to connect *nakshatra* festivals with certain *solar* months in which they are celebrated ; e.g., *Paṅguni Uttaram* (i.e., *Uttara Phalgunī* nakshatra in the solar month called *Paṅguni*), *Chittirai Mūlam* (i.e., *Mūla* nakshatra in the solar month called *Chittirai*) ; *Āvaṇi Avittam* (vide supra), etc. *Tithi* festivals are also often connected in Southern India with solar months ; and if a festival falls, for instance, on śukla panchamī in a particular solar month, and there are two śukla panchamīs in that month, the first is called *sūnya tithi* and the second only is celebrated.

Occasionally something else is required for the celebration of a feast besides the concurrence of a *tithi* and a *nakshatra* ; and there are also festivals and fasts which cannot conveniently be arranged under *tithis*. Such matters are arranged in the following alphabetical notes, which will be of interest to the general reader as well as to students of epigraphy.

156. *Amāvāsyā* : the Tarpana or minor *Śrāddha* should be in *aparāhna*. If it occurs in *aparāhna* on two days, and is less than 60 ghaṭikas in length, it is kept on the first day ; otherwise (i.e., if of normal length or longer) on second day. If not occurring in *aparāhna* of two days, it should be kept on the first day. The same rule is observed for *śrāddhas*.

Suklayajurveda.—*Amāvāsyā* is kept on the third day, before moonrise.

Time for yāgās (yājnya kāla).—The last fourth part of a *parva* (i.e., either *amāvāsyā* or *purnamī*) and first three parts of *pratipad* are suitable as *yāgakāla*. If there is *yāgakāla* on two days, then the day on which the *kāla* is current at noon is the proper day.

Chaturdaśī (14th *tithi*).—*Bahula chaturdaśī* in every month is *Śivarātri*, but *Māgha ba. 14* is *Mahā Śivarātri*.

Chāturmasya dvitīyās.—*Bhādrapada ba. 2* ; *Āshāḍha ba. 2* ; *Phālguna ba. 2* ; *Kārttika ba. 2*.

The *bahula dvitīyā* in *Āshāḍha*, *Śrāvana*, *Bhādrapada* and *Āśvina* is called *Asūnyasayana vrata* and the fast is broken at moonrise.

Ekādaśī (11th *tithi*).—Every *ekādaśī* is sacred, like every *amāvāsyā*, and receives a special name. It is called *Vijayā* when joined with the nakshatra “*Punarvasū*.” The following are the names of the 24 *ekādaśīs* : (12 in bright halves and 12 in dark halves of the 12 lunar months) :—

Month	Suklapaksha	Bahulapaksha.
Chaitra	Kūnadā ekādaśī	Varāthini ekādaśī.
Vaiśākha	Mohini do.	Aparā do.
Jyeshtha	Nirjalā do.	Yogini do.
Āshāḍha	Vishnuṣayan otsava, Śayanī or Vishnu-sayanī ekādaśī (i.e., Vishnu going to sleep).	Kāmadā do.
Śrāvana	Putradā ekādaśī	or Kāmikā do.
Bhādrapada	Vishnuparivartanotsava or Parivartini ekādaśī (Vishnu turning on his side, called Vishnuśrunkhala, when 11th and 12th <i>tithis</i> meet in nakshatra ‘ <i>Śrāvana</i> ’)	Ajā do.
Āśvina	Pūṣāṅkasa ekādaśī	Indirā do.
Kārttika	Prabodhini ekādaśī (waking of Vishnu), Bhishma panchakavratā commences.	Ramā do.
Mārgaśīrsha	Mokṣadā ekādaśī	Utpatti do.
Pausha	Putradā ekādaśī or Mukkoṭṭi or Vaikunṭha ekādaśī	Saphalā do.
Māgha	Jayā ekādaśī	Shatṭilā do.
Phālguna	Āmalakī ekādaśī	Vijayā do.
		Pāpamochini ekādaśī.

(Vaishnavas).—If *dasamī* ends after 56 ghaṭikas, the fast is on *dvādaśī* day.

If on *ekādaśī* day, there is any part of *navamī* or *dasamī* day, then also the fast should be kept on *dvādaśī*.

If *dvādaśī* touches three days, then the fast is on the day which is wholly *drādaśī* and *pāraṇam* on the next day when *dvādaśī* ends.

In any other case, *ekādaśī* is the fast day and *dvādaśī* the day of *pāraṇam*.

Sanyāsins and widows of all creeds observe this rule for *ekādaśī*.

(Smārthas).—Even if *dasamī* ends after 56 ghaṭikas, the fast is kept on *ekādaśī*.

If *dvādaśī* touches three days, Smārthas observe the first *dvādaśī* day as *ekādaśī*.

(Kāmyā *ekādaśī*).—Those who observe *ekādaśī* for *kāmya* purposes (begetting children, etc.) observe the Smārtha rule: those who observe *ekādaśī* for *mōksha* (like Sanyāsins) observe the Vaishnava rule.

If a death occurs on the day of *ekādaśī* fast, whether it be *ekādaśī* or *dvādaśī* tithi, then the *śrāddha* is on the next day. Only Mādhyas and Tēngalai Vaishnavas observe this rule: Smārthas and Vadagalai Vaishnavas observe the *śrāddha* on *ekādaśī* fast day also.

Grahana.—For 9 hours before commencement of a lunar eclipse, and for 12 hours before commencement of a solar eclipse, neither *śrāddha* nor meals are allowed: they are allowed after *mōksha*, i.e., release of the eclipsed body. On the occasion of a *grasthōdaya*, eclipse of the moon (when moon rises in an eclipsed condition), neither *śrāddha* nor meals are allowed during day, and after *mōksha*, performers of *purnimā śrāddha* must fast and perform *śrāddha* next day, but others may have food at night.

Grasthāsthāmanam (lunar eclipse).—If the moon sets in an eclipsed condition, meals are allowed only after next moonrise, except to the performer of *śrāddha*, who must fast in the night and perform *śrāddha* next day.

According to Manu, no *śrāddha* on account of a tithi can be performed at night, but *śrāddhas* on account of eclipse must be performed during the time of eclipse, even if it be at night.

Jayanti—

1. *Matsya jayanti*—Chaitra su. 5 (*aparāhna*).
2. *Kūrma jayanti*—Jyeshtha su. 12 (*pradōsha*).
3. *Varāha jayanti*—Chaitra su. 9 (*aparāhna*).
4. *Nārisimha jayanti*—Vaiśākha su. 13 (*pradōsha*).
5. *Vāmana jayanti*—Bhādrapada su. 12 (*madhyāhna*).
6. *Parasurāma jayanti*—Vaiśākha su. 3 (between 5 and 9 p.m.).
7. *Śrī Rāma jayanti*—Chaitra su. 9 (*madhyāhna*).
8. *Balarāma jayanti*—Bhādrapada su. 3 (*madhyāhna*).
9. *Krishna jayanti*—Śrāvana b. 8 (must be current at midnight).
10. *Bauddha jayanti*, *Kalki jayanti*—Jyeshtha su. 3 (*pradōsha*).

Kalpādi—

- | | |
|------------------------------------|------------------------|
| Kūrma kalpādi—Chaitra su. 5 | } (<i>pūrvāhna</i> .) |
| or Chaitra Amāvāsyā. | |
| Pārthiva kalpādi—Vaiśākha ba. 3. | |
| Sāvitrī kalpādi—Kārttika su. 7. | |
| Pralaya kalpādi—Mārgaśīrsha su. 9. | |
| Varāha kalpādi—Māgha su. 13. | |
| Brahma kalpādi—Phālguna ba. 3. | |

Mādhyas tīrthams and Puṇyadinams.—South of Madras, Mādhyas observe these commemorations as *aparāhna vyāpini* and North of Madras, they observe them as *udaya vyāpini*, because the days are days, not of birth, but of death.

These festivals are associated with lunar months and tithis, and are inserted in the general list accordingly.

Manvādi—

List of *Manvādis*—

1. Svārochisha—Āśvina su. 9.
2. Svāyambhuva—Kārttika su. 12.

3. Uttama—Chaitra su. 3.
4. Tāmasa—Bhādrapada su. 3.
5. Agnisāvarṇi—Śrāvana Amāvāsyā.
6. Raivata—Pushya su. 11.
7. Chākshusha—Āshādha su. 10.
8. Vaivasvata—Māgha su. 7.
9. Sūryasāvarṇi—Bhādrapada su. 7.
10. Rudrasāvarṇi—Āshādha ba. 8.
11. Indrasāvarṇi—Kārttika ba. 8.
12. Brahmasāvarṇi—Phālguna pūrṇimā.
13. Rauchyaka—Chaitra pūrṇimā.
14. Bhauchya—Jyeshtha pūrṇimā.

N.B.—*Manvādi* and *Yugādi*, occurring in *śuklapaksha*, should be in *purvāhna*, i.e., before noon: if they occur in *krishnapaksha*, they should lie within *aparāhna*, i.e., afternoon.

Māsa Śivarātri.—Every month, ba. 14 (*pradosha* or *pūrvaviddha*) is *Śivarātri*. See *Chaturdaśī*.*

Panchadaśī (15th tithi).—A śukla 15 or pūrṇimā (full moon) is called *Somavatī* when it falls on Monday and is special for donations.

It is called *chūdāmam* when it is further joined with an lunar eclipse.

Most pūrṇimās receive special names, which are given in the general list.

Paraviddha, a tithi kept on the day on which it ends.

Pratipad (1st tithi).—The Chaitra śukla *pratipad*, i.e., that which precedes the Mēsha sankrānti, is the beginning of the Hindu lunar year, new year's day (lunar) being that on which the pratipad is current at sunrise. (When there is an *adhika Chaitra*, that begins the year.) The tithi is therefore called *Vatsarārambha* (commencement of the year). It is also *Navarātrārambha*, there being another *Navarātrārambha* on *Āśvina* śukla pratipad.

Pūrvaviddha.—A tithi kept on the day on which it begins, provided it begins more than 4 ghatikas before the sunset of one day and ends before sunset of following day.

Pushkara, or festival of a river, is celebrated when Jupiter enters certain signs of the zodiac. The signs for the 12 chief rivers are—

Jupiter in Mēsha—Gangā.	Jupiter in Tulā—Kāveri.
„ Rishabha—Revā.	„ Vriśchika—Bhimarathi.
„ Mithuna—Sarasvatī.	„ Dhanus—Pushkaram.
„ Karkataka—Jamna.	„ Makara—Tungabhadra.
„ Simha—Gōdāvari.	„ Kumbha—Indus.
„ Kanyā—Krishna.	„ Mīna—Sapranītantasī.

The moment of Jupiter's entry into a rāśi is the Pushkaram, and the period of the festival is 12 days.

A rāśi into which Jupiter enters twice (i.e., before retrogression and after) is counted only at second entry.

N.B.—For time of entry of Jupiter into the several rāśis, during the years 1024 B.C. to A.D. 1999 see Tables V-A and V-B

Sankramana.—When sankrānti occurs during daylight, it should be observed as closely as possible: if after sunset, it is kept on the first day in the case of sankrānti occurring before midnight: otherwise, next day. If at midnight, it may be kept on either day. Rishabha, Simha, Vriśchika, Kumbha sankrāntis (sthira rāśi sankrāntis) are called *Vishnupāda*. Mithuna, Kanyā, Dhanus, Mīna (dvisvabhāva rāśis) are called *Shadasīti punyakāla*.

Mēsha and Tulā sankrāntis are called Vishuvat punyakāla. Karkataka and Makara sankrāntis are called respectively Dakshināyana and Uttarāyana punyakāla.

Sopapadas.—Jyeshtha su. 2, Āśvina su. 10, Māgha su. 4 and 12 (*pūrvāhna*).

Tisroshṭakas.—7th, 8th and 9th tithis in bahula paksha of Mārgaśīrsha, Pushya, Māgha, Phālguna (*aparāhna*).

Upākarma.—Śrāvana su. 15 (*samgavyāpinī* 6 ghaṭ. to 12). For Yajurvedis, if Sankramana, Mūdham, heliacal setting of Jupiter or Venus or eclipse concur, then the upākarma is on Bhādrapada pūrṇimā: if that also is objectionable, then

the people observe it in Āshāḍha; but this is not according to the śāstras, which require it in this case to be performed in Śrāvana month.

“Śrāvana” nakshatra is the date for Ṛigvedīs, whether the tithi be su. 14 or 15 or ba. 1.

For Vājasaneyīs, pūrṇimā must be *madhyāhna vyāpini*.

In Simha month, “Hasta” day is upākarma for Sāmavedīs south of the Narbadha. For those north of the Narbadha, “Hasta” nakshatra in Śrāvana month is the appointed time.

Vatsarārambha—lit: beginning of the year, is the name given to Chaitra su. 1, which marks the commencement of the Hindu lunar year, and which is the su. 1 immediately preceding the Mēsha sankrānti. When there is an *adhika* Chaitra, su. 1 of that month begins the year. Pratipad is *pāraviddha*, i.e., it is kept on the day on which it ends. When pratipad is *kṣaya*, it is kept on Amāvāsyā day: when it touches three days, it is kept on the third day.

Yogas—

Budhāshtamī.—Su. 8 + Wednesday in any month

Ekādaśī Guruvāra vrata.—Ekādaśī + Thursday in any month and either paksha.

Śani trayōdaśī.—Shashthi + trayōdaśī in any month and either paksha.

Kṛishnāṅgāraka chaturdaśī vrata.—Kṛishna paksha 14 + Tuesday in any month (divayāpini, i.e., must be between sunrise and sunset).

Strīnām chandradarśanam.—The whole of the night from sunset to sunrise must be pūrṇimā without occurrence of chaturdaśī.

Amāvāsyā Sōmarāra vrata.—Monday + Amāvāsyā.

Bhūmi sapṭamī.—Sunday + sapṭamī, any month and } Tithi must be current
either paksha. } at sunrise and noon

Āṅgāraka Chaturthī.—Tuesday + chaturthī. } (*divayāpini*).

Ashṭamī Sōmarāra vrata.—Monday + ashṭamī. }

Mahapurnamī vrata.—Moon and Jupiter should join in the nakshatra whence the month takes its name.

Mahāmāgha.—Saturn in Mēsha + moon in “Māgha” + Jupiter in Simha + sun in “Śrāvana” nakshatra.

Mahāvratīpāta.—Jupiter and Mars in Simha + Venus in Mēsha + su. 12 + “Hasta” nakshatra in any month.

Govindadvādaśī.—Sun in Kumbha + Jupiter in Dhanu + Śukha (i.e., auspicious) tithi, vāra, and nakshatra in Phālguna śukla paksha: otherwise sun in Kumbha + Saturn in Makara + su. 12 + “Pushya” nakshatra.

Kūṭa māg.—Tyājya at meeting of Amāvāsyā and pratipad.

Yugādi—

Kṛitāyugādi—Kārttika su. 9.

Tretāyugādi—Vaiśākha su. 3.

Dvāparayugādi—Māgha Amāvāsyā.

Kaliyugādi—Bhādrapada ba. 13.

Manvādi and Yugādi occurring in *śukla paksha* should be in *pūrvāhna*, i.e., beforenoon: if they occur in *kṛishna paksha*, they should be within *aparāhna*, i.e., afternoon.

Yugānta—

Kṛetāyugānta—Simha sankrānti.

Tretāyugānta—Vṛishika „

Dvāparayugānta—Vṛishabha „

Kaliyugānta—Kumbha „

} Same rule as for sankrānti.
q.v. as regards time of day.

157. Table of Hindu fasts, feasts and festivals—

Note—The sign + means ‘combined with.’ The abbreviation “when +” means “when the tithi in question is combined with.” *Asterisks* refer to the alphabetical list prefixed to this table.

Chaitra.

St. 1. Chāndra Vatsarārambha. Navarātrārāmbha Nimbakusuma pakshana.
„ „ Vēdavyāsa Tīrtham (Mādhvas).

- SU. 3. Āndōlana-tritīyā (*paravidhha*). Gaurī-tritīya Matsajayanti (afternoon). Manvādi.
- SU. 5. Lakshmi panchamī or Srīpanchamī (*pūrvavidhha*). Kalpādi * (*pūrvāhna*).
- SU. 8. Bhavāni-utpatti (*paravidhha*); bathing special when + Wednesday + Nak. "Punarvasū" Aśokāshtami.
- SU. 9. Rāma navamī or *Srīrāma jayanti* (*madhyāhna*). Varāha jayanti aparāhna Kavindira tīrtham (Mādhvas).
- SU. 10. Dharmarāja daśamī.
- SU. 11. Dōlotsava. Kāmadā ekādaśī. See *Ekādaśī*.
- SU. 12. Vāmana dvādaśī. Jayā; when + nakshatra "Pushya." See *Dvādaśī*.*
- SU. 13. Madana trayōdasi (*pūrvavidhha*) or Ananga pūjana vrata; god of love worshipped. Satyavrata tīrthānām punyadinam (Mādhvas).
- SU. 15. Damanakōtsava (*pūrvavidhha*); (special for bathing when + Sunday, Thursday or Saturday. Manvādi * (forenoon). Hanumatjayanti. Virarāghava tīrthānām punyadinam (Mādhvas).
- BA. 3. Vāgīśa tīrthānām punyadinam (Mādhvas).
- BA. 11. Varūthmī ekādaśī. Satyavijaya tīrthānām punyadinam (Mādhvas).
- BA. 13. Vārūnī; when + Nak. "Śatabhishaj." Māhāvārūnī; when + Nak. "Śatabhishaj" + Saturday. Mahāmahāvarūnī; when + Nak. "Śatabhishaj" + Saturday + Yoga Śubha. Satyapriya tīrthānām punyadinam (Mādhvas).
- BA. 15. Kalpādi.*

Vaiśākha.

- SU. 3. Akshayatritīyā (*pūrvavidhha*); special when + Wednesday + Nak. "Rohini." Trētāyugādi. See *Yugādi*.* Parasurāma jayanti.
- SU. 4. Vidyādhira tīrtham (Mādhvas).
- SU. 5. Sankara's birthday.
- SU. 6. Rāmachandra tīrtham (Mādhvas).
- SU. 7. Gangā saptamī or Gangōtpatti; birth of Gangā; midday.
- SU. 11. Paraśurāma ekādaśī. Mōhini Ekādaśī.
- SU. 12. Vyatīpātā (when Nak. "Hasta" + Jupiter and Mars in Simha + Sun in Mēsha).
- SU. 13. Narasimha jayanti (*pradōsha*).
- SU. 14. Narasimha jayanti.
- SU. 15. Vaiśākhi pūrnimā. Sampat Gaurī vrata (*paravidhha*). Kūrma jayanti (*pradōsha*). See *Jayanti* * Maha-Vaiśākhi; when purnimā + sun in Mēsha + Jupiter in Dhanus + Mars in Makara + Saturn in Tulā + Nak. "Viśākha" + Variya yoga + Sunday.
- BA. 3. Kalpādi * (*pūrvāhna*).
- BA. 11. Aparā ekādaśī.

Jyeshtha.

- SU. 2. Sopapada. Satyasindha tīrtham (Mādhvas).
- SU. 3. Rambhā-tritīyā (*pūrvavidhha*); worship of Bhavāni. Buddha jayanti. Kalki jayanti (*pradōsha*).
- SU. 6. Aranya Gaurī vratam (*pūrvavidhha*).
- SU. 10. Daśaharā (expiation of ten sins), or Gangāvatāra. Jyeshtha Su. 10 + Wednesday (or Tuesday) + Nak. "Hasta" + Yoga "Vyatīpātā" is called DAŚAHARĪ.
- SU. 11. Nirjalā ekādaśī.
- SU. 12. Rāmalakshmana dvādaśī. Kūrma jayanti * (*pradōsha*).
- SU. 15. Rishabha pūja Mahājyeshthā (Jupiter in Aindra, i.e., Nak. "Jyeshthā" + moon in Aindra or Nak. "Jyeshthā" + sun in Nak. "Rohini" + Jyeshthā pūrnimā. Manvādi * and Vaṭa Pūrṇimā or Vaṭa Sāvitrī (*pūrvavidhha*).
- BA. 2. Satya pūrṇa tīrtham (Mādhvas).
- BA. 3. Raghu variya tīrtham (Mādhvas).
- BA. 8. Trilōchana pūja.

- BA. 11. Yoginī ekādaśī.
 BA. 14. Satyābhinava tīrtham (Mādhvas).
 BA. 15. Vaṭa Sāvitri vratam (*pūrvavidha*).

Āshāḍha.

- SU. 2. Ratha-yātra dvitīyā or Rāmarathōtsava.
 SU. 3. Satyādhirāja tīrtham (Mādhvas).
 SU. 5. Skanda-panchamī (*pāraviddha*).
 SU. 6. Kumāra shashthī (*pāraviddha*).
 SU. 7. Vivasvat saptamī; (when + Nak. "Pūrva-Phalgunī").
 SU. 10. Lakshmīvrātārambha. Śāka vrātārambha. Manvādī* (forenoon).
 SU. 11. Śayana ekādaśī (not to be observed in adhika month); or Vishnu-
 śayana ekādaśī or Vishnuśayanōtsava; (i.e., Vishnu going to
 sleep).
 SU. 12. Gōpadma vrātārambha. Chaturmāsya* vrata commences.
 SU. 14. Pavitrārōpanam (*pāraviddha*). See *Upākarma**
 SU. 15. Vyāsapūrnimā (6 to 9 ghāt after sunrise). Hariśāyanam. (*Sāyāh-
 naryāpni*). Manvādī* Śivaśayanotsava or Kokila vrata or Vyāsa-
 pūja.
 BA. 2. Chaturmāsya dvitīya.* Asūnyaśayana vrata; fast broken at moon-
 rise.
 BA. 3. Śrīvijaya tīrtham (Mādhvas).
 BA. 7. Special, when + Nak. "Revatī" + Tuesday.
 BA. 8. Manvādī.*
 BA. 11. Kāmadā or Kāmika ekādaśī. v. *Ekādasī*.*
 BA. 12. Pāpanāśini, when + Nak. "Rohinī." See *Dvādasī*.*
 BA. 15. Satyādīśa tīrtham (Mādhvas).

Śrāvana.

- SU. 3. Madhu-Śravā (in Guzerat).
 SU. 5. Nāgapanchamī (*pāraviddha*); worship of snakes.
 SU. 6. Suryashashthī (*pāraviddha*). Hala-shashthī.
 SU. 7. Satyavara tīrthānām puṇyadinam (Mādhvas).
 SU. 10. Dadhivratārambha
 SU. 11. Putradā ekādaśī.
 SU. 12. Dāmōdara dvādaśī, Vishnuh-pavitrārōpanam.
 SU. 14. Varalakshmī vrata, on Friday, nearest to pūrnimā in śuklapaksha.
 SU. 15. Hayagrivōtpatti; Upākarma.* Rig-yajuh-Śrāvāṇī. Rakshabandhana
 (tying a string round the arm), or Rakipūrnimā; or Nārālī-
 pūrnimā (when coconuts are thrown into the sea).
 Hayagriva jayanti; or Hayagrivotpatti.
 BA. 2. Asūnyaśayana vrata. See "Chaturmāsya dvitīya."* Rāghavendra-
 swāmī puṇyadinam (Mādhvas).
 BA. 3. Kajjali-tritīyā
 BA. 4. Bahula chaturthī; when cows are worshipped.
 BA. 7. Sītālā saptamī or Sītālā-vrata (*pūrvavidha*).
 BA. 8. Janmāshṭamī. Krishnāshṭamī or *Krishna-Jayanti*. Special when +
 Nak. "Rohinī"; less so when joined only to Monday or Wednes-
 day Manvādī.* Vaishnavas observe this invariably in Simha
 month.
 BA. 11. Ajā ekādaśī.
 BA. 12. Jayanti; (when + Nak. "Punarvasū"). See *Dvādasī*.*
 BA. 13. Satyadharma tīrthānām puṇyadinam (Mādhvas).
 BA. 15. Pithori or Kuśotpatinī (end of Śrāvana). Manvādī.*

Bhādrapada.

- SU. 1. Maunavratam (*pūrvavidha*).
 SU. 3. Shōdashomāvrata. Varāha jayanti (see *Jayanti**). Haritālīka;
 worship of Pārvatī. Manvādī.* Śivā (a name for this tithi).
 Bālarāma jayanti (*madhyāhna*).

- Su. 4. *Vināyaka chaturthī* (*madhyāhna vyāpinī*) Spl. when + Sunday or + Tuesday.
- Su. 5. *Rishipanchami* (*aparāhna vyāpinī*).
- Su. 6. *Champa shashthī* (when + Nak. "Visākhā" + Yoga Vāidhriti + Tuesday). *Sūrya shashthī* (*pūrvaviddha*) or *Skanda shashthī*.
- Su. 7. *Amuktābharana saptamī* (*pūrvaviddha*). *Jayasaptamī* *Aparājītā*. *Manvādi*.*
- Su. 8. *Durvāshtamī* (*pūrvaviddha*). *Jyeshthā pūja* (when + Nak. "Jyeshthā"). *Jyeshthā-Gaurī-pūjā-vrata*, when + nakshatra "Jyeshthā."
- Su. 9. *Nandanavamī*. *Adhukha-navamī*.
- Su. 10. *Kshīravratārambha*. *Satyāshthakāma tīrthānām punyadinam* (*Mādhvas*).
- Su. 11. *Vishnu parivartanōtsava* or *Parivarttana ekādaśī*. *Lakshmīnārāyana Yoga*.
- Su. 12. *Kalki-dvādaśī*. *Sakrottāpanam*. *Vāmana-jayanti* (*madhyāhna*) (see *Jayanti* *). *Śrāvana-dvādaśī* (when + Nak. *Śrāvana*, + Wednesday). *Vijaya*, (when + Nak. "Śrāvana"). See *Dvādaśī*.*
- Su. 14. *Anantavratam* or *Anantapadmanābha Chaturdaśī* (*pūrvaviddha*); must be current for 3 muhūrtas, i.e., 6 ghatikas, after sunrise; and for those who perform this *vrata* for the first time, the tithi must be current at noon.
- Su. 15. *Praushthapadī pūrṇimā* or *Śrāddha*.
- BA. 1. *Mahālayapakshārambha*. (*Mahālaya* when + Nak. "Bharanī" in *aparāhna*).
- BA. 2. *Āsūnyaśayana-vrata*. "Chāturmāsya dvitīya."*
- BA. 3. *Brihatyuma vratam* (*pūrvaviddha*).
- BA. 6. *Chandrasasthivratam*. *Kapila shashthī* (when + Nak. "Rōhinī" + Yōga "Vyatipāta" + Sun in "Hasta" + Tuesday).
- BA. 8. *Rudrāshtamī* (*pradōshakāla vyāpinī*). *Madhyāshṭamī*. *Mahālakshmī vrata* (*pūrvaviddha*). *Ashtaka Śrāddha*.
- BA. 9. *Durgā navamī* (in *Mahārāshtra*). *Gajagaurī vratam* (when + Sun entering nakshatra "Hasta").
- BA. 10. *Hariśankara Yōga* (*pūrvaviddha*), when there is a concurrence (1) of ba. 9 and ba. 10. (2) of Nak. "Punarvasū" and Nak. "Pushya," (3) of "Śivayōga" with "Siddhayōga," and (4) of "Garijakaṛṇa" with "Vanijakaṛṇa"; for 8 ghatikas by day or night; may be kept in *adhika* months.
- BA. 11. *Indirā ekādaśī*.
- BA. 12. *Yatimahālaya* (*aparāhna vyāpinī*). *Jayā* (see *Dvādaśī* *).
- BA. 13. *Gajachchāyā* (when + Sun in "Hasta" + Nak. "Maghā"). *Kali-yugādi*. See *Yugādi*.* *Maghā trayōdaśī* (Nak. "Maghā").
- BA. 14. *Vishāsastrahatānām Mahālaya*.
- BA. 15. *Sarvapitri* or *Mahālaya Amāvāsyā*. Special, when sun and moon are both in Nak. "Hasta." *Mādhava tīrthānām punyadinam* (*Mādhvas*).

Āśvina.

- Su. 1. *Chandīpūjārambha* or commencement of *Navarātri* (*pūrvaviddha*). *Stanavridhhi Gaurī vratam*.
- Su. 5. *Upāngalalita Gaurī vratam*: esp. in *Mahārāshtra* (*pūrvaviddha*). *Sarasvatīpūjārambha* ("Mūla" Nak.). *Lalitā panchamī*.
- Su. 7. About this tithi, when it concurs with Nak. "Mūla," *Sarasvatī* is worshipped. *Satyaprayana tīrthānām punyadinam* (*Mādhvas*).
- Su. 8. *Mahāshtamī* (Spl. when + Tuesday). *Satyaparākrama tīrthānām punyadinam* (*Mādhvas*).
- Su. 9. *Mahānavamī* (*pūrvaviddha*) or *Durgā-navamī* *Manvādi*.* *Āyudha pūja*.
- Su. 10. *Vijayadaśami* or *Daśara* (*pūrvaviddha*); (Spl. when + Nak. "Śrāvana"). *Rājnyā pattābhishēkha* (*pūrvaviddha*). *Sarasvatīpūja* (ends in "Śrāvana" Nak.) *Dvidāśa vratārambha*: *Buddha-Jayanti*. (See *Jayanti*.) *Sopapada*

- Su. 11. Pāsāṅkuśa ekādaśī.
 Su. 12. Padmanābha dvādaśī, Godvādaśī (*pradōsha vyāpinī*). Vijayā (when + Nak. “Śravaṇa”). See *Dvādaśī*. *
 Su. 15. Dhanaphalavratārambha, when + Sunday. Kaumudyutsava (*pūrvaviddha*). Kojāgari pūrṇimā or Kojāgari vrata ; worship of Lakshmi and Indra. Games of chance. Navāṇa pūrṇimā (when new grain is cooked).
 BA. 2. Aśunyaśayana-vrata. See “Chāturmāsya dvitīya.” *
 BA. 3. Chandrōdaya Māsa vratam (*pūrvaviddha*).
 BA. 11. Ramā ekādaśī.
 BA. 12. Gōvatsa dvādaśī.
 BA. 13. Dhanatrayodaśī ; when money lenders worship money.
 BA. 14. Narakachaturdaśī (*pūrvaviddha*) or Dīpāvalipānam, Dīpadānam. Svātyabnyanga (at moonrise).
N.B.—Dīpāvali is special on this tithi if joined to Nak “Svāti”
 BA. 15. Kedāra vratam (*pūrvaviddha*).

Kārttika.

- Su. 1. Balipratipad or Balipūja.
 Su. 2. Yamadvitīyā (*avarāṇa vyāpinī*) or Bhrātridvitīyā.
 Su. 3. Ālochana Gaurī vratam (*pūrvaviddha*).
 Su. 4. Nāga chaturthī (*pūrvaviddha* ; *at P. 15. 1. vyāpinī*).
 Su. 6. Mahāshashthī ; special for feeding of Brahmans when it falls on Tuesday.
 Su. 7. Kalpādi * (*pūrvahna*).
 Su. 8. Gō-ashṭamī (*pūrvaviddha*).
 Su. 9. Kretāyugādi See *Yugādi*. *
 Su. 10. Satyavara tīrthānām puṇyadinam (Mādhvas).
 Su. 11. Bōdhana ekādaśī or Prabōdhini ekādaśī Bhīṣmapanchaka vrata. Vedanidhi tīrthānām puṇyadinam. (Mādhvas).
 Su. 12. Yōgeśvaradvādaśī. Kshirābdhi mahōtsava. Chāturmāsya vrata * (begins). Prabōdhotsava or Utthāna dvādaśī (preparation for waking Vishnu). Tulasi vivāha. Manvādi.*
 Su. 14. Vaikunṭha chaturdaśī—midnight (*rātrivyāpinī*). Tulasi vratodhyāpanam.
 Su. 15. Special (when + Nak. “Krittikā”). Jvālatoranam (*pradōsha vyāpinī*). Dhatri yōga (when + Nak. “Krittikā”). Manvādi * Chāturmāsya vrata (ends). Tripurī pūrṇimā or tripurōtsava. Mahākārttikī (when + Nak. “Rohini”), or when moon and Jupiter are both in Nak. “Krittikā” on Kārttika su. 15. Pādmakayoga (when + Sun in Nak. “Viśākha” + Moon in Nak. “Krittikā”). *Krittikā* Festival.
 BA. 2. Kārttika “Chāturmāsya dvitīyā.” *
 BA. 3. Vidyānidhi tīrthānām puṇyadinam (Mādhvas).
 BA. 8. Krishnāshṭamī v. *Ashṭamī*. * Kāla-Bhairāvāshṭamī or Kāla-Bhairava jayanti. Manvādi.*
 BA. 11. Utpatti ekādaśī.
 BA. 13. Yamādīpa (*pradōsha vyāpinī*).
 BA. 14. Padmanābha tīrthānām puṇyadinam (Mādhvas).

Mārgaśīrsha.

- Su. 5. Nāgapūjā or Nugapanchamī.
 Su. 6. Skanda shashthī (*pūrvaviddha*), or Mahā shashthī. Champa shashthī ; Śiva worshipped as Khandoba. Spl. when + Sunday or Tuesday + Nak. “Śatabhishaj” or + Yoga “Vaidhriti.”
 Su. 7. Mitra saptamī (*pūrvaviddha*). Sūryavrata.
 Su. 9. Kalpādi (*pūrvahna*).
 Su. 10. Satyanidhi tīrthānām puṇyadinam (Mādhvas).
 Su. 11. Mōkshadā ekādaśī. Sātyanātha tīrthānām puṇyadinam (Mādhvas).
 Su. 12. Matsya-dvādaśī. Akāṇḍa dvādaśī vratam.

- SU. 13. Hanumad vratam (*Abhijitvyūpinī*).
 SU. 14. Pāshānapakshana (*pradōshavyūpinī*), or Pāshāna chaturdaśī. Dattātreya jayanti (in some places; elsewhere it is su. 15).
 SU. 15. Spl. for donations of salt, when + Nak. "Mrigaśirsha." Chandra Pūjā (*pradōsha*). Śiva Pūjā ("Ārdra" Nak.). Dattātreyā or Dattajayanti. Ārdra festival.*
 BA. 1. Raghunātha tīrthānām punyadinam (Mādhvas).
 BA. 5. Akshobhya tīrthānām punyadinam (Mādhvas).
 BA. 7. Tisroshṭaka * (*aparāhna*).
 BA. 8. Kālabhairava Ashtamī (*pātrivvyūpinī*). Ashtaka-Srāddha. Tisrosh-taka* (*aparāhna*).
 BA. 9. Tisroshṭaka (*aparāhna*).
 BA. 11. Saphala ekādaśī.

Pausa.

- SU. 8. Spl. when + Wednesday + Nak. "Bharanī"; + "Rohini" or "Ārdra," according to some.
 SU. 11. Putradā ekādaśī or Mukkoṭi Ekādaśī or Vaikunṭha Ekādaśī. Manvādi.* Raghūttama tīrthānām punyadinam (Mādhvas).
 SU. 12. Kūrma dvādaśī.
 BA. 6. Satyakāma tīrthānām punyadinam (Mādhvas).
 BA. 7. Tisroshṭaka * (*aparāhna*). Naraharitīrthānām punyadinam (Mādhvas).
 BA. 8. Tisroshṭaka * (*aparāhna*). Ashtaka Śrāddha.
 BA. 9. Tisroshṭaka * (*aparāhna*).
 BA. 11. Shaṭtilā ekādaśī.
 BA. 14. Vidyādiśa tīrtham.
 BA. 15. Ardhodaya; when + Sunday + Nak. "Śravana" + yoga "Vyatīpāta." The tithi is called *Mahōdaya*, when any one of the above special features is wanting and the others are present. Purandharadāsa tīrtham (Mādhvas).

Māgha.

- SU. 4. Tila chaturthī or Kunda chaturthī (*pūrvavidha*) Sopapada.
 SU. 5. Madana panchamī (*pūrvavidha*). Vasanta panchamī; worship of Ratī and Kāma in forenoon; or Śripanchamī.
 SU. 7. Rathasaptamī (*pāraviddha*) or Mahāsaptamī Chandrāvarkavratam. Manvādi.*
 SU. 8. Bhīshmadarpanam (*pūrvavidha*). Bhīshmāshṭamī.
 SU. 9. Madhva navamī or Ananta tīrthānām punyadinam (Mādhvas).
 SU. 11. Bhīshmapanchakam. Jayā Ekādaśī.
 SU. 12. Bhīshmadvādaśī or Varāhadvādaśī. Sopapada.*
 SU. 13. Kalpādi * (*pūrvāhna*).
 SU. 15. Mahā Māghī; when moon and Jupiter are both in Nak. "Maghā."
 BA. 7. Tisroshṭaka.*
 BA. 8. Tisroshṭaka.* Ashtaka Srāddha.
 BA. 9. Rāmadāsa navamī. Tisroshṭaka.*
 BA. 11. Vijayā ekādaśī.
 BA. 12. Tilā dvādaśī or Vijaya when + Nak. "Śravana."
 BA. 14. *Mahāśivarātri*—midnight nearest ba. 14, when Nak. "Śravana" is current; spl. when + yoga "Śiva" + Sunday or Tuesday.
 If Nak. "Śravana" is current at two successive midnights, the second is *Śivarātri*.
 BA. 15. Dvāparayugādi. See *Yugādi*.*

Phālguna.

- SU. 3. Vadiraja Svāmigaḷ punyadinam (Mādhvas).
 SU. 4. Śānta chaturthī (*pāraviddha*).

SU. 6. Satyavratatīrthānām puṇyadinam (Mādhvas).

SU. 11. Āmalakī ekādaśī.

SU. 12. Narasimhadvādaśī.

SU. 13. Kāmadahanam (*pūraviddha*) at midnight.

The concurrence of Sunday, Saturday, Tuesday or Friday is an objection to the feast: *chaturdaśī* (su. 14) is then the proper day. If that also is objectionable then this festival is celebrated at that midnight at which Nak. "Pūrva Phālguni" is current.

SU. 15. Helikotsava (*sāyāhana vyāpinī*). Manvādī.*

Holikā or Hutāśani pūrnimā. In South India, Kāman Paṇḍigai, commemorating the destruction of Cupid or Kāmadēva by Śiva.

BA. 1. Vasantotsava. Satyabodha tīrthānam puṇyadinam (Mādhvas).

BA. 2. Chāturmāsya dvitīyā.*

BA. 3. Kalpādi * (*purvāhna*).

BA. 4. Vyāsarāyaswāmigaḷ puṇyadinam (Mādhvas).

BA. 5. Rangapanchamī; when colours are thrown about.

BA. 7. Tisroṣṭaka.*

BA. 8. Tisroṣṭaka.* Ashtakaśrāddha.

BA. 9. Tisroṣṭaka.*

BA. 11. Pāpamōchini ekādaśī.

BA. 13. Vāruṇī, when + Nak. "Śatabhishaj."

Mahā-Vāruṇī, when + Nak. "Śatabhishaj" Saturday.

Mahā-Mahā-Vāruṇī, when + Nak. "Śatabhishaj" + "Yoga Śubha."

BA. 15. Manvādī.*

158. In the following list the feasts, fasts and festivals are arranged in order of tithis:—

Pratipad (Tithi I).

The Chaitra śukla *pratipad*, i.e., that which precedes the Mēsha Sankrānti, is the beginning of the Hindu lunar year, New Year's Day (Lunar) being that on which the *pratipad* is current at sunrise. (When there is an *Adhika Chaitra*, that begins the year.) The tithi is therefore called *Vatsarārambha* (commencement of the year). It is also *Navarātrarāmbha*, there being another *Navarātrarārambhā* on *Āsvina śukla pratipad*.

Kārttika śukla 1 is *Balipratipad* or *Bali pūjā* and it is *pūraviddha* as to time.

Bhādrapada bahula 1 is *Mahālayārambha*.

Phālguna bahula 1 is *Vasantotsava*.

Dvitiyā (Tithi II).

Āshāḍa śukla 2 is *Ratha-yātra dvitīyā* or *Rāma-rathotsava*.

Kārttika śukla 2 is *Yama dvitīyā* or *Bhrātṛi-dvitiyā* (because sisters make presents to brothers), and the time is afternoon.

The bahula dvitīyā in Āshāḍha, rāvaṇa, Bhādrapada and Āsvina is called *Asūnyaśayana-vrata* and the fast is broken at moonrise.

Tritiyā (Tithi III).

Chaitra śukla 3 is *Gaurī-tritīyā*; also *Matsa-jayantī* (afternoon); also *Manvādī* (forenoon).

Vaiśākha śukla 3 is *Kalpādi* (forenoon); *Tretāyugādi* (forenoon); *Akshaya-tritīyā* special, when combined with Wednesday and Nak. Rōhiṇī; time (forenoon); also *Parasurāma jayantī*.

Jyēṣṭha śukla 3 is *Rambhā-tritīyā*, when Bhavāni is worshipped at *pūraviddha*.

Śrāvaṇa śukla 3 is *Madhu-sravā* in Guzerat.

Śrāvaṇa bahula 3 is *Kajjali-tritīyā*.

Bhādrapada śukla 3 is *Varāhā-jayantī* (afternoon); *Haritālīkā*, when Parvati is worshipped; *Manvādī* (forenoon). The tithi is by some called *Śivā*.

Phālguna bahula 3 is *Kalpādi* (afternoon).

Chaturthī (Tithi IV).

The śukla Chaturthī in every month is called *Ganeśa Chaturthī* or *Vināyaka Chaturthī*, the chief being *Māgha Chaturthī* (*Ganeśa jayantī*). It is celebrated at midday. *Tila*

Chaturthī is another name for *Māgha śukla chaturthī*. It is performed in the evening and is *pūrvaviddha*. *Kuṇḍa Chaturthī* is another name for the same festival.

Bhādrapada śukla chaturthī is special when it falls on Sunday or Tuesday.

Similarly, the *bahula chaturthī* in every month is *Sankashṭachaturthī* and is a fast day for people in difficulties : the fast is broken at moonrise which is the time. This *chaturthī* is called *Angāraka Chaturthī* if it falls on Tuesday and continues till moonrise.

Śrāvaṇa bahula chaturthī is called, par excellence, *Rahula Chaturthī* and cows are then worshipped.

Panchamī (Tithi V).

Chaitra śukla 5 is *Sri panchamī* according to some : it is also *Kalpādi* (forenoon).

Śrāvaṇa śukla 5 is *Nāga panchamī* and snakes are then worshipped. If *tithi* begins within 6 *ghaṭikas* after sunrise of one day and ends within 6 *ghaṭikas* after sunrise on the next day, the *tithi* is celebrated on the former day and that is *Nāga panchamī*.

Bhādrapada śukla 5 is *Rishi panchamī* (midday).

Āsvina śukla 5 is *Lalitā panchamī* or *Upāṅga-lalitā-vrata*, when *Durgā* is worshipped in the afternoon.

Mārgaśīrsha śukla 5 is *Nāgapūja* or *Nāga panchamī*.

Magha śukla 5 is *Vasanta panchamī*, when *Rati* and *Kāma* are worshipped in forenoon. *Srī panchamī* is another name.

Phālguna bahula 5 is *Ranga panchamī*, when colours are thrown about.

Shashṭī (Tithi VI).

Śrāvaṇa śukla 6 is *Kalki-Jayanti* (sunset), the last *avatāra* of *Vishnu*.

Śrāvaṇa bahula 6 is *Hala Shashṭhī*.

Bhādrapada śukla 6 is *Sūrya-Shashṭhī* or *Skanda-Shashṭhī*.

Bhādrapada bahula 6 is *Chandra Shashṭhī*. It is called *Kapila-Shashṭhī* when it combines on Tuesday with *Nak. Rohini* and *Yoga Vyatīpāta* and the sun is in *Hasta*.

Kārttika śukla 6 is special for feeding of Brahmins when it falls on Tuesday.

Mārgaśīrsha śukla 6 is *Skanda-Shashṭhī* or *Māhā-Shashṭhī*; *Chāmpā-Shashṭhī*, when *Śiva* is worshipped as *Khandoba*. This *tithi* is special when it falls on Sunday or Tuesday and combines with *Nakṣatra Satabhishaj* and *Yoga Vaidhṛti*, or either of the two.

N.B.—Eye-table S shows that *Nak. Satabhishaj* (No. 24) may concur with the *tithi* in a year in which some month before *Mārgaśīrsha* is 'adhika', but *Yoga Vaidhṛti* (No. 27) can never concur with this *tithi* Eye-table v.

Saptamī (Tithi VII).

A *saptamī* on Tuesday, combined with *Nak. Revatī* (that is, by Eye-table, section s *bahula 7* in *Āshāḍha* or *Śukla 7* in *Pauṣa* or *Māgha*) is very auspicious. A *śukla saptamī*, falling on Sunday, is called *Vijaya*, and is special for donations. A *śukla saptamī*, joined with the first quarter of *Nak. Hasta*, is called *Bhadra*. A *śukla saptamī*, coinciding with a *Sankrānti*, is called *Mahajayā*, which, for making donations, is superior even to an eclipse.

Vaiśākha śukla 7 is *Gangā-Saptamī* or *Gangotpatti* (birth of *Gangā*—midday).

Śrāvaṇa bahula 7 is *Sitalā-Saptamī* or *Sitalā-Vrata*, time *pūrvaviddha*.

Bhādrapada śukla 7 is called by some *Āparājita*.

Āsvina śukla 7 : about this *tithi* *Sarasvatī* is worshipped under *Nakṣatra Mūla*.

Kārttika śukla 7 is *Kalpādi* (forenoon).

Mārgaśīrsha śukla 7 is *Sūryavrata*.

Māgha śukla 7 is *Ratha-Saptamī* or *Mahā-Saptamī* (time, *arunodhaya*) ; *Munvādi* (forenoon.)

Ashṭamī (Tithi VIII).

An *Ashṭamī*, falling on Wednesday, is special and receives the name of *Budhāshṭamī*. The *Śukla Ashṭamī* in every month is sacred to *Durgā* or *Annapūranā*; while the *Bahula Ashṭamī* in every month, called *Kālāshṭamī*, celebrated at *pūrvaviddha*, is sacred to *Krishṇa*.

Chaitra śukla 8 is *Bhavāni-utpatti* : when joined with Wednesday and *Nak. Punarvasū* ; bathing on this *tithi* is special.

Śrāvaṇa bahula 8 : *Janmāshṭamī*, *Krishṇāshṭamī* or *Krishṇa Jayanti* (midnight) ; special when combined with *Nak. Rohinī* ; less so, when joined only to *Monday* or *Wednesday* ; *Manvādi* (afternoon).

Bhādrapada śukla 8 : *JyeshthāGāuri-pūjana-vrata*, when moon is in *Nak. Jyeshthā*.

Bhādrapada bahula 8 : *Mahalakshmi vrata* (pūrvaviddhā) ; *Ashṭaka-śrāddha*.

Āsvinā śukla 8 is *Mahāshṭamī* and is special when joined to Tuesday.

Kārttika śukla 8 is *Gopāshṭamī*, when cows are worshipped.

Kārttika bahula 8 is *Kṛishnāshṭamī*, *Kāla-Bhairavāshṭamī*, or *Kāla-Bhairavajayanti*.

Mārgaśīrsha bahula 8 is *Ashṭaka-śrāddha* in the afternoon. The same is the case with bahula 8 in Pausha, Māgha and Phālguna.

Pausha śukla 8 is special when joined to Wednesday and Nak. Bharanī (Rōhinī or Ādra, according to some).

Māgha śukla 8 is *Bhīshmasṭamī* and is celebrated at midday.

Māgha bahula 8 is Birth of Sītā.

Navamī (Tithi IX).

Chaitra śukla 9 is *Rāma-navamī* or *Rāma-jayanti*, at midday.

Bhādrapada śukla 9 is *Adulakha-navamī*.

Āsvinā śukla 9 is *Mahā-navamī* or *Durgā-navamī* : *Manvādī* (forenoon).

Kārttika śukla 9 is *Kṛitāyugādī* (forenoon).

Mārgaśīrsha śukla 9 is *Kalpādī* (forenoon).

Māgha bahula 9 is *Rāmadāśa navamī*.

Daśamī (Tithi X).

Jyēshtha śukla 10 is *Daśa-harā* (expiating ten sins) or *Gangāvatāra*.

Ashāḍha śukla 10 is *Manvādī* (forenoon).

Āsvinā śukla 10 is *Vijayadasamī* or *Daśara* (afternoon), special with Nak. Śrāvaṇa ; *Buddha-jayanti*.

Dvādaśī (Tithi XII).

The *Dvādaśī* is called *Mahā-dvādaśī* in the following circumstances :—

11th Tithi current at sunrise on two successive days. the next Dvādaśī is called Unmīlani.

12th Do. do. : the Dvādaśī is called Vanjuli.

12th Tithi, to be followed by a full moon or a new moon tithi, current at two sunrises—Pakshavardhini.

12th Tithi, joined with Nakshatra *Pushya*, is *Jaya* [i.e., by Eye-table s, Bahula 12 in Bhād., or śukla 12 in Phālg. or Chait.]

Do. *Śrāvaṇa* is *Vijaya* [i.e., by Eye-Table s, śukla 12 in Bhād., Asv., ; Bahula 12 in Phālg.]

Do. *Punarvasū* is *Jayanti* [i.e., by Eye-table s, śukla 12 in Phālg. ; Bahula 12 in Śrāvaṇa].

Do. *Rohini* is *Papanasini* [i.e., by Eye-table s, śukla 12 in Pausha, Māgha, Bahula 12 in Ashāḍha].

Vaiśākha śukla 12, joined with Nak. *Hastā*, and Jupiter and Mars in *Simha*, sun in *Mesha*, is *Vyātīpata*.

Ashāḍha śukla 12 is the commencement of *Chāturmāsya vrata*.

Śrāvaṇa śukla 12 is *Vishnuh-pavitṛā-ropanam*.

Bhādrapada śukla 12 is *Vāmana jayanti* (midday) ; called Śrāvaṇa Dvādaśī, when joined with Nak. Śrāvaṇa, and specially, when further joined with *Wednesday*.

Āsvinā bahula 12 is *Govatsa Dvādaśī* (evening).

Kārttika śukla 12 : (1) end of *Chāturmāsya vrata*, which began on same tithi in Ashāḍha.

(2) *Prabodhotsava* or *Uttāna dvādaśī* (preparation for waking Vishnu).

(3) *Tulasī vivāha* (marriage of Vishnu with the Tulasi plant).

(4) *Manvādī* (forenoon).

Māgha śukla 12 : *Bhīshma dvādaśī*.

Māgha bahula 12 : *Tila dvādaśī* or *Vijaya*, when combined with Nak. Śrāvaṇa.

[N.B.—This can only happen when a month previous to Māgha is Adhika—See Eye-table s]

Trayōdaśī (Tithi XIII).

Chaitra śukla 13 : *Madana trayōdaśī* or *Ananga Pūjana vrata* (pūrvaviddhā) ; God of Love worshipped.

Bhādrapada bahula 13: (1) *Kaliyugādi* (afternoon).

(2) *Māgha trayodasī*, when combined with Nak. *Maghā*.

(3) *Gajachaya*, when joined to Nak. *Maghā* and sun in *Hasta*.

Āsvina bahula 13: *Dhana trayōdasī*, when money-lenders worship money.

Māgha śukla 13: *Kalpādi* (forenoon).

Phālguna bahula 13: (1) *Vārūni*, when joined with Nak. *Satabhishaj*.

(2) *Mahāvārūni*, when joined with Nak. *Satabhishaj* + *Saturday*.

(3) *Mahā-Mahā-Vārūni* when joined with Nak. *Satabhishaj* + *Saturday* + *Yoga Subha*.

[N.B.—Combinations (1) to (3) can happen only when Phalguni or some previous month is *Adhika*—See Eye-tables.]

Chaturdaśi (Tithi XIV).

Bahula Chaturdaśi in every month is *Sivarātri*.

Vaiśākha śukla 14: *Narasimha jayantī* (sunset). special when joined to Nak. *Svāti* + *Saturday*

Śrāvana śukla 14: *Varalakṣmī vrata*.

Bhādrapada śukla 14: *Ananta chaturdaśi*.

Āsvina bahula 14: *Naraka chaturdaśi* (moonrise), fasting to avoid *naraka* or hell.

Dīpavali (see *Āsvina amāvāsyā* below), may fall on this tithi if joined to Nak. *Svāti*.

Kārttika śukla 14: *Vaikunṭha chaturdaśi* (midnight).

Mārgaśīrṣa śukla 14: *Pāshāna chaturdaśi*

Māgha bahula 14: *Mahā Sivarātri* (midnight, when Nak. *Śrāvana* is current).

Special, when combined with *Sunday* or *Tuesday* and *Yoga Śiva*.

[N.B.—*Yoga Śiva* can combine with *Sivarātri* only when some month previous to *Magha* is *Adhika*. See Eye-tables.]

Sukla Panchadaśi (Tithi XV): sukla 15 or Pūrṇimā, full moon.

A sukla 15 or Pūrṇimā is called *Somavati* when it falls on Monday and is special for donations.

It is called *Chūdamani* when it is further joined with a lunar eclipse.

Most pūrṇimās receive special names, which are given below:—

Chaitra pūrṇimā:—(1) *Manvādi* (forenoon).

(2) *Hanumat-jayantī*.

(3) Special for bathing, when combined with Sunday, Thursday or Saturday.

Vaiśākha pūrṇimā:—*Kūrma jayantī* (late afternoon)

Jyēṣṭha pūrṇimā:—(1) *Manvādi* (forenoon).

(2) *Vata pūrṇimā* or *Vata Sāvitrī* (pūrvaviddha).

(3) *Maha-jyāishthī*, when moon and Jupiter are in Nak. *Jyēṣṭhā* and sun in *Rohini*.

Āshāda pūrṇimā:—(1) *Manvādi* (forenoon).

(2) *Śivasayanotsava*, or *Kokilā-vrata* or *Vyāsapūjā*.

Śrāvaṇa pūrṇimā:—(1) *Rig-yajur-Śrāvaṇa* (i.e., *Śrāvaṇa* for followers of *Rig* and *Yajur* Vedas).

(2) *Rakṣābandhana* (tying a string round the arm) or *Rakī-pūrṇimā* or *Nārālī pūrṇimā* (throwing coconuts into the sea)

(3) *Hayagrīva Jayantī*.

Bhādrapada pūrṇimā:—*Praushṭhapādi pūrṇimā* or *srāddha*.

Āsvina pūrṇimā:—(1) *Kojāgarī pūrṇimā* or *Kojāgara vrata* (midnight). *Lakṣmī* and *Indra* worshipped; games of chance.

(2) *Navānna pūrṇimā*, when new grain is cooked.

Kārttika pūrṇimā:—(1) *Manvādi* (forenoon).

(2) *Chāturmāsya vrata* ends.

(3) *Tripurī pūrṇimā* or *tripurotsava*.

(4) Special when joined to Nak. *Kṛittika*.

(5) *Mahā kārttika*, when joined to Nak. *Rōhini*; or when moon and Jupiter are both in Nak. *Kṛittikā*.

(6) *Padmakayoga*, when moon is in Nak. *Kṛittikā* and sun in Nak. *Viśākha*.

(7) *Kṛittika* festival in Southern India.

Mārgaśīrsha Pūrṇimā :—(1) *Dattā treya* or *Datta-jayanti* (evening).

(2) Special for donations of salt, when joined to Nak *Mrigāśīra*.

(3) *Ārdra* festival in honour of Śiva at Chidambaram and else where Śiva, in his incarnation of Natesa, is said to have been born on *Mārgaśīrsha Pūrṇimā* under the Nakshatra *Ārdra* the combination could take place only when some month previous to *Mārgaśīrsha* was *adhika*. (See Eye-table s.)

Māgha Pūrṇimā *Maha-Maghi*, when Moon and Jupiter are both in Nak. *Maghā*

Phālguna pūrṇimā : (1) *Manvādī* (forenoon).

(2) *Holikā* or *Hulāsani pūrṇimā* (evening).

(3) *Kāman Pandūgai* (in South India destruction of the Indian Cupid by Śiva)

Bahula Panchadaśī (*Tithi XV*): *Amāvāsyā*—*New Moon*.

A solar eclipse on Sunday is Chudamani, and is special for donations.

Amāvāsyā at the end of Śrāvana and beginning of Bhādrapada: *Pithori* or *Kusotpāṭini*.

Amāvāsyā at the end of Bhādrapada and beginning of Āsvina: *Sarvapatri* or *Mahālaya Amāvāsyā*: special when sun and moon are both in Nak. *Ilāsta*.

Amāvāsyā at the end of Āvina and beginning of Kārttika is *Dipāvali*, with previous and following tithis: that on which Nak. is *Śrāti* being the special day

Amāvāsyā at the end of Pausa and beginning of Maghā (1) *Ārdhodaya*, when joined with Sunday in day time + Nak. *Śrātaṇa* + Yogn Vyatipūta

[N.B.—This can only happen when some month previous to Mūgha is *Adhika*]

Amāvāsyā at the end of Pausa and beginning of Maghā (2) *Mahodaya* when any one of these special features is wanting.

Amāvāsyā at the end of Maghā and beginning of Phālguna: (1) *Dvāparayugadi* (afternoon).

(2) Special for Śrāddhas, when joined with Nak. *Satabhishaj* or Nak. *Dhanishtha*.

Amāvāsyā at the end of Phālguna and beginning of Chaitra: *Manvādī* (afternoon).

N.B.—Miss Underhill's *Hindu Religious Year* (1921—*Religious Life of India Series*) contains a full popular account of Hindu religious fasts, feasts and festivals

SECTION XX.—*The Muhammadan year.*

159. The Muhammadan era, commonly called *Hejra* or *Hijra*, is dated from Friday, 16 July, A.D. 622, the day of the flight of the Prophet.

The Muhammadan calendar is not luni-solar like the Indian calendar, but strictly lunar. The length of the synodical month according to the Muhammadan calendar is 29 days 12 hours 44 minutes. The three seconds reckoned in addition in the Hindu calendar are neglected in the Muhammadan. The months are alternately 29 and 30 days long, which, again, if carried out uniformly, would result in an error of 44 minutes per month, which, in 360 months, or 30 lunar years, would amount to $\frac{360 \times 44}{60 \times 24} = 11$ days. These 11 days are accordingly added to the last month of the calendar in 11 out of every 30 years, and the year containing an extra day is, from analogy, sometimes called a leap year.

160. Every 30 years form a cycle in the Muhammadan calendar. The years which have 355 days, instead of 354, are in some countries the 2nd, 5th, 7th, 10th, 13th, 15th, 18th, 21st, 24th, 26th and 29th. Elsewhere, the 2nd, 5th, 8th, 10th, 13th, 15th, 19th, 21st, 24th, 27th and 29th are kept as leap years.

It will be noticed that the difference of usage is as regards the 8th, 19th and 27th years in each cycle. The generality of authorities (including the *Encyclopædia Britannica*) have adopted the 7th, 18th and 28th years of each cycle as leap years and the *Ephemeris* follows this usage.

161. All the books that deal with the Muhammadan calendar mention the above difference of usage, but they do not give the reason of it. The reason is, however, not far to seek.

If we write down the accumulated error which remains at the end of each year by reason of the neglect to take account of 44 minutes and which was adverted to in the first section of this chapter, we obtain the following result under the system of reckoning the 8th, 19th and 27th as leap years:—

Year.	Error.	How error is corrected by leap year.	Year.	Error	How error is corrected by leap year.
1st year,	8 hrs. 48'		16th year,	20 hrs. 48'	6th day added by leap year.
2nd year,	17 hrs. 36'	1st day added by leap year.	17th year,	5 hrs. 36'	
3rd year,	2 hrs. 24'		18th year,	14 hrs. 24'	
4th year,	11 hrs. 12'		19th year,	23 hrs. 12'	7th day added by leap year.
5th year,	20 hrs. 0'	2nd day added by leap year.	20th year,	8 hrs. 0'	
6th year,	4 hrs. 48'		21st year,	16 hrs. 48'	8th day added by leap year.
7th year,	13 hrs. 36'		22nd year,	1 hr. 36'	
8th year,	22 hrs. 24'	3rd day added by leap year.	23rd year,	10 hrs. 24'	
9th year,	7 hrs. 12'		24th year,	19 hrs. 12'	9th day added by leap year.
10th year,	16 hrs. 0'	4th day added by leap year	25th year,	4 hrs. 0'	
11th year,	0 hrs. 48'		26th year,	12 hrs. 48'	
12th year,	9 hrs. 36'		27th year,	21 hrs. 36'	10th day added by leap year.
13th year,	18 hrs. 24'	5th day added by leap year.	28th year,	6 hrs. 24'	
14th year,	3 hrs. 12'		29th year,	15 hrs. 12'	11th day added by leap year.
15th year,	12 hrs. 0'		30th year,	Nil.	

Those who observe the 8th, 19th and 27th years as leap years add a day by means of a leap year in order to avoid the error accumulating to more than 1 *day* at the end of the following year; while those that observe the 7th, 18th and 26th as leap years add a day by means of a leap year in order to avoid the error accumulating to more than *half a day* at the end of the following year.

162. The months and the number of days in each are as follows :—

Month	Number of days.	Day of commencement reckoning from beginning of year.	Month.	Number of days	Day of commencement reckoning from beginning of year
1. Muharram	30		7. Rajab	30	177
2. Safar	29	30	8. Sha'bān	29	207
3. Rabi-ul-awwal	30	59	9. Ramazān	30	236
4. Rabi-ul-akhir or Rabi-us-sani	29	89	10. Shawwāl	29	266
5. Jamāda'l-awwal	30	118	11. Zi-l-ka'da	30	295
6. Jamāda'l akhir or Jumad-us-sani	29	148	12. Zi-l-hijja	29	325
			Do (when intercalary)	30	

All readers are familiar with the names of two of the Muhammadan months, *Muharram* and *Ramazān*, and all are equally familiar with the fact (due to the strictly lunar character of the year) that Muharram is liable to occur at any part of the solar year.

163. The Muhammadan day, like the Jewish, is reckoned from sunset to sunset, and the first day of Muharram is that on which the moon is for the first time visible at sunset after new moon. This is called the heliacal rising of the moon. Our readers are familiar with the Muhammadan usage of observing the heliacal rising of the moon from eminences of any sort, and passing word as soon as she is seen, so as to give notice that Muharram has commenced.

To the reader who is by this time quite at home among tithis and their ending moments, we would quote the following rule from Messrs. SEWELL & DIKSHIT'S *Indian Calendar* :—

“It is well to note that where the first tithi of a month ends not less than 5 *ghaṭikas* before sunset, the heliacal rising of the moon will probably take place on the same evening; but where the first tithi ends 5 *ghaṭikas* or more after sunset, the heliacal rising will probably not take place till the following evening. When the first tithi ends within these two periods between 5 *ghaṭikas* before and 5 *ghaṭikas* after sunset, the day of the heliacal rising can only be ascertained by elaborate calculations.”

Where so much depends upon sunset and moonrise, it is obvious that places with different longitudes and latitudes will often not agree in regard to the exact date of commencement of the Muhammadan year.

CHAPTER IV.—CONSTRUCTION OF TABLES.

SECTION i.—Theory of anomalies and equations of the centre.

164. The uses of the Eye-table, sections e to i, will be sufficiently obvious from examples already worked out. We may therefore give in this place in popular language a theory of anomalies and their equations.

165. From the fact that the orbit of the moon as well as that of the earth is elliptical, not circular, it follows that the motions of these bodies cannot be uniform from day to day or from hour to hour. This irregularity is called the *eccentricity* of the orbit and the correction to be applied on this account is called the equation of the centre.

166. The following extract from Professor Jacobi's Table in Vol. I of *Epigraphia Indica* will serve to introduce the reader to the general theory of solar and lunar anomalies, and it will also show how the material furnished by the siddhāntas has been worked into sections e to i of the Eye-table in the present work. Professor Jacobi's tables are reproduced more fully at pages 79 to 81 below. See explanation prefixed to these tables on pages 75 to 77 below.

Sūrya siddhānta—

☾'s eqn. + ; ☿'s eqn. -		♂'s eqn. - ; ♀'s eqn. +		Moon's equation of the centre.			Sun's eqn. of the centre.		
Deg.	Min.	Deg.	Min.	Deg.	Min.	Sec.	Deg.	Min.	Sec.
0	0	180	0	180	0	360	0	0	0
30	0	150	0	210	0	330	0	1	6
60	0	120	0	240	0	300	0	1	53
90	0	90	0	270	0	270	0	2	10
									31

167. Let us try to interpret in detail the meaning of this table. We are supposed to measure the moon's rate of progress, beginning from perigee, the point when she is nearest the earth, and at every step we must distinguish the moon's mean position, i.e., the position which she would have attained at a uniform rate of motion equal to the mean, and the actual position which she attains on account of the eccentricity of her orbit.

168. The mean and actual positions are the same at 0° or 360° , i.e., at perigee and at 180° , i.e., at apogee.

When the moon's mean position is 30° from perigee, her actual position has advanced by 2 degrees 32 minutes.

When her mean position ought to be 60° , we find her actually at $64^\circ 22' 30''$ from perigee.

When her mean position ought to be 90° , that is half way between perigee and apogee, she is actually $95^\circ 2' 46''$ from perigee.

From this point she begins to move more slowly, though her actual position is still in advance of the mean.

At 120° from perigee, she is $4^\circ 22'$ in advance of the mean position, that is, exactly as she was at mean 60° .

At 150° from perigee she is only $2^\circ 32'$ in advance of the mean position.

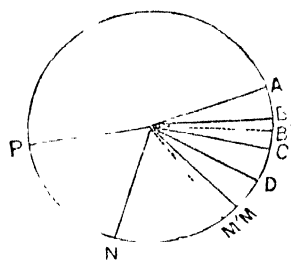
From 180° onwards she begins to slow down, and when she ought to be 210° from perigee, or 30° from apogee, we find she has reached only 210° minus $2^\circ 32'$ or $207^\circ 28'$. When she ought to be 270° from perigee, she is only 270° minus $5^\circ 2' 46''$ or $264^\circ 57' 14''$.

From 270° onwards she begins to move quicker, though she is still behind her mean position. At 300° she is behind by $4^\circ 22' 30''$ and at 330° she is behind her mean position by only $2^\circ 32'$ and at 360° or at perigee she is even with her mean position.

169. In like manner we might trace the sun's mean and actual positions from perigee through apogee back to perigee, using the figures in the last column of the above table, from which we see that the maximum equation of the centre for the sun is $2^\circ 10' 31''$.

170. In our tables (except under Planetary Table IV) we do not refer to the sun's or moon's position by degrees, but by days, which is more readily intelligible and handier for purposes of calculation. Our Eye-table, sections e to i, is simply the result of a careful expansion of the tables at pages 79 to 81 below from which the above figures have been extracted.

171. It is now necessary to explain how the *anomaly* and equation in degrees are converted into days and fractions of a day. Let us suppose the sun and the moon to move in the same plane and in circular orbits, describing equal spaces in



equal times. Let AB, BC, CD be the mean spaces described by the sun in three successive tithis, and let AM, MN, NP be the corresponding mean spaces described by the moon in the same tithis. If there were no irregularity or eccentricity in the sun's and moon's motions, the first tithi would be the time taken by the moon to gain 12° , that is, the arc BM over the sun; similarly the second and third tithis would be the periods in which the moon gains (MN minus BC) and (NP minus CD) over the sun. But owing to the eccentricity of their orbits we will suppose the sun to be at B' (actual position) when he ought to be at B (mean position) and the moon to be at M' (actual position) when she ought to be at M (mean position). Then in the period of a mean tithi (.9843 day) the moon gains over the sun the arc B'M' but our tithi is the period during which the moon actually gains over the sun $12'$, i.e., we must cut off from B'M' an arc equal to BM and determine the time during which that length is gained by the moon. Our problem would be solved if we knew the time during which B'M' minus BM was gained by the moon.

172. Now B'M' minus BM = MM' minus BB'. The time during which MM' — BB' is gained, is evidently the time during which MM' is gained minus the time during which BB' is gained. The times during which MM' and BB' are respectively gained are obtained by turning MM' and BB' into days at the rate of 29.53058 days to 360° . For nakshatra and yoga equations other scales, viz., 27.32166 days and 25.4202 days respectively to 360° were used for converting degrees into days. For the moon's anomaly, the scale $360^\circ = 27.5546$ days was used.

173. As the equation for the sun as well as the equation for the moon is sometimes positive and sometimes negative, and for *tithis* we have to take the difference between the two equations, some confusion would result from our having to change signs so often. Therefore the sun's equations are tabulated, as in the extract given above, with the signs reversed. That is why the sun's eccentricity, starting from perigee, is shown in the table extracted above as negative whereas it is really positive.

174. The reader will also observe that the moon's equation in the above table is, as it should be, positive between perigee and apogee, whereas in Eye-table e to g it is negative for the same period. The reason is that when the moon does in a given time more than the mean space, this is equivalent to a given space being done in less than mean time. This is why in the Eye-table, which derives equations of time from equations of space, the signs of space-equations are reversed. In the case of the sun's equations, a double reversion of signs takes place, first a reversion in order to make the operation of combining the sun's and moon's equations always an addition, and secondly a reversion in order to derive equations of time from equations of space. As a final result, the sun's equation of time is shown in Eye-table h as positive after perigee and negative after apogee. A third reversion takes place in calculating sunrise, where we have to derive equations of space from equations of time.

175. In calculating tithis, all we have to do, is to sum up the equations of the sun and the moon according to the Eye-table whether they are positive or negative. Before taking the moon's equation, however, we in practice add to or deduct from the moon's anomaly the sun's equation and we determine the equations for the net moon's anomaly. The reason is that when the effect of the sun's anomaly is to diminish or increase the mean time that would be necessary for a tithi, it is necessary to take the moon's anomalies for the altered mean time.

176. Conversely, in calculating yogas, where we have to take the sum of the proper anomalistic equations of the sun and the moon, our yoga equations in the Eye-table have had to be suitably altered as to their signs.

177. For *nakshatras*, we have to convert the moon's eccentricity, in other words her equation of the centre, into days at the rate of the moon's sidereal motion, i.e., 360° for 27.32166 days.

178. The sun's anomaly in the Eye-tables (sections **h** and **i**) is expressed, not in days of the *anomalistic* year, but as days of the *solar* year, and this is done for convenience of use. The length of the modern anomalistic year is 365·2596 days while that of the Hindu sidereal year is 365·2587 days. There is no practical error in adopting, as the Indian siddhāntis have done, an identical period for the anomalistic and solar sidereal years. The modern anomalistic lunar month is, like the Hindu anomalistic month, 27·5546 days. In converting degrees of anomaly into days we, therefore, put—

Sun's anomaly : $360^\circ = 365\cdot258756481$ days.

Moon's anomaly : $360^\circ = 27\cdot45459999$ days.

179. The above theory of anomalies and equations is subject to an important variation in practice. Supposing a mean tithi is accomplished at A days of the solar year, when the moon's anomaly is B days, then, if the $\odot$'s equation for A days is— a , this means that the tithi would be accomplished (supposing for the moment that the $\odot$'s anomaly had no influence) in $A - a$ days of the solar year, at a moment when the moon's anomaly would be $B - a$. Now we proceed to determine the influence of this moon's anomaly $B - a$ and find the moon's equation to be, let us suppose, $-b$. We then put down, as the actual ending moment of the tithi, $A - a - b$ days of the solar year.

180. Strictly speaking, we ought to take (1) the sun's equation for $A + b + a$ days of the solar year, where b is the equation (positive or negative) of the moon for anomaly B , and a is the $\odot$'s equation, positive or negative, for A days of the solar year, (2) the moon's equation for anomaly of $B + a$ days, and then add the equation so found. But in practice this refinement is not necessary for the sun's equation, since the maximum value of $b + a$ is ($+1138 + +1784 =$) $+5922$ day, and the maximum variation of the sun's equation for this period is about $\cdot0018$ day or 6 palas only. We may note, however, that in the test example, worked by Prof. Jacobi for Āshādhā śukla 12, K.Y. 3585, a difference of 4 palas does occur between his method and Mr. Dikshit's, and the learned Professor rightly surmises in a footnote (*Hp. Ind.*, Vol. I, p. 430) that the difference must be due to an abridgment in the Hindu method. We now see what the abridgment consists in.

SECTION II.—Tables for converting space into time.

181. In the body of the present work as well as in the connected tables measures of time alone are used, and measures of space (i.e., *degrees* of celestial longitude, *degrees* of mean anomaly of the sun and moon, etc.), have been generally excluded. This is the principle known as Largeteau's method, which was first applied to Indian astronomical computation by Professor Jacobi in 1888. Messrs. Sewell and Dikshit have applied the same principle in their "*Indian Calendar*" (1896). The present method is founded on Largeteau's principle, but differs materially from it as well as all previous applications of it in one important respect. Instead of using Largeteau's method to discover how much *space* has been accomplished at a particular moment of time, the present writer has used an adaptation of the method to discover the *moment of time* at which a particular extent of space has been accomplished. Thus, instead of determining the expired portion of a tithi, corresponding to a given moment of time (i.e., generally to mean sunrise on a particular day), as is done by Messrs. Jacobi and Sewell, and then calculating the unexpired portion of the tithi by means of successive approximations, the present writer investigates, directly and once for all, the *ending moment of a tithi*, the very thing required by Indian usage. Not only does this procedure abridge the labour of ascertaining ending moments of tithis, nakshatras and yogas, but it furnishes a very ready criterion for testing whether a month is *adhika* or *kshaya*, whether two tithis ended on the same day, etc.

182. The principles upon which space was converted into time for the purposes of the present work are set forth in the following paragraphs.

183. The principal measure of space, the distance of the moon from the sun, was converted into days in the ratio of 29·530587946 days to 360° in the case of the Sūrya siddhānta, 29·5305925 days to 360° in the case of the Ārya siddhānta, and 29·530582052 days in the case of the Brahma siddhānta and Siddhānta Śiromani.

184. The increase of the moon's age, according to the Sūrya siddhānta, for each solar year is according to the above rate of conversion, 10·891701184 days.

Instead of reckoning the increase of the moon's age, however, the present method reckons directly the *retardation in the date of appearance of the first new moon* in each solar year, for which purpose it is, of course, necessary to deduct 10·891701134 days from 29·530587946 days: result, 18·638886812 days. This, then, is the number of days by which the appearance of the first new moon is retarded each year, and the first thing to do every year is to calculate the interval of retardation for that year. The interval (if we take the retardation for one year) will, *ipso facto*, be the date of appearance of the first or Vaisākha new moon in solar year 1 of Kaliyuga (expired). From this date all other mean new moons for that or any subsequent solar year may be found by the successive addition of multiples of 29·53059 days; and the mean ending moment of every tithi is given by the addition of the tithi equivalent in days (according to the Eye-table section d) to the date of mean new moon. Precisely the same method was followed for the Ārya siddhānta, Lalla's corrections being introduced at the appropriate date, and for the Brahma siddhānta and Siddhānta Śiromaṇi.

185. The mean anomaly, in the case of the moon as well as that of the sun, was reckoned from perigee, as in Professor Jacobi's article in the *Indian Antiquary* (1883), and not from apogee, as in his articles in Volumes I and II of *Epigraphia Indica*. For the purpose of the Eye-table, the moon's mean anomaly was converted into days in the ratio of 27·554599899 days to 360° in the case of the Sūrya siddhānta, and of 27·554566936 days to 360° in the case of the Ārya siddhānta. The increase of the moon's mean anomaly for a single solar year is thus:—

Sūrya siddhānta, 7·048957797 days.

Ārya siddhānta, 7·049310381 days.

The anomaly of the moon at the first moment of Kaliyuga was taken as 90° from perigee, that being the figure according to all the authorities. From the year A.D. 1609, the corrected period of the anomalistic month (27·55459797 days) has been adopted for Sūrya siddhānta calculations.

186. The moon's mean anomaly, as entered in the Eye-table, corresponds to the *tithi* or *space* accomplished, while the equation is the addition to or deduction from the tithi, to be made in order to arrive at the *time* or *ending moment* of the tithi. Consequently, the equation in time was in every case added to or deducted from the mean anomaly, after the conversion of the anomaly in degrees into anomaly in days. The same procedure was adopted in regard to the sun's equation. This procedure is explained more fully in the next section.

SECTION iii.—Construction of sun's and moon's anomaly tables, i.e., of Eye-table, sections e to i.

187. The accompanying three tables show, in detail, the different processes employed in the computation of the sun's and moon's anomaly and equation tables in Eye-table, sections e to i.

188. Table I shows (1) how the 0 day of the sidereal-anomalistic year was arrived at for the Eye-table, sections h and i; (2) corrections to be applied at different epochs when using Eye-tables, sections h and i; (3) Śōdhya in degrees and in days at different epochs under Brahma siddhānta, Siddhānta Śiromaṇi and Sūrya siddhānta.

189. SPECIAL TABLE I.—The sun's anomaly at the moment of commencement of the mean solar year (columns 2, 8 and 14) was taken from Professor Jacobi's tables in *Ep. Ind.*, Vol. I, and the śōdhya in degrees entered in the columns next to the above were obtained by conversion from Dr. Schram's figures quoted in Mr. Sewell's *Indian Chronography*. By subtracting the śōdhya from the anomaly at 0 day, mean solar year, we obtain the sun's anomaly at the commencement of the true solar year, namely, at *Mēsha sankrānti*, which is entered in columns 4, 10 and 16 of Special Table I. The anomaly in degrees being converted into solar days at the rate of 1·0146 days for each degree (this ratio is the same for all siddhāntas), and the result being subtracted from the total number of days in the year, 365·26 days (for all siddhāntas), we have the 0 day of the sidereal-anomalistic year for the purpose of the Eye-table, sections h and i. In the Ārya siddhānta alone the sidereal year is absolutely identical with the anomalistic year and the 0 day is 81·29 days of the solar year always. In the other siddhāntas, the anomalistic year is slightly different from the sidereal year and this is shown by the variation

of the *śōdhya* from century to century. Nevertheless for the construction of anomaly tables the 0 day of a particular epoch has to be selected. It will be seen from Table I, columns 7, 13 and 19, that the 0 day shown in the Eye-table pertaining to the several *siddhāntas* is correct for the following respective epochs:—

Brahma siddhānta, K.Y. 3900 to 4000.

Siddhānta Śiromaṇi, *Circa* K.Y. 550.

Sūrya siddhānta, K.Y. 3600 to 3800.

190. The *Brahma siddhānta* could not have been brought into use much before the eighth century A.D., and the 0 day of the Eye-tables, sections **h** and **i** is correct for that century. The corrections to be applied for subsequent centuries, up to a maximum of—.04, may be neglected, since the sun's anomalistic equation undergoes hardly any change in the first three decimal places for .04 of a day. Similar observations apply to the *Sūrya siddhānta* anomaly tables which may be used for any epoch in the epigraphical period without correction.

191. It is hardly worth while to construct separate anomaly tables for the *Siddhānta Śiromaṇi* which was intended by its author *Bhāskarachārya* merely as a recension of the earlier *Brahma siddhānta*; but it will be seen from column 9 of Table I that the *śōdhya* changes rapidly from century to century, and the period for which the *Brahma siddhānta* Eye-tables, sections **h** and **i** would be quite correct for the *Siddhānta Śiromaṇi*, is somewhere between K.Y. 500 and K.Y. 1000, i.e., *Circa* 2600 B.C. During the epigraphical period in particular, and remembering that the *Siddhānta Śiromaṇi* could not have been in use earlier than the twelfth century A.D., when it was composed, a correction from 1 to 1.25 days has to be applied when using the *Brahma siddhānta*, Eye-table **h** and **i**, for the *Siddhānta Śiromaṇi*. Thus in calculating a *tithi* or a *yoga* by the *Siddhānta Śiromaṇi* in, say, the fourteenth century A.D. each of the sun's anomalies in days, entered in the Eye-table **h** and **i** should be read as if it was 1.18 days less. In other words, supposing the equation by the *Siddhānta Śiromaṇi* for a sun's anomaly of 90 days was required, we should take from the *Brahma siddhānta* Eye-table **h** or **i** as the case may be, the equation corresponding to a sun's anomaly of 90 minus 1.18 days, or 88.82 days. For practical purposes it is enough if one day is deducted from all the sun's anomalies in *Brahma siddhānta*, Eye-table **h** and **i** when applying the *Siddhānta Śiromaṇi*. It will be seen that in working the illustrative problem appended to the *Brahma siddhānta* Eye-table, we deduct .90 of a day from the sun's anomaly for a date in A.D. 484; the case is purely supposititious, however, since the *Siddhānta Śiromaṇi* did not come into use till some eight centuries later.

192. We may now consider *Special Table II* which shows the process of converting the sun's anomalies and equations in degrees into anomalies and equations in days of the solar year and fractions of a day. The entries in columns 1 to 4, 9, 19 and 34 are taken from Professor *Jacobi's* table in Vol. I of *Ep. Indica*, showing the sun's anomaly and equation in 24 stages by the different *siddhāntas*. In the transformation of these figures into Eye-table, sections **h** and **i**, the following stages may be noted:—

(1) Before the stages of the anomaly could be converted into days of the solar year, the first step, namely the determination of 0 day of the sidereal-anomalistic year, 80.23 days for *Brahma siddhānta* and *Siddhānta Śiromaṇi*, 80.55 days for the *Sūrya siddhānta* and 81.29 days for the first *Ārya siddhānta* (columns 5, 15 and 30 of Table II) was effected in the manner already explained under *Special Table I*. The subsequent stages of anomalies entered in columns 5 to 8, 15 to 18, and 30 to 33 were arrived at by adding successively the day equivalent of 3.75 degrees, the unit stage in Professor *Jacobi's* tables.

(2) The conversion of the equations in columns 9, 19 and 34 of *Special Table II*, which are in degrees, into days was effected at the rate of 29.53059 days for 360 degrees for *tithi* equations and 25.4202 days for 360 degrees for *yoga* equations.

(3) The sun's anomaly in days, already determined, was corrected by including or excluding the corresponding equations, as each case might require; this process requires some explanation and somewhat careful reflection on the part of the reader who makes acquaintance with it for the first time. Some of the observations below can be more easily understood with reference to the moon than

193. To construct an Indian Calendar of tithis and nakshatras, we have to pass at every step from *the mean phase of a moment* to the *moment of the actual phase*, and from *the anomaly at the mean ending moment of a tithi, or yoga*, to the *actual ending moment of the tithi or yoga*, and we have to accomplish this passage, in other words, to bridge the interval, by means of an equation. The “phase of a moment,” say, the phase accomplished by the moon at sunrise on a particular day, can be calculated, as is done by Professor Jacobi, by ascertaining, first the mean phase accomplished at that moment, and then the fraction of the phase resulting from the addition of the acceleration in degrees (let us call it A) or retardation in degrees (which we might call R), corresponding to the mean anomaly of that moment. For most purposes this is enough, because it will enable us to determine approximately the time in which the remainder of the phase will be accomplished, and all we want generally is to find out on what day between sunrise and sunrise a particular tithi or phase actually ended.

194. But we may also want to know when the tithi actually ended, which knowledge is necessary (1) when a tithi is likely to have ended about the moment of sunrise, and we want to know definitely whether it preceded or followed sunrise, for in either case the day of the tithi would have a different vara or week day, (2) when we want to know the limits of an adhika month or of a kshaya month. Every Indian panchāṅga, therefore, always gives the ending moment of a tithi in ghaṭikas and palas; i.e., in 4 decimal places of a day, and our aim is to devise a method which will give us this result.

195. We know the moment of every mean phase just as we know the mean phase of every moment; we know also for any moment, which we may call n the mean phase or the mean event of some other kind which must belong to it and also the acceleration in time ($-a$) or retardation in time ($+r$), belonging to the mean anomaly of that moment. For instance, we know that at a moment n the moon attains a mean elongation of 96° , in other words that n is the mean ending moment of the 8th tithi: we also know what the mean anomaly, which we may call M , of that moment is; lastly we know that the acceleration belonging to that moment is $+A$ in degrees or that the retardation belonging to that moment is $-R$ in degrees, so that the actual place of the moon at that moment n is, $96^\circ + A$, or $96^\circ - R$. But what we wish to know further for the purposes of Indian astronomy is the moment, let us call it x , when the moon's mean elongation plus the acceleration or retardation belonging to that moment will together exactly equal 96° .

196. The contents of the first ten columns of Special Tables II and III (pages 79, 81 below) which are all the material we have in Prof. Jacobi's and other existing tables will not enable us to solve this problem, and we shall have to attack it in a somewhat indirect manner, as shown in the remaining columns of Special Tables II and III. In doing so, we lay down, as our fundamental proposition, *that the mean anomaly in days of the moment of an actual phase* (which anomaly we may denote by m) $+ \text{the acceleration in fraction of a day, appropriate to that phase}$ (which we may call a) $= \text{mean anomaly in days of the moment of the mean phase}$. A little reflection will convince the reader that the same equation serves as a bridge (1) between the mean ending moment and the actual ending moment of a tithi and (2) between the mean anomaly at the mean ending moment and the mean anomaly at the actual ending moment of a tithi. We shall also use this identity. We proceed to arrange according to the above proposition and the above identity the mean anomalies noted in columns 5 to 8 of Special Table III and the accelerations noted in column 10 of the same table. The formula for retardations is exactly similar, namely, *the mean anomaly of the moment of an actual phase minus the retardation appropriate to that phase*, or $m - r = \text{mean anomaly of the moment of the mean phase (in days)}$.

When the mean anomaly of the moon at the moment of an actual phase or tithi is .287 day (column 5), this quantity *plus* the acceleration due to that anomaly, .0271 day (column 10), or .3141 day, is the mean anomaly at the moment of the corresponding mean phase or tithi. This means that when the mean anomaly at the mean ending moment of a tithi is .3141 day, the equation, i.e., the time difference between the ending moments of the mean and the actual tithi, is .0271 day. We proceed to tabulate other results in the same way with pairs of figures of which one is taken from column 10 and the other from columns 5 to 8.

(1)	For a mean anomaly, at mean tithi end, of	·287 day + ·0271 day or	314 day, the equation is —	·0271 day.
(2)	"	3 444 days + 2932 "	3 787 days	— 2932 "
(3)	"	6 889 " + 4139 "	7 303 "	— 4139 "
(4)	"	10 633 " + 2932 "	10 925 "	— 2932 "
(5)	"	13 400 " + ·0271 "	13 517 "	— ·0271 "
(6)	"	14 064 " — ·0271 "	14 037 "	+ ·0271 "
(7)	"	17 222 " — ·2932 "	16 929 "	+ 2932 "
(8)	"	24 110 " — ·2932 "	23 817 "	+ 2932 "

Cases (1) to (4) illustrate acceleration (**a**), while cases (5) to (8) illustrate retardation (**r**).

These results are made use of in columns 11 to 14 of Special Table III.

197. In the same manner columns 5 to 8 of Special Sun-Table II, page 79 below, for Brahma siddhānta and Siddhānta Śiromani, are corrected in columns 11 to 14 for tithi equations; columns 15 to 18 (Sūrya siddhānta) headed **m** are corrected in columns 22 to 25 for tithi equations, and become **m + a**, **m — r** and are corrected again in columns 26 to 29 for yoga equations and then become **m — r**, **m + a**; and lastly columns 30 to 33 (first Ārya siddhānta), headed **m** are corrected in columns 36 to 39 for tithi equation and become **m + a**, **m — r**. That is, the equations in column 10 are added to the uncorrected anomalies in columns 5 and 6 in order to form the corrected anomalies in columns 11 and 12; and the same equations in column 10 are subtracted from the uncorrected anomalies in columns 7 and 8 in order to form the corrected anomalies in columns 13 and 14 for tithi equations. Exactly the same processes of addition and subtraction account for the transformation of columns 15 to 18 into columns 22 to 25 (Sūrya siddhānta) and that of columns 30 to 33 into columns 36 to 39 (First Ārya siddhānta). The case for addition becomes one for subtraction, and *vice versa*, in the case of yogas; as an example of this is shown the transformation of the uncorrected anomalies in columns 15 to 18 into corrected anomalies for yoga equations by the sūrya siddhānta in columns 30 to 33.

The symbols **M**, **m**, **A**, **a**, **R**, **r**, in the senses above explained, are retained in the headings of Special Tables II and III on pages 79 to 81 below, in order that the reader may be enabled to follow easily the different steps of the process. It will be seen that the equations in degrees in column 9 of both tables and in other similar columns are called "A or R" and the equations, as decimals of a day, are called "— **a** or + **r**," because (1) the same quantities, when positive, are called **A** and **r** respectively, and when negative, they are called **R** and **a** respectively, that is, an acceleration in space is a decrease of time: while a retardation in space means an increase of time in *passing from the mean to the actual ending moment of a tithi or phase*: and (2) the combination **m + a** means that when an anomaly in days is **m + a**, the corresponding equation is — **a**; similarly, when the anomaly in days is **m — r**, the corresponding equation is + **r**.

From the 24 stages entering into various columns in Special Tables II and III and called "anomalies corrected for equations," are obtained; by interpolation, the different stages required for Eye-tables, sections **e** to **i**, pages 171 to 194 below. For example, in column 11 of Special Table II (page 79), the equation corresponding to a sun's anomaly of 123 20 days is — 1177 days and the equation corresponding to a sun's anomaly of 127 02 days is — 1262 day. From these anomalies and equations we derive by proportional parts,

(s)'s anomaly	Equation
123 35 day —	·118 day (1).
126 94 day —	·126 day (2).

Between (1) and (2) we proceed to interpolate, again by proportional parts, the anomalies corresponding to the following equations: — 119 — 120 — 121 — 122 — 123 — 124, and — 125 as in Brahma siddhānta, Eye-table **h** for tithis, page 193 infra; the same device is used in regard to moon's anomalies and equations—Special Table III, page 81 and Eye-table **e** to **g**, pages 171 to 192 below

198. The anomalies and equations of the moon for nakshatras, Eye-table, section **f**, are not shown in Special Table III, because they are dealt with in exactly the same manner, only with a different scale of conversion, as stated elsewhere, paragraph 46, page 14. Equations according to the second Ārya siddhānta are also shown in Special Table III in order to bring out the fact that they differ from equations according to the first Ārya siddhānta only in the fourth decimal place, and that, therefore, separate anomaly and equation tables for the second Ārya siddhānta are not necessary.

*I.—Table showing (1) how the 0 day of the sidereal-anomalistic year indicated in heavy type in columns 6, 12, 18, was arrived at for Eye-table, sections h and i;
 (2) corrections to be applied at different epochs when using Eye-tables h and i;
 (3) Sôdhyā in degrees at different epochs under Brahma siddhānta, Siddhānta Śirōmāni and Sūrya siddhānta.*

Year Kali- vuga.	BRAHMA SIDDHĀNTA										SIDDHĀNTA ŚIRŌMĀNI.										SŪRYA SIDDHĀNTA.									
	Sun's anomaly at moment of commence- ment of mean solar year.	Sôdhyā in degrees.	Sun's anomaly at commencement of true solar year.	Day of Indian solar year corre- sponding to the 0 day of anoma- listic year	Correc- tion to be applied when using Eye- table. sections h and i	Sun's anomaly at moment of commence- ment of mean solar year.	Sôdhyā in degrees.	Sun's anomaly at commencement of true solar year	Day of Indian solar year corre- sponding to the 0 day of anoma- listic year	Correc- tion to be applied when using Eye- table, sections h and i.	DEGREES.	DAYS.	DEGREES.	DAYS.	DEGREES.	DAYS.	DEGREES.	DAYS.	DEGREES.	DAYS.	DEGREES.	DAYS.	DEGREES.	DAYS.	DEGREES.	DAYS.	DEGREES.	DAYS.	DEGREES.	DAYS.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0	282-2400	2-14069	280-08031	284-1833	81-07	+16	282-2400	2-14069	280-08031	284-1833	81-07	+16	282-2400	2-14069	280-08031	284-1833	81-07	+16	282-2400	2-14069	280-08031	284-1833	81-07	+16	282-2400	2-14069	280-08031	284-1833	81-07	+16
500	282-2030	2-14095	280-0591	284-1450	81-11	+12	282-2030	2-14095	280-0591	284-1450	81-11	+12	282-2030	2-14095	280-0591	284-1450	81-11	+12	282-2030	2-14095	280-0591	284-1450	81-11	+12	282-2030	2-14095	280-0591	284-1450	81-11	+12
1000	282-1600	2-14120	280-0188	284-1071	81-14	+09	282-1600	2-14120	280-0188	284-1071	81-14	+09	282-1600	2-14120	280-0188	284-1071	81-14	+09	282-1600	2-14120	280-0188	284-1071	81-14	+09	282-1600	2-14120	280-0188	284-1071	81-14	+09
3000	282-1200	2-14145	279-9786	284-0663	81-19	+05	282-1200	2-14145	279-9786	284-0663	81-19	+05	282-1200	2-14145	279-9786	284-0663	81-19	+05	282-1200	2-14145	279-9786	284-0663	81-19	+05	282-1200	2-14145	279-9786	284-0663	81-19	+05
3100	282-1180	2-14148	279-9745	284-0621	81-19	+04	282-1180	2-14148	279-9745	284-0621	81-19	+04	282-1180	2-14148	279-9745	284-0621	81-19	+04	282-1180	2-14148	279-9745	284-0621	81-19	+04	282-1180	2-14148	279-9745	284-0621	81-19	+04
3200	282-1120	2-14150	279-9705	284-0581	81-19	+04	282-1120	2-14150	279-9705	284-0581	81-19	+04	282-1120	2-14150	279-9705	284-0581	81-19	+04	282-1120	2-14150	279-9705	284-0581	81-19	+04	282-1120	2-14150	279-9705	284-0581	81-19	+04
3300	282-1080	2-14152	279-9665	284-0540	81-20	+03	282-1080	2-14152	279-9665	284-0540	81-20	+03	282-1080	2-14152	279-9665	284-0540	81-20	+03	282-1080	2-14152	279-9665	284-0540	81-20	+03	282-1080	2-14152	279-9665	284-0540	81-20	+03
3400	282-1040	2-14155	279-9625	284-0500	81-21	+02	282-1040	2-14155	279-9625	284-0500	81-21	+02	282-1040	2-14155	279-9625	284-0500	81-21	+02	282-1040	2-14155	279-9625	284-0500	81-21	+02	282-1040	2-14155	279-9625	284-0500	81-21	+02
3500	282-1000	2-14157	279-9584	284-0458	81-21	+02	282-1000	2-14157	279-9584	284-0458	81-21	+02	282-1000	2-14157	279-9584	284-0458	81-21	+02	282-1000	2-14157	279-9584	284-0458	81-21	+02	282-1000	2-14157	279-9584	284-0458	81-21	+02
3600	282-0960	2-14160	279-9544	284-0417	81-22	+01	282-0960	2-14160	279-9544	284-0417	81-22	+01	282-0960	2-14160	279-9544	284-0417	81-22	+01	282-0960	2-14160	279-9544	284-0417	81-22	+01	282-0960	2-14160	279-9544	284-0417	81-22	+01
3700	282-0920	2-14162	279-9504	284-0377	81-22	+01	282-0920	2-14162	279-9504	284-0377	81-22	+01	282-0920	2-14162	279-9504	284-0377	81-22	+01	282-0920	2-14162	279-9504	284-0377	81-22	+01	282-0920	2-14162	279-9504	284-0377	81-22	+01
3800	282-0880	2-14165	279-9464	284-0336	81-22	+01	282-0880	2-14165	279-9464	284-0336	81-22	+01	282-0880	2-14165	279-9464	284-0336	81-22	+01	282-0880	2-14165	279-9464	284-0336	81-22	+01	282-0880	2-14165	279-9464	284-0336	81-22	+01
3900	282-0840	2-14167	279-9423	284-0295	81-23	+00	282-0840	2-14167	279-9423	284-0295	81-23	+00	282-0840	2-14167	279-9423	284-0295	81-23	+00	282-0840	2-14167	279-9423	284-0295	81-23	+00	282-0840	2-14167	279-9423	284-0295	81-23	+00
4000	282-0800	2-14170	279-9383	284-0254	81-23	+00	282-0800	2-14170	279-9383	284-0254	81-23	+00	282-0800	2-14170	279-9383	284-0254	81-23	+00	282-0800	2-14170	279-9383	284-0254	81-23	+00	282-0800	2-14170	279-9383	284-0254	81-23	+00
4100	282-0760	2-14172	279-9343	284-0213	81-24	-01	282-0760	2-14172	279-9343	284-0213	81-24	-01	282-0760	2-14172	279-9343	284-0213	81-24	-01	282-0760	2-14172	279-9343	284-0213	81-24	-01	282-0760	2-14172	279-9343	284-0213	81-24	-01
4200	282-0720	2-14175	279-9303	284-0173	81-24	-01	282-0720	2-14175	279-9303	284-0173	81-24	-01	282-0720	2-14175	279-9303	284-0173	81-24	-01	282-0720	2-14175	279-9303	284-0173	81-24	-01	282-0720	2-14175	279-9303	284-0173	81-24	-01
4300	282-0680	2-14177	279-9262	284-0132	81-24	-01	282-0680	2-14177	279-9262	284-0132	81-24	-01	282-0680	2-14177	279-9262	284-0132	81-24	-01	282-0680	2-14177	279-9262	284-0132	81-24	-01	282-0680	2-14177	279-9262	284-0132	81-24	-01
4400	282-0640	2-14180	279-9222	284-0093	81-25	-02	282-0640	2-14180	279-9222	284-0093	81-25	-02	282-0640	2-14180	279-9222	284-0093	81-25	-02	282-0640	2-14180	279-9222	284-0093	81-25	-02	282-0640	2-14180	279-9222	284-0093	81-25	-02
4500	282-0600	2-14182	279-9182	284-0051	81-25	-02	282-0600	2-14182	279-9182	284-0051	81-25	-02	282-0600	2-14182	279-9182	284-0051	81-25	-02	282-0600	2-14182	279-9182	284-0051	81-25	-02	282-0600	2-14182	279-9182	284-0051	81-25	-02
4600	282-0560	2-14185	279-9142	284-0010	81-25	-02	282-0560	2-14185	279-9142	284-0010	81-25	-02	282-0560	2-14185	279-9142	284-0010	81-25	-02	282-0560	2-14185	279-9142	284-0010	81-25	-02	282-0560	2-14185	279-9142	284-0010	81-25	-02
4700	282-0520	2-14187	279-9101	283-9969	81-26	-03	282-0520	2-14187	279-9101	283-9969	81-26	-03	282-0520	2-14187	279-9101	283-9969	81-26	-03	282-0520	2-14187	279-9101	283-9969	81-26	-03	282-0520	2-14187	279-9101	283-9969	81-26	-03
4800	282-0480	2-14190	279-9061	283-9928	81-26	-03	282-0480	2-14190	279-9061	283-9928	81-26	-03	282-0480	2-14190	279-9061	283-9928	81-26	-03	282-0480	2-14190	279-9061	283-9928	81-26	-03	282-0480	2-14190	279-9061	283-9928	81-26	-03
4900	282-0440	2-14193	279-9021	283-9888	81-27	-04	282-0440	2-14193	279-9021	283-9888	81-27	-04	282-0440	2-14193	279-9021	283-9888	81-27	-04	282-0440	2-14193	279-9021	283-9888	81-27	-04	282-0440	2-14193	279-9021	283-9888	81-27	-04
5000	282-0400	2-14195	279-8981	283-9847	81-27	-04	282-0400	2-14195	279-8981	283-9847	81-27	-04	282-0400	2-14195	279-8981	283-9847	81-27	-04	282-0400	2-14195	279-8981	283-9847	81-27	-04	282-0400	2-14195	279-8981	283-9847	81-27	-04

II.—Sun-table, showing process of converting anomalies and equations in degrees into anomalies and equations in days of the solar year for the purposes of the Eye-table, sections **h** and **i**. For explanation **a** of the symbols **m**, **M**, **a**, **A**, **r**, **R**, see paragraphs 193, 196 of the Text.

[illegible]

III.—Moon-table showing method of converting anomalies *asol* equations in degrees into anomalies and equations in days and fractions of a day for the purposes of the Eye-table, sections *o* to *g*. For explanation of the symbols *m*, *M*, *a*, *A*, *r*, *R*, *s*-e paragraphs 193, 196 of the text.

SŪRYA SIDDHĀNTA TITHIS.												SŪRYA SIDDHĀNTA YOGAS												Equations according to Brahma-siddhānta and Sūryasiddhānta.				Equations according to first Ārya-siddhānta.				Equations according to second Ārya-siddhānta.															
Moon's anomaly in days uncorrected for equation.												Moon's anomaly in days corrected for tithi equation												Moon's anomaly in days corrected for yoga equation												For Tithis.				For Tithis.				For Tithis.			
Equation in degrees as $\frac{a}{b}$ or $\frac{r}{s}$												Equation in days $m - r$												Equation in days $m - r$												Equation in days $m - r$				Equation in days $m - r$				Equation in days $m - r$			
Equation in degrees as $\frac{a}{b}$ or $\frac{r}{s}$												Equation in days $m - r$												Equation in days $m - r$												Equation in days $m - r$				Equation in days $m - r$				Equation in days $m - r$			
Equation in degrees as $\frac{a}{b}$ or $\frac{r}{s}$												Equation in days $m - r$												Equation in days $m - r$												Equation in days $m - r$				Equation in days $m - r$				Equation in days $m - r$			
Equation in degrees as $\frac{a}{b}$ or $\frac{r}{s}$												Equation in days $m - r$												Equation in days $m - r$												Equation in days $m - r$				Equation in days $m - r$				Equation in days $m - r$			
Equation in degrees as $\frac{a}{b}$ or $\frac{r}{s}$												Equation in days $m - r$												Equation in days $m - r$												Equation in days $m - r$				Equation in days $m - r$				Equation in days $m - r$			
Equation in degrees as $\frac{a}{b}$ or $\frac{r}{s}$												Equation in days $m - r$												Equation in days $m - r$												Equation in days $m - r$				Equation in days $m - r$				Equation in days $m - r$			
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SECTION IV.—*Computation of number of days comprised in each solar month.*

199. The days in each solar month are obtained from the number of days in the solar year up to the moment of each sankrānti entered in section a of the Eye-table. The manner in which these days are fixed is by no means simple ; but it can be understood with some little trouble by reference to special Sun-table I which was explained above. It will be seen from that table that the sun's anomaly at the moment of commencement of the mean solar year K.Y. 4200 was by Sūrya siddhānta $282^{\circ}73'14''$, and that the sun's anomaly for the corresponding day in K.Y. 4300 was $282^{\circ}72'82''$. The difference is $0032''$ for a hundred years or $0022''$ for two-thirds of a century. Consequently at the commencement of mean solar year K.Y. 4267, the sun's mean anomaly was $282^{\circ}73'241''$. The equation for this anomaly, or śodhya in degrees is, according to special Table I and all the authorities, $2^{\circ}13'85''$; but Mr. Dikshit, for some unaccountable reason, as admitted by his joint-author, Mr. Sewell, at page 15 of his *Indian Chronography*, adopted $2^{\circ}13'943644''$ as the śodhya by Sūrya siddhānta for K.Y. 4238. The figure adopted by Mr. Dikshit will not become true for Sūrya siddhānta till somewhere about 10,000 K.Y. or A.D. 7000. Mr Dikshit must have had some reason for this extraordinary assumption, but it may be presumed, in the case of such a well-known system as the Sūrya siddhānta, which had been in use for hundreds of years, that there was a general consensus or tradition among Indian astronomers as to the number of days comprised in each solar month, and that Mr. Dikshit adjusted his figures in some way to suit the general tradition. In any case, it would be very unsafe to attempt to recalculate the lengths of the solar months so as to suit the correct śodhya for K.Y. 4238, and to run counter to what must be presumed to be the traditional lengths of the solar months under the Sūrya siddhānta ; and the object of the present work is to expound in plain language results acted on by Indian astronomers and calendar-makers during the epigraphical period, not to correct those results on account of any error, real or presumed.

200. It being given, then, that the mean anomaly of the sun at 0 day mean solar year in K.Y. 4267 was $282^{\circ}73'241''$ and that the equation for this anomaly or śodhya in degrees was $2^{\circ}13'944''$, therefore, the mean anomaly of the sun at 0 day true solar year was $282^{\circ}73'241'' - 2^{\circ}13'944'' = 280^{\circ}59'297''$. From this we have the following successive stages of anomaly and equation, which enable us to calculate the moment of entry of the sun into each sankrānti by Sūrya siddhānta. It will be seen that all the stages of the anomaly and all the equations given below are extracted from Professor Jacobi's tables reproduced in columns 1 to 4 and 19 of special Sun-table II, pages 79 and 80 supra.

Sun's anomaly.	Mean longitude of sun in degree.	Equation in degrees.	True longitude of sun.
280.59297	— 2 13944	+ 2 13944	
{ 307 50000	+ 24.76759	+ 1.73472	285.50231
{ 311 25000	+ 28.51759	+ 1 64555	30.16814
341 25000	+ 58.51759	+ .71055	59 22814
345 00000	02.26759	+ 57333	62.84092
11 25000	88.51759	— .43278	88.08481
15 00000	92.26759	— .57333	91.69126
41 25000	118.51759	— 1 44639	117 07120
45.00000	122.26759	— 1.54917	120 71842
71.25000	148.51759	— 2.06278	146.45481
75 00000	152.26759	— 2.16305	150.16454
101.25000	178.51759	— 2.18444	176 88315
105.00000	182.26759	— 2.10805	180.16454
131.25000	208.51759	— 1.64555	206.87204
135.00000	212.26759	— 1.54917	210.71842
161.25000	238.51759	— .71055	237 80704
165 00000	242.26759	— 57333	241.69426
191.25000	268.51759	+ .43278	268.95087
195.00000	272.26759	+ .57333	272.84092
221.25000	298.51759	+ 1.44639	299.96898
225.00000	302.26759	+ 1.54917	308.81676
247.50000	324.76759	+ 2 01889	326.78148
251 25000	328.51759	+ 2.06278	330 58087

201. Our object being to discover the moment of the Indian solar year when the sun enters each sankrānti, i.e., when his true longitude is 30° , 60° , 90° , etc., up to 360° , we shall first endeavour to find out when exactly he reaches 30° true longitude. We see from the first two lines of the above table that when the sun reaches 26.50231° true longitude his mean longitude is $26.50231^\circ - 1.73472^\circ$, and when his true longitude is 30.16314° , his mean longitude is 30.16314° less 1.64555° . As these figures are taken from two successive stages of the sun's anomaly according to column 4 of Sun-table II (page 79 supra), his equation at any point between the two stages is assumed to be in proportion to the difference between the equation of the first and the equation of the second stage. In other words, when the sun reaches 30° true longitude, his mean longitude will be

$$\begin{aligned} &= 30^\circ - (1.64555 + .16314 \times \frac{.08917}{3.66083}) \\ &= 30^\circ - (1.64555 + .16314 \times .024358) \\ &= 30^\circ - (1.64555 + .00397376412) \\ &= 30^\circ - 1.64953^\circ \\ &= 28.35047^\circ \end{aligned}$$

This then, viz., 28.35047° is the sun's mean longitude when his true longitude is 30° . In order to know the number of days of the solar year that must have elapsed when the sun reaches 28.35047° mean longitude we must find his distance at this moment from the point when he commences the true Indian solar year. We know that the distance from the latter point to 0° mean longitude is the *sodhya* in degrees, i.e., 2.13944° . Therefore the sun's mean longitude reckoned from the commencement of the Indian solar year to mean longitude 28.35047° = $28.35047^\circ + 2.13944^\circ = 30.48991^\circ$.

(1) Now the sun takes $\frac{360 \times 258756481}{360}$ or 1.014607 days to travel one degree of mean longitude.

∴ For 30.48991° of mean longitude he takes $30.48991^\circ \times 1.014607 = 30.93527611537$ days. This is the number of days constituting Mēsha month (Tamil *Chittirai*) according to Sūrya siddhānta.

Dikshit's corresponding figure is 30.93527 days, which is identical with the result reached by the present method.

For the remaining sankrāntis we may omit the explanation which is the same as the above and simply give the working.

(2) When the sun reaches 60° true longitude, his mean longitude is

$$\begin{aligned} &60^\circ - (.57333 + 2.84092 \times \frac{.13722}{3.61278}) \\ &= 60^\circ - (.57333 + 2.84092 \times .0379868) = 60^\circ - (.57333 + .1079032) \\ &= 60^\circ - .68124^\circ = 59.31876^\circ. \end{aligned}$$

$$\text{Now } (59.31876^\circ + 2.13944^\circ) \times 1.014607 = 62.35594021954 \text{ days}$$

$$\text{Dikshit's result} = 62.3555 \text{ days}$$

Difference .0004 day

(3) When the sun reaches 90° true longitude, his mean longitude is

$$\begin{aligned} &90^\circ + (.57333 - 1.69426 \times \frac{.14055}{3.60945}) = 90^\circ - (.57333 - 1.69426 \times .038925) \\ &= 90^\circ + (.57333 - .06595) = 90^\circ + .50738^\circ = 90.50738^\circ. \end{aligned}$$

$$\text{Now } (90.50738^\circ + 2.13944^\circ) \times 1.01407 = 94.00011209974 \text{ days.}$$

$$\text{Dikshit's result} = 94.00028 \text{ days.}$$

Difference .00017 day.

(4) When the sun reaches 120° true longitude, his mean longitude is

$$\begin{aligned} &120^\circ + (1.54917 - 0.71842 \times \frac{.10282}{3.64722}) = 120^\circ + (1.54917 - .71842 \\ &\quad \times .02819^\circ) \\ &= 120^\circ + (1.54917 - .02015) = 120^\circ + 1.52892^\circ = 121.52892^\circ. \end{aligned}$$

$$\text{Now } (121.52892^\circ + 2.13944^\circ) \times 1.01461 = 125.475154 \text{ days.}$$

$$\text{Dikshit's result} = 125.4755 \text{ days.}$$

Difference .0004 day.

(5) When the sun reaches 150° true longitude, his mean longitude is

$$\begin{aligned} &150^\circ + (2.10305 - .16454 \times \frac{.04.27}{.26955}) = 150^\circ + (2.10305 - .16454 \\ &\quad \times .010855) \\ &= 150^\circ + (2.10305 - .001786) = 150^\circ + 2.10127 = 152.10127^\circ. \end{aligned}$$

$$\text{Now } (152.10127^\circ + 2.13944^\circ) \times 1.01461 = 156.494167 \text{ days.}$$

$$\text{Dikshit's result} = 156.49417 \text{ days.}$$

- (6) When the sun reaches 180° true longitude, his mean longitude is

$$180^\circ + (2.10305^\circ + .16454 \times \frac{.03189}{3.78139}) = 180^\circ + (2.10305^\circ + .16454 \times .0083^\circ) \\ = 180^\circ + (2.10305^\circ + .001366^\circ) = 182.10442^\circ. \\ \text{Now } (182.10442 + 2.13944) \times 1.01461 = 186.935663 \text{ days.} \\ \text{Dikshit's result} = 186.93555 \text{ days.}$$

- (7) When the sun's true longitude is 210° , his mean longitude is

$$210^\circ + (1.54917 + .71842 \times \frac{.0963}{3.84636}) = 210^\circ + (1.54917^\circ + .71842 \times .09638 \times .26) \\ = 210^\circ + 1.54917^\circ + .06924 \times .26^\circ = 210^\circ + 1.54917^\circ + .018024^\circ \\ = 211.56719^\circ. \\ \text{Now } (211.56719 + 2.13944) \times 1.01461 \text{ days} = 216.8288838643 \text{ days.} \\ \text{Dikshit's result} = 216.82888 \text{ days.}$$

- (8) When the sun's true longitude is 240° , his mean longitude is

$$240^\circ + (.57333 + 1.69426 + 13722 \times \frac{1}{3.88722}) \\ = 240^\circ + .57333 + 1.69426 + .035295 = 240^\circ + .57333^\circ + .05980^\circ \\ = 240.63313^\circ. \\ \text{Now } (240.63313 + 2.13944) \times 1.01461 \text{ days} = 246.319477 \text{ days.} \\ \text{Dikshit's result} = 246.31916 \text{ days.}$$

- (9) When the sun's true longitude is 270° , his mean longitude is

$$270^\circ - (.57333 - 2.84092 \times \frac{.14055}{3.85055}) = 270^\circ - (.57333 - 2.84092 \times .03613) \\ = 270^\circ - (.57333 - .10263)^\circ = 270^\circ - .47070^\circ = 269.5293^\circ. \\ \text{Now } (269.52930 + 2.13944) \times 1.014607 \text{ days} = 275.637005 \text{ days.} \\ \text{Dikshit's result} = 275.63694 \text{ days.}$$

- (10) When the sun's true longitude is 300° , his mean longitude is

$$300^\circ - (1.54917 - 3.381676 \times \frac{.10282}{3.85278}) \\ = 300^\circ - (1.54917 - 3.81676 \times .02668) = 300^\circ - (1.54917 - .101831)^\circ \\ = 298.55266^\circ. \\ \text{Now } (298.55266 + 2.13944) \times 1.014607 \text{ days} = 305.084309 \text{ days.} \\ \text{Dikshit's result} = 305.08499 \text{ days.}$$

- (11) When the sun's true longitude is 330° , his mean longitude is

$$330^\circ - (2.06278 - .58037 \times \frac{.04889}{3.79889}) \\ = 330^\circ - (2.06278 - .58037 \times .01287) \\ = 330^\circ - (2.06278 - .00747) = 330^\circ - 2.05531 = 327.94469^\circ. \\ \text{Now } (327.94469 + 2.13944) \times 1.014607 \text{ days} = 334.90566888 \text{ days.} \\ \text{Dikshit's result} = 334.90555 \text{ days.}$$

- (12) We know that when the sun's true longitude is 360° , he has completed 365.258756 days of the Indian solar year.

202. *Duration of solar months by Siddhānta Śiromani and Brahma siddhānta.*—

The above calculations for Sūrya siddhānta will have shown that the method there followed is correct for the purpose of ascertaining the duration of solar months by Sūrya siddhānta for the epoch K.Y. 4267. So far as the writer is aware, there is no recognized list showing the duration of solar months by the Siddhānta Śiromani either in Mr. Dikshit's *History of Indian Astronomy* or anywhere else. The writer, therefore, used for the Siddhānta Śiromani the method already tried by him successfully for the Sūrya siddhānta, taking of course the equations from column 9 of special Sun-table II (page 79 *supra*) and fixing the duration of solar months by Siddhānta Śiromani for the epoch K.Y. 4280 which was selected by the writer: and he arrived at the following results, with which may be compared the results recently published by Mr. Sewell in *Epigraphia Indica* for the epoch K.Y. 4500. It will be seen that the results approximate as closely as may be expected with investigations carried on by two different writers working independently on a subject of acknowledged difficulty and not altogether free from doubt.

Siddhānta Śirōmani.

Day of Indian solar year when sun enters.	By the author's method.	By Mr R Sewell's method.	Mr. Sewell's variations for K.Y. 4200	Actual variation of column 2 as compared with column 3.
(1)	(2)	(3)	(4)	(5)
	DAY.	DAY.	FRACTION OF DAY	FRACTION OF DAY.
Mesha sankrānti	0 000	0 000		
Rishabha sankrānti	30 9109	30 9106	+ 00039	+ 0003
Mithuna sankrānti	62 3111	62 3092	+ 0019	+ 0019
Karkataka sankrānti	93 9312	93 9294	+ 0017	+ 0014
Simha sankrānti	125 4213	125 4205	+ 00027	+ 0006
Kanya sankrānti	156 4805	156 48109	- 00072	- 0006
Tula sankrānti	186 9562	186 95819	- 0014	- 0020
Vrischika sankrānti	216 8699	216 87306	- 0034	- 0032
Dhanus sankrānti	246 3774	246 38164	- 0029	- 0042
Makara sankrānti	275 7160	275 7201	0033	- 0041
Kumbha sankrānti	305 1533	305 15744	- 00105	- 0041
Mina sankrānti	334 9385	334 9424	- 00014	- 0039

N.B. The same method was used to determine the lengths of the solar months according to *Brahma siddhānta* which are entered in section a of the *Brahma siddhānta* Eye-table.

SECTION V. —Construction of Sunrise table III.

203. The moment of sunrise for any latitude and longitude in India can be ascertained by means of Table III based on the rules and table of *asus* given by Professor Jacobi in Volume I of the *Epigraphia Indica*. Professor Jacobi has himself given detailed tables for sunrise in Volume II of the same publication, but the results achieved by means of those tables can, it is believed, be more easily reached by the present Table III. For the purpose of determining the equation of time for each day of the solar year, the sun's equation of the centre, according to Eye-table h was used, with the sign changed: likewise the *asus* given in Professor Jacobi's table and reproduced in paragraph 125, page 44 supra, had to be suitably modified.

Thus (according to Professor Jacobi's table) in the 10th degree of northern latitude 30 degrees of sign 1 of the zodiac take 1544 *asus* or 1544×4 seconds of time to rise; or in lunation-longitude,

$\left(\frac{30}{360}\right) \times 29.53059$, or 2.46088 units of space take 1544×4 seconds of time to rise;

$\therefore$ 1 unit of space takes $\frac{1544 \times 4}{2.46088} = 1544 \times 1.62 = 2,510$ seconds.

This 2,510 then, is the factor by which each day's equation of the centre according to Eye-table h should be multiplied (so long as the sun is in the first sign) in order to give that day's equation of time.

And generally, all the *asus* in Professor Jacobi's table were multiplied by $\frac{4}{2.46088} = 1.62$, and the factors thus obtained were multiplied again by each day's equation according to Eye-table h in the present work: the result was each day's equation of time in seconds as entered in Table III of this work. The same result could of course have been arrived at directly from Table IVC "Sun's equation in degrees for each day of solar year."

204. In the present Table III, the moment of sunrise for any day of any solar year is obtained by simply adding a figure in the column "Tropical longitude" to the figure opposite the given day of the solar year in the column "Equation of time"; and the result is the correction, in seconds of time, to be applied to mean sunrise at Lanka (6 a.m.) to determine the local sunrise for the given latitude.

SECTION VI.—Determination of test tithi by different siddhāntas.

Example.—*Āshāḍha śukla* 12, *Kaliyuga* 3585 (expired), A.D. 484.

205. A single test problem, the same as that worked out by Mr. Dikshit in the Introduction to Dr. FLEET's *Gupta Inscriptions* as well as by Professor Jacobi in

Volume I of *Epigraphia Indica*, will suffice to demonstrate the absolute reliability and extreme simplicity of the above processes as carried out in the present work. The problem is to determine the ending moment of *Āshādha sukla dvādasi* in *Kaliyuga* 3585 (expired), A.D. 484. The ending moment has to be determined (a) for Lanka and (b) for the latitude and longitude of Eran (Lat. 24°, Long. 78° 15'). Lastly, the problem has to be worked out, first according to the *Sūrya siddhānta*, and then according to the *first Ārya siddhānta*, and then according to *Siddhānta Siromaṇi* and *Brahma siddhānta*.

Sūrya siddhānta.

References to tables.	Days of solar year	Moon's mean anomaly in days.
(Table II): Kaliyuga 3585, A.D. 484, * March 18-2212		
First new moon in solar year	24-3900	4 494
Eye-table y Āshādha sukla 12	70-8734	15-764
	95-2634	20 258
Eye-table h: ☉'s Eqn. for 95-26 days of solar year = ...	- 0454	(☉'s Eqn.)—0454
Eye-table e: ☾'s Eqn. for anomaly of 20 212 days = ...	+ 4138	20-212
	+ 3684 + 3684	
* English month, day, and fraction of day marking commencement of solar year	95-6318	
	* March 18-2212	
	113-8540	

Our result is : the tithi ended at .8530 of a day, i.e., (by Table VI) at 51 ghaṭikas 11 palas on the 113th day of the English calendar, counting from 1st March.

206. The reader will be pleased to note that this absolutely correct result for the ending moment of a tithi is obtained by *simply adding* up six or seven figures from Table II and the Eye-table and that absolutely no other process is required for any tithi in any year.

Now, by Eye-table section q, the 113th day of the English calendar, counting from 1st March, is 21st June ;

by Table VI, .8530 of a day = 51 ghaṭikas 11 palas ;
by Eye-table j we arrive at the week-day as follows :—

co-efficient of A.D 400	2
co-efficient of odd year 84	0
co-efficient of June	3
day of the month	21
	26

Since 26, divided by 7, leaves remainder 5 = THURSDAY, the final answer is THURSDAY, 21ST JUNE, A.D. 484, 51 GHATIKAS 11 PALAS after mean sunrise at Lanka.

Note—This is the absolutely correct ending moment, according to Mr. Dikshit ; but Professor Jacobi arrives at a result which is 4 palas short. To arrive at the latter result, ☉'s + ☉'s Eqn. must be added to ☉'s Anom. before ascertaining ☉'s Eqn., just as ☉'s Eqn. is in the actual working supra, added to ☾'s anom. before ascertaining ☾'s Eqn. This extra step, however, is a nicety seldom required in practice, since the error on this account can never exceed 6 palas.

207. To determine the ending moment of the above tithi in true local time at Eran.—We first of all (v. pp. 40, 41 supra) find the sun's sidereal longitude for 95-85 days, for which purpose we deduct the *śodhya*, 2-17 days. Remainder, 94 days nearly.

We turn to Table III and bring down the entry under latitude 24° corresponding to the 94th day of the solar year, for ☉'s trop* long. and the entry corresponding to the 95th day for the equation of time.

* *Note*.—In the solar year, K.Y. 3585 we make no correction for the difference between ☉'s sidereal and tropical longitude because in K.Y. 3600, i.e., only 15 years later, the ☉'s sidera coincided with the ☉'s tropical longitude.

(1) Equation of time (95th day) : + 148 seconds of time.

(2) ☉'s tropical longitude (94th day) : + 2,647 seconds of time.

(3) To these figures from Table III we add the time difference for the longitude of Eran (+2°53 degrees Ujjain longitude), namely, + 2°53 × 240 or + 608 seconds of time. Total : + 148 + 2647 + 608 = + 3,403 seconds of time.

Now 3,403 seconds of time, divided by 60, are 56 minutes 43 seconds or ·0393 of a day. Adding this to the mean Lanka time already arrived at, viz., ·8529, we obtain, as TRUE LOCAL TIME at ERAN for Āshādha śukla 12, Kaliyuga 3585, ·8922 of a day or 53 GHATIKAS 32 PALAS which is exactly the same as Mr. Dikshit's result at page 157 of DR. J. F. FLEET'S *Gupta Inscriptions*.

208. According to first Ārya siddhānta—same tithi calculated by other siddhāntas.—Mr. Dikshit (*loc. cit.*) worked out the ending moment of the same tithi by the Brahma siddhānta, the Siddhānta Śiromani, and the first Ārya siddhānta. It will be shown, in the illustrative examples appended to the Brahma siddhānta Eye-table that the results for the above tithi according to the present writer's method agree identically with Mr. Dikshit's results for Siddhānta Śiromani as well as for Brahma siddhānta. It remains to test the accuracy of the present method by the first Ārya siddhānta.

	Commencement of Ind. Solar Year	Sun's anomaly.	Moon's anomaly
A.D. 400 ...	March 17·49305	23·82154	21·4181 Equation.
84 years ...	72917	0·55681	13·4954
		24·37835	24·3783
			59·2918
			55·1092 (2 anomalistic months).
			4·1826
Eye-table y Āshādha Su. 12 ...		70·8734	15·784
	March 18·2222	95·6517	19·946
Sun's Eqn. for 95·62 days ...		—·0429	
			19·903 Eqn. + ·4111
Sun's Eqn. for 95·62 days + 41 (☉'s Eqn.) ..			☉'s Eqn — ·0441
			+ ·3670
Sum of ☉'s + ☽'s Eqn. ...	+ ·3670	+ ·3670	
	March 18·2222		
	March 113·8409		

The tithi ended according to the present method at ·8409 of the day, i.e., at 50 ghatikas 27 palas after mean sunrise whereas Mr. Dikshit's result for the same siddhānta is 49 ghatikas 48 palas, a difference of 39 palas. This difference, though ordinarily negligible, is somewhat surprising when it is considered that by three other siddhāntas the present writer has reached results identical with Dikshit's and if only for this reason, it requires explanation.

209. The explanation is to be found in Professor Jacobi's statement at page 450 of *Epigraphia Indica*, Vol. I, that the distance of sun from moon is the same in Ārya as in Sūrya siddhānta up to K.Y. 3600. The distance of sun from moon is the same as the mean ending moments of tithis. The reason for this assumption may be conjectured to be this, that the Indian astronomers of the sixth century A.D. were content to rely on the *Sūrya siddhānta* for retrospective mean calculations, there being no object in making them separately by the Ārya siddhānta. If we make this assumption, we have to go back to the figures already worked out by the Sūrya siddhānta and adopt 95·2634 as the interval from the beginning of the solar year to the end of Āshādha śu. 12. From this we must deduct the difference between the Ārya and Sūrya siddhānta śodhyas (2·1707 minus 2·1468 =) ·0239 day, because the Sūrya siddhānta true solar year begins ·0239 day earlier than

the Ārya siddhānta true solar year and, therefore, the interval from the commencement of the Ārya siddhānta year to the mean ending moment of any tithi must, *ceteris paribus*, be less by .0239 day.

Then our figures by Ārya siddhānta will be—

Commencement of Ind. solar year A.D. 484 March 18.2222.

Add, for interval up to Āshāḍha 4 12, 95.2634 days less

.0239 day = 95.2395.

Sun's Eqn. by Ārya siddhānta for 95 24 days = —.0418.

Moon's Eqn. will have to be modified by adopting Sūrya siddhānta figures so far as tithi ending moments are concerned.

Moon's anomaly for the ending moment of tithi will therefore be—

21.4181 (Ārya siddhānta, fig. on page 87).—C's An. at commencement of the Indian solar year.

13.4954 (Ārya siddhānta, fig. on page 87).—Eye-table p, addition for 84 years.

24.3661 (*i.e.*, 24.3900, Sūrya siddhānta, figure on page 86 for interval between commencement of Indian solar year and first new moon in solar year less *sodhya* difference, .0239.)

15.764 (Eye-table y, addition to C's anomaly for Āshāḍha, sukla 12.

— 75.043

55.109 (two anom. months).

19.934

— .0418 (C's eqn.)

19.892 days.

C's Eqn. for this anomaly is + .4110.

Sum of C's and C's Eqns. + .4110 — .0418 + .3682

March 113.8299

The ending moment of the tithi is now .8299 which is 49 ghatikas 48 palas and is identical with Mr. Dikshit's result (page 157 of Dr. J. F. FLETCHER's *Gupta Inscriptions*).

SECTION VII.—Construction of Tables for nakshatras and yogas—Eye-table, sections S to X.

210. The method of using these tables having been already explained (paragraphs 57 and 58), it remains to state how they were constructed.

The longitude of the moon may, for many purposes in astronomy, be arrived at by the formula (moon's longitude — sun's) + sun's longitude = moon's longitude. "Moon's longitude *minus* the sun's" is the tithi; and at the first new moon in the solar year, as at any other new moon, "moon's longitude — sun's" = 0. Therefore at this moment the sun's longitude is also the moon's longitude, and to determine the nakshatra appropriate to this moment it is only necessary to convert the sun's longitude into days of the solar year. The sun's longitude is reckoned from the 0 point of the mean solar year which is later than the 0 point of the ordinary or true Indian solar year by the *sodhya* given in special sun Table I in this chapter (page 78). We follow the Sūrya siddhānta for which the *sodhya*, resting on the authority of Mr. Dikshit (paragraph 199 *supra*) is 2.170694 days (or 2.13943644 degrees). The sun's mean longitude in days is, therefore, given by the formula ($i - 2.170694$) where i is the interval in days between the commencement of the Indian solar year and the first new moon in the solar year.

This can be converted into degrees of longitude by multiplying the above formula by .9856, which is the fraction of a degree accomplished by the sun in a day or $\left(\frac{360^\circ}{365.25876}\right)$.

Now this being also the moon's longitude at the moment of the first new moon in the solar year we have, at the rate of $13^\circ 20'$ for each nakshatra, the

following expression for the number of nakshatras and fraction of a nakshatra completed at this moment:—

$$(i - 2.170694) \times \frac{.9856}{13.33}$$

When i is a maximum, i.e., 29.530588 days, the above expression becomes

$$\frac{26.966016}{13.33} = \frac{40 - 13.033}{13.33} = 3 - \frac{13.033}{13.33};$$

because 3 nakshatras cover 40° of longitude and 26.966016° are equal to $40^\circ - 13.033^\circ$. Since a degree of moon's longitude is accomplished in $\frac{27.32166}{360}$ or .0759 of a day, the time required for 13.033° to be accomplished is $13.033 \times .0759 = .9892$ of a day. In other words when i is a maximum, the interval from the first new moon in the solar year to the ending moment of the 3rd nakshatra or *Krittikā* is .9892 of a day. That is why section **s** of the Eye-table (page 156) opens with the entry "3rd nakshatra9892 of a day" and the mean ending moment of every successive nakshatra is arrived at by successively adding 1.01191 day, the mean duration of a nakshatra.

211. This is the shortest interval from first new moon in the solar year to the ending moment of nakshatra *Krittikā*: for it will be seen that as i in the above expression is diminished the remainder arrived at by deducting $(i - 2.170694) \times .9856^\circ$ from 40° will be increased, in other words the interval from first new moon to end of nakshatra *Krittikā* will be increased. The figures in section **t** of the Eye-table are arrived at by substituting 1, 2, 3 . . . up to 29 days for i in the expression $(i - 2.170694) \times .9856^\circ$.

212. Similarly, for yogas the formula is, (moon's — sun's longitude) + 2 × sun's longitude = moon's yoga longitude: and the Yoga table, section **v** of the Eye-table, is constructed accordingly.

213. It will also be seen that the main difference between the nakshatra and yoga-tables for one siddhanta and those for other siddhāntas arises from the difference of *śodhya*.

CHAPTER V.—PLANETS, PLANETARY AND ECLIPSE CHRONOLOGY.

SECTION I.—*Calculation of planets' mean and geocentric places.*

214. The mean sidereal periods, used in Table IV, are those of modern European astronomy adjusted, as explained below, to the Indian sidereal year. The following table compares the sidereal period of each planet, by *Sūrya siddhānta* without *bīja*, with that adopted in this work as well as with the results of modern astronomy. A full explanation of the difference between columns 3 and 4 is furnished in paragraphs 217 to 220 below:—

Planet.	<i>Sūrya siddhānta</i> without <i>bīja</i> .	Modern astronomy (<i>Encycl. Brit.</i>).	Figure adopted in this work.
Col. 1.	Col. 2.	Col. 3.	Col. 4.
	DAYS.	DAYS.	DAYS.
Mars	686·99749	686·979702	686·98818
Mercury .. .	87·969702	87·969256	87·96939
Jupiter	4332·3206	4332·58479	4332·92495
Venus	224·698568	224·700798	224·70170
Saturn	10765·7780	10769·2010	10761·2795

215. In the first place it was thought unnecessary to observe in regard to planetary sidereal periods the same scrupulous adherence to Indian authorities which is incumbent in the case of the solar year and the synodical month. In the next place, the difference between Indian and modern astronomy in the length of the sidereal year results in a slight displacement of the starting point of Indian celestial longitudes, which displacement amounts to $7^{\circ} 4' 96''$ in 50 years and should be added to the precession,* amounting at the present epoch, according to modern astronomy, to $41^{\circ} 52' 27''$ for fifty years. The total difference between Indian sidereal and modern tropical longitudes is thus $48^{\circ} 57' 23''$ for 50 years or $59''$ per annum, while Bhāskara's estimate of the precession, $59^{\circ} 9' 007''$ per annum, is only slightly larger.

216. If the slight annual displacement of the zero point of Indian longitudes, which is a practical postulate of Indian astronomy, however unrecognized in theory, is applied to the sidereal places of planets, their mean sidereal periods will have to be altered as shown in column 4 of paragraph 214 above. In this manner alone will it be possible to apply to the planets the same precession as is applied to the sun, for the purpose of converting sidereal into tropical longitude.

N.B.—By taking this slight liberty with the mean sidereal periods of planets, the exact agreement of the mean place of any planet with its place in modern astronomy is secured, and the serious divergences between the two systems, commented on in Whitney's notes on the *Sūrya siddhānta* have been effectually avoided. As a result, the place, whether mean or actual, assigned to any planet in Table IV, may not tally exactly with Indian calculations, unless the corrections indicated in paragraph 297 below are made; but the difference will generally be found to be very slight, while there is an obvious advantage in having for every possible epoch a mean place for each planet, identical with that assigned to it by modern astronomy.

217. The reader may be desirous of being furnished with a somewhat fuller explanation of the expression "the slight annual displacement of the zero point of Indian longitudes." In the *Encyclopædia Britannica*, 11th edition, Volume 13, page 492, the lengths of the sidereal year in Indian and in modern European astronomy are compared as follows:—

<i>Sūrya siddhānta</i> ,	365 d.	6 hrs.	12 min.	$36^{\circ} 56''$
Modern astronomy	365 d.	6 hrs.	9 min.	$9^{\circ} 60''$

The difference between the two lengths of the sidereal year is $\cdot 00239537$ of a day. When the sun has completed a sidereal year according to modern astronomy, he is still assumed in the *Sūrya siddhānta* to continue to move on for $\cdot 00239537$ of a day before completing his sidereal orbit; and during this space of time he describes, by modern astronomy, $\cdot 98560901 \times \cdot 00239537 = \cdot 002360898$ of a degree. In consequence, the 0° point of Indian celestial longitude, which in theory is supposed to be absolutely fixed in the heavens, is actually shifted every

* An investigation of the precessional correction, necessary to convert Indian sidereal into European tropical longitudes will be found in the second paper in the appendix: "Luni-solar precession as applied to Indian astronomy."

year, so far as the sun is concerned, by $\cdot 002361$ of a degree. For 1,400 years this shift amounts to $3\cdot 3054$ or a little less than $3\frac{1}{2}$ degrees. If, according to the general opinion of historians of Indian astronomy, the sun was at the 0 point of longitude and in *Zēta Piscium* on or about 18 March A.D. 532, his present 0 point in A.D. 1932 is, according to Indian astronomy, $3\frac{1}{2}$ degrees to the east of *Zēta Piscium*.

218. The practical consequence of this shift is that a planet which was with the sun in *Zēta Piscium* and in 0° longitude on 18 March A.D. 532, and which during the last 1,400 years has, by modern astronomy, completed a certain *integral* number of revolutions, must in A.D. 1932, i.e., at the end of exactly 1,400 years and exactly at the end of the last of those revolutions, be *ex hypothesi* with the sun again in *Zēta Piscium*; but in Indian astronomy such a planet would still be $3\frac{1}{2}$ degrees short of a conjunction with the sun, because the sun's 0 point of longitude had in the interval of 1400 years moved $3\frac{1}{2}$ degrees away to the east of *Zēta Piscium*. Now the 0° of longitude must in any system of astronomy be the same for the sun as for the planets, as otherwise we would be in hopeless confusion in investigating their relative positions; and therefore it is inevitable that any conventional lengthening of the sun's course in order to reach his 0 point of longitude should entail a proportionate lengthening of the sidereal course of each planet. We will now proceed to study the exact amounts by which the sidereal periods of the different planets have to be lengthened.

219. *Mars*.—The period of Mars' revolution is 1·88082 sidereal years (modern) and to keep up with the Indian sun, Mars' revolution must be carried forward by $1\cdot 88082 \times \cdot 002361^\circ = \cdot 00441$ degree, before Mars can be said to have returned to 0° longitude. Now Mars' motion (modern astronomy) being 1·9083 days per degree, the lengthening of the sidereal period of revolution in his case is $1\cdot 9083 \times \cdot 00441 = \cdot 0084748$ day.

Add Mars' modern sidereal period : ...	...	...	686·979702 days.
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Total sidereal period for Mars, required by			
Indian astronomy ...	...	...	686·988177 days.

That is, if we fix the sidereal period of Mars at the figure last arrived at, we shall, it is true, not arrive at his true mean sidereal longitude for any given year, particularly for remote years, but the correction to be made in order to get either his true mean sidereal longitude or his true tropical longitude will be the same as in the case of the sun. For the remaining planets, the working is given below without the explanation which is the same as in the case of Mars.

Mercury.—Rate : 2444 day per degree; 2408 year for one sidereal revolution (mod. astron.).

$2408 \times \cdot 002361 \times 2444$ day = ...	...	...	000139 day.
Add Mercury's sidereal period (modern) ...	...	...	87·969256 (mod. astr.).

Total required by Indian astronomy ...	...	...	87·969395 days.
--	-----	-----	-----------------

Jupiter.—Rate : 12·085 days per degree; 11·8618 years for 1 sidereal revolution (mod. astron.).

$11\cdot 8618 \times \cdot 002361 \times 12\cdot 085$ day = ...	...	...	0·33705 day.
Add Jupiter's sidereal period (modern) ...	...	...	4332·5879.

Total required by Indian astronomy ...	...	...	4332·92495 days.
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Venus.—Rate : 6242 day per degree; 6151 year for one sidereal revolution.

$\cdot 6151 \times \cdot 002361 \times 6242$ day = ...	...	...	0·0009065 day.
Add Venus' sidereal period (modern) ...	...	...	224·700798 (mod. astr.).

Total required by Indian astronomy ...	...	...	224·701704 days.
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Saturn.—Rate : 29·8864 days per degree; 29·46 years for one sidereal revolution.

$29\cdot 8864 \times 29\cdot 46 \times \cdot 002361$ days = ...	...	...	2·07855 days.
Add Saturn's sidereal period (modern) ...	...	...	10759·2010 (mod. astr.).

Total required by Indian astronomy ...	...	...	10761·2795 days.
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220. It will strike the reader that the result of adopting periods of revolution differing from those recognized in Indian astronomy must be that in a long period of time there would be a considerable divergence between the mean longitude of a planet arrived at with the aid of the *Ephemeris* and that, for instance, implied in an ancient Indian record. To guard against such divergences, it is necessary to tabulate them from epoch to epoch, so that in a given case we may know what to expect in an Indian record. This is a precaution which should certainly not be neglected by an investigator and it will be found from the small table in paragraph 297 *infra* that the necessity for such a correction has been foreseen, and the table is made good use of in the investigation of Rama's horoscope, of which the final result is set out in paragraph 300 below. See also Table IV-B.

221. After settling the sidereal periods of revolution of the several planets, which are necessary to bring Indian astronomy into line with modern results, we have next to settle the exact quantity by which the mean longitude of each planet is increased every year. The best method of ascertaining the annual motion of a planet is to take a long synodic period, the longer the better, that is, a period after which the sun and the planet in question come very nearly together. An example will illustrate what is meant.

$$\begin{array}{rcl} 222. \text{ Mars' period for 193 revolns.} & = 193 \times 686.9862 & \text{days.} = 132588.7226 \text{ days.} \\ 368 \text{ Indian solar sidereal years} & = 368 \times 365.258756 & \text{,,} = 132588.9286 \text{ days.} \end{array}$$

$$\begin{array}{rcl} 368 \text{ years} & = & 193 \text{ revolns. of Mars} + 2060 \text{ day.} \\ \text{Mars' movement in 2060 day} & = & 206 \times .524 = .107944 \text{ degree and 193 revolutions} \\ & & = 193 \times 360 = 69480 \text{ degrees.} \end{array}$$

$\therefore$ In 368 Indian solar years, or 193 Mars' revolutions + 2060 day, Mars' movement is 69480.107944 degrees.

$$\therefore \text{ In one Indian sidereal year Mars' movement} = \frac{69480.107944}{368} = 191.405253 \text{ degrees.}$$

$$\begin{array}{rcl} \text{Mercury: 1,474 revolutions of Mercury} & = 1474 \times 87.96939 & = 129666.88086 \text{ days.} \\ 355 \text{ Indian sidereal years} & = 355 \times 365.258756 & \dots = 129666.8585 \text{ days.} \end{array}$$

$$\begin{array}{rcl} \therefore 355 \text{ Indian solar years} & = & 1,474 \text{ revolutions of Mercury} - .02236 \text{ day.} \\ \text{Mercury's movement for .02236 day} & = & .02236 \times 4.09283^\circ = .0915045^\circ \text{ degree.} \\ \text{Since 355 Indian solar years} & = & 1,474 \text{ Mercury's revolutions} - .0915045^\circ = \\ & & 580639.9084955^\circ \text{ degrees of Mercury;} \end{array}$$

$$\therefore \text{ In one Indian sidereal year Mercury's movement} = 580639.9084955^\circ + 355 = 1494.76080562^\circ, \text{ which (casting out multiples of } 360^\circ) \text{ is the same as } 54.76030562^\circ.$$

$$\begin{array}{rcl} \text{Jupiter: 131 revolutions of Jupiter} & = 131 \times 4832.92495 \text{ days} & = 567618.175 \text{ days.} \\ 1554 \text{ Indian sidereal years} & \dots & \dots = 567612.108 \text{ days.} \end{array}$$

$$\begin{array}{rcl} \therefore 1554 \text{ Indian solar years} & = & 131 \text{ revolutions of Jupiter} - 1.067 \text{ days.} \\ \text{Jupiter's movement for 1.067 day} & = & 1.067 \times .088087^\circ = .088658729^\circ \text{ degree.} \\ \therefore 1,554 \text{ years} & = & (131 \times 360^\circ) - .088658729^\circ = 47159.911846271^\circ \text{ degrees of Jupiter;} \end{array}$$

$$\therefore \text{ Jupiter's movement in 1 Indian solar year} = \text{the last figure} + 1554 = 30.3474383^\circ.$$

$$\begin{array}{rcl} \text{Venus: 1,541 revolutions of Venus} & = 1541 \times 224.701704 \text{ days} & (= 1541 \times 224.701704). \\ 948 \text{ Indian sidereal years} & \dots & = 346265.8011 \text{ days.} \end{array}$$

$$\begin{array}{rcl} \therefore 948 \text{ years} & = & 1541 \text{ revolutions of Venus} - .0247 \text{ day} \\ & = & (1541 \times 360^\circ) - (.0247 \times 1.602^\circ) = 554760^\circ - .0395694^\circ = \\ & & 554759.960431^\circ \text{ of Venus.} \end{array}$$

$$\therefore \text{ Venus' movement in one Indian solar year} = \text{the last figure} + 948 = 225.189831^\circ.$$

$$\begin{array}{rcl} \text{Saturn: 13 revolutions of Saturn} & = 13 \times 10761.2795 \text{ days} & = 139896.6835 \text{ days.} \\ 383 \text{ Indian sidereal years} & = 383 \times 365.258756484 & = 139894.108 \text{ days.} \end{array}$$

$$\begin{array}{rcl} \therefore 383 \text{ Indian solar years} & = & 13 \text{ revolutions of Saturn} - 2.580 \text{ days.} \\ & = & (13 \times 360^\circ) - (2.580 \times .03346^\circ) = 4680^\circ - .086538^\circ = 4679.915346^\circ \text{ of Saturn;} \end{array}$$

The last figure divided by 383 gives Saturn's yearly movement for one Indian solar year, viz., 12.2191001 degrees.

228. From the yearly motions of the planets, fixed as above, are obtained (1) the daily motions used in calculating the increase of mean longitude of each planet for odd days of the year, see Table IV; (2) the motions of planets for odd years of a century, see Table IV and (3) the cyclic variations for different cycles, prefixed to Table V-A.

224. The planetary anomalies and annual equations, which were used for Table IV of this work, were taken from Warren's *Kāla Sankalita* and are ascribed by that author to a Telugu astronomer of the thirteenth century A.D., called *Vāvilāla Kuchinna*. The tables are no doubt old-fashioned, but they are handy and sufficiently accurate for the purposes of Indian horoscope chronology. This is the main reason for resuscitating them into present-day use. The author is glad to find that so eminent an authority as Professor Jacobi of Bonn and Heidelberg has also adopted the same tables in his contribution to *Epigraphia Indica*, Volume XII. The figures as to longitudes of apsides and nodes and the greatest apparent latitudes of planets (Tables IV, IV-G) are taken, partly from Warren and partly from the *Siddhānta Śirōmaṇi*.

225. The computation of anomalies and equations, even as simplified by *Vāvilāla Kuchinna*, is a tedious operation for determining planetary places, especially when the number of trials required in an investigation, e.g., for Rama's horoscope (pages 118—120 below) is at all considerable. This inconvenience is altogether eliminated when Tables V-A and V-B are used, and there is hardly any problem in Indian planetary records which cannot be solved by means of those tables. Still, it is occasionally of importance to know what mean longitude corresponds to a given geocentric place of a planet on a particular day of the Indian solar year and *vice versa*: and in one case at least, viz., that of Mars, as will be explained in paragraph 282 below, this information is indispensable in any investigation concerning that planet. For these reasons an Eye-table has been devised for each planet (vide Table IV), and the reader will do well to familiarize himself with it by studying sec. iv (pages 132—134) of this Chapter.

226. Indian astronomy reckons nine planets, spoken of collectively as *navagrahas*, namely, the Sun, Moon, Mars, Mercury, Jupiter, Venus, Saturn, *Rāhu* and *Kētu*. It will be seen that the first seven are named in the order of the days of the week, and this is nearly always the order in which they are referred to in Indian astronomy, showing that planetary week-days and planets' names came into India at the same epoch. *Rāhu* is another name for the moon's ascending node, one of the points at which the moon's orbit cuts that of the sun (the ecliptic), the other point, or the descending node, being called *Kētu*. An eclipse cannot happen except when the moon is at either node and the sun is at the same or the opposite node; hence the popular legend which depicts *Rāhu* as a dragon swallowing up the moon or the sun at the time of an eclipse. (See the quotation from *Paripāḍal* at page 109 below.) All the planets, except *Rāhu* and *Kētu*, move, like the sun, from west to east in their apparent path round the earth. *Rāhu* moves in the opposite direction, and *Kētu* is always assigned a position 180° from that of *Rāhu*. For *Rāhu* see Table IV-K, and for eclipses see Table IV-L, and section v of this Chapter (pages 134 to 150).

227. All the data necessary for calculating the geocentric longitude and latitude of the five planets, Mars, Mercury, Jupiter, Venus and Saturn, are given in Table IV. The actual geocentric places at any time can be deduced from Tables V-A and V-B, as shown by numerous examples in sections ii and iii of this chapter, or from the planetary Eye-tables included in Table IV.

228. The longitude of any planet is its distance, measured in degrees, from an arbitrary point in the ecliptic, which point may perhaps best be defined as the 0 point of the sun's mean longitude. The sun's mean longitude is always 0 at a certain part of the Indian solar year, namely, at 2·1707 days from the commencement of each Indian solar (according to the *Sūrya siddhānta*), while at the moment of commencement of the Indian solar year, the sun's actual longitude is 0. The difference between the sun's mean and actual longitude at any time is his equation of the centre, and this difference is due to his varying pace at different times of the year as he journeys round the earth. The sun's mean longitude and equation for every complete day of the solar year are given in Table IV-C, and these are most important data in Indian astronomy. Table IV-D gives the increase of the sun's mean longitude for hundredth parts of a day.

229. The sun's mean longitude at any moment is ascertained (in *Sūrya siddhānta*) by deducting 2·1707 from the number of days and fraction of day elapsed since the commencement of the Indian solar year, and applying to the result the table of sun's longitudes (Table IV-E). The difference between the sun's longitude thus calculated and the mean longitude of the sun for the same moment

given in any European *Nautical Almanac*, is the true Indian precession, and this difference should always be added to the longitude of a planet given in this work for years subsequent to A.D. 532 in order to arrive at the corresponding longitude according to the *Nautical Almanac*. The following table gives the precession to be added to Indian celestial longitudes at various epochs since A.D. 532 (when the European and Indian longitudes coincided*), in order to arrive at the European celestial longitude. The initial rate of precession adopted for this table is $\cdot 016322$ of a degree per annum or 1.63 degrees for every 100 years. The exact method by which the precessional quantities tabled below have been arrived at will be found fully explained in the paper on precession appended to this work.

(The European longitude of a planet is called its *tropical* longitude from its being regulated by the tropical year, whereas the Indian longitude is generally called a *sidereal* longitude from its being regulated by the sidereal year—see further paragraph 289 below.)

A.D.	Kaliyuga	Indian precession in degrees.	A.D.	Kaliyuga.	Indian precession in degrees	A.D.	Kaliyuga	Indian precession in degrees.
532	3633	0 0	1062	4163	8 6	1600	4701	17 3
562	3663	0 5	1100	4201	9 2	1632	4733	17 9
592	3693	1 0	1132	4233	9 7	1662	4763	18 4
632	3733	1 6	1162	4263	10 2	1700	4801	19 0
662	3763	2 5	1200	4301	11 8	1732	4833	19 5
700	3801	3 0	1232	4333	11 4	1762	4863	20 0
732	3832	3 2	1262	4363	11 9	1800	4901	20 6
762	3862	3 7	1300	4401	12 5	1832	4933	21 2
800	3901	4 3	1332	4433	13 0	1862	4963	21 7
832	3953	4 9	1362	4463	13 5	1900	5001	22 2
862	3963	5 4	1400	4501	14 1	1932	5033	22 8
900	4001	6 0	1432	4533	14 6	1962	5063	23 3
932	4033	6 5	1462	4563	15 1	2000	5101	23 9
962	4063	7 0	1500	4601	16 7	2032	5133	24 4
1000	4101	7 6	1532	4633	16 3			
1032	4133	8 1	1562	4663	16 8			

230. Numerous practical applications of the foregoing observations regarding the difference between European and Indian precession will be found in sections ii and iii of this chapter when we come to compare our verification of Rama's horoscope (page 289 below) and of ancient Chinese observations (paragraph 304) with similar investigations by European astronomers. It will be explained in the same sections that though the names of Indian *rāsis* are merely translations of Greek names of the signs of the zodiac, yet an Indian astronomer speaking of Jupiter having been in Rishabha *rāsi* about 3100 B.C. does not mean the same thing as a European astronomer who says that Jupiter was in the sign of the zodiac Taurus about the same time. This difference appears to have been overlooked even by competent European astronomers like Bentley when writing about Indian horoscopes. See paragraph 291 below.

231. The reader who has carefully digested all that has been said touching the mean longitudes of planets, their yearly and daily mean motions and the precession, will probably still be puzzled a good deal to understand their actual motions as depicted in Table V-B. He will find that while Jupiter and Saturn occasionally adhere to their mean motions, namely, 12 days per degree in the case of Jupiter and 30 days per degree in the case of Saturn, the other planets do not seem to observe any particular relation between their mean longitudes investigated above and the geocentric longitudes entered in Table V-B, which are longitudes of the planets as seen from the earth and which are also the longitudes recorded in Indian horoscopes. The best plan for the general reader will be to read the text of sections ii and iii of this chapter where he will learn not only how to deal with practical problems but also how to follow the courses of the several planets through the centuries, and he will thus be enabled to form a definite picture of the successive actual movements of each planet which picture is materially different from that presented by the mean longitudes.

232. It is possible to calculate, in the manner explained in the next and subsequent paragraphs, the actual geocentric longitude of any planet at any given moment, just as it is possible to calculate, by the rules already laid down in the earlier portions of this work, the *tithi* and the *nakshatra* for any given moment.

* See Paper No. ii in the Appendix: "Luni-solar precession as applied to Indian Astronomy."

The object of this work is, however, to demonstrate that it is equally possible, by taking advantage of cycles of recurrence, to construct a ready-made Ephemeris for any number of years past or future in regard to the positions of planets as well as in regard to tithis and nakshatras. Such an ephemeris or perpetual planetary almanac for the five planets, Mars, Mercury, Jupiter, Venus and Saturn, and embracing a period of 3,000 years, from 1000 B.C. to A.D. 2000, is presented in Tables V-A and V-B, the contents of which are fully explained in sections ii and iii of this chapter.

233. Meanwhile we will explain briefly how the geocentric longitudes of planets may be rigorously computed for any given moment past or future by the rules of Indian astronomy. The method used in modern European astronomy is much more elaborate, as may be seen from any standard work on the subject, for instance. Dr. P. V. NEUGEBAUER'S *Tafeln für Sonne, Planeten und Mond* (Leipzig, 1914).

234. The mean longitude of a planet at any moment is obtained by adding together its mean longitude at the commencement of the century, the mean motion for the given odd year, and the mean motion for the given day. Thus for 202·54 days of the Indian solar year, A.D. 961 (Kaliyuga 4062) we have—

(Table IV) Mars' mean longitude at commencement of K.Y. 4001	..	Degrees	79°48'73
(") Mars' increase of mean longitude for 61 years	...	...	155°72
(") " " " 202 days	...	...	105°85
(") " " " 54 day	...	...	2830
<i>Answer</i>			341°34'

235. This is the mean longitude of the planet in his path round the sun, though not his longitude, as he appears to us from the earth. To obtain this, which is called the geocentric longitude, and which is the longitude usually cited in Indian time-records, we have to perform a fairly tedious sum, which however, we may, if we like, avoid by using Tables V-A and V-B or the planetary Epyetables in Table IV.

236. The place of the moon, the only remaining planet, can be deduced either from the tithi or from the nakshatra as in paragraph 241 below

The principle applied in paragraph 241 is that—

If we find the sun's longitude at the ending moment of a tithi and add it to the moon's elongation or tithi, we shall obtain the moon's longitude, or which is the same thing, the nakshatra current at the ending moment of tithi.

237. The true geocentric longitudes of the other planets may be calculated in the following manner.—

The planets are divided into two classes: *inferior* (Mercury and Venus) and *superior* (Mars, Jupiter and Saturn). Three quantities, which we may call *a*, *b*, *v*, in the case of the inferior planets, Mercury and Venus, and *A*, *B*, *N*, in the case of the superior planets, Mars, Jupiter and Saturn, have to be determined first of all, before working out the actual geocentric longitude of any planet. Having determined those three quantities, the further procedure is the same, whether the planet is superior or inferior. We give below the calculations (1) for the *inferior* planets, Mercury and Venus and (2) for the *superior* planets, Mars, Jupiter and Saturn for 89 completed days of the solar year A.D. 634 (i.e., half an hour after mean sunrise on 17th June A.D. 634), when there was a partial lunar eclipse in the lunar month of Āshāḍha. The Indian solar year A.D. 634, began, according to Table II, at 0243 of the day, i.e., half an hour after mean sunrise and the 89th or any other day became complete at the same time of the day, but in the working below this half hour is neglected.

1. *True geocentric longitude of Mercury for 89 completed days of the Indian solar year A.D. 634.*

Time and English date, mean sunrise on 17th June A.D. 634.

(1)—*a*. Mean longitude of planet minus mean longitude of sun.

Mean longitude of Mercury		Mean longitude of sun. (Table IV-C)		Venus' mean longitude.	
For A.D. 600	305°49°	89 days	85°58° v	A.D. 600	57°19°
34 years	61°85°			34 years	96°45°
89 days	4°22°			89 days	142°59°
	371°56°				296°28°
<i>Deduct</i>	360°				
	11°56°				

	Mercury's M.L. minus sun's M.L.		Venus' M.L. minus sun's M.L.
11·56°	371·56°		296·23
	— 85·58° <i>v</i>		— 85·58 <i>v</i>
	285·98° <i>a</i>		210·65 <i>a</i>
(2)— <i>b</i> . Longitude of planet's apsis <i>minus</i> sun's mean longitude.			
	Mercury		Venus.
Longitude of planet's apsis for A.D. 634 *	220·43°		(= 79 81° +
Deduct sun's mean longitude (as above) ...	— 85·58°		360°)
			439·81
			— 85·58
	134·85°	<i>b</i>	354·23° <i>b</i>
(3)— <i>v</i> . Mean longitude of sun	85·58°	<i>v</i>	85·58° <i>v</i>
(4) Planet's annual equation for <i>a</i> (Table IV) ...	— 17·5°	(4)	— 44·5° (4)
(5) Take half of (4) with reversed sign, and add	134·85		354·23°
to <i>b</i>	+ 8·75°	...	+ 22·25°
	143·60	(5)	376·48° (5)
(6) Planet's anomalistic equation for (5) (Table IV). +	2·7°	(6)	+ 0·55° (6)
(7) Take half of (6), with reversed sign, and add	143·60		16·48
to (5)	— 1·35°		— 0·27°
	142·25°	(7)	16·21° (7)
(8) Anomalistic equation of (7) (Table IV) ... +	2·8°	(8)	+ 0·55° (8)
(9) Take (8), with reversed sign, and add to <i>a</i> ...	285·98°		210·65°
	— 2·8°		— 0·55°
	283·18°	(9)	210·10° (9)
(10) Annual equation of (9) (Table IV)	— 18·0°	(10)	— 44·5° (10)
(11) Add (8) and (10)	— 15·2°	(11)	— 44·0° (11)
(12) Add <i>v</i> and (11)	70·38°	(12)	41·58° (12)

70·38 or 10½ degrees in **Mithuna** is the true **geocentric place of Mercury** for the moment in question, while 41·58° or 11½ degrees in **Rishabha** was the true **geocentric place of Venus**.

N.B.—These geocentric places could have been ascertained, by mere inspection, either from the Eye-tables, or from Tables V-A and V-B, see paragraphs 276 and 322 below.

238. II. To find the *latitude* of Mercury (i.e., his distance above or below the ecliptic for the same moment)—

(13) Mercury's mean longitude	...	11·56° or 371·56°
<i>minus</i> longitude of Mercury's node (Table IV) .	...	—20·74
		350·82° (13)
(14) Take (8) above, with sign reversed, and add to (13) :		—2·8°
		348·0° (14)
(15) Sine of (14) according to Table IV-H	...	630 (15)
(16) Equation corresponding to (9) <i>supra</i> , 283·18° by Table IV-G.		
Equation for 281·25° = 3886 ; while equation for the next		
stage 285·00 = 3957, difference between the two equations		
= 71		
(Table IV-I)	1·92° = .51 × 71 = 36·21	
∴ Equation for 283·18° = 3886 <i>plus</i> 36 = 3922		3922 (16)
(17) Multiply (15) by 120, as a constant for Mercury, and divide the product by (16)		
	$\frac{630 \times 120}{3922} = \frac{8560}{3922} = 2·1$	

Now by Table IV-F, 225 is the sine of 3·75°
∴ 2·1 is the sine of $\frac{3·75 \times 2·1}{225} = .031°$

N.B.—The corresponding constants for the other planets are the sines of their greatest apparent latitudes, given at foot of Table IV-G.

The latitude of Mercury is .031° and inasmuch as (14) is greater than 180°, i.e., below the ecliptic, the latitude .031° is south.

* The apses and nodes of planets, except the moon, have such slow motions that their places need not be calculated for odd years and days.

Mars, Jupiter and Saturn (superior planets).

239. I. To find the geocentric longitude of Mars, Jupiter and Saturn (superior planets) for 89 completed days in solar year A.D. 634 (mean sunrise on 17th June A.D. 634, when there was a partial lunar eclipse) see paragraph 268, page 17 below.

Time and English date. Mean Lankā sunrise on 17th June A.D. 634 (15th Śukla tithi of lunar Āshāḍha).

(1) A. Mean longitude of sun minus planet's mean longitude.

Mean longitude of sun	Difference between mean longitudes of sun and Mars.	Difference between mean longitudes of sun and Jupiter.	Difference between mean longitudes of sun and Saturn
(85°58' by Table IV-C) + 360° = 445°58'	Jupiter's 445°58'	Saturn's 445°58'	
Mean longitude of Mars	mean long.	mean long.	
For A.D. 600, 257°91'	11°63'	201°98'	
„ 84 years, 27°37'	311°81'	55°45'	
„ 89 days, 46°64'	7°39'	2°98'	
331°92'	—331°92'	330°83'	—330°83'
	113°66' A	114°75' A	185°17' A

(2) B. Longitude of planet's apsis minus

mean longitude of planet.

Longitude of planet's apsis 130°04' or 490°04'

Mean longitude of planet ..

(3) N. Mean longitude of planet.

(4) Planet's annual equation for A*

(5) Take half of (4) with reversed sign, and add to B ...

(6) Planet's anomalistic equation for (5) [Table IV]

(7) Take half of (6), with reversed sign, and add to (5) ...

(8) Anomalistic equation of (7)*

(9) Take (8), with reversed sign, and add to A ...

(10) Annual equation of (9) [Table IV] + 37°0' (10)

(11) Add (8) and (10): ...

(12) Add N and (11): ...

The true geocentric longitude 17° in MĒSHA, 104° in MĪNA, 17° in DHANUS.

N.B.—These geocentric places could have been ascertained, by mere inspection either from the planetary Eye-tables, or from Tables V-A and V-B. See paragraphs 276 and 322 to 324 below.

240. II. To find the latitude of Mars, i.e., his distance above or below the ecliptic for the same moment—

(13) Mar's true geocentric longitude ...

minus longitude of Mar's node for A.D. 900 (Table IV)

(14) Take (10) above for Mars, with sign reversed, and add to (13):

(15) Sine of (14) according to Table IV-H ...

(16) Equation for (9) above, 105°16', by Table IV-G ...

(17) Multiply (15) by 90, as a constant for Mars, and divide by (16)

$$\frac{90 \times 2981}{3573} = \frac{268290}{3573} = 75.1$$

N.B.—The corresponding constants for the other planets are the sines of their greatest apparent latitudes, given at foot of Table IV-G

Now by Table IV-H the sine 75 belongs to an angle between 0° and 3°75'

225 is the sine of 3°75'

∴ 75 " 1°25'

∴ The latitude of Mars sought is 1°25' which is south since (14) is above 180°

* See Table IV under Mars, Jupiter and Saturn respectively

241. *To find the longitude and latitude of the moon for the above moment—*

We should first of all find the moon's true longitude which we may calculate either from the tithi direct, which being 15 tithis completed is 180° . Moon's longitude = (moon's *minus* sun's longitude) + sun's longitude = $180^\circ + 85.58^\circ + .32$ ($\odot$'s equation by Table IV-A) = 265.90° .

Now to find the moon's latitude at the moment sought—

- (1) Find the place of moon's node, i.e., Rāhu—

By Table IV-K place of Rahu for A.D. 600 is

By same table Rāhu's motion for 34 years, 298.18° .. $\left\{ \begin{array}{l} 196.57 \\ \text{or } 556.75 \end{array} \right.$

N.B.—Rāhu's mean motion for odd years 89 days 4.77

and days should be subtracted from the mean place for century.

34 years and 89 days = 302.95 — 302.95

253.80° (1)

- (2) Moon's true place *minus* place of her node ... 265.90°
— 253.80

12.10 (2)

- (3) Sine of (2) by Table IV-H ... 71.9 (3)

- (4) Multiply (3) by $\frac{270}{34.38}$, as a constant for the moon: $71.9 \times 2.70 = 5.6$.
 34.38

By Table IV-H, 225 is the sine of 3.75°

$\therefore 56$ „ $.94^\circ$

Inasmuch as (2) is less than 180° , the **latitude** sought is 0.94° north.

242. The reader should note—

- (a) that for Venus the procedure is the same as for Mercury;
- (b) that for Jupiter and Saturn, the procedure is the same as for Mars;
- (c) that for Mercury and Venus, the geocentric longitude has for its basis the sun's mean longitude and not that of the planet; whereas the geocentric places of Mars, Jupiter and Saturn are based on their respective mean longitudes;
- (d) that we may always subtract a larger number of degrees from a smaller by adding 360° to the smaller number;
- (e) that the apsis of any planet except the moon does not change materially in position during a century, and that therefore we need not calculate the change of apsis for odd years or odd days;
- (f) that after calculating a , b and v , or A , B and N , respectively, the procedure is the same for all planets, whether inferior or superior;
- (g) that the mean longitudes of planets for decimals of a day may be obtained from the longitude for odd days by prefixing decimals to the latter. Only we should remember that a mean revolution of Mercury is completed in 87 days and a mean revolution of Venus in 225 days, and the increase of Mercury's longitude for .89 day is not 0.422° , but 3.6422° . Similarly, the increase of Venus' longitude for .231 day is not $.01009$, but $.37009^\circ$;
- (h) that the latitudes of planets are not referred to in Indian usage except in what is known as a planetary fight in astrology;
- (i) that the greatest apparent latitudes of the several planets and their corresponding Hindu sines are given at foot of Table IV-G.

SECTION II.—*Examination of planetary time-records called horoscopes.*

243. Side by side with calendar dates expressed in vara, tithi and nakshatra, there are to be found, scattered here and there in Indian literature, records of time, indicating the positions of one or more of the chief planets on particular days, whereby the modern investigator is enabled, even when no year, month, or date is expressed, to compute the probable time at which the records were composed, or to which they refer. But to assess at their real value these planetary records,

usually called horoscopes, one or two preliminary observations are necessary in the light of facts disclosed by modern historical research. In the first place, although the Indian horoscope as well as the Indian panchanga is at present used largely, and used chiefly, for astrological purposes, this was not the case always. It is certain that the sun's and moon's motions have been observed in this country from very ancient, in fact from vedic, times for the legitimate purpose of measuring time, and there is little doubt that, like the Babylonians, the Hindus also looked upon planetary records or horoscopes originally in the same light. Even now the horoscope is essentially a record of time from which the astrologer deduces what appears to him to be the influence of the several planets at the moment envisaged by the horoscope.

244. Secondly, as between the Indian calendar and the Indian horoscope, the latter is comparatively a new-comer. Traces of astrological prediction in the Indian literature of the centuries B.C. are few and far between, and they seem to point specially to prediction by means of the sun's and moon's movements rather than by means of the motions of the planets properly so called. When exactly the people of this country became acquainted with the names of the other planets (for the sun and moon are also planets in the Indian system) or began to observe their motions, is a moot point. On the one hand it seems *a priori* probable, from the intercourse of this country with the western nations from very ancient times, that Greek, if not Phœnician, Chaldean and Egyptian astronomy and astrology must have found their way into this country at a very early time. It seems difficult to suppose that Chaldean astrology in particular, which was practised in the Grecian and Roman States for some centuries before A.D. 1, did not find its way into India in the wake of Alexander's conquest or of the Græco-Bactrian civilization. Indeed in an account of the life of Apollonius of Tyana, who lived in the first century A.D., it is stated that he became acquainted with the names of the planets and of the week-days from an Indian prince whom he visited, but there is reason to believe that the extant semi-mythic accounts of the life of Apollonius of Tyana were composed considerably later than the first century A.D.

245. All the historical, as distinguished from the presumptive, evidence that has come down to us points to the probability of western influence on Indian planetary astronomy not having been anterior to the fourth or fifth century A.D., when the works of the great Greek astronomer and astrologer Klaudios Ptolemy and his successors, Paulus Alexandrinus and Firmicus Maternus, were first introduced into this country during the Gupta period. Some mention is made of planet names in the *purāṇas*, but the date of composition of the *purāṇas* is itself a matter of critical speculation. On the whole it may be safe to presume that the Hindus in some way became acquainted with the names of the planets, and possibly of the planetary week-days, a century or two before the Christian era, but that they did not make any practical use of this knowledge until they were brought face to face with its results in Ptolemy's works in the fourth or fifth century A.D. It seems also exceedingly probable that the practice of calculating horoscopes or the positions of the planets at given moments, came into vogue in India a century or two after the fifth A.D. Whether any particular part of the country, e.g., Southern India, acquired a knowledge of planetary astrology from independent Chaldean sources before the introduction of Ptolemy's works into Northern India is also a matter purely for conjecture. We have it on the authority of Juvenal, the Latin satirist of the time of Domitian (first century A.D.), that in his time the wealthy Roman ladies used to employ four classes of sooth-sayers, the Phrygian, the Chaldean, the Etruscan and the Indian. From the way in which Juvenal has coupled Indians with Phrygian augurs in this passage (Satire VI, lines 585—587) it may be presumed that Indian fortune tellers were imported into Rome for their knowledge of augury and not for their knowledge of astronomy, for which Juvenal seems rather to give credit (in this respect again the passage is not free from doubt) to the Chaldean, not to the Indian, sooth-sayer. In confirmation of Juvenal's statement, we have allusions to an Indian science of birds (in the sense of augury) occurring in literature which is entirely destitute of notions of planetary astrology, e.g., the Tamil *Tolkāppiam*. The passage where Juvenal refers to Indian augury or Indian astrology has

been the subject of numerous *variae lectiones* (various readings) and one version refers to female, not male, fortune tellers (*Inda*—Indian women).

Translation.

Divitibus responsa dabunt Phryx augur et Indus

*Conductus, dabit astrorum mundiue peritus,
Aut aliquis senior qui publica fulgura condit.*

To the rich women answers will be given by a Phrygian augur or by an Indian engaged for hire, or by one who understands the universe and the stars, or by an elderly person who covers up with due rites the parts of the city which have been struck by lightning.

Note.—(1) For *dabunt* some editions read *dabit*
(2) For *Indus*, the various other readings are *Indæ*, and *indr*

246. The practical deduction from all these considerations is that one has to be very sure of one's ground before imputing to Indian society before the fifth century A.D. a knowledge or practice of planetary astrology (compare remarks in paragraph 50, page 15 *supra*). Such Indian horoscopes as refer to a previous period must have been composed retrospectively, and this remark applies in a special manner to Rāma's horoscope in the Rāmāyana, which occurs in a canto admitted by critics to be a subsequent composition. Whether Rāma's horoscope was meant to be a real horoscope or merely a description of planets in certain exalted positions has also not yet been settled; but taking it as a horoscope, Bentley ascribed it to the year 961 B.C. while the present writer, had in previous works of his computed the time to correspond to 964 B.C. although he would now not attach any particular significance to the year 964 B.C. as a year of Rāma's birth, or even as a year answering the conditions of Rāma's horoscope (vide paragraph 302 *infra*). The exact manner in which this interesting horoscope can be computed will be shown in section iii of this chapter (pages 112 to 122 *infra*). The references to planet-positions in the Mahābhārata are so conflicting that it is impossible to make any inference from them as to the time referred to; whereas a genuine horoscope containing the positions of the principal planets in rāsis, provided the time of year is indicated even in general terms, should enable an investigator to verify a date in such a manner that the same horoscope would not be applicable to any other date during a period of several thousands of years. This is the chronological vantage-ground of the horoscope, and it will be illustrated presently by a thoroughly practical, and at the same time a somewhat unique, example from early Tamil literature; but horoscopes are liable to all the failings to which human compositions are subject, and unless one was certain of all the elements in a horoscope having been correctly recorded, the time inference drawn therefrom may turn out to be widely discrepant from the truth. The obvious inaccuracies in the Mahābhārata references to planets will be commented on in an Appendix. (Paper No. v.)

247. Table V-A showing the increase of the mean longitudes of the principal planets, Mars, Jupiter and Saturn for a period of 2,000 years will be found useful in such investigations. It can be used in various ways, but the most practical way of using it will be illustrated by an example which has itself considerable interest for the student of Tamil literature. The ancient Tamil anthology called *Paripādal*, of which an excellent edition in print was brought out in 1918 by the veteran editor of Tamil classics, Mahāmahōpādya Paṇḍit V. Swāminātha Ayyar, and of which the date of composition is as yet a mystery, contains, in the eleventh canto, a description of the river Vaigai (near Madura) in flood. The author of this poem *Nallantuvanār*, commonly believed to be one of the *sangam* poets, to whom we also owe *Kalittogai*, says (see Text, English translation and commentary extracted below, page 109) that he witnessed the flood on a morning when the moon was eclipsed, when the nakshatra Krittikā ($26^{\circ}7'$ to 40° longitude) was at day-break "high up," i.e., at or near the zenith, when Mars was in Mēsha (0° to 29° longitude), Jupiter was in Mīna (330° to 359°), Saturn was in Dhanus and going towards Makara (say 260° to 269°), Venus in Rishabha (30° to 59°) and Mercury in Mithuna (60° to 89°).

248. This extract from the poem is a horoscope in the true sense of the word, for it is a time-record, though one drawn up on the occasion of the occurrence of a flood, not of the birth of a human child. It is just the kind of horos-

cope that one would expect from the Babylonian prototype. There are many circumstances which make the investigation of this mysterious time-record as difficult as it is interesting. In the first place, if the poem really is very ancient, the poet may have become acquainted only with the mean positions of the planets, and he may have supplemented his knowledge by observing their actual situation in the heavens. Secondly, the above positions are recorded in Tamil verse, whose quaint language cannot be understood even by Tamil readers without a reliable commentary. In this case the commentator, himself an ancient classical author, Parimēlalagar, whose commentary on Tiruvalluvar's Kural is well-known, enjoys the reputation of being thoroughly reliable in literary matters and he may be presumed to be no less so in astronomical matters. Thirdly, neither the lunar month nor the position of the sun is referred to directly in the passage, but from the circumstance that nakshatra Krittikā, whose sidereal longitude is between $26^{\circ}7'$ and 40° , was in or near the zenith at daybreak, the commentator, *Parimēlalagar* infers that the sun must have been at or near 90° from this position, i.e., the sun's longitude must have been between $116^{\circ}7'$ and 130° since he had not yet risen when the nakshatra was in the zenith. If so, the sun must have been in the first few degrees of *Simha rāśi*, and the time must have been within the first few days of the month of *Āraṇi* or *Simha*; this, in fact, is the commentator's own statement. There is a fourth circumstance which the commentator is careful to note as limiting the position of both sun and moon; for he remarks that as it was a time of lunar eclipse in Śrāvana month, the moon must have been in nakshatra *Śrāviṣṭhā* or *Dhanishṭhā* ($293^{\circ}3'$ to $306^{\circ}7'$ according to *Sūrya* and *Ārya siddhāntas*; $294^{\circ}7'5''$ to $307^{\circ}7'40''$ according to *Brahma siddhānta* and *Siddhānta Śrōmaṇi*, see Eye-table, section S); and as the *tithi* or distance from the moon to the sun at the middle of a lunar eclipse is exactly 180° , the sun's longitude could not have been less than $113^{\circ}3'$ or more than 127° whichever of the four siddhāntas was followed; and he could not have been more than 7 days old in *Simha rāśi* or month. An astronomer may be disposed to object that the hypothesis of the sun being in *Simha rāśi* and the moon in *Dhanishṭhā* nakshatra hangs on a single peg, namely on Krittikā nakshatra being exactly at the zenith, but the ancient Tamil commentator *Parimēlalagar* appears to have entertained no doubt on the point. Fifthly, from the position of Mercury, and more especially from that of Venus recorded *by the poet*, 60° to 89° , and 30° to 59° , respectively, when the sun was, *according to the commentator*, between, say, 120° and 127° , it may be inferred (if the commentator is right) that the poet could not have recorded, or even contemplated, *actual* positions in respect of these planets. The possibility that he referred to *actual* positions in respect of Venus and Mercury as well as of Mars, Jupiter and Saturn, constitutes in fact the crux of the problem; and we shall examine this alternative later. It will be seen from the anomaly and equation tables of Mercury and Venus (Table IV of the present work) that their maximum distance from the sun is $26'$ and $48.03'$, respectively (i.e., the sum of maximum equations for each planet in Table IV), whereas according to the poet's description, Venus was not less than $60'$ and Mercury not less than 30° from the sun. Thus, in the case of Venus, it is clear that if the sun was really in *Simha*, the poet could have had in view its *mean* longitude only; and if so, it becomes pertinent to ask whether he did not contemplate *mean* longitudes in the case of the other planets also. This is our sixth difficulty. [The difference between mean and actual longitudes in the case of Jupiter and Saturn is never very much, but Mars's actual position may be removed by as much as 51.6° from his mean position.]

249. Seventhly, and lastly, the poet may have recorded the positions of the planets either actually as he saw them in the heavens, or partly as he saw them and partly as he imagined them from his knowledge of astronomy. As we have just observed, however, he could not possibly have *seen* Venus in the position he has recorded, if the solar month was *Simha* or *Āvani*, as stated by his commentator.

250. Having noted all these seven difficulties, we shall endeavour to solve them, and Table V-A should enable us to do so if there is a solution. To use Table V-A properly, we want two temporary tables which we should make afresh for each problem, and which we shall call respectively "the table for a fixed year" and "the table of moveable years." We note first of all from Table IV the mean

positions of the planets in 1 B.C., i.e., 0 A.D. (which we treat as our fixed year) at a time when the mean longitude of the sun was about 125°, or when about 130 days of the Indian solar year had passed (Table IV-C). This is a good *average* time of the year for the occurrence of a lunar eclipse in Śrāvaṇa.

Table for fixed year 1 B.C. = 0 A.D.

Mean positions of planets at end of 130th day of the Indian solar year, 1 B.C., or 0 A.D.

	Mars	Jupiter.	Saturn.
(1) At commencement of Indian solar year in B.C. 1=0 A.D. (Table IV)	254°74'	163°17'	70°54'
(2) Planets' motion for 130 days (Table IV)	68°12'	10°80'	4°35'
(3) Total	322°86'	173°97'	74°89'
(4) or in nearest degree	323°	174°	75°
(5) Actual geocentric places recorded by the poet	0° to 29°	330° to 359°	270° to 299°
(6) Mean positions corresponding to actual positions recorded by the poet (according to planetary eye-table).	320° to 340°	320° to 348°	274° to 303°
(7) To (4) we have to add in order to arrive at (6) mean positions corresponding to those recorded by the poet	-3° to +17°	146° to 184°	195° to 221°
(8) If the year we are in search of is B.C., then we should in order to reach it, add algebraically to (4)	-343° to -3°	-180° to -210°	-130° to -160°

251. We now see the use of Table V-A which will enable us to construct our second table, the one for moveable years, in other words to determine approximately, as a first step, the year or years A.D. or B.C. when alone the increases in longitude noted in the last two lines (7) and (8) *supra* were *possible*. Line (7) of the table will help us in A.D. years and line (8) in B.C. years.

252. Table V-A does not give the increases of longitude of Venus or Mercury from year to year, because their positions are difficult to follow except in the light of the sun's movements and if the others are right, a difference in the position of Venus and Mercury alone may not matter; on the other hand, if in the year that we fix upon, Venus and Mercury happen to be in the positions required by us, so much the better. The actual positions of both Mercury and Venus depend but to a small extent on their mean longitude and principally on the sun's.

253. It is usually therefore, enough, provided we know the month, to set to work with the three major planets, Mars, Jupiter and Saturn, particularly when we are in search of *actual* positions. We may repeat once more that the mean longitude neither of Venus nor of Mercury is a guide, except indirectly, to their actual position which is determined by the sun's position, coupled with the annual and anomalistic equations of Venus or of Mercury as the case may be. We shall find that the search for the positions of three planets is tedious enough when our object is not merely to find when the planets attained certain *mean* positions, but to locate them in their *actual* positions in a year satisfying all our conditions. In the case of Mars in particular we have to bear in mind that the difference between his actual and his mean position varies according to the time of the year. This fact is made evident by Mars's eye-table, which shows us that in order that Mars may be *actually* in Mēsha (0° to 29°) on or about the 130th day of the year, his mean position should be between 320° and 340°, and the addition we have to make to the mean position of Mars on the 130th day of our fixed year (1 B.C.) in order to arrive at an actual position in Mēsha rāṣi is -3° to +17° which we have accordingly entered in line (7) of the table in paragraph 250. In the case of Jupiter and Saturn we have taken the precaution to extract their mean positions also from their respective eye-tables, but the difference is not very much in their case.

254. We find from Table V-A that the only years out of 4,000 which can possibly satisfy most of the conditions of our search (i.e., those as to the moon being in Śrāvaṇa and as to the mean longitudes of the three planets, Mars, Jupiter and Saturn) entered in line (6) of the table in paragraph 250 are the following. This will be our table of moveable years from which we should be able to select one to suit our purpose finally. It is therefore of the utmost importance to include in

our table of moveable years in the first instance *all* possible years, so that even if we have to make another table for our fixed year, as we shall have to do in this case, we may not have to change our second table or table of moveable years.

255. *Table of moveable years with reference to 1 B.C. or 0 A.D., as a fixed year; 130th day of Indian solar year. Mean longitude in fixed year 1 B.C. (v. line 4 of the table in paragraph 250).*

323° (Mars) 174° (Jupiter) 75° (Saturn)

Limits of increase sought (v. lines, 7 and 8 of the table in paragraph 250), in other words, quantities to be added to the mean longitudes of Mars, Jupiter and Saturn at full moon in Śrāvana, 1 B.C., in order to arrive at the mean longitudes of the same planets at the end of the same tithi in the year sought.

A.D. Years: - 3' to + 17" (Mars) + 150" to + 180" (Jupiter) 200" to 230" (Saturn).
 B.C. Years: - 343' to - 3 (Mars) - 180" to - 210" (Jupiter) - 130" to - 160" (Saturn).

Years.	Day of solar year corresponding to Śrāvana full moon.	Mars. (Table V-A).	Jupiter. (Table V-A).	Saturn. (Table V-A).
<i>A.D. years.</i>				
A.D. 17 (lunar eclipse in Śrāvana—see Table I)	134	14	156	208
A.D. 634 (lunar eclipse in Ashāḍha—Table II)	128	31	161	187
A.D. 694 (lunar eclipse in Āśvina—Table II)	114	355	181	200
A.D. 871 (lunar eclipse in Bhādrapada—Table II, sun's longitude 157°)	185	34	153	203
A.D. 931 (no lunar eclipse)	131	358	173	216
A.D. 1050 (lunar eclipse in Śrāvana—Table II)	134	95	185	230
A.D. 1108 (lunar eclipse in Kārttika—Table II)	123	37	145	219
A.D. 1168 (lunar eclipse in Āśvina—Table II)	129	1	166	232
A.D. 1548 (lunar eclipse in Kārttika—Table II)	115	15	178	195
<i>B.C. years.</i>				
A.D.—160, i.e., 161 B.C. (lunar eclipse in Śrāvana—Guinness' Tables)	..	- 25	- 176	- 155
A.D.—220, i.e., B.C. 221 (no eclipse in Śrāvana but there was a lunar eclipse in May 9, Rishabha solar month—Guinness' Tables)	...	- 349	196	- 168
A.D.—397, i.e., B.C. 398 (no eclipse in Śrāvana, but there was a lunar eclipse in May 17, which would be the month of solar Mithuna or lunar Jyeshtha—Guinness' Tables)	..	- 28	- 168	- 171
A.D.—1572, i.e., 1573 B.C. (no lunar eclipse)	...	- 239	- 186	128

256. The B.C. years will not yield us any date when there was a lunar eclipse in Śrāvana and when the three major planets were in the positions assigned to them by the poet. Although there was a lunar eclipse in Śrāvana of 161 B.C., the mean position of Mars was then such that the planet could not actually have been in Mēsha at full moon in Śrāvana of that year. The other B.C. years in our table of moveable years are not worth investigating, since there was no lunar eclipse in two of them, while in the third, the eclipse was in Jyeshthā, and Mars' mean position (323°—28°, i.e., 295°) was not such as to give us an actual position for that planet in Mēsha.

257. Incidentally, we may note first that Table V-A is equally useful for a search up to 2000 B.C. or down to A.D. 2000, or for any period of 4,000 years in all. Secondly, in order to use Table V-A, it is not necessary that we should make a start always with mean longitudes of 1 B.C. We may start by calculating mean longitudes for any year B.C. or A.D. and, with that as a fixed year, proceed to determine, by addition or subtraction according to Table V-A, the mean longitudes attained on the corresponding day in any other year which we may call the moveable year. The mean longitudes of the three superior planets for every 10 completed days in the principal years from which, according to the nature of the problem, the choice of a fixed year will have to be made are given at the beginning of Table V-A. These years are 3201, 3102, 2101, 1101, 101, 1 B.C. and A.D. 1000 and 1800. The advantage of making a start with 1 B.C. or 0 A.D. is that each one of the moveable years in our field of selection (the second table) becomes *ipso facto* an A.D. year. This, however, is an advantage which we can easily forgo, provided there is any reason for choosing a fixed year other than 1 B.C. The method of subtraction for B.C. years has obvious inconveniences and it will

* "Tables of Vernal Equinoxes and New Moons for 3,555 years" By H. Grattan Guinness, D.D., F.R.S., (London—Hodder and Stoughton, 1896).

generally be better to use the method of addition even for B.C. years, as illustrated in section iii of this chapter, on Rāma's horoscope (paragraph 294, p. 118 below).

258. In A.D. years, if we apply the test of a lunar eclipse in Śrāvana month which, as is the case with eclipses always, ought to be a conclusive test, and *if the ancient commentator is right*, there is only one year which satisfies more or less the Paripādal horoscope, although some critics may demur a good deal to accepting it; and that is A.D. 17 in which the actual positions of Mars, Jupiter and Saturn were, as any one may, with a little trouble, satisfy himself by following the instructions in paragraphs 237 and 239 *supra*, or much more quickly by using tables V-A and V-B.

Mars 25°5' in Mesha.

Jupiter 334° or 4° in Mīna.

Saturn 274°1' or 4° in Makara.

Venus' mean longitude at the same date was 28° which was only 2° short of Rishabha; it has already been shown (paragraph 248) that Rishabha was an impossible rāsi for the actual position of Venus under the given conditions; in A.D. 17 on Śrāvana full moon day she was *actually* in 90°02' (end of Mithuna or beginning of Karkāṭaka). Mercury's mean longitude at Śrāvana full moon of 17 A.D. was not Mithuna, but 252°77' (Dhanu) and his actual position was 156°02' (Kanya).

259. Among the possible A.D. years which we selected with the help of Table V-A there is only one, other than A.D. 17, in which there was a lunar eclipse in Śrāvana month, and that is the year A.D. 1050; but in that year Mars' increase of mean longitude was +95° which would never give us an actual position for Mars in Mēsha (in fact it yields an actual position 92°57' i.e., 3 degrees in Karkāṭaka, the fourth rāsi instead of the first). Also, in A.D. 1050, neither Venus' mean, nor her actual position, was satisfactory. Therefore, apart from considerations of the probable period of the literary work *Paripādal*, A.D. 1050 must be rejected.

260. The fixation of A.D. 17, as a date for the poem, however satisfactory it might be to the upholders of the theories propounded by the late Mr. Kanagasabhai Pillai (in his *Tamils 1,800 years ago*) and by Mr. A. Kumāraswāmi (quoted by Dr. HULTZSCH in *South Indian Inscriptions*, volume II, Part iii, p. 378, 1895), namely, that the extant *Saṅgam* literature in Tamil was produced in the first century A.D., runs counter to all probabilities, as inferred in paragraph 245 *supra*, of the period when Indian astronomers could have begun to calculate the movements of the planets. There is a bare *possibility*, as the writer has already hinted, that the South-Indian astronomers received the elements of the planetary motions from a direct Chaldean source in the centuries immediately preceding the Christian era, but it has to be remembered that there is no *evidence* of their having habitually cast horoscopes before the seventh century A.D. It would appear that from Alexander's time at least the Śramāṇas (or Jains) boasted of an astronomical learning equal or superior to that of the Brahmanas, and possibly the Jain astronomy inculcated a knowledge of the planetary motions, and Jains were plentiful in Southern India from the fourth century B.C. There is also a good deal that has a look of great antiquity about it in the way in which the Tamil people have clung to the solar reckoning when all the rest of India practically followed the lunar reckoning, in the peculiar way in which they name some of the solar months when ordinarily all other month-names have been confessedly borrowed from Sanskrit, in the many variations of solar month-names, to be found among primitive tribes in Southern India, e.g., Tulu month names, noted by Dr. BURNELL in his *South Indian Palaeography*, and Toda month names on the Nilgiris, noted in Dr. RIVERS' *Todas*; and lastly in the many synonyms which are to be found, in Tamil only, for the names of nakshatras. (See *Piṅgala Nigandhu*.)

261. Still, before accepting A.D. 17, one would like to know something about the other evidence for the relative age of this poem *Paripādal*, as compared with other works of the *saṅgam* age. Most of the productions of that age which have come down to us have come down only as anthologies, and this is a class of literature peculiar to Tamil. Hundreds of poets are known to have flourished during the *saṅgam* age in each part of the Tamil country: of a very few of them

like Tiruvalluvar, Ilango-Adigaḷ, Sittalai Sāttanār, Tiruttakkatōvar (authors of the well-known *Kural*, *Śilappadikāram*, *Manimēkalan*, and *Jiraka Chintāmani*, respectively) we have entire works that have come down to us, as *sangam* works: all the rest are preserved either by name only or in ancient anthologies, called *Padirrupattu*, *Pura-nānūru*, *Aha-nānūru*, *Nālaḍi*, *Narriṇai*, *Kurunogai*, etc.; and we are left to conjecture the period during which these poets' works must have been current, each in its entirety, before *their* posterity thought it prudent to preserve them in anthologies or excerpts of their works; and such abridgements must have been necessitated by the rapidly accumulating bulk of literature and the difficulty and expense of making copies of entire works. The careful way, too, in which these anthologies were compiled, the number of genuinely good poets whose remains are, as it were, enshrined in them, and the scrupulous accuracy with which they were annotated by eminent commentators, some of them men not less famous than the authors whom they annotated, must make us pause before we can limit the *sangam* period, (even supposing it came to an end about A.D. 800), to less than three or four hundred years before that date; that is, nobody would have taken the trouble that has been taken with these anthologies or in editing so systematically such minute extracts unless the poets' names were really ancient and nearly as venerable then as they are now. In the allegorical language of the legend associated with the origin of *Nālaḍi*, the *sangam* editors were so fastidious in their choice that they salvaged only those productions which had resisted the devastating flood of time. See further Paper No. (iii) in Appendix "on the chronology of early Tamil Literature."

262. About *Paripādal* itself, its venerable editor in print tells us in his preface that he was able to secure only two manuscripts (which were copies, the one transcribed from the other) containing the extant portions of the anthology (20 out of 70 ancient selections), and certain other manuscripts containing a few fragments: and it is scarcely likely that any portion of this work, not already published by Mr. Swāminātha Ayyar, will ever come to light hereafter and help us to unravel the age of its composition, or, supposing that it really belonged to the first century A.D., to enlighten us as to how the poet acquired his knowledge of planetary astronomy. Even so, other portions of the Paripādal anthology which deal with developments of Śaivism and Vaiṣṇavism seem to be more recent than the first century A.D., if we are to follow Dr. Bhandarkar and other eminent authorities.

263. We have so far given full credit to the ancient commentator Parimēla-lagar for correctly interpreting the poet, but we have done so at the expense, so to say, of the positions of the inferior planets, to one of which only (viz., Venus) the commentator's hypothesis of sun in Sīmha and a lunar eclipse in Śrāvana month allows even an approximately correct mean position, while Mercury's position, whether mean or actual, has to be abandoned altogether on that hypothesis. Also, the time of lunar eclipse in Śrāvana month in A.D. 17 was not the morning but, as any one may satisfy himself by computing the sun's and moon's anomalies and equations, at 55 of the day (i.e., an hour after sunset) on the 27th July A.D. 17. This is the first feature that strikes us as defective in the commentator's hypothesis; for the poet says that, when Krittikā nakshatra was at or near the zenith at daybreak on a certain day, "presently" (the poet is careful to use the expressive Tamil adverb *ollai*, i.e., "presently"), there was an eclipse of the moon. The poet would not have referred in these terms to an eclipse which had occurred the previous evening or which was to occur in the evening of the day when Krittikā was near the zenith in the morning.

264. We are reluctantly led to the conclusion that the commentator was, like ourselves, trying to make the best of an obscure text, but that not having at hand the astronomical tables that we have, he hazarded his hypothesis about the lunar eclipse having occurred in the month of Āvani or Sīmha, when the moon was in nakshatra Dhanishṭhā or Śravisṭhā, simply because Krittikā nakshatra was thought by him to be then at or near the zenith, and also fell into the error of supposing that a position of the sun in Sīmha rāsi was compatible with Mercury being actually in Mithuna or with Venus being actually in Rishabha.

265. It is somewhat dangerous, even in a purely astronomical speculation, to reject the authority of a commentator like Parimēla-lagar, but the astronomical

critic cannot discharge his duty unless he exhausts every reasonable alternative that presents itself; and after all, it seems to be more than doubtful whether Parimēlalagar was the real author of the commentary on *Paripādai* which passes under his venerable name.

266. A lunar eclipse in Āshādha month, with the sun about 90° in mean longitude, is no doubt more compatible with actual positions for Venus and Mercury in Rishabha (30° to 59°) and Mithuna (60° to 89°) respectively, and we have a year among the A.D. years in our table of moveable years in paragraph 255, when there was a lunar eclipse in Āshādha, and that is the year 634 A.D. This eclipse occurred on 17th June 634 A.D., and the exact time of its occurrence, according to the Ārya siddhānta, as will be seen from one of the specimen problems worked out under the Ārya siddhānta Eye-table (p. 159) was 4,42½ a.m. The centre of the eclipse, according to Sūrya siddhānta was the moment of sunrise. (The reader should be able to verify this from Table II and Sūrya siddhānta Eye-table e, h and y.) It looks as if we had got hold of the very kind of lunar eclipse (*grastāsthama*na, i.e., the setting of the moon in a state of eclipse, see paragraph 29) that the poet says he actually beheld. It is true that in making a bid for this eclipse, we are setting aside the *commentator's* hypothesis, that because *Krittikā* (30°) was in the zenith at day-break, the sun must have been in or about 120° sidereal longitude. But the *poet's* description of *Krittikā* may mean “at or near the zenith” and it is just as reasonable to suppose that a Tamil poet using the word *uyar* (உயர்) in this context may have employed it to mean “high up” as that he meant “at the zenith.” The eclipse was a partial one of 1½ digits and occurred, according to *L'Art de Vérifier les Dates* (the standard French work quoted in paragraph 134 supra) at 11–30 p.m. in the Paris meridian, i.e., about 4½ a.m. next day in the meridian of Madura. At this time the moon was eclipsed for an hour (see paragraph 135). The point of the ecliptic rising at that hour must have been that which rose two hours before the sun, i.e., the 59th degree of the celestial longitude. *Krittikā* nakshatra whose initial longitude is from 20° to 26° (according to the siddhānta followed) must have been at this time (4 a.m.) at least about one-third way up the heavens. By sunrise *Krittika* would have advanced to a point in the heavens about 30° from the zenith to the east. At 4–30 a.m. the darkness of the eclipse, though it was partial, would be such as to allow stars to be distinguished, notwithstanding the full moon, and *Krittikā* would still be fairly high up; and 4–30 or 5 a.m. is apparently the time indicated by the poet's expression *pular vidiyal*, i.e., at the first dawn.

267. If we search for a suitable year with a lunar eclipse in Āshādha month and with Mars, Jupiter and Saturn in the positions recorded by the poet, we shall want a preliminary table somewhat different from the one in paragraph 250 with which we started. Our starting points for 1 B.C. will then be as follows:—

	Mars.	Jupiter.	Saturn.
(1) Commencement of Indian solar year in 1 B.C., A.D. 0	254° 74'	168° 17'	70° 54'
(2) Planets' motion for 89 days . . .	46° 64"	7° 39"	2° 98"
(3) Total . . .	301° 38'	170° 56"	73° 52"
(4) or in nearest degree . . .	302°	171°	74°
(5) Positions recorded by the poet	0° to 29°	330° to 350°	270° to 290°
(6) Mean positions corresponding to those recorded by the poet (by Planetary eye-tables)	314° to 347°	320° to 350°	274° to 303°
(7) Number of degrees to be added in each case to (4) in order to arrive at (6) . . .	12° to 45°	150° to 180°	200° to 230°

For Mars we shall now want an increase of longitude (over and above his 1 B.C. longitude) of 12° to 45°, for Jupiter 150° to 180°, and for Saturn 200° to 230°. We see that these limits are not such as to modify our second table or table of moveable years, on page 103, that is to say, the years included by us in that table will serve us as the possible years in this case also. And there is only one year among the A.D. years included by us in the table on page 103 which had a lunar eclipse in Āshādha. The possible year 398 B.C. when the sun was in Rishabha has to be rejected, because Mars, at the eclipse of that year was, as already stated

(paragraph 256) not in Mēsha. (If Bhādrapada or Jyēshtha were suitable months for the lunar eclipse and for the sun's position, we would have to change our starting table again, but we know—paragraphs 248 and 256—that the month of Bhādrapada would be too late for the recorded positions of Mercury and Venus and in Jyēshtha the sun would be too near Krittikā nakshatra. Moreover our second table would not be different for Jyēshtha, for which the limits of increase of longitude for Mars would be -9° to $+30^{\circ}$, limits already included in our table of moveable years, and in that table there is no lunar eclipse in Jyēshtha.)

268. The mean longitudes of the five planets at mean sunrise (6 a.m.) on 17th June A.D. 634 (full moon tithi of lunar Āshādha month when the moon was in a state of eclipse), were as follows:—

	Mars	Jupiter	Saturn	Venus	Mercury
Mean longitudes	341 92'	340 83'	262 41'	296 28'	371 56'
actual geocentric places	16 12	339 53'	256 51'	41 53'	70 38'
and the Rāsis	Mesha	Mina	i.e., second-half of Dhanus, 13' short of Makara.	Rishabha	Mithuna

This seems far more satisfactory than the uncertainties in which we were landed by our first attempt to follow the ancient commentator's hypothesis at all costs. All the planets are now in the actual positions recorded by the poet and we have not lost even one, not even Mercury, though we made no special endeavour to search either for that planet or for Venus. It is true that our result for Saturn is 13' short of Makara but that in all probability is what the poet himself means. His verse (see page 109 below) may be translated: "Saturn was at the end of *vil* (i.e., Dhanus) and was going to Makara," which makes much better sense of the text than the commentator's gloss: "Saturn was in the rāsi following Dhanus, i.e., in Makara." Moreover, as happily pointed out to the author by Mr. Manikka Nayagar, Tamil *virṅkadai* might mean what the commentator says, but Tamil *vilṅkadai*, the expression actually used by the poet, can only mean "at the end of *vil*, i.e., of Dhanus" not "after Dhanus." The commentator is, however, right in noting that the poet evidently views with satisfaction the fact that each of the planets Mars, Jupiter, Saturn, Venus and Mercury was either in his own house (svakshetra) or, (in the case of Saturn) going to it. In astrology, Mars permanently owns, or is lord of, Mēsha, Jupiter is lord of Mina, Saturn of Makara, Venus of Rishabha, and Mercury of Mithuna. A planet like Saturn going to his own house is said to be very powerful, even though he may not be actually in it. We have also to note (see paragraph 297 below) that according to the Sūrya siddhānta, Saturn's place in 101 B.C. was 6° in advance of the place assigned to him in this work, and in A.D. 900, the planet occupied nearly the same place as he would by this work. In A.D. 600 his place by Sūrya siddhānta must have been at least 2.4° in advance of what is deducible from the present work. We say "at least" 2.4° , because subsequently a *bija* was admitted in the case of Saturn which, if it had been accepted or adopted in A.D. 634, would have had the effect of advancing by several degrees the position of Saturn, just what we want in order to satisfy the commentator; but we must at the same time remark, that the *bija* was in all probability adopted after A.D. 900 when the position of Saturn by Sūrya siddhānta began to fall behind his actual position in the heavens (see Table in paragraph 297, page 121 below, and also Burgess' *Sūrya siddhānta*, page 165, and Bentley's *History*, page 126). We may take it that Saturn's mean place by Sūrya siddhānta was about 260° or 10° short of Makara. What tables were used in India in 634 A.D. for ascertaining Saturn's actual place we do not know. On the particular morning in question, Saturn was above the horizon when the sun

was rising (sun being in 86th degree and Saturn in 256th of longitude). About 5 a.m., Saturn may have been just above the horizon or just below it; but the poet evidently was able to calculate where Saturn was at the time, whether or not he saw it in the heavens during the eclipse.

269. The poet does not say that the sun was in Simha; which he would surely not have omitted to note if that had been the case, because Simha is the sun's own house and the poet evidently noticed the fact that the five planets Mars, Jupiter, Saturn, Venus and Mercury were each in (or going to) his own house. The moon's own house is Karkāṭaka or Cancer, and the moon just then was in Dhanus (2:6° mean longitude).

270. On the whole, we need have no doubt now but that the poet was writing about the lunar eclipse which happened at or a little before sunrise on 17th June A.D. 634; and if our solution is at all near the mark, it furnishes us with a very reliable landmark in the history of Tamil *Sangam* literature, a landmark which, incidentally, is in perfect accord with another which was brought to light by the author some years ago, viz., the date A.D. 756 to be inferred from *Silappadikāram*.* If Tables V-A and V-B had rendered to chronology no other service than to enable us to solve this one chronological riddle, they would be worth all the trouble expended on their compilation. Table V-A is most useful when we know for certain the solar or the lunar month of a horoscope; but it is equally useful when we have to guess the month in the first instance; for the positions of Mercury and Venus will then enable us to make a rough guess of the month, and for Mars we need only a table of moveable years with fairly wide limits of increase of longitude, like the one we actually framed with the help of the Mars Eye-table. The limits of Jupiter and Saturn do not vary very much, as we may see from their Eye-tables, for one month or for another. It is well to note thus the different ways in which our tables of fixed and moveable years should be adjusted to suit the mean and actual movements of the different planets.

271. The author has already taken the opportunity, in paragraphs 216 to 219, to warn the reader that in fixing the mean sidereal periods of planetary revolutions adopted in this work, he has followed, so to speak, no particular siddhānta but a siddhānta of his own. The reasons for this unusual procedure on his part are (1) that no two siddhāntas agree in this important matter, (2) that *bījas* are freely admitted for planets in the Indian siddhāntas, and one can never be certain in epigraphical research whether a particular record did or did not make allowance for *bīja*, (3) that one never knows which siddhānta to follow, (4) that where there is an antecedent probability, as in the case of the visible planets, that the person who framed a record did so after checking his calculations by ocular observation of the planets themselves in the heavens, more weight should be attached to the actual position of the planets, as a guide in fixing the time of the record, than to the particular siddhānta which may have been followed or to the particular *bīja* which was or was not allowed for. Experience, and the unsolicited testimony of numerous correspondents, particularly of Mr. Ketakar, the well-known author of "*Jyōtiḥ-Gaṇita*," has shown that the present author in employing his own planetary siddhānta in Table V-B, has hit off, very accurately, for purposes of historical research, the actual positions of all the five planets. In the particular case expounded in this section, the place assigned to Saturn agrees very well with that which would follow from Professor Jacobi's Tables published in *Ep. Ind.*, Vol. XII (1912). The mean place of Saturn on the day in question was, according to Professor Jacobi, $294^{\circ} + 322^{\circ}, 37' + 5^{\circ}, 33'$ or $262^{\circ}, 10'$ whereas the mean place found above and fully worked out in paragraph 239 supra is $260^{\circ}, 24', 6''$. (It has already been shown in paragraph 268 that according to Sūrya siddhānta, without *bīja*, which Professor Jacobi follows, Saturn's place in A.D. 634 must have been 2' in advance of that arrived at by means of this work.) The actual place, according to Professor Jacobi, must be equally close to the actual place arrived at above, because his tables, like those in Table IV of this work, are taken from Warren, who adopted them from *Vāṇilāla Kuchinna*, a Telugu astronomer of the twelfth or thirteenth century A.D.

* See paper iii in the Appendix, "Notes on the Chronology of Early Tamil Literature."

Paripādal, canto 11, lines 4—10.

(Edition of 1918 by Mahāmahōpādhyāya V. Swāminātha Ayyar.)

The Tamil Text.

Urugelu velli vandēṛriyal sēra
varuḍayyay ppaḍimakan vāyppa pporuḍeri
pundi mitunam porunda ppularviḍiya
lanki¹ yuyarniṛpa vandauṇṇ pankuvi
ṇillattunaikkuppā leyda viṇayamaṇṇ
villiṛ kaḍaimakara² mēvappām pollai
madiya maṛaya³ varunaḷil.

உருகெழு வெள்ளிவந் டதந்தியல்சேர
வருடைசையப் படிமகன் வாய்ப்பப் பொருடெரி
புந்தி மிதுனம் பொருததப் புலர்விடிய
லங்கி யுயர்நிற்ப வந்தணை பகருவ
னில்லத்தனைக்குப்பா லெய்த விநையமன்
வில்லிற்கடைமகர மேவப்பாம பொலலை
மதிய மறைய வருநாளில்.

English translation.

“On a day when bright Venus joined with the Bull, when Mars obtained the Ram, when wise Mercury joined with Mithuna, at the first dawn, when Kṛittika stood high¹ up, when Jupiter was beyond the two houses of Saturn, and when Saturn was at the end of Dhanus and going to Makara, and Rāhu³ was fast causing an eclipse of the moon”

Parimelaḷagar's Commentary.

¹ “The poet says that Kṛittika was on high at daybreak in order to indicate that the sun was in Simha.

² “i.e., when Saturn, the brother of Yama, had reached Makara which comes after Dhanus.

³ “The meaning of pāmpollai . . . varunaḷ is that it was Śravishṭha nakshatra on the full-moon day of the month of Āvani. Therefore, it is evident that the moon and Rāhu were in Makara, and Kētu in the seventh house from Makara, i.e., in Karkāṭaka.”

“The sense of the passage is ‘at an eclipse of the moon on a day of nakshatra Śravishṭha in the month of Āvani, when the planets were in the rāsīs which are their own houses.’”

SECTION III.—*Perpetual Planetary Almanac.—Ascertainment of the actual place of a planet (Mars, Jupiter, Saturn, Venus or Mercury) on any day in any year between 3102 B.C. and A.D. 2000.—Rama's and Sankara's horoscopes.*

272. The reader who has followed attentively the observations made in the last section will have noticed (1) that it is a comparatively easy matter, with the help of Table V-A, to ascertain the year or years in which the planets Mars, Jupiter and Saturn attained any specified mean longitudes, but (2) that it is by no means easy to arrive at the actual places of these planets on the dates that we wish to examine, if our method of computation is to be that prescribed in paragraphs 237 and 239; and (3) that the ascertainment of the mean longitudes of Mercury and Venus in any year does not give even a rough indication of their actual places which depend mainly on the sun's longitude and to a very minor extent on the mean longitudes of the planets themselves. Much of our difficulty would disappear, if having been given a particular mean longitude for a planet, we could ascertain at once, without going through the 12 steps described in paragraphs 237 and 239 *supra*, the actual place of the planet. It is proposed to show in this section how the task of the investigator in this respect can be simplified without any risk to the accuracy of the result.

273. The most useful device in astronomy for calculating the moments of occurrence of phenomena in times long past is by means of cycles of recurrence. It will be shown in an appendix that the body of the present ephemeris was constructed upon a basis of cycles of recurrence in respect of the ending moments of tithis and nakshatras and their equations. In the same way we can make use of certain cycles of recurrence in the case of planets also. The principal cycles of recurrence for planets are noted at the beginning of Table V-A and the reader will do well to study carefully the effect of each cycle which will be explained presently. We learn from the *Encycl. Brit.* (11th Edition) art. *Astronomy, History*

of —, that the Babylonians of the second century B.C. used some of the very cycles of which we are about to learn the use, viz., 79 years for Mars, 46 years for Mercury, 83 years for Jupiter, 8 years for Venus and 59 years for Saturn.

But we want longer cycles than these if we wish to extend our calculations over long periods of time without sacrifice of accuracy. The most useful cycles for our purposes are accordingly the following, to most of which the reader has already been introduced in paragraph 222 :—

- | | | |
|--|----|-------------|
| (1) For Mars, 363 years ; increase of mean longitude | .. | + 0·107944° |
| (2) For Jupiter,* 605 years ; increase of mean longitude | .. | + 0·19714° |
| (3) For Saturn, 383 years ; decrease of mean longitude | .. | — 0·091586° |
| (4) For Venus,* 235 years ; decrease of mean longitude | .. | — 0·3897° |
| (5) For Mercury, 355 years ; decrease of mean longitude | .. | — 0·091505° |

There are other cycles which are tabulated at the beginning of Table V-A, but the above are so important that an investigator should be able to recall them and the corresponding increases or decreases of longitude from memory to at least two decimal places.

The meaning of the above cycles of recurrence is this : After 363 years from any given date, reckoned by the solar day of any Indian year, say the 10th solar day, the 100th solar day, the 125th solar day, etc., of Indian solar year 1 B.C. or A.D. 0, the planet Mars returns to the same mean longitude as at the beginning of the period of 363 years, increased by $\cdot 11^\circ$. Now the actual position of Mars is determined by a certain algebraical addition to his mean longitude, which addition in turn depends upon the difference between the mean longitudes of the sun and Mars on that date and the difference between Mars' apsis and Mars' mean longitude. On any given solar day, say, the 10th, the 20th, the 200th, or the 325th day of the Indian solar year, etc., the sun's longitude is always the same from year to year, the very slight variations noticed in paragraph 189 *supra* being negligible for our present purpose ; and the longitude of the apses of all our five planets do not vary from year to year as will be seen from Table IV. Consequently, when Mars' mean longitude on any solar day of the year is the same or practically the same as on the same solar day at the beginning of our 363-year period, it follows that his actual place must also be the same as at the beginning of that period. The same observations apply to Jupiter after 605 years, to Saturn after 383 years, to Venus after 235 years and to Mercury after 355 years, making allowance for the fact that the actual places of Venus and Mercury follow closely those of the sun. Since the increase or decrease of longitude after each of these cycles of recurrence is less than half a degree, it follows that even after four cycles of recurrence, which in the case of the shortest cycle, that of Venus, is equal to 1,040 years, the difference in mean longitude is still negligible for our purpose ; indeed, in the case of Jupiter, Saturn and Mars, which are the most important planets, we may repeat the cycles of recurrence up to 2,000 years without any sensible difference in the actual place of any of these planets ; and in the case of Venus there is an important cycle of 948 years (noticed in paragraph 222 *supra*) which makes it possible to construct out of our cycle of 235 years a table of geocentric places for Venus for 10,000 years without any appreciable risk of error.

274. If, therefore, we could calculate the actual places of planets for 235 years in the case of Venus, for 355 years in the case of Mercury, for 363 years in the case of Mars, for 383 years in the case of Saturn and for 605 years in the case of Jupiter, we should have the means at our disposal for ascertaining the actual places of these planets on any day in any year for a period of 2,000 or any number of 1,000 years forwards or backwards. Table V-B gives the actual places of these planets for every 10 days, for 235 years in the case of Venus, for 363 years in the case of Mars, for 344 years in the case of Jupiter, for 383 years in the case of Saturn and for 355 years in the case of Mercury. In the case of Jupiter alone, the cycle fully calculated in Table V-B, and used in Table V-A, is shorter than the cycle of 605 years first mentioned, but the shorter Jupiter's cycle of 344 years, combined with a still shorter cycle of 261 years, is capable of yielding results fully equal in accuracy to those obtainable with the major cycle of 605

* Jupiter's cycle of 1554 years and Venus' cycle of 948 years were used in paragraph 222 *supra* in preference to the shorter cycles of 605 and 235 years here mentioned.

years. After 344 years, Jupiter's mean longitude is changed by -0.46832° ; after 261 years more his mean longitude increases by $+0.69111^\circ$, so that at the end of $344 + 261$ or 605 years, his mean longitude increases by $0.69111^\circ - 0.46832^\circ = +.2227^\circ$, the figure given above. It would of course be more satisfactory if we could have tables of actual places calculated to the longest periods of recurrence in the case of all the planets, but two considerations prevented the author from attempting such a gigantic task. The first was that the calculation of tables of actual places is a tedious process and is recognized as such by astronomers in the west as well as in the east. For the Indian Chronology (1911), and the first instalment of "Indian Ephemeris, A.D. 1800 to A.D. 2000" (published in 1915), the author calculated the actual places of planets for every 10 days in the year from A.D. 1840 to 1999—2000 A.D., in all about 160 years. These places have now been extended, as will be seen from Table V-B, to 235 years (Venus), 344 years (Jupiter), 383 years (Saturn), 363 years (Mars) and 355 years (Mercury). The second consideration was that so little use is likely to be made of these lists of actual places for the purpose of *historical* investigation, that it did not seem worth while to expend the additional time and trouble that would be necessary for constructing tables for cycles of recurrence longer than the above, when no corresponding improvement in the accuracy of results was in prospect. The single example of a useful planetary investigation in Tamil literature, commented on in section (ii) of this chapter, encouraged the author to expand his original table for 160 years into the present Table V-B, which is practically a perpetual planetary almanac, and which ought to answer the needs of the most fastidious investigator.

275. In order to use Table V-B for historical investigation, it is necessary to take from it the geocentric places of the planets for a particular day and apply them to any year past or future according to the key furnished in columns 5—9 and 11—15 of Table V-A. Column 1 of Table V-A gives the list of years from A.D. 1 to A.D. 2000, while column 10 of the same table gives the list of B.C. years from 1 B.C. to 1024 B.C. The reader will please note that columns 2, 3, 4 of Table V-A give the increase or decrease of mean longitudes of the three principal planets Mars, Jupiter and Saturn for any number of years reckoned forwards or backwards from a fixed year. The further use to be made of these columns in historical investigations has been fully explained in section ii of this chapter, paragraph 251, etc. The reader is, therefore, now concerned only with column 1 and columns 5 to 15 of Table V-A. An illustration will best show how these columns are to be used in conjunction with Table V-B. The first line of Table V-A reads as follows (omitting columns 2, 3 and 4, the use of which has been fully explained in section ii of this chapter).

Table V-A.

Col. 1	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12	Col. 13	Col. 14	Col. 15
	Mars.	Mercury.	Jupiter.	Venus.	Saturn.	B.C.	Mars.	Mercury.	Jupiter.	Venus.	Saturn.
A.D. 1	1816	1776	1816	1897	1916	1	1815	1775	1815	1896	1915.

This means that if we wish to know the actual position of Mars, say, on the 200th day of the Indian solar year in A.D. 1, it was the same (with a small cyclic variation) as Mars' actual place on the 200th day of A.D. 1816 (Table V-B); Mercury's actual place on the 200th day of A.D. 1 was the same as his actual place on the 200th day of A.D. 1776 (Table V-B); Jupiter's actual place on the 200th day of A.D. 1 was the same as his actual place on the 200th day of A.D. 1816 (Table V-B.); while Venus and Saturn, on the 200th day of A.D. 1, stood exactly where they stood, according to Table V-B on the 200th day of A.D. 1897 and A.D. 1916, respectively.

Similarly the actual places of the five planets on the 100th day of 1 B.C. were the same as their actual places on the 100th day of A.D. 1815, of A.D. 1775, of A.D. 1815 of A.D. 1896 and of A.D. 1915, respectively.

These places can be verified by actual calculation and they will be found to be the same as those given by the key in Table V-A, the cyclic variation in no case exceeding a degree. In the case of Mars, Jupiter and Saturn the exact variation is found as follows from the interval between the given year and the year which corresponds to it in the current cycle.

(Mars) The interval between A.D. 1 and A.D. 1816 is 1,815 years $= 5 \times 363$ years.

The cyclic variation in Mars' place for 5 cycles of 363 years each = $5 \times (+.107 \text{ degree}) = +.535 \text{ degree}$ or $32'$.

(Jupiter) The interval between A.D. 1 and A.D. 1775 = 1554 + 261 years. The cyclic variation in Jupiter's place for this interval = $-.09 + .68 = +.59 \text{ degree}$ or $36'$.

N.B.—1554 years is a major cycle of Jupiter, vide paragraph 222 supra.

(Mercury) The interval between A.D. 1 and A.D. 1776 = 1,775 years = $5 \times 355 \text{ years}$.

The cyclic variation in Mercury's *mean* place for this interval is $5 \times (+.09) = +.45^\circ$, but since Mercury's *actual* place depends mainly on the sun's place and to a comparatively minor extent on his own mean place, it will be found by calculation that Mercury's place in A.D. 1 did not differ by even $.45$ of a degree from his place on the same solar day in A.D. 1776.

The same remark applies to Venus, in whose case the interval between A.D. 1 and A.D. 1897 = 1,896 years = a major cycle of 1,661 years + a cycle of 235 years.

(Saturn) The interval between A.D. 1 and A.D. 1916 is 1,915 years = $5 \times 383 \text{ years}$. The cyclic variation in Saturn's place corresponding to this interval is only $5 \times (-.08) = -.40 \text{ degree}$ or only 24 minutes.

276. An actual example from a case with which the reader is already familiar will show not only the practical use of Table V-A in historical investigations but also the degree of accuracy—a very important point—which we may expect to attain by its means. Supposing we take the mean positions of the planets for any one of the years in the table of moveable years in paragraph 254 supra and wish to know the actual places of the planets on that particular date, taking first the year A.D. 634 which we found was a probable year, the actual longitudes (called geocentric places) of the planets at the completion of 89 days of the solar year in the year A.D. 634 were as follows:—

Places of planets on 89th complete solar day, A.D. 634.

[For the method of obtaining from the column "90 days" in Table V-B the places of the planets on 89th complete day, see N.B. to paragraph 285 below].—

	Table V-B.	Actual place ascertained by calculation, paragraph 287 or 289.
Table V-A. Mars A.D. "1723" $-.3 = 17.8 - .3 = 17.5^\circ$		17.12
" Mercury A.D. "1699" $= 70.4^\circ$		7.04
" Jupiter A.D. "1844" $-.4 = 340.5^\circ$		340.5
" Venus A.D. "1817" $= 42.8$		41.6
" Saturn A.D. "1783" $+.3 = 256.4^\circ$		256.4

The A.D. years entered above are the years in the current cycle (Table V-B) in which the several planets attained the same places as they did in A.D. 634. The decimal places, $-.3$, $-.4$ and $+.3$ are the cyclic variations.

It will be seen by comparison with the results of actual computation in paragraphs 237 and 239 that practically correct results can be obtained as above by mere inspection of Tables V-A and V-B. In the same manner we can obtain the actual places of the five planets for any of the other years tabled in paragraph 255 supra and satisfy ourselves that the year A.D. 634 is the only suitable date.

277. We may consider another example, that of Rāma's horoscope, along with which we may treat Śankara's horoscope as given in Mādhavachārya's *Śankara-vijayam*. We are told, in Vālmiki's Rāmāyana, that Rāma was born "in the twelfth month Chaitra (this is the southern version), on the ninth tithi, on a day of nakshatra Punarvasū, when five planets were in their houses of exaltation, and when Jupiter was in Karkāṭaka, as lagna, along with the moon" Mr. M. N. Dutt's translation of the Rāmāyana, which presumably follows some northern version, has: "and then, when the six seasons had rolled away after the completion of the sacrifice, in the twelfth month, on the ninth lunar day, under the influence of the Punarvasū asterism, when the sun, the moon, Saturn, Jupiter and Venus

were at Aries, Capricorn, Libra, Cancer and Pisces, and when Jupiter had arisen with the moon at Cancer, Kauṣalyā gave birth to the Lord of the Universe."

278. We may follow the southern version as being self-consistent, while Mr. M. N. Dutt's version places the moon simultaneously in its house of exaltation (Rishabha) and in the lagna (Karkaṭaka) which is impossible. The first *Moon* in Mr. M. N. Dutt's version is probably a printer's error for *Mars*, because *Capricorn* or *Makara* is Mars' house of exaltation, not the moon's. The reader unacquainted with astrology may have to be told that a planet's own house (vide paragraph 268 *supra*) is different from the house of exaltation now in question.

279. We may take it then, that the five planets in exaltation in Rāma's horoscope were, —the sun in Mēsha (0° to 29°), the moon in Rishabha (30° to 59°), Mars in Makara (270° to 299°), Jupiter in Karkaṭaka (90° to 119°), and Saturn in Tula (180° to 209°).

280. We note that the month, solar or lunar, in which Rāma was born is described as the twelfth month. Chaitra month is mentioned in the southern version, and Chaitra can be described as the twelfth month only with reference to the solar year, since it is the first month of the lunar year (paragraph 152 *supra*). When the Rāmāyana was first composed, i.e., some few centuries before the Christian era, we may be certain that the practice of casting horoscopes at the birth of a child, however royal or divine, was entirely unknown, and it is very doubtful if the Hindus of that age were acquainted with the names, much less the movements, of any planets other than the sun and the moon. As already surmised (paragraph 245), the practice of casting horoscopes must have come into vogue about the time of Varāhamihira (sixth century A.D.) and the casting of Rāma's horoscope, whether it was deliberately cast with reference to a particular date, or merely imagined with reference to the supposed superexcellence of the planets presiding over his birth, may be ascribed to the fifth or sixth century A.D. (BENTLEY in his *Historical View of Hindu Astronomy*—vide page 115 below—ascribed it to the second or third century A.D.). There is good reason to suppose that the second of the motives here suggested really dictated the terms of this famous horoscope, the more so as we find exactly the same attempt made, and with the same planets, except Venus, in the case of Śankara's horoscope. Omitting Venus, we shall find that the same investigation, following the method indicated in this and the previous sections of this chapter, will do for both Rāma's and Śankara's horoscopes, supposing we decide to treat them as genuine horoscopes.

281. The mention of the month Chaitra as the twelfth month of the luni-solar year in the case of Rāma's horoscope is perfectly consistent with the solar month having been the first of the solar year, because we are given to understand, at any rate by a probable inference in the case of Rāma's horoscope, that the sun was in Mēsha.* In Śankara's horoscope, according to Mādhavāchārya's *Śankara-vijayam*, the Sun, Mars, Jupiter and Saturn were occupying exalted positions. That the moon at the time of Śankara's birth was in nakshatra Ārdra and in the fifth śukla tithi is the common tradition and we may accept these details, at any rate, as a working hypothesis.

282. In order to determine the years in which Rāma's and Śankara's horoscopes would be true horoscopes, we may follow the method of investigation explained in detail in section ii of this chapter, paragraphs 250 to 255 *supra*. That is, we may first of all construct a table for a fixed year for which purpose we may again adopt the convenient year, 1 B.C. or A.D.0: this will suit both Rāma's and Śankara's horoscopes. Referring to paragraph 250 we notice that it is necessary first of all to settle as approximately as possible the day of the solar year corresponding to the horoscope. In the case of Rāma's horoscope, the tithi is śukla navamī in Mēsha month; and in the case of Śankara, it is śukla panchami in the same month. The lunar month to which these tithis belonged may have commenced a few days before Mēsha month or it may have commenced any time from 0 to $29\frac{1}{2}$ days after the commencement of the Indian solar year, because we are not told whether the lunar month was Chaitra or (as in the case of Buddha) Vaiśākha. We may take ten days after the commencement of the Indian solar

* The well-known inconsistency in Rāma's horoscope, viz., that between the 8th tithi when the moon must have had a longitude of at least 96° and Punarvasu nakshatra which by all systems cannot extend beyond $92\frac{1}{2}^{\circ}$ of longitude, may be mentioned parenthetically, but we do not propose to notice it further on this occasion.

year as a fair average for the ninth or fifth sukla tithi of the lunar month with which the horoscopes are concerned. The mean longitudes of the three major planets (neglecting Venus for the present) were :—

	Mars.	Jupiter.	Saturn.
Longitude on 0 day, A.D.0 (Table IV) ...	254·7	163·2	70·5
Mean motion for 10 days (Table IV) ...	5·2	0·8	0·3
	259·9	164·0	70·8
In whole numbers ...	260	164	71
To obtain the actual positions necessary for the two horoscopes, viz. ...	270° to 299°	90° to 119°	180° to 209°
We have, by the eye-table, as corresponding mean positions ...	240° to 270°*	97° to 127°	175° to 205°
To reach these mean positions, we have, in the case of Rāma's horoscope, to deduct from the positions on the tenth day of the Indian solar year A.D. 0; or add algebraically.	-350° to -20°	-37° to -67°	-226° to -256°

And in the case of Śankara's horoscope, we have to add ... +340° to +10°, +293° to +330°, +105° to +140°

283. We have now to search in Table V-A for the following quantities which being subtracted, or added, as the case may require, will give us the positions required respectively for Rāma's and Śankara's horoscopes :—

	Mars.	Jupiter	Saturn.
Table V-A.—Subtract (for Rāma's horoscope) or add algebraically ...	-350° to -20°	-37° to -67°	-226° to -256°
Table V-A.—Add (for Śankara's horoscope) ...	+340° to +10°	+293 to +330°	+105° to +140°
We find without much difficulty that the following quantities, indicating the year A.D.0 minus 963, or 964 B.C., satisfy the mean longitudes of Rāma's horoscope, while the following quantities from the same Table V-A, indicating the year A.D. 805, satisfy Śankara's horoscope ...	-5°	-65°	-247°
	+1°	+310°	+116°

284. We have now to calculate the exact day of the solar year on which the tithi śukla 9 fell in the case of Rāma's horoscope and the tithi śukla 5 in the case of Śankara's horoscope.

	Rāma's horoscope. 964, B.C.	First new moon in solar year.
Śūrya siddhānta Eye-table, k B.C. 1001	Mar. 5·2266	l 4·9123
n 37 years	·5740	o 10·4353
d 9 tithis		d 8·8592
	24·2068	24·2068
	March 30·0074	
Śankara's horoscope A.D. 805.		
Eye-table, k A.D. 800 ...	Mar. 20·9883	l 8·1606
n (5 years) ...	·2938	o 4·6027
d (5 tithis) ...	...	d 4·9218
	17·6851	17·6851
	A.D. 805 Mar. 38·9672	
	i.e., Ap. 7·9672	

We assume that Rāma's birth took place at the end of 24 days of the Indian solar year 964 B.C., and Śankara's at the end of 18 days of the Indian solar year, A.D. 805, and proceed to verify the two horoscopes with the aid of Tables V-A and V-B.

285. From Table V-A we learn that the positions (true geocentric places, not merely mean longitudes) of the several planets on the twenty-fourth day, 964 B.C.

* The necessity for a reference to Mars' Eye-table has been pointed out in paragraph 253 supra; it was pointed out in the same place that the Eye-table is not so necessary in the case of Jupiter and Saturn.

(= A.D. 0 *minus* 963), and on the eighteenth day, A.D. 805, were, practically and, except for small cyclic variations, very nearly, the same as their positions in certain years of the current cycle (Table V-B).

Years in the current cycle (Table V-B) when the several planets attained the positions required for the two horoscopes.

	Mars.	Jupiter.	Venus.	Saturn.
<i>Rāma's horoscope—</i>				
Table V-A, 24th day, B.C. 964, or A.D. 0 <i>minus</i> 963, corresponds in the current cycle, to 24th day of	A.D. 1862	A.D. 1801	A.D. 1881	A.D. 1718
Table V-B, on the 24th day of these several years the planets' geocentric places and the cyclic variations were	298°0' - 3° or 297°7' (28° in Makara)	94°7' - 3° or 94°4' (4° in Kāṭaka).	21°3' (in Mēsha)	188°1' + 7° or 188°8' (8° in Tula)
<i>Śaṅkara's horoscope—</i>				
Table V-A, 18th day, 805 A.D., corresponds in the current cycle, to 18th day of	A.D. 1894	A.D. 1671	..	A.D. 1954
Table V-B, on the 18th day of these several years the planets' geocentric places, and the cyclic variations were	299°0' - 3° or 298°7' (19° in Makara)	108°2' + 20° or 108°4' (18° in Kāṭaka).	..	182°4' + 3° or 183°2' (13° in Tulā)

N.B.—(1) In taking out the geocentric places from Table V-B, we should remember that that table gives the position for every tenth day in the year and that for intermediate days we should take proportional parts. Thus, for Mars' position in Rāma's horoscope we have to take the position of the planet on the twenty-fourth day of A.D. 1862 and subtract 3°. Now the position of Mars on the 20th day of A.D. 1862 was by table V-B, 295°3' and on the 30th day 302°1', increase for 10 days, 6°: therefore, the increase for 4 days is $4 \times .68 = 2.72^\circ$, or 2°7' and Mars' position on the 24th day of 1862 A.D. was therefore $295.3^\circ + 2.7^\circ = 298.0^\circ$, while its position on the twenty-fourth day of B.C. 964, was $298.0^\circ - 3^\circ = 297.7^\circ$ or 18° in Makara. We have to proceed in the same way for all the other planets.

(2) The positions in the two years, 964 B.C. and A.D. 805 are the positions required by the horoscopes (if we remember that the solar month in both cases was Mēsha and that the sun was therefore in his house of exaltation, equally with the other planets named above); but in Rāma's horoscope Venus ought to be in Mīna (830° to 380°) according to Vālmiki whereas on the 24th day in B.C. 964, Venus' position was 21°3' or 21 degrees beyond Mīna.

When we come to study more closely the movements of Venus, we shall find that in most years she is in or beyond Mēsha at the beginning of the Indian solar year: that only in certain years she is at this time in Mīna (330° to 359°); that once she is in Mīna, she continues to return thereto every 8 years; and that lastly, 964 B.C., was not the kind of year when Venus would in Mēsha month be in the constellation Mīna.

Evidently we have to make a second attempt, as we did in the case of the Paripādāl horoscope, in section (ii), paragraph 263, and for the same reason, namely, that we have failed so far to get a correct position for Venus. But before doing so we may devote some time to a consideration of Bentley's solution of this problem.

286. In a well-known and otherwise valuable and suggestive work entitled "*Historical View of Hindu Astronomy*" (1825), Bentley says:—

"According to the Rāmāyana, called Valmiki's, five of the planets were in their houses of exaltation, as the astrologers term it, at the birth of Rāma, that is to say, sun in Aries, moon in Cancer, Venus in Pisces, Jupiter in Cancer, Mars in Capricorn, Saturn in Libra, on the ninth lunar day of Chaitra. The position of the planets here given, I strongly suspect, are the result of modern computation and not from actual observation; for the signs of the ecliptic, at least by these names, were totally unknown in the time of Rāma and were not introduced into India until the second or third century A.D.

Rāma born on 6th April 961 B.C.

(By Lalande's tables.)

	s	°	'	"	
Sun	0	6	11	23	Aries.
Moon	3	12	13	54	Cancer.
Venus	11	1	0	0	Pisces.
Mars	10	2	47	0	Capricorn.
Jupiter	4	6	24	13	Cancer.
Saturn	6	8	27	0	Libra.

in which Jupiter is only $6^{\circ} 24' 13''$ beyond the limit and Mars $2^{\circ} 47'$. Rāmāyana, B.I Sarga 3, Verse 16."

287. The reader who has carefully noted the mean annual movements of the planets (paragraph 222 *supra*) will probably be inclined to ask how it was possible for Jupiter and Saturn which were in certain signs in 961 B.C. according to Bentley to occupy the same signs in 964 B.C. according to paragraph 285 *supra*. We found that Jupiter's position in 964 B.C. on Mēsha sukla navamī was, according to the Ephemeris, 94.4° while, according to Bentley, on much the same solar day in 961 B.C., his position was 126.3° , an advance of 32° for three years, whereas Jupiter advances at least 30° every year or 90° in three years. Again Saturn's position, according to the Ephemeris, on Mēsha sukla navamī in 964 B.C. was 188.8° or 189° whereas, according to Bentley, he was in the same sign in 961 B.C. and was occupying a position defined by Lalande's Tables as 188.4° . That Saturn in 3 years should not have moved even one degree must land the reader in the conviction that either Bentley or the Ephemeris is wrong.

288. In the first place, we observe that Bentley assigns to the sun only 6° of longitude on Ap. 6, 961 B.C.; in other words that 6th April was, according to him, the sixth or seventh day of the solar year, whereas we know from Eye-table sec. **k** that it was not till A.D. 1751 that the Indian solar year began to commence as late as March 29, and that 6th April was only then the eighth day of the Indian solar year. We know also from section **k** of the Eye-table that in 961 B.C., April 7 was the thirty-second day, and not the seventh day of the Indian solar year.

289. An explanation of these serious discrepancies between Bentley's figures and those furnished by the *Ephemeris* is to be found in the facts that Bentley follows the ordinary European reckoning of celestial longitude (vide paragraph 230 *supra*) which starts from the First Point of Aries, or the meeting point of the equator and the ecliptic; whereas Indian celestial longitudes are reckoned from this meeting point as it stood in a particular year, *circa* A.D. 532; that on account of precession, the First Point of Aries has since A.D. 532, moved westward at the rate of 50 seconds of an arc per annum; that for every year before A.D. 532, the First Point of Aries must be shifted to a position east of that which it occupied in A.D. 532; that in 963 B.C. the First Point of Aries was fully 24.3 degrees (paragraph 229) east of the point where Indian celestial longitudes commence; that consequently in order to convert the positions in Bentley's horoscope into those of an Indian horoscope, we should add about 24.5 degrees to each of Bentley's positions; in other words, Bentley's horoscope would read as follows in terms of the Indian sidereal year:—

Sun	...	...	...	...	...	...	...	$30^{\circ} 41'$
Moon	...	...	...	...	...	...	...	$126^{\circ} 43'$
Venus	...	...	...	...	...	...	...	$355^{\circ} 30'$
Mars	...	...	...	...	...	...	...	$327^{\circ} 17'$
Jupiter	...	...	...	...	...	...	...	$150^{\circ} 54'$
Saturn	...	...	...	...	...	...	...	$210^{\circ} 57'$

290. According to Bentley's horoscope, sidereally construed, none of the planets except Venus was in the position required for Rāma's horoscope, unless we suppose that the framers of that horoscope used the system of tropical celestial longitudes which has been for a long time current in Europe but which, so far as is known, has never been adopted in this country, and in fact could not have been adopted here at any time, since the Indian astronomers, before Bhāskara's time (twelfth century A.D.) either were ignorant of, or misunderstood, the precise effect of precession (see WHITNEY and BURGESS' *Sūrya siddhānta*—1865). The Hindus no doubt used a tropical year until about A.D. 532, but they imagined that it was, or was bound to be, of the same length as the sidereal year, and they reckoned celestial longitudes, not from the First Point of Aries which is a point created by, and for, spherical astronomy, but from a fixed constellation in the heavens, which was *Kṛittikā* long before A.D. 532, and *Āśvinī* since that year.

291. It is possible that Bentley thought that for Rāma's epoch the celestial longitudes of heavenly bodies would be the same, whether reckoned, by the tropical system from the European First Point of Aries, or from *Kṛittika* by the

sidereal system, because the interval between the First Point of Aries of 961 B.C. and that of A.D. 532 is 24·5 degrees and the interval between the commencement of Krittikā and the commencement of Asvinī is $26^{\circ}40'$, a difference of only 2 degrees and ten minutes. But our complaint against Bentley's horoscope is not merely that his positions are reckoned from Krittikā or from the First Point of Aries, but that they do not yield the particular rāsīs or constellations indicated in Rāma's horoscope. The reader should remember that when a European astronomer speaks of the *sign Cancer*, for instance, he does not mean the *constellation* called Cancer or Karkāṭaka which is composed of certain fixed stars called *α Canceri*, *β Canceri* and so forth, but merely a part of the ecliptic removed by 90° to 119° from the point which happens at that particular epoch to be the First Point of Aries or the meeting point of the ecliptic and the equator. Some confusion necessarily underlies this mode of speech of European astronomers and in order to obviate it, they use the expression *sign* or *sign of the zodiac* when they mean a division of the ecliptic with reference to the moveable First Point of Aries; and the expression *constellation* or *constellation of the zodiac* when they mean a particular group of fixed stars. In Indian usage, whether astronomic or popular, there has never been any distinction between a *sign of the zodiac* and a *constellation of the zodiac*, and a horoscope gives the position of a planet located in a particular group of fixed stars, or somewhere near it, whereas in European astronomy the sign *Pisces* with reference to 2500 B.C., for instance, means an arc of 30° in the ecliptic, actually occupied in part by the *constellation* Aries (Mēsha) and in part by the *constellation* Taurus (Rishabha) and therefore 50 degrees distant from the *constellation* *Pisces* or *Mīna*.

292. We have not quite done with our criticism of Bentley's version of Rāma's horoscope. If we compare again the Ephemeris version of Rāma's horoscope in paragraph 285 supra, where we assumed the horoscope to be one of the year 964 B.C., and Bentley's version, read in terms of Indian sidereal longitude (vide paragraph 289 supra), we shall see that the advance in Jupiter's position from 964 B.C. (according to the Ephemeris) to 961 B.C. (Bentley, after allowing for precession) is 56 degrees and the advance of Saturn from the former to the latter year is 22 degrees. Now these advances are the advances of Jupiter and Saturn respectively for two years and not for three years, and we may suspect that Bentley's positions belong to 962 B.C. or A.D. 0 *minus* 961, not to 961 B.C. or A.D. 0 *minus* 960. In fact if we determine the positions of the planets in 962 B.C. according to Tables V-A and V-B of the Ephemeris, we shall find them to be as follows:—

B.C. 962; 31 complete days of the Indian solar year, when the moon had reached the 9th tithi—

English date	Sun.	Mars.	Jupiter.	Venus.	Saturn
6th April B.C. 962 ...	30°	$324^{\circ}6'$	$152^{\circ}9'$	$356^{\circ}0'$	$215^{\circ}0'$

These positions are in every case, within 2° of Bentley's positions—vide paragraph 289 supra. We may conclude that Bentley, when referring to B.C. 961, really meant B.C. 962 and ought to have said—as astronomers do in such cases—"A.D. *minus* 961"; and that the positions of his planets as given by him, are *tropical* not *sidereal*.

293. We may now resume the consideration of Rāma's horoscope. Having failed (vide paragraph 285) to locate it in its entirety in 964 B.C., and having satisfied ourselves that Bentley's identification, referring really to 962 B.C., is not such as to satisfy the conditions of an Indian horoscope, we may still wish to ascertain whether there is any year within the traditional period of Indian history (we shall have something to say later, vide paragraph 300, as to the limits of the traditional period itself) when Vālmīki's horoscope would have been a true horoscope for a child born in that year, whether that child was Rāma or any other. This is a legitimate curiosity, and considering the interest which must always attach to any legitimate search for Rāma's horoscope, and so long as we are in a position to indulge it, historical considerations may for the moment be held in abeyance.

294. The general procedure is that indicated in paragraph 250 supra. Failing 964 B.C., we may wish to search in a remoter past, but Table V-A gives a list of

B.C. years only up to 1024 B.C. If we want to go further back, all we have to do is to select for our fixed year, 1501 B.C., 2501 B.C. or 3102 B.C. (the year 0 of Kaliyuga). If we propound to ourselves the problem, what year or years since 3102 B.C. up to date satisfied Rama's horoscope, we might divide the problem into two parts: (1) what years between 3102 B.C. and 1101 B.C. satisfied the conditions; and (2) what years between 1101 B.C. and A.D. 900 satisfied the conditions.

In this way our operations will be throughout additive and we shall avoid the inconvenience of subtraction or the algebraic addition of minus quantities; vide paragraph 257 supra.

For the first part of the problem we have to start as follows with 3102 B.C. as our fixed year.

3102 B.C. (Tables IV and IV-A).											
Mean longitude on 0 day of solar year.						Mars.		Jupiter.		Saturn.	
Add for mean motion for 10 days of solar year						347°0'		15°7'		339°2'	
						5°2'		0°8'		0°3'	
						352°2'		16°5'		339°5'	
In nearest whole degrees						352°		17°		340°	
Actual geocentric places of which we are in search						270° to 299°		90° to 119°		180° to 209°	
Corresponding mean positions (by Eye-Table) as before (paragraph 282) ..						240° to 270°		97° to 127°		175° to 205°	
Wanted increase to mean longitude of year 3102 B.C., 10th solar day, of ...						+248° to +278°		+80° to +110°		+200° to +230°	
1	2	3	4	5	6	7	8	9	10	11	12
Calculation for day of solar year.	Years from 3102 B.C.	Mars.	Jup.	Sat.	B.C.	A.D.	Day of solar year.	Mars.	Jup.	Venus.	Sat.
Eye-tab. 1, o, d.		(Increases of longitude by Table V-A.)		(3102 minus yr. in Col. 2.)		(Col. 1.)		(See explanation in paragraph 296.)			
3001 B.C. 24°27'	193	221	97	198	2809	-2908	24	4277 yrs. -2908 "	4318 yrs. -2908 "	4270 yrs. -2908 "	4272 yrs. -2908 "
93 years 20°64'								A.D. 1869 +363	A.D. 1410 +344	A.D. 1862 +478	A.D. 1364 +383
9 tithis 8°86'								1762 A.D. 231°	1754 A.D. 107°	1840 A.D. 1°2'	1747 A.D. 183°
58°77'											
29°68'											
24°24'											
2801 B.C. 1°06'	370	258	69	201	2782	-2731	27	4277 yrs. -2731 "	4318 yrs. -2731 "	4270 yrs. -2731 "	4272 yrs. -2731 "
69 years 16°27'								A.D. 1546 +363	A.D. 1587 +344	A.D. 1539 +285	A.D. 1541 +363
9 tithis 8°86'								A.D. 1909 295°	A.D. 1931 82° (a)	A.D. 1774 344°	A.D. 1924 185°
26°79'											
2501 B.C. 12°05'	667	227	82	230	2485	-2434	10	4277 yrs. -2434 "	4318 yrs. -2434 "	4270 yrs. -2434 "	4272 yrs. -2434 "
66 years 18°42'								A.D. 1843 240°	A.D. 1884 94° (a)	A.D. 1838 53°5'	A.D. 1838 215° (d)
9 tithis 8°86'											
40°32'											
29°53'											
10°79'											
2101 B.C. 25°89'	1047	241	94	193	2055	-2054	6	3551 yrs. -2054 "	3369 yrs. -2054 "	3557 yrs. -2054 "	5300 yrs. -2540 "
46 years 1°00'								A.D. 1497 +363	A.D. 1315 +605	A.D. 1508 +470	A.D. 1452 +383
9 tithis 8°86'								A.D. 1860 260° (b)	A.D. 1920 104° (c)	A.D. 1973 7° (e)	A.D. 1885 179° (f)
35°75'											
29°53'											
6°22'											

(a) Jupiter's place was less advanced at the time by Śūrya siddhānta than by Ephemeris.

(b) Mars at the time was +8° by Śūrya siddhānta.

(c) Jupiter was 11° less advanced at the time by Śūrya siddhānta.

(d) Saturn at the time was 15° in advance by Śūrya siddhānta.

(e) If we allow 25° less for Venus' mean longitude, its actual place was by eye-table, 358°0' by Śūrya siddhānta.

(f) Saturn was at the time 10 degrees in advance of this by Śūrya siddhānta.

1	2	3	4	5	6	7	8	9	10	11	12
Calculation for day of solar year.	Years from S102 B.C.	Mars.	Jup.	Sat.	B.C.	A.D.	Day of solar year.	Mars.	Jup.	Ven.	Sat.
Eye-tab. 1, o, d		(Increases of longitude by Table V-A.)				(3102 minus yr. in Col. 2).	(Col. 1.)	(See explanation in paragraph 296.)			
1901 B.C. 83 years 9 tithis	3:29 11:44 8:86 23 59	1284	244	86	209	1818	-1817 24	3551 yrs. -1817 "	3369 yrs. -1817 "	3557 yrs. -1817 "	3506 yrs. -1817 "
								A.D. 1734	A.D. 1552	A.D. 1740	A.D. 1689
								844	235		...
								A.D. 1896	1975		
								274°	97°	64°	194°
1201 B.C. 60 years 9 tithis	27:52 25:70 8:86 62:08 59:06 3 02	1961	226	111	202	1141	-1140 3	2178 yrs. -1140 "	2159 yrs. -1140 "	2139 yrs. -1140 "	2298 yrs. -1140 "
								A.D. 1038	A.D. 1019	A.D. 999	A.D. 1158
								+ 726	+ 949	+ 948	+ 766
								A.D. 1764	A.D. 1668	A.D. 1647	A.D. 1624
								237°	121° (a)	327°	187°
1201 B.C. 9 tithis	27:52 8:86 36:38 29:53 6:85	1901	261	90	188	1201	-1200 7	2178 yrs. -1200 "	2159 yrs. -1200 "	2139 yrs. -1200 "	2298 yrs. -1200 "
								A.D. 978	A.D. 959	A.D. 939	A.D. 1098
								+ 726	+ 949	+ 948	+ 766
								A.D. 1704	A.D. 1608	A.D. 1587	A.D. 1604
								285°	100°	38°	173°

For the second part of the problem we start with 1101 B.C.

			Mars.			Jup.			Sat.			
1101 B.C. 0 day, mean long.			309°			261°			310°			
10 days ...			5°2'			0°8'			0°3'			
			314°			262°			310°			
Wanted	...	..	270° to 299°			90° to 119°			180° to 209°			
Wanted corresponding positions (Eye-table)	...	... ..	240° to 270°			97° to 127°			175° to 205°			
Increases sought.	..		+285° to 315°			+195° to +225°			+225° to 255°			
1	2		3	4	5	6	7	8	9	10	11	12
Calculation for day of solar year.	Years from 1101 B.C.		Mars.	Jup.	Sat.	B.C.	A.D.	Day of solar year.	Mars.	Jup.	Ven.	Sat.
Eye-tab. 1, o, d.			(Increases of longitude by Table V-A.)			(1101 minus yr. in Col. 2.)		(Col. 1.)	(See explanation in paragraph 296.)			
1001 B.C.	4°01	137	302	198	234	964	-963	24	2178 yrs.	2159 yrs.	2139 yrs.	2298 yrs.
87 years	10°43								-963	..	-963	..
9 tithis	8°86											
	24°20								A.D. 1215	A.D. 1196	A.D. 1176	A.D. 1335
									+726	+688	+705	+383
									A.D. 1941	A.D. 1884	A.D. 1881	A.D. 1718
									298°	94° (b)	21° (c)	188°
801 B.C.	11°84	374	305	190	250	727	-726	12	A.D. 1786	A.D. 1777	A.D. 1883	A.D. 1955
74 years	20°87											
9 tithis	8°86								296°	85°	332°	206°
	41°57											
	29°53											
	12°04											

(a) Jupiter at the time was 7° less by *Sūrya siddhānta* than by *Ephemeris*.

(b) Jupiter's place at the time was 6° less by *Sūrya siddhānta* than by *Ephemeris*.

(c) Venus' place at the time, by *Sūrya siddhānta*, was 53°, i.e., in *Rishabhā rāśi*, not in *Mina*.

1	2	3	4	5	6	7	8	9	10	11	12	
Calculation for day of solar year.	Years from 1101 B.C.	Mars.	Jup.	Sat.	B.C.	A.D.	Day of solar year.	Mars.	Jup.	Ven.	Sat	
Eye-tab. 1, o, d.		(Increases of longitude by Table V-A.)			(1101 minus yr in Col. 2.)		(Col. 1.)	(See explanation in paragraph 296)				
301 B.C. 14 years 9 tithis	29 14 24 70 8 88	814	284	223	226	287	- 286	4	A.D. 1818	A.D. 1878	A.D. 1845	A.D. 1927
	32.70 59.06								265° (a)	118°	356°	178° (b)
201 B.C. 91 years 9 tithis	3.64 3.07 12.89 8.86	991	322	195	229	110	- 109	26	A.D. 1706 317°	A.D. 1708 90° (c)	A.D. 1787 344°	A.D. 1808 184°
101 B.C. 51 years 9 tithis	25.82 6.5 5.6 8.8	1051	287	215	242	50	- 49	21	A.D. 1766 279°	A.D. 1768 109°	A.D. 1847 53°	A.D. 1868 197°
100 A.D. 88 years 9 tithis	20.9 13.5 16.0 8.9	1288	290	207	258	...	A.D. + 188	9	A.D. 1640 276°	A.D. 1742 102°	A.D. 1849 40°	A.D. 1720 212° (b)
	38.4 29.5											
See Table II	8.9 5	1668	304	219	221	...	568	5	A.D. 1657 287.4°	A.D. 1778 114°	A.D. 1994 27°	A.D. 1717 177° (d)
See Table II	21	1905	307	212	237	...	805	21	A.D. 1894 300°	A.D. 1754 107°	A.D. 1988 62°	A.D. 1954 192°

295. The two tables set out above contain the results of an exhaustive search for Rāma's horoscope, extending over a period of 4,000 years from 3102 B.C., the year 0 of Kaliyuga, to A.D. 900. Apart from the opportunity which they afford us of substantiating the claim advanced in paragraph 257 supra, viz., that by means of Tables V-A and V-B it is possible to review the geocentric places of 5 planets during a period of 4,000 years, our present investigation table may be made to serve a quasi-historic purpose. (1) The framer of Rāma's horoscope may have had in view not an actual year or an actual horoscope, but only an ideal horoscope in which five planets occupied exalted positions. If so, the search for a year in which the five planets actually occupied such positions ranks no higher than as an astronomical pastime and is in no sense an historical problem. (2) For the reasons stated in paragraphs 245 and 280 supra, we must, as serious critics, dismiss the supposition that Rāma's horoscope was actually calculated at the time of his birth and that, in the absence of writing, the details of that horoscope were preserved by tradition from Rāma's epoch down to the time when the horoscope was inserted in Vālmiki's Rāmāyana. (3) It remains to consider a third alternative, viz., that somebody, during the period when a study of planetary astrology was possible in India, viz., the period since about A.D. 300, actually noticed a year when the five planets occupied exalted positions, and framed Rāma's horoscope in imitation of that actual horoscope. If the year, or one of the years, when the five planets occupied exalted positions was comprised in what we may designate the astrological period, i.e., the period since A.D. 300 and if it also was a year in which it was possible for Rāma's horoscope to be interpolated or inserted in the Rāmāyana, then the investigation will have served the quasi-historical purpose of indicating the probable time when this interesting interpolation in the text of the Rāmāyana was carried out.

296. Now which of these alternatives does the investigation we have just concluded serve to establish? By its means we satisfied ourselves, in the first place, that there were only 15 years since 3102 B.C. when the 5 planets, Sun, Mars, Jupiter, Venus and Saturn were so placed that they *could* reach exalted positions in the month of Mēsha. These years are 2909, 2732, 2435, 2055, 1818, 1201, 1141, 964, 727, 287, 110, 50 B.C. and A.D. 188, 568 and 805. We next calculated, in

(a) Mars at the time was 6 to 5° in advance of this by Śūrya siddhānta; it is, therefore, regarded as a suitable position.
(b) Saturn at the time was 6° more advanced by Śūrya siddhānta than by Ephemeris.
(c) Jupiter's place at the time 3° less by Śūrya siddhānta than by Ephemeris.
(d) Saturn at the time stood 3.2 degrees further by Śūrya siddhānta than by Ephemeris.

column 1 of the table, on what day of the Indian solar year, the mean tithi śukla navamī in Mēsha month actually fell in each of these years. We did not calculate the actual ending moment of the tithi, because that would affect our result only to the extent of half-a-day (paragraph 28 *supra*). Nor did we calculate the equivalent English date in each case, as this is a detail which can easily be supplied from Eye-table **k** and **n** when we know the year.

As a third step, we filled up columns 9 to 12 of our investigation table, first, with the year in the current cycle of each planet when it attained the same position as in the year entered in columns 6 and 7. By "current cycle" we of course mean the cycles of years, 383, 363, 355, 344 and 235 for which the actual geocentric places of the five planets Saturn, Mars, Mercury, Jupiter and Venus respectively for every tenth day are furnished in Table V-B. Table V-A enables us to fill up columns 9 to 12 of our investigation table from the year 1024 B.C. to the year A.D. 2005. For years before 1024 B.C. we use, in filling up columns 9 to 12, the major cycles given at the beginning of Table V-A in combination with the by-now familiar cycles of 363, 344, 235 and 383 cycles for Mars, Jupiter, Venus and Saturn, respectively. Lastly in columns 9 to 12, we noted any suitable results reached by us by means of heavy type numerals, and unsuitable results by means of italic numerals.

297. The geocentric places thus arrived at are correct astronomical places, with, in any case, a probable error not exceeding a degree either way. But we have also to bear in mind that the mean places assumed in Indian astronomy for the different planets at the epoch 0 Kaliyuga were not the correct places by modern astronomy, which it is the object of the Ephemeris to reproduce, but a mean longitude of 0 degree in every case (*Sūrya siddhānta* I. 57). As the centuries advanced from 0 Kaliyuga, the differences between *Sūrya siddhānta* without *bīja* and modern astronomy underwent variations which are tabulated below; and by A.D. 900 there was practically no difference between the mean places of planets by *Sūrya siddhānta* (without *bīja*) and those deduced by modern astronomy. Since A.D. 900 differences have accumulated again, and this is the period when *bījas* or corrections were introduced by Indian astronomers to bring the planetary positions, as calculated by them, into accord with actual observation (see paragraph 268 *supra*).

The following quantities, extracted from Table IV-B, have to be added, or subtracted (as the case may be), in order to obtain *Sūrya siddhānta* mean positions of planets at different epochs from the standard positions deduced from the Ephemeris Tables V-A and V-B:—

B.C.		Mars.	Jupiter.	Saturn.	Venus.	Mercury.
3101	...	+ 11.9	- 15.9	+ 20.7	- 33.0	+ 33.0
2101	...	+ 9.2	- 11.7	+ 15.7	- 24.9	+ 28.9
1101	...	+ 6.6	- 7.5	+ 10.7	- 16.7	+ 24.7
101	...	+ 4.0	- 3.2	+ 5.7	- 8.6	+ 20.5
A.D.						
900	...	+ 1.3	+ 1.0	+ 0.7	- 0.4	+ 16.3
1900	..	- 1.3	+ 5.2	- 4.3	+ 7.7	+ 12.1

298. At a first glance, and judged by Indian Ephemeris figures, without correction for *Sūrya siddhānta*, none of the 15 possible years since 3102 B.C. could have yielded a horoscope satisfying all the conditions of Rāma's horoscope. In ten years, 2909, 2435, 2055, 1818, 1201, 964, 50 B.C., and A.D. 188, 568, and 805, Venus was not in Mīna, but in Mēsha or Rishabha, and in one case in Mithuna. [In one of these years 2055 B.C., which was otherwise suitable, Venus was only 7° beyond Mīna, and this is a case which we shall have to re-consider later, first because if we make the correction for Venus' mean longitude according to *Sūrya siddhānta* suitable for the epoch, viz.,—25° as compared with Ephemeris, we shall find that by the Eye-table for Venus the actual geocentric place of Venus at the end of six days of the Indian solar year in 2055 B.C. must have been 358.0° which was in Mīna rāśi as required by Rāma's horoscope; and secondly, because Mars' position on the same day by *Sūrya siddhānta*, was 260.6° (the position by Ephemeris) + 9.2 = 269.8°, which is within a few minutes of Makara rāśi (270°), the position required by Rāma's horoscope.]

Mars.—In three of the 15 years entered in our investigation tables, viz., 2909, 2435, 1141 B.C., Mars was so far short of Makara that even the addition required by *Sūrya siddhānta* would not make up for the deficiency. In two years, 2055 B.C.

(already adverted to in the last sub-paragraph) and 287 B.C., Mars' position was $260^{\circ}6'$ and 265° respectively by Ephemeris, but by *Sūrya siddhānta* it would have been $269^{\circ}8'$ and 270° respectively, which would satisfy Rāma's horoscope. We shall, therefore, have to review these two years separately, as the other planets then occupied suitable positions.

299. *Jupiter*.—In two of the 15 possible years 2732 B.C. and 727 B.C., Jupiter's position by the Ephemeris was 82° and 85° respectively. In the case of Jupiter, the conversion from Ephemeris to *Sūrya siddhānta* positions at the epoch in question requires a *deduction*, not an *addition*: if we make the appropriate deduction, we shall find that Jupiter's actual geocentric place on *sukla navami* in Mēsha month in 2732 B.C. was 68° while his place on the same tithi in 727 B.C. was 79° . Neither of these positions suits Rāma's horoscope.

Saturn.—In two of the fifteen possible years, viz., 2435 B.C. and A.D. 100, which are equally unsuitable for Venus, the position of Saturn by the Ephemeris was in excess of that required by Rāma's horoscope, and by *Sūrya siddhānta*, Saturn's position in those years would have been still more in excess. In two other years, 2055 B.C. and 287 B.C., Saturn's position by the Ephemeris was 179° and 178° degrees respectively, but by *Sūrya siddhānta*, he would have attained 194° and 184° respectively which would satisfy Rāma's horoscope.

300. To enable the eye to take in rapidly the results of each year investigated on pages 118, 119, the position of any planet suitable for Rāma's horoscope is indicated in heavy arabic numerals and the reverse in italic numerals. Reviewing the fifteen years' tabulated results as a whole, we find that by *Sūrya siddhānta* the conditions of Rāma's horoscope would have been fully satisfied in two years, 2055 B.C. and 287 B.C. The positions were, by *Sūrya siddhānta*,

	Sun.	Mars.	Jupiter.	Venus.	Saturn.
2055 B.C.	7°	270°	98°	358°	184°
287 B.C.	5°	270°	114°	356°	184°
				[or somewhat less, but still in Mīna]	
Rāsi and house of exaltation for each planet.	Mēsha.	Makara.	Karkāṭaka.	Mīna.	Tulā.

To what extent historical or literary criticism will be able to turn to account these two dates for Rāma's horoscope is a speculation on which it would be foreign to our purpose to enter at present. We set out in paragraph 294 with the single proposition, namely, to try and discover the year or years between 3102 B.C. and A.D. 900, which would satisfy Rāma's horoscope and we have reached two astronomically correct solutions of this problem, understanding, of course, by astronomy the Indian science, and more particularly, the system of the *Sūrya siddhānta* without *bīja*. 2055 B.C. may be considered too remote for any historical or quasi-historical speculation. 287 B.C. was about the epoch when the *Ramāyaṇa* epic was in process of evolution and construction, but data are as yet wanting to enable us to affirm that Indian astronomers of that time had the knowledge requisite for the construction of a horoscope like Rāma's.

301. We may note in passing that the last of the possible years in our investigation table, viz., A.D. 805 is a year which satisfies Śankara's horoscope. It fails altogether to give a position for Venus that would satisfy Rāma's horoscope, but Venus was not in exaltation in Śankara's horoscope in which only the four remaining planets Sun, Mars, Jupiter and Saturn were in exaltation. It has been sometimes assumed that A.D. 805 is the only year that satisfies Śankara's horoscope; but we may note that not only A.D. 805 but also A.D. 568, 50 B.C. and 287 B.C. satisfy Śankara's horoscope. In *Ind. Antiq.*, Vol. XIII (Ap. 1884), Mr. K. T. Telang wrote as follows: "I am content to accept the beginning of the seventh century A.D. as a period down to which we can trace Pūrṇavarma as reigning in Magadha and that is about the time, therefore, when Sankarachārya must have composed his great *Śārīraka Bhāṣya*."

302. Incidentally we may note that the year 964 B.C. which is one of 15 possible years for Rāma's horoscope, and not a particularly good one either (because it shares with other years in the series the defect of an unsuitable position for Venus—vide paragraph 285 *supra*), is marred by another serious defect, viz., a position for Jupiter ($94^{\circ}4'$) which though one of exaltation (i.e., in Karkāṭaka rāsi) by the Ephemeris, is not so by *Sūrya siddhānta*, because at the epoch in

question, according to the small table in paragraph 297 *supra*, the position of Jupiter by Sūrya siddhānta without *bīja* was 7 degrees less than by the Ephemeris ; in other words, the position of Jupiter by Sūrya siddhānta on *śukla navamī* tithi in Mēsha month in the year 964 B.C. was $94^{\circ}4'$ less 7° , or $87^{\circ}4'$ which would have been 3 degrees short of Karkataka. Considering the importance of Jupiter in an Indian horoscope, let alone Rāma's in whose horoscope it is all in all, we must finally discard 964 B.C. as being an impossible year for Rāma's horoscope.

303. Tables V-A and V-B, being based on the constants of modern astronomy, will be found serviceable in verifying statements occurring in any literature, ancient or modern, regarding the positions of planets. We read, at page 4 of LOCKYER's *Star-gazing*, of a Chinese observation of the conjunction of 5 (*sic*) planets between 2514 and 2436 B.C. The same occasion is apparently referred to in CHAMBERS' *Sun, Planets and Comets*, where we read : "The earliest record we possess of an occurrence of this kind is for China. A conjunction of Mars, Jupiter, Saturn and Mercury in the constellation of *Shi* was assumed as an epoch by the Emperor Chuen-hio and it has been found by Messrs. Desvignoles and Kirch that such a conjunction actually took place on 18 February 2446 B.C. between 10° and 18° of Pisces. De Mailla fixes 9 February 2441 B.C. as the date of the conjunction and says that the four planets, with the moon, were comprised within an arc of 12° extending from 15° to 27° of Pisces.

De Mailla gives the following positions :—

Mercury, R.A....	$344^{\circ}56'16''$	Saturn	...	...	$354^{\circ}39'47''$
Jupiter	... $347^{\circ}2'12''$	Mars	...	...	$356^{\circ}45'11''$
Moon	... $353^{\circ}18'21''$				

304. In the first place it is not possible that both Desvignoles and De Mailla can be correct, since between 18 February 2446 B.C. and 9 February 2441 B.C. Jupiter must have moved 150° or 5 signs and Saturn 60° or 2 signs. In the second place, it is easy to satisfy ourselves, with the aid of tables V-A and V-B, that neither of the above dates is correct. But before doing so, we should observe, as we did in paragraph 289 *supra*, that in European astronomy longitudes are reckoned from the First Point of Aries. In this case we may assume De Mailla's positions in R.A. (Right Ascension) to be tropical longitudes, and convert them into Indian sidereal longitudes by adding to each position 49° , which was the distance from the First Point of Aries in 2500 B.C. to the 0 degree of the sun's mean longitude in the same year in the Indian ecliptic. We then have the following as De Mailla's positions for 9th February 2441 B.C., expressed in terms of Indian sidereal longitude :—

Mars 46° (rounding off fractions of a degree) ; Mercury 34° ; Jupiter 36° ; Saturn 44° ; Moon 42° .

In 2441 B.C. the Indian solar year began on February 21, because in 2501 B.C., the Indian solar year began on Feb. 21.09 (Eye-table, section *k*) and for 60 years from 2441 B.C. we add ... $.52$ (Eye-table, section *n*).

Feb. 21.61-

Therefore 9 February in 2441 B.C. was about 12 days before the commencement of the Indian solar year. Consequently at the commencement of the solar year 2441 B.C., Mars would be about 6 degrees further than on 9 February and Mercury about 12 degrees further, while Jupiter and Saturn would be very much in the same position. We can, therefore, apply a preliminary test by calculating, with the help of tables V-A and V-B, the positions of the 4 planets on 0 day of the Indian solar year 2441 B.C. Applying the large cycles found at the beginning of table V-A, we have, for the positions of the planets on 0 day of Indian solar year 2441 B.C.,—

	Mars.	Mercury.	Jupiter.	Saturn.
	4277 yrs.	4306 yrs.	4318 yrs.	4272 yrs.
— 2440 „	— 2440 „	— 2440 „	— 2440 „	— 2440 „
A.D. 1837	A.D. 1866	A.D. 1878	A.D. 1832	
(Table V-B)	110°	9°	282°	140°
353rd day of previous year or				
9 February 2441 B.C. ...	104°	0°	281	139°

305. Evidently, there was no conjunction of the four planets in question, or of even of two of them, on 9 February 2441 B.C., and there must be a mistake somewhere. Using the indications furnished by De Mailla's positions for Mercury and the moon, we may conjecture that the date he had in mind was somewhere about 2 March 2449 B.C., or the 10th day of the Indian solar year, 2449 B.C. For, applying the same major cycles as before, we have, for 10th day of 2449 B.C.,—

	Mars.	Mercury.	Jupiter.	Saturn.
	4277 yrs.	4306 yrs.	4318 yrs.	4272 yrs.
	— 2448 „	— 2448 „	— 2448 „	— 2448 „
	A.D. 1829	A.D. 1858	A.D. 1870	A.D. 1824
10th day of 2449 B.C.				
(2 March 2449 B.C.) ...	46°	28°	32°	34°
Cf. De Mailla's positions				
(converted into Indian				
sidereal longitudes)				
paragraph 304 ...	46°	34°	36°	44°

For the moon's position on the same day, we proceed as follows:—
(Eye-table, section **k, l, n, o.**) 2501 B.C., commencement

	of Indian solar year,	
	Feb. 21·09, 1st N.M. in S. year	12·05
52 years	... 45	24·24
	Feb. 21·54	36·29
		— 29·53
		6·76
Mean ending moment of 3rd tithi	9·71	Add 3 tithis
		2·95

Feb. 31·25 = Mar. 2. 9·71

March 2, 2449 B.C. was the day on which the 3rd tithi came to an end. The sun's longitude on the day in question being nearly 10 degrees, the moon's longitude at the mean ending moment of the tithi must have been $10 + 3 \times 12 = 46^\circ$. De Mailla's longitude for the moon is 42° , which must have been attained about 6 to 8 hours on either side of the end of the 3rd mean tithi. We see therefore that the date which De Mailla had in mind must have been 2 March, 2449 B.C. There is also probably an error of 10° in his position for Saturn. None of the planets was in the constellation Pisces but all were in Rishabha, a part of which probably corresponds to the Chinese constellation Shi (= Indian Krittika).

306. For another example of planetary conjunctions we select the following from CHAMBERS' *Sun, Planets and Comets*:—

“On September 15, A.D. 1186, Mercury, Venus, Mars, Jupiter and Saturn were in conjunction between the Wheat-ear of Virgo (Spica Virginis) and Libra.”

Here is an unmistakable reference to a constellation (not a tropical sign) of the zodiac and we ought to be able to verify it easily. The 15 September A.D. 1186 was the 174th day of the Indian solar year A.D. 1186.

We take out the positions of the planets on that day from tables V-A and V-B.

	Mars.	Mercury.	Jupiter.	Venus.	Saturn.
(Table V-A) A.D. 1186 = A.D. 1912	A.D. 1896	A.D. 1791	A.D. 1899	A.D. 1952	
(Table V-B) 174th day	177°	176°	169°	170°	174°

The planets were, we find, comprised within an arc of 8 degrees in the constellation Kanyā or Virgo. In this position, however, they were not visible to the naked eye since the longitude of the sun was 167° . The 14 September 1186 was, as we may see from the Ephemeris for that date (Vol. III of the present work), a day of new moon, and on the 29th of that month there was a lunar eclipse. We know also from the *Encyclopædia Britannica* (11th edition, Volume 2, page 799) that the end of the world was imminently expected in 1186 A.D., and predicted by astrologers all over Europe, apparently on account of this extraordinary conjunction, the like of which perhaps has not occurred since man began to observe the stars.

307. Mention of the year A.D. 1186 leads us to another conjunction of the same kind which must have happened in 2588 B.C., on the 175th day of the Indian solar year (about 14th August). There is no record of this conjunction

anywhere; but that it must have occurred on the date in question may be inferred from Table V-A and Table V-B. In fact after 3,773 years (a compound of 2,005 and 1,768 years) the mean longitudes of Mars, Jupiter and Saturn must according to Table V-A, increase by 11, 20 and 22 degrees, respectively. The reader should find no difficulty in making the necessary calculations.

Mars.	Mercury.	Jupiter.	Venus.	Saturn.	Sun.
4277 yrs.	4206 yrs.	4318 yrs.	4270 yrs.	4272 yrs.	(Table
— 2587	— 2587	— 2587	— 2587	— 2587	IV-C.)
A.D. 1690	A.D. 1719	A.D. 1731	A.D. 1683	A.D. 1685	
			+ 285		
			= A.D. 1918		

175th day, 2588 B.C. 172° 160° 154° 155° 155° 167°

The sun was 13° to the east of Jupiter, Venus and Saturn and these planets must have been visible shortly before sunrise. The moon was in a different constellation. With these positions we may compare the places of the five planets on 30th Oct. A.D. 1921 (the current year) which was also a day of new moon, or better still, one week earlier on 23 Oct. A.D. 1921 when Jupiter, Saturn and Venus were in close proximity to each other and Mars only 10 degrees off.

308. The reader will find it a useful exercise to verify the following conjunctions, also extracted from CHAMBERS' *Sun, Planets and Comets* :—

“On November 11, A.D. 1544, Venus, Jupiter, Mars and Saturn were very close, and Mercury was only 16' distant . . . On 11 November A.D. 1544, Venus, Jupiter, Mercury and Saturn were enclosed in a space of 10'. . . On March 17, A.D. 1725, Venus, Jupiter, Mars and Mercury appeared together in the same field of the telescope . . . On December 23, A.D. 1769, Venus, Jupiter and Mars were very close. On October 3, A.D. 1801, Venus, Jupiter and Moon were very close in Leo and Saturn not far off.” (For the last two dates the positions of all 5 planets are given *in situ* in Table V-B.)

309. We will conclude the present subject with an example which has an important bearing on Biblical chronology. We are told in the *Encyclopædia Britannica* (11th edition, Volume 2, page 888), art. *Bible—New Testament Chronology*, that the astronomer Kepler identified the star of the Magi with a conjunction of the planets Jupiter and Saturn which occurred, in the constellation Pisces in May, October and December of 7 B.C. The same work adds, in a footnote (*ibid.*) :—“It is a curious coincidence that a medieval Jew, R. Abarbanel (Abrabanel), records that a conjunction of these particular planets in this particular constellation was to be a sign of Messiah's coming. It is just conceivable that his statement may ultimately depend on some such ancient tradition as may have been known to Chaldaean Magi.”

We can, with the help of tables V-A and V-B, trace the successive positions of Jupiter and Saturn which must have occupied in 7 B.C. the same positions as they did in 1809 and 1909 respectively. We may set down the positions in a table as follows :—

Movements of Jupiter and Saturn in 7 B.C. (Indian solar year).

Day of Indian solar year.	Julian date.	Jupiter.	Saturn.	Remarks.
0 Day.	March 14 43	343.4°	350.5°	Jupiter's movements in 7 B.C. were the same within a fraction of a degree as in A.D. 1809, and Saturn's movements the same as in A.D. 1909. Tables V-A and V-B. The cyclic variation in the case of Jupiter was that for 1809 + 6 = 1815 years = 3 cycles of 605 years each. The variation was ∴ 3 × − 228' = − 684'. The cyclic variation in the case of Saturn was that corresponding to 1908 + 6 = 1915 = 5 × 383 years, i.e., 5 × − 095' = − 475'.
10 "	March 24	345.8°	351.8°	
20 "	April 3	348.1°	353.0°	
30 "	April 13	350.3°	354.3°	
40 "	April 23	352.5°	355.4°	
50 "	May 3	354.5°	356.4°	Distance between the sun and the planets 800° = 20 hrs. Jupiter and Saturn rise in the east 8 hrs. after sunset.
60 "	May 13	356.4°	357.5°	

Day of Indian solar year.	Julian date		Jupiter.	Saturn	Remarks.
70 Day.	May	23	358.1	358.2	Distance between sun and the planets 290°. Jupiter and Saturn rise in the east 7 hrs. after sunset.
80 "	June	2	359.5	358.8	
90 "	June	12	1.0	359.6	
100 "	June	22	1.3	359.7	
110 "	July	2	2.8	359.9	
120 "	July	12	2.3	0.1	
130 "	July	22	2.2	359.8	
140 "	August	1	2.1	359.4	
150 "	August	11	1.0	358.9	
160 "	August	21	0.0	358.2	
170 "	August	31	358.6	357.5	
180 "	September	10	357.4	356.7	Distance between sun and the planets 180°. Saturn and Jupiter rise in the east about the time of sunset.
190 "	September	20	358.7	355.9	
200 "	September	30	355.4	355.2	
210 "	October	10	353.7	354.3	
220 "	October	20	352.8	353.8	Distance between sun and the planets 135°. Saturn and Jupiter rise 9 hrs. before the sun, i.e., at 8 p.m.
230 "	October*	30	352.3	353.4	} Both Jupiter and Saturn are stationary for about a month.
240 "	November	9	359.0	352.8	
250 "	November	19	352.1	352.9	
260 "	November	29	352.5	352.9	
270 "	December	9	353.3	352.9	Saturn still stationary. Distance between sun and the planets 90°. Saturn and Jupiter appear in zenith at sunset.
280 "	December	19	354.4	353.6	
290 "	December	29	355.6	354.2	At sunset Jupiter and Saturn appear in the western sky.
300 "	January	8	357.2	354.8	
310 "	January	18	359.0	355.8	
320 "	January	28	1.1	356.9	
330 "	February	7	3.1	358.0	
340 "	February	17	5.4	359.2	Mars on 344th day was in conjunction with Saturn.
350 "	February	27	7.6	0.4	
360 "	March	9	10.0	1.6	In March 6 B.C. both Jupiter and Saturn had conjunctions with the sun and disappeared and they must have reappeared about 4 April as morning stars in the east.

310. The above table shows that on the 70th solar day (May 23) Jupiter and Saturn were within a degree of each other in the last few degrees of Pisces. On the same day the distance between the sun and Jupiter *cum* Saturn was about 290° and the planets must have risen together in the east about seven hours after sunset. From this time the conjoined planets continued to rise night after night in the east until the 180th day (September 10) when they must have risen in the east just as the sun set in the west. On this date the longitude of Jupiter was 357.4 and of Saturn 356.7 and they must have been very close.

We read in St. Matthew, 2, 1-12. "Now when Jesus was born in Bethlehem of Judea in the days of Herod the King, behold, there came wise men from the east to Jerusalem, saying, Where is he that is born King of the Jews? for we have seen his star *in the east*, and are come to worship him. . . . Then Herod, when he had privily called the wise men, inquired of them diligently *what time* the star appeared When they had heard the king, they departed; and lo, the star which they saw in the east, *went before them and stood over where the young child was*. When they saw the star, they rejoiced with exceeding great joy . . . and when they came into the house, they saw the young child with Mary his Mother, and fell down and worshipped him," etc.

On 9 December 7 B.C., the distance between the sun and Jupiter *cum* Saturn was 90° and the two planets must at sunset have appeared in the zenith of the sky. As after this date they ceased to appear in the eastern sky at night, the conference of the Magi with Herod may have occurred about December 9, and they probably referred to their experience in May of the same year when they said that they had seen the star of the King of the Jews *in the east*.

On the 340th day of the Indian solar year 7 B.C., i.e., about 17 February 6 B.C., there was a further phenomenon, for on that day the longitudes of Mars, Saturn and Jupiter were 359.4°, 359.2° and 5.4°, respectively, so that now Mars and Saturn were in conjunction.

* Dr. Neugebauer (*op. cit.* page 95 *ante*) has calculated very accurately, according to modern astronomy, the geocentric longitudes of Jupiter and Saturn for Memphis (6 p.m.) on October 27, 7 B.C. His longitudes are, Jupiter, 345.16° and Saturn 345.77°. If to these figures we add the Indian precession for 589 years (page 94 *ante*), i.e., 8.5°, we get 353.66° for Jupiter and 354.27° for Saturn.

The Scripture narrative refers to a temporary disappearance of the star and to its reappearance at Bethlehem. We find from the table of movements that between the 0 and the 15th day of the Indian solar year 6 B.C., i.e., between March 14 and March 29 of that year, first Saturn and then Jupiter must have had a conjunction with the sun, that is, they temporarily disappeared, and about April 4, they were to the west of the sun, and they must have appeared low in the western sky, immediately after sunset. This may have been the reappearance at which the Magi rejoiced. Or the expression "the star *stood* over where the child was" may refer to the fact that Saturn became stationary for about two months from October 20, 7 B.C. till December 19 of the same year and that during the same period Jupiter came closer and closer to Saturn until they were again together on December 29. The appearance of the two planets blazing from the zenith after sunset on December 9 must have been a striking phenomenon, at which the Magi could well have wondered as the star "stood" (i.e., was stationary in the zenith for several days) "over where the child was." December 25 is the traditional day when Christ was born.

Kepler, from a study of these phenomena in the light of the tradition recorded by Abrabanel, came to the conclusion that Christ was probably born in 7 B.C. during a conjunction of Saturn and Jupiter. It is now well known that the chronology of St. Dionysius Exiguus who identified what we now call 1 B.C. (= the year 753 A.U.C. or of the Foundation of Rome) with the year of the birth of the Christ was wrong by at least three or four years, and that Christ must have been born before the year now spoken of as 4 B.C. (A U.C. 750).

311. Before concluding this chapter, it may be useful to indicate, for the benefit of other investigators, an important application, and one that is by no means self-evident, of the principle of cyclic recurrence in the positions of planets. In order to obtain the positions of planets in the current cycle, as is done in table V-B, for 363 years (Mars), 355 years (Mercury), 344 years (Jupiter), 235 years (Venus), and 383 years (Saturn), it is not necessary to calculate the positions of these planets for all these years. If we have the calculated positions of Mars for a series of 126 years, in all, say from A.D. 1822 to A.D. 1947, of Mercury for 79 years (say, from A.D. 1855 to A.D. 1933), of Jupiter for 95 years (say, from A.D. 1818 to A.D. 1912), of Venus for 48 years (see paragraph 313 below) and of Saturn for 88 years (say, from A.D. 1842 to A.D. 1929), we have sufficient material for fixing the positions of these planets in the first place for 363, 355, 344, 235 and 383 years, respectively, and secondly through tables V-A and V-B for all the time comprised in the range of history and tradition. The procedure is as follows.

312. Let us assume that we have the calculated positions of Mars for every tenth day in every year from A.D. 1822 to A.D. 1917. With the help of the positions in the first and last of these years as well as of the positions in two intermediate years 1869 and 1909, we obtain the positions in six other years as below :—

0 DAY.		0 DAY.
Position in A.D. 1947 <i>minus</i> .1 degree		Position in A.D. 1869 <i>minus</i> .1 degree
= position in 1584 A.D. ... 337.6°		= position in A.D. 1506 ... 115.2°
1663 ... 338.3°		1585 116.5°
1742 ... 339.1°		1664 117.9°
1821 ... 339.8°		1743 119.2°
1900 ... 340.6°		1822 ... 120.5°
4) 3.0°		4) 5.3°
0.75°		1.3°

We know that Mars' position on 0 day in A.D. 1584 must have been the same as his position 363 years later, i.e., on 0 day in A.D. 1947, less .1 degree. We therefore write down as Mars' position in A.D. 1584, the position we have already calculated for 0 day in A.D. 1947, less .1 degree, i.e., 337.6 degrees.

Similarly we write down as Mars' position on 0 day in A.D. 1506, his ascertained position on 0 day in A.D. 1869 less .1 degree, i.e., 115.2 degrees.

Between A.D. 1584 and A.D. 1900 there are 316 years or 4 periods of 79 years each. We know from the table of Mars' cycles that in 79 years Mars' mean

longitude increases by + 1.015 degree. Our difficulty is, that owing to the annual equation and the anomaly, the actual geocentric place of Mars after 79 years may not increase by exactly + 1.015 degree, but by something more or something less. But for small increases of mean longitude the annual equation and the anomaly will operate uniformly, and we may assume, without risk of error, that if Mars' position on 0 day in A.D. 1584 was 337.6° and if his position on 0 day in A.D. 1900, was 340.6 degrees, his three intermediate stages, viz., those on 0 day in A.D. 1663, in A.D. 1742, and in A.D. 1821 may be obtained by applying a uniform increment of $\frac{3.0}{4} = 0.75$ degree. We obtain in this way the actual geocentric place of Mars on 0 day in the years A.D. 1663 (338.3°), 1742 A.D. (339.1°) and 1821 A.D. (339.8°), and we may, if we please, verify these figures by direct calculation.

It is obvious that for every ascertained position of Mars between A.D. 1822 and A.D. 1900, we shall be able to obtain his positions in three other years, in other words, by means of his ascertained positions in the 79 years A.D. 1822 to A.D. 1900, we shall be able to obtain the positions in $3 \times 79 = 237$ years; and since we have already ascertained the positions of Mars for 126 years, A.D. 1822 to A.D. 1947, we shall have on the whole the positions for $237 + 126 = 363$ years, the full number of years required for a Mars' cycle of 363 years:

313. The following table shows at a glance how cycles of 355, 344 and 383 years may be obtained for Mercury, Jupiter and Saturn respectively by following the method we have already indicated for Mars. (The figures refer of course to A.D. years):—

Mars.		Mercury.		Jupiter.		Saturn.	
1947 = 1584	1869 = 1506	1933 = 1578	1888 = 1533	1912 = 1568	1880 = 1486	1929 = 1546	1871 = 1488
1663	1585	1624	1579	1651	1569	1605	1547
1742	1664	1670	1625	1734	1652	1664	1606
1821	1743	1716	1661	1817	1735	1723	1665
1900	1822	1762	1717	1900	1818	1782	1724
		1808	1763			1841	1783
		1854	1809			1900	1842
		1900	1855				

The figures in heavy type are those indicated in paragraph 311 *supra*.

By means of the positions of Mercury, ascertained for the 46 years A.D. 1855 to A.D. 1900, we obtain positions for $46 \times 6 = 276$ years in addition to the ascertained positions for 79 years; total 355 years, which is Mercury's cycle.

By means of the positions of Jupiter, ascertained for the 83 years A.D. 1818 to A.D. 1900, we obtain positions for $83 \times 3 = 249$ years in addition to the ascertained positions for 95 years; total 344 years, which is Jupiter's cycle.

By means of the positions of Saturn, ascertained for the 59 years A.D. 1842 to A.D. 1900, we obtain positions for $59 \times 5 = 295$ years in addition to the ascertained positions for 88 years; total 383 years, which is Saturn's cycle.

314. For obtaining the figures for a Venus' cycle of 235 years we proceed by a slightly different method. We first of all calculate the positions of Venus for 48 years as follows:—

I	II	III	IV	V	VI	VII	VIII
1800	1801	1802	1803	1804	1805	1806	1807
1840	1841	1842	1843	1844	1845	1846	1847
1880	1881	1882	1883	1884	1885	1886	1887
1920	1921	1922	1923	1924	1925	1926	1927
1960	1961	1962	1963	1964	1965	1966	1967
2000	2001	2002	2003	2004	2005	2006	2007

To these six rows of eight figures each we can, without calculation, add a seventh row—

VI	VII	VIII	I	II	III	IV	V
2040	2041	2042	2035	2036	2037	2038	2039

For, the position of Venus in A.D. 2040 is the same as its position 235 years before, in 1805, which stands at the head of column VI. We therefore repeat for A.D. 2040 the figure already obtained for 1805. Similarly we repeat for 2041.....2039 the figures already obtained for 1806 . . . 1804.

315. (Venus—*contd.*) We next proceed to interpolate between 1800 and 2040 the figures for every eighth year as we did before for the other planets. Thus, supposing we want the figure for 0 day in each case we interpolate as follows:—

0 DAY.				0 DAY.			
30	...	...	329.3 (ascertained figure).	1888	...	335.4 (ascertained figure).	
38	...	329.8		1896	...	336.1	
46	...	330.4		1904	...	336.8	
54	...	331.0		1912	...	337.5	
62	...	331.6		1920	...	...	338.2 (ascertained figure)
70	...	...	332.2 (ascertained figure).			3.5	$\div 5 = .7$
			$2.9 \div 5 = .6$	2000	...	...	344.0 (ascertained figure)
78	...	332.7		2008	...	344.5	
86	...	333.2		2016	...	345.0	
94	...	333.7		2024	...	345.6	
102	...	334.2		2032	...	346.1	
110	...	...	334.7 (ascertained figure).	2040	...	346.6	(figure ascertained for A.D. 1805)
			$2.5 \div 5 = .5$.				$2.6 \div 5 = .52$.

From every year for which we possess ascertained figures we are thus able to obtain figures for four more years; out of 48 years' figures we can thus evolve figures for 192 years in addition to the original 48; total 240 years, which is five years more than the full Venus' cycle of 235 years.

316. The increase of mean longitude of Venus every 8 years is 1.52 degrees, and we could have interpolated all the figures between A.D. 1800 and A.D. 2040 in one series of thirty steps, thus

0 DAY.				0 DAY.			
A.D. 1800	...	...	...	...	329.3 (ascertained figure).		
1808	...	...	...	...	329.9		
1816	...	...	...	...	330.5		
1824	...	...	...	...	331.0		
1832	...	...	...	...	331.6		
1840	...	...	...	...	332.2		
1848	...	...	...	...	332.7		
...	...	...	...	...	...		
A.D. 2040	...	...	...	...	346.6 (figure ascertained for 1805)		
				...	30)17.3		
					.57		

We see that the figures obtained in the last paragraph for

• A.D. 1808	1816	1824	1832	1840	1848
are 329.9	330.5	331.0	331.6	332.2	332.7
against 329.8	330.4	331.0	331.6	332.2	332.7

which we obtained in paragraph 315 and the differences are hardly perceptible; nevertheless it is safe to proceed by breaking the thirty steps into a number of stages as we did in paragraph 315 because the successive differences in the anomaly and annual equation of the thirty steps caused by differences in mean longitude amounting in all to 17.3 degrees may not be uniform in the case of Venus.

317. In the following table, in which the base year is A.D. 1999, the above method of development of a perpetual planetary ephemeris from day today is illustrated in greater detail. The figures for the top and bottom line in the case of each planet being known, the examples show how the figures for intermediate years may be obtained by interpolation. If this table is extended to 79 years in the case of Mars, taking 1998, 1997 . . . 1921 as the successive base-years, to 46 years in the case of Mercury, to 83 years in the case of Jupiter, to 48 years in the case of Venus, and 59 years in the case of Saturn, we shall have all the material required for a perpetual planetary almanac (Tables V-A and V-B). Considerations of space alone forbid the reproduction of these tables, which have the merit of yielding certain important corollaries, one of which (viz., that Mars cannot retrograde in Maghā nakshatra in Kārttika-Margāśīrsha months) is made use of in paper No. V in the appendix *On the astronomical references in the Mahābhārata*.

Table illustrating the process of obtaining, from the calculated places of Mars, Mercury, Jupiter, Venus of 363, 355, 344, 248 and 383 years, respectively

Days of solar year		0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
A.D.		Degrees of longitude.															
Mars	A.D. 1967=1684	180°0	176°5	173°5	171°7	171°2	172°1	174°1	177°1	180°5	184°8	189°6	194°7	200°4	206°2	212°3	218°7
	1683	182°4	178°9	175°8	173°9	173°0	173°6	175°6	178°4	181°8	186°0	190°7	195°7	201°5	207°8	213°2	219°6
	1762	184°8	181°4	178°1	176°1	175°0	175°4	177°1	179°7	183°0	187°1	191°8	196°7	202°5	208°3	214°1	220°5
	1841	187°2	183°9	180°4	178°3	177°0	177°2	178°6	181°0	184°3	188°3	192°9	197°7	203°5	209°3	215°0	221°4
	1920	189°6	186°4	182°7	180°5	179°0	179°0	180°1	182°3	185°6	189°5	194°0	198°7	204°5	210°3	215°9	222°3
	1999	192°1	188°9	185°2	182°7	181°1	180°8	181°7	183°8	186°9	190°7	194°9	199°8	205°2	211°0	216°9	223°2
Δ or variation from cycle to cycle.		+2°4	+2°5	+2°3	+2°2	+2°0	+1°8	+1°5	+1°3	+1°3	+1°2	+1°1	+1°0	+1°0	+1°0	+0°9	+0°9
Mercury	A.D. 1986=1631	332°8	345°5	2°3	20°6	39°7	58°6	75°9	90°8	100°5	100°1	92°8	91°0	98°8	112°1	128°7	146°3
	1677	332°8	345°3	2°1	20°4	39°4	58°4	75°7	90°7	100°6	100°7	93°4	91°2	98°8	111°9	128°5	146°0
	1723	332°8	345°2	1°8	20°1	39°1	58°1	75°5	90°6	100°7	101°2	94°1	91°5	98°7	111°8	128°2	145°7
	1769	332°8	345°1	1°5	19°8	38°8	57°8	75°3	90°5	100°8	101°7	94°7	91°8	98°6	111°6	127°9	145°5
	1815	332°8	345°0	1°3	19°6	38°5	57°5	75°1	90°4	100°9	102°2	95°4	92°1	98°6	111°5	127°7	145°2
	1861	332°7	344°9	1°1	19°3	38°2	57°2	74°9	90°3	101°0	102°7	96°0	92°4	98°5	111°3	127°5	145°0
	1907	332°7	344°8	0°9	19°1	37°9	56°9	74°7	90°2	101°1	103°2	96°7	92°7	98°5	111°2	127°3	144°7
	1953	332°7	344°7	0°6	18°8	37°6	56°6	74°5	90°1	101°2	103°7	97°3	92°9	98°4	111°0	127°0	144°5
	1999	332°7	344°5	0°4	18°6	37°3	56°4	74°2	89°9	101°3	104°2	97°9	93°2	98°4	110°9	126°8	144°2
Δ or variation from cycle to cycle.		+0°0	+0°1	+0°2	+0°2	+0°3	+0°3	+0°2	+0°2	-0°1	-0°5	-0°6	-0°3	+0°1	+0°1	+0°3	+0°2
Jupiter	A.D. 1999=1655	349°1	351°5	353°8	356°2	358°4	0°5	2°6	4°4	6°0	7°4	8°5	9°3	9°7	10°0	9°7	9°2
	1738	348°6	351°0	353°8	356°6	357°7	359°9	2°1	3°8	5°3	6°8	7°8	8°6	8°8	9°1	8°7	8°3
	1821	347°5	349°9	352°2	354°5	356°6	358°8	0°9	2°6	4°1	5°5	6°5	7°3	7°5	7°7	7°3	6°8
	1904	346°4	348°8	351°1	353°4	355°5	357°7	359°7	1°4	2°9	4°2	5°2	6°0	6°2	6°3	5°9	5°8
	1987	345°3	347°7	350°0	352°3	354°4	346°6	358°5	0°2	1°7	2°9	3°9	4°7	4°9	4°9	4°5	3°8
Δ or variation from cycle to cycle.		1°1	1°1	1°1	1°1	1°1	1°1	1°2	1°2	1°2	1°3	1°3	1°3	1°3	1°4	1°4	1°5
N.B.—For the top line, A.D. 1655, the figures for A.D. 1699 have been repeated: but as the cyclic variation between A.D. 1999 and A.D. of the difference between A.D. 1655 and A.D. 1987 by 4, that the figure for Jupiter for A.D. 1655 is in excess of the figure for A.D. 1999 (344 years column the figure for A.D. 1987 is 345°3 and that for A.D. 1999 is 349°1, a difference of 3°8. We add °6 to 3°8 in order to get an exact quotient (1°1)																	
Venus	A.D. 1999	38°0	49°0	61°2	72°1	83°0	93°4	103°3	102°5	120°5	126°6	130°6	131°0	127°5	121°2	115°7	113°8
	2007=1772	38°5	49°9	61°6	72°5	83°3	93°4	103°1	112°1	119°6	125°1	128°1	127°5	123°5	117°5	113°0	112°0
	2015=1780	39°0	50°4	62°0	72°8	83°5	93°5	103°0	111°6	118°8	123°7	125°7	124°1	119°5	113°9	110°2	110°3
	2023=1788	39°5	50°9	62°4	73°1	83°7	93°6	102°9	111°1	117°9	122°3	123°2	120°7	115°5	110°2	107°4	108°5
	2031=1796	40°0	51°4	62°8	73°4	83°9	93°7	102°8	110°6	117°1	120°8	120°8	117°3	111°5	106°5	104°6	106°7
	2039=1804	40°5	51°9	63°2	73°7	84°1	93°8	102°7	110°1	116°2	119°3	118°3	113°9	107°5	102°8	101°3	105°0
Δ or variation from cycle to cycle.		+0°5	+0°5	+0°4	+0°3	+0°2	+0°1	-0°1	-0°5	-0°8	-1°5	-2°4	-3°4	-4°0	-3°7	-2°8	-1°8
Saturn	A.D. 1969=1586	3°4	4°7	6°0	7°3	8°5	9°7	10°9	11°8	12°7	13°7	14°1	14°5	15°0	14°9	14°9	14°6
	1645	4°3	5°6	6°9	8°2	9°4	10°6	11°8	12°7	13°6	14°6	15°1	15°5	16°0	15°9	15°8	15°7
	1704	5°2	6°5	7°8	9°1	10°3	11°5	12°8	13°7	14°6	15°6	16°1	16°6	17°1	17°0	16°9	16°8
	1763	6°1	7°4	8°7	10°0	11°2	12°5	13°7	14°6	15°6	16°6	17°1	17°6	18°1	18°1	18°0	17°9
	1822	7°0	8°3	9°6	10°9	12°1	13°4	14°7	15°6	16°6	17°6	18°1	18°7	19°2	19°2	19°1	19°0
	1881	7°9	9°2	10°5	11°8	13°0	14°3	15°6	16°8	17°6	18°6	19°1	19°7	20°3	20°3	20°2	20°1
	1940	8°8	10°1	11°4	12°7	14°0	15°3	16°6	17°6	18°6	19°6	20°2	20°8	21°4	21°4	21°3	21°3
	1999	9°8	11°1	12°4	13°7	15°0	16°3	17°6	18°6	19°6	20°6	21°2	21°8	22°4	22°4	22°3	22°3
Δ or variation from cycle to cycle.		+0°9	+0°9	+0°9	+0°8	+0°9	+0°9	+0°9	+1°0	+1°0	+1°0	+1°0	+1°0	+1°1	+1°1	+1°0	+1°0

SECTION IV.—*The Planetary Eye-tables.*

318. The planetary eye-tables for Mars, Mercury, Jupiter, Venus and Saturn, which are included in Table IV, constitute an important by-product of the perpetual planetary almanac. The general nature and use of the planetary eye-tables has been referred to in paragraph 225 supra (page 93) and it only remains to explain how the eye-tables were constructed. The object is to ascertain for each mean longitude of a planet, whether superior or inferior, say for 0° , 10° , 20° , . . . 350° of its mean longitude, the corresponding actual geocentric place attainable by it on each day of the Indian solar year, say on 0 day, on the 10th complete day . . . on the 360th complete day and *vice versa*. Supposing we wished to have such an eye-table in 36 stages, for each planet, and for every ten complete days of the Indian solar year (like the eye-tables we actually possess in Table IV), it would be theoretically necessary to compute, in the manner shown in paragraphs 237 and 239 supra (pages 96, 97), the actual geocentric places corresponding to $5 \times 36 \times 36 = 6,480$ mean positions, which might take a whole year or more to compute.

319. As an alternative to this formidable undertaking, we simply note, in the perpetual planetary almanac (Table V-B), the occasions on which 0° , 10° , 20° . . . 350° are attained as geocentric places, on the 0 day of the solar year, first by Mars, then by Jupiter, and thirdly by Saturn; then, the occasions on which 0° , 10° , 20° , etc., are attained as geocentric places by the same planets on the 10th complete day of any solar year; and so on up to 360 complete days of the solar year. Having secured these occurrences, we tabulate them, and add to each geocentric place the corresponding mean longitude, which is easily done with the help of Table V-A. The result is the eye-table for each of the superior planets Mars, Jupiter and Saturn.

320. For the *inferior* planets Venus and Mercury, we first of all tabulate their increases of mean longitude, for every 10 days, for 235 years in the case of Venus, and for 46 years in the case of Mercury. Then we select from Table V-B the actual geocentric places corresponding to definite stages of increase of these mean longitudes. As a result, the eye-table for Venus presents the same general appearance as the eye-table for Mars, Jupiter and Saturn, but whereas the vertical heavy-type column in the eye-tables of Mars, Jupiter and Saturn presents actual geocentric places, and the body of the tables presents mean longitudes, the first vertical column in the eye-table of Venus furnishes *mean* longitudes and the rest of the table presents the geocentric places. This variation in the eye-table for Venus is a necessity, because, to every single mean longitude of Mars, on, say, the 100th day of the Indian solar year, there corresponds but a single geocentric place, and *vice versa*, whereas the *vice versa* does not hold good in the case of Venus: for instance, on the 160th complete day of the Indian solar year, Venus may have a geocentric place of 164° when her mean longitude is 180° , and she will have the same geocentric place also when her mean longitude is 329° .

321. In the case of the Mercury eye-table, there is a further peculiarity. All the possible positions, whether mean or actual, of Mercury on a given day of the Indian solar year are reducible to 46 definite types, exemplified by the years noted in column 1 of Mercury's eye-table and the actual positions in other years do not vary from these excepted to the extent of a degree or two. It was, therefore, thought advisable to retain these types themselves as an eye-table: it thus happens that for every 10th day of the Indian solar year the Mercury eye-table presents 46 stages at intervals of about 8° , instead of 36 stages at intervals of 10° between one stage and the next, as in the case of the other planets.

322. It was stated in paragraph 268 supra (page 107) that the eye-tables can be used for the purpose of computing the actual geocentric places of the five planets in the *Paripādal* horoscope. We may now compare the results of applying to the calculation of this date (1) the rigorous method presented in paragraphs 237, 239 supra (pages 96, 97), (2) Tables V-A and V-B, (3) the planetary eye-tables.

	Mars	Mercury.	Jupiter	Venus.	Saturn.
Mean longitude on 89th complete day A.D. 684, i.e., 17th June, time about mean sunrise.	331° 92'	11° 56'	330° 83'	296° 23'	260° 41'
(1) Actual geocentric place by strict calculation, paragraphs 237 and 239 (pages 96 and 97)	17° 12'	70° 4'	340° 5'	41° 6'	256° 4'
(2) Actual geocentric place by Tables V-A and V-B (page 112 supra).	17° 5'	70° 4'	340° 6'	42° 8'	256° 4'
(3) Actual geocentric place by planetary eye-tables (Table IV).	17° 1'	70° 4'	341° 0'	42° 7'	256° 0'

It will be seen that, although the planetary eye-tables omit fractions of a degree, yet the results yielded by them are accurate enough for all practical purposes.

323. The eye-tables have, however, one drawback, as compared with tables V-A and V-B. When a planetary eye-table is used, as in the last paragraph, for ascertaining the geocentric place of a planet directly from its mean longitude on a given day of the Indian solar year, proportionate parts will generally have to be taken, and that, more than once in each case. Thus in the case dealt with in the last paragraph, the reader, on looking into the Mars and Mercury eye-tables, will find certain entries under the 80th and 90th completed days, which he should proceed to manipulate as shown below:—

Mars.

Col. 1. Actual geocentric place (Eye-table.)	Col. 2 Mean longitude on 80th complete day. (Eye-table)	Col. 3. Mean longitude on 90th complete day (Eye-table.)
10°	325°	324°
20°	338°	335°

By taking proportional parts for the 89th day, we find that Mars, on 89th complete day,

would have attained 10° actual geocentric place for a mean longitude of **324° ... (1)**

and would have attained 20° actual geocentric place for a mean longitude of **335° 3' (2)**

By taking proportional parts again with reference to (1) and (2), we see that if Mars on 89th complete day attained, with an increase of 11° 3' mean longitude (i.e., 335° 3' — 324°), an increase of 10° in actual geocentric place, he would, with an increase of 8° mean longitude, attain an increase of $\frac{8 \times 10}{11 \cdot 3} = 7 \cdot 1^\circ$ in actual geocentric place. In other words, on the 89th complete day Mars' geocentric place, corresponding to mean longitude 332° = 10° + 7° 1' or 17° 1', which is exactly the result obtained by strict calculation in accordance with paragraph 239, page 96 supra.

Mercury.

From the following entries in Mercury's Eye-table under 80th and 90th complete days,

80th complete day.	90th complete day.
i.e., mean longitude ... 332°	mean longitude ... 13°
actual geocentric place ... 57°	actual geocentric place ... 71°

we obtain, by proportional parts for 89th complete day,

mean longitude ... 9°	} (2)
actual geocentric place ... 69° 8'	

similarly, from the following entries under 80th and 90th complete days,

80th complete day.	90th complete day.
mean longitude ... 339°	mean longitude ... 20°
actual geocentric place ... 58°	actual place ... 73°

we obtain, by proportional parts, for 89 complete days,

mean longitude ... 16°	} (4)
actual geocentric place ... 71° 5'	

Lastly from (2) and (4) we reason as follows, by proportional parts:—

with an increase of 7° in mean longitude (i.e., $16^\circ - 9^\circ$) Mercury attains an increase in geocentric place of 1.7° (i.e., $71.5^\circ - 69.8^\circ$).

with an increase of 2.6° in mean longitude (i.e., $11.6^\circ - 9^\circ$) Mercury attains an increase in geocentric place of $\frac{2.6 \times 1.7}{7} = \frac{4.42}{7} = .63^\circ$.

That is, on 89th complete day, Mercury's actual place, corresponding to mean longitude ($9^\circ + 2.56^\circ$) or 11.56° , = $69.8^\circ + .63^\circ = 70.4^\circ$, which is exactly the result obtained by strict calculation in accordance with paragraph 237, page 95, supra.

324. In taking proportional parts for the 89th complete day, the eye-tables for Jupiter and Saturn should be used in the same way as the eye-table for Mars.

325. For Venus, we have, by the Venus Eye-table.

Col. 1. Mean longitude.	Col. 2. Actual geocentric place on 80th complete day.	Col. 3. Actual geocentric place on 90th complete day.	Col. 4. Therefore actual geocen- tric place on both com- plete day (by proportional parts).
290°	32°	47°	45.5°
300°	31°	42°	40.9°

That is, we find, from the first and last columns, that with an increase in mean longitude of 10° (i.e., 290° to 300°), Venus undergoes a decrease in geocentric place of 4.6° (i.e., $45.5^\circ - 40.9^\circ$).

Therefore, with an increase in mean longitude of 6° (i.e., $296^\circ - 290^\circ$), Venus undergoes a decrease in geocentric place of $6 \times .46^\circ = 2.76^\circ$.

In other words, on 89th complete day, Venus' geocentric place, corresponding to a mean longitude of 296.23° , = $45.5^\circ - 2.76^\circ = 42.7^\circ$, which is within 1 degree of the result obtained by strict calculation in accordance with paragraph 237, page 95, supra.

SECTION V.—*Eclipses and Eclipse chronology.*

326. All over the world, and whatever system of chronology may be followed in any particular country, a recorded eclipse is an unerring landmark for the chronologist, and therefore the energy of mathematicians since the 16th century A.D. has been expended on the production of lists of eclipses for ancient as well as modern times. In such lists the path of each solar eclipse is often noted, showing in what parts of the terrestrial globe it was central and where it was visible. Oppolzer's *Kanon der Finsternisse*, which is generally regarded as a standard work on the subject, describes the eclipses, both lunar and solar, from 1207 B.C. to A.D. 2161 and is fully illustrated with charts. For eclipses comprised within this period, no other guide is necessary, and it happens that the most ancient eclipses recorded anywhere in history fall within this period. Professor Newcomb's *Tables of Solar Eclipses from 700 B.C. to A.D. 2300*, and Dr. Gratton Guinness' very accurate list of lunar eclipses in his *New Moons and Vernal Equinoxes* (B.C. 1622 to A.D. 1934) may also be referred to. Lastly, frequent use has been made in the course of this work of a French work, first published in the 18th century, *L'Art de Vérifier les dates*, which gives all kinds of eclipses in some detail from A.D. 1 to A.D. 2000. The eclipses in Sir A. Cunningham's *Book of Indian Eras* are reproduced from the French work. Italicized solar eclipses in IV-L will generally be found in Oppolzer, but not in the French work. The reason why such eclipses are omitted in the French work is given in paragraph 345 below.

327. But in India public curiosity occasionally fastens itself on eclipses which are more ancient than any recorded in the above works, and which there is no known means of dating, because the literary documents referring to them are themselves destitute of any historical dates. For instance, a solar eclipse is believed to have occurred on the day when Rāma was to have been crowned, and when, instead of being crowned, he went into exile. Bentley referred this eclipse to 940 B.C., July 2. In the Mahābhārata two eclipses, occurring in the course of a fortnight (this is the most sensible construction that can be placed on a passage which literally means that both a lunar and a solar eclipse occurred on the same day, which is physically impossible), are said to have preceded the great battle, and

these eclipses must have occurred, according to the commentators, in the lunar month of Kārttika or Mārgaśīrsha. But there are no dates in either the Rāmāyaṇa or the Mahābhārata, and as there is nothing whereon we can base even an approximation to a date, critics and investigators imagine dates, more or less hypothetical, for the events of the Rāmāyaṇa or for those of the Mahābhārata and seek to establish their hypothesis by showing that there were eclipses on those dates.

328. It is not, however, solely to gratify such speculative curiosity that the following tables have been devised. A recorded eclipse is a genuine and solid landmark in history ; but ancient records of eclipses, equally with those of other events, are often not quite exact in detail, and then it is necessary to ascertain by other means whether there was an eclipse on a particular date and what was its nature and extent. An eclipse obeys certain laws of cyclic recurrence, like a tithi or a nakshatra or a planet ; and it is the object of this section to define and exemplify the cycles which will be found most useful in practical investigation, and which will enable us to satisfy ourselves whether an eclipse which is believed to have occurred on a certain date did occur, or could have occurred at that time.

329. An eclipse cycle may be defined as a period, composed of a certain number of partial or complete solar years, after which the sun's distance from a node is the same at new moon (in the case of a solar eclipse), or at full moon (in the case of a lunar eclipse), and the sun's and moon's anomalies are also nearly the same, as at the beginning of the period. A perfect eclipse cycle in this sense probably does not exist, but there is no harm in using an imperfect cycle, provided we apply from time to time the correction, which we may call the cyclic variation.

330. It was stated in paragraph 140, page 40, supra, that in order that an eclipse may be possible, the sun should be within a certain distance from either of the moon's nodes. For a solar eclipse, it suffices if the sun is between 0° and $16^{\circ}2'$ from a node : indeed a solar eclipse is possible so long as the sun is not more than $18^{\circ}9'$ from a node. For lunar eclipses, the limits are much narrower : for a lunar eclipse to be fairly certain, the sun must not be more than $10^{\circ}44'$ from a node, and when his distance from a node is between $10^{\circ}44'$ and $13^{\circ}86'$, a lunar eclipse is possible, not probable. It follows from the tables of Rāhu's (IV-K) and sun's (IV-C) motions, that the distance of the sun from the node diminishes every day at the rate of 1.0386015 degree, and the interval from the moment when the mean sun is at a node to the moment when he is at the same node again is $\frac{360^{\circ}}{1.0386015} = 346.61996$ days. This is the period of a joint revolution of the sun and node, fixed by modern astronomy ; but when using this period in Indian astronomy, we have to make the same allowance for the annual displacement of the 0° point of longitude in Indian astronomy as we did in paragraph 219, page 91, supra, in the case of the planets. Applying the same method to the distance of the sun from the node, or as it is shortly called, "Sun from node," we proceed as follows:—

Sun and node together do $\frac{360^{\circ}}{346.61996} = 1.0386015$ degrees per day (modern astronomy).

Sun alone does $\frac{360^{\circ}}{365.25636} = .9856091212$ degree per sidereal day (modern).

$\therefore$ node alone does $1.0386015 - .9856091 = .0529924$ degree per day (modern).

And a given node does 360° in $\frac{360^{\circ}}{0.0529924} = 6793.4269$ days = 18.59906 sidereal years (modern).

In 18.59906 years, the displacement of sun's 0° longitude (vide paragraph 217, page 90, supra) = $18.59906 \times .002361^{\circ} = .04391238^{\circ}$.

But the node travels $.0529924$ degree per day in a direction opposite to that of the sun.

$\therefore$ it travels $.0439124^{\circ}$ in $\frac{.0439124}{.0529924} = .8286453$ day.

$\therefore$ node, by Indian astronomy, must be held to complete an orbit in $6793.4269 - .8286 = 6792.5983$ days.

$\therefore$ node, by Indian astronomy, travels in one day $\frac{360^{\circ}}{6792.5983} = .0529988^{\circ}$.

But the sun, by Indian astronomy (Sūrya Siddhānta), in one day travels $.9856026^{\circ}$.

∴ sun and node, by Indian astronomy, together travel in one day 1.0386014° .

And sun and node travel in 1 year $1.0386014 \times 365.25876^\circ = 379.3583^\circ$.

∴ Sun and node together travel in 360° in $\frac{360^\circ}{1.0386014} = 346.61998337$ days.

According to *Sūrya siddhānta*, the last figure, as observed by Professor Jacobi in *Epig. Ind.*, Vol. I, page 442, ought to be 346.6246334 days: but inasmuch as the only use ordinarily made of the distance of sun from node in chronological investigations is in connexion with eclipses, and eclipses are peculiarly a matter of observation and therefore a matter which, to be safe, should, as far as possible, be regulated by the quantities of modern astronomy, we adopt, for the period of joint revolution of the sun and node, 346.61998337 days which, as compared with the figure adopted in modern astronomy, involves a slight correction for the annual displacement of the sun's 0° longitude in Indian astronomy.

331. The other quantities which we shall make use of in Table IV-L follow from those above settled. The length of a tithi, as a fraction of a day, by *Sūrya siddhānta* $= \frac{29.530587943}{80} = .9843529315$ of a day.

The joint motion of sun and node for one tithi $= .9843529315 \times 1.0386014 = 1.02235033275$ degrees.

∴ The joint motion of sun and node for 360 tithis, or an ordinary lunar year of 12 months $= 360 \times 1.02235033275 = (36) 8.046011979$ degrees; and the joint motion of sun and node for 390 tithis or 13 lunar months (when the lunar year includes an *ādhika* month) $= 3 (9) 8.716521961^\circ$.

N.B.—Tables for readily calculating the distance of sun from node for any number of days or years will be found at the end of this section.

332. We now proceed to define the principal cycles which we shall use in investigating the recurrence of eclipses. The first is the famous saros of 18 years and 10 days, which has been known at any rate in the west from a period of remote antiquity.

- (1) (a) 18 Indian sidereal years $= 6,574.65768$ days (*Sūrya siddhānta*).
- (b) 223 synodical months $= 6,585.321124$ days (*Sūrya siddhānta*).
- (c) 19 joint revolutions of sun and node $= 6,585.779684$ days (*Ephemeris*).

Difference between (a) and (b) $= 10.66344$ days.

Difference between (b) and (c) $= -.45856$ of a day, or, at the rate the daily joint motion of the sun and node already arrived at, $+ .4762^\circ$. In other words, in 18 Indian sidereal years $+ 10.66344$ days, the distance of the sun from node advances by $+ .4762^\circ$. The reader should reason out for himself why the result is $+ .4762^\circ$ and not $-.4762^\circ$.

- (2) (a) 19 sidereal years (Indian) $= 6,939.916364$ days.
- (b) 235 synodical months (*Sūrya siddhānta*) $= 6,939.6881565$ days.

This is the Metonic cycle, which is as ancient and as interesting as the saros.

- (c) 20 joint revolutions of sun and node (*Ephemeris*) $= 6,932.3996674$ days.

In 235 synodical months (*Sūrya siddhānta*)
difference between (b) and (c) $= 7.2884891$ days.

In this interval the distance of the sun from the node decreases by $7.2884891 \times 1.0386014^\circ = 7.5698349831^\circ$.

The Metonic cycle can be applied to eclipses when the sun is very near a node at one of the eclipses compared. For example, on the 87th day of A.D. 1 (Table IV-L, first line) the distance of the sun from node was 3.41° . Nineteen years later, the distance must have decreased by 7.57° , i.e., the distance then was $-.416^\circ$, at which distance an eclipse was still probable. We find from Table IV-L that on the 87th completed day of A.D. 20 there was a solar eclipse at which the sun's distance from node was $-.416^\circ$.

- (3) (a) 358 synodical months (*Sūrya siddhānta*) $= 10571.9504682$ days.
- (b) $30\frac{1}{2}$ joint revolutions of sun and node (*Ephemeris*) $= 10571.909390$ days.

(c) 29 Indian sidereal years (Sūrya siddhanta) = 10592·503924 days.

Difference between (a) and (c) = 20·6 days.

Difference between (a) and (b) = +·041 day,
or —·04258°.

This cycle of 29 years *less* 20·6 days is the foundation of the next two cycles.

Days.

(4) (a) 716 synodical months (Sūrya siddhanta) ... = 21143·9009364

(b) 61 joint revolutions of sun and node (Ephemeris) = 21143·18780

(c) 58 Indian sidereal years (Sūrya siddhanta) ... = 21185·007848

Difference between (a) and (c) = 41·107

Difference between (a) and (b) = +·082156 day
or —·08516°.

This cycle of 58 years, *less* 41·1 days, is the one most frequently used in Table IV-L. (See headlines of Table IV-L.)

Days.

(5) (a) 521 sidereal years (modern) = 190298·56356

(b) 521 Julian years (modern and tropical) ... = 190295·25

(c) 521 sidereal years (Sūrya siddhanta) = 190299·81396

(d) 6,444 synodical months (Indian or modern) ... = 190295·109072

(e) 549 joint revolutions of sun and node (Ephemeris) = 190294·36902

Difference between (d) and (c) = 0·74 day or 0·76444°; difference
between (c) and (d) = 4·7 days; and the difference between (b)
and (d) = 0·14 day.

(f) In 521 Indian sidereal years, *less* 4·7 days, the moon's anomaly
moves 3·1 days. (Eyc-table e.)

N.B.—(i) All the quantities in this cycle of 521 Julian years are 18 times those in (3), the cycle of 29 years *less* 20 days, or 9 times those in (4), the cycle of 58 years *less* 41·1 days.

(ii) After 521 Julian years, eclipses recur on the same day of the European calendar (old style). This can be verified by means of Table II. For instance, the solar eclipse on June 9, A.D. 1 is repeated on June 10, A.D. 522. But when one of two eclipses, compared at an interval of 521 years, occurred before 14th September A.D. 1752 (when the new style was introduced into the United Kingdom) and another occurred after the above date, the day of the month will be increased by 10 or 11 days.

333. The cycles of recurrence used in Table IV-L are (1) *supra*, 18 years *plus* 10·66344 days, and (4) *supra*, 58 years *less* 41·107 days, and combinations of these, as noted at the top of the several columns in that table. Cycle No. (3) *supra*, 29 years *less* 20·6 days, is a good cycle for the half joint-revolution of the sun and node, and because an eclipse may occur when the sun is at either node, and at the end of 29 years *less* 20·6 days, the sun is only 0·04 degree nearer to or further from the node than he was at the beginning of this period, it follows that eclipses occur regularly at the end of every 29 years *less* 20 days. It is noted in the *Encyclopædia Britannica* (Art. *Eclipse*) that, “starting from the eclipse of Nineveh, June 15, 763 B.C. we find eclipses on May 27, 734 B.C., May 7, 705 B.C. and so on, in an unbroken series for 2,600 years down to A.D. 1843, A.D. 1872 and A.D. 1901, i.e., once in 29 years *less* 20 days, the last being the 93rd of the series.”

334. The disadvantage of cycles of 29 years *less* 20·6 days in chronological investigation is that we have to reckon by half-joint-revolutions of the sun and node. By doubling this cycle to 58 years *less* 41·1 days, we secure the recurrence of meetings of the sun and node in the same degree of longitude.

335. But a pure cycle of 58 years *less* 41·1 days, like a pure saros of 18 years *plus* 10·7 days, has the disadvantage of accumulating, in a long period of time, the small difference in longitude noted above to what may turn out to be a considerable amount. Thus at the end of 9 cycles of 58 years *less* 41·1 days, or 521 Julian years, or 521 Indian sidereal years *less* 4·7 days, the sun will be at the same

distance from the node as at the beginning of this period, *less* 0.76 of a degree. The probability of an eclipse is not much affected by this difference, but after five such periods, the distance is less by $5 \times .76 = 3.8^\circ$, and if the distance of the sun from the node was 164° at the beginning of the period, at which distance an eclipse is within the bounds of possibility, it would, at the end of 5×521 , or 2,605 years, be 164° *less* 3.8° or 160.2° , at which distance an eclipse is impossible.

336. To avoid such accumulation of cyclic differences in a long period of time, and still more to avoid the accumulation of $+ .47^\circ$ for every saros of 18 years, we vary the cycles, as will be seen from the headlines of Table IV-L, in such a way as to prevent any cyclic variation exceeding $.29$ of a degree. This is effected by combining the 58 years' cycle occasionally with the saros of 18 years, that is, five times in the course of 1,711 years, after which the distance of the sun from node is exactly what it was at the beginning of the 1,711 years' cycle.

337. For

1,711 Indian sidereal years	... ..	=	624957.731516 days (a).
21,163 synodical months (Sūrya siddhānta)		=	624955.833844 days (b).
1,803 joint revolutions of the sun and node		=	624955.829349 days (c).

The remarkable closeness of (b) and (c), the difference between them being only $.0045$ of a day, or 39 seconds of time, or $.00467$ of a degree, which is only 2 seconds of an arc, makes this cycle a very useful one in chronological investigation. The difference between (a) and (b) is only 1.9 days or just under two days, which means that if we have an eclipse say on the 35th day of the Indian solar year, A.D. 1901, there was probably another eclipse in the year 1901 *less* 1711, or A.D. 190, on the 37th day, and another in A.D. 190 *less* 1711 or — 1521 A.D., i.e., B.C. 1522 (vide remarks on *minus* A.D. years in paragraph 292, page 117 supra), on the 39th day, and another in B.C. $(1,522 + 1,711)$ or 3,233 B.C. on the 41st day. So far as A.D. 190 and A.D. 1901 are concerned, we find this to be the case from Table IV-L (see the line of the eclipses beginning with A.D. 16, 160th day), and we know that the same must have been the case in B.C. 1522, and in B.C. 3233, though we have no records of eclipses going back so far.

338. Let us study an actual example which will illustrate exactly the use we might make of Table IV-L, and of the key prefixed to it. An ancient Babylonian record refers to an eclipse of the sun on 20th June, 1070 B.C. (*Encycl. Brit.*, Art. *Eclipse*), and we wish to verify this. In 1070 B.C. the 20th June was about the 108th day of the Indian solar year (Eye-table **k** and **q**). We know from the 1,711 years' cycle that, if the Babylonian record is correct, then 1,711 years later, i.e., in A.D. 1711—1069 or A.D. 642, there must have been a solar eclipse about the 106th completed day. Now turning to Table IV-L, we find a solar eclipse in A.D. 642, on the 105th complete day. We expected it on the 106th day, but our fixation of 20th June, 1070 B.C. as the 108th completed day of that year was a rough one, arrived at by simply deducting March 4 (Eye-table **k**, 1101 B.C.) from March 112 (the equivalent of June 20, acc. to Eye-table **q**).

339. If we calculated the exact day of the Indian solar year 1070 B.C. which corresponded to June 20, and calculated also the actual ending moment of the new moon tithi in June of 1070 B.C. and in June of A.D. 642, we would have a difference of two whole days only (according to the 1,711 years' cycle) and not of three whole days. This, however, does not vitiate our chronological result, that on 20th June, 1070 B.C. there was probably a solar eclipse, the distance of the sun from the node having then been, as on the 105th day of 642 A.D., 356.83 degrees. We know from the headlines of Table IV-L that in A.D. 642, as compared with A.D. 27, the cyclic variation for the distance of the sun from the node was $+ .10$ degree, so that since the distance of the sun from the node in A.D. 27 at the first solar eclipse of that year was 356.83 degrees, the distance at the corresponding eclipse of the year A.D. 642 must have been 356.93 degrees, and the distance at the corresponding eclipse of 1070 B.C. must have been also 356.93 degrees, because the cyclic variation in the distance of the sun from the

node for 1,711 years *less* 2 days is only .004 of a degree. Lastly, if we wish to know the English equivalent of the 105th completed day of A.D. 642 we turn to Table IV-M (Table of equivalence of English and Indian days in the several centuries A.D.), which shows us that in A.D. 642 the 105th completed day of the Indian solar year was either July 3 or July 4. We see that, unlike the 521 years' cycle, the 1,711 years' cycle does not give us an eclipse in the same English month: but it is very convenient for all other purposes in chronological investigation.

340. We shall next study two ancient eclipses of the moon. In Shakespeare's *Hamlet*, Act I, scene i, there is a reference to the fact that "a little ere the mightiest Julius fell," i.e., before 15th March, 44 B.C. the moon "was sick almost to doomsday with eclipse." According to astronomers, there was an eclipse of the moon on 7th November, B.C. 45 visible at Rome two hours after midnight. The 7th November, in B.C. 45 was, by Eye-table **k** and **q**, March 252 *less* 13, i.e., the 239th completed day of the year. On the 237th completed day of A.D. 1711 *minus* 44, or A.D. 1667 we should have, if Shakespeare's reference is historical, a lunar eclipse. The key to Table IV-L shows that eclipses of the year A.D. 1667 follow the same order as eclipses of the year A.D. 14, and against A.D. 14 we find in Table IV-L, a lunar eclipse on the 237th completed day of the year A.D. 1667, just what we expected. The commentators of Shakespeare's *Hamlet* are silent as to the exact authority for his reference to a lunar eclipse in the year B.C. 45. Plutarch, who is Shakespeare's usual source of information in regard to Roman history, mentions portents, not a lunar eclipse as having preceded the assassination of Julius Cæsar. Ovid's *Metamorphoses*, Bk. xv, ll. 787–790 which, in the "Howard" Shakespeare, is cited as an authority, refers to a solar, not a lunar, eclipse. Lucan's *Pharsalia*, Bk. I, ll. 526, etc., refers no doubt to a lunar as well as a solar eclipse, but that was before the battle of Pharsalia, B.C. 48. We have good reason, however as chronologists, for supposing that Shakespeare relied on some authority more specific than Ovid, Lucan or Virgil (*Georg.* I, l. 467). Whatever Shakespeare's source of information was, the lunar eclipse alluded to by him appears to have been a solid historical fact, referable to a definite date 7th November, 45 B.C.

Plutarch, in his life of Paullus Æmilius (Langhorne's Translation), says that when the Roman army was about to retire to rest on the eve of the battle of Pydna (June 22, B.C. 168) "on a sudden the moon was totally eclipsed." June 21 (the eve of the battle) was, by Eye-table **k** and **q** (March 113 *minus* 12 =) the 101st completed day of the Indian solar year, and about the 99th day of the year A.D. 1544 (i.e., A.D. 1711 *minus* 167) we should find a lunar eclipse, if there was one on 21 June, B.C. 168. On the 99th day of A.D. 1544, we do find a lunar eclipse (see Table IV-L, the line beginning with A.D. 24); and the sun's distance from the node then was $173^{\circ}57' - 23^{\circ} = 173^{\circ}34'$. In fact there was a lunar eclipse at the end of every cycle in the line beginning with A.D. 24, 354th day.

341. The distances of the sun from the node given in the first column of Table IV-L are distances of the *mean* sun: but of course a solar eclipse depends on the distance of the actual sun, for which purpose we want the sun's equation of the centre for the day in question according to Table IV-C. Thus in the example given above (B.C. 1070, June 20) when the distance of the *mean* sun from the node of the 108th completed day of the Indian solar year was $356^{\circ}93'$ degrees, the sun's equation of the centre was by Table IV-C, *minus* $1^{\circ}00'09''$ degree, which of course made the sun, $+1^{\circ}00'09''$ degree further from the node (because the sun moves in a direction opposite to the node), so that the actual distance of the sun from the node on the 108th completed day of 1070 B.C. was $356^{\circ}93' + 1^{\circ}00' = 357^{\circ}93'$ degrees. This only made a solar eclipse more certain on the 108th day in B.C. 1070 than in A.D. 642 on the 106th day.

For a lunar eclipse also the sun must be at or near a node at the moment of an eclipse when the moon is at the opposite node: here again our tables give us the distance of the *mean* sun from a node and for his actual distance, we want not only his equation of the centre but also the elongation of the sun from the node due to the difference in time between the mean and actual ending moment of the tithi.

342. Thus, the lunar eclipse alluded to in *Hamlet*, took place on the 239th completed day of the Indian solar year 45 B.C., when the distance of the *mean* sun from the node was, by Table IV-L, 178·11 degrees (the entry in column 1 under A.D. 14, 2nd lunar eclipse) *plus* ·07 degrees (entry in the headline above A.D. 1667), or 178·18 degrees. But the interval between the actual and *mean* ending moment of this full moon tithi was as follows :

	☾'s An. days		☾'s An. days
Eye-table k, l, m, 101 B.C. March	13·16	6·54	24·26
Eye-table n, o, p, 56 years.	·49	10·21	8·98
	16·75	16·75	16·75
			49·99
			27·55
			22·44
Mārgaśīra Full Moon Eye-table y	221·48	22·148	1·04
March.	251·83	238·23	23·48
☾'s Anomaly for 238·23 d. (Eye-table h.) — 08			—·08 (☾'s An.)
			23·40
☾'s Anomaly for 23·40 d. (Eye-table e.) +·32			+·32
	+·24	.....	+·24
	March 252·07.		

The actual tithi having occurred +·24 days later than the mean tithi, the sun was thereby ·24 degree nearer the node, and the sun's equation of the centre for the 238th day being *minus* ·93 degree, he was for this reason ·93 degree further from the node : altogether the sun's distance from the node at the centre of the eclipse was 178·13 *minus* ·24 *plus* ·93 = 178·85 degrees.

The eclipse occurred at ·07 of day, Lanka time on March 252, i.e., on 7th November ; at Rome the corresponding time was 4 hours 16 minutes less, or ·18 of day less than at Lanka ; in other words the time of the eclipse at Rome was ·89 of the day, that is, by Table VI, 21 hours 22 minutes after Lanka sunrise, i.e., 3 hours 22 minutes after mid-night.

The maximum effect of tithi equations being an addition to, or subtraction from, the mean ending moment, of ·58 of a day (paragraph 28, page 8 supra) and the maximum of sun's equation of the centre being 2·14 degrees, it follows that the *actual* sun may, by reason of these equations, be at a given moment nearer to or further from the node than the *mean* sun by 2·72 degrees.

343. The moon's anomaly and the sun's anomaly are therefore important considerations in the investigation of eclipses. In 87 years *less* 62 days [i.e., three times (29 years *less* 20·6 days)] the moon's anomaly, by Eye-table p moves only ·52 of a day : consequently, after 87 years *less* 62 days, there will not be much change due to the moon's anomaly in the relative position of the sun with reference to the node ; and the *Ency. Brit.* (*loc. cit.*) therefore observes :—" In a series including every third eclipse " (i.e., every eclipse after an interval of 87 years *less* 62 days) " the eclipses will be of the same character through a thousand years or more. Thus the eclipses of A.D. 1467, 1554, 1640, 1727, 1814, 1901, 1988 are total."

344. We may here remind the reader of the observations made in paragraph 137, page 49 supra, regarding the universality of a lunar eclipse, so far as the earth's surface is concerned, and the comparatively circumscribed limits of a solar eclipse. Hence a lunar eclipse is much easier to verify than a solar eclipse. If we know the date of a lunar eclipse according to any good modern authority, we may be sure that, making allowance for terrestrial longitude, the same eclipse must have occurred over every part of the terrestrial globe illuminated by the moon. Thus in investigating the lunar eclipse referred to in the Tamil poem *Paripādal* (vide

paragraph 266, page 106 supra), we took the time of occurrence of the eclipse from the French work "*L'Art de Vérifier les dates*," and applied to that time the correction due to the difference in terrestrial longitude between Paris and Madura, and found that the result agreed very closely with the actual ending moment of the full moon tithi of Āshāḍha month in the year A.D. 634, according to Ārya siddhānta.

345. The verification of a solar eclipse is not so easy. Whether a particular solar eclipse was visible in India depends on whether any part of India was 30 degrees, 40 degrees or 50 degrees north or south of the central track of the eclipse, as we shall explain in paragraphs 351 to 355 below. The central track of a solar eclipse can be laid down only by an elaborate calculation, but the best books on eclipses, like the French work above referred to, and the more modern catalogues by OPPOLZER indicate the track of every important eclipse. Eclipses which could have been observed only in inaccessible regions of the earth, or which were wholly confined to America are not included in the French work, though they are in OPPOLZER. When an eclipse is alluded to in an Indian record, we do not generally know whether it was an eclipse strictly visible in India or an eclipse which, owing to the proximity of the sun to the moon's node, was bound to occur, and to be visible, somewhere on the earth. Table IV-L serves the useful purpose of indicating all possible eclipses, those visible somewhere in the northern half of the eastern hemisphere being printed in ordinary type, while those visible in India between A.D. 1 and A.D. 2000 are distinguished by asterisks. When the solar day on which an eclipse (solar) was due is indicated by italics in Table IV-L, it means that the eclipse will probably be found in OPPOLZER, but is not given in the French work, having been excluded from the latter, either because it was hardly noticeable, or because it did not occur in an inhabited part of the Old World. (The object of the French work, like that of the present work, is to help students of chronology in verifying dates; and eclipses which could have been observed only in the polar regions or in remote seas, are not catalogued by it: nor does it catalogue eclipses which could have been observed only in America, because before the discovery of America, there were no records in the New World, at any rate none that are available to us for study: we know that the Aztecs of Peru made astronomical observations in pre-Columbus days and have left behind pictorial records of the same, but no clue has been found which will enable us to decipher them). If *every* one of the 8,000 solar eclipses catalogued in OPPOLZER were taken into practical account, it would more often retard or confuse investigation than help it forward. For instance, if we turn to the entries of solar eclipses in the *calendar* year A.D. 1935, i.e., the year beginning on the 267th day of the Indian solar year A.D. 1934-35, corresponding to the 1st January A.D. 1935, we shall find three possible solar eclipses indicated in Table IV-L, on the 296th, 79th and 266th days. All these dates are, however, italicised in Table IV-L, because the French work omits them, but Mrs. TODD in her well-known book "*Total eclipses of the Sun*," says: "as many as five solar eclipses in a single year are possible, but this happens very rarely; the last occasion was early in the present century" (the book was published in 1894), "and it occurs only once—1935—in the next two and a half centuries." There is a similar remark about the year 1935 in YOUNG's *Elements of Astronomy* (1902), page 172. If we look in Table IV-L for the other two possible solar eclipses of the year 1935, we shall find them on the 267th day of the year 1934-35, and on the 108th day of the year 1935, i.e., two of the five eclipses here referred to must have occurred a month in each case before or after two other eclipses already noticed as possible. Such eclipses are hardly reckoned except in theoretical astronomy, because no eclipse that occurs on the 30th day after a previous eclipse is reckoned in practice; in fact none of the eclipses of 1935 is assigned a track in OPPOLZER's maps, though all five are mentioned in his catalogue.

346. The reader will notice that—

(1) in certain lines of Table IV-L (and these are cases in which the sun was very near a node), eclipses, whether solar or lunar, recur almost as many times as there are cycles; while

(2) in other lines a solar or a lunar eclipse is quite exceptional;

(3) in a few lines again all the figures are in italics, i.e., there was no eclipse which the French work thought it worthwhile to record, though most of these eclipses (if solar), will be found in OPPOLZER;

Lastly, (4) there are a few lines in which the distance of sun from node, marked in column 1 of Table IV-L is beyond the theoretical limits of possibility (i.e., beyond 18.9 degrees in the case of solar, and 13.9 degrees in the case of lunar eclipses), and nevertheless there are one or two eclipses even in these lines (see for instance, paragraph 364 below), due, no doubt, to the fact that the distance was brought within possible limits by reason of the sun's and moon's anomalies.

When, in an investigation, we come across ancient eclipses corresponding to those in Table IV-L (i.e.) to eclipses in years which were later by 1,711 years or multiples thereof, we should class the first of the four kinds of eclipses above referred as certain, the second as possible, the third as highly improbable, and the fourth as quite exceptional. Of course, if the solar day of a year under investigation is not cyclically repeated in Table IV-L (i.e., repeated after 1,711 years or a multiple thereof, with a difference of only 2 days for every such cycle), we may safely conclude that a solar eclipse was impossible on such a day. To justify us in asserting more than this in the four classes of cases, e.g., to justify the conclusion that a particular ancient solar eclipse was visible in some part of India, we need a very elaborate calculation, or a positive authority like OPPOLZER.

347. Table IV-L may be studied from different points of view :

(1) It shows practically for all time all the possible positions of the sun with reference to the nodes at which an eclipse could occur. A series of positions for 58 years, column 1 of table IV-L, having been once ascertained, may be continued, as shown in the head-lines of that table, for 1,711 years and after 1,711 years the series must recur, with a difference of only two days in the day of the solar year. As to this we may satisfy ourselves from table IV-L itself by comparing, for instance, the eclipses of A.D. 1 with those of A.D. 1712, or the eclipses of A.D. 257 with those of A.D. 1968.

(2) Table IV-L shows, in ordinary type, the eclipses of the Old World, as defined in paragraph 345 *supra*. These are the only eclipses with which the student of chronology in any country is likely to be concerned, until we come to quite modern times, i.e., to the 15th and subsequent centuries.

(3) Table IV-L marks with asterisks the solar eclipses visible anywhere in India between A.D. 1 and A.D. 2000.

(4) Table IV-L marks all other eclipse positions in italics. Most of these, in the case of eclipses of the sun, may be traced in OPPOLZER, though by reason of their being penumbral or of their having their central tracks elsewhere than in the Old World, they would not ordinarily interest the student of chronology.

(5) Table IV-L does not distinguish between eclipse positions, italicised because they lie outside the limits within which eclipses are possible, and small, remote or penumbral eclipses, which, though catalogued as such by OPPOLZER, do not interest the student of chronology. For instance, in the lines beginning with A.D. 11, 96.9th day (sun from node 340.26°) and A.D. 29, 107.5th day (sun from node 340.74°) the limits of an eclipse noted in paragraph 330 (18.9 degrees from a node) are exceeded and most of the eclipse positions in these lines do not figure in OPPOLZER; but there are exceptions like A.D. 1664, 136th day and A.D. 1682, 147th day (noticed in paragraph 364 below) due to the fact that the sun's anomaly brings the sun at this time of the year (August) two degrees nearer the node, that is, to within eclipse limits. Similar remarks apply to the line beginning with A.D. 17, 120th day (sun from node 199.98 degrees) and A.D. 18, 139th day (sun from node 161.26°).

348. We may analyse with the aid of OPPOLZER all the 39 eclipses in one line of Table IV-L, namely, the line beginning with A.D. 19, 276th day, and ending with A.D. 1980, 120th day.

A.D.	Day of Indian solar year.	Day of English calendar year by Table IV m.	Sunrise.		Noon.		Sunset.		Remarks.
			Long	Lat.	Long	Lat.	Long.	Lat	
19	275°6*	Dec. 15	+ 89	- 4	+ 153	- 26	- 145	0	
77	234°5	Nov. 4	- 94	+ 7	- 36	- 21	+ 31	- 18	America and
135	193°4*	Sep. 24	+ 82	+ 6	- 146	- 13	- 148	- 30	Africa.
193	152°3	Aug. 14	- 102	- 2	- 42	- 1	+ 15	- 27	Do
211	163°0	Aug. 25	+ 148	- 3	- 152	- 8	- 94	- 33	Pacific Ocean.
269	121°9	July 16	- 109	- 4	- 49	+ 13	+ 9	- 11	America and South
327	80°8*	June 6	+ 45	- 13	+ 104	+ 31	+ 172	+ 10	Africa.
385	39°7*	Apr. 26	+ 126	- 20	- 179	+ 19	- 109	+ 29	
442-3	96°3	Mar. 17	- 121	- 15	- 62	+ 15	+ 4	+ 43	
500 1	322°7	Feb. 3	+ 124	+ 14	- 169	- 5	- 113	+ 32	
558	291°6	Dec. 26	- 143	- 5	- 80	- 21	- 24	+ 10	
576-7	292°3*	Jan. 6	+ 95	- 10	+ 160	- 20	- 145	+ 14	
634	251°2*	Nov. 23	- 58	+ 2	+ 4	- 23	+ 68	- 5	
692	210°1	Oct. 15	- 126	+ 5	- 64	- 21	+ 7	- 26	
750	169°0	Sep. 5	- 94	+ 2	- 34	- 10	+ 26	- 32	
808	127°9*	July 27	+ 83	+ 2	+ 147	+ 12	- 155	- 15	
866	86°8*	June 16	- 31	- 7	+ 29	+ 22	+ 95	+ 4	
884	97°5	June 26	- 141	- 7	- 80	+ 17	- 18	- 4	
942	56°4*	May 17	+ 134	- 13	- 171	+ 24	- 102	+ 20	
1000	15°3*	Apr. 7	- 13	- 16	+ 45	+ 22	+ 119	+ 38	
1057-8	339°5	Feb. 25	- 93	- 18	- 29	+ 4	+ 32	+ 38	
1115	298°4	Jan. 16	- 175	- 10	- 112	- 11	- 60	+ 25	
1173	257°3	Dec. 6	+ 174	- 2	- 123	- 13	- 61	+ 2	
1231	216°2	Oct. 26	+ 129	+ 3	- 169	- 25	- 89	- 21	
1249	226°9	Nov. 6	+ 2	- 1	+ 64	- 28	+ 135	- 19	
1307	185°8	Sep. 27	- 115	+ 5	- 57	- 18	+ 9	- 30	
1365	144°7	Aug. 17	- 133	+ 6	- 69	+ 1	- 9	- 25	
1433	103°6*	July 8	+ 109	- 2	+ 170	+ 15	- 131	- 10	
1481	62°5	May 28	- 123	- 5	- 71	+ 29	- 2	+ 17	
1533	21°4	Apr. 18	- 95	- 13	- 36	+ 26	+ 41	+ 34	
1557	32°1	Apr. 28	+ 150	- 14	- 151	+ 25	- 76	+ 28	
1614-5	356°2*	Mar. 29	+ 15	- 20	+ 73	+ 13	+ 141	+ 37	
1672-3	315°1	Feb. 16	+ 167	- 14	- 132	+ 1	- 76	+ 37	
1730-1	274°0*	Jan. 8	- 42	- 10	+ 27	- 20	- 86	+ 14	
1786	232°9	Nov. 27	- 157	- 4	- 94	- 30	- 27	- 12	
1846	191°8*	Oct. 20	- 1	+ 7	+ 59	- 19	+ 126	- 24	
1904	150°7	Sep. 9	+ 163	+ 8	- 133	- 5	- 70	- 27	
1922	161°4	Sep. 21	+ 43	+ 5	+ 106	- 12	+ 173	- 30	
1980	120°3	Aug. 10	- 169	+ 1	- 108	+ 4	- 52	- 23	

* Eclipses visible in India.

349. The columns in the above table headed “Sunrise, noon and sunset” with sub-headings “Longitude and latitude” give particulars of the central track of each solar eclipse (vide page 49, paragraph 137 supra) wherefrom we may form a very fair idea of the positions of the earth’s surface where an eclipse was visible centrally, that is, along the path of the moon’s shadow. But as will be explained presently in paragraphs 351 to 355 below, an eclipse is also visible for at least 30 degrees of latitude to the north and an equal number of degrees to the south of the central track.

350. The moon during an eclipse, as at any other time, travels from west to east, and during a solar eclipse its shadow after striking the earth travels rapidly from west to east. This means that if a solar eclipse is seen anywhere on earth at sunrise, it will be seen at sunset at the same moment in a remote part of the earth to the east; and in some part of the earth between these limits, it will be noon at the same moment. The above table indicates by longitude (Greenwich) and latitude the spots of the earth where it was respectively sunrise, noon and sunset during each solar eclipse; and if we know the limits of latitude and longitude between which any country lies, we shall know (1) if that country or any part of it lay across the central track of the eclipse, and (2) whether in any part of the country the eclipse was visible, though not centrally, by reason of the central track passing within 30 or 40 degrees north or south of the country.

India (including Burma and Ceylon) lies between 5° and 35° north latitude and between 60° and 100° east longitude. Now, taking the first of the solar eclipses tabled above, that on 15th December A.D. 19, we see that the extreme length of the central track lay between 89° east longitude and 145° west longitude (—145° in the table means 145° longitude west of Greenwich), and a part of India (i.e., that between 89° and 100° east longitude) is comprised within these limits. Now the latitude of the central track was 4° south latitude (—4° in the table means 4° latitude south of the equator) and the eclipse, though not central, anywhere in India, was visible for at least 30° north of the central track and it must therefore have been visible over a great part of India, east of 89° east longitude.

The next solar eclipse in the table, i.e., that of 4th November A.D. 77, was central from 94° west longitude to 31° east longitude; in other words, the central track did not reach anything like the neighbourhood of India nor would it have been visible in Europe because the latitude of the central track was from 18° to 11° south latitude and from such a long way south of the equator, the eclipse could not have been seen in Europe. It is true that one part of the central track lay in 7° north latitude but its longitude was 94° west of Greenwich, which was in America not in Europe. The reader will notice that the eclipses marked with an asterisk in the above table as those which were visible in India conform to the above limits. He may, if he pleases, pursue the study of the rest of the table in the light of the above remarks.

351. We shall now subjoin a few useful remarks from the same French work as regards the limits of an eclipse whose central track is known: “An eclipse is visible at least 32 or 33 degrees to the north and as many degrees to the south of the central track; but there are times when an eclipse can be observed up to 64 degrees to the north or to the south of the central track. It is difficult to lay down precise rules on this point; but the following observations have the merit of being clear, although they may be wanting in absolute mathematical accuracy. We shall call the central track the umbra, and we shall give the name of penumbra to all that region of the earth which is comprised between the umbra and the regions where the eclipse is not visible; in other words, all the regions within which an eclipse is visible, outside the umbra, will be called the penumbra.

352. “In the month of June, that is to say, *towards the summer solstice*, at midday, if the umbra is in not more than 25 degrees of latitude, the penumbra will extend at most 32, 33 or 35 degrees to the north; it will extend 41 degrees in the same direction if the umbra is in 40 degrees of latitude; and finally if the latitude of the umbra is 50 degrees, the extent of the penumbra has no limits, because it will extend as far north as the sun illuminates the earth. Towards the

south, the penumbra will extend 32, 33, 34, or 35 degrees as long as the latitude of the umbra does not exceed 60 degrees (north latitude). At 70 degrees of latitude for the umbra, the extent of the penumbra will be 38 degrees to the south; the umbra being in 80 degrees of latitude (north), the penumbra will extend 42 degrees south of that latitude; when the umbra is in 90 degrees of latitude, that is, at the pole, the penumbra will extend 47 degrees to the south of the pole; and when the umbra is in 100 degrees of latitude, that is 10 degrees beyond the pole, the penumbra will extend 53 degrees south of the track. We see that in the last case the penumbra may extend down to France; in fact, since the track of the umbra is then in 100 degrees of latitude (that is 10 degrees beyond the pole) and since the penumbra extends for 53 degrees south of the central track, by subtracting 53 from 100 degrees, we obtain 47 degrees of latitude for the extent of the penumbra; in this case the eclipse will be visible in all parts of France, of which the latitude exceeds 47 degrees. What has been stated concerning the month of June at noon should be applied to the month of March or *the vernal equinox at sunset*, and to the month of September or *the autumnal equinox at sunrise*.

353. “*At the equinoxes at noon*, the extent of the penumbra is 32 or 33 degrees to the north if the track of the umbra lies along the equator or south of it. When the umbra is in 10 or 20 degrees of north latitude, the penumbra will extend for 37 or 44 degrees to the north of such latitude. Lastly, if the umbra runs along 26 degrees of latitude, the penumbra will extend for 64 degrees more to the north, that is to say, as far as the pole. Towards the south, the penumbra will not extend over more than 35 degrees, so long as the latitude of the umbra is not more than 35 degrees. Corresponding to a central track of the umbra in 50 degrees of latitude, is an extent of 38 degrees for the penumbra; if the umbra is in 60 degrees of latitude, the penumbra extends 42 degrees to the south thereof; if the umbra is in 70 degrees of latitude, the penumbra extends over 48 degrees to the south; when the umbra is in 80 degrees of latitude, the penumbra extends 55 degrees south; and if the umbra is at 90 degrees of latitude, that is to say at the pole, the penumbra extends 64 degrees that is to say, to regions of which the latitude is 36 degrees north. The same remark may be made about *the solstice at sunrise and sunset*; with this difference, that at the time of the solstices, when the sun is near the horizon, the extent of the penumbra is a little less to the north and a little more to the south than it is *at noon at the time of the equinoxes*; the difference is, however, not very considerable except in high latitudes.

354. “In the month of December, or *at the winter solstice, at noon*, when the central track runs through $3\frac{1}{2}$ degrees of south latitude, the extent of the penumbra is 44 degrees to the north; and when the umbra is $2\frac{1}{2}$ degrees north latitude, the extent of the penumbra is 64 degrees, that is to say, the penumbra will then touch the polar circle, beyond which, in winter, there can be no daylight. The penumbra extends south over 36, 41, 50 or 64 degrees of latitude, according as the latitude of the umbra is 20, 35, 50 or $66\frac{1}{2}$ degrees north latitude. The same remarks apply to eclipses *in March at sunrise*, and to those *in September, at sunset*.

355. “If the extent of the penumbra is 32, 33, 34 or 35 degrees, we can divide that extent into twelve nearly equal parts, and we shall have, as a result, the regions where the eclipse will appear to be one of 11 digits, of 10 digits, of 9, etc. If the penumbra is wider than the above limits, the interval between the digits will be more or less unequal; generally speaking, this distance is less towards the equator and greater towards the pole. In June at noon, in March at sunset, and in September at sunrise; there is a difference of one digit for every $2\frac{3}{4}$ degrees in the tropics, for every 3 degrees under the 45th parallel of latitude, and of 4 degrees in the polar circle. At the time of the equinoxes, at noon, and at the time of the solstices, sunrise or sunset, there is a variation of one digit for every 3 degrees in the tropics, for every 4 degrees under the 45th parallel of latitude, and for every 8 degrees in the polar circle. At the winter solstice, at noon, and also in March at sunrise and in

September at sunset, the variation is one digit for every 4 degrees in the tropics, for every 8 degrees under the 45th parallel of latitude and for every $15\frac{1}{2}$ degrees in the polar circle. These depths of the penumbra and these variations of digits are subject to a thousand further variations dependent upon the relative distances of the sun, the earth and the moon at the time of an eclipse. The figures given above are however, those corresponding to the average distances of these bodies."

356. The cycles of eclipses which we studied in paragraph 348 *supra* practically never fail because they go on for 1,711 years with practically no alteration in the distance of the sun from the node; and after 1,711 years (Indian sidereal) *less* 2 days, the sun returns to absolutely the same distance from the node as at the beginning of the 1,711 years' cycle. It will be interesting to study, by contrast, what happens if we follow a shorter cycle, the saros of 18 years *plus* 10·7 days, uninterruptedly, for a long period. Mrs. Todd in her book: '*Total eclipses of the Sun*,' gives, at page 194, a short but lucid description of such a series of eclipses. "The advent of a slight partial eclipse near either pole of the earth will herald the beginning of a new series. (On the average new cycles will begin at intervals of 30* years.) At each succeeding return, conformably to the saros, the particular eclipse will move a little further towards the opposite pole, its magnitude gradually increasing for about 200 years, but during all this time only the lunar penumbra will impinge on the earth. But when the true shadow (or umbra) begins to touch, the obscuration will have become annular or total near the pole where it first appears. The eclipse has now acquired a track, which will cross the earth slightly farther from that pole every time it returns, for about 750 years. At the conclusion of this interval, the shadow path will have reached the opposite pole: the eclipse will then become partial again, and continue to grow smaller and smaller for about 200 years additional. The series then ceases to exist, its entire duration having been about 1,150 years."

357. We shall illustrate this description by a practical example. In Table IV-L, A.D. 199, on May 13th (= 57th day of the Indian solar year), the distance of the sun from the node was 341·78 degrees, which, by our rule in paragraph 140, page 50, is near the extreme limit for the possibility of a solar eclipse. In fact neither on this day nor on the next saros, A.D. 217, May 23, is an eclipse marked (Table II). But at the next saros, A.D. 235, June 3, an eclipse is marked which is thus described in the French work:—

"6 a.m. Paris time: very small eclipse in the north of Europe."

Similar remarks, but showing that the eclipse gradually widened in area though without a track of its own, occur at the following 7 successive saroses: (2) A.D. 253, June 13; (3) A.D. 271, June 24, (4) A.D. 289, July 5, (5) A.D. 307, July 16, (6) A.D. 325, July 6, (7) A.D. 343, August 6.

We have now covered 150 years from the year A.D. 199, but according to Mrs. Todd, we must suppose the series of penumbral eclipses to have begun really 18 years earlier, that is at the new moon of May 1, A.D. 181, though it is not marked even in Oppolzer.

Two hundred years after this last date, we come upon a saros A.D. 379, August 28, when there was a solar eclipse marked in the French work, and having a track of its own. For it is thus described:—"Annular; time, Paris 0·30 p.m.; Europe and Asia; Central in the 58th parallel of latitude (that is near the pole) and 13 degrees longitude west of Greenwich; central also in the 88rd parallel of latitude and the meridian where it was then noon, that is, the meridian of Paris; central also in the 53rd degree of latitude and the 90th degree of long. east of Greenwich." So we can lay down the central track of this eclipse, from 88 degrees north latitude, 13 degrees west longitude, through 83 degrees north latitude, 2 degrees east longitude, to 53 degrees north latitude, 90 degrees east longitude. We notice that according to Mrs. Todd, "the obscuration has become annular near the pole where it first appeared" and that "the eclipse has now acquired a track."

At each successive saros, which can be easily followed by adding 18 years and 10 or 11 days every time, the eclipse crossed the earth, as stated by Mrs. Todd,

* Exactly, 29 years less 20·6 days, as we have already seen.

slightly farther and farther everytime from the north pole, for about 750 years. A.D. 1118, November 15, (Table II or IV-L) was the last saros in this series, at which an eclipse is marked, and it had by now reached the South pole. There are no further saroses with eclipses in this series.

358. There is a close connexion between the series of saroses described by Mrs. Todd and the sun's distances from the node, tabulated in Table IV-L. On the 1st May, A.D. 181 (46th completed day), when the series above studied began, the sun's distance from the node was, by Table IV-L, $341^{\circ}78'$ minus $25'$, which is equal to $341^{\circ}53'$ degrees. This is about the limiting distance for an eclipse of the sun, and we see from Mrs. Todd's description and our illustration that when the sun's distance from the node is at this limit, the penumbra is just beginning to touch the earth at the north pole. We know that after every 18 years and $10\frac{1}{2}$ days, the sun's distance from the node increases by $4762'$ of a degree, and that since 30 degrees is almost exactly equal to $63 \times 4762'$, it must be 63 saroses, that is 1,136 years, before the sun's distance from the node passes from $341^{\circ}53'$ degrees, to $341^{\circ}53'$ degrees *plus* 30 degrees, which is equal to $11^{\circ}53'$ degrees, i.e., the distance will be $11^{\circ}53'$ degrees in A.D. 181 *plus* 1136, which is equal to A.D. 1317, March 13 (Table II). On that day, being the 352nd day of the Indian solar year, A.D. 1316-17, the distance of the sun from the node was, by Table IV-L, $11^{\circ}41'$ *plus* $11'$ (vide head-lines of Table IV-L), which is equal to $11^{\circ}52'$ just what we expected.

359. According to Mrs Todd, if a new series of saroses began at the north pole about A.D. 180, the eclipse would acquire a central track near the pole about A.D. 580, it would cross the earth farther and farther from that pole for 750 years, and about A.D. 1138 it would have reached the other pole and cease to yield any eclipses after another 200 years. We have seen by actual investigation that a series of saroses beginning on 3rd May of A.D. 181, when the sun's distance from the node was $341^{\circ}53'$ degrees, did yield an eclipse with a track near the north pole on 28th August 379 (164th day), when the sun's distance from node was, by Table IV-L (line of 14 A.D.), $346^{\circ}79'$ degrees; that about 730 years after this date, that is on 15th November A.D. 1118 (236th day), when the sun's distance from the node was $6^{\circ}39'$ degrees, the last eclipse of the series occurred near the south pole, and that in 200 years more, that is about A.D. 1317, the series ceased to yield any eclipses, although the sun's distance from the node was only $11^{\circ}52'$ degrees. In fact we could have gone on for another 100 years before reaching anything like the distance of sun from node at which eclipses become uncertain: but the number of these imperceptible eclipses is really undetermined. Instead of Mrs. Todd's 1150 years, which is 64 saroses, another popular authority, *Chambers' Story of Eclipses* (Hodder and Stoughton, 1902), gives "70 saros or more than 1,200 years" for the total length of an eclipse series from pole to pole. In practice, it is well to remember (1) that the sun's distance from the node increases from 15 degrees *less* than 360 degrees, to 15 degrees *more than* 360 degrees in exactly 63 saroses, or 1,136 years less 56 days; (2) that in 613 years (tropical) the saros repeats itself nearly on the same day of the European or Julian calendar: for there were exactly 34 saroses of 18 years and $10\frac{7}{8}$ days each between A.D. 181, May 13, when our eclipse was fringing the north pole and 14th May, A.D. 812 when there was a total eclipse in the same series, central in 30° degrees north latitude when it was noon there, i.e., in the meridian of Paris; (3) that in 1226 tropical years (1226 Indian sidereal years less 5 days) there are exactly 68 saroses, which may be regarded as the total length of an eclipse series from pole to pole.

360. Given a particular solar eclipse, say, the very first one recorded in Table II, on 10th June A.D. 1, what, the reader may ask, was its place in the series of eclipses which we have supposed must have gone on uninterruptedly for 1,200 years and must have consisted of 63 to 70 saroses of 18 years and $10\frac{1}{2}$ days each? We cannot answer this question (if we do not use Table IV-L) except by following the tracks of the same eclipse through successive saroses with the aid of the French work or of Oppolzer. There are, absolutely, about 43 solar eclipses in the course of a saros of 18 years and $10\frac{1}{2}$ days. Each of these eclipses will have to be

followed through a period of about 900 years (as we did from the eclipse of June 3, A.D. 235 to the eclipse of November 15, A.D. 1118) before we can place a given eclipse in its proper position among the 60 odd eclipses of *its* series. When we have taken all this trouble, we shall still be in considerable doubt about the eclipses for the first two hundred and fifty and the last two hundred and fifty years of a series of seventy saroses.

361. It will be instructive, however, to follow, in the light of the above remarks, the history, as far as we can trace it through Table II, of the eclipses in the first saros of the Christian era (A.D. 1 to A.D. 18). We shall note in each case (1) whether the track of the eclipse advanced from the north pole to the south pole, or in the reverse direction; (2) the last eclipse in the series of saroses which is entered in Table IV-L; (3) the distance of the sun from the node, according to Table IV-L, at the last recorded eclipse in the series.

			S. to N. pole;— last recorded eclipse.	S. to N. pole;— Distance of sun from node at last eclipse.	N. to S. pole;— last recorded eclipse	N. to S. Pole;— Distance of sun from node at last eclipse.
				Degrees.		Degrees
1.	A.D. 1, June 10	.. ..	A.D. 506, Apr. 9	196°95	.. .	..
2.	A.D. 2, May 30	... ..	A.D. 705, July 25	193°92	...	...
3.	A.D. 2, Nov. 23	... ..	.. ..	...	A.D. 814, Mar. 24	12°77
4.	A.D. 3, Nov. 12	... ..	... ..	...	A.D. 959, June 8	8°53
5.	A.D. 4, Apr. 8	... ..	A.D. 148 July 3	193°75	....	...
6.	A.D. 5, Mar. 28	.. ..	A.D. 487, Dec. 13	193°44	.. ..	...
7.	A.D. 5, Sep. 21	... ..	... ..	...	A.D. 402, May 18	8°38
8.	A.D. 6, Sep. 11	.. ..	.....	..	A.D. 637, Sep. 24	6°32
9.	A.D. 7, Feb. 6	... ..	A.D. 97, Apr. 1	198°94	... .	...
10.	A.D. 7, Aug. 31	... ..	A.D. 412, Apr. 27	195°21	... .	...
11.	A.D. 8, Jan. 26	... ..	A.D. 242, June 15	194°40	...	...
12.	A.D. 9, July 10	... ..	.....	..	A.D. 568, June 10	11°41
13.	A.D. 10, June 30	. ...	.....	..	A.D. 659, July 24	5°36
14.	A.D. 10, Nov. 24	.. ..	A.D. 101, Jan. 17	197°48	... ..	...
15.	A.D. 11, Nov. 14	.. ..	A.D. 336, May 27	195°43	... .	...
16.	A.D. 12, Nov. 2	... ..	A.D. 784, Jan. 10	197°39	. ...	.
17.	A.D. 13, Apr. 28	... ..	.....	...	A.D. 662, May 23	11°89
18.	A.D. 14, Apr. 18	... ..	. ...	...	A.D. 843, Aug. 29	8°86
19.	A.D. 15, Sep. 2	... ..	A.D. 412, Apr. 27	195°91	....	...
20.	A.D. 16, Aug. 21	... ..	A.D. 647, Sep. 4	193°92	. ...	...
21.	A.D. 17, Feb. 16	... ..	.....	...	A.D. 648, Feb. 29	9°96
22.	A.D. 18, Feb. 4	... ..	.....	...	A.D. 883, July 8	8°14
23.	A.D. 18, July 1	... ..	A.D. 126, Sep. 4	194°94	....	...

362. We notice first, with reference to the statements made in paragraphs 345 and 360 supra, that there were not anything like 43 solar eclipses in this saros, A.D. 1 to A.D. 18; for there were only 23 eclipses actually registered and even among these 23, we have been obliged to include one or two which are not found actually registered, but which we have every reason to suppose occurred near either pole, particularly the south pole. Secondly, we notice that in all the eclipses travelling from the north to the south pole, the distances of the sun from the node range about 360°; whereas in the eclipses travelling from the south to the south pole, the distances of the sun from the node range about 180°. This is

an important practical deduction. Thirdly, we notice, that while the distance of the sun from the node, in the case of eclipses travelling from the south to the north pole, reaches the theoretical limit of 199° (vide paragraph 330 supra), the distance of the sun from the node in the case of eclipses travelling in the opposite direction scarcely reaches 10° .

363. The third observation made in the last paragraph is the one that most concerns us in chronology. The eclipses that most interest us in chronology are those recorded in the northern, or the *land* hemisphere of the earth, as it was known up to the 16th century A.D. For until A.D. 1492, the date of the discovery of America, the nations that have recorded historical or chronological events were practically unacquainted with any country south of the equator, whereas they were acquainted with countries up to within 40° of the north pole. If we graph the observations made in paragraphs 351 to 355 supra, and apply to eclipses with tracks south of the equator what is there said about eclipses whose central tracks are in northern latitudes, we shall find that for an eclipse to be visible as far north as the tenth degree of northern latitude (the latitude of Madura), the central track, south of the equator, should not be below the twentieth degree of south latitude ; whereas an eclipse whose central track is near the north pole will be visible as we have seen, in France. Therefore, in chronological investigations, we take into account all eclipses whose central tracks are between the north pole and 20 degrees south of the equator, and eclipses whose central tracks are between the twentieth degree of south latitude and the south pole are neglected. If we suppose the whole course of an eclipse to be 180° , from the north to the south pole, or vice versa, we neglect a third of the track which begins, or ends, with the south pole.

364. A solar eclipse can take place as long as the sun at the time of new moon is not more than 19° removed from a node. In the above list of eclipses belonging to the first saros in the Christian era, A.D. 1 to A.D. 19, we see four eclipses ending with the north pole, in which the extreme distance of the sun from node was 17° , 18° or 19° ; whereas, in the case of eclipses travelling from the north to the south pole, the extreme distance of the sun from the node at any recorded eclipse reached nearly 13° in only one case, and in most cases was less than 9° , and there are no eclipses corresponding to the last 10° , or a third of the arc of 30° (15° on either side of each node, between which limits, according to paragraph 330 supra, the sun is to be found during a solar eclipse). The reason is not that there was no eclipse when the sun was between 9° and 19° distant from a node, but that the central track of such eclipses was so far south of the equator that the eclipses could not have been observed as such any where north of the equator. Among eclipses beginning at the north pole, we have a few cases on record, where the distance of the mean sun from the node was at the extreme limit of 341.1° , or even a little beyond, the sun's distance from the node at which an eclipse is ordinarily possible. Such cases are the following :—

340.74" (A.D. 1682, 147th completed day = August 22.

(N.B.—By Table IV-C sun's anomaly on 147th day would bring the sun 2° nearer the node.)

341.78°. A.D. 7, 564, 622, 1045, 1237, 1660, 1718.

341.22°. A.D. 470, 662, 1027, 1143.

Beyond 342° , solar eclipses became fairly frequent ; and they become more frequent as the distance of the sun from the node approaches 360° or 0° . When the sun's distance from the node is between 0° and 5° , the number of eclipses is still frequent but in the neighbourhood of 7° , the recorded eclipses are few, and confined to those visible in India ; see the lines against 7.35° (A.D. 58), 6.87° (A.D. 40), 7.91° (A.D. 18), 6.39° (A.D. 22). When the sun's distance from the node is about 9° , and *a fortiori* when it is more than 9° , there are practically no eclipses in our record (Table IV-L.), for the reason already investigated, viz., that chronology does not take account of eclipses which are visible only in southern latitudes. Of course an eclipse which is central in southern latitudes may be visible in Northern latitudes (vide paragraph 354 supra).

365. Conversely, in the case of eclipses whose tracks gradually advance northwards, beginning at the South Pole and ending at the North Pole, and which are indicated by the sun's distance from the node being within 19 degrees on either side of 180°, we find that eclipses near the South Pole, when the sun's distance from the node is between 161° and 171°, are either not represented at all in Table IV-L or are represented (towards the end of this limit) by eclipses visible only in South-East Asia (including India). Above 170° and up to 197°, we have the largest number of recorded and observed solar eclipses, and we lose count of their tracks only when they have reached the North Pole. These are important indications which will guide us in the investigation of ancient eclipses.

We subjoin tables showing the daily and yearly joint motions of the sun and node (1) from 1 to 99 days, and (2) from 1 to 20 years. It will, however, seldom be necessary to refer to these tables because the exact distance of the mean sun from the node at any new moon or full moon, at which an eclipse could possibly occur, in times ancient or modern, can always be ascertained at a glance from column 1 of Table IV-L, the cycle of 1711 years being used when necessary.

(1) Joint motion of sun and node from 1 to 99 days.

Days.	Degrees.	Days.	Degrees.	Days.	Degrees.
1	1° 0388	34	35° 3124	67	69° 5863
2	2° 0772	35	36° 3510	68	70° 6249
3	3° 1158	36	37° 3897	69	71° 6635
4	4° 1544	37	38° 4283	70	72° 7021
5	5° 1930	38	39° 4669	71	73° 7407
6	6° 2316	39	40° 5055	72	74° 7793
7	7° 2702	40	41° 5441	73	75° 8179
8	8° 3088	41	42° 5827	74	76° 8565
9	9° 3474	42	43° 6213	75	77° 8951
10	10° 3860	43	44° 6599	76	78° 9337
11	11° 4246	44	45° 6985	77	79° 9723
12	12° 4632	45	46° 7371	78	81° 0109
13	13° 5018	46	47° 7757	79	82° 0495
14	14° 5404	47	48° 8143	80	83° 0881
15	15° 5790	48	49° 8529	81	84° 1267
16	16° 6176	49	50° 8915	82	85° 1653
17	17° 6562	50	51° 9301	83	86° 2039
18	18° 6948	51	52° 9687	84	87° 2425
19	19° 7334	52	53° 0073	85	88° 2811
20	20° 7720	53	55° 0459	86	89° 3197
21	21° 8106	54	56° 0845	87	90° 3583
22	22° 8492	55	57° 1231	88	91° 3969
23	23° 8878	56	58° 1617	89	92° 4355
24	24° 9264	57	59° 2003	90	93° 4741
25	25° 9650	58	60° 2389	91	94° 5127
26	27° 0036	59	61° 2775	92	95° 5513
27	28° 0422	60	62° 3161	93	96° 5899
28	29° 0808	61	63° 3547	94	97° 6285
29	30° 1194	62	64° 3933	95	98° 6671
30	31° 1580	63	65° 4319	96	99° 7057
31	32° 1966	64	66° 4705	97	100° 7443
32	33° 2352	65	67° 5091	98	101° 7829
33	34° 2738	66	68° 5477	99	102° 8215

(2) Joint motion of sun and node from 1 to 20 years.

Years.	Degrees.	Years.	Degrees.	Years.	Degrees.
1	19° 3582558	8	154° 8660464	15	290° 3738374
2	38° 7165116	9	174° 2243022	16	309° 7320932
3	58° 0747674	10	193° 5825584	17	328° 0908490
4	77° 4330232	11	212° 9408142	18	348° 4486048
5	96° 7912790	12	232° 2990700	19	7° 8068606
6	116° 1495348	13	251° 6573258	20	27° 1651164
7	135° 5077906	14	271° 0155816		

TABLES

EYE-TABLES.

SŪRYA SIDDHĀNTA EYE-TABLE—Specimen problems.

This Eye-table alone will enable any one to solve correctly, to four decimal places of a day, and by a single operation, any problem in solar dates, nakshatras, or week-days, for 5,100 years, i.e., from B.C. 3102 to A.D. 1999. The tables of equations are given to two places of decimals in the abridged sections e to i of the Eye-table—see next page—and to four places of decimals in the unabridged sections e to i, pages 171 to 188 below.

The computation of the ending moment, whether of a tithi, a nakshatra, or a yoga, always comprises four processes: (1) to find the mean ending moment, (2) to find the anomaly or anomalies for that moment, (3) to find the equation or equations corresponding to the anomaly or anomalies, and (4) to add together the mean ending moment and the equation or equations.

Problem I.—Required to find the ending moment, by Sūrya siddhānta, of Āshāḍha Śukla 13, A.D. 484. Note stages (1) to (10).

Commencement of solar year. Col. 1	Days of solar year and sun's anomaly in days of S. Yr. Col. 2	Moon's anomaly. Col. 3
A.D. 400 ... Mar. 17 48569 k 84 years ... 73554 n	First new moon { A.D. 400 ... 23 84466 l 84 years 0 54523 o A.D. 484 ... 24 38999 (2)	21 75223 m 18 48585 p 24 38999 (2) (1st N.M. in solar year). 59 60812 -55 10910 d (2 anom. months) 4 4991 (3) (C's An. at 1st N.M. in S. Yr.)
A.D. 484-5 ... Mar. 18 22123 (1) N.B.—This, by itself, is a valuable piece of information, giving the English year, month, day and fraction of day on which a particular Indian solar year between 3102 B.C. and A.D. 2000 commenced, and it may be had in a few seconds from the Eye-table, sections k and n for any one of 5,100 years.	Add for Āshāḍha new moon 59 60812 b Do. 12 tithis ... 11 8122 d 15 2634 (4)	... 3 452 c ... 11 812 d 20 263 -045 (C's equation—h). 20 918 (5)
Note how stages (1), (2), (3), (4), (5), (6), (7) and (8) are successively arrived at with the help of the Eye-table and then add together (4), (8) and (1), as shown in column 2.	Sum of C's and C's eqns. (col. 3) ... + 3685 (8) 95 6319 Add commencement of solar year A.D. 484-5 Mar. 18 2212 (1) Mar. 113 8531 (9)	C's eqn. for An. of 95 26 d (4) ... -0453 h (6) C's eqn. for An. of 20 918 d. (5) ... + 4138 e (7) Sum of C's and C's eqns. + 3685 (8)

We reach, for the ending moment of the tithi, the result, March 113 8531 (9). By Eye-table **q**, the 63rd day from March 1 is June 1. The 113th day from March 1 is June 1 + 20 = June 21 **q**, and by Eye-table **r**, 8500 of a day = 51 ghaṭikas and 0081 day = 11 palas (10).

For the week-day, we have, for 21 June A.D. 484, by Eye-table **j**, 2 + 0 + 3 + 21 = 26; 26 + 7 leaves remainder 5, i.e., Thursday.

The ending moment of the tithi was 51 ghaṭikas 11 palas after mean sunrise, on Thursday, 21 June A.D. 484 which is identical with the result reached by Mr. Dikshīt in the *Introduction to Dr. Fleet's Gupta Inscriptions*, p. 157 ... (10).

Problem II.—Problem I worked to four places of decimals, with the aid of table II and Eye-tables **y**, **e** and **h**.

N.B.—The above problem can be worked in a much shorter time with the additional help of Eye-table **y** (p. 158) and Table II (p. 218).

Table II. First new moon in solar year A.D. 484-85	Days of S. Yr. and sun's anomaly	Moon's mean anomaly in days
Eye-table y . Āshāḍha Śu 12 ...	24 3900 ...	4 498
...	70 8784 ...	15 704
...	95 2654 ...	20 262
Eye-table h . C's eqn. for anomaly of 95 26 days ...	-0453	C's eqn. - 0453
Eye-table e . C's eqn. for anomaly of 20 216 days ...	+ 4138	20 216
...	+ 3685	+ 3685
...	95 6319	

Add English month and day, marking commencement of Indian solar year

A.D. 484-5 (Table II) ... Mar. 18 2212

Mar. 113 8531 = June 21, A.D. 484, 50 ghaṭikas 11 palas after mean sunrise (Eye-tables **q** and **r**).

Same problem.—The shortest method, and the one ordinarily recommended. In general, it will be quite enough to obtain a result correct to two places of decimals, as in the Ephemeris, and this of course will take less time.

Table II. New moon tithi, Āshāḍha, A.D. 484-85 ...	(7) June 9 67	Table II. 1st N.M. in S. Yr. A.D. 484-85 ...	Days. 24 39	Moon's anomaly in days. An. of 1st N.M. in S. Yr. 4 50
Eye-table d Add for 12 tithis ...	11 81	Eye-table y . Add for Āshāḍha Śu. 12 ...	70 87	15 76
(19) June 21 48		...	95 26	20 26
...		Eye-table h C's eqn. for An. of 95 26 days ...	- 04	- 04
...		C's eqn. for An. of 20 22 d. = ...	+ 41	20 22
...	+ 37	...	+ 37	
(19) June 21 85, i.e., Thursday, 21st June, A.D. 484 at 85 of day.				

* N.B.—This (7) is the week-day, Saturday, to which we add 12, since the days of June, 9, are increased by 12 when 12 tithis or 11 81 days are added. Resulting week-day, 19, i.e., 19 + 7 which leaves remainder 5, or Thursday.

Problem III.—Required the ending moment of nakshatra Anurādhā (No. 17) in June, A.D. 484.

N.B.—We do not require C's An. for this (see paragraph 97, p. 83 of Text).

Table II. Ending moment mean of new moon tithi, Āshāḍha, A.D. 484 ...	(7) June 9 67	Table II. 1st N.M. in S. Yr. A.D. 484-85 ...	Days. 24 39	Moon's anomaly in days. An. of 1st N.M. in S. Yr. 4 50
Anomaly of Āshāḍha N.M., i.e., An. at 1st N.M. in S. year, 4 50 (Table II) + 3 95 [addn. for Āshāḍha N.M. by Eye-table o] ...	...	...	...	8 45
Eye-table g . Shortest interval from Āshāḍha N.M. to No. 17 Anurādhā nakshatra ...	10 74	...	...	10 74
Eye-tables t , u . Nak. corr. for 1st N.M. in S. year, 24 39 d., i.e., corr. for 24 days, + 0 41 (t) less corr. for 39 day, 03 (u); Total correction ...	+ 0 38	...	...	+ 0 38
Eye-table f . C's nak. eqn. for anomaly of 19 57 d. (last col.) ...	+ 38	...	...	19 57
...	19 June 21, i.e., Thursday, 21st June, at 17 of day.			

Problem IV.—Required the ending moment of yoga Śukla (No. 24) in June A.D. 484. N.B.—We require sun's anomaly for yogas, v. p. 36.

Table II. Ending moment of mean new moon tithi, Āshāḍha, A.D. 484-85 ...	(7) June 9 67	Sun's anomaly in days, and sun's and moon's equations. 1st N.M. in S. Y. 24 39	Moon's anomaly in days. C's An. at 1st N.M., S.Y. 4 50
Eye-tables b and c ...	...	Add for Āshāḍha N.M. 50 08	8 95
Eye-table v . Shortest interval from Āshāḍha N.M. to yoga No. 24, Śukla ...	10 57	...	10 57
Eye-tables w , x . Yoga corr. for 1st N.M. in S.Y., i.e., corr. for 24 days, 0 77 (w) less corr. for 39 day, 05 (x) ...	0 72	...	0 72
...	...	...	19 74
Eye-table i . Sun's yoga eqn. for An. of 94 74 days (col. 2). ...	...	...	+ 0 04
...	...	...	19 78
Eye-table g . Moon's yoga eqn. for An. of 19 78 days (last col.) ...	...	...	+ 35
...	...	...	+ 39
(19) June 21 85, i.e., Thursday, 21st June, at 85 of day.			

SŪRYA SIDDHĀNTA.

the way in which they are to be used is shown in the specimen problems on reverse.
represent days and fractions of a day.

5...120°	6...130°	7...180°	8...210°	9...240°	10...270°	11...300°	12...330°
Bhādrapada	Āsvina	Kārttika	Mārgaśīraha	Pausha	Māgha	Phālguna	Chaitra
Simha	Kanyā	Tulā	Vriśohika	Dhanus	Makara	Kumbha	Mina
Āvartī	Purattāsī	Alpāsī	Kārttigai	Mārgaḥ	Tai	Māḥi	Panguni
125-4756	156-4942	186-9356	218-8289	246-3192	275-6369	305-0850	331-0053
Aug. 16	Sep. 16	Oct. 17	Nov. 16	Dec. 15	Jan. 14	Feb. 12	Mar. 13
(5) Bhādrapada	(6) Āsvina	(7) Kārttika	(8) Mārgaśīraha	(9) Pausha	(10) Māgha	(11) Phālguna	(12) Chaitra
118-1223	147-6530	177-1835	206-7141	236-2477	265-7758	295-3059	324-8365
7-904	9-880	11-866	13-832	15-808	17-784	19-760	21-736
							(13) Chaitra when three or adikamāsa
							384-3570
							23-712

decimals of a day, and moon's anomalistic months.

6	7	8	9	10	11	12	13	14	15
5-9061	6-8905	7-8718	8-8592	9-8435	10-8379	11-8122	12-7986	13-7809	14-7653
21	22	23	24	25	26	27	28	29	30
20-6714	21-6558	22-6401	23-6245	24-6088	25-5932	26-5775	27-5619	28-5462	29-5306

Moon's anomalistic months.

1 month = 27 5545 days.
2 months = 55 1090 days
12 months = 330 6540.
18 months = 558 2085.

decimals of a day. (The signs - and + are to be applied to the equation in heavy type and not to the anomaly)

21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
2-53	2-67	2-80	2-94	3-08	3-23	3-38	3-53	3-69	3-85	4-01	4-19	4-37	4-56	4-76	4-98	5-21	5-48	5-78	6-14	6-70
11-66	11-55	11-43	11-31	11-19	11-07	10-94	10-81	10-67	10-53	10-38	10-23	10-07	9-90	9-71	9-51	9-30	9-06	8-78	8-43	7-90
15-89	16-00	16-12	16-24	16-36	16-49	16-61	16-75	16-88	17-03	17-17	17-33	17-49	17-66	17-84	18-03	18-25	18-49	18-77	19-12	19-45
25-02	24-89	24-75	24-61	24-47	24-32	24-18	24-02	23-87	23-73	23-54	23-36	23-18	22-99	22-79	22-58	22-34	22-08	21-73	21-41	20-86
2-74	2-89	3-04	3-20	3-36	3-52	3-69	3-87	4-05	4-24	4-44	4-65	4-88	5-13	5-40	5-72	6-11	6-73			
11-45	11-32	11-19	11-06	10-52	10-37	10-22	10-07	9-90	9-77	9-56	9-33	9-07	8-78	8-41	7-81					
16-10	16-23	16-36	16-50	16-64	16-78	16-93	17-09	17-25	17-42	17-60	17-79	18-00	18-22	18-48	18-78	19-15	19-74			
24-81	24-66	24-51	24-35	24-19	24-03	23-86	23-68	23-50	23-32	23-11	22-90	22-68	22-43	22-15	21-83	21-44	20-83			
2-96	3-13	3-30	3-47	3-65	3-84	4-03	4-24	4-46	4-68	4-93	5-20	5-52	5-89	6-42						
11-23	11-09	10-94	10-78	10-62	10-45	10-28	9-10	8-90	8-69	8-48	8-21	7-89	7-56	7-22	6-88	6-42				
16-32	16-46	16-61	16-77	16-93	17-10	17-27	17-46	17-67	17-86	18-09	18-34	18-63	18-99	19-49						
25-59	24-43	24-26	24-08	23-90	23-71	23-52	23-31	23-09	22-87	22-62	22-35	22-04	21-66	21-16						

e For tithis.

f For nakshatras.

g For yogas

year and decimals of a day. (The anomalies are entered in ordinary type and the equations, with appropriate signs, in heavy type.)

+ 01	00	-01	-02	-03	-04	-05	-06	-07	-08	-09	-10	-11	-12	-13	-14	-15	-16	-17	-18
77	80	84	87	90	93	97	100	103	107	111	115	119	123	128	132	138	145	154	160
266	283	260	257	251	250	247	244	240	237	233	229	225	221	216	211	206	199	190	183
-02	-01	00	+01	+02	+03	+04	+05	+06	+07	+08	+09	+10	+11	+12	+13	+14	+15	+16	+17
73	77	80	84	88	92	96	99	103	108	112	116	121	126	132	139	147	156	167	171
271	267	263	258	256	252	248	241	240	236	232	227	222	217	211	205	197	186	177	171

for centuries.

Fraction of day.	First new moon in solar year.	1's anomaly at commencement of solar year.
l	m	
22662	4-91229	17-75813
10223	8-37393	6-23432
97791	11-83557	22-26509
85356	15-29721	10-74128
72921	18-75885	26-77305
60486	22-22049	15-24824
48051	25-68213	3-72448
35615	29-14377	19-75520
23180	3-07482	8-23139
10746	6-53846	24-26216
98310	9-99810	12-73885
85875	13-45974	1-21454
73440	16-92138	17-24532
61004	20-38302	5-72151
48569	23-84466	21-75228
36134	27-30630	10-22845
23698	1-23785	26-25922
11264	4-69999	14-73539
99228	8-16063	3-21156
86393	11-62227	19-24233
73958	15-08391	7-71850
61523	18-54556	23-74927
49088	22-00720	12-22544
36652	25-46884	0-70161
24217	28-93048	16-73238
11782	2-39213	5-20855
99347	6-83217	21-35937
86913	9-78481	9-83810
74477	13-24645	25-87144
62041	16-70809	14-35017

Sūrya siddhānta—Odd years.

Fraction of day, mark- ing com- mencement of solar year.	First new moon in solar year.	1's anomaly for begin- ning of solar year.
n	o	p
1	25876	18-83889
2	31751	7-74718
3	77627	26-88607
4	93502	15-49487
5	29378	4-60267
6	55254	23-24156
7	81129	12-84086
8	07005	1-45815
9	32881	20-09704
10	58756	9-20534
11	84632	27-84423
12	10508	16-95253
13	36383	6-06082
14	62259	24-69971
15	88135	18-80801
16	14010	2-91631
17	39886	21-55530
18	65761	10-66860
19	91637	29-80238
20	17513	18-41068
21	43388	7-51898
22	69264	26-15787
23	95140	15-26616
24	21015	4-37446
25	46891	28-01335
26	72767	12-12165
27	98642	1-22995
28	24518	19-86884
29	50393	8-97713
30	76269	27-01602
31	102145	16-72432
32	28020	5-83262
33	53896	24-47151
34	79772	13-57981
35	105647	2-68810
36	31523	21-32099
37	57399	10-43529
n	o	p
38	83274	29-07418
39	109150	18-18247
40	35026	7-29077
41	60901	25-92966
42	86777	16-03796
43	112652	4-14626
44	38528	22-78515
45	64404	11-89344
46	90279	1-00174
47	116155	18-64068
48	42031	8-74898
49	67906	27-38782
50	93782	16-49611
51	119658	5-60441
52	45533	24-24330
53	71409	13-35160
54	97284	2-45990
55	123160	21-09878
56	49036	10-20708
57	74911	28-84697
58	100787	17-95420
59	126663	7-06257
60	52538	25-70146
61	78414	14-80976
62	104290	3-91805
63	130165	22-55694
64	56041	11-66524
65	81917	0-77354
66	107792	19-41242
67	133668	8-52078
68	59543	27-15961
69	85419	16-26791
70	111295	5-37621
71	137170	24-01509
72	63046	18-12339
73	88922	2-22169
74	114797	20-87068
n	o	p
75	140673	9-97888
76	66549	28-61776
77	92424	17-72606
78	118300	6-83436
79	144176	25-47325
80	70051	14-58155
81	95927	3-68985
82	121802	22-32873
83	147678	11-43703
84	73554	0-54533
85	99430	19-18422
86	125305	8-29252
87	151181	26-93140
88	77056	16-08970
89	102932	5-14800
90	128808	23-78689
91	154683	12-89519
92	80559	2-00349
93	106434	20-64237
94	132310	9-75067
95	158186	28-88956
96	84061	17-49786
97	109937	6-60616
98	135813	25-24504
99	161688	14-35334
100	87565	3-46164
100	75130	6-92328
200	62394	10-39432
300	50259	18-46657
400	37824	7-70821
500	25389	20-79985
600	12954	24-28149
700	00519	9-76912
800	88084	1-62418
900	75648	5-06583
1000	51297	10-71164
2000	98945	15-25746
3000		12-49527

q Days counted from March 1

	Mar. 1	Apr. 1	May 1	June 1	July 1	Aug. 1	Sep. 1	Oct. 1	Nov. 1	Dec. 1	Jan. 1	Feb. 1	Mar. 1
March	...	1	32	62	93	123	154	185	215	246	276	307	338
r Ghaṭikas		1	2	3	4	5	6	7	8	9	10	11	12
Fraction of day ..		0167	0333	0500	0667	0833	1000	1167	1333	1500	1667	1833	2000
Ghaṭikas		31	32	33	34	35	36	37	38	39	40	41	42
Fraction of day ...		5167	5333	5500	5667	5833	6000	6167	6333	6500	6667	6833	7000
Palas		1	2	3	4	5	6	7	8	9	10	12	15
Fraction of day		0008	0006	0008	0011	0014	0017	0019	0022	0025	0028	0033	0042

NAKSHA

s Shortest interval in days from new moon to ending

Longitude at commencement.	Order	Names of nakshatras.	Days.	Order	Ordina- rily Vaiśā- kha	Order	Ordina- rily Jyesh- tha	Order	Ordina- rily Āshā- dha	Order	Ordina- rily Śrāvāṇa	Order	Ordina- rily Bhādra- pada	Order	Ordina- rily Āśvina	Order	Ordina- rily Kārttika
Deg. Min.					I	II	III	IV	V	VI	VII						
0 0	27	Revati ...	...	3	08892	5	08041	7	06190	9	04339	11	02488	13	00638	16	08906
13 20	1	Asvini ...	...	4	20011	6	18160	8	16308	10	14458	12	12608	14	10757	17	19025
26 40	2	Bharani ...	...	5	30130	7	28279	9	26428	11	24578	13	22727	15	20876	18	29144
40 0	3	Krittikā ...	...	6	40249	8	38398	10	36548	12	34697	14	32846	16	30995	19	39263
53 20	4	Rohiṇi ...	...	7	50368	9	48518	11	46667	13	44816	15	42965	17	41114	20	49382
66 40	5	Mṛgaśīra ...	...	8	60488	10	58637	12	56786	14	54935	16	53084	18	51233	21	59502
80 0	6	Ārdrā ...	...	9	70607	11	68756	13	66905	15	65054	17	63203	19	61352	22	69621
93 20	7	Punarvasu ...	...	10	80726	12	78875	14	77024	16	75173	18	73322	20	71471	23	79740
106 40	8	Puṣya ...	...	11	90845	13	88994	15	87143	17	85292	19	83441	21	81590	24	89859
	9	Āśleṣhā ...	...	12	100964	14	99113	16	97262	18	95411	20	93560	22	91709	25	99978
120 0	10	Māghā ...	...	13	111083	15	109232	17	107381	19	105530	21	103679	23	101828	26	110097
133 20	11	Pūrva Phalgunī ...	...	14	121202	16	119351	18	117500	20	115649	22	113798	24	111947	27	120216
146 40	12	Uttara Phalgunī ...	...	15	131321	17	129470	19	127619	21	125768	23	123917	25	122066	1	130385
160 0	13	Hastā ...	...	16	141440	18	139589	20	137738	22	135887	24	134036	26	132185	2	140454
173 20	14	Chitrā ...	...	17	151559	19	149708	21	147857	23	146006	25	144155	27	142304	3	150573
186 40	15	Śvātā ...	...	18	161678	20	159827	22	157976	24	156125	26	154274	1	152423	4	160692
200 0	16	Viśākhā ...	...	19	171797	21	169946	23	168095	25	166244	27	164393	2	162542	5	170811
213 20	17	Anurādhā ...	...	20	181916	22	180065	24	178214	26	176363	1	174512	3	172661	6	180930
226 40	18	Jyeshthā ...	...	21	192035	23	190184	25	188333	27	186482	2	184631	4	182780	7	191049
240 0	19	Mūla ...	...	22	202154	24	200303	26	198452	1	196601	3	194750	5	192899	8	201168
253 20	20	Pūrva Āśādhā ...	...	23	212273	25	210422	27	208571	2	206720	4	204869	6	203018	9	211287
266 40	21	Uttara Āśādhā ...	...	24	222392	26	220541	1	218690	3	216839	5	214988	7	213137	10	221406
280 0	22	Śrāvāṇa ...	...	25	232511	27	230660	2	228809	4	226958	6	225107	8	223256	11	231525
293 20	23	Śrāviṣṭhā ...	...	26	242630	1	240779	3	238928	5	237077	7	235226	9	233375	12	241694
306 40	24	Satābhishat ...	...	27	252749	2	250898	4	249047	6	247196	8	245345	10	243494	13	251813
320 0	25	Pūrva Bhādrapadā ...	...	1	262868	3	261017	5	259166	7	257315	9	255464	11	253613	14	261932
333 20	26	Uttara Bhādrapadā ...	...	2	272987	4	271136	6	269285	8	267434	10	265583	12	263732	15	271051
346 40	27	Revati ...	...	3	283106	5	281255	7	279404	9	277553	11	275702	13	273851	16	281970
			...	4	293225	6	291374	8	289523	10	287672	12	285821	14	283970	17	292089

YOGAS

v Shortest interval in days from new moon to

Longitude at commencement.	Order	Names of yogas.	Days.	Order	Ordina- rily Vaiśā- kha	Order	Ordina- rily Jyesh- tha	Order	Ordina- rily Āshā- dha	Order	Ordina- rily Śrāvāṇa	Order	Ordina- rily Bhādra- pada	Order	Ordina- rily Āśvina	Order	Ordina- rily Kārttika
Deg. Min.																	
0 0	27	Vaidhriti ...	...	5	08992	9	05548	13	02104	18	08075	22	04631	26	01187	4	07157
13 20	1	Vikumbha ...	...	6	18407	10	14963	14	11519	19	17490	23	14046	27	10601	5	16672
26 40	2	Pṛithi ...	...	7	27822	11	24378	15	20934	20	26905	24	23460	1	20016	6	25987
40 0	3	Ayushmat ...	...	8	37237	12	33793	16	30349	21	36320	25	32875	2	29481	7	35452
53 20	4	Saubhagya ...	...	9	46652	13	43208	17	39764	22	45734	26	42290	3	38546	8	44417
66 40	5	Sobhana ...	...	10	56067	14	52623	18	49179	23	55149	27	51705	4	48261	9	54232
80 0	6	Atigunā ...	...	11	65482	15	62038	19	58593	24	64564	1	61120	5	57676	10	63647
93 20	7	Sukarman ...	...	12	74897	16	71453	20	68009	25	73979	2	70535	6	67091	11	73042
106 40	8	Dhriti ...	...	13	84311	17	80867	21	77423	26	83394	3	79950	7	76506	12	82477
	9	Suho ...	...	14	93726	18	90282	22	86838	27	92809	4	89365	8	85921	13	91381
120 0	10	Gandā ...	...	15	103141	19	99697	23	96253	1	102224	5	98780	9	95335	14	101806
133 20	11	Vridhī ...	...	16	112556	20	109112	24	105668	2	111639	6	108195	10	104750	15	110721
146 40	12	Dhruva ...	...	17	121971	21	118527	25	115083	3	121058	7	117609	11	114165	16	120196
160 0	13	Vyaghata ...	...	18	131386	22	127942	26	124498	4	130168	8	126724	12	123280	17	129551
173 20	14	Harshaṇa ...	...	19	140801	23	137357	27	133912	5	142983	9	139489	13	136045	18	142606
186 40	15	Vajra ...	...	20	150216	24	146771	1	143327	6	149398	10	145954	14	142510	19	148881
200 0	16	Siddhi ...	...	21	159631	25	156186	2	152742	7	158813	11	155369	15	151925	20	158200
213 20	17	Vyatipata ...	...	22	169046	26	165601	3	162157	8	168228	12	164784	16	161340	21	167611
226 40	18	Varivata ...	...	23	178461	27	175016	4	171572	9	177643	13	174199	17	170755	22	177026
240 0	19	Parigraha ...	...	24	187876	1	184431	5	180987	10	187058	14	183614	18	180170	23	186631
253 20	20	Siva ...	...	25	197291	2	193846	6	190402	11	196473	15	193029	19	189585	24	196046
266 40	21	Siddha ...	...	26	206706	3	203261	7	199817	12	205888	16	202444	20	198999	25	205407
280 0	22	Sadhya ...	...	27	216121	4	212676	8	209232	13	215303	17	211859	21	208414	26	214875
293 20	23	Subha ...	...	1	225536	5	222091	9	218647	14	224718	18	221274	22	217829	27	224290
306 40	24	Śukla ...	...	2	234951	6	231506	10	228062	15	234133	19	230689	23	227244	1	233705
320 0	25	Brahman ...	...	3	244366	7	240921	11	237477	16	243548	20	240004	24	236559	2	242816
333 20	26	Indra ...	...	4	253781	8	250336	12	246942	17	253013	21	249469	25	246024	3	251927
346 40	27	Vaidhriti ...	...	5	263196	9	259751	13	256306	18	262377	22	258833	26	255389	4	261038
			...	6	272611	10	269166	14	265721	19	271792	23	268248	27	264804	5	270149
			...	7	282026	11	278581	15	275136	20	281297	24	277853	1	274409	6	279260
			...	8	291441	12	287936	16	284491	21	290152	25	286708	2	283264	7	288375
			...	17	300856									3	290819		

q Days counted from April 1

April ...	1	May 1	June 1	July 1	Aug. 1	Sep. 1	Oct. 1	Nov. 1	Dec. 1	Jan. 1	Feb. 1	Mar. 1
April ...	1	31	62	92	123	154	184	215	245	276	307	336
Leap Year, Ap. 336												
15	16	17	18	19	20	21	22	23	24	25	26	27
2500	2567	2583	2600	2617	2633	2650	2667	2683	2700	2717	2733	2750
45	46	47	48	49	50	51	52	53	54	55	56	57
7500	7607	7623	7640	7657	7673	7690	7707	7723	7740	7757	7773	7790
22	25	27	30	32	35	37	40	42	45	47	50	52
0061	0069	0076	0083	0089	0097	0103	0111	0117	0125	0130	0139	0144

TRAS.

moment of each nakshatra.

Order	Ordinarily Mārga-sīrsha.	Order	Ordinarily Pausa.	Order	Ordinarily Māgha.	Order	Ordinarily Phālguna.	Order	Chaitra, when no Adhika Masa.	Order	Chaitra when there is Adhika Masa.
VIII	IX	X	XI	XII	XIII						
18	07055	20	05204	22	03853	24	01502	27	09771	2	07920
19	17174	21	15823	23	13472	25	11622	1	19890	3	18059
20	27298	22	25442	24	23592	26	21741	2	30009	4	28158
21	37412	23	35562	25	33711	27	31860	3	40128	5	38277
22	47532	24	45681	26	43830	1	41979	4	50247	6	48396
23	57651	25	55800	27	53949	2	52098	5	60366	7	58516
24	67770	26	65919	1	64068	3	62217	6	70435	8	68635
25	77889	27	76038	2	74187	4	72336	7	80505	9	78754
26	88008	1	86157	3	84306	5	82455	8	90574	10	88778
27	98127	2	96276	4	94426	6	92575	9	100843	11	98932

1	108246	3	108856	5	104545	7	102694	10	110862	12	109111
2	118866	4	116515	6	114664	8	112813	11	121081	13	119230
3	128485	5	126034	7	124763	9	122932	12	131200	14	129350
4	138604	6	136753	8	134902	10	133051	13	141820	15	139439
5	148723	7	146872	9	145021	11	143170	14	151439	16	149588
6	158842	8	156991	10	155140	12	153290	15	161558	17	159707
7	168961	9	167110	11	165260	13	163409	16	171677	18	169826
8	179080	10	177230	12	175379	14	173528	17	181796	19	179945
9	189199	11	187349	13	185498	15	183647	18	191915	20	190064
10	199318	12	197468	14	195617	16	193766	19	202084	21	200183
11	209438	13	207587	15	205736	17	203885	20	212153	22	210303
12	219557	14	217706	16	215855	18	214004	21	222278	23	220422
13	229676	15	227825	17	225974	19	224124	22	232392	24	230541
14	239795	16	237944	18	236094	20	234243	23	242511	25	240660
15	249914	17	248064	19	246213	21	244362	24	252680	26	250779
16	260033	18	258183	20	256332	22	254481	25	262749	27	260899
17	270152	19	268302	21	266451	23	264600	26	272868	1	271017
18	280271	20	278421	22	276570	24	274719	27	282987	2	281187
19	290391	21	288540	23	286689	25	284838	1	292107	3	291256
						26	294957				

ending moment of each yoga.

Order	Ordinarily Mārga-sīrsha.	Order	Ordinarily Pausa.	Order	Ordinarily Māgha.	Order	Ordinarily Phālguna.	Order	Chaitra, when no Adhika Masa.	Order	Chaitra when there is Adhika Masa.
8	03713	12	00269	17	06240	21	02796	26	08767	3	05323
9	13128	13	09684	18	15655	22	12211	27	18182	4	14737
10	22543	14	19099	19	25070	23	21626	1	27596	5	24152
11	31958	15	28514	20	34485	24	31041	2	37011	6	33567
12	41373	16	37929	21	43900	25	40455	3	46426	7	42982
13	50788	17	47344	22	53314	26	49870	4	55841	8	52397
14	60203	18	56759	23	62729	27	59285	5	65256	9	61812
15	69618	19	66173	24	72144	1	68700	6	74671	10	71227
16	79032	20	75588	25	81559	2	78115	7	84036	11	80642
17	88447	21	85003	26	90974	3	87530	8	93501	12	90057
18	97862	22	94418	27	100389	4	96945	9	102916	13	99472
19	107277	23	103833	1	109804	5	106360	10	112331	14	108886
20	116892	24	113248	2	119219	6	115775	11	121745	15	118301
21	126507	25	122663	3	128634	7	125190	12	131160	16	127716
22	136122	26	132078	4	138048	8	134604	13	140575	17	137131
23	145737	27	141493	5	147463	9	144019	14	149990	18	146546
24	155352	1	150907	6	156878	10	153434	15	159405	19	155961
25	164967	2	160322	7	166293	11	162849	16	168820	20	165376
26	174582	3	169737	8	175708	12	172264	17	178235	21	174791
27	184197	4	179152	9	185123	13	181879	18	187650	22	184206
1	193812	5	188567	10	194538	14	191094	19	197065	23	193621
2	203427	6	197982	11	203953	15	200509	20	206479	24	203035
3	213042	7	207397	12	213368	16	209924	21	215894	25	212450
4	222657	8	216812	13	222783	17	219338	22	225309	26	221865
5	232272	9	226227	14	232197	18	228753	23	234724	27	231280
6	241887	10	235642	15	241612	19	238168	24	244139	1	240695
7	251502	11	245057	16	251027	20	247583	25	253554	2	250110
8	261117	12	254472	17	260442	21	256998	26	262969	3	259525
9	270732	13	263887	18	269857	22	266413	27	272384	4	268940
10	280347	14	273302	19	279272	23	275828	1	281799	5	278355
11	289962	15	282717	20	288687	24	285243	2	291214	6	287769
		16	292131			25	294658				

Annual correction.

Argument:—Date of appearance of let new moon in each solar year according to Table X.

The correction corresponding to the decimal portion of the argument should be subtracted from the nakshatra or yoga correction corresponding to the integral portion; thus the nakshatra correction corresponding to an argument 28.53 = 0.11 minus 04 = 0.07.

NAKSHATRAS.

Arg. Corr.	Arg. Corr.	Arg. Corr.	Arg. Corr.	Arg. Corr.	Arg. Corr.
t	u	t	u	t	u
0 220890	01 00075	30 02244	59 04413	88 06582	
1 213410	02 00150	31 02319	60 04488	89 06657	
2 205930	03 00224	32 02394	61 04563	90 06732	
3 198450	04 00299	33 02468	62 04638	91 06807	
4 190970	05 00374	34 02543	63 04713	92 06882	
5 183490	06 00449	35 02618	64 04787	93 06956	
6 176010	07 00524	36 02693	65 04862	94 07031	
7 168531	08 00598	37 02768	66 04937	95 07106	
8 161049	09 00673	38 02842	67 05012	96 07181	
9 153569	10 00748	39 02917	68 05086	97 07256	
10 146089	11 00823	40 02992	69 05161	98 07330	
11 138609	12 00898	41 03067	70 05236	99 07405	
12 131129	13 00972	42 03142	71 05311		
13 123649	14 01047	43 03216	72 05386		
14 116169	15 01122	44 03291	73 05460		
15 108689	16 01197	45 03366	74 05535		
16 101209	17 01272	46 03441	75 05610		
17 093729	18 01346	47 03516	76 05685		
18 086249	19 01421	48 03590	77 05760		
19 078769	20 01496	49 03665	78 05834		
20 071289	21 01571	50 03740	79 05909		
21 063809	22 01646	51 03815	80 05984		
22 056328	23 01720	52 03890	81 06059		
23 048848	24 01795	53 03964	82 06134		
24 041368	25 01870	54 04039	83 06208		
25 033888	26 01945	55 04114	84 06283		
26 026408	27 02020	56 04189	85 06358		
27 018928	28 02094	57 04264	86 06433		
28 011448	29 02169	58 04338	87 06508		
29 003968					

YOGAS.

See note on ANNUAL CORRECTION supra.

W	X	X	X	X
0 411086	01 00139	30 04176	59 08212	88 12249
1 397117	02 00278	31 04315	60 08351	89 12388
2 383198	03 00417	32 04454	61 08491	90 12527
3 369279	04 00557	33 04593	62 08630	91 12666
4 355360	05 00696	34 04732	63 08769	92 12805
5 341441	06 00835	35 04872	64 08908	93 12944
6 327522	07 00974	36 05011	65 09047	94 13084
7 313603	08 01113	37 05150	66 09186	95 13223
8 299684	09 01253	38 05289	67 09326	96 13362
9 285765	10 01392	39 05428	68 09465	97 13501
10 271846	11 01530	40 05568	69 09604	98 13641
11 257927	12 01670	41 05707	70 09743	99 13780
12 244008	13 01809	42 05846	71 09882	
13 230089	14 01949	43 05985	72 10022	
14 216170	15 02088	44 06124	73 10161	
15 202251	16 02227	45 06263	74 10300	
16 188332	17 02366	46 06403	75 10439	
17 174413	18 02505	47 06542	76 10578	
18 160494	19 02645	48 06681	77 10718	
19 146575	20 02784	49 06820	78 10857	
20 132656	21 02923	50 06959	79 10996	
21 118737	22 03063	51 07098	80 11135	
22 104818	23 03201	52 07238	81 11274	
23 090899	24 03340	53 07377	82 11413	
24 076980	25 03480	54 07516	83 11553	
25 063061	26 03619	55 07655	84 11692	
26 049142	27 03758	56 07795	85 11831	
27 035223	28 03897	57 07934	86 11970	
28 021304	29 04036	58 08073	87 12108	
29 007385				

y Calendar to be used with Table II, as directed in specimen problems, for ascertaining the A.D. month and day corresponding to any solar date, lunar tithi, nakshatra, yoga or karana.

Vaiśākha.				Āshāḍha—cont.				Bhādrapada—cont.				Kārttika—cont.				Pauṣa—cont.				Phālguna—cont.				
0 9848	1 0 984	64 9873	6 9 858	128 9502	11 18 732	192 9332	1 0 051	256 9161	6 8 825	320 8991	11 17 7	0 9848	1 0 984	64 9873	6 9 858	128 9502	11 18 732	192 9332	1 0 051	256 9161	6 8 825	320 8991	11 17 7	
1 9887	2 1 969	65 9518	7 10 842	129 9846	12 19 716	193 9175	2 1 035	257 9005	7 9 809	321 8834	12 18 7	1 9887	2 1 969	65 9518	7 10 842	129 9846	12 19 716	193 9175	2 1 035	257 9005	7 9 809	321 8834	12 18 7	
2 9530	3 2 953	66 9880	8 11 827	130 9189	13 20 700	194 9019	3 2 020	258 8848	8 10 893	322 8678	13 19 7	2 9530	3 2 953	66 9880	8 11 827	130 9189	13 20 700	194 9019	3 2 020	258 8848	8 10 893	322 8678	13 19 7	
3 9874	4 3 937	67 9203	9 12 811	131 9033	14 21 685	195 8862	4 3 004	259 8689	9 11 878	323 8521	14 20 7	3 9874	4 3 937	67 9203	9 12 811	131 9033	14 21 685	195 8862	4 3 004	259 8689	9 11 878	323 8521	14 20 7	
4 9217	5 4 921	68 9047	10 13 795	132 8876	15 22 669	196 8706	5 4 988	260 8535	10 12 862	324 8365	15 21 7	4 9217	5 4 921	68 9047	10 13 795	132 8876	15 22 669	196 8706	5 4 988	260 8535	10 12 862	324 8365	15 21 7	
5 9061	6 5 906	69 8891	11 14 780	133 8720	1 23 654	197 8549	6 5 973	261 8379	11 13 846			5 9061	6 5 906	69 8891	11 14 780	133 8720	1 23 654	197 8549	6 5 973	261 8379	11 13 846			
6 8904	7 6 890	70 8734	12 15 764	134 8563	2 24 638	198 8393	7 6 957	262 8222	12 14 831	Chaitra (when the is no adhika masa)				6 8904	7 6 890	70 8734	12 15 764	134 8563	2 24 638	198 8393	7 6 957	262 8222	12 14 831	
7 8748	8 7 875	71 8578	13 16 749	135 8407	3 25 622	199 8236	8 7 941	263 8066	13 15 815			7 8748	8 7 875	71 8578	13 16 749	135 8407	3 25 622	199 8236	8 7 941	263 8066	13 15 815			
8 8592	9 8 859	72 8421	14 17 733	136 8251	4 26 607	200 8080	9 7 926	264 7909	14 16 799			8 8592	9 8 859	72 8421	14 17 733	136 8251	4 26 607	200 8080	9 7 926	264 7909	14 16 799			
9 8435	10 9 843	73 8265	15 18 717	137 8094	5 0 036	201 7924	10 8 910	265 7758	15 17 784			9 8435	10 9 843	73 8265	15 18 717	137 8094	5 0 036	201 7924	10 8 910	265 7758	15 17 784			
10 8279	11 10 827	74 8108	1 19 702	138 7938	6 1 021	202 7767	11 9 894					10 8279	11 10 827	74 8108	1 19 702	138 7938	6 1 021	202 7767	11 9 894					
11 8122	12 11 812	75 7952	2 20 686	139 7781	7 2 005	203 7611	12 10 879					11 8122	12 11 812	75 7952	2 20 686	139 7781	7 2 005	203 7611	12 10 879					
12 7966	13 12 797	76 7795	3 21 670	140 7625	8 2 989	204 7454	13 11 868					12 7966	13 12 797	76 7795	3 21 670	140 7625	8 2 989	204 7454	13 11 868					
13 7809	14 13 781	77 7639	4 22 655	141 7468	9 3 974	205 7298	14 12 848					13 7809	14 13 781	77 7639	4 22 655	141 7468	9 3 974	205 7298	14 12 848					
14 7652	15 14 765	78 7482	5 23 639	142 7312	10 4 958	206 7141	15 13 832					14 7652	15 14 765	78 7482	5 23 639	142 7312	10 4 958	206 7141	15 13 832					
15 7496	1 15 750	79 7326	6 24 623	143 7155	11 5 942							15 7496	1 15 750	79 7326	6 24 623	143 7155	11 5 942							
16 7340	2 16 734	80 7169	7 25 608	144 6999	12 6 927							16 7340	2 16 734	80 7169	7 25 608	144 6999	12 6 927							
17 7183	3 17 718	81 7013	8 26 592	145 6842	13 7 911							17 7183	3 17 718	81 7013	8 26 592	145 6842	13 7 911							
18 7027	4 18 703	82 6856	9 0 022	146 6686	14 8 896							18 7027	4 18 703	82 6856	9 0 022	146 6686	14 8 896							
19 6870	5 19 687	83 6700	10 1 006	147 6529	15 9 880							19 6870	5 19 687	83 6700	10 1 006	147 6529	15 9 880							
20 6714	6 20 671	84 6543	11 1 991									20 6714	6 20 671	84 6543	11 1 991									
21 6557	7 21 658	85 6387	12 2 975									21 6557	7 21 658	85 6387	12 2 975									
22 6401	8 22 640	86 6231	13 3 959									22 6401	8 22 640	86 6231	13 3 959									
23 6244	9 23 624	87 6074	14 4 944									23 6244	9 23 624	87 6074	14 4 944									
24 6088	10 24 609	88 5918	15 5 928									24 6088	10 24 609	88 5918	15 5 928									
25 5932	11 25 593											25 5932	11 25 593											
26 5775	12 26 577											26 5775	12 26 577											
27 5619	13 0 007											27 5619	13 0 007											
28 5462	14 0 992											28 5462	14 0 992											
29 5306	15 1 976											29 5306	15 1 976											
Jyeshṭha.				Śrāvana.				Āsīna.				Mārgaśīrsha.				Pauṣa.				Phālguna.				
30 5149	1 2 980	89 5761	1 6 912	153 5591	6 15 786	207 6945	1 14 816	266 7597	1 18 768	325 8208	1 23 7	30 5149	1 2 980	89 5761	1 6 912	153 5591	6 15 786	207 6945	1 14 816	266 7597	1 18 768	325 8208	1 23 7	
31 4993	2 3 945	90 5605	2 7 897	154 5434	7 16 770	208 6828	2 15 801	267 7440	2 19 753	326 8052	2 23 7	31 4993	2 3 945	90 5605	2 7 897	154 5434	7 16 770	208 6828	2 15 801	267 7440	2 19 753	326 8052	2 23 7	
32 4836	3 4 929	91 5448	3 8 881	155 5278	8 17 755	209 6672	3 16 785	268 7284	3 20 737	327 7895	3 24 6	32 4836	3 4 929	91 5448	3 8 881	155 5278	8 17 755	209 6672	3 16 785	268 7284	3 20 737	327 7895	3 24 6	
33 4680	4 5 913	92 5292	4 9 865	156 5121	9 18 739	210 6515	4 17 769	269 7127	4 21 721	328 7739	4 28 6	33 4680	4 5 913	92 5292	4 9 865	156 5121	9 18 739	210 6515	4 17 769	269 7127	4 21 721	328 7739	4 28 6	
34 4523	5 6 896	93 5135	5 10 850	157 4965	10 19 723	211 6359	5 18 754	270 6971	5 22 708	329 7582	5 26 6	34 4523	5 6 896	93 5135	5 10 850	157 4965	10 19 723	211 6359	5 18 754	270 6971	5 22 708	329 7582	5 26 6	
35 4367	6 7 882	94 4979	6 11 834	158 4808	11 20 708	212 6202	6 19 738	271 6814	6 23 690	330 7426	6 0 0	35 4367	6 7 882	94 4979	6 11 834	158 4808	11 20 708	212 6202	6 19 738	271 6814	6 23 690	330 7426	6 0 0	
36 4210	7 8 866	95 4822	7 12 818	159 4652	12 21 692	213 6046	7 20 722	272 6658	7 26 643	331 7269	7 1 0	36 4210	7 8 866	95 4822	7 12 818	159 4652	12 21 692	213 6046	7 20 722	272 6658	7 26 643	331 7269	7 1 0	
37 4054	8 9 851	96 4666	8 13 803	160 4495	13 22 676	214 5889	8 21 707	273 6501	8 25 659	332 7113	8 2 0	37 4054	8 9 851	96 4666	8 13 803	160 4495	13 22 676	214 5889	8 21 707	273 6501	8 25 659	332 7113	8 2 0	
38 3898	9 10 835	97 4509	9 14 787	161 4339	14 23 661	215 5733	9 22 691	274 6345	9 29 643	333 6957	9 3 0	38 3898	9 10 835	97 4509	9 14 787	161 4339	14 23 661	215 5733	9 22 691	274 6345	9 29 643	333 6957	9 3 0	
39 3741	10 11 819	98 4353	10 15 771	162 4182	15 24 645	216 5576	10 23 675	275 6188	10 0 078	334 6800	10 4 0	39 3741	10 11 819	98 4353	10 15 771	162 4182	15 24 645	216 5576	10 23 675	275 6188	10 0 078	334 6800	10 4 0	
40 3585	11 12 804	99 4196	11 16 755	163 4026	1 25 630	217 5420	11 24 660	276 6032	11 1 057	335 6644	11 5 0	40 3585	11 12 804	99 4196	11 16 755	163 4026	1 25 630	217 5420	11 24 660	276 6032	11 1 057	335 6644	11 5 0	
41 3428	12 13 788	100 4040	12 17 740	164 3869	2 26 614	218 5264	12 25 644	277 5875	1															

ĀRYA SIDDHĀNTA EYE-TABLE—Specimen problems from ancient Tamil literature.

This Eye-table alone will enable any one to solve correctly, to four decimal places of a day, and by a single operation any problem in solar dates, nakshatras or week-days, for 2,000 years, i.e., from B.C. 1 to 2000 A.D. The tables of equations are given to two places of decimals in the abridged sections e to i of the eye-table—see next page—and to four places of decimals in the unabridged sections a to i, page 179 to 186 below.

The computation of the ending moment, whether of a tithi, or of a nakshatra, or of a yoga, always comprises four processes: (1) to find the mean ending moment; (2) to find the anomaly or anomalies for that moment, (3) to find the equation or equations corresponding to the anomaly or anomalies; and (4) to add together the mean ending moment and the equation or equations.

Problem I.—Required to find the ending moment, by Ārya siddhānta, of Āshāḍha Full moon tithi (when there was a lunar eclipse) in A.D. 634—See the Paripāḍai horoscope, (Ch. V, sec. ii, page 160 of the Text).

Commencement of solar year. Col. 1.	Days of solar year and sun's anomaly in days of solar year. Col. 2.	Moon's anomaly. Col. 3.
600 A.D. ... March 19 229165 k 84 years 79514 n	First new moon { 400 A.D. ... 1 22789 1 84 years ... 13 58446 o 684 A.D. ... 14 81236 (2)	25 95007 m 19 23974 p 14 81236 (2) 60 00217 -55 1090 d (2 Anom months). 4 9332 (3) (C's An. at 1st N.M. in S. year). 8 952 c 14 7658 d 23 610 - 0222 h (C's equation). 23 588 (5) C's eqn. for An of 88 64 d. (4) - 0222 h (6) C's eqn. for An of 23 588 d. (5) + 3052 e (7) Sum of C's + C's eqns + 2830 (8)
684 A.D. ... March 20 02480 (1) N.B.—This, by itself, is a valuable piece of information, giving the English year, month, day and fraction of day on which a particular Indian solar year between 1 B.C. and A.D. 2000 commenced by Ārya siddhānta; and this information can be had in a few seconds from the eye-table, sections k and n for any one of 2,000 years. Note how stages (1), (2), (3), (4), (5), (6), (7) and (8) are successively arrived at with the help of the eye-table and then add together (4), (8) and (1) , as shown in column 2	Add for Āshāḍha new moon ... 59 9612 b Do. 15 tithis 14 7658 d 88 6389 (4) Sum of C's and C's eqns. + 2830 (8) Add commencement of solar year (first column) Mar. 20 0243 (1) Actual ending moment Mar. 108 9482 (9)	

We reach, for the ending moment of the full-moon tithi, or the centre of the lunar eclipse, March 108 9482. By Eye-table **q**, the 93rd day from March 1 is June 1. Therefore the 108th day from March 1 = June 16 ... **q**; and by Eye-table **r**, 9500 of a day = 57 ghatikas and 0032 day = 12 palas.

The full-moon tithi ended and the eclipse occurred, according to Ārya siddhānta, at 56 ghāt. 48 palas after mean sunrise or by Table VI at 22 hours, 42½ minutes, i.e., one hour and 17½ minutes before sunrise on Friday, 17th June A.D. 634.

*Problem II.—The same problem worked to four places of decimals with the aid of Table II and Eye-tables **y, e** and **h**.*

	Days of solar year.	Moon's mean anomaly in days	☾'s and ☾'s equations.
Table II, first new moon, in solar year acc. to Ār. siddh.	14 8124	4 893	☾'s eqn. for 88 64 d. = - 0222 (E.T. h)
Eye-table y , Āshāḍha Śu. 15	73 8265	18 717	☾'s eqn. for 23 588 d. = + 3052 (E.T. e)
	88 6389	23 610	Sum of ☾'s + ☾'s eqns. + 2830
Add sum of ☾'s and ☾'s eqns. acc. to last column	+ 2830	- 0222 (☾'s eqn. in last column).	
		23 588	
Add Eng. month and day, marking commencement of S. yr. A.D. 634-35 (Table II)	Mar. 20 0243		
			Mar. 108 9482 = June 16, A.D. 634, 56 gh 48 p after mean sunrise (E.T. q and r .)

Same problem.—The shortest method and the one ordinarily used by the author for tithis like the present one, when the Ephemeris is not available.

(N.B.—All the entries in the first dotted line are from Table II.)

New moon tithi, Āshāḍha, A.D. 634-5 ... (4) June 1 90	1st N.M. in S. year ... 14 81	An. of 1st N.M. in S. Yr. ... 4 89 Tab. II.
Eye-table d . Add for 15 tithis ... 14 76	(E.T. y) Add for Āshāḍha, Śukla 15 ... 73 88	18 72 r 23 61
(19) June 16 66	88 64	(Abridged Eye-tab. h) C's eqn. for An of 88 64 d. ... - 02 - 02
		(Abridged Eye-tab. e) C's eqn. for An. of 23 59 d. ... + 30
Sum of C's and C's eqns. (last column). + 28		+ 28

(19) June 16 66 = Thursday, 16 June A.D. 634, at 94 of day or 1½ hours or 3½ gh. before sunrise on Friday, 17 June

Problem III.—Required to find the moment of commencement of the 1st Svāti nakshatra (No. 16) or the ending moment of Chitra nakshatra (No. 14) in the month of Chaitra—Māshu, A.D. 756, the date probably referred to in Selappadhikāram, Nāḍukūṇḍai. (The Ephemeris gives this information complete, but the method may be used in other cases where the Ephemeris is not available.)

Table II, Mean ending moment of new moon tithi, Chaitra, A.D. 756-56 ...	(6) Mar. 5 97	C's An. in days
" Anomaly of 1st N.M. in solar year A.D. 756-56 ...	14 66	14 66
Eye-table c . Add for anomaly of Chaitra new moon, same year (no adhika month).	21 74	36 40
Eye-table s Shortest interval from Chaitra N.M. to nakshatra Chaitra (No. 14) ...	15 14	15 14
Eye-table t, u Nakshatra correction for 1st N.M. in S. year 25 81 days, i.e., correction for 25 days = 0 84 t . Correction for 81 day = - 0 06 u .	0 28	0 28
Total nakshatra correction for 25 81 days = 0 84 - 0 06 = 0 28 ...	51 82	51 82
	- 27 55 (1 An. Mo. E.T. d)	
Abridged Eye-table f , moon's nak. eqn. for anom. of 24 27 days (last column) ...	+ 24	24 27
	(22) Mar. 21 68	

That is, Sunday, 21st March A.D. 756, 63 of a day, or 88 ghatikas after mean sunrise.

EYE-TABLE FOR

NOTE.—The different parts of the Table are lettered in order from a to y and All the figures, except where otherwise indicated

Order of signs of zodiac or rāsis and longitude at commencement	1...0°	2...30°	3...60°	4...90°
Bengal solar months ...	...	Vaiśākha	Jyeshtha	Āshāḍha
Tamil and Malayālam solar months; also names of rāsis	...	Mēsha Medam	Vriśabha Edavam	Mithuna
Tamil solar months...	...	Chittirai	Vaiyāṣi	Āni
a Moment of sankrānti in days of solar year, and decimals of a day	...	0·0	30·9250	62·3261
English date corresponding to each sankrānti (A.D. 1911)	...	Apr. 13	May 14	June 14
Lunar month: each month commences before sankrānti noted in next column	...	(1) Vaiśākha	(2) Jyeshtha	(3) Āshāḍha
b Increase in days, (1) of lunar months, (2) of sun's anomaly	...	0·000	29·5308	59·0612
c " of c's An. when interval between Mēsha sank. and 1st N.M. in sol. year is 0·00 day	...	0·000	1·976	3·952

Tithi equivalents in days and

d Tithi equivalent in days	1	2	3	4	5
...	·9843	1·9687	2·9531	3·9374	4·9218
...	16	17	18	19	20
...	15·7495	16·7340	17·7182	18·7027	19·6871

e, f, g Moon's equation of the centre and moon's anomaly in days and

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20
-	0·00	0·12	0·23	0·35	0·47	0·58	0·70	0·82	0·94	1·06	1·18	1·30	1·42	1·54	1·66	1·79	1·91	2·04	2·17	2·30	2·43
-	13·78	13·68	13·58	13·49	13·39	13·29	13·20	13·10	13·00	12·90	12·80	12·70	12·60	12·50	12·39	12·29	12·18	12·08	11·97	11·86	11·75
+	13·78	13·87	13·97	14·07	14·16	14·26	14·36	14·46	14·55	14·65	14·75	14·85	14·96	15·06	15·16	15·27	15·37	15·48	15·58	15·69	15·80
+	27·55	27·44	27·32	27·20	27·09	26·97	26·85	26·73	26·62	26·50	26·38	26·26	26·13	26·01	25·89	25·76	25·64	25·51	25·39	25·26	25·13
-	0·00	0·12	0·25	0·38	0·50	0·63	0·75	0·88	1·01	1·14	1·27	1·40	1·53	1·66	1·79	1·93	2·06	2·20	2·34	2·48	2·63
-	13·78	13·67	13·57	13·48	13·35	13·25	13·14	13·04	12·93	12·82	12·71	12·60	12·49	12·38	12·26	12·15	12·03	11·92	11·80	11·67	11·55
+	13·78	13·88	13·99	14·09	14·20	14·30	14·41	14·52	14·62	14·73	14·84	14·95	15·06	15·18	15·29	15·40	15·52	15·64	15·76	15·88	16·01
+	27·55	27·48	27·30	27·18	27·05	26·93	26·80	26·67	26·55	26·42	26·29	26·16	26·03	25·89	25·76	25·63	25·50	25·35	25·21	25·07	24·92
-	0·00	0·18	0·27	0·40	0·54	0·67	0·81	0·94	1·08	1·22	1·36	1·50	1·64	1·78	1·92	2·07	2·22	2·37	2·52	2·67	2·83
-	13·78	13·66	13·55	13·43	13·32	13·21	13·09	12·97	12·86	12·74	12·62	12·50	12·38	12·25	12·13	12·01	11·88	11·75	11·62	11·48	11·34
+	13·78	13·89	14·00	14·12	14·23	14·35	14·46	14·58	14·70	14·81	14·93	15·05	15·17	15·30	15·42	15·54	15·67	15·80	15·94	16·07	16·21
+	27·55	27·42	27·29	27·15	27·02	26·88	26·75	26·61	26·47	26·34	26·20	26·06	25·92	25·77	25·63	25·49	25·34	25·19	25·03	24·88	24·72

h For tithis. Sun's equation of the centre and sun's anomaly in days of the solar

+176	+175	+17	+16	+15	+14	+13	+12	+11	+10	+09	+08	+07	+06	+05	+04	+03	+02	+01	+00
357·90	362	5	15	22	28	33	38	42	46	50	54	57	61	65	68	71	75	78	81·29
352·20	348	340	330	323	317	312	307	303	299	295	291	288	284	281	277	274	271	267	263·92

i For yugas.—Sun's equation.	-152	-151	-150	-14	-13	-12	-11	-10	-09	-08	-07	-06	-05	-04	-03
" Anomaly	355·88	361	364	13	22	28	34	40	44	49	53	58	62	66	70
in days of solar year	351·89	350	347	332	324	317	311	306	301	296	292	288	283	279	275

j Perpetual almanac for European calendar.

[N.B.—Heavy type means week-day, Sunday being 1, Monday 2, etc.]																			
		1	2	3	4	5	6	7	or 0	N.B.—B.C. years should be made positive thus: 44 B.C. is 57th year of century beginning with 101 B.C. —see page 14 of Text.									
Centuries B.C.	{	3001	3101	3201	2301	2701	2801	2901											
		2301	2401	2501	2601	2701	2801	2901											
		1801	1701	1801	1901	2001	2101	2201											
		901	1001	1101	1201	1301	1401	1501											
		201	301	401	501	601	701	801											
							1	101											
Centuries A.D. old style.	{	500	400	300	200	100	0			N.B.—Old Style ceased in continental countries (exc. Russia) on 4-10-1582 and New Style began on 15-10-1582, 10 days being dropped. In United Kingdom, New Style began on 14-9-1752, 11 days being dropped.									
		1200	1100	1000	900	800	700	600											
				1700	1600	1500	1400	1300											
Centuries A.D. new style.	{	1600	1900		1800		1700												
		2000	2300		2200		2100												
Odd years in a century.	{	1	2	3	4	5	6	7	or 0	1	2	3	4	5	6	7	or 0		
		7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
		24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	
		41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	
		58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	
		75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	
		92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	
		09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
		26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
		44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61
Months in	{	Ordinary years.	Aug.	Feb.	June	Sep.	Apr.	Jan.	May										
				Mar.		Dec.	July	Oct.											
				Nov.															
		Leap years	...	Feb.	...	...	...	Jan.	...	...									
Arya Siddhanta constants for centuries.																			
		Commencement of solar year.		First new moon in solar year.		Anomaly at commencement of solar year.													
		Month of date.		Fraction of day.															
		k		l		m													
Year A.D.	Kaliyuga.																		
B.C.		3101	Mar. 14	020832	9	97497	12	44500											
A.D.		3201	Mar. 14	088887	13	48062	0	91097											
100		3301	Mar. 15	750943	16	86826	16	08165											
200		3401	Mar. 16	624998	20	85990	5	39762											
300		3501	Mar. 17	493054	23	82154	21	41810											
400		3601	Mar. 18	361109	27	28318	9	88407											
500		3701	Mar. 19	229165	1	22789	25	95007											
600		3801	Mar. 20	097220	4	70820	14	46145											
700		3901	Mar. 20	965276	8	17851	2	97285											
800		4001	Mar. 21	833331	11	65388	19	03883											
900		4101	Mar. 22	701387	15	12914	7	56022											
1000		4201	Mar. 23	569442	19	00446	23	61622											
1100		4301	Mar. 24	437498	22	07977	12	12760											
1200		4401	Mar. 25	305553	25	55508	0	68900											
1300		4501	Mar. 26	173609	29	08039	16	70498											
1400		4601	Mar. 27	041664	2	97511	5	21637											
1500		4701	Mar. 27	909720	6	45048	21	28287											
1600		4801	Mar. 28	777775	9	2574	9	79375											
1700		4901	Apr. 10	645881	13	40105	25	85975											
1800		5001	Apr. 12	513886	16	67686	14	87114											
1900																			

ĀRYA SIDDHĀNTA.

the way in which they are to be used is shown in the specimen problems on reverse.
represent days and fractions of a day.

5 ... 120°	6 ... 150°	7 ... 180°	8 ... 210°	9 ... 240°	10 ... 270°	11 ... 300°	12 ... 330°	
Bhādrapada	Āsvinā	Kārttika	Mārgaśīrṣa	Pauṣa	Magha	Phālguna	Chaitra.	
Simha	Kanyā	Tulā	Vṛśchikā	Dhanu	Makara	Kumbha	Mina	—
Āvaṇi	Parat̐kṣi	Aippasi	Kārttigai	Mārgaḷi	Tai	Māsi	Panguni	
125-4011	156-4858	186-8925	216-7958	246-3044	275-6550	305-1117	334-9200	365-2588
Aug. 16	Sep. 16	Oct. 17	Nov. 16	Dec. 15	Jan. 14	Feb. 12	Mar. 13	
(5) Bhādrapada	(6) Āsvinā	(7) Kārttika	(8) Mārgaśīrṣa	(9) Pauṣa	(10) Magha	(11) Phālguna	(12) Chaitra	(13) Chaitra when there is an adhika month.
118-1228	147-6580	177-1885	206-7141	236-2447	265-7758	295-8059	324-8365	354-8670
7-904	9-880	11-866	13-832	15-808	17-784	19-760	21-736	23-712

decimals of a day, and moon's anomalistic months.

6	7	8	9	10	11	12	13	14	15
5-9081	6-8906	7-8748	8-8592	9-8435	10-8379	11-8122	12-7968	13-7809	14-7653
21	22	23	24	25	26	27	28	29	30
20-6714	21-6558	22-6401	23-6245	24-6088	25-5932	26-5775	27-5619	28-5462	29-5306

Moon's anomalistic months.

1 month = 27-6545 days
2 months = 55-1090 days
12 months = 380-6540
13 months = 358-2085

decimals of a day. (The signs - and + are to be applied to the equation in heavy type and not to the anomaly.)

21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
2-56	2-70	2-83	2-97	3-11	3-26	3-41	3-56	3-72	3-89	4-05	4-23	4-41	4-60	4-81	5-03	5-27	5-54	5-85	6-28	6-93
11-04	11-52	11-40	11-28	11-16	11-04	10-51	10-38	10-26	10-14	10-02	9-50	9-38	9-26	9-14	9-02	8-50	8-38	8-26	8-14	8-02
15-92	16-03	16-15	16-27	16-39	16-52	16-65	16-78	16-92	17-06	17-21	17-37	17-53	17-70	17-89	18-09	18-31	18-55	18-84	19-21	19-89
25-00	24-86	24-72	24-58	24-44	24-29	24-14	23-99	23-83	23-67	23-50	23-33	23-14	22-95	22-74	22-53	22-29	22-02	21-71	21-33	20-62
2-77	2-92	3-08	3-23	3-39	3-56	3-73	3-91	4-09	4-28	4-49	4-70	4-93	5-18	5-48	5-79	6-19	6-69			
11-42	11-29	11-16	11-02	10-88	10-74	10-59	10-43	10-27	10-09	9-91	9-72	9-51	9-28	9-01	8-71	8-32	7-85			
16-13	16-26	16-39	16-53	16-67	16-82	16-97	17-12	17-29	17-46	17-64	17-84	18-05	18-27	18-54	18-85	19-28	20-00			
24-78	24-63	24-48	24-32	24-16	23-99	23-82	23-65	23-48	23-27	23-07	22-85	22-62	22-38	22-09	21-76	21-36	20-57			
2-99	3-16	3-33	3-51	3-69	3-88	4-08	4-28	4-50	4-73	4-98	5-26	5-59	5-98	6-56						
11-20	11-06	10-50	10-35	10-19	10-02	9-86	9-69	9-51	9-35	9-15	8-95	8-71	8-47	7-92						
16-85	16-50	16-35	16-20	16-07	15-93	15-78	15-60	15-49	15-30	15-14	14-50	14-21	13-98	13-64						
24-56	24-39	24-22	24-05	23-87	23-68	23-48	23-27	23-06	22-83	22-57	22-29	21-96	21-57	21-00						

e For tithis.

f For nakshatras.

g For yogas.

year and decimals of a day. (The anomalies are entered in ordinary type and the equations, with appropriate signs, in heavy type.)

-01	-02	-03	-04	-05	-06	-07	-08	-09	-10	-11	-12	-13	-14	-15	-16	-17	-175	-176	
85	88	91	95	98	102	105	109	113	116	121	125	130	135	141	148	157	166	169-98	
261	257	254	251	247	241	240	237	233	229	225	220	216	211	205	198	188	180	175-63	
-02	-01	-00	+01	+02	+03	+04	+05	+06	+07	+08	+09	+10	+11	+12	+13	+14	+150	+151	+152
74	77	80-29	85	89	93	97	101	105	109	113	118	123	128	134	141	149	164	167	171-96
272	268	263-92	260	256	252	248	244	240	236	232	227	222	217	211	204	196	181	178	172-95

Ārya siddhānta—Odd years.

	Fraction of day, marking commencement of solar year.	First new moon in solar year.	It's anomaly for beginning of solar year.		Fraction of day, marking commencement of solar year.	First new moon in solar year.	It's anomaly for beginning of solar year.		Fraction of day, marking commencement of solar year.	First new Moon in solar year.	It's anomaly for beginning of solar year.
	n	o	p		n	o	p		n	o	p
1	25868	18-63903	7-04991	38	82986	29-07937	19-58238	75	1-40104	9-98913	5-18084
2	51736	7-74745	14-09862	39	1-08854	18-18780	26-98169	76	8-6972	28-62815	12-21015
3	77604	26-88648	21-14798	40	3-4722	7-29624	6-42440	77	9-1840	17-73659	19-25946
4	103472	15-49492	0-64264	41	6-0590	25-93526	13-47571	78	1-17708	6-84502	26-30877
5	20340	4-60835	7-61195	42	8-6458	15-04370	20-52502	79	1-48576	25-48405	5-80848
6	55208	23-24238	14-74126	43	1-12326	4-15214	0-01973	80	6-9444	14-59249	12-85279
7	81076	12-35082	21-79057	44	3-8194	22-79116	7-06904	81	9-6312	3-70092	19-90210
8	106944	1-45924	1-28528	45	6-4062	11-89959	14-11835	82	1-21180	22-33994	26-96141
9	32812	20-09827	8-33460	46	8-9980	1-06803	21-16766	83	1-47048	11-44288	6-44612
10	55680	9-20671	15-88390	47	1-15790	19-64705	0-66287	84	7-2917	0-55691	13-43543
11	84549	27-84578	22-48321	48	4-1667	8-75549	7-71168	85	9-8785	19-19584	20-54474
12	10417	16-95417	1-27922	49	6-7535	27-39452	14-76099	86	1-24658	8-30428	0-03945
13	36285	6-06260	8-97723	50	9-3403	16-50294	21-81030	87	1-50521	26-94329	7-08876
14	62153	24-70162	16-02654	51	1-19271	5-61138	1-80500	88	7-0883	16-05178	14-18807
15	88021	18-81006	23-07585	52	4-5139	24-25041	8-85432	89	1-02257	5-16017	21-18738
16	13889	2-91850	2-67056	53	7-1007	13-35884	15-40368	90	1-28125	23-79919	0-68209
17	39767	21-55752	9-61987	54	9-6875	2-46728	22-46294	91	1-53998	12-90763	7-73140
18	65625	10-66596	16-66918	55	1-22748	21-10630	1-94764	92	7-9861	2-01607	14-78071
19	91443	29-80498	23-71849	56	4-8311	10-21474	8-99895	93	1-05729	20-65508	21-82002
20	17361	18-41341	8-21320	57	7-4479	28-85376	16-04627	94	1-31597	9-76352	1-32474
21	43229	7-52185	10-26251	58	1-00347	17-96219	28-09558	95	1-57465	28-40254	8-37405
22	69097	26-16088	17-81182	59	1-26215	7-07063	2-59028	96	8-3333	17-51098	15-42-36
23	94965	15-26980	24-36113	60	5-2083	25-70966	9-63959	97	1-09201	6-61942	22-47267
24	20883	4-37774	8-85584	61	7-7951	14-81810	16-68890	98	1-35069	25-25844	1-66783
25	46701	28-01677	10-90515	62	1-08819	8-92653	28-73822	99	1-60987	14-36887	9-01668
26	72569	12-12520	17-95446	63	1-29687	22-56555	8-23292	100	8-8805	8-47531	16-08800
27	98437	1-23364	26-00877	64	5-5555	11-67399	10-28223	200	7-8611	8-50662	4-57788
28	24305	19-87267	4-49848	65	8-1423	0-78243	17-38154	300	6-0417	10-42593	20-64332
29	50174	8-98109	11-54779	66	1-07292	19-42144	24-38086	400	4-7222	13-80124	9-15486
30	76042	27-62012	18-59710	67	1-38160	8-52989	8-87556	500	8-4028	17-87655	25-22064
31	1-01810	16-72856	25-64641	68	5-9028	27-16891	10-92488	600	2-0833	20-85186	13-78208
32	2-7778	5-83959	5-14113	69	8-4896	16-27734	17-97419	700	0-7639	24-32717	2-24342
33	6-6846	24-47602	12-19048	70	1-10764	5-86578	25-02350	800	9-4444	27-80348	18-80941
34	7-9514	18-58446	19-23974	71	1-86832	24-02480	4-51820	900	8-1250	1-74720	6-02080
35	1-05382	2-69268	26-28905	72	6-3500	13-13323	11-56751	1000	6-8055	5-22251	22-88979
36	8-1250	21-38191	5-76876	73	8-8368	2-24167	18-61682	2000	3-8111	10-44502	18-21896
37	5-7118	10-44085	12-83307	74	1-14236	20-88070	25-6661	3000	0-4166	15-66753	18-55117

	Apr. 1	May 1	June 1	July 1	Aug 1	Sep. 1	Oct. 1	Nov. 1	Dec 1	Jan 1	Feb. 1	Mar. 1
April ...	1	31	62	92	123	154	184	215	245	276	307	335
											Lead Year, Ap. 836	

15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
*2500	*2667	*2833	*3000	*3167	*3333	*3500	*3667	*3833	*4000	*4167	*4333	*4500	*4667	*4833	*5000
45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
*7500	*7667	*7833	*8000	*8167	*8333	*8500	*8667	*8833	*9000	*9167	*9333	*9500	*9667	*9833	1-0000
22	25	27	30	32	35	37	40	42	45	47	50	52	55	57	60
*0061	*0069	*0075	*0083	*0089	*0097	*0103	*0111	*0117	*0125	*0130	*0139	*0144	*0153	*0158	*0167

moment of each nakshatra.

Order	Ordinarily Māgashira	Order	Ordinarily Pauṣa	Order	Ordinarily Māgha	Order	Ordinarily Phālguna	Order	Chaitra, when no Adhika Masa	Order	Chaitra, when there is Adhika Masa
VIII		IX		X		XI		XII		XIII	
18	0 7037	20	0 5186	22	0 3385	24	0 1484	27	0 9753	2	0 7902
19	1 7156	21	1 5905	23	1 3164	25	1 1604	1	1 9872	3	1 8021
20	2 7275	22	2 5424	24	2 3574	26	2 1723	2	2 9091	4	2 8140
21	3 7394	23	3 5544	25	3 3693	27	3 1842	3	4 0110	5	3 8259
22	4 7514	24	4 5663	26	4 3812	1	4 1961	4	5 1229	6	4 8378
23	5 7633	25	5 5782	27	5 3931	2	5 2080	5	6 0818	7	5 8497
24	6 7752	26	6 5901	1	6 4050	3	6 2199	6	7 0468	8	6 8617
25	7 7871	27	7 6020	2	7 4169	4	7 2318	7	8 0597	9	7 8735
26	8 7990	1	8 0139	3	8 4288	5	8 2438	8	9 0708	10	8 8858
27	9 8109	2	9 0258	4	9 4408	6	9 2557	9	10 0825	11	9 8974

1	0 8228	3	10 6378	5	10 4527	7	10 2676	10	11 0944	12	10 9093
2	11 8848	4	11 6497	6	11 4646	8	11 2795	11	12 1063	13	11 9212
3	12 8467	5	12 6616	7	12 4765	9	12 2914	12	13 1182	14	12 9332
4	13 8586	6	13 6735	8	13 4884	10	13 3033	13	14 1802	15	13 9451
5	14 8705	7	14 6854	9	14 5003	11	14 3152	14	15 1421	16	14 9570
6	15 8824	8	15 6973	10	15 5122	12	15 3272	15	16 1540	17	15 9689
7	16 8943	9	16 7092	11	16 5242	13	16 3391	16	17 1659	18	16 9808
8	17 9062	10	17 7212	12	17 5361	14	17 3510	17	18 1778	19	17 9927
9	18 9181	11	18 7331	13	18 5480	15	18 3629	18	19 1897	20	18 0046
10	19 9301	12	19 7450	14	19 5599	16	19 3748	19	20 2016	21	20 0165

11 20 8420	13 20 7569	15 20 5718	17 20 8867	20 21 2136	22 21 0285
12 21 9539	14 21 7688	16 21 5837	18 21 3986	21 22 2255	23 22 0404
13 22 9658	15 22 7807	17 22 5966	19 22 4106	22 23 2374	24 23 0523
14 23 9777	16 23 7926	18 23 6076	20 23 4225	23 24 2493	25 24 0642
15 24 9896	17 24 8046	19 24 6195	21 24 4344	24 25 2612	26 25 0761
16 26 0015	18 25 8165	20 25 6314	22 25 4463	25 26 2781	27 26 0880
17 27 0135	19 26 8284	21 26 6433	23 26 4582	26 27 2860	27 27 0999
18 28 0254	20 27 8403	22 27 6552	24 27 4701	27 28 2969	28 28 1119
19 29 0373	21 28 8522	23 28 6671	25 28 4820	1 29 8089	3 29 1238
			26 29 4939		

Order	Ordinarily Mārga- śrīṣṭha	Order	Ordinarily Pauṣa	Order	Ordinarily Māgha	Order	Ordinarily Phālguna	Order	Chaitra when no Adhika Masa	Order	Chaitra when there is Adhika Masa
8	0 3680	12	0 0236	17	0 6207	21	0 2733	26	0 8784	3	0 5290
9	1 3005	13	0 9651	18	1 5622	22	1 2178	27	1 8149	4	1 4704
10	2 2510	14	1 9066	19	2 5087	23	2 1593	1	2 7563	5	2 4119
11	3 1925	15	2 8481	20	3 4452	24	3 1008	2	3 6978	6	3 3534
12	4 1340	16	3 7896	21	4 3867	25	4 0422	3	4 6393	7	4 2949
13	5 0755	17	4 7311	22	5 3281	26	4 9837	4	5 5808	8	5 2364
14	6 0170	18	5 6726	23	6 2696	27	5 9252	5	6 5223	9	6 1779
15	6 9585	19	6 6140	24	7 2111	1	6 8667	6	7 4638	10	7 1194
16	7 8999	20	7 5555	25	8 1526	2	7 8082	7	8 4053	11	8 0609
17	8 8414	21	8 4970	26	9 0941	3	7 7497	8	9 3468	12	9 0024

18	9 7829	22	9 4385	27	10-0858	4	9-6912	9	10-2883	13	9-9439
19	10-7244	23	10 8900	1	10-9771	5	10-6827	10	11-2298	14	10 8853
20	11-6659	24	11 3215	2	11-9186	6	11 5742	11	12-1712	15	11 8268
21	12-0074	25	12 2680	3	12-9601	7	12-5157	12	13-1127	16	12 7683
22	18-5489	26	18 2045	4	18-8015	8	13-4571	13	14-0542	17	18 7098
23	14-4604	27	14-1460	5	14-7430	9	14 3886	14	14-9957	18	14-6513
24	15-4819	1	15 0774	6	15 6845	10	15-3401	15	15-9372	19	15-5928
25	16-3783	2	16 0289	7	16-6260	11	16-2816	16	16 8787	20	16 5343
26	17-3148	3	16-9704	8	17 5675	12	17-2291	17	17-8202	21	17-4758
27	18-2568	4	17-9119	9	18-6090	13	18-1646	18	18 7617	22	18-4173

1 19-1978	5 18-8534	10 19-4505	14 19-1001	19 19-7032	23 19-3588
2 20-1989	6 18-7949	10 20-3920	15 20-0476	20 20-4448	24 20 3002
3 21-0608	7 20-7364	12 21-3335	16 20-9891	21 21-5681	25 21 2417
4 22-0228	8 21-6779	13 22-2750	17 21-9305	22 22-5276	26 22 1832
5 22-9638	9 22-6184	14 23-2164	18 22-8720	23 23-4691	27 23 1247
6 23-9053	10 23-5609	15 24-1579	19 28-8135	24 24-4101	1 24 0662
7 24-8408	11 24-5023	16 25-0994	20 24-7550	25 25-8521	2 25 0087
8 25-7882	12 25-4488	17 26-0409	21 25-6965	26 26-2936	3 25 9492
9 26-7297	13 26-8853	18 26-9824	22 26-6380	27 27-2851	4 26 8907
10 27-6112	14 27-8268	19 27-9289	23 27-5795	1 28-1768	5 27-8322
11 28-6127	15 28-2683	20 28-8654	24 28-5210	2 28-1181	6 28-7786
	16 29-2098		25 29-4625		

Argument —Date of appearance of 1st new moon in each solar year according to Table X.

The correction corresponding to the decimal portion of the argument should be subtracted from the nakshatra or yoga correction corresponding to the integral portion, thus the nakshatra correction corresponding to an argument $28.53 = 0.11$ minus $0.04 = 0.07$.

Arg. Corr.	Arg. Corr.	Arg. Corr.	Arg. Corr.	Arg. Corr.
†	u	u	u	u
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30
31	32	33	34	35
36	37	38	39	40
41	42	43	44	45
46	47	48	49	50
51	52	53	54	55
56	57	58	59	60
61	62	63	64	65
66	67	68	69	70
71	72	73	74	75
76	77	78	79	80
81	82	83	84	85
86	87	88	89	90
91	92	93	94	95
96	97	98	99	100

0 2'20890	01 -00075	30 02244	59 -04418	88 06582
1 2 13410	02 -00150	31 02319	60 04488	89 06657
2 2-05930	03 -00224	32-02394	61 -04568	90 -06732
3 198450	04 -00299	33 -02468	62 04888	91 06807
4 1-90970	05 -00374	34 02543	63 -04712	92 06882
5 183490	06 00440	35 02618	64 -01787	93 06956
6 1 76910	07 -00524	36 02693	65 04962	94 -07081
7 -1-8531	08 -00598	37 02768	66 04897	95 07106
8 1-61049	09 -00673	38 -02842	67 -05012	96 -07181
9 1-53569	10 -00748	39 02917	68 -05088	97 -07256

10	1-46089	11	-00823	40	02992	69	05181	98	07330
11	1-38609	12	-00898	41	03067	70	-05236	99	-07405
12	1-81129	13	-00972	42	03142	71	05311		
13	1-23649	14	-01047	43	03216	72	-06386		
14	1-16169	15	-01122	44	03291	73	05460		
15	1-08689	16	-01197	45	03366	74	05535		
16	1-01209	17	-01272	46	03441	75	05610		
17	0-93729	18	-01346	47	-03516	76	05685		
18	0-86249	19	01421	48	-03590	77	-05760		
19	0-78769	20	-01496	49	-03665	78	-05834		

20	0.71288	21	0.1571	50	0.3740	79	0.5909
21	0.63808	22	0.1646	51	0.3815	80	0.5984
22	0.56328	23	0.1720	52	0.3890	81	0.6060
23	0.48848	24	0.1795	53	0.3964	82	0.6134
24	0.41368	25	0.1870	54	0.4039	83	0.6208
25	0.38888	26	0.1945	55	0.4114	84	0.6283
26	0.26408	27	0.2020	56	0.4189	85	0.6358
27	0.18928	28	0.2094	57	0.4264	86	0.6433
28	0.11448	29	0.2169	58	0.4338	87	0.6508
29	0.03968						

See note on ANNUAL CORRECTION *supra*.

	W	X	X	X	X				
0	411086	01	00139	30	04176	59	08212	88	12240
1	397117	02	00278	31	04315	60	08351	89	12388
2	883198	03	00417	32	04454	61	08491	90	12527
3	860279	04	00557	33	04598	62	08630	91	12666
3	856360	05	00696	34	04732	63	08769	92	12805
5	341441	06	00835	35	04872	64	08908	93	12945
6	327522	07	00974	36	05011	65	09047	94	13084
7	313603	08	01113	37	05150	66	09186	95	13223
8	299684	09	01253	38	05289	67	09326	96	13362
9	285765	10	01392	39	05428	68	09465	97	13501
10	271846	11	01530	40	05568	69	09604	98	13641
11	257927	12	01670	41	05707	70	09743	99	13780

12	2-44008	13	-01809	42	-05840	71	09882
13	2-30089	14	-01949	43	-05985	72	-10022
14	2-18170	15	-02088	44	-08124	73	10161
15	2-02251	16	-02227	45	-06263	74	-10300
16	1-88332	17	-02366	46	06493	75	-10439
17	1-74418	18	-02505	47	-06542	76	-10578
18	1-60494	19	-02645	48	-06681	77	10798
19	1-46575	20	-02784	49	06820	78	10837
20	1-82656	21	-02923	50	-06959	79	-10976
21	1-18787	22	-03063	51	-07098	80	-11115

22	0.104818	23	0.03291	52	0.7238	81	11274
23	0.90899	24	0.0340	53	0.7377	82	11413
24	0.76980	25	0.03480	54	0.7516	83	11553
25	0.63061	26	0.03619	55	0.7655	84	11693
26	0.48142	27	0.03758	56	0.7795	85	11831
27	0.35223	28	0.03897	57	0.7934	86	11970
28	0.21804	29	0.04036	58	0.8073	87	12109
29	0.07885						

Calendar to be used with Table II, as directed in specimen problems, for ascertaining the A.D. month and day corresponding to any solar date, lunar tithi, nakshatra, yoga or karana.

Day of solar year. Tithi No. Ending mo- ment of tithi. Ā's An. for each tithi.	Day of solar year. Ending mo- ment of tithi Tithi No. Ā's An. for each tithi.	Day of solar year. Ending mo- ment of tithi. Tithi No. Ā's An. for each tithi.	Day of solar year. Ending mo- ment of tithi. Tithi No. Ā's An. for each tithi.	Day of solar year. Ending mo- ment of tithi. Tithi No. Ā's An. for each tithi.	Day of solar year. Ending mo- ment of tithi. Tithi No. Ā's An. for each tithi.
Vaiśākha.					
0	9843	1	0 984	64	9673
1	9887	2	1 969	65	9618
2	9930	3	2 953	66	9563
3	9974	4	3 937	67	9508
4	9917	5	4 921	68	9453
5	9961	6	5 906	69	9398
6	9904	7	6 890	70	9343
7	9848	8	7 875	71	9288
8	9892	9	8 859	72	9233
9	9835	10	9 843	73	9178
10	9879	11	10 827	74	9123
11	9822	12	11 812	75	9068
12	9766	13	12 797	76	9013
13	9709	14	13 781	77	8958
14	9653	15	14 765	78	8903
15	9596	1	15 750	79	8848
16	9540	2	16 734	80	8793
17	9483	3	17 718	81	8738
18	9427	4	18 703	82	8683
19	9370	5	19 687	83	8628
20	9314	6	20 671	84	8573
21	9257	7	21 655	85	8518
22	9201	8	22 640	86	8463
23	9144	9	23 624	87	8408
24	9088	10	24 609	88	8353
25	9032	11	25 593		
26	8975	12	26 577		
27	8919	13	0 007		
28	8862	14	0 992		
29	8806	15	1 976		
Jyeshtha.					
30	8749	1	2 960	89	8298
31	8693	2	3 945	90	8243
32	8636	3	4 929	91	8188
33	8580	4	5 913	92	8133
34	8523	5	6 898	93	8078
35	8467	6	7 882	94	8023
36	8410	7	8 866	95	7968
37	8354	8	9 851	96	7913
38	8298	9	10 835	97	7858
39	8241	10	11 819	98	7803
40	8185	11	12 804	99	7748
41	8128	12	13 788	100	7693
42	8072	13	14 773	101	7638
43	8015	14	15 757	102	7583
44	7959	15	16 741	103	7528
45	7902	1	17 726	104	7473
46	7846	2	18 710	105	7418
47	7789	3	19 694	106	7363
48	7733	4	20 679	107	7308
49	7676	5	21 663	108	7253
50	7620	6	22 647	109	7198
51	7563	7	23 632	110	7143
52	7507	8	24 616	111	7088
53	7450	9	25 600	112	7033
54	7394	10	26 585	113	6978
55	7337	11	0 015	114	6923
56	7281	12	0 999	115	6868
57	7224	13	1 983	116	6813
58	7168	14	2 968	117	6758
59	7111	15	3 952	118	6703
Āshāḍha.					
60	7055	1	4 936	119	6648
61	7000	2	5 921	120	6593
62	6943	3	6 905	121	6538
63	6887	4	7 889	122	6483
64	6830	5	8 874	123	6428
Bhādrapada.					
65	6774	6	9 858	124	6373
66	6717	7	10 842	125	6318
67	6661	8	11 827	126	6263
68	6604	9	12 811	127	6208
69	6548	10	13 795		
70	6491	11	14 780		
71	6435	12	15 764		
72	6378	13	16 749		
73	6322	14	17 733		
74	6265	15	18 717		
75	6209	1	19 702		
76	6152	2	20 686		
77	6096	3	21 670		
78	6039	4	22 655		
79	5983	5	23 639		
80	5926	6	24 623		
81	5870	7	25 608		
82	5813	8	26 592		
83	5757	9	0 022		
84	5700	10	1 006		
85	5644	11	1 991		
86	5587	12	2 975		
87	5531	13	3 959		
88	5474	14	4 944		
89	5418	15	5 928		
Āśvina.					
90	5361	1	6 912	148	6373
91	5305	2	7 897	149	6318
92	5248	3	8 881	150	6263
93	5192	4	9 865	151	6208
94	5135	5	10 850	152	6152
95	5079	6	11 834	153	6096
96	5022	7	12 818	154	6040
97	4966	8	13 803	155	5983
98	4909	9	14 787	156	5927
99	4853	10	15 771	157	5870
100	4796	11	16 756	158	5814
101	4740	12	17 740	159	5757
102	4683	13	18 725	160	5701
103	4627	14	19 709	161	5645
104	4570	15	20 693	162	5588
105	4514	1	21 678	163	5532
106	4457	2	22 662	164	5476
107	4401	3	23 646	165	5419
108	4344	4	24 631	166	5363
109	4288	5	25 615	167	5307
110	4231	6	26 599	168	5250
111	4175	7	0 029	169	5194
112	4118	8	1 013	170	5138
113	4062	9	1 998	171	5081
114	4005	10	2 982	172	5025
115	3949	11	3 966	173	4969
116	3892	12	4 951	174	4912
117	3836	13	5 935	175	4856
118	3779	14	6 920	176	4799
119	3723	15	7 904	177	4743
Bhādrapada.					
120	3666	1	8 888	178	4687
121	3610	2	9 873	179	4630
122	3553	3	10 857	180	4574
123	3497	4	11 841	181	4518
124	3440	5	12 826	182	4461
125	3384	6	13 810	183	4405
126	3327	7	14 794	184	4349
127	3271	8	15 779	185	4292
128	3214	9	16 763	186	4236
129	3158	10	17 747	187	4179
130	3101	11	18 731	188	4123
131	3045	12	19 715	189	4067
132	2988	13	20 699	190	4010
133	2932	14	21 683	191	3954
134	2875	15	22 667		
Kārttika.					
135	2819	1	23 651	192	3897
136	2762	2	24 635	193	3841
137	2706	3	25 619	194	3785
138	2649	4	26 603	195	3728
139	2593	5	27 587	196	3672
140	2536	6	28 571	197	3616
141	2480	7	29 555	198	3559
142	2423	8	30 539	199	3503
143	2367	9	31 523	200	3447
144	2310	10	32 507	201	3390
145	2254	11	33 491	202	3334
146	2197	12	34 475	203	3278
147	2141	13	35 459	204	3221
148	2084	14	36 443	205	3165
149	2028	15	37 427	206	3109
Kārttika.					
150	1971	1	38 411	207	3052
151	1915	2	39 395	208	2996
152	1858	3	40 379	209	2940
153	1802	4	41 363	210	2883
154	1745	5	42 347	211	2827
155	1689	6	43 331	212	2771
156	1632	7	44 315	213	2714
157	1576	8	45 299	214	2658
158	1519	9	46 283	215	2602
159	1463	10	47 267	216	2545
160	1406	11	48 251	217	2489
161	1350	12	49 235	218	2433
162	1293	13	50 219	219	2376
163	1237	14	51 203	220	2320
164	1180	15	52 187	221	2264
Kārttika.					
165	1124	1	53 171	222	2207
166	1067	2	54 155	223	2151
167	1011	3	55 139	224	2095
168	954	4	56 123	225	2038
169	898	5	57 107	226	1982
170	841	6	58 91	227	1926
171	785	7	59 75	228	1869
172	728	8	60 59	229	1813
173	672	9	61 43	230	1757
174	615	10	62 27	231	1700
175	559	11	63 11	232	1644
176	502	12	64 00	233	1588
Kārttika.					
177	446	1	65 00	234	1531
178	389	2	66 00	235	1475
179	333	3	67 00	236	1419
180	276	4	68 00	237	1362
181	220	5	69 00	238	1306
182	163	6	70 00	239	1250
183	107	7	71 00	240	1193
184	50	8	72 00	241	1137
185	00	9	73 00	242	1080
186	00	10	74 00	243	1024
187	00	11	75 00	244	967
188	00	12	76 00	245	911
189	00	13	77 00	246	854
190	00	14	78 00	247	798
191	00	15	79 00	248	741
Kārttika.					
192	00	1	80 00	249	685
193	00	2	81 00	250	628
194	00	3	82 00	251	572
195	00	4	83 00	252	515
196	00	5	84 00	253	459
197	00	6	85 00	254	402
198	00	7	86 00	255	346
199	00	8	87 00		
200	00	9	88 00		
201	00	10	89 00		
202	00	11	90 00		
203	00	12	91 00		
204	00	13	92 00		
205	00	14	93 00		
206	00	15	94 00		
Pauṣa.					
207	00	1	95 00	256	290

BRAHMA SIDDHĀNTA AND SIDDHĀNTA ŚĪROMANĪ EYE-TABLE—Specimen problems.

This eye-table alone will enable any one to solve correctly, to four places of decimals of a day and by a single working, any problem in solar dates, nakshatras or week days, for 1,800 years, i.e., from A.D. 400 to A.D. 2000 by the Brahma Siddhānta and from A.D. 900 to A.D. 2000 by the Siddhānta Śīromanī. The tables of equations are given to two places of decimals in the abridged sections a to i of the eye-table—see next page—and so four places of decimals in the unabridged sections a to i of the same table, pages 187 to 194 below.

The computation of the ending moment, whether of a tithi or of a nakshatra or of a yoga, always comprises four processes: (1) to find the mean ending moment, (2) to find the anomaly or anomalies for that moment, (3) to find the equation or equations corresponding to the anomaly or anomalies, and (4) to add together the mean ending moment and the equation or equations.

Problem I.—Required to find the ending moment, by Brahma Siddhānta, of Āshāḍha, Śukla 12, A.D. 484. Note stages (1) to (11).

Commencement of solar year. Col. 1.	Days in solar year or sun's anomaly. Col. 2.	Moon's anomaly. Col. 3.
A.D. 400 ... Mar 16 61677 k 84 years ... 70875 n	1st new moon { A.D. 400 .. 24 70841 1 84 years .. + 56601 o A.D. 484 25 2744 (2)	20 4106 m 13 4989 p 25 2744 (2) (1st N.M. in S.Y.). 59 1839 — 55 1090 (2 anom. months). 4 075 (3) (C's An. at 1st N.M. in S.Y.). + 3 952 c + 11 812 d 19 839 (5) — 047 (C's equation) h (6) 19 792 (7) C's eqn. for 96 15 d. (4) + 41 [C's eqn. for 19 84 d. (5)] or 96 56 d. = — 0468 h (6) C's eqn. for 19 792 d (7) = + 4107 e (8) Sum of (c)'s and (d)'s eqns. + 3641 (9)
A.D. 484 ... Mar 17 32552 (1) N.B.—This, by itself, is a valuable piece of information, giving the English year, month, date and fraction of day on which a particular Indian solar year between A.D. 400 and A.D. 2000 commenced, and it may be had, in a few seconds, from the eye-table, for any one of 1,800 years.	Add for Āshāḍha new moon + 59 0612 b " 12 tithis + 11 8122 d 96 1478 (4) Add sum of (c)'s & (d)'s eqns. + 3641 (9) 96 5119 Add commencement of solar year, A.D. 484 .. Mar 17 3255 (1) Mar 113 8374 (10)	
Note how stages (1), (2), (3), (4), (5), (6), (7), (8) and (9) are successively arrived at and then add (4), (9) and (1), as shown in column 2.		

The 98rd day from March 1 is, by eye-table, June 1, q ., the 113th day from March 1 is, by eye-table, June 21.

For the week day of 21 June, A.D. 484, we have, by eye-table j, 2 + 0 + 3 + 21 = 26, 26, divided by 7, leaves remainder 5 = Thursday ... and 8374 of a day is 50 ghatikas and 15 palas

(11) .. Tithi ended on Thursday 21 June, A.D. 484, at 50 ghatikas 15 palas after mean sunrise, which is identical with Mr. Dikshit's result in Introduction to Fleet's Gupta Inscriptions (1888), p. 157.

Problem II.—Required the ending moment by Siddhānta Śīromanī of the same tithi, Āshāḍha, Śukla 12, A.D. 484.

The process and details are the same as those given in example I for a tithi by Brahma Siddhānta, except that (1) **k**, **l**, **m** are slightly different as will be seen from the eye-table, (2) **o** and **p** present minute differences, also explained in the eye-table and (3) the sun's anomaly in days has to be diminished by the following quantities, before finding out the equation. For each Kaliyuga century in the first line below, make the corresponding deduction from (c)'s An. shown in the second line —

K.Y. 8000, 8100, 8200, 8300, 8400, 8500, 8600, 8700, 8800, 8900, 9000, 9100, 9200, 9300, 9400, 9500, 9600, 9700, 9800, 9900, 10000
— 78, — 78, — 78, — 82, — 85, — 88, — 91, — 94, — 97, — 100, — 103, — 106, — 109, — 112, — 115, — 118, — 121, — 124, — 127, — 130, — 133 days.

For K.Y. 3585 = A.D. 484, we deduct 90 day from sun's anomaly, according to the above table

The working for a Siddhānta Śīromanī tithi is as follows:—

Commencement of solar year. Col. 1.	C's anomaly Col. 2.	C's anomaly. Col. 3.
A.D. 400 ... Mar 16 6112 k 84 years ... 7087 n A.D. 484 ... Mar. 17 3119 (1) C's eqn. for 95 71 d., i.e., for 96 20 d (4) — 0 90 d. + 41 d. [C's eqn. for 19 818 d.] .. — 0438 h (5) * C's An. 96 20 d. (4) should be diminished by 0 90 d. for K.Y. 3500 to 3600 acc to Siddhānta Śīromanī. See note supra. C's eqn. for 19 774 d. (6) = + 4105 e (7) Add (5) and (7) ... + 3667 (8) Mar 17 3198 (1) Add (4), (8) and (1) .. Mar 113 8890 (9)	24 7918 1 0 5672 o 25 8290 (2) Add for Āshāḍha new moon ... 59 0612 b Add for 12 tithis ... 11 8122 d Add (2), b and d 96 2024 (4) ← ... + 3667 (8) Mar 17 3198 (1) Add (4), (8) and (1) .. Mar 113 8890 (9)	20 3880 m 13 4971 p 25 3290 (2) 59 1641 [m + p + (2)] — 55 110 (2 anom. months) 4 054 (3) (C's An. at 1st N.M. S.Y.) 3 952 c 11 812 d 19 818 [(3) + c + d]. C's eqn. for this is + 41. — 044 [C's eqn. h (5)] 19 774 (6) Note how stages (1), (2), (3), (4), (5), (6), (7), (8) are successively arrived at, and then add (1), (4) and (8), as shown in column 2

Result (9), Mar. 113 8890, reduced to day of month, ghatikas and palas, becomes Thursday (j) June 21, q 53 ghatikas, 21 palas after mean sunrise, which is identical with Mr. Dikshit's result in Introduction to Fleet's Gupta Inscriptions, p. 157 ... (10)

Problem III.—Required the ending moment by Brahma Siddhānta of No. 17 Anurādhā Nakshatra in June, A.D. 484. Stages of work I to IV

Days.	C's Anom. days.
Āshāḍha new moon, A.D. 484 (Table II, p. 218, and footnote) ... June 9 66	4 07 [(3) + c] + 3 95
Shortest interval from Āshāḍha new moon to No. 17 Anurādhā Nakshatra ... + 10 53 s	+ 10 53 s
Nak. correction for A.D. 484-85 is that corresponding to 25 27 = 0 34 (t) minus 0 02 (u) ... + 32 I	+ 82 (I)
(f) C's Naksh. eqn. for Anom. of 18 82 (II) days, is ... June 20 52 (III)	18 87 (II)
	+ 34 (F)
	June 20 86 (IV)

(IV) Nakshatra Anurādhā (No. 17) ended on Wednesday j 20 June, A.D. 484, at 86, i.e., 52 ghat (x) after mean sunrise.

Problem IV.—Required the ending moment by Brahma Siddhānta of Yoga Śukla (No. 24) in June, A.D. 484. Stages of work A to G.

Days.	C's Anom. days.	C's Anom. days.
Āshāḍha new moon, A.D. 484 (Table II, p. 218, and footnote) ... June 9 66	25 28 (2) + 59 06 b + 10 57 v	4 07 (3) + 3 95 c + 10 57 v
Shortest interval from Āshāḍha new moon to No. 24 Yoga Śukla v ... + 10 57	+ 10 57 v	+ 10 57 v
Yoga correction for A.D. 484-85 is that corresponding to an argument of 25 27 days, i.e., 0 33 w minus 0 04 x day ... = + 0 59 (A) + 0 59 (A)	+ 0 59 (A) + 0 59 (A)	+ 0 59 (A)
Sun's yoga equation (i) for 95 49 d. + 34 (C's eqn) d. = + 0 4 d i ... June 20 83 (B)	95 50 (C)	+ 19 18
Moon's yoga equation for 19 22 days (D) is + 34 d. = + 34 d. g. ... + 38 (F)	+ 38 (F)	+ 0 04 (i)
Sum of sun's and moon's yoga equations i + g = + 38 (F) ...		C's Yoga equation. 19 22 (D)

Ending moment of yoga No. 24 Śukla [(B) + (F)] = June 21 21 = 13 ghatikas (x) after mean sunrise on Thursday (j) 21 June, A.D. 484 (G).

EYE-TABLE FOR BRAHMA SIDDHĀNTA

NOTE.—The different sections of this Table are lettered in order from a to y and

All the figures, except where otherwise indicated, represent days and fractions of a day.

Order of signs of zodiac or rāsis and ☉'s Long. at commencement.		1 ... 0°	2 ... 30°	3 ... 60°	4 ... 90°
Bengal solar month	...	Vaiśākha	Jyeshtha	Āshāḍha	Śrāvṇa
Tamil and Malayālam solar months; also names of rāsis	...	Mēsha	Vṛṣabha	Mithuna	Karkāṭika
Tamil solar months	...	Chittirai	Vaiṅkai	Āni	Adi
a Moment of sankrānti in days of solar year, and decimals of a day (Br. Sid.)	...	0'0	30'9816	62'3456	93'9677
" " " (Sid. Śirom.)	...	0'0	30'9109	62'8111	93'9812
English date corresponding to each sankrānti (A.D. 1900)	...	Apr. 11	May 12	June 11	July 14
Lunar month: each month commences before sankrānti noted in next column	...	(1) Vaiśākha	(2) Jyeshtha	(3) Āshāḍha	(4) Śrāvṇa
b Increase in days, (1) of lunar months, (2) of sun's anomaly	...		29'5806	59'0612	88'5918
c " of ☉'s An. when interval between Mēsha sank and 1st N. M. in sol. yr. is 0'00 day.	...		1'976	3'952	5'928

Tithi equivalents in days and

d Tithi equivalent in days	1	2	3	4	5
	9643	1'9687	2'9581	3'9374	4'9218
	15'7496	16'7340	17'7182	18'7027	19'6871

e, f, g Moon's equation of the centre and moon's anomaly in days and

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20
-	0'00	0'12	0'24	0'35	0'46	0'58	0'70	0'82	0'94	1'06	1'17	1'29	1'42	1'53	1'66	1'79	1'92	2'04	2'16	2'29	2'41
-	13'78	13'68	13'58	13'49	13'39	13'29	13'20	13'10	13'00	12'90	12'80	12'70	12'60	12'50	12'40	12'29	12'19	12'08	11'98	11'87	11'76
+	13'78	13'87	13'97	14'07	14'16	14'26	14'36	14'45	14'55	14'65	14'75	14'85	14'95	15'05	15'16	15'26	15'37	15'47	15'58	15'69	15'79
+	27'55	27'44	27'32	27'20	27'09	26'97	26'85	26'74	26'62	26'50	26'38	26'26	26'14	26'02	25'90	25'77	25'64	25'52	25'39	25'27	25'14
-	0'00	0'12	0'25	0'37	0'50	0'62	0'75	0'87	1'00	1'13	1'26	1'39	1'52	1'65	1'79	1'92	2'06	2'19	2'33	2'47	2'61
-	13'78	13'67	13'57	13'46	13'36	13'25	13'15	13'04	12'94	12'83	12'72	12'61	12'50	12'38	12'27	12'15	12'04	11'92	11'80	11'68	11'56
+	13'78	13'88	13'98	14'09	14'19	14'30	14'40	14'51	14'62	14'73	14'84	14'95	15'06	15'17	15'29	15'40	15'52	15'63	15'75	15'87	15'99
+	27'55	27'43	27'31	27'18	27'06	26'93	26'81	26'68	26'55	26'42	26'29	26'16	26'03	25'90	25'77	25'63	25'50	25'36	25'22	25'08	24'94
-	0'00	0'13	0'27	0'40	0'53	0'67	0'80	0'94	1'07	1'21	1'35	1'49	1'63	1'78	1'92	2'06	2'21	2'36	2'50	2'66	2'82
-	13'78	13'66	13'55	13'44	13'32	13'21	13'09	12'98	12'86	12'74	12'63	12'51	12'38	12'26	12'14	12'01	11'89	11'76	11'63	11'50	11'38
+	13'78	13'89	14'00	14'12	14'24	14'35	14'46	14'57	14'69	14'81	14'93	15'04	15'17	15'29	15'42	15'54	15'66	15'79	15'92	16'05	16'20
+	27'55	27'42	27'29	27'15	27'02	26'89	26'76	26'62	26'48	26'34	26'20	26'07	25'92	25'78	25'64	25'49	25'35	25'20	25'05	24'90	24'74

h For Tithis. Sun's equation of the centre and sun's anomaly in days of the solar

+ 178	+ 175	+ 17	+ 16	+ 15	+ 14	+ 13	+ 12	+ 11	+ 10	+ 09	+ 08	+ 07	+ 06	+ 05	+ 04	+ 03	+ 02	+ 01	+ 00
359	1'16	8	16	23	29	34	38	42	47	50	54	58	61	65	68	71	75	78	81'28
351	844	337	328	322	316	311	307	302	298	294	291	287	284	280	277	274	270	267	263'86

i For yugas.—Sun's equation	-154	-153	-15	-14	-13	-12	-11	-10	-09	-08	-07	-06	-05	-04	-03
Anomaly			355'2	361	3	15	23	29	35	40	45	49	54	58	62
in days of solar year			355'32	360	843	831	823	818	810	805	800	796	791	787	783
															279
															275

j Perpetual almanac for European calendar

[N.B.—Heavy type means week-day, Sunday being 1, Monday 2, etc.]

Centuries B.C.	1	2	3	4	5	6	7 or 0
	3001	3101	3201				
	2301	2401	2501	2601	2701	2801	2901
	1601	1701	1801	1901	2001	2101	2201
	901	1001	1101	1201	1301	1401	1501
	201	301	401	501	601	701	801
						1	101

Centuries A.D. old style.	500	400	300	200	100	0
	1200	1100	1000	900	800	700
			1700	1600	1500	1400
				1300	1200	1100

Centuries A.D. new style.	(1600)	1900	1800	1700
	2000	2300	2200	2300

N.B.—B.C. years should be made positive thus 44 B.C. is 57th year of century beginning with 101 B.C.—see page 14 of the Text.

N.B.—Old Style ceased in continental countries (exc. Russia) on 4-10-1582 and New Style began on 15-10-1582, 10 days being dropped. In United Kingdom, New Style began on 14-9-1752, 11 days being dropped.

Kaliyuga	Commence-ment of solar year month and date.	Fraction of day.	First new moon in solar year.	(s anomaly at com-mencement of solar year.
Brahma Siddhānta.				
B.C.	k	l	m	
0 3102	Feb. 15	'82708	2'17292	1'9988
1 3101	Feb. 16	'08552	20'81204	9'0481
A.D.				
3501 400	Mar. 16	'61677	24'70841	20'4106
3601 500	Mar. 17	'46052	23'19406	8'9262
3701 600	Mar. 18	'30427	2'15632	24'9968
3801 700	Mar. 19	'14802	5'63657	18'5118
3901 800	Mar. 19	'99177	9'12823	2'0274
4001 900	Mar. 20	'83552	12'60607	18'0975
4101 1000	Mar. 21	'67927	16'08532	6'6130
4201 1100	Mar. 22	'52302	19'56156	22'6881
4301 1200	Mar. 23	'36677	23'03781	11'1987
4401 1300	Mar. 24	'21052	26'51406	27'2688
4501 1400	Mar. 25	'05427	0'50873	15'7843
4601 1500	Mar. 25	'89802	3'99598	4'2999
4701 1600	Mar. 26	'74177	7'48223	20'3700
4801 1700	Mar. 27	'58552	10'96848	8'8855
4901 1800	Apr. 9	'42927	14'45473	24'9552
5001 1900	Apr. 11	'27302	17'94098	18'4712

Siddhānta Śiromanī.

B.C.	k	l	m
0 3102	Feb. 15	'82808	2'17197
1 3101	Feb. 16	'00095	20'81110
A.D.			
3501 400	Mar. 16	'61120	24'76178
4001 900	Mar. 20	'82908	12'87021
4101 1000	Mar. 21	'67265	16'15800
4201 1100	Mar. 22	'51621	19'64580
4301 1200	Mar. 23	'35978	23'13360
4401 1300	Mar. 24	'20335	26'62139
4501 1400	Mar. 25	'04691	0'57863
4601 1500	Mar. 25	'89048	4'06841
4701 1600	Mar. 26	'73404	7'55422
4801 1700	Mar. 27	'57761	11'04203
4901 1800	Apr. 9	'42117	14'52982
5001 1900	Apr. 11	'26474	18'01762

[Example.—To find week-day of 36th Jan. 1844—

Add 4 + 6 + 5 + 26 and divide the total 41 by 7. Remainder, 6 = Friday.]

The Table is the same for Brahma Siddhānta and Siddhānta Śiromani, except under a, k, l, m, o, p.

5...120°	6...150°	7...180°	8...210°	9...240°	10...270°	11...300°	12...330°	
Bhādrapada	Āśvina	Kārttika	Mārgaśīrṣa	Pauṣa	Māgha	Phālguna	Chaitra	
Simha	Kanyā	Tulā	Vriśchika	Dhanuṣ	Makara	Kumbha	Mina	—
Avai	Purattāsi	Aippasi	Kūrttigai	Mārgaḷ	Tai	Mūai	Panguni	
125°44'71	156°48'72	186°04'15	216°08'08	246°29'33	275°07'19	305°11'77	334°02'33	365°25'84
125°42'13	156°48'05	186°06'62	216°08'09	246°37'74	275°7'180	305°15'33	334°03'85	365°25'84
Aug 15	Sep. 15	Oct 15	Nov. 14	Dec. 14	Jan. 12	Feb. 10	March 12	
(5) Bhādrapada	(6) Āśvina	(7) Kārttika	(8) Mārgaśīrṣa	(9) Pauṣa	(10) Māgha	(11) Phālguna	(12) Chaitra	(13) Chaitra when there is an adhika month.
118°12'23	147°05'30	177°18'35	206°71'41	236°24'47	265°77'53	295°30'59	324°03'05	354°36'70
7°04	9°50	11°56	13°52	15°50	17°54	19°50	21°56	23°52

Moon's anomalistic months.

6	7	8	9	10	11	12	13	14	15	1 month = 27'55'45 days.
5'9061	6'8905	7'8748	8'8592	9'8435	10'8379	11'8122	12'7968	13'7809	14'7653	2 months = 55'10'00 days.
21	22	23	24	25	26	27	28	29	30	12 months = 380'65'40.
20'6714	21'6558	22'6401	23'6245	24'6088	25'5932	26'5775	27'5619	28'5462	29'5306	13 months = 358'2'06.

21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
2:55	2:58	2:82	2:96	3:10	3:25	3:40	3:55	3:71	3:87	4:04	4:22	4:41	4:60	4:79	5:00	5:25	5:52	5:84	6:23	6:79
11:65	11:58	11:41	11:29	11:17	11:05	10:92	10:75	10:55	10:51	10:36	10:20	10:03	9:86	9:68	9:49	9:28	9:02	8:74	8:39	7:83
15:90	16:02	16:14	16:26	16:38	16:51	16:64	16:77	16:90	17:05	17:20	17:36	17:52	17:69	17:87	18:06	18:27	18:64	18:81	19:17	19:72
25:01	24:87	24:73	24:59	24:45	24:30	24:15	24:00	23:85	23:68	23:51	23:33	23:15	22:96	22:76	22:55	22:32	22:08	21:74	21:36	20:79
2:76	2:91	3:06	3:22	3:38	3:54	3:71	3:89	4:07	4:27	4:48	4:69	4:90	5:15	5:46	5:79	6:16	6:82			
11:43	11:30	11:17	11:04	10:90	10:76	10:61	10:45	10:28	10:11	9:92	9:73	9:53	9:31	9:01	8:71	8:36	7:72			
16:12	16:25	16:38	16:52	16:66	16:80	16:95	17:11	17:27	17:45	17:63	17:82	18:02	18:24	18:54	18:85	19:19	19:84			
24:79	24:64	24:49	24:33	24:17	24:01	23:84	23:67	23:45	23:29	23:08	22:87	22:65	22:41	22:09	21:76	21:39	20:78			
2:98	3:14	3:31	3:49	3:67	3:86	4:05	4:26	4:49	4:72	4:97	5:24	5:58	5:95	6:49						
11:21	11:07	10:92	10:77	10:61	10:44	10:26	10:07	9:87	9:65	9:42	9:18	8:86	8:50	7:99						
16:34	16:48	16:63	16:79	16:95	17:11	17:29	17:48	17:68	17:90	18:13	18:38	18:69	19:05	19:57						
24:57	24:41	24:24	24:06	23:88	23:70	23:50	23:29	23:07	22:83	22:58	22:31	21:98	21:60	21:05						

e For
tithis.

f For nakshatras.

g For yogas.

-01	-02	-03	-04	-05	-06	-07	-08	-09	-10	-11	-12	-13	-14	-15	-16	-17	-175	-178	
86	88	91	94	98	101	105	108	112	116	120	124	129	134	139	143	155	161	169	
261	257	254	251	247	244	240	237	233	229	226	221	218	214	206	199	191	184	176	
-02	-01	-00	+01	+02	+03	+04	+05	+06	+07	+08	+09	+10	+11	+12	+13	+14	+15	+153	+154
74	77	81	83	85	89	93	96	100	104	109	113	118	122	128	133	140	148	160	167
271	268	263	26	260	256	252	248	244	240	236	232	227	223	217	212	205	197	185	178

	n	o	p	n	o	p	n	o	p
	Fraction of day, marking commencement of solar year.	First new moon in solar year	ϵ 's anomaly at beginning of solar year.	Fraction of day, marking commencement of solar year.	First new moon in solar year.	ϵ 's anomaly at beginning of solar year.	Fraction of day, marking commencement of solar year.	First new moon in solar year	ϵ 's anomaly at beginning of solar year
1	25844	1863913	70493	35	104531	269672	26	2804	8219
2	51687	774768	14087	36	30375	2135584	5	7852	109063
3	77631	2636861	211480	37	56219	1044440	12	8346	184906
4	93875	1549535	06428	38	82063	2008552	19	8839	2408256
5	20219	460390	76921	39	107906	1812021	26	9332	307650
6	55062	2324308	147415	40	33750	730061	6	4280	80594
7	80906	1235158	217908	41	59594	2593874	13	4773	112488
8	90750	148012	12866	42	85438	1504829	20	5267	138281
9	32594	200925	63349	43	111281	415684	27	5760	64125
10	58438	920789	153843	44	37125	2278596	7	0708	89069
11	84281	2784698	224336	45	62969	1190451	14	1202	115813
12	10125	1695548	14284	46	88813	101806	21	1695	141656
13	35969	606402	89778	47	114556	1865219	28	2188	180123
14	61813	2470815	160271	48	40500	876074	7	7136	93344
15	87656	1381170	230764	49	66344	2739987	14	7630	19188
16	13500	292025	25712	50	92188	1650841	21	8123	234890
17	39344	2155937	96206	51	118031	561696	1	3971	45031
18	65188	1666792	166690	52	43875	2425608	8	3565	70875
19	94081	2980705	237192	53	69719	1836464	15	4008	96719
20	16875	1841560	82140	54	95563	247318	22	4561	122568
21	42719	752415	102684	55	121406	2111231	1	9499	148406
22	68503	2616327	178127	56	47250	1022086	8	8993	100094
23	94406	1527182	243620	57	73094	2856999	16	9486	125937
24	20250	439087	98508	58	98938	1796854	23	9979	161781
25	46094	2301950	199062	59	124781	707708	2	5927	77625
26	71982	1212804	179555	60	50325	2571621	9	6421	108469
27	97781	0123066	250048	61	76469	1482476	16	6914	129313
28	23625	1987572	44996	62	102318	893331	23	7407	155156
29	49469	898427	115490	63	128156	2257244	3	8255	81000
30	75313	2762840	185938	64	54000	1188098	10	8850	106844
31	101156	5878194	256476	65	79844	078953	17	9342	132688
32	27000	584049	51424	66	05088	1942866	24	9835	155156
33	52844	2447962	121918	67	181631	853721	3	8778	81000
34	78688	1358817	192411	68	43735	2717634	10	9276	106844

For *Siddhanta Śiromani*, odd years, n is the same as for *Brahma Siddhanta*. o is very slightly more, the increase being +.000014 for every year; total increase of o for 100 yrs. = .00187. Similarly p for *Siddhanta Śiromani* odd years decreases by .00002 for every year; total decrease of p for 100 yrs. = .002.

	Mar. 1	Apr. 1	May 1	June 1	July 1	Aug. 1	Sep. 1	Oct. 1	Nov. 1	Dec. 1	Jan. 1	Feb. 1	Mar. 1
March ...	1	32	62	98	123	154	185	215	246	276	307	338	...

x	Ghatikas ...	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Fraction of day.	·0167	·0333	·0500	·0667	·0833	·1000	·1167	·1333	·1500	·1667	·1833	·2000	·2167	·2333
x	Ghatikas ...	31	32	33	34	35	36	37	38	39	40	41	42	43	44
	Fraction of day.	·5167	·5333	·5500	·5667	·5833	·6000	·6167	·6333	·6500	·6667	·6833	·7000	·7167	·7333
x	Palas	1	2	3	4	5	6	7	8	9	10	12	15	17	20
	Fraction of day.	·0008	·0005	·0008	·0011	·0014	·0017	·0019	·0022	·0025	·0028	·0038	·0042	·0047	·0055

s Shortest interval in days, from new moon to ending

Longitude at commence- ment.	Order	Names of nakshatras.	Days.	Order Ordina- rily Vaiśi- kha	Order Ordina- rily Jyesh- tha	Order Ordina- rily Āshā- dha	Order Ordina- rily Śrāvana	Order Ordina- rily Bhādra- pada	Order Ordina- rily Āśvina	Order Ordina- rily Kārtika
Deg. Min. Sec.				I	II	III	IV	V	VI	VII
0	0	0	27	Rovati	...	...	...	...	...	...
13	10	35	2	Āśvini	...	...	...	...	...	...
19	45	52	3	Kṛttikā	...	...	...	...	...	...
32	56	27	4	Kohini	...	...	...	...	...	...
52	42	20	5	Mṛgaśīra	...	...	...	...	...	...
65	52	55	6	Ārdra	...	...	...	...	...	...
72	28	12	7	Punarvasu	...	...	...	...	...	...
92	14	5	8	Puṣya	...	...	...	...	...	...
105	24	40	9	Āśleṣhā	...	...	...	...	...	...
111	59	57	10	Māghā	...	...	...	...	...	...
125	10	32	11	Pūrva-Phalguni	...	...	...	...	...	...
138	21	7	12	Uttara-Phalguni	...	...	...	...	...	...
158	7	0	13	Hastā	...	...	...	...	...	...
171	17	35	14	Chitrā	...	...	...	...	...	...
178	24	10	15	Svātī	...	...	...	...	...	...
191	3	27	16	Viśākṣā	...	...	...	...	...	...
210	49	20	17	Anurādhā	...	...	...	...	...	...
223	59	55	18	Jyeshthā	...	...	...	...	...	...
230	35	12	19	Mūla	...	...	...	...	...	...
248	45	47	20	Pūrva-Āshādhā	...	...	...	...	...	...
256	58	22	21	Uttara-Āshādhā	...	...	...	...	...	...
276	42	15	22	Abhijit	...	...	...	...	...	...
280	56	30	23	Nṛavana	...	...	...	...	...	...
294	7	5	24	Dhanishṭha	...	...	...	...	...	...
307	17	40	25	Satābhishaj	...	...	...	...	...	...
313	52	57	26	Pūrva-Bhādrapadā	...	...	...	...	...	...
327	3	32	27	Uttara-Bhādrapadā	...	...	...	...	...	...
346	40	25	28	Revati	...	...	...	...	...	...

v Shortest interval in days from new moon to

Longitude at commence- ment.		Order	Names of yogas.	v Shortest interval in days from new moon to													
Deg.	Min.			Order	Ordina- rily Vaisū- kha	Order	Ordina- rily Jyesh- tha	Order	Ordina- rily Āshā- dha	Order	Ordina- rily Śrāvapa	Order	Ordina- rily Bhādra- pada	Order	Ordina- rily Āśvina	Order	Ordina- rily Kārttika
346	40	27	Vaidhriti	5	0'8995	9	0'5551	13	0'2107	18	0'8078	22	0'4634	26	0'1190	4	0'7180
0	0	1	Vishkamba	6	1'8410	10	1'4966	14	1'1522	19	1'7498	23	1'4049	27	1'0804	5	1'6576
13	20		Prithi	7	2'7825	11	2'4381	15	2'0937	20	2'6908	24	2'3463	1	2'0019	6	2'5900
26	40	3	Ayusbinat	8	3'7240	12	3'3796	16	3'0352	21	3'6312	25	3'2878	2	2'9434	7	3'5405
40	0	4	Saubhagya	9	4'0655	13	4'3211	17	3'9766	22	4'5737	26	4'2293	3	3'8849	8	4'4820
53	20	5	Sobhana	10	5'6700	14	5'2826	18	4'9181	23	5'5152	27	5'1708	4	4'8264	9	5'4235
66	40	6	Atiganda	11	6'5485	15	6'2040	19	5'8596	24	6'4567	1	6'1123	5	5'7679	10	6'3650
80	0	7	Sukarman	12	7'4889	16	7'1455	20	6'8011	25	7'3982	2	7'0538	6	6'7094	11	7'2085
93	20	8	Dhriti	13	8'4314	17	8'0870	21	7'7426	26	8'3307	3	7'9953	7	7'6509	12	8'3460
106	40	9	Sula	14	9'3729	18	9'0285	22	8'6841	27	9'2812	4	8'9368	8	8'5924	13	9'1894
120	0	10	Ganda	15	10'3144	19	9'9700	23	9'6256	1	10'2227	5	9'8783	9	9'5338	14	10'1300
133	20	11	Vridhdh	16	11'2559	20	10'9115	24	10'5671	2	11'1642	6	10'8198	10	10'4763	15	11'0724
146	40	12	Dhruva	17	12'1974	21	11'8530	25	11'5086	3	12'1056	7	11'7612	11	11'4168	16	12'0139
160	0	13	Vyaghata	18	13'1389	22	12'7945	26	12'4501	4	13'0471	8	12'7027	12	12'3583	17	12'9654
173	20	14	Harshana	19	14'0804	23	13'7360	27	13'3915	5	13'9886	9	13'6442	13	13'2998	18	13'8939
186	40	15	Vajra	20	15'0219	24	14'6774	1	14'3330	6	14'9801	10	14'6357	14	14'2413	19	14'8384
200	0	16	Siddhi	21	15'9633	25	15'6189	2	15'2745	7	15'8716	11	15'5272	15	15'1828	20	15'7799
213	20	17	Vyatipata	22	16'9048	26	16'5604	3	16'2160	8	16'8131	12	16'4687	16	16'1243	21	16'7214
226	40	18	Variyas	23	17'8463	27	17'5019	4	17'1575	9	17'7546	13	17'4102	17	17'0658	22	17'6628
240	0	19	Parigha	24	18'7878	1	18'4434	5	18'0990	10	18'6961	14	18'3517	18	18'0073	23	18'6043
253	20	20	Siva	25	19'7293	2	19'3849	6	19'0405	11	19'6376	15	19'2932	19	19'9487	24	19'5458
266	40	21	Niddha	26	20'6708	3	20'3284	7	19'9820	12	20'5791	16	20'2346	20	19'8903	25	20'4873
280	0	22	Sadhyā	27	21'6128	4	21'2679	8	20'9235	13	21'5205	17	21'1761	21	20'8317	26	21'4288
293	20	23	Subha	1	22'5538	5	22'2094	9	21'8650	14	22'4620	18	22'1176	22	21'7732	27	22'3708
306	40	24	Sukla	2	23'4953	6	23'1509	10	22'8064	15	23'4035	19	23'0591	23	22'7147	1	23'3118
320	0	25	Brahman	3	24'4368	7	24'0923	11	23'7479	16	24'3450	20	24'0006	24	23'6562	2	24'2533
333	20	26	Indra	4	25'3782	8	25'0338	12	24'6994	17	25'2965	21	24'9421	25	24'5977	3	25'1948
346	40	27	Vaidhriti	5	26'3197	9	25'9758	13	25'6309	18	26'2280	22	25'8836	26	25'5392	4	26'1865
				6	27'2619	10	26'9168	14	26'5724	19	27'1695	23	26'8251	27	26'4805	5	27'0777
				7	28'2027	11	27'8588	15	27'5189	20	28'1110	24	27'7668	1	27'4222	6	28'0192
				8	29'1442	12	28'7998	16	28'4554	21	29'0525	25	28'7081	2	28'3636	7	28'9607
								17	29'3999					3	29'2051		

q Days counted from April 1

Leap Year, Ap. 386															
Apr. ...	Apr. 1	May 31	June 62	July 92	Aug. 123	Sep. 154	Oct. 184	Nov. 215	Dec. 245	Jan. 276	Feb. 307	Mar. 385			
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
2500	2607	2833	3000	3167	3333	3500	3667	3833	4000	4167	4333	4500	4667	4833	5000
45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
7500	7667	7833	8000	8167	8333	8500	8667	8833	9000	9167	9333	9500	9667	9833	10000
22	25	27	30	32	35	37	40	42	45	47	50	52	55	57	60
0061	0069	0075	0083	0089	0097	0103	0111	0117	0125	0130	0139	0144	0153	0158	0167

Annual correction.

TRAE.

moment of each nakshatra.

Order	Ordina- rily Mūga- slasha	Order	Ordina- rily Pausha	Order	Ordina- rily Māgha	Order	Ordina- rily Phālguna	Order	Chaitra when no Adhika Masa	Order	Chaitra when there is Adhika Masa
VIII	IX	X	XI	XII	XIII						
19	0 9910	21	1 2821	22	0 3948	25	0 8869	27	0 9770	2	0 2681
20	1 0910	A	1 6037	23	1 3948	26	2 1859	1	1 9770	3	1 2681
21	3 4910	22	2 6037	24	1 8948	27	3 1859	2	2 4770	4	2 7681
A	3 8126	23	3 8037	25	2 2848	1	4 1859	3	3 4770	5	3 7681
22	4 8126	24	4 1037	26	4 3948	2	4 6859	4	4 9770	6	4 2681
23	5 8126	25	5 1037	27	5 3948	3	5 6859	5	5 9770	7	5 7681
24	6 3126	26	6 6037	1	6 3948	4	7 1859	6	6 4770	8	6 7681
25	7 3126	27	7 6037	2	6 8948	5	8 1859	7	7 4770	9	7 2681
26	8 8126	1	8 6037	3	7 9948	6	8 6859	8	8 9770	10	8 2681
27	9 8126	2	9 1037	4	9 3948	7	10 1859	9	9 4770	11	9 2681
1	10 8126	3	10 1037	5	10 3948	8	11 1859	10	10 4770	12	10 7621
2	11 3126	4	11 6037	6	10 8948	9	11 6859	11	11 4770	13	11 7681
3	12 3126	5	12 6037	7	12 3948	10	12 6859	12	12 9770	14	12 2681
4	13 8126	6	13 1037	8	13 3948	11	13 6859	13	13 9770	15	13 2681
5	14 8126	7	14 6037	9	14 8948	12	14 1859	14	14 4770	16	14 7681
6	15 8126	8	15 6037	10	15 3948	13	15 6859	15	15 4770	17	15 7681
7	16 8126	9	16 1037	11	16 3948	14	16 6859	16	16 4770	18	16 2681
8	17 8126	10	17 1037	12	17 3948	15	17 6859	17	17 4770	19	17 2681
9	18 8126	11	18 1037	13	18 3948	16	18 1859	18	18 4770	20	18 2681
10	19 3126	12	19 6037	14	18 8948	17	19 1859	19	19 4770	21	19 7681
11	20 3126	13	20 6037	15	19 3948	18	20 6859	20	20 4770	A	20 0897
12	21 8126	14	21 1037	16	21 3948	19	21 6859	21	21 9770	22	21 0897
13	22 8126	15	22 1037	17	22 3948	20	22 6859	A	22 2086	23	22 0897
14	23 3126	16	23 6037	18	23 3948	21	23 1859	22	23 2086	24	22 5897
15	24 8126	17	24 6037	19	23 8948	A	24 5075	23	24 2086	25	23 5897
16	25 8126	18	25 1037	20	24 3948	22	25 5075	24	24 7986	26	25 0897
17	26 8126	19	26 1037	21	24 8948	23	26 5075	25	25 7986	27	26 0897
18	27 3126	20	27 1037	A	26 7164	24	27 0075	26	27 2086	1	27 0897
19	28 3126	21	28 6037	22	27 7164	25	28 0075	27	28 2086	2	27 5897
20	29 3126	A	28 9253	23	28 7164	26	29 5075	1	29 2086	3	28 5897
				24	29 2164						

Argument.—Date of appearance of 1st new moon in each solar year

The correction u or x corresponding to the decimal portion of the argument should be subtracted from the nakshatra or yoga correction corresponding to the integral portion t or u .
Ex the nakshatra correction corresponding to an argument 28 52 = 0.11 minus 0.04 = 0.07. The yoga correction for the same argument is 0.21 minus 0.07 = 0.14.

The whole correction thus obtained should be added to ending moment of nakshatra or yoga in Eye-table (s) or (v).

NAKSHATRAS.

Arg.	Corr.	Arg.	Corr.	Arg.	Corr.	Arg.	Corr.	Arg.	Corr.
t	t	t	t	t	t	t	t	t	t
0 2 20890	6 1 76010	12 1 31129	18 0 86249	24 0 41968					
1 2 13110	7 1 65531	13 1 23640	19 0 78762	25 0 33888					
2 2 05030	8 1 61019	14 1 16160	20 0 71288	26 0 26408					
3 1 08450	9 1 53569	15 1 08689	21 0 63808	27 0 18928					
4 1 00970	10 1 46089	16 1 01209	22 0 56328	28 0 11448					
5 1 83490	11 1 38609	17 0 93729	23 0 48848	29 0 03968					
u	u	u	u	u					
01 00075	21 01571	41 03037	61 04563	81 06059					
02 00150	22 01646	42 03142	62 04638	82 06134					
03 00224	23 01720	43 03216	63 04712	83 06208					
04 00299	24 01795	44 03291	64 04787	84 06283					
05 00374	25 01870	45 03366	65 04862	85 06358					
06 00449	26 01945	46 03441	66 04937	86 06433					
07 00524	27 02020	47 03516	67 05012	87 06508					
08 00598	28 02094	48 03590	68 05086	88 06582					
09 00673	29 02169	49 03665	69 05161	89 06657					
10 00748	30 02244	50 03740	70 05236	90 06732					
11 00823	31 02319	51 03815	71 05311	91 06807					
12 00898	32 02394	52 03890	72 05386	92 06882					
13 00972	33 02468	53 03964	73 05460	93 06956					
14 01047	34 02543	54 04039	74 05535	94 07031					
15 01122	35 02618	55 04114	75 05610	95 07106					
16 01197	36 02693	56 04189	76 05685	96 07181					
17 01272	37 02768	57 04264	77 05760	97 07256					
18 01346	38 02842	58 04338	78 05834	98 07330					
19 01421	39 02917	59 04413	79 05909	99 07405					
20 01495	40 02992	60 04488	80 05984						

ending moment of each yoga.

Order	Ordina- rily Mūga- slasha	Order	Ordina- rily Pausha	Order	Ordina- rily Māgha	Order	Ordina- rily Phālguna	Order	Chaitra when no Adhika Masa	Order	Chaitra when there is Adhika Masa
8	0 3716	12	0 0272	17	0 6243	21	0 2799	26	0 8770	3	0 5325
9	1 3181	13	0 9687	18	1 5658	22	1 2214	27	1 8185	4	1 4740
10	2 2546	14	1 9102	19	2 5073	23	2 1629	1	2 7599	5	2 4155
11	3 1961	15	2 8517	20	3 4488	24	3 1044	2	3 7014	6	3 3570
12	4 1376	16	3 7980	21	4 3903	25	4 0458	3	4 6429	7	4 2985
13	5 0791	17	4 7347	22	5 3317	26	4 9873	4	5 5844	8	5 2400
14	6 0206	18	5 6762	23	6 2732	27	5 9288	5	6 5259	9	6 1815
15	6 9621	19	6 6176	24	7 2147	1	6 8703	6	7 4674	10	7 1230
16	7 9035	20	7 5591	25	8 1562	2	7 8118	7	8 4089	11	8 0645
17	8 8450	21	8 5006	26	9 0977	3	8 7533	8	9 3504	12	9 0060
18	9 7865	22	9 4421	27	10 0392	4	9 6948	9	10 2919	13	9 9475
19	10 7280	23	10 3836	1	11 0807	5	10 6363	10	11 2334	14	10 8890
20	11 6695	24	11 3251	2	12 0222	6	11 5778	11	12 1748	15	11 8304
21	12 6110	25	12 2666	3	12 9637	7	12 5193	12	13 1163	16	12 7719
22	13 5525	26	13 2081	4	13 9051	8	13 4607	13	14 0578	17	13 7134
23	14 4940	27	14 1496	5	14 8466	9	14 4022	14	14 9993	18	14 6549
24	15 4355	1	15 0910	6	15 7881	10	15 3437	15	15 9408	19	15 5964
25	16 3769	2	16 0325	7	16 7296	11	16 2852	16	16 8823	20	16 5379
26	17 3184	3	16 9740	8	17 6711	12	17 2267	17	17 8238	21	17 4794
27	18 2599	4	17 9155	9	18 6126	13	18 1682	18	18 7653	22	18 4209
1	19 2014	5	18 8570	10	19 4541	14	19 1097	19	19 7068	23	19 3624
2	20 1429	6	19 7985	11	20 3956	15	20 0512	20	20 6487	24	20 3039
3	21 0844	7	20 7400	12	21 3371	16	20 9927	21	21 5897	25	21 2452
4	22 0259	8	21 6815	13	22 2786	17	21 9341	22	22 5310	26	22 1866
5	22 9674	9	22 6230	14	23 2200	18	22 8756	23	23 4727	27	23 1281
6	23 9088	10	23 5645	15	24 1615	19	23 8171	24	24 4187	1	24 0696
7	24 8504	11	24 5059	16	25 1030	20	24 7586	25	25 3597	2	25 0111
8	25 7918	12	25 4474	17	26 0445	21	25 7001	26	26 2972	3	25 9526
9	26 7333	13	26 3889	18	26 9860	22	26 6417	27	27 2387	4	26 8943
10	27 6748	14	27 3304	19	27 9275	23	27 5831	1	28 1802	5	27 8358
11	28 6163	15	28 2719	20	28 8690	24	28 5247	2	29 1217	6	28 7773
		16	29 2134			25	29 4661				

YOGAS.

See note on ANNUAL CORRECTION supra.

W	W	W	W	W
0 4 11036	6 3 27522	12 2 44008	18 1 60494	24 0 76980
1 3 97117	7 3 18603	13 2 30089	19 1 46575	25 0 63061
2 3 83198	8 2 95684	14 2 16170	20 1 32656	26 0 49142
3 3 69279	9 2 85765	15 2 02251	21 1 18787	27 0 35223
4 3 55360	10 2 71846	16 1 88332	22 1 04818	28 0 21304
5 3 41411	11 2 57927	17 1 74413	23 0 90899	29 0 07885
X	X	X	X	X
01 00139	21 02923	41 05707	61 08491	81 11274
02 00278	22 03063	42 05946	62 08630	82 11413
03 00417	23 03291	43 05985	63 08769	83 11558
04 00557	24 03340	44 06124	64 08908	84 11692
05 00696	25 03480	45 06263	65 09047	85 11831
06 00835	26 03619	46 06493	66 09186	86 11970
07 00974	27 03758	47 06542	67 09326	87 12109
08 01113	28 03897	48 06681	68 09465	88 12249
09 01253	29 04036	49 06820	69 09604	89 12388
10 01392	30 04176	50 06959	70 09743	90 12527
11 01530	31 04315	51 07098	71 09882	91 12666
12 01670	32 04454	52 07239	72 10022	92 12805
13 01809	33 04593	53 07377	73 10161	93 12945
14 01949	34 04732	54 07516	74 10300	94 13084
15 02088	35 04872	55 07655	75 10439	95 13223
16 02227	36 05011	56 07795	76 10578	96 13362
17 02366	37 05150	57 07934	77 10718	97 13501
18 02505	38 05289	58 08073	78 10851	98 13641
19 02645	39 05428	59 08213	79 10996	99 13780
20 02784	40 05568	60 08351	80 11135	

y Calendar to be used with Table II, as directed in specimen problems, for ascertaining the A.D. month and day corresponding to any solar date, lunar tithi, nakshatra, yoga or karana.

Day of solar year. Tithi No.	Ending mo- ment of tithi.	It's An. for each tithi.	Day of solar year. Tithi No.	Ending mo- ment of tithi.	It's An. for each tithi.	Day of solar year. Tithi No.	Ending mo- ment of tithi.	It's An. for each tithi.	Day of solar year. Tithi No.	Ending mo- ment of tithi.	It's An. for each tithi.	Day of solar year. Tithi No.	Ending mo- ment of tithi.	It's An. for each tithi.	Day of solar year. Tithi No.	Ending mo- ment of tithi.	It's An. for each tithi.
Vaiśākha.			Āśhāḍha—cont.			Bhādrapada—cont.			Kārttika—cont.			Pauṣa—cont.			Phālguna—cont.		
0 0643	1 0084		64 0673	6 9 858		128 0502	11 18 732		192 0332	1 0 051		256 0161	6 8 825		320 0891	11 17 798	
1 0687	2 1 969		65 0616	7 10 842		129 0846	12 19 716		193 0175	2 1 035		257 0005	7 9 909		321 0834	12 18 783	
2 0630	3 2 958		66 0860	8 11 827		130 0189	13 20 700		194 0019	3 2 020		258 0818	8 10 893		322 0878	13 19 767	
3 0874	4 3 937		67 0203	9 12 811		131 0033	14 21 685		195 0862	4 3 004		259 0602	9 11 878		323 0821	14 20 751	
4 0217	5 4 921		68 0047	10 13 795		132 0876	15 22 669		196 0706	5 3 988		260 0535	10 12 862		324 0865	15 21 736	
5 0061	6 5 906		69 0891	11 14 780		133 0720	1 23 654		197 0549	6 4 973		261 0879	11 13 846		Chaitra (when there is no adhika masa)		
6 0904	7 6 890		70 0734	12 15 764		134 0563	2 24 638		198 0393	7 5 957		262 0222	12 14 831				
7 0748	8 7 875		71 0578	13 16 749		135 0407	3 25 622		199 0236	8 6 941		263 0066	13 15 815		325 0808	1 22 720	
8 0592	9 8 859		72 0421	14 17 733		136 0251	4 26 607		200 0080	9 7 926		264 0709	14 16 799		326 0852	2 23 705	
9 0435	10 9 843		73 0265	15 18 717		137 0094	5 0 593		201 0724	10 8 910		265 0753	15 17 784		327 0895	3 24 689	
10 0279	11 10 827		74 0108	1 19 702		138 0798	6 1 021		202 0767	11 9 894		Māgha.			328 0779	4 25 673	
11 0122	12 11 812		75 0752	2 20 686		139 0781	7 2 005		203 0611	12 10 879					329 0752	5 26 658	
12 0966	13 12 797		76 0796	3 21 670		140 0625	8 2 989		204 0454	13 11 863		266 0757	1 18 768		330 0726	6 0 687	
13 0809	14 13 781		77 0639	4 22 655		141 0469	9 3 974		205 0298	14 12 848		267 0440	2 19 753		331 0709	7 1 072	
14 0652	15 14 765		78 0482	5 23 639		142 0312	10 4 958		206 0141	15 13 832		268 0284	3 20 737		332 0718	8 2 056	
15 0496	1 15 750		79 0326	6 24 623		143 0156	11 5 942		Mārgaśīrṣa.			269 0127	4 21 721		333 0657	9 3 040	
16 0339	2 16 734		80 0169	7 25 608		144 0009	12 6 927					270 0071	5 22 706		270 0071	5 22 706		334 0600	10 4 025
17 0183	3 17 718		81 0018	8 26 592		145 0842	13 7 911		207 0095	1 14 816		271 0014	6 23 690		335 0644	11 5 009	
18 0027	4 18 703		82 0856	9 0 022		146 0686	14 8 896		208 0082	2 15 801		272 0658	7 24 674		336 0487	12 5 993	
19 0870	5 19 687		83 0700	10 1 006		Āśvina.			209 0672	3 16 785		273 0601	8 25 659		337 0631	13 6 978	
20 0714	6 20 671		84 0543	11 1 991					210 0615	4 17 769		210 0615	4 17 769		274 0545	9 26 643		338 0674	14 7 962
21 0557	7 21 656		85 0387	12 2 975		148 0373	1 10 864		211 0350	5 18 754		275 0188	10 0 078		339 0618	15 8 947	
22 0401	8 22 640		86 0231	13 3 959		149 0216	2 11 849		212 0202	6 19 738		276 0032	11 1 067		340 0561	1 9 931	
23 0244	9 23 624		87 0074	14 4 944		150 0060	3 12 833		213 0046	7 20 722		277 0575	12 2 041		341 0505	2 10 915	
24 0088	10 24 609		88 0918	15 5 928		151 0904	4 13 817		214 0889	8 21 707		278 0519	13 3 026		342 0548	3 11 900	
25 0932	11 25 593		Śrāvaṇa.			152 0747	5 14 802		215 0733	9 22 691		279 0562	14 4 010		343 0592	4 12 884	
26 0775	12 26 577					89 0761	1 6 912		153 0591	6 15 786		216 0576	10 23 675		280 0506	15 4 995		344 0535	5 13 868
27 0619	13 0 007		90 0605	2 7 897		154 0434	7 16 770		217 0420	11 24 660		281 0249	1 5 979		345 0579	6 14 853	
28 0462	14 0 992		91 0448	3 8 881		155 0278	8 17 755		218 0264	12 25 644		282 0093	2 6 963		346 0522	7 15 837	
29 0306	15 1 976		92 0292	4 9 865		156 0121	9 18 739		219 0107	13 26 628		283 0037	3 7 948		347 0466	8 16 821	
Jyeshṭha.			93 0135	5 10 850		157 0965	10 19 723		220 0951	14 0 058		284 0082	4 8 932		348 0410	9 17 806	
			94 0979	6 11 834		158 0808	11 20 708		221 0794	15 1 043		285 0026	5 9 916		349 0453	10 18 790	
30 0149	1 2 960		95 0822	7 12 818		159 0652	12 21 692		222 0638	1 2 027		286 0070	6 10 901		350 0497	11 19 774	
31 0993	2 3 945		96 0666	8 13 803		160 0495	13 22 676		223 0481	2 3 011		287 0014	7 11 885		351 0440	12 20 759	
32 0836	3 4 929		97 0509	9 14 787		161 0339	14 23 661		224 0325	3 3 996		288 0058	8 12 869		352 0384	13 21 743	
33 0680	4 5 913		98 0353	10 15 771		162 0182	15 24 645		225 0168	4 4 980		289 0002	9 13 854		353 0327	14 22 727	
34 0523	5 6 898		99 0196	11 16 756		163 0026	1 25 630		226 0012	5 5 964		290 0841	10 14 838		354 0271	15 23 712	
35 0367	6 7 882		100 0040	12 17 740		164 0869	2 26 614		227 0855	6 6 949		291 0685	11 15 822		Chaitra (when there is adhika masa).		
36 0210	7 8 866		101 0883	13 18 725		165 0713	3 0 044		228 0699	7 7 933		292 0528	12 16 807				
37 0054	8 9 851		102 0727	14 19 709		166 0556	4 1 028		229 0542	8 8 917		293 0372	13 17 791		355 0314	1 24 696	
38 0898	9 10 835		103 0571	15 20 693		167 0400	5 2 012		230 0386	9 9 902		294 0315	14 18 775		356 0358	2 25 681	
39 0741	10 11 819		104 0414	1 21 678		168 0244	6 3 997		231 0229	10 10 886		295 0259	15 19 760		357 0301	3 26 665	
40 0585	11 12 804		105 0258	2 22 662		169 0087	7 4 981		232 0073	11 11 870		Phālguna.			358 0345	4 0 095	
41 0428	12 13 788		106 0101	3 23 646		170 0931	8 5 965		233 0916	12 12 855					359 0288	5 1 079	
42 0272	13 14 773		107 0945	4 24 631		171 0774	9 6 950		234 0760	13 13 839		296 0202	1 20 744		360 0232	6 2 063	
43 0115	14 15 757		108 0788	5 25 615		172 0618	10 6 934		235 0604	14 14 824		297 0246	2 21 729		361 0275	7 3 048	
44 0959	15 16 741		109 0632	6 26 599		173 0461	11 7 918		236 0447	15 15 808		298 0289	3 22 713		362 0219	8 4 032	
45 0802	1 17 726		110 0475	7 27 583		174 0305	12 8 903		237 0291	1 16 792		299 0233	4 23 697		363 0262	9 5 016	
46 0646	2 18 710		111 0319	8 28 567		175 0148	13 9 887		238 0134	2 17 777		300 0277	5 24 682		364 0206	10 6 001	
47 0489	3 19 694		112 0162	9 29 551		176 0992	14 10 872		239 0978	3 18 761		301 0220	6 25 666		365 0150	11 6 985	
48 0333	4 20 679		113 0006	10 30 535		177 0835	15 11 856		240 0821	4 19 745		302 0164	7 26 650		366 0193	12 7 969	
49 0176	5 21 663		114 0849	11 31 519		Kārttika.			241 0665	5 20 730		303 0107	8 0 080		367 0137	13 8 954	
50 0020	6 22 647		115 0693	12 0 503					242 0508	6 21 714		241 0665	5 20 730		304 0051	9 1 064		368 0180	14 9 938
51 0863	7 23 632		116 0536	13 0 487		178 0709	1 12 840		243 0352	7 22 698		305 0094	10 2 048		369 0224	15 10 923	
52 0707	8 24 616		117 0380	14 0 471		179 0552	2 13 825		244 0195	8 23 682		306 0038	11 3 033		370 0167	1 11 907	
53 0551	9 25 600		118 0223	15 0 455		180 0396	3 14 809		245 0039	9 24 667		307 0082	12 4 017		371 0111	2 12 891	
54 0394	10 26 585		Bhādrapada.			181 0239	4 15 793		246 0882	10 25 651		308 0026	13 5 002		372 0054	3 13 876	
55 0238	11 0 015					182 0083	5 16 778		247 0726	11 26 636		247 0726	11 26 636		309 0070	14 5 986		373 0098	4 14 860
56 0081	12 0 999		120 0911	2 9 873		183 0898	6 17 762		248 0569	12 0 065		310 0014	15 6 971		374 0041	5 15 844	
57 0925																	

e-EYE-TABLE FOR TITHIS—continued.
Moon's anomaly and equation of the centre expressed in days and fractions of a day.

(SŪRYA SIDDHĀNTA.)

Eqn. +	0	1	2	3	4	5	6	7	8	9	Eqn. +	0	1	2	3	4	5	6	7	8	9	Eqn. +
13-777 ^a	13-777 ^a	13-786	13-795	13-805	13-815	13-824	13-834	13-844	13-853	13-863	13-873	13-883	13-893	13-903	13-913	13-923	13-933	13-943	13-953	13-963	13-973	13-983
13-872	13-872	13-881	13-891	13-901	13-911	13-920	13-930	13-939	13-949	13-958	13-968	13-978	13-988	13-998	14-008	14-018	14-028	14-038	14-048	14-058	14-068	14-078
13-968	13-968	13-977	13-987	13-996	14-006	14-016	14-026	14-036	14-046	14-056	14-066	14-076	14-086	14-096	14-106	14-116	14-126	14-136	14-146	14-156	14-166	14-176
14-064	14-064	14-074	14-083	14-093	14-102	14-112	14-121	14-131	14-140	14-150	14-160	14-170	14-180	14-190	14-200	14-210	14-220	14-230	14-240	14-250	14-260	14-270
14-159	14-159	14-169	14-178	14-188	14-197	14-207	14-216	14-226	14-236	14-246	14-256	14-266	14-276	14-286	14-296	14-306	14-316	14-326	14-336	14-346	14-356	14-366
14-255	14-255	14-264	14-273	14-283	14-292	14-301	14-311	14-320	14-330	14-340	14-350	14-360	14-370	14-380	14-390	14-400	14-410	14-420	14-430	14-440	14-450	14-460
14-349	14-349	14-358	14-368	14-377	14-387	14-396	14-406	14-415	14-425	14-435	14-445	14-455	14-465	14-475	14-485	14-495	14-505	14-515	14-525	14-535	14-545	14-555
14-444	14-444	14-454	14-464	14-474	14-484	14-494	14-504	14-514	14-524	14-534	14-544	14-554	14-564	14-574	14-584	14-594	14-604	14-614	14-624	14-634	14-644	14-654
14-544	14-544	14-554	14-564	14-574	14-584	14-594	14-604	14-614	14-624	14-634	14-644	14-654	14-664	14-674	14-684	14-694	14-704	14-714	14-724	14-734	14-744	14-754
14-640	14-640	14-650	14-660	14-670	14-680	14-690	14-700	14-710	14-720	14-730	14-740	14-750	14-760	14-770	14-780	14-790	14-800	14-810	14-820	14-830	14-840	14-850
14-740	14-740	14-750	14-760	14-770	14-780	14-790	14-800	14-810	14-820	14-830	14-840	14-850	14-860	14-870	14-880	14-890	14-900	14-910	14-920	14-930	14-940	14-950
14-840	14-840	14-850	14-860	14-870	14-880	14-890	14-900	14-910	14-920	14-930	14-940	14-950	14-960	14-970	14-980	14-990	15-000	15-010	15-020	15-030	15-040	15-050
14-940	14-940	14-950	14-960	14-970	14-980	14-990	15-000	15-010	15-020	15-030	15-040	15-050	15-060	15-070	15-080	15-090	15-100	15-110	15-120	15-130	15-140	15-150
15-040	15-040	15-050	15-060	15-070	15-080	15-090	15-100	15-110	15-120	15-130	15-140	15-150	15-160	15-170	15-180	15-190	15-200	15-210	15-220	15-230	15-240	15-250
15-140	15-140	15-150	15-160	15-170	15-180	15-190	15-200	15-210	15-220	15-230	15-240	15-250	15-260	15-270	15-280	15-290	15-300	15-310	15-320	15-330	15-340	15-350
15-240	15-240	15-250	15-260	15-270	15-280	15-290	15-300	15-310	15-320	15-330	15-340	15-350	15-360	15-370	15-380	15-390	15-400	15-410	15-420	15-430	15-440	15-450
15-340	15-340	15-350	15-360	15-370	15-380	15-390	15-400	15-410	15-420	15-430	15-440	15-450	15-460	15-470	15-480	15-490	15-500	15-510	15-520	15-530	15-540	15-550
15-440	15-440	15-450	15-460	15-470	15-480	15-490	15-500	15-510	15-520	15-530	15-540	15-550	15-560	15-570	15-580	15-590	15-600	15-610	15-620	15-630	15-640	15-650
15-540	15-540	15-550	15-560	15-570	15-580	15-590	15-600	15-610	15-620	15-630	15-640	15-650	15-660	15-670	15-680	15-690	15-700	15-710	15-720	15-730	15-740	15-750
15-640	15-640	15-650	15-660	15-670	15-680	15-690	15-700	15-710	15-720	15-730	15-740	15-750	15-760	15-770	15-780	15-790	15-800	15-810	15-820	15-830	15-840	15-850
15-740	15-740	15-750	15-760	15-770	15-780	15-790	15-800	15-810	15-820	15-830	15-840	15-850	15-860	15-870	15-880	15-890	15-900	15-910	15-920	15-930	15-940	15-950
15-840	15-840	15-850	15-860	15-870	15-880	15-890	15-900	15-910	15-920	15-930	15-940	15-950	15-960	15-970	15-980	15-990	16-000	16-010	16-020	16-030	16-040	16-050
15-940	15-940	15-950	15-960	15-970	15-980	15-990	16-000	16-010	16-020	16-030	16-040	16-050	16-060	16-070	16-080	16-090	16-100	16-110	16-120	16-130	16-140	16-150
16-040	16-040	16-050	16-060	16-070	16-080	16-090	16-100	16-110	16-120	16-130	16-140	16-150	16-160	16-170	16-180	16-190	16-200	16-210	16-220	16-230	16-240	16-250
16-140	16-140	16-150	16-160	16-170	16-180	16-190	16-200	16-210	16-220	16-230	16-240	16-250	16-260	16-270	16-280	16-290	16-300	16-310	16-320	16-330	16-340	16-350
16-240	16-240	16-250	16-260	16-270	16-280	16-290	16-300	16-310	16-320	16-330	16-340	16-350	16-360	16-370	16-380	16-390	16-400	16-410	16-420	16-430	16-440	16-450
16-340	16-340	16-350	16-360	16-370	16-380	16-390	16-400	16-410	16-420	16-430	16-440	16-450	16-460	16-470	16-480	16-490	16-500	16-510	16-520	16-530	16-540	16-550
16-440	16-440	16-450	16-460	16-470	16-480	16-490	16-500	16-510	16-520	16-530	16-540	16-550	16-560	16-570	16-580	16-590	16-600	16-610	16-620	16-630	16-640	16-650
16-540	16-540	16-550	16-560	16-570	16-580	16-590	16-600	16-610	16-620	16-630	16-640	16-650	16-660	16-670	16-680	16-690	16-700	16-710	16-720	16-730	16-740	16-750
16-640	16-640	16-650	16-660	16-670	16-680	16-690	16-700	16-710	16-720	16-730	16-740	16-750	16-760	16-770	16-780	16-790	16-800	16-810	16-820	16-830	16-840	16-850
16-740	16-740	16-750	16-760	16-770	16-780	16-790	16-800	16-810	16-820	16-830	16-840	16-850	16-860	16-870	16-880	16-890	16-900	16-910	16-920	16-930	16-940	16-950
16-840	16-840	16-850	16-860	16-870	16-880	16-890	16-900	16-910	16-920	16-930	16-940	16-950	16-960	16-970	16-980	16-990	17-000	17-010	17-020	17-030	17-040	17-050
16-940	16-940	16-950	16-960	16-970	16-980	16-990	17-000	17-010	17-020	17-030	17-040	17-050	17-060	17-070	17-080	17-090	17-100	17-110	17-120	17-130	17-140	17-150
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17-140	17-140	17-150	17-160	17-170	17-180	17-190	17-200	17-210	17-220	17-230	17-240	17-250	17-260	17-270	17-280	17-290	17-300	17-310	17-320	17-330	17-340	17-350
17-240	17-240	17-250	17-260	17-270	17-280	17-290	17-300	17-310	17-320	17-330	17-340	17-350	17-360	17-370	17-380	17-390	17-400	17-410	17-420	17-430	17-440	17-450
17-340	17-340	17-350	17-360	17-370	17-380	17-390	17-400	17-410	17-420	17-430	17-440	17-450	17-460	17-470	17-480	17-490	17-500	17-510	17-520	17-530	17-540	17-550
17-440	17-440	17-450	17-460	17-470	17-480	17-490	17-500	17-510	17-520	17-530	17-540	17-550	17-560	17-570	17-580	17-590	17-600	17-610	17-620	17-630	17-640	17-650
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17-740	17-740	17-750	17-760	17-770	17-780	17-790	17-800	17-810	17-820	17-830	17-840	17-850	17-860	17-870	17-880	17-890	17-900	17-910	17-920	17-930	17-940	17-950
17-840	17-840	17-850	17-860	17-870	17-880	17-890	17-900	17-910	17-920	17-930	17-940	17-950	17-960	17-970	17-980	17-990	18-000	18-010	18-020	18-030	18-040	18-050
17-940	17-940	17-950	17-960	17-970	17-980	17-990	18-000	18-010	18-020	18-030	18-040	18-050	18-060	18-070	18-080	18-090	18-100	18-110	18-120	18-130	18-140	18-150
18-040	18-040	18-050	18-060	18-070	18-080	18-090	18-100	18-110	18-120	18-130	18-140	18-150	18-160	18-170	18-180	18-190	18-200	18-210	18-220	18-230	18-240	18-250
18-140	18-140	18-150	18-160	18-170	18-180	18-190	18-200	18-210	18-220	18-230	18-240	18-250	18-260	18-270	18-280	18-290	18-300	18-310	18-320	18-330	18-340	18-350
18-240	18-240	18-250	18-260	18-270	18-280	18-290	18-300	18-310	18-320	18-330	18-340	18-350	18-360	18-370	18-380	18-390	18-400	18-410	18-420	18-430	18-440	18-450
18-340	18-340	18-350	18-360	18-370	18-380	18-390	18-400	18-410	18-420	18-430	18-440	18-450	18-460	18-470	18-480	18						

(SŪRYA SIDDHĀNTA.)

(SURIASIDDHANTA.)												
Eqn. +	0	1	2	3	4	5	6	7	8	9	Eqn. +	Moon's anomaly in days.
13777	13787	13797	13808	13818	13828	13839	13849	13859	13870	13880	13890	13900
13880	13890	13901	13911	13922	13932	13943	13953	13964	13975	13985	13995	14005
13985	13995	14005	14016	14026	14037	14047	14058	14068	14079	14089	14099	14109
14089	14099	14110	14120	14130	14141	14151	14162	14172	14183	14193	14203	14213
14193	14203	14213	14224	14234	14244	14255	14265	14275	14286	14296	14306	14316
14296	14306	14316	14327	14337	14347	14358	14368	14378	14389	14399	14409	14419
14399	14410	14421	14431	14442	14453	14463	14474	14485	14495	14505	14515	14525
14505	14517	14528	14539	14549	14560	14570	14581	14592	14602	14613	14624	14635
14613	14624	14635	14645	14656	14667	14677	14688	14699	14709	14720	14730	14741
14720	14730	14741	14752	14763	14774	14785	14796	14807	14818	14829	14840	14851
14829	14839	14850	14861	14872	14883	14894	14905	14916	14927	14938	14949	14960
14938	14948	14959	14970	14981	14992	15003	15014	15025	15036	15047	15058	15069
15047	15058	15069	15080	15091	15102	15113	15124	15135	15146	15157	15168	15179
15168	15179	15190	15201	15212	15223	15234	15245	15256	15267	15278	15289	15300
15278	15289	15300	15311	15322	15333	15344	15355	15366	15377	15388	15399	15410
15399	15410	15421	15432	15443	15454	15465	15476	15487	15498	15509	15520	15531
15509	15520	15531	15542	15553	15564	15575	15586	15597	15608	15619	15630	15641
15630	15641	15652	15663	15674	15685	15696	15707	15718	15729	15740	15751	15762
15751	15762	15773	15784	15795	15806	15817	15828	15839	15850	15861	15872	15883
15883	15894	15905	15916	15927	15938	15949	15960	15971	15982	15993	16004	16015
16015	16026	16037	16048	16059	16070	16081	16092	16103	16114	16125	16136	16147
16147	16158	16169	16180	16191	16202	16213	16224	16235	16246	16257	16268	16279
16279	16290	16301	16312	16323	16334	16345	16356	16367	16378	16389	16400	16411
16411	16422	16433	16444	16455	16466	16477	16488	16499	16510	16521	16532	16543
16543	16554	16565	16576	16587	16598	16609	16620	16631	16642	16653	16664	16675
16675	16686	16697	16708	16719	16730	16741	16752	16763	16774	16785	16796	16807
16807	16818	16829	16840	16851	16862	16873	16884	16895	16906	16917	16928	16939
16939	16950	16961	16972	16983	16994	17005	17016	17027	17038	17049	17060	17071
17071	17082	17093	17104	17115	17126	17137	17148	17159	17170	17181	17192	17203
17203	17214	17225	17236	17247	17258	17269	17280	17291	17302	17313	17324	17335
17335	17346	17357	17368	17379	17390	17401	17412	17423	17434	17445	17456	17467
17467	17478	17489	17500	17511	17522	17533	17544	17555	17566	17577	17588	17599
17599	17610	17621	17632	17643	17654	17665	17676	17687	17698	17709	17720	17731
17731	17742	17753	17764	17775	17786	17797	17808	17819	17830	17841	17852	17863
17863	17874	17885	17896	17907	17918	17929	17940	17951	17962	17973	17984	17995
17995	18006	18017	18028	18039	18050	18061	18072	18083	18094	18105	18116	18127
18127	18138	18149	18160	18171	18182	18193	18204	18215	18226	18237	18248	18259
18259	18270	18281	18292	18303	18314	18325	18336	18347	18358	18369	18380	18391
18391	18402	18413	18424	18435	18446	18457	18468	18479	18490	18501	18512	18523
18523	18534	18545	18556	18567	18578	18589	18600	18611	18622	18633	18644	18655
18655	18666	18677	18688	18699	18710	18721	18732	18743	18754	18765	18776	18787
18787	18798	18809	18820	18831	18842	18853	18864	18875	18886	18897	18908	18919
18919	18930	18941	18952	18963	18974	18985	18996	19007	19018	19029	19040	19051
19051	19062	19073	19084	19095	19106	19117	19128	19139	19150	19161	19172	19183
19183	19194	19205	19216	19227	19238	19249	19260	19271	19282	19293	19304	19315
19315	19326	19337	19348	19359	19370	19381	19392	19403	19414	19425	19436	19447
19447	19458	19469	19480	19491	19502	19513	19524	19535	19546	19557	19568	19579
19579	19590	19601	19612	19623	19634	19645	19656	19667	19678	19689	19700	19711
19711	19722	19733	19744	19755	19766	19777	19788	19799	19810	19821	19832	19843
19843	19854	19865	19876	19887	19898	19909	19920	19931	19942	19953	19964	19975
19975	19986	19997	20008	20019	20030	20041	20052	20063	20074	20085	20096	20107
20107	20118	20129	20140	20151	20162	20173	20184	20195	20206	20217	20228	20239
20239	20250	20261	20272	20283	20294	20305	20316	20327	20338	20349	20360	20371
20371	20382	20393	20404	20415	20426	20437	20448	20459	20470	20481	20492	20503
20503	20514	20525	20536	20547	20558	20569	20580	20591	20602	20613	20624	20635
20635	20646	20657	20668	20679	20690	20701	20712	20723	20734	20745	20756	20767
20767	20778	20789	20800	20811	20822	20833	20844	20855	20866	20877	20888	20899
20899	20910	20921	20932	20943	20954	20965	20976	20987	20998	21009	21020	21031
21031	21042	21053	21064	21075	21086	21097	21108	21119	21130	21141	21152	21163
21163	21174	21185	21196	21207	21218	21229	21240	21251	21262	21273	21284	21295
21295	21306	21317	21328	21339	21350	21361	21372	21383	21394	21405	21416	21427
21427	21438	21449	21460	21471	21482	21493	21504	21515	21526	21537	21548	21559
21559	21570	21581	21592	21603	21614	21625	21636	21647	21658	21669	21680	21691
21691	21702	21713	21724	21735	21746	21757	21768	21779	21790	21801	21812	21823
21823	21834	21845	21856	21867	21878	21889	21900	21911	21922	21933	21944	21955
21955	21966	21977	21988	21999	22010	22021	22032	22043	22054	22065	22076	22087
22087	22098	22109	22120	22131	22142	22153	22164	22175	22186	22197	22208	22219
22219	22230	22241	22252	22263	22274	22285	22296	22307	22318	22329	22340	22351
22351	22362	22373	22384	22395	22406	22417	22428	22439	22450	22461	22472	22483
22483	22494	22505	22516	22527	22538	22549	22560	22571	22582	22593	22604	22615
22615	22626	22637	22648	22659	22670	22681	22692	22703	22714	22725	22736	22747
22747	22758	22769	22780	22791	22802	22813	22824	22835	22846	22857	22868	22879
22879	22890	22901	22912	22923	22934	22945	22956	22967	22978	22989	22999	23010
23010	23021	23032	23043	23054	23065	23076	23087	23098	23109	23120	23131	23142
23142	23153	23164	23175	23186	23197	23208	23219	23230	23241	23252	23263	23274
23274	23285	23296	23307	23318	23329	23340	23351	23362	23373	23384	23395	23406
23406	23417	23428	23439	23450	23461	23472	23483	23494	23505	23516	23527	23538
23538	23549	23560	23571	23582	23593	23604	23615	23626	23637	23648	23659	23670
23670	23681	23692	23703	23714	23725	23736	23747	23758	23769	23780	23791	23802
23802	23813	23824	23835	23846	23857	23868	23879	23890	23901	23912	23923	23934
23934	23945	23956	23967	23978	23989	23999	24010	24021	24032	24043	24054	24065
24065	24076	24087	24098	24109	24120	24131	24142	24153	24164	24175	24186	24197
24197	24208	24219	24230	24241	24252	24263	24274	24285	24296	24307	24318	24329
24329	24340	24351	24362	24373	24384	24395	24406	24417	24428	24439	24450	24461
24461	24472	24483	24494	24505	24516	24527	24538	24549	24560	24571	24582	24593
24593	24604	24615	24626	24637	24648	24659	24670	24681	24692	24703	24714	24725
24725	24736	24747	24758	24769	24780	24791	24802	24813	24824	24835	24846	24857
24857	24868	24879	24890	24901	24912	24923	24934	24945	24956	24967	24978	24989
24989	24999	25010	25021	25032	25043	25054	25065	25076	25087	25098	25109	25120
25120	25131	25142	25153	25164	25175	25186	25197	25208	25219	25230	25241	25252
25252	25263	25274	25285	25296	25307	25318	25329	25340	25351	25362	25373	25384
25384	25395	25406	25417	25428	25439	25450	25					

g-EYE-TABLE FOR YOGAS—*continued.*

[illegible]

h—EYE-TABLE FOR TITHIS.
Sun's anomaly expressed as days of the solar year and sun's equation of the centre in fractions of a day.
(SURYA SIDDHANTA.)

Eqn.	9	8	7	6	5	4	3	2	1	0	Eqn.	0	1	2	3	4	5	6	7	8	9
175	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
176	0.77	0.92	1.07	1.22	1.37	1.52	1.67	1.82	1.96	0.62	...	80.55	80.87	81.19	81.51	81.83	82.15	82.48	82.80	83.12	83.44
177	2.25	2.40	2.54	2.68	2.82	2.97	3.11	3.26	3.40	3.55	0.01	83.76	84.06	84.38	84.71	85.03	85.35	85.68	86.01	86.33	86.65
178	3.69	3.84	3.98	4.13	4.28	4.43	4.58	4.73	4.87	5.02	0.02	86.96	87.26	87.58	87.91	88.23	88.55	88.88	89.21	89.53	89.85
179	5.13	5.28	5.43	5.58	5.73	5.88	6.03	6.18	6.33	6.48	0.03	90.21	90.51	90.83	91.15	91.48	91.81	92.14	92.47	92.80	93.12
180	6.57	6.72	6.87	7.02	7.17	7.32	7.47	7.62	7.77	7.92	0.04	93.49	93.79	94.11	94.44	94.77	95.10	95.43	95.76	96.09	96.41
181	8.01	8.16	8.31	8.46	8.61	8.76	8.91	9.06	9.21	9.36	0.05	96.82	97.12	97.44	97.77	98.10	98.43	98.76	99.09	99.41	99.73
182	9.45	9.60	9.75	9.90	10.05	10.20	10.35	10.50	10.65	10.80	0.06	100.13	100.43	100.75	101.08	101.41	101.74	102.07	102.40	102.73	103.05
183	10.89	11.04	11.19	11.34	11.49	11.64	11.79	11.94	12.09	12.24	0.07	103.41	103.71	104.03	104.36	104.69	105.02	105.35	105.68	106.01	106.33
184	12.33	12.48	12.63	12.78	12.93	13.08	13.23	13.38	13.53	13.68	0.08	106.73	107.03	107.35	107.68	108.01	108.34	108.67	109.00	109.33	109.65
185	13.77	13.92	14.07	14.22	14.37	14.52	14.67	14.82	14.97	15.12	0.09	110.07	110.37	110.69	111.02	111.35	111.68	112.01	112.34	112.67	113.00
186	15.21	15.36	15.51	15.66	15.81	15.96	16.11	16.26	16.41	16.56	0.10	113.41	113.71	114.03	114.36	114.69	115.02	115.35	115.68	116.01	116.33
187	16.65	16.80	16.95	17.10	17.25	17.40	17.55	17.70	17.85	18.00	0.11	116.75	117.05	117.37	117.70	118.03	118.36	118.69	119.02	119.35	119.67
188	18.09	18.24	18.39	18.54	18.69	18.84	18.99	19.14	19.29	19.44	0.12	120.09	120.39	120.71	121.04	121.37	121.70	122.03	122.36	122.69	123.01
189	19.53	19.68	19.83	19.98	20.13	20.28	20.43	20.58	20.73	20.88	0.13	123.43	123.73	124.05	124.38	124.71	125.04	125.37	125.70	126.03	126.35
190	20.97	21.12	21.27	21.42	21.57	21.72	21.87	22.02	22.17	22.32	0.14	126.77	127.07	127.39	127.72	128.05	128.38	128.71	129.04	129.37	129.69
191	22.41	22.56	22.71	22.86	23.01	23.16	23.31	23.46	23.61	23.76	0.15	130.11	130.41	130.73	131.06	131.39	131.72	132.05	132.38	132.71	133.03
192	23.85	24.00	24.15	24.30	24.45	24.60	24.75	24.90	25.05	25.20	0.16	133.45	133.75	134.07	134.40	134.73	135.06	135.39	135.72	136.05	136.37
193	25.29	25.44	25.59	25.74	25.89	26.04	26.19	26.34	26.49	26.64	0.17	136.79	137.09	137.41	137.74	138.07	138.40	138.73	139.06	139.39	139.71
194	26.73	26.88	27.03	27.18	27.33	27.48	27.63	27.78	27.93	28.08	0.18	140.13	140.43	140.75	141.08	141.41	141.74	142.07	142.40	142.73	143.05
195	28.17	28.32	28.47	28.62	28.77	28.92	29.07	29.22	29.37	29.52	0.19	143.47	143.77	144.09	144.42	144.75	145.08	145.41	145.74	146.07	146.39
196	29.61	29.76	29.91	30.06	30.21	30.36	30.51	30.66	30.81	30.96	0.20	146.81	147.11	147.43	147.76	148.09	148.42	148.75	149.08	149.41	149.73
197	31.05	31.20	31.35	31.50	31.65	31.80	31.95	32.10	32.25	32.40	0.21	150.15	150.45	150.77	151.10	151.43	151.76	152.09	152.42	152.75	153.07
198	32.49	32.64	32.79	32.94	33.09	33.24	33.39	33.54	33.69	33.84	0.22	153.49	153.79	154.11	154.44	154.77	155.10	155.43	155.76	156.09	156.41
199	33.93	34.08	34.23	34.38	34.53	34.68	34.83	34.98	35.13	35.28	0.23	156.83	157.13	157.45	157.78	158.11	158.44	158.77	159.10	159.43	159.75
200	35.37	35.52	35.67	35.82	35.97	36.12	36.27	36.42	36.57	36.72	0.24	160.17	160.47	160.79	161.12	161.45	161.78	162.11	162.44	162.77	163.09
201	36.81	36.96	37.11	37.26	37.41	37.56	37.71	37.86	38.01	38.16	0.25	163.51	163.81	164.13	164.46	164.79	165.12	165.45	165.78	166.11	166.43
202	38.25	38.40	38.55	38.70	38.85	39.00	39.15	39.30	39.45	39.60	0.26	166.85	167.15	167.47	167.80	168.13	168.46	168.79	169.12	169.45	169.77
203	39.69	39.84	39.99	40.14	40.29	40.44	40.59	40.74	40.89	41.04	0.27	170.19	170.49	170.81	171.14	171.47	171.80	172.13	172.46	172.79	173.11
204	41.13	41.28	41.43	41.58	41.73	41.88	42.03	42.18	42.33	42.48	0.28	173.53	173.83	174.15	174.48	174.81	175.14	175.47	175.80	176.13	176.45
205	42.57	42.72	42.87	43.02	43.17	43.32	43.47	43.62	43.77	43.92	0.29	176.87	177.17	177.49	177.82	178.15	178.48	178.81	179.14	179.47	179.79
206	44.01	44.16	44.31	44.46	44.61	44.76	44.91	45.06	45.21	45.36	0.30	180.21	180.51	180.83	181.16	181.49	181.82	182.15	182.48	182.81	183.13
207	45.45	45.60	45.75	45.90	46.05	46.20	46.35	46.50	46.65	46.80	0.31	183.55	183.85	184.17	184.50	184.83	185.16	185.49	185.82	186.15	186.47
208	46.89	47.04	47.19	47.34	47.49	47.64	47.79	47.94	48.09	48.24	0.32	186.89	187.19	187.51	187.84	188.17	188.50	188.83	189.16	189.49	189.81
209	48.33	48.48	48.63	48.78	48.93	49.08	49.23	49.38	49.53	49.68	0.33	190.23	190.53	190.85	191.18	191.51	191.84	192.17	192.50	192.83	193.15
210	49.77	49.92	50.07	50.22	50.37	50.52	50.67	50.82	50.97	51.12	0.34	193.57	193.87	194.19	194.52	194.85	195.18	195.51	195.84	196.17	196.49
211	51.21	51.36	51.51	51.66	51.81	51.96	52.11	52.26	52.41	52.56	0.35	196.91	197.21	197.53	197.86	198.19	198.52	198.85	199.18	199.51	199.83
212	52.65	52.80	52.95	53.10	53.25	53.40	53.55	53.70	53.85	54.00	0.36	200.25	200.55	200.87	201.20	201.53	201.86	202.19	202.52	202.85	203.17
213	54.09	54.24	54.39	54.54	54.69	54.84	54.99	55.14	55.29	55.44	0.37	203.59	203.89	204.21	204.54	204.87	205.20	205.53	205.86	206.19	206.51
214	55.53	55.68	55.83	55.98	56.13	56.28	56.43	56.58	56.73	56.88	0.38	206.93	207.23	207.55	207.88	208.21	208.54	208.87	209.20	209.53	209.85
215	56.97	57.12	57.27	57.42	57.57	57.72	57.87	58.02	58.17	58.32	0.39	210.27	210.57	210.89	211.22	211.55	211.88	212.21	212.54	212.87	213.19
216	58.41	58.56	58.71	58.86	59.01	59.16	59.31	59.46	59.61	59.76	0.40	213.61	213.91	214.23	214.56	214.89	215.22	215.55	215.88	216.21	216.53
217	59.85	60.00	60.15	60.30	60.45	60.60	60.75	60.90	61.05	61.20	0.41	216.95	217.25	217.57	217.90	218.23	218.56	218.89	219.22	219.55	219.87
218	61.29	61.44	61.59	61.74	61.89	62.04	62.19	62.34	62.49	62.64	0.42	220.29	220.59	220.91	221.24	221.57	221.90	222.23	222.56	222.89	223.21
219	62.73	62.88	63.03	63.18	63.33	63.48	63.63	63.78	63.93	64.08	0.43	223.63	223.93	224.25	224.58	224.91	225.24	225.57	225.90	226.23	226.55
220	64.17	64.32	64.47	64.62	64.77	64.92	65.07	65.22	65.37	65.52	0.44	226.97	227.27	227.59	227.92	228.25	228.58	228.91	229.24	229.57	229.89
221	65.61	65.76	65.91	66.06	66.21	66.36	66.51	66.66	66.81	66.96	0.45	230.31	230.61	230.93	231.26	231.59	231.92	232.25	232.58	232.91	233.23
222	67.05	67.20	67.35	67.50	67.65	67.80	67.95	68.10	68.25	68.40	0.46	233.65	233.95	234.27	234.60	234.93	235.26	235.59	235.92	236.25	236.57
223	68.49	68.64	68.79	68.94	69.09	69.24	69.39	69.54	69.69	69.84	0.47	236.99	237.29	237.61	237.94	238.27	238.60	238.93	239.26	239.59	239.91
224	69.93	70.08	70.23	70.38	70.53	70.68	70.83	70.98	71.13	71.28	0.48	240.33	240.63	240.95	241.28	241.61	241.94	242.27	242.60	242.93	243.25
225	71.37	71.52	71.67	71.82	71.97	72.12	72.27	72.42	72.57	72.72	0.49	243.67	243.97	244.29	244.62	244.95	245.28	245.61	245.94	246.27	246.59
226	72.81	72.96	73.11	73.26	73.41	73.56	73.71	73.86	74.01	74.16	0.50	247.01	247.31	247.63	247.96	248.29	248.62	248.95	249.28	249.61	249.93
227	74.25	74.40	74.55	74.70	74.85	75.00	75.15	75.30	75.45	75.60	0.51	250.35	250.65	250.97	251.30	251.63	251.9				

i-EYE-TABLE FOR YOGAS.
Sun's anomaly expressed as days of the solar year and sun's equation of the centre in fractions of a day.
(SURYA SIDDHANTA.)

Eqn.	9	8	7	6	5	4	3	2	1	0	Eqn.	0	1	2	3	4	5	6	7	8	9
.151	...	...	...	...	...	...	...	...	...	0.08	...	80.55	80.91	81.28	81.65	82.02	82.39	82.75	83.12	83.49	83.86
.150	0.32	0.56	0.79	1.00	1.21	1.42	1.63	1.84	2.05	2.26	...	84.23	84.60	84.97	85.35	85.72	86.10	86.46	86.84	87.21	87.59
.14	3.73	6.15	6.57	7.99	9.09	10.19	11.29	12.39	13.32	14.24	...	87.96	88.33	88.71	89.08	89.45	89.83	90.20	90.57	90.95	91.32
.13	15.16	16.08	16.95	17.82	18.68	19.54	20.25	20.96	21.67	22.38	...	91.70	92.08	92.47	92.85	93.24	93.62	94.00	94.38	94.77	95.15
.12	23.09	23.89	24.50	25.20	25.88	26.57	27.26	27.95	28.51	29.07	...	95.54	95.92	96.31	96.70	97.09	97.48	97.86	98.25	98.64	99.04
.11	29.63	30.19	30.75	31.31	31.88	32.42	32.98	33.54	34.10	34.66	...	99.44	99.84	100.25	100.65	101.06	101.46	101.86	102.26	102.67	103.07
.10	35.22	35.74	36.26	36.78	37.29	37.81	38.33	38.84	39.34	39.84	...	103.48	103.89	104.30	104.72	105.13	105.55	105.96	106.36	106.77	107.19
.09	40.33	40.82	41.31	41.80	42.28	42.77	43.24	43.71	44.18	44.65	...	107.01	107.44	107.85	108.27	108.68	109.09	109.50	110.18	110.61	111.04
.08	45.12	45.59	46.05	46.52	46.96	47.40	47.83	48.29	48.73	49.17	...	111.82	112.26	112.68	113.10	113.52	113.94	114.35	114.77	115.18	115.59
.07	49.61	50.05	50.48	50.92	51.33	51.76	52.19	52.62	53.05	53.48	...	116.44	116.91	117.38	117.85	118.32	118.81	119.29	119.78	120.27	120.76
.06	53.90	54.32	54.73	55.14	55.52	55.96	56.37	56.79	57.20	57.61	...	121.25	121.75	122.25	122.76	123.28	123.80	124.31	124.83	125.35	125.87
.05	58.02	58.42	58.83	59.23	59.63	60.03	60.41	60.84	61.25	61.65	...	126.43	126.93	127.43	127.93	128.43	128.93	129.43	129.93	130.43	130.93
.04	62.05	62.45	62.84	63.23	63.61	64.00	64.39	64.78	65.17	65.55	...	132.02	132.52	133.02	133.52	134.02	134.52	135.02	135.52	136.02	136.52
.03	65.94	66.32	66.71	67.09	67.47	67.85	68.24	68.62	69.01	69.39	...	138.71	139.14	139.57	140.00	140.43	140.86	141.29	141.72	142.15	142.58
.02	69.77	70.14	70.52	70.89	71.26	71.63	72.01	72.38	72.76	73.13	...	146.85	147.27	147.70	148.13	148.56	148.99	149.42	149.85	150.28	150.71
.01	73.50	73.88	74.25	74.63	74.99	75.37	75.74	76.12	76.49	76.86	...	158.83	159.24	159.65	159.98	160.41	160.84	161.27	161.70	162.13	162.56
.00	77.23	77.60	77.97	78.34	78.70	79.07	79.44	79.81	80.18	80.55	...	161.01	161.42	161.83	162.24	162.65	163.06	163.47	163.88	164.29	164.70
										.153	...	163.89	164.29	164.69	165.09	165.49	165.89	166.29	166.69	167.09	167.49
										.153	...	166.77	167.15	167.53	167.91	168.29	168.67	169.05	169.43	169.81	170.19
											Eqn.	0	1	2	3	4	5	6	7	8	9
.153	...	...	...	...	...	...	...	...	...	...	...	263.15	263.54	263.91	264.28	264.65	265.02	265.40	265.77	266.14	266.51
.152	177.04	177.42	177.80	178.18	178.56	178.94	179.32	179.69	180.08	180.46	...	266.88	267.25	267.62	267.99	268.37	268.75	269.13	269.51	269.88	270.26
.151	180.27	180.51	180.75	181.00	181.25	181.47	181.71	181.95	182.18	182.41	...	270.63	270.93	271.23	271.55	271.87	272.19	272.51	272.83	273.15	273.47
.150	182.65	182.89	183.12	183.35	183.54	183.75	183.96	184.17	184.38	184.59	...	274.89	275.17	275.46	275.75	276.04	276.33	276.62	276.91	277.20	277.49
.14	186.08	187.48	188.90	190.32	191.44	192.54	193.64	194.74	195.84	196.94	...	278.25	278.63	279.02	279.41	279.80	280.19	280.58	280.97	281.36	281.75
.13	197.51	198.43	199.35	200.17	201.05	201.91	202.62	203.33	204.04	204.75	...	282.17	282.57	282.95	283.33	283.71	284.09	284.47	284.85	285.23	285.61
.12	205.46	206.17	206.87	207.57	208.27	208.95	209.65	210.34	211.00	211.66	...	286.23	286.64	287.05	287.46	287.87	288.28	288.69	289.10	289.51	289.92
.11	213.03	212.58	213.14	213.70	214.27	214.83	215.39	215.95	216.51	217.07	...	290.38	290.81	291.24	291.67	292.10	292.53	292.97	293.40	293.83	294.27
.10	217.73	218.15	218.67	219.19	219.72	220.24	220.76	221.27	221.77	222.27	...	294.71	295.15	295.58	296.01	296.44	296.87	297.30	297.73	298.16	298.59
.09	222.76	223.25	223.74	224.23	224.73	225.22	225.69	226.16	226.63	227.10	...	299.25	299.72	300.19	300.66	301.13	301.60	302.07	302.54	303.01	303.48
.08	227.57	228.04	228.51	228.97	229.43	229.87	230.32	230.76	231.20	231.64	...	304.08	304.58	305.08	305.59	306.09	306.59	307.09	307.59	308.09	308.59
.07	232.05	232.52	232.95	233.38	233.82	234.25	234.68	235.11	235.54	235.97	...	309.28	309.84	310.40	310.96	311.52	312.08	312.65	313.21	313.77	314.33
.06	236.39	236.81	237.22	237.63	238.05	238.47	238.88	239.30	239.71	240.12	...	314.49	315.45	316.41	317.37	318.33	319.29	320.25	321.21	322.17	323.13
.05	240.55	240.93	241.34	241.74	242.16	242.56	242.97	243.37	243.78	244.18	...	323.60	324.31	325.02	325.73	326.44	327.15	327.86	328.57	329.28	329.99
.04	244.58	244.98	245.37	245.76	246.16	246.55	246.94	247.33	247.72	248.10	...	329.76	330.68	331.61	332.54	333.47	334.40	335.33	336.26	337.19	338.12
.03	248.49	248.87	249.26	249.64	250.04	250.42	250.81	251.19	251.58	251.96	...	334.76	335.77	336.78	337.79	338.80	339.81	340.82	341.83	342.84	343.85
.02	252.34	252.71	253.09	253.46	253.85	254.22	254.60	254.97	255.35	255.72	...	343.94	344.97	346.00	347.03	348.06	349.09	350.12	351.15	352.18	353.21
.01	256.09	256.47	256.84	257.22	257.60	257.98	258.35	258.73	259.10	259.47	...	348.32	349.36	350.40	351.44	352.48	353.52	354.56	355.60	356.64	357.68
.00	259.84	260.21	260.58	260.95	261.33	261.70	262.07	262.44	262.81	263.18	...	349.70	350.78	351.86	352.94	354.02	355.10	356.18	357.26	358.34	359.42
											Eqn.	9	8	7	6	5	4	3	2	1	0
.153	...	...	...	...	...	...	...	...	...	...	...	359.97	360.35	360.73	361.11	361.49	361.87	362.25	362.63	363.01	363.39
.152	...	...	...	...	...	...	...	...	...	...	...	363.20	363.58	363.96	364.34	364.72	365.10	365.48	365.86	366.24	366.62
.151	...	...	...	...	...	...	...	...	...	...	...	366.20	366.58	366.96	367.34	367.72	368.10	368.48	368.86	369.24	369.62

e-EYE-TABLE FOR TITHIS—continued.
Moon's anomaly and equation of the centre expressed in days and fractions of a day.
(ĀRYA SIDDHĀNTA.)

Eqn.	0	1	2	3	4	5	6	7	8	9	Eqn.	+	8	7	6	5	4	3	2	1	0
00	13777	13786	13796	13806	13816	13825	13835	13844	13853	13863	411	+	13863	20254	20283	20312	20342	20371	20400	20429	20458
01	13878	13882	13892	13902	13911	13921	13931	13940	13950	13960	410	2/483	13960	20514	20542	20571	20600	20629	20658	20687	20716
02	13989	13993	13998	14008	14018	14028	14038	14048	14058	14068	408	20634	14058	20657	20686	20715	20744	20773	20802	20831	20860
03	14067	14077	14087	14096	14106	14116	14125	14135	14145	14155	408	20751	14145	20751	20780	20809	20838	20867	20896	20925	20954
04	14165	14174	14184	14194	14203	14213	14223	14232	14242	14252	406	20852	14242	20852	20881	20910	20939	20968	20997	21026	21055
05	14261	14271	14281	14290	14300	14310	14320	14330	14340	14350	406	20915	14340	20915	20944	20973	21002	21031	21060	21089	21118
06	14368	14378	14387	14397	14407	14417	14427	14436	14446	14456	405	20984	14436	20984	21013	21042	21071	21100	21129	21158	21187
07	14465	14475	14485	14495	14505	14515	14525	14535	14545	14555	404	21050	14535	21050	21079	21108	21137	21166	21195	21224	21253
08	14565	14575	14585	14595	14605	14615	14625	14635	14645	14655	403	21117	14635	21117	21146	21175	21204	21233	21262	21291	21320
09	14664	14674	14684	14694	14704	14714	14724	14734	14744	14754	402	21178	14734	21178	21207	21236	21265	21294	21323	21352	21381
10	14754	14764	14774	14784	14794	14804	14814	14824	14834	14844	401	21229	14834	21229	21258	21287	21316	21345	21374	21403	21432
11	14854	14864	14875	14885	14895	14905	14915	14925	14935	14945	400	21290	14935	21290	21319	21348	21377	21406	21435	21464	21493
12	14956	14966	14976	14986	14996	15006	15016	15026	15036	15046	39	21361	15046	21361	21390	21419	21448	21477	21506	21535	21564
13	15056	15067	15078	15089	15099	15110	15121	15131	15141	15152	38	21422	15141	21422	21451	21480	21509	21538	21567	21596	21625
14	15162	15173	15183	15194	15204	15215	15225	15236	15246	15257	37	22044	15246	22044	22073	22102	22131	22160	22189	22218	22247
15	15267	15278	15288	15298	15308	15318	15328	15338	15348	15358	36	22105	15348	22105	22134	22163	22192	22221	22250	22279	22308
16	15371	15381	15392	15403	15413	15424	15434	15445	15456	15466	35	22166	15445	22166	22195	22224	22253	22282	22311	22340	22369
17	15477	15487	15498	15509	15519	15530	15540	15551	15562	15573	34	22227	15562	22227	22256	22285	22314	22343	22372	22401	22430
18	15584	15595	15606	15617	15628	15639	15650	15661	15672	15683	33	22288	15661	22288	22317	22346	22375	22404	22433	22462	22491
19	15694	15705	15716	15727	15738	15749	15760	15771	15782	15793	32	23160	15782	23160	23189	23218	23247	23276	23305	23334	23363
20	15804	15815	15826	15837	15848	15859	15870	15881	15892	15903	31	23341	15903	23341	23370	23399	23428	23457	23486	23515	23544
21	15918	15929	15940	15951	15962	15973	15984	15995	16006	16017	30	23517	16017	23517	23546	23575	23604	23633	23662	23691	23720
22	16033	16045	16056	16068	16079	16091	16102	16114	16125	16137	29	23644	16137	23644	23673	23702	23731	23760	23789	23818	23847
23	16149	16161	16173	16185	16197	16209	16221	16234	16246	16258	28	23844	16258	23844	23873	23902	23931	23960	23989	24018	24047
24	16269	16281	16293	16305	16317	16329	16341	16354	16367	16379	27	24006	16379	24006	24035	24064	24093	24122	24151	24180	24209
25	16392	16405	16417	16430	16442	16455	16467	16480	16492	16505	26	24159	16492	24159	24188	24217	24246	24275	24304	24333	24362
26	16518	16531	16544	16557	16570	16583	16596	16609	16622	16634	25	24308	16634	24308	24337	24366	24395	24424	24453	24482	24511
27	16647	16660	16674	16687	16701	16714	16728	16741	16755	16768	24	24454	16768	24454	24483	24512	24541	24570	24599	24628	24657
28	16782	16795	16808	16822	16836	16850	16864	16878	16892	16906	23	24596	16906	24596	24625	24654	24683	24712	24741	24770	24799
29	16920	16934	16949	16963	16978	16992	17007	17021	17036	17050	22	24736	17050	24736	24765	24794	24823	24852	24881	24910	24939
30	17064	17078	17093	17107	17122	17137	17152	17167	17182	17197	21	24871	17197	24871	24900	24929	24958	24987	25016	25045	25074
31	17213	17228	17244	17259	17275	17291	17306	17322	17338	17353	20	25006	17353	25006	25035	25064	25093	25122	25151	25180	25209
32	17369	17385	17400	17416	17432	17447	17463	17479	17495	17511	19	25140	17511	25140	25169	25198	25227	25256	25285	25314	25343
33	17531	17548	17565	17582	17599	17616	17633	17650	17667	17684	18	25270	17684	25270	25300	25329	25358	25387	25416	25445	25474
34	17701	17719	17737	17756	17775	17794	17813	17832	17851	17870	17	25400	17870	25400	25430	25459	25488	25517	25546	25575	25604
35	17889	17908	17927	17946	17965	17984	18003	18022	18041	18060	16	25532	18060	25532	25562	25591	25620	25649	25678	25707	25736
36	18090	18111	18132	18153	18174	18195	18216	18237	18258	18279	15	25665	18279	25665	25695	25724	25753	25782	25811	25840	25869
37	18306	18331	18356	18381	18406	18431	18456	18481	18506	18531	14	25797	18531	25797	25827	25856	25885	25914	25943	25972	26001
38	18554	18583	18610	18639	18668	18697	18726	18755	18784	18813	13	25930	18813	25930	25960	25989	26018	26047	26076	26105	26134
39	18845	18881	18917	18953	18989	19025	19061	19097	19134	19170	12	26062	19170	26062	26092	26121	26150	26179	26208	26237	26266
400	19206	19211	19221	19231	19241	19251	19261	19271	19281	19291	11	26197	19291	26197	26227	26256	26285	26314	26343	26372	26401
401	19355	19360	19370	19380	19390	19400	19410	19420	19430	19440	10	26332	19440	26332	26362	26391	26420	26449	26478	26507	26536
402	19505	19510	19520	19530	19540	19550	19560	19570	19580	19590	09	26467	19590	26467	26497	26526	26555	26584	26613	26642	26671
403	19656	19661	19671	19681	19691	19701	19711	19721	19731	19741	08	26602	19741	26602	26632	26661	26690	26719	26748	26777	26806
404	19807	19812	19822	19832	19842	19852	19862	19872	19882	19892	07	26737	19892	26737	26767	26796	26825	26854	26883	26912	26941
405	19958	19963	19973	19983	19993	20003	20013	20023	20033	20043	06	26872	20043	26872	26902	26931	26960	26989	27018	27047	27076
406	20109	20114	20124	20134	20144	20154	20164	20174	20184	20194	05	27007	20194	27007	27037	27066	27095	27124	27153	27182	27211
407	20260	20265	20275	20285	20295	20305	20315	20325	20335	20345	04	27142	20345	27142	27172	27201	27230	27259	27288	27317	27346
408	20411	20416	20426	20436	20446	20456	20466	20476	20486	20496	03	27277	20496	27277	27307	27336	27365	27394	27423	27452	27481
409	20562	20567	20577	20587	20597	20607	20617	20627	20637	20647	02	27412	20647	27412	27442	27471	27500	27529	27558	27587	27616
410	20713	20718	20728	20738	20748	20758	20768	20778	20788	20798	01	27547	20798	27547	27577	27606	27635	27664	27693	27722	27751
411	20864	20869	20879	20889	20899	20909	20919	20929	20939	20949	00	27682	20949	27682	27712	27741	27770	27799	27828	27857	27886

§—EYE-TABLE FOR WAKSHATRAS.
Moon's anomaly and moon's equation of the centre in days and fractions of a day.
(ĀRYA SIDDHĀNTA.)

Eqn.	0	1	2	3	4	5	6	7	8	9	Eqn.	0	1	2	3	4	5	6	7	8	9	Eqn.
00	0-000	0-012	0-024	0-036	0-049	0-061	0-074	0-086	0-099	0-111	380	7-271	7-304	7-338	7-372	7-405	7-438	7-472	7-506	7-539	7-572	0
01	0-124	0-136	0-149	0-161	0-174	0-186	0-199	0-211	0-224	0-236	379	7-563	7-576	7-589	7-602	7-614	7-625	7-638	7-651	7-664	7-677	1
02	0-249	0-261	0-274	0-287	0-299	0-312	0-325	0-337	0-350	0-363	378	7-859	7-871	7-883	7-895	7-907	7-918	7-929	7-941	7-953	7-965	2
03	0-378	0-389	0-401	0-414	0-427	0-439	0-452	0-464	0-477	0-489	377	7-915	7-927	7-939	7-951	7-963	7-974	7-986	7-998	8-010	8-022	3
04	0-502	0-514	0-527	0-539	0-552	0-564	0-577	0-589	0-602	0-614	376	7-966	7-978	7-990	8-002	8-014	8-025	8-037	8-049	8-061	8-073	4
05	0-627	0-639	0-652	0-664	0-677	0-689	0-702	0-714	0-727	0-739	375	8-065	8-077	8-089	8-101	8-113	8-124	8-136	8-148	8-160	8-172	5
06	0-752	0-764	0-777	0-789	0-802	0-815	0-828	0-841	0-854	0-867	374	8-115	8-127	8-139	8-151	8-163	8-174	8-186	8-198	8-210	8-222	6
07	0-880	0-893	0-905	0-917	0-930	0-943	0-956	0-969	0-982	0-995	373	8-165	8-177	8-189	8-201	8-213	8-224	8-236	8-248	8-260	8-272	7
08	1-008	1-020	1-033	1-046	1-059	1-072	1-085	1-098	1-111	1-124	372	8-215	8-227	8-239	8-251	8-263	8-274	8-286	8-298	8-310	8-322	8
09	1-187	1-150	1-162	1-175	1-188	1-201	1-214	1-227	1-240	1-253	371	8-263	8-275	8-287	8-299	8-311	8-322	8-334	8-346	8-358	8-370	9
10	1-274	1-279	1-292	1-305	1-318	1-331	1-344	1-357	1-370	1-383	370	8-311	8-323	8-335	8-347	8-359	8-370	8-382	8-394	8-406	8-418	10
11	1-391	1-409	1-422	1-435	1-448	1-461	1-474	1-487	1-500	1-513	369	8-359	8-371	8-383	8-395	8-407	8-418	8-430	8-442	8-454	8-466	11
12	1-527	1-540	1-553	1-566	1-580	1-593	1-606	1-619	1-632	1-645	368	8-407	8-419	8-431	8-443	8-455	8-466	8-478	8-490	8-502	8-514	12
13	1-661	1-673	1-687	1-700	1-714	1-727	1-741	1-754	1-768	1-781	367	8-455	8-467	8-479	8-491	8-503	8-514	8-526	8-538	8-550	8-562	13
14	1-795	1-808	1-821	1-835	1-848	1-861	1-875	1-888	1-901	1-914	366	8-503	8-515	8-527	8-539	8-551	8-562	8-574	8-586	8-598	8-610	14
15	1-824	1-842	1-855	1-869	1-882	1-896	1-909	1-922	1-936	1-949	365	8-551	8-563	8-575	8-587	8-599	8-610	8-622	8-634	8-646	8-658	15
16	2-064	2-078	2-092	2-105	2-119	2-133	2-146	2-160	2-174	2-187	364	8-599	8-611	8-623	8-635	8-647	8-658	8-670	8-682	8-694	8-706	16
17	2-201	2-215	2-229	2-243	2-257	2-271	2-285	2-299	2-313	2-327	363	8-647	8-659	8-671	8-683	8-695	8-706	8-718	8-730	8-742	8-754	17
18	2-341	2-355	2-369	2-383	2-397	2-411	2-425	2-439	2-454	2-468	362	8-695	8-707	8-719	8-731	8-743	8-754	8-766	8-778	8-790	8-802	18
19	2-483	2-497	2-512	2-526	2-541	2-555	2-570	2-584	2-599	2-614	361	8-743	8-755	8-767	8-779	8-791	8-802	8-814	8-826	8-838	8-850	19
20	2-629	2-643	2-658	2-672	2-687	2-701	2-716	2-730	2-744	2-759	360	8-791	8-803	8-815	8-827	8-839	8-850	8-862	8-874	8-886	8-898	20
21	2-774	2-789	2-804	2-819	2-834	2-849	2-863	2-878	2-893	2-908	359	8-839	8-851	8-863	8-875	8-887	8-898	8-910	8-922	8-934	8-946	21
22	2-922	2-937	2-953	2-968	2-984	2-999	3-015	3-030	3-046	3-061	358	8-887	8-899	8-911	8-923	8-935	8-946	8-958	8-970	8-982	8-994	22
23	3-070	3-085	3-101	3-116	3-132	3-147	3-163	3-178	3-194	3-209	357	8-935	8-947	8-959	8-971	8-983	8-994	9-006	9-018	9-030	9-042	23
24	3-238	3-253	3-269	3-284	3-299	3-315	3-330	3-346	3-361	3-377	356	8-983	8-995	9-007	9-019	9-031	9-042	9-054	9-066	9-078	9-090	24
25	3-393	3-409	3-425	3-441	3-457	3-473	3-489	3-505	3-521	3-537	355	9-031	9-043	9-055	9-067	9-079	9-090	9-102	9-114	9-126	9-138	25
26	3-559	3-575	3-591	3-607	3-623	3-639	3-655	3-671	3-687	3-703	354	9-079	9-091	9-103	9-115	9-127	9-138	9-150	9-162	9-174	9-186	26
27	3-729	3-745	3-761	3-777	3-793	3-809	3-825	3-841	3-857	3-873	353	9-127	9-139	9-151	9-163	9-175	9-186	9-198	9-210	9-222	9-234	27
28	3-906	3-924	3-943	3-961	3-980	3-998	4-017	4-035	4-054	4-072	352	9-175	9-187	9-199	9-211	9-223	9-234	9-246	9-258	9-270	9-282	28
29	4-091	4-110	4-129	4-148	4-167	4-186	4-205	4-224	4-243	4-262	351	9-223	9-235	9-247	9-259	9-271	9-282	9-294	9-306	9-318	9-330	29
30	4-282	4-303	4-328	4-344	4-364	4-385	4-405	4-426	4-446	4-466	350	9-271	9-283	9-295	9-307	9-319	9-330	9-342	9-354	9-366	9-378	30
31	4-486	4-506	4-529	4-549	4-571	4-592	4-618	4-634	4-655	4-676	349	9-319	9-331	9-343	9-355	9-367	9-378	9-390	9-402	9-414	9-426	31
32	4-689	4-722	4-745	4-768	4-791	4-814	4-837	4-860	4-883	4-906	348	9-367	9-379	9-391	9-403	9-415	9-426	9-438	9-450	9-462	9-474	32
33	4-929	4-953	4-977	5-002	5-027	5-052	5-077	5-102	5-126	5-152	347	9-415	9-427	9-439	9-451	9-463	9-474	9-486	9-498	9-510	9-522	33
34	5-177	5-206	5-235	5-263	5-292	5-321	5-349	5-378	5-407	5-436	346	9-463	9-475	9-487	9-499	9-511	9-522	9-534	9-546	9-558	9-570	34
35	5-466	5-496	5-529	5-561	5-594	5-626	5-659	5-692	5-725	5-758	345	9-511	9-523	9-535	9-547	9-559	9-570	9-582	9-594	9-606	9-618	35
36	5-790	5-830	5-870	5-910	5-950	5-990	6-030	6-070	6-111	6-152	344	9-559	9-571	9-583	9-595	9-607	9-618	9-630	9-642	9-654	9-666	36
37	6-183	6-230	6-277	6-324	6-371	6-418	6-465	6-512	6-559	6-606	343	9-607	9-619	9-631	9-643	9-655	9-666	9-678	9-690	9-702	9-714	37
38	6-248	6-253	6-258	6-263	6-269	6-276	6-281	6-288	6-293	6-298	342	9-655	9-667	9-679	9-691	9-703	9-714	9-726	9-738	9-750	9-762	38
39	6-304	6-309	6-316	6-322	6-328	6-334	6-340	6-346	6-352	6-358	341	9-703	9-715	9-727	9-739	9-751	9-762	9-774	9-786	9-798	9-810	39
40	6-364	6-370	6-376	6-382	6-388	6-395	6-401	6-407	6-413	6-420	340	9-751	9-763	9-775	9-787	9-799	9-810	9-822	9-834	9-846	9-858	40
41	6-427	6-431	6-441	6-448	6-455	6-463	6-470	6-478	6-485	6-494	339	9-799	9-811	9-823	9-835	9-847	9-858	9-870	9-882	9-894	9-906	41
42	6-501	6-505	6-515	6-522	6-529	6-537	6-543	6-550	6-557	6-564	338	9-847	9-859	9-871	9-883	9-895	9-906	9-918	9-930	9-942	9-954	42
43	6-571	6-578	6-585	6-592	6-599	6-607	6-614	6-621	6-628	6-635	337	9-895	9-907	9-919	9-931	9-943	9-954	9-966	9-978	9-990	10-002	43
44	6-641	6-650	6-657	6-665	6-672	6-680	6-686	6-694	6-703	6-711	336	9-943	9-955	9-967	9-979	9-991	10-002	10-014	10-026	10-038	10-050	44
45	6-717	6-724	6-732	6-740	6-748	6-757	6-765	6-773	6-782	6-790	335	9-991	10-003	10-015	10-027	10-039	10-050	10-062	10-074	10-086	10-098	45
46	6-783	6-791	6-799	6-807	6-815	6-823	6-832	6-840	6-848	6-856	334	10-039	10-051	10-063	10-075	10-087	10-098	10-110	10-122	10-134	10-146	46
47	6-858	6-871	6-884	6-897	6-910	6-923	6-936	6-948	6-961	6-974	333	10-087	10-099	10-111	10-123	10-135	10-146	10-158	10-170	10-182	10-194	47
48	6-934	6-947	6-960	6-973	6-986	6-999	7-012	7-025	7-038	7-051	332	10-135	10-147	10-159	10-171	10-183	10-194	10-206	10-218	10-230	10-242	48
49	7-010	7-019	7-028	7-037	7-046	7-055	7-064	7-073	7-082	7-091	331	10-183	10-195	10-207	10-219	10-231	10-242	10-254	10-266	10-278	10-290	49

g-EYE-TABLE FOR YOGAS.

Moon's anomaly and moon's equation of the centre in days and fractions of a day.

(ARYA SIDDHANTA.)

Eqn.	0	1	2	3	4	5	6	7	8	9	Eqn.	0	1	2	3	4	5	6	7	8	9	Eqn.	0	1	2	3	4	5	6	7	8	9	Eqn.	0	1	2	3	4	5	6	7	8	9	Eqn.	0	1	2	3	4	5	6	7	8	9	Eqn.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
47	0000	0013	0026	0040	0053	0066	0080	0093	0106	0119	354	0132	0145	0158	0171	0184	0197	0210	0223	0236	0249	355	0262	0275	0288	0301	0314	0327	0340	0353	0366	0379	0392	0405	0418	0431	0444	0457	0470	0483	0496	0509	0522	0535	0548	0561	0574	0587	0600	0613	0626	0639	0652	0665	0678	0691	0704	0717	0730	0743	0756	0769	0782	0795	0808	0821	0834	0847	0860	0873	0886	0899	0912	0925	0938	0951	0964	0977	0990	1003	1016	1029	1042	1055	1068	1081	1094	1107	1120	1133	1146	1159	1172	1185	1198	1211	1224	1237	1250	1263	1276	1289	1302	1315	1328	1341	1354	1367	1380	1393	1406	1419	1432	1445	1458	1471	1484	1497	1510	1523	1536	1549	1562	1575	1588	1601	1614	1627	1640	1653	1666	1679	1692	1705	1718	1731	1744	1757	1770	1783	1796	1809	1822	1835	1848	1861	1874	1887	1900	1913	1926	1939	1952	1965	1978	1991	2004	2017	2030	2043	2056	2069	2082	2095	2108	2121	2134	2147	2160	2173	2186	2199	2212	2225	2238	2251	2264	2277	2290	2303	2316	2329	2342	2355	2368	2381	2394	2407	2420	2433	2446	2459	2472	2485	2498	2511	2524	2537	2550	2563	2576	2589	2602	2615	2628	2641	2654	2667	2680	2693	2706	2719	2732	2745	2758	2771	2784	2797	2810	2823	2836	2849	2862	2875	2888	2901	2914	2927	2940	2953	2966	2979	2992	3005	3018	3031	3044	3057	3070	3083	3096	3109	3122	3135	3148	3161	3174	3187	3200	3213	3226	3239	3252	3265	3278	3291	3304	3317	3330	3343	3356	3369	3382	3395	3408	3421	3434	3447	3460	3473	3486	3499	3512	3525	3538	3551	3564	3577	3590	3603	3616	3629	3642	3655	3668	3681	3694	3707	3720	3733	3746	3759	3772	3785	3798	3811	3824	3837	3850	3863	3876	3889	3902	3915	3928	3941	3954	3967	3980	3993	4006	4019	4032	4045	4058	4071	4084	4097	4110	4123	4136	4149	4162	4175	4188	4201	4214	4227	4240	4253	4266	4279	4292	4305	4318	4331	4344	4357	4370	4383	4396	4409	4422	4435	4448	4461	4474	4487	4500	4513	4526	4539	4552	4565	4578	4591	4604	4617	4630	4643	4656	4669	4682	4695	4708	4721	4734	4747	4760	4773	4786	4799	4812	4825	4838	4851	4864	4877	4890	4903	4916	4929	4942	4955	4968	4981	4994	5007	5020	5033	5046	5059	5072	5085	5098	5111	5124	5137	5150	5163	5176	5189	5202	5215	5228	5241	5254	5267	5280	5293	5306	5319	5332	5345	5358	5371	5384	5397	5410	5423	5436	5449	5462	5475	5488	5501	5514	5527	5540	5553	5566	5579	5592	5605	5618	5631	5644	5657	5670	5683	5696	5709	5722	5735	5748	5761	5774	5787	5800	5813	5826	5839	5852	5865	5878	5891	5904	5917	5930	5943	5956	5969	5982	5995	6008	6021	6034	6047	6060	6073	6086	6099	6112	6125	6138	6151	6164	6177	6190	6203	6216	6229	6242	6255	6268	6281	6294	6307	6320	6333	6346	6359	6372	6385	6398	6411	6424	6437	6450	6463	6476	6489	6502	6515	6528	6541	6554	6567	6580	6593	6606	6619	6632	6645	6658	6671	6684	6697	6710	6723	6736	6749	6762	6775	6788	6801	6814	6827	6840	6853	6866	6879	6892	6905	6918	6931	6944	6957	6970	6983	6996	7009	7022	7035	7048	7061	7074	7087	7100	7113	7126	7139	7152	7165	7178	7191	7204	7217	7230	7243	7256	7269	7282	7295	7308	7321	7334	7347	7360	7373	7386	7399	7412	7425	7438	7451	7464	7477	7490	7503	7516	7529	7542	7555	7568	7581	7594	7607	7620	7633	7646	7659	7672	7685	7698	7711	7724	7737	7750	7763	7776	7789	7802	7815	7828	7841	7854	7867	7880	7893	7906	7919	7932	7945	7958	7971	7984	7997	8010	8023	8036	8049	8062	8075	8088	8101	8114	8127	8140	8153	8166	8179	8192	8205	8218	8231	8244	8257	8270	8283	8296	8309	8322	8335	8348	8361	8374	8387	8400	8413	8426	8439	8452	8465	8478	8491	8504	8517	8530	8543	8556	8569	8582	8595	8608	8621	8634	8647	8660	8673	8686	8699	8712	8725	8738	8751	8764	8777	8790	8803	8816	8829	8842	8855	8868	8881	8894	8907	8920	8933	8946	8959	8972	8985	8998	9011	9024	9037	9050	9063	9076	9089	9102	9115	9128	9141	9154	9167	9180	9193	9206	9219	9232	9245	9258	9271	9284	9297	9310	9323	9336	9349	9362	9375	9388	9401	9414	9427	9440	9453	9466	9479	9492	9505	9518	9531	9544	9557	9570	9583	9596	9609	9622	9635	9648	9661	9674	9687	9700	9713	9726	9739	9752	9765	9778	9791	9804	9817	9830	9843	9856	9869	9882	9895	9908	9921	9934	9947	9960	9973	9986	10000	10013	10026	10039	10052	10065	10078	10091	10104	10117	10130	10143	10156	10169	10182	10195	10208	10221	10234	10247	10260	10273	10286	10299	10312	10325	10338	10351	10364	10377	10390	10403	10416	10429	10442	10455	10468	10481	10494	10507	10520	10533	10546	10559	10572	10585	10598	10611	10624	10637	10650	10663	10676	10689	10702	10715	10728	10741	10754	10767	10780	10793	10806	10819	10832	10845	10858	10871	10884	10897	10910	10923	10936	10949	10962	10975	10988	11001	11014	11027	11040	11053	11066	11079	11092	11105	11118	11131	11144	11157	11170	11183	11196	11209	11222	11235	11248	11261	11274	11287	11300	11313	11326	11339	11352	11365	11378	11391	11404	11417	11430	11443	11456	11469	11482	11495	11508	11521	11534	11547	11560	11573	11586	11599	11612	11625	11638	11651	11664	11677	11690	11703	11716	11729	11742	11755	11768	11781	11794	11807	11820	11833	11846	11859	11872	11885	11898	11911	11924	11937	11950	11963	11976	11989	12002	12015	12028	12041	12054	12067	12080	12093	12106	12119	12132	12145	12158	12171	12184	12197	12210	12223	12236	12249	12262	12275	12288	12301	12314	12327	12340	12353	12366	12379	12392	12405	12418	12431	12444	12457	12470	12483	12496	12509	12522	12535	12548	12561	12574	12587	12600	12613	12626	12639	12652	12665	12678	12691	12704	12717	12730	12743	12756	12769	12782	12795	12808	12821	12834	12847	12860	12873	12886	12899	12912	12925	12938	12951	12964	12977	12990	13003	13016	13029	13042	13055	13068	13081	13094	13107	13120	13133	13146	13159	13172	13185	13198	13211	13224	13237	13250	13263	13276	13289	13302	13315	13328	13341	13354	13367	13380	13393	13406	13419	13432	13445	13458	13471	13484	13497	13510	13523	13536	13549	13562	13575	13588	13601	13614	13627	13640	13653	13666	13679	13692	13705	13718	13731	13744	13757	13770	13783	13796	13809	13822	13835	13848	13861	13874	13887	13900	13913	13926	13939	13952	13965	13978	13991	14004	14017	14030	14043	14056	14069	14082	14095	14108	14121	14134	14147	14160	14173	14186	14199	14212	14225	14238	14251	14264	14277	14290	14303	14316	14329	14342	14355	14368	14381	14394	14407	14420	14433	14446	14459	14472	14485	14498	14511	14524	14537	14550	14563	14576	14589	14602	14615	14628	14641	14654	14667	14680	14693	14706	14719	14732	14745	14758	14771	14784	14797	14810	14823	14836	14849	14862	14875	14888	14901	14914	14927	14940	14953	14966	14979	14992	15005	15018	15031	15044	15057	15070	15083	15096	15109	15122	15135	15148	15161	15174	15187	15200	15213	15226	15239	15252	15265	15278	15291	15304	15317	15330	15343	15356	15369	15382	15395	15408	15421	15434	15447	15460	15473	15486	15499	15512	15525	15538	15551	15564	15577	15590	15603	15616	15629	15642	15655	15668	15681	15694	15707	15720	15733	15746	15759	15772	15785	15798	15811	15824	15837	15850	15863	15876	15889	15902	15915	15928	15941	15954	15967	15980	15993	16006	16019	16032	16045	16058	16071	16084	16097	16110	16123	16136	16149	16162	16175	16188	16201	16214	16227	16240	16253	16

g-EYE-TABLE FOR YOGAS--continued.

Moon's anomaly and moon's equation of the centre in days and fractions of a day.
(ĀRYA SIDDHĀNTA.)

[illegible]

h-EYE-TABLE FOR TITHIS.
Sun's anomaly and equation of the centre expressed in days and fractions of a day.
(**ĀRYA SIDDHĀNTA.**)

Eqn.	9	8	7	6	5	4	3	2	1	0	Eqn.	0	1	2	3	4	5	6	7	8	9
+173	1.23	1.38	1.52	1.66	1.80	1.94	2.08	2.22	2.36	2.50	0.92	0.00	81.62	81.95	82.28	82.61	82.94	83.28	83.61	83.94	84.28
+172	2.64	2.78	2.92	3.06	3.20	3.34	3.48	3.62	3.76	3.90	0.01	0.01	84.93	85.26	85.59	85.92	86.26	86.59	86.93	87.26	87.60
+171	4.04	4.18	4.32	4.46	4.60	4.73	4.86	4.99	5.12	5.25	0.02	0.02	88.25	88.58	88.91	89.24	89.58	89.92	90.26	90.60	90.93
+170	5.45	5.59	5.73	5.87	6.00	6.13	6.26	6.39	6.52	6.65	0.03	0.03	91.59	91.92	92.25	92.58	92.92	93.26	93.60	93.94	94.28
+169	6.85	6.99	7.13	7.27	7.40	7.53	7.66	7.79	7.92	8.05	0.04	0.04	94.99	95.32	95.65	95.98	96.32	96.66	97.00	97.34	97.68
+168	8.25	8.39	8.53	8.67	8.80	8.93	9.06	9.19	9.32	9.45	0.05	0.05	98.39	98.72	99.05	99.38	99.72	100.06	100.40	100.74	101.08
+167	9.65	9.79	9.93	10.07	10.20	10.33	10.46	10.59	10.72	10.85	0.06	0.06	101.79	102.12	102.45	102.78	103.12	103.46	103.80	104.14	104.48
+166	11.05	11.19	11.33	11.46	11.59	11.72	11.85	11.98	12.11	12.24	0.07	0.07	105.19	105.52	105.85	106.18	106.52	106.86	107.20	107.54	107.88
+165	12.45	12.59	12.73	12.86	12.99	13.12	13.25	13.38	13.51	13.64	0.08	0.08	108.59	108.92	109.25	109.58	110.00	110.34	110.68	111.02	111.36
+164	13.85	13.99	14.13	14.26	14.39	14.52	14.65	14.78	14.91	15.04	0.09	0.09	111.99	112.32	112.65	112.98	113.32	113.66	114.00	114.34	114.68
+163	15.25	15.39	15.53	15.66	15.79	15.92	16.05	16.18	16.31	16.44	0.10	0.10	115.39	115.72	116.05	116.38	116.72	117.06	117.40	117.74	118.08
+162	16.65	16.79	16.93	17.06	17.19	17.32	17.45	17.58	17.71	17.84	0.11	0.11	118.79	119.12	119.45	119.78	120.12	120.46	120.80	121.14	121.48
+161	18.05	18.19	18.33	18.46	18.59	18.72	18.85	18.98	19.11	19.24	0.12	0.12	122.19	122.52	122.85	123.18	123.52	123.86	124.20	124.54	124.88
+160	19.45	19.59	19.73	19.86	19.99	20.12	20.25	20.38	20.51	20.64	0.13	0.13	125.59	125.92	126.25	126.58	126.92	127.26	127.60	127.94	128.28
+159	20.85	20.99	21.13	21.26	21.39	21.52	21.65	21.78	21.91	22.04	0.14	0.14	128.99	129.32	129.65	130.00	130.34	130.68	131.02	131.36	131.70
+158	22.25	22.39	22.53	22.66	22.79	22.92	23.05	23.18	23.31	23.44	0.15	0.15	132.39	132.72	133.05	133.38	133.72	134.06	134.40	134.74	135.08
+157	23.65	23.79	23.93	24.06	24.19	24.32	24.45	24.58	24.71	24.84	0.16	0.16	135.79	136.12	136.45	136.78	137.12	137.46	137.80	138.14	138.48
+156	25.05	25.19	25.33	25.46	25.59	25.72	25.85	25.98	26.11	26.24	0.17	0.17	139.19	139.52	139.85	140.18	140.52	140.86	141.20	141.54	141.88
+155	26.45	26.59	26.73	26.86	26.99	27.12	27.25	27.38	27.51	27.64	0.18	0.18	142.59	142.92	143.25	143.58	143.92	144.26	144.60	144.94	145.28
+154	27.85	27.99	28.13	28.26	28.39	28.52	28.65	28.78	28.91	29.04	0.19	0.19	145.99	146.32	146.65	146.98	147.32	147.66	148.00	148.34	148.68
+153	29.25	29.39	29.53	29.66	29.79	29.92	30.05	30.18	30.31	30.44	0.20	0.20	149.39	149.72	150.05	150.38	150.72	151.06	151.40	151.74	152.08
+152	30.65	30.79	30.93	31.06	31.19	31.32	31.45	31.58	31.71	31.84	0.21	0.21	152.79	153.12	153.45	153.78	154.12	154.46	154.80	155.14	155.48
+151	32.05	32.19	32.33	32.46	32.59	32.72	32.85	32.98	33.11	33.24	0.22	0.22	156.19	156.52	156.85	157.18	157.52	157.86	158.20	158.54	158.88
+150	33.45	33.59	33.73	33.86	33.99	34.12	34.25	34.38	34.51	34.64	0.23	0.23	159.59	160.00	160.41	160.82	161.23	161.64	162.05	162.46	162.87
+149	34.85	34.99	35.13	35.26	35.39	35.52	35.65	35.78	35.91	36.04	0.24	0.24	162.99	163.40	163.81	164.22	164.63	165.04	165.45	165.86	166.27
+148	36.25	36.39	36.53	36.66	36.79	36.92	37.05	37.18	37.31	37.44	0.25	0.25	166.39	166.80	167.21	167.62	168.03	168.44	168.85	169.26	169.67
+147	37.65	37.79	37.93	38.06	38.19	38.32	38.45	38.58	38.71	38.84	0.26	0.26	169.79	170.20	170.61	171.02	171.43	171.84	172.25	172.66	173.07
+146	39.05	39.19	39.33	39.46	39.59	39.72	39.85	39.98	40.11	40.24	0.27	0.27	173.19	173.60	174.01	174.42	174.83	175.24	175.65	176.06	176.47
+145	40.45	40.59	40.73	40.86	40.99	41.12	41.25	41.38	41.51	41.64	0.28	0.28	176.59	177.00	177.41	177.82	178.23	178.64	179.05	179.46	179.87
+144	41.85	41.99	42.13	42.26	42.39	42.52	42.65	42.78	42.91	43.04	0.29	0.29	180.00	180.41	180.82	181.23	181.64	182.05	182.46	182.87	183.28
+143	43.25	43.39	43.53	43.66	43.79	43.92	44.05	44.18	44.31	44.44	0.30	0.30	183.40	183.81	184.22	184.63	185.04	185.45	185.86	186.27	186.68
+142	44.65	44.79	44.93	45.06	45.19	45.32	45.45	45.58	45.71	45.84	0.31	0.31	186.80	187.21	187.62	188.03	188.44	188.85	189.26	189.67	190.08
+141	46.05	46.19	46.33	46.46	46.59	46.72	46.85	46.98	47.11	47.24	0.32	0.32	190.00	190.41	190.82	191.23	191.64	192.05	192.46	192.87	193.28
+140	47.45	47.59	47.73	47.86	47.99	48.12	48.25	48.38	48.51	48.64	0.33	0.33	193.20	193.61	194.02	194.43	194.84	195.25	195.66	196.07	196.48
+139	48.85	48.99	49.13	49.26	49.39	49.52	49.65	49.78	49.91	50.04	0.34	0.34	196.40	196.81	197.22	197.63	198.04	198.45	198.86	199.27	199.68
+138	50.25	50.39	50.53	50.66	50.79	50.92	51.05	51.18	51.31	51.44	0.35	0.35	199.60	200.01	200.42	200.83	201.24	201.65	202.06	202.47	202.88
+137	51.65	51.79	51.93	52.06	52.19	52.32	52.45	52.58	52.71	52.84	0.36	0.36	202.80	203.21	203.62	204.03	204.44	204.85	205.26	205.67	206.08
+136	53.05	53.19	53.33	53.46	53.59	53.72	53.85	53.98	54.11	54.24	0.37	0.37	206.00	206.41	206.82	207.23	207.64	208.05	208.46	208.87	209.28
+135	54.45	54.59	54.73	54.86	54.99	55.12	55.25	55.38	55.51	55.64	0.38	0.38	209.20	209.61	210.02	210.43	210.84	211.25	211.66	212.07	212.48
+134	55.85	55.99	56.13	56.26	56.39	56.52	56.65	56.78	56.91	57.04	0.39	0.39	212.40	212.81	213.22	213.63	214.04	214.45	214.86	215.27	215.68
+133	57.25	57.39	57.53	57.66	57.79	57.92	58.05	58.18	58.31	58.44	0.40	0.40	215.60	216.01	216.42	216.83	217.24	217.65	218.06	218.47	218.88
+132	58.65	58.79	58.93	59.06	59.19	59.32	59.45	59.58	59.71	59.84	0.41	0.41	218.80	219.21	219.62	220.03	220.44	220.85	221.26	221.67	222.08
+131	60.05	60.19	60.33	60.46	60.59	60.72	60.85	60.98	61.11	61.24	0.42	0.42	222.00	222.41	222.82	223.23	223.64	224.05	224.46	224.87	225.28
+130	61.45	61.59	61.73	61.86	61.99	62.12	62.25	62.38	62.51	62.64	0.43	0.43	225.20	225.61	226.02	226.43	226.84	227.25	227.66	228.07	228.48
+129	62.85	62.99	63.13	63.26	63.39	63.52	63.65	63.78	63.91	64.04	0.44	0.44	228.40	228.81	229.22	229.63	230.04	230.45	230.86	231.27	231.68
+128	64.25	64.39	64.53	64.66	64.79	64.92	65.05	65.18	65.31	65.44	0.45	0.45	231.60	232.01	232.42	232.83	233.24	233.65	234.06	234.47	234.88
+127	65.65	65.79	65.93	66.06	66.19	66.32	66.45	66.58	66.71	66.84	0.46	0.46	234.80	235.21	235.62	236.03	236.44	236.85	237.26	237.67	238.08
+126	67.05	67.19	67.33	67.46	67.59	67.72	67.85	67.98	68.11	68.24	0.47	0.47	238.00	238.41	238.82	239.23	239.64	240.05	240.46	240.87	241.28
+125	68.45	68.59	68.73	68.86	68.99	69.12	69.25	69.38	69.51	69.64	0.48	0.48	241.20	241.61	242.02	242.43	242.84	243.25	243.66	244.07	244.48
+124	69.85	69.99	70.13	70.26	70.39	70.52	70.65	70.78	70.91	71.04	0.49	0.49	244.40	244.81	245.22	245.63	246.04	246.45	246.86	247.27	247.68
+123	71.25	71.39	71.53	71.66	71.79	71.92	72.05	72.18	72.31	72.44	0.50	0.50	247.60	248.01	248.42	248.83	249.24	249.65	250.06	250.47	250.88
+122	72.65	72.79	72.93	73.06	73.19	73.32	73.45	73.58	73.71	73.84	0.51	0.51	250.80	251.21	251						

e-EYE-TABLE FOR TITHIS—(BRAHMA SIDDHĀNTA AND SIDDHĀNTA ŚĪROMANĪ.)
Moon's anomaly and equation of the centre expressed in days and fractions of a day.

[illegible]

e-EYE-TABLE FOR TITHIS—(BRAHMA SIDDHANTA AND SIDDHANTA ŚIROMANI)—continued.
Moon's anomaly and equation of the centre expressed in days and fractions of a day.

Eqn.	0	1	2	3	4	5	6	7	8	9	Eqn.	+	9	8	7	6	5	4	3	2	1	0
00	13.777	13.787	13.796	13.806	13.815	13.825	13.834	13.844	13.854	13.863	413	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
01	13.873	13.882	13.892	13.902	13.911	13.921	13.931	13.941	13.950	13.960	412	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
02	13.970	13.979	13.989	13.999	14.009	14.019	14.028	14.037	14.047	14.057	411	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
03	14.066	14.076	14.086	14.096	14.106	14.115	14.124	14.134	14.144	14.153	410	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
04	14.163	14.173	14.182	14.192	14.202	14.212	14.221	14.230	14.240	14.250	409	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
05	14.269	14.279	14.289	14.299	14.309	14.318	14.327	14.337	14.347	14.357	408	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
06	14.366	14.376	14.386	14.396	14.405	14.414	14.424	14.434	14.443	14.453	407	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
07	14.463	14.473	14.483	14.493	14.502	14.511	14.521	14.531	14.541	14.551	406	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
08	14.561	14.571	14.581	14.591	14.601	14.611	14.621	14.631	14.641	14.651	405	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
09	14.651	14.661	14.671	14.681	14.691	14.701	14.711	14.721	14.731	14.741	404	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
10	14.751	14.761	14.771	14.781	14.791	14.801	14.811	14.820	14.830	14.840	403	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
11	14.850	14.860	14.870	14.880	14.890	14.900	14.910	14.920	14.930	14.940	402	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
12	14.950	14.960	14.970	14.980	14.990	15.000	15.010	15.021	15.031	15.041	401	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
13	15.052	15.063	15.073	15.083	15.094	15.105	15.115	15.126	15.136	15.147	400	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
14	15.157	15.168	15.178	15.189	15.199	15.210	15.220	15.231	15.241	15.252	399	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
15	15.262	15.272	15.283	15.293	15.304	15.314	15.325	15.335	15.346	15.356	398	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
16	15.367	15.377	15.388	15.398	15.409	15.419	15.430	15.440	15.451	15.461	397	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
17	15.472	15.482	15.493	15.503	15.514	15.524	15.535	15.545	15.556	15.566	396	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
18	15.577	15.587	15.598	15.608	15.619	15.630	15.641	15.652	15.663	15.674	395	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
19	15.685	15.696	15.707	15.718	15.729	15.740	15.751	15.762	15.773	15.784	394	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
20	15.795	15.805	15.817	15.828	15.839	15.850	15.861	15.872	15.883	15.894	393	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
21	15.905	15.916	15.927	15.938	15.949	15.961	15.973	15.985	15.997	16.009	392	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
22	16.021	16.032	16.043	16.054	16.065	16.076	16.087	16.098	16.109	16.120	391	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
23	16.140	16.152	16.163	16.175	16.186	16.198	16.210	16.222	16.234	16.246	390	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
24	16.260	16.272	16.284	16.296	16.308	16.320	16.332	16.344	16.356	16.368	389	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
25	16.380	16.392	16.404	16.416	16.428	16.441	16.454	16.467	16.480	16.493	388	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
26	16.506	16.519	16.532	16.545	16.558	16.571	16.584	16.597	16.610	16.623	387	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
27	16.636	16.649	16.662	16.675	16.688	16.701	16.714	16.727	16.740	16.753	386	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
28	16.766	16.777	16.788	16.800	16.812	16.824	16.836	16.848	16.861	16.873	385	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
29	16.905	16.919	16.933	16.947	16.961	16.975	16.989	17.003	17.018	17.033	384	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
30	17.047	17.063	17.077	17.092	17.107	17.122	17.137	17.152	17.167	17.182	383	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
31	17.197	17.213	17.228	17.244	17.260	17.276	17.292	17.308	17.324	17.340	382	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
32	17.356	17.372	17.388	17.405	17.422	17.439	17.456	17.473	17.490	17.507	381	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
33	17.624	17.641	17.658	17.675	17.692	17.709	17.726	17.743	17.760	17.777	380	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
34	17.695	17.713	17.730	17.748	17.765	17.783	17.800	17.818	17.836	17.854	379	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
35	17.868	17.886	17.903	17.920	17.938	17.955	17.973	17.991	18.009	18.027	378	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
36	18.060	18.080	18.100	18.120	18.140	18.160	18.180	18.200	18.220	18.240	377	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
37	18.275	18.301	18.327	18.353	18.379	18.405	18.431	18.457	18.483	18.509	376	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
38	18.536	18.563	18.590	18.618	18.646	18.674	18.702	18.730	18.758	18.786	375	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
39	18.814	18.842	18.873	18.906	18.941	18.976	19.011	19.046	19.081	19.116	374	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
400	19.167	19.171	19.175	19.179	19.183	19.187	19.191	19.196	19.201	19.206	373	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
401	19.210	19.215	19.220	19.225	19.230	19.235	19.240	19.245	19.250	19.255	372	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
402	19.259	19.264	19.269	19.274	19.279	19.284	19.289	19.294	19.299	19.304	371	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
403	19.308	19.313	19.318	19.323	19.328	19.333	19.338	19.343	19.348	19.353	370	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
404	19.367	19.372	19.377	19.382	19.387	19.392	19.397	19.402	19.407	19.412	369	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
405	19.406	19.411	19.416	19.421	19.426	19.431	19.436	19.441	19.446	19.451	368	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
406	19.455	19.460	19.465	19.470	19.475	19.480	19.485	19.490	19.495	19.500	367	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
407	19.504	19.510	19.516	19.522	19.528	19.534	19.540	19.546	19.552	19.558	366	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	20.412	20.415
408	19.570	19.577	19.584	19.591	19.598	19.605	19.612	19.619	19.626	19.633	365	+	20.388	20.391	20.394	20.397	20.400	20.403	20.406	20.409	2	

MOON'S ANOMALY AND MOON'S EQUATION OF THE CENTRE IN DAYS AND FRACTIONS OF A DAY.
(BRAHMA SIDDHANTA AND SIDDHANTA SÍROMANĪ.)

[illegible]

g-EYE-TABLE FOR YOGAS.
 Moon's anomaly and equation of the centre expressed in days and fractions of a day.
 (BRAHMA SIDDHĀNTA AND SIDDHĀNTA ŚĪROMANĪ.)

Eqn.	0	1	2	3	4	5	6	7	8	9	Eqn.	0	1	2	3	4	5	6	7	8	9	Eqn.	0	1	2	3	4	5	6	7	8	9	Eqn.
	Moon's anomaly in days											Moon's anomaly in days											Moon's anomaly in days										
-00	0.000	0.014	0.028	0.041	0.054	0.067	0.080	0.093	0.106	0.120	-35	0.133	0.146	0.159	0.173	0.186	0.199	0.212	0.225	0.238	0.251	-36	0.264	0.277	0.290	0.303	0.316	0.329	0.342	0.355	0.368	0.381	-37
-01	0.132	0.146	0.159	0.173	0.187	0.200	0.213	0.226	0.240	0.254	-34	0.267	0.280	0.294	0.307	0.320	0.334	0.347	0.361	0.374	0.387	-33	0.400	0.414	0.428	0.441	0.455	0.468	0.481	0.495	0.508	0.522	-32
-02	0.267	0.280	0.294	0.307	0.320	0.334	0.347	0.361	0.374	0.387	-33	0.400	0.414	0.428	0.441	0.455	0.468	0.481	0.495	0.508	0.522	-32	0.535	0.549	0.562	0.576	0.589	0.602	0.615	0.629	0.642	0.656	-31
-03	0.401	0.414	0.428	0.441	0.454	0.468	0.481	0.495	0.508	0.522	-32	0.535	0.549	0.562	0.576	0.589	0.602	0.615	0.629	0.642	0.656	-31	0.669	0.682	0.695	0.709	0.722	0.735	0.749	0.762	0.776	0.789	-30
-04	0.535	0.547	0.561	0.575	0.588	0.602	0.614	0.628	0.642	0.656	-31	0.669	0.682	0.695	0.709	0.722	0.735	0.749	0.762	0.776	0.789	-30	0.802	0.816	0.829	0.843	0.856	0.869	0.882	0.896	0.909	0.922	-29
-05	0.669	0.682	0.695	0.709	0.722	0.735	0.749	0.762	0.776	0.789	-30	0.802	0.816	0.829	0.843	0.856	0.869	0.882	0.896	0.909	0.922	-29	0.935	0.949	0.962	0.975	0.988	1.001	1.014	1.027	1.040	1.053	-28
-06	0.802	0.816	0.829	0.843	0.856	0.869	0.882	0.896	0.909	0.922	-29	0.935	0.949	0.962	0.975	0.988	1.001	1.014	1.027	1.040	1.053	-28	1.066	1.080	1.093	1.106	1.119	1.132	1.145	1.158	1.171	1.184	-27
-07	0.935	0.952	0.965	0.979	0.993	1.007	1.021	1.034	1.048	1.062	-28	1.075	1.089	1.103	1.117	1.131	1.144	1.158	1.172	1.186	1.200	-27	1.213	1.227	1.241	1.254	1.268	1.282	1.295	1.309	1.323	1.337	-26
-08	1.066	1.075	1.090	1.105	1.117	1.131	1.144	1.158	1.172	1.186	-27	1.197	1.211	1.223	1.236	1.249	1.262	1.275	1.288	1.301	1.314	-26	1.327	1.340	1.353	1.366	1.379	1.392	1.405	1.418	1.431	1.444	-25
-09	1.197	1.213	1.227	1.241	1.254	1.268	1.282	1.295	1.309	1.323	-26	1.337	1.350	1.363	1.376	1.389	1.402	1.415	1.428	1.441	1.454	-25	1.467	1.480	1.493	1.506	1.519	1.532	1.545	1.558	1.571	1.584	-24
-10	1.351	1.364	1.378	1.391	1.405	1.419	1.433	1.447	1.461	1.474	-25	1.487	1.500	1.513	1.527	1.540	1.553	1.566	1.579	1.592	1.605	-24	1.618	1.631	1.644	1.657	1.670	1.683	1.696	1.709	1.722	1.735	-23
-11	1.488	1.502	1.516	1.530	1.544	1.558	1.572	1.587	1.602	1.617	-24	1.631	1.645	1.659	1.673	1.687	1.701	1.715	1.729	1.743	1.757	-23	1.771	1.785	1.799	1.813	1.827	1.841	1.855	1.869	1.883	1.897	-22
-12	1.632	1.647	1.661	1.675	1.690	1.705	1.719	1.733	1.747	1.761	-23	1.775	1.789	1.803	1.817	1.831	1.845	1.859	1.873	1.887	1.901	-22	1.915	1.929	1.943	1.957	1.971	1.985	1.999	2.013	2.027	2.041	-21
-13	1.776	1.791	1.805	1.819	1.833	1.847	1.862	1.876	1.891	1.905	-22	1.919	1.933	1.948	1.962	1.976	1.990	2.004	2.018	2.032	2.046	-21	2.060	2.074	2.088	2.102	2.116	2.130	2.144	2.158	2.172	2.186	-20
-14	1.919	1.933	1.948	1.963	1.978	1.992	2.006	2.020	2.034	2.049	-21	2.063	2.077	2.092	2.106	2.120	2.135	2.149	2.163	2.178	2.192	-20	2.206	2.220	2.234	2.249	2.263	2.277	2.291	2.305	2.319	2.333	-19
-15	2.063	2.077	2.092	2.106	2.120	2.135	2.149	2.163	2.178	2.192	-20	2.206	2.220	2.234	2.249	2.263	2.277	2.291	2.305	2.319	2.333	-19	2.347	2.361	2.375	2.389	2.403	2.417	2.431	2.445	2.459	2.473	-18
-16	2.207	2.222	2.237	2.252	2.267	2.282	2.297	2.312	2.327	2.342	-19	2.356	2.371	2.385	2.399	2.414	2.428	2.442	2.456	2.470	2.484	-18	2.498	2.512	2.526	2.540	2.554	2.568	2.582	2.596	2.610	2.624	-17
-17	2.357	2.371	2.385	2.400	2.414	2.428	2.442	2.456	2.470	2.484	-18	2.498	2.512	2.526	2.540	2.554	2.568	2.582	2.596	2.610	2.624	-17	2.638	2.652	2.666	2.680	2.694	2.708	2.722	2.736	2.750	2.764	-16
-18	2.505	2.520	2.535	2.550	2.565	2.580	2.595	2.610	2.625	2.640	-17	2.655	2.670	2.685	2.700	2.715	2.730	2.745	2.760	2.775	2.790	-16	2.805	2.820	2.835	2.850	2.865	2.880	2.895	2.910	2.925	2.940	-15
-19	2.653	2.674	2.690	2.706	2.722	2.738	2.754	2.770	2.786	2.802	-16	2.818	2.834	2.850	2.866	2.882	2.898	2.914	2.930	2.946	2.962	-15	2.978	2.994	3.010	3.026	3.042	3.058	3.074	3.090	3.106	3.122	-14
-20	2.819	2.835	2.853	2.869	2.886	2.903	2.918	2.934	2.950	2.966	-15	2.982	2.998	3.016	3.032	3.048	3.064	3.080	3.096	3.112	3.128	-14	3.144	3.160	3.176	3.192	3.208	3.224	3.240	3.256	3.272	3.288	-13
-21	2.982	2.999	3.016	3.032	3.048	3.064	3.080	3.096	3.112	3.128	-14	3.144	3.160	3.176	3.192	3.208	3.224	3.240	3.256	3.272	3.288	-13	3.304	3.320	3.336	3.352	3.368	3.384	3.400	3.416	3.432	3.448	-12
-22	3.144	3.160	3.176	3.192	3.208	3.224	3.240	3.256	3.272	3.288	-13	3.304	3.320	3.336	3.352	3.368	3.384	3.400	3.416	3.432	3.448	-12	3.464	3.480	3.496	3.512	3.528	3.544	3.560	3.576	3.592	3.608	-11
-23	3.313	3.330	3.348	3.366	3.384	3.402	3.420	3.438	3.456	3.473	-12	3.491	3.509	3.527	3.545	3.563	3.581	3.599	3.617	3.635	3.653	-11	3.671	3.689	3.707	3.725	3.743	3.761	3.779	3.797	3.815	3.833	-10
-24	3.490	3.508	3.526	3.544	3.561	3.579	3.597	3.614	3.632	3.651	-11	3.669	3.687	3.705	3.723	3.741	3.759	3.777	3.795	3.813	3.831	-10	3.849	3.867	3.885	3.903	3.921	3.939	3.957	3.975	3.993	4.011	-9
-25	3.670	3.689	3.707	3.725	3.743	3.763	3.783	3.801	3.820	3.838	-10	3.856	3.875	3.893	3.911	3.929	3.947	3.965	3.983	4.001	4.019	-9	4.037	4.055	4.073	4.091	4.109	4.127	4.145	4.163	4.181	4.199	-8
-26	3.858	3.878	3.898	3.918	3.937	3.955	3.975	3.995	4.015	4.035	-9	4.055	4.075	4.095	4.114	4.134	4.154	4.174	4.194	4.214	4.234	-8	4.254	4.274	4.294	4.314	4.334	4.354	4.374	4.394	4.414	4.434	-7
-27	4.055	4.075	4.095	4.114	4.134	4.154	4.174	4.194	4.214	4.234	-8	4.254	4.274	4.294	4.314	4.334	4.354	4.374	4.394	4.414	4.434	-7	4.454	4.474	4.494	4.514	4.534	4.554	4.574	4.594	4.614	4.634	-6
-28	4.264	4.285	4.306	4.326	4.347	4.368	4.389	4.410	4.432	4.454	-7	4.475	4.496	4.517	4.538	4.559	4.580	4.601	4.622	4.643	4.664	-6	4.685	4.706	4.727	4.748	4.769	4.790	4.811	4.832	4.853	4.874	-5
-29	4.488	4.510	4.532	4.554	4.576	4.598	4.620	4.642	4.664	4.686	-6	4.708	4.730	4.752	4.774	4.796	4.818	4.840	4.862	4.884	4.906	-5	4.928	4.950	4.972	4.994	5.016	5.038	5.060	5.082	5.104	5.126	-4
-30	4.723	4.746	4.773	4.798	4.823	4.848	4.873	4.898	4.923	4.949	-5	4.974	4.999	5.024	5.049	5.074	5.099	5.124	5.149	5.174	5.199	-4	5.224	5.249	5.274	5.299	5.324	5.349	5.374	5.399	5.424	5.449	-3
-31	4.975	5.001	5.026	5.053	5.079	5.105	5.131	5.157	5.183	5.209	-4	5.235	5.261	5.287	5.313	5.339	5.365	5.391	5.417	5.44													

g-EYE-TABLE FOR YOGAS—continued.
Moon's anomaly and equation of the centre expressed in days and fractions of a day.
(BRAHMA SIDDHĀNTA AND SIDDHĀNTA SĪROMANĪ.)

Yoga. +	0	1	2	3	4	5	6	7	8	9	Eqn. +	0	1	2	3	4	5	6	7	8	9	Moon's anomaly in days	0
00	13777	13789	13801	13812	13823	13834	13845	13856	13867	13879	35	20441	20453	20465	20477	20489	20501	20513	20525	20537	20549	20561	20573
01	13889	13901	13912	13924	13936	13947	13958	13969	13981	13993	34	21211	21223	21235	21247	21259	21271	21283	21295	21307	21319	21331	21343
02	14004	14015	14027	14039	14051	14062	14074	14085	14097	14108	33	21615	21627	21639	21651	21663	21675	21687	21699	21711	21723	21735	21747
03	14118	14129	14141	14152	14163	14175	14186	14198	14209	14221	32	22013	22025	22037	22049	22061	22073	22085	22097	22109	22121	22133	22145
04	14232	14242	14254	14266	14277	14289	14299	14311	14323	14335	31	22315	22327	22339	22351	22363	22375	22387	22399	22411	22423	22435	22447
05	14348	14357	14368	14380	14391	14402	14414	14425	14437	14449	30	22615	22627	22639	22651	22663	22675	22687	22699	22711	22723	22735	22747
06	14459	14471	14482	14494	14505	14516	14528	14539	14551	14563	29	22815	22827	22839	22851	22863	22875	22887	22899	22911	22923	22935	22947
07	14576	14587	14598	14610	14622	14634	14646	14657	14669	14681	28	23015	23027	23039	23051	23063	23075	23087	23099	23111	23123	23135	23147
08	14692	14704	14716	14728	14740	14751	14763	14775	14787	14799	27	23311	23323	23335	23347	23359	23371	23383	23395	23407	23419	23431	23443
09	14810	14822	14834	14845	14857	14869	14880	14892	14904	14916	26	23511	23523	23535	23547	23559	23571	23583	23595	23607	23619	23631	23643
10	14928	14939	14951	14962	14974	14986	14998	15010	15022	15033	25	23716	23728	23740	23752	23764	23776	23788	23800	23812	23824	23836	23848
11	15045	15057	15069	15081	15093	15105	15117	15130	15143	15156	24	23916	23928	23940	23952	23964	23976	23988	24000	24012	24024	24036	24048
12	15169	15182	15194	15206	15219	15232	15244	15256	15268	15280	23	24081	24093	24105	24117	24129	24141	24153	24165	24177	24189	24201	24213
13	15298	15306	15318	15330	15342	15354	15367	15379	15392	15404	22	24261	24273	24285	24297	24309	24321	24333	24345	24357	24369	24381	24393
14	15416	15428	15441	15454	15467	15479	15491	15503	15515	15528	21	24428	24440	24452	24464	24476	24488	24500	24512	24524	24536	24548	24560
15	15540	15552	15565	15577	15589	15602	15614	15627	15639	15651	20	24606	24618	24630	24642	24654	24666	24678	24690	24702	24714	24726	24738
16	15664	15677	15690	15703	15716	15729	15742	15755	15768	15781	19	24754	24766	24778	24790	24802	24814	24826	24838	24850	24862	24874	24886
17	15794	15806	15819	15832	15845	15858	15871	15884	15897	15910	18	24914	24926	24938	24950	24962	24974	24986	24998	25010	25022	25034	25046
18	15922	15935	15948	15961	15974	15987	16000	16013	16027	16041	17	25068	25080	25092	25104	25116	25128	25140	25152	25164	25176	25188	25200
19	16055	16069	16083	16097	16111	16125	16139	16153	16167	16181	16	25214	25226	25238	25250	25262	25274	25286	25298	25310	25322	25334	25346
20	16196	16211	16226	16240	16255	16269	16283	16297	16311	16325	15	25384	25396	25408	25420	25432	25444	25456	25468	25480	25492	25504	25516
21	16389	16354	16369	16383	16397	16411	16425	16439	16453	16467	14	25507	25519	25531	25543	25555	25567	25579	25591	25603	25615	25627	25639
22	16481	16495	16509	16524	16538	16554	16569	16584	16599	16614	13	25651	25663	25675	25687	25699	25711	25723	25735	25747	25759	25771	25783
23	16630	16645	16661	16677	16693	16709	16725	16741	16757	16772	12	25795	25807	25819	25831	25843	25855	25867	25879	25891	25903	25915	25927
24	16787	16803	16819	16835	16850	16866	16882	16897	16913	16930	11	25939	25951	25963	25975	25987	25999	26011	26023	26035	26047	26059	26071
25	16947	16964	16980	16996	17013	17030	17048	17064	17081	17097	10	26085	26097	26109	26121	26133	26145	26157	26169	26181	26193	26205	26217
26	17115	17133	17151	17169	17186	17202	17220	17238	17256	17274	09	26219	26231	26243	26255	26267	26279	26291	26303	26315	26327	26339	26351
27	17392	17310	17329	17348	17367	17386	17405	17424	17443	17462	08	26359	26371	26383	26395	26407	26419	26431	26443	26455	26467	26479	26491
28	17481	17500	17521	17541	17561	17581	17601	17622	17643	17664	07	26494	26506	26518	26530	26542	26554	26566	26578	26590	26602	26614	26626
29	17685	17707	17729	17750	17771	17792	17813	17835	17856	17878	06	26633	26645	26657	26669	26681	26693	26705	26717	26729	26741	26753	26765
30	17900	17923	17946	17969	17992	18015	18038	18061	18084	18108	05	26780	26792	26804	26816	26828	26840	26852	26864	26876	26888	26900	26912
31	18132	18156	18180	18204	18228	18252	18276	18300	18324	18348	04	26914	26926	26938	26950	26962	26974	26986	26998	27010	27022	27034	27046
32	18377	18406	18435	18464	18493	18522	18551	18580	18609	18638	03	27034	27046	27058	27070	27082	27094	27106	27118	27130	27142	27154	27166
33	18596	18780	18765	18800	18835	18869	18903	18937	18971	19005	02	27168	27180	27192	27204	27216	27228	27240	27252	27264	27276	27288	27300
34	19052	19086	19140	19184	19228	19272	19316	19360	19404	19448	01	27301	27313	27325	27337	27349	27361	27373	27385	27397	27409	27421	27433
35	19567	19706	19846	19984	20123	20312	...	...	...	...	00	27435	27447	27459	27471	27483	27495	27507	27519	27531	27543	27555	27567

Sun's anomaly expressed as days of the solar year and sun's equation of the centre in fractions of a day.
(BRĀHMA SIDDHĀNTA AND SIDDHĀNTA SĪROMANĪ.)

Eqn.	9	8	7	6	5	4	3	2	1	0	Eqn.	0	1	2	3	4	5	6	7	8	9
175	130	145	159	173	187	201	215	229	243	257	175	81	88	95	102	109	116	123	130	137	144
176	131	146	160	174	188	202	216	230	244	258	176	82	89	96	103	110	117	124	131	138	145
177	132	147	161	175	189	203	217	231	245	259	177	83	90	97	104	111	118	125	132	139	146
178	133	148	162	176	190	204	218	232	246	260	178	84	91	98	105	112	119	126	133	140	147
179	134	149	163	177	191	205	219	233	247	261	179	85	92	99	106	113	120	127	134	141	148
180	135	150	164	178	192	206	220	234	248	262	180	86	93	100	107	114	121	128	135	142	149
181	136	151	165	179	193	207	221	235	249	263	181	87	94	101	108	115	122	129	136	143	150
182	137	152	166	180	194	208	222	236	250	264	182	88	95	102	109	116	123	130	137	144	151
183	138	153	167	181	195	209	223	237	251	265	183	89	96	103	110	117	124	131	138	145	152
184	139	154	168	182	196	210	224	238	252	266	184	90	97	104	111	118	125	132	139	146	153
185	140	155	169	183	197	211	225	239	253	267	185	91	98	105	112	119	126	133	140	147	154
186	141	156	170	184	198	212	226	240	254	268	186	92	99	106	113	120	127	134	141	148	155
187	142	157	171	185	199	213	227	241	255	269	187	93	100	107	114	121	128	135	142	149	156
188	143	158	172	186	200	214	228	242	256	270	188	94	101	108	115	122	129	136	143	150	157
189	144	159	173	187	201	215	229	243	257	271	189	95	102	109	116	123	130	137	144	151	158
190	145	160	174	188	202	216	230	244	258	272	190	96	103	110	117	124	131	138	145	152	159
191	146	161	175	189	203	217	231	245	259	273	191	97	104	111	118	125	132	139	146	153	160
192	147	162	176	190	204	218	232	246	260	274	192	98	105	112	119	126	133	140	147	154	161
193	148	163	177	191	205	219	233	247	261	275	193	99	106	113	120	127	134	141	148	155	162
194	149	164	178	192	206	220	234	248	262	276	194	100	107	114	121	128	135	142	149	156	163
195	150	165	179	193	207	221	235	249	263	277	195	101	108	115	122	129	136	143	150	157	164
196	151	166	180	194	208	222	236	250	264	278	196	102	109	116	123	130	137	144	151	158	165
197	152	167	181	195	209	223	237	251	265	279	197	103	110	117	124	131	138	145	152	159	166
198	153	168	182	196	210	224	238	252	266	280	198	104	111	118	125	132	139	146	153	160	167
199	154	169	183	197	211	225	239	253	267	281	199	105	112	119	126	133	140	147	154	161	168
200	155	170	184	198	212	226	240	254	268	282	200	106	113	120	127	134	141	148	155	162	169
201	156	171	185	199	213	227	241	255	269	283	201	107	114	121	128	135	142	149	156	163	170
202	157	172	186	200	214	228	242	256	270	284	202	108	115	122	129	136	143	150	157	164	171
203	158	173	187	201	215	229	243	257	271	285	203	109	116	123	130	137	144	151	158	165	172
204	159	174	188	202	216	230	244	258	272	286	204	110	117	124	131	138	145	152	159	166	173
205	160	175	189	203	217	231	245	259	273	287	205	111	118	125	132	139	146	153	160	167	174
206	161	176	190	204	218	232	246	260	274	288	206	112	119	126	133	140	147	154	161	168	175
207	162	177	191	205	219	233	247	261	275	289	207	113	120	127	134	141	148	155	162	169	176
208	163	178	192	206	220	234	248	262	276	290	208	114	121	128	135	142	149	156	163	170	177
209	164	179	193	207	221	235	249	263	277	291	209	115	122	129	136	143	150	157	164	171	178
210	165	180	194	208	222	236	250	264	278	292	210	116	123	130	137	144	151	158	165	172	179
211	166	181	195	209	223	237	251	265	279	293	211	117	124	131	138	145	152	159	166	173	180
212	167	182	196	210	224	238	252	266	280	294	212	118	125	132	139	146	153	160	167	174	181
213	168	183	197	211	225	239	253	267	281	295	213	119	126	133	140	147	154	161	168	175	182
214	169	184	198	212	226	240	254	268	282	296	214	120	127	134	141	148	155	162	169	176	183
215	170	185	199	213	227	241	255	269	283	297	215	121	128	135	142	149	156	163	170	177	184
216	171	186	200	214	228	242	256	270	284	298	216	122	129	136	143	150	157	164	171	178	185
217	172	187	201	215	229	243	257	271	285	299	217	123	130	137	144	151	158	165	172	179	186
218	173	188	202	216	230	244	258	272	286	300	218	124	131	138	145	152	159	166	173	180	187
219	174	189	203	217	231	245	259	273	287	301	219	125	132	139	146	153	160	167	174	181	188
220	175	190	204	218	232	246	260	274	288	302	220	126	133	140	147	154	161	168	175	182	189
221	176	191	205	219	233	247	261	275	289	303	221	127	134	141	148	155	162	169	176	183	190
222	177	192	206	220	234	248	262	276	290	304	222	128	135	142	149	156	163	170	177	184	191
223	178	193	207	221	235	249	263	277	291	305	223	129	136	143	150	157	164	171	178	185	192
224	179	194	208	222	236	250	264	278	292	306	224	130	137	144	151	158	165	172	179	186	193
225	180	195	209	223	237	251	265	279	293	307	225	131	138	145	152	159	166	173	180	187	194
226	181	196	210	224	238	252	266	280	294	308	226	132	139	146	153	160	167	174	181	188	195
227	182	197	211	225	239	253	267	281	295	309	227	133	140	147	154	161	168	175	182	189	196
228	183	198	212	226	240	254	268	282	296	310	228	134	141	148	155	162	169	176	183	190	197
229	184	199	213	227	241	255	269	283	297	311	229	135	142	149	156	163	170	177	184	191	198
230	185	200	214	228	242	256	270	284	298	312	230	136	143	150	157	164	171	178	185	192	199
231	186	201	215	229	243	257	271	285	299	313	231	137	144	151	158	165	172	179	186	193	200
232	187	202	216	230	244	258	272	286	300	314	232	138	145	152	159	166	173	180	187	194	201
233	188	203	217	231	245	259	273	287	301	315	233	139	146	153	160	167	174	181	188	195	202
234	189	204	218	232	246	260	274	288	302	316	234	140	147	154	161	168	175	182	189	196	203
235	190	205	219	233	247	261	275	289	303	317	235	141	148	155	162	169	176	183	190	197	204
236	191	206	220	234	248	262	276	290	304	318	236	142	149	156	163	170	177	184	191	198	205
237	192	207	221	235	249	263	277	291	305	319	237	143	150	157	164	171	178	185	192	199	206
238	193	208	222	236	250	264	278	292	306	320	238	144	151	158	165	172	179	186	193	200	207
239	194	209	223	237	251	265	279	293	307	321	239	145	152	159	166	173	180	187	194	201	208
240	195	210	224	238	252	266	280	294	308	322	240	146	153	160	167	174	181	188	195	202	209
241	196	211	225	23																	

i—EYE-TABLE FOR YOGAS.

Sun's anomaly expressed as days of the solar year and sun's equation of the centre in fractions of a day.

(BRAHMA SIDDHĀNTA AND SIDDHĀNTA SĪROMANĪ.)

Eqn.	9	8	7	6	5	4	3	2	1	0	Eqn.	0	1	2	3	4	5	6	7	8	9
—	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...
151	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-00	81-23	81-62	82-00	82-38	82-76	83-14	83-51	84-27	84-65
150	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-01	85-03	85-41	85-79	86-17	86-55	86-93	87-30	87-68	88-06
149	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-01	89-82	89-20	89-58	90-34	90-72	91-09	91-47	91-85	92-23
148	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-02	92-64	93-02	93-40	93-79	94-19	94-59	94-97	95-35	95-71
147	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-03	96-84	97-23	97-62	98-00	98-38	98-76	99-15	99-53	100-05
146	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-04	100-40	100-86	101-35	101-87	102-38	102-89	103-30	103-71	104-12
145	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-05	104-53	104-94	105-35	105-77	106-18	106-61	107-02	107-44	107-85
144	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-06	108-71	109-13	109-56	110-00	110-43	110-84	111-27	111-71	112-15
143	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-07	112-93	113-36	113-80	114-24	114-67	115-11	115-57	116-01	116-46
142	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-08	117-55	118-02	118-48	118-94	119-40	119-86	120-32	120-78	121-24
141	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-09	122-36	122-86	123-36	123-86	124-36	124-86	125-35	125-85	126-35
140	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-10	127-55	128-11	128-67	129-23	129-79	130-35	130-90	131-46	132-02
139	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-11	133-26	133-88	134-50	135-13	135-76	136-43	137-09	137-76	138-43
138	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-12	138-78	140-54	141-39	142-06	142-82	143-58	144-38	145-09	145-81
137	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-13	144-82	148-73	149-64	150-64	151-74	152-84	153-94	155-15	156-55
136	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-14	150-83	160-00	160-17	160-35	160-52	160-70	160-88	161-05	161-23
135	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-15	161-57	161-81	162-05	162-29	162-53	162-77	163-01	163-25	163-49
134	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-16	168-97	164-28	164-59	164-91	165-23	165-55	165-87	166-19	166-51
133	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-17	167-15	168-02	168-89	169-76	170-63	171-51	172-39	173-26	174-13
132	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-18	203-86	204-25	204-63	205-01	205-39	205-77	206-16	206-54	206-94
131	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-19	207-68	208-06	208-44	208-82	209-20	209-58	210-37	210-75	211-11
130	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-20	211-49	211-87	212-25	212-63	213-00	213-38	213-75	214-16	214-55
129	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-21	215-83	216-21	216-59	217-37	218-15	218-53	219-31	219-69	220-07
128	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-22	219-68	220-06	220-44	220-82	221-20	221-58	222-36	222-74	223-12
127	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-23	223-52	223-90	224-28	224-66	225-04	225-42	225-80	226-18	226-56
126	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-24	227-35	227-73	228-11	228-49	228-87	229-25	229-63	230-01	230-39
125	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-25	231-19	231-57	231-95	232-33	232-71	233-09	233-47	233-85	234-23
124	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-26	235-03	235-41	235-79	236-17	236-55	236-93	237-31	237-69	238-07
123	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-27	238-87	239-25	239-63	240-01	240-39	240-77	241-15	241-53	241-91
122	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-28	242-71	243-09	243-47	243-85	244-23	244-61	244-99	245-37	245-75
121	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-29	246-55	246-93	247-31	247-69	248-07	248-45	248-83	249-21	249-59
120	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-30	250-39	250-77	251-15	251-53	251-91	252-29	252-67	253-05	253-43
119	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-31	254-23	254-61	254-99	255-37	255-75	256-13	256-51	256-89	257-27
118	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-32	258-07	258-45	258-83	259-21	259-59	260-37	260-75	261-13	261-51
117	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-33	261-91	262-29	262-67	263-05	263-43	263-81	264-19	264-57	264-95
116	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-34	265-75	266-13	266-51	266-89	267-27	267-65	268-03	268-41	268-79
115	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-35	269-59	270-37	270-75	271-13	271-51	271-89	272-27	272-65	273-03
114	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-36	273-43	273-81	274-19	274-57	274-95	275-33	275-71	276-09	276-47
113	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-37	277-27	277-65	278-03	278-41	278-79	279-17	279-55	279-93	280-31
112	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-38	281-11	281-49	281-87	282-25	282-63	283-01	283-39	283-77	284-15
111	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-39	284-95	285-33	285-71	286-09	286-47	286-85	287-23	287-61	287-99
110	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-40	288-79	289-17	289-55	289-93	290-31	290-69	291-07	291-45	291-83
109	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-41	292-63	293-01	293-39	293-77	294-15	294-53	294-91	295-29	295-67
108	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-42	296-47	296-85	297-23	297-61	297-99	298-37	298-75	299-13	299-51
107	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-43	300-31	300-69	301-07	301-45	301-83	302-21	302-59	302-97	303-35
106	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-44	304-15	304-53	304-91	305-29	305-67	306-05	306-43	306-81	307-19
105	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-45	307-99	308-37	308-75	309-13	309-51	309-89	310-27	310-65	311-03
104	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-46	311-83	312-21	312-59	312-97	313-35	313-73	314-11	314-49	314-87
103	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-47	315-67	316-05	316-43	316-81	317-19	317-57	317-95	318-33	318-71
102	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-48	319-51	320-29	320-67	321-05	321-43	321-81	322-19	322-57	322-95
101	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-49	323-35	323-73	324-11	324-49	324-87	325-25	325-63	326-01	326-39
100	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-50	327-19	327-57	327-95	328-33	328-71	329-09	329-47	329-85	330-23
99	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-51	330-31	330-69	331-07	331-45	331-83	332-21	332-59	332-97	333-35
98	1-05	1-22	1-40	1-57	1-75	1-93	2-10	2-28	2-45	2-62	0-88	0-52	334-15	334-53	334-91	335-29	335-67	336-05	33		

TABLE I (i).

Jupiter's Cycle of 60 years—Southern Cycle. A.D. 967 to 1926
with corresponding A.D. years—(Centuries A.D. in heavy type).

(N.B.—The Indian year begins in March or April of the A.D. year.)

1	Prabhava ...	9 67	10 27	10 87	11 47	12 07	12 67	13 27	13 87	14 47	15 07	15 67	16 27	16 87	17 47	18 07	18 67
2	Vibhava ...	08	28	88	48	08	68	28	88	48	08	68	28	88	48	08	68
3	Śukla ...	09	29	89	49	09	69	29	89	49	09	69	29	89	49	09	69
4	Pramodhata ...	70	30	90	50	10	70	30	90	50	10	70	30	90	50	10	70
5	Prajāpati ...	71	31	91	51	11	71	31	91	51	11	71	31	91	51	11	71
6	Angirasa ...	72	32	92	52	12	72	32	92	52	12	72	32	92	52	12	72
7	Śrīmukha ...	73	33	93	53	13	73	33	93	53	13	73	33	93	53	13	73
8	Bhāva ...	74	34	94	54	14	74	34	94	54	14	74	34	94	54	14	74
9	Yava ...	75	35	95	55	15	75	35	95	55	15	75	35	95	55	15	75
10	Dbātri ...	76	36	96	56	16	76	36	96	56	16	76	36	96	56	16	76
11	Isvara ...	77	37	97	57	17	77	37	97	57	17	77	37	97	57	17	77
12	Bahudhānya ...	78	38	98	58	18	78	38	98	58	18	78	38	98	58	18	78
13	Pramāthi ...	79	39	99	59	19	79	39	99	59	19	79	39	99	59	19	79
14	Vikrama ...	80	40	100	60	20	80	40	100	60	20	80	40	100	60	20	80
15	Vṛisha ...	81	41	01	61	21	81	41	01	61	21	81	41	01	61	21	81
16	Chitrabhānu ...	82	42	02	62	22	82	42	02	62	22	82	42	02	62	22	82
17	Subhānu ...	83	43	03	63	23	83	43	03	63	23	83	43	03	63	23	83
18	Tāraṇa ...	84	44	04	64	24	84	44	04	64	24	84	44	04	64	24	84
19	Pārthiva ...	85	45	05	65	25	85	45	05	65	25	85	45	05	65	25	85
20	Vyaya ...	86	46	06	66	26	86	46	06	66	26	86	46	06	66	26	86
21	Sarvajit ...	87	47	07	67	27	87	47	07	67	27	87	47	07	67	27	87
22	Sarvadhārī ...	88	48	08	68	28	88	48	08	68	28	88	48	08	68	28	88
23	Virodhi ...	89	49	09	69	29	89	49	09	69	29	89	49	09	69	29	89
24	Vikṛita ...	90	50	10	70	30	90	50	10	70	30	90	50	10	70	30	90
25	Khara ...	91	51	11	71	31	91	51	11	71	31	91	51	11	71	31	91
26	Nandana ...	92	52	12	72	32	92	52	12	72	32	92	52	12	72	32	92
27	Vijaya ...	93	53	13	73	33	93	53	13	73	33	93	53	13	73	33	93
28	Jaya ...	94	54	14	74	34	94	54	14	74	34	94	54	14	74	34	94
29	Manmatha ...	95	55	15	75	35	95	55	15	75	35	95	55	15	75	35	95
30	Durmukha ...	96	56	16	76	36	96	56	16	76	36	96	56	16	76	36	96
31	Hemalamba ...	97	57	17	77	37	97	57	17	77	37	97	57	17	77	37	97
32	Vilamba ...	98	58	18	78	38	98	58	18	78	38	98	58	18	78	38	98
33	Vikāri ...	99	59	19	79	39	99	59	19	79	39	99	59	19	79	39	99
34	Sārvari ...	100	60	20	80	40	100	60	20	80	40	100	60	20	80	40	100
35	Plava ...	01	61	21	81	41	01	61	21	81	41	01	61	21	81	41	01
36	Subhākrit ...	02	62	22	82	42	02	62	22	82	42	02	62	22	82	42	02
37	Sobhana (Sobhākrit).	03	63	23	83	43	03	63	23	83	43	03	63	23	83	43	03
38	Krodhi ...	04	64	24	84	44	04	64	24	84	44	04	64	24	84	44	04
39	Viśvāvasu ...	05	65	25	85	45	05	65	25	85	45	05	65	25	85	45	05
40	Parābhava ...	06	66	26	86	46	06	66	26	86	46	06	66	26	86	46	06
41	Plavaṅga ...	07	67	27	87	47	07	67	27	87	47	07	67	27	87	47	07
42	Kilaka ...	08	68	28	88	48	08	68	28	88	48	08	68	28	88	48	08
43	Saumya ...	09	69	29	89	49	09	69	29	89	49	09	69	29	89	49	09
44	Sādharana ...	10	70	30	90	50	10	70	30	90	50	10	70	30	90	50	10
45	Virodhakrit ...	11	71	31	91	51	11	71	31	91	51	11	71	31	91	51	11
46	Paridhāvi ...	12	72	32	92	52	12	72	32	92	52	12	72	32	92	52	12
47	Pramātoha ...	13	73	33	93	53	13	73	33	93	53	13	73	33	93	53	13
48	Ānanda ...	14	74	34	94	54	14	74	34	94	54	14	74	34	94	54	14
49	Rākshasa ...	15	75	35	95	55	15	75	35	95	55	15	75	35	95	55	15
50	Ānala (Nala).	16	76	36	96	56	16	76	36	96	56	16	76	36	96	56	16
51	Piṅgala ...	17	77	37	97	57	17	77	37	97	57	17	77	37	97	57	17
52	Kūlayukta ...	18	78	38	98	58	18	78	38	98	58	18	78	38	98	58	18
53	Siddhārthi ...	19	79	39	99	59	19	79	39	99	59	19	79	39	99	59	19
54	Raudra ...	20	80	40	100	60	20	80	40	100	60	20	80	40	100	60	20
55	Durmati ...	21	81	41	01	61	21	81	41	01	61	21	81	41	01	61	21
56	Dundubhi ...	22	82	42	02	62	22	82	42	02	62	22	82	42	02	62	22
57	Rudhīrodgārī.	23	83	43	03	63	23	83	43	03	63	23	83	43	03	63	23
58	Raktāksha ...	24	84	44	04	64	24	84	44	04	64	24	84	44	04	64	24
59	Krodhana ...	25	85	45	05	65	25	85	45	05	65	25	85	45	05	65	25
60	Kshaya (Kshaya)	26	86	46	06	66	26	86	46	06	66	26	86	46	06	66	26

TABLE I (ii)—cont.

Jupiter's Cycle of 60 years—Northern System, showing suppressed years. A.D. 280 to A.D. 2000—cont.

Vijaya ...	1166	12 29	12 88	13 47	14 07	14 66	15 25	0	15 85	16 44	17 03	17 63	18 22	18 81	19 41
Jaya ...	70	80	89	48	08	67	26	1	86	45	04	64	23	82	...
Menmatha ...	71	81	90	49	09	68	27	2	87	46	05	65	24	83	42
Durmukha ...	72	82	91	50	10	69	28	3	88	47	06	66	25	84	43
Homalamba ...	73	83	92	51	11	70	29	4	89	48	07	67	26	85	44
Vilamba ...	74	84	93	52	12	71	30	5	90	49	08	68	27	86	45
Vikārin ...	75	85	94	53	13	72	31	6	91	50	09	69	28	87	46
Śārvarī ...	76	86	95	54	14	73	32	7	92	51	10	70	29	88	47
Plava ...	77	87	96	55	15	74	33	8	93	52	11	71	30	89	48
Subhakarit ...	78	88	97	56	16	75	34	9	94	53	12	72	31	90	49
Sobhana ...	79	89	98	57	17	76	35	10	95	54	13	73	32	91	50
Krodhin ...	80	40	99	58	18	77	36	11	96	55	14	74	33	92	51
Viśvāvasu ...	81	41	13 00	59	19	78	37	12	97	56	15	75	34	93	52
Parābhava ...	82	42	01	60	20	79	38	13	98	57	16	76	35	94	53
Plavanga ...	83	43	02	61	21	80	39	14	99	58	17	77	36	95	54
Kilaka ...	84	44	03	62	22	81	40	15	16 00	59	18	78	37	96	55
Saumya ...	85	45	04	63	23	82	41	16	01	60	19	79	38	97	56
Sādharapa ...	86	46	05	64	24	83	42	17	02	61	20	80	39	98	57
Virodhakarit ...	87	47	06	65	25	84	43	18	03	62	21	81	40	99	58
Paridhāvīn ...	88	48	07	66	26	85	44	19	04	63	22	82	41	19 00	59
Pramādin ...	89	49	08	67	27	86	45	20	05	64	23	83	42	01	60
Ānanda ...	90	50	09	68	28	87	46	21	06	65	24	84	43	02	61
Rākshasa ...	91	51	10	69	29	88	47	22	07	66	25	85	44	03	62
Anala ...	92	52	11	70	30	89	48	23	08	67	26	86	45	04	63
Prīgula ...	93	53	12	71	31	90	49	24	09	68	27	87	46	05	64
Kālayukta ...	94	54	13	72	32	91	50	25	10	69	28	88	47	06	65
Siddhārtin ...	95	55	14	73	33	92	51	26	11	70	29	89	48	07	66
Raudra ...	96	56	15	74	34	93	52	27	12	71	30	90	49	08	67
Darmatī ...	97	57	16	75	35	94	53	28	13	72	31	91	50	09	68
Dundubhi ...	98	58	17	76	36	95	54	29	14	73	32	92	51	10	69
Rudhrodgārīn ...	99	59	18	77	37	96	55	30	15	74	33	93	52	11	70
Raktāksha ...	12 00	60	19	78	38	97	56	31	16	75	34	94	53	12	71
Krodhana ...	01	61	20	79	39	98	57	32	17	76	35	95	54	13	72
Kshaya ...	02	62	21	80	40	99	58	33	18	77	36	96	55	14	73
Prabhava ...	03	63	22	81	41	15 00	59	34	19	78	37	97	56	15	74
Vibhava ...	04	64	23	82	42	01	60	35	20	79	38	98	57	16	75
Śukla ...	05	65	24	83	43	02	61	36	21	80	39	99	58	17	76
Pramoda ...	06	66	25	84	44	03	62	37	22	81	40	18 00	59	18	77
Prajāpati ...	07	67	26	85	45	04	63	38	23	82	41	01	60	19	78
Angiraa ...	08	68	27	86	46	05	64	39	24	83	42	02	61	20	79
Śrimukha ...	09	69	28	87	47	06	65	40	25	84	43	03	62	21	80
Bhāva ...	10	70	29	88	48	07	66	41	26	85	44	04	63	22	81
Yuva ...	11	71	30	89	49	08	67	42	27	86	45	05	64	23	82
Dhātri ...	12	72	31	90	50	09	68	43	28	87	46	06	65	24	83
Jāvara ...	13	73	32	91	51	10	69	44	29	88	47	07	66	25	84
Bahudhānya ...	14	74	33	92	52	11	70	45	30	89	48	08	67	26	85
Pramāthin ...	15	75	34	93	53	12	71	46	31	90	49	09	68	27	86
Vikrama ...	16	76	35	94	54	13	72	47	32	91	50	10	69	28	87
Vriśa ...	17	77	36	95	55	14	73	48	33	92	51	11	70	29	88
Chitrabhānu ...	18	78	37	96	56	15	74	49	34	93	52	12	71	30	89
Subhānu ...	19	79	38	97	57	16	75	50	35	94	53	13	72	31	90
Tārana ...	20	80	39	98	58	17	76	51	36	95	54	14	73	32	91
Parthiva ...	21	81	40	14 00	59	18	77	52	37	96	55	15	74	33	92
Vyaya ...	22	82	41	01	60	19	78	53	38	97	56	16	75	34	93
Sarvajit ...	23	83	42	02	61	20	79	54	39	98	57	17	76	35	94
Sarvadhārīn ...	24	84	43	03	62	21	80	55	40	99	58	18	77	36	95
Virodhin ...	25	85	44	04	63	22	81	56	41	17 00	59	19	78	37	96
Vikṛita ...	26	86	45	05	64	23	82	57	42	01	60	20	79	38	97
Khara ...	27	87	46	06	65	24	83	58	43	02	61	21	80	39	98
Nandana ...	28	88	47	07	66	25	84	59	44	03	62	22	81	40	99

TABLE I (iii).

Months.											
Signs of Zodiac; also names of Malabar months.	Lunar months; also Bengal solar months.	Tamil solar months.	Sūrya siddhānta.					Ārya siddhānta.			
			Number of days in each solar month	Moment of Saṅkrānti; or No. of days up to beginning of each solar month.	Moment of each new moon; or No. of days up to beginning of each lunar month.	Increase of $\frac{1}{2}$ anomaly up to beginning of each lunar month.	I	No. of days in anomalistic months.	No. of days in each solar month.	Moment of saṅkrānti; or No. of days up to beginning of each solar month.	
Mēṣa (Mal. Mēdam).	Vaiśākha ...	Chittirai ..	30·93528	..	..	..	1	27·5546	80·92500000	...	
Vṛishabha (Mal. Edavam).	Jyeshṭha	Vaiṅāṣi ..	31·42028	80·93528	29·53059	1·976	2	55·1092	31·40111111	30·925000	
Mithuna ...	Āṣhāḍha ...	Āṇi ...	31·64472	62·35555	59·06117	3·952	3	82·6688	31·60722222	62·3261111	
Karkatāka ..	Śrāvana ...	Āḍi ...	31·47528	94·00028	88·59176	5·928	4	110·2184	31·46777777	98·9883338	
Siṁha ..	Bhādrapada	Āṣāḍi ...	31·01861	125·47555	118·12235	7·904	5	137·7780	31·03472222	125·4011111	
Kanyā ...	Āśvina ...	Purāṭṭāṣi ..	30·44138	156·49417	147·65293	9·880	6	165·3276	30·45666666	156·4358838	
Tulā ...	Kārttika	Āippāṣi ...	29·89833	186·93556	177·18353	11·856	7	192·6822	29·90333333	186·8925000	
Vṛiṣchika ...	Mārgasīrsha.	Kūrttignai ...	29·49027	216·82888	206·71411	18·832	8	220·4368	29·50861111	216·7958838	
Dhanuṣ ...	Pauṣa ..	Mārgaḷi ..	29·31777	246·31916	236·24470	15·808	9	247·9914	29·35055555	246·3044444	
Makara ...	Māgha ...	Tai ..	29·44805	275·63694	265·77529	17·784	10	275·5460	29·45666666	275·6550000	
Kumbha ...	Phālguna	Māṣi ...	29·82027	305·08499	295·80583	19·760	11	303·1006	29·80833333	305·1116666	
Mina ...	Chaitra ..	Paṅguni	30·35348	334·90527	324·83647	21·736	12	330·6552	30·38876157	334·9200000	
				365·25875	354·86705	23·712	13	358·2098		365·2586805	
					363·89764	25·688					

TABLE I (iv). (See p. 30 of Text)

Limits of Adhika months.						Limits of Kshaya months.		
Before			Before			After		
Vaiśākha ...	1·40469	Bhādrapada ...	8·84122	...	...	Mārgasīrsha	10·07446	10·11475
Jyeshṭha ...	3·29438	Āśvina ...	9·75201	Phālguna	9·77912	Pauṣa ...	9·86164	10·07447
Āṣhāḍha ...	5·40851	Kārttika ...	10·11475	Chaitra ...	10·06880	Māgha ...	9·77910	9·86164
Śrāvana ...	7·35320	...	...	...	...	...	...	...

TABLE I (v).

Tithis.			Tithis.		
Duration of tithis.	Names of tithis.		Duration of tithis.	Names of tithis.	
Days.			Days.		
0·98435	1	Śukla Pratipada.	15·74985	1	Krishna Prathama.
1·96870	2	Do. Dvitiya.	16·73400	2	Do. Dvitiya.
2·95306	3	Do. Tritiya.	17·71835	3	Do. Tritiya.
3·93741	4	Do. Chaturthi.	18·70270	4	Do. Chaturthi.
4·92176	5	Do. Panchami.	19·68706	5	Do. Panchami.
5·90612	6	Do. Shashṭhi.	20·67141	6	Do. Shashṭhi.
6·89047	7	Do. Saptami.	21·65576	7	Do. Saptami.
7·87482	8	Do. Ashtami.	22·64012	8	Do. Ashtami.
8·85918	9	Do. Navami.	23·62447	9	Do. Navami.
9·84353	10	Do. Daśami.	24·60882	10	Do. Daśami.
10·82788	11	Do. Ekādaśi.	25·59318	11	Do. Ekādaśi.
11·81223	12	Do. Dvādaśi.	26·57753	12	Do. Dvādaśi.
12·79659	13	Do. Trayodaśi.	27·56188	13	Do. Trayodaśi.
13·78094	14	Do. Chaturdaśi.	28·54623	14	Do. Chaturdaśi.
14·76529	15	Paurṇami.	29·53059	15	Amāyāsyā.

TABLE I (vi).

Nakshatras.					Yogas.	
Order and names of nakshatras.	Collective duration of nakshatras (equal space).	Deities presiding over nakshatras.	Duration of nakshatras (Garga).	Duration of nakshatras (Brahma).	Names of yogas.	Collective duration of yogas.
	Days.		Days.	Days.		Days.
1 Aśvinī	1·01191	Aśvin ..	1·01191	1·0	1 Viśhkamba.	0·94149
2 Bharaṇī ..	2·02383	Yama ..	1·51787	1·5	2 Pṛiti ..	1·88298
3 Kṛttikā (Tam. Kirut-tigai).	3·03574	Agni ..	2·52978	2·5	3 Aynahmat ..	2·82447
4 Rohiṇī	4·04765	Prajāpati ...	4·04765	4·0	4 Saubhāgya.	3·76596
5 Mrigāśiras (Tam. Mirugasirām).	5·05957	Soma ...	5·05956	5·0	5 Sobhana ..	4·70745
6 Ardra (Tam. Arudrā or Tiruvadirai).	6·07148	Rudra ...	5·56552	5·5	6 Atigandā ...	5·64894
7 Punarvasu	7·08340	Aditi ..	7·08339	7·0	7 Sukarman ...	6·59043
8 Pushya (Tam. Pusam).	8·09531	Bṛhaspati ..	8·09531	8·0	8 Dhṛiti ...	7·53192
9 Aśleshā (Tam. Ayl-yam).	9·10722	Sarpah ..	8·60126	8·5	9 Sula ...	8·47341
10 Māgha (Tam. Magham).	10·11914	Pitarah ..	9·61318	9·5	10 Gaṇḍa ..	9·41489
11 Pūrva-Phalgunī (Tam. Pūram).	11·13105	Bhaga ..	10·62510	10·5	11 Vriddhi ...	10·35683
12 Uttara-Phalgunī (Tam. Uttirām).	12·14297	Aryaman ..	12·14297	12·0	12 Dhṛuva ...	11·29787
13 Hasta (Tam. Hastam).	13·15488	Sāvitrī ..	13·15488	13·0	13 Vyaghanta ..	12·23986
14 Chaitrā (Tam. Chittirai).	14·16679	Tvaṣtri ...	14·16679	14·0	14 Harshana ..	13·18085
15 Svāti ..	15·17871	Vāyū ...	14·67275	14·5	15 Vajra ...	14·12234
16 Viśākhā (Tam. Viśākam).	16·19062	Indrāgni ..	16·19062	16·0	16 Siddhi ..	15·06383
17 Anurādhā (Tam. Anusham).	17·20273	Mitra ...	17·20253	17·0	17 Vyntipāta ..	16·00532
18 Jyēṣṭhā (Tam. Kōttai).	18·21445	Indra ...	17·70849	17·5	18 Variyaa ...	16·94681
19 Māla (Tam. Molam)	19·22636	Nirriti ..	18·72040	18·5	19 Parigha ...	17·88830
20 Pūrva-Āshāḍha (Tam. Pūrādam).	20·23828	Apah ...	19·73232	19·5	20 Śiva ...	18·82979
21 Uttara-Āshāḍha (Tam. Uttirādam).	21·25019	Vasavadeva Brahman.	21·25019	21·0	21 Siddha ...	19·77128
22 Śrāvaṇa (Tam. Tiruvonam).	22·26210	Viśhnu ...	22·26210	22·3217 (Abhijit)	22 Sadhya ..	20·71277
23 Śraviṣṭha or Dhanishthā (Tam. Avittam).	23·27402	Va-ava ...	23·27401	23·3217	23 Subha ...	21·65426
24 Satābhishat or Sataraka (Tam. Sadayam).	24·28593	Varuna ..	23·77997	23·8217	24 Śukla ..	22·59575
25 Pūrva-Bhādrapada (Tam. Pūrāttadi).	25·29785	Aja Ekapad.	24·79188	24·8217	25 Brahman ...	23·53724
26 Uttara-Bhādrapada (Tam. Uttirāttadi).	26·30976	Abi Būdhnnya.	26·30975	26·8217	26 Indra ...	24·47878
27 Revatī	27·32167	Pushan ..	27·32167	27·8217	27 Vaidhṛiti ...	25·42022

TABLE I (vii).

Karanas.

Kimstughna ... 1,	58 = Sakuni.
Bava ... 2, 9, 16, 23, 30, 37, 44, 51,	59 = Nāga.
Balava ... 3, 10, 17, 24, 31, 38, 45, 52,	60 = Chatushpada.
Kaulava ... 4, 11, 18, 25, 32, 39, 46, 53,	
Taitila ... 5, 12, 19, 26, 33, 40, 47, 54,	
Gara ... 6, 13, 20, 27, 34, 41, 48, 55,	
Banija ... 7, 14, 21, 28, 35, 42, 49, 56,	
Viṣṭi ... 8, 15, 22, 29, 36, 43, 50, 57,	
(or Bhadra).	

TABLE II.—NEW MOONS AND ECLIPSES

TABLE II.—Solar years and new moons

			Com- mence- ment of solar year.		First new moon in solar year.		Anomaly of first new moon.		Christian era.		Vaiśākha.		Jyeshṭha.		Āshāḍha.		Śrāvaṇa.		Bhādrapada.		
Kaliyuga.	Vikrama era.	Śaka era.	Month and day A.D.	Fraction of day.	First new moon in solar year.	Anomaly of first new moon.	Christian era.	Week-day. Month Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.		
3101	57	...	13M	9831	9-9981	22-786	B.C. 1	3 Mr 23	98	5 Ap 22	51 7 My 22	04 1 Je 20	57 3 Ji 20	10							
3102	58	...	14M	9841	22-6370	20-870	A.D. 1	2 Ap 11	98	4 My 11	41 5 Je 9	84 7 Ji 9	47 2 Au 8	00							
3103	59	...	14M	9851	17-7453	17-027	2	7 Ap 1	98	1 Ap 30	78 3 My 30	81 4 Je 28	84 6 Ji 28	87							
3104	60	...	14M	9861	6-8536	13-184	3	4 Mr 21	98	6 Ap 20	14 7 My 19	07 8 Ji 17	78 5 Au 16	27							
3105	61	...	14M	9871	25-4925	11-817	4	3 Ap 8	98	5 My 8	04 6 Je 6	57 1 Ji 6	10 2 Au 4	68							
3106	62	...	14M	9881	14-6008	7-475	5	7 Mr 28	98	2 Ap 27	41 3 My 26	94 5 Je 26	47 7 Ji 25	00							
3107	63	...	14M	9891	3-7091	3-638	6	5 Mr 18	98	6 Ap 16	77 2 Je 14	34 4 Ji 14	87 5 Au 12	90							
3108	64	...	14M	9901	23-8479	1-765	7	4 Ap 6	98	5 My 5	67 7 Je 4	20 1 Ji 3	73 3 Au 2	26							
3109	65	...	14M	9911	11-4562	25-477	8	1 Mr 25	98	3 Ap 24	04 4 My 23	57 6 Je 22	10 7 Ji 21	68							
3110	66	...	14M	9921	0-5645	21-634	9	5 Mr 14	98	1 My 12	94 3 Je 11	47 5 Ji 11	00 6 Au 9	53							
3111	67	...	14M	9931	19-2034	19-767	10	7 Ap 13	98	6 My 2	30 7 My 31	88 2 Je 30	37 3 Ji 29	90							
3112	68	...	14M	9941	8-3117	15-925	11	4 Ap 2	98	3 Ap 21	07 5 My 21	20 6 Je 19	78 2 Au 17	79							
3113	69	...	14M	9951	20-9506	14-058	12	1 Ap 10	98	2 My 9	57 4 Je 8	10 5 Ji 7	68 7 Au 6	16							
3114	70	...	14M	9961	16-0589	10-215	13	5 Mr 30	98	6 Ap 28	94 1 My 28	47 3 Je 27	00 4 Ji 26	68							
3115	71	...	14M	9971	5-1672	6-873	14	2 Mr 18	98	4 Ap 18	30 7 Je 18	36 3 Ji 15	89 3 Au 14	48							
3116	72	...	14M	9981	23-8061	4-506	15	1 Ap 7	98	3 My 7	20 4 Je 5	78 6 Ji 5	26 7 Au 3	79							
3117	73	...	14M	9991	12-9144	0-663	16	6 Mr 27	98	7 Ap 25	57 2 My 25	10 3 Je 23	68 5 Ji 23	16							
3118	74	...	14M	10001	2-0227	24-375	17	3 Mr 16	98	4 Ap 14	93 1 Je 18	00 2 Ji 12	58 4 Au 11	06							
3119	75	...	14M	10011	20-6616	23-508	18	8 Ap 18	98	3 My 3	88 5 Je 2	86 6 Ji 1	89 1 Ji 31	42							
3120	76	...	14M	10021	9-7699	18-665	19	7 Ap 2	98	1 My 1	99 8 My 31	52 5 Je 30	05 6 Ji 29	58							
3121	77	...	14M	10031	20-6616	23-508	20	4 Mr 22	98	6 Ap 21	36 7 My 20	89 2 Je 19	42 5 Au 17	48							
3122	78	...	14M	10041	9-7699	18-665	21	3 Ap 10	98	5 My 10	26 6 Je 8	79 1 Ji 8	32 2 Au 6	85							
3123	79	...	14M	10051	6-8254	9-113	22	1 Mr 30	98	2 Ap 28	62 4 My 28	15 5 Je 26	69 7 Ji 26	22							
3124	80	...	14M	10061	25-2647	7-246	23	5 Mr 19	98	6 Ap 17	99 1 My 17	52 4 Ji 15	58 6 Au 14	11							
3125	81	...	14M	10071	17-5171	12-956	24	4 Ap 7	98	5 My 6	89 7 Je 5	42 1 Ji 4	95 3 Au 3	48							
3126	82	...	14M	10081	8-4809	27-115	25	1 Mr 27	98	3 Ap 26	26 4 My 25	79 6 Je 24	32 7 Ji 23	85							
3127	83	...	14M	10091	22-1197	25-249	26	6 Mr 16	98	2 My 14	15 3 Je 12	68 5 Ji 12	21 6 Au 10	75							
3128	84	...	14M	10101	11-2280	21-406	27	4 Ap 3	98	6 My 3	52 1 Je 2	05 2 Ji 1	58 4 Ji 31	11							
3129	85	...	14M	10111	0-8363	17-563	28	2 Mr 21	98	3 Ap 22	89 5 My 22	42 6 Je 20	95 1 Ji 20	48							
3130	86	...	14M	10121	18-9752	15-696	29	1 Ap 12	98	2 My 11	79 4 Je 10	32 5 Ji 9	85 7 Au 8	38							
3131	87	...	14M	10131	8-0835	11-854	30	5 Mr 31	98	7 Ap 30	15 1 My 29	88 3 Je 28	21 4 Ji 27	74							
3132	88	...	15M	10141	26-7224	9-987	31	2 Mr 20	98	4 Ap 19	52 6 My 19	05 2 Ji 17	53 3 Au 16	64							
3133	89	...	15M	10151	15-8807	6-144	32	1 Ap 8	98	3 My 8	42 4 Je 6	95 6 Ji 6	48 1 Au 5	01							
3134	90	...	15M	10161	4-9390	2-301	33	6 Mr 29	98	7 Ap 27	78 2 My 27	31 3 Je 25	85 5 Ji 25	88							
3135	91	...	15M	10171	23-5779	0-435	34	3 Mr 17	98	5 Ap 16	15 5 Je 14	21 2 Ji 18	74 4 Au 12	27							
3136	92	...	15M	10181	12-6662	24-146	35	2 Ap 5	98	4 My 5	05 5 Je 3	95 7 Ji 3	11 1 Au 1	64							
3137	93	...	15M	10191	1-7945	20-304	36	6 Mr 25	98	1 Ap 24	42 2 My 23	88 4 Je 22	48 6 Ji 22	01							
3138	94	...	15M	10201	20-4834	18-437	37	4 Mr 15	98	7 My 13	31 1 Je 11	84 3 Ji 11	87 4 Au 9	91							
3139	95	...	15M	10211	9-5417	14-594	38	5 Ap 13	98	78	68 6 My 31	21 7 Je 29	74 2 Ji 29	27							
3140	96	...	15M	10221	28-1806	12-727	39	3 Ap 2	98	15 4 My 1	68 6 My 31	21 7 Je 29	74 2 Ji 29	27							
3141	97	...	15M	10231	17-2889	8-885	40	7 Mr 22	98	52 2 Ap 21	05 8 My 20	68 5 Je 19	11 1 Au 17	17							
3142	98	...	15M	10241	6-3972	5-043	41	6 Ap 10	98	41 7 My 9	95 2 Je 8	48 3 Ji 8	01 5 Au 6	54							
3143	99	...	15M	10251	25-0861	3-175	42	8 Mr 30	98	78 5 Ap 29	81 6 My 28	84 1 Je 27	87 2 Ji 26	90							
3144	100	...	15M	10261	14-1443	26-867	43	1 Mr 19	98	15 2 Ap 17	68 4 My 17	21 7 Ji 15	27 1 Au 13	80							
3145	101	...	15M	10271	3-2526	23-044	44	7 Ap 7	98	05 1 My 6	58 3 Je 5	11 4 Ji 4	64 6 Au 3	17							
3146	102	...	15M	10281	21-8015	21-178	45	4 Mr 27	98	41 5 Ap 25	94 7 My 25	47 2 Je 24	01 3 Ji 23	54							
3147	103	...	15M	10291	10-9998	17-335	46														
3148	104	...	15M	10301	0-1081	13-498	47														
3149	105	...	15M	10311	13-7470	11-625	48														
3150	106	...	15M	10321	7-6553	7-788	49														
3151	107	...	15M	10331	26-4942	5-916	50														
3152	108	...	15M	10341	15-6025	2-078	51														
3153	109	...	15M	10351	4-7108	25-785	52														
3154	110	...	15M	10361	23-8497	23-918	53														
3155	111	...	15M	10371	12-4580	20-075	54														

* Ending moments of tithis by Ārya and Sārya Siddhāntas are the same.

from 1 B.C. to A.D. 500 (Sūrya siddhānta).*

[illegible]

For tithis by Brahma siddhānta, add algebraically - '02 to the above.

TABLE II.—NEW MOONS AND ECLIPSES

TABLE II.—Solar years and new moons

Kaliyuga.	Vikrama era.	Śaka era.	Month and day A.D.	Com- mence- ment of solar year.	First new moon in solar year	Anomaly of first new moon.	Christian era	Vaisākha. Jyeshtha. Āshāḍha. Śrāvaṇa. Bhādrapada.				
								Week-day Month Day	Fraction Week-day. Month Day.	Fraction Week-day Month. Day	Fraction Week-day Month Day.	Fraction. Week-day. Month. Day
3156 112	...	15M	2147	15668	16238		55	1 Mr 16	78 { 8 Ap 15 4 My 14	31 6 Je 18	87 7 Ji 12	90 2 Au 11
3157 118	...	14M	4735	202032	14366		56	7 Ap 3	68 2 My 3	21 3 Je 1	74 5 Ji 1	27 6 Ji 30
3158 114	...	14M	7822	93135	10523		57	5 Mr 24	05 6 Ap 22	58 1 My 22	11 2 Je 20	64 4 Ji 20
3159 115	...	14M	9910	279524	8656		58	3 Ap 11	94 5 My 11	47 7 Je 10	00 1 Ji 9	53 3 Au 8
3160 116	...	15M	2497	170007	4814		59	1 Ap 1	31 2 Ap 30	84 4 My 30	37 5 Je 28	90 7 Ji 28
3161 117	...	14M	5085	61690	0971		60	5 Mr 20	68 7 Ap 19	21 1 My 18	74 { 3 Je 17 4 Ji 16	80 6 Au 15
3162 118	...	14M	7672	248078	26659		61	4 Ap 8	57 6 My 8	11 7 Je 6	64 2 Ji 6	17 8 Au 4
3163 119	...	15M	0260	139161	22816		62	1 Mr 28	94 3 Ap 27	47 5 My 27	00 6 Je 25	53 1 Ji 25
3164 120	...	15M	2848	30244	18078		63	6 Mr 18	31 7 Ap 16	84 { 2 My 16 3 Je 14	37 5 Ji 14	43 6 Au 12
3165 121	...	14M	5485	216633	17107		64	5 Ap 5	21 6 My 4	74 1 Je 3	27 2 Ji 2	60 4 Au 1
3166 122	...	14M	8023	107716	18264		65	2 Mr 25	57 4 Ap 24	10 5 My 23	63 7 Je 22	17 1 Ji 21
3167 123	...	15M	0610	294105	11397		66	1 Ap 18	47 3 My 13	00 4 Je 11	53 6 Ji 11	06 7 Au 9
3168 124	...	15M	8198	185188	7554		67	5 Ap 2	84 7 My 2	37 1 My 31	90 3 Je 30	43 4 Ji 29
3169 125	...	14M	5785	76271	8712		68	3 Mr 22	21 4 Ap 20	74 6 My 20	27 { 7 Je 18 2 Ji 18	80 3 Au 16
3170 126	...	14M	8373	262660	1845		69	2 Ap 10	10 3 My 9	63 5 Je 8	16 6 Ji 7	69 1 Au 6
3171 127	...	15M	0960	153748	25657		70	6 Mr 30	47 1 Ap 29	00 2 My 28	53 4 Je 27	06 5 Ji 26
3172 128	...	15M	3548	44826	21714		71	3 Mr 19	84 5 Ap 18	37 { 1 Je 16 1 Ji 16	43 2 Ji 15	96 4 Au 14
3173 129	...	14M	6186	231215	19847		72	2 Ap 6	78 4 My 6	27 5 Je 4	80 7 Ji 4	33 1 Au 2
3174 130	...	14M	8723	122298	16004		73	7 Mr 27	10 1 Ap 25	68 3 My 25	16 4 Je 23	69 6 Ji 23
3175 131	...	14M	1311	13381	12163		74	4 Mr 16	47 { 6 Ap 15 7 My 14	00 2 Je 18	06 3 Ji 12	59 5 Au 11
3176 132	...	15M	8898	199770	10295		75	3 Ap 4	37 4 My 3	90 6 Je 2	48 7 Ji 1	96 2 Ji 31
3177 133	...	14M	6496	90853	6452		76	7 Mr 23	78 2 Ap 22	26 3 My 21	79 5 Je 20	33 6 Ji 19
3178 134	...	14M	9078	277242	4585		77	6 Ap 11	63 1 My 11	16 2 Je 9	69 4 Ji 9	22 5 Au 7
3179 135	...	15M	1661	168825	0743		78	4 Ap 1	00 5 Ap 30	53 7 My 30	06 1 Je 28	59 3 Ji 28
3180 136	...	15M	4249	59408	24455		79	1 Mr 21	36 2 Ap 19	90 4 My 19	43 { 5 Je 17 7 Ji 17	96 2 Au 16
3181 137	...	14M	6886	245796	22588		80	7 Ap 8	26 1 My 7	79 3 Je 6	32 4 Ji 5	85 6 Au 4
3182 138	...	14M	9424	136879	18745		81	4 Mr 28	63 6 Ap 27	16 7 My 26	69 2 Je 25	22 3 Ji 24
3183 139	...	15M	2011	27962	14902		82	2 Mr 18	00 { 3 Ap 16 5 My 16	53 6 Je 14	59 1 Ji 14	12 2 Au 13
3184 140	...	15M	4599	214351	13036		83	7 Ap 5	89 2 My 5	43 3 Je 3	96 5 Ji 3	49 7 Au 2
3185 141	...	14M	7186	105434	9198		84	5 Mr 25	26 6 Ap 23	79 1 My 23	32 2 Je 21	85 4 Ji 21
3186 142	...	14M	9774	291823	7326		85	4 Ap 13	16 5 My 12	69 7 Je 11	22 1 Ji 10	75 3 Au 9
3187 143	...	15M	2362	182906	3433		86	1 Ap 2	53 3 My 2	06 4 My 31	59 6 Je 30	12 7 Ji 29
3188 144	...	15M	4949	73989	27195		87	6 Mr 22	89 7 Ap 21	42 1 My 20	95 { 3 Je 19 5 Ji 19	48 6 Au 17
3189 145	...	14M	7537	260378	25328		88	4 Ap 9	79 6 My 9	32 7 Je 7	85 2 Ji 7	38 3 Au 5
3190 146	...	15M	0124	151461	21486		89	2 Mr 30	16 3 Ap 23	69 5 My 23	22 6 Je 26	75 1 Ji 26
3191 147	...	15M	2712	42544	17643		90	6 Mr 19	52 1 Ap 18	06 { 2 My 17 4 Je 16	59 5 Ji 15	65 7 Au 14
3192 148	...	15M	5299	228933	15776		91	5 Ap 7	42 6 My 6	95 1 Je 5	48 3 Ji 5	01 4 Au 3
3193 149	...	14M	7887	120016	11933		92	2 Mr 26	79 4 Ap 25	32 5 My 24	85 7 Je 23	88 1 Ji 23
3194 150	...	15M	0474	11099	8091		93	{ 7 Mr 18 1 Ap 14	16 3 My 14	22 4 Je 12	75 6 Ji 12	23 7 Au 10
3195 151	...	15M	8062	197488	6224		94	6 Ap 4	05 7 My 3	58 2 Je 2	19 3 Ji 1	65 5 Ji 31
3196 152	...	15M	5650	88571	2381		95	3 Mr 24	42 4 Ap 22	95 6 My 22	48 1 Je 21	01 { 2 Ji 20 4 Au 19
3197 153	...	14M	8237	274959	0514		96	2 Ap 11	32 3 My 10	85 5 Je 9	38 6 Ji 8	91 1 Au 7
3198 154	...	15M	0825	166042	24226		97	6 Mr 31	09 1 Ap 30	22 2 My 29	75 4 Je 28	28 5 Ji 27
3199 155	...	15M	8412	57125	20383		98	4 Mr 21	05 5 Ap 19	58 7 My 19	11 { 1 Je 17 3 Ji 17	18 4 Au 15
3200 156	...	15M	6000	243514	18517		99	2 Ap 8	95 4 My 8	48 6 Je 7	01 7 Ji 6	54 2 Au 5
3201 157	...	14M	8597	134597	14674		100	7 Mr 28	32 1 Ap 26	85 3 My 26	38 4 Je 24	91 6 Ji 24
3202 158	...	15M	1175	25680	10831		101	4 Mr 17	68 { 6 Ap 16 7 My 15	22 2 Je 14	28 3 Ji 13	81 5 Au 13
3203 159	...	15M	8783	212069	8064		102	3 Ap 5	58 5 My 5	11 6 Je 3	64 1 Ji 3	17 2 Au 1
3204 160	...	15M	6350	108152	5122		103	7 Mr 25	95 2 Ap 24	48 4 My 24	01 5 Je 22	54 7 Ji 22
3205 161	...	14M	8939	289541	3255		104	6 Ap 12	85 1 My 12	38 2 Je 10	91 4 Ji 10	44 5 Au 8
3206 162	...	15M	1525	180624	26967		105	4 Ap 3	21 5 My 1	74 7 My 31	28 1 Je 29	81 3 Ji 29
3207 163	...	15M	4113	71707	33124		106	1 Mr 23	58 3 Ap 21	11 4 My 20	64 { 8 Je 19 7 Ji 18	17 2 Au 17
3208 164	...	15M	6700	258096	21257		107	7 Ap 10	48 2 My 10	01 3 Je 8	54 5 Ji 8	07 6 Au 6
3209 165	...	14M	9288	149179	17415		108	4 Mr 24	85 6 Ap 23	38 7 My 27	21 2 Je 26	44 3 Ji 25

* Ending moments of tithis by Ārya and Śārya siddhāntas are the same.

from 1 B.C. to A.D. 500 (Sārya Siddhānta)*—cont.

Āśvina.	Kārttika.	Mārgaśīrṣa.	Pauṣa.	A.D.	Māgha.	A.D.	Phālguna.	Chaitra.	
Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Week-day. Month. Day.	Fraction	Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction.
3 S 9	·96 5 O 9	·49 7 N 8	·03 1 D 7	·56	56 3 Jr 6	·09	4 F 4	·62 6 Mr 5	·15
1 Au 29	·23 2 S 27	·66 4 O 27	·39 5 N 25	·92	7 D 25	·45	57 1 Jr 23	·98 3 F 23	·51
5 Au 18	·70 1 O 16	·76 3 N 15	·29 4 D 14	·82	58 6 Jr 13	·35	7 F 11	·88 2 Mr 13	·41
7 S 17	·23 1 O 16	·76 3 N 15	·29 4 D 14	·82	59 3 Jr 2	·72	5 F 1	·25 6 Mr 2	·78
4 S 6	·60 6 O 6	·13 7 N 4	·66 2 D 4	19	1 D 23	·09	60 2 Jr 21	·62 4 F 20	·15
1 Au 28	·96 3 S 25	·49 5 O 25	·02 6 N 23	·55	61 6 Jr 9	·98	1 F 8	·51 3 Mr 10	·04
7 S 13	·86 2 O 13	·39 8 N 11	·92 5 D 11	·45	4 D 30	·85	62 5 Jr 28	·88 7 F 27	·41
5 S 3	·23 6 O 2	·76 1 N 1	·29 2 N 30	·82	1 D 19	·72	63 3 Jr 18	·25 4 F 16	·78
2 Au 23	·59 4 S 22	·13 5 O 21	·66 7 N 20	·19	64 7 Jr 7	·61	2 F 6	·15 3 Mr 6	·68
1 S 11	·49 3 O 11	·02 4 N 9	·55 6 D 9	·08	4 D 26	·98	65 6 Jr 25	·51 1 F 24	·04
5 Au 30	·86 7 S 29	·39 1 O 28	·92 3 N 27	·45	2 D 16	·85	66 3 Jr 14	·88 5 F 13	·41
3 Au 20	·23 4 S 18	·76 6 O 18	·29 7 N 16	·82	67 1 Jr 4	·25	2 F 2	·78 4 Mr 4	·81
2 S 8	·12 3 O 7	·65 5 N 6	·19 6 D 5	·72	5 D 24	·61	68 7 Jr 23	·14 1 F 21	·67
6 Au 28	·40 1 S 27	·02 2 O 26	·55 4 N 25	·08	69 4 Jr 11	·51	6 F 10	·04 7 Mr 11	·5
5 S 15	·89 6 O 14	·92 1 N 13	·45 2 D 12	·98	1 D 31	·88	70 3 Jr 30	·41 4 F 28	·94
2 S 4	·76 4 O 4	·29 5 N 2	·82 7 D 2	·35	6 D 21	·25	71 7 Jr 19	·78 2 F 18	·31
7 Au 25	·12 1 S 23	·65 3 O 23	·18 4 N 21	·71	72 5 Jr 9	·14	6 F 7	·67 1 Mr 8	·20
6 S 13	·02 7 O 12	·55 2 N 11	·08 3 D 10	·61	2 D 28	·51	73 4 Jr 27	·04 5 F 25	·57
3 S 1	·89 4 S 30	·92 6 O 30	·45 7 N 28	·98	6 D 17	·88	74 1 Jr 16	·41 2 F 14	·94
7 Au 21	·75 2 S 20	·29 3 O 19	·82 5 N 18	·85	75 5 Jr 5	·77	7 F 4	·81 1 Mr 5	·84
6 S 9	·65 1 O 9	·18 2 N 7	·71 4 D 7	·24	3 D 26	·14	76 4 Jr 24	·87 6 F 23	·20
4 Au 30	·02 5 S 28	·55 7 O 28	·08 1 N 26	·61	77 2 Jr 13	·04	3 F 11	·57 5 Mr 13	·10
1 Au 18	·89 4 O 16	·45 5 N 14	·98 7 D 14	·51	78 6 Jr 2	·41	7 Jr 31	·94 2 Mr 2	·47
2 S 16	·92 4 O 16	·45 5 N 14	·98 7 D 14	·51	3 D 22	·77	79 5 Jr 21	·30 6 F 19	·83
4 S 6	·23 1 O 5	·81 3 N 4	·35 4 D 3	·88	80 2 Jr 10	·67	4 F 9	·20 5 Mr 9	·73
4 Au 26	·95 6 S 25	·18 7 O 24	·71 2 N 23	·24	7 D 30	·04	81 1 Jr 28	·57 3 F 27	·10
3 S 14	·55 5 O 14	·08 6 N 12	·61 1 D 12	·14	4 D 19	·41	82 5 Jr 17	·94 7 F 16	·47
7 S 2	·93 2 O 2	·45 3 O 31	·98 5 N 30	·51	83 3 Jr 7	·30	4 F 5	·88 6 Mr 7	·36
5 Au 23	·28 6 S 21	·81 1 O 21	·34 2 N 19	·87	7 D 27	·67	84 2 Jr 26	·20 3 F 24	·73
4 S 11	·18 5 O 10	·71 7 N 9	·24 1 D 8	·77	5 D 16	·04	85 6 Jr 14	·57 1 F 13	·10
1 Au 31	·55 8 S 30	·08 4 O 29	·61 6 N 28	·14	86 3 Jr 3	·98	5 F 2	·46 7 Mr 4	·00
5 Au 19	·91 7 S 18	·45 1 O 17	·98 3 N 16	·51	1 D 24	·30	87 2 Jr 22	·83 4 F 21	·86
4 S 7	·81 6 O 7	·34 7 N 5	·87 2 D 5	·40	88 7 Jr 12	·20	1 F 10	·73 3 Mr 11	·26
2 Au 28	·18 3 S 26	·71 5 O 26	·24 6 N 24	·77	4 D 31	·57	89 6 Jr 30	·10 7 F 28	·63
1 S 16	·08 2 O 15	·61 4 N 14	·14 5 D 13	·67	1 D 20	·98	90 3 Jr 19	·46 4 F 17	·99
5 S 4	·44 6 O 3	·97 1 N 2	·50 3 D 2	·04	91 7 Jr 8	·83	2 F 7	·36 3 Mr 8	·89
2 Au 24	·81 4 S 23	·34 5 O 22	·87 7 N 21	·40	5 D 29	·20	92 6 Jr 27	·73 1 F 26	·26
1 S 12	·71 3 O 12	·24 4 N 10	·77 6 D 10	·80	2 D 17	·56	93 4 Jr 16	·10 5 F 14	·63
6 S 2	·08 7 O 1	·61 2 O 31	·14 3 N 29	·67	94 1 Jr 5	·46	2 F 3	·99 4 Mr 5	·52
3 Au 21	·44 4 S 19	·97 6 O 19	·50 1 N 18	·03	5 D 25	·83	95 7 Jr 24	·36 1 F 22	·89
2 S 9	·34 3 O 8	·87 5 N 7	·40 6 D 6	·93	96 4 Jr 13	·73	6 F 12	·26 7 Mr 12	·79
6 Au 29	·71 1 S 28	·24 2 O 27	·77 4 N 26	·80	97 2 Jr 2	·09	3 Jr 31	·62 5 Mr 2	·18
5 S 17	·60 7 O 17	·14 1 N 15	·67 3 D 15	·20	6 D 22	·46	7 Jr 20	·99 2 F 19	·52
3 S 5	·97 4 O 5	·50 6 N 4	·03 7 D 3	·56	99 5 Jr 10	·86	6 F 8	·89 1 Mr 10	·42
7 Au 26	·34 1 S 24	·87 3 O 24	·40 4 N 22	·93	2 D 30	·73	100 4 Jr 29	·26 5 F 27	·79
6 S 14	·24 7 O 13	·77 2 N 12	·30 3 D 11	·88	7 D 19	·09	1 Jr 17	·62 3 F 16	·15
3 S 3	·60 5 O 3	·18 6 N 1	·66 1 D 1	·20	5 Jr 6	·99	7 F 5	·52 2 Mr 7	·05
7 Au 22	·97 2 S 21	·50 4 O 21	·03 5 N 19	·56	3 D 27	·86	03 4 Jr 25	·89 6 F 24	·42
6 S 10	·87 1 O 10	·40 2 N 8	·93 4 D 8	·46	7 D 16	·72	04 2 Jr 15	·36 3 F 13	·79
4 Au 31	·24 5 S 29	·77 7 O 29	·30 1 N 27	·83	05 6 Jr 3	·62	1 F 2	·15 2 Mr 8	·68
1 Au 20	·60 3 S 19	·13 4 O 18	·86 6 N 17	·19	3 D 23	·99	06 5 Jr 22	·52 7 F 21	·05
7 S 7	·50 2 O 7	·03 3 N 5	·56 5 D 5	·09	07 2 Jr 11	·89	4 F 10	·42 5 Mr 11	·95
4 Au 27	·87 6 S 26	·40 7 O 25	·98 2 N 24	·46	08 7 Jr 1	·25	1 Jr 30	·78 3 F 28	·82
3 S 15	·76 5 O 15	·30 6 N 13	·83 1 D 13	·86	4 D 20	·62	09 6 Jr 19	·15 7 F 17	·68
1 S 5	·18 2 O 4	·66 4 N 3	·19 5 D 2	·72					
5 Au 24	·50 7 S 23	·03 1 O 22	·56 8 N 21	·09					

For tithis by Brahma Siddhānta add algebraically —·02 to the above.

TABLE II.—Solar years and new moons

			Com- mence- ment of solar year.						Vaisākha.		Jyeshtha.		Āshāḍha.		Śrāvaṇa.		Bhādrapada.				
Kaliyuga.	Vikrama era.	Śaka era.	Month and day A.D.	Fraction of day.	First new moon in solar year.	Anomaly of first new moon.	Christian era.		Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	
A.D.																					
3210	166	81	15M	.1876	4-0262	13-572	109		2	Mr	19	.21	3	Ap	17	.74	5	My	17	.27	
3211	167	82	15M	.4463	22-6651	11-705	110		1	Ap	7	.11	2	My	6	.64	4	Je	5	.17	
3212	168	83	15M	.7051	11-7738	7-862	111		5	Mr	27	.48	7	Ap	26	.01	1	My	25	.54	
3213	169	84	14M	.9638	0-8817	4-020	112		2	Mr	15	.84	5	My	13	.91	7	Je	12	.44	
3214	170	85	15M	.2226	19-5206	2-153	113		1	Ap	3	.74	3	My	3	.27	4	Je	1	.80	
3215	171	86	15M	.4813	8-6289	25-865	114		6	Mr	24	.11	7	Ap	22	.64	2	My	22	.17	
3216	172	87	15M	.7401	27-2677	23-998	115		5	Ap	12	.01	6	My	11	.54	1	Je	10	.07	
3217	173	88	14M	.9988	16-3760	20-155	116		2	Mr	31	.87	3	Ap	29	.90	5	My	29	.44	
3218	174	89	15M	.2576	5-4843	16-812	117		6	Mr	20	.74	1	Ap	19	.27	2	My	18	.80	
3219	175	90	15M	.5164	24-1232	14-446	118		5	Ap	8	.64	7	My	8	.17	1	Je	6	.70	
3220	176	91	15M	.7761	13-2815	10-603	119		3	Mr	29	.01	4	Ap	27	.54	6	My	27	.07	
3221	177	92	15M	.0339	2-3398	6-760	120		7	Mr	17	.37	1	Ap	15	.90	4	Je	13	.96	
3222	178	93	15M	.2926	20-9787	4-893	121		6	Ap	5	.27	7	My	4	.80	2	Je	3	.33	
3223	179	94	15M	.5514	10-0870	1-051	122		3	Mr	25	.64	5	Ap	24	.17	6	My	23	.70	
3224	180	95	15M	.8101	28-7259	26-739	123		2	Ap	13	.54	4	My	13	.07	5	Je	11	.60	
3225	181	96	15M	.0689	17-8842	22-896	124		6	Ap	1	.90	1	My	1	.43	2	My	80	.96	
3226	182	97	15M	.3277	6-9425	19-053	125		4	Mr	22	.28	5	Ap	20	.80	7	My	20	.33	
3227	183	98	15M	.5864	25-5814	17-176	126		3	Ap	10	.17	4	My	9	.70	6	Je	8	.23	
3228	184	99	15M	.8452	14-0897	13-344	127		7	Mr	30	.53	2	Ap	29	.06	3	My	28	.60	
3229	185	100	15M	.1039	3-7980	9-501	128		4	Mr	18	.90	6	Ap	17	.43	7	My	16	.86	
3230	186	101	15M	.3627	22-4369	7-634	129		3	Ap	6	.80	5	My	6	.38	6	Je	4	.86	
3231	187	102	15M	.6214	11-5462	3-791	130		1	Mr	27	.17	2	Ap	25	.70	4	My	25	.23	
3232	188	103	15M	.8802	6-6535	27-503	131		5	Mr	16	.53	1	My	14	.59	3	Je	13	.12	
3233	189	104	15M	.1399	19-2923	26-636	132		7	Ap	15	.08	5	My	2	.96	7	Je	1	.49	
3234	190	105	15M	.3977	8-4006	21-794	133		4	Ap	3	.43	5	My	2	.96	7	Je	1	.49	
3235	191	106	15M	.6565	27-0395	19-927	134		1	Mr	23	.80	3	Ap	22	.38	4	My	21	.86	
3236	192	107	15M	.9152	16-1478	16-084	135		7	Ap	11	.70	2	My	11	.23	3	Je	9	.78	
3237	193	108	15M	.1740	5-2561	12-241	136		5	Ap	1	.06	6	Ap	80	.59	1	My	80	.12	
3238	194	109	15M	.4327	28-8950	10-875	137		2	Mr	20	.43	3	Ap	18	.96	5	My	18	.49	
3239	195	110	15M	.6915	13-0033	6-532	138		9	6	Ap	18	.96	5	My	18	.49	1	Je	17	.55
3240	196	111	15M	.9502	2-1116	2-689	139		1	Ap	8	.83	2	My	7	.86	4	Je	6	.39	
3241	197	112	15M	.2090	20-7505	0-822	140		5	Mr	28	.69	7	Ap	27	.22	1	My	26	.76	
3242	198	113	15M	.4678	9-8589	24-534	141		3	Mr	18	.06	4	Ap	16	.59	7	Je	14	.65	
3243	199	114	15M	.7265	28-4977	22-667	142		6	Ap	4	.96	3	My	4	.49	5	Je	3	.02	
3244	200	115	15M	.9853	17-6060	18-825	143		1	Mr	25	.38	7	Ap	23	.86	2	My	23	.89	
3245	201	116	15M	.2440	6-7143	14-982	144		5	Ap	13	.22	6	My	12	.07	5	Je	11	.60	
3246	202	117	15M	.5028	25-3532	13-115	145		2	Ap	2	.59	4	My	2	.12	5	My	81	.65	
3247	203	118	15M	.7615	14-4615	9-272	146		6	Mr	21	.96	1	Ap	20	.49	3	My	20	.02	
3248	204	119	16M	.0203	3-5698	5-480	147		5	Ap	9	.86	7	My	9	.39	1	Je	7	.92	
3249	205	120	15M	.2791	22-2087	3-563	148		3	Mr	30	.22	4	Ap	28	.75	6	My	28	.28	
3250	206	121	15M	.5378	11-3170	27-275	149		7	Mr	19	.59	2	Ap	18	.12	5	Je	16	.18	
3251	207	122	15M	.7966	0-4253	23-432	150		6	Ap	6	.49	1	My	6	.02	2	Je	4	.55	
3252	208	123	16M	.0553	19-0841	21-565	151		8	Mr	26	.85	5	Ap	25	.93	6	My	24	.92	
3253	209	124	15M	.3141	8-1724	17-723	152		1	Mr	18	.06	4	Ap	16	.59	7	Je	14	.65	
3254	210	125	15M	.5728	26-8118	15-858	153		4	Mr	28	.49	6	Ap	22	.93	7	My	21	.55	
3255	211	126	15M	.8316	16-9196	12-018	154		3	Ap	11	.38	4	My	10	.91	6	Je	9	.44	
3256	212	127	16M	.0904	5-0279	8-170	155		7	Mr	31	.75	2	Ap	30	.28	3	My	29	.81	
3257	213	128	15M	.3491	23-8668	6-304	156		5	Mr	21	.12	6	Ap	19	.65	2	My	19	.18	
3258	214	129	15M	.6079	12-7751	2-461	157		4	Ap	8	.02	5	My	7	.55	7	Je	6	.08	
3259	215	130	15M	.8666	1-8834	20-173	158		1	Mr	28	.38	2	Ap	26	.91	4	My	26	.44	
3260	216	131	16M	.1254	20-5223	23-306	159		5	Mr	17	.75	1	Ap	16	.28	3	Je	14	.34	
3261	217	132	15M	.3841	9-6306	20-463	160		8	Mr	26	.85	5	Ap	25	.93	6	My	24	.92	
3262	218	133	15M	.6429	28-2895	18-596	161		1	Mr	18	.06	4	Ap	16	.59	7	Je	14	.65	

from 1 B.C. to A.D. 500 (Sūrya siddhānta)*—cont.

Āśvina.			Kārttika.			Mārgaśīrsha.			Pauṣa.			A.D.			Māgha.			A.D.			Phālguna.			Chaitra.			
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
4 S	12		40 5 O 11	93	7 N	10		46 1 D	9	99		10	8 Jr	8	52		5 F	7	05	6 Mr	8	58					
1 S	1		76 3 O 1	29	4 O	30		82 6 N	29	86			7 D	28	89		11	2 Jr	27	42	3 F	25	95				
6 An	22		13 7 S 20	66	2 O	20		19 3 N	18	72			5 D	18	26		12	6 Jr	16	78	1 F	15	81				
5 S	9		03 6 O 8	56	1 N	7		09 2 D	6	62		13	4 Jr	5	15			5 F	3	68	7 Mr	5	21				
2 Au	29		40 3 S 27	93	5 O	27		46 6 N	25	99			1 D	25	52		14	3 Jr	24	05	4 F	22	58				
1 S	17		29 2 O 16	82	4 N	15		35 5 D	14	88		15	7 Jr	13	42			1 F	11	95	3 Mr	13	48				
5 S	6		66 7 O 6	19	1 N	4		72 3 D	4	25		16	4 Jr	2	78			6 F	1	81	7 Mr	1	84				
3 Au	26		08 4 S 24	56	6 O	24		09 7 N	22	62			2 D	22	15		17	3 Jr	20	68	5 F	19	21				
1 S	13		92 3 O 13	46	4 N	11		99 6 D	11	52		18	1 Jr	10	05			2 F	8	58	4 Mr	10	10				
6 S	3		29 7 O 2	82	2 N	1		35 3 N	30	88			5 D	30	41		19	6 Jr	28	94	1 F	27	48				
3 An	23		68 5 S 22	19	6 O	21		72 1 N	20	25			2 D	19	78		20	4 Jr	18	31	5 F	16	84				
2 S	10		56 4 O 10	09	5 N	8		62 7 D	8	15		21	1 Jr	6	68			3 F	5	21	4 Mr	6	74				
6 An	30		92 1 S 29	45	2 O	28		98 4 N	27	52			6 D	27	05		22	7 Jr	25	58	2 F	24	11				
4 Au	20		29 7 O 18	35	Mārgaśīrsha Kṣhaya.				1 N	16	88			3 D	16	41		23	4 Jr	14	94	1 Mr	15	06			
8 S	8		19 4 S 19	82	6 N	6		25 7 D	5	78		24	2 Jr	4	81			8 F	2	84	5 Mr	3	37				
7 An	27		56 2 S 26	09	3 O	25		62 5 N	24	15			6 D	23	68		25	1 Jr	22	21	2 F	20	74				
6 S	15		45 7 O 14	98	2 N	13		51 4 D	13	04		26	5 Jr	11	58			7 F	10	11	1 Mr	11	64				
8 S	4		82 5 O 4	35	6 N	2		88 1 D	2	41			2 D	31	94		27	4 Jr	30	47	6 Mr	1	00				
1 Au	25		19 2 S 23	72	4 O	23		25 5 N	21	78			7 D	21	81		28	1 Jr	19	84	3 F	18	87				
7 S	12		08 1 O 11	62	3 N	10		15 4 D	9	68		29	6 Jr	8	21			7 F	6	74	2 Mr	8	27				
4 S	1		45 5 S 30	98	7 O	30		51 2 N	29	04			3 D	28	57		30	5 Jr	27	10	6 F	25	64				
1 Au	21		82 3 S 20	35	4 O	19		88 6 N	18	41			7 D	17	94		31	2 Jr	16	47	4 F	15	00				
7 S	9		72 2 O 9	25	3 N	7		78 5 D	7	31		32	6 Jr	5	84			1 F	4	37	2 Mr	4	90				
5 An	29		08 6 S 27	61	1 O	27		14 2 N	25	68			4 D	25	21		33	5 Jr	28	74	7 F	22	27				
3 S	18		98 5 O 18	51	7 N	15		04 1 D	14	57		34	3 Jr	13	10			4 F	11	68	6 Mr	13	16				
1 S	6		35 2 O 5	88	4 N	4		41 5 D	3	94		35	7 Jr	2	47			2 F	1	00	3 Mr	2	53				
5 Au	26		72 7 S 25	25	1 O	24		78 3 N	23	81			4 D	22	84		36	6 Jr	21	37	7 F	19	90				
4 S	13		61 6 O 13	14	7 N	11		67 2 D	11	20		37	3 Jr	9	74			5 F	8	27	6 Mr	9	80				
1 S	2		98 3 O 2	51	5 N	1		04 6 N	30	57			1 D	30	10		38	2 Jr	28	68	4 F	27	16				
6 An	23		35 7 S 21	88	2 O	21		41 3 N	19	94			5 D	19	47		39	7 Jr	18	00	1 F	16	53				
5 S	11		24 6 O 10	78	1 N	9		81 2 D	8	84		40	4 Jr	7	87			5 F	5	90	7 Mr	6	43				
2 Au	30		61 4 S 29	14	5 O	28		67 7 N	27	20			1 D	26	78		41	3 Jr	25	28	4 F	23	80				
6 An	19		98 3 O 18	04	Mārgaśīrsha Kṣhaya.				4 N	16	57			6 D	16	10		42	7 Jr	14	83	2 F	13	16			
1 S	18		51																								
5 S	7		88 7 O 7	41	1 N	5		94 3 D	5	47		43	5 Jr	4	00			6 F	2	58	1 Mr	4	06				
8 An	28		24 4 S 26	77	6 O	26		30 7 N	24	84			2 D	24	87		44	3 Jr	22	90	5 F	21	43				
2 S	15		14 3 O 14	07	5 N	13		20 6 D	13	73		45	1 Jr	11	26			2 F	9	79	4 Mr	11	82				
6 S	4		51 1 O 4	04	2 N	2		57 4 D	2	10			5 D	31	63		46	7 Jr	30	16	1 F	28	69				
3 Au	24		88 5 S 23	41	6 O	22		94 1 N	21	47			3 D	21	00		47	4 Jr	19	53	6 F	18	06				
2 S	12		77 4 O 12	80	5 N	10		83 7 D	10	86		48	1 Jr	8	90			3 F	7	43	4 Mr	7	96				
7 S	1		14 1 S 30	67	3 O	30		20 4 N	28	73			6 D	28	26		49	7 Jr	26	79	2 F	25	32				
4 Au	21		51 7 S 20	04	7 O	19		57 2 N	18	10			3 D	17	63		50	5 Jr	16	16	6 F	14	69				
3 S	9		40 4 O 8	94	6 N	7		47 1 D	7	00		51	2 Jr	5	53			4 F	4	08	5 Mr	5	59				
7 An	29		77 2 S 28	30	3 O	27		83 5 N	26	86			6 D	25	89		52	1 Jr	24	42	2 F	22	96				
6 S	16		67 1 O 16	20	2 N	14		78 4 D	14	26		53	5 Jr	12	79			7 F	11	82	1 Mr	12	85				
4 S	6		04 5 O 5	57	7 N	4		10 1 D	3	68		54	3 Jr	2	16			4 Jr	31	69	6 Mr	2	22				
1 Au	26		40 2 S 24	98	4 O	24		48 6 N	23	00			7 D	22	53		55	2 Jr	21	06	3 F	19	59				
7 S	14		80 1 O 13	83	3 N	12		36 4 D	11	89		56	6 Jr	10	42			7 F	8	95	2 Mr	9	48				
4 S	2		67 6 O 2	20	7 O	31		73 2 N	30	26			3 D	29	79		57	5 Jr	28	32	6 F	26	85				
2 Au	23		04 3 S 21	57	5 O	21		10 6 N	19	63			1 D	19	16		58	2 Jr	17	69	4 F	16	22				
7 S	10		98 2 O 10	46	3 N	8		99 5 D	8	52		59	7 Jr	7	06			1 F	5	59	3 Mr	7	12				
5 An	31		80 6 S 29	38	1 O	29		36 2 N	27	89			4 D	27	42		60	5 Jr	25	95	7 F	24	84				
2 Au	19		67																								
4 S	18		20																								
1 S	7		56 3 O 7	10	4 N	5		63 6 D	5	16		62	7 Jr	3	89			2 F	2	22	3 Mr	3	75				

For tithis by Brahma siddhānta add algebraically — .02 to the above.

TABLE II.—NEW MOONS AND ECLIPSES

TABLE II.—Solar years and new moons

			Com- mence- ment of solar year.		First new moon in solar year.		Anomaly of first new moon.		Christian era.		Vaiśākha.				Jyēṣṭha.				Āṣāḍha.				Śrāvaṇa.				Bhādrapada.			
Kaliyuga.	Vikrama era.	Śaka era.	Month and day A.D.	Fraction of day.	First new moon in solar year.	Anomaly of first new moon.	Christian era.	A.D.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.		
3263	219	84	15M	9016	17-3778	14-764	162	5 Ap	2	28	6 My	1	81	1 My	31	84	2 Je	29	87	4 Ji	29	40								
3264	220	85	16M	1604	6-4861	10-911	163	2 Mr	22	65	4 Ap	21	18	5 My	20	71	7 Je	19	24	3 Au	17	30								
3265	221	86	15M	4192	25-1250	9-044	164	1 Ap	9	54	3 My	9	07	4 Je	7	60	6 Ji	7	14	7 Au	5	67								
3266	222	87	15M	6779	14-2838	5-201	165	5 Mr	29	91	7 Ap	28	44	1 My	27	97	8 Je	26	50	5 Ji	26	08								
3267	223	88	15M	9887	3-8416	1-859	166	3 Mr	19	28	6 My	17	34	7 Je	15	87	2 Ji	15	40	3 Au	18	93								
3268	224	89	16M	1954	21-9805	27-047	167	2 Ap	7	18	3 My	6	71	5 Je	5	24	6 Ji	4	77	1 Au	3	80								
3269	225	90	15M	4542	11-0888	23-204	168	6 Mr	26	54	1 Ap	25	07	2 My	24	60	4 Je	23	13	5 Ji	22	66								
3270	226	91	15M	7129	0-1971	19-861	169	3 Mr	15	91	6 My	13	07	1 Je	12	50	3 Ji	12	08	4 Au	10	56								
3271	227	92	15M	8717	18-8359	17-494	170	5 Ap	14	44	4 My	3	34	5 Je	1	87	7 Ji	1	40	1 Ji	30	93								
3272	228	93	16M	2305	7-9442	13-652	171	2 Ap	3	81	4 My	8	70	3 My	22	24	4 Je	20	77	7 Au	18	83								
3273	229	94	15M	4892	26-5831	11-785	172	7 Mr	24	17	1 Ap	22	70	3 My	22	24	4 Je	20	77	7 Au	18	83								
3274	230	95	15M	7480	15-6914	7-942	173	6 Ap	11	07	7 Mr	10	60	2 Je	9	13	3 Ji	8	68	5 Au	7	19								
3275	231	96	16M	0067	4-7997	4-090	174	8 Mr	31	44	4 Ap	29	97	6 My	29	50	1 Je	28	03	2 Ji	27	56								
3276	232	97	16M	2655	23-4386	2-233	175	7 Mr	20	81	2 Ap	19	84	5 Je	17	40	6 Ji	16	93	1 Au	15	46								
3277	233	98	15M	5242	12-5469	25-945	176	6 Ap	8	70	1 My	8	23	2 Je	6	76	4 Ji	6	80	5 Au	4	83								
3278	234	99	15M	7830	1-6552	22-102	177	4 Mr	28	07	5 Ap	26	60	7 My	26	13	1 Je	24	68	3 Ji	24	19								
3279	235	100	16M	0417	20-2941	20-235	178	1 Mr	17	44	2 Ap	15	97	6 Je	14	03	7 Ji	13	56	2 Au	12	09								
3280	236	101	16M	3005	9-4024	16-892	179	7 Ap	6	34	1 My	4	87	3 Je	8	40	4 Ji	2	93	6 Au	1	46								
3281	237	102	15M	5593	28-0418	14-526	180	4 Mr	25	70	6 Ap	24	23	7 My	23	76	2 Je	22	29	8 Ji	21	82								
3282	238	103	15M	8180	17-1406	10-638	181	4 Mr	25	70	6 Ap	24	23	7 My	23	76	2 Je	22	29	8 Ji	21	82								
3283	239	104	16M	0768	6-2579	6-840	182	3 Ap	12	60	5 My	12	13	6 Je	10	68	1 Ji	10	19	2 Au	8	72								
3284	240	105	16M	3355	24-8988	4-973	183	7 Ap	1	97	2 My	1	60	4 My	31	03	5 Je	29	58	7 Ji	29	09								
3285	241	106	15M	5943	14-0051	1-180	184	5 Mr	22	33	6 Ap	20	68	1 My	20	40	2 Je	18	98	5 Au	16	99								
3286	242	107	15M	8530	3-1134	24-842	185	4 Ap	10	23	5 My	9	76	7 Je	8	29	1 Ji	7	82	3 Au	6	35								
3287	243	108	16M	1118	21-7522	22-976	186	1 Mr	29	60	3 Ap	28	13	4 My	27	68	6 Je	26	19	7 Ji	25	72								
3288	244	109	16M	3706	10-8905	19-133	187	5 Mr	18	97	7 Ap	17	50	3 Je	15	56	5 Ji	15	09	6 Au	13	62								
3289	245	110	15M	6293	29-4994	17-266	188	4 Ap	6	68	6 My	6	89	7 Je	4	92	2 Ji	4	46	3 Au	2	99								
3290	246	111	15M	8881	18-6077	13-423	189	2 Mr	27	60	3 Ap	25	76	5 My	25	29	6 Je	23	82	1 Ji	23	85								
3291	247	112	16M	1468	7-7160	9-581	190	6 Mr	15	50	2 My	18	06	4 Je	12	19	5 Ji	11	72	7 Au	10	25								
3292	248	113	16M	4056	26-8549	7-714	191	1 Ap	14	13	7 My	3	03	1 Je	1	56	3 Ji	1	09	4 Ji	30	62								
3293	249	114	15M	6643	15-4632	3-871	192	5 Ap	3	86	4 Ap	22	39	5 My	21	92	7 Je	20	45	1 Ji	19	98								
3294	250	115	15M	9231	4-5715	0-028	193	2 Mr	23	86	3 My	11	29	4 Je	9	82	6 Ji	9	85	7 Au	7	88								
3295	251	116	16M	1819	23-2104	25-716	194	6 Mr	31	43	7 Ap	29	86	2 My	29	19	8 Je	27	72	5 Ji	27	25								
3296	252	117	16M	4406	12-3187	21-873	195	3 Mr	20	19	5 Ap	19	03	6 My	18	56	2 Ji	16	62	4 Au	15	15								
3297	253	118	15M	6994	1-4270	18-031	196	2 Ap	8	89	3 My	7	92	5 Je	6	45	6 Ji	5	98	1 Au	4	61								
3298	254	119	16M	9581	20-0659	16-164	197	6 Mr	28	76	1 Ap	27	29	2 My	28	82	4 Je	25	85	5 Ji	24	86								
3299	255	120	16M	2169	9-1742	12-321	198	4 Mr	17	18	5 Ap	15	66	1 Je	18	72	3 Ji	13	25	4 Au	11	78								
3300	256	121	16M	4756	27-8181	10-454	199	3 Ap	5	02	7 My	4	55	6 Je	3	08	7 Ji	2	62	2 Au	1	15								
3301	257	122	15M	7344	16-9214	6-612	200	7 Mr	23	89	1 Ap	23	92	3 My	23	45	4 Je	21	91	6 Ji	21	51								
3302	258	123	15M	9932	6-0297	2-769	201	6 Ap	13	29	7 My	12	82	2 Je	11	85	3 Ji	10	88	5 Au	9	41								
3303	259	124	16M	2519	24-6686	0-902	202	3 Ap	1	66	5 My	1	19	6 My	30	72	1 Je	29	25	7 Ji	28	76								
3304	260	125	16M	5107	13-7789	24-614	203	1 Mr	22	03	2 Ap	20	55	4 My	20	08	5 Je	18	14	1 Au	16	66								
3305	261	126	15M	7694	2-8852	20-771	204	6 Mr	30	45	1 My	9	45	2 Je	7	98	4 Ji	7	51	6 Au	6	04								
3306	262	127	16M	0282	21-5240	18-904	205	4 Mr	30	29	5 Ap	28	82	7 My	28	95	1 Je	26	88	3 Ji	26	41								
3307	263	128	16M	2869	10-6323	15-062	206	1 Mr	18	65	8 Ap	17	18	6 Je	15	25	7 Ji	14	78	2 Au	18	81								
3308	264	129	16M	5457	29-2712	13-195	207	7 Ap	6	55	2 My	6	09	3 Je	4	61	5 Ji	4	14	6 Au	2	67								
3309	265	130	15M	8044	18-8795	9-852	208	4 Mr	26	92	6 Ap	25	45	7 My	24	98	2 Je	23	51	4 Ji	23	04								
3310	266	131	16M	0632	7-4878	5-509	209	3 Ap	14	82	5 My	14	85	6 Je	12	88	1 Ji	12	41	2 Au	10	9								
3311	267	132	16M	3220	20-1267	3-543	210	1 Ap	3	18	2 My	2	71	4 Je	1	24	6 Je	30	78	7 Ji	30	3								
3312	268	133	16M	5807	15-2850	27-355	211	6 Mr	20	18	7 Ap	18	71	8 Je	16	24	5 Ji	16	80	6 Au	14	8								
3313	269	134	15M	8395	4-3433	23-512	212	5 Ap	8	08	6 My	7	61	1 Je	6	14	2 Ji	5	67	4 Au	4	1								
3314	270	135	16M	0982	22-9822	21-645	213	2 Mr	28	45	3 Ap	26	98	5 My	26	51	7 Je	25	04	1 Ji	24	1								
3315	271	136	16M	3570	12-0905	17-802	214	6 Mr	17	81	2 My	15	88	4 Je	14	41	5 Ji	13	94	7 Au	12	4								
3316	272	137	16M	6157	1-1988	18-260	215																							

* Ending moment of tithis are the same for Ārya and Śārya siddhānta

from 1 B.C. to 500 A.D. (Sūrya siddhānta)*—cont.

Āśvina.				Kārttika.				Mārgaśīrṣa.				Pauṣa.				A.D.	Māgha.				A.D.	Phālguna.				Chaitra.			
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.		Week-day.	Month.	Day.	Fraction.		Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
5 Au 27			'88	7 S	20	○	'46	1 O	25		'99	3 N	24	'52		5 D	24	'05		63	6 Jr	22	'58	1 F	21	'12			
4 S	15	○	'83	6 O	15		'86	7 N	13		'89	2 D	13	'42		64	3 Jr	11	'95		5 F	10	'48	7 Mr	11	'01			
2 S	4	●	'20	3 O	3		'73	5 N	2		'26	6 D	1	'79		1 D	31	'82		65	2 Jr	20	'85	4 F	28	'38			
6 Au 24			'56	1 S	28		'09	2 O	22		'62	4 N	21	'15		5 D	20	'69		66	4 Jr	18	'22	1 F	17	'75			
5 S	12		'46	6 O	11		'99	1 N	10		'52	3 D	10	'05		67	4 Jr	8	'58		6 F	7	'11	7 Mr	8	'64			
2 S	1		'88	4 O	1		'36	5 O	30		'89	7 N	29	'42		1 D	28	'95		68	3 Jr	27	'48	5 F	26	'01			
7 Au 21			'20	1 S	19		'73	3 O	19		'26	4 N	17	'79		6 D	17	'32		69	7 Jr	15	'85	2 F	14	'38			
6 S	9		'09	7 O	8		'62	2 N	7	○	'15	3 D	6	'68		70	5 Jr	5	'22		6 F	3	'75	1 Mr	5	'28			
3 Au 29			'46	4 S	27		'99	6 O	27	○	'52	1 N	26	'05		2 D	25	'58		71	4 Jr	24	'11	5 F	22	'64			
2 S	17		'36	3 O	16		'89	5 N	15		'42	6 D	14	'95		72	1 Jr	13	'48		3 F	12	'01	4 Mr	12	'54			
6 S	5	○	'72	1 O	5	●	'26	2 N	3		'79	4 D	3	'82		73	5 Jr	1	'85		7 Jr	31	'38	1 Mr	1	'91			
4 Au 26			'09	5 S	24		'62	7 O	24		'15	1 N	22	'68		3 D	22	'21		74	4 Jr	20	'74	6 F	19	'28			
2 S	18		'99	4 O	13		'52	6 N	12		'05	7 D	11	'58		75	2 Jr	10	'11		3 F	8	'64	5 Mr	10	'17			
7 S	8		'86	1 O	2		'89	5 N	1		'42	4 N	30	'95		6 D	30	'48		76	1 Jr	29	'01	2 F	27	'54			
4 Au 22			'72	6 S	21		'25	7 O	20		'78	2 N	19	'82		3 D	18	'85		77	5 Jr	17	'38	6 F	15	'91			
3 S	10		'62	5 O	10		'15	6 N	8		'68	1 D	8	'21		78	2 Jr	6	'74		4 F	5	'27	5 Mr	6	'80			
7 Au 30			'99	2 S	29		'52	4 O	29		'05	5 N	27	'58		7 D	27	'11		79	1 Jr	25	'64	3 F	24	'17			
5 Au 20			'86				'42	2 N	16		'95	4 D	16	'48		80	6 Jr	15	'01		7 F	13	'54	2 Mr	14	'07			
6 S	18		'89	1 O	18	○	'42	2 N	16		'95	4 D	16	'48		81	3 Jr	3	'88		4 F	1	'91	6 Mr	3	'44			
4 S	7		'25	5 O	6	○	'78	7 N	5		'31	1 D	4	'84		7 D	23	'74		82	2 Jr	22	'27	3 F	20	'80			
1 Au 27			'62	3 S	26	○	'15	4 O	25		'68	6 N	24	'21		83	6 Jr	11	'64		1 F	10	'17	2 Mr	11	'70			
7 S	15		'52	2 O	15		'05	3 N	13		'58	5 D	13	'11		84	4 Jr	1	'01		5 Jr	30	'54	7 F	29	'07			
4 S	4		'88	6 O	4		'42	7 N	2		'95	2 D	2	'48		1 D	20	'37		85	2 Jr	18	'90	4 F	17	'44			
2 Au 24			'25	3 S	22		'78	5 O	22		'31	6 N	20	'84		86	7 Jr	8	'27		1 F	6	'80	3 Mr	8	'33			
1 S	12		'15	2 O	11		'68	4 N	10		'21	5 D	9	'74		4 D	28	'64		87	6 Jr	27	'17	7 F	25	'70			
5 S	1		'52	7 O	1		'05	1 O	30		'58	3 N	29	'11		2 D	18	'01		88	3 Jr	16	'54	5 F	16	'07			
2 Au 21			'88	4 S	20		'41	5 O	19		'94	7 N	18	'48		89	7 Jr	4	'90		2 F	3	'43	3 Mr	4	'96			
1 S	8		'78	3 O	8		'31	4 N	6	○	'84	6 D	6	'87		5 D	25	'27		90	6 Jr	23	'80	1 F	22	'88			
6 Au 29			'15	7 S	27		'68	2 O	27	●	'21	3 N	25	'74		91	4 Jr	13	'17		5 F	11	'70	7 Mr	13	'23			
5 S	17		'05	6 O	16		'58	1 N	15		'11	2 D	14	'64		92	1 Jr	2	'54		3 F	1	'07	4 Mr	1	'60			
2 S	6	○	'41	3 O	5	●	'94	5 N	4		'47	7 D	4	'00		5 D	21	'90		93	7 Jr	20	'43	1 F	18	'96			
6 Au 25			'78	1 S	24		'31	2 O	28		'84	4 N	22	'37		94	4 Jr	9	'80		6 F	8	'33	7 Mr	9	'86			
5 S	18		'68	7 O	13		'21	1 N	11		'74	3 D	11	'27		2 D	30	'17		95	3 Jr	28	'70	5 F	27	'23			
3 S	8		'04	4 O	2		'58	6 N	1		'11	7 N	30	'64		6 D	19	'53		96	1 Jr	18	'06	2 F	16	'00			
7 Au 23			'41	1 S	21		'94	3 O	21		'47	5 N	20	'00		97	5 Jr	6	'43		6 F	4	'96	1 Mr	6	'49			
6 S	10		'31	7 O	9		'84	2 N	8		'37	3 D	7	'90		2 D	26	'80		98	4 Jr	25	'33	5 F	23	'86			
3 Au 30			'68	5 S	29		'21	6 O	28	○	'74	1 N	27	'27		99	1 Jr	84	'70		3 F	18	'23	4 Mr	14	'76			
1 Au 20			'04				'10	5 N	16		'64	7 D	16	'17		200	6 Jr	4	'06		7 F	2	'59	2 Mr	3	'12			
2 S	18		'57	5 O	18	○	'10	5 N	16		'64	7 D	16	'17		3 D	23	'43		01	4 Jr	21	'96	6 F	20	'49			
6 S	7		'94	1 O	7	○	'47	3 N	6		'00	4 D	5	'53		02	2 Jr	11	'33		3 F	9	'86	5 Mr	11	'89			
4 Au 27			'31	5 S	25		'84	7 O	25		'37	1 N	23	'90		6 D	31	'70		03	1 Jr	30	'23	2 F	28	'76			
3 S	15		'21	4 O	14		'74	6 N	13		'27	7 D	12	'80		4 D	21	'06		04	5 Jr	19	'59	7 F	18	'12			
7 S	4		'57	2 O	4		'10	3 N	2		'63	5 D	2	'16		05	2 Jr	7	'96		4 F	6	'49	6 Mr	8	'02			
4 Au 24			'94	6 S	23		'47	1 O	23		'00	2 N	21	'53		6 D	31	'70		06	1 Jr	26	'86	3 F	25	'39			
3 S	11		'84	5 O	11		'37	6 N	9		'90	1 D	9	'43		7 D	28	'33		07	6 Jr	16	'22	7 F	14	'76			
1 S	1		'20	2 S	30		'74	4 O	30		'27	5 N	28	'80		4 D	17	'69		08	3 Jr	5	'59	5 F	4	'12	6 Mr	4	'65
5 Au 21			'57	7 S	20		'10	1 O	19		'63	3 N	18	'16		7 D	24	'96		09	2 Jr	23	'49	4 F	22	'02			
4 S	9		'47	6 O	9		'00	7 N	7		'53	2 D	7	'06		10	6 Jr	12	'86		1 F	11	'39	2 Mr	12	'92			
1 Au 28			'84	3 S	27		'37	4 O	26	●	'90	6 N	25	'43		11	4 Jr	2	'22		5 Jr	31	'75	7 Mr	2	'23			
7 S	16	○	'73	2 O	16	●	'26	3 N	14		'80	5 D	14	'83		1 D	22	'59		12	3 Jr	21	'12	4 F	19	'65			
5 S	6	○	'10	6 O	5		'68	1 N	4		'16	2 D	3	'69		13	7 Jr	9	'49		2 F	8	'02	3 Mr	9	'55			
2 Au 26			'47	4 S	25		'00	5 O	24		'53	7 N	23	'06		4 D	20	'86		14	6 Jr	28	'39	7 F	26	'92			
1 S	13		'37	2 O	12		'90	4 N	11		'43	5 D	10	'96		2 D	19	'22		15	3 Jr	17	'75	5 F	16	'23			
5 S	2		'78	7 O	2		'26	1 O	31		'79	3 N	30	'82		16	1 Jr	7	'12		2 F	5	'65	4 Mr	6	'18			
3 Au 28			'10	4 S	21		'63	6 O	21		'16	7 N	19	'69															
2 S	11		'00	3 O	10		'53	5 N	9		'06	6 D	8	'59		16	1 Jr	7	'12										

For tithis by Brahma siddhānta add algebraically — '02 to the above.

TABLE II.—Solar years and new moons

Kalyuga.	Vi. rama era.	Śaka era.	Month and day A.D.	Commence-ment of solar year.	First new moon in solar year.	Anomaly of first new moon	Christian era	Vaiśākha.				Jyeshṭha.				Āshāḍha.				Śrāvaṇa.				Bhādrapada.			
								Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
8317	273	188	15M	8745	198377	12093	216	5	Ap	4	71	7	My	4	24	1	Je	2	77	3	Ji	2	80	4	Ji	31	88
8318	274	139	16M	1338	89460	8250	217	3	Mr	25	08	4	Ap	23	61	6	My	23	14	7	Je	21	67	2	Ji	21	20
8319	275	140	16M	3920	275849	6888	218	1	Ap	12	98	3	My	12	51	5	Je	11	04	6	Ji	10	57	1	An	9	10
8320	276	141	16M	6508	166932	2541	219	6	Ap	2	84	7	My	1	87	2	My	31	40	3	Je	29	94	5	Ji	29	47
8321	277	142	15M	9095	58015	28252	220	3	Mr	21	71	5	Ap	20	24	6	My	19	77	1	Je	18	30	4	An	16	36
8322	278	143	16M	1688	244404	24886	221	2	Ap	9	61	4	My	9	14	5	Je	7	07	7	Ji	7	20	1	An	5	73
8323	279	144	16M	4270	185486	20543	222	6	Mr	29	98	1	Ap	28	51	8	My	28	04	4	Je	26	57	6	Ji	26	10
8324	280	145	16M	6858	26569	16700	223	4	Mr	19	34	7	My	17	87	1	Je	15	93	3	Ji	15	46	5	An	14	00
8325	281	146	15M	9445	212958	14838	224	3	Ap	6	24	4	My	5	77	6	Je	4	30	7	Ji	8	83	2	An	2	88
8326	282	147	16M	2038	104041	10991	225	7	Mr	26	61	2	Ap	25	14	3	My	24	67	5	Je	23	20	6	Ji	22	78
8327	283	148	16M	4621	290430	9124	226	6	Ap	14	50	1	My	14	04	2	Je	12	57	4	Ji	12	10	5	An	10	63
8328	284	149	16M	7208	181513	5281	227	3	Ap	8	87	5	My	8	40	6	Je	1	98	1	Ji	1	46	3	Ji	30	99
8329	285	150	15M	9796	72596	1438	228	1	Mr	23	24	2	Ap	21	77	4	My	21	80	5	Je	19	83	1	An	17	89
8330	286	151	16M	2383	258985	27126	229	7	Ap	11	14	1	My	10	67	3	Je	9	20	4	Ji	8	73	6	An	7	26
8331	287	152	16M	4971	150098	23284	230	4	Mr	31	50	6	Ap	30	08	7	My	29	56	2	Je	28	10	3	Ji	27	63
8332	288	153	16M	7558	41151	19441	231	1	Mr	20	87	3	Ap	19	40	4	My	18	93	7	Ji	16	99	2	An	15	52
8333	289	154	16M	0146	227540	17574	232	7	Ap	7	77	2	My	7	30	3	Je	5	83	5	Ji	5	36	6	An	3	89
8334	290	155	16M	2734	118623	13731	233	5	Mr	28	14	6	Ap	26	67	1	My	26	20	2	Je	24	73	4	Ji	24	26
8335	291	156	16M	5321	09706	9889	234	2	Mr	17	50	5	My	15	56	7	Je	14	09	1	Ji	13	62	3	An	12	16
8336	292	157	16M	7909	160095	8022	235	1	Ap	5	40	2	My	4	93	4	Je	3	46	5	Ji	2	99	7	An	1	52
8337	293	158	16M	0496	87178	4179	236	5	Mr	24	77	7	Ap	23	30	1	My	22	83	3	Je	21	86	4	Ji	20	89
8338	294	159	16M	3084	273587	2312	237	4	Ap	12	86	6	My	12	20	7	Je	10	73	2	Ji	10	26	3	An	8	79
8339	295	160	16M	5671	164650	26024	238	2	Ap	2	08	3	My	1	56	5	My	31	09	6	Je	29	62	1	Ji	29	15
8340	296	161	16M	8259	55738	22181	239	6	Mr	22	40	7	Ap	20	93	2	My	20	46	8	Je	18	52	7	An	17	05
8341	297	162	16M	0847	242121	20315	240	5	Ap	9	30	6	My	8	83	1	Je	7	36	2	Ji	6	89	4	An	5	42
8342	298	163	16M	3434	183204	16472	241	2	Mr	29	66	4	Ap	28	19	5	My	27	72	7	Je	26	26	1	Ji	25	79
8343	299	164	16M	6022	24237	12629	242	7	Mr	19	08	1	Ap	17	56	4	Je	15	62	6	Ji	15	15	7	An	13	68
8344	300	165	16M	8609	210676	10762	243	5	Ap	7	93	7	My	6	46	1	Je	4	99	3	Ji	4	52	5	An	3	05
8345	301	166	16M	1197	101759	6920	244	3	Mr	26	30	4	Ap	24	88	6	My	24	86	7	Je	22	89	2	Ji	22	42
8346	302	167	16M	3784	288148	5058	245	2	Ap	14	19	3	My	13	72	5	Je	12	25	6	Ji	11	78	1	An	10	32
8347	303	168	16M	6372	179231	1210	246	6	Ap	3	06	1	My	3	09	2	Je	1	62	4	Ji	1	15	5	Ji	30	08
8348	304	169	16M	8959	70314	24922	247	8	Mr	23	93	5	Ap	22	46	6	My	21	99	1	Je	20	52	4	An	18	58
8349	305	170	16M	1547	256703	23055	248	2	Ap	10	82	4	My	10	36	5	Je	8	89	7	Ji	8	42	1	An	6	95
8350	306	171	16M	4135	147786	10213	249	7	Mr	31	19	1	Ap	29	72	3	My	29	25	4	Je	27	78	6	Ji	27	81
8351	307	172	16M	6722	88869	15370	250	4	Mr	20	56	6	Ap	19	09	7	My	18	62	8	Ji	16	68	5	An	15	21
8352	308	173	16M	9310	225268	18508	251	3	Ap	8	46	4	My	7	99	6	Je	6	52	1	Ji	6	05	2	An	4	58
8353	309	174	16M	1897	116341	9660	252	7	Mr	27	82	2	Ap	26	85	3	My	25	88	5	Je	24	41	6	Ji	23	95
8354	310	175	16M	4485	07424	5818	253	5	Mr	17	19	1	My	15	25	2	Je	13	78	4	Ji	13	31	5	An	11	84
8355	311	176	16M	7072	193818	3951	254	4	Ap	5	09	5	My	4	62	7	Je	3	15	1	Ji	2	68	3	An	1	21
8356	312	177	16M	9660	84896	0108	255	1	Mr	25	45	2	Ap	23	99	4	My	23	52	6	Je	22	05	2	An	20	11
8357	313	178	16M	2248	271285	25796	256	7	Ap	12	85	1	My	11	88	3	Je	10	41	4	Ji	9	94	6	An	8	47
8358	314	179	16M	4855	162368	21953	257	4	Ap	1	72	6	My	1	25	7	My	30	78	2	Je	29	81	3	Ji	28	64
8359	315	180	16M	7423	58451	18110	258	2	Mr	22	09	3	Ap	20	62	5	My	20	15	6	Je	18	68	2	An	16	74
8360	316	181	17M	0010	289889	16244	259	7	Ap	9	98	2	My	9	51	4	Je	8	05	5	Ji	7	59	7	An	6	11
8361	317	182	16M	2598	180922	12401	260	5	Mr	29	35	6	Ap	27	88	1	My	27	41	2	Je	25	94	4	Ji	25	47
8362	318	183	16M	5185	22005	8558	261	2	Mr	18	72	4	Ap	17	25	7	Je	15	31	1	Ji	14	84	3	An	13	87
8363	319	184	16M	7773	208894	6691	262	1	Ap	6	62	3	My	6	15	4	Je	4	68	6	Ji	4	21	7	An	2	74
8364	320	185	17M	0361	99477	2849	263	5	Mr	26	98	7	Ap	25	51	2	My	25	04	3	Je	23	57	5	Ji	23	11
8365	321	186	16M	2948	28586	0982	264	4	Ap	13	88	6	My	13	41	7	Je	11	94	2	Ji	11	47	4	An	10	00
8366	322	187	16M	5536	176949	24694	265	2	Ap	3	25	3	My	2	78	5	Je	1	31	6	Je	30	84	1	Ji	30	87
8367	323	188	16M	8123	68032	20851	266	6	Mr	23	61	1	Ap	22	15	2	My	21	68	4	Je	20	21	7	An	18	27
8368	324	189	17M	0711	254421	18984	267	5	Ap	11	51	7	My	11	04	1	Je	9	57	3	Ji	9	10	4	An	7	68
8369	325	190	16M	8298	145504	15141	268	2	Mr	30	88	4	Ap	29	41	5	My	28	94	7	Je	27	47	2	Ji	27	00

* Ending moments of tithis by Ārya siddhānta are the same as those given above.

from 1 B.C. to A.D. 500 (Sūrya siddhānta) *—cont.

Āśvina.	Kārttika.	Mārgaśīrsha.	Pauṣa.	A.D.	Māgha.	A.D.	Phalguṇa.	Chaitra.
Week-day. Month. Day.	Fraction. Week-day Month. Day.	Fraction. Week-day Month. Day.	Fraction. Week-day Month. Day.	Fraction. Week-day Month. Day.	Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Week-day. Month. Day.	Fraction. Week-day. Month. Day.
6 Au 30	·86 7 8 28	90 2 0 28○	·43 3 N 28	·98	5 D 26	49	17 7 Jr 25	02 1 F 23
8 Au 19	·78 6 0 17○	79 1 N 16	·82 2 D 15	85	18 4 Jr 14	38	5 F 12	·92 7 Mr 14
5 S 18	·26 4 0 7○	16 5 N 5	·69 7 D 5	22	19 1 Jr 3	75	3 F 2	28 4 Mr 3○
2 S 7	·63 1 8 26	·53 3 0 26	06 4 N 24	59	6 D 24	12	20 7 Jr 22	65 2 F 21○
7 Au 28○	·00 7 0 14	·42 1 N 12	96 3 D 12	49	21 5 Jr 11	·02	6 F 9○	55 1 Mr 11
5 S 14	·89 4 0 3	79 6 N 2	82 7 D 1	·85	2 D 81	38	22 3 Jr 29●	91 5 F 28
3 S 4	·26 2 8 23	16 3 0 22	69 5 N 21	22	6 D 20○	75	23 1 Jr 19●	28 2 F 17
7 Au 24	·63 1 0 12	·06 2 N 10	59 4 D 10○	12	24 5 Jr 8●	65	7 F 7	·18 1 Mr 7
6 S 12	·58 5 8 30	·42 6 0 29	95 1 N 28○	·48	3 D 28	·02	25 4 Jr 26	·55 6 F 25
3 Au 31	·89 2 8 19	·79 4 0 19	82 5 N 17●	85	7 D 17	·88	26 1 Jr 15	·91 { 3 F 14
1 Au 21	·26 1 0 8	·69 3 N 7●	·22 4 D 6	75	27 6 Jr 5	28	7 F 3	81 2 Mr 5
7 S 9	·16 6 8 28○	06 7 0 27	·59 2 N 26	·12	3 D 25	65	28 5 Jr 24	18 6 F 22
4 Au 29	·62 4 0 15	·95 6 N 14	·48 1 D 14	·01	29 2 Jr 12	54	4 F 11	08 5 Mr 12●
3 S 16○	·42 2 0 5	·32 3 N 3	·85 5 D 3	·38	30 6 Jr 1	·91	1 Jr 31○	44 2 Mr 1
7 S 5	·79 6 8 24	·69 1 0 24	22 2 N 22	·75	4 D 22	28	31 5 Jr 20○	·81 7 F 19
5 Au 26●	·16 5 0 13	58 7 N 12	12 1 D 11	·65	32 3 Jr 10●○	18	4 F 8	71 6 Mr 9
4 S 14	·05 2 0 1	·95 4 0 31	·48 6 N 30	01	7 D 29●	·54	33 2 Jr 28	07 3 F 26
1 S 2	·42 7 8 21	·32 1 0 20	·85 3 N 19	·38	4 D 18	91	34 6 Jr 17	·44 7 F 15
5 Au 22	·79 6 0 10	·22 7 N 8○	75 2 D 8	28	35 3 Jr 6	·81	5 F 5	34 6 Mr 6
4 S 10	·69 3 8 29	58 5 0 29●○	11 6 N 27	·64	1 D 27	18	36 2 Jr 25	71 4 F 24
2 Au 31	·05 2 0 17○	48 4 N 16	·01 5 D 15	54	37 7 Jr 14	07	1 F 12	60 3 Mr 14
7 S 17	·95 6 0 6	·85 1 N 5	·38 2 D 4	91	38 4 Jr 3	·44	5 F 1	·87 7 Mr 8○
5 S 7○	·82 4 8 26	·22 5 0 25	·75 7 N 24	·28	1 D 23	81	39 3 Jr 22	·94 4 F 20○
2 Au 27○	·58 3 0 15	11 4 N 13	64 6 D 13	·17	40 7 Jr 11	·70	2 F 10○	·24 3 Mr 10
1 S 15	·58 7 0 3	·48 2 N 2	·01 3 D 1	·54	5 D 31○	07	41 6 Jr 29●	·60 1 F 28
5 S 3	·95 4 8 22	·85 6 0 22	·38 7 N 20	·91	2 D 20○	44	42 3 Jr 18	·97 5 F 17
3 Au 24	·32 3 0 11	·74 5 N 10	·28 6 D 9○	·81	43 1 Jr 8	34	2 F 6	·87 4 Mr 8
2 S 12	·21 1 0 1	·11 2 0 30	·64 4 N 29	·17	5 D 28	70	44 7 Jr 27	23 1 F 25
6 S 1	·58 4 0 8○	·88 5 N 6●	·91 7 D 6	·44	3 D 17	·07	45 4 Jr 15	·60 { 6 F 14
3 Au 20	·95 7 8 27○	·74 8 0 27	·27 4 N 25	·80	46 1 Jr 4	·97	2 F 3	·50 5 Mr 5
2 S 8	·85 2 N 15	·17 3 D 14	·70	48 5 Jr 13	·23	6 F 11○	·76 1 Mr 12	·29
7 Au 29	·21 5 0 3	·01 6 N 3	·54 1 D 3	·07	49 2 Jr 1	·60	4 Jr 31○	·18 5 Mr 1
6 S 17	·11 6 8 24	·88 3 0 23	91 5 N 22	44	6 D 21	·97	1 Jr 20●○	·50 3 F 19
3 S 5●	·48 1 0 13	·27 2 N 11	·80 4 D 11	·38	51 5 Jr 9●	86	7 F 8	·40 1 Mr 9
7 Au 25●	·84 7 N 1	·17 1 N 30	·70	3 D 30	·23	52 4 Jr 28	·76 6 F 27	29
6 S 13	·74 4 0 20	·54 6 N 19○	·07	7 D 18	·60	53 2 Jr 17	·13 3 F 15	·66
4 S 3	·11 3 N 8○	·43 4 D 7	·97	54 6 Jr 6	·50	1 F 5	·03 2 Mr 6	·56
1 Au 22	·48 2 N 27	·80 2 N 27	·33	3 D 26	·86	55 5 Jr 25	·89 6 F 23	92
7 S 10	·37 6 N 16	·70 1 D 16	·23	56 2 Jr 14	76	4 F 13	·29 5 Mr 13○	·82
4 Au 30	·64 4 N 5	07 5 D 4	·60	57 7 Jr 3	·13	1 F 1	·66 3 Mr 3○	·19
3 S 18○	·01 2 25	·43 2 N 23	·96	4 D 23	·49	58 6 Jr 22	·03 7 F 20	·56
1 S 7○	·37 7 N 13	·33 1 D 12	·86	59 3 Jr 11○	·39	4 F 9	·92 6 Mr 11	45
5 Au 27○●	·27 5 0 4	·17 4 N 2	·70 6 D 2	·23	7 D 31○	·76	60 2 Jr 30●	·29 3 F 28
4 S 15	·64 2 0 22	·53 2 0 22	07 8 N 20	·00	5 D 20○	·13	61 5 Jr 18	·66 1 F 17
1 S 4	·90 6 0 11	·43 7 N 9	96 2 D 9	·49	62 4 Jr 8	·02	5 F 6	53 7 Mr 8
6 Au 24	·90 5 0 30	83 6 N 28●	·86	1 D 28	·39	63 2 Jr 26	·92 4 F 25	·45
4 S 11	·27 1 S 20	17	38 6 N 28●	28	5 D 17	·76	64 7 Jr 16	·29 { 1 F 14
2 S 1	·64 { 2 0 19○	·70	4 N 18●	28	65 4 Jr 4	86	6 F 3	·19 7 Mr 4
6 Au 21	·53 7 0 8	·06 1 N 6	·59 3 D 6	·13	2 D 25	·02	66 3 Jr 23	·55 5 F 22○
5 S 8	·90 4 8 27○	·43 5 0 26	·96 7 N 25	·49	67 7 Jr 12	·92	2 F 11○	·45 3 Mr 12
2 Au 28	·80 3 0 16	·33 4 N 14	·86 6 D 14	·39	68 5 Jr 3	29	6 Jr 31○	·82 1 Mr 1
1 S 16●	·17 7 0 5	·70 2 N 4	·23 3 D 3	·76	2 D 21	65	69 4 Jr 20	19 5 F 18
6 S 6●	·58 5 8 24	·06 6 0 23	·59 1 N 22	·12				
3 Au 25								

For tithis by Brahma siddhānta add algebraically — '02 to the above.

TABLE II.—NEW MOONS AND ECLIPSES

TABLE II.—Solar years and new moons

			Com- mence- ment of solar year.	First new moon in solar year.	Anomaly of first new moon	Christian era.	Vaisākha.			Jyeshtha.			Āshāḍha.			Śrāvaṇa.			Bhādrapada.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
Kaliyuga	Vikrama era.	Śaka era.	Month and day A.D.	Fraction of day.			Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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* Ending moments of tithis by Ārya Siddhānta are the same as those given above.

from 1 B.C. to A.D. 500 (Sūrya siddhānta)*—cont.

Āsṛina.	Kārttika.	Mārgaśīrṣa.	Pausha.	A.D.	Māgha.	A.D.	Phālguna.	Chaitra.
Week-day. Month Day. Fraction.	Week-day. Month. Day. Fraction.	Week-day. Month. Day. Fraction.	Week-day. Month. Day. Fraction.	Week-day. Month. Day. Fraction.	Week-day. Month. Day. Fraction.	Week-day. Month. Day. Fraction.	Week-day. Month. Day. Fraction.	Week-day. Month. Day. Fraction.
2 S 18 .43 3 O 12 .96 5 N 11 .49 7 D 11 .02				70 7 Jr 9 .55			3 F 8 .08 4 Mr 9 .61	
6 S 2 .80 1 O 2 .33 2 O 31 .86 4 N 30 .39				5 D 29 .92	71 7 Jr 28 .45 1 F 26 .98			
4 Au 23 .16 5 S 21 .69 7 O 21 .22 1 N 19 .76				3 D 19 .29	72 4 Jr 17 .82 6 F 26 .35			
3 S 10 .08 4 O 9 .59 6 N 8 .12 7 D 7 .65				73 2 Jr 6 .18			3 F 4 .71 5 Mr 6 .25	
7 Au 30 .43 1 S 28 .96 3 O 28 .49 5 N 27 .02				6 D 26 .55	74 1 Jr 25 .08 2 F 23 .61			
6 S 18 .83 7 O 17 .86 2 N 16 .39 3 D 15 .92				75 5 Jr 14 .45			6 F 12 .98 1 Mr 14 .51	
3 S 7 .89 5 O 7 .22 6 N 5 .75 1 D 5 .29				76 2 Jr 3 .82			4 F 2 .35 5 Mr 2 .88	
1 Au 27 .06 2 S 25 .59 4 O 25 .12 5 N 23 .65				7 D 23 .18	77 1 Jr 21 .71 3 F 20 .24			
6 S 14 .96 1 O 14 .49 3 N 13 .02 4 D 12 .55				78 6 Jr 11 .08			7 F 9 .61 2 Mr 11 .14	
4 S 4 .83 5 O 3 .86 7 N 2 .39 1 D 1 .92				3 D 31 .45	79 4 Jr 29 .98 6 F 28 .51			
1 Au 24 .69 8 S 23 .22 4 O 22 .75 6 N 21 .28				7 D 20 .81	80 2 Jr 19 .85 3 F 17 .88			
7 S 11 .59 2 O 11 .12 3 N 9 .65 5 D 9 .18				81 6 Jr 7 .71			1 F 6 .24 2 Mr 7 .77	
4 Au 31 .96 6 S 30 .46 1 O 30 .02 2 N 28 .55				4 D 28 .08	82 5 Jr 26 .61 7 F 25 .14			
2 Au 21 .82 5 O 19 .86				1 D 17 .45	83 2 Jr 15 .98 4 F 14 .51			
3 S 19 .85 2 S 18 .75 4 N 7 .28 5 D 6 .81				84 7 Jr 5 .34	1 F 3 .87 3 Mr 4 .41			
1 S 9 .22 2 O 8 .12 1 O 26 .65 3 N 25 .18				4 D 24 .71	85 6 Jr 28 .24 7 F 21 .77			
5 Au 28 .59 7 S 27 .02 7 N 14 .55 2 D 14 .08				86 3 Jr 12 .61			5 F 11 .14 6 Mr 12 .67	
4 S 16 .49 6 O 16 .02 7 N 14 .55 2 D 14 .08				87 7 Jr 1 .98			2 Jr 31 .51 4 Mr 2 .04	
1 S 5 .85 3 O 5 .38 4 N 3 .91 6 D 3 .45				5 D 22 .34	88 6 Jr 20 .87 1 F 19 .40			
6 Au 26 .22 7 S 24 .75 2 O 24 .28 3 N 22 .81				89 4 Jr 9 .24			5 F 7 .77 7 Mr 9 .30	
5 S 13 .12 6 O 12 .65 1 N 11 .18 2 D 10 .71				1 D 29 .61	90 3 Jr 28 .14 4 F 26 .67			
2 S 2 .49 4 O 2 .02 5 O 31 .55 7 N 30 .08				5 D 18 .87	91 7 Jr 17 .51 3 F 16 .04			
6 Au 22 .85 1 S 21 .38 2 O 20 .91 4 N 19 .44				92 4 Jr 6 .87			6 F 5 .40 7 Mr 5 .98	
5 S 10 .75 7 O 10 .28 1 N 8 .81 3 D 8 .34				2 D 26 .24	93 3 Jr 24 .77 5 F 23 .30			
3 Au 30 .12 4 S 28 .65 6 O 28 .05 6 N 16 .08				1 Jr 14 .14	94 2 F 12 .67 4 Mr 14 .20			
2 S 18 .01 8 O 17 .55 5 N 16 .08 6 D 15 .61				95 5 Jr 3 .50			7 F 2 .03 1 Mr 3 .57	
6 S 7 .38 7 O 6 .41 2 N 5 .44 3 D 4 .97				2 D 23 .87	96 4 Jr 22 .40 5 F 20 .93			
3 Au 27 .75 5 S 26 .98 6 O 26 .81 1 N 24 .34				97 1 Jr 10 .77			3 F 9 .30 4 Mr 10 .83	
2 S 14 .85 4 O 14 .18 5 N 12 .71 7 D 12 .24				6 D 31 .14	98 7 Jr 29 .67 2 F 28 .20			
7 S 4 .01 1 O 3 .54 3 N 2 .07 4 D 1 .61				3 D 20 .60	99 5 Jr 19 .08 6 F 17 .56			
4 Au 24 .38 5 S 22 .91 7 O 22 .44 1 N 20 .97				300 3 Jr 8 .40			4 F 6 .93 6 Mr 7 .46	
3 S 12 .28 4 O 11 .81 6 N 10 .84 7 D 9 .87				6 D 27 .77	01 1 Jr 26 .30 2 F 24 .83			
7 Au 31 .65 2 S 30 .18 3 O 29 .71 5 N 28 .24				02 5 Jr 15 .67			7 F 14 .20 1 Mr 15 .73	
5 Au 21 .01 1 O 19 .07 2 N 17 .60 4 D 17 .13				03 3 Jr 5 .03			4 F 3 .56 6 Mr 5 .09	
6 S 19 .54 2 S 18 .44 6 N 6 .97 1 D 6 .50				7 D 25 .14	04 1 Jr 23 .93 3 F 22 .46			
3 S 8 .91 5 O 8 .44 4 O 27 .81 4 N 25 .87				05 6 Jr 12 .30			7 F 10 .83 2 Mr 12 .36	
1 Au 29 .28 2 S 27 .71 3 N 14 .24 4 D 13 .77				06 3 Jr 1 .66			5 Jr 31 .19 6 Mr 1 .73	
7 S 16 .17 1 O 15 .71 3 N 14 .24 4 D 13 .77				1 D 22 .03	07 2 Jr 20 .56 4 F 19 .09			
4 S 5 .64 6 O 5 .07 7 N 3 .60 2 D 3 .13				08 6 Jr 9 .98			1 F 8 .46 2 Mr 8 .99	
1 Au 25 .91 3 S 24 .44 4 O 23 .97 6 N 22 .50				4 D 29 .30	09 5 Jr 27 .88 7 F 26 .36			
7 S 13 .81 2 O 13 .34 3 N 11 .87 5 D 11 .40				1 D 18 .66	10 3 Jr 17 .19 4 F 15 .72			
5 S 2 .17 6 O 1 .70 1 O 31 .23 2 N 29 .77				11 7 Jr 6 .56			2 F 5 .09 3 Mr 6 .62	
2 Au 22 .54 4 S 21 .97 5 O 20 .60 7 N 19 .13				4 D 26 .93	12 6 Jr 25 .46 7 F 23 .99			
1 S 10 .44 2 O 9 .97 4 N 8 .50 6 D 8 .03				13 3 Jr 13 .83			5 F 12 .36 6 Mr 13 .89	
5 Au 30 .81 7 S 29 .34 1 O 28 .87 3 N 27 .40				14 1 Jr 3 .19			2 F 1 .72 4 Mr 3 .25	
4 S 17 .70 6 O 17 .23 7 N 15 .76 2 D 15 .29				5 D 23 .56	15 7 Jr 22 .09 1 F 20 .62			
2 S 7 .07 3 O 6 .60 5 N 5 .13 6 D 4 .66				16 4 Jr 11 .46			5 F 9 .99 7 Mr 10 .52	
6 Au 27 .44 7 S 25 .97 2 O 25 .50 4 N 24 .08				1 D 30 .82	17 3 Jr 29 .85 4 F 27 .89			
5 S 15 .33 6 O 14 .87 1 N 13 .40 2 D 12 .93				6 D 20 .19	18 7 Jr 18 .72 2 F 17 .25			
2 S 8 .70 4 O 3 .23 5 N 1 .76 7 D 1 .29				19 5 Jr 8 .09			6 F 6 .62 1 Mr 8 .15	
7 Au 24 .07 1 S 22 .60 3 O 22 .13 4 N 20 .66				2 D 28 .46	20 3 Jr 26 .99 5 F 25 .52			
6 S 11 .97 7 O 11 .50 2 N 10 .08 3 D 9 .56				21 1 Jr 15 .85			2 F 13 .88 4 Mr 15 .41	
3 S 1 .33 4 S 30 .86 6 O 30 .39 7 N 28 .93				22 5 Jr 4 .72			7 F 3 .25 1 Mr 4 .78	
7 Au 20 .70 3 O 18 .76 5 N 17 .29 6 D 16 .82								
2 S 19 .23 3 O 18 .76 5 N 17 .29 6 D 16 .82								
6 S 8 .80 1 O 8 .18 2 N 6 .66 4 D 6 .19								

For tithis by Brahma siddhānta add algebraically —.02 to the above.

from 1 B.C. to A.D. 500 (Sūrya siddhānta)*—cont.

Āśvinā.	Kārttika.	Mārgasīrsha.	Pauṣa.	A.D.	Māgha.	A.D.	Phālguna.	Chaitra.
Week-day. Month Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction.	Week day. Month. Day.	Fraction.	Week-day. Month. Day.	Fraction. Week-day. Month. Day.
3 Au 28○	·97 5 8 27	·50 7 0 27	·03 1 N 25	56	3 D 25	·09 23	4 Jr 23	·62 6 F 22
2 S 16	·86 4 0 16	·39 5 N 14	·92 7 D 14	·45	24 1 Jr 12	·99	3 F 11●	·52 5 Mr 12
7 S 5	·23 1 0 4	·76 3 N 3	29 4 D 2	82	25 6 Jr 1○	·35	7 Jr 30	·88 2 Mr 1
4 Au 25	·60 6 8 24	13 7 0 23	·66 2 N 22	19	3 D 21●○	·72 26	5 Jr 20	·25 6 F 18
3 S 13	·49 5 0 13	·03 6 N 11	56 1 D 11●○	09	27 2 Jr 9	·62	4 F 8	15 5 Mr 9
7 S 2	·80 2 0 2	·39 3 0 31	·92 5 N 30	45	6 D 29	·98 28	1 Jr 28	·51 3 F 27
5 Au 22	·23 6 8 20	76 1 0 20○	·29 2 N 18	82	4 D 18	35 29	5 Jr 16	88 7 F 15
4 S 10	·13 5 0 9●○	·66 7 N 8	·19 1 D 7	72	30 3 Jr 6	25	4 F 4	78 6 Mr 6
1 Au 30	49 3 8 29	·02 4 0 28	55 6 N 27	09	7 D 26	·62 31	2 Jr 25	·15 3 F 23○
7 S 18	·39 1 0 17	·92 3 N 16	15 4 D 15	98	32 6 Jr 14	51	1 F 13○	04 2 Mr 12●
4 S 6	76 6 0 6	·29 7 N 4	82 2 D 4	35	33 3 Jr 2	88	5 F 1○	·41 6 Mr 2
2 Au 27	·13 3 8 25	·66 5 0 25	19 6 N 23	·72	1 D 23	·25 34	2 Jr 21●	78 4 F 20
1 S 15	·02 2 0 14	·55 4 N 13	08 5 D 12	61	35 7 Jr 11	15	1 F 9	·68 8 Mr 11
5 S 4	·39 6 0 3	·92 1 N 2	45 2 D 1○	98	4 D 31	51 36	6 Jr 30	·04 7 F 28
2 Au 23	76 4 8 22	·29 5 0 21	·82 7 N 20○	35	1 D 19	88 37	3 Jr 18	41 4 F 16
1 S 11	65 3 0 11	·19 4 N 9○	·72 6 D 9	25	38 7 Jr 7	·78	2 F 6	31 3 Mr 7
6 S 1	·02 7 8 30	·55 2 0 30	08 3 N 28	61	5 D 28	14 39	6 Jr 26	·67 1 F 25
3 Au 21	39 6 0 19●	45 7 N 17	98 2 D 17	51	40 4 Jr 16	04	5 F 11	·57 7 Mr 15○
4 S 19○	92 3 0 7	82 5 N 6	·35 6 D 5	88	41 1 Jr 4	41	2 F 2	·94 4 Mr 4●
2 S 8○	·29 3 0 7	·18 2 0 26	·71 1 N 25	25	5 D 24	·78 42	7 Jr 23	·31 1 F 21
6 Au 28○	65 1 8 27	·08 1 N 14	61 3 D 14	·14	43 4 Jr 12○	67	6 F 11	·20 7 Mr 12
5 S 16	·55 7 0 16	·45 5 N 3	98 7 D 3	51	44 2 Jr 2○	·04	3 Jr 31	57 4 Mr 1
2 S 5	·92 4 0 5	·82 3 0 23	·35 4 N 21	·88	6 D 21○	41 45	7 Jr 19	·94 2 F 18
7 Au 25	·29 1 8 23	·71 2 N 11	24 3 D 10	77	46 5 Jr 9	31	6 F 7	84 1 Mr 9
6 S 13	·18 7 0 12	·08 6 0 31○	61 1 N 30	·14	2 D 29	67 47	4 Jr 28	·20 5 F 28
3 S 2	·55 5 0 2	·45 3 0 20○	·98 5 N 19	·51	7 D 19	·04 48	1 Jr 17	·57 { 3 F 16
7 Au 22	92 2 8 21	·35 2 N 7	·88 4 D 7	·41	49 5 Jr 5	·94	7 F 4	47 2 Mr 6
6 S 9	·81 1 0 9●	·71 7 0 23	·24 1 N 26	·77	3 D 26	30 50	4 Jr 24	·88 6 F 23○
4 Au 30	·18 5 8 28	·61 6 N 16	14 7 D 15	·67	51 2 Jr 14	·20	3 F 12○	73 5 Mr 14
3 S 18	·08 4 0 17	·98 3 N 5	·51 5 D 5	·04	52 6 Jr 3	·57	1 F 2●	·10 2 Mr 2
7 S 7	45 1 0 6	·84 7 0 24	·87 2 N 23	·41	3 D 22	·94 53	5 Jr 21	·47 7 F 20
4 Au 26	·81 6 8 25	·24 6 N 12	·77 1 D 12○	·80	54 2 Jr 10●	·83	4 F 9	36 5 Mr 10
3 S 14	·71 5 0 14	·61 1 N 2	14 5 D 1○	·67	7 D 81	·20 55	1 Jr 29	·73 3 F 28
1 S 4	·08 2 0 3	·98 1 0 22	·51 3 N 21○	·04	4 D 20	·57 56	6 Jr 19	10 7 F 17
5 Au 24	·45 6 8 22	·87 7 N 9●	·40 1 D 8	·93	57 3 Jr 7	·47	5 F 6	00 6 Mr 7
4 S 11	·34 5 0 10	·77 6 N 28	·30	·30	7 D 27	83 58	2 Jr 26	86 3 F 24
1 Au 31	·71 3 8 30○	·24 4 0 29	·77 6 N 28	·30	59 6 Jr 15	·73	1 F 14	·26 2 Mr 15○
6 Au 21	·68 2 0 19	·14 3 N 17	67 5 D 17	·20	60 4 Jr 5	·10	5 F 3	63 7 Mr 4●
7 S 19○	·01 6 0 8	·51 1 N 7	·04 2 D 6	·57	1 D 24	·46 61	2 Jr 22○	·99 4 F 21
4 S 8○	·97 6 0 8	87 5 0 26	40 6 N 24	93	62 7 Jr 12○	·36	1 F 10	89 3 Mr 12
2 Au 28●	·34 3 8 26	·77 4 N 14	·80 5 D 18	·88	63 4 Jr 1○	·73	6 Jr 81	26 7 Mr 1
1 S 16	·24 2 0 15	·14 1 N 3	·67 3 D 3	·20	2 D 22	·10 64	3 Jr 20	63 5 F 19
5 S 5	·61 7 0 5	·50 6 0 24	·03 7 N 22	·57	65 7 Jr 8	·99	2 F 7	·52 4 Mr 9
2 Au 25	·97 4 8 24	·40 4 N 10○	·93 6 D 10	·46	5 D 29	·36 66	6 Jr 27	89 1 F 26
1 S 12	·87 3 0 12	·77 2 0 31○	·30 3 N 29	·83	2 D 18	·73 67	4 Jr 17	·26 7 Mr 17
6 S 2	·24 7 0 1	·67 1 N 19	·20	·20	5 F 15	·79	5 F 15	·79
3 Au 22	·61 5 8 21	·14 6 0 20○	·67 1 N 19	·20	68 1 Jr 6	·83	3 F 5	·16 4 Mr 5○
2 S 10	·50 4 0 10●	·03 5 N 8	·56 7 D 8	·09	5 D 25	·99 69	7 Jr 24	52 2 F 23○
6 Au 29○	·87 1 8 28	·40 2 0 27	·93 4 N 26	·46	70 4 Jr 13	·89	6 F 12	·42 7 Mr 13
5 S 17	·77 7 0 17	·80 1 N 15	·83 3 D 15	·86	71 2 Jr 3	26	3 F 1●	·70 5 Mr 3
3 S 7	·13 4 0 6	·07 6 N 5	·20 7 D 4	·73	6 D 23○	·62 72	1 Jr 22	·15 2 F 20
7 Au 27	·50 2 8 26	·08 3 0 25	·56 5 N 24	·09	73 5 Jr 10	·52	7 F 9	·05 1 Mr 10
6 S 14	·40 7 0 13	·93 2 N 12	·46 3 D 11○	·99	2 D 30	·89 74	4 Jr 29	·42 5 F 27
3 S 3	·77 5 0 3	·30 6 N 1	·83 1 D 1○	·36	7 D 20	·26 75	1 Jr 18	79 3 F 17
1 Au 24	·13 2 8 22	·66 4 0 22	·19 5 N 20●	·73				

For tithis by Bṛhma siddhānta add algebraically —·02 to the above.

from 1 B.C. to A.D. 500 (Sūrya siddhānta)*—cont.

Āśvinā.	Kārttika.	Mārgaśīrsha.	Pauṣa.	A.D.	Māgha.	A.D.	Phālguna.	Chaitra.	
Week-day. Month Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction.	Week day. Month Day.	Fraction.	Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction.
3 Au 28○	·97 5 S 27	·50 7 O 27	·03 1 N 25	56	3 D 25	(09) 23	4 Jr 23	·62 6 F 22	·15
2 S 16	·86 4 O 16	·39 5 N 14	·92 7 D 14	·45	24 1 Jr 12	·99	3 F 11●	·52 5 Mr 12	·05
7 S 5	·23 1 O 4	·76 3 N 3	29 4 D 2	82	25 6 Jr 1○	·35	7 Jr 30	·88 2 Mr 1	·41
4 Au 25	·60 6 S 24	·13 7 O 23	·66 2 N 22	19	3 D 21●○	·72 26	5 Jr 20	·25 6 F 18	·78
3 S 13	·49 5 O 13	·03 6 N 11	56 1 D 11●○	09	27 2 Jr 9	·62	4 F 8	15 5 Mr 9	·68
7 S 2	·80 2 O 2	·39 3 O 31	·92 5 N 30	45	6 D 29	·98	1 Jr 28	·51 3 F 27	06
5 Au 22	·23 6 S 20	76 1 O 20○	·29 2 N 18	82	4 D 18	35	5 Jr 16	88 7 F 15	·41
4 S 10	·13 5 O 9●○	·66 7 N 8	·19 1 D 7	72	30 3 Jr 6	25	4 F 4	78 6 Mr 6	·31
1 Au 30	49 3 S 29	·02 4 O 28	55 6 N 27	09	7 D 26	62	2 Jr 25	·15 3 F 23○	·68
7 S 18	·39 1 O 17	·92 3 N 16	·45 4 D 15	98	32 6 Jr 14	51	1 F 13○	04 2 Mr 13●	57
4 S 6	76 6 O 6	·29 7 N 4	82 2 D 4	35	33 3 Jr 2	88	5 F 1●○	·41 6 Mr 2	·94
2 Au 27	·13 3 S 25	·66 5 O 25	19 6 N 23	·72	1 D 23	·25 34	2 Jr 21●	·78 4 F 20	·31
1 S 15	·02 2 O 14	·55 4 N 13	08 5 D 12	61	35 7 Jr 11	15	1 F 9	·68 3 Mr 11	·21
5 S 4	·39 6 O 3	·92 1 N 2	45 2 D 1○	98	4 D 31	51	6 Jr 30	·04 7 F 28	·57
2 Au 23	76 4 S 22	·29 5 O 21	·82 7 N 20○	35	1 D 19	·88 37	3 Jr 18	41 4 F 16	·94
1 S 11	65 3 O 11	·19 4 N 9○	72 6 D 9	25	38 7 Jr 7	·78	2 F 6	·31 3 Mr 7	·84
6 S 1	·02 7 S 30	·55 2 O 30	·08 3 N 28	61	5 D 28	14	39 6 Jr 26	·67 1 F 25	·21
3 Au 21	·39 6 O 19●	45 7 N 17	98 2 D 17	51	40 4 Jr 16	04	5 F 14	·57 7 Mr 15○	·10
4 S 19○	·92 3 O 7	82 5 N 6	·35 6 D 5	88	41 1 Jr 1	41	2 F 2	·94 4 Mr 4●	·47
2 S 8○	·29 1 S 27	·18 2 O 26	·71 4 N 25	25	5 D 24	78	42 7 Jr 23	·31 1 F 21	·84
6 Au 24○	65 1 S 27	·18 2 O 26	·71 4 N 25	25	5 D 24	78	42 7 Jr 23	·31 1 F 21	·84
5 S 16	·55 7 O 16	·08 1 N 14	·61 3 D 14	·14	43 4 Jr 12○	67	6 F 11	20 7 Mr 12	·73
2 S 5	·92 4 O 5	·45 5 N 3	98 7 D 3	51	44 2 Jr 2○	·04	3 Jr 31	·57 4 Mr 1	·10
7 Au 25	·29 1 S 23	·82 3 O 23	·35 4 N 21	·88	6 D 21○	41	45 7 Jr 19	·94 2 F 18	·47
6 S 13	·18 7 O 12	·71 2 N 11	24 3 D 10	77	46 5 Jr 9	31	6 F 7	84 1 Mr 9	·37
3 S 2	·55 5 O 2	·08 6 O 31○	·61 1 N 30	·14	2 D 29	·67	47 4 Jr 28	·20 5 F 26	·73
7 Au 22	92 2 S 21	45 3 O 20○	·98 5 N 19	·51	7 D 19	·04	48 1 Jr 17	·57 { 3 F 16	·10
6 S 9	·81 1 O 9●	·85 2 N 7	88 4 D 7	·41	49 5 Jr 5	·94	7 F 4	·47 4 Mr 16	·63
4 Au 30	·18 5 S 28	·71 7 O 28	·24 1 N 26	·77	3 D 26	·30	50 4 Jr 24	·88 2 Mr 6	·00
3 S 18	·08 4 O 17	·61 6 N 16	14 7 D 15	·67	51 2 Jr 14	·20	3 F 12○	·73 5 Mr 14	·26
7 S 7	45 1 O 6	·98 3 N 5	·51 5 D 5	04	52 6 Jr 3	·57	1 F 2●	·10 2 Mr 2	·63
4 Au 26	·81 6 S 25	·34 7 O 24	·87 2 N 23	·41	3 D 22	·94	53 5 Jr 21	·47 7 F 20	·00
3 S 14	·71 5 O 14	·24 6 N 12	77 1 D 12○	·30	54 2 Jr 10●	·83	4 F 9	36 5 Mr 10	·89
1 S 4	·08 2 O 3	·61 4 N 2	14 5 D 1○	·67	7 D 31	·20	55 1 Jr 29	·73 3 F 28	·26
5 Au 24	·45 6 S 22	·98 1 O 22	·51 3 N 21○	04	4 D 20	·57	56 6 Jr 19	10 7 F 17	63
4 S 11	·84 5 O 10	·87 7 N 9●	·40 1 D 8	·93	57 3 Jr 7	·47	5 F 6	00 6 Mr 7	·53
1 Au 31	·71 8 S 30○	·24 4 O 29	·77 6 N 28	·30	7 D 27	83	58 2 Jr 26	86 3 F 24	·89
6 Au 21	·08 2 O 19	·14 3 N 17	·67 5 D 17	·20	59 6 Jr 15	·73	1 F 14	26 2 Mr 15○	·79
7 S 19○	·61 6 O 8	·51 1 N 7	·04 2 D 6	·57	60 4 Jr 5	·10	5 F 3	63 7 Mr 4●	·16
4 S 8○	·97 3 S 26	·87 5 O 26	40 6 N 24	98	1 D 24	·46	61 2 Jr 22○	·99 4 F 21	·53
2 Au 28●	·34 2 O 15	·77 4 N 14	·30 5 D 13	·83	62 7 Jr 12○	·36	1 F 10	89 3 Mr 12	·42
1 S 16	·24 2 O 15	·77 4 N 14	·30 5 D 13	·83	62 7 Jr 12○	·36	1 F 10	89 3 Mr 12	·42
5 S 5	·61 7 O 5	14 1 N 3	·67 3 D 3	20	63 4 Jr 1●○	·73	6 Jr 31	26 7 Mr 1	·76
2 Au 25	·97 4 S 24	·50 6 O 24	·03 7 N 22	·57	2 D 22	·10	64 3 Jr 20	63 5 F 19	·19
1 S 12	·87 3 O 12	·40 4 N 10○	·93 6 D 10	·46	65 7 Jr 8	·99	2 F 7	·52 4 Mr 9	08
6 S 2	·24 7 O 1	·77 2 O 31○	·30 3 N 29	·83	5 D 29	·36	66 6 Jr 27	89 1 F 26	42
3 Au 22	·61 5 S 21	·14 6 O 20○	·67 1 N 19	·20	2 D 18	·78	67 { 4 Jr 17	·26 7 Mr 17	·32
2 S 10	·50 4 O 10●	·03 5 N 8	·56 7 D 8	·09	68 1 Jr 6	·63	3 F 15	·79 4 Mr 15	·69
6 Au 29○	·87 1 S 28	·40 2 O 27	93 4 N 26	·46	5 D 25	·99	69 7 Jr 24	52 2 F 23○	·05
5 S 17	·77 7 O 17	·80 1 N 15	·83 3 D 15	·86	70 4 Jr 13	·89	6 F 12	·42 7 Mr 13	·95
3 S 7	·18 4 O 6	·67 6 N 5	·20 7 D 4	·73	71 2 Jr 3	·26	3 F 1●	79 5 Mr 3	·32
7 Au 27	·50 2 S 26	·08 3 O 25	·56 5 N 24	·09	6 D 23○	·62	72 1 Jr 22	·15 2 F 20	·69
6 S 14	·40 7 O 13	·93 2 N 12	·46 3 D 11○	·99	73 5 Jr 10	·52	7 F 9	05 1 Mr 10	·53
3 S 3	·77 5 O 3	·30 6 N 1	·83 1 D 1○	·36	2 D 30	·89	74 4 Jr 29	·42 5 F 27	·95
1 Au 24	·18 2 S 22	·66 4 O 22	·19 5 N 20●	·73	7 D 20	·26	75 1 Jr 18	79 3 F 17	·32

For tithis by Brahma siddhānta add algebraically —02 to the above.

TABLE II.—NEW MOONS AND ECLIPSES

TABLE II.—Solar years and new moons

			Com- mence- ment of solar year.	Vaisākha. Jyeshtha. Āshāḍha. Śrāvaṇa. Bhādrapada.																			
Kalyuga.	Vikrama era.	Śaka era.		Month and day A.D.	Fraction of day.	First new moon in solar year.	Anomaly of first new moon.	Christian era.	Vaisākha.			Jyeshtha.			Āshāḍha.			Śrāvaṇa.			Bhādrapada.		
									Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
A.D.																							
3476	432	297	18M	0168	0.8313	11 687	375	4 Mr 18	85	7 My 16	91	2 Je 15	44	3 Ji 14	97	5 Au 13	50						
3477	433	298	17M	2755	19.4702	9 820	376	6 Ap 17	88	5 My 5	28	6 Je 8	81	1 Ji 3	34	2 Au 1	87						
3478	434	299	17M	5843	8.5785	5 977	377	1 Mr 26	11	2 Ap 24	64	4 My 24	17	5 Je 22	70	7 Ji 22	23						
3479	435	300	17M	7980	27.2174	4 110	378	7 Ap 14	01	1 My 13	54	3 Je 12	07	4 Ji 11	60	6 Au 10	13						
3480	436	301	18M	0518	16.3259	0 268	379	4 Ap 3	88	5 My 2	91	7 Je 1	44	1 Je 30	97	3 Ji 30	50						
3481	437	302	17M	3106	5.4340	23 979	380	1 Mr 22	74	3 Ap 21	27	4 My 20	81	7 Ji 18	87	2 Au 17	40						
3482	438	303	17M	5693	24.0729	22 113	381	7 Ap 10	64	2 My 10	17	3 Je 8	70	5 Ji 8	28	6 Au 6	76						
3483	439	304	17M	8281	13.1812	18 270	382	5 Mr 31	01	6 Ap 29	54	1 My 29	07	2 Je 27	60	4 Ji 27	13						
3484	440	305	18M	0868	2.2895	14 427	383	2 Mr 20	38	3 Ap 18	91	6 Je 16	97	1 Ji 16	50	3 Au 15	08						
3485	441	306	17M	3456	20.9288	12 560	384	1 Ap 7	27	2 My 6	80	4 Je 5	38	5 Ji 4	87	7 Au 3	40						
3486	442	307	17M	6043	10.0366	8 718	385	5 Mr 27	64	7 Ap 26	17	1 My 25	70	3 Je 24	23	4 Ji 23	76						
3487	443	308	17M	8681	28.6755	6 851	386	4 Ap 15	54	6 My 15	07	7 Je 13	60	2 Ji 13	13	3 Au 11	66						
3488	444	309	18M	1219	17.7838	3 008	387	1 Ap 4	91	3 My 4	44	4 Je 2	97	6 Ji 2	50	1 Au 1	08						
3489	445	310	17M	3806	6.8921	26 720	388	6 Mr 24	27	7 Ap 22	80	2 My 22	33	3 Je 20	86	6 Au 18	93						
3490	446	311	17M	6894	25.5310	24 853	389	5 Ap 12	17	6 My 11	70	1 Je 10	23	2 Ji 9	76	4 Au 8	29						
3491	447	312	17M	8981	14.6393	21 011	390	2 Ap 1	54	4 My 1	07	5 My 30	60	7 Je 29	13	1 Ji 28	66						
3492	448	313	18M	1569	3.7476	17 168	391	6 Mr 21	90	1 Ap 20	43	2 My 19	97	6 Ji 18	08	7 Au 16	56						
3493	449	314	17M	4156	22.3865	15 301	392	5 Ap 8	80	7 My 8	33	1 Je 6	88	3 Ji 6	39	4 Au 4	92						
3494	450	315	17M	6744	11.4948	11 458	393	3 Mr 29	17	4 Ap 27	70	6 My 27	23	7 Je 35	76	2 Ji 25	29						
3495	451	316	17M	9332	0.6031	7 616	394	2 Ap 17	07	3 My 16	60	5 Je 15	13	6 Ji 14	66	1 Au 13	19						
3496	452	317	18M	1919	19.2420	5 749	395	6 Ap 6	43	7 My 5	96	2 Je 4	49	4 Ji 4	03	5 Au 2	56						
3497	453	318	17M	4507	8.3503	1 906	396	3 Mr 25	80	5 Ap 24	33	6 My 23	86	1 Je 22	39	2 Ji 21	92						
3498	454	319	17M	7094	26.9892	0 039	397	2 Ap 13	70	4 My 13	28	5 Je 11	76	7 Ji 11	29	1 Au 9	82						
3499	455	320	17M	9682	16.0975	23 751	398	7 Ap 8	07	1 My 2	60	8 Je 1	18	4 Je 30	66	6 Ji 30	19						
3500	456	321	18M	2269	5.2058	19 908	399	4 Mr 23	48	5 Ap 21	96	2 Je 20	02	3 Ji 19	55	5 Au 18	09						
3501	457	322	17M	4857	23.8447	18 042	400	3 Ap 10	33	4 My 9	86	6 Je 8	39	7 Ji 7	92	2 Au 6	45						
3502	458	323	17M	7444	12.9580	14 199	401	7 Mr 30	70	2 Ap 29	23	3 My 28	76	5 Je 27	29	6 Ji 26	82						
3503	459	324	18M	0032	2.0613	10 356	402	5 Mr 20	06	6 Ap 18	13	2 Je 16	66	4 Ji 16	19	5 Au 14	72						
3504	460	325	18M	2620	20.7001	8 489	403	3 Ap 7	96	5 My 7	49	7 Je 6	02	2 Ji 5	55	8 Au 4	08						
3505	461	326	17M	5207	9.8084	4 647	404	1 Mr 27	33	2 Ap 25	86	4 My 25	39	6 Je 24	92	7 Ji 23	45						
3506	462	327	17M	7795	28.4473	2 780	405	7 Ap 15	23	1 My 14	76	2 Je 13	29	4 Ji 12	82	6 Au 11	35						
3507	463	328	18M	0382	17.5556	26 492	406	4 Ap 4	59	6 My 4	12	7 Je 2	65	2 Ji 2	19	3 Ji 31	72						
3508	464	329	18M	2970	6.6639	22 649	407	1 Mr 24	96	3 Ap 23	49	5 My 23	02	6 Je 21	55	2 Au 19	61						
3509	465	330	17M	5557	25.8028	20 782	408	7 Ap 11	86	2 My 11	39	3 Je 9	92	5 Ji 9	45	6 Au 7	98						
3510	466	331	17M	8145	14.4111	16 939	409	5 Ap 1	23	6 Ap 30	76	1 My 30	29	2 Je 28	82	4 Ji 28	35						
3511	467	332	18M	0732	3.5194	18 097	410	2 Mr 21	59	4 Ap 20	12	7 Je 18	19	1 Ji 17	71	3 Au 16	25						
3512	468	333	18M	3320	22.1583	11 230	411	1 Ap 9	49	3 My 9	02	4 Je 7	55	6 Ji 7	08	1 Au 5	61						
3513	469	334	17M	5908	11.2666	7 387	412	5 Mr 28	86	7 Ap 27	39	1 My 26	92	3 Je 25	45	4 Ji 24	98						
3514	470	335	17M	8495	0.8749	3 544	413	3 Mr 18	22	6 My 16	28	7 Je 14	82	2 Ji 14	35	3 Au 12	88						
3515	471	336	18M	1083	19.0138	1 678	414	4 Ap 16	75	5 My 5	65	5 Je 4	18	6 Ji 3	71	1 Au 2	24						
3516	472	337	18M	3670	8.1221	25 300	415	6 Mr 26	49	1 Ap 25	02	2 My 24	55	4 Je 23	08	5 Ji 22	61						
3517	473	338	17M	6258	26.7810	23 523	416	5 Ap 13	39	6 My 12	92	1 Je 11	45	2 Ji 10	98	4 Au 9	51						
3518	474	339	17M	8845	15.8693	19 680	417	2 Ap 2	75	4 My 2	28	5 My 31	81	7 Je 30	84	1 Ji 29	88						
3519	475	340	18M	1433	4.9776	15 887	418	7 Mr 23	12	1 Ap 21	65	3 My 21	18	6 Ji 19	24	7 Au 17	77						
3520	476	341	18M	4021	23.6164	18 971	419	6 Ap 11	02	7 My 10	55	2 Je 9	08	3 Ji 8	61	5 Au 7	14						
3521	477	342	17M	6608	12.7247	10 128	420	3 Mr 30	88	4 Ap 28	92	6 My 28	45	7 Je 26	98	2 Ji 26	51						
3522	478	343	17M	9196	1.8330	6 285	421	7 Mr 19	75	2 Ap 18	81	5 Je 16	34	6 Ji 15	87	1 Au 14	40						
3523	479	344	18M	1788	20.4719	4 418	422	6 Ap 7	65	1 My 7	18	2 Je 5	71	4 Ji 5	24	5 Au 3	77						
3524	480	345	18M	4371	9.5802	0 576	423	4 Mr 28	02	5 Ap 26	55	7 My 26	03	1 Je 24	61	3 Ji 24	14						
3525	481	346	17M	6958	28.2191	26 263	424	2 Ap 14	91	4 My 14	44	5 Je 12	98	7 Ji 12	51	2 Au 11	04						
3526	482	347	17M	9546	17.3274	22 421	425	7 Ap 4	28	1 My 3	81	3 Je 2	84	4 Ji 1	87	6 Ji 31	40						
3527	483	348	18M	2134	6.4857	18 578	426	4 Mr 24	65	6 Ap 23	18	7 My 22	74	2 Je 21	24	5 Au 19	80						
3528	484	349	18M	4721	25.0746	16 711	427	3 Ap 12	55	5 My 12	08	6 Je 10	61	1 Ji 10	14	2 Au 8	67						

* Ending moments of tithis are the same by Ārya siddhānta.

from 1 B.C. to A.D. 500 (Sārya siddhānta)*—*cont.*

Āśvina.				Kārttika.				Mārgasīrsha.				Pauṣa.				A.D.	Māgha.				A.D.	Phālguna.				Chaitra.										
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.					
7 S 12			·08 1 O 11	·56 3 N 10	·09 4 D 9	·62	76 6 Jr 8	15	7 F 6	68 2 Mr 7	21	4 Au 31	·40 5 S 29	·93 7 O 29	·46 1 N 27	·99	3 D 27	·52	77 5 Jr 26	05 6 F 24	58	3 S 19	·80 4 O 18	·83 6 N 17	·36 7 D 16	·89	78 2 Jr 15	·42	3 F 13	95 5 Mr 15	·48					
7 S 8			·86 2 O 8	·19 3 N 6	·72 5 D 6	·25	79 6 Jr 4	·70	1 F 3	32 2 Mr 4	85	5 Au 29	·03 6 S 27	·56 1 O 27	·09 2 N 26	·62	4 D 25	·15	80 5 Jr 23	·68 7 F 22	21	7 S 8	·86 2 O 8	·19 3 N 6	·72 5 D 6	·25	79 6 Jr 4	·70	1 F 3	32 2 Mr 4	85					
5 Au 29			·03 6 S 27	·56 1 O 27	·09 2 N 26	·62	81 3 Jr 12	·05	4 F 10	·58 6 Mr 12	11	3 S 15	·93 5 O 15	·46 6 N 13	·99 1 D 13	·52	82 7 Jr 1	·42	83 6 Jr 20	·31 7 F 18	85	5 Au 29	·03 6 S 27	·56 1 O 27	·09 2 N 26	·62	81 3 Jr 12	·05	4 F 10	·58 6 Mr 12	11					
3 S 15			·93 5 O 15	·46 6 N 13	·99 1 D 13	·52	82 7 Jr 1	·42	1 Jr 30	·95 8 Mr 1	48	1 S 5	·29 2 O 4	·83 4 N 3	·38 5 D 2	·89	4 D 21	·78	83 6 Jr 20	·31 7 F 18	85	1 S 5	·29 2 O 4	·83 4 N 3	·38 5 D 2	·89	84 3 Jr 9	·68	5 F 8	·21 6 Mr 8	74					
1 S 5			·29 2 O 4	·83 4 N 3	·38 5 D 2	·89	84 3 Jr 9	·68	5 F 8	·21 6 Mr 8	74	5 Au 25	·66 7 S 24	·19 1 O 23	·72 3 N 22	·25	1 D 29	·05	85 2 Jr 27	58 4 F 26	11	5 Au 25	·66 7 S 24	·19 1 O 23	·72 3 N 22	·25	85 2 Jr 27	58 4 F 26	11	5 Au 25	·66 7 S 24	·19 1 O 23	·72 3 N 22	·25		
4 S 13			·56 6 O 13	·09 7 N 11	·62 2 D 11	·15	86 3 Jr 16	·45	3 Mr 17	·01	6 Au 22	·29 7 S 20	·82 2 O 20	·35 3 N 18	·89	5 D 18	·42	86 3 Jr 16	·45	3 Mr 17	·01	6 Au 22	·29 7 S 20	·82 2 O 20	·35 3 N 18	·89	87 4 Jr 6	·31	5 F 4	84 7 Mr 6	·37					
1 S 1			·93 3 O 1	·46 4 O 30	·99 6 N 29	·52	87 4 Jr 6	·31	5 F 4	84 7 Mr 6	·37	5 S 10	·19 6 O 9	·72 1 N 8	·25 2 D 7	78	1 D 26	·68	88 8 Jr 25	21 4 F 23	74	5 S 10	·19 6 O 9	·72 1 N 8	·25 2 D 7	78	87 4 Jr 6	·31	5 F 4	84 7 Mr 6	·37					
6 Au 22			·29 7 S 20	·82 2 O 20	·35 3 N 18	·89	89 7 Jr 13	·58	2 F 12	11 3 Mr 13	64	2 Au 30	·56 4 S 29	·09 5 O 28	·62 7 N 27	·15	2 D 23	·31	91 3 Jr 21	·84 5 F 20	·37	2 Au 30	·56 4 S 29	·09 5 O 28	·62 7 N 27	·15	89 7 Jr 13	·58	2 F 12	11 3 Mr 13	64					
5 S 10			·19 6 O 9	·72 1 N 8	·25 2 D 7	78	90 4 Jr 2	·95	6 F 1	·48 1 Mr 3	01	1 S 17	·46 2 O 16	·99 4 N 15	·52 6 D 15	·05	1 Jr 11	·21	92 1 Jr 11	·21	2 F 9	74 4 Mr 10	·27	1 S 17	·46 2 O 16	·99 4 N 15	·52 6 D 15	·05	90 4 Jr 2	·95	6 F 1	·48 1 Mr 3	01			
2 Au 30			·56 4 S 29	·09 5 O 28	·62 7 N 27	·15	92 1 Jr 11	·21	2 F 9	74 4 Mr 10	·27	5 S 6	·82 7 O 6	·35 1 N 4	·88 3 D 4	·41	5 D 30	·58	93 7 Jr 29	11 1 F 27	·64	5 S 6	·82 7 O 6	·35 1 N 4	·88 3 D 4	·41	92 1 Jr 11	·21	2 F 9	74 4 Mr 10	·27					
1 S 17			·46 2 O 16	·99 4 N 15	·52 6 D 15	·05	93 7 Jr 29	·58	7 Jr 29	11 1 F 27	·64	3 Au 27	·19 4 S 25	·72 6 O 25	·25 7 N 23	·78	2 D 19	·94	94 4 Jr 18	·47 6 F 17	·01	3 Au 27	·19 4 S 25	·72 6 O 25	·25 7 N 23	·78	93 7 Jr 29	·58	7 Jr 29	11 1 F 27	·64					
5 S 6			·82 7 O 6	·35 1 N 4	·88 3 D 4	·41	94 4 Jr 18	·94	4 Jr 18	·47 6 F 17	·01	3 Au 27	·19 4 S 25	·72 6 O 25	·25 7 N 23	·78	1 Jr 7	84	95 1 Jr 7	84	3 F 6	·37 4 Mr 7	·90	3 Au 27	·19 4 S 25	·72 6 O 25	·25 7 N 23	·78	94 4 Jr 18	·94	4 Jr 18	·47 6 F 17	·01			
3 Au 27			·19 4 S 25	·72 6 O 25	·25 7 N 23	·78	95 1 Jr 7	84	3 F 6	·37 4 Mr 7	·90	2 S 15	·09 3 O 14	·62 5 N 13	·15 6 D 12	·68	6 D 28	·21	96 7 Jr 26	·74 2 F 25	·27	2 S 15	·09 3 O 14	·62 5 N 13	·15 6 D 12	·68	95 1 Jr 7	84	3 F 6	·37 4 Mr 7	·90					
2 S 15			·09 3 O 14	·62 5 N 13	·15 6 D 12	·68	97 5 Jr 15	·11	6 F 13	·84 1 Mr 15	·17	6 S 3	·45 7 O 2	·99 2 N 1	·52 4 D 1	·05	5 Jr 15	·11	98 2 Jr 4	·47	4 F 3	·00 5 Mr 4	·58	6 S 3	·45 7 O 2	·99 2 N 1	·52 4 D 1	·05	97 5 Jr 15	·11	6 F 13	·84 1 Mr 15	·17			
6 S 3			·45 7 O 2	·99 2 N 1	·52 4 D 1	·05	98 2 Jr 4	·47	4 F 3	·00 5 Mr 4	·58	3 Au 23	·82 5 S 22	·35 6 O 21	·88 1 N 20	·41	6 D 24	84	99 2 Jr 4	·47	4 F 3	·00 5 Mr 4	·58	3 Au 23	·82 5 S 22	·35 6 O 21	·88 1 N 20	·41	98 2 Jr 4	·47	4 F 3	·00 5 Mr 4	·58			
3 Au 23			·82 5 S 22	·35 6 O 21	·88 1 N 20	·41	99 2 Jr 4	·47	4 F 3	·00 5 Mr 4	·58	2 S 11	·72 4 O 11	·25 5 N 9	78 7 D 9	·31	5 Jr 12	·74	400 5 Jr 12	·74	7 F 11	·27 1 Mr 11	·80	2 S 11	·72 4 O 11	·25 5 N 9	78 7 D 9	·31	99 2 Jr 4	·47	4 F 3	·00 5 Mr 4	·58			
2 S 11			·72 4 O 11	·25 5 N 9	78 7 D 9	·31	400 5 Jr 12	·74	7 F 11	·27 1 Mr 11	·80	7 S 1	·09 1 S 30	·62 3 O 30	·15 4 N 28	68	5 Jr 15	·11	01 3 Jr 1	11	4 Jr 30	·64 6 Mr 1	·17	7 S 1	·09 1 S 30	·62 3 O 30	·15 4 N 28	68	400 5 Jr 12	·74	7 F 11	·27 1 Mr 11	·80			
7 S 1			·09 1 S 30	·62 3 O 30	·15 4 N 28	68	01 3 Jr 1	11	4 Jr 30	·64 6 Mr 1	·17	5 S 18	·98 7 O 18	·51 2 N 17	·05 3 D 16	·58	7 D 21	·47	02 2 Jr 20	·00 3 F 18	·53	5 S 18	·98 7 O 18	·51 2 N 17	·05 3 D 16	·58	01 3 Jr 1	11	4 Jr 30	·64 6 Mr 1	·17					
5 S 18			·98 7 O 18	·51 2 N 17	·05 3 D 16	·58	02 2 Jr 20	·47	2 Jr 20	·00 3 F 18	·53	3 S 8	·35 4 O 7	·88 6 N 6	·41 7 D 5	94	6 Jr 9	·37	03 6 Jr 9	·37	7 F 7	·90 2 Mr 9	·48	3 S 8	·35 4 O 7	·88 6 N 6	·41 7 D 5	94	02 2 Jr 20	·47	2 Jr 20	·00 3 F 18	·53			
3 S 8			·35 4 O 7	·88 6 N 6	·41 7 D 5	94	03 6 Jr 9	·37	7 F 7	·90 2 Mr 9	·48	7 Au 28	·72 2 S 27	·25 3 O 26	78 5 N 25	·31	8 D 29	·74	04 5 Jr 28	·27 6 F 26	80	7 Au 28	·72 2 S 27	·25 3 O 26	78 5 N 25	·31	03 6 Jr 9	·37	7 F 7	·90 2 Mr 9	·48					
7 Au 28			·72 2 S 27	·25 3 O 26	78 5 N 25	·31	04 5 Jr 28	·74	2 Jr 28	·27 6 F 26	80	6 S 16	·62 1 O 16	·15 2 N 14	·68 4 D 14	·21	1 D 18	·10	05 2 Jr 16	·63	5 Mr 16	·70	6 S 16	·62 1 O 16	·15 2 N 14	·68 4 D 14	·21	04 5 Jr 28	·74	2 Jr 28	·27 6 F 26	80				
6 S 16			·62 1 O 16	·15 2 N 14	·68 4 D 14	·21	05 2 Jr 16	·63	5 Mr 16	·70	1 Au 25	·35 2 S 23	·88 4 O 23	·41 5 N 21	·94	7 Jr 6	·00	06 7 Jr 6	·00	1 F 4	53 3 Mr 6	·06	1 Au 25	·35 2 S 23	·88 4 O 23	·41 5 N 21	·94	05 2 Jr 16	·63	5 Mr 16	·70	1 Au 25	·35 2 S 23	·88 4 O 23	·41 5 N 21	·94
3 S 4			·98 5 O 4	·51 7 N 3	·04 1 D 2	·57	06 7 Jr 6	·00	1 F 4	53 3 Mr 6	·06	1 Au 25	·35 2 S 23	·88 4 O 23	·41 5 N 21	·94	8 Jr 14	·27	07 5 Jr 24	·80 7 F 23	·43	1 Au 25	·35 2 S 23	·88 4 O 23	·41 5 N 21	·94	06 7 Jr 6	·00	1 F 4	53 3 Mr 6	·06					
1 Au 25			·35 2 S 23	·88 4 O 23	·41 5 N 21	·94	07 5 Jr 24	·87	5 Jr 24	·80 7 F 23	·43	7 S 13	·25 1 O 12	·78 3 N 11	·31 4 D 10	84	5 Jr 26	·87	08 8 Jr 14	·27	4 F 12	·80 6 Mr 13	·33	7 S 13	·25 1 O 12	·78 3 N 11	·31 4 D 10	84	07 5 Jr 24	·87	5 Jr 24	·80 7 F 23	·43			
7 S 13			·25 1 O 12	·78 3 N 11	·31 4 D 10	84	08 8 Jr 14	·27	4 F 12	·80 6 Mr 13	·33	4 S 2	·61 6 O 2	·15 7 O 31	68 2 N 30	21	7 D 21	·47	09 7 Jr 2	·63	2 F 1	·16 3 Mr 2	·69	4 S 2	·61 6 O 2	·15 7 O 31	68 2 N 30	21	08 8 Jr 14	·27	4 F 12	·80 6 Mr 13	·33			
4 S 2			·61 6 O 2	·15 7 O 31	68 2 N 30	21	09 7 Jr 2	·63	2 F 1	·16 3 Mr 2	·69	1 Au 21	·98 5 O 20	·51 5 O 20	·04 6 N 18	·57	1 D 18	·10	10 6 Jr 21	·53 1 F 20	·06	1 Au 21	·98 5 O 20	·51 5 O 20	·04 6 N 18	·57	09 7 Jr 2	·63	2 F 1	·16 3 Mr 2	·69					
1 Au 21			·98 5 O 20	·51 5 O 20	·04 6 N 18	·57	10 6 Jr 21	·53	1 F 20	·06	6 Au 23	·51 1 S 22	·04 2 O 21	·57 4 N 20	10	5 D 23	·00	11 8 Jr 10	·90	5 F 9	·43 6 Mr 10	·96	6 Au 23	·51 1 S 22	·04 2 O 21	·57 4 N 20	10	10 6 Jr 21	·53	1 F 20	·06	6 Au 23	·51 1 S 22	·04 2 O 21	·57 4 N 20	10
7 S 8			·88 2 O 9	·41 3 N 7	·94 5 D 7	47	11 8 Jr 10	·90	5 F 9	·43 6 Mr 10	·96	5 Au 30	·25 6 S 28	·78 1 O 28	·31 2 N 26	84	1 D 81	27	12 2 Jr 29	·80 4 F 28	·33	5 Au 30	·25 6 S 28	·78 1 O 28	·31 2 N 26	84	11 8 Jr 10	·90	5 F 9	·43 6 Mr 10	·96					
5 Au 30			·25 6 S 28	·78 1 O 28	·31 2 N 26	84	12 2 Jr 29	·80	4 F 28	·33	6 Au 23	·51 1 S 22	·04 2 O 21	·57 4 N 20	10	1 D 19																				

TABLE II.—Solar years and new moons

			Com- mence- ment of solar year.		First new moon in solar year		Anomaly of first new moon.		Christian era.		Vaiśākha.		Jyeshtha.		Āshāḍha.		Śrāvaṇa.		Bhādrapada.				
Kaliyuga.	Vikrama era.	Śaka era.	Month and day A.D.	Fraction of day.	First new moon in solar year	Anomaly of first new moon.	Christian era.	Week-day	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
3529	485	850	17M	7809	14-1829	12-868	428	7	Mr	31	·01	2	Ap	30	·44	8	My	29	·97	5	Je	28	·50
3530	486	851	17M	9896	3-2912	9-026	429	5	Mr	21	·28	6	Ap	19	·81	2	Je	17	·87	4	Jl	17	·40
3531	487	852	18M	2484	21-9801	7-159	430	4	Ap	9	·18	5	My	8	·71	7	Je	7	·24	1	Jl	6	·77
3532	488	853	18M	5071	11-0384	8-316	431	1	Mr	29	·54	3	Ap	28	·08	4	My	27	·61	6	Je	26	·14
3533	489	854	17M	7659	0-1467	27-028	432	5	Mr	17	·91	1	My	15	·97	3	Je	14	·60	5	Jl	14	·03
3534	490	855	18M	0246	18-7859	25-161	433	7	Ap	16	·44	6	My	5	·34	7	Je	8	·87	2	Jl	8	·40
3535	491	856	18M	2834	7-8839	21-319	434	4	Ap	5	·81	8	Ap	24	·71	5	My	24	·24	6	Je	22	·77
3536	492	857	18M	5422	26-5328	19-452	435	2	Mr	26	·18	3	My	18	·60	4	Je	12	·14	5	Jl	11	·67
3537	493	858	17M	8009	15-6411	15-609	436	1	Ap	14	·07	2	My	18	·60	4	Je	12	·14	5	Jl	11	·67
3538	494	859	18M	0597	4-7494	11-766	437	5	Ap	2	·44	6	My	1	·97	1	My	31	·50	3	Je	30	·08
3539	495	860	18M	3184	23-8882	9-900	438	2	Mr	22	·81	4	Ap	21	·34	5	My	20	·87	1	Jl	18	·98
3540	496	861	18M	5772	12-4965	6-057	439	4	Ap	5	·81	6	My	5	·34	7	Je	8	·87	2	Jl	8	·40
3541	497	862	17M	8359	1-6045	2-214	440	1	Ap	10	·71	3	My	10	·24	4	Je	8	·77	6	Jl	8	·30
3542	498	863	18M	0947	20-2487	0-347	441	6	Mr	31	·07	7	Ap	29	·60	2	My	29	·13	8	Je	27	·68
3543	499	864	18M	3535	9-8520	24-059	442	3	Mr	19	·44	4	Ap	17	·97	1	Je	16	·08	2	Jl	15	·56
3544	500	865	18M	6122	27-9909	22-192	443	2	Ap	7	·34	3	My	6	·87	5	Je	5	·40	6	Jl	4	·98
3545	501	866	17M	8710	17-0992	18-350	444	6	Mr	27	·70	1	Ap	26	·24	2	My	25	·77	4	Je	24	·30
3546	502	867	18M	1297	6-2075	14-507	445	5	Ap	15	·60	7	My	15	·18	1	Je	13	·66	8	Jl	13	·19
3547	503	868	18M	3885	24-8464	12-640	446	2	Ap	3	·97	4	My	3	·50	6	Je	2	·08	7	Jl	1	·56
3548	504	869	18M	6472	18-9547	8-797	447	7	Mr	24	·34	1	Ap	22	·87	8	My	22	·40	4	Je	20	·93
3549	505	870	17M	9060	3-0630	4-955	448	6	Ap	12	·23	7	My	11	·76	2	Je	10	·80	8	Jl	9	·83
3550	506	871	18M	1648	21-7018	8-088	449	8	Ap	1	·60	5	My	1	·13	6	My	30	·66	1	Je	29	·19
3551	507	872	18M	4235	10-8102	26-800	450	7	Mr	20	·97	4	My	19	·50	5	Je	17	·56	7	Jl	17	·09
3552	508	873	18M	6823	29-4491	24-933	451	4	Mr	29	·28	5	Ap	27	·76	7	My	27	·29	1	Je	25	·82
3553	509	874	17M	9410	18-5574	21-090	452	1	Mr	18	·60	4	My	16	·66	6	Je	15	·19	7	Jl	14	·72
3554	510	875	18M	1998	7-6657	17-248	453	8	Ap	17	·12	4	My	16	·66	6	Je	15	·19	7	Jl	14	·72
3555	511	876	18M	4585	26-8046	14-381	454	7	Ap	5	·50	2	My	5	·08	3	Je	3	·56	5	Jl	3	·09
3556	512	877	18M	7173	15-4128	11-538	455	4	Mr	25	·86	6	Ap	24	·40	7	My	23	·93	2	Je	22	·46
3557	513	878	17M	9760	4-5211	7-695	456	3	Ap	18	·76	5	My	18	·29	6	Je	11	·82	1	Jl	11	·35
3558	514	879	18M	2348	23-1600	5-829	457	1	Ap	3	·13	2	My	2	·66	4	Je	1	·19	5	Je	30	·72
3559	515	880	18M	4936	12-2688	1-966	458	5	Mr	22	·50	7	Ap	21	·08	1	My	20	·56	4	Jl	18	·62
3560	516	881	18M	7523	1-3766	25-698	459	4	Ap	10	·39	5	My	9	·92	7	Je	8	·46	1	Jl	7	·99
3561	517	882	18M	0111	20-0155	23-881	460	1	Mr	30	·76	3	Ap	29	·29	4	My	28	·82	6	Je	27	·35
3562	518	883	18M	2698	9-1238	19-988	461	6	Mr	20	·13	2	My	18	·66	3	Je	16	·72	5	Jl	16	·25
3563	519	884	18M	5286	27-7627	18-121	462	5	Ap	7	·03	6	My	6	·56	1	Je	5	·09	2	Jl	4	·62
3564	520	885	18M	7873	16-8710	14-279	463	2	Mr	27	·39	3	Ap	25	·92	5	My	25	·45	6	Je	23	·98
3565	521	886	18M	0461	5-9798	10-436	464	1	Ap	15	·29	2	My	14	·82	4	Je	13	·35	5	Jl	12	·88
3566	522	887	18M	3049	24-6182	8-569	465	5	Ap	4	·66	7	My	4	·19	1	Je	2	·72	8	Jl	2	·25
3567	523	888	18M	5636	18-7242	4-726	466	3	Mr	24	·02	4	Ap	22	·56	6	My	22	·09	4	Jl	18	·62
3568	524	889	18M	8224	2-8347	0-884	467	1	Ap	11	·92	3	My	11	·45	4	Je	9	·98	6	Jl	9	·51
3569	525	890	18M	0811	21-4737	26-571	468	6	Ap	1	·29	7	Ap	30	·82	2	My	30	·35	3	Je	28	·88
3570	526	891	18M	3399	10-5826	22-729	469	5	Ap	20	·19	6	My	19	·72	1	Je	18	·25	2	Jl	17	·78
3571	527	892	18M	5986	29-2209	20-862	470	2	Ap	8	·55	4	My	8	·08	5	Je	6	·62	7	Jl	6	·15
3572	528	893	18M	8574	18-3292	17-019	471	6	Mr	28	·92	1	Ap	27	·45	2	My	26	·98	4	Je	25	·51
3573	529	894	18M	1162	7-4375	13-176	472	4	Mr	18	·29	7	My	16	·85	1	Je	14	·88	8	Jl	14	·41
3574	530	895	18M	3749	26-0768	11-810	473	5	Ap	6	·82	4	My	5	·72	6	Je	4	·25	7	Jl	3	·78
3575	531	896	18M	6387	15-1846	7-467	474	7	Mr	25	·55	2	Ap	24	·08	3	My	23	·61	5	Je	22	·14
3576	532	897	18M	8924	4-2929	3-624	475	6	Ap	18	·45	7	My	12	·98	2	Je	11	·51	4	Jl	11	·04
3577	533	898	18M	1512	22-9318	1-757	476	8	Ap	2	·82	5	My	2	·85	6	My	31	·88	1	Je	30	·41
3578	534	899	18M	4099	12-0401	25-469	477	1	Mr	23	·18	2	Ap	21	·72	4	My	21	·25	7	Jl	19	·31
3579	535	900	18M	6687	1-1484	21-627	478	7	Ap	10	·08	1	My	9	·61	8	Je	8	·14	4	Jl	7	·67
3580	536	901	18M	9274	19-7873	19-760	479	4	Mr	30	·45	5	Ap	28	·98	7	My	28	·51	2	Je	27	·04
3581	537	902	18M	1862	8-8956	15-917	480	1	Mr	19	·82	3	Ap	18	·85	6	Je	16	·41	7	Jl	15	·94
								7	Ap	7	·71	2	My	7	·24	8	Je	5	·78	5	Jl	5	·81

from 1 B.C. to A.D. 500 (Sārya siddhānta)*—cont.

Āśvina.	Kārttika.	Mārgaśīrṣa.	Pauṣa.	A.D.	Māgha.	A.D.	Phālguna.	Chaitra.
Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Week-day Month. Day.	Fraction. Week-day. Month. Day.	Week-day. Month. Day.	Fraction. Week-day. Month. Day.
1 An 26	57 8 8 25	10 4 0 24	68 6 N 23	16	7 D 22	69	29 2 Jr 21	22 3 F 19
7 S 14	46 1 0 18	99 8 N 12	52 5 D 12	06	30 6 Jr 10	59	1 F 9	12 2 Mr 10
4 S 8	88 6 0 8	36 7 4 1	89 2 D 1	42	8 D 30	95	31 5 Jr 29	18 7 F 28
2 An 24	20 3 8 22	78 5 0 22	26 6 N 20	79	1 D 20	32	32 2 Jr 18	85 4 F 17
1 S 11	10 2 0 10	68 4 N 9	16 5 D 8	69	33 7 Jr 7	22	1 F 5	75 3 Mr 7
5 An 31	46 6 8 29	99 1 0 29	52 8 N 28	05	4 D 27	58	34 6 Jr 26	12 7 F 24
4 S 19	86 5 0 18	89 7 N 17	42 1 D 16	96	35 3 Jr 15	48	5 F 14	01 6 Mr 15
1 S 8	78 2 0 8	26 4 N 6	79 6 D 6	82	36 7 Jr 4	85	2 F 3	38 3 Mr 3
6 An 28	09 7 8 26	62 2 0 26	16 8 N 24	69	5 D 24	22	37 6 Jr 22	75 1 F 21
4 S 15	99 6 0 15	52 1 N 14	05 2 D 13	58	38 4 Jr 12	11	5 F 10	64 7 Mr 12
2 S 5	36 3 0 4	89 5 N 3	42 6 D 2	95	39 1 Jr 1	48	3 Jr 31	01 4 Mr 1
6 An 25	73 1 8 24	26 2 0 23	79 4 N 22	32	5 D 21	85	40 7 Jr 20	38 1 F 18
5 S 12	62 7 0 12	15 1 N 10	68 8 D 10	22	41 4 Jr 8	75	6 F 7	28 7 Mr 8
2 S 1	99 4 0 1	52 6 0 31	05 7 N 29	58	2 D 29	11	42 3 Jr 27	64 5 F 26
1 S 20	89 3 0 20	42 4 N 18	95 6 D 18	48	43 1 Jr 17	01	2 F 15	54 4 Mr 17
6 S 10	26 7 0 9	79 2 N 8	32 3 D 7	85	44 5 Jr 6	38	6 F 4	91 1 Mr 5
3 An 29	62 5 8 28	15 6 0 27	68 1 N 26	21	2 D 25	74	45 4 Jr 24	28 5 F 22
2 S 17	52 4 0 17	05 5 N 15	58 7 D 15	11	46 1 Jr 13	64	3 F 12	17 4 Mr 13
6 S 6	89 1 0 6	42 2 N 4	95 4 D 4	48	47 6 Jr 3	01	7 F 1	54 2 Mr 3
4 An 27	25 5 8 25	78 7 0 25	32 1 N 23	85	3 D 23	38	48 4 Jr 21	91 6 F 20
3 S 14	15 4 0 13	68 6 N 12	21 7 D 11	74	49 2 Jr 10	27	3 F 8	80 5 Mr 10
7 S 3	52 2 0 3	05 8 N 1	58 5 D 1	11	6 D 30	64	50 1 Jr 29	17 2 F 27
4 An 23	89 6 8 22	42 7 0 21	95 2 N 20	48	4 D 20	01	51 5 Jr 18	54 7 F 17
3 S 11	78 5 0 11	31 6 N 9	84 1 D 9	38	52 2 Jr 7	91	4 F 6	44 5 Mr 6
1 An 31	15 2 8 29	68 4 0 29	21 5 N 27	74	7 D 27	27	53 1 Jr 25	80 3 F 24
7 S 19	05 1 0 18	58 3 N 17	11 4 D 16	64	54 6 Jr 15	17	7 F 13	70 2 Mr 15
4 S 8	42 5 0 7	95 7 N 6	48 2 D 6	01	55 3 Jr 4	54	5 F 3	07 6 Mr 4
1 An 28	78 3 8 27	31 4 0 26	84 6 N 25	87	7 D 24	90	56 2 Jr 23	44 3 F 21
7 S 15	68 2 0 15	21 3 N 13	74 5 D 13	27	57 6 Jr 11	80	1 F 10	33 2 Mr 11
5 S 5	05 6 0 4	58 1 N 3	11 2 D 2	64	58 4 Jr 1	17	5 Jr 30	70 7 Mr 1
2 An 25	41 8 8 23	94 5 0 23	48 7 N 22	01	1 D 21	54	59 3 Jr 20	07 4 F 18
1 S 13	31 2 0 12	84 4 N 11	37 5 D 10	90	60 7 Jr 9	43	1 F 7	96 3 Mr 8
5 S 1	68 7 0 1	21 1 0 30	74 3 N 29	27	4 D 28	80	61 6 Jr 27	33 7 F 25
4 S 20	58 6 0 20	11 7 N 18	64 2 D 18	17	62 3 Jr 16	70	5 F 15	23 6 Mr 16
1 S 9	94 3 0 9	47 5 N 8	00 6 D 7	54	63 1 Jr 6	07	2 F 4	60 4 Mr 6
6 An 30	31 7 8 28	84 2 0 28	37 3 N 26	90	5 D 26	43	64 6 Jr 24	96 1 F 23
5 S 17	21 6 0 16	74 1 N 15	27 2 D 14	80	65 4 Jr 13	33	5 F 11	86 7 Mr 13
2 S 6	58 4 0 6	11 5 N 4	64 7 D 4	17	66 1 Jr 2	70	3 F 1	23 4 Mr 2
6 An 26	94 1 8 25	47 3 0 25	00 4 N 23	53	6 D 23	06	67 7 Jr 21	60 2 F 20
5 S 14	84 7 0 14	37 1 N 12	90 3 D 12	43	68 4 Jr 10	96	6 F 9	49 1 Mr 10
3 S 3	21 4 0 2	74 6 N 1	27 7 N 30	80	2 D 30	33	69 3 Jr 28	86 5 F 27
7 An 23	57 2 8 22	10 3 0 21	64 5 N 20	17	6 D 19	70	70 1 Jr 18	23 2 F 16
6 S 11	47 1 0 11	00 2 N 9	53 4 D 9	06	71 5 Jr 7	59	7 F 6	12 1 Mr 7
3 An 31	84 5 8 30	37 6 0 29	90 1 N 28	43	2 D 27	96	72 4 Jr 26	49 6 F 25
2 S 18	74 4 0 18	27 5 N 16	80 7 D 16	38	73 1 Jr 14	86	3 F 13	39 4 Mr 14
7 S 8	10 1 0 7	63 8 N 6	16 4 D 5	70	74 6 Jr 4	23	7 F 2	76 2 Mr 4
4 An 28	47 6 8 27	00 7 0 26	53 2 N 25	06	8 D 24	59	75 5 Jr 23	12 6 F 21
3 S 16	37 4 0 15	90 6 N 14	43 7 D 13	96	76 2 Jr 12	49	4 F 11	02 5 Mr 11
7 S 4	74 2 0 4	27 8 N 2	80 5 D 2	33	6 D 31	86	77 1 Jr 30	39 2 F 28
5 An 25	10 6 8 23	63 1 0 23	16 2 N 21	69	4 D 21	22	78 5 Jr 19	76 7 F 18
4 S 13	00 5 0 12	58 7 N 11	06 1 D 10	59	79 8 Jr 9	12	4 F 7	65 6 Mr 9
1 S 2	87 2 0 1	90 4 0 31	43 5 N 29	96	7 D 29	49	80 2 Jr 28	02 3 F 26
5 An 21	73 1 0 19	80 3 N 18	38 4 D 17	86	81 6 Jr 16	39	7 F 14	92 2 Mr 16
7 S 20	26							

To mean ending moment of tithis, add algebraically .02 for Brahma siddhānta.

TABLE II.—NEW MOONS AND ECLIPSES

TABLE II.—Solar years and new moons

			Com- mence- ment of solar year.		First new moon in solar year.		Anomaly of first new moon.		Christian era.		Vaisākha.			Jyeshtha.			Āshāḍha.			Śrāvaṇa.			Bhādrapada.				
Kaliyuga.	Vikrama era.	Śaka era.	Month and day A.D.	Fraction of day.							Week-day Month Day.	Fraction	Week-day. Month. Day.	Fraction.	Week-day. Month. Day.	Fraction	Week-day. Month. Day.	Fraction	Week-day. Month. Day.	Fraction.	Week-day. Month. Day.	Fraction.					
A.D.																											
3582	538	403	18M	4450	27 5345	14 050	481	3	Ap	14	98	5	My	14	51	7	Je	13	04	1	Ji	12	57	3	An	11	10
3583	539	404	18M	7037	16 6428	10 208	482	1	Ap	4	35	2	My	3	88	4	Je	2	41	5	Ji	1	94	7	Ji	31	47
3584	540	405	18M	9625	5 7511	6 365	483	5	Mr	24	71	7	Ap	23	24	1	My	22	77	3	Je	21	84	6	An	19	37
3585	541	406	18M	2212	24 8900	4 498	484	4	Ap	11	61	5	My	11	14	7	Je	9	67	2	Ji	9	20	3	An	7	73
3586	542	407	18M	4800	13 4988	0 655	485	1	Mr	31	98	3	Ap	30	51	5	My	30	04	6	Je	28	57	1	Ji	28	10
3587	543	408	18M	7387	2 6061	24 367	486	6	Mr	21	34	7	Ap	19	88	3	Je	17	94	5	Ji	17	47	7	An	16	00
3588	544	409	18M	9975	21 2455	22 500	487	5	Ap	9	24	6	My	8	77	1	Je	7	30	2	Ji	6	88	4	An	5	36
3589	545	410	18M	2563	10 3538	18 658	488	2	Mr	28	61	4	Ap	27	14	5	My	26	67	7	Je	25	20	1	Ji	24	73
3590	546	411	18M	5150	28 9927	16 791	489	1	Ap	16	51	3	My	16	04	4	Je	14	57	6	Ji	14	10	7	An	12	68
3591	547	412	18M	7738	18 1010	12 948	490	5	Ap	5	87	7	My	5	40	1	Je	3	94	3	Ji	3	47	5	An	2	00
3592	548	413	19M	0325	7 2092	9 105	491	3	Mr	26	24	4	Ap	24	77	6	My	24	80	7	Je	22	83	2	Ji	22	86
3593	549	414	18M	2913	25 8481	7 239	492	2	Ap	18	14	3	My	12	67	5	Je	11	20	6	Ji	10	73	1	An	9	26
3594	550	415	18M	5500	14 9564	3 398	493	6	Ap	2	51	1	My	2	04	2	My	31	57	4	Je	30	10	5	Ji	29	63
3595	551	416	18M	8088	4 0647	27 108	494	3	Mr	22	87	5	Ap	21	40	6	My	20	98	3	Ji	19	00	4	An	17	58
3596	552	417	19M	0675	22 7086	25 241	495	2	Ap	10	77	4	My	10	30	5	Je	8	83	7	Ji	8	86	1	An	6	89
3597	553	418	18M	3263	11 8119	21 398	496	7	Mr	30	14	1	Ap	28	67	3	My	28	20	4	Je	26	78	6	Ji	26	26
3598	554	419	18M	5861	0 9202	17 556	497	4	Mr	19	50	6	Ap	18	04	2	Je	16	10	3	Ji	15	68	5	An	14	11
3599	555	420	18M	8488	19 5591	15 689	498	3	Ap	7	40	4	My	6	93	6	Je	5	46	7	Ji	4	99	2	An	3	52
3600	556	421	19M	1026	8 6674	11 846	499	7	Mr	27	77	2	Ap	26	30	3	My	25	83	5	Je	25	36	6	Ji	23	89
ĀRYA SIDDHĀNTA																											
3601	557	422	18M	8611	27 28318	9 812	500	6	Ap	14	65	1	My	14	18	2	Je	12	71	4	Ji	12	24	5	An	10	77
3602	558	423	18M	6198	16 39182	5 770	501	4	Ap	4	02	5	My	3	54	7	Je	2	08	1	Ji	1	61	3	Ji	31	40
3603	559	424	18M	8785	5 50004	1 928	502	1	Mr	24	88	2	Ap	22	91	4	My	22	44	7	Ji	20	50	2	An	19	08
3604	560	425	19M	1371	24 13907	0 062	503	7	Ap	12	28	1	My	11	81	3	Je	10	84	4	Ji	9	87	6	An	8	40
3605	561	426	18M	3958	13 24751	23 774	504	4	Mr	31	65	6	Ap	30	18	7	My	29	71	2	Je	28	24	3	Ji	27	77
3606	562	427	18M	6545	2 35594	10 932	505	2	Mr	21	01	3	Ap	19	54	5	Je	17	61	1	Ji	17	14	2	An	15	67
3607	563	428	18M	9132	20 99497	18 066	506	7	Ap	8	91	2	My	8	44	3	Je	6	97	5	Ji	6	50	7	An	5	03
3608	564	429	19M	1719	10 10341	14 224	507	5	Mr	29	28	6	Ap	27	81	1	My	27	34	2	Je	25	87	4	Ji	25	40
3609	565	430	18M	4305	28 74242	12 357	508	4	Ap	16	18	5	My	15	71	7	Je	14	24	1	Ji	13	77	3	An	12	30
3610	566	431	18M	6892	17 85086	8 515	509	1	Ap	5	64	3	My	5	07	4	Je	3	60	6	Ji	3	13	7	An	1	66
3611	567	432	18M	9479	6 95930	4 673	510	5	Mr	25	91	7	Ap	24	44	1	My	23	97	5	Je	22	50	6	An	20	56
3612	568	433	19M	2066	25 59832	2 806	511	4	Ap	18	81	6	My	18	34	7	Je	11	87	2	Ji	11	40	3	An	9	98
3613	569	434	18M	4653	14 70876	26 518	512	2	Ap	2	17	3	My	1	70	5	My	31	24	6	Je	29	77	1	Ji	29	30
3614	570	435	18M	7240	3 81519	22 677	513	6	Mr	22	54	1	Ap	21	07	2	My	20	60	5	Ji	18	66	6	An	17	19
3615	571	436	18M	9826	22 45421	20 810	514	5	Ap	10	44	6	My	9	97	1	Je	8	50	3	Ji	8	08	4	An	6	56
3616	572	437	19M	2418	11 56265	10 968	515	2	Mr	30	81	4	Ap	29	34	5	My	28	87	7	Je	27	40	1	Ji	26	98
3617	573	438	18M	5000	0 67109	13 126	516	7	Mr	19	17	3	My	17	23	4	Je	15	76	6	Ji	15	30	7	An	18	88
3618	574	439	18M	7587	19 31011	11 260	517	6	Ap	7	07	7	My	6	60	2	Je	5	18	3	Ji	4	66	5	An	3	19
3619	575	440	19M	0174	8 41855	7 417	518	3	Mr	27	44	4	Ap	25	97	6	My	25	50	1	Je	24	08	2	Ji	23	56
3620	576	441	19M	2760	27 03757	5 551	519	2	Ap	15	34	3	My	14	87	5	Je	18	40	6	Ji	12	98	1	An	11	46
3621	577	442	18M	5347	16 16600	1 709	520	6	Ap	3	70	1	My	3	23	2	Je	1	78	4	Ji	1	29	5	Ji	30	82
3622	578	443	18M	7934	5 27444	25 421	521	4	Mr	24	07	5	Ap	22	60	1	Je	20	86	3	Ji	20	19	4	An	18	72
3623	579	444	19M	0521	23 91847	23 655	522	2	Ap	11	97	4	My	11	50	6	Je	10	08	7	Ji	9	56	2	An	8	09
3624	580	445	19M	3108	13 02189	19 718	523	7	Ap	1	33	1	Ap	30	86	3	My	30	40	4	Je	28	93	6	Ji	28	46
3625	581	446	18M	5694	2 18038	15 870	524	4	Mr	20	70	6	Ap	19	28	2	Je	17	29	4	Ji	16	82	5	An	15	85
3626	582	447	18M	8281	20 76986	14 004	525	3	Ap	8	60	5	My	8	13	6	Je	6	66	1	Ji	6	19	2	An	4	72
3627	583	448	19M	0868	9 87779	10 162	526	7	Mr	28	97	2	Ap	27	50	4	My	27	08	5	Je	25	56	7	Ji	25	09
3628	584	449	19M	3455	23 51082	8 295	527	6	Ap	16	86	1	My	16	39	2	Je	14	92	4	Ji	14	40	5	An	12	99
3629	585	450	18M	8042	17 62526	4 468	528	4	Ap	5	28	5	My	4	76	7	Je	3	29	1	Ji	2	32	3	An	1	35
3630	586	451	18M	8628	6 78868	0 611	529	1	Mr	25	60	3	Ap	24	13	4	My	23	69	6	Je	22	19	2	An	20	25
3631	587	452	19M	1215	25 37271	26 299	530	7	Ap	18	50	2	My	18	03	3	Je	11	56	5	Ji	11	00	6	An	9	62
3632	588	453	19M	3802	14 48115	22 457	531	4	Ap	2	86	6	My	2	39	7	My	31	92	2	Je	30	45	3	Ji	29	98
3633	589	454	18M																								

TABLE II.—NEW MOONS AND ECLIPSES

from 1 B.C. to A.D. 500 (Sūrya siddhānta)*—cont.

Āsvina.	Kārttika.	Mārgaśīrṣa.	Pausha.	A.D.	Māgha.	A.D.	Phālguna.	Chaitra.	
Week-day. Month Day	Fraction. Week-day Month. Day.	Fraction. Week-day. Month. Day.	Fraction Week-day. Month. Day	Fraction	Week-day. Month Day.	Fraction.	Week-day Month Day	Fraction. Week-day. Month. Day	Fraction.
4 S 9	·63 6 O 9	·16 7 N 7	·69 2 D 7	·22	82 8 Jr 5	·75	5 F 4	·28 6 Mr 5	·82
2 Au 30	·00 3 S 28	·53 5 O 28	·06 6 N 28	·59	1 D 26	·12	83 2 Jr 24	·65 4 F 23	·18
7 S 17	·90 2 O 17	·43 3 N 15	·96 5 D 15	·49	84 7 Jr 14	·02	1 F 12	·55 3 Mr 13	·08
5 S 6	·26 6 O 5	·79 1 N 4	·32 2 D 3	·86	85 4 Jr 2	·89	5 Jr 31	·92 7 Mr 2	·45
2 Au 26	·63 4 S 25	·16 5 O 24	·69 7 N 23	·22	1 D 22	·75	86 3 Jr 21	·28 4 F 19	·81
1 S 14	·53 3 O 14	·06 4 N 12	·59 6 D 12	12	87 7 Jr 10	·65	2 F 9	·18 3 Mr 10	·71
5 S 3	·90 7 O 3	·43 1 N 1	·96 3 D 1	·49	5 D 31	·02	88 6 Jr 29	·55 1 F 28	·08
3 Au 23	·26 4 S 21	·79 7 N 19	·85	Pausa Kshaya	2 D 19	·38	89 3 Jr 17	·92 6 Mr 17	·98
2 S 11	·16 3 O 10	·69 5 N 9	·22 6 D 8	·75	90 1 Jr 7	·28	2 F 5	·81 4 Mr 7	·34
6 Au 31	·53 1 S 30	·06 2 O 29	·59 4 N 28	·12	5 D 27	·65	91 7 Jr 26	·18 1 F 24	·71
5 S 19	·42 6 O 18	·96 1 N 17	·49 3 D 17	·02	92 4 Jr 15	·55	6 F 14	·08 7 Mr 14	·61
2 S 7	·79 4 O 7	·32 5 N 5	·85 7 D 5	·38	93 1 Jr 3	·91	3 F 2	·44 4 Mr 3	·98
7 Au 28	·16 1 S 26	·69 3 O 26	·22 4 N 24	·75	6 D 24	·28	94 1 Jr 22	·81 2 F 21	·84
6 S 16	·06 7 O 15	·59 2 N 14	·12 3 D 13	·65	95 5 Jr 12	18	6 F 10	·71 1 Mr 12	·24
3 S 5	·42 4 O 4	·95 6 N 3	·48 1 D 3	·02	96 2 Jr 1	·55	4 Jr 31	·08 5 F 29	·61
7 Au 24	·79 2 S 23	·32 3 O 22	·85 5 N 21	·38	6 D 20	·91	97 1 Jr 19	·44 2 F 17	·97
6 S 12	·69 1 O 12	·22 2 N 10	·75 4 D 10	·28	98 5 Jr 8	·81	7 F 7	·34 1 Mr 8	·87
4 S 2	·06 5 O 1	·59 7 O 31	·12 1 N 29	·65	3 D 29	·18	99 4 Jr 27	·71 6 F 26	·24
1 Au 22	·42 4 O 20	·48 6 N 19	·01 7 D 18	·54	500 2 Jr 17	06	3 F 15	·59 5 Mr 16	·12
2 S 20	·95								
FROM A.D. 500 TO A.D. 999.									
7 S 9	·30 1 O 8	·83 3 N 7	·36 4 D 6	·89	01 6 Jr 5	·42	7 F 8	·95 2 Mr 5	·48
4 Au 29	·67 6 S 28	·20 7 O 27	·78 2 N 26	·26	3 D 25	·79	02 5 Jr 24	·82 6 F 22	·85
3 S 17	·56 5 O 17	·10 6 N 15	·63 1 D 15	·16	03 2 Jr 13	·69	4 F 12	·22 5 Mr 13	·75
7 S 6	·93 2 O 6	·46 3 N 4	·99 5 D 4	·52	04 7 Jr 3	·05	1 F 1	·58 3 Mr 2	·12
5 Au 26	·30 6 S 24	·83 1 O 24	·36 2 N 22	·89	4 D 22	·42	05 5 Jr 20	·95 7 F 19	·48
4 S 14	·20 5 O 13	·73 7 N 12	·26 1 D 11	·79	06 8 Jr 10	·32	4 F 8	·79 6 Mr 10	·38
1 S 3	·56 3 O 3	·09 4 N 1	·62 6 D 1	·16	7 D 30	·69	07 2 Jr 29	·22 3 F 27	·75
5 Au 23	·93 7 S 22	·46 8 N 20	·52 5 D 20	05	Māgha Kshaya.		08 6 Jr 18	·58 2 Mr 17	·62
4 S 10	·83 6 O 10	·36 7 N 8	·99 2 D 8	·42	09 3 Jr 6	·95	1 F 17	·10 4 Mr 7	·01
2 Au 31	·20 8 S 29	·73 5 O 29	·26 6 N 27	·79	1 D 27	·32	10 2 Jr 25	·85 4 F 24	·38
1 S 19	·09 2 O 18	·62 4 N 17	·15 5 D 16	68	11 7 Jr 15	·22	1 F 13	·75 3 Mr 15	·28
5 S 8	·46 7 O 8	·09 1 N 6	·52 3 D 6	·05	12 4 Jr 4	·58	6 F 8	·11 7 Mr 3	·64
2 Au 27	·83 4 S 26	·36 5 O 25	·89 7 N 24	·42	1 D 23	·95	13 3 Jr 22	·48 5 F 21	·01
1 S 15	·72 3 O 15	·26 4 N 13	·79 6 D 13	·32	14 7 Jr 11	·85	2 F 10	·38 3 Mr 11	·91
6 S 5	·09 7 O 4	·62 2 N 3	·15 3 D 2	·68	15 5 Jr 1	·21	6 Jr 30	·74 1 Mr 1	·28
8 Au 25	·46 4 S 23	·99 6 O 23	·52 1 N 22	·05	2 D 21	·58	16 4 Jr 20	·11 5 F 18	·64
2 S 12	·36 3 O 11	·89 5 N 10	·42 6 D 9	·95	17 1 Jr 8	·48	3 F 7	·01 4 Mr 8	·54
6 S 1	·72 1 O 1	·25 2 O 30	·78 4 N 29	·32	5 D 28	·85	18 7 Jr 27	·38 1 F 25	·91
5 S 20	·62 7 O 20	·15 1 N 18	·68 3 D 18	·21	19 4 Jr 16	·74	6 F 15	·27 7 Mr 16	·80
2 S 9	·99 4 O 9	·52 6 N 8	·05 7 D 7	·58	20 2 Jr 6	·11	3 F 4	·64 5 Mr 5	·17
7 Au 29	·86 1 S 27	·89 3 O 27	·42 4 N 25	·95	6 D 25	·48	21 1 Jr 24	·01 2 F 22	·54
6 S 17	·25 7 O 16	·78 2 N 15	·31 3 D 14	·84	22 5 Jr 13	·38	7 F 11	·91 1 Mr 13	·44
3 S 6	·62 5 O 6	·15 6 N 4	·88 1 D 4	·21	23 2 Jr 3	·74	4 F 1	·27 5 Mr 2	·80
1 Au 26	·99 2 S 25	·52 4 O 25	·05 5 N 23	·58	7 D 23	·11	24 1 Jr 21	·64 3 F 20	·17
6 S 13	·88 1 O 13	·42 2 N 11	·95 4 D 11	·48	25 6 Jr 10	·01	7 F 8	·54 2 Mr 10	·07
4 S 3	·25 5 O 2	·78 7 N 1	·31 1 N 30	·84	3 D 30	·37	26 4 Jr 28	·90 6 F 27	·44
1 Au 23	·62 3 S 22	·15 6 N 20	·21	Pausa Kshaya	7 D 19	·74	27 2 Jr 18	·27 5 Mr 18	·33
7 S 11	·52 2 O 11	·05 3 N 9	·58 5 D 9	·11	28 6 Jr 7	·64	1 F 16	·80 3 Mr 6	·70
4 Au 30	·98 6 S 29	·41 7 O 29	·94 2 N 27	·48	4 D 27	·01	29 5 Jr 25	·45 7 F 24	·07
3 S 18	·78 5 O 18	·31 6 N 16	·84 1 D 16	·37	30 2 Jr 14	·90	4 F 13	·43 5 Mr 14	·96
1 S 8	·15 2 O 7	·68 4 N 6	·21 5 D 5	·74	31 7 Jr 4	·27	1 F 2	·80 3 Mr 4	·33
5 Au 28	·52 7 S 27	·05 1 O 26	·58 3 N 25	·11	4 D 24	·64	32 6 Jr 23	·17 7 F 21	·70
4 S 15	·41 5 O 14	·94 7 N 13	·2 D 13	·00	33 8 Jr 11	·54	5 F 10	·07 6 Mr 11	·60

A.D. 999 see pages 238 to 241 below.

For tithis by Brahma siddhānta add algebraically —02 to the above.

TABLE II.—Solar years and new moons

Kaliyuga.	Vikrama era.	Śaka era.	Month and day A.D.	Commencement of solar year.	First new moon in solar year.	Anomaly of first new moon.	Christian era.	Vaiśākha.				Jyeshtha.				Āshāḍha.				Śrāvaṇa.				Bhādrapada.			
								Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
3634	500	455	18M	8978	22-22861	16-749	533	1	Ap	10	13	2	My	9	66	4	Je	8	19	5	Jl	7	72	7	Au	6	25
3635	501	456	19M	1562	11-38705	12-906	534	5	Mr	30	48	7	Ap	29	02	1	My	28	56	3	Je	27	09	4	Jl	26	62
3636	502	457	19M	4149	0-44517	9-064	535	2	Mr	19	86	5	My	17	92	7	Je	16	45	1	Jl	15	98	8	Au	14	51
3637	503	458	18M	6738	19-08450	7-198	536	4	Ap	18	39	1	Ap	6	76	8	My	6	29	4	Je	4	82	6	Jl	4	88
3638	504	459	18M	9328	8-19294	8-356	537	6	Mr	27	13	7	Ap	25	66	2	My	25	19	3	Je	23	72	5	Jl	23	25
3639	505	460	19M	1910	26-83228	1-490	538	2	Ap	4	39	3	My	3	92	5	Je	2	45	0	Jl	1	98	1	Jl	31	51
3640	506	461	19M	4496	15-94039	25-202	539	6	Mr	23	76	1	Ap	22	29	2	My	21	35	5	Jl	19	88	7	Au	18	41
3641	507	462	18M	7083	5-04883	21-859	540	5	Ap	11	66	7	My	11	19	1	Je	9	12	3	Jl	9	25	4	Au	7	78
3642	508	463	18M	9670	23-63785	19-498	541	3	Ap	1	02	4	Ap	30	55	6	My	30	08	7	Je	28	61	2	Jl	28	14
3643	509	464	19M	2257	12-79629	15-851	542	7	Mr	21	39	1	Ap	19	92	4	Je	17	95	6	Jl	17	51	1	Au	16	04
3644	600	465	19M	4844	1-90473	11-809	543	6	Ap	8	29	7	My	7	82	2	Je	6	35	3	Jl	5	88	5	Au	4	41
3645	601	466	18M	7430	20-54375	9-942	544	3	Mr	28	65	5	Ap	27	28	6	My	26	72	1	Je	25	25	2	Jl	24	78
3646	602	467	19M	0017	9-65218	6-100	545	2	Ap	16	55	4	My	16	08	5	Je	14	61	7	Jl	14	14	1	Au	12	67
3647	603	468	19M	2604	28-29121	4-234	546	6	Ap	5	92	1	My	5	45	2	Je	3	98	4	Jl	3	51	6	Au	2	04
3648	604	469	19M	5191	17-89964	0-392	547	4	Mr	25	29	5	Ap	23	82	7	My	23	85	1	Je	21	88	4	Au	19	94
3649	605	470	18M	7778	6-50808	24-104	548	3	Ap	13	18	4	My	12	71	6	Je	11	24	7	Jl	10	43	2	Au	9	31
3650	606	471	19M	0365	25-14711	22-238	549	7	Ap	2	55	2	My	2	08	3	My	31	61	5	Je	30	14	6	Jl	29	67
3651	607	472	19M	2951	14-25553	18-395	550	4	Mr	22	92	6	Ap	21	45	7	My	20	98	4	Jl	19	64	5	Au	17	57
3652	608	473	19M	5538	3-36897	14-553	551	3	Ap	9	82	5	My	9	34	6	Je	7	88	1	Jl	7	41	2	Au	5	94
3653	609	474	18M	8125	22-00300	12-688	552	1	Mr	30	18	2	Ap	28	71	4	My	28	24	5	Je	26	77	7	Jl	26	30
3654	610	475	19M	0711	11-11143	8-845	553	5	Mr	19	86	1	My	17	92	3	Je	16	14	4	Jl	15	67	6	Au	14	20
3655	611	476	19M	3299	0-21987	5-012	554	7	Ap	18	08	5	My	6	61	7	Je	5	51	2	Jl	5	04	3	Au	3	57
3656	612	477	19M	5885	18-85889	3-136	555	4	Ap	7	45	5	My	6	98	7	Je	5	88	6	Je	23	41	2	Au	21	47
3657	613	478	18M	8472	7-96738	26-848	556	1	Mr	26	81	8	Ap	25	84	4	My	24	51	2	Jl	5	04	3	Au	3	57
3658	614	479	19M	1059	26-80635	24-982	557	7	Ap	14	71	2	My	14	24	3	Je	12	77	5	Jl	12	80	6	Au	10	88
3659	615	480	19M	3646	15-71472	21-140	558	5	Ap	4	08	6	My	3	61	1	Je	2	14	2	Jl	1	67	4	Jl	31	20
3660	616	481	19M	6238	4-62383	17-298	559	2	Mr	24	45	3	Ap	23	98	5	My	22	51	1	Jl	20	57	3	Au	19	10
3661	617	482	18M	8819	28-46225	15-481	560	7	Je	21	04	1	Jl	20	04	1	Jl	20	57	3	Au	19	10	3	Au	19	10
3662	618	483	19M	1406	12-57069	11-589	561	1	Ap	11	84	2	My	10	87	4	Je	9	40	5	Jl	8	94	7	Au	7	47
3663	619	484	19M	3998	1-67012	7-747	562	5	Mr	31	71	7	Ap	30	24	1	My	29	77	3	Je	28	80	4	Jl	27	83
3664	620	485	19M	6580	20-81814	5-881	563	3	Mr	21	08	4	Ap	19	61	7	Je	17	67	2	Jl	17	20	3	Au	15	73
3665	621	486	19M	9167	9-42658	2-038	564	1	Ap	8	98	3	My	8	51	5	Je	7	08	6	Jl	6	56	1	Au	5	10
3666	622	487	18M	1758	28-06561	27-727	565	6	Mr	28	34	7	Ap	26	87	2	My	26	40	3	Je	24	98	5	Jl	24	46
3667	623	488	19M	4346	17-17403	23-894	566	5	Ap	16	24	6	My	15	77	1	Je	14	30	2	Jl	13	83	4	Au	12	86
3668	624	489	19M	6927	6-28248	20-042	567	2	Ap	5	61	4	My	5	14	5	Je	3	67	7	Jl	3	20	1	Au	1	73
3669	625	490	19M	9514	24-92150	18-166	568	6	Mr	25	97	1	Ap	24	50	3	My	24	04	4	Je	22	57	7	Au	20	63
3670	626	491	19M	2101	14-02998	14-833	569	5	Ap	12	85	7	My	12	40	1	Je	10	98	3	Jl	10	46	4	Au	8	99
3671	627	492	19M	4687	3-13887	10-491	570	3	Ap	2	74	4	My	1	77	6	My	31	83	7	Je	29	88	2	Jl	29	34
3672	628	493	19M	7274	21-77749	8-625	571	7	Mr	22	61	2	Ap	21	13	5	Je	19	19	6	Jl	18	78	1	Au	17	26
3673	629	494	18M	9861	10-88582	4-783	572	6	Ap	10	50	1	My	10	08	2	Je	8	56	4	Jl	8	09	5	Au	6	62
3674	630	495	19M	2448	29-52484	0-941	573	3	Mr	29	87	5	Ap	28	40	6	My	27	98	1	Je	26	46	2	Jl	25	99
3675	631	496	19M	5035	18-63329	26-629	574	1	Mr	19	28	4	My	17	80	5	Je	15	83	7	Jl	15	36	1	Au	13	89
3676	632	497	19M	7621	7-74172	22-787	575	2	Ap	7	77	1	My	6	66	3	Je	5	19	4	Jl	4	72	6	Au	3	26
3677	633	498	19M	0208	26-38074	20-920	576	7	Ap	14	40	4	My	13	93	6	Je	12	46	1	Jl	11	99	2	Au	10	53
3678	634	499	19M	2795	15-48918	17-078	577	4	Mr	27	60	6	Ap	26	03	7	My	25	56	2	Je	24	09	3	Jl	23	62
3679	635	500	19M	5382	4-59781	13-286	578	3	Ap	14	40	4	My	13	93	6	Je	12	46	1	Jl	11	99	2	Au	10	53
3680	636	501	19M	7969	23-28664	11-370	579	7	Ap	3	76	2	My	3	29	3	Je	1	83	7	Jl	1	86	7	Jl	30	89
3681	637	502	19M	0555	12-34508	7-627	580	5	Mr	24	13	6	Ap	22	66	1	My	22	19	4	Jl	30	25	5	Au	18	78
3682	638	503	19M	3143	1-45351	3-684	581	4	Ap	12	08	5	My	11	56	7	Je	10	09	1	Jl	9	62	3	Au	8	15
3683	639	504	19M	5729	20-09253	1-819	582	1	Mr	31	40	2	Ap	29	98	4	My	29	46	5	Je	27	99	7	Jl	27	52
3684	640	505	19M	8316	9-20097	25-528	583	5	Mr	20	76	1	My	18	82	3	Je	17	85	4	Jl	16	89	6	Au	16	42
3685	641	506	19M	0903	27-83999	23-665	584	7	Ap	19	29	6	My	8	19	7	Je	6	72	2	Jl	6	25	3	Au	4	78
3686	642	507	19M	3499	11-38705	12-906	585	2	Mr	29	08	3	Ap	27	56	5	My	27	09	6	Je	25	62	1	Jl	25	15
3687	643	508	19M	6087	19-08450	7-198	586	7	Ap	15	93	2	My	15	46	3	Je	13	99	5	Jl	13	52	7	Au	12	65

* For Sūrya Siddhānta figures for A.D. 500 to Ending moments of tithis are the same for Ārya and Sūrya Siddhāntas.

from A.D. 500 to A.D. 999 (Ārya siddhānta)*—cont.

Āsvina.	Kārttika.	Mārgaśīrṣa.	Pauṣa.	A.D.	Māgha.	A.D.	Phālgua.	Chaitra.
Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.
1 S 4	78 8 O 4	81 4 N 2	84 6 D 2	37	7 D 31	90	34 2 Jr 30	43 3 F 28
6 An 25	15 7 S 23	68 2 O 23	21 3 N 21	74	5 D 21	27	35 6 Jr 19	80 1 F 18
5 S 13	04 6 O 12	58 1 N 11	11 2 D 10	64	36 4 Jr 9	17	5 F 7	70 7 Mr 8
2 S 1	41 3 S 80	94 5 O 30	47 7 N 29	00	1 D 28	53	37 3 Jr 27	06 4 F 25
1 S 20	31 2 O 19	84 4 N 18	37 5 D 17	90	38 7 Jr 16	48	1 F 14	96 3 Mr 16
5 S 9	68 7 O 9	21 1 N 7	74 3 D 7	27	39 4 Jr 5	80	6 F 4	38 7 Mr 5
3 An 30	04 4 S 28	57 6 O 28	10 7 N 26	64	2 D 26	17	40 3 Jr 24	70 5 F 23
1 S 16	94 3 O 16	47 5 N 15	00 6 D 14	53	41 1 Jr 13	06	2 F 11	59 4 Mr 13
6 S 6	31 7 O 5	84 2 N 4	37 3 D 3	90	42 5 Jr 2	43	6 Jr 31	96 1 Mr 2
3 An 26	68 5 S 25	21 6 O 24	74 1 N 23	27	2 D 22	80	43 4 Jr 21	33 5 F 19
2 S 14	57 4 O 14	10 5 N 12	63 7 D 12	16	44 1 Jr 10	70	3 F 9	23 4 Mr 9
6 S 2	94 1 O 2	47 3 N 1	00 4 N 30	53	6 D 30	06	45 7 Jr 28	59 2 F 27
4 An 23	31 5 S 21	84 1 N 19	90	Pauṣa Kṣhaya	3 D 19	43	46 4 Jr 17	96 1 Mr 18
3 S 11	20 4 O 10	74 6 N 9	27 7 D 8	80	47 2 Jr 7	82	3 F 16	49 5 Mr 7
7 An 31	55 2 S 30	10 3 O 29	63 5 N 28	16	6 D 27	69	48 1 Jr 26	22 2 F 24
6 S 18	47 1 O 18	00 2 N 16	53 4 D 16	06	49 5 Jr 14	59	7 F 13	12 1 Mr 14
3 S 7	80 5 O 7	37 6 N 5	90 1 D 5	43	50 2 Jr 3	96	4 F 2	49 6 Mr 4
1 An 28	20 2 S 26	73 4 O 26	26 5 N 24	80	7 D 24	33	51 1 Jr 22	86 3 F 21
7 S 16	14 1 O 15	63 3 N 14	16 4 D 13	69	52 6 Jr 12	22	7 F 10	75 2 Mr 11
4 S 4	47 6 O 4	00 7 N 2	53 2 D 2	06	3 D 31	59	53 5 Jr 30	12 6 F 28
1 An 24	84 3 S 23	37 4 O 22	90 6 N 21	43	7 D 20	96	54 2 Jr 19	49 4 F 18
7 S 12	73 2 O 12	26 3 N 10	79 5 D 10	32	55 6 Jr 8	86	1 F 7	39 2 Mr 8
5 S 2	10 6 O 1	63 1 O 31	16 2 N 29	69	4 D 29	22	56 5 Jr 27	75 7 F 26
4 S 20	00 5 O 19	53 7 N 18	06 1 D 17	59	57 3 Jr 16	12	4 F 14	65 6 Mr 16
1 S 9	38 2 O 8	90 4 N 7	43 5 D 6	96	58 7 Jr 5	49	2 F 4	02 3 Mr 5
5 An 20	78 7 S 28	25 1 O 27	79 3 N 26	32	4 D 25	85	59 6 Jr 24	38 7 F 22
4 S 17	63 6 O 17	15 7 N 15	69 2 D 15	22	60 3 Jr 13	75	5 F 12	28 6 Mr 12
2 S 6	00 3 O 5	53 5 N 4	06 6 D 3	59	61 1 Jr 2	12	2 Jr 31	65 4 Mr 2
6 An 26	36 7 S 24	89 2 O 24	42 3 N 22	96	5 D 22	49	62 7 Jr 21	02 4 F 19
5 S 14	26 6 O 13	79 1 N 12	32 2 D 11	85	63 4 Jr 10	38	5 F 8	91 7 Mr 10
2 S 3	68 4 O 3	16 5 N 1	69 7 D 1	22	1 D 30	75	64 3 Jr 29	28 4 F 27
6 An 22	99 3 O 21	05 5 N 19	58	Pauṣa Kṣhaya	6 D 19	12	65 7 Jr 17	65 3 Mr 17
1 S 11	52 7 O 10	42 1 N 8	95 3 D 8	43	5 Jr 7	01	2 F 16	18 5 Mr 7
3 An 31	26 4 S 29	79 6 O 29	32 7 N 27	85	2 D 27	38	6 F 5	54 5 F 24
2 S 19	16 3 O 18	69 5 N 17	22 6 D 16	75	68 1 Jr 15	28	4 Jr 25	91 5 F 24
6 S 7	20 1 O 7	05 2 N 5	59 4 D 5	12	69 5 Jr 3	64	2 F 13	81 4 Mr 14
3 An 27	89 5 S 26	42 6 O 25	95 1 N 24	48	3 D 24	01	7 F 2	18 1 Mr 3
2 S 15	79 4 O 15	82 5 N 13	85 7 D 13	88	71 1 Jr 11	91	4 Jr 22	54 6 F 21
7 S 5	15 1 O 4	63 3 N 3	21 4 D 2	75	72 6 Jr 1	28	3 F 10	44 4 Mr 11
4 An 24	52 6 S 23	06 7 O 22	58 2 N 21	11	3 D 20	64	7 Jr 30	81 2 F 29
3 S 12	42 4 O 11	95 6 N 10	48 1 D 10	01	74 2 Jr 8	51	5 Jr 19	17 6 F 17
7 S 1	79 2 O 1	82 3 O 30	85 5 N 29	38	6 D 23	91	4 F 7	07 5 Mr 8
6 S 20	68 1 O 20	23 2 N 18	74 4 D 18	27	76 5 Jr 16	81	1 Jr 27	44 2 F 25
4 S 9	05 5 O 8	58 7 N 7	11 1 D 6	64	77 3 Jr 5	17	7 F 15	34 1 Mr 15
1 An 23	42 2 S 27	95 4 O 27	48 6 N 26	01	7 D 25	54	4 F 3	70 6 Mr 5
7 S 17	31 1 O 16	85 3 N 15	88 4 D 14	91	79 6 Jr 13	44	2 Jr 24	07 3 F 22
4 S 6	68 3 O 6	21 7 N 4	74 2 D 4	27	80 3 Jr 2	80	7 F 11	97 2 Mr 18
2 An 26	05 3 S 24	58 5 O 24	11 6 N 22	64	1 D 22	17	5 F 1	83 6 Mr 1
7 S 13	95 2 O 13	48 4 N 12	01 5 D 11	54	82 7 Jr 10	07	2 Jr 20	70 4 F 19
5 S 3	31 6 O 2	84 1 N 1	87 2 N 30	91	4 D 30	44	1 F 8	60 3 Mr 10
4 S 22	21 5 O 21	74 7 N 20	27 1 D 19	50	84 3 Jr 13	33	6 Jr 28	97 7 F 27
1 S 10	58 3 O 10	11 4 N 8	64 6 D 8	17	85 7 Jr 6	70	4 F 16	86 6 Mr 17
							2 F 5	23 3 Mr 6

A.D. 999 see pages 233 to 241 below.

For tithis by Brahama Siddhanta add algebraically — 02 to the above.

TABLE II.—Solar years and new moons

			Com- mence- ment of solar year.		First new moon in solar year.		Anomaly of first new moon.		Christian era.		Vaiśākha.					Jyeshṭha.					Āṣāḍha.					Śrāvaṇa.					Bhādrapada.				
Kaliyuga.	Vikrama era.	Śaka era.	Month and day A.D.	Fraction of day.	First new moon in solar year.	Anomaly of first new moon.	Christian era.	A.D.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.							
3686	642	507	19M	3490	16-94843	19-823	585	5	Ap	5	29	6	My	4	82	1	Je	3	35	2	Jl	2	88	4	Au	1	41								
3687	643	508	19M	6078	6-05687	15-980	586	2	Mr	25	66	4	Ap	24	19	5	My	23	72	7	Je	22	25	3	Au	20	31								
3688	644	509	19M	8668	24-69588	14-114	587	1	Ap	18	16	3	My	13	09	4	Je	11	82	6	Jl	11	15	7	Au	9	68								
3689	645	510	19M	1250	18-80482	10-273	588	5	Ap	1	92	7	My	1	45	1	My	30	99	8	Je	29	52	5	Jl	29	05								
3690	646	511	19M	3837	2-91276	6-480	589	3	Mr	22	29	6	My	20	82	7	Je	18	88	2	Jl	18	41	8	Au	16	04								
3691	647	512	19M	6424	21-55178	4-563	590	2	Ap	10	19	3	My	9	72	5	Je	8	25	6	Jl	7	78	1	Au	6	81								
3692	648	513	19M	9010	10-66022	0-721	591	6	Mr	30	56	1	Ap	29	09	2	My	28	62	4	Je	27	15	5	Jl	26	68								
3693	649	514	19M	1597	29-29925	26-409	592	4	Mr	18	92	6	My	16	98	1	Je	15	51	8	Jl	15	06	4	Au	13	58								
3694	650	515	19M	4184	18-40757	22-568	593	5	Ap	17	45	4	My	6	35	5	Je	4	88	7	Jl	4	41	1	Au	2	94								
3695	651	516	19M	6771	7-51611	18-725	594	2	Ap	6	82	4	My	6	35	5	Je	4	88	7	Jl	4	41	1	Au	2	94								
3696	652	517	19M	9358	26-15445	16-858	595	7	Mr	27	19	1	Ap	25	75	3	My	25	25	4	Je	23	78	6	Jl	23	81								
3697	653	518	19M	1944	15-26357	18-016	596	6	Ap	15	09	7	My	14	62	2	Je	13	15	3	Jl	12	68	5	Au	11	21								
3698	654	519	19M	4531	4-37201	9-174	597	3	Ap	3	45	4	My	2	98	6	Je	1	51	1	Jl	1	04	2	Jl	30	57								
3699	655	520	19M	7118	23-01108	7-308	598	7	Mr	23	22	2	Ap	22	35	3	My	21	88	6	Jl	19	94	1	Au	18	47								
3700	656	521	19M	9705	12-11946	3-466	599	6	Ap	11	72	1	My	11	25	2	Je	9	78	4	Jl	9	81	5	Au	7	84								
3701	657	522	19M	2292	1-22790	27-178	600	4	Ap	1	08	5	Ap	30	62	7	My	30	15	1	Je	28	68	8	Jl	28	21								
3702	658	523	19M	4878	10-86693	25-812	601	1	Mr	20	46	4	My	18	52	6	Je	17	05	7	Jl	16	58	2	Au	15	11								
3703	659	524	19M	7465	8-97535	21-469	602	2	Ap	18	99	1	My	7	80	3	Je	6	42	4	Jl	5	95	6	Au	4	48								
3704	660	525	20M	0052	27-61438	19-603	603	7	Ap	8	36	1	My	7	80	3	Je	6	42	4	Jl	5	95	6	Au	4	48								
3705	661	526	19M	2639	16-72282	15-761	604	4	Mr	28	72	6	Ap	27	25	7	My	26	79	2	Je	25	82	3	Jl	24	85								
3706	662	527	19M	5225	5-83125	11-919	605	3	Ap	16	62	5	My	16	15	6	Je	14	68	1	Jl	14	21	2	Au	12	74								
3707	663	528	19M	7812	24-47028	10-053	606	7	Ap	4	99	2	My	4	52	4	Je	3	05	5	Jl	2	58	7	Au	1	11								
3708	664	529	20M	0399	18-57872	6-210	607	5	Mr	25	38	6	Ap	23	89	1	My	23	42	2	Je	21	95	6	Au	20	01								
3709	665	530	19M	2986	2-68714	2-388	608	4	Ap	18	25	5	My	12	78	7	Je	11	31	1	Jl	10	85	3	Au	9	38								
3710	666	531	19M	5578	21-32617	0-502	609	1	Ap	2	62	3	My	2	15	4	My	31	68	6	Je	30	21	7	Jl	29	74								
3711	667	532	19M	8160	10-43461	24-215	610	5	Mr	21	90	7	Ap	20	52	3	Je	18	58	5	Jl	18	11	6	Au	16	64								
3712	668	533	20M	0746	29-07363	22-348	611	4	Ap	9	89	6	My	9	42	7	Je	7	95	2	Jl	7	48	4	Au	6	01								
3713	669	534	19M	3338	18-18207	18-506	612	2	Mr	30	25	3	Ap	28	78	5	My	28	31	6	Je	26	84	1	Jl	26	37								
3714	670	535	19M	5920	7-29050	14-663	613	6	Mr	19	62	2	My	17	68	4	Je	16	21	6	Jl	15	74	7	Au	14	27								
3715	671	536	19M	8507	25-92952	12-797	614	1	Ap	18	15	2	My	6	05	1	Je	4	58	3	Jl	4	11	4	Au	2	64								
3716	672	537	20M	1094	15-03796	8-955	615	5	Ap	6	52	7	My	6	05	1	Je	4	58	3	Jl	4	11	4	Au	2	64								
3717	673	538	19M	3680	4-14604	5-112	616	2	Mr	26	88	4	Ap	25	41	5	My	24	95	7	Je	23	48	3	Au	21	54								
3718	674	539	19M	6267	22-78542	3-246	617	1	Ap	14	78	3	My	14	31	4	Je	12	84	6	Jl	12	37	7	Au	10	90								
3719	675	540	19M	8854	11-59386	26-959	618	6	Ap	4	15	7	My	3	68	2	Je	2	81	3	Jl	1	74	5	Jl	31	27								
3720	676	541	20M	1441	1-00229	23-116	619	3	Mr	23	52	5	Ap	22	05	6	My	21	58	2	Jl	19	64	4	Au	18	17								
3721	677	542	19M	4028	19-64131	21-250	620	4	Ap	11	41	3	My	10	94	5	Je	9	47	7	Jl	9	01	1	Au	7	54								
3722	678	543	19M	6614	8-74975	17-408	621	6	Mr	31	78	1	Ap	30	81	2	My	29	84	4	Je	28	87	5	Jl	27	90								
3723	679	544	19M	9201	27-38878	15-542	622	4	Mr	21	15	7	My	19	21	1	Je	17	74	3	Jl	17	27	4	Au	15	80								
3724	680	545	20M	1788	16-49720	11-699	623	5	Ap	19	68	4	My	7	58	6	Je	6	11	7	Jl	5	64	2	Au	4	17								
3725	681	546	19M	4875	6-80564	7-857	624	3	Ap	8	04	4	My	7	58	6	Je	6	11	7	Jl	5	64	2	Au	4	17								
3726	682	547	19M	6962	24-24467	5-980	625	7	Mr	28	41	1	Ap	26	94	3	My	26	47	5	Je	25	00	6	Jl	24	53								
3727	683	548	19M	9548	18-85310	2-149	626	6	Ap	16	81	7	My	15	84	2	Je	14	87	3	Jl	13	90	6	Au	12	43								
3728	684	549	20M	1213	2-46154	25-861	627	3	Ap	5	68	5	My	5	21	6	Je	3	74	1	Jl	3	27	2	Au	1	80								
3729	685	550	19M	3837	2-91276	6-480	589	1	Mr	25	06	2	Ap	23	57	4	My	23	11	5	Je	21	84	1	Au	19	70								
3730	686	551	19M	6424	21-55178	4-563	590	6	Ap	12	94	1	My	12	47	3	Je	11	00	4	Jl	10	53	6	Au	9	06								
3731	687	552	19M	9010	10-66022	0-721	591	4	Ap	2	81	5	My	1	84	7	My	31	87	1	Je	29	90	3	Jl	29	43								
3732	688	553	20M	1597	29-29925	26-409	592	1	Mr	22	68	4	My	20	74	6	Je	19	27	7	Jl	18	80	2	Au	17	83								
3733	689	554	19M	4184	18-40757	22-568	593	7	Ap	9	57	2	My	9	10	8	Je	7	63	5	Jl	7	17	6	Au	5	70								
3734	690	555	19M	6771	7-51611	18-725	594	4	Mr	29	94	6</																							

from A.D. 500 to A.D. 999 (Ārya siddhānta)*—cont.

Āśvina.	Kārttika.	Mārgaśīrsha.	Pauṣa.	A.D.	Māgha.	A.D.	Phālguna.	Chaitra.
Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction.	Week-day. Month. Day.	Fraction.	Week-day. Month. Day.	Fraction. Week-day. Month. Day.
5 Au 30	·95 7 S 29	·48 2 O 29	·01 3 N 27	·54	5 D 27	·07	86 6 Jr 25	·10 1 F 24
4 S 18	·84 6 O 18	·37 7 N 16	·90 2 D 16	·39	87 3 Jr 14	·97	5 F 13	·50 7 Mr 15
2 S 8	·21 3 O 7	·74 5 N 6	·27 6 D 5	·80	88 1 Jr 4	·33	2 F 2	·86 4 Mr 8
6 Au 27	·58 1 S 26	·11 3 O 25	·64 4 N 24	·17	5 D 23	·70	89 7 Jr 22	·23 1 F 20
5 S 15	·47 7 O 15	·01 1 N 18	·54 3 D 13	·07	90 4 Jr 11	·60	6 F 10	·13 7 Mr 11
2 S 4	·84 4 O 4	·37 5 N 2	·90 7 D 2	·43	2 D 31	·96	91 3 Jr 30	·49 5 Mr 1
7 Au 25	·21 1 S 23	·74 3 O 23	·27 4 N 21	·80	6 D 21	·33	92 7 Jr 19	·86 2 F 18
6 S 12	·11 7 O 11	·64 2 N 10	·17 3 D 9	·70	93 5 Jr 8	·23	6 F 6	·71 1 Mr 8
3 S 1	·47 5 O 1	·00 6 O 30	·53 1 N 29	·07	2 D 28	·60	94 4 Jr 27	·18 5 F 25
2 S 20	·37 3 O 19	·90 5 N 18	·43 6 D 17	·96	95 1 Jr 16	·55	3 F 15	·02 4 Mr 16
6 S 9	·74 1 O 9	·27 2 N 7	·80 4 D 7	·33	96 5 Jr 5	·86	7 F 4	·89 1 Mr 4
4 Au 29	·12 5 S 27	·64 7 O 27	·17 1 N 25	·70	8 D 25	·23	97 4 Jr 23	·76 6 F 22
3 S 17	·00 4 O 16	·53 6 N 15	·06 7 D 14	·59	98 2 Jr 13	·13	3 F 11	·66 5 Mr 13
7 S 6	·37 1 O 5	·90 3 N 4	·43 4 D 3	·96	99 6 Jr 2	·49	1 F 1	·02 2 Mr 2
4 Au 26	·74 6 S 25	·27 7 O 24	·80 2 N 23	·33	6 D 22	·86	600 5 Jr 21	·39 6 F 19
3 S 13	·64 5 O 13	·17 6 N 11	·70 1 D 11	·23	01 2 Jr 9	·77	4 F 8	·30 5 Mr 9
1 S 3	·01 2 O 2	·54 4 N 1	·07 5 N 30	·60	7 D 30	·13	02 1 Jr 28	·63 3 F 27
6 S 21	·91 1 O 21	·44 2 N 19	·97 4 D 19	·50	03 6 Jr 18	·03	7 F 16	·56 2 Mr 18
4 S 11	·27 5 O 10	·81 7 N 9	·34 1 D 8	·87	04 3 Jr 7	·40	4 F 5	·93 6 Mr 6
1 Au 30	·84 3 S 29	·17 4 O 28	·70 6 N 27	·23	7 D 26	·16	05 2 Jr 25	·29 3 F 23
7 S 18	·54 2 O 18	·07 3 N 16	·60 5 D 16	·13	06 6 Jr 14	·66	1 F 13	·19 2 Mr 14
4 S 7	·91 6 O 7	·44 7 N 5	·97 2 D 5	·50	07 4 Jr 4	·03	5 F 2	·56 7 Mr 4
2 Au 28	·27 3 S 26	·80 5 O 26	·33 6 N 24	·87	1 D 24	·40	08 2 Jr 22	·98 4 F 21
1 S 15	·17 2 O 14	·70 4 N 13	23 5 D 12	·76	09 7 Jr 11	·29	7 F 9	·82 3 Mr 11
5 S 4	·54 7 O 4	·07 1 N 2	·60 3 D 2	·13	4 D 31	·66	10 5 Jr 30	·19 7 F 28
2 Au 24	·91 { 4 S 23 5 O 22	·44 { Mārgaśīrsha Kṣhaya	7 N 21	·50	2 D 21	·03	11 3 Jr 19	·56 6 F 18
1 S 12	·80 3 O 12	33 4 N 10	·86 6 D 10	·39	12 7 Jr 8	·93	2 F 7	·46 3 Mr 7
6 S 1	·17 7 S 30	·70 2 O 30	·23 3 N 28	·76	5 D 28	·29	13 6 Jr 26	·82 1 F 25
5 S 20	·07 6 O 19	·60 1 N 18	·13 2 D 17	·66	14 4 Jr 16	·19	5 F 14	·72 7 Mr 16
2 S 9	·43 3 O 8	·97 5 N 7	·50 7 D 7	·03	15 1 Jr 5	·56	3 F 4	·09 4 Mr 5
6 Au 29	·80 1 S 28	·33 2 O 27	·86 4 N 26	·39	5 D 25	·92	16 7 Jr 24	·45 2 F 23
5 S 16	·70 7 O 16	·23 1 N 14	·76 3 D 14	·29	17 4 Jr 12	·82	6 F 11	·35 7 Mr 12
3 S 6	·07 4 O 5	·60 6 N 4	·13 7 D 3	·86	18 2 Jr 2	·19	3 Jr 31	·72 5 Mr 2
7 Au 26	·43 1 S 24	·96 3 O 24	·49 5 N 23	·03	6 D 22	·56	19 1 Jr 21	·19 2 F 19
6 S 14	·33 7 O 13	·86 2 N 12	·39 3 D 11	·92	20 5 Jr 10	·45	6 F 8	·98 1 Mr 9
3 S 2	·70 5 O 2	·23 6 O 31	·76 1 N 30	·29	2 D 29	·82	21 4 Jr 23	·35 5 F 26
2 S 21	·60 4 O 21	·13 5 N 19	·66 7 D 19	·19	22 1 Jr 17	·72	3 F 16	·25 4 Mr 17
6 S 10	·96 1 O 10	49 3 N 9	·12 4 D 8	·55	23 6 Jr 7	·09	7 F 5	·62 2 Mr 7
4 Au 31	·33 5 S 29	·86 7 O 29	·39 1 N 27	·92	3 D 27	·45	24 4 Jr 25	·98 6 F 24
3 S 18	·23 4 O 17	73 6 N 16	·29 7 D 15	·82	25 2 Jr 14	·35	3 F 12	·88 5 Mr 14
7 S 7	·60 2 O 7	·13 3 N 5	·66 5 D 5	·19	26 6 Jr 3	·72	1 F 2	·25 2 Mr 3
4 Au 27	·96 6 S 26	·49 1 O 26	·02 2 N 24	·55	4 D 24	·08	27 5 Jr 22	·67 7 F 21
3 S 15	·88 5 O 15	·39 6 N 13	·92 1 D 13	·45	28 2 Jr 11	·98	4 F 10	·51 6 Mr 11
1 S 4	·23 2 O 3	·76 4 N 2	·29 5 D 1	·82	7 D 31	·35	29 1 Jr 29	·88 3 F 28
{ 5 Au 24 7 S 23	·50 { 1 O 22 ·12	·65 3 N 21	·19 { Pauṣa Kṣhaya		4 D 20	·72	30 6 Jr 19	·25 { 7 F 17 2 Mr 19
4 S 12	·49 6 O 12	·02 7 N 10	·55 2 D 10	·08	31 3 Jr 8	·61	5 F 7	·14 6 Mr 8
1 S 1	·86 3 O 1	·39 4 O 30	·92 6 N 29	·45	7 D 28	·98	32 2 Jr 27	·51 4 F 26
7 S 19	·76 2 O 19	·29 3 N 17	·82 5 D 17	·35	33 6 Jr 15	·88	1 F 14	·41 2 Mr 15
5 S 9	·12 6 O 8	·65 1 N 7	·18 2 D 6	·71	34 4 Jr 5	·25	5 F 3	·78 7 Mr 5
2 Au 29	·49 4 S 28	·02 5 O 27	·55 7 N 26	·08	1 D 25	·61	35 3 Jr 24	·14 4 F 22
1 S 17	·39 2 O 16	·92 4 N 15	·45 5 D 14	·98	36 7 Jr 13	·51	2 F 12	·04 3 Mr 12

A.D. 999 see pages 238 to 241 below.

For tithis by Brahma siddhānta add algebraically — '02 to the above.

TABLE II.—Solar years and new moons

Kaliyuga.	Vikrama era.	Śaka era.	Month and day A.D.	Commencement of solar year.	First new moon in solar year.	Anomaly of first new moon.	Christian era.	Vaiśākha.				Jyeshṭha.				Āshāḍha.				Śrāvaṇa.				Bhādrapada.			
								Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
3737 693 558	19M		5417	22-55091	26-739		A.D.	5	Ap	11	0	6	My	10	68	1	Je	9	16	2	Jl	8	69	4	Au	7	22
3738 694 559	19M		8003	11-68825	22-897		636	2	Mr	31	0	4	Ap	30	00	5	My	29	53	7	Je	28	07	1	Jl	27	59
3739 695 560	20M		0590	0-77698	19-055		638	6	Mr	20	84	2	My	18	80	4	Je	17	43	5	Jl	16	96	7	Au	15	40
3740 696 561	20M		3177	19-41570	17-184		639	1	Ap	19	87	7	My	8	26	1	Je	6	79	3	Jl	6	83	4	Au	4	86
3741 697 562	19M		5764	8-52414	13-346		640	5	Ap	8	73	7	My	8	26	1	Je	6	79	3	Jl	6	83	4	Au	4	86
3742 698 563	19M		8351	27-16316	11-480		641	3	Mr	28	10	4	Ap	26	83	6	My	26	16	7	Je	24	69	3	Au	22	75
3743 699 564	20M		0937	16-27160	7-638		642	2	Ap	16	00	3	My	15	53	5	Je	14	06	6	Jl	13	59	1	Au	12	12
3744 700 565	20M		3524	5-38004	3-795		643	6	Ap	5	37	7	My	4	90	2	Je	3	43	8	Jl	2	96	5	Au	1	49
3745 701 566	19M		6111	24-01906	1-929		644	3	Mr	25	78	5	Ap	24	26	6	My	23	79	2	Jl	21	85	4	Au	20	39
3746 702 567	19M		8698	13-12749	25-641		645	2	Ap	12	63	4	My	12	16	5	Je	10	69	7	Jl	10	92	1	Au	8	75
3747 703 568	20M		1285	2-23593	21-799		646	7	Ap	2	00	1	My	1	53	3	My	31	06	4	Je	29	54	6	Jl	29	12
3748 704 569	20M		3871	20-87495	19-933		647	4	Mr	22	36	7	My	20	43	1	Je	18	96	3	Jl	18	41	5	Au	17	02
3749 705 570	19M		0458	9-98339	16-091		648	3	Ap	10	26	4	My	9	79	6	Je	8	32	7	Jl	7	85	2	Au	6	39
750 706 571	19M		9045	28-62242	14-234		649	7	Mr	29	63	2	Ap	28	16	3	My	27	69	5	Je	26	22	6	Jl	25	75
751 707 572	20M		1632	17-73084	10-383		650	6	Ap	17	53	1	My	17	06	2	Je	15	59	4	Jl	15	12	5	Au	13	65
8752 708 573	20M		4219	6-83928	6-540		651	3	Ap	6	89	5	My	6	42	6	Je	4	95	1	Jl	4	49	3	Au	3	02
3753 709 574	19M		6805	25-47811	4-694		652	1	Mr	27	26	2	Ap	25	79	4	My	25	32	5	Je	23	95	1	Au	21	91
3754 710 575	19M		9392	14-58674	0-831		653	7	Ap	14	16	1	My	13	64	3	Je	12	22	4	Jl	11	75	6	Au	10	28
3755 711 576	20M		1979	3-69518	24-544		654	4	Ap	3	53	6	My	8	06	7	Je	1	59	2	Jl	1	12	3	Jl	30	65
3756 712 577	20M		4586	22-38420	22-677		655	1	Mr	23	89	3	Ap	22	42	4	My	21	95	1	Jl	20	01	2	Au	18	55
3757 713 578	19M		7153	11-44264	18-835		656	7	Ap	11	79	2	My	11	32	8	Je	9	85	5	Jl	9	39	6	Au	7	91
3758 714 579	19M		9788	0-55107	14-993		657	5	Mr	31	16	6	Ap	29	69	1	My	29	22	2	Je	27	75	4	Jl	27	28
3759 715 580	20M		2325	19-19003	13-127		658	2	Mr	20	52	5	My	18	59	7	Je	17	12	1	Jl	16	65	3	Au	15	18
3760 716 581	20M		4913	8-29914	9-285		659	4	Ap	19	05	2	My	7	95	4	Je	6	48	6	Jl	6	01	7	Au	4	54
3761 717 582	19M		7500	26-93756	7-418		660	1	Ap	8	42	2	My	7	95	4	Je	6	48	6	Jl	6	01	7	Au	4	54
3762 718 583	20M		0087	16-04600	3-576		661	5	Mr	28	79	7	Ap	27	32	1	My	26	85	3	Je	25	38	4	Jl	24	91
3763 719 584	20M		2673	5-15443	27-288		662	4	Ap	15	69	6	Mr	15	22	7	Je	18	75	2	Jl	18	28	3	Au	11	81
3764 720 585	20M		5260	23-79345	25-422		663	2	Ap	5	05	3	My	4	58	5	Je	3	11	6	Jl	2	65	1	Au	1	18
3765 721 586	19M		7847	12-90189	21-580		664	6	Mr	25	42	7	Ap	23	95	2	My	23	48	5	Jl	21	54	7	Au	20	07
3766 722 587	20M		0434	2-01033	17-737		665	5	Ap	13	32	6	My	12	85	1	Je	11	83	2	Jl	10	91	4	Au	9	44
3767 723 588	20M		3021	20-64934	15-871		666	2	Ap	1	69	4	My	1	22	5	My	30	75	7	Je	29	28	1	Jl	28	81
3768 724 589	20M		5608	9-75779	12-029		667	7	Mr	22	05	1	Ap	20	58	4	Je	18	64	6	Jl	18	17	7	Au	16	71
3769 725 590	19M		8194	23-39631	10-163		668	5	Ap	9	95	7	My	9	48	2	Je	8	01	3	Jl	7	54	5	Au	6	07
3770 726 591	20M		0781	17-50524	6-320		669	3	Mr	30	32	4	Ap	28	85	6	My	28	88	7	Je	26	91	2	Jl	26	44
3771 727 592	20M		3368	6-61368	2-478		670	2	Ap	17	21	3	My	16	75	5	Je	15	28	6	Jl	14	81	1	Au	13	84
3772 728 593	20M		5955	25-26280	0-612		671	6	Ap	6	58	1	My	6	11	2	Je	4	64	4	Jl	4	17	5	Au	2	70
3773 729 594	19M		8542	14-86113	24-324		672	3	Mr	26	95	5	Ap	5	48	7	My	25	01	8	Jl	23	07	4	Au	21	60
3774 730 595	20M		1128	3-46957	20-433		673	2	Ap	14	85	4	My	14	28	5	Je	12	27	7	Jl	12	44	1	Au	10	97
3775 731 596	20M		3715	22-10860	18-618		674	7	Ap	3	21	1	My	2	74	3	Je	1	91	4	Je	30	81	6	Jl	30	34
3776 732 597	20M		6302	11-21703	14-773		675	4	Mr	23	58	6	Ap	22	11	2	Je	20	17	3	Jl	19	70	5	Au	18	22
3777 733 598	19M		8889	0-32546	10-931		676	3	Ap	11	48	5	My	11	01	6	Je	9	54	1	Jl	9	07	2	Au	7	60
3778 734 599	20M		1476	18-96449	9-065		677	7	Mr	31	85	2	Ap	30	38	3	My	29	91	5	Je	28	44	6	Jl	27	97
3779 735 600	20M		4062	8-07292	5-223		678	5	Mr	20	21	1	My	18	27	2	Je	16	80	4	Jl	16	33	6	Au	14	87
3780 736 601	20M		6649	26-71195	3-356		679	4	Ap	8	11	5	My	7	64	7	Je	6	17	1	Jl	5	70	3	Au	4	23
3781 737 602	19M		9236	15-82039	27-069		680	1	Mr	28	48	3	Ap	27	61	4	My	26	54	6	Je	25	07	7	Jl	24	60
3782 738 603	20M		1828	4-92892	23-226		681	7	Ap	16	37	1	My	15	91	3	Je	14	44	4	Jl	13	97	6	Au	12	50
3783 739 604	20M		4410	23-56784	21-880		682	4	Ap	4	74	6	My	4	27	7	Je	2	80	2	Jl	2	38	3	Jl	31	86
3784 740 605	20M		6996	12-07628	17-518		683	2	Mr	25	11	3	Ap	23	64	5	My	23	17	1	Jl	21	23	2	Au	19	76
3785 741 606	19M		9583	1-78471	13-676		684	1	Ap	13	01	2	My	12	54	4	Je	11	07	5	Jl	10	60	7	Au	9	13
3786 742 607	20M		2170	20-42874	11-809		685	5	Ap	2	37	6	My	1	90	1	My	31	43	2	Je	29	97	4	Jl	29	50
3787 743 608	20M		4757	9-53218	7-967		686	2	Mr	21	74	4	Ap	20	27	7	Je	18	33	1	Jl	17	86	3	Au	16	39
3788 744 609	20M		7344	28-17119	6-101		687	1	Ap	9	64	3	My	9	17	4	Je	7	70	6	Jl	7	23	7	Au	5	76
								6	Mr	30	01	7	Ap	28	54	2	My	28	07	3	Je	26	60	5	Jl	26	13
								4	Ap	17	90	6	My	17	43	7	Je	15	98	2	Jl	15	49	4	Au	14	08

* For Surya siddhanta figures for A.D. 500 to
Ending moments of tithis are the same for Arya and Surya siddhantas.

from A.D. 500 to A.D. 999 (Ārya siddhānta)*—cont.

Āsṛina.	Kārttika.	Mārgaśīrṣa.	Pauṣa.	A.D.	Māgha.	A.D.	Phālguna.	Chaitra.
Week-day. Month. Day.	Fraction Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction Week-day. Month. Day.	Fraction.	Week-day. Month. Day.	Fraction.	Week-day. Month. Day.	Fraction. Week-day. Month. Day.
5 S 5	75 7 O 5	29 1 N 3	82 3 D 3	35	37 4 Jr 1	88	6 Jr 31	41 7 Mr 1
3 Au 26	12 4 S 24	65 6 O 24	18 7 N 22	71	2 D 22	21	3 Jr 20	77 5 F 19
2 S 14	02 3 O 18	55 5 N 12	08 6 D 11	61	1 Jr 10	14	2 F 8	67 4 Mr 10
6 S 3	39 7 O 2	92 2 N 1	45 4 N 30	98	5 D 30	51	7 Jr 29	04 1 F 27
5 S 21	28 6 O 20	81 1 N 19	35 2 D 18	88	4 Jr 17	41	5 F 15	94 7 Mr 17
2 S 10	65 4 O 10	18 5 N 8	71 7 D 8	24	1 Jr 6	77	3 F 6	30 4 Mr 6
7 Au 31	02 1 S 29	55 3 O 29	08 4 N 27	61	6 D 27	14	7 Jr 25	67 2 F 24
5 S 18	92 7 O 18	45 1 N 16	98 3 D 16	51	4 Jr 15	04	6 F 13	57 1 Mr 14
3 S 7	28 4 O 6	81 6 N 5	34 7 D 4	87	2 Jr 3	41	3 F 1	94 5 Mr 3
7 Au 27	65 2 S 26	18 3 O 25	71 5 N 24	24	6 D 23	77	1 Jr 22	30 2 F 20
6 S 15	55 1 O 15	08 2 N 13	61 4 D 13	14	5 Jr 11	07	7 F 10	20 1 Mr 11
3 S 4	91 5 O 4	45 6 N 2	90 1 D 2	51	3 Jr 1	04	4 Jr 30	57 6 F 29
1 Au 24	28 2 S 22	81 5 N 20	87 7 D 20	40	1 Jr 18	93	3 F 17	47 5 Mr 19
7 S 12	18 1 O 11	71 3 N 10	24 4 D 9	77	6 Jr 8	80	7 F 6	83 2 Mr 8
4 S 1	55 6 O 1	08 7 O 30	61 2 N 29	14	3 D 28	67	5 Jr 27	20 6 F 25
3 S 20	44 4 O 19	97 6 N 18	51 1 D 18	04	2 Jr 16	57	4 F 15	10 5 Mr 15
7 S 8	81 2 O 8	34 3 N 6	87 5 D 6	40	6 Jr 4	93	1 F 3	46 3 Mr 4
5 Au 29	18 6 S 27	71 1 O 27	24 2 N 25	77	4 D 25	80	5 Jr 23	83 7 F 22
4 S 17	08 5 O 16	61 7 N 15	14 1 D 14	67	3 Jr 13	20	4 F 11	73 6 Mr 13
1 S 6	44 2 O 5	90 4 N 4	50 6 D 4	03	7 Jr 2	57	2 F 1	10 3 Mr 1
5 Au 25	81 7 S 24	34 1 O 23	87 3 N 22	40	4 D 21	93	6 Jr 20	46 7 F 18
4 S 13	71 6 O 13	24 7 N 11	77 2 D 11	80	3 Jr 9	83	5 F 8	36 6 Mr 9
2 S 3	07 3 O 2	61 5 N 1	14 6 N 30	67	1 D 30	20	2 Jr 28	73 4 F 27
7 S 21	97 2 O 21	50 4 N 20	03 5 D 19	56	7 Jr 18	09	1 F 16	62 3 Mr 17
5 S 10	34 6 O 9	87 1 N 8	40 2 D 7	93	4 Jr 6	46	5 F 4	99 7 Mr 6
2 Au 30	71 4 S 29	24 5 O 28	77 7 N 27	80	1 D 26	83	3 Jr 23	36 4 F 23
1 S 13	60 3 O 18	13 4 N 16	67 6 D 16	20	7 Jr 14	73	2 F 13	26 3 Mr 14
5 S 7	98 7 O 7	50 2 N 6	03 3 D 5	56	5 Jr 4	09	6 F 2	62 1 Mr 3
2 Au 27	34 4 S 25	87 6 O 25	40 7 N 23	98	2 D 23	46	3 Jr 21	99 5 F 20
2 S 15	24 3 O 14	77 5 N 13	30 6 D 12	83	1 Jr 11	36	2 F 9	89 4 Mr 11
6 S 4	60 1 O 4	13 2 N 2	66 4 D 2	19	5 D 31	73	7 Jr 30	26 1 F 28
4 Au 24	97 5 S 23	50 1 N 21	56 3 D 21	09	4 Jr 19	62	6 F 18	15 7 Mr 18
2 S 11	87 4 O 11	40 6 N 9	93 7 D 9	46	2 Jr 8	09	3 F 6	52 5 Mr 8
7 S 1	23 1 S 30	77 3 O 30	30 4 N 28	83	6 D 28	36	7 Jr 26	89 2 F 25
6 S 20	13 7 O 19	66 2 N 18	19 3 D 17	72	5 Jr 16	25	6 F 14	79 1 Mr 16
3 S 9	50 5 O 9	08 6 N 7	56 1 D 7	09	2 Jr 5	62	4 F 4	15 5 Mr 4
7 Au 28	87 2 S 27	40 3 O 26	93 5 N 25	48	6 D 24	99	1 Jr 23	52 3 F 22
6 S 16	76 1 O 16	29 2 N 14	83 4 D 14	36	5 Jr 12	89	7 F 11	42 1 Mr 12
4 S 6	13 5 O 5	86 7 N 4	19 1 D 3	72	3 Jr 2	25	4 Jr 31	78 5 Mr 2
1 Au 26	40 3 S 25	03 4 O 24	56 6 N 23	09	7 D 22	62	2 Jr 21	15 3 F 19
7 S 13	50 1 O 12	98 3 N 11	46 4 D 10	99	6 Jr 9	52	1 F 8	05 2 Mr 9
4 S 2	76 6 O 2	29 7 O 31	82 2 N 30	35	3 D 29	89	5 Jr 28	42 6 F 26
3 S 21	66 5 O 21	19 6 N 19	72 1 D 19	25	2 Jr 17	78	4 F 16	31 5 Mr 17
1 S 11	03 2 O 10	56 1 N 9	09 5 D 8	62	7 Jr 7	15	1 F 5	68 3 Mr 6
5 Au 30	39 6 S 28	93 1 O 28	46 2 N 26	99	4 D 26	52	6 Jr 25	05 7 F 23
4 S 18	29 5 O 17	82 7 N 16	35 1 D 15	88	3 Jr 14	41	4 F 12	95 6 Mr 14
1 S 7	66 3 O 7	19 4 N 5	72 6 D 5	25	7 Jr 3	78	2 F 2	81 3 Mr 3
6 Au 28	03 7 S 26	56 2 O 26	09 3 N 24	62	5 D 24	15	6 Jr 22	68 1 F 21
4 S 14	92 6 O 14	45 7 N 12	99 2 D 12	52	4 Jr 11	05	5 F 9	58 7 Mr 11
2 S 4	29 3 O 3	82 5 N 2	35 6 D 1	88	1 D 31	41	2 Jr 29	94 4 F 28
6 Au 24	68 1 S 23	72 4 N 21	25 5 D 20	78	7 Jr 19	31	1 F 17	84 3 Mr 19
5 S 12	56 7 O 12	09 1 N 10	62 3 D 10	15	4 Jr 8	68	6 F 7	21 7 Mr 7

A.D. 999 see pages 238 to 241 below.

For titles by Brahms siddhānta add algebraically .02 to the above.

TABLE II.—NEW MOONS AND ECLIPSES

TABLE II.—Solar years and new moons

			Com- mence- ment of solar year.		First new moon in solar year		Anomaly of first new moon.		Christian era.		Vaisākha.		Jyeshtha.		Āshāḍha.		Śrāvaṇa.		Bhādrapada.	
Kaliyuga.	Vikrama era.	Saka era.	Month and day A.D.	Fraction of day.				A.D.	Week-day.	Fraction.	Week-day.	Fraction.	Week-day.	Fraction.	Week-day.	Fraction.	Week-day.	Fraction.	Week-day.	Fraction.
									Month.	Day.	Month.	Day.	Month.	Day.	Month.	Day.	Month.	Day.	Month.	Day.
3789	745	610	19M	9630	17-27-63	2-259	688	688	2 Ap 6	27	3 My 5	80	5 Je 4	33	6 Ji 3	88	1 Au 2	39		
3790	746	611	20M	2517	6-3-807	25-971	689	689	6 Mr 26	64	1 Ap 25	17	2 My 24	70	4 Je 23	23	7 Au 21	29		
3791	747	612	20M	5104	25-02-709	24-105	690	690	5 Ap 14	53	7 My 14	07	1 Je 12	60	3 Ji 12	13	4 Au 10	66		
3792	748	613	20M	7891	14-18-553	20-262	691	691	2 Ap 8	90	4 My 3	43	5 Je 1	96	7 Ji 1	49	2 Ji 31	02		
3793	749	614	20M	0278	3-21-397	16-420	692	692	7 Mr 23	27	1 Ap 21	80	3 My 21	33	6 Ji 19	89	7 Au 17	92		
3794	750	615	20M	2884	21-82-298	14-554	693	693	6 Ap 11	17	7 My 10	70	2 Je 9	23	3 Ji 8	76	5 Au 7	29		
3795	751	616	20M	5451	10-99-142	10-712	694	694	8 Mr 31	53	5 Ap 30	06	6 My 29	59	1 Je 28	13	2 Ji 27	66		
3796	752	617	20M	8038	0-09-985	6-889	695	695	2 Ap 19	43	3 My 18	96	5 Je 17	49	7 Ji 17	02	1 Au 15	55		
3797	753	618	20M	0625	18-78-888	5-003	696	696	6 Ap 7	80	1 My 7	83	2 Je 5	86	4 Ji 5	39	5 Au 3	92		
3798	754	619	20M	3212	7-84-732	1-161	697	697	4 Mr 28	17	5 Ap 26	70	7 My 26	23	1 Je 24	70	4 Au 22	82		
3799	755	620	20M	5798	26-48-634	20-819	698	698	3 Ap 16	06	4 My 15	59	6 Je 14	12	7 Ji 13	65	2 Au 12	19		
3800	756	621	20M	8385	15-59-477	23-007	699	699	7 Ap 5	43	1 My 4	96	3 Je 3	49	5 Ji 3	02	6 Au 1	55		
3801	757	622	20M	0972	4-70-321	19-164	700	700	4 Mr 24	80	6 Ap 23	33	7 My 22	86	3 Ji 20	92	5 Au 19	45		
3802	758	623	20M	3559	23-34-224	17-288	701	701	3 Ap 12	70	5 My 12	23	6 Je 10	78	1 Ji 10	29	2 Au 8	82		
3803	759	624	20M	6146	12-45-086	13-456	702	702	1 Ap 2	07	2 My 1	60	4 My 31	13	5 Je 29	66	7 Ji 29	19		
3804	760	625	20M	8733	1-55-910	9-614	703	703	5 Mr 22	43	1 My 20	50	3 Je 19	03	4 Ji 18	56	6 Au 17	09		
3805	761	626	20M	1319	20-19-813	7-747	704	704	4 Ap 9	33	5 My 8	86	7 Je 7	39	1 Ji 6	92	3 Au 5	45		
3806	762	627	20M	3906	9-80-656	3-905	705	705	1 Mr 29	70	3 Ap 28	23	4 My 27	76	6 Je 26	29	7 Ji 25	82		
3807	763	628	20M	6498	27-94-559	2-039	706	706	7 Ap 17	60	2 My 17	13	3 Je 15	66	5 Ji 15	19	6 Au 13	72		
3808	764	629	20M	9080	17-05-408	25-751	707	707	4 Ap 6	96	6 My 6	49	1 Je 5	08	3 Ji 4	56	4 Au 3	09		
3809	765	630	20M	1667	6-18-245	21-909	708	708	2 Mr 26	33	3 Ap 24	86	5 My 24	39	1 Ji 22	45	2 Au 20	98		
3810	766	631	20M	4253	24-80-148	20-043	709	709	1 Ap 14	23	2 My 13	78	4 Je 12	29	5 Ji 11	82	7 Au 10	35		
3811	767	632	20M	6840	13-90-992	16-201	710	710	5 Ap 3	60	7 My 3	13	1 Je 1	66	3 Ji 1	19	4 Ji 30	74		
3812	768	633	20M	9427	30-19-835	12-358	711	711	2 Mr 23	98	4 Ap 22	49	7 Je 20	55	2 Ji 20	09	3 Au 18	62		
3813	769	634	20M	2014	21-65-788	10-492	712	712	1 Ap 10	86	3 My 10	39	4 Je 8	92	6 Ji 8	45	7 Au 6	98		
3814	770	635	20M	4601	10-76-581	6-650	713	713	6 Mr 31	23	7 Ap 29	76	2 My 29	29	3 Je 27	82	5 Ji 27	35		
3815	771	636	20M	7187	29-40-483	4-784	714	714	5 Ap 19	13	6 My 16	66	1 Je 17	19	2 Ji 16	72	4 Au 15	25		
3816	772	637	20M	9774	18-51-327	0-941	715	715	2 Ap 8	49	4 My 8	02	5 Je 6	55	7 Ji 6	08	1 Au 4	61		
3817	773	638	20M	2361	7-62-171	24-653	716	716	6 Mr 27	86	1 Ap 26	89	2 My 25	92	4 Je 24	45	7 Au 22	51		
3818	774	639	20M	4943	26-26-078	22-788	717	717	5 Ap 15	76	7 My 15	28	1 Je 13	82	3 Ji 13	35	4 Au 11	88		
3819	775	640	20M	7535	15-36-907	18-945	718	718	3 Ap 5	12	4 My 4	65	6 Je 3	19	7 Ji 2	72	2 Au 1	25		
3820	776	641	21M	0121	4-47-760	15-103	719	719	7 Mr 25	49	2 Ap 24	02	5 My 23	55	6 Ji 21	61	1 Au 20	14		
3821	777	642	20M	2708	23-11-662	13-237	720	720	6 Ap 12	39	7 My 11	92	2 Je 10	45	3 Ji 9	98	5 Au 8	51		
3822	778	643	20M	5295	12-22-506	9-894	721	721	3 Ap 1	76	5 My 1	29	6 My 30	82	1 Je 29	35	2 Ji 28	69		
3823	779	644	20M	7882	1-33-350	5-552	722	722	1 Mr 22	12	4 My 20	18	5 Je 18	71	7 Ji 18	25	1 Au 16	78		
3824	780	645	21M	0169	19-97-251	3-688	723	723	2 Ap 20	65	1 My 9	55	3 Je 8	08	4 Ji 7	61	6 Au 6	14		
3825	781	646	20M	8055	9-08-095	27-398	724	724	7 Ap 10	02	1 My 9	55	3 Je 8	08	4 Ji 7	61	6 Au 6	14		
3826	782	647	20M	5642	27-71-998	25-532	725	725	4 Mr 29	39	5 Ap 27	92	7 My 27	45	1 Je 25	98	3 Ji 25	51		
3827	783	648	20M	8229	16-82-841	21-690	726	726	3 Ap 17	29	4 My 18	82	6 Je 15	85	7 Ji 14	88	2 Au 13	41		
3828	784	649	21M	0816	5-83-685	17-847	727	727	7 Ap 6	65	2 My 6	18	3 Je 4	71	5 Ji 4	24	6 Au 2	77		
3829	785	650	20M	8403	24-67-588	15-981	728	728	5 Mr 27	02	6 Ap 25	55	1 My 25	08	4 Ji 23	14	5 Au 21	67		
3830	786	651	20M	5990	19-68-430	12-159	729	729	3 Ap 13	92	5 My 13	45	6 Je 11	98	1 Ji 11	51	3 Au 10	04		
3831	787	652	20M	8576	2-79-274	8-296	730	730	1 Ap 30	28	2 My 2	81	4 Je 1	35	5 Je 30	88	7 Ji 30	41		
3832	788	653	21M	1163	21-43-177	6-430	731	731	5 Mr 28	05	7 Ap 22	18	8 Je 20	24	4 Ji 19	77	6 Au 18	30		
3833	789	654	20M	3749	10-54-020	2-588	732	732	1 My 21	71	1 My 11	08	7 Je 9	61	2 Ji 9	14	3 Au 7	67		
3834	790	655	20M	6337	29-17-923	0-722	733	733	4 Ap 11	55	6 My 11	08	7 Je 9	61	2 Ji 9	14	3 Au 7	67		
3835	791	656	20M	8924	18-28-767	24-434	734	734	1 Mr 30	92	3 Ap 29	45	4 My 28	98	6 Je 27	51	1 Ji 27	04		
3836	792	657	21M	1510	7-89-609	20-592	735	735	7 Ap 18	81	2 My 18	84	8 Je 16	87	5 Ji 16	41	6 Au 14	94		
3837	793	658	20M	4097	26-03-512	18-725	736	736	5 Ap 8	18	6 My 7	71	1 Je 6	24	2 Ji 5	77	4 Au 4	80		
3838	794	659	20M	6684	15-14-356	14-833	737	737	2 Mr 28	55	4 Ap 27	08	5 My 26	61	7 Je 25	14	8 Au 23	20		
3839	795	660	20M	9271	4-25-229	11-042	738	738	5 Mr 28	05	7 Ap 22	18	8 Je 20	24	4 Ji 19	77	6 Au 18	30		
3840	796	661	21M	1858	22-89-101	9-175	739	739	1 Ap 15	45	2 My 14	98	4 Je 18	51	6 Ji 18	40	7 Au 11	57		
									5 Ap 4	81	7 My 4	34	1 Je 2	87	3 Ji 2	40	4 Ji 31	94		
									3 Mr 25	18	4 Ap 23	71	6 My 23	77	2 Ji 21	80	3 Au 19	83		
									2 Ap 13	08	3 My 12	61	5 Je 11	14	6 Ji 10	67	1 Au 9	20		

• For Surya siddhānta figures for A.D. 500 to

Ending moments of tithis are the same for Ārya and Surya siddhānta

Āśvina. Kārttika. Mārgaśīrṣa. Pauṣa. A.D. Māgha. A.D. Phālguna. Chaitra

[illegible]

For tithis by Brahma siddhānta add algebraically $-.08$ to the above.

TABLE II.—NEW MOONS AND ECLIPSES

TABLE II.—Solar years and new moons

Kaliyuga.			Vikrama era.			Śaka era.			Month and day A.D.			Commencement of solar year.			First new moon in solar year.			Anomaly of first new moon.			Christian era.			A.D.											
Week-day.			Month.			Day.			Fraction.			Week-day.			Month.			Day.			Fraction.			Week-day.			Month.			Day.			Fraction.		
Vaiśākha.			Jyeshṭha.			Āṣāḍha.			Śrāvaṇa.			Bhādrapada.																							
8841	797	662	20M	4444	11 99945	5 333	740	8 Ap 1	44	7 Ap 30	97	2 My 30	51	4 Je 29	04	5 Ji 28	57																		
8842	798	663	20M	7031	1 10788	1 490	741	8 Mr 21	81	8 My 19	87	1 Je 18	41	2 Ji 17	93	4 Au 16	46																		
8843	799	664	20M	9618	19 74691	27 179	742	5 Ap 20	34	4 My 9	24	5 Je 7	77	7 Ji 7	30	1 Au 5	83																		
8844	800	665	21M	2205	8 85525	23 337	743	2 Ap 9	71	1 Ap 28	61	3 My 28	14	4 Je 26	67	6 Ji 26	20																		
8845	801	666	20M	4792	27 49437	21 470	744	7 Mr 30	08	7 My 16	50	2 Je 15	03	3 Ji 14	57	7 Au 24	78																		
8846	802	667	20M	7378	16 60280	17 629	745	3 Ap 6	34	4 My 5	87	6 Je 4	40	7 Ji 3	93	5 Au 18	10																		
8847	803	668	20M	9995	5 71124	18 786	746	2 Ap 9	71	2 Ap 25	24	3 My 24	08	5 Je 28	30	1 Au 21	36																		
8848	804	669	21M	2552	24 35026	11 920	747	7 Mr 26	71	1 My 14	14	2 Je 12	07	4 Ji 12	20	5 Au 10	73																		
8849	805	670	20M	5132	13 45870	8 077	748	3 Ap 2	97	5 My 2	50	7 Je 1	03	1 Je 30	56	3 Ji 30	09																		
8850	806	671	20M	7726	2 56714	4 235	749	1 Mr 23	34	4 My 21	87	6 Je 19	93	7 Ji 19	46	1 Au 17	89																		
8851	807	672	21M	0312	21 20615	2 389	750	4 My 21	40	1 My 10	77	3 Je 9	80	4 Ji 8	83	6 Au 7	36																		
8852	808	673	21M	2899	10 31459	26 081	751	7 Ap 11	24	6 Ap 30	18	7 My 29	67	2 Je 28	20	3 Ji 27	73																		
8853	809	674	20M	5436	28 95362	24 215	752	4 Mr 31	60	5 My 18	03	6 Je 16	56	1 Ji 16	09	2 Au 14	62																		
8854	810	675	20M	8073	18 06295	20 873	753	3 Ap 7	87	2 My 7	40	3 Je 5	98	5 Ji 5	43	6 Au 3	99																		
8855	811	676	21M	0680	7 17049	16 530	754	5 Mr 28	24	6 Ap 26	77	1 My 26	30	2 Je 24	83	5 Au 22	89																		
8856	812	677	21M	3246	25 80951	14 664	755	4 Ap 16	13	5 My 15	66	7 Je 14	19	1 Ji 13	73	3 Au 12	26																		
8857	813	678	20M	5833	14 91795	10 822	756	1 Ap 4	50	3 My 4	03	4 Je 2	56	6 Ji 2	09	7 Ji 31	62																		
8858	814	679	20M	8420	4 02638	6 980	757	5 Mr 24	87	7 Ap 23	40	3 My 22	98	4 Ji 20	99	6 Au 19	52																		
8859	815	680	21M	1007	22 66534	5 113	758	4 Ap 12	77	6 My 12	30	7 Je 10	83	2 Ji 10	36	3 Au 8	89																		
8860	816	681	21M	8594	11 77445	1 272	759	2 Ap 2	13	3 My 1	66	5 My 31	19	6 Je 29	72	1 Ji 29	25																		
8861	817	682	20M	6180	0 89228	24 983	760	6 Mr 21	50	2 My 19	56	4 Je 18	09	5 Ji 17	62	7 Au 16	15																		
8862	818	683	20M	8767	19 52131	23 117	761	1 Ap 20	03	2 My 10	40	6 My 8	93	1 Je 7	46	2 Ji 6	99																		
8863	819	684	21M	1354	8 62974	19 275	762	5 Ap 9	40	6 My 8	93	1 Je 7	46	2 Ji 6	99	4 Au 5	52																		
8864	820	685	21M	1354	8 62974	19 275	762	2 Mr 29	77	4 Ap 28	30	5 My 27	83	7 Je 26	30	1 Ji 25	89																		
8864	820	685	21M	3941	27 26976	17 409	763	1 Ap 17	67	3 My 17	20	4 Je 15	73	6 Ji 15	26	7 Au 13	79																		
8865	821	686	20M	6528	16 37720	13 566	764	6 Ap 6	03	7 My 5	56	2 Je 4	09	3 Ji 8	62	5 Au 2	15																		
8866	822	687	20M	9114	5 48564	9 724	765	3 Mr 26	40	4 Ap 24	93	6 My 24	46	7 Je 22	52	4 Au 21	05																		
8867	823	688	21M	1701	24 12466	7 858	766	8 Ap 3	66	1 My 3	83	5 Je 1	73	4 Ji 1	89	1 Au 10	42																		
8868	824	689	21M	4288	13 23310	4 016	767	6 Ap 3	66	1 My 3	83	5 Je 1	73	4 Ji 1	89	1 Au 10	42																		
8869	825	690	20M	6875	2 84153	0 173	768	4 Mr 23	02	6 Ap 21	56	1 Je 19	62	3 Ji 19	15	4 Au 17	68																		
8870	826	691	20M	9362	20 98055	25 862	769	7 My 21	08	7 My 10	46	5 Je 8	99	7 Ji 8	52	2 Au 7	05																		
8871	827	692	21M	2049	10 08899	22 019	770	2 Ap 10	93	4 My 10	46	5 Je 8	99	7 Ji 8	52	2 Au 7	05																		
8871	827	692	21M	2049	10 08899	22 019	770	7 Mr 31	30	1 Ap 29	83	3 My 29	86	4 Je 27	89	2 Ji 27	42																		
8872	828	693	21M	4635	28 72811	20 153	771	2 Ap 10	93	4 My 10	46	5 Je 8	99	7 Ji 8	52	2 Au 7	05																		
8873	829	694	20M	7222	17 83644	16 811	772	7 Mr 31	30	1 Ap 29	83	3 My 29	86	4 Je 27	89	2 Ji 27	42																		
8874	830	695	20M	9809	6 94488	12 489	773	6 Ap 19	19	7 My 18	73	2 Je 17	25	3 Ji 16	79	5 Au 15	32																		
8875	831	696	21M	2396	25 53891	10 602	774	3 Ap 7	56	5 My 7	09	6 Je 5	62	1 Ji 5	15	2 Au 8	68																		
8876	832	697	21M	4983	14 69234	6 760	775	7 Mr 27	98	2 Ap 26	46	3 My 25	99	7 Ji 24	52	1 Au 22	58																		
8877	833	698	20M	7569	3 80077	2 912	776	6 Ap 15	83	1 My 15	86	2 Je 18	89	4 Ji 13	42	5 Au 11	95																		
8878	834	699	21M	0156	22 48980	1 052	777	4 Ap 5	19	5 My 4	72	7 Je 3	25	1 Ji 2	78	3 Au 1	81																		
8879	835	700	21M	2743	11 54828	24 764	778	1 Mr 24	56	3 Ap 23	09	4 My 22	62	7 Ji 20	68	2 Au 19	21																		
8880	836	701	21M	0156	22 48980	1 052	777	7 Ap 12	46	1 My 11	99	3 Je 10	52	5 Ji 10	05	6 Au 8	58																		
8881	837	702	20M	2743	11 54828	24 764	778	8 Ap 4	82	6 My 1	35	7 My 30	88	2 Je 29	42	3 Ji 28	94																		
8880	836	701	21M	6330	0 65687	20 922	779	2 Mr 22	19	5 My 20	25	6 Je 18	78	1 Ji 18	31	2 Au 16	85																		
8881	837	702	20M	7917	18 29570	19 055	780	8 Ap 20	72	5 My 20	25	6 Je 18	78	1 Ji 18	31	2 Au 16	85																		
8881	837	702	20M	7917	18 29570	19 055	780	1 Ap 9	09	2 My 8	62	4 Je 7	15	6 Ji 6	68	7 Au 5	21																		
8882	838	703	21M	0503	8 40413	15 213	781	5 Mr 29	46	6 Ap 27	99	1 My 27	52	3 Je 26	05	4 Ji 25	58																		
8883	839	704	21M	3090	27 04316	13 347	782	6 Ap 3	66	1 My 3	83	5 Je 1	73	4 Ji 1	89	1 Au 10	42																		
8884	840	705	21M	5677	16 15159	9 505	783	4 Ap 17	35	5 My 16	88	7 Je 15	41	1 Ji 14	95	3 Au 18	48																		
8885	841	706	20M	8264	5 26002	5 662	784	1 Ap 6	72	3 My 6	26	4 Je 4	78	6 Ji 4	81	7 Au 2	84																		
8886	842	707	20M	8264	5 26002	5 662	784	6 Mr 26	09	7 Ap 21	62	2 My 24	68	5 Ji 22	21	6 Au 20	74																		
8886	842	707	21M	0851	23 89905	3 796	785	2 Ap 3	35	3 My 2	88	5 Je 1	41	6 Je 30	94	1 Ji 30	47																		
8887	843	708	21M	3437	13 00749	27 508	786	6 Mr 26	09	7 Ap 21	62	2 My 24	68	5 Ji 22	21	6 Au 20	74																		
8888	844	709	21M	6024	2 11591	23 666	787	4 Ap 13	99	6 My 13	52	1 Je 12	05	2 Ji 11	58	4 Au 10	11																		
8889	845	710	20M	3437	13 00749	27 508	786	2 Ap 3	35	3 My 2	88	5 Je 1	41	6 Je 30	94	1 Ji 30	47																		
8889	845	710	20M	8611	20 75494	21 800	788	6 Mr 23	72	2 My 21	78																								

from A.D. 500 to A.D. 999 (Ārya siddhānta)*—cont.

Āśvina.			Kārttika.			Mārgasīrsha.			Pauṣa.			A.D.			Māgha.			A.D.			Phālguna.			Chaitra.			
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
7 Au	27○	10	1 S	25	63	3 O	25	16	4 N	23	69					6 D	28	22	41	7 Jr	21	75	2 F	20○	28		
8 S	14	99	7 O	14	53	2 N	13	06	3 D	12	59	42	5 Jr	11	12					6 F	9○	65	1 Mr	11	18		
3 S	4	36	4 O	3	89	6 N	2	42	7 D	1	95					2 D	31	48	43	4 Jr	30	01	5 F	28	55		
2 S	23	28	3 O	22	79	5 N	21	32	6 D	20○	85	44	1 Jr	19	38					2 F	17	91	4 Mr	18	44		
6 S	11	63	1 O	11	16	2 N	9	69	4 D	9○	22	45	5 Jr	7	75					7 F	6	28	1 Mr	7	81		
3 Au	31	99	5 S	30	52	7 O	30	05	1 N	28○	59					3 D	28	12	46	4 Jr	26	65	6 F	25	18		
2 S	19	89	4 O	19	42	5 N	17	95	7 D	17	48	47	2 Jr	16	01					3 F	14	54	5 Mr	16	07		
7 S	9	26	1 O	8	79	3 N	7●	32	4 D	6	85	48	6 Jr	5	38					7 F	3	98	2 Mr	4	44		
4 Au	28	63	6 S	27○	16	7 O	26	69	2 N	25	22					3 D	24	75	49	5 Jr	23	28	6 F	21	81		
3 S	16○	52	5 O	16	05	6 N	14	58	1 D	14	11	50	2 Jr	12	64					4 F	11	18	5 Mr	12	71		
7 S	5	89	2 O	5	42	3 N	3	96	5 D	3	43	51	7 Jr	2	01					1 Jr	31○	54	3 Mr	2	07		
5 Au	26	26	8 S	24	79	Mārgasīrsha			2 N	22	85					4 D	22	38	52	5 Jr	20○	91	7 F	19	44		
4 S	13	15	5 O	12	69	7 N	11	22	1 D	10	75	53	3 Jr	9●	28					4 F	7	81	6 Mr	9	34		
1 S	2	52	3 O	2	05	4 O	31	58	6 N	30	11					7 D	29●	64	54	2 Jr	28	17	3 F	26	71		
7 S	21	42	1 O	20	95	3 N	19○	43	5 D	19	01	55	6 Jr	17	54					1 F	16	07	2 Mr	17	60		
4 S	10	79	6 O	10	32	7 N	8○	85	2 D	8	38	56	3 Jr	6	91					5 F	5	44	6 Mr	5	97		
2 Au	30	15	3 S	28	68	5 O	28●	21	6 N	26	75					1 D	26	28	57	2 Jr	24	81	4 F	23	34		
1 S	18	05	2 O	17	58	4 N	16	11	5 D	15	64	58	7 Jr	14	17					1 F	12	70	3 Mr	14○	78		
5 S	7○	42	6 O	6●	95	1 N	5	48	3 D	5	01	59	4 Jr	3	54					6 F	2	07	7 Mr	3○	60		
2 Au	27○	79	4 S	26	32	5 O	25	85	7 N	24	38					1 D	23	91	60	3 Jr	22	44	"	20○	97		
1 S	14	68	3 O	14	21	4 N	12	74	6 D	12	27	61	7 Jr	10	81					2 F	9	34	3 Mr	10	87		
6 S	4	05	7 O	3	58	2 N	2	11	3 D	1	64					5 D	31○	13	62	6 Jr	29●	71	1 F	28	24		
4 S	22	95	6 O	22	48	1 N	21	01	2 D	20○	54	63	4 Jr	19●	07					5 F	17	60	7 Mr	19	13		
2 S	12	32	3 O	11	85	5 N	10	38	6 D	9○	91	64	1 Jr	8	44					2 F	6	97	4 Mr	7	50		
6 Au	31	69	1 S	30	22	2 O	29	75	4 N	28●	28					5 D	27	81	65	7 Jr	26	34	1 F	24	87		
5 S	19	58	7 O	19	11	1 N	17	64	3 D	17	17	66	4 Jr	15	71					6 F	14	24	7 Mr	15	77		
2 S	8	95	4 O	8○	48	6 N	7●	01	7 D	6	54	67	2 Jr	5	07					3 F	3	60	5 Mr	5	13		
7 Au	29	32	1 S	27○	85	3 O	27	88	4 N	25	91					6 D	25	44	68	7 Jr	23	97	2 F	22	50		
6 S	16	25	7 O	15	75	2 N	14	28	3 D	13	81	69	5 Jr	12	34					6 F	10○	87	1 Mr	12	40		
8 S	5●	58	5 O	5	11	6 N	3	64	1 D	3	17	70	2 Jr	1	70					4 Jr	31○	23	5 Mr	1	77		
7 Au	25●	95	4 O	24	01	5 N	22	64	Pauṣa							7 D	22	07	71	1 Jr	20○	60	3 F	19	13		
2 S	24	48							Kṣhaya												4 Mr	20		4	Mr	20	66
6 S	13	85	1 O	13	38	2 N	11	91	4 D	11	44	72	5 Jr	9	97					7 F	8	50	2 Mr	9	03		
4 S	2	21	5 O	1	74	6 O	31	27	1 N	29○	81					3 D	29●	34	73	4 Jr	27	87	6 F	26	40		
3 S	21	11	5 O	20	64	9 N	19○	17	7 D	18	70	74	2 Jr	17	23					3 F	15	76	5 Mr	17	29		
7 S	10	48	2 O	10	01	3 N	8○	54	5 D	8	07	75	6 Jr	6	60					1 F	5	13	2 Mr	6	66		
4 Au	30	85	6 S	29	38	7 O	28●	91	2 N	27	44					3 D	26	97	76	5 Jr	25	50	7 F	24	03		
3 S	17○	74	5 O	17	27	6 N	15	60	1 D	15	33	77	2 Jr	13	87					4 F	12	40	5 Mr	18○	93		
1 S	7○	11	2 O	6	64	4 N	5	17	5 D	4	70	78	7 Jr	3	23					1 F	1	76	3 Mr	8○	29		
5 Au	27○	48	7 S	26	01	1 O	25	54	3 N	24	07					4 D	23	60	79	6 Jr	22	13	7 F	20●	66		
4 S	15	37	5 O	14	91	7 N	13	44	1 D	12	87	80	3 Jr	11○	50					5 F	10●	03	6 Mr	10	56		
1 S	3	74	3 O	3	27	4 N	1	80	6 D	1	33					7 D	30○	86	81	2 Jr	29	39	3 F	27	92		
7 S	22	64	2 O	22	17	3 N	20	70	5 D	20○	28	82	6 Jr	18	76					1 F	17	29	2 Mr	18	82		
5 S	12	01	6 O	11	54	1 N	10	07	2 D	9●	60	83	4 Jr	8	13					5 F	6	66	7 Mr	8	19		
2 S	1	37	8 S	30	90	5 O	30	48	6 N	28●	97					1 D	28	50	84	3 Jr	27	03	4 F	25	56		
1 S	19	27	2 O	18○	80	4 N	17	33	5 D	16	86	85	7 Jr	15	39					1 F	13	92	3 Mr	15	45		
5 S	8	64	7 O	8○	17	1 N	6	70	3 D	6	23	86	4 Jr	4	78					6 F	3	29	7 Mr	4	82		
3 Au	29	01	4 S	27●	54	6 O	27	07	7 N	25	60					2 D	25	18	87	3 Jr	23	06	5 F	22○	19		
1 S	16●	90	3 O	16	43	4 N	14	96	6 D	14	49	88	1 Jr	13	08					2 F	11○	56	4 Mr	12	09		
6 S	6	27	7 O	4	80	2 N	3	33	3 D	2	86	89	5 Jr	1	39					6 Jr	30●	92	1 Mr	1	45		
3 Au	25	64	6 O	23	70	1 N	22	23	2 D	21	76	90	4 Jr	20●	29					5 F	18	82	7 Mr	20	35		
5 S	24	17										91	1 Jr	9●	66					3 F	8	19	4 Mr	9	72		
2 S	13	53	4 O	13	07	5 N	11	60	7 D	11○	13					6 D	30	02	92	7 Jr	28	55	2 F	27	09		
8 S	2	90	1 O	2	43	2 O	31	96	4 N	30○	49									6 F	15	45	7 Mr	16	98		
5 S	20	80	7 O	20	33	1 N	18●	86	3 D	18	39	93	4 Jr	16	92					3 F	4	82	5 Mr	6	85		
3 S	10	17	4 O	9	70	6 N	8	23	7 D	7	76	94	2 Jr	6	29					6 D	26	66					
7 Au	30	53	2 S	29○	06	3 O	28	59	5 N	27	13									1 Jr	25	19	2 F	23	72		

to A.D. 999 see pages 238 to 241 below.

For ātithy by Brahma siddhānta add algebraically — 04 to the above.

TABLE II.—Solar years and new moons

			Com- mence- ment of solar year.		Vaiśākha.		Jyeshtha.		Āshāḍha.		Śrāvaṇa.		Bhādrapada.							
Kaliyuga.	Vikrama era.	Śaka era.	Month and day A.D.	Fraction of day.	First new moon in solar year.	Anomaly or first new moon.	Christian era.	Week-day. Month	Day.	Fraction. Week-day. Month.	Day.	Fraction. Week-day. Month.	Day.	Fraction. Week-day. Month.	Day.					
A.D.																				
3896	852	717	21M	6719	3-57448	26-410	795	4	Mr 25○	25	5	Ap 28	78 { 7 My 23 1 Je 21	81 } 3	Jl 21	37	4	Au 19	90	
3897	853	718	20M	9305	22-21419	24-544	796	3	Ap 12	15	4	My 11	88 6 Je 10	21	7	Jl 9	74	2	Au 8	27
3898	854	719	21M	1892	11-32263	20-702	797	7	Ap 1	51	2	My 1	04 8 My 30	57	5	Je 29	10	6	Jl 28	63
3899	855	720	21M	4479	0-43106	16-860	798	{ 4 Mr 21 6 Ap 20	88 } 7	My 19	94	2	Je 18	47	4	Jl 18○	00	5	Au 16	53
3900	856	721	21M	7066	19-07008	14-993	799	3	Ap 9	78	5	My 9	31 6 Je 7	84	1	Jl 7○	37	2	Au 5	90
3901	857	722	20M	9653	8-17852	11-151	800	1	Mr 29	15	2	Ap 27	68 4 My 27	21	5	Je 25●	74 { 7	Jl 25	27	
3902	858	723	21M	2240	26-81755	9-285	801	7	Ap 17	04	1	My 16	57 3 Je 15●	11	4	Jl 14	64	6	Au 13	17
3903	859	724	21M	4826	15-92587	5-443	802	4	Ap 6	41	5	My 5○	94 7 Je 4●	47	2	Jl 4	00	8	Au 2	53
3904	860	725	21M	7413	5-03441	1-601	803	1	Mr 26	78	3	Ap 25●	31 { 4 My 24 6 Je 23	84 } 7	Jl 22	90	2	Au 21	43	
3905	861	726	21M	0000	23-67344	27-289	804	7	Ap 13	68	2	My 13	21 8 Je 11	74	5	Jl 11	27	6	Au 9	80
3906	862	727	21M	2587	12-74187	23-447	805	5	Ap 3	04	6	My 2	57 1 Je 1	10	2	Je 30	63	4	Jl 30	17
3907	863	728	21M	5174	1-89031	15-604	806	2	Mr 28	41	{ 8 Ap 21 5 My 21	84 } 7	Je 20	00	1	Jl 19	53	3	Au 18○	06
3908	864	729	21M	7760	20-52934	17-738	807	1	Ap 11	31	2	My 10	84 4 Je 9	37	5	Jl 8	90	7	Au 7○	43
3909	865	730	21M	0347	9-63776	18-892	808	5	Mr 30	67	7	Ap 29	21 1 My 28	74	8	Je 27	27	4	Jl 26●	80
3910	866	731	21M	2934	24-27679	12-030	809	4	Ap 18	57	6	My 18	10 7 Je 16○	63	2	Jl 16●	16	3	Au 14	69
3911	867	732	21M	5521	17-38523	8-187	810	1	Ap 7	94	8	My 7	47 5 Je 6○	00	6	Jl 5	53	1	Au 4	06
3912	868	733	21M	8108	6-49366	4-345	811	6	Mr 28	31	7	Ap 26	84 2 My 20○	37	{ 3 Je 24 5 Jl 24	24 } 6	Au 22	96		
3913	869	734	21M	0694	25-13289	2-479	812	5	Ap 15	20	6	My 14●	73 1 Je 13	27	2	Jl 12	80	4	Au 11	33
3914	870	735	21M	3281	14-24112	26-191	813	2	Ap 4○	57	4	My 4●	10 5 Je 2	63	7	Jl 2	16	1	Jl 31	69
3915	871	736	21M	5868	3-34955	22-349	814	6	Mr 24○	94	1	Ap 23	47 { 3 My 23 4 Je 21	00 } 6	Jl 21	06	7	Au 19	59	
3916	872	737	21M	8455	21-98858	20-483	815	5	Ap 12	84	7	My 12	37 1 Je 10	90	3	Jl 10	43	4	Au 8	96
3917	873	738	21M	1042	11-09702	16-640	816	8	Ap 1	20	4	Ap 30	73 6 My 30	26	7	Je 28	79	2	Jl 28	33
3918	874	739	21M	3623	0-20545	12-799	817	{ 7 Mr 21 2 Ap 20	57 } 8	My 19	63	5	Je 18	16	6	Jl 17○	69	1	Au 16	22
3919	875	740	21M	6215	18-84448	10-932	818	6	Ap 9	47	1	My 9	00 2 Je 7	53	4	Jl 7●	06	5	Au 5	59
3920	876	741	21M	8802	7-95291	7-089	819	3	Mr 29	83	5	Ap 28	87 6 My 27	90	1	Je 26●	43 { 2 Jl 25 4 Au 24	25 } 96		
3921	877	742	21M	1389	26-59193	5-223	820	2	Ap 16	78	4	My 16○	26 5 Je 14	79	7	Jl 14	32	1	Au 12	85
3922	878	743	21M	3976	15-70037	1-381	821	7	Ap 6	10	1	My 5●	68 8 Je 4	16	4	Jl 3	69	6	Au 2	22
3923	879	744	21M	6562	4-81881	25-103	822	4	Mr 26	47	6	Ap 25●	00 { 7 My 24 2 Je 23	53 } 3	Jl 22	59	5	Au 21	12	
3924	880	745	21M	9149	23-44782	23-227	823	3	Ap 14	36	4	My 13	89 6 Je 12	43	7	Jl 11	96	2	Au 10	49
3925	881	746	21M	1736	12-56626	19-385	824	7	Ap 2	73	2	My 2	26 3 My 31	79	5	Je 30	32	6	Jl 29	85
3926	882	747	21M	4323	1-66470	15-543	825	5	Mr 23	10	{ 6 Ap 21 1 My 21	63 } 2	Je 19	69	4	Jl 19	22	5	Au 17○	75
3927	883	748	21M	6910	20-80372	13-676	826	4	Ap 11	00	5	My 10	53 7 Je 9	06	1	Jl 8	59	3	Au 7●	12
3928	884	749	21M	9496	9-41246	9-834	827	1	Mr 31	36	2	Ap 29	89 4 My 29	42	5	Je 27○	95	7	Jl 27	49
3929	885	750	21M	2083	28-05119	7-968	828	7	Ap 18	26	1	My 17	79 8 Je 16○	32	4	Jl 15	85	6	Au 14	88
3930	886	751	21M	4670	17-15961	4-126	829	4	Ap 7	63	6	My 7	16 7 Je 5●	69	2	Jl 5	22	3	Au 3	75
3931	887	752	21M	7257	6-26805	0-283	830	1	Mr 27	99	3	Ap 26	53 5 My 26	06	{ 6 Je 24 1 Jl 24	24 } 12	2	Au 22	65	
3932	888	753	21M	9844	24-90708	25-971	831	7	Ap 15○	89	2	My 15●	42 8 Je 13	95	5	Jl 13	48	7	Au 12	01
3933	889	754	21M	2431	14-01551	22-129	832	5	Ap 4○	26	6	My 3	79 1 Je 2	92	2	Jl 1	85	4	Jl 31	88
3934	890	755	21M	5017	3-12395	18-267	833	2	Mr 24○	63	4	Ap 23	16 { 5 My 22 7 Je 21	69 } 2	Jl 20	75	3	Au 19	28	
3935	891	756	21M	7604	21-76298	16-421	834	1	Ap 12	52	3	My 12	05 4 Je 10	59	6	Jl 10	12	7	Au 8	65
3936	892	757	22M	0191	10-87140	12-579	835	5	Ap 1	89	7	My 1	42 2 My 30	95	3	Je 29	48	5	Jl 29○	01
3937	893	758	21M	2778	29-51043	8-736	836	4	Ap 19	79	6	My 19	32 7 Je 17	85	2	Jl 17●	38	8	Au 15	91
3938	894	759	21M	5365	18-61887	6-870	837	2	Ap 9	16	8	My 8	69 5 Je 7	22	6	Jl 6	75	1	Au 5	28
3939	895	760	21M	7951	7-72760	3-028	838	6	Mr 29	52	1	Ap 28	05 2 My 27○	58	{ 4 Je 26 5 Jl 25	26 } 11	7	Au 24	18	
3940	896	761	22M	0538	26-86632	1-161	839	5	Ap 17	42	6	My 16○	95 1 Je 15	48	3	Jl 15	01	4	Au 13	54
3941	897	762	21M	3125	15-47476	24-874	840	2	Ap 5	79	4	My 5●	82 5 Je 3	85	7	Jl 3	38	1	Au 1	91
3942	898	763	21M	5712	4-58319	21-032	841	7	Mr 26	15	1	Ap 24●	69 { 3 My 24 4 Je 22	22 } 6	Jl 22	28	7	Au 20	81	
3943	899	764	21M	8299	23-22222	19-176	842	6	Ap 14	05	7	My 13	58 2 Je 12	11	8	Jl 11	64	5	Au 10	17
3944	900	765	22M	0885	12-33066	15-323	843	3	Ap 3	42	4	My 2	95 6 Je 1	48	1	Jl 1	01	2	Jl 30	54
3945	901	766	21M	3472	1-43909	11-481	844	7	Mr 22	79	{ 2 Ap 21 3 My 20	82 } 5	Je 19	38	6	Jl 18	91	1	Au 17	44
3946	902	767	21M	6059	20-07811	9-615	845	6	Ap 10	68	1	My 10	21 2 Je 8	75	4	Jl 8○	28	5	Au 6●	81
3947	903	768	21M	8646	9-18655	5-773	846	4	Mr 31	05	6	Ap 29	58 7 My 29	11	1	Je 27○	64	8	Jl 27	17
3948	904	769	22M	1233	27-82557	3-906	847	2	Ap 18	95	4	My 18	48 6 Je 17○	01	7	Jl 16	54	2	Au 15	07
3949	905	770	21M	3819	18-93401	0-064	848	7	Ap 7	32	1	My 6	85 3 Je 5●	88	4	Jl 4	91	6	Au 3	44

* For Surya siddhanta figures for A.D. 500 to Ending moments of tithis are the same for

from A.D. 500 to A.D. 999 (Ārya siddhānta)*—cont.

Āsṛina.	Kārttika.	Mārgaśīrṣa.	Pauṣa.	A.D.	Māgha.	A.D.	Phālguna.	Chaitra.	
Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	
6 S 18○	48 7 O 17	96 2 N 16	50 4 D 16	02	96 5 Jr 14	55	7 F 13	08 1 Mr 13○	61
3 S 6○	80 5 O 6	33 6 N 4	86 1 D 4	39	97 2 Jr 2	92	4 F 1	45 5 Mr 2	98
1 Au 27	17 2 S 25	70 4 O 25	23 5 N 23	76	7 D 23	29	98 1 Jr 21○	82 3 F 20	35
7 S 15	06 1 O 14	59 3 N 13	12 4 D 12	65	99 6 Jr 11○	19	7 F 9	72 2 Mr 11	25
4 S 4	43 5 O 3	96 7 N 2	49 2 D 2	02	3 D 31○	55	800 5 Jr 30	08 6 F 28	61
3 S 22	82 4 O 21	86 6 N 20	39 7 D 19	92	01 2 Jr 18	45	3 F 16	98 5 Mr 18	51
7 S 11	70 2 O 11	23 3 N 9	78 5 D 9	29	02 6 Jr 7	82	1 F 6	35 2 Mr 7	88
5 S 1	08 6 S 30	59 1 O 30○	18 2 N 28●	66	4 D 28	19	03 5 Jr 26	72 7 F 25	25
3 S 19	96 5 O 19○	49 7 N 18	02 1 D 17	55	04 3 Jr 16	09	4 F 14	61 6 Mr 15	15
1 S 8	33 2 O 7	86 4 N 6	39 5 D 5	92	05 7 Jr 4	45	1 F 2	98 3 Mr 4	51
5 Au 28○	70 7 S 27	23 1 O 26	76 3 N 25	29	4 D 24	82	06 6 Jr 23	35 1 F 21○	96
4 S 16●	59 6 O 16	12 7 N 14	65 2 D 14	19	07 3 Jr 12	72	5 F 11○	25 6 Mr 12	78
1 S 5	96 3 O 5	49 5 N 4	02 6 D 3	55	08 1 Jr 2	08	2 Jr 31●	61 4 Mr 1	14
6 Au 25	32 2 O 23	39 3 N 21	92 5 D 21○	45	09 6 Jr 19	98	1 F 18	51 3 Mr 20	04
7 S 23	86	76 1 N 11	29 2 D 10○	82	10 4 Jr 9	35	5 F 7	88 7 Mr 9	41
5 S 18	23 6 O 12	12 5 O 31	65 7 N 30○	19	1 D 29	71	11 3 Jr 28	25 4 F 26	78
2 S 2	59 4 O 2	02 4 N 19	55 6 D 19	08	12 7 Jr 17	61	2 F 16	14 3 Mr 16	67
1 S 21	49 3 O 21	89 1 N 7●	92 3 D 7	45	13 4 Jr 5	98	6 F 4	51 1 Mr 6	04
3 Au 30	22 4 S 28○	75 6 O 28	29 7 N 26	82	2 D 26	35	14 3 Jr 24	88 5 F 23	41
2 S 18○	12 3 O 17	65 5 N 16	18 6 D 15	71	15 1 Jr 14	24	2 F 12	77 4 Mr 14	31
6 S 7●	49 1 O 7	02 2 N 5	55 4 D 5	08	16 5 Jr 3	61	7 F 2○	14 1 Mr 2●	67
3 Au 26	86 5 S 25	39 6 O 24	92 1 N 23	45	2 D 22	98	17 4 Jr 21○	51 6 F 20●	04
2 S 14	75 4 O 14	28 5 N 12	81 7 D 12	85	18 1 Jr 10○	88	3 F 9	41 4 Mr 10	94
6 S 23	02 7 O 22	55 2 N 21	08 3 D 20	61	6 D 31	24	19 7 Jr 29	77 2 F 28	80
3 S 11	39 4 O 10	92 6 N 9○	45 7 D 8●	98	20 5 Jr 19	14	6 F 17	67 1 Mr 18	20
7 Au 31	75 2 S 30	28 3 O 29○	81 5 N 28	84	21 2 Jr 7	51	4 F 6	04 5 Mr 7	57
6 S 19	65 1 O 19○	18 2 N 17	71 4 D 17	24	6 D 27	87	22 1 Jr 26	41 2 F 24	94
4 S 9○	02 5 O 8●	55 7 N 7	08 1 D 6	61	23 5 Jr 15	27	7 F 14	30 1 Mr 15	83
1 Au 28○	38 2 S 26●	91 4 O 26	45 5 N 24	98	24 3 Jr 5	14	4 F 3	87 6 Mr 4○	20
7 S 16	28 1 O 15	81 3 N 14	34 4 D 13	87	7 D 24	51	25 2 Jr 23	04 3 F 21○	57
4 S 5	65 6 O 5	18 7 N 3	71 2 D 3	24	26 6 Jr 12	40	7 F 10	93 2 Mr 12	47
2 Au 26	02 5 O 24	08 6 N 22	61 1 D 22○	14	27 8 Jr 1○	77	5 Jr 31	30 6 Mr 1	83
3 S 24	55	44 4 N 10	97 5 D 10○	51	28 2 Jr 20	67	4 F 19	20 5 Mr 19	73
1 S 12	91 2 O 12	81 1 O 31	34 2 N 29●	87	29 7 Jr 9	04	1 F 7	57 3 Mr 9	10
5 S 2	28 6 O 1	71 7 N 19	24 1 D 18	77	4 D 29	40	30 5 Jr 27	93 7 F 26	46
4 S 21	81 5 O 20○	08 4 N 8	61 6 D 8	14	31 3 Jr 17	80	5 F 15	83 6 Mr 17	86
1 S 10	55 3 O 10○	44 1 O 27	97 8 N 26	50	32 7 Jr 6	67	2 F 5	20 3 Mr 5	72
5 Au 29	91 7 S 28○	34 7 N 15	87 2 D 15	40	5 D 26	08	33 6 Jr 24	57 1 F 23	10
4 S 17●	81 6 O 17	71 5 N 5	24 6 D 4	77	34 3 Jr 13	93	5 F 12○	43 6 Mr 13●	99
2 S 7●	18 3 O 6	07 2 O 25	61 4 N 24	14	35 1 Jr 3	30	2 F 1○	83 4 Mr 3●	86
6 Au 27	54 1 S 26	97 1 N 12	50 3 D 12	03	5 D 23	67	36 7 Jr 22○	20 { 1 F 20	73
5 S 14	44 6 O 13	34 5 N 1	87 7 D 1	40	37 4 Jr 10	56	6 F 9	09 7 Mr 10	63
2 S 3	83 4 O 3	24 4 N 20○	77 6 D 20	30	1 D 30●	98	38 3 Jr 29	46 4 F 27	99
1 S 22	71 3 O 22	60 2 N 10○	13 3 D 9	67	39 7 Jr 18	88	2 F 17	36 3 Mr 18	89
6 S 12	07 7 O 11	97 6 O 29○	50 1 N 28	03	40 5 Jr 8	20	6 F 8	73 1 Mr 7	26
3 Au 31	44 4 S 29	87 5 N 17	40 6 D 16	98	2 D 27	56	41 4 Jr 26	09 5 F 24	62
2 S 19	34 3 O 19●	24 2 N 6	77 4 D 6	80	42 1 Jr 15	46	2 F 13	99 4 Mr 15○	52
6 S 8○	71 1 O 8	60 7 O 27	13 1 N 25	66	43 5 Jr 4	83	7 F 3	36 1 Mr 4○	89
4 Au 29○	07 5 S 27	50 6 N 14	03 7 D 13	56	8 D 25	19	44 4 Jr 23	73 6 F 22●	26
2 S 15	97 4 O 15	87 3 N 3	40 4 D 2	93	45 2 Jr 12○	09	3 F 10●	62 5 Mr 12	15
7 S 5	84 1 O 4	77 2 N 22	80 3 D 21○	83	46 6 Jr 1○	46	7 Jr 30	99 2 Mr 1	52
4 Au 25	70 7 O 23	13 6 N 11	66 1 D 11	19	47 5 Jr 20	36	6 F 13	19 1 Mr 20	42
6 S 24	23	50 4 O 31○	03 5 N 29	56	48 2 Jr 9	72	4 F 8	25 5 Mr 8	79
7 S 1	97 2 O 1	60 4 O 31○	03 5 N 29	56	7 D 29	09	49 1 Jr 27	62 3 F 26	15

A.D. 999 see pages 238 to 241 below.

For tithis by Brahma siddhānta add algebraically — 04 to the above.

TABLE II.—NEW MOONS AND ECLIPSES

TABLE II.—Solar years and new moons

			Com- mence- ment of solar year.		First new moon in solar year.		Anomaly of first new moon.		Christian era.		Vaiśākha.		Jyeshṭha.		Āśhāḍha.		Śrāvaṇa.		Bhādrapada.								
Kaliyuga.	Vikrama era.	Śaka era.	Month and day A.D.	Fraction of day.						Week-day. Month. Day.	Fraction.	Week-day. Month. Day.	Fraction.	Week-day. Month. Day.	Fraction.	Week-day. Month. Day.	Fraction.	Week-day. Month. Day.	Fraction.								
A.D.																											
8950 906	771	21M	6406	6 04245	23 776	849	4	Mr	27	68	6	Ap	26	0	21	7	My	25	74	2	Je	24	27	5	An	22	34
8951 907	772	21M	8893	24 08146	21 910	850	3	Ap	15	58	5	My	15		11	6	Je	13	64	1	Jl	13	17	2	An	11	70
8952 908	773	22M	1580	13 78990	18 068	851	7	Ap	4	96	2	My	4		48	4	Je	8	01	5	Jl	2	54	7	An	1	07
8953 909	774	21M	4167	2 89834	14 228	852	5	Mr	24	81	6	Ap	22		85	1	My	22	38	4	Jl	20	44	5	An	18	97
8954 910	775	21M	6753	21 53736	12 359	853	4	Ap	12	21	5	My	11		74	7	Je	10	27	1	Jl	9	80	3	An	8	83
8955 911	776	21M	9840	10 64580	8 517	854	1	Ap	1	58	3	My	1		11	4	My	30	64	6	Je	29	17	7	Jl	28	70
8956 912	777	22M	1927	29 28482	6 651	855	7	Ap	20	48	2	My	20		01	3	Je	18	54	5	Jl	18	07	6	An	16	60
8957 913	778	21M	4514	18 39326	2 809	856	4	Ap	8	84	6	My	8		37	7	Je	6	01	2	Jl	6	44	3	An	4	97
8958 914	779	21M	7101	7 50169	26 521	857	2	Mr	29	21	3	Ap	27		74	5	My	27	27	6	Je	25	80	2	An	23	86
8959 915	780	21M	9687	26 14085	24 655	858	1	Ap	17	11	2	My	16		64	4	Je	15	17	5	Jl	14	70	7	An	13	23
8960 916	781	22M	2274	15 24976	20 813	859	5	Ap	6	48	7	My	6		01	1	Je	4	54	3	Jl	4	07	4	An	2	60
8961 917	782	21M	4861	4 35759	16 970	860	2	Mr	25	84	4	Ap	24		37	7	Je	22	43	1	Jl	21	97	3	An	20	60
8962 918	783	21M	7448	22 99062	15 104	861	1	Ap	13	74	3	My	13		27	4	Je	11	80	6	Jl	11	33	7	An	9	86
8963 919	784	22M	0085	12 10505	11 262	862	6	Ap	3	11	7	My	2		64	2	Je	1	17	3	Je	30	70	5	Jl	30	23
8964 920	785	22M	2621	1 21348	7 419	863	3	Mr	23	47	6	My	21		54	1	Je	20	85	2	Jl	18	60	4	An	18	13
8965 921	786	21M	5208	19 85251	5 553	864	5	Ap	22	01	6	My	9		90	5	Je	8	43	6	Jl	7	96	1	An	6	49
8966 922	787	21M	7795	8 96095	1 711	865	6	Mr	30	74	1	Ap	29		27	2	My	28	80	4	Je	27	33	7	An	25	39
8967 923	788	22M	0882	27 59996	27 399	866	5	Ap	18	64	7	My	18		17	1	Je	16	70	3	Jl	16	28	4	An	14	76
8968 924	789	22M	2969	16 70841	23 557	867	3	Ap	8	00	4	My	7		58	6	Je	6	07	7	Jl	5	80	2	An	4	13
8969 925	790	21M	5556	5 81684	19 715	868	7	Mr	27	37	1	Ap	25		90	3	My	25	43	6	Jl	23	49	1	An	22	02
8970 926	791	21M	8142	24 45586	17 848	869	6	Ap	15	27	7	My	14		80	2	Je	13	80	2	Jl	12	86	5	An	11	39
8971 927	792	22M	0729	13 66430	14 008	870	3	Ap	4	64	5	My	4		17	6	Je	2	70	1	Jl	2	23	2	Jl	31	76
8972 928	793	22M	8316	2 67283	10 164	871	1	Mr	25	00	2	Ap	23		53	5	Je	21	59	7	Jl	21	12	1	An	19	68
8973 929	794	21M	5903	21 31175	8 298	872	6	Ap	11	90	1	My	11		48	2	Je	9	96	4	Jl	9	49	6	An	8	09
8974 930	795	21M	8490	10 42019	4 455	873	4	Ap	1	27	5	Ap	30		80	7	My	30	33	1	Je	28	86	3	Jl	28	32
8975 931	796	22M	1078	29 05822	2 589	874	3	Ap	20	16	4	My	19		70	6	Je	18	23	7	Jl	17	78	2	An	16	29
8976 932	797	22M	3663	18 16765	26 301	875	7	Ap	9	53	2	My	9		06	8	Je	7	59	5	Jl	7	12	6	An	5	65
8977 933	798	21M	6250	7 27608	22 459	876	4	Mr	28	90	6	Ap	27		43	7	My	26	43	7	Je	25	49	5	An	23	55
8978 934	799	21M	8847	25 91511	20 593	877	3	Ap	16	80	5	My	16		32	6	Je	14	86	1	Jl	14	89	2	An	12	92
8979 935	800	22M	1424	15 02354	16 751	878	1	Ap	6	16	2	My	5		69	4	Je	4	22	5	Jl	3	76	7	An	2	29
8980 936	801	22M	4009	4 13198	12 908	879	5	Mr	26	53	7	Ap	25		06	1	My	24	09	4	Jl	22	65	6	An	21	18
8981 937	802	21M	6597	22 77101	11 042	880	4	Ap	13	43	5	My	12		96	7	Je	11	49	2	Jl	11	02	3	An	9	55
8982 938	803	21M	9184	11 87944	7 200	881	1	Ap	2	80	3	My	2		33	4	My	31	86	6	Je	30	89	7	Jl	29	92
8983 939	804	22M	1771	0 98787	3 358	882	6	Mr	23	16	2	My	21		22	3	Je	19	75	5	Jl	19	28	6	An	17	82
8984 940	805	22M	4353	19 62690	1 491	883	5	Ap	11	06	6	My	10		59	1	Je	9	12	2	Jl	8	65	4	An	7	18
8985 941	806	21M	8944	8 73533	25 204	884	2	Mr	30	43	3	Ap	28		98	5	My	28	49	7	Je	27	05	3	An	25	08
8986 942	807	21M	9531	27 37436	23 337	885	1	Ap	18	32	2	My	17		86	4	Je	16	39	5	Jl	15	92	7	An	14	45
8987 943	808	22M	2118	16 48280	19 465	886	5	Ap	7	69	7	My	7		22	1	Je	5	75	8	Jl	5	28	4	An	3	81
8988 944	809	22M	4705	5 59122	15 653	887	3	Mr	28	06	4	Ap	26		59	6	My	26	12	7	Je	24	65	3	An	22	71
8989 945	810	21M	7292	24 28025	13 787	888	1	Ap	14	96	3	My	14		49	5	Je	13	02	6	Jl	12	55	1	An	11	06
8990 946	811	21M	9878	13 83869	9 944	889	6	Ap	4	32	7	My	3		85	2	Je	2	38	3	Jl	1	92	5	Jl	31	45
8991 947	812	22M	2465	2 44712	6 102	890	3	Mr	24	09	5	Ap	23		22	1	Je	21	28	2	Jl	20	81	4	An	19	84
8992 948	813	22M	5052	21 08615	4 236	891	2	Ap	12	59	4	My	12		12	5	Je	10	65	7	Jl	10	18	1	An	8	71
8993 949	814	21M	7639	10 19459	0 394	892	6	Mr	31	96	1	Ap	30		49	3	My	30	02	4	Je	28	55	6	Jl	28	08
8994 950	815	22M	0226	28 83380	26 082	893	5	Ap	19	85	7	My	19		38	1	Je	17	91	3	Jl	17	44	4	An	15	98
8995 951	816	22M	2812	17 94204	22 240	894	3	Ap	9	22	4	My	8		75	6	Je	7	28	7	Jl	6	81	2	An	5	84
8996 952	817	22M	5399	7 04979	18 397	895	7	Mr	29	59	2	Ap	28		12	3	My	27	85	5	Je	26	18	1	An	24	24
8997 953	818	21M	7986	25 68950	16 531	896	6	Ap	16	48	1	My	16		02	2	Je	14	55	4	Jl	14	08	5	An	12	61
8998 954	819	22M	0573	14 79794	12 689	897	3	Ap	5	35	5	My	5		38	6	Je	3	21	1	Jl	3	44	2	An	1	97
8999 955	820	22M	8180	3 90637	8 846	898	1	Mr	26	75	2	Ap	24		75	4	My	24	28	7	Jl	22	34	1	An	20	

from A.D. 500 to A.D. 999 (Ārya siddhānta)*—cont.

Ājvina.				Kārttika.				Mārgaśīrsha.				Pauṣa.				A.D.				Māgha.				A.D.				Phālguna.				Chaitra.			
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.				
6 S	20		·87 1 O 20○	·40 2 N 18		93 4 D 18	·46	50	5 Jr	16	·99		7 F 15	·52 2 Mr 17	·05																				
4 S	10		·23 5 O 9●	·76 7 N 8		·29 1 D 7	·83	51	3 Jr	6	·86		4 F 4	·89 6 Mr 6	·42																				
1 An	30		·60 3 S 29	·18 4 O 28		·66 3 N 27	·19		7 D 26	·72		52	2 Jr 25	·25 3 F 23○	·78																				
7 S	17		·50 2 O 17	·08 3 N 16		·56 5 D 15	·09	53	6 Jr	13	·82		1 F 12○	·15 2 Mr 13	·68																				
4 S	6●		·87 6 O 6	·40 7 N 4		·93 2 D 4	·46	54	3 Jr	2	·99		5 F 1●	·52 7 Mr 3	·05																				
2 Au	27		·23 3 S 25	·76 5 O 25		·29 6 N 23	·82		1 D 23	·35		55	2 Jr 21	·89 { 4 F 20	·42																				
1 S	15		·13 2 O 14	·68 4 N 13		·19 5 D 12	·72		7 Jr 11	·25		56	7 Jr 11	·78 3 Mr 10	·81																				
5 S	3		·50 7 O 3	·08 1 N 1		·56 3 D 1○	·09		4 D 30●	·62		57	6 Jr 29	·18 7 F 27	·68																				
4 S	22		·39 5 O 21	·93 7 N 20○		·46 1 D 19	·90	58	3 Jr	18	·52		5 F 17	·05 6 Mr 18	·58																				
1 S	11		·76 3 O 11	·29 4 N 9○		·82 6 D 9	·35	59	7 Jr	7	·88		2 F 6	·41 3 Mr 7	·95																				
6 S	1		·13 7 S 30	·66 2 O 30		·19 3 N 28	·72		5 D 28	·25		60	6 Jr 26	·78 1 F 25	·31																				
5 S	19○		·03 6 O 18●	·56 1 N 17		·09 2 D 16	·62	61	4 Jr	15	·15		5 F 13	·68 7 Mr 15●○	·21																				
2 S	8○		·39 3 O 7	·92 5 N 6		·45 6 D 5	·99	62	1 Jr	4	·52		3 F 3	·05 4 Mr 4●	·58																				
6 Au	28●		·76 1 S 27	·29 2 O 26		·82 4 N 25	·35		5 D 24	·88		63	7 Jr 23○	·41 1 F 21	·94																				
5 S	16		·66 7 O 16	·19 1 N 14		·72 3 D 14	·25	64	4 Jr	12○	·78		6 F 11	·31 7 Mr 11	·84																				
3 S	5		·03 4 O 4	·56 6 N 3		·09 7 D 2	·62	65	2 Jr	1○	·15		3 Jr 30	·68 5 Mr 1	·21																				
1 S	23		·92 3 O 23	·45 4 N 21		·98 6 D 21	·51	66	1 Jr	20	·05		2 F 18	·58 4 Mr 20	·11																				
6 S	13		·29 7 O 12	·82 2 N 11○		·85 3 D 10●	·88	67	5 Jr	9	·41		6 F 7	·94 1 Mr 9	·47																				
3 S	2		·66 5 O 2	·19 6 O 31○		·72 1 N 30	·25		2 D 29	·78		68	4 Jr 28	·31 5 F 26	·84																				
2 S	29		·55 4 O 20○	·09 5 N 18		·62 7 D 18	·15	69	1 Jr	16	·68		3 F 15	·21 4 Mr 16	·74																				
6 S	9		·92 1 O 9●	·45 2 N 7		·98 4 D 7	·51	70	6 Jr	6	·04		7 F 4	·57 2 Mr 6○	·11																				
4 Au	30		·29 5 S 28	·82 7 O 28		·35 1 N 26	·88		3 D 26	·41		71	4 Jr 24	·94 6 F 23○	·47																				
3 S	18		·19 4 O 17	·72 6 N 16		·25 7 D 15	·78	72	2 Jr	14	·31		3 F 12○	·84 5 Mr 13	·37																				
7 S	6		·55 2 O 6	·08 3 N 4		·61 5 D 4	·14	73	6 Jr	2	·68		1 F 1●	·21 2 Mr 2	·74																				
4 Au	26		·92 6 S 25	·45 7 O 24		·98 2 N 23	·51		4 D 23	·04		74	5 Jr 21	·57 { 7 F 20	·10																				
3 S	14		·82 5 O 14	·35 6 N 12		·89 1 D 12○	·41	75	2 Jr	10	·94		4 F 9	·47 6 Mr 11	·00																				
1 S	4		·19 2 O 3	·72 4 N 2		·25 5 D 1○	·78		7 D 31	·31		76	1 Jr 29	·84 3 F 28	·37																				
7 S	22		·08 1 O 21	·61 3 N 20○		·14 4 D 19	·67	77	6 Jr	18	·20		7 F 16	·74 2 Mr 18	·27																				
4 S	11		·45 5 O 10	·98 7 N 9●		·51 2 D 9	·04	78	3 Jr	7	·57		5 F 6	·10 6 Mr 7	·63																				
1 An	31		·82 3 S 30○	·35 4 O 29		·88 6 N 28	·41		7 D 27	·94		79	2 Jr 26	·47 4 F 25	·00																				
7 S	19○		·71 2 O 19	·24 3 N 17		·78 5 D 17	·31	80	6 Jr	15	·84		1 F 14	·37 2 Mr 14○	·90																				
5 S	8●		·08 6 O 7	·61 1 N 6		·14 2 D 5	·87	81	4 Jr	4	·20		5 F 2○	·78 7 Mr 4	·26																				
2 Au	28		·45 3 S 28	·98 5 O 26		·51 7 N 25	·04		1 D 24	·57		82	3 Jr 23○	·10 4 F 21	·68																				
1 S	16		·35 2 O 15	·88 4 N 14		·41 5 D 13	·94	83	7 Jr	12○	·47		2 F 11	·00 3 Mr 12	·53																				
5 S	5		·71 7 O 5	·24 1 N 3		·77 3 D 3	·30	84	4 Jr	1●	·84		6 Jr 31	·37 7 F 29	·90																				
4 S	23		·61 6 O 23	·14 7 N 21○		·67 2 D 21●	·20	85	3 Jr	19	·73		5 F 13	·26 6 Mr 19	·79																				
1 S	12		·98 3 O 12	·51 5 N 11○		·04 6 D 10	·57	86	1 Jr	9	·10		2 F 7	·63 4 Mr 9	·16																				
6 S	2		·34 7 O 1	·88 2 O 31○		·41 3 N 29	·94		5 D 29	·47		87	7 Jr 28	·00 1 F 26	·53																				
5 S	21		·24 6 O 20	·77 1 N 19		·30 2 D 18	·83	88	4 Jr	17	·86		5 F 15	·90 7 Mr 16○	·43																				
2 S	9		·61 4 O 9●	·14 5 N 7		·67 7 D 7	·20	89	1 Jr	5	·73		3 F 4	·26 4 Mr 5○	·79																				
6 Au	29○		·98 1 S 28	·51 3 O 28		·04 4 N 26	·57		6 D 26	·10		90	7 Jr 24	·68 2 F 23○	·16																				
5 S	17		·87 7 O 17	·40 1 N 15		·94 3 D 15	·47	91	5 Jr	14	·00		6 F 12	·53 1 Mr 14	·06																				
3 S	7		·24 4 O 6	·77 6 N 5		·30 7 D 4	·88	92	2 Jr	3	·36		3 F 1●	·89 5 Mr 2	·42																				
7 Au	26		·61 { 2 S 25	·14 Mārgaśīrsha	5 N 23	·20			6 D 22○	·78		93	1 Jr 21	·26 { 2 F 19	·79																				
6 S	14		·51 1 O 14	·04 2 N 12		·57 4 D 12○	·10	94	5 Jr	10	·63		7 F 9	·16 1 Mr 10	·69																				
3 S	3		·87 5 O 3	·40 6 N 1		·98 1 D 1●	·46		3 D 31	·00		95	4 Jr 29	·58 6 F 28	·06																				
2 S	22		·77 4 O 22	·30 5 N 20●		·88 7 D 20	·86	96	1 Jr	18	·89		3 F 17	·42 4 Mr 17	·95																				
7 S	11		·14 1 O 10○	·67 3 N 9		·20 4 D 8	·73	97	6 Jr	7	·26		7 F 5	·79 2 Mr 7	·32																				
4 Au	31		·80 6 S 30○	·04 7 O 29		·57 2 N 28	·10		3 D 27	·63		98	5 Jr 26	·16 6 F 24	·69																				
3 S	19○		·40 4 O 18	·98 6 N 17		·46 7 D 16	·99	99	2 Jr																										

TABLE II.—Solar years and new moons

			Com- mence- ment of solar year.	First new-moon in solar year.			Anomaly of first new moon.						Vaiśākha.				Jyeshṭha.				Āṣāḍha.				Śrāvaṇa.				Bhādrapada.			
Kaliyuga.	Vikrama era.	Śaka era.	Month and day A.D.	Fraction of day.	First new-moon in solar year.	Anomaly of first new moon.	Christian era.	Week-day.	Month.	Day.	Fraction.	Week day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.					
A.D.																																
4004	960	825	22M	6084	850973	21:142	903	5	Mr	31	·12	6	Ap	29	·65	1	My	29	○	·18	2	Je	27	·71	{	4	Jl	27	·24			
4005	961	826	21M	8890	27:14876	19:275	904	4	Ap	18	·02	5	My	17	○	·55	7	Je	16	·08	1	Jl	15	·61	8	Au	14	·14				
4006	962	827	22M	1267	16:25719	15:438	905	1	Ap	7	·89	2	My	6	○	·92	4	Je	5	·45	5	Jl	4	·98	7	Au	3	·51				
4007	963	828	22M	3854	5:36563	11:591	906	5	Mr	27	·75	7	Ap	26	●	·28	1	My	25	·81	{	8	Je	24	·34	6	Au	22	·41			
4008	964	829	22M	6441	24:00466	9:725	907	4	Ap	15	·65	6	My	15	·18	7	Je	13	·71	2	Jl	13	·24	8	Au	11	·77					
4009	965	830	21M	9028	18:11808	5:883	908	2	Ap	4	·02	3	My	3	·55	5	Je	2	·08	6	Jl	1	·61	1	Jl	81	·14					
4010	966	831	22M	1614	2:22152	2:040	909	6	Mr	24	·39	{	7	Ap	22	·92	3	Je	20	·98	5	Jl	20	·51	1	Au	19	○	·04			
4011	967	832	22M	4201	20:86055	0:174	910	5	Ap	12	·28	6	My	11	·81	1	Je	10	·84	2	Jl	9	○	·87	4	Au	8	·40				
4012	968	833	22M	6788	9:96898	28:886	911	2	Ap	1	·65	4	My	1	·18	5	My	30	·71	7	Je	29	○	·24	1	Jl	28	·77				
4013	969	834	21M	9375	28:60801	22:020	912	1	Ap	19	·55	3	My	19	·08	4	Je	17	○	·61	6	Jl	17	·14	7	Au	15	·67				
4014	970	835	22M	1962	17:71044	18:178	913	5	Ap	8	·92	7	My	8	·44	1	Je	6	●	·98	3	Jl	6	·51	5	Au	5	·04				
4015	971	836	22M	4549	6:82487	14:335	914	3	Mr	29	·28	4	Ap	27	○	·81	6	My	27	·84	{	7	Je	25	·88	3	Au	23	·94			
4016	972	837	22M	7185	25:46390	12:489	915	2	Ap	17	○	·18	3	My	16	·71	5	Je	15	·24	6	Jl	14	·77	1	Au	13	·80				
4017	973	838	21M	9722	14:57234	8:627	916	6	Ap	5	○	·55	1	My	5	·08	2	Je	3	·61	4	Jl	3	·14	5	Au	1	·67				
4018	974	839	22M	2809	8:68077	4:785	917	3	Mr	25	·91	5	Ap	24	·44	{	6	My	23	·97	3	Jl	22	·04	4	Au	20	·57				
4019	975	840	22M	4896	22:31980	2:910	918	2	Ap	13	·81	4	My	13	·34	5	Je	11	·67	7	Jl	11	·40	1	Au	9	○	·93				
4020	976	841	22M	7483	11:42823	26:631	919	7	Ap	3	·18	1	My	2	·71	3	Je	1	·24	4	Je	30	·77	6	Jl	30	○	·80				
4021	977	842	22M	0069	0:53036	22:789	920	{	4	Mr	22	·54	7	My	20	·61	2	Je	19	·14	3	Jl	18	●	·67	5	Au	17	·20			
4022	978	843	22M	2656	19:17669	20:922	921	3	Ap	10	·44	4	My	9	·97	6	Je	8	○	·50	1	Jl	8	●	·03	2	Au	6	·56			
4023	979	844	22M	5243	8:28413	17:080	922	7	Mr	30	·81	2	Ap	29	·34	3	My	28	○	·87	5	Je	27	·40	{	6	Jl	26	·93			
4024	980	845	22M	7880	26:92314	15:214	923	6	Ap	18	·71	1	My	18	○	·24	2	Je	16	·77	4	Jl	16	·30	5	Au	14	·83				
4025	981	846	22M	0417	16:08158	11:872	924	4	Ap	7	·07	5	My	6	·60	7	Je	5	·14	1	Jl	4	·67	3	Au	3	·20					
4026	982	847	22M	3008	5:14002	7:529	925	1	Mr	27	○	·44	2	Ap	25	·97	{	4	My	25	·50	7	Jl	23	·56	2	Au	22	·09			
4027	983	848	22M	5590	23:77904	5:663	926	7	Ap	15	·84	1	My	14	·87	3	Je	13	·40	4	Jl	12	·93	6	Au	11	·46					
4028	984	849	22M	8177	12:86748	1:821	927	4	Ap	4	·71	6	My	4	·24	7	Je	2	·77	2	Jl	2	·30	3	Jl	31	·83					
4029	985	850	22M	0764	1:99592	25:533	928	2	Mr	24	·07	{	3	Ap	22	·60	6	Je	20	·66	1	Jl	20	○	·20	2	Au	18	●	·73		
4030	986	851	22M	3351	20:63493	23:667	929	7	Ap	11	·97	2	My	11	·50	4	Je	10	·08	5	Jl	9	○	·56	7	Au	8	·09				
4031	987	852	22M	5937	9:74337	19:822	930	5	Ap	1	·84	6	Ap	30	·87	1	My	30	·40	2	Je	28	○	·93	4	Jl	28	·46				
4032	988	853	22M	8524	28:38240	17:959	931	4	Ap	20	·24	5	My	19	·77	7	Je	18	·80	1	Jl	17	·83	3	Au	16	·86					
4033	989	854	22M	1111	17:49083	14:116	932	1	Ap	8	·60	3	My	8	○	·13	4	Je	6	·66	6	Jl	6	·19	7	Au	4	·72				
4034	990	855	22M	3698	6:59927	10:274	933	5	Mr	28	·97	7	Ap	27	○	·50	2	My	27	·03	{	3	Je	25	·56	6	Au	23	·63			
4035	991	856	22M	6285	25:23830	8:408	934	4	Ap	16	○	·87	6	My	16	·40	7	Je	14	·93	2	Jl	14	·46	3	Au	13	·99				
4036	992	857	22M	8871	14:34672	4:565	935	2	Ap	6	●	·23	3	My	5	·76	5	Je	4	·30	6	Jl	3	·83	1	Au	2	·86				
4037	993	858	22M	1458	3:45516	0:723	936	6	Mr	25	·60	{	1	Ap	24	·13	4	Je	22	·19	5	Jl	21	·72	7	Au	20	○	·25			
4038	994	859	22M	4045	22:09419	26:412	937	5	Ap	13	·50	7	My	13	·08	1	Je	11	·56	3	Jl	11	·09	4	Au	9	○	·63				
4039	995	860	22M	6632	11:20232	22:670	938	2	Ap	2	·87	4	My	2	·40	5	My	31	·93	7	Je	30	·46	1	Jl	29	·99					
4040	996	861	22M	9219	0:31105	18:727	939	{	7	Mr	28	·23	3	My	21	·29	4	Je	19	○	·82	6	Jl	19	●	·36	7	Au	17	·89		
4041	997	862	22M	1805	18:95008	16:861	940	1	Ap	21	·76	3	My	21	·29	4	Je	19	○	·82	6	Jl	19	●	·36	7	Au	17	·89			
4042	998	863	22M	4392	8:05451	13:019	941	3	Mr	30	·50	5	Ap	29	·03	6	My	28	○	·56	1	Je	27	·09	{	2	Jl	26	·62			
4043	999	864	22M	6979	26:89764	11:152	942	2	Ap	18	·40	3	My	17	●	·93	5	Je	16	·48	6	Jl	15	·99	1	Au	14	·52				
4044	1000	865	22M	9568	15:80598	7:310	943	6	Ap	7	○	·76	1	My	7	●	·29	2	Je	5	·82	4	Jl	5	·35	5	Au	3	·83			
4045	1001	866	22M	2153	4:91441	3:468	944	4	Mr	27	○	·18	5	Ap	25	·67	{	7	My	25	·19	3	Jl	23	·25	4	Au	21	·78			
4046	1002	867	22M	4739	23:55343	1:601	945	3	Ap	15	·88	4	My	14	·56	6	Je	13	·09	7	Jl	12	·62	2	Au	11	·15					
4047	1003	868	22M	7326	12:66187	25:314	946	7	Ap	4	·39	1	My	3	·92	3	Je	2	·46	4	Jl	1	·99	6	Jl	81	·52					
4048	1004	869	22M	9318	1:77030	21:472	947	4	Mr	24	·78	{	6	Ap	23	·29	2	Je	21	·85	3	Jl	20	○	·88	5	Au	19	·41			
4049	1005	870	22M	2500	20:49333	19:605	948	3	Ap	11	·63	5	My	11	·19	6	Je	9	·72	1	Jl	9	○	·25	2	Au	7	·78				
4050	1006	871	22M	5087	9:51777	15:763	949	1																								

from A.D. 500 to A.D. 999 (Ārya siddhānta)*—cont.

Āsvin.	Kārttika.	Mārgaśīrṣa.	Pausha.	A.D.	Māgha.	A.D.	Phālguna.	Chaitra.
Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.
7 S 24	80 1 O 23	84 3 N 22	87 4 D 21	90 04 6 Jr 20	43 7 F 18	96 2 Mr 19	49	
4 S 12	67 6 O 12	20 7 N 10	73 2 D 10	26 05 3 Jr 8	79 5 F 7	32 6 Mr 8	86	
2 S 2	04 3 O 1	57 5 O 31	10 6 N 29	63 1 D 29	16 06 2 Jr 27	69 4 F 26	22	
7 S 20	94 2 O 20	47 4 N 19	00 5 D 18	58 07 7 Jr 17	06 1 F 15	59 3 Mr 17	12	
5 S 10	80 6 O 9	83 1 N 8	86 2 D 7	90 08 4 Jr 6	43 5 F 4	96 7 Mr 5	49	
2 Au 29	67 4 S 28	20 5 O 27	73 7 N 26	26 1 D 25	79 09 3 Jr 24	82 4 F 22	85	
1 S 17	57 8 O 17	10 4 N 15	63 6 D 15	16 10 7 Jr 13	69 2 F 12	22 3 Mr 13	75	
5 S 6	94 7 O 6	47 2 N 5	00 3 D 4	53 11 5 Jr 3	06 6 F 1	59 1 Mr 3	12	
3 Au 27	80 6 O 25	86 7 N 23	90 2 D 23	42 12 3 Jr 21	06 8 Jr 21	5 F 20	49	
4 S 25	84 6 O 25	86 7 N 23	90 2 D 23	42 12 3 Jr 21	06 8 Jr 21	5 F 20	49	
2 S 14	20 3 O 13	73 5 N 12	26 6 D 11	79 13 1 Jr 10	32 2 F 8	86 4 Mr 10	38	
6 S 3	57 1 O 3	10 2 N 1	63 4 D 1	16 5 D 30	69 14 7 Jr 29	22 1 F 27	75	
5 S 22	46 7 O 22	00 1 N 20	53 3 D 20	06 15 4 Jr 18	62 6 F 17	12 7 Mr 18	65	
2 S 11	58 4 O 11	86 5 N 9	90 7 D 9	42 16 1 Jr 7	96 3 F 6	48 5 Mr 7	02	
7 Au 31	28 1 S 28	73 3 O 29	26 4 N 27	79 6 D 27	82 17 3 Jr 25	85 2 F 24	38	
6 S 19	10 7 O 18	63 2 N 17	16 3 D 16	69 18 5 Jr 15	22 6 F 13	75 1 Mr 15	28	
3 S 8	46 4 O 7	99 6 N 6	52 1 D 6	06 19 2 Jr 4	59 4 F 3	12 5 Mr 4	65	
7 Au 28	88 2 S 27	36 3 O 26	89 5 N 25	42 6 D 24	95 20 1 Jr 23	48 3 F 22	01	
6 S 15	73 1 O 15	26 2 N 13	79 4 D 13	82 21 5 Jr 11	85 7 F 10	38 1 Mr 11	91	
4 S 5	10 5 O 4	63 7 N 3	16 1 D 2	69 22 3 Jr 1	22 4 Jr 30	75 6 Mr 1	28	
3 S 24	00 4 O 23	58 6 N 22	05 7 D 21	58 23 2 Jr 20	12 3 F 18	65 5 Mr 20	18	
7 S 13	86 1 O 12	89 3 N 11	42 4 D 10	95 24 6 Jr 9	48 1 F 8	01 2 Mr 8	54	
4 S 1	78 6 O 1	26 7 O 30	79 2 N 29	32 3 D 28	85 25 5 Jr 27	38 6 F 25	91	
3 S 20	62 5 O 20	16 6 N 18	69 1 D 18	22 26 2 Jr 16	75 4 F 15	28 5 Mr 16	81	
7 S 9	99 2 O 9	52 4 N 8	05 5 D 7	58 27 7 Jr 6	11 1 F 4	64 3 Mr 6	18	
5 Au 30	80 6 S 28	89 1 O 28	42 2 N 26	95 4 D 26	48 28 6 Jr 25	01 7 F 23	54	
4 S 17	26 5 O 16	79 7 N 15	82 1 D 14	85 29 3 Jr 13	38 4 F 11	91 6 Mr 13	44	
1 S 6	62 3 O 6	15 4 N 4	68 6 D 4	22 30 7 Jr 2	75 2 F 1	28 3 Mr 2	81	
5 Au 26	99 2 O 25	05 3 N 23	58 5 D 23	11 31 6 Jr 21	64 1 F 20	17 2 Mr 21	70	
7 S 25	52 1 O 1	95 3 O 31	48 5 N 30	01 32 4 Jr 11	01 1 D 30	38 5 F 9	54	
4 S 14	89 6 O 14	42 7 N 12	95 2 D 12	57 32 6 N 30	85 33 2 Jr 28	91 4 F 27	44	
2 S 3	26 3 O 2	79 5 N 1	32 6 N 30	85 34 7 Jr 18	28 1 F 16	51 3 Mr 18	34	
1 S 22	15 2 O 21	69 4 N 20	21 5 D 19	74 35 4 Jr 7	64 6 F 6	17 7 Mr 7	70	
5 S 11	52 7 O 11	05 1 N 9	58 3 D 9	11 2 Au 31	89 4 S 30	52 5 O 29	48	
1 S 18	78 3 O 18	32 4 N 16	85 6 D 16	38 37 7 Jr 14	91 2 D 28	01 36 3 Jr 26	07	
6 S 8	15 7 O 7	68 2 N 6	21 3 D 5	74 38 5 Jr 4	27 6 F 2	80 1 Mr 4	84	
3 Au 28	52 5 S 27	05 6 O 26	58 1 N 25	11 2 D 24	64 39 4 Jr 23	17 5 F 21	70	
2 S 16	42 3 O 15	95 5 N 14	48 7 D 14	01 40 1 Jr 12	54 5 D 31	91 41 7 Jr 30	44	
6 S 4	78 1 O 4	31 2 N 2	84 4 D 2	88 42 4 Jr 19	80 6 F 18	33 7 Mr 19	86	
5 S 23	68 7 O 23	21 1 N 21	74 3 D 21	27 43 2 Jr 9	17 3 F 7	70 5 Mr 9	23	
3 S 13	05 4 O 12	58 6 N 11	11 7 D 10	64 44 6 D 29	54 1 Jr 28	07 2 F 28	60	
7 S 2	42 1 O 1	95 3 O 31	48 5 N 30	01 45 5 Jr 16	44 6 F 14	96 1 Mr 16	50	
6 S 20	81 7 O 19	84 2 N 18	37 3 D 17	90 46 2 Jr 5	80 4 F 4	33 5 Mr 5	86	
3 S 9	68 5 O 9	21 6 N 7	74 1 D 7	27 47 7 D 26	17 1 Jr 24	70 3 F 23	28	
1 Au 30	05 2 S 28	58 4 O 28	11 5 N 26	64 48 6 Jr 14	07 7 F 12	60 2 Mr 13	13	
6 S 17	94 1 O 17	48 3 N 16	01 4 D 15	54 49 3 Jr 2	43 4 Jr 31	96 6 Mr 2	50	
4 S 6	31 5 O 5	84 7 N 4	87 1 D 3	90 50 2 Jr 21	38 3 F 19	86 5 Mr 21	39	
1 Au 26	68 4 O 24	74 6 N 23	27 7 D 22	80 51 6 Jr 10	70 1 F 9	23 2 Mr 10	76	
3 S 25	21 4 O 24	74 6 N 23	27 7 D 22	80 51 6 Jr 10	70 4 D 31	07 52 5 Jr 29	60	
7 S 14	58 2 O 14	11 3 N 12	64 8 D 12	17 53 2 Jr 17	96 4 F 16	49 6 Mr 18	02	
4 S 3	94 6 O 3	47 1 N 2	00 2 D 1	54 54 7 Jr 7	83 1 F 5	86 3 Mr 7	89	
3 S 21	84 5 O 21	87 6 N 19	90 1 D 19	48 55 4 D 27	70 6 Jr 26	23 7 F 24	76	
1 S 11	21 2 O 10	74 4 N 9	27 5 D 8	80 56 3 Jr 15	60 5 F 14	13 6 Mr 14	66	
5 Au 31	58 7 S 30	11 1 O 29	64 3 N 28	17 57 7 Jr 3	96 2 F 2	49 4 Mr 4	02	
4 S 19	47 6 O 19	00 7 N 17	53 2 D 17	06 58 5 D 24	83 6 Jr 22	86 1 F 21	89	
1 S 7	84 3 O 7	37 4 N 5	90 6 D 5	43 59 7 Jr 3	96 5 D 24	83 58 6 Jr 22	86	
6 Au 28	21 7 S 26	74 2 O 26	27 3 N 24	80				

A.D. 999 see pages 288 to 241 below

For tithis by Brahma siddhānta add algebraically — 04 to the above.

TABLE II.—Solar years and new moons

			Com- mence- ment of solar year.	First new moon in solar year.	Anomaly of first new moon.	Christian era.	Vaiśākha.	Jyeshtha.	Āshāḍha.	Śrāvaṇa.	Bhādrapada.					
Kaliyuga.	Vikrama era.	Śaka era.	Month and day A.D.	Fraction of day.			Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.					
A.D.																
4059	1015	880	22M	·8368	0·08538	14·665	958 { 2 Mr 22	·92	5 My 20	·98	7 Je 19○	·51	2 Ji 19●	·04	3 Au 17	·57
4060	1016	881	23M	·0955	18·72508	12·600	959 { 4 Ap 21	·45	3 My 10	·35	4 Je 8●○	·88	6 Ji 8	·41	7 Au 6	·94
4061	1017	882	22M	·3542	7·83291	8·957	960 { 6 Mr 30	·19	7 Ap 28	·72	2 My 28●	·25	3 Je 26	·78 { 5 Ji 26	·31	
4062	1018	883	22M	·6128	26·47194	7·101	961 { 5 Ap 18○	·08	6 My 17●	·61	1 Je 16	·14	2 Ji 15	·68	4 Au 14	·21
4063	1019	884	22M	·8715	15·58037	3·248	962 { 2 Ap 7○	·45	3 My 6	·98	5 Je 5	·51	7 Ji 5	·04	1 Au 3	·57
4064	1020	885	23M	·1802	4·68880	26·961	963 { 6 Mr 27○	·82	1 Ap 26	·35	2 My 25	·88	5 Ji 23	·94	7 Au 22	·47
4065	1021	886	22M	·8889	23·32783	25·094	964 { 5 Ap 14	·72	7 My 14	·25	1 Je 12	·78	3 Ji 12	·81	4 Au 10	·84
4066	1022	887	22M	·6476	12·43627	21·252	965 { 8 Ap 4	·08	4 My 3	·61	6 Je 2	·14	7 Ji 1	·67	2 Ji 31○	·20
4067	1023	888	22M	·9062	1·54469	17·410	966 { 7 Mr 24	·15 { 1 Ap 22	·98	5 Je 21	·04	6 Ji 20○	·57	1 Au 19	·10	
4068	1024	889	23M	·1649	20·18373	15·544	967 { 3 My 22	·51	7 My 11	·88	2 Je 10	·41	3 Ji 9●	·04	5 Au 8	·47
4069	1025	890	22M	·4236	9·29216	11·701	968 { 6 Ap 12	·35	7 My 11	·88	2 Je 10	·41	3 Ji 9●	·04	5 Au 8	·47
4070	1026	891	22M	·6823	27·93118	9·835	969 { 3 Mr 31	·71	5 Ap 30	·24	6 My 29○	·78	1 Je 28	·31	2 Ji 27	·84
4071	1027	892	22M	·9410	17·08062	5·993	970 { 2 Ap 19	·61	4 My 19○	·14	5 Je 17	·67	7 Ji 17	·20	1 Au 15	·73
4072	1028	893	23M	·1996	6·14815	2·151	971 { 6 Ap 8	·98	1 My 8●○	·51	3 Je 7	·04	4 Ji 6	·57	6 Au 5	·10
4073	1029	894	22M	·4583	24·78707	0·284	972 { 4 Mr 29	·35	5 Ap 27	·88	7 My 27	·41 { 1 Je 25	·94	5 Au 24	·00	
4074	1030	895	22M	·7170	13·89551	23·997	973 { 8 Ap 5	·61	2 My 5	·14	3 Je 3	·67	5 Ji 3	·20	6 Au 1	·78
4075	1031	896	22M	·9757	3·00395	20·154	974 { 6 Ap 24	·51	2 Je 22	·57	4 Ji 22	·10	5 Au 20●	·63		
4076	1032	897	23M	·2344	21·64287	18·288	975 { 1 My 24	·04	5 My 13	·04	6 Je 11	·94	1 Ji 11	·47	3 Au 10●	·00
4077	1033	898	22M	·4980	10·75140	14·446	976 { 3 Ap 18	·88	5 My 13	·41	6 Je 11	·94	1 Ji 11	·47	3 Au 10●	·00
4078	1034	899	22M	·7517	29·89043	12·580	977 { 1 Ap 2	·24	2 My 1	·77	4 My 31	·30	5 Je 29○	·83	7 Ji 29	·36
4079	1035	900	23M	·0104	18·49886	8·737	978 { 7 Ap 21	·14	1 My 20	·67	3 Je 19○	·20	4 Ji 18	·78	6 Au 17	·26
4080	1036	901	23M	·2691	7·60730	4·895	979 { 4 Ap 10	·51	6 My 10	·04	7 Je 8●	·57	2 Ji 8	·10	3 Au 6	·63
4081	1037	902	22M	·5278	26·24633	3·029	980 { 1 Mr 30	·87	8 Ap 29○	·40	4 My 28	·94 { 6 Je 27	·47	2 Au 25	·53	
4082	1038	903	22M	·7864	15·35478	28·741	981 { 7 Ap 17○	·77	2 My 17●	·30	3 Je 15	·83	5 Ji 15	·36	6 Au 13	·89
4083	1039	904	23M	·0451	4·46319	22·899	982 { 5 Ap 7●○	·14	6 My 6	·67	1 Je 5	·20	2 Ji 4	·73	4 Au 3	·26
4084	1040	905	23M	·8038	23·10222	21·038	983 { 2 Mr 27●	·51	4 Ap 26	·04 { 5 My 25	·57	1 Ji 23	·63	3 Au 22	·16	
4085	1041	906	22M	·5625	12·21065	17·190	984 { 7 Ap 15	·40	2 My 14	·93	4 Je 13	·46	6 Ji 13	·00	7 Au 11○	·53
4086	1042	907	22M	·8212	1·81909	13·848	985 { 5 Ap 3	·77	7 My 3	·30	1 Je 1	·83	3 Ji 1	·36	4 Ji 30●○	·89
4087	1043	908	22M	·0799	19·95612	11·482	986 { 4 Mr 24	·14 { 4 Ap 22	·67	7 Je 20	·73	2 Ji 20○	·26	3 Au 18	·79	
4088	1044	909	23M	·3385	9·06654	7·640	987 { 6 My 22	·20	3 My 11	·58	5 Je 10○	·10	6 Ji 9	·63	1 Au 8	·16
4089	1045	910	22M	·5972	27·70557	5·773	988 { 2 Ap 12	·03	3 My 11	·58	5 Je 10○	·10	6 Ji 9	·63	1 Au 8	·16
4090	1046	911	23M	·0799	19·95612	11·482	989 { 6 Ap 1	·40	7 Ap 30	·93	2 My 30○	·46	3 Je 28	·99	5 Ji 28	·52
4091	1047	912	22M	·8559	16·81401	1·931	990 { 5 Ap 19	·30	6 My 18●○	·88	1 Je 17	·36	2 Ji 16	·89	4 Au 15	·42
4092	1048	913	23M	·1146	5·92244	25·643	991 { 2 Ap 8●	·67	4 My 8●	·20	5 Je 6	·73	7 Ji 6	·26	1 Au 4	·79
4093	1049	914	23M	·3733	24·58147	23·777	992 { 7 Mr 29○	·08	1 Ap 27	·56	3 My 27	·09 { 4 Je 25	·62	7 Au 23	·69	
4094	1050	915	22M	·6319	13·66991	19·935	993 { 4 My 25	·66 { 2 Ap 24	·20	5 Je 22	·26	6 Ji 21	·79	1 Au 20●	·32	
4095	1051	916	22M	·8906	2·77833	16·093	994 { 3 My 23	·73	20	·10	2 Je 11	·62	4 Ji 11○	·15	5 Au 9	·68
4096	1052	917	23M	·1493	21·41764	14·227	995 { 6 Ap 13	·56	1 My 13	·10	2 Je 11	·62	4 Ji 11○	·15	5 Au 9	·68
4097	1053	918	23M	·4080	10·52511	10·885	996 { 3 Ap 2	·93	5 My 2	·46	6 My 31	·99	1 Je 30○	·52	3 Ji 30	·05
4098	1054	919	22M	·6667	29·16482	8·518	997 { 3 Ap 20	·83	4 My 20	·36	5 Je 18	·89	7 Ji 18	·42	1 Au 16	·95
4099	1055	920	22M	·9253	18·27326	4·676	998 { 7 Ap 10	·19	1 My 9○	·72	3 Je 8	·26	4 Ji 7	·79	6 Au 6	·32
4100	1056	921	23M	·1840	7·38169	0·883	999 { 4 Mr 30	·56	6 Ap 29○	·09	7 My 28	·62 { 2 Je 27	·15	5 Au 25	·21	
4101	1056	921	23M	·4427	26·02072	26·522	999 { 3 Ap 18○	·46	4 My 17	·99	6 Je 16	·52	1 Ji 16	·05	2 Au 14	·58

* For Sārya siddhānta figures for A.D. 500 to
Ending moments of tithis are the same for Ārya and Sārya siddhāntas.

from A.D. 500 to A.D. 999 (Ārya siddhānta)*—cont.

Āśvina.	Kārttika.	Mārgaśīrṣa.	Pauṣa.	A.D.	Māgha.	A.D.	Phālguna.	Chaitra	
Week-day. Month. Day.	Fraction. Week-day Month. Day.	Fraction. Week-day. Month Day.	Fraction. Week-day. Month. Day.	Fraction	Week-day. Month. Day.	Fraction	Week-day. Month. Day.	Fraction. Week-day. Month Day.	Fraction.
5 S 16	10 6 O 15	64 1 N 14	17 2 D 13	70	59 4 Jr 12	23	5 F 10	78 7 Mr 12	29
2 S 5	47 4 O 5	00 5 N 3	53 7 D 3	06	60 1 Jr 1	59	3 Jr 31	12 4 F 29	66
1 S 23	37 2 O 22	90 4 N 21	43 5 D 20	96	61 7 Jr 19	49	2 F 18	02 3 Mr 19	55
5 S 12	74 7 O 12	27 1 N 10	80 3 D 10	33	62 4 Jr 8	86	6 F 7	39 7 Mr 8	92
3 S 2	10 4 O 1	63 6 O 31	16 7 N 29	70	2 D 29	23	63 3 Jr 27	76 5 F 26	29
2 S 21	00 3 O 20	53 5 N 19	06 6 D 18	59	64 1 Jr 17	12	2 F 15	65 4 Mr 16	18
6 S 9	37 7 O 8	90 2 N 7	43 3 D 6	96	65 5 Jr 5	49	7 F 4	02 1 Mr 5	55
3 Au 29	74 5 S 28	27 6 O 27	80 1 N 26	33	2 D 25	86	66 4 Jr 24	39 5 F 22	92
2 S 17	63 4 O 17	16 5 N 15	69 7 D 15	22	67 1 Jr 13	76	3 F 12	29 4 Mr 13	82
7 S 7	00 1 O 6	58 3 N 5	06 4 D 4	59	68 6 Jr 3	12	7 F 1	65 2 Mr 2	18
4 Au 26	37 7 O 24	43 1 N 22	96 3 D 22	49	69 5 Jr 21	02	6 F 19	55 1 Mr 21	08
5 S 24	90 7 O 24	43 1 N 22	96 3 D 22	49	70 2 Jr 10	39	3 F 8	92 5 Mr 10	45
3 S 14	26 4 O 13	80 6 N 12	33 7 D 11	87	6 D 30	75	71 1 Jr 29	23 2 F 27	82
7 S 3	63 2 O 3	16 3 N 1	69 5 D 1	22	72 5 Jr 18	65	7 F 17	18 1 Mr 17	71
6 S 22	53 1 O 22	06 2 N 20	56 4 D 20	12	73 3 Jr 7	02	4 F 5	55 6 Mr 7	08
3 S 10	90 5 O 10	43 6 N 8	96 1 D 8	49	7 D 27	39	74 1 Jr 25	92 3 F 24	45
1 Au 31	26 2 S 29	79 4 O 29	32 5 N 27	86	75 6 Jr 15	28	7 F 13	81 2 Mr 15	34
7 S 19	16 1 O 18	69 3 N 17	22 4 D 16	75	76 3 Jr 4	65	5 F 3	18 6 Mr 3	71
4 S 8	53 6 O 8	06 7 N 6	59 2 D 6	12	1 D 24	02	77 2 Jr 22	55 4 F 21	08
1 Au 27	90 8 S 26	43 4 O 25	96 6 N 24	49	78 6 Jr 11	91	1 F 10	45 2 Mr 11	98
7 S 15	79 2 O 15	32 3 N 13	85 5 D 13	89	79 4 Jr 1	28	5 Jr 30	81 7 Mr 1	34
5 S 5	16 6 O 4	69 1 N 3	22 2 D 2	75	80 3 Jr 20	18	4 F 18	71 6 Mr 19	24
4 S 24	06 5 O 23	59 7 N 22	12 1 D 21	65	81 7 Jr 8	65	2 F 7	08 8 Mr 8	61
1 S 12	42 2 O 11	96 4 N 10	49 6 D 10	02	4 D 28	91	82 6 Jr 27	44 7 F 25	98
5 S 1	79 7 O 1	32 1 O 30	85 3 N 29	38	83 3 Jr 16	81	5 F 15	34 6 Mr 16	87
4 S 20	69 6 O 20	22 7 N 18	75 2 D 18	28	84 1 Jr 6	18	2 F 4	71 4 Mr 5	24
2 S 10	06 8 O 9	59 5 N 8	12 6 D 7	65	5 D 25	55	85 7 Jr 24	08 1 F 22	61
6 Au 29	42 7 S 27	95 2 O 27	48 4 N 26	02	86 4 Jr 30	44	5 F 11	97 7 Mr 18	50
5 S 17	32 6 O 16	85 1 N 15	38 2 D 14	91	87 1 Jr 2	81	3 F 1	34 4 Mr 2	87
2 S 6	69 4 O 6	22 5 N 4	75 7 D 4	28	88 7 Jr 21	71	2 F 20	24 3 Mr 20	77
7 Au 27	05 8 O 25	12 4 N 23	65 6 D 23	18	89 5 Jr 10	07	6 F 8	60 1 Mr 10	14
1 S 25	58 3 O 25	12 4 N 23	65 6 D 23	18	2 D 30	44	90 3 Jr 28	97 5 F 27	50
5 S 13	96 7 O 13	48 2 N 12	01 3 D 11	54	91 1 Jr 18	34	2 F 16	87 4 Mr 18	40
3 S 3	32 4 O 2	84 6 N 1	88 7 N 30	91	92 5 Jr 7	71	7 F 6	24 1 Mr 6	77
2 S 22	22 3 O 21	75 5 N 20	28 6 D 19	81	3 D 27	07	93 4 Jr 25	60 6 F 24	13
6 S 11	58 1 O 11	11 2 N 9	64 4 D 9	18	94 1 Jr 14	97	3 F 13	50 5 Mr 15	03
3 Au 30	95 5 S 29	48 7 O 29	01 1 N 27	54	95 6 Jr 4	84	7 F 2	87 2 Mr 4	40
2 S 18	85 4 O 18	38 5 N 16	91 7 D 16	44	3 D 24	70	96 5 Jr 23	24 6 F 21	77
7 S 8	22 1 O 7	75 3 N 6	28 4 D 5	81	97 2 Jr 11	60	4 F 10	18 5 Mr 11	66
4 Au 28	58 6 S 27	11 7 O 26	64 2 N 25	17	6 D 31	97	98 1 Jr 30	50 3 Mr 1	08
3 S 15	48 5 O 15	01 6 N 13	54 1 D 13	07	99 5 Jr 10	87	7 F 18	40 1 Mr 19	93
7 S 4	85 2 O 4	38 3 N 2	91 5 D 2	44	00 3 Jr 9	23	00 4 F 7	76 6 Mr 8	80
6 S 23	74 1 O 23	28 2 N 21	81 4 D 21	34					
4 S 13	11 5 O 12	64 7 N 11	17 1 D 10	70					

A.D. 999 see pages 238 to 241 below.

For tithis by Brahma siddhānta add algebraically — '05 to the above.

TABLE II.—Sūrya siddhānta figures

A.D.	Kaliyuga.	Week-day of 1st January.	Commence- ment of Indian solar year.	Fraction of day	First new moon in solar year.	Anomaly of first new moon.	A.D.	Kaliyuga.	Week-day of 1st January.	Commence- ment of Indian solar year.	Fraction of day	First new moon in solar year	Anomaly of first new moon.	A.D.	Kaliyuga.	Week-day of 1st January.	Commence- ment of Indian solar year.	Fraction of day
500	3601	7	18M	3618	27·3063	9·979	560	3661	5	18M	8867	23·4772	15·769	620	3721	4	19M	4121
501	3602	1	18M	6200	16·4146	6·187	561	3662	7	19M	1454	12·5854	11·926	621	3722	5	19M	6708
502	3603	2	18M	8788	5·5229	2·294	562	3663	1	19M	4042	1·6937	8·038	622	3723	6	19M	9296
503	3604	4	19M	1375	25·1618	0·427	563	3664	2	19M	6629	20·3326	6·216	623	3724	1	20M	1884
504	3605	5	18M	8963	13·2701	24·139	564	3665	3	18M	9217	9·4409	2·374	624	3725	2	19M	4471
505	3606	6	18M	6550	2·3784	20·206	565	3666	5	19M	1805	28·0798	0·597	625	3726	3	19M	7059
506	3607	7	18M	9138	21·0173	18·429	566	3667	6	19M	4392	17·1881	24·219	626	3727	4	19M	9646
507	3608	2	19M	1726	10·1256	14·587	567	3668	7	19M	6980	6·2964	20·376	627	3728	5	20M	2234
508	3609	3	18M	4313	28·7644	12·720	568	3669	1	18M	9577	24·9353	18·509	628	3729	7	19M	4821
509	3610	4	18M	6901	17·8727	8·677	569	3670	3	19M	2155	14·0436	14·666	629	3730	1	19M	7409
510	3611	5	18M	9488	6·9810	5·034	570	3671	4	19M	4742	3·1519	10·824	630	3731	2	19M	9996
511	3612	7	19M	2076	25·6199	3·168	571	3672	5	19M	7330	21·7908	8·957	631	3732	4	20M	2584
512	3613	1	18M	4663	14·7282	26·880	572	3673	6	18M	9918	10·8991	5·114	632	3733	5	19M	5172
513	3614	2	18M	7251	3·8365	28·087	573	3674	1	19M	2505	0·0074	1·271	633	3734	6	19M	7759
514	3615	3	18M	9869	22·4754	21·170	574	3675	2	19M	5093	18·6468	26·959	634	3735	1	20M	9347
515	3616	5	19M	2426	11·5837	17·327	575	3676	3	19M	7680	7·7546	23·117	635	3736	2	20M	2934
516	3617	6	18M	5014	0·8920	13·485	576	3677	5	19M	0268	26·3935	21·250	636	3737	3	19M	5522
517	3618	7	18M	7601	19·8309	11·618	577	3678	6	19M	2855	15·5018	17·407	637	3738	4	19M	8109
518	3619	2	19M	0189	8·4392	7·775	578	3679	7	19M	5443	4·6101	13·564	638	3739	6	20M	0697
519	3620	3	19M	2776	27·0781	5·908	579	3680	1	19M	8031	23·2489	11·698	639	3740	7	20M	3285
520	3621	4	18M	5364	16·1864	2·066	580	3681	3	19M	0618	12·3572	7·855	640	3741	1	19M	5872
521	3622	5	18M	7952	5·2947	25·777	581	3682	4	19M	3206	1·4655	4·013	641	3742	2	19M	8460
522	3623	7	19M	0569	23·9336	23·911	582	3683	5	19M	5793	20·1044	2·145	642	3743	4	20M	1047
523	3624	1	19M	3127	18·0419	20·068	583	3684	6	19M	8381	9·2127	25·857	643	3744	5	20M	3635
524	3625	2	18M	5714	2·1502	16·225	584	3685	1	19M	0958	27·8516	28·990	644	3745	6	19M	6222
525	3626	3	18M	8302	20·7891	14·358	585	3686	2	19M	3556	16·9599	20·148	645	3746	7	19M	8810
526	3627	5	19M	0889	9·8974	10·516	586	3687	3	19M	6143	6·0682	16·305	646	3747	2	20M	1298
527	3628	6	18M	3477	28·5362	8·649	587	3688	4	19M	8731	24·7071	14·438	647	3748	3	20M	3885
528	3629	7	18M	6065	17·6445	4·806	588	3689	5	19M	1319	13·8154	10·595	648	3749	4	19M	6473
529	3630	1	18M	8652	6·7528	0·963	589	3690	7	19M	3906	2·9237	6·753	649	3750	5	19M	9063
530	3631	3	19M	1240	25·3917	26·651	590	3691	1	19M	6494	21·5626	4·886	650	3751	7	20M	1748
531	3632	4	19M	3827	14·5000	22·809	591	3692	2	19M	9081	10·6709	1·043	651	3752	1	20M	4335
532	3633	5	18M	6415	3·6083	18·966	592	3693	4	19M	1669	29·3098	26·731	652	3753	2	19M	6923
533	3634	6	18M	9002	22·2472	17·099	593	3694	5	19M	4256	18·4181	22·888	653	3754	3	19M	9511
534	3635	1	19M	1590	11·3555	13·256	594	3695	6	19M	6844	7·5264	19·045	654	3755	5	20M	2098
535	3636	2	19M	4177	0·4638	9·414	595	3696	7	19M	9432	26·1653	17·179	655	3756	6	20M	4686
536	3637	3	18M	6765	19·1027	7·547	596	3697	2	19M	2019	15·2736	13·336	656	3757	7	19M	7273
537	3638	4	18M	9353	8·2110	3·704	597	3698	3	19M	4607	4·3819	9·493	657	3758	1	19M	9860
538	3639	5	19M	1940	26·8499	1·837	598	3699	4	19M	7194	23·0207	7·627	658	3759	3	20M	2448
539	3640	7	19M	4518	15·9582	25·549	599	3700	5	19M	9782	12·1290	3·784	659	3760	4	20M	5036
540	3641	1	18M	7115	5·0665	21·706	600	3701	7	19M	2369	1·2373	27·496	660	3761	5	19M	7623
541	3642	2	18M	9703	23·7054	19·840	601	3702	1	19M	4957	19·5762	25·629	661	3762	7	20M	9211
542	3643	4	19M	2290	12·8187	16·997	602	3703	2	19M	7545	8·9845	21·786	662	3763	1	20M	2799
543	3644	5	19M	4868	1·9220	12·154	603	3704	4	20M	0132	27·6281	19·919	663	3764	2	20M	5386
544	3645	6	18M	7466	20·5603	10·277	604	3705	5	19M	2720	16·7317	16·077	664	3765	3	18M	7974
545	3646	1	19M	0053	9·6691	6·445	605	3706	6	19M	5307	5·8400	12·234	665	3766	5	20M	9561
546	3647	2	19M	2641	28·3080	4·678	606	3707	7	19M	7895	24·4789	10·367	666	3767	6	20M	2149
547	3648	3	19M	5228	17·4163	0·735	607	3708	2	20M	0482	13·5872	6·524	667	3768	7	20M	4737
548	3649	4	18M	7816	6·5246	24·447	608	3709	3	19M	3070	2·6955	2·681	668	3769	1	19M	7324
549	3650	6	19M	0403	25·1635	22·580	609	3710	4	19M	5658	21·3844	0·815	669	3770	3	20M	9912
550	3651	7	19M	2991	14·2718	18·737	610	3711	5	19M	8245	10·4427	24·527	670	3771	4	20M	2500
551	3652	1	19M	5579	3·3801	14·894	611	3712	7	20M	0833	29·0816	22·660	671	3772	5	20M	5087
552	3653	2	18M	8166	22·0190	13·028	612	3713	1	19M	3420	18·1899	18·817	672	3773	6	19M	7674
553	3654	4	19M	0754	11·1273	9·185	613	3714	2	18M	6008	7·2982	14·974	673	3774	1	20M	1262
554	3655	5	19M	3341	0·2356	5·343	614	3715	3	19M	8595	25·9370	13·107	674	3775	2	20M	3850
555	3656	6	19M	5929	18·8745	3·476	615	3716	5	20M	1183	15·0453	9·265	675	3776	3	20M	6437
556	3657	7	18M	8516	7·9828	27·188	616	3717	6	19M	3771	4·1586	5·423	676	3777	4	19M	9025
557	3658	2	19M	1104	26·6217	25·321	617	3718	7	19M	6358	22·7925	3·555	677	3778	6	20M	1612
558	3659	3	19M	3692	15·7306	21·478	618	3719	1	19M	8946	11·9008	27·267	678	3779	7	20M	4200
559	3660	4	19M	6279	4·8383	17·635	619	3720	2	20M	1533	1·0081	23·425	679	3780	1	20M	6787

for A.D. 500 to A.D. 999.

First new moon in solar year.	Anomaly of first new moon.	A.D.	Kaliyuga.	Week-day of 1st January.	Commence-ment of Indian solar year.	Fraction of day.	First new moon in solar year.	Anomaly of first new moon.	A.D.	Kaliyuga.	Week-day of 1st January.	Commence-ment of Indian solar year.	Fraction of day.	First new moon in solar year.	Anomaly of first new moon.
19-6480	21-558	680	3781	2	19M	9375	15-8189	27-347	740	3841	1	20M	4629	11-9897	5-582
8-7568	17-715	681	3782	4	20M	1962	4-9272	23-504	741	3842	2	20M	7217	1-0980	1-789
27-3952	15-848	682	3783	5	20M	4550	23-5681	21-638	742	3843	3	20M	9804	19-7369	27-427
16-5035	12-006	683	3784	6	20M	7188	12-6744	17-795	743	3844	5	21M	2392	8-8452	23-584
5-6118	8-168	684	3785	7	19M	9725	1-7827	18-952	744	3845	6	20M	4979	27-4841	21-717
24-2507	6-296	685	3786	2	20M	2318	20-4216	12-085	745	3846	7	20M	7567	18-5924	17-875
13-3590	2-458	686	3787	8	20M	4900	9-5299	8-242	746	3847	1	21M	0154	5-7007	14-032
2-4673	26-165	687	3788	4	20M	7488	28-1687	6-376	747	3848	3	21M	2742	24-3396	12-165
21-1062	24-298	688	3789	5	20M	0075	17-2770	2-533	748	3849	4	20M	5330	13-4479	8-322
10-2145	20-456	689	3790	7	20M	2663	6-8853	26-245	749	3850	5	20M	7917	2-5562	4-480
28-8534	18-589	690	3791	1	20M	5251	25-0242	24-378	750	3851	7	21M	0505	21-1951	2-618
17-9617	14-746	691	3792	2	20M	7838	14-1325	20-535	751	3852	1	21M	3092	10-3034	26-325
7-0700	10-908	692	3793	4	20M	0426	3-2408	18-698	752	3853	2	20M	5680	28-9423	24-458
25-7088	9-037	693	3794	5	20M	3013	21-8797	14-826	753	3854	3	20M	8267	18-0508	20-615
14-8171	5-194	694	3795	6	20M	5601	10-9808	10-988	754	3855	5	21M	0855	7-1589	16-772
8-9254	1-351	695	3796	7	20M	8188	0-0968	7-140	755	3856	6	21M	3443	25-7978	14-906
22-5648	27-089	696	3797	2	20M	0776	18-7852	5-274	756	3857	7	20M	6030	14-9061	11-063
11-6726	28-196	697	3798	3	20M	3364	7-8435	1-431	757	3858	1	20M	8618	4-0144	7-220
0-7809	19-854	698	3799	4	20M	5951	26-4824	27-119	758	3859	3	21M	1205	22-6582	5-853
19-4198	17-487	699	3800	5	20M	8539	15-5907	23-276	759	3860	4	21M	3798	11-7615	1-511
8-5281	13-644	700	3801	7	20M	1126	4-6990	19-433	760	3861	5	20M	6386	0-8698	25-223
27-1670	11-777	701	3802	1	20M	8714	23-3379	17-567	761	3862	6	20M	8968	19-5087	23-356
16-2753	7-935	702	3803	2	20M	6301	12-4462	18-724	762	3863	1	21M	1556	8-6170	18-518
5-8836	4-093	703	3804	3	20M	8889	1-5545	9-881	763	3864	2	21M	4143	27-2559	17-646
24-0225	2-225	704	3805	5	20M	1477	20-1933	8-014	764	3865	3	20M	6731	16-3642	13-804
13-1308	25-987	705	3806	6	20M	4064	9-3016	4-172	765	3866	4	20M	9318	5-4725	9-961
2-2301	22-094	706	3807	7	20M	6652	27-9405	2-305	766	3867	6	21M	1906	24-1114	8-094
20-8780	20-227	707	3808	1	20M	9209	17-0488	28-017	767	3868	7	21M	4493	18-2197	4-251
9-9868	16-384	708	3809	3	20M	1827	6-1571	22-174	768	3869	1	20M	7081	2-3280	0-409
28-6251	14-518	709	3810	4	20M	4414	24-7980	20-307	769	3870	2	20M	9668	20-9669	26-096
17-7334	10-675	710	3811	5	20M	7002	13-9043	16-464	770	3871	4	21M	2256	10-0752	22-254
6-8417	6-833	711	3812	6	20M	9590	8-0128	12-622	771	3872	5	21M	4844	28-7141	20-387
25-4806	4-965	712	3813	1	20M	2177	21-6515	10-755	772	3873	6	20M	7431	17-3234	16-544
14-6889	1-123	713	3814	2	20M	4765	10-7598	6-912	773	3874	7	21M	0019	6-9807	12-761
3-6972	24-885	714	3815	3	20M	7352	29-8987	5-045	774	3875	2	21M	2606	25-6696	10-835
22-3361	22-938	715	3816	4	20M	9940	18-5070	1-208	775	3876	3	21M	5194	14-6779	6-992
11-4444	19-125	716	3817	6	20M	2527	7-6153	24-914	776	3877	4	20M	7781	8-7862	8-149
0-5527	15-283	717	3818	7	20M	5115	26-2542	23-048	777	3878	6	21M	0369	22-4250	1-282
19-1916	18-416	718	3819	1	20M	7708	15-3625	19-205	778	3879	7	21M	2957	11-5333	24-994
8-2999	9-573	719	3820	3	21M	0290	4-4768	15-362	779	3880	1	21M	5544	0-6416	21-152
26-9388	7-706	720	3821	4	20M	2878	23-1097	18-495	780	3881	2	20M	8132	19-2805	19-284
16-0471	3-864	721	3822	5	20M	5465	12-2180	9-653	781	3882	4	21M	0719	8-3888	15-442
5-1654	0-021	722	3823	6	20M	8053	1-3263	5-810	782	3883	5	21M	3307	27-0277	18-575
23-7943	25-709	723	3824	1	21M	0640	19-9651	3-943	783	3884	6	21M	5894	16-1360	9-783
12-9036	21-866	724	3825	2	20M	3228	9-0784	0-100	784	3885	7	20M	8482	5-2443	5-890
2-0109	18-023	725	3826	3	20M	5815	27-7123	25-788	785	3886	2	21M	1070	23-8832	4-028
20-6498	16-156	726	3827	4	20M	8403	16-8206	21-046	786	3887	3	21M	3657	12-9915	0-180
9-7581	12-314	727	3828	6	21M	0991	5-9289	18-103	787	3888	4	21M	6245	2-0998	23-892
28-3969	10-447	728	3829	7	20M	3578	24-5678	16-236	788	3889	5	20M	8832	20-7887	22-025
17-5052	6-604	729	3830	1	20M	6166	13-6761	12-398	789	3890	7	21M	1420	9-8470	18-183
6-6185	2-761	730	3831	2	20M	8753	2-7844	8-551	790	3891	1	21M	4007	28-4859	16-316
25-2524	0-895	731	3832	4	21M	1341	21-4233	6-674	791	3892	2	21M	6595	17-5942	12-473
14-3607	24-606	732	3833	5	20M	3928	10-5316	2-841	792	3893	3	20M	9183	6-7025	8-630
3-4690	20-764	733	3834	6	20M	6516	29-1705	0-974	793	3894	5	21M	1770	25-3418	6-764
22-1079	18-897	734	3835	7	20M	9104	18-2788	24-686	794	3895	6	21M	4358	14-4496	2-921
11-2162	15-054	735	3836	2	21M	1691	7-3871	20-848	795	3896	7	21M	6945	3-5579	26-683
0-3245	11-212	736	3837	3	20M	4279	26-0260	18-976	796	3897	1	20M	9533	22-1968	24-766
18-9684	9-845	737	3838	4	20M	6866	15-1343	15-134	797	3898	3	21M	2120	11-3051	20-923
8-0717	5-502	738	3839	5	20M	9454	4-2426	11-291	798	3899	4	21M	4708	0-4134	17-080
26-7106	3-635	739	3840	7	21M	2041	22-8815	9-424	799	3900	5	21M	7296	19-0523	16-214

TABLE II.—Sūrya siddhānta figures

A.D.							A.D.							A.D.							
Kaliyuga.		Week-day of 1st January.		Commence- ment of Indian solar year.		First new moon in solar year.	Anomaly of first new moon.	Kaliyuga.		Week-day of 1st January.		Commence- ment of Indian solar year.		First new moon in solar year.	Anomaly of first new moon.	Kaliyuga.		Week-day of 1st January.		Commence- ment of Indian solar year.	
Day.	Fraction of day.	Day.	Fraction of day.	Day.	Fraction of day.			Day.	Fraction of day.	Day.	Fraction of day.	Day.	Fraction of day.								
800	3901	6	20M	9883	8-1808	11-371	840	3941	1	21M	3386	15-4514	25-074	880	3981	2	21M	6889			
801	3902	1	21M	2471	26-7995	9-504	841	3942	2	21M	5973	4-5597	21-231	881	3982	3	21M	9476			
802	3903	2	21M	5058	15-9078	5-661	842	3943	3	21M	8561	23-1986	19-334	882	3983	5	22M	2064			
803	3904	3	21M	7646	5-0161	1-819	843	3944	5	22M	1149	12-3069	15-522	883	3984	6	22M	4651			
804	3905	5	21M	0233	28-6550	27-507	844	3945	6	21M	3736	1-4152	11-679	884	3985	7	21M	7239			
805	3906	6	21M	2821	12-7633	23-664	845	3946	7	21M	6324	20-0541	9-812	885	3986	1	21M	9826			
806	3907	7	21M	5409	1-8716	19-821	846	3947	1	21M	8911	9-1624	5-969	886	3987	3	22M	2414			
807	3908	1	21M	7996	20-5105	17-954	847	3948	3	22M	1499	27-8012	4-103	887	3988	4	22M	5002			
808	3909	3	21M	0584	9-0188	14-112	848	3949	4	21M	4086	16-9095	0-280	888	3989	5	21M	7589			
809	3910	4	21M	3171	28-2577	12-245	849	3950	5	21M	6674	6-0178	23-972	889	3990	6	22M	0177			
810	3911	5	21M	5759	17-3660	8-402	850	3951	6	21M	9262	24-6567	22-105	890	3991	1	22M	2764			
811	3912	6	21M	8346	6-4743	4-559	851	3952	1	22M	1849	13-7650	18-262	891	3992	3	22M	5352			
812	3913	1	21M	0934	25-1181	2-693	852	3953	2	21M	4437	2-8733	14-419	892	3993	3	21M	7939			
813	3914	2	21M	3522	14-2214	26-404	853	3954	3	21M	7024	21-5122	12-552	893	3994	5	22M	0527			
814	3915	3	21M	6109	3-3297	22-562	854	3955	4	21M	9612	10-6205	8-170	894	3995	6	22M	3115			
815	3916	4	21M	8697	21-9886	20-695	855	3956	6	22M	2199	29-2594	6-843	895	3996	7	22M	5702			
816	3917	6	21M	1284	11-0769	16-852	856	3957	7	21M	4787	18-3877	3-000	896	3997	1	21M	8290			
817	3918	7	21M	3872	0-1852	13-009	857	3958	1	21M	7375	7-4760	26-712	897	3998	3	22M	0877			
818	3919	1	21M	6459	18-8241	11-143	858	3959	2	21M	9963	26-1149	24-845	898	3999	4	22M	3465			
819	3920	2	21M	9047	7-9824	7-300	859	3960	4	22M	2550	15-2232	21-003	899	4000	5	22M	6052			
820	3921	4	21M	1634	26-5713	5-483	860	3961	5	21M	5137	4-3315	17-180	900	4001	6	21M	8640			
821	3922	5	21M	4222	15-6796	1-590	861	3962	6	21M	7725	22-9704	15-293	901	4002	1	22M	1228			
822	3923	6	21M	6810	4-7879	25-302	862	3963	1	22M	0812	12-0787	11-450	902	4003	2	22M	3815			
823	3924	7	21M	9397	23-4268	23-485	863	3964	2	22M	2900	1-1870	7-608	903	4004	3	22M	6403			
824	3925	2	21M	1985	12-5551	19-598	864	3965	3	21M	5487	19-8259	5-741	904	4005	4	21M	8990			
825	3926	3	21M	4572	1-6484	15-750	865	3966	4	21M	8075	6-8342	1-898	905	4006	6	22M	1578			
826	3927	4	21M	7160	20-2823	13-883	866	3967	6	22M	0663	27-5730	0-031	906	4007	7	22M	4165			
827	3928	5	21M	9747	9-3906	10-040	867	3968	7	22M	3250	16-6813	23-744	907	4008	1	22M	6753			
828	3929	7	21M	2335	28-0295	8-174	868	3969	1	21M	5838	5-7896	19-901	908	4009	2	21M	9341			
829	3930	1	21M	4923	17-1378	4-831	869	3970	2	21M	8425	24-4285	18-084	909	4010	4	22M	1928			
830	3931	2	21M	7510	6-2461	0-488	870	3971	4	22M	1013	3-5868	14-191	910	4011	5	22M	4516			
831	3932	3	22M	0098	24-8849	26-176	871	3972	5	22M	3600	2-6451	10-348	911	4012	6	22M	7103			
832	3933	5	21M	2685	13-9932	22-333	872	3973	6	21M	6188	21-2840	8-481	912	4013	7	21M	9691			
833	3934	6	21M	5273	8-1015	18-491	873	3974	7	21M	8776	10-8923	4-639	913	4014	2	22M	2278			
834	3935	7	21M	7860	21-7404	16-624	874	3975	2	22M	1363	29-0312	2-772	914	4015	3	22M	4866			
835	3936	2	22M	0448	10-8487	12-781	875	3976	3	22M	3951	18-1895	26-484	915	4016	4	22M	7453			
836	3937	3	21M	3036	29-4876	10-914	876	3977	4	21M	6538	7-2478	22-641	916	4017	5	21M	0041			
837	3938	4	21M	5623	18-5959	7-072	877	3978	5	21M	9126	25-8867	20-774	917	4018	7	22M	2629			
838	3939	5	21M	8211	7-7042	3-229	878	3979	7	22M	1718	14-9950	16-932	918	4019	1	22M	5216			
839	3940	7	22M	0798	26-3431	1-362	879	3980	1	22M	4301	4-1038	13-089	919	4020	2	22M	7804			

for A.D. 500 to A.D. 999—cont.

First new moon in solar year.	Anomaly of first new moon.	A.D.	Kaliyuga.	Week-day of 1st January.	Day.	Fraction of day.	Commence-ment of Indian solar year.	First new moon in solar year.	Anomaly of first new moon.	A.D.	Kaliyuga.	Week-day of 1st January.	Day.	Fraction of day.	Commence-ment of Indian solar year.	First new moon in solar year.	Anomaly of first new moon.
22-7422	11-222	920	4021	4	22M	0391	0-5024	22-949	960	4061	5	22M	0894	7-7981	9-098		
11-8505	7-379	921	4022	5	22M	0297	19-1412	21-083	961	4062	6	22M	06482	26-4320	7-281		
0-9588	3-537	922	4023	6	22M	5586	8-2495	17-240	962	4063	7	22M	09069	15-5403	3-388		
19-5977	1-870	923	4024	7	22M	8154	26-8894	15-373	963	4064	2	23M	0657	4-6186	27-100		
8-7080	27-382	924	4025	2	22M	0742	15-9967	11-530	964	4065	3	23M	0244	23-2875	25-238		
27-3448	23-515	925	4026	3	22M	3329	5-1050	7-688	965	4066	4	22M	06832	12-3958	21-391		
16-4531	19-672	926	4027	4	22M	5917	23-7439	5-828	966	4067	5	22M	09419	1-5041	17-548		
5-5614	15-829	927	4028	5	22M	8504	12-8522	1-978	967	4068	7	23M	02007	20-1430	15-681		
24-2003	13-963	928	4029	7	22M	1092	1-9605	25-690	968	4069	1	22M	04595	9-2513	11-838		
13-8086	10-120	929	4030	1	22M	8679	20-6994	23-823	969	4070	2	23M	07182	27-8902	9-972		
2-4160	6-277	930	4031	2	22M	6267	9-7077	19-980	970	4071	3	22M	9770	16-9985	6-129		
21-0558	4-410	931	4032	3	22M	8855	23-3466	18-114	971	4072	5	23M	02857	6-1068	2-286		
10-1641	0-568	932	4033	5	22M	1442	17-4549	14-271	972	4073	6	22M	04945	24-7457	0-419		
28-8030	26-256	933	4034	6	22M	4020	6-5032	10-428	973	4074	7	22M	07532	13-8540	24-131		
17-9113	22-413	934	4035	7	22M	6617	25-2021	8-561	974	4075	1	23M	00120	2-9623	20-288		
7-0196	18-570	935	4036	1	22M	9205	14-3104	4-719	975	4076	3	23M	02708	21-6011	18-422		
25-6585	16-708	936	4037	3	22M	1792	8-4187	0-876	976	4077	4	22M	06295	10-7044	14-579		
14-7608	12-861	937	4038	4	22M	4380	22-0575	26-564	977	4078	5	22M	07883	29-3483	12-712		
3-8751	9-018	938	4039	5	22M	6968	11-1658	22-721	978	4079	7	23M	00470	18-4566	8-869		
22-5140	7-151	939	4040	6	22M	9555	0-2741	18-878	979	4080	1	23M	03058	7-5649	5-030		
11-6220	3-309	940	4041	1	22M	2148	18-9130	17-011	980	4081	2	22M	05645	26-2038	3-160		
0-7306	27-021	941	4042	2	22M	4730	8-0213	13-169	981	4082	3	22M	08233	15-3121	26-872		
19-8694	25-154	942	4043	3	22M	7318	26-6602	13-299	982	4083	5	23M	00821	4-4204	23-029		
8-4777	21-311	943	4044	4	22M	9904	15-7685	7-459	983	4084	6	23M	03408	23-0593	21-162		
27-1166	19-444	944	4045	5	22M	2493	4-8768	3-617	984	4085	7	22M	05996	12-1676	17-319		
16-2249	15-602	945	4046	7	22M	5081	23-5157	1-750	985	4086	1	22M	08583	1-2759	13-477		
5-8382	11-752	946	4047	1	22M	7668	12-6240	25-463	986	4087	3	23M	01171	16-9148	11-610		
23-9721	9-892	947	4048	2	22M	0256	1-7323	21-612	987	4088	4	23M	03578	9-0231	7-787		
13-0804	6-049	948	4049	4	22M	2843	20-8712	19-752	988	4089	5	22M	06346	27-6620	5-900		
2-1387	2-207	949	4050	5	22M	5431	9-4795	15-909	989	4090	6	22M	08994	16-7708	2-058		
30-8276	0-840	950	4051	6	22M	8018	28-1184	14-043	990	4091	1	23M	01521	5-8786	35-789		
9-9359	24-052	951	4052	1	23M	0606	17-2267	10-200	991	4092	2	23M	04109	24-5174	23-908		
28-5748	22-185	952	4053	2	22M	3194	6-3350	6-357	992	4093	3	22M	06696	13-6257	20-080		
17-6831	18-342	953	4054	3	22M	5781	24-9739	4-490	993	4094	4	22M	09284	27-340	16-217		
6-7914	14-499	954	4055	4	22M	8369	14-0822	0-648	994	4095	6	23M	01871	21-3729	14-350		
25-4303	12-833	955	4056	6	23M	0956	3-1905	24-359	995	4096	7	23M	04459	10-4812	10-508		
14-5386	8-790	956	4057	7	22M	3544	21-3293	22-498	996	4097	1	22M	07047	29-1201	8-641		
3-6469	4-947	957	4058	1	22M	6131	10-9376	18-650	997	4098	2	22M	09734	18-2284	4-798		
22-2858	3-080	958	4059	2	22M	8719	0-0459	14-807	998	4099	4	23M	02222	7-8367	0-955		
11-8941	26-792	959	4060	4	23M	1306	18-6848	12-940	999	4100	5	23M	04809	35-9756	26-643		

Kaliyuga.	Vikrama era.	Śaka era.	Month and day A.D.	Com- mence- ment of solar year.	First new moon in solar year	Anomaly of first new moon.	A.D.	Vaiśākha.		Jyeshtha.		Āshāḍha.		Śrāvaṇa.		Bhādrapada.	
								Week-day.	Month.	Week-day.	Month.	Week-day.	Month.	Week-day.	Month.	Week-day.	Month.
4101	1057	922	22M	7396	15-0839	22-801	1000	7 Ap	6	82	2 My	6	35	3 Je	4	41	6 Au
4102	1058	923	22M	9983	4-1922	18-959	1001	5 Mr	27	19	6 Ap	25	72	1 My 25	25	31	5 Au
4103	1059	924	23M	2571	22-8811	17-091	1002	4 Ap	15	09	5 My	14	82	7 Je	18	68	3 Au
4104	1060	925	23M	5158	11-9394	13-249	1003	1 Ap	4	45	2 My	8	99	4 Je	2	05	7 Jl
4105	1061	926	22M	7748	1-0477	9-406	1004	5 Mr	28	82	1 My	21	88	3 Je	20	94	6 Au
4106	1062	927	23M	0384	19-6806	7-539	1005	7 Ap	22	35	6 My	11	25	7 Je	9	31	8 Au
4107	1063	928	23M	2921	8-7949	8-696	1006	4 Ap	11	72	8 My	11	62	5 My	30	68	1 Jl
4108	1064	929	23M	5509	27-4338	1-830	1007	2 Ap	1	09	8 Ap	30	62	5 My	30	68	2 Au
4109	1065	930	22M	8096	16-5421	25-542	1008	7 Ap	19	98	2 My	19	51	4 Je	18	58	7 Au
4110	1066	931	23M	0684	5-6504	21-699	1009	5 Ap	8	35	6 My	7	88	1 Je	6	94	4 Au
4111	1067	932	23M	8271	24-2892	19-832	1010	2 Mr	28	72	4 Ap	27	25	5 My	26	84	3 Au
4112	1068	933	23M	5859	13-8975	15-939	1011	1 Ap	16	62	3 My	16	15	4 Je	14	21	7 Au
4113	1069	934	22M	3446	2-5058	12-147	1012	5 Ap	5	98	7 My	5	51	2 Je	4	57	5 Au
4114	1070	935	23M	1034	21-1447	10-280	1013	4 Ap	23	88	4 Ap	23	41	7 Je	21	47	4 Au
4115	1071	936	23M	3822	10-2530	6-437	1014	6 Mr	25	35	6 My	23	78	5 Je	11	84	1 Au
4116	1072	937	23M	6209	28-8919	4-570	1015	2 Ap	13	25	8 My	12	78	5 Je	11	84	1 Au
4117	1073	938	22M	8797	18-0002	0-727	1016	6 Ap	2	61	1 My	2	15	2 My	31	68	4 Je
4118	1074	939	23M	1884	7-1085	24-439	1017	5 Ap	21	51	7 My	21	04	1 Je	19	57	3 Jl
4119	1075	940	23M	3972	25-7474	22-573	1018	2 Ap	9	88	4 My	9	41	5 Je	7	94	7 Jl
4120	1076	941	23M	6559	14-8557	18-730	1019	7 Mr	30	25	1 Ap	28	78	3 My	28	31	4 Je
4121	1077	942	22M	9147	8-9640	14-887	1020	6 Ap	18	14	7 My	17	67	2 Je	16	51	3 Jl
4122	1078	943	23M	1735	22-6029	13-020	1021	3 Ap	7	51	5 My	7	04	6 Je	5	27	1 Jl
4123	1079	944	23M	4322	11-7112	9-178	1022	6 Ap	14	14	5 My	3	31	3 My	24	94	7 Jl
4124	1080	945	23M	6910	0-8195	5-834	1023	4 Ap	4	14	5 My	3	67	7 Je	2	84	1 Jl
4125	1081	946	22M	9497	19-4584	8-468	1024	1 Mr	24	51	4 My	22	57	6 Je	21	10	7 Jl
4126	1082	947	23M	2085	8-5667	27-180	1025	8 Ap	23	04	1 My	10	94	3 Je	9	00	6 Au
4127	1083	948	23M	4672	27-2056	25-813	1026	7 Ap	11	41	1 My	10	81	7 My	29	84	2 Je
4128	1084	949	23M	7260	16-3189	21-470	1027	4 Mr	31	77	6 Ap	30	81	7 My	29	84	2 Je
4129	1085	950	22M	9848	5-4223	17-628	1028	3 Ap	19	67	5 My	19	20	6 Je	17	73	1 Jl
4130	1086	951	23M	2435	24-0610	15-761	1029	1 Ap	9	04	2 My	8	57	4 Je	7	10	5 Jl
4131	1087	952	23M	5023	18-1693	11-918	1030	5 Mr	28	41	6 Ap	26	94	1 My	26	47	3 Je
4132	1088	953	23M	7610	2-2776	8-075	1031	4 Ap	16	30	5 My	15	83	7 Je	14	87	1 Jl
4133	1089	954	23M	0198	20-9165	6-209	1032	1 Ap	5	67	3 My	5	20	4 Je	8	78	6 Jl
4134	1090	955	23M	2785	10-0218	2-866	1033	6 Mr	26	04	7 Ap	24	57	3 Je	22	63	5 Jl
4135	1091	956	23M	5373	28-6687	0-499	1034	4 Ap	12	94	6 My	12	47	1 Je	11	00	2 Jl
4136	1092	957	23M	7960	17-7720	24-211	1035	2 Ap	2	30	3 My	1	83	5 My	31	86	6 Je
4137	1093	958	23M	0548	6-6808	20-868	1036	1 Ap	21	20	2 My	20	73	4 Je	18	26	5 Jl
4138	1094	959	23M	3136	25-5192	18-501	1037	5 Ap	10	57	7 My	10	10	1 Je	8	63	3 Jl
4139	1095	960	23M	5728	14-6275	14-659	1038	2 Mr	29	93	4 Ap	28	47	6 My	28	00	7 Je
4140	1096	961	23M	8311	8-7358	10-816	1039	6 Ap	17	83	3 My	17	36	4 Je	15	89	6 Jl
4141	1097	962	23M	0898	22-3747	8-949	1040	3 Ap	7	20	7 My	6	78	2 Je	5	26	8 Jl
4142	1098	963	23M	3486	11-4830	5-106	1041	8 Mr	27	57	5 Ap	26	10	6 My	25	63	2 Jl
4143	1099	964	23M	6073	0-5913	1-264	1042	2 Ap	14	46	3 My	13	99	5 Je	12	53	7 Jl
4144	1100	965	23M	8661	19-2802	26-952	1043	6 Ap	3	83	1 My	3	36	2 Je	1	89	4 Jl
4145	1101	966	23M	1249	8-3885	23-109	1044	4 Mr	24	20	7 My	22	26	1 Je	20	79	3 Jl
4146	1102	967	23M	3836	28-9773	21-243	1045	5 Ap	12	10	4 My	11	63	6 Je	10	16	7 Jl
4147	1103	968	23M	6424	18-0856	17-399	1046	7 Mr	31	46	1 Ap	29	99	3 My	29	52	5 Je
4148	1104	969	23M	9011	5-1939	18-557	1047	6 Ap	19	86	7 My	18	89	2 Je	17	42	3 Jl
4149	1105	970	23M	1599	23-8328	11-860	1048	3 Ap	8	73	5 My	8	26	6 Je	6	79	1 Jl
4150	1106	971	23M	4186	12-9411	7-847	1049	1 Mr	29	09	2 Ap	27	68	4 My	27	16	7 Jl
4151	1107	972	23M	6774	2-0494	4-004	1050	6 Ap	15	99	1 My	15	52	3 Je	14	05	4 Jl
4152	1108	973	23M	9362	20-6883	2-138	1051	4 Ap	5	86	5 My	4	89	7 Je	8	55	3 Jl
4153	1109	974	23M	1949	9-7906	25-849	1052	1 Mr	25	73	4 My	23	26	6 Je	22	42	7 Jl
								7 Ap	13	62	2 My	18	15	3 Je	11	69	5 Jl
								4 Ap	1	99	6 My	1	52	1 My	31	05	2 Je

Sūrya siddhānta.

Āsvina.				Kārttika.				Mārgaśīrṣa.				Pauṣa.				A.D.	Māgha.				A.D.	Phalguṇa.				Chaitra.			
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.		Week-day.	Month.	Day.	Fraction.		Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
1 S	1	48	8 O	1 ●	01	4 O	30	54	6 N	29	07						7 D	28	60			01	2 Jr	27	13	3 F	25○	66	
7 S	20●	37	1 O	19	90	3 N	18	43	4 D	17	97	02	6 Jr	16	50			1 F	15○	03			1 F	15○	03	2 Mr	16	56	
4 S	9	74	6 O	9	27	7 N	7	80	2 D	7	33	03	3 Jr	5	86			5 F	4○	39			5 F	4○	39	6 Mr	5	92	
2 An	30	11	3 S	28	64	5 O	28	17	6 N	26	70						1 D	26	23			04	2 Jr	24	76	4 F	23	29	
1 S	17	01	2 O	16	54	4 N	15	07	5 D	14○	60	05	7 Jr	13●	13			1 F	11	66			1 F	11	66	3 Mr	13	19	
5 S	6	37	6 O	5	90	1 N	4	43	2 D	8○	96	06	4 Jr	2	49			6 F	1	03			6 F	1	03	7 Mr	2	56	
4 S	25	27	5 O	24	80	7 N	23○	33	1 D	22	86	07	3 Jr	21	39			4 F	19	92			4 F	19	92	6 Mr	21	45	
1 S	14	64	3 O	14	17	4 N	12	70	6 D	12	23	08	7 Jr	10	78			2 F	9	29			2 F	9	29	3 Mr	9	82	
6 S	8	00	7 O	2○	53	2 N	1	07	3 N	30	60						5 D	30	13			09	6 Jr	28	66	1 F	27	19	
4 S	21○	90	6 O	21	43	7 N	19	96	2 D	19	49	10	4 Jr	18	02			5 F	16	55			5 F	16	55	7 Mr	18○	09	
2 S	11○	27	3 O	10	80	5 N	9	33	6 D	8	86	11	1 Jr	7	39			2 F	5	92			2 F	5	92	4 Mr	7	45	
6 An	31	64	1 S	30	17	2 O	29	70	4 N	28	23						5 D	27	76			12	7 Jr	26○	29	1 F	24	82	
5 S	18	53	7 O	18	66	1 N	16	59	3 D	18	13	13	4 Jr	14○	66			6 F	13	19			6 F	13	19	7 Mr	14	72	
2 S	7	90	4 O	7	43	5 N	5	96	7 D	5	49	14	2 Jr	4●	02			3 F	2	53			3 F	2	53	5 Mr	4	08	
7 An	26	27	1 S	26	80	3 O	26	33	4 N	24	86						6 D	24	39			15	7 Jr	22	92	2 F	21	45	
6 S	16	17	7 O	15	70	2 N	14○	23	3 D	13	76	16	5 Jr	12	29			6 F	10	82			6 F	10	82	1 Mr	11	85	
3 S	4	53	5 O	4	06	6 N	2○	59	1 D	2	12						2 D	31	65			17	4 Jr	30	19	5 F	28	72	
2 S	23	43	3 O	22○	96	5 N	21	49	7 D	21	02	18	1 Jr	19	55			3 F	18	08			3 F	18	08	4 Mr	19	61	
6 S	12	83	1 O	12	33	2 N	10	86	4 D	10	39	19	5 Jr	8	92			7 F	7	45			7 F	7	45	1 Mr	8○	96	
4 S	2○	16	5 O	1	69	7 O	31	23	1 N	29	76						3 D	29	29			20	4 Jr	27	82	6 F	26○	35	
3 S	20	06	4 O	19	59	6 N	18	12	7 D	17	65	21	2 Jr	16	18			3 F	14○	71			3 F	14○	71	5 Mr	16	78	
7 S	9	43	1 O	8	96	3 N	7	49	5 D	7	02	22	6 Jr	5	55			1 F	4	08			1 F	4	08	2 Mr	5	61	
4 An	29	80	6 S	28	33	7 O	27	86	2 N	26	39						3 D	25○	92			23	5 Jr	24	45	6 F	22	93	
3 S	17	69	5 O	17	22	6 N	15	75	1 D	15○	29	24	2 Jr	13	82			4 F	12	35			4 F	12	35	5 Mr	12	88	
1 S	6	06	2 O	5	59	4 N	4	12	5 D	3●○	65	25	7 Jr	2	18			1 Jr	31	71			1 Jr	31	71	3 Mr	2	24	
6 S	24	96	1 O	24	49	3 N	23●	02	4 D	22	55	26	6 Jr	21	08			7 F	19	61			7 F	19	61	2 Mr	21	14	
4 S	14	33	5 O	13○	86	7 N	12●	39	1 D	11	92	27	3 Jr	10	45			4 F	8	98			4 F	8	98	6 Mr	10	51	
1 S	3	69	3 O	3○	22	4 N	1●	75	6 D	1	28						7 D	30	81			28	2 Jr	29	35	3 F	27	88	
7 S	21●○	59	2 O	31	12	3 N	19	65	5 D	19	18	29	6 Jr	17	71			1 F	16	24			1 F	16	24	2 Mr	17	77	
4 S	10●	96	6 O	10	49	1 N	9	02	2 D	8	55	30	4 Jr	7	08			5 F	5○	61			5 F	5○	61	7 Mr	7	14	
2 An	31	32	3 S	29	85	5 O	29	89	6 N	27	92						1 D	27	45			31	2 Jr	25○	98	4 F	24	51	
1 S	19	22	2 O	18	75	4 N	17	28	5 D	16	81	32	7 Jr	16●	34			1 F	13	87			1 F	13	87	3 Mr	14	41	
5 S	7	59	7 O	7	12	1 N	5	86	3 D	5	18	33	4 Jr	3●	71			6 F	2	24			6 F	2	24	7 Mr	3	77	
2 An	27	96	4 S	26	49	6 O	26	02	7 N	24○	55						2 D	24	08			34	3 Jr	22	61	5 F	21	14	
1 S	15	85	3 O	15	33	4 N	13○	91	6 D	13	45	35	7 Jr	11	98			2 F	10	51			2 F	10	51	4 Mr	12	04	
6 S	5	22	7 O	4	75	2 N	3○	28	3 D	2	81	36	5 Jr	1	34			6 Jr	30	87			6 Jr	30	87	1 F	20	40	
5 S	23	12	6 O	22●	65	1 N	21	18	2 D	20	71	37	4 Jr	19	24			5 F	17	77			5 F	17	77	7 Mr	19○	30	
2 S	12○	49	4 O	12	02	5 N	10	55	7 D	10	08	38	1 Jr	8	61			3 F	7	14			3 F	7	14	4 Mr	8○	67	
6 S	1○	85	1 O	1	88	2 O	30	91	4 N	29	44						5 D	28	97			39	7 Jr	27	61	2 F	26○	04	
5 S	20	75	7 O	20	28	1 N	18	81	3 D	18	34	40	4 Jr	16	87			6 F	15●	40			6 F	15●	40	7 Mr	15	99	
3 S	9	12	4 O	8	65	6 N	7	18	7 D	6	71	41	2 Jr	5○	24			3 F	3	77			3 F	3	77	5 Mr	5	80	
7 An	29	46	2 S	28	01	3 O	27	55	5 N	26	08						6 D	25○	61			42	1 Jr	24	14	2 F	22	67	
6 S	17	38	7 O	16	91	2 N	15	44	3 D	14○	97	43	5 Jr	13	50			7 F	12	03			7 F	12	03	1 Mr	13	57	
3 S	6	75	5 O	6	28	6 N	4	81	1 D	4●	34	44	2 Jr	2	87			4 F	1	40			4 F	1	40	5 Mr	21	93	
2 S	24	65	4 O	24○	18	5 N	22●	71	7 D	22	24	45	1 Jr	20	77			3 F	19	30			3 F	19	30	4 Mr	20	83	
7 S	14	01	1 O	13○	54	3 N	12	07	4 D	11	61	46	6 Jr	10	14			7 F	8	67			7 F	8	67	2 Mr	10	30	
4 S	3	88	5 O	2○	91	7 N	1	44	1 N	30	97						8 D	30	50			47	5 Jr	29	03	6 F	27	56	
3 S	22●	28	4 O	21	81	6 N	20	84	7 D	19	87	48	2 Jr	18	40			3 F	16○	93			3 F	16○	93	5 Mr	17●	46	
7 S	10	65	2 O	10	18	3 N	8	71	5 D	8	24	49	6 Jr	6	77			1 F	5○	80			1 F	5○	80	2 Mr	6	83	
5 An	31	01	6 S	29	54	1 O	29	07	2 N	27	60						4 D	27	13			50	5 Jr	25	67	7 F	24	20	
3 S	18	91	5 O	18	44	6 N	16	97	1 D	16	50	51	3 Jr	15●	08			4 F	13	56			4 F	13	56	6 Mr	15	09	
1 S	8	28	2 O	7	81	4 N	6	34	5 D	5○	87	52	7 Jr	4	40			1 F	2	93			1 F	2	93	3 Mr	3	46	
{ 5 An	27	64	1 O	25	71	3 N	24●○	24	Pauṣa Kṣhaya								4 D	23	77			53	6 Jr	22	80	2 F	20	83	
{ 7 S	26	17																								2 Mr	22	36	

the above + '01 for Ārya siddhānta and — '06 for Brahma siddhānta.

TABLE II.																												
									Vaiśākha.			Jyeshṭha.			Āshāḍha.			Śrāvaṇa.			Bhādrapada.							
Kaliyuga.	Vikrama era.	Śaka era.	Month and day A.D.	Fraction of day.	Com- mence- ment of solar year.	First new moon in solar year.	Anomaly of first new- moon.	Christian era.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
A.D.																												
4154	1110	975	23M	4537	28:4355	23 983	1053	8	Ap	20		89	5	My	20	42	6	Je	18	95	1	Jl	18	48	3	Au	17	01
4155	1111	976	28M	7124	17:5438	20 140	1054	1	Ap	10		26	2	My	9	79	4	Je	8	32	5	Jl	7	85	7	Au	6	88
4156	1112	977	28M	9711	6:6521	16 297	1055	5	Mr	30		62	7	Ap	29	15	1	My	28	68	3	Je	27	21	6	Au	25	28
4157	1113	978	23M	2299	25:2910	14 430	1056	4	Ap	17		52	6	My	17	05	7	Je	15	58	2	Jl	15	11	3	Au	13	64
4158	1114	979	28M	4887	14:3998	10 588	1057	1	Ap	6		89	3	My	6	42	4	Je	4	95	6	Jl	4	48	1	Au	3	01
4159	1115	980	23M	7474	3:5076	6 745	1058	6	Mr	27		25	7	Ap	25	79	3	Je	23	85	5	Jl	23	38	6	Au	21	91
4160	1116	981	24M	0062	22:1465	4 878	1059	5	Ap	15		15	6	My	14	68	1	Je	13	21	2	Jl	12	74	4	Au	11	27
4161	1117	982	23M	2650	11:2543	1 035	1060	2	Ap	8		52	4	My	8	05	5	Je	1	58	7	Jl	1	11	1	Jl	30	64
4162	1118	983	28M	5237	0:3631	24 747	1061	6	Mr	23		89	2	My	23	48	2	Je	22	01	3	Jl	21	54	5	Au	20	07
4163	1119	984	23M	7825	19:0020	22 880	1062	1	Ap	22		42	2	My	21	95	4	Je	20	48	6	Jl	20	01	7	Au	18	54
4164	1120	985	24M	0412	8:1108	19 088	1063	5	Ap	11		78	7	My	11	81	1	Je	9	85	8	Jl	9	38	4	Au	7	91
4165	1121	986	23M	3000	26:7491	17 171	1064	2	Ap	19		05	3	My	18	53	5	Je	17	11	6	Jl	16	64	1	Au	15	17
4166	1122	987	28M	5587	15:8574	18 828	1065	8	Ap	8		42	7	My	7	95	2	Je	6	48	4	Jl	6	01	5	Au	4	54
4167	1123	988	23M	8175	4:9657	9 485	1066	3	Mr	28		78	5	Ap	27	81	6	My	26	84	2	Jl	24	47	4	Au	23	44
4168	1124	989	24M	0763	23:6046	7 619	1067	2	Ap	16		68	4	My	16	21	5	Je	14	74	7	Jl	14	27	1	Au	12	80
4169	1125	990	23M	3350	12:7129	8 776	1068	7	Ap	5		05	1	My	4	58	3	Je	3	11	4	Jl	2	64	6	Au	1	17
4170	1126	991	23M	5938	1:8212	27 488	1069	4	Mr	25		41	5	Ap	23	95	2	Je	22	01	3	Jl	21	54	5	Au	20	07
4171	1127	992	23M	8525	20:4601	25 621	1070	3	Ap	18		81	4	My	12	84	6	Je	11	87	7	Jl	10	90	2	Au	9	43
4172	1128	993	24M	1113	9:5684	21 778	1071	7	Ap	2		68	2	My	2	21	3	My	31	74	5	Je	30	27	6	Jl	29	80
4173	1129	994	23M	3700	28:2078	19 912	1072	6	Ap	20		58	1	My	20	11	2	Je	18	64	4	Jl	18	17	5	Au	16	70
4174	1180	995	23M	6288	17:3156	16 069	1073	8	Ap	9		94	5	My	9	47	7	Je	8	00	1	Jl	7	54	3	Au	6	07
4175	1181	996	23M	8876	6:4239	12 226	1074	1	Mr	30		31	2	Ap	28	84	4	My	28	37	7	Jl	26	43	1	Au	24	96
4176	1182	997	24M	1463	25:0628	10 859	1075	7	Ap	18		21	1	My	17	74	3	Je	16	27	4	Jl	15	80	6	Au	14	33
4177	1183	998	23M	4051	14:1711	6 517	1076	4	Ap	6		58	6	My	6	11	7	Je	4	64	2	Jl	4	17	8	Au	2	70
4178	1184	999	23M	6638	3:2794	2 674	1077	1	Mr	26		94	3	Ap	25	47	6	Je	23	53	1	Jl	23	06	2	Au	21	60
4179	1185	1000	23M	9226	21:0183	0 897	1078	7	Ap	14		84	2	My	14	37	8	Je	12	00	5	Jl	12	43	6	Au	10	96
4180	1186	1001	24M	1813	11:0266	24 519	1079	5	Ap	4		21	6	My	3	74	1	Je	2	27	2	Jl	1	80	4	Jl	31	38
4181	1187	1002	23M	4401	0:1349	20 676	1080	2	Mr	23		57	5	My	21	64	7	Je	20	17	1	Jl	19	70	3	Au	18	23
4182	1188	1003	23M	6988	18:7788	18 809	1081	4	Ap	22		10	8	My	21	64	7	Je	20	17	1	Jl	19	70	3	Au	18	23
4183	1189	1004	23M	9576	7:8820	14 967	1082	1	Ap	11		47	3	My	11	00	4	Je	9	58	6	Jl	9	06	7	Au	7	59
4184	1190	1005	24M	1214	29:5209	13 100	1083	5	Mr	31		84	7	Ap	30	37	1	My	29	90	3	Je	28	43	4	Jl	27	96
4185	1141	1006	23M	4751	15:6282	9 257	1084	4	Ap	19		74	6	My	19	27	7	Je	17	80	2	Jl	17	33	3	Au	15	86
4186	1142	1007	23M	7389	4:7375	5 414	1085	2	Ap	8		10	3	My	7	68	5	Je	6	16	6	Jl	5	70	1	Au	4	23
4187	1143	1008	23M	9926	23:3764	8 548	1086	6	Mr	28		47	1	Ap	27	00	2	My	26	53	5	Jl	24	59	7	Au	23	12
4188	1144	1009	24M	12514	12:4847	27 259	1087	5	Ap	16		37	6	My	15	90	1	Je	14	43	2	Jl	13	96	4	Au	12	49
4189	1145	1010	23M	15101	1:5930	23 417	1088	2	Ap	5		74	4	My	5	27	5	Je	3	80	7	Jl	3	83	1	Au	1	86
4190	1146	1011	23M	17689	20:2319	21 556	1089	7	Mr	25		10	1	Ap	23	68	4	Je	21	69	6	Jl	21	22	7	Au	19	76
4191	1147	1012	23M	20277	9:3402	17 707	1090	6	Ap	18		00	7	My	12	53	2	Je	11	06	3	Jl	10	59	5	Au	9	12
4192	1148	1013	24M	22864	27:9791	15 840	1091	3	Ap	2		37	4	My	1	90	6	My	31	43	7	Je	29	96	2	Jl	29	49
4193	1149	1014	23M	25452	17:0874	11 998	1092	2	Ap	21		26	3	My	20	80	5	Je	19	38	6	Jl	18	86	1	Au	17	89
4194	1150	1015	23M	28039	6:1957	8 155	1093	6	Ap	9		63	1	My	9	16	2	Je	7	69	4	Jl	7	22	5	Au	5	75
4195	1151	1016	24M	30627	24:8346	6 283	1094	4	Mr	30		08	5	Ap	28	53	7	My	28	08	1	Je	28	59	4	Au	24	65
4196	1152	1017	24M	33214	13:9429	2 445	1095	2	Ap	17		90	4	My	17	43	5	Je	15	96	7	Jl	15	49	2	Au	14	02
4197	1153	1018	23M	35802	3:0512	26 157	1096	7	Ap	7		28	1	My	6	79	3	Je	5	82	4	Jl	4	86	6	Au	3	39
4198	1154	1019	23M	38390	21:8901	24 291	1097	4	Mr	26		08	6	Ap	25	16	2	Je	23	22	3	Jl	22	75	5	Au	21	28
4199	1155	1020	24M	40977	10:7984	20 448	1098	3	Ap	14		53	5	My	14	06	6	Je	12	59	1	Jl	12	12	2	Au	10	65
4200	1156	1021	24M	43565	29:4872	18 581	1099	7	Ap	8		90	2	My	3	43	3	Je	1	96	5	Jl	1	49	7	Jl		

Sūrya siddhānta—cont.

Āsvin.				Kārttika.				Mārgaśīrṣa.				Pauṣa.				A.D.				Māgha.				A.D. Phālguna.				Chaitra.			
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
4 S	15		54	6 O	15		07	7 N	18	○	60	2 D	13		18	54	3 Jr	11		66	5 F	10		19	6 Mr	11		73			
1 S	4		91	3 O	4		44	4 N	2	●	97	6 D	2		50	55	1 Jr	1		03	2 Jr	30		56	4 Mr	1		09			
7 S	23	○	81	2 O	23	●	84	3 N	21		87	5 D	21		40	56	6 Jr	19		08	1 F	18		46	2 Mr	18	○	99			
5 S	12	○	17	6 O	11		70	1 N	10		23	2 D	9		77	57	4 Jr	8		80	5 F	6		83	7 Mr	8	○	86			
2 S	1	○	64	4 O	1		07	5 O	30		60	7 N	29		13		1 D	28		66	3 Jr	27		19	4 F	25		72			
1 S	20		44	2 O	19		07	4 N	18		50	6 D	18		03	59	7 Jr	16	○	56	2 F	15	●	09	3 Mr	16		62			
5 S	9		81	7 O	9		34	1 N	7		87	3 D	7		40	60	4 Jr	5	○	93	6 F	4		46	7 Mr	4		99			
3 Au	29		17	4 S	27		70	6 O	87		23	7 N	25		76		2 D	25	○	29	3 Jr	28		88	5 F	22		36			
2 S	17		07	3 O	16		60	5 N	15		13	6 D	14		68	62	1 Jr	18		19	2 F	11		72	4 Mr	18		25			
6 S	6		44	7 O	5		97	2 N	4	○	50	4 D	4		08	63	5 Jr	2		56	7 F	1		09	1 Mr	2		62			
5 S	25		33	6 O	24	○	87	1 N	23		40	2 D	22		93	64	4 Jr	21		46	5 F	19		09	7 Mr	20		52			
2 S	13		70	4 O	13	○	23	5 N	11		76	7 D	11		29	65	1 Jr	9		82	3 F	8		85	4 Mr	9		89			
7 S	3		07	1 O	2		60	3 N	1		13	4 N	80		66		6 D	30		19	7 Jr	28		72	2 F	27	○	25			
5 S	21	●	97	7 O	21		50	2 N	20		03	3 D	19		56	67	5 Jr	18		09	6 F	16	○	62	1 Mr	18		15			
3 S	11		33	1 O	10		86	6 N	9		39	7 D	8		98	68	2 Jr	7		46	3 F	5	○	99	5 Mr	6		52			
7 Au	30		70	2 S	29		23	3 O	28		76	5 N	27		29		6 D	26		82	1 Jr	25		35	2 F	23		88			
6 S	18		60	1 O	18		13	2 N	16		66	4 D	16	○	19	70	5 Jr	14		72	7 F	13		25	1 Mr	14		78			
3 S	7		97	5 O	7		50	7 N	6		03	1 D	5	○	56	71	3 Jr	4		09	4 F	2		62	6 Mr	4		15			
1 Au	28		33	4 O	26		39	5 N	24	○	92	7 D	24		45	72	1 Jr	22		98	3 F	21		52	5 Mr	22		05			
2 S	26		86													73	6 Jr	11		85	7 F	9		88	2 Mr	11		41			
7 S	15		23	1 O	14		76	3 N	13		29	4 D	12		82		3 D	31		72	5 Jr	30		25	6 F	28		78			
4 S	4		60	6 O	4	○	13	7 N	2		66	2 D	2		19	75	2 Jr	19		62	4 F	18		15	5 Mr	19	○	68			
8 S	23	○	49	5 O	23		02	6 N	21		56	1 D	21		09	76	6 Jr	8		98	1 F	7		51	3 Mr	8		04			
7 S	12	○	86	2 O	12		89	3 N	10		92	5 D	10		45		4 D	28		85	5 Jr	26	○	88	7 F	25		41			
5 S	1	●	23	6 S	30		76	1 O	30		29	2 N	28		82	78	3 Jr	16	○	25	4 F	14		78	6 Mr	16		81			
4 S	20		13	5 O	19		66	7 N	18		19	1 D	17		72	79	7 Jr	5	○	61	2 F	4		15	3 Mr	5		68			
1 S	9		49	3 O	9		02	4 N	7		55	6 D	7		08	81	3 Jr	12		88	6 Jr	24		51	1 F	23		04			
5 Au	29		86	7 S	28		39	1 O	27		92	3 N	26		45		4 D	25	●	98	5 F	11		41	6 Mr	12		94			
4 S	16		76	6 O	16		29	7 N	14	○	82	2 D	14	●	35	82	1 Jr	2		25	2 Jr	31		78	4 Mr	2		81			
2 S	6		12	3 O	5		66	5 N	4	○	19	6 D	3	●	72	83	7 Jr	21		14	1 F	19		68	3 Mr	21		21			
1 S	25		02	2 O	24	○	55	4 N	23		08	5 D	22		61	84	4 Jr	10		51	6 F	9		04	7 Mr	9	○	57			
5 S	14		39	6 O	13	●	92	1 N	12		45	2 D	11		98		1 D	29		88	3 Jr	28		41	4 F	28	○	94			
2 S	2	○	76	4 O	2		29	5 O	31		82	7 N	30		35	86	7 Jr	17		78	2 F	18	○	31	3 Mr	17		84			
1 S	21		65	3 O	21		18	4 N	19		72	6 D	19		25	87	5 Jr	7		14	4 Jr	26	●	04	5 F	24		57			
6 S	11		02	7 O	10		55	2 N	9		08	3 D	8		61		2 D	27	○	51	2 F	12		94	4 Mr	14		47			
3 Au	31		39	4 S	29		92	6 O	29		45	7 N	27		98	89	1 Jr	14		41	7 F	2		31	1 Mr	3		84			
2 S	13		29	3 O	17		82	5 N	16		35	6 D	15	○	88	90	5 Jr	3		78	6 F	21		20	7 Mr	22		73			
6 S	7		65	1 O	7		18	2 N	5		71	4 D	5	○	24	91	4 Jr	22		67	3 F	10		57	5 Mr	11		10			
4 Au	28		02	7 O	26		08	1 N	24	●	61	3 D	24		14	92	2 Jr	12		04	7 Jr	29		94	2 F	28		47			
5 S	26		55														6 D	31		41	6 F	17		84	1 Mr	19	●	87			
2 S	15		92	4 O	15	○	45	5 N	13		98	7 D	13		51	94	5 Jr	19		80	4 F	7	○	20	5 Mr	8		73			
7 S	4		28	1 O	3	○	82	3 N	2		35	4 D	1		88	95	2 Jr	8		67	1 Jr	27		57	3 F	26		10			
6 S	23	○	18	7 O	22		71	2 N	21		24	3 D	20		77	97	5 Jr	15	○	94	7 F	14		47	2 Mr	16		00			
8 S	12		55	5 O	12		08	6 N	10		61	1 D	10		14	98	3 Jr	5	●	30	4 F	3		83	6 Mr	5		36			
7 S	1		92	2 O	1		45	3 O	30		98	5 N	29		51		7 D	29		04	2 Jr	24		20	3 F	22		73			
6 S	19		81	1 O	19		34	2 N	17		88	4 D	17		41	99	6 Jr	13		57	1 F	12		10	2 Mr	12		68			
4 S	9		18	5 O	8		71	7 N	7		24	1 D	6		77	01	3 Jr	1		94	5 Jr	31		47	7 Mr	2		00			
1 Au	29		55	3 S	28		08	4 O	27		61	6 N	26	○	14	02	2 Jr	20		83	4 F	19		36	5 Mr	20	○	89			
4 S	17		45	1 O	16		98	3 N	15	○	51	5 D	15		04	03	7 Jr	10		20	1 F	8		73	3 Mr	10	○	26			
3 S	24		71	5 O	24	●	24	6 N	22		77	1 D	22		30	04	4 D	30		57	6 Jr	29		10	7 F	27	○	63			
1 S	14	○	08	2 O	13		61	4 N	12		14	5 D	11		67	05	3 Jr	17		46	5 F	16		00	6 Mr	17		53			
5 S	3	○	44	6 O	2		98	1 N	1		51	3 D	1		04	06	7 Jr	6	○	83	2 F	5		36	3 Mr	6		89			
4 S	21		34	5 O	20		87	7 N	19		40	1 D	18		93		5 D	27	○	20	6 Jr	25		73	1 F	24		26			
1 S	10		71	3 O	10		24	4 N	8		77	6 D	8		80	08	4 Jr	15		10	5 F	13		63	7 Mr	14		16			
6 Au	31		08	7 S	29		61	2 O	29		14	3 N	27		87																
4 S	18		97	6 O	18		50	1 N	17		04	2 D	16	○	56																

the above + '01 for Ārya siddhānta and — '05 for Brahma siddhānta.

TABLE II.—

			Com- mence- ment of solar year		First new moon in solar year.		Anomaly of first new- moon		Christian era.		Vaiśākha.			Jyeshṭha.			Āshāḍha.			Śrāvaṇa.			Bhādrapada.		
Kaliyuga.	Vikrama era.	Śaka era.	Month and day A.D.	Fraction of day							Week-day. Month Day.	Fraction.	Week-day. Month Day.	Fraction.	Week-day. Month. Day.	Fraction.	Week-day. Month. Day.	Fraction.	Week-day. Month. Day.	Fraction.	Week-day. Month Day.	Fraction.			
A.D.																									
4209	1165	1080	23M	•6853	20 0087	17 479	1108				1 Ap 12	•69	3 My 12	•23	4 Je 10	•75	6 Ji 10	•28	7 Au 8	•81					
4210	1166	1081	23M	•0440	9 1120	18 636	1109				6 Ap 2	•06	7 My 1	•59	2 My 31	•12	3 Je 29	•65	5 Ji 29	•18					
4211	1167	1082	24M	•2028	27 7509	11 770	1110				4 Ap 20	•95	6 My 20	•48	1 Je 19	•01	2 Ji 18	•54	4 Au 17	•08					
4212	1168	1083	24M	•4615	16 8592	7 927	1111				2 Ap 10	•32	3 My 9	•85	5 Je 8	•38	6 Ji 7	•91	1 Au 6	•44					
4213	1169	1084	23M	•7203	5 9875	4 084	1112				6 Mr 29	•69	1 Ap 28	•22	2 My 27	•75	4 Je 26	•28	7 Au 24	•34					
4214	1170	1085	23M	•9791	24 8064	2 217	1113				5 Ap 17	•58	7 My 17	•12	1 Je 15	•65	3 Ji 15	•18	4 Au 13	•71					
4215	1171	1086	24M	•2378	18 7147	25 929	1114				2 Ap 6	•95	4 My 6	•48	6 Je 5	•01	7 Ji 4	•54	2 Au 3	•07					
4216	1172	1087	24M	•4966	2 8230	22 087	1115				7 Mr 27	•32	1 Ap 25	•85	4 Je 23	•91	6 Ji 23	•44	7 Au 21	•97					
4217	1173	1088	23M	•7553	21 4619	20 220	1116				6 Ap 14	•22	7 My 13	•75	2 Je 12	•28	3 Ji 11	•81	5 Au 10	•34					
4218	1174	1089	24M	•0141	10 5702	16 377	1117				3 Ap 3	•58	5 My 3	•11	6 Je 1	•64	1 Ji 1	•18	2 Ji 30	•71					
4219	1175	1040	24M	•2728	29 2090	14 510	1118				2 Ap 22	•48	4 My 22	•01	5 Je 20	•54	7 Ji 20	•07	1 Au 18	•60					
4220	1176	1041	24M	•5316	18 8173	10 668	1119				6 Ap 11	•85	1 My 11	•33	2 Je 9	•91	4 Ji 9	•44	5 Au 7	•97					
4221	1177	1042	23M	•7904	7 4256	6 825	1120				4 Mr 31	•22	5 Ap 29	•75	7 My 29	•28	1 Je 27	•81	3 Ji 27	•34					
4222	1178	1043	24M	•0491	26 0645	4 958	1121				3 Ap 19	•11	4 My 18	•64	6 Je 17	•17	7 Ji 16	•70	2 Au 15	•24					
4223	1179	1044	24M	•3079	15 1728	1 115	1122				7 Ap 8	•48	2 My 8	•01	3 Je 6	•54	5 Ji 6	•07	6 Au 4	•60					
4224	1180	1045	24M	•5666	4 2811	24 827	1123				4 Mr 28	•85	6 Ap 27	•38	7 My 26	•91	3 Ji 24	•97	5 Au 23	•50					
4225	1181	1046	23M	•8254	22 9200	22 960	1124				3 Ap 15	•74	5 My 15	•27	6 Je 13	•80	1 Ji 13	•34	2 Au 11	•87					
4226	1182	1047	24M	•0841	12 0283	19 118	1125				1 Ap 5	•11	2 My 4	•64	4 Je 3	•17	5 Ji 2	•70	7 Au 1	•28					
4227	1183	1048	24M	•3429	1 1866	15 275	1126				5 Mr 25	•48	7 Ap 24	•01	3 Je 22	•07	4 Ji 21	•60	6 Au 20	•13					
4228	1184	1049	24M	•6016	19 7755	18 408	1127				4 Ap 13	•38	5 My 12	•91	7 Je 11	•44	1 Ji 10	•97	3 Au 9	•50					
4229	1185	1050	23M	•8604	8 8838	9 565	1128				1 Ap 1	•74	3 My 1	•27	4 My 30	•80	6 Je 29	•34	7 Ji 28	•87					
4230	1186	1051	24M	•1192	27 5227	7 899	1129				7 Ap 20	•64	2 My 20	•17	3 Je 18	•70	5 Ji 18	•23	6 Au 16	•76					
4231	1187	1052	24M	•3779	16 6310	3 856	1130				5 Ap 10	•01	6 My 9	•54	1 Je 8	•07	2 Ji 7	•60	4 Au 6	•13					
4232	1188	1053	24M	•6367	5 7893	0 018	1131				2 Mr 30	•38	3 Ap 28	•91	5 My 28	•44	1 Ji 26	•50	3 Au 25	•08					
4233	1189	1054	23M	•9554	24 3782	25 701	1132				1 Ap 17	•27	2 My 16	•80	4 Je 15	•33	5 Ji 14	•86	7 Au 13	•40					
4234	1190	1055	24M	•1542	18 4865	21 858	1133				5 Ap 6	•64	7 My 6	•17	1 Je 4	•70	3 Ji 4	•23	4 Au 2	•76					
4235	1191	1056	24M	•4139	2 5948	18 015	1134				3 Mr 27	•01	4 Ap 25	•54	7 Je 23	•60	2 Ji 23	•13	3 Au 21	•66					
4236	1192	1057	24M	•6717	21 2336	16 149	1135				1 Ap 14	•90	3 My 14	•44	4 Je 12	•97	6 Ji 12	•50	1 Au 11	•08					
4237	1193	1058	23M	•9305	10 3419	12 306	1136				6 Ap 3	•27	7 My 2	•90	2 Je 1	•83	3 Je 30	•86	5 Ji 30	•39					
4238	1194	1059	24M	•1892	28 9808	10 439	1137				5 Ap 22	•17	6 My 21	•70	1 Je 20	•23	2 Ji 19	•76	4 Au 18	•29					
4239	1195	1060	24M	•4490	18 0891	6 696	1138				2 Ap 11	•54	4 My 11	•07	5 Je 9	•60	7 Ji 9	•13	1 Au 7	•66					
4240	1196	1061	24M	•7067	7 1974	2 754	1139				6 Mr 31	•90	1 Ap 30	•43	2 My 29	•96	4 Je 28	•50	7 Au 26	•56					
4241	1197	1062	23M	•9655	25 8363	0 687	1140				5 Ap 18	•80	7 My 18	•33	1 Je 16	•86	3 Ji 16	•39	4 Au 14	•92					
4242	1198	1063	24M	•2242	14 9446	24 599	1141				3 Ap 8	•17	4 My 7	•70	6 Je 6	•23	7 Ji 5	•76	2 Au 4	•29					
4243	1199	1064	24M	•4830	4 0529	20 756	1142				7 Mr 28	•54	2 Ap 27	•07	8 My 26	•60	6 Ji 24	•68	1 Au 23	•19					
4244	1200	1065	24M	•7418	22 6918	18 889	1143				6 Ap 16	•43	7 My 15	•96	2 Je 14	•49	4 Ji 14	•02	5 Au 12	•56					
4245	1201	1066	24M	•0005	11 8001	15 047	1144				3 Ap 4	•80	5 My 4	•38	6 Je 2	•86	1 Ji 2	•89	2 Ji 31	•92					
4246	1202	1067	4M	•2593	0 9084	11 204	1145				1 Mr 25	•17	4 My 23	•23	5 Je 21	•76	7 Ji 21	•29	1 Au 19	•82					
4247	1203	1068	24M	•5180	19 5478	9 337	1146				2 Ap 23	•70	1 My 12	•60	3 Je 11	•13	4 Ji 10	•66	6 Au 9	•19					
4248	1204	1069	24M	•7768	8 6555	5 494	1147				4 Ap 2	•48	5 My 1	•96	7 My 31	•49	2 Je 30	•02	3 Ji 29	•55					
4249	1205	1070	24M	•0855	27 2945	3 628	1148				3 Ap 20	•38	4 My 19	•86	6 Je 18	•39	7 Ji 17	•92	2 Au 16	•45					
4250	1206	1071	24M	•2943	16 4028	27 339	1149				7 Ap 9	•70	2 My 9	•23	3 Je 7	•76	5 Ji 7	•29	6 Au 5	•82					
4251	1207	1072	24M	•5530	5 5111	23 497	1150				5 Mr 30	•06	6 Ap 28	•59	1 My 28	•12	4 Ji 26	•18	5 Au 24	•72					
4252	1208	1073	24M	•8118	24 1500	21 630	1151				3 Ap 17	•96	5 My 17	•49	7 Je 16	•02	1 Ji 15	•55	3 Au 14	•08					
4253	1209	1074	24M	•0706	13 2583	17 787	1152				1 Ap 6	•33	2 My 5	•86	4 Je 4	•89	5 Ji 3	•92	7 Au 2	•45					
4254	1210	1075	24M	•3293	2 3666	18 944	1153				5 Mr 26	•70	7 Ap 25	•23	3 Je 23	•29	4 Ji 22	•82	6 Au 21	•35					
4255	1211	1076	24M	•5881	21 0054	12 078	1154				4 Ap 14	•59	6 My 14	•12	7 Je 12	•65	2 Ji 12	•18	3 Au 10	•73					
4256	1212	1077	24M	•8468	10 1137	8 235	1155				1 Ap 3	•96	3 My 3	•49	5 Je 2	•02	6 Ji 1	•55	1 Ji 31	•08					
4257	1213	1078	24M	•1056	28 7526	6 368	1156				7 Ap 21	•86	2 My 21	•39	3 Je 19	•92	5 Ji 19	•45	6 Au 17	•98					
4258	1214	1079	24M	•3643	17 8609	2 625	1157				5 Ap 11	•22	6 My 10	•76	1 Je 9	•29	2 Ji 8	•82	4 Au 7	•35					
4259	1215	1080	24M	•6231	6 96902</																				

Sūrya siddhānta—cont.

Āśvina.	Kārttika.	Mārgaśīrṣa.	Pauṣa.	A.D.	Māgha.	A.D.	Phālguna.	Chaitra.	
Week-day. Month. Day.	Fraction. Week-day. Month. Day	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day	Fraction. Week-day. Month. Day	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day	Fraction. Week-day. Month. Day	Fraction. Week-day. Month. Day	
2 S 7	·84 3 0 6	·87 5 N 5	·40 6 D 4	·93	09 1 Jr 3	46	2 F 1	·99 4 Mr 3	·52
1 S 27	·71 2 0 25	·77 4 N 24	·30 5 D 23	·88	10 7 Jr 22	·86	1 F 20	·89 3 Mr 22	·42
5 S 15	·61 7 0 15	·14 1 N 13	·07 3 D 13	·20	11 4 Jr 11	·73	6 F 10	·26 7 Mr 11	·79
2 S 4	·97 4 0 4	·50 6 N 3	·68 7 D 2	·56	12 2 Jr 1	·10	3 Jr 30	·68 5 F 29	·16
1 S 22	·87 3 0 22	·40 4 N 20	·93 6 D 20	·46	13 7 Jr 18	99	2 F 17	·52 4 Mr 19	·05
6 S 12	·24 7 0 11	·77 2 N 10	·30 3 D 9	·83	14 5 Jr 8	·86	6 F 6	·89 1 Mr 8	·42
3 S 1	·60 5 0 1	·14 6 0 30	·67 1 N 29	·20	2 D 28	·73	15 4 Jr 27	·26 5 F 25	·79
2 S 20	·50 4 0 20	·08 5 N 18	·56 7 D 18	·09	16 1 Jr 16	·62	3 F 15	·16 4 Mr 15	·69
6 S 8	·87 1 0 8	·40 2 N 6	·93 4 D 6	·46	17 5 Jr 4	99	7 F 3	·52 2 Mr 5	·05
4 Au 29	·24 5 8 27	·77 7 0 27	·30 1 N 25	·83	3 D 25	·86	18 4 Jr 23	·89 6 F 22	·42
3 S 17	·13 4 0 16	·66 6 N 15	·20 7 D 14	·73	19 2 Jr 13	26	3 F 11	·79 5 Mr 13	·32
7 S 6	·50 2 0 6	·03 3 N 4	·56 5 D 4	·09	20 6 Jr 2	62	1 F 1	·15 2 Mr 1	·68
6 S 24	·40 7 0 23	·98 2 N 22	·46 3 D 21	·99	21 5 Jr 20	·52	7 F 19	·05 1 Mr 20	·58
3 S 13	·77 5 0 13	·30 6 N 11	·83 1 D 11	·36	22 2 Jr 9	·89	4 F 8	·42 5 Mr 9	·95
1 S 3	·13 2 0 2	·66 4 N 1	·19 5 N 30	·72	7 D 30	·26	23 1 Jr 28	·79 3 F 27	·32
7 S 23	·03 1 0 21	·56 3 N 20	·09 4 D 19	·62	24 6 Jr 18	·15	7 F 16	·68 2 Mr 17	·21
4 S 10	·40 5 0 9	·93 7 N 8	·46 1 D 7	·99	25 3 Jr 6	·52	5 F 5	·05 6 Mr 6	·58
1 Au 30	·76 3 8 29	·30 4 0 28	·83 6 N 27	·36	7 D 26	·89	26 2 Jr 25	·42 3 F 23	·95
7 S 18	·66 2 0 18	·19 3 N 16	·72 5 D 16	·25	27 6 Jr 14	·78	1 F 13	·32 2 Mr 14	·85
5 S 8	·03 6 0 7	·56 1 N 6	·09 2 D 5	·62	28 4 Jr 4	·15	5 F 2	·68 7 Mr 3	·21
2 Au 27	·40 5 0 25	·46 6 N 23	·99 1 D 23	·52	29 3 Jr 22	·05	4 F 20	·58 6 Mr 22	·11
3 S 25	93	·29 4 N 24	·36 5 D 12	·89	30 7 Jr 11	·42	1 F 9	·95 3 Mr 11	·48
1 S 15	26 7 0 14	·82 4 N 13	·36 5 D 12	·89	4 D 31	·78	31 6 Jr 30	·31 7 F 28	·84
5 S 4	69 2 0 4	·19 1 N 2	·72 3 D 2	·25	32 3 Jr 19	·68	5 F 18	·21 6 Mr 18	·74
4 S 23	·56 6 0 23	·09 7 N 21	·62 2 D 21	·15	33 1 Jr 8	·05	2 F 6	·58 4 Mr 8	·11
1 S 11	93 3 0 11	·46 4 N 9	·99 6 D 9	·52	5 D 28	42	34 6 Jr 26	·95 1 F 25	·48
6 S 1	·29 7 8 30	·82 2 0 30	·35 3 N 28	88	35 4 Jr 16	·31	5 F 14	·84 7 Mr 16	·37
5 S 20	·19 6 0 19	·72 1 N 18	·25 2 D 17	·78	36 1 Jr 5	·68	3 F 4	·21 4 Mr 4	·74
2 S 9	·56 4 0 9	·09 5 N 7	·62 7 D 7	15	6 D 25	·05	37 7 Jr 23	·58 2 F 22	·11
6 Au 28	·92 1 8 27	·46 2 0 26	·99 4 N 25	·52	38 4 Jr 12	·94	6 F 11	·48 1 Mr 13	·01
5 S 16	·82 7 0 16	·85 1 N 14	·88 3 D 14	·41	39 2 Jr 2	31	3 Jr 31	·84 5 Mr 2	37
3 S 6	·19 4 0 5	·72 6 N 4	·25 7 D 3	·78	40 1 Jr 21	·21	2 F 19	·74 4 Mr 20	·27
2 S 25	·09 3 0 24	·62 5 N 23	·15 6 D 22	·68	41 5 Jr 9	·58	7 F 8	·11 1 Mr 9	·64
6 S 13	·45 7 0 12	·98 2 N 11	·52 4 D 11	·05	2 D 29	·94	42 4 Jr 28	·47 6 F 27	·00
3 S 2	·82 5 0 2	·35 6 0 31	·88 1 N 30	·41	43 1 Jr 17	84	3 F 16	·37 4 Mr 17	90
2 S 21	·72 4 0 21	·25 5 N 19	·78 7 D 19	·81	44 6 Jr 7	·21	7 F 5	·74 2 Mr 6	·27
7 S 11	·09 1 0 10	·62 3 N 9	·15 4 D 8	·68	3 D 26	·58	45 5 Jr 25	·11 6 F 23	64
4 Au 30	·45 5 8 28	·98 7 0 28	·51 2 N 27	·04	46 2 Jr 14	·47	4 F 13	·00 5 Mr 14	·53
3 S 18	·35 4 0 17	·88 6 N 16	·41 7 D 15	94	47 6 Jr 3	·84	1 F 2	·37 2 Mr 3	·90
7 S 7	·72 2 0 7	·25 3 N 5	·78 5 D 5	·81	48 5 Jr 22	·74	7 F 21	·27 1 Mr 21	80
6 S 26	·62 1 0 26	·15 2 N 24	·68 4 D 24	·21	49 3 Jr 11	·10	4 F 9	·64 6 Mr 11	·17
3 S 14	98 5 0 14	·51 7 N 13	·04 1 D 12	·57	7 D 31	·47	50 2 Jr 30	·00 3 F 28	·53
1 S 4	·35 2 0 3	·88 4 N 2	·41 5 D 1	·94	51 6 Jr 19	·87	7 F 17	·00 2 Mr 19	43
7 S 23	25 1 0 22	·78 3 N 21	·31 4 D 20	·84	52 3 Jr 8	74	5 F 7	·27 6 Mr 7	·80
4 S 12	61 6 0 12	·14 7 N 10	·68 2 D 10	·21	1 D 28	·10	53 2 Jr 26	·63 4 F 25	16
1 Au 31	·98 3 8 30	·51 5 0 30	·04 6 N 28	·57	54 7 Jr 16	·00	1 F 14	·53 8 Mr 16	·08
7 S 19	88 2 0 19	·41 3 N 17	·94 5 D 17	·47	55 4 Jr 5	·37	5 F 3	·90 7 Mr 5	·43
5 S 9	25 6 0 8	·78 1 N 7	31 2 D 6	·84	1 D 25	·74	56 3 Jr 24	·27 6 Mr 23	·33
2 Au 29	·61 4 8 28	14 5 0 27	·67 7 N 26	·20	57 7 Jr 12	·68	2 F 11	16 8 Mr 12	·69
1 S 16	·51 3 0 16	·04 4 N 14	·57 6 D 14	·10	58 5 Jr 2	·00	6 Jr 31	·53 1 Mr 2	·06
5 S 5	88 7 0 5	·41 1 N 3	·94 3 D 3	·47	59 3 Jr 20	·90	5 F 19	·43 6 Mr 20	·96
4 S 24	·78 6 0 24	·81 7 N 22	84 2 D 22	·37	60 1 Jr 10	·26	2 F 8	·80 4 Mr 9	·33
2 S 14	14 3 0 13	67 5 N 12	20 6 D 11	73	5 D 29	·63	61 7 Jr 28	·16 1 F 26	·69
6 S 2	·51 1 0 2	·04 2 0 31	·57 4 N 30	·10	62 4 Jr 17	·53	6 F 16	·06 7 Mr 17	·59
5 S 21	·41 6 0 20	94 1 N 19	·47 3 D 19	·00	63 1 Jr 6	·90	3 F 5	·43 4 Mr 6	·96
2 S 10	·77 4 0 10	·80 5 N 8	·84 7 D 8	37					

the above + ·02 for Ārya siddhānta and — ·06 for Brahma siddhānta.

TABLE II.—

			Com- mence- ment of solar year.		First new moon in solar year.		Anomaly of first new moon.				Vaisākha.			Jyeshtha.			Āshāḍha.			Śrāvaṇa.			Bhādrapada.		
Kaliyuga.	Vikrama era.	Śaka era	Month and day A.D.	Fraction of day.				Christian era.	Week day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	
A.D.																									
4264	1220	1085	24 M	·9169	11·5719	10·975	1163		6 Ap	5	·49	1 My	5	·02	2 Je	3○	·55	4 J	3●	·08	5 Au	1	·61		
4265	1221	1086	24 M	·1756	0·6902	7·138	1164		3 Mr	24	·86	6 My	22○	·92	1 Je	21●	·45	2 JI	20	·98	4 Au	19	·51		
4266	1222	1087	24 M	·1344	19·3191	5·266	1165		5 Ap	23	·39	4 My	12○	·28	5 Je	10	·81	7 JI	10	·34	1 Au	8	·88		
4267	1223	1088	24 M	·6932	8·4273	1·423	1166		2 Ap	12	·75	1 My	1●	·65	8 My	31	·18	4 Je	29	·71	6 JI	29	·24		
4268	1224	1089	24 M	·9519	27·0663	27·111	1167		7 Ap	2	·12	7 My	1●	·65	8 My	31	·18	4 Je	29	·71	6 JI	29	·24		
4269	1225	1090	24 M	·2107	16·1746	23·268	1168		6 Ap	21●	·02	7 My	20	·55	2 Je	19	·08	8 JI	18	·61	5 Au	17	·14		
4270	1226	1091	24 M	·4694	5·2829	19·426	1169		3 Ap	9	·38	4 My	8	·92	6 Je	7	·45	7 JI	6	·98	2 Au	5	·51		
4271	1227	1092	24 M	·7282	23·9218	17·559	1170		7 Mr	29	·75	2 Ap	28	·28	8 My	27	·81	5 JI	26	·34	1 Au	24●	·40		
4272	1228	1093	24 M	·9869	13·0801	13·716	1171		6 Ap	17	·65	1 My	17	·18	2 Je	15	·71	4 JI	15	·24	5 Au	18	·77		
4273	1229	1094	24 M	·2457	2·1884	9·873	1172		4 Ap	7	·02	5 My	6	·55	7 Je	5	·08	1 JI	4○	·61	8 Au	8	·14		
4274	1230	1095	24 M	·5044	20·7772	8·006	1173		1 Mr	26	·38	2 Ap	24	·91	5 Je	22○	·98	7 JI	22	·61	2 Au	21	·04		
4275	1231	1096	24 M	·7632	9·8855	4·164	1174		4 Ap	14	·28	1 My	13	·81	3 Je	12●	·34	4 JI	11	·87	6 Au	10	·40		
4276	1232	1097	24 M	·0220	28·5244	2·297	1175		7 Ap	3	·65	6 My	3○	·18	7 Je	1●	·71	2 JI	1	·24	3 JI	30	·77		
4277	1233	1098	24 M	·2807	17·6327	26·008	1176		8 Ap	22○	·55	5 My	22	·08	6 Je	20	·61	1 JI	20	·14	2 Au	18	·67		
4278	1234	1099	24 M	·5395	6·7410	22·171	1177		7 Ap	10●	·91	2 My	10	·44	3 Je	8	·97	5 JI	8	·50	7 Au	7	·04		
4279	1235	1100	24 M	·7982	25·3799	20·299	1178		5 Mr	31	·28	6 Ap	29	·81	1 My	29	·34	2 Je	27	·87	5 Au	25	·98		
4280	1236	1101	25 M	·0570	14·4882	16·457	1179		4 Ap	19	·18	5 My	18	·71	7 Je	17	·24	1 JI	16	·77	8 Au	15○	·30		
4281	1237	1102	24 M	·3157	8·5965	12·614	1180		1 Ap	8	·54	3 My	8	·08	4 Je	6	·61	6 JI	6	·14	7 Au	4○	·67		
4282	1238	1103	24 M	·5745	22·2354	10·747	1181		5 Mr	27	·91	7 Ap	26	·44	3 Je	24	·50	5 JI	24●	·03	6 Au	22	·56		
4283	1239	1104	24 M	·8333	11·3437	6·904	1182		4 Ap	15	·81	6 My	15	·34	7 Je	13	·87	2 JI	13	·40	8 Au	11	·98		
4284	1240	1105	25 M	·0920	0·4520	3·062	1183		2 Ap	5	·18	8 My	4	·71	5 Je	3○	·24	6 JI	2	·77	1 Au	1	·30		
4285	1241	1106	24 M	·3508	19·0909	1·195	1184		6 Mr	25	·54	2 My	23●	·60	4 Je	22	·14	5 JI	21	·67	7 Au	20	·20		
4286	1242	1107	24 M	·6095	8·1992	24·907	1185		1 Ap	24	·07	5 Ap	24	·07	1 Je	10	·50	3 JI	10	·03	4 Au	8	·56		
4287	1243	1108	24 M	·8683	26·8381	28·040	1186		5 Ap	12	·44	6 My	11	·97	1 Je	10	·50	3 JI	10	·03	4 Au	8	·56		
4288	1244	1109	25 M	·1270	15·9464	19·197	1187		2 Ap	1○	·81	4 My	1●	·34	5 My	30	·87	7 Je	29	·40	1 JI	28	·93		
4289	1245	1110	24 M	·3858	5·0547	15·354	1188		8 Ap	11●	·60	5 My	11	·18	6 Je	9	·66	1 JI	9	·19	2 Au	7	·72		
4290	1246	1111	24 M	·6445	23·6936	13·488	1189		6 Ap	10	·07	7 My	9	·60	2 Je	8	·13	3 JI	7	·66	5 Au	6	·20		
4291	1247	1112	24 M	·9033	12·8019	9·645	1190		3 Mr	29	·44	4 Ap	27	·97	6 My	27	·50	1 Je	26	·08	4 Au	24●	·10		
4292	1248	1113	25 M	·1621	1·9101	5·802	1191		2 Ap	17	·34	3 My	16	·87	5 Je	15	·40	6 JI	14○	·98	1 Au	13	·46		
4293	1249	1114	24 M	·4208	20·5490	3·985	1192		6 Ap	6	·70	1 My	6	·24	2 Je	4	·77	4 JI	4●	·30	5 Au	2	·83		
4294	1250	1115	24 M	·6796	9·6573	0·093	1193		4 Mr	27	·07	5 Ap	25	·60	1 Je	23●	·66	3 JI	23	·19	4 Au	21	·72		
4295	1251	1116	24 M	·9383	28·2662	25·780	1194		2 Ap	13	·97	4 My	18○	·50	6 Je	12	·03	7 JI	11	·56	2 Au	10	·09		
4296	1252	1117	25 M	·1971	17·4045	21·938	1195		7 Ap	3	·34	1 My	2○	·87	3 Je	1●	·40	4 Je	30	·93	6 JI	30	·46		
4297	1253	1118	24 M	·4558	6·5128	18·095	1196		6 Ap	22○	·23	7 My	21	·76	2 Je	20	·30	8 JI	19	·83	5 Au	18	·86		
4298	1254	1119	24 M	·7146	25·1517	16·228	1197		3 Ap	11●	·60	5 My	11	·18	6 Je	9	·66	1 JI	9	·19	2 Au	7	·72		
4299	1255	1120	24 M	·9734	14·3600	12·385	1198		7 Mr	30	·97	2 Ap	29	·50	4 My	29	·08	5 Je	27	·56	1 Au	25○	·62		
4300	1256	1121	25 M	·2321	3·3683	8·543	1199		6 Ap	18	·87	1 My	18	·40	2 Je	16	·98	4 JI	16	·46	5 Au	14○	·99		
4301	1257	1122	24 M	·4909	22·0072	6·676	1200		4 Ap	8	·28	5 My	7	·76	7 Je	6	·29	1 JI	5	·82	3 Au	4○	·36		
4302	1258	1123	24 M	·7496	11·1155	2·834	1201		1 Mr	28	·60	3 Ap	27	·18	4 My	26	·66	7 JI	24	·72	2 Au	23	·25		
4303	1259	1124	25 M	·0084	0·2288	26·545	1202		7 Ap	15	·50	2 My	15	·03	3 Je	13○	·56	5 JI	18	·09	6 Au	11	·62		
4304	1260	1125	25 M	·2671	18·8827	24·679	1203		4 Ap	4	·86	6 My	4	·40	7 Je	2○	·93	2 JI	2	·46	3 JI	31	·99		
4305	1261	1126	24 M	·5259	7·9710	20·886	1204		2 Mr	25	·28	5 My	23●	·29	6 Je	21	·82	1 JI	21	·35	2 Au	19	·88		
4306	1262	1127	24 M	·7847	26·0099	18·969	1205		3 Ap	23	·76	6 My	23	·29	6 Je	21	·82	1 JI	21	·35	2 Au	19	·88		
4307	1263	1128	25 M	·0434	15·7182	15·126	1206		1 Ap	18○	·13	2 My	12	·66	4 Je	11	·19	5 JI	10	·72	7 Au	9	·25		
4308	1264	1129	25 M	·3022	4·8265	11·284	1207		5 Ap	1○	·50	7 My	1	·03	1 My	30	·56	3 Je	29	·09	4 JI	28	·62		
4309	1265	1130	24 M	·5609	28·4658	9·417	1208		4 Ap	20	·39	5 My	19	·92	7 Je	18	·46	1 JI	17	·99	3 Au	16	·52		
4310	1266	1131	24 M	·8197	12·5736	5·574	1209		1 Ap	9	·76	3 My	9	·29	4 Je	7	·82	6 JI	7	·85	7 Au	5	·88		
4311	1267	1132	25 M	·0784	1·6819	1·731	1210		6 Mr	26	·76	1 Ap	25	·29	4 Je	23	·35	5 JI	22	·88	7 Au	21	·41		
4312	1268	1133	25 M	·3372	20·3208	27·419	1211		5 Ap	14	·66	7 My	14○	·19	1 Je	12	·72	8 JI	12	·25	4 Au	10	·78		
4313	1269	1134	24 M	·5959	9·4291	23·577	1212		3 Ap	8	·02	4 My	2○	·56	6 Je	1	·09	7 Je	30	·62	2 JI	·30	·15		
4314	1270	1135	24 M	·8547	28·0680	21·710	1213		1 Ap	21●	·92	3 My	21	·45	4 Je	19	·98	6 JI	19	·51	1 Au	18	·04		
4315	1271	1136	25 M																						

Sūrya siddhānta—cont.

Āśvina.				Kārttika.				Mārgaśīrṣa.				Pauṣa.				A.D. Māgha.				A.D. Phālguna.				Chaitra.					
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.		
7 Au	31		·14	1 S	29		·67	3 O	29		·20	4 N	27	○	·73		6 D	27		·26	64	7 Jr	25		·79	2 F	24		·32
6 S	18		·04	7 O	17		·57	2 N	16	●	·10	3 D	15		·68	65	5 Jr	14		·16		6 F	12		·69	1 Mr	14		·22
8 S	7		·41	4 O	6		·94	6 N	5	○	·47	1 D	5		·00	66	2 Jr	3		·53		4 F	2		·06	5 Mr	3		·59
2 S	26		·30	3 O	25		·83	5 N	24		·86	6 D	23		·90	67	1 Jr	22		·43		2 F	20		·06	4 Mr	22	○	·49
6 S	15	○	·67	1 O	15		·20	2 N	13		·73	4 D	13		·26	68	5 Jr	11		·79		7 F	10		·32	1 Mr	10	○	·85
4 S	4	●	·04	5 O	3		·57	7 N	2		·10	1 D	1		·63		3 D	31		·16	69	4 Jr	29		·69	6 F	28	○	·22
2 S	22		·93	4 O	22		·47	6 N	21		·00	7 D	20		·58	70	2 Jr	19		·06		8 F	17		·59	5 Mr	19		·12
7 S	12		·80	1 O	11		·88	3 N	10		·36	4 D	9		·89	71	6 Jr	8	○	·42		7 F	6		·96	2 Mr	8		·49
4 S	1		·67	6 O	1		·20	7 O	30		·78	2 N	29		·26		3 D	28	○	·79	72	5 Jr	27	●	·32	6 F	25		·85
3 S	19		·57	5 O	19		·10	6 N	17		·63	1 D	17	○	·16	73	2 Jr	15		·69		4 F	14		·22	5 Mr	15		·76
7 S	8		·93	2 O	8		·46	4 N	7		·00	5 D	6		·53	74	7 Jr	5		·06		1 F	3		·59	3 Mr	5		·12
5 Au	29		·30	6 S	27		·88	1 O	27	○	·36	2 N	25	●	·89		4 D	25		·42	75	5 Jr	23		·95	7 F 22		·48	
4 S	17		·20	5 O	16	○	·73	7 N	15		·26	1 D	14		·79	76	3 Jr	13		·82		4 F	11		·85	6 Mr	12		·38
1 S	5		·57	8 O	5	○	·10	4 N	3		·63	6 D	3		·16	77	7 Jr	1		·69		2 Jr	31		·22	3 Mr	1		·75
7 S	24		·46	1 O	23		·99	3 N	22		·52	5 D	22		·06	78	6 Jr	20		·59		1 F	19	○	·12	2 Mr	20	●	·65
4 S	13	●	·83	6 O	18		·36	7 N	11		·89	2 D	11		·42	79	3 Jr	9		·95		6 F	8	○	·48	7 Mr	10		·01
2 S	3		·20	8 O	2		·73	5 N	1		·26	6 N	30		·79		1 D	30		·32	80	2 Jr	28	○	·85	4 F	27		·38
1 S	21		·10	2 O	20		·63	4 N	19		·16	5 D	18		·69	81	7 Jr	17	●	·22		1 F	15		·75	3 Mr	17		·28
5 S	10		·46	6 O	9		·99	1 N	8		·52	3 D	8	○	·05	82	4 Jr	6		·58		6 F	5		·12	7 Mr	6		·65
2 Au	30		·83	4 S	29		·36	5 O	28		·89	7 N	27	○	·42		1 D	26		·95	83	3 Jr	25		·48	5 F	24		·01
1 S	18		·73	3 O	18		·26	4 N	16	●	·79	6 D	16		·32	84	7 Jr	14		·85		2 F	13		·38	3 Mr	13		·91
6 S	7		·09	7 O	6		·62	2 N	5		·16	3 D	4		·69	85	5 Jr	3		·22		6 F	1		·75	1 Mr	3		·28
4 S	25	○	·99	6 O	25	●	·52	1 N	24		·05	2 D	23		·68	86	4 Jr	22		·11		5 F	20		·64	7 Mr	22	○	·18
2 S	15	○	·36	3 O	14		·89	5 N	13		·42	6 D	12		·95	87	1 Jr	11		·48		3 F	10		·01	4 Mr	11	○	·54
6 S	4	●	·78	1 O	4		·26	2 N	2		·79	4 D	2		·32		5 D	31		·85	88	7 Jr	30		·88	1 F	28	●	·91
5 S	22		·62	7 O	22		·15	1 N	20		·68	3 D	20		·22	89	4 Jr	18	○	·76		6 F	17	●	·28	7 Mr	18		·81
2 S	11		·99	4 O	11		·52	6 N	10		·05	7 D	9		·58	90	2 Jr	8	○	·11		3 F	6		·64	5 Mr	8		·17
7 S	1		·86	1 S	30		·89	3 O	30		·42	4 N	28		·95		6 D	28	○	·48	91	1 Jr	27		·01	2 F	25		·54
6 S	20		·26	7 O	19		·79	2 N	18		·32	3 D	17	●	·85	92	5 Jr	16		·38		6 F	14		·91	1 Mr	15		·44
3 S	8		·62	5 O	8		·15	6 N	6	○	·68	1 D	6		·21	93	2 Jr	4		·74		4 F	3		·28	5 Mr	4		·81
7 Au	28		·99	4 O	27	○	·05	5 N	25		·58	Pauṣa. Kṛṣṇa.					7 D	25		·11	94	1 Jr	23		·64	3 F 22		·17	
2 S	27		·52																			4 F	31		·91	6 Mr	1	○	·44
6 S	16		·89	1 O	16	○	·42	2 N	14		·95	4 D	14		·48	95	6 Jr	13		·00		7 F	11		·54	2 Mr	13		·07
4 S	6		·25	5 O	5	●	·78	7 N	4		·32	1 D	3		·85	96	3 Jr	2		·38		4 Jr	31		·91	6 Mr	1	○	·44
3 S	24		·15	4 O	23		·68	6 N	22		·21	7 D	21		·74	97	2 Jr	20		·27		3 F	18	○	·80	5 Mr	20		·34
7 S	13	●	·52	2 O	13		·05	3 N	11		·58	5 D	11		·11	98	6 Jr	9		·64		1 F	8	○	·17	2 Mr	9		·70
4 S	2		·89	6 O	2		·43	7 O	31		·95	2 N	30		·48		4 D	30		·01	99	5 Jr	28	●	·54	7 F	27		·07
3 S	21		·78	5 O	21		·31	6 N	19		·84	1 D	19	○	·38	12	2 Jr	17		·91	00	4 F	18		·44	5 Mr	16		·97
1 S	10		·15	2 O	9		·68	4 N	8		·21	5 D	7	○	·74	01	7 Jr	6		·27		1 F	4		·80	3 Mr	6		·33
5 Au	30		·52	7 S	29		·05	1 O	28		·58	3 N	27	○	·11		4 D	26		·64	02	6 Jr	25		·17	7 F	23		·70
4 S	18		·42	5 O	17		·95	7 N	16	●	·48	2 D	16		·01	03	3 Jr	14		·54		5 F	13		·07	6 Mr	14		·60
1 S	7		·78	3 O	7	○	·31	4 N	5		·84	6 D	5		·37	04	7 Jr	3		·90		2 F	2		·44	3 Mr	2		·97
7 S	25	○	·68	2 O	25		·21	3 N	23		·74	5 D	23		·27	05	6 Jr	21		·80		1 F	20		·33	2 Mr	21	○	·86
5 S	16	○	·05	6 O	14		·58	1 N	13		·11	2 D	12		·64	06	4 Jr	11		·17		5 F	9		·70	7 Mr	11	●	·23
2 S	4	●	·41	3 O	3		·94	5 N	2		·48	7 D	2		·01		1 D	31		·54	07	3 Jr	30	○	·07	4 F	28	●	·60
1 S	23		·31	2 O	22		·84	4 N	21		·37	5 D	20		·90	08	7 Jr	19	○	·43		1 F	17		·96	3 Mr	18		·50
5 S	11		·68	6 O	11		·21	1 N	9		·74	3 D	9		·27	09	4 Jr	7	○	·80		6 F	6		·33	7 Mr	7		·86
3 S	1		·05	4 S	30		·58	6 O	30		·11	7 N	28		·64		2 D	28		·17	10	3 Jr	26		·70	5 F	25		·28
1 S	19		·94	3 O	19		·47	5 N	18	○	·00	6 D	17		·54	11	1 Jr	16		·07		2 F	14		·60	4 Mr	16		·13
6 S	9		·31	7 O	8		·84	2 N	7	○	·87	3 D	7	●	·90	12	5 Jr	5		·43		6 F	3		·96	1 Mr	4		·49
3 Au	28		·68	6 O	26	○	·74	1 N	25		·27	2 D	24		·80	13	4 Jr	23		·33		5 F	21		·86	7 Mr	23		·39
5 S	27		·21																			3 F	11		·23	4 Mr	12		·76
2 S	16		·58	4 O	16		·11	5 N	14		·64	7 D	14		·17	14	1 Jr	12		·70		7 Jr	31		·60	2 Mr	2	○	·18
6 S	5	○	·94	1 O	5	●																							

(1) for Ārya siddhānta + '02; (2) for Brahma siddhānta — '07; and (3) for Siddhānta Śirōmaṇi — '01.

TABLE II.—

			Com- mence- ment of solar year.	First new moon in solar year	Anomaly of first new moon.	Christian era.	Vaiśākha.	Jyeshṭha.	Āshāḍha.	Śrāvana.	Bhādrapada.			
Kaliyuga.	Vikrama.	Śaka era.	Month and day A.D.	Fraction of day.			Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.			
A.D.														
4318	1274	1139	24M	8897	140818	8-315	1217	6 Ap 7	92 1 My 7	45 2 Je 5	98 4 Ji 5	51 6 Au 4●	04	
4319	1275	1140	25M	1485	31401	4472	1218	4 Mr 28	29 { 5 Ap 26 7 My 26	82 1 Je 24○	88 8 Ji 24●	41 4 Au 22	94	
4320	1276	1141	25M	4072	217790	2605	1219	3 Ap 16	19 4 My 15	72 6 Je 14○	25 7 Ji 13	78 2 Au 12	31	
4321	1277	1142	24M	6660	108878	26317	1220	7 Ap 4	55 2 My 4	08 3 Je 2●	61 5 Ji 2	14 6 Ji 31	68	
4322	1278	1143	24M	9248	295262	24450	1221	4 Mr 24	92 7 My 22●	98 2 Je 21	51 4 Ji 21	04 5 Au 19	57	
4323	1279	1144	25M	1835	186345	20608	1222	6 Ap 23	45 3 Ap 12○	82 5 My 12	85 6 Je 10	68 1 Ji 10	41 2 Au 8	94
4324	1280	1145	25M	4128	77428	16765	1223	1 Ap 2○	18 2 My 1	72 4 My 31	25 5 Je 29	78 { 7 Ji 29 1 Au 27	31	
4325	1281	1146	24M	7010	268917	14898	1224	7 Ap 20	08 1 My 19	61 3 Je 18	14 4 Ji 17	67 6 Au 16	20	
4326	1282	1147	24M	9598	154900	11055	1225	4 Ap 9	45 5 My 8	98 7 Je 7	51 2 Ji 7	04 8 Au 5○	57	
4327	1283	1148	25M	2185	45982	7213	1226	1 Mr 29	82 3 Ap 28	35 { 4 My 27 6 Je 26	88 7 Ji 25○	94 2 Au 24	47	
4328	1284	1149	25M	4773	232371	5316	1227	7 Ap 17	71 2 My 17	24 3 Je 15	78 5 Ji 15●	81 6 Au 13	94	
4329	1285	1150	24M	7361	123454	1503	1228	5 Ap 6	08 6 My 5	61 1 Je 4	14 2 Ji 3●	67 4 Au 2	20	
4330	1286	1151	24M	9948	14537	25215	1229	2 Mr 26	45 { 3 Ap 24 5 My 24○	88 7 Je 23	04 1 Ji 22	57 3 Au 21	10	
4331	1287	1152	25M	2536	200926	28348	1230	1 Ap 14	35 2 My 13○	88 4 Je 12	41 5 Ji 11	94 7 Au 10	47	
4332	1288	1153	25M	5123	92009	19506	1231	5 Ap 3	71 7 My 3	24 1 Je 1	77 3 Ji 1	30 4 Ji 30	84	
4333	1289	1154	24M	7711	278398	17639	1232	4 Ap 21●	61 6 My 21	14 7 Je 19	67 2 Ji 19	20 3 Au 17	73	
4334	1290	1155	25M	0208	169481	13796	1233	1 Ap 10	88 3 My 10	51 5 Je 9	04 6 Ji 8	57 1 Au 7	10	
4335	1291	1156	25M	2886	60564	9953	1234	6 Mr 31	34 7 Ap 29	88 2 My 29	41 { 3 Je 27 5 Ji 27	94 7 Au 26○	00	
4336	1292	1157	25M	5473	246853	8087	1235	5 Ap 19	24 6 My 18	77 1 Je 17	30 2 Ji 16	83 4 Au 15●	38	
4337	1293	1158	24M	8061	188086	4244	1236	2 Ap 7	61 4 My 7	14 5 Je 5	67 7 Ji 5○	20 1 Au 3●	73	
4338	1294	1159	25M	0649	29119	0401	1237	6 Mr 27	98 { 1 Ap 26 3 My 26	51 4 Je 24○	57 6 Ji 24	10 7 Au 22	83	
4339	1295	1160	25M	9326	215508	26089	1238	5 Ap 15	87 7 My 15	40 1 Je 18○	94 3 Ji 13	47 5 Au 12	00	
4340	1296	1161	25M	5824	106591	22246	1239	3 Ap 5	24 4 My 4	77 6 Je 8●	30 7 Ji 2	89 2 Au 1	26	
4341	1297	1162	24M	8411	292980	20379	1240	7 Mr 24	61 3 My 22●	67 5 Je 21	20 6 Ji 20	73 1 Au 19	28	
4342	1298	1163	25M	0999	184068	16537	1241	2 Ap 28○	14 6 Ap 12○	51 1 My 12	04 2 Je 10	57 4 Ji 10	10 5 Au 8	63
4343	1299	1164	25M	3586	75146	12694	1242	8 Ap 1	87 5 My 1	40 6 My 30	93 1 Je 29	46 { 3 Ji 29 4 Au 27	53	
4344	1300	1165	25M	6174	261534	10827	1243	2 Ap 20	77 4 My 20	30 5 Je 18	83 7 Ji 18	36 1 Au 16○	89	
4345	1301	1166	24M	8762	152617	6984	1244	7 Ap 9	14 1 My 8	67 3 Je 7	20 4 Ji 6	73 6 Au 5○	26	
4346	1302	1167	25M	1849	43700	8143	1245	4 Mr 29	50 6 Ap 28	08 { 7 My 27 2 Je 26	57 3 Ji 25●	63 5 Au 24	16	
4347	1303	1168	25M	8937	230089	1275	1246	3 Ap 17	40 4 My 16	98 6 Je 15	46 7 Ji 14	99 2 Au 13	52	
4348	1304	1169	25M	6524	121172	24987	1247	7 Ap 6	77 2 My 6	30 8 Je 4○	83 5 Ji 4●	36 6 Au 2	89	
4349	1305	1170	24M	9112	12255	21144	1248	5 Mr 26	14 { 6 Ap 24 1 My 24○	67 2 Je 22	73 4 Ji 22	26 5 Au 20	79	
4350	1306	1171	25M	1699	198644	19277	1249	4 Ap 14	03 5 My 13●	56 7 Je 12	09 1 Ji 11	63 3 Au 10	16	
4351	1307	1172	25M	4287	89727	15434	1250	1 Ap 3○	40 2 My 2●	93 4 Je 1	46 5 Je 30	99 7 Ji 30	52	
4352	1308	1173	25M	6875	276117	18568	1251	7 Ap 22	30 1 My 21	83 3 Je 20	36 4 Ji 19	89 9 Au 18	42	
4353	1309	1174	24M	9462	167199	9725	1252	4 Ap 10	67 6 My 10	20 7 Je 8	73 2 Ji 8	28 3 Au 6	79	
4354	1310	1175	25M	2050	58282	5883	1253	2 Mr 31	03 3 Ap 29	56 5 My 29	09 { 6 Je 27 1 Ji 27	62 2 Au 25	69	
4355	1311	1176	25M	4687	244671	4015	1254	7 Ap 18	93 2 My 18	48 3 Je 16	99 5 Ji 16○	52 7 Au 15	05	
4356	1312	1177	25M	7225	135754	0173	1255	5 Ap 8	30 6 My 7	83 1 Je 6	36 2 Ji 5○	89 4 Au 4	42	
4357	1313	1178	24M	9812	26837	23885	1256	2 Mr 27	66 { 4 Ap 28 5 My 25	19 7 Je 24○	26 1 Ji 23	79 3 Au 22	32	
4358	1314	1179	25M	2400	213226	22018	1257	1 Ap 15	56 3 My 15	09 4 Je 13	62 6 Ji 13	15 7 Au 11	68	
4359	1315	1180	25M	4987	104309	18175	1258	5 Ap 4	93 7 My 4○	46 1 Je 2●	99 3 Ji 2	52 5 Au 1	05	
4360	1316	1181	25M	7575	290698	16308	1259	4 Ap 23○	83 6 My 23	36 7 Je 21	89 2 Ji 21	42 3 Au 19	95	
4361	1317	1182	25M	0163	181781	12466	1260	2 Ap 12●	19 3 My 11	72 5 Je 10	25 6 Ji 9	79 1 Au 8	32	
4362	1318	1183	25M	2750	72864	8623	1261	6 Ap 1●	56 1 My 1	09 2 My 30	62 4 Je 29	15 { 5 Ji 28 7 Au 27○	68	
4363	1319	1184	25M	5338	299252	6756	1262	5 Ap 20	46 6 My 19	99 1 Je 18	52 8 Ji 18	05 4 Au 16●	58	
4364	1320	1185	25M	7925	150335	2913	1263	2 Ap 9	83 4 My 9	36 5 Je 7	89 7 Ji 7	42 1 Au 5○	95	
4365	1321	1186	25M	0518	41418	26625	1264	7 Mr 29	19 1 Ap 27	72 { 3 My 27 4 Je 25	25 6 Ji 25	31 7 Au 23	85	
4366	1322	1187	25M	8100	227807	24758	1265	6 Ap 17	09 7 My 16	62 2 Je 15○	15 8 Ji 14	68 5 Au 13	21	
4367	1323	1188	25M	5688	118890	20916	1266	3 Ap 6	46 4 My 5	89 6 Je 4○	52 1 Ji 4	05 2 Au 2	58	
4368	1324	1189	25M	8276	09973	17073	1267	7 Mr 26	82 { 2 Ap 25 3 My 24○	35 5 Je 23	42 6 Ji 22	95 1 Au 21	43	
4369	1325	1190	25M	0863	193362	15206	1268	6 Ap 13○	72 1 My 13	25 2 Je 11	73 4 Ji 11	31 5 Au 9	84	
4370	1326	1191	25M	3451	87445	11368	1269	4 Ap 3○	08 5 My 2	62 7 Je 1	15 1 Je 30	68 3 Ji 30	21	
4371	1327	1192	25M	6038	278884	9497	1270	2 Ap 21	99 4 My 21	52 6 Je 20	05 7 Ji 19	58 2 Au 18	11	

N.B.—For tithis by other siddhāntas, add to the above algebraically as follows:—

Sūrya siddhānta—cont.

Āsvin.	Kārtika.	Mārgaśīrṣa.	Pauṣa.	A.D.	Māgha.	A.D.	Phālguna.	Chaitra.
Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction.	Week-day. Month. Day.	Fraction.	Week-day. Month. Day.	Fraction. Week-day. Month. Day.
7 S 2	·57 2 0 2	·10 3 0 31	·64 5 N 80	·17	6 D 29	·70	18 1 Jr 28	·23 2 F 26
6 S 21	·47 1 0 21	·00 2 N 19	·53 4 D 19	·06	19 5 Jr 17	·59	7 F 16	·12 1 Mr 17
3 S 10	·84 5 0 10	·37 6 N 8	·90 1 D 8	·43	20 2 Jr 6	·96	4 F 5	·49 6 Mr 6
1 Au 30	·21 2 8 28	·74 4 0 28	·27 5 N 28	·80	7 D 26	·83	21 1 Jr 24	·86 3 F 23
7 S 18	·10 1 0 17	·63 3 N 16	·16 4 D 15	·70	22 6 Jr 14	·23	7 F 12	·76 2 Mr 14
4 S 7	·47 6 0 7	·00 7 N 5	·53 2 D 5	·06	23 3 Jr 3	·59	5 F 2	·12 6 Mr 8
3 S 26	·87 4 0 25	·90 6 N 24	·43 7 D 23	·96	24 2 Jr 22	·49	4 F 21	·02 5 Mr 21
7 S 14	·74 2 0 14	·27 3 N 12	·80 5 D 12	·33	25 6 Jr 10	·86	1 F 9	·39 2 Mr 10
5 S 4	·10 6 0 8	·63 1 N 2	·16 2 D 1	·69	4 D 31	·22	26 5 Jr 29	·76 7 F 28
4 S 23	·00 5 0 22	·53 7 N 21	·06 1 D 20	·59	27 3 Jr 19	·12	4 F 17	·65 6 Mr 19
1 S 12	·37 2 0 11	·90 4 N 10	·43 5 D 9	·96	28 7 Jr 8	·49	2 F 7	·02 3 Mr 7
5 Au 31	·73 7 8 30	·26 1 0 29	·80 3 N 28	·33	4 D 27	·86	29 6 Jr 26	·39 7 F 25
4 S 19	·63 6 0 19	·16 7 N 17	·69 2 D 17	·22	30 3 Jr 15	·75	5 F 14	·28 6 Mr 15
2 S 9	·00 3 0 8	·53 5 N 7	·06 6 D 6	·59	31 1 Jr 5	·12	2 F 3	·65 4 Mr 5
6 Au 29	·87 2 0 27	·43 3 N 25	·96 5 D 25	·49	32 7 Jr 24	·02	1 F 22	·55 3 Mr 23
7 S 27	·90	·79 1 N 14	·32 2 D 13	·86	33 4 Jr 12	·39	5 F 10	·92 7 Mr 12
5 S 16	·28 6 0 15	·16 5 N 3	·69 7 D 3	·22	34 1 Jr 1	·75	3 Jr 31	·28 4 Mr 1
2 S 5	·63 4 0 5	·06 4 N 22	·59 6 D 22	·12	35 7 Jr 20	·65	2 F 19	·18 3 Mr 20
1 S 24	·53 3 0 24	·43 5 N 11	·96 3 D 11	·49	36 5 Jr 10	·02	6 F 8	·55 1 Mr 9
5 S 13	·90 7 0 13	·79 6 0 31	·32 7 N 29	·85	2 D 29	·38	37 3 Jr 27	·92 5 F 26
3 S 2	·26 4 0 1	·69 5 N 19	·22 6 D 18	·75	38 1 Jr 17	·28	2 F 15	·81 4 Mr 17
2 S 21	·16 3 0 20	·06 2 N 8	·59 4 D 8	·12	39 5 Jr 6	·65	7 F 5	·18 1 Mr 6
6 S 10	·53 1 0 10	·42 6 0 28	·95 1 N 27	·49	3 D 27	·02	40 4 Jr 25	·55 6 F 24
3 Au 30	·89 5 8 29	·32 5 N 15	·85 7 D 15	·38	41 1 Jr 13	·91	3 F 12	·44 4 Mr 13
2 S 17	·79 4 0 17	·69 3 C 5	·22 4 D 4	·75	42 6 Jr 3	·28	7 F 1	·81 2 Mr 3
7 S 7	·16 1 0 6	·59 2 N 24	·12 3 D 23	·65	43 5 Jr 22	·18	6 F 20	·71 1 Mr 22
6 S 26	·06 7 0 25	·95 6 N 13	·43 1 D 13	·01	44 2 Jr 11	·55	4 F 10	·08 5 Mr 10
3 S 15	·42 4 0 14	·32 3 N 1	·85 5 D 1	·38	6 D 30	·91	45 1 Jr 29	·44 2 F 27
7 S 8	·79 2 0 3	·22 2 N 20	·75 4 D 20	·28	46 5 Jr 18	·81	7 F 17	·34 1 Mr 18
6 S 22	·69 1 0 22	·59 7 N 10	·12 1 D 9	·65	47 3 Jr 8	·18	4 F 6	·71 6 Mr 8
4 S 12	·05 5 0 11	·95 4 0 30	·43 6 N 29	·01	7 D 28	·54	48 2 Jr 27	·07 3 F 25
1 S 1	·42 2 8 30	·38 3 N 17	·38 4 D 16	·91	49 6 Jr 15	·44	7 F 13	·97 2 Mr 15
7 S 19	·32 1 0 18	·22 7 N 6	·75 2 D 6	·28	50 3 Jr 4	·81	5 F 3	·34 6 Mr 4
4 S 8	·69 6 0 8	·11 6 N 25	·65 1 D 25	·18	51 2 Jr 23	·71	4 F 22	·24 5 Mr 23
2 Au 29	·05 5 0 27	·48 4 N 15	·01 5 D 14	·54	52 7 Jr 13	·07	1 F 11	·60 3 Mr 12
3 S 27	·58	·85 1 N 3	·38 2 D 2	·91	53 4 Jr 1	·44	5 Jr 30	·97 7 Mr 1
7 S 16	·95 2 0 16	·75 7 N 22	·28 1 D 21	·81	54 3 Jr 20	·34	4 F 18	·87 6 Mr 20
5 S 5	·32 6 0 4	·11 4 N 11	·64 6 D 11	·17	55 7 Jr 9	·71	2 F 8	·24 3 Mr 9
4 S 24	·22 5 0 23	·48 2 N 1	·01 8 N 30	·54	5 D 30	·07	56 6 Jr 28	·60 1 F 27
1 S 13	·58 3 0 13	·38 7 N 18	·91 2 D 18	·44	57 3 Jr 16	·97	5 F 15	·50 7 Mr 17
5 S 2	·95 7 0 2	·75 5 N 8	·28 6 D 7	·81	58 1 Jr 6	·34	2 F 4	·87 4 Mr 6
4 S 20	·85 6 0 20	·11 4 N 27	·17		5 D 26	·70	59 7 Jr 25	·23 1 F 23
2 S 10	·21 3 0 9	·64 1 N 16	·54 3 D 16	·07	60 4 Jr 14	·60	6 F 13	·13 7 Mr 13
6 Au 30	·58 { 1 S 29 2 0 28	·38 5 N 4	·91 7 D 4	·44	61 1 Jr 2	·97	3 F 1	·50 5 Mr 3
5 S 18	·48 7 0 18	·81 6 D 23	·81		62 7 Jr 21	·87	2 F 20	·40 3 Mr 21
2 S 6	·85 4 0 6	·17 3 D 12	·70		63 5 Jr 11	·23	6 F 9	·76 1 Mr 11
1 S 25	·74 3 0 25	·54 1 D 2	·07		2 D 31	·60	64 4 Jr 30	·13 5 F 28
6 S 15	·11 7 0 14	·44 6 D 19	·97		65 1 Jr 18	·50	3 F 17	·03 4 Mr 18
3 S 4	·43 5 0 4	·80 4 D 9	·33		66 5 Jr 7	·87	7 F 6	·40 1 Mr 7
2 S 22	·38 3 0 21	·17 1 N 28	·70		3 D 28	·23	67 4 Jr 26	·76 6 F 25
6 S 11	·74 1 0 11	·07 7 D 17	·60		68 2 Jr 16	·13	3 F 14	·66 5 Mr 15
4 S 1	·11 5 8 30	·44 4 D 5	·97		69 6 Jr 4	·50	1 F 3	·03 2 Mr 4
3 S 20	·01 4 0 19	·33 3 D 24	·86		70 5 Jr 23	·39	6 F 21	·93 1 Mr 23
7 S 8	·37 1 0 7	·70 1 D 14	·23		71 2 Jr 12	·76	4 F 11	·29 5 Mr 12
4 Au 28	·74 7 0 26							
6 S 27	·27							
3 S 16	·64 5 0 16							

(1) for Ārya siddhānta +02; (2) for Brahma siddhānta —07; (3) for Siddhānta Śīromāpi —01.

TABLE II.—

			Com- mence- ment of solar year.		First new moon in solar year		Anomaly of first new moon.		Christian era		Vaisākha.			Jyeshṭha.			Āṣāḍha.			Śrāvana.			Bhādrapada.				
Kaliyuga.	Vikrama era	Saka era.	Month and day A.D.	Fraction of day	First new moon in solar year	Anomaly of first new moon.	Christian era	Week-day.	Month.	Day.	Fraction.	Week-day.	Month	Day	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	
A.D.																											
4372	1328	1193	25M	8626	164917	5654	1271	7	Ap	11	85	1	My	10	88	3	Je	9	41	4	Jl	8	95	6	Au	7	48
4373	1329	1194	25M	1213	56000	1811	1272	4	Mr	30	72	6	Ap	29	25	7	My	28	78	3	Jl	26	84	5	Au	25	37
4374	1330	1195	25M	3801	242389	27499	1273	3	Ap	18	62	5	My	18	15	6	Je	16	68	1	Jl	16	21	2	Au	14	74
4375	1331	1196	25M	6389	133472	23656	1274	7	Ap	7	99	2	My	7	52	4	Je	6	05	5	Jl	5	58	7	Au	4	11
4376	1332	1197	25M	8976	24555	19814	1275	5	Mr	28	35	6	Ap	26	88	2	Je	24	94	4	Jl	24	47	6	Au	23	01
4377	1333	1198	25M	1564	210944	17947	1276	4	Ap	15	25	5	My	14	78	7	Je	13	31	1	Jl	12	84	3	Au	11	37
4378	1334	1199	25M	4151	102027	14104	1277	1	Ap	4	62	3	My	4	15	4	Je	2	68	6	Jl	2	21	7	Jl	31	74
4379	1335	1200	25M	6734	288416	12237	1278	7	Ap	23	51	2	My	23	05	3	Je	21	58	5	Jl	21	11	6	Au	19	64
4380	1336	1201	25M	9336	179498	8395	1279	4	Ap	12	88	6	My	12	41	7	Je	10	94	2	Jl	10	47	4	Au	9	00
4381	1337	1202	25M	1914	70581	4552	1280	2	Ap	1	25	3	Ap	30	78	5	My	30	31	6	Je	28	84	2	Au	26	90
4382	1338	1203	25M	4501	256970	2685	1281	1	Ap	20	15	2	My	19	68	4	Je	18	21	5	Jl	17	74	7	Au	16	27
4383	1339	1204	25M	7089	148053	26397	1282	5	Ap	9	51	7	My	9	64	1	Je	7	57	3	Jl	7	11	4	Au	5	64
4384	1340	1205	25M	9677	39136	22554	1283	2	Mr	29	88	4	Ap	28	41	5	My	27	94	2	Jl	26	00	3	Au	24	53
4385	1341	1206	25M	2264	225325	20688	1284	1	Ap	16	78	3	My	16	31	4	Je	14	84	6	Jl	14	37	7	Au	12	90
4386	1342	1207	25M	4852	116603	16845	1285	6	Ap	6	15	7	My	5	68	2	Je	4	21	3	Jl	3	74	5	Au	2	27
4387	1343	1208	25M	7439	07691	13002	1286	3	Mr	26	51	6	My	24	57	1	Je	23	10	2	Jl	22	63	4	Au	21	17
4388	1344	1209	26M	0027	194080	11135	1287	2	Ap	14	41	3	My	13	94	5	Je	12	47	7	Jl	12	00	1	Au	10	53
4389	1345	1210	25M	2614	85163	7292	1288	6	Ap	2	78	1	My	2	81	2	My	31	84	4	Je	30	37	5	Jl	29	90
4390	1346	1211	25M	5202	271552	5426	1289	5	Ap	21	67	7	My	21	21	1	Je	19	74	3	Jl	19	27	4	Au	17	80
4391	1347	1212	25M	7790	162635	1583	1290	3	Ap	11	04	4	My	10	57	6	Je	9	10	7	Jl	8	63	2	Au	7	16
4392	1348	1213	26M	0377	53718	25295	1291	7	Mr	31	41	2	Ap	30	94	3	My	29	47	6	Jl	27	53	1	Au	26	06
4393	1349	1214	25M	2965	240107	23448	1292	6	Ap	18	31	7	My	17	84	2	Je	16	37	3	Jl	15	90	5	Au	14	43
4394	1350	1215	25M	5552	131190	19586	1293	3	Ap	7	67	5	My	7	20	6	Je	5	73	1	Jl	5	27	2	Au	3	80
4395	1351	1216	25M	8140	22273	15744	1294	1	Mr	28	04	2	Ap	26	57	4	My	26	10	5	Je	24	63	7	Jl	24	69
4396	1352	1217	26M	0727	208662	13876	1295	6	Ap	15	94	1	My	15	47	3	Je	14	00	4	Jl	13	53	6	Au	12	06
4397	1353	1218	25M	3315	99745	10033	1296	4	Ap	4	31	5	My	3	84	7	Je	2	37	1	Jl	1	90	3	Jl	31	43
4398	1354	1219	25M	5902	286133	8166	1297	3	Ap	23	20	4	My	22	73	6	Je	21	26	7	Jl	20	79	2	Au	19	33
4399	1355	1220	25M	8490	177216	4324	1298	7	Ap	12	57	2	My	12	10	3	Je	10	63	5	Jl	10	16	6	Au	8	69
4400	1356	1221	26M	1078	68299	0481	1299	4	Ap	1	94	6	My	1	47	1	My	31	00	4	Jl	29	53	5	Au	27	59
4401	1357	1222	25M	3665	254688	26169	1300	3	Ap	19	83	5	My	19	37	6	Je	17	90	1	Jl	17	43	2	Au	16	96
4402	1358	1223	25M	6253	145771	22326	1301	1	Ap	9	20	2	My	8	73	4	Je	7	26	5	Jl	6	79	7	Au	5	82
4403	1359	1224	25M	8840	30354	18483	1302	5	Mr	29	57	7	Ap	28	10	1	My	27	63	4	Jl	25	69	6	Au	24	22
4404	1360	1225	26M	1428	228243	16616	1303	4	Ap	17	47	6	My	17	06	7	Je	15	53	2	Jl	15	06	3	Au	13	59
4405	1361	1226	25M	4015	114326	12774	1304	1	Ap	5	83	3	My	5	36	4	Je	3	60	6	Jl	3	43	7	Au	1	96
4406	1362	1227	25M	6603	05409	8981	1305	6	Mr	26	20	2	My	24	26	3	Je	22	79	5	Jl	22	32	6	Au	20	85
4407	1363	1228	25M	9191	191798	7064	1306	5	Ap	14	10	6	My	13	63	1	Je	12	16	2	Jl	11	69	4	Au	10	22
4408	1364	1229	26M	1778	82881	3221	1307	2	Ap	3	47	4	My	3	00	5	Je	1	53	7	Jl	1	06	1	Jl	30	59
4409	1365	1230	25M	4366	269270	1355	1308	1	Ap	21	86	2	My	20	89	4	Je	19	43	5	Jl	18	96	7	Au	17	40
4410	1366	1231	25M	6953	160353	25067	1309	5	Ap	10	73	7	My	10	26	1	Je	8	79	3	Jl	8	32	4	Au	6	85
4411	1367	1232	25M	9541	51436	21224	1310	3	Mr	31	10	4	Ap	29	68	6	My	29	16	2	Jl	27	22	3	Au	25	75
4412	1368	1233	26M	2128	237825	19357	1311	2	Ap	19	00	3	My	18	58	5	Je	17	06	6	Jl	16	59	1	Au	15	12
4413	1369	1234	25M	4716	128908	15514	1312	6	Ap	7	86	7	My	6	89	2	Je	5	42	3	Jl	4	96	5	Au	3	49
4414	1370	1235	25M	7304	199901	11672	1313	3	Mr	27	78	5	Ap	26	28	1	Je	24	32	2	Jl	23	86	4	Au	22	38
4415	1371	1236	25M	9892	206880	9905	1314	2	Ap	15	63	4	My	15	16	5	Je	13	69	7	Jl	13	22	1	Au	11	75
4416	1372	1237	26M	2479	97463	5962	1315	7	Ap	5	00	1	My	4	53	3	Je	3	06	4	Jl	3	59	6	Au	1	12
4417	1373	1238	25M	5068	283851	4095	1316	5	Ap	22	89	7	My	22	42	1	Je	20	95	3	Jl	20	48	5	Au	19	02
4418	1374	1239	25M	7654	174834	0254	1317	3	Ap	12	26	4	My	11	79	6	Je	10	32	7	Jl	9	85	2	Au	8	38
4419	1375	1240	26M	0241	66017	23294	1318	7	Ap	1	63	2	My	1	16	3	My	30	69	5	Je	29	22	1	Au	27	28
4420	1376	1241	26M	2829	252406	23098	1319	6	Ap	20	53	1	My	20	06	2	Je	18	59	4	J						

N.B.—For tithis by other siddhāntas, add to the above algebraically as follows :—

Sūrya siddhānta—cont.

Āsvina.				Kārttika.				Mārgasīrsha.				Pauṣa.				A.D.	Māgha.				A.D.	Phālguna.				Chaitra.			
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.		
1 S	6●	01	2 0	5	54	4 N	4	07	5 D	8	60	72	7 Jr	2	13		1 Jr	31○	66	3 Mr	1●	19							
6 S	23	90	1 0	23	43	2 N	21	97	4 D	21	50	73	6 Jr	20○	03		7 F	18	56	2 Mr	20	09							
4 S	13	27	5 0	12	80	7 N	11	33	1 D	10	86	74	3 Jr	9○	89		4 F	7	92	6 Mr	9	45							
1 S	2	64	3 0	2	17	4 O	31	70	6 N	30	23		7 D	29	76	75	2 Jr	28	29	3 F	26	82							
7 S	21	54	2 0	21	07	3 N	19○	60	5 D	19	13	76	6 Jr	17	68		1 F	16	19	2 Mr	16	72							
4 S	9	90	6 0	9	43	7 N	7○	96	2 D	7	49	77	4 Jr	6	03		5 F	4	58	7 Mr	6	09							
2 An	30	27	8 8	28	80	6 N	26	86	Pauṣa Kṣhaya				1 D	26	39	78	2 Jr	24	92	5 Mr	24	98							
1 S	18	17	2 0	17	70	4 N	16	23	5 D	15	76	79	7 Jr	14	29		1 F	12	82	3 Mr	14○	85							
5 S	7○	53	7 0	7	07	1 N	5	60	3 D	5	13	80	4 Jr	3	86		6 F	2	19	7 Mr	20	72							
4 S	25	43	5 0	24	96	7 N	23	49	2 D	23	02	81	3 Jr	21	55		5 F	20●	09	6 Mr	21	62							
1 S	14	80	3 0	14	33	4 N	12	86	6 D	12	39	82	7 Jr	10	92		2 F	9●	45	3 Mr	10	98							
6 S	4	17	7 0	8	70	2 N	2	23	3 D	1	76		5 D	31○	29	83	6 Jr	25●	82	1 F	28	35							
5 S	23	06	6 0	22	59	1 N	21	13	2 D	20○	66	84	4 Jr	19	19		5 F	17	72	7 Mr	18	25							
2 S	11	43	3 0	10	96	5 N	9	49	7 D	9○	02	85	1 Jr	7	55		3 F	6	08	4 Mr	7	61							
6 Au	31	80	1 8	30	33	2 O	29	86	4 N	28●	89		5 D	27	92	86	7 Jr	26	45	1 F	24	98							
5 S	19	70	7 0	19○	23	1 N	17	76	3 D	17	29	87	4 Jr	15	82		6 F	14	35	7 Mr	15	88							
3 S	9	06	5 0	8○	59	6 N	7●	12	7 D	6	65	88	2 Jr	5	19		3 F	3	72	5 Mr	4	25							
1 S	26○	98	3 0	26	49	5 N	25	02	6 D	24	55	89	1 Jr	23	08		2 F	21	61	4 Mr	23●	14							
6 S	16●	33	7 0	15	86	2 N	14	39	3 D	13	92	90	5 Jr	12	45		6 F	10○	98	1 Mr	12	51							
3 S	5●	09	5 0	5	23	6 N	3	76	1 D	3	29	91	2 Jr	1	82		4 Jr	31○	35	5 Mr	1	88							
2 S	24	59	4 0	24	12	5 N	22	65	7 D	22	18	92	1 Jr	20○	71		3 F	19	25	4 Mr	19	78							
6 S	12	98	1 0	12	49	3 N	11	02	4 D	10	55	93	6 Jr	9	08		7 F	7	61	2 Mr	9	14							
4 S	2	38	5 0	1	86	7 O	31	39	1 N	29○	92		3 D	29●	45	94	4 Jr	27	98	6 F	26	51							
3 S	21	22	4 0	20	75	6 N	19○	29	7 D	18	82	95	2 Jr	17	35		3 F	15	88	5 Mr	17	41							
7 S	10	59	2 0	10	12	3 N	8○	65	5 D	8	18	96	6 Jr	6	71		1 F	5	24	2 Mr	5	77							
4 An	29	96	6 8	28	49	1 O	28●	02	Pauṣa Kṣhaya				4 D	26	38	97	5 Jr	24	61	1 Mr	24○	67							
3 S	17○	86	5 0	17	39	6 N	15	92	1 D	15	45	98	2 Jr	18	98		4 F	12	51	6 Mr	14○	04							
1 S	7○	22	2 0	6	75	4 N	5	23	5 D	4	81	99	7 Jr	3	35		1 F	1	88	3 Mr	3	41							
7 S	26	12	1 0	25	65	3 N	24	18	4 D	23	71	13	6 Jr	22	24	00	7 F	20●	77	2 Mr	21	30							
4 S	14	49	6 0	14	02	7 N	12	55	2 D	12	08	01	3 Jr	10	61		5 F	9	14	6 Mr	10	67							
1 S	2	85	3 0	3	39	4 N	1	92	6 D	1	45		7 D	30○	98	02	2 Jr	29	51	4 F	28	04							
7 S	22	75	2 0	22	28	3 N	20	81	5 D	20○	34	03	6 Jr	18	87		1 F	17	41	2 Mr	18	94							
5 S	12	12	6 0	11	65	1 N	10	18	2 D	9●	71	04	4 Jr	8	24		5 F	6	77	7 Mr	7	30							
2 An	31	49	4 8	30	02	5 O	29○	55	7 N	28●	08		1 D	27	61	05	3 Jr	26	14	4 F	24	67							
1 S	19	88	2 0	18○	92	4 N	17	45	5 D	16	98	06	7 Jr	15	51		2 F	14	04	3 Mr	15	57							
5 S	8	75	7 0	8○	28	1 N	6	81	3 D	6	34	07	4 Jr	4	87		6 F	3	40	7 Mr	4	94							
4 S	27	65	6 0	27	18	7 N	25	71	2 D	25	24	08	3 Jr	23	77		5 F	22○	80	6 Mr	22	83							
2 S	16	02	3 0	15	55	5 N	14	08	6 D	13	61	09	1 Jr	12	14		2 F	10○	67	4 Mr	12	20							
6 S	5	38	7 0	4	91	2 N	3	44	8 D	2	98	10	5 Jr	1	51		7 Jr	31○	04	1 Mr	1	57							
5 S	24	28	6 0	23	81	1 N	23	84	2 D	21	87	11	4 Jr	20	40		5 F	18	98	7 Mr	20	47							
2 S	13	65	4 0	13	18	5 N	11	71	7 D	11○	24	12	1 Jr	9	77		3 F	8	30	4 Mr	8	83							
7 S	2	02	1 0	1	55	3 O	31	08	4 N	29○	61		6 D	29	14	13	7 Jr	27	67	2 F	26	20							
5 S	20	91	7 0	20	44	1 N	18○	98	3 D	18	51	14	5 Jr	17	04		6 F	15	57	1 Mr	17	10							
3 S	10	28	4 0	9	81	6 N	8	34	7 D	7	87	15	2 Jr	6	40		3 F	4	98	5 Mr	6	16							
7 An	30	65	2 8	29○	18	Mārgasīrsha Kṣhaya				5 N	27	24		6 D	28	77	16	2 Jr	25	80	4 Mr	34○	86						
6 S	17○	55	1 0	17	08	2 N	15	61	4 D	15	14	17	5 Jr	13	67		7 F	12	20	1 Mr	13○	73							
3 S	6●	91	5 0	6	44	6 N	4	97	1 D	4	50	18	3 Jr	3	04		4 F	1	57	6 Mr	8	10							
2 S	25●	61	4 0	25	34	5 N	23	87	7 D	23	40	19	1 Jr	21○	98		3 F	20●	46	5 Mr	22	63							
7 S	15	18	1 0	14	71	3 N	13	24	4 D	12	77	20	6 Jr	11○	80		7 F	9●	83	2 Mr	10	86							
4 S	3	56	6 0	3	08	7 N	1	61	2 D	1	14		3 D	30○	67	21	5 Jr	29	20	6 F	27	73							
3 S	22	44	4 0	21	97	6 N	20	50	1 D	20	04	22	2 Jr	18	57		4 F	17	10	5 Mr	18	63							
7 S	11	81	2 0	11	34	3 N	9	87	5 D	9●	40	23	6 Jr	7	93		1 F	6	48	2 Mr	7	99							
5 S	1	18	6 8	30	71	1 O	30○	24	2 N	28	77		4 D	28	30	24	5 Jr	26	83	7 F	25	86							
4 S	19	08	5 0	18○	61	7 N	17	14	1 D	16	67	25	3 Jr	15	20		4 F	18	73	6 Mr	15	26							
1 S	8	44	3 0	7●	97	4 N	6	50	6 D	6	03	26	7 Jr	4	56		2 F	8	10	3 Mr	4○	63							

(1) for Ārya siddhānta + 02; (2) for Brahma siddhānta - 07; and (3) for Siddhānta Śiromaṇi - 01.

Kaliyuga.	Vikrama era.	Saka era.	Month and day A.D.	Commencement of solar year.	First new moon in solar year.	Anomaly of first new moon.	Christian era.	Vaisākha.			Jyeshtha.			Āṣāḍha.			Śrāvaṇa.			Bhādrapada.		
								Week-day.	Fraction.	Day.	Week-day.	Fraction.	Day.	Week-day.	Fraction.	Day.	Week-day.	Fraction.	Day.	Week-day.	Fraction.	Day.
A.D.																						
4427	1388	1248	26M	0042	80569	26.705	1326	5 Ap 3	16	6 My 2	60	1 Je 1	22	2 Je 30	75	4 Ji 30	28	5 Au 28	81			
4428	1384	1249	26M	3528	266988	24.838	1327	4 Ap 22	05	5 My 21	59	7 Je 20	12	1 Ji 19	65	8 Au 18	18	7 Au 6	54			
4429	1385	1250	25M	6117	158071	20.995	1328	1 Ap 10	42	2 My 9	95	4 Je 8	48	6 Ji 8	01	7 Au 6	54	6 Au 25	44			
4430	1386	1251	25M	8705	49154	17.158	1329	5 Mr 30	79	7 Ap 29	32	1 My 28	85	4 Ji 26	91	6 Au 25	44	5 Au 8	07			
4431	1387	1252	26M	1292	235548	15.286	1330	4 Ap 18	69	6 My 18	22	7 Je 16	75	2 Ji 16	28	8 Au 14	81	7 Au 6	54			
4432	1388	1253	26M	3880	126626	11.443	1331	2 Ap 8	05	3 My 7	58	5 Je 6	11	6 Ji 5	65	1 Au 4	18	6 Au 25	44			
4433	1389	1254	25M	6467	177709	7.800	1332	6 Mr 27	42	7 Ap 25	95	4 Je 24	01	5 Ji 23	54	7 Au 22	07	5 Au 8	07			
4434	1390	1255	25M	9055	204087	5.734	1333	5 Ap 15	82	6 My 14	85	1 Je 13	38	2 Ji 12	91	4 Au 11	44	4 Au 28	60			
4435	1391	1256	26M	1642	95180	1.891	1334	2 Ap 4	69	4 My 4	22	5 Je 2	75	7 Ji 2	28	1 Ji 31	81	3 Au 18	18			
4436	1392	1257	26M	4230	281569	0.024	1335	1 Ap 23	58	3 My 23	11	4 Je 21	64	6 Ji 21	18	7 Au 19	71	3 Au 18	18			
4437	1393	1258	25M	6818	172652	23.736	1336	5 Ap 11	95	7 My 11	48	2 Je 10	01	3 Ji 9	54	5 Au 8	07	3 Au 18	18			
4438	1394	1259	25M	9405	63735	19.898	1337	3 Ap 1	82	4 Ap 30	85	6 My 30	38	7 Je 28	91	8 Au 26	97	3 Au 18	18			
4439	1395	1260	26M	1993	250124	18.027	1338	2 Ap 20	22	3 My 19	75	5 Je 18	28	6 Ji 17	81	1 Au 16	34	3 Au 18	18			
4440	1396	1261	26M	4580	141207	14.184	1339	6 Ap 9	58	1 My 9	11	2 Je 7	64	4 Ji 7	17	5 Au 5	71	3 Au 18	18			
4441	1397	1262	25M	7168	82290	10.841	1340	3 Mr 28	95	5 Ap 27	48	7 My 27	01	8 Ji 25	07	4 Au 23	60	3 Au 18	18			
4442	1398	1263	25M	9755	218679	8.474	1341	2 Ap 16	85	4 My 16	38	5 Je 14	51	7 Ji 14	44	1 Au 12	97	3 Au 18	18			
4443	1399	1264	26M	2343	109762	4.632	1342	7 Ap 6	21	1 My 5	75	3 Je 4	28	4 Ji 3	81	6 Au 2	34	3 Au 18	18			
4444	1400	1265	26M	4930	00845	0.789	1343	4 Mr 26	58	7 My 24	64	2 Je 23	17	3 Ji 22	70	5 Au 21	23	3 Au 18	18			
4445	1401	1266	25M	7518	187234	26.477	1344	6 Ap 25	11	6 Ap 25	11							3 Au 18	18			
4446	1402	1267	26M	0106	78317	22.634	1345	3 Ap 13	48	5 My 13	01	6 Je 11	54	1 Ji 11	07	2 Au 9	60	3 Au 18	18			
4447	1403	1268	26M	2698	264706	20.767	1346	7 Ap 2	84	2 My 2	38	3 My 31	91	5 Je 30	44	6 Ji 29	97	3 Au 18	18			
4448	1404	1269	26M	5281	155789	16.924	1347	4 Ap 11	11	5 My 10	64	7 Je 9	17	1 Ji 8	70	8 Au 7	23	3 Au 18	18			
4449	1405	1270	25M	7868	46872	13.082	1348	1 Mr 30	48	3 Ap 29	01	4 My 28	54	7 Ji 26	60	2 Au 25	13	3 Au 18	18			
4450	1406	1271	26M	0456	233261	11.215	1349	7 Ap 18	38	1 My 17	91	3 Je 16	44	4 Ji 15	97	6 Au 14	50	3 Au 18	18			
4451	1407	1272	26M	3043	124344	7.372	1350	4 Ap 7	74	6 My 7	27	7 Je 5	81	2 Ji 5	34	3 Au 8	87	3 Au 18	18			
4452	1408	1273	26M	5731	15427	3.629	1351	2 Mr 28	11	5 My 26	17	5 Je 24	70	1 Ji 24	23	2 Au 22	76	3 Au 18	18			
4453	1409	1274	25M	8219	201815	1.663	1352	1 Ap 15	01	2 My 14	54	4 Je 13	07	5 Ji 12	60	7 Au 11	18	3 Au 18	18			
4454	1410	1275	26M	0806	92898	25.375	1353	5 Ap 4	88	6 My 3	91	1 Je 2	44	2 Ji 1	97	7 Au 11	18	3 Au 18	18			
4455	1411	1276	26M	3394	279287	23.508	1354	4 Ap 23	27	5 My 22	80	7 Je 21	33	1 Ji 20	87	8 Au 19	40	3 Au 18	18			
4456	1412	1277	26M	5981	170370	19.665	1355	1 Ap 12	64	3 My 12	17	4 Je 10	70	6 Ji 10	28	7 Au 8	76	3 Au 18	18			
4457	1413	1278	25M	8565	61453	15.823	1356	6 Ap 1	01	7 Ap 30	54	2 My 30	07	3 Je 28	60	6 Au 26	06	3 Au 18	18			
4458	1414	1279	26M	1156	247842	18.956	1357	4 Ap 19	91	6 My 19	44	7 Je 17	97	2 Ji 17	50	4 Au 16	08	3 Au 18	18			
4459	1415	1280	26M	3744	138925	10.113	1358	2 Ap 9	27	3 My 8	80	5 Je 7	38	6 Ji 6	86	1 Au 5	39	3 Au 18	18			
4460	1416	1281	26M	6331	30008	6.270	1359	6 Mr 29	64	1 Ap 28	17	4 Je 26	23	5 Ji 25	76	7 Au 24	29	3 Au 18	18			
4461	1417	1282	25M	8919	216397	4.403	1360	5 Ap 16	54	7 My 16	07	1 Je 14	60	3 Ji 14	13	4 Au 12	66	3 Au 18	18			
4462	1418	1283	26M	1507	107480	0.561	1361	2 Ap 5	90	4 My 5	48	5 Je 3	97	7 Ji 3	50	2 Au 2	08	3 Au 18	18			
4463	1419	1284	26M	4094	293869	26.218	1362	7 Mr 26	27	3 My 24	33	4 Je 22	86	6 Ji 22	39	7 Au 20	92	3 Au 18	18			
4464	1420	1285	26M	6682	184852	22.406	1363	1 Ap 24	80	1 Ap 24	80							3 Au 18	18			
4465	1421	1286	25M	9269	76035	18.568	1364	3 Ap 2	51	5 My 2	07	6 My 31	60	1 Ji 30	18	2 Ji 29	66	3 Au 18	18			
4466	1422	1287	26M	1857	262424	16.696	1365	2 Ap 21	43	8 My 20	96	5 Je 19	49	7 Ji 19	08	1 Au 17	56	3 Au 18	18			
4467	1423	1288	26M	4444	158507	12.853	1366	6 Ap 10	80	1 My 10	33	2 Je 8	86	4 Ji 8	89	5 Au 6	92	3 Au 18	18			
4468	1424	1289	26M	7032	44590	9.011	1367	4 Mr 31	17	5 Ap 29	70	7 My 29	76	3 Ji 27	29	4 Au 25	82	3 Au 18	18			
4469	1425	1290	25M	9620	230979	7.144	1368	3 Ap 18	07	4 My 17	60	6 Je 16	13	7 Ji 15	68	2 Au 14	19	3 Au 18	18			
4470	1426	1291	26M	2207	122062	83.301	1369	7 Ap 7	43	1 My 6	96	3 Je 5	19	5 Ji 5	02	6 Au 3	55	3 Au 18	18			
4471	1427	1292	26M	4795	13144	27.018	1370	4 Mr 27	80	7 My 25	86	2 Je 24	39	3 Ji 23	92	5 Au 22	45	3 Au 18	18			
4472	1428	1293	26M	7382	199583	25.146	1371	6 Ap 26	33	3 My 26	70	5 My 15	23	6 Je 18	76	1 Ji 18	29	3 Au 18	18			
4473	1429	1294	25M	9970	90619	21.304	1372	1 Ap 4	06	2 My 3	59	4 Je 2	18	5 Ji 1	66	7 Ji 31	19	3 Au 18	18			
4474	1430	1295	26M	2557	277005	19.437	1373	6 Ap 22	96	1 My 22	49	3 Je 21	02	4 Ji 20	55	6 Au 19	08	3 Au 18	18			
4475	1431	1296	26M	5145	168088	15.594	1374	4 Ap 12	33	5 My 11	86	7 Je 10	39	1 Ji 9	92	3 Au 8	45	3 Au 18	18			
4476	1432	1297	26M	7733	59171	11.751	1375	1 Ap 1	70	8 My 1	25	4 My 30	76	6 Je 29	29	2 Au 27	35	3 Au 18	18			
4477	1433	1298	26M	0323	245560	9.885	1376	7 Ap 19	59	2 My 19	12	3 Je 17	65	5 Ji 17	19	6 Au 15	72	3 Au 18	18			
4478	1434	1299	26M	2908	136643	6.042	1377	4 Ap 8	96	6 My 8	49	1 Je 7	02	2 Ji 6	55	4 Au 5	08	3 Au 18	18			
4479	1435	1300	26M	5495	27728	2.199	1378	2 Mr 29	33	3 Ap 27	86	6 Je 25	92	1 Ji 25	45	2 Au 23	98	3 Au 18	18			

N.B.—For tithis by other siddhāntas, add to the above algebraically as follows:—

Sūrya siddhānta—cont.

Āśvina.				Kārttika.				Mārgaśīrsha.				Pauṣa.				A.D. Māgha.				A.D. Phālguna.				Chaitra.			
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
7 S	27		·84 1 O 28	·87 3 N 25	·40 4 D 24	·98		27	6 Jr	23	·46					1 F	22	○	·89 2 Mr 23	·52							
4 S	16		·71 6 O 16	·24 7 N 14	·77 2 D 14	·80		28	3 Jr	12	·83					6 F	11	○	·36 6 Mr 11	·89							
2 S	5		·07 3 O 4	61 5 N 3	·14 6 D 2	·87		29	1 Jr	1	·20					2 Jr	30		·73 4 Mr 1	·26							
7 S	23		·87 2 O 23	·50 4 N 22	·03 5 D 21	○	·56	30	7 Jr	20	·09					1 F	18		·68 3 Mr 20	·16							
5 S	13		·34 6 O 12	·87 1 N 11	·40 2 D 10	○	·93	31	4 Jr	9	·46					5 F	7		·99 7 Mr 9	·52							
2 S	2		·71 4 O 2	·24 5 O 31	·77 7 N 30	○	·80		1 D	29	·83					3 Jr	28		·86 4 F 28	·89							
1 S	20		·60 3 O 20	·14 4 N 18	·67 6 D 18	·20		33	7 Jr	16	·73					2 F	15		·26 3 Mr 16	·79							
5 S	9		·97 7 O 9	·50 2 N 8	·03 3 D 7	·56		34	5 Jr	6	·00					6 F	4		·62 1 Mr 6	·16							
3 A	30		·84 6 O 28	·40 7 N 26	·93				2 D	26	·46					3 Jr	24		·99 7 Mr 25	○	·05						
4 S	28		·87 8 O 17	·77 5 N 16	·80 6 D 15	·83		36	1 Jr	14	·36					5 F	23		·52 4 Mr 13	·42							
2 S	18		·24 1 O 6	·13 2 N 4	·66 4 D 4	·20		37	5 Jr	2	·73					2 F	12		·89 1 Mr 2	·79							
6 S	6		·60 7 O 25	·08 1 N 23	·56 3 D 28	·09		38	4 Jr	21	○	·62				7 F	1	○	·26 7 Mr 21	·68							
5 S	25		·50 4 O 14	·40 5 N 12	·93 7 D 12	·46		39	1 Jr	10	○	·99				6 F	20		·15 5 Mr 11	·05							
2 S	14		·87 2 O 3	·77 3 N 2	·30 4 D 1	·83		40	6 D	81	●	·86				3 F	9		·52 2 F 28	·42							
7 S	4		·24 7 O 21	·66 2 N 20	·19 3 D 19	·73		41	5 Jr	18	·26					7 Jr	29		·79 1 Mr 18	·32							
6 S	22		·13 5 O 11	·03 6 N 9	·56 7 D 9	●	·09	42	2 Jr	7	·62					6 F	16		·15 5 Mr 7	·68							
3 S	11		·50 2 S 30	·40 3 O 29	·93 5 N 28	·46		43	6 D	27	·99					1 Jr	26		·52 3 F 25	·05							
7 A	31		·87 1 O 18	·30 2 N 17	·83 4 D 17	·36		44	5 Jr	15	·89					7 F	14		·42 1 Mr 14	·95							
6 S	19		·77 5 O 7	·66 7 N 6	·19 1 D 5	·72		45	3 Jr	4	·26					4 F	2		·79 6 Mr 4	○	·32						
4 S	8		·13 4 O 26	·56 6 N 25	·09 7 D 24	·62		46	2 Jr	23	·15					3 F	21	○	·68 5 Mr 23	·21							
3 S	27		·03 1 O 15	·98 3 N 14	·46 4 D 13	·99		47	6 Jr	12	·52					1 F	11	●	·05 2 Mr 12	·58							
7 S	16		·76 6 O 5	·30 7 N 3	·83 2 D 3	·36		48	3 Jr	1	○	·89				5 Jr	31		·42 6 F 29	·95							
4 S	5		·66 5 O 23	·19 6 N 21	·72 1 D 21	○	·25	49	2 Jr	19	·79					4 F	18		·31 5 Mr 19	·85							
8 S	23		·08 2 O 12	·56 4 N 11	·09 5 D 10	○	·62	50	7 Jr	9	·16					1 F	7		·68 3 Mr 9	·21							
5 S	2		·40 6 O 1	·93 1 O 31	·46 2 N 29	●	·99	51	4 D	29	·52					6 Jr	28		·05 7 F 28	·58							
4 S	21		·29 5 O 20	·83 7 N 19	·36 1 D 18	·89		52	3 Jr	17	·42					4 F	15		·95 6 Mr 16	·48							
1 S	9		·66 3 O 9	·19 4 N 7	·72 6 D 7	·25		53	7 Jr	5	·78					2 F	4		·81 3 Mr 5	·85							
7 S	28		·56 2 O 28	·09 3 N 26	·62 5 D 26	·15		54	6 Jr	24	·68					1 F	23		·21 2 Mr 24	●	·74						
4 S	17		·98 6 O 17	·46 7 N 15	·99 2 D 15	·52		55	4 Jr	14	·05					5 F	12	○	·58 7 Mr 14	·11							
2 S	7		·29 3 O 6	·82 5 N 5	·35 6 D 4	·89		56	1 Jr	3	·42					2 F	1	○	·95 4 Mr 2	·48							
1 S	25		·19 2 O 24	·72 4 N 23	·25 5 D 22	·78		57	7 Jr	21	○	·31				1 F	19		·84 3 Mr 21	·37							
5 S	14		·56 7 O 14	·09 1 N 12	·62 3 D 12	·15		58	4 Jr	10	●	·68				6 F	9		·21 7 Mr 10	·74							
2 S	3		·98 4 O 3	·46 5 N 1	·99 7 D 1	·52		59	2 D	81	●	·05				3 Jr	29		·58 5 F 28	·11							
1 S	22		·83 3 O 22	·35 4 N 20	·88 6 D 20	·41		60	7 Jr	18	·95					2 F	17		·48 4 Mr 18	·01							
6 S	11		·19 7 O 10	·72 2 N 9	·25 3 D 8	·78		61	5 Jr	7	·31					6 F	5		·84 1 Mr 7	·87							
3 A	31		·56 5 S 30	·09 6 O 29	·62 1 N 28	·15		62	2 D	27	·68					4 Jr	26		·21 5 F 24	·74							
2 S	19		·45 3 O 18	·99 5 N 17	·52 7 D 17	·05		63	1 Jr	15	·58					3 F	14		·11 4 Mr 15	○	·64						
6 S	8		·82 1 O 8	·35 2 N 6	·88 4 D 6	·41		64	5 Jr	4	·94					7 F	3		·47 2 Mr 4	○	·01						
5 S	26		·72 7 O 26	·25 1 N 24	·78 3 D 24	·31		65	4 Jr	22	·84					6 F	21	●	·87 7 Mr 22	·90							
3 S	16		·09 4 O 15	·62 6 N 14	·15 7 D 13	·68		66	2 Jr	12	○	·21				8 F	10		·74 5 Mr 12	·27							
7 S	5		·45 1 O 4	·98 3 N 3	·51 5 D 3	·05		67	6 Jr	1	○	·58				1 Jr	31		·11 2 Mr 1	·64							
6 S	24		·35 7 O 23	·88 2 N 22	·41 3 D 21	○	·94	68	5 Jr	20	·47					7 F	19		·00 1 Mr 19	·58							
3 S	12		·72 5 O 12	·25 6 N 10	·78 1 D 10	·31		69	2 Jr	8	·84					4 F	7		·37 5 Mr 8	·90							
1 S	2		·09 2 O 1	·62 4 O 31	·15 5 N 29	●	·68	70	7 D	29	·21					1 Jr	27		·74 3 F 26	·27							
6 S	20		·98 1 O 20	·61 3 N 19	·04 4 D 18	·57		71	6 Jr	17	·11					7 F	15		·64 2 Mr 17	·17							
4 S	10		·85 5 O 9	·88 7 N 8	·41 1 D 7	·94		72	3 Jr	6	·47					5 F	5		·00 6 Mr 5	·53							
3 S	28		·25 4 O 27	·78 6 N 26	·81 7 D 25	·84		73	2 Jr	24	·87					3 F	22	○	·90 5 Mr 24	●	·43						
7 S	17		·61 2 O 17	·15 3 N 15	·68 5 D 15	·21		74	6 Jr	13	·74					1 F	12	○	·27 2 Mr 13	●	·80						
4 S	6		·98 6 O 6	·51 1 N 5	·04 2 D 3	·57		75	4 Jr	3	·10					5 F	1	○	·63 7 Mr 3	·17							
3 S	25		·88 5 O 25	·41 6 N 23	·94 1 D 23	·47		76	3 Jr	22	·00					4 F	20		·53 6 Mr 21	·06							
1 S	14		·25 2 O 13	·78 4 N 12	·81 5 D 11	·84		77	7 Jr	10	●	·87				1 F	8		·90 3 Mr 10	·43							
5 S	3		·61 7 O 3	·14 1 N 1	·67 3 D 1	○	·21	78	4 D	80	●	·74				6 Jr	29		·27 7 F 27	·80							
4 S	22		·51 6 O 22	·04 7 N 20	·57 2 D 20	·10		79	3 Jr	18	·68					5 F	17		·16 6 Mr 18	·69							

(1) for Sūrya siddhānta + ·08; (2) for Brahma siddhānta -- ·08; and (3) for Siddhānta Śirōmaṇi -- ·02.

Kaliyuga.	Vikrama era.	Śaka era.	Month and day A.D.	Commencement of solar year.	First new moon in solar year.	Anomaly of first new moon.	Christian era.	Vaiśākha.				Jyeshṭha.				Āshāḍha.				Śrāvaṇa.				Bhādrapada.			
								Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
4480	1486	1801	26M	8098	21:4115	0:382	1379	1	Ap	17	23	2	My	16	76	4	Je	15	29	5	Ji	14	82	7	An	13	85
4481	1487	1802	26M	8070	10:5198	24:044	1380	5	Ap	5	59	7	My	5	12	1	Je	3	65	3	Ji	8	18	4	An	1	71
4482	1488	1803	26M	8258	29:1587	22:177	1381	2	Mr	25	96	6	My	24	02	7	Je	22	55	2	Ji	22	08	8	An	20	61
4483	1489	1804	26M	8545	18:2670	18:835	1382	1	Ap	13	86	3	My	13	39	4	Je	11	92	6	Ji	11	45	7	An	9	98
4484	1440	1805	26M	8433	7:8753	14:492	1383	6	Ap	8	22	7	My	2	75	2	Je	1	29	8	Je	80	82	5	Ji	30	35
4485	1441	1806	26M	1021	26:0142	12:425	1384	5	Ap	21	12	6	My	20	65	1	Je	19	18	2	Ji	18	71	4	An	17	24
4486	1442	1807	26M	8608	15:1225	8:782	1385	2	Ap	10	49	4	My	10	02	5	Je	8	55	7	Ji	8	08	1	An	6	61
4487	1443	1808	26M	8196	4:2808	4:940	1386	6	Mr	30	86	1	Ap	29	89	2	My	28	92	5	Ji	26	98	7	An	25	51
4488	1444	1809	26M	8783	22:8696	3:078	1387	5	Ap	18	75	7	My	18	28	1	Je	16	81	3	Ji	16	35	4	An	14	88
4489	1445	1810	26M	1871	11:9779	26:785	1388	3	Ap	7	12	4	My	6	65	6	Je	5	18	7	Ji	4	71	2	An	8	24
4490	1446	1811	26M	8958	1:0862	22:942	1389	7	Mr	27	49	2	Ap	26	02	5	Je	24	08	6	Ji	23	61	1	An	22	14
4491	1447	1812	26M	8546	19:7251	21:075	1390	6	Ap	15	39	7	My	14	92	2	Je	13	45	3	Ji	12	98	5	An	11	51
4492	1448	1813	26M	9134	8:8334	17:232	1391	3	Ap	4	75	5	My	4	28	6	Je	2	81	1	Ji	2	34	2	Ji	81	87
4493	1449	1814	26M	1721	27:4723	15:366	1392	2	Ap	22	65	4	My	22	18	5	Je	20	71	7	Ji	20	24	1	An	18	77
4494	1450	1815	26M	4809	16:5806	11:523	1393	7	Ap	12	02	1	My	11	55	3	Je	10	08	4	Ji	9	61	6	An	8	14
4495	1451	1816	26M	6896	5:6889	7:680	1394	4	Ap	1	88	6	My	1	91	7	My	80	45	8	Ji	28	98	5	An	27	04
4496	1452	1817	26M	8484	24:3278	5:813	1395	3	Ap	20	28	1	My	9	81	6	Je	18	34	7	Ji	17	87	2	An	16	40
4497	1453	1818	26M	2071	13:4361	1:970	1396	7	Ap	8	65	2	My	8	18	3	Je	6	71	5	Ji	6	24	6	An	4	77
4498	1454	1819	26M	4659	2:5444	25:683	1397	5	Mr	29	02	6	Ap	27	55	2	Je	25	61	4	Ji	25	14	5	An	23	67
4499	1455	1820	26M	7247	21:1833	23:816	1398	3	Ap	16	91	5	My	16	44	6	Je	14	97	1	Ji	14	51	3	An	13	04
4500	1456	1821	26M	9834	10:2916	19:973	1399	1	Ap	6	28	2	My	5	81	4	Je	4	34	5	Ji	3	87	7	An	2	40
4501	1457	1822	26M	2422	28:9805	18:106	1400	7	Ap	24	18	1	My	23	71	3	Je	22	24	4	Ji	21	77	6	An	20	30
4502	1458	1823	26M	5009	19:0388	14:264	1401	4	Ap	18	55	6	My	18	08	7	Je	11	61	2	Ji	11	14	3	An	9	67
4503	1459	1824	26M	7597	7:1471	10:421	1402	1	Ap	2	91	3	My	2	44	4	My	31	97	6	Je	30	50	2	Ji	30	08
4504	1460	1825	27M	0184	25:7860	8:554	1403	7	Ap	21	81	2	My	21	34	3	Je	19	87	5	Ji	19	40	6	An	17	98
4505	1461	1826	26M	2772	14:8943	4:711	1404	5	Ap	10	18	6	My	9	71	1	Je	8	24	2	Ji	7	77	4	An	6	30
4506	1462	1827	26M	5360	4:0026	0:869	1405	2	Mr	30	54		Ap	29	07	5	My	28	61	1	Ji	26	67	3	An	25	20
4507	1463	1828	26M	7047	22:6414	26:556	1406	1	Ap	18	44	2	My	17	97	4	Je	16	50	6	Ji	16	03	7	An	14	56
4508	1464	1829	27M	0535	11:7497	22:714	1407	5	Ap	7	81	7	My	7	34	1	Je	5	87	3	Ji	5	40	4	An	3	93
4509	1465	1830	26M	3122	0:8580	18:871	1408	3	Mr	27	18	6	My	25	24	7	Je	23	77	2	Ji	23	30	3	An	21	83
4510	1466	1831	26M	5710	19:4969	17:004	1409	2	Ap	15	07	8	My	14	60	5	Je	13	13	6	Ji	12	67	1	An	11	20
4511	1467	1832	26M	8297	8:0052	13:161	1410	6	Ap	4	44	7	My	3	97	2	Je	2	50	4	Ji	2	08	7	An	30	56
4512	1468	1833	27M	0885	27:2441	11:295	1411	5	Ap	23	84	6	My	22	87	1	Je	21	40	2	Ji	20	93	4	An	19	48
4513	1469	1834	26M	8472	16:3524	7:453	1412	2	Ap	11	71	4	My	11	24	5	Je	9	77	7	Ji	9	30	1	An	7	83
4514	1470	1835	26M	6060	5:4807	3:609	1413	7	Ap	1	07	1	Ap	30	60	3	My	30	13	6	Ji	28	19	7	An	26	72
4515	1471	1836	26M	8648	24:0996	1:742	1414	5	Ap	19	97	7	My	19	50	2	Je	18	08	3	Ji	17	56	5	An	16	03
4516	1472	1837	27M	1235	13:2079	25:454	1415	3	Ap	9	34	4	My	8	87	6	Je	7	40	7	Ji	6	98	2	An	5	46
4517	1473	1838	26M	8823	2:3162	21:612	1416	7	Mr	28	70	2	Ap	27	23	5	Je	25	80	6	Ji	24	88	1	An	23	36
4518	1474	1839	26M	6410	20:9551	19:745	1417	6	Ap	16	00	1	My	16	13	2	Je	14	66	4	Ji	14	19	5	An	12	72
4519	1475	1840	26M	8998	10:0684	16:902	1418	3	Ap	5	97	5	My	5	50	7	Je	4	03	1	Ji	3	56	3	An	2	09
4520	1476	1841	27M	1585	28:7023	14:035	1419	2	Ap	24	87	4	My	24	40	5	Je	22	93	7	Ji	22	46	1	An	20	99
4521	1477	1842	26M	4173	17:8106	10:193	1420	7	Ap	13	23	1	My	12	76	3	Je	11	29	4	Ji	10	83	6	An	9	36
4522	1478	1843	26M	6761	6:9189	6:850	1421	4	Ap	2	60	6	My	2	13	7	My	81	66	2	Je	30	19	5	An	28	25
4523	1479	1844	26M	9348	25:5578	4:483	1422	8	Ap	21	50	5	My	21	08	6	Je	19	53	1	Ji	19	09	2	An	17	62
4524	1480	1845	27M	1886	14:6660	0:640	1423	7	Ap	10	87	2	My	10	48	3	Je	8	93	5	Ji	8	46	8	An	6	99
4525	1481	1846	26M	4523	3:7743	24:352	1424	5	Mr	30	23	6	Ap	28	76	1	My	28	29	4	Ji	26	85	5	An	24	89
4526	1482	1847	26M	7111	22:4132	22:495	1425	4	Ap	18	18	5	My	17	66	7	Je	16	19	1	Ji	15	72	3	An	14	25
4527	1483	1848	26M	9698	11:5215	18:644	1426	1	Ap	7	50	3	My	7	08	4	Je	5	53	6	Ji	5	09	7	An	3	62
4528	1484	1849	27M	2286	0:6298	14:800	1427	5	Mr	27	86	1	My	25	93	3	Je	24	46	4	Ji	23	93	6	An	22	52
4529	1485	1850	26M	4878	19:2687	12:983	1428	4	Ap	14	76	6	My	14	29	7	Je	12	82	2	Ji	12	85	3	An	10	88
4530	1486	1851	26M	7461	8:3770	9:090	1429	2	Ap	4	18	3	My	3	66	5	Je	2	19	6	Ji	1	72	1	Ji	31	25
4531	1487	1852	27M	0049	27:0159	7:224	1430	1	Ap	23	08	2	My	22	56	4	Je	21	09	5	Ji	20	63	7	An	19	15
4532	1488	1853	27M	2686	16:1242	8:381	1431	5	Ap	12	89	6	My	11	92	1	Je	10	45	2	Ji	9	99	4	An	8	52

N.B.—For tithis by other siddhāntas, add to the above algebraically as follows:—

Sūrya siddhānta—cont.

Āśvina.				Kārttika.				Mārgaśīrsha.				Pauṣa.				A.D.				Māgha.				A.D. Phālguna.				Chaitra.			
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
1 S	11	○	·88	3 O	11	·41	4 N	9	·94	6 D	9	·47	80	1 J	8	·00															
6 Au	31		·25	7 S	29	·78	Mārgaśīrsha Kṣhaya				3 N	27	·84																		
				2 O	29	·31																									
5 S	18	○	·14	6 O	18	·67	1 N	17	·20	2 D	16	·73	82	4 J	15	·27															
2 S	8	○	·51	4 O	8	·04	5 N	6	·57	7 D	6	·10	83	1 J	4	·68															
1 S	27		·41	2 O	26	·94	4 N	25	·47	6 D	25	·00	84	7 J	23	○	55														
5 S	15		·77	7 O	15	·81	1 N	13	·84	3 D	13	·37	85	4 J	11	○	·90														
3 S	5		·14	4 O	4	·67	6 N	3	·20	7 D	2	·73	86	2 J	1	○	·28														
2 S	24		·04	3 O	23	·57	5 N	22	·10	6 D	21	●	87	1 J	20	·16															
6 S	13		·41	7 O	12	·94	2 N	11	○	·47	4 D	11	●	88	5 J	9	·53														
3 S	1		·77	5 O	1	·30	6 O	30	○	83	1 N	29	·37																		
2 S	20		·67	4 O	20	·20	5 N	18	·73	7 D	18	·26	90	1 J	16	·79															
7 S	10		·04	1 O	9	●	57	3 N	8	·10	4 D	7	·63	91	6 J	6	·16														
5 S	28		·94	7 O	28	·47	2 N	27	·00	3 D	26	·53	92	5 J	25	·06															
3 S	17		·30	4 O	16	·83	6 N	15	·36	7 D	14	·89	93	2 J	13	·43															
7 S	6		·67	2 O	6	·20	3 N	4	·73	5 D	4	·26	94	6 J	2	·79															
6 S	25		·57	1 O	25	·10	2 N	23	·63	4 D	23	·16	95	5 J	21	·69															
3 S	14		·98	5 O	14	·47	7 N	13	·00	1 D	12	○	·53	96	3 J	11	·06														
1 S	3		·80	2 O	2	·83	4 N	1	·36	5 N	30	○	80	7 D	30	·42															
7 S	22		·20	1 O	21	·78	3 N	20	·26	4 D	19	·79	98	6 J	18	·32															
4 S	11		·57	6 O	11	○	10	7 N	9	●	63	2 D	9	·16	99	3 J	7	·69													
1 Au	31		·93	3 S	30	·46	Pauṣa Kṣhaya				6 N	28	·53	14	1 D	28	·06														
				4 O	29	·99																									
7 S	18	○	·63	2 O	18	·36	3 N	16	·89	5 D	16	·42	01	6 J	14	·95															
5 S	8	●	·20	6 O	7	·73	1 N	6	·26	2 D	5	·79	02	4 J	4	·32															
4 S	27		·10	5 O	26	·63	7 N	25	·16	1 D	24	·69	03	3 J	23	○	·22														
1 S	16		·46	2 O	15	·99	4 N	14	·52	6 D	14	·05	04	7 J	12	○	·59														
5 S	4		·88	7 O	4	·36	1 N	2	·89	3 D	2	·42																			
4 S	28		·73	6 O	23	·26	7 N	21	○	·79	2 D	21	·32	06	3 J	19	·85														
2 S	18		·09	3 O	12	·63	5 N	11	○	·16	6 D	10	·69	07	1 J	9	·22														
6 S	2		·46	7 O	1	·99	2 O	31	○	·52	4 N	30	·05																		
5 S	20		·36	6 O	19	●	89	1 N	18	·42	2 D	17	·95	09	4 J	16	·48														
2 S	9		·73	4 O	8	●	26	5 N	7	·79	7 D	7	·32	10	1 J	5	·85														
1 S	28		·62	3 O	28	·15	4 N	26	·69	6 D	26	·22	11	7 J	24	·75															
5 S	17		·99	7 O	17	·52	2 N	16	·05	3 D	15	·58	12	5 J	14	·11															
3 S	6		·36	4 O	5	·89	6 N	4	·42	7 D	3	·95	13	2 J	2	·49															
2 S	25		·26	3 O	24	·79	5 N	23	·32	6 D	22	○	·85	14	1 J	21	·88														
6 S	14		·62	1 O	14	·15	2 N	12	·68	4 D	12	○	·21	15	5 J	10	·75														
3 S	3		·99	5 O	3	·52	7 N	2	·05	1 D	1	·58																			
2 S	21		·89	4 O	21	○	42	5 N	19	·95	7 D	19	·48	17	2 J	18	·01														
7 S	11		·25	1 O	10	○	79	3 N	9	·32	4 D	8	·85	18	6 J	7	·38														
4 Au	31		·62	6 S	30	·15	Phālguna				2 N	28	·21	3 D	27	·74															
				7 O	29	·68																									
8 S	19		·52	5 O	19	·05	6 N	17	·58	1 D	17	·11	20	2 J	15	·64															
7 S	7	●	·89	2 O	7	·42	3 N	5	·95	5 D	5	·48	21	7 J	4	·01															
6 S	26		·78	1 O	26	·31	2 N	24	·85	4 D	24	·38	22	5 J	22	○	·91														
4 S	18		·15	5 O	15	·68	7 N	14	·21	1 D	13	·74	23	3 J	12	·27															
1 S	5		·52	3 O	5	·05	4 N	3	·58	6 D	3	○	·11	24	7 J	1	·64														
7 S	28		·42	1 O	22	·95	3 N	21	○	·48	5 D	21	·01	25	6 J	19	·54														
4 S	12		·78	6 O	12	·31	7 N	10	○	·84	2 D	10	·37	26	3 J	8	·91														
2 S	2		·15	3 O	1	·68	5 O	31	○	·21	6 N	29	·74																		
1 S	21		·05	2 O	20	·58	4 N	19	·11	5 D	18	·64	28	7 J	17	·17															
5 S	9	○	·42	6 O	8	●	95	1 N	7	·48	3 D	7	·01	29	4 J	5	·54														
4 S	28		·31	5 O	27	·84	7 N	26	·37	1 D	25	·90	30	3 J	24	·48															
1 S	17		·68	3 O	17	·21	4 N	15	·74	6 D	15	·27	31	7 J	13	·80															
6 S	7		·05	7 O	6	·58	2 N	5	·11	3 D	4	·64	32	5 J	3	○	·17														

(1) for Ārya siddhānta +·08; (2) for Brahma siddhānta —·08; and (3) for Siddhānta Śīromani —·02.

TABLE II.—

Kaliruga.	Vikrama era.	Śaka era.	Month and day A.D.	Fraction of day.	First new-moon in solar year.	Anomaly of first new moon	Christian era.	Vaiśākha.			Jyeshṭha.			Āṣaḍha.			Śrāvana.			Bhādrapada.		
								Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
A.D.																						
4533	1489	1354	26M	·5224	5·2325	27·093	1432	2 Mr	31	·76	4 Ap	30	·29	{ 5 My 29 7 Je 28	·82	1 Jl	27	·84	3 Au	26	·41	
4534	1490	1355	26M	·7811	23·8714	25·226	1433	1 Ap	19	·66	3 My	19	·19	4 Je 17	·72	6 Jl	17	·26	7 Au	15	·78	
4535	1491	1356	27M	·0399	12·9797	21·383	1434	6 Ap	9	·03	7 My	8	·56	2 Je 7	·09	3 Jl	6	·62	5 Au	5	15	
4536	1492	1357	27M	·2986	2·0880	17·541	1435	3 Mr	29	·39	{ 4 Ap 27 6 My 27	·92	7 Je 25	·98	2 Jl	25	·51	4 Au	24	·05		
4537	1493	1358	26M	·5574	20·7269	15·674	1436	2 Ap	16	·29	3 My	15	·82	5 Je 14	·85	6 Jl	13	·88	1 Au	12	·41	
4538	1494	1359	26M	·8162	9·8352	11·831	1437	6 Ap	5	·66	1 My	5	·19	2 Je 3	·72	4 Jl	3	·25	5 Au	1	·78	
4539	1495	1360	27M	·0749	28·4741	9·864	1438	5 Ap	24	·55	7 My	24	·09	1 Je 22	·62	3 Jl	22	·15	4 Au	20	·68	
4540	1496	1361	27M	·3337	17·5824	6·122	1439	2 Ap	13	·92	4 My	13	·15	5 Je 11	·98	7 Jl	11	·51	2 Au	10	·04	
4541	1497	1362	26M	·5924	6·6907	2·279	1440	7 Ap	2	·29	1 My	1	81	8 My 31	·85	{ 4 Je 29 6 Jl 29	·88	7 Au	27	·94		
4542	1498	1363	26M	·8512	25·3295	0·412	1441	6 Ap	21	·19	7 My	20	·72	2 Je 19	·25	3 Jl	18	·78	5 Au	17	·31	
4543	1499	1364	27M	·1099	14·4378	24·124	1442	3 Ap	10	·55	5 My	10	·03	6 Je 8	·61	1 Jl	8	·15	2 Au	6	·68	
4544	1500	1365	27M	·3687	3·5481	20·281	1443	7 Mr	30	·92	2 Ap	29	·45	{ 3 My 28 5 Je 27	·98	7 Jl	27	·04	1 Au	25	·57	
4545	1501	1366	26M	·6275	22·1850	18·414	1444	6 Ap	17	·82	1 My	17	·35	2 Je 15	·88	4 Jl	15	·41	5 Au	13	·94	
4546	1502	1367	26M	·8862	11·2933	14·572	1445	4 Ap	7	·18	5 My	6	·71	7 Je 5	·25	1 Jl	4	·78	3 Au	3	·81	
4547	1503	1368	27M	·1450	0·4016	10·729	1446	{ 1 Mr 27 3 Ap 26	·55	4 My	25	·61	6 Je 24	·14	7 Jl	23	·67	2 Au	22	·20		
4548	1504	1369	27M	·4037	19·0405	8·862	1447	7 Ap	15	·45	1 My	14	·98	8 Je 13	·51	5 Jl	13	·04	6 Au	11	·57	
4549	1505	1370	26M	·6625	8·1488	5·019	1448	4 Ap	3	·82	6 My	3	·35	7 Je 1	·88	2 Jl	1	·41	{ 3 Ji 30 5 Au 29	·94	·47	
4550	1506	1371	26M	·9212	26·7877	3·153	1449	3 Ap	22	·71	5 My	22	24	6 Je 20	·77	1 Jl	20	·81	2 Au	18	·84	
4551	1507	1372	27M	·1800	15·8960	26·864	1450	1 Ap	12	·08	2 My	11	·61	4 Je 10	·14	5 Jl	9	·67	7 Au	8	·20	
4552	1508	1373	27M	·4387	5·0043	23·022	1451	5 Ap	1	·45	6 Ap	30	·98	{ 1 My 30 3 Je 29	·51	4 Jl	28	·57	6 Au	27	·10	
4553	1509	1374	26M	·6975	23·6132	21·155	1452	4 Ap	19	·35	5 My	18	·88	7 Je 17	·41	1 Jl	16	·94	3 Au	16	·47	
4554	1510	1375	26M	·9563	12·7515	17·312	1453	1 Ap	8	·71	3 My	8	·24	4 Je 6	·77	6 Jl	6	·30	7 Au	4	·83	
4555	1511	1376	27M	·2150	1·8598	18·469	1454	6 Mr	29	·08	{ 7 Ap 27 2 My 27	·61	3 Je 25	·67	5 Jl	25	·20	6 Au	23	·73		
4556	1512	1377	27M	·4738	20·4987	11·603	1455	4 Ap	16	·98	6 My	16	·51	1 Je 15	·04	2 Jl	14	·57	4 Au	13	·10	
4557	1513	1378	26M	·7325	9·0070	7·760	1456	2 Ap	5	·34	3 My	4	·87	5 Je 3	41	6 Jl	2	·94	1 Au	1	·47	
4558	1514	1379	26M	·9913	28·2459	5·893	1457	1 Ap	24	·24	2 My	23	·77	4 Je 22	·30	5 Jl	21	·83	7 Au	20	·86	
4559	1515	1380	27M	·2500	17·3542	2·050	1458	5 Ap	13	·61	7 My	13	·14	1 Je 11	·07	3 Ji	11	·20	4 Au	9	·78	
4560	1516	1381	27M	·5088	6·4625	25·762	1459	2 Ap	2	·98	4 My	2	·51	6 Je 1	·04	{ 7 Je 30 2 Ji 30	·57	3 Au	28	·63		
4561	1517	1382	26M	·7676	25·1013	23·898	1460	1 Ap	20	·87	3 My	20	·40	4 Je 18	·93	6 Ji	18	·47	1 Au	17	·00	
4562	1518	1383	27M	·0253	14·2096	20·053	1461	6 Ap	10	·24	7 My	9	·77	2 Je 8	·30	3 Ji	7	·83	5 Au	6	·36	
4563	1519	1384	27M	·2851	3·3179	16·210	1462	3 Mr	30	·61	5 Ap	29	·14	{ 6 My 28 1 Je 27	·67	2 Ji	26	·73	4 Au	25	·26	
4564	1520	1385	27M	·5438	21·9588	14·343	1463	2 Ap	18	·51	4 My	18	·04	5 Je 16	·57	7 Ji	16	·10	1 Au	14	·63	
4565	1521	1386	26M	·8026	11·0651	10·501	1464	6 Ap	6	·87	1 My	6	·40	2 Je 4	·93	4 Ji	4	·46	5 Au	2	·99	
4566	1522	1387	27M	·0613	0·1734	6·658	1465	5 Ap	25	·77	7 My	25	·39	1 Je 23	·83	3 Ji	23	·88	4 Au	21	·89	
4567	1523	1388	27M	·3201	18·8123	4·791	1466	3 Ap	15	·15	4 My	14	·67	6 Je 13	·20	7 Ji	12	73	2 Au	11	·26	
4568	1524	1389	27M	·5789	7·9206	0·948	1467	7 Ap	4	·50	2 My	4	·03	3 Je 2	·56	5 Ji	2	·09	{ 6 Ji 31 1 Au 30	·63	·16	
4569	1525	1390	26M	·8376	26·5595	26·636	1468	6 Ap	22	·10	7 My	21	·93	2 Je 20	46	3 Ji	19	·99	5 Au	18	·52	
4570	1526	1391	27M	·0964	15·6878	22·793	1469	3 Ap	11	·77	5 My	11	·80	6 Je 9	·83	1 Ji	8	·36	2 Au	7	·89	
4571	1527	1392	27M	·3551	4·7761	18·951	1470	1 Ap	1	·14	2 Ap	30	·67	{ 4 My 30 5 Je 28	·73	7 Ji	28	28	1 Au	26	·79	
4572	1528	1393	27M	·6139	23·4150	17·084	1471	7 Ap	20	·03	1 My	19	·56	3 Je 18	·09	4 Ji	17	·62	6 Au	16	·16	
4573	1529	1394	26M	·8726	12·5233	13·241	1472	4 Ap	8	·40	5 My	7	·93	7 Je 6	46	1 Ji	5	·69	3 Au	4	·52	
4574	1530	1395	27M	·1314	1·6316	9·398	1473	1 Mr	28	·77	{ 8 Ap 27 4 My 26	·30	6 Je 25	·86	7 Ji	24	·89	2 Au	23	·42		
4575	1531	1396	27M	·3901	20·2705	7·532	1474	7 Ap	16	·67	2 My	16	·20	3 Je 14	·73	5 Ji	14	·26	6 Au	12	·79	
4576	1532	1397	27M	·6489	9·3788	3·689	1475	5 Ap	6	·03	6 My	5	·56	1 Je 4	·09	2 Ji	3	·62	4 Au	2	·15	
4577	1533	1398	26M	·9077	28·0176	1·822	1476	3 Ap	23	·93	5 My	23	46	6 Je 21	·99	1 Ji	21	·52	3 Au	20	·06	
4578	1534	1399	27M	·1654	17·1259	25·534	1477	1 Ap	13	·30	2 My	12	83	4 Je 11	·36	6 Ji	10	·69	7 Au	9	·42	
4579	1535	1400	27M	·4252	6·2342	21·691	1478	5 Ap	2	·66	7 My	2	·19	1 My 31	·72	{ 8 Je 30 4 Ji 29	·25	6 Au	28	·31		
4580	1536	1401	27M	·6839	24·8781	19·825	1479	4 Ap	21	·56	6 My	21	·09	7 Je 19	·62	2 Ji	19	15	3 Au	17	·66	
4581	1537	1402	26M	·9427	13·9814	15·982	1480	1 Ap	9	·98	3 My	9	46	4 Je 7	·99	6 Ji	7	·52	1 Au	6	·05	
4582	1538	1403	27M	·2014	3·0897	12·139	1481	6 Mr	30	·30	7 Ap	28	·83	{ 2 My 28 8 Je 26	·86	5 Ji	26	42	6 Au	24	·95	
4583	1539	1404	27M	·4602	21·7286	10·272	1482	5 Ap	18	·19	6 My	17	·72	1 Je 16	·25	2 Ji	15	·78	4 Au	14	·81	
4584	1540	1405	27M	·7190	10·8869	6·430	1483	2 Ap	7	·56	4 My	7	·09	5 Je 5	·62	7 Ji	5	15	1 Au	3	·68	
4585	1541	1406	26M	·9777	29·4758	4·568	1484	1 Ap	25	·46	2 My	24	·99	4 Je 23	·52	6 Ji	23	·05	7 Au	21	·58	

N.B.—For this by other siddhāntas add to the above algebraically as follows :—

Sūrya siddhānta—cont.

Āśvina.				Kārttika.				Mārgaśīrsha.				Pauṣa.				A.D.	Māgha.				A.D.	Phālguna.				Chaitra.			
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.		Week-day.	Month.	Day.	Fraction.		Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
4 S	24		94 6 0	24	47	1 N	23	01	2 D	22	54	33	4 Jr	21	07		5 F	19	60	7 Mr	21	13							
2 S	14		81 3 0	13	84	5 N	12	37	6 D	11	90	34	1 Jr	10	43		2 F	8	96	4 Mr	10	40							
6 S	8		68 1 0	8	21	2 N	1	74	4 D	1	27		5 D	30	80	35	7 Jr	29	33	1 F	27	86							
5 S	22		58 7 0	22	11	1 N	20	94	3 D	20	17	36	4 Jr	18	70		6 F	17	23	7 Mr	17	76							
2 S	10		94 4 0	10	47	6 N	9	00	7 D	8	53	37	2 Jr	7	07		3 F	5	60	5 Mr	7	13							
7 Au	31		81 1 8	29	84	4 N	27	90	6 D	27	43	38	7 Jr	25	96		2 F	24	49	4 Mr	26	02							
6 S	18		21 7 0	18	74	2 N	17	27	3 D	16	80	39	5 Jr	15	83		6 F	13	86	1 Mr	15	39							
3 S	8		57 5 0	8	11	6 N	6	64	1 D	6	17	40	2 Jr	4	70		4 F	8	23	5 Mr	3	76							
2 S	26		47 4 0	26	00	5 N	24	53	7 D	24	06	41	1 Jr	22	59		3 F	21	13	4 Mr	22	66							
6 S	15		84 1 0	15	37	2 N	13	90	4 D	13	43	42	5 Jr	11	96		7 F	10	49	2 Mr	12	02							
4 S	5		21 5 0	4	74	7 N	3	27	1 D	2	80	43	3 Jr	1	83		4 Jr	30	86	6 Mr	1	39							
3 S	24		10 4 0	23	63	6 N	22	17	7 D	21	70	44	2 Jr	20	28		3 F	18	76	5 Mr	19	20							
7 S	12		47 2 0	12	00	3 N	10	53	5 D	10	06	45	6 Jr	8	59		1 F	7	12	2 Mr	8	65							
4 S	1		84 6 0	1	37	7 O	30	90	2 N	29	43		3 D	28	96	46	5 Jr	27	19	7 F	28	02							
3 S	20		73 5 0	20	27	6 N	18	80	1 D	18	33	47	2 Jr	16	86		4 F	15	39	5 Mr	16	92							
1 S	10		10 2 0	9	63	4 N	8	16	5 D	7	69	48	7 Jr	6	22		1 F	4	76	3 Mr	5	29							
7 S	28		00 1 0	27	53	3 N	26	06	4 D	25	59	49	6 Jr	24	12		7 F	22	65	2 Mr	24	18							
4 S	17		37 5 0	16	90	7 N	15	43	1 D	14	96	50	3 Jr	13	49		5 F	12	02	6 Mr	13	55							
1 S	6		73 3 0	6	26	4 N	4	79	6 D	4	33	51	7 Jr	2	86		2 F	1	39	3 Mr	2	92							
7 S	25		63 2 0	25	16	3 N	23	69	5 D	23	22	52	6 Jr	21	75		1 F	20	28	2 Mr	20	81							
5 S	14		00 6 0	13	53	1 N	12	06	2 D	11	59	53	4 Jr	10	12		5 F	8	65	7 Mr	10	18							
2 S	3		37 8 0	2	90	5 N	1	43	6 N	30	96		1 D	30	49	54	3 Jr	29	02	4 F	27	55							
1 S	22		26 2 0	21	79	4 N	20	32	5 D	19	85	55	7 Jr	18	39		1 F	16	92	3 Mr	18	45							
5 S	11		63 7 0	11	16	1 N	9	69	3 D	9	22	56	4 Jr	7	75		6 F	6	28	7 Mr	6	61							
3 Au	31		00 4 8	29	53	7 N	27	59	2 D	27	12	57	3 Jr	25	65		5 F	24	18	6 Mr	25	71							
1 S	18		89 3 0	18	43	4 N	16	96	6 D	16	49	58	1 Jr	15	02		2 F	13	65	4 Mr	15	08							
6 S	8		26 7 0	7	79	2 N	6	32	3 D	5	85	59	5 Jr	4	38		6 F	2	91	1 Mr	4	45							
5 S	27		16 6 0	26	69	1 N	25	22	2 D	24	75	60	4 Jr	23	28		5 F	21	81	7 Mr	22	84							
2 S	15		53 4 0	15	06	5 N	13	59	7 D	13	12	61	1 Jr	11	65		3 F	10	18	4 Mr	11	71							
6 S	4		89 1 0	4	42	2 N	2	95	4 D	2	49	62	6 Jr	1	02		7 Jr	30	55	2 Mr	1	08							
5 S	23		79 7 0	23	32	1 N	21	85	3 D	21	38	63	4 Jr	19	91		6 F	18	44	7 Mr	19	97							
3 S	13		16 4 0	12	69	6 N	11	22	7 D	10	75	64	2 Jr	9	28		3 F	7	81	5 Mr	8	84							
7 S	1		53 2 0	1	06	3 O	30	59	5 N	29	12		6 D	28	65	65	1 Jr	27	18	2 F	25	71							
6 S	20		42 7 0	19	95	2 N	18	48	4 D	18	01	66	5 Jr	16	55		7 F	15	08	1 Mr	16	61							
3 S	9		79 5 0	9	32	6 N	7	85	1 D	7	38	67	2 Jr	5	91		4 F	4	44	5 Mr	5	97							
2 S	28		69 4 0	28	22	5 N	26	75	7 D	26	28	68	1 Jr	24	81		3 F	23	84	4 Mr	23	87							
7 S	17		05 1 0	16	58	3 N	15	11	4 D	14	64	69	6 Jr	13	17		7 F	11	70	2 Mr	13	23							
4 S	6		42 5 0	5	95	7 N	4	48	2 D	4	01	70	3 Jr	2	54		5 F	1	07	6 Mr	2	60							
3 S	25		32 4 0	24	85	6 N	23	38	7 D	22	91	71	2 Jr	21	44		3 F	19	97	5 Mr	21	50							
7 S	14		89 2 0	14	22	3 N	12	75	5 D	12	28	72	6 Jr	10	81		1 F	9	84	2 Mr	9	87							
5 S	3		05 6 0	2	58	1 N	1	11	2 N	30	64		4 D	30	17	73	5 Jr	28	70	7 F	27	23							
3 S	21		95 5 0	21	48	7 N	20	01	1 D	19	54	74	3 Jr	18	07		4 F	16	60	6 Mr	18	13							
1 S	11		32 2 0	10	85	4 N	9	38	5 D	8	91	75	7 Jr	7	44		1 F	5	97	8 Mr	7	50							
5 Au	31		68 1 0	29	74	3 N	28	27	4 D	27	81		6 Jr	26	33	76	6 Jr	26	33	2 Mr	25	39							
7 S	30		21 1 0	29	74	3 N	28	27	4 D	27	81		7 F	24	86		7 F	24	86	2 Mr	25	39							
4 S	18		58 6 0	18	11	7 N	16	64	2 D	16	17	77	3 Jr	14	70		5 F	13	23	6 Mr	14	76							
1 S	7		95 3 0	7	48	5 N	6	01	6 D	5	54	78	1 Jr	4	07		2 F	2	60	4 Mr	4	13							
7 S	26		84 2 0	26	37	3 N	24	90	5 D	24	43	79	6 Jr	22	96		1 F	21	49	3 Mr	23	02							
5 S	16		21 6 0	15	74	1 N	14	27	2 D	13	80	80	4 Jr	12	33		5 F	10	86	7 Mr	11	39							
2 S	4		58 4 0	4	11	5 N	2	64	7 D	2	17		1 D	31	70	81	3 Jr	30	23	4 F	28	76							
1 S	23		48 3 0	23	01	4 N	21	54	6 D	21	07	82	7 Jr	19	60		2 F	18	18	3 Mr	19	66							
5 S	12		85 7 0	12	38	1 N	10	91	3 D	10	44	83	4 Jr	8	97		6 F	7	50	1 Mr	9	03							
3 S	2		21 4 0	1	74	6 O	31	27	7 N	29	80		2 D	29	83	84	3 Jr	27	86	5 F	26	39							
2 S	20		11 8 0	19	64	5 N	18	17	6 D	17	70	85	1 Jr	16	23		2 F	14	76	4 Mr	16	29							

(1) for Ārya siddhānta +04; (2) for Brahma siddhānta -09; and (3) for Siddhānta Śirōmaṇi -02.

TABLE II.—

Kaliyuga	Vikrama era.	Saka era.	Month and day A.D.	Fraction of day.	First new moon in solar year.	Anomaly of first new moon.	Christian era.	Vaiśākha.			Jyeshtha.			Āshāḍha.			Śrāvaṇa.			Bhādrapada.		
								Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.
							A.D.															
4586	1542	1407	27M	2365	185841	0.720	1485	5	Ap	14	.83	7	My	14	.36	1	Je	12	.89	3	Ji	12
4587	1543	1408	27M	4952	76924	24.432	1486	8	Ap	4	.19	4	My	3	.72	6	Je	2	.25	7	Ji	1
4588	1544	1409	27M	7540	268313	22.565	1487	2	Ap	23	.09	3	My	22	.62	5	Je	21	.15	6	Ji	31
4589	1545	1410	27M	0127	154896	18.722	1488	6	Ap	11	.46	7	My	10	.99	2	Je	9	.52	4	Ji	9
4590	1546	1411	27M	2715	45479	14.880	1489	3	Mr	31	.82	5	Ap	30	.35	6	My	29	.88	2	Ji	27
4591	1547	1412	27M	5308	231868	13.013	1490	2	Ap	19	.72	4	My	19	.25	5	Je	17	.78	7	Ji	17
4592	1548	1413	27M	7890	122951	9.173	1491	7	Ap	9	.09	1	My	8	.62	3	Je	7	.15	4	Ji	6
4593	1549	1414	27M	0478	14034	5.327	1492	4	Mr	28	.46	7	My	26	.52	2	Je	25	.05	3	Ji	24
4594	1550	1415	27M	3065	260423	3.461	1493	3	Ap	16	.85	4	My	15	.88	6	Je	14	.41	7	Ji	13
4595	1551	1416	27M	5653	91506	27.173	1494	7	Ap	5	.72	2	My	5	.25	3	Je	3	.78	5	Ji	3
4596	1552	1417	27M	8240	277894	25.306	1495	6	Ap	24	.62	1	My	24	.15	2	Je	22	.69	4	Ji	22
4597	1553	1418	27M	0828	168977	21.463	1496	3	Ap	12	.98	5	My	12	.52	7	Je	1	.05	1	Ji	10
4598	1554	1419	27M	3415	60080	17.620	1497	1	Ap	2	.35	2	My	1	.88	4	My	31	.41	5	Je	29
4599	1555	1420	27M	6003	246449	15.754	1498	7	Ap	21	.25	1	My	20	.78	3	Je	19	.31	4	Ji	18
4600	1556	1421	27M	8591	137532	11.911	1499	4	Ap	10	.62	6	My	10	.15	7	Je	8	.68	2	Ji	8
4601	1557	1422	27M	1178	28615	8.068	1500	1	Mr	29	.98	5	My	28	.51	6	Je	26	.57	1	Ji	26
4602	1558	1423	27M	3766	215004	6.201	1501	7	Ap	17	.88	2	My	17	.41	3	Je	15	.94	5	Ji	15
4603	1559	1424	27M	6353	106087	2.859	1502	5	Ap	7	.24	6	My	6	.77	1	Je	5	.30	2	Ji	4
4604	1560	1425	27M	8941	292476	0.492	1503	4	Ap	26	.14	5	My	25	.67	7	Je	24	.20	1	Ji	23
4605	1561	1426	27M	1528	183556	24.204	1504	1	Ap	14	.51	3	My	14	.04	4	Je	12	.57	6	Ji	12
4606	1562	1427	27M	4118	74642	20.361	1505	5	Ap	3	.88	7	My	3	.41	1	Je	1	.94	8	Ji	1
4607	1563	1428	27M	6704	261031	18.494	1506	4	Ap	22	.77	6	My	22	.30	7	Je	20	.83	2	Ji	20
4608	1564	1429	27M	9291	152114	14.651	1507	2	Ap	12	.14	3	My	11	.67	5	Je	10	.20	6	Ji	9
4609	1565	1430	27M	1879	43197	10.809	1508	6	Mr	31	.51	1	Ap	30	.04	2	My	29	.57	5	Ji	27
4610	1566	1431	27M	4466	229586	8.942	1509	5	Ap	19	.40	6	My	18	.94	1	Je	17	.47	3	Ji	17
4611	1567	1432	27M	7054	120669	5.099	1510	2	Ap	8	.77	4	My	8	.30	5	Je	6	.83	7	Ji	6
4612	1568	1433	27M	9641	11752	1.256	1511	7	Mr	29	.14	3	My	27	.20	4	Je	25	.73	6	Ji	25
4613	1569	1434	27M	2229	198141	26.944	1512	6	Ap	16	.04	7	My	15	.57	2	Je	14	.10	3	Ji	13
4614	1570	1435	27M	4816	89224	23.101	1513	3	Ap	5	.40	4	My	4	.93	6	Je	3	.46	1	Ji	3
4615	1571	1436	27M	7404	275612	21.235	1514	2	Ap	24	.30	3	My	23	.88	5	Je	22	.36	6	Ji	21
4616	1572	1437	27M	9992	166695	17.392	1515	6	Ap	13	.67	1	My	13	.20	2	Je	11	.73	4	Ji	11
4617	1573	1438	27M	2579	57778	13.549	1516	4	Ap	2	.04	5	My	1	.57	7	My	31	.10	1	Je	29
4618	1574	1439	27M	5167	244167	11.682	1517	2	Ap	20	.93	4	My	20	.46	5	Je	18	.99	7	Ji	18
4619	1575	1440	27M	7754	136250	7.840	1518	7	Ap	10	.30	1	My	9	.82	3	Je	8	.86	4	Ji	7
4620	1576	1441	28M	0342	26333	3.997	1519	4	Mr	30	.67	6	Ap	29	.20	2	Je	27	.26	3	Ji	26
4621	1577	1442	27M	2929	212722	2.130	1520	3	Ap	17	.56	5	My	17	.10	6	Je	15	.63	1	Ji	15
4622	1578	1443	27M	5517	103805	25.842	1521	7	Ap	6	.93	2	My	6	.46	3	Je	4	.99	5	Ji	4
4623	1579	1444	27M	8105	290194	23.975	1522	5	Mr	27	.30	1	My	25	.36	2	Je	23	.89	4	Ji	23
4624	1580	1445	28M	0692	181277	20.133	1523	4	Ap	15	.20	5	My	14	.78	7	Je	13	.26	1	Ji	12
4625	1581	1446	27M	3280	72360	16.290	1524	1	Ap	3	.56	3	My	3	.09	4	Je	1	.62	6	Ji	1
4626	1582	1447	27M	5867	258749	14.423	1525	7	Ap	22	.46	2	My	22	.00	3	Je	20	.52	5	Ji	20
4627	1583	1448	27M	8455	149832	10.580	1526	4	Ap	11	.83	6	My	11	.36	7	Je	9	.89	2	Ji	9
4628	1584	1449	28M	1042	40915	6.738	1527	2	Ap	1	.20	3	Ap	30	.73	5	My	30	.29	1	Ji	28
4629	1585	1450	27M	3680	227304	4.871	1528	1	Ap	19	.09	2	My	19	.62	4	Je	17	.15	5	Ji	16
4630	1586	1451	27M	6218	118387	1.028	1529	5	Ap	8	.46	6	My	7	.99	1	Je	6	.52	3	Ji	6
4631	1587	1452	27M	8805	09470	24.740	1530	2	Mr	28	.83	5	My	26	.89	7	Je	25	.42	1	Ji	24
4632	1588	1453	28M	1393	195858	22.873	1531	1	Ap	16	.72	3	My	16	.26	4	Je	14	.79	6	Ji	14
4633	1589	1454	27M	3980	86941	19.030	1532	6	Ap	5	.09	7	My	4	.62	2	Je	3	.15	3	Ji	2
4634	1590	1455	27M	6568	273330	17.165	1533	4	Ap	23	.99	6	My	23	.52	1	Je	22	.05	2	Ji	21
4635	1591	1456	27M	9155	164413	13.321	1534	2	Ap	13	.36	3	My	12	.89	5	Je	11	.42	6	Ji	10
4636	1592	1457	28M	1743	55498	9.478	1535	6	Ap	2	.72	1	My	2	.25	2	My	31	.78	4	Ji	30
4637	1593	1458	27M	4330	241885	7.611	1536	5	Ap	20	.62	7	My	20	.15	1	Je	18	.68	3	Ji	18
4638	1594	1459	27M	6918	132968	3.769	1537	2	Ap	9	.99	4	My	9	.52	6	Je	8	.05	7	Ji	7

N.B.—For tithis by other siddhāntas add to the above algebraically as follows :—

Sūrya siddhānta—cont.

Āśvina.				Kārttika.				Mārgaśīrsha.				Pauṣa.				A.D. Māgha.				A.D. Phālguna.				Chaitra.													
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.										
6 S	9●	48	1 0 9	01	2 N	7	54 4 D 7	07	86	5 Jr	5	60	7 F	4○	13	1 Mr	5●	66	5 S	28	37	6 0 27	90	1 N	26	43 2 D 25	96	87	4 Jr	24○	40	6 F	23	02	7 Mr	24	55
2 S	17	74	4 0 17	27	5 N	15	80 7 D 15	33	88	1 Jr	13○	86	3 F	12	39	4 Mr	12	92	7 S	6	11	1 0 5	64	3 N	4	17 4 D 3	70	89	6 Jr	2	28	7 Jr	31	76	2 Mr	2	29
6 S	25	00	7 0 24	53	2 N	23○	06 3 D 22●	59	90	5 Jr	21	12	6 F	19	65	1 Mr	21	19	8 S	14	37	4 0 13	90	6 N	12○	43 7 D 11	96	91	2 Jr	10	49	4 F	9	02	5 Mr	10	55
7 S	3	74	2 0 3	27	3 N	1●○	80 5 D 1	33	92	1 Jr	29	86	1 Jr	29	30	2 F	27	92	6 S	21	64	1 0 21●	17	2 N	19	70 4 D 19	23	93	5 Jr	17	76	7 F	16	29	1 Mr	17○	82
4 S	11○	00	5 0 10	53	7 N	9	06 1 D 8	59	94	3 Jr	7	12	4 F	5	65	6 Mr	7○	18	2 S	29	90	4 0 29	43	5 N	27	96 7 D 27	40	95	2 Jr	26	03	3 F	24●	56	5 Mr	26	0
7 S	19	27	1 0 18	80	3 N	17	33 4 D 16	86	96	6 Jr	15○	39	7 F	13●	92	2 Mr	14	45	4 S	7	64	6 0 7	17	7 N	5	70 2 D 5	23	97	3 Jr	3○	76	5 F	2	29	6 Mr	3	82
3 S	26	54	5 0 26	07	6 N	24	60 1 D 24○	13	98	2 Jr	22	66	4 F	21	19	5 Mr	22	72	7 S	15	90	2 0 15	43	3 N	13	96 5 D 13●	49	99	7 Jr	12	02	1 F	10	55	3 Mr	12	09
5 S	5	27	6 0 4	80	1 N	3	33 2 D 2	86	15	4 Jr	1	39	5 Jr	30	92	7 F	29	45	5 S	5	26	5 0 1	43	3 N	13	96 5 D 13●	49	99	7 Jr	12	02	1 F	10	55	3 Mr	12	09
4 S	23	16	5 0 22○	69	7 N	21	22 1 D 20	75	01	3 Jr	19	28	4 F	17	81	6 Mr	19	34	1 S	12	53	3 0 12●○	06	4 N	10	59 6 D 10	12	02	7 Jr	8	65	2 F	7	18	3 Mr	8	71
5 S	1	89	7 0 1●○	42	1 0 30	95	3 N 29	48	04	8 Jr	16	91	6 Jr	27	54	1 F	28	07	6 S	1	89	7 0 1●○	42	1 0 30	95	3 N 29	48	05	1 Jr	5	28	2 F	3○	81	4 Mr	5	34
4 S	20●	79	6 0 20	32	7 N	18	85 2 D 18	38	05	1 Jr	5	28	5 F	15○	44	6 Mr	15	97	2 S	9	16	3 0 8	69	5 N	7	22 6 D 6	75	06	7 Jr	24●○	18	1 F	22	71	3 Mr	24	24
1 S	28	06	2 0 27	59	4 N	26	12 5 D 25	65	07	4 Jr	13●	55	6 F	12	08	7 Mr	13	61	5 S	17	43	6 0 16	96	1 N	15	40 3 D 15	02	08	1 Jr	2	92	3 F	1	45	4 Mr	1	98
6 S	14	06	7 0 13	59	2 N	12●○	12 3 D 11	65	09	7 Jr	20	81	2 F	19	84	3 Mr	20	87	2 S	6	79	4 0 6	32	5 N	4	85 7 D 4○	38	10	5 Jr	10	18	6 F	8	71	1 Mr	10	24
3 S	3	42	4 0 2	96	6 N	1	49 1 D 1	02	12	1 Jr	18	44	4 Jr	29	08	5 F	27	61	2 S	22○	82	3 0 21	85	5 N	20	38 6 D 19	91	13	5 Jr	6	81	2 F	16	98	4 Mr	17○	51
6 S	10○	69	1 0 10	22	2 N	8	75 4 D 8	28	14	4 Jr	25○	71	7 F	5	34	1 Mr	6●○	87	6 S	29	59	7 0 29	12	1 N	27	65 3 D 27	18	15	2 Jr	15○	08	6 F	24	24	7 Mr	25	77
5 S	18	95	4 0 18	48	6 N	17	02 7 D 16	55	16	6 Jr	4●○	44	3 F	13	61	5 Mr	15	14	2 S	18	95	4 0 18	48	6 N	17	02 7 D 16	55	17	5 Jr	22	34	3 F	10	87	1 Mr	22	40
7 S	8	32	1 0 7	85	3 N	6	88 4 D 5	91	18	2 Jr	11	71	4 F	10	24	5 Mr	11	77	6 S	26	22	7 0 25	75	2 N	24	28 3 D 23	81	19	7 Jr	1	08	1 Jr	30	61	3 Mr	1	14
6 S	23	85	1 0 23○	38	2 N	21	91 4 D 21	44	20	5 Jr	19	97	6 F	20	87	1 Mr	22	40	3 S	15	57	5 0 15	12	6 N	13	65 1 D 13●	18	21	5 Jr	19	97	7 F	18	50	2 Mr	19	03
4 S	12	22	5 0 11○	75	7 N	10	28 1 D 9	81	22	3 Jr	8	34	4 F	6	87	6 Mr	8	40	7 S	4	95	2 0 4	48	4 N	3○	01 5 D 2	54	23	6 Jr	16	60	5 F	4○	50	7 Mr	5	03
1 S	1	58	3 0 1	12	Mārgaśīrsha Kshaya	6 N	29	18	24	3 Jr	5	97	4 F	22	40	5 Mr	23	98	6 S	23	85	1 0 23○	38	2 N	21	91 4 D 21	44	25	2 Jr	23	87	4 F	22	40	5 Mr	23	98
7 S	20	48	2 0 20	01	3 N	18	54 5 D 18	07	26	7 Jr	18●	24	1 F	11	77	3 Mr	13	30	4 S	12	22	5 0 11○	75	7 N	10	28 1 D 9	81	27	4 Jr	2	60	6 F	1	13	7 Mr	2	66
4 S	9	85	6 0 9	38	7 N	7	91 2 D 7	44	28	3 Jr	21	50	5 F	20	08	6 Mr	20	56	3 S	27	75	5 0 27	28	6 N	25	81 1 D 25	34	29	7 Jr	9	87	2 F	8	40	3 Mr	9	93
1 S	17	11	2 0 16	64	4 N	15	18 5 D 14○	71	30	5 Jr	11	76	4 F	11	77	3 Mr	13	30	6 S	6	48	7 0 6	01	1 N	4	54 3 D 4○	07	31	4 Jr	18	13	5 F	16	66	7 Mr	18○	19
4 S	25	38	5 0 24	91	7 N	23○	44 1 D 22	97	32	1 Jr	7	50	6 F	1	13	7 Mr	2	66	1 S	13	75	3 0 13	28	4 N	11●	81 6 D 11	34	33	7 Jr	25○	40	1 F	23	93	3 Mr	25	46
1 S	13	75	3 0 13	28	4 N	11●	81 6 D 11	34	34	4 Jr	14○	76	3 F	13	80	7 Mr	14	83	6 S	3	11	7 0 2○	64	2 N	1●	17 3 N 30	70	35	2 Jr	4	13	6 F	2	66	5 Mr	4	19
5 S	22○	01	6 0 21	54	1 N	20	07 2 D 19	60	36	1 Jr	23	03	5 F	20	08	6 Mr	20	56	1 S	26	91	3 0 26	44	4 N	24	97 6 D 24	50	37	5 Jr	11	40	2 F	21	56	4 Mr	23	09
2 S	11○	38	3 0 10	91	5 N	9	44 6 D 8	97	37	5 Jr	11	40	6 F	9	98	1 Mr	11	46	6 S	15	27	7 0 14	80	2 N	13○	84 3 D 12	87	38	4 Jr	30	76	6 F	9	98	1 Mr	11	46
1 S	29	23	2 0 28	81	4 N	27	84 5 D 26	87	39	5 Jr	11	40	6 F	9	98	1 Mr	11	46	3 S	4	64	5 0 4	17	6 N	2○	70 1 D 2	23	40	2 D	31	76	4 Jr	30	29	5 F	28	82

. (1) for Ārya siddhānta + 04; (2) for Brahma siddhānta — 09; and (3) for Siddhānta Śiromaṇi — 02.

Kalivuga.	Vikrama era.	Śaka era.	Month and day A.D.	Com- mence- ment of solar year.	Fraction of day.	First new moon in solar year	Anomaly of first new moon.	Christian era.	Vaiśākha.	Jyeshṭha.	Aśvadhā.	Śrāvaṇa.	Bhādrapada.
									Week-day Month Day.	Fraction. Week-day, Month. Day	Fraction. Week-day, Month. Day	Fraction. Week-day, Month Day	Fraction. Week-day, Month Day.
A.D.													
463	1595	1460	27M	9506	24057	27481	1538	7 Mr 30	36 { 1 Ap 28	89 { 4 Je 26	95 6 Ji 26	48 1 Au 25	01
4610	1596	1461	28M	2003	210440	25614	1539	6 Ap 18	25 7 My 17	78 2 Je 16	81 3 Ji 15	84 5 An 14	38
4641	1597	1462	27M	4681	101523	21771	1540	3 Ap 6	62 5 My 6	15 6 Je 4	68 1 Ji 4	21 2 Au 2	74
4642	1598	1463	27M	7268	87912	19004	1541	2 Ap 25	52 4 My 25	06 5 Je 23	58 7 Ji 23	11 1 Au 21	64
4643	1599	1464	27M	9856	178995	16062	1542	6 Ap 14	88 1 My 14	42 2 Je 12	85 4 Ji 12	48 6 Au 11	01
4644	1600	1465	28M	2443	70078	12219	1543	4 Ap 4	25 5 My 3	78 7 Je 2	31 { 1 Ji 1	84 4 Au 29	90
4645	1601	1466	27M	5031	256467	10352	1544	3 Ap 22	15 4 My 21	68 6 Je 20	21 7 Ji 19	74 2 Au 18	27
4646	1602	1467	27M	7619	147550	6509	1545	7 Ap 11	52 2 My 11	05 3 Je 9	58 5 Ji 9	11 6 Au 7	64
4647	1603	1468	28M	0206	38633	2667	1546	4 Mr 31	88 6 Ap 30	41 { 7 My 29	94 4 Ji 28	01 5 Au 26	54
4648	1604	1469	28M	2794	225022	0800	1547	3 Ap 19	78 5 My 19	31 6 Je 17	84 1 Ji 17	87 2 Au 15	90
4649	1605	1470	27M	5381	116105	24512	1548	1 Ap 8	15 2 My 7	68 4 Je 6	21 5 Ji 5	74 7 Au 4	27
4650	1606	1471	27M	7969	07188	20669	1549	5 Mr 28	52 1 My 26	58 3 Je 25	11 4 Ji 24	84 6 Au 28	17
4651	1607	1472	28M	0556	193576	18802	1550	4 Ap 16	41 5 My 15	94 7 Je 14	47 2 Ji 14	00 3 Au 12	54
4652	1608	1473	28M	3144	84659	14959	1551	1 Ap 5	78 3 My 5	31 4 Je 3	84 6 Ji 3	87 { 7 Au 1	43
4653	1609	1474	27M	5782	271048	13093	1552	7 Ap 23	58 2 My 23	21 3 Je 21	74 5 Ji 21	27 6 Au 19	80
4654	1610	1475	27M	8319	162131	9250	1553	5 Ap 13	04 6 My 12	58 1 Je 11	11 2 Ji 10	64 4 Au 9	17
4655	1611	1476	28M	0907	53214	5407	1554	2 Ap 2	41 3 My 1	04 { 5 My 31	47 { 1 Ji 29	54 3 Au 28	07
4656	1612	1477	28M	3494	239603	3510	1555	1 Ap 21	31 2 My 20	84 4 Je 18	87 5 Ji 18	90 7 Au 17	43
4657	1613	1478	27M	6082	130686	27253	1556	5 Ap 9	68 7 My 9	21 1 Je 7	74 3 Ji 7	27 4 Au 5	80
4658	1614	1479	27M	8669	21769	23430	1557	3 Mr 30	04 { 4 Ap 28	57 7 Je 26	64 2 Ji 26	17 3 Au 24	70
4659	1615	1480	28M	1257	208158	21543	1558	1 Ap 17	94 3 My 17	47 5 Je 16	00 6 Ji 15	53 1 Au 14	06
4660	1616	1481	28M	3844	99241	17700	1559	6 Ap 7	31 7 My 6	84 2 Je 5	87 3 Ji 4	90 5 Au 3	43
4661	1617	1482	27M	6432	285680	15883	1560	5 Ap 25	21 6 My 24	74 1 Je 23	27 2 Ji 22	80 4 Au 21	33
4662	1618	1483	27M	9020	176713	11991	1561	2 Ap 14	57 4 My 14	10 5 Je 12	43 7 Ji 12	16 1 Au 10	70
4663	1619	1484	28M	1607	67796	8148	1562	6 Ap 3	94 1 My 3	47 3 Je 2	00 { 6 Ji 31	06 { 7 Au 29	59
4664	1620	1485	28M	4195	254185	6281	1563	5 Ap 22	84 7 My 22	37 1 Je 20	90 3 Ji 20	43 4 Au 18	96
4665	1621	1486	27M	6782	145268	2438	1564	3 Ap 11	20 4 My 10	73 6 Je 9	27 7 Ji 8	80 2 Au 7	38
4666	1622	1487	27M	9370	36351	26150	1565	7 Mr 31	57 2 Ap 30	10 { 3 My 29	68 6 Ji 27	69 1 An 26	22
4667	1623	1488	28M	1957	222740	24283	1566	6 Ap 19	47 1 My 19	00 2 Je 17	58 4 Ji 17	06 5 Au 15	59
4668	1624	1489	28M	4545	118822	20440	1567	3 Ap 8	84 5 My 8	87 6 Je 6	90 1 Ji 6	43 2 Au 4	96
4669	1625	1490	27M	7133	04905	16598	1568	1 Mr 28	20 4 My 26	26 5 Je 24	79 7 Ji 24	88 1 An 22	86
4670	1626	1491	27M	9720	191294	14731	1569	2 Ap 26	73 1 My 15	68 3 Je 14	16 4 Ji 13	69 6 Au 12	22
4671	1627	1492	28M	2308	82377	10888	1570	7 Ap 16	10 1 My 15	68 3 Je 14	16 4 Ji 13	69 6 Au 12	22
4672	1628	1493	28M	4895	268766	9022	1571	3 Ap 24	87 4 My 23	90 6 Je 22	43 7 Ji 21	96 2 Au 20	49
4673	1629	1494	27M	7483	159849	5179	1572	7 Ap 12	73 2 My 12	26 3 Je 10	79 5 Ji 10	32 6 Au 8	85
4674	1630	1495	28M	0070	50982	1386	1573	5 Ap 2	10 6 My 1	68 { 1 My 31	16 4 Ji 29	22 5 Au 27	75
4675	1631	1496	28M	2658	237321	27024	1574	4 Ap 21	09 5 My 20	53 7 Je 19	08 1 Ji 18	59 3 Au 17	12
4676	1632	1497	28M	5246	128404	23181	1575	1 Ap 10	36 2 My 8	89 4 Je 8	42 5 Ji 7	95 7 Au 6	48
4677	1633	1498	27M	7833	19487	19339	1576	5 Mr 29	73 { 7 Ap 28	26 3 Je 26	32 4 Ji 25	85 6 Au 24	38
4678	1634	1499	28M	0421	205876	17472	1577	4 Ap 17	68 6 My 17	16 7 Je 15	69 2 Ji 15	22 3 Au 18	75
4679	1635	1500	28M	3008	98959	13629	1578	2 Ap 7	00 3 My 6	58 5 Je 5	06 6 Ji 4	59 1 Au 3	12
4680	1636	1501	28M	5596	283348	11762	1579	7 Ap 25	89 2 My 25	42 3 Je 23	95 5 Ji 23	49 7 Au 22	02
4681	1637	1502	27M	8188	174431	7919	1580	5 Ap 14	26 6 My 13	79 1 Je 12	32 2 Ji 11	85 4 Au 10	83
4682	1638	1503	28M	0771	65514	4077	1581	2 Ap 3	63 4 My 3	16 6 Je 1	69 { 7 Ji 1	22 3 Au 29	28
4683	1639	1504	28M	3368	251908	2210	1582	1 Ap 22	53 3 My 22	06 4 Je 20	59 6 Ji 20	12 7 Au 18	65
4684	1640	1505	28M	5946	142886	25922	1583	5 Ap 11	89 7 My 11	42 1 Je 9	95 3 Ji 9	48 5 Au 8	02
4685	1641	1506	27M	8534	34069	22079	1584	3 Mr 31	26 4 Ap 29	79 { 6 My 29	82 2 Ji 27	38 3 Au 25	91
4686	1642	1507	28M	1121	220457	20212	1585	2 Ap 19	16 3 My 18	69 5 Je 17	22 6 Ji 16	75 1 Au 15	28
4687	1643	1508	28M	3709	111540	16370	1586	6 Ap 8	52 1 My 8	05 2 Je 6	59 4 Ji 6	12 5 Au 4	65
4688	1644	1509	28M	6296	02623	12527	1587	3 Mr 28	89 6 My 26	95 1 Je 25	48 3 Ji 25	01 4 Au 23	54
4689	1645	1510	27M	8884	189012	10660	1588	5 Ap 27	42 5 Ap 15	32 5 Je 13	85 7 Ji 13	88 1 Au 11	91
4690	1646	1511	28M	1471	80095	6817	1589	2 Ap 15	16 1 My 4	69 3 Je 3	22 4 Ji 2	75 { 6 Au 1	28
4691	1647	1512	28M	4059	266484	4951	1590	7 Ap 5	05 7 My 23	58 2 Je 22	11 3 Ji 21	65 5 Au 20	18
4692	1648	1513	28M	6647	157567	1108	1591	3 Ap 13	42 4 My 12	95 6 Je 11	48 1 Ji 11	01 2 Au 9	54

N.B.—For tithis by other siddhāntas add to the above algebraically as follows :—

Sūrya siddhānta—cont.

Āśvina.	Kārttika.	Mārgaśīrṣa.	Pauṣa.	A.D.	Māgha.	A.D.	Phālguna.	Chaitra.	
Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction. Week-day. Month. Day.	Fraction	Week-day. Month. Day.	Fraction.	Week-day Month Day.	Fraction Week-day. Month. Day.	Fraction.
2 S 23	·54 4 O 23○	·07 5 N 21	·60 7 D 21	·13	39 1 Jr 19	·66	3 F 18	·19 4 Mr 19	·72
6 S 12	·91 1 O 12●	·44 2 N 10	·97 4 D 10	·50	40 6 Jr 9	·08	7 F 7	·56 2 Mr 8○	·09
{ 4 S 1○	·27 7 O 30	·33 1 N 28	·86	Pauṣa Kṣhaya	3 D 28	·40	41 4 Jr 26	·93 { 6 F 25○	·46
	5 S 30	·80	7 Mr 26					·99	
3 S 20	·17 4 O 19	·70 6 N 18	·23 7 D 17	·76	42 2 Jr 16	·29	3 F 14○	·82 5 Mr 16	·85
7 S 9	·54 2 O 9	·07 8 N 7	·60 5 D 7	·18	43 6 Jr 5	·66	1 F 4	·19 2 Mr. 5	·72
6 S 28	·44 7 O 27	·97 2 N 26	·50 4 D 26○	·03	44 5 Jr 24●	·56	7 F 23	·09 1 Mr 23	·02
3 S 16	·80 5 O 16	·33 6 N 14	·86 1 D 14○	·89	45 2 Jr 12	·92	4 F 11	·45 5 Mr 12	·98
1 S 6	·17 2 O 5	·70 4 N 4	·23 5 D 3●	·76	46 7 Jr 2	·29	1 Jr 31	·82 3 Mr 2	·35
7 S 25	·07 1 O 24	·80 3 N 23●	·18 4 D 22	·66	47 6 Jr 21	·19	7 F 19	·72 2 Mr 21	·25
4 S 14	·48 5 O 13○	·96 7 N 12	·49 2 D 12	·02	48 3 Jr 10	·55	5 F 9	·08 6 Mr 9	·62
1 S 2	·80 3 O 2○	·33 4 O 31	·88 6 N 30	·39	7 D 29	·92	49 2 Jr 28	·45 3 F 26	·98
7 S 21●	·70 2 O 21	·23 3 N 19	·76 5 D 19	·29	50 6 Jr 17	·82	1 F 16	·35 2 Mr 17●	·88
5 S 11	·07 6 O 10	·60 1 N 9	·13 2 D 8	·66	51 4 Jr 7	·19	5 F 5○	·72 7 Mr 7	·25
3 S 29	·96 5 O 29	·49 7 N 28	02 1 D 27	·55	52 3 Jr 26○	·08	4 F 24	·61 6 Mr 25	·14
1 S 18	·38 2 O 17	·86 4 N 16	·39 5 D 15	·92	53 7 Jr 14●	·45	1 F 12	·98 3 Mr 14	·51
5 S 7	·70 7 O 7	·23 1 N 5	·76 3 D 5	·29	54 4 Jr 3	·82	6 F 2	·85 7 Mr 3	·88
4 S 26	·60 6 O 26	·13 7 N 24○	·66 2 D 24	·19	55 3 Jr 22	·72	5 F 21	·25 6 Mr 22	·78
1 S 15	·96 3 O 15	·49 5 N 14●	02 6 D 13	·55	56 1 Jr 12	·08	2 F 10	·61 4 Mr 11	·14
6 S 4	·33 7 O 3	·86 2 N 2●	·89 3 D 1	·92	5 D 31	·45	57 6 Jr 29	·98 1 F 28	·51
5 S 28	·22 6 O 22●	·76 1 N 21	·29 2 D 20	·82	58 4 Jr 19	·85	5 F 17	·88 7 Mr 19○	·41
2 S 12○	·59 4 O 12	·12 5 N 10	·65 7 D 10	·18	59 1 Jr 8	·71	3 F 7	·24 4 Mr 8○	·77
6 S 1○	·96 3 O 31	·02 4 N 29	·55 6 D 29	·08	60 7 Jr 27	·61	2 F 26●	·14 3 Mr 26	·67
{ 1 O 1	·49								
5 S 19	·86 7 O 19	·39 1 N 17	·92 3 D 17	·45	61 4 Jr 15	·08	6 F 14●	·51 1 Mr 16	·04
3 S 9	·22 4 O 8	·75 6 N 7	·28 7 D 6	·81	62 2 Jr 5○	·34	8 F 3	·87 5 Mr 5	·40
2 S 28	·12 3 O 27	·65 5 N 26	·18 6 D 25○	·71	63 1 Jr 24	·24	2 F 22	·77 4 Mr 24	·30
6 S 17	·49 1 O 17	·02 2 N 15	·55 4 D 15●	·08	64 5 Jr 13	·61	7 F 12	·14 1 Mr 12	·67
3 S 5	·86 5 O 5	·39 6 N 3	·92 1 D 3	·45	65 2 Jr 1	·98	4 Jr 31	·51 6 Mr 2	·04
2 S 24	·75 4 O 24○	·28 5 N 22	·81 7 D 22	·84	66 1 Jr 20	·87	3 F 19	·40 4 Mr 20	·93
7 S 14	·12 1 O 13○	·65 3 N 12	·18 4 D 11	·71	67 6 Jr 10	·24	7 F 8	·77 2 Mr 10	·30
4 S 3	·49 6 O 3○	02 7 N 1	·55 2 D 1	·08	8 D 30	·61	68 5 Jr 29	·14 6 F 27	·07
3 S 21●	·88 4 O 20	·91 6 N 19	·44 7 D 18	·97	69 2 Jr 17	·50	4 F 16○	·03 5 Mr 17	·56
7 S 10	·75 2 O 10	·28 3 N 8	·81 5 D 8	·84	70 6 Jr 6	·87	1 F 5●	·40 2 Mr 6	·93
6 S 29	·65 1 O 29	18 2 N 27	·71 4 D 27	·24	71 5 Jr 25	·77	7 F 24	·30 1 Mr 25	·83
4 S 19	·02 5 O 18	·55 7 N 17	·08 1 D 16	·61	72 3 Jr 15●	·14	4 F 13	·87 6 Mr 14	·20
1 S 7	·88 2 O 6	·91 4 N 5	·44 5 D 4○	·97	73 7 Jr 3	·50	2 F 2	08 3 Mr 3	·56
7 S 26	·28 1 O 25	·81 3 N 24○	·84 4 D 23	·87	74 6 Jr 22	·40	7 F 20	·93 2 Mr 22	·46
4 S 15	·66 6 O 15	·18 7 N 13○	·71 2 D 13	·24	75 3 Jr 11	·77	5 F 10	·30 6 Mr 11	·88
2 S 5	·01 3 O 4	·54 5 N 3	·07 6 D 2	·60	76 1 Jr 1	·13	2 Jr 30	·66 4 F 29	·19
7 S 22○	·91 2 O 22	·44 8 N 20	·97 5 D 20	·50	77 7 Jr 19	·08	1 F 17	·56 3 Mr 19○	·09
5 S 12○	·28 6 O 11	·81 1 N 10	·84 2 D 9	·87	78 4 Jr 8	·40	5 F 6	·93 7 Mr 8●	·46
2 S 1○	·65 5 O 30	·71 7 N 29	·24 1 D 28	·77	79 3 Jr 27	·80	4 F 25	·83 6 Mr 27	·36
{ 4 O 1	·18								
1 S 20	·54 8 O 20	·07 4 N 18	·61 6 D 18	·18	80 7 Jr 16○	·86	2 F 15●	·19 3 Mr 15	·72
5 S 8	·91 7 O 8	·44 1 N 6	·97 3 D 6	·60	81 5 Jr 5○	·03	6 F 3	·56 1 Mr 5	·09
4 S 27	·81 6 O 27	·34 7 N 25	·87 2 D 25○	·40	82 3 Jr 23	·93	5 F 22	·46 6 Mr 23	·99
2 S 17	·18 3 O 16	·71 5 N 15	·24 6 D 14●	·77	83 1 Jr 13	·30	2 F 11	·88 4 Mr 13	·36
6 S 6	·55 1 O 6	·08 2 N 4○	·61 4 D 4●	·14	84 5 Jr 2	·67	7 F 1	·20 1 Mr 1	·78
5 S 24	·44 6 O 23○	·97 1 N 22	·50 3 D 22	·03	85 4 Jr 20	·57	6 F 19	·10 7 Mr 20	·68
2 S 13	·81 4 O 13○	·34 5 N 11	·87 7 D 11	·40	86 1 Jr 9	·93	3 F 8	·46 4 Mr 9	·99
7 S 3	·18 1 O 2	·71 3 N 1	·24 4 N 30	·77	6 D 30	·30	87 7 Jr 28	·83 2 F 27○	·86
6 S 22●	·07 7 O 21	·61 2 N 20	14 3 D 19	·67	88 5 Jr 18	·20	6 F 16○	·73 1 Mr 17	·26
3 S 10	·44 4 O 9	·97 6 N 8	·50 1 D 8	·03	89 2 Jr 6	·56	4 F 5●	·09 5 Mr 6	·68
2 S 29	·34 3 O 28	·87 5 N 27	·40 6 D 26	·93	90 1 Jr 25	·46	2 F 23	·99 4 Mr 25	·52
6 S 18	·71 1 O 18	·24 2 N 16	·77 4 D 16○	·80	91 5 Jr 14	·68	7 F 13	·36 1 Mr 14	·89
4 S 8	·07 5 O 7	·60 7 N 6	·13 1 D 5○	·67	92 3 Jr 4	·20	4 F 2	·78 6 Mr 3	·26

(1) for Ārya siddhānta +·04; (2) for Brahma siddhānta -·09; and (3) for Siddhānta Śiromani -·08.

TABLE II.—

			Com- mence- ment of solar year.		First new moon in solar year.		Anomaly of first moon.		Christian era.		Vaiśākha.			Jyeshtha.			Āshāḍha.			Śrāvaṇa.			Bhādrapada.		
Kaliyuga.	Vikrama era.	Śaka era	Month and day A.D.	Fraction of day.	First new moon in solar year.	Anomaly of first moon.	Christian era.	Week-day. Month.	Day.	Fraction.	Week-day. Month.	Day.	Fraction.	Week-day. Month.	Day.	Fraction.	Week-day. Month.	Day.	Fraction.	Week-day. Month.	Day.	Fraction.	Week-day. Month.	Day.	
A.D.																									
4698	1649	1514	27M	9234	48650	24820	1592	7 Ap 1	79	2 My 1	32	3 My 30	85	6 Ji 28	91	1 Au 27	44								
4694	1650	1515	28M	9222	235039	22953	1593	6 Ap 20	69	1 My 20	22	2 Je 18	76	4 Ji 18	28	5 Au 16	81								
4695	1651	1516	28M	9409	126122	19110	1594	4 Ap 10	05	5 My 9	68	7 Je 8	11	1 Ji 7	64	3 Au 6	17								
4696	1652	1517	28M	8997	17205	15268	1595	1 Mr 30	42	2 Ap 28	95	6 Je 27	01	7 Ji 26	54	2 Au 26	07								
4697	1653	1518	27M	9584	203594	13401	1596	7 Ap 17	82	1 My 16	85	3 Je 15	38	4 Ji 14	91	6 Au 13	44								
4698	1654	1519	28M	2172	94077	9558	1597	4 Ap 6	68	6 My 6	21	7 Je 4	75	2 Ji 4	28	3 Au 2	81								
4699	1655	1520	28M	4759	281066	7691	1598	3 Ap 25	58	5 My 25	11	6 Je 23	64	1 Ji 23	17	2 Au 21	70								
4700	1656	1521	28M	7347	172149	3848	1599	7 Ap 14	95	2 My 14	48	4 Je 13	01	5 Ji 12	54	7 Au 11	07								
4701	1657	1522	27M	9935	63233	0128	1600	5 Ap 8	32	6 My 2	85	1 Je 1	38	2 Je 30	91	5 Au 28	97								
4702	1658	1523	28M	2522	219621	25816	1601	4 Ap 22	21	5 My 21	74	7 Je 20	27	1 Je 19	81	3 Au 18	84								
4703	1659	1524	28M	5110	140701	21973	1602	1 Ap 11	58	3 My 11	11	4 Je 9	64	6 Ji 9	17	7 Au 7	70								
4704	1660	1525	28M	7697	31787	18180	1603	5 Mr 31	95	7 Ap 30	48	3 Je 28	54	5 Ji 28	07	6 Au 26	60								
4705	1661	1526	28M	0285	218175	16264	1604	4 Ap 18	85	6 My 18	88	7 Je 16	91	2 Ji 16	44	3 Au 14	97								
4706	1662	1527	28M	2872	109258	12421	1605	2 Ap 8	21	3 My 7	74	5 Je 6	27	6 Ji 5	80	1 Au 4	33								
4707	1663	1528	28M	5460	03341	8578	1606	1 Ap 27	11	2 My 26	64	4 Je 25	17	5 Ji 24	70	7 Au 23	23								
4708	1664	1529	28M	8048	186730	6711	1607	5 Ap 16	48	7 My 16	01	1 Je 14	54	3 Ji 14	07	4 Au 12	80								
4709	1665	1530	28M	0635	77813	2868	1608	2 Ap 4	84	4 My 4	37	5 Je 2	91	7 Ji 2	44	1 Ji 31	87								
4710	1666	1531	28M	3223	264202	1002	1609	1 Ap 23	74	3 My 23	27	4 Je 21	80	6 Ji 21	38	7 Au 19	86								
4711	1667	1532	28M	5810	155285	24714	1610	6 Ap 13	11	7 My 12	64	2 Je 11	17	3 Ji 10	70	5 Au 9	23								
4712	1668	1533	28M	8398	46368	20871	1611	3 Ap 2	48	5 My 2	01	6 My 31	54	2 Ji 29	60	4 Au 28	18								
4713	1669	1534	28M	0985	232757	19004	1612	2 Ap 20	37	3 My 19	90	5 Je 18	43	6 Ji 17	97	1 Au 16	50								
4714	1670	1535	28M	3573	123840	15161	1613	6 Ap 9	74	1 My 9	27	2 Je 7	80	4 Ji 7	38	5 Au 5	86								
4715	1671	1536	28M	6161	14023	11819	1614	4 Mr 30	11	5 Ap 28	64	1 Je 26	70	3 Ji 26	23	4 Au 24	76								
4716	1672	1537	28M	8748	201312	9452	1615	3 Ap 18	01	4 My 17	54	6 Je 16	07	7 Ji 15	60	2 Au 14	13								
4717	1673	1538	28M	1336	92395	5609	1616	7 Ap 6	37	1 My 5	90	3 Je 4	43	4 Ji 3	96	6 Au 2	49								
4718	1674	1539	28M	3923	278784	3742	1617	6 Ap 25	27	7 My 24	80	2 Je 23	33	3 Ji 22	86	5 Au 21	39								
4719	1675	1540	28M	6511	169867	27454	1618	8 Ap 14	64	5 My 14	17	6 Je 12	70	1 Ji 12	23	2 Au 10	76								
4720	1676	1541	28M	9098	60950	23611	1619	1 Ap 4	00	2 My 3	53	4 Je 2	07	5 Ji 1	60	1 Au 29	66								
4721	1677	1542	28M	1686	247388	21745	1620	6 Ap 21	90	1 My 21	43	2 Je 19	96	4 Ji 19	49	6 Au 18	02								
4722	1678	1543	28M	4274	138421	17902	1621	4 Ap 11	27	5 My 10	80	7 Je 9	88	1 Ji 8	86	3 Au 7	39								
4723	1679	1544	28M	6861	29504	14059	1622	1 Mr 31	64	3 Ap 30	17	4 My 29	70	7 Ji 27	76	2 Au 26	29								
4724	1680	1545	28M	9449	215838	12192	1623	7 Ap 19	53	2 My 19	06	3 Je 17	59	5 Ji 17	13	6 Au 15	66								
4725	1681	1546	28M	2038	108976	8350	1624	4 Ap 7	90	6 My 7	43	7 Je 5	96	2 Ji 5	49	4 Au 4	02								
4726	1682	1547	28M	4624	293365	6488	1625	3 Ap 26	80	5 My 26	38	6 Je 24	86	1 Ji 24	89	2 Au 22	92								
4727	1683	1548	28M	7211	184448	2640	1626	1 Ap 16	17	2 My 15	70	4 Je 14	23	5 Ji 13	76	7 Au 12	29								
4728	1684	1549	28M	9799	75531	26352	1627	5 Ap 5	53	7 My 5	06	1 Je 3	59	3 Ji 3	12	6 Au 31	19								
4729	1685	1550	28M	2388	261920	24485	1628	4 Ap 23	43	5 My 22	96	7 Je 21	49	2 Ji 21	02	3 Au 19	55								
4730	1686	1551	28M	4974	153003	20643	1629	1 Ap 12	80	3 My 12	83	4 Je 10	86	6 Ji 10	89	7 Au 8	92								
4731	1687	1552	28M	7562	44088	16800	1630	6 Ap 2	16	7 My 1	60	2 My 29	23	5 Ji 29	29	6 Au 27	82								
4732	1688	1553	29M	0149	230475	14938	1631	5 Ap 21	06	6 My 20	59	1 Je 19	12	2 Ji 18	65	4 Au 17	18								
4733	1689	1554	28M	2787	121558	11090	1632	2 Ap 9	43	3 My 8	98	5 Je 7	49	7 Ji 7	02	1 Au 5	55								
4734	1690	1555	29M	5324	12641	7248	1633	6 Mr 29	80	2 My 27	86	4 Je 26	89	5 Ji 25	92	7 Au 24	45								
4735	1691	1556	29M	7912	199030	5381	1634	1 Ap 28	83	7 My 17	22	1 Je 15	75	3 Ji 15	29	4 Au 18	82								
4736	1692	1557	29M	0499	90118	1538	1635	3 Ap 7	06	4 My 6	59	6 Je 5	12	7 Ji 4	65	2 Au 8	18								
4737	1693	1558	28M	3087	276502	27226	1636	1 Ap 24	96	3 My 24	49	5 Je 23	02	6 Ji 22	55	1 Au 21	08								
4738	1694	1559	28M	5675	167585	23383	1637	6 Ap 14	83	7 My 13	86	2 Je 12	39	8 Ji 11	92	5 Au 10	45								
4739	1695	1560	28M	8262	58668	19540	1638	3 Ap 3	69	5 My 3	22	6 Je 1	75	1 Ji 1	28	4 Au 29	85								
4740	1696	1561	29M	0850	245056	17674	1639	2 Ap 22	59	4 My 22	12	5 Je 20	65	7 Ji 20	18	1 Au 18	71								
4741	1697	1562	28M	3437	136139	18681	1640	6 Ap 10	96	1 My 10	49	3 Je 9	02	4 Ji 8	55	6 Au 7	08								
4742	1698	1563	28M	6025	27222	9998	1641	4 Mr 31	82	5 Ap 29	85	1 Je 27	92	3 Ji 27	45	4 Au 25	98								
4743	1699	1564	28M	8612	218611	8121	1642	3 Ap 19	22	4 My 18	75	6 Je 17	28	7 Ji 16	81	2 Au 15	84								
4744	1700	1565	29M	1200	104894	4279	1643	7 Ap 8	59	2 My 8	12	3 Je 6	65	5 Ji 6	18	6 Au 4	71								
4745	1701	1566	28M	3787	291083	2412	1644	6 Ap 26	49	1 My 26	02	2 Je 24	55	4 Ji 24	08	5 Au 22	61								
4746	1702	1567	28M	6375	182166	26124	1645	3 Ap 15	85	5 My 15	38	6 Je 13	91	1 Ji 13	45	2 Au 11	98								
4747	1703	1568	28M	8963	73249	22281	1646	1 Ap 5	22	2 My 4	75	4 Je 3	28	5 Ji 2	81	1 Au 30	87								

N.B.—For tithis by other siddhāntas add to the above algebraically as follows:—

Sūrya siddhānta—cont.

Āsṛina.				Kārttika.				Mārgaśīrṣa.				Pauṣa.				A.D.				Māgha.				A.D.				Phālguna.				Chaitra.			
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.				
2 S	25	97	4 O	25	50	6 N	24○	08	7 D	23	56	93	2 Jr	22	09																				
7 S	15	34	1 O	14	87	3 N	13●	40	4 D	12	98	94	6 Jr	11	46																				
4 S	4	71	6 O	4○	24	7 N	2	77	2 D	2	30					95	5 Jr	30	86	6 F	28	89													
3 S	28●	60	5 O	28	13	6 N	21	66	1 D	21	19	96	2 Jr	19	73																				
7 S	11●	97	2 O	11	50	4 N	10	03	5 D	9	56	97	7 Jr	8	09																				
5 S	1	34	1 O	30	40	2 N	28	93	4 D	28	46	98	5 Jr	26○	99																				
6 S	80	87	1 O	80	40	2 N	28	93	4 D	28	46																								
4 S	20	23	5 O	19	77	7 N	18	30	1 D	17	83	99	8 Jr	16○	36																				
1 S	9	60	8 O	9	18	4 N	7	66	6 D	7	19	16	7 Jr	5○	72																				
7 S	27	50	2 O	27	03	3 N	25	56	5 D	25●	09	01	6 Jr	23	62																				
4 S	16	87	6 O	16	40	7 N	14○	93	2 D	14	46	02	3 Jr	12	99																				
2 S	6	23	3 O	5	76	5 N	4○	29	6 D	3	83	03	1 Jr	2	36																				
1 S	25	18	2 O	24○	66	4 N	23	19	5 D	22	72	04	7 Jr	21	25																				
5 S	13	50	7 O	13	03	1 N	11	56	3 D	11	09	05	4 Jr	9	62																				
2 S	2○	87	4 O	2	40	5 O	31	93	7 N	30	46					06	3 Jr	28	52	5 F	27	05													
1 S	21	78	3 O	21	29	4 N	19	82	6 D	19	35	07	7 Jr	17	89																				
6 S	11	13	7 O	10	66	2 N	9	19	3 D	8	72	08	5 Jr	7	25																				
5 S	29	03	6 O	28	56	1 N	27	09	2 D	26○	62	09	4 Jr	25	15																				
2 S	18	39	3 O	17	93	5 N	16	46	6 D	15●	99	10	1 Jr	14	52																				
6 S	7	76	1 O	7	29	2 N	5	82	4 D	5●	35	11	5 Jr	3	88																				
5 S	26	66	7 O	26	19	1 N	24●	72	3 D	24	25	12	4 Jr	22	78																				
3 S	15	03	4 O	14○	56	6 N	13	09	7 D	12	62	13	2 Jr	11	15																				
7 S	4	39	1 O	3○	92	3 N	2	45	4 D	1	99					14	1 Jr	30	05	2 F	28	58													
6 S	23●	29	7 O	22	82	2 N	21	35	3 D	20	88	15	5 Jr	19	41																				
3 S	12	66	5 O	12	19	6 N	10	72	1 D	10	25	16	2 Jr	8	78																				
1 S	1●	08	5 O	30	09	5 N	28	62	7 D	28	15	17	1 Jr	26○	68																				
2 S	30	56	4 O	30	09	5 N	28	62	7 D	28	15																								
6 S	19	92	1 O	19	45	2 N	17	98	4 D	17	51	18	6 Jr	16○	05																				
4 S	9	29	5 O	8	82	7 N	7	35	1 D	6	88	19	3 Jr	5	41																				
3 S	28	19	4 O	27	72	6 N	26○	25	7 D	25	78	20	2 Jr	24	31																				
7 S	16	55	2 O	16	09	3 N	14○	62	5 D	14	15	21	6 Jr	12	63																				
4 S	5	92	6 O	5	46	7 N	3○	98	2 D	3	51	22	4 Jr	2	04																				
3 S	24	82	5 O	24●	35	6 N	22	88	1 D	22	41	23	2 Jr	20	94																				
1 S	14○	19	2 O	13	72	4 N	12	25	5 D	11	78	24	7 Jr	10	31																				
5 S	2○	55	7 O	2	08	1 O	31	61	3 N	30	15					25	6 Jr	28	21	7 F	26○	74													
4 S	21	45	5 O	20	98	7 N	19	51	2 D	19	04	26	3 Jr	17	57																				
1 S	10	82	3 O	10	35	4 N	8	88	6 D	8	41	27	7 Jr	6○	94																				
7 S	29	72	2 O	29	25	3 N	27	78	5 D	27○	31	28	6 Jr	25	84																				
5 S	18	08	6 O	17	61	1 N	16	14	2 D	15○	67	29	4 Jr	14	21																				
2 S	7	45	3 O	6	98	5 N	5	51	7 D	5	04	30	1 Jr	3	57																				
1 S	26	35	2 O	25○	88	4 N	24●	41	5 D	23	94	31	7 Jr	22	47																				
5 S	15	71	7 O	15●	25	1 N	18	78	3 D	13	31	32	4 Jr	11	84																				
3 S	4	08	4 O	3○	61	6 N	2	14	7 D	1	67					33	3 Jr	29	73	5 F	28	27													
1 S	22●	98	3 O	22	51	5 N	21	04	6 D	20	57	34	1 Jr	19	10																				
6 S	12	35	7 O	11	88	2 N	10	41	3 D	9	94	35	5 Jr	8	47																				
5 O	1	24	6 O	30	77	1 N	29	31	2 D	28	84	36	4 Jr	27○	37																				
2 S	19	61	4 O	19	14	5 N	17	67	7 D	17	20	37	1 Jr	15●	73																				
6 S	8	98	1 O	8	51	3 N	7	04	4 D	6○	57	38	6 Jr	5●	10																				
5 S	27	88	7 O	27	41	1 N	25○	94	3 D	25	47	39	5 Jr	24	00																				
3 S	17	24	4 O	16	77	6 N	15○	30	7 D	14	83	40	3 Jr	13	37																				
7 S	5	61	2 O	5	14	3 N	3	67	5 D	3	20	41	6 Jr	1	73																				
6 S	24○	51	1 O	24●	04	2 N	22	57	4 D	22	10	42	5 Jr	20	63																				
3 S	13○	87	5 O	13	41	6 N	11	94	1 D	11	47	43	3 Jr	10	00																				
1 S	3●	24	2 O	2	77	4 N	1	30	5 N	30	83					44	1 Jr	28	89	3 F	27	06													
7 S	21	14	1 O	20	67	3 N	19	20	4 D	18	73	45	6 Jr	17○	26																				
4 S	10	51	6 O	10	04	7 N	8	57	2 D	8	10	46	3 Jr	6○	63																				
3 S	29	40	4 O	28	93	6 N	27	47	1 D	27○	00	47	2 Jr	25	53																				

(1) for Ārya siddhānta + '05; (2) for Brahma siddhānta - '10; and for Siddhānta Śiromani - '03.

Kalyuga.	Vikrama era.	Śaka era.	Month and day A.D.	Commencement of solar year.	First new moon in solar year	Anomaly of first new moon	Christian era.	Vaiśākha.			Jyeshtha.			Āshāḍha.			Śrāvaṇa.			Bhādrapada.		
								Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.
							A.D.															
4748	1704	1569	29M	1550	25-9688	20-414	1647	7	Ap	24	12	1	My	23	65	3	Je	22	18	4	Jl	21
4749	1705	1570	28M	1551	15-0721	16-571	1648	4	Ap	12	49	6	My	12	02	7	Je	10	55	2	Jl	10
4750	1706	1571	28M	1552	4-1804	12-729	1649	1	Ap	1	85	3	My	10	38	4	My	29	91	7	Jl	28
4751	1707	1572	28M	1553	22-8198	10-862	1650	7	Ap	20	75	2	My	20	28	3	Je	18	81	5	Jl	18
4752	1708	1573	29M	1554	11-9276	7-019	1651	5	Ap	10	12	6	My	9	65	1	Je	8	18	2	Jl	7
4753	1709	1574	28M	1555	1-0359	3-176	1652	2	Mr	29	01	5	My	27	55	7	Je	26	08	1	Jl	25
4754	1710	1575	28M	1556	19-0748	1-310	1653	1	Ap	17	38	2	My	16	91	4	Je	15	44	5	Jl	14
4755	1711	1576	28M	1557	8-7881	25-022	1654	5	Ap	6	75	7	My	6	28	1	Je	4	81	3	Jl	4
4756	1712	1577	29M	1558	27-4220	28-155	1655	4	Ap	25	65	6	My	25	18	7	Je	23	71	2	Jl	23
4757	1713	1578	28M	1559	16-5808	19-812	1656	2	Ap	14	01	3	My	18	54	5	Je	12	07	8	Jl	11
4758	1714	1579	28M	1560	5-6386	15-469	1657	6	Ap	3	88	7	My	2	91	2	Je	1	44	5	Jl	30
4759	1715	1580	29M	1561	24-2774	13-603	1658	5	Ap	22	28	6	My	21	81	1	Je	20	84	2	Jl	19
4760	1716	1581	29M	1562	13-8857	9-760	1659	2	Ap	11	65	4	My	11	18	5	Je	9	71	7	Jl	9
4761	1717	1582	28M	1563	2-4940	5-917	1660	7	Mr	31	01	1	Ap	29	54	4	Je	27	60	6	Jl	27
4762	1718	1583	28M	1564	21-1329	4-050	1661	5	Ap	18	91	7	My	18	44	1	Je	16	97	3	Jl	16
4763	1719	1584	29M	1565	10-2412	0-208	1662	3	Ap	8	28	4	My	7	81	6	Je	6	34	7	Jl	5
4764	1720	1585	29M	1566	28-8801	25-895	1663	2	Ap	27	17	3	My	26	71	5	Je	25	24	6	Jl	24
4765	1721	1586	28M	1567	17-9884	22-053	1664	6	Ap	15	54	1	My	15	07	2	Je	13	60	4	Jl	13
4766	1722	1587	28M	1568	7-0967	18-210	1665	3	Ap	4	91	5	My	4	44	6	Je	2	97	1	Jl	2
4767	1723	1588	29M	1569	25-7356	18-343	1666	2	Ap	23	81	4	My	23	34	5	Je	21	87	7	Jl	21
4768	1724	1589	29M	1570	14-8439	12-500	1667	7	Ap	13	17	1	My	12	70	3	Je	11	23	4	Jl	10
4769	1725	1590	28M	1571	8-9522	8-658	1668	4	Ap	1	54	6	My	10	07	7	My	30	60	3	Jl	28
4770	1726	1591	28M	1572	22-5911	6-791	1669	3	Ap	20	44	4	My	19	97	6	Je	18	50	1	Jl	18
4771	1727	1592	29M	1573	11-6994	2-948	1670	7	Ap	9	81	2	My	9	34	3	Je	7	87	5	Jl	7
4772	1728	1593	29M	1574	0-8077	26-660	1671	5	Mr	30	17	1	My	28	23	2	Je	26	76	4	Jl	26
4773	1729	1594	28M	1575	19-4466	24-793	1672	6	Ap	28	70	5	My	16	60	7	Je	15	18	1	Jl	14
4774	1730	1595	28M	1576	8-5549	20-951	1673	1	Ap	6	44	2	My	5	97	4	Je	4	50	6	Jl	4
4775	1731	1596	29M	1577	27-1937	19-084	1674	7	Ap	25	33	1	My	24	87	3	Je	23	40	4	Jl	22
4776	1732	1597	29M	1578	16-8020	15-241	1675	4	Ap	14	70	6	My	14	23	7	Je	12	76	2	Jl	12
4777	1733	1598	28M	1579	5-4103	11-398	1676	2	Ap	3	07	3	My	2	60	5	Je	1	13	6	Je	30
4778	1734	1599	28M	1580	24-0492	9-531	1677	7	Ap	21	97	2	My	21	50	4	Je	20	08	5	Jl	19
4779	1735	1600	29M	1581	13-1575	5-629	1678	5	Ap	11	33	6	My	10	86	1	Je	9	39	2	Jl	8
4780	1736	1601	29M	1582	2-2658	1-846	1679	2	Mr	31	70	4	Ap	30	23	7	Je	28	29	1	Jl	27
4781	1737	1602	28M	1583	20-9047	27-534	1680	1	Ap	18	60	3	My	18	13	4	Je	16	06	6	Jl	16
4782	1738	1603	28M	1584	10-0180	23-691	1681	5	Ap	7	97	7	My	7	59	2	Je	6	03	3	Jl	5
4783	1739	1604	29M	1585	28-6519	21-824	1682	4	Ap	26	86	6	My	26	29	7	Je	24	92	2	Jl	24
4784	1740	1605	29M	1586	17-7602	17-882	1683	2	Ap	16	23	8	My	15	76	5	Je	14	29	6	Jl	18
4785	1741	1606	28M	1587	6-8685	14-139	1684	6	Ap	4	60	1	My	4	18	2	Je	2	66	4	Jl	2
4786	1742	1607	28M	1588	25-5074	12-272	1685	5	Ap	23	49	7	My	23	03	1	Je	21	56	3	Jl	21
4787	1743	1608	29M	1589	14-6157	8-429	1686	2	Ap	12	86	4	My	12	39	5	Je	10	92	7	Jl	10
4788	1744	1609	29M	1590	3-7240	4-587	1687	7	Ap	2	23	1	My	1	76	8	My	31	29	6	Jl	29
4789	1745	1610	28M	1591	22-8629	2-720	1688	6	Ap	20	13	7	My	19	66	2	Je	18	19	3	Jl	17
4790	1746	1611	29M	1592	11-4712	28-432	1689	8	Ap	9	49	5	My	9	02	6	Je	7	55	1	Jl	7
4791	1747	1612	29M	1593	0-5795	22-589	1690	7	Mr	29	86	3	My	27	92	5	Je	26	45	6	Jl	25
4792	1748	1613	29M	1594	19-2184	20-722	1691	2	Ap	23	36	1	My	17	29	2	Je	15	82	4	Jl	15
4793	1749	1614	28M	1595	8-3267	16-880	1692	4	Ap	6	18	5	My	5	66	7	Je	4	19	1	Jl	8
4794	1750	1615	29M	1596	26-9655	15-013	1693	3	Ap	25	02	4	My	24	55	6	Je	23	08	7	Jl	22
4795	1751	1616	29M	1597	16-0738	11-170	1694	7	Ap	14	39	1	My	13	92	3	Je	12	45	4	Jl	11
4796	1752	1617	29M	1598	5-1821	7-327	1695	4	Ap	3	76	6	My	3	29	7	Je	1	82	3	Jl	30
4797	1753	1618	28M	1599	23-8210	5-461	1696	8	Ap	21	65	5	My	21	19	6	Je	19	72	1	Jl	19
4798	1754	1619	29M	1600	12-9293	1-618	1697	1	Ap	11	02	2	My	10	55	4	Je	9	08	5	Jl	8
4799	1755	1620	29M	1601	2-0370	25-330	1698	5	Mr	31	39	1	My	29	45	3	Je	27	98	4	Jl	27
4800	1756	1621	29M	1602	20-6765	23-468	1699	4	Ap	19	29	5	My	18	82	7	Je	17	35	1	Jl	16

N.B.—For tithis by other siddhāntas add to the above algebraically as follows:—

Sūrya siddhānta—cont.

Āsīna.				Kārttika.				Mārgaśīrṣa.				Pauṣa.				A.D. Māgha.				A.D. Phālguna.				Chaitra.				
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	
7 S	18		·77	2 O	18		·30	3 N	18		·83	5 D	16	●	·36	48	6 Jr	14	·89	1 F	13		·42	2 Mr	13		·95	
5 S	7		·14	6 O	6		·67	1 N	5	○	·20	2 D	4		·73	49	4 Jr	8	·26	5 F	1		·79	7 Mr	3		·32	
4 S	26		·04	5 O	25	○	·57	7 N	24		·10	1 D	23		·63	50	3 Jr	22	·16	4 F	20		·69	6 Mr	22		·23	
1 S	15		·40	2 O	14	●	·93	4 N	13		·48	5 D	12		·99	51	7 Jr	11	·53	2 F	10		·06	3 Mr	11		·59	
5 S	4		·77	7 O	4		·30	1 N	2		·83	3 D	2		·86		4 D	31	·89	6 Jr	30		·42	7 F	28	○	·95	
4 S	22		·67	6 O	22		·20	7 N	20		·73	2 D	20		·26	53	3 Jr	18	·79	5 F	17	○	·32	6 Mr	18	●	·85	
2 S	12		·03	3 O	11		·57	5 N	10		·10	6 D	9		·63	54	1 Jr	8	·16	2 F	6	○	·69	4 Mr	8		·22	
7 S	30		·93	2 O	30		·46	3 N	28		·99	5 D	28		·52	55	7 Jr	27	●	·05	1 F	25		·59	3 Mr	27		·12
5 S	20		·30	6 O	19		·83	1 N	18		·36	2 D	17	○	·89	56	4 Jr	16	·42	5 F	14		·95	7 Mr	15		·48	
2 S	8		·67	4 O	8		·20	5 N	6		·73	7 D	6	○	·26	57	1 Jr	4	·79	3 F	3		·32	4 Mr	4		·85	
1 S	27		·56	3 O	27		·09	4 N	25	○	·63	6 D	25		·16	58	7 Jr	23	·69	2 F	22		·22	3 Mr	23		·75	
5 S	16		·93	7 O	16		·46	1 N	14		·99	3 D	14		·52	59	5 Jr	13	·05	6 F	11		·58	1 Mr	13		·11	
3 S	6		·30	4 O	5	○	·83	6 N	4		·36	7 D	3		·89	60	2 Jr	2	·42	3 Jr	31		·95	5 Mr	1		·48	
2 S	24	○	·20	3 O	23		·73	5 N	22		·26	6 D	21		·79	61	1 Jr	20	·32	2 F	18		·85	4 Mr	20	○	·38	
6 S	18	○	·56	1 O	18		·09	2 N	11		·62	4 D	11		·15	62	5 Jr	9	·69	7 F	8		·22	1 Mr	9	●	·75	
3 S	2	●	·93	5 O	2		·46	6 O	31		·99	1 N	30		·52		3 D	30	·05	4 Jr	28	○	·58	6 F	27		·11	
2 S	21		·83	4 O	21		·36	5 N	19		·89	7 D	19		·42	64	1 Jr	17	○	3 F	16		·48	5 Mr	17		·01	
7 S	10		·19	1 O	9		·73	3 N	8		·26	4 D	7		·79	65	6 Jr	6	○	7 F	4		·85	2 Mr	6		·38	
6 S	29		·09	7 O	28		·62	2 N	27		·15	3 D	26	●	·68	66	5 Jr	25	·21	6 F	23		·75	1 Mr	25		·28	
3 S	18		·46	4 O	17		·99	6 N	16	○	·52	1 D	16		·05	67	2 Jr	14	·58	4 F	13		·11	5 Mr	14		·64	
7 S	7		·83	2 O	7		·36	3 N	5	○	·89	5 D	5		·42	68	6 Jr	3	·95	1 F	2		·48	3 Mr	3		·01	
6 S	25		·72	1 O	25	○	·25	2 N	23		·79	4 D	23		·32	69	5 Jr	21	·85	7 F	20		·38	1 Mr	21		·91	
4 S	15		·09	5 O	14		·62	7 N	13		·15	1 D	12		·68	70	3 Jr	11	·21	4 F	9		·74	6 Mr	11	○	·27	
1 S	4	○	·46	2 O	3		·99	4 N	2		·52	6 D	2		·05		7 D	31	·58	2 Jr	30		·11	3 F	28	○	·64	
7 S	23		·36	1 O	22		·89	3 N	21		·42	4 D	20		·95	72	6 Jr	19	·48	1 F	18	○	·01	2 Mr	18		·54	
4 S	11		·72	6 O	11		·25	7 N	9		·78	2 D	9		·31	73	3 Jr	7	·85	5 F	6		·38	6 Mr	7		·91	
3 S	30		·62	5 O	30		·15	6 N	28		·68	1 D	28	○	·21	74	2 Jr	26	·74	4 F	25		·27	5 Mr	26		·80	
7 S	19		·99	2 O	19		·52	4 N	18		·05	5 D	17	○	·58	75	7 Jr	16	·11	1 F	14		·64	3 Mr	16		·17	
5 S	9		·35	6 O	8		·89	1 N	7		·42	2 D	6	○	·95	76	4 Jr	5	·48	6 F	4		·01	7 Mr	4		·54	
4 S	27		·25	5 O	26		·78	7 N	25	●	·31	1 D	24		·84	77	3 Jr	23	·37	4 F	21		·91	6 Mr	23		·44	
1 S	16		·62	3 O	16	○	·15	4 N	14		·69	6 D	14		·21	78	7 Jr	12	·74	2 F	11		·27	3 Mr	12		·80	
5 S	5		·99	7 O	5	○	·52	2 N	4		·05	3 D	3		·58	79	5 Jr	2	·11	6 Jr	31		·64	1 Mr	2		·17	
4 S	24	○	·88	6 O	24		·41	7 N	22		·95	2 D	22		·48	80	4 Jr	21	·01	5 F	19		·54	7 Mr	20	●	·07	
2 S	13		·25	3 O	12		·78	5 N	11		·31	6 D	10		·84	81	1 Jr	9	·87	2 F	7	○	·90	4 Mr	9		·43	
6 S	2	●	·62	2 O	31		·68	4 N	30		·21						5 D	20	·74	7 Jr	28	○	·27	1 F	26		·80	
1 O	2		·15														4 Jr	17	○	6 F	16		·17	7 Mr	17		·70	
5 S	21		·52	7 O	21		·05	1 N	19		·58	3 D	19		·11	83	2 Jr	7	·01	3 F	5		·54	5 Mr	6		·07	
2 S	10		·88	4 O	10		·41	5 N	8		·94	7 D	8		·47	84				2 F	23		·43	3 Mr	24		·96	
1 S	28		·78	3 O	28		·31	4 N	26	○	·84	6 D	26		·37	85	7 Jr	24	·90	6 F	12		·80	1 Mr	14		·83	
6 S	18		·15	7 O	17		·68	2 N	16	○	·21	3 D	15		·74	86	5 Jr	14	·27	4 F	2		·17	5 Mr	3		·70	
3 S	7		·51	5 O	7		·05	6 N	5	○	·58	1 D	5		·11	87	2 Jr	3	·64	3 F	21		·07	4 Mr	21	○	·60	
2 S	26		·41	3 O	25	●	·94	5 N	24		·47	7 D	24		·00	88	1 Jr	22	·53	7 F	9		·43	1 Mr	10		·96	
6 S	14	○	·78	1 O	14		·31	2 N	12		·84	4 D	12		·37	89	5 Jr	10	·90	4 Jr	29		·06	6 F	28	○	·38	
4 S	4	○	·15	5 O	3		·68	7 N	2		·21	1 D	1		·74		3 D	31	·27	3 F	17	●	·70	5 Mr	19		·23	
3 S	23		·04	4 O	22		·57	6 N	21		·11	7 D	20		·64	91	2 Jr	19	·17	1 F	7	○	·06	2 Mr	7		·59	
7 S	12		·41	1 O	11		·94	3 N	10		·47	5 D	10		·00	92	6 Jr	8	○	6 F	24		·98	1 Mr	26		·49	
6 S	30		·31	7 O	29		·84	2 N	28		·37	3 D	27	●	·90	93	5 Jr	26	·43	4 F	14		·33	5 Mr	15		·86	
3 S	19		·68	5 O	19		·21	6 N	17		·74	1 D	17	●	·27	94	2 Jr	15	·80	1 F	3		·70	3 Mr	5		·23	
1 S	9		·04	2 O	8		·57	4 N	7		·10	5 D	6		·63	95	7 Jr	5	·17	7 F	22		·59	2 Mr	23		·12	
6 S	27		·94	1 O	27	○	·47	3 N	26	●	·00	4 D	25		·53	96	6 Jr	24	·06	4 F	10		·96	6 Mr	12		·49	
4 S	16		·31	5 O	15	○	·84	7 N	14		·37	1 D	13		·90	97	3 Jr	12	·43	2 Jr	31		·33	3 Mr	1		·86	
1 S	5		·67	3 O	5	○	·21	4 N	3		·74	6 D	3		·27	98	7 Jr	1	·80	1 F	19	○	·23	2 Mr	20	●	·76	
7 S	24	●	·57	2 O	24		·10	3 N	22		·63	5 D	22		·16	99	6 Jr	20	·69	5 F	8	○	·59	7 Mr	9		·13	
4 S	13	●	·94	6 O	13		·47	1 N	12		·00	2 D	11		·53	17	4 Jr	10	·06	00								

(1) for Ārya siddhānta + '05; (2) for Brahma siddhānta — '10; and (3) for Siddhānta Śiromaṣi — '03.

TABLE II.—

			Com- mence- ment of solar year	First new moon in solar year.		Anomaly of first new moon	Christian era.	Vaisākha.			Jyeshtha.			Āshāḍha.			Śrāvaṇa.			Bhādrapada.							
Kaliyuga.	Vikrama era.	Saka era.	Month and day A.D	Fraction of day.				Week-day.	Month.	Day.	Fraction.	Week-day.	Month	Day	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.				
A.D.																											
4801	1757	1622	28M	8891	9 7848	19 623	1700	1	Ap	7	65	3	My	7	18	4	Je	5	71	6	Jl	5	24	7	Au	3	78
4802	1758	1623	29M	1279	28 4237	17 756	1701	7	Ap	26	55	2	My	26	08	3	Je	24	61	5	Jl	24	14	6	Au	22	67
4803	1759	1624	29M	3868	17 5320	18 913	1702	4	Ap	15	92	6	My	15	45	7	Je	13	98	2	Jl	13	51	4	Au	12	04
4804	1760	1625	29M	6454	6 6403	10 071	1703	2	Ap	5	23	8	My	4	82	5	Je	3	35	6	Jl	2	88	2	Au	30	94
4805	1761	1626	28M	9041	25 2792	8 204	1704	1	Ap	23	18	2	My	22	71	4	Je	21	24	5	Jl	20	77	7	Au	19	31
4806	1762	1627	29M	1620	14 3875	4 361	1705	5	Ap	12	55	7	My	12	08	1	Je	10	61	3	Jl	10	14	4	Au	8	67
4807	1763	1628	29M	4217	3 4958	0 518	1706	2	Ap	1	92	4	My	1	45	7	Je	29	51	2	Jl	29	04	3	Au	27	57
4808	1764	1629	29M	6804	22 1347	26 206	1707	1	Ap	29	81	3	My	20	35	4	Je	18	88	6	Jl	18	41	7	Au	16	94
4809	1765	1630	28M	9392	11 2430	22 883	1708	6	Ap	9	18	7	My	8	71	2	Je	7	24	3	Jl	6	77	5	Au	5	80
4810	1766	1631	29M	1979	0 8513	18 521	1709	3	Mr	29	55	6	My	27	61	1	Je	26	14	2	Jl	25	67	4	Au	24	20
4811	1767	1632	29M	4567	18 9902	16 654	1710	2	Ap	17	45	3	My	16	98	5	Je	15	51	7	Jl	15	04	1	Au	13	57
4812	1768	1633	29M	7154	8 0984	12 811	1711	6	Ap	6	81	1	My	6	84	2	Je	4	87	4	Jl	4	40	5	Au	2	94
4813	1769	1634	28M	9742	26 7373	10 944	1712	5	Ap	24	71	7	My	24	24	1	Je	22	77	3	Jl	22	30	4	Au	20	83
4814	1770	1635	29M	2329	15 8456	7 102	1713	3	Ap	14	08	4	My	13	61	6	Je	12	14	7	Jl	11	67	2	Au	10	20
4815	1771	1636	29M	4917	4 9589	3 259	1714	7	Ap	3	45	1	My	2	98	8	Je	1	51	6	Jl	30	57	1	Au	29	10
4816	1772	1637	29M	7505	23 5928	1 392	1715	6	Ap	22	34	7	My	21	87	2	Je	20	40	3	Jl	19	93	5	Au	18	47
4817	1773	1638	29M	0092	12 7011	25 104	1716	8	Ap	10	71	5	My	10	24	6	Je	8	77	1	Jl	8	30	2	Au	6	83
4818	1774	1639	29M	2680	1 8094	21 261	1717	1	Mr	31	08	2	Ap	29	61	5	Je	27	67	7	Jl	27	20	1	Au	25	73
4819	1775	1640	29M	5267	20 4483	19 395	1718	6	Ap	18	97	1	My	18	51	3	Je	17	04	4	Jl	16	57	6	Au	15	10
4820	1776	1641	29M	7855	9 5568	15 552	1719	4	Ap	8	34	5	My	7	87	7	Je	6	40	1	Jl	5	93	3	Au	4	46
4821	1777	1642	29M	0442	28 1855	13 685	1720	3	Ap	26	24	4	My	25	77	6	Je	24	30	7	Jl	23	83	2	Au	22	36
4822	1778	1643	29M	3030	17 3078	9 842	1721	7	Ap	15	61	2	My	15	14	3	Je	13	67	5	Jl	13	20	6	Au	11	73
4823	1779	1644	29M	5618	6 4121	6 000	1722	4	Ap	4	97	6	My	4	50	1	Je	3	03	2	Jl	2	57	5	Au	30	63
4824	1780	1645	29M	8205	25 0510	4 133	1723	3	Ap	23	87	5	My	23	40	6	Je	21	93	1	Jl	21	46	2	Au	19	99
4825	1781	1646	29M	0798	14 1593	0 290	1724	1	Ap	12	24	2	My	11	77	4	Je	10	30	5	Jl	9	88	7	Au	8	36
4826	1782	1647	29M	3380	3 2676	24 002	1725	5	Ap	1	61	7	My	1	14	7	Je	29	20	4	Jl	28	73	6	Au	27	26
4827	1783	1648	29M	5968	21 9085	22 135	1726	4	Ap	20	50	6	My	20	03	7	Je	18	56	2	Jl	18	09	3	Au	16	63
4828	1784	1649	29M	8555	11 0148	18 292	1727	1	Ap	9	87	3	My	9	40	4	Je	7	98	6	Jl	7	46	7	Au	5	99
4829	1785	1650	29M	1143	0 1281	14 450	1728	6	Mr	29	24	2	My	27	80	3	Je	25	83	5	Jl	25	36	6	Au	23	89
4830	1786	1651	29M	3731	18 7619	12 588	1729	5	Ap	17	13	6	My	16	66	1	Je	15	20	2	Jl	14	73	4	Au	13	26
4831	1787	1652	29M	6318	7 8702	8 743	1730	2	Ap	6	50	4	My	6	03	5	Je	4	56	7	Jl	4	99	1	Au	2	62
4832	1788	1653	29M	8906	26 5091	6 878	1731	1	Ap	25	40	2	My	24	93	4	Je	23	46	5	Jl	22	99	7	Au	21	52
4833	1789	1654	29M	1498	15 6174	3 031	1732	5	Ap	13	77	7	My	13	30	1	Je	11	88	3	Jl	11	36	4	Au	9	89
4834	1790	1655	29M	4081	4 7257	26 742	1733	8	Ap	3	13	4	My	2	66	6	Je	1	19	2	Jl	30	26	3	Au	28	79
4835	1791	1656	29M	6668	23 3643	24 876	1734	2	Ap	22	08	3	My	21	56	5	Je	20	09	6	Jl	19	62	1	Au	18	15
4836	1792	1657	29M	9256	12 4729	21 033	1735	6	Ap	11	40	7	My	10	93	2	Je	9	46	3	Jl	8	99	5	Au	7	52
4837	1793	1658	29M	1848	1 5812	17 190	1736	3	Mr	30	76	5	Ap	29	30	1	Je	27	36	2	Jl	26	89	4	Au	25	42
4838	1794	1659	29M	4431	20 2201	15 323	1737	2	Ap	18	66	4	My	18	19	5	Je	16	72	7	Jl	16	25	1	Au	14	78
4839	1795	1660	29M	7019	9 3284	11 481	1738	7	Ap	8	03	1	My	7	56	3	Je	6	09	4	Jl	5	62	6	Au	4	15
4840	1796	1661	29M	9606	27 9673	9 814	1739	5	Ap	26	93	7	My	26	46	1	Je	24	99	3	Jl	24	52	5	Au	23	05
4841	1797	1662	29M	2194	17 0756	5 771	1740	3	Ap	15	29	4	My	14	82	6	Je	13	36	7	Jl	12	89	2	Au	11	42
4842	1798	1663	29M	4781	6 1839	1 929	1741	7	Ap	4	66	2	My	4	19	3	Je	2	72	6	Jl	2	78	1	Au	30	31
4843	1799	1664	29M	7369	24 8228	0 062	1742	6	Ap	23	09	1	My	23	09	2	Je	21	62	4	Jl	21	15	5	Au	19	68
4844	1800	1665	29M	9956	13 9311	23 774	1743	8	Ap	12	93	5	My	12	46	6	Je	10	99	1	Jl	10	52	8	Au	9	05
4845	1801	1666	29M	2544	8 0394	19 931	1744	1	Ap	1	29	2	Ap	30	82	4	My	30	35	7	Jl	28	42	1	Au	26	95
4846	1802	1667	29M	5132	21 6783	18 064	1745	7	Ap	20	19	1	My	19	72	8	Je	18	25	4	Jl	17	78	6	Au	16	31
4847	1803	1668	29M	7719	10 7866	14 221	1746	4	Ap	9	56	6	My	9	09	7	Je	7	62	2	Jl	7	15	3	Au	5	68
4848	1804	1669	30M	0307	29 4254	12 355	1747	3	Ap	28	46	4	My	27	99	6	Je	26	52	1	Jl	26	05	2	Au	24	58
4849	1805	1670	29M	2894	18 5337	8 512	1748	7	Ap	6	82	2	My	16	35	3	Je	14	88	5	Jl	14	41	6	Au	12	94
4850	1806	1671	29M	5482	7 6420	4 669	1749	5																			

Sūrya siddhānta—cont.

Āsвина.				Kārttika.				Mārgaśīrṣa.				Pauṣa.				A.D.	Māgha.				A.D.	Phālguna.				Chaitra.			
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.		Week-day.	Month.	Day.	Fraction.		Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
2 S	2	31	5 O 31	37	6 N	29	90	1 D	29	43	01	2 Jr	27	96			4 F	26	49	6 Mr	28	02							
3 O	1	84	5 O 31	37	6 N	29	90	1 D	29	43	01	2 Jr	27	96			4 F	26	49	6 Mr	28	02							
1 S	21	20	2 O 20	73	4 N	19	26	5 D	18	80	02	7 Jr	17	33			1 F	15	86	3 Mr	17	89							
5 S	10	57	7 O 10	10	1 N	8	68	3 D	8	16	03	4 Jr	6	69			6 F	5	23	7 Mr	6	75							
4 S	29	47	6 O 29	00	7 N	27	53	2 D	27	06	04	3 Jr	25	59			5 F	24	12	6 Mr	24	65							
1 S	17	84	3 O 17	37	4 N	15	90	6 D	15	43	05	7 Jr	13	96			2 F	12	49	4 Mr	14	02							
6 S	7	20	7 O 6	73	2 N	5	26	3 D	4	79	06	5 Jr	3	82			6 F	1	86	1 Mr	8	89							
5 S	26	10	6 O 25	63	1 N	24	16	2 D	23	69	07	4 Jr	22	22			5 F	20	75	7 Mr	22	28							
2 S	15	47	4 O 15	00	5 N	13	53	7 D	13	06	08	1 Jr	11	59			3 F	10	12	4 Mr	10	65							
6 S	3	88	1 O 3	86	2 N	1	90	4 D	1	43		5 D	30	96		09	7 Jr	29	49	2 F	28	02							
5 S	22	73	7 O 22	26	1 N	20	79	3 D	20	32	10	4 Jr	18	81			6 F	17	39	7 Mr	18	92							
3 S	12	10	4 O 11	63	6 N	10	16	7 D	9	69	11	2 Jr	8	22			3 F	6	75	5 Mr	8	28							
2 O	1	00	8 O 30	53	5 N	29	06	6 D	28	59	12	1 Jr	27	12			2 F	25	65	4 Mr	26	18							
6 S	19	36	7 O 18	89	2 N	17	43	3 D	16	96	13	5 Jr	15	49			7 F	14	02	1 Mr	15	55							
3 S	8	73	5 O 8	26	6 N	6	79	1 D	6	32	14	2 Jr	4	85			4 F	3	38	5 Mr	4	91							
2 S	27	63	4 O 27	16	5 N	25	69	7 D	25	22	15	1 Jr	23	75			3 F	22	28	4 Mr	23	81							
7 S	17	00	1 O 16	53	3 N	15	06	4 D	14	59	16	6 Jr	13	12			7 F	11	65	2 Mr	12	18							
4 S	5	36	5 O 4	89	7 N	3	42	1 D	2	95	17	3 Jr	1	49			5 Jr	31	02	6 Mr	1	55							
3 S	24	26	4 O 23	79	6 N	22	32	7 D	21	85	18	2 Jr	20	38			3 F	18	91	5 Mr	20	44							
7 S	13	63	2 O 13	16	3 N	11	06	5 D	11	22	19	6 Jr	9	75			1 F	8	28	2 Mr	9	81							
4 S	2	99	1 N 1	06	2 N	30	59	4 D	30	12	20	5 Jr	28	65			7 F	27	18	1 Mr	27	71							
6 O	2	53	1 N 1	06	2 N	30	59	4 D	30	12	20	5 Jr	28	65			7 F	27	18	1 Mr	27	71							
3 S	20	89	5 O 20	42	6 N	18	95	1 D	18	48	21	3 Jr	17	01			4 F	15	55	6 Mr	17	08							
1 S	10	26	2 O 9	79	4 N	8	32	5 D	7	85	22	7 Jr	6	38			1 F	4	91	3 Mr	6	44							
7 S	29	16	1 O 28	69	3 N	27	22	4 D	26	75	23	6 Jr	25	28			7 F	23	81	2 Mr	25	34							
4 S	18	52	6 O 18	05	7 N	16	59	2 D	16	12	24	3 Jr	14	65			5 F	13	18	6 Mr	13	71							
1 S	6	89	3 O 6	12	4 N	4	95	6 D	4	48	25	1 Jr	3	01			2 F	1	54	4 Mr	3	07							
7 S	25	79	2 O 25	32	3 N	23	85	5 D	23	38	26	6 Jr	21	91			1 F	20	44	2 Mr	21	97							
5 S	15	16	6 O 14	69	1 N	13	22	2 D	12	75	27	4 Jr	11	28			5 F	9	81	7 Mr	11	84							
2 S	4	52	4 O 4	05	5 N	2	58	7 D	2	11		1 D	31	64		28	3 Jr	30	18	4 F	28	71							
1 S	22	42	2 O 21	95	4 N	20	48	6 D	20	01	29	7 Jr	18	54			2 F	17	07	3 Mr	18	60							
5 S	11	79	7 O 11	32	1 N	9	85	3 D	9	38	30	4 Jr	7	91			6 F	6	44	7 Mr	7	97							
4 S	30	68	6 O 30	22	7 N	28	75	2 D	28	28	31	3 Jr	26	81			5 F	25	34	6 Mr	26	87							
2 S	20	05	3 O 19	58	5 N	18	11	6 D	17	64	32	1 Jr	16	17			2 F	14	70	4 Mr	15	24							
6 S	8	42	7 O 7	95	2 N	6	48	4 D	6	01	33	5 Jr	4	54			7 F	3	07	1 Mr	4	60							
5 S	27	32	6 O 26	85	1 N	25	38	2 D	24	91	34	4 Jr	23	44			5 F	21	97	7 Mr	23	50							
2 S	16	68	4 O 16	21	5 N	14	74	7 D	14	28	35	1 Jr	12	81			3 F	11	84	4 Mr	12	87							
7 S	6	05	1 O 5	58	3 N	4	11	4 D	3	64	36	6 Jr	2	17			7 Jr	31	70	2 Mr	1	28							
5 S	23	95	7 O 23	48	2 N	22	01	3 D	21	54	37	5 Jr	20	07			6 F	18	60	1 Mr	20	13							
3 S	13	32	4 O 12	85	6 N	11	38	7 D	10	91	38	2 Jr	9	44			3 F	7	97	5 Mr	9	50							
7 S	2	68	3 O 31	74	5 N	30	27	6 D	29	80	39	1 Jr	28	84			2 F	26	87	4 Mr	28	46							
2 O	2	21	3 O 31	74	5 N	30	27	6 D	29	80	39	1 Jr	28	84			2 F	26	87	4 Mr	28	46							
6 S	21	58	1 O 21	11	2 N	19	64	4 D	19	17	40	5 Jr	17	70			7 F	16	23	1 Mr	16	76							
3 S	9	95	5 O 9	18	7 N	8	01	1 D	7	54	41	3 Jr	6	07			1 F	4	60	6 Mr	6	13							
2 S	28	84	4 O 28	88	5 N	26	91	7 D	26	44	42	1 Jr	24	97			3 F	23	50	5 Mr	25	08							
7 S	18	21	1 O 17	74	3 N	16	27	4 D	15	80	43	6 Jr	14	33			7 F	12	86	2 Mr	14	40							
4 S	7	58	6 O 7	11	7 N	5	64	2 D	5	17	44	3 Jr	3	70			5 F	2	23	6 Mr	2	76							
3 S	25	48	5 O 25	01	6 N	23	54	1 D	23	07	45	2 Jr	21	60			4 F	20	18	5 Mr	21	68							
7 S	14	84	2 O 14	37	3 N	12	91	5 D	12	44	46	6 Jr	10	97			1 F	9	50	3 Mr	11	03							
5 S	4	21	6 O 3	74	1 N	2	27	2 D	1	80		4 D	31	33		47	5 Jr	29	86	7 F	28	39							
4 S	28	11	5 O 22	64	7 N	21	17	1 D	20	70	48	3 Jr	19	23			4 F	17	76	6 Mr	18	29							
1 S	11	48	3 O 11	01	4 N	9	54	6 D	9	07	49	7 Jr	7	60			2 F	6	13	3 Mr	7	66							
7 S	30	97	1 O 29	90	3 N	28	43	4 D	27	96	50	6 Jr	26	50			1 F	25	08	2 Mr	26	56							
4 S	19	74	6 O 19	27	7 N	17	80	2 D	17	33	51	3 Jr	15	86			5 F	14	39	6 Mr	15	92							
2 S	8	11	8 O 8	64	5 N	7	17	6 D	6	70	52	1 Jr	5	23			2 F	3	76	4 Mr	4	29							

(1) for Ārya siddhānta + '05; (2) for Brahma siddhānta - '10; and (3) for Siddhānta Siromapi -- '03.

TABLE II.—

			Com- mence- ment of solar year.				Vaiśākha.	Jyeshthā.	Āshāḍha.	Śrāvana.	Bhādrapada.		
Kalivga.	Vikrama era.	Śaka era	Month and day A.D.	Fraction of day	First new moon in solar year	Anomaly of first new moon.	Christian era.	Week-day Month Day.	Fraction Week-day. Month Day	Fraction. Week-day. Month. Day	Fraction. Week-day Month. Day.	Fraction. Week-day. Month Day.	Fraction.
A.D.													
4858	1809	1674	29M	3244	4-4975	22-671	1752	5 Ap 2	82 7 My 2	35 { 1 My 31 3 Je 30	68 4 Jl 29	94 6 Au 28	47
4854	1810	1675	9A	5832	23 1364	20 805	1753	4 My 2	72 6 Je 1	25 7 Je 30	78 2 Jl 80	81 3 Au 28	84
4855	1811	1676	9A	8420	12-2447	16 962	1754	2 Ap 22	09 3 My 21	62 5 Je 20	15 6 Jl 19	68 1 Au 18	21
4856	1812	1677	10A	1007	1-3530	13-119	1755	6 Ap 11	45 { 7 My 10 2 Je 9	98 4 Jl 9	04 5 Au 7	58 7 S 6	11
4857	1813	1678	9A	3595	19 9919	11-252	1756	5 Ap 29	85 6 My 28	88 1 Je 27	41 2 Jl 28	94 4 Au 25	47
4858	1814	1679	9A	6182	9-1002	7-410	1757	2 Ap 18	72 4 My 18	25 5 Je 16	78 7 Jl 16	31 1 Au 14	84
4859	1815	1680	9A	8770	27-7391	5-548	1758	1 My 7	62 3 Je 6	15 4 Jl 5	68 6 Au 4	21 7 S 2	74
4860	1816	1681	10A	1357	16-8474	1-700	1759	5 Ap 26	98 7 My 26	51 2 Je 25	04 3 Jl 24	57 5 Au 23	10
4861	1817	1682	9A	3945	5-9557	25-412	1760	3 Ap 15	35 4 My 14	88 6 Je 13	41 { 7 Jl 12 2 Au 11	47 4 S 10	00
4862	1818	1683	9A	6533	24-5946	23-545	1761	2 My 4	25 3 Je 2	78 5 Jl 2	31 6 Jl 31	84 1 Au 30	37
4863	1819	1684	9A	9120	13-7629	19-703	1762	6 Ap 23	61 1 My 23	14 2 Je 21	68 4 Jl 21	21 5 Au 19	74
4864	1820	1685	10A	1708	2-8112	15-860	1763	3 Ap 12	98 { 5 My 12 7 Je 11	51 1 Jl 10	57 3 Au 9	10 4 S 7	68
4865	1821	1686	9A	4295	21-4500	13-993	1764	2 Ap 30	88 4 My 30	41 5 Je 28	94 7 Jl 28	47 2 Au 27	00
4866	1822	1687	9A	6883	10-5568	10-150	1765	7 Ap 20	25 1 My 19	78 3 Je 18	31 4 Jl 17	84 6 Au 16	37
4867	1823	1688	9A	9470	29 1972	8-284	1766	6 My 9	14 7 Je 7	67 2 Jl 7	20 3 Au 5	74 5 S 4	27
4868	1824	1689	10A	2058	18-3055	4-441	1767	3 Ap 28	51 5 My 28	04 6 Je 26	57 1 Jl 26	10 2 Au 24	63
4869	1825	1690	9A	4646	7-4138	0-598	1768	7 Ap 16	88 2 My 16	41 3 Je 14	94 { 5 Jl 14 7 Au 13	47 1 S 11	53
4870	1826	1691	9A	7233	26 0527	26-236	1769	6 My 5	78 1 Je 4	31 2 Jl 3	84 4 Au 2	37 5 Au 31	90
4871	1827	1692	9A	9821	15-1610	22-445	1770	4 Ap 25	14 5 My 24	67 7 Je 23	20 1 Jl 22	73 3 Au 21	26
4872	1828	1693	10A	2408	4-2393	18-600	1771	1 Ap 14	51 3 My 14	04 { 4 Je 12 6 Jl 12	57 7 Au 10	63 2 S 9	16
4873	1829	1694	9A	4996	22-9032	16-734	1772	7 My 2	41 1 My 31	94 3 Je 30	47 5 Jl 30	00 6 Au 28	53
4874	1830	1695	9A	7583	12-6165	12-891	1773	4 Ap 21	77 6 My 21	30 7 Je 19	84 2 Jl 19	37 3 Au 17	80
4875	1831	1696	10A	0171	1-1248	9-048	1774	2 Ap 11	14 5 Je 9	20 6 Jl 8	73 1 Au 7	26 2 S 5	79
4876	1832	1697	10A	2758	19-7637	7-181	1775	3 My 10	67 2 My 29	57 4 Je 28	10 5 Jl 27	63 7 Au 26	16
4877	1833	1698	9A	5346	8-8720	3-339	1776	5 Ap 18	41 6 My 17	94 1 Je 16	47 3 Jl 16	00 { 4 Au 14 6 S 13	53
4878	1834	1699	9A	7934	27-5109	1-472	1777	4 My 7	30 5 Je 5	83 7 Jl 5	36 1 Au 3	90 3 S 2	43
4879	1835	1700	10A	0521	16-6182	25-184	1778	1 Ap 26	67 3 My 26	20 4 Je 24	78 6 Jl 24	26 7 Au 22	79
4880	1836	1701	10A	3109	5-7275	21-341	1779	6 Ap 16	04 7 My 15	57 2 Je 14	10 { 3 Jl 13 5 Au 12	16 6 S 10	69
4881	1837	1702	9A	5696	24-8664	19-474	1780	4 My 3	94 6 Je 2	47 1 Jl 2	00 2 Jl 31	53 4 Au 30	06
4882	1838	1703	9A	8284	13-4747	15-632	1781	2 Ap 23	30 3 My 22	83 5 Je 21	36 6 Jl 20	89 1 Au 19	42
4883	1839	1704	10A	0871	2-5830	11-789	1782	6 Ap 12	67 { 1 My 12 2 Je 10	20 4 Jl 10	26 5 Au 8	79 7 S 7	32
4884	1840	1705	10A	3459	21-2218	9-922	1783	5 My 1	57 7 My 31	10 1 Je 29	63 3 Jl 29	16 4 Au 27	69
4885	1841	1706	9A	6047	10-3301	6-079	1784	2 Ap 19	98 4 My 19	46 6 Je 18	00 7 Jl 17	53 2 Au 16	08
4886	1842	1707	9A	8634	28-0690	4-213	1785	1 My 8	83 3 Je 7	36 4 Jl 6	89 6 Au 5	42 7 S 3	95
4887	1843	1708	10A	1222	18-0773	0-370	1786	6 Ap 28	20 7 My 27	73 2 Je 26	26 3 Jl 25	79 5 Au 24	32
4888	1844	1709	10A	3809	7-1656	24-082	1787	3 Ap 17	57 5 My 17	10 6 Jl 15	63 { 1 Jl 15 2 Au 13	16 4 S 12	22
4889	1845	1710	9A	6897	25-8245	22-215	1788	2 My 5	46 3 Je 3	99 5 Jl 3	52 7 Au 2	06 1 Au 31	59
4890	1846	1711	9A	9984	14-9328	18-372	1789	6 Ap 24	83 1 My 24	36 2 Je 22	89 4 Jl 22	42 5 Au 20	95
4891	1847	1712	10A	1572	4-0411	14-529	1790	4 Ap 14	20 5 My 13	73 { 7 Je 12 1 Jl 11	79 3 Au 10	32 4 S 8	86
4892	1848	1713	10A	4160	22-6800	2-663	1791	3 My 3	10 4 Je 1	63 6 Jl 1	16 7 Jl 30	69 2 Au 29	22
4893	1849	1714	9A	6747	11-7883	8-520	1792	4 Ap 21	46 1 My 20	99 3 Je 19	52 5 Jl 19	05 6 Au 17	58
4894	1850	1715	9A	9335	0-8966	4-977	1793	4 Ap 10	88 7 Je 8	89 2 Jl 8	42 3 Au 6	95 5 S 5	48
4895	1851	1716	10A	1922	19-5355	3-110	1794	3 Ap 29	73 5 My 29	26 6 Je 27	79 1 Jl 27	32 2 Au 25	85
4896	1852	1717	10A	4510	8-5438	26-822	1795	1 Ap 19	09 2 My 18	62 4 Je 17	16 5 Jl 16	69 { 7 Au 15 1 S 13	75
4897	1853	1718	9A	7097	27-2427	24-955	1796	6 My 6	99 1 Je 5	52 3 Jl 5	05 4 Au 3	58 6 S 2	11
4898	1854	1719	9A	9685	16-3910	21-113	1797	4 Ap 26	36 5 M 25	89 7 Je 24	42 1 Jl 23	95 3 Au 22	48
4899	1855	1720	10A	2272	5-4993	17-270	1798	1 Ap 15	73 3 My 15	26 4 Je 13	79 { 6 Jl 18 7 Au 11	85 2 S 10	38
4900	1856	1721	10A	4860	24-1382	15-403	1799	7 My 4	62 2 Je 3	15 3 Jl 2	68 5 Au 1	22 6 Au 30	75
4901	1857	1722	10A	7448	13-2464	11-563	1800	4 Ap 23	69 6 My 23	52 1 Je 22	05 2 Jl 21	58 4 Au 20	11
4902	1858	1723	11A	0035	2-3548	7-720	1801	2 Ap 13	86 { 8 My 12 5 Je 11	89 6 Jl 10	95 1 Au 9	48 3 S 8	01
4903	1859	1724	11A	2623	20-9936	5-854	1802	1 My 2	26 2 My 31	79 4 Je 30	82 5 Jl 29	85 7 Au 28	38
4904	1860	1725	11A	5210	10-1019	2-011	1803	5 Ap 21	62 7 My 21	15 1 Je 19	68 3 Jl 19	21 4 Au 17	74
4905	1861	1726	10A	7798	28-7408	0-144	1804	4 My 9	52 6 Je 8	05 7 Jl 7	88 2 Au 6	11 3 S 4	64

Sūrya siddhānta—cont.

Āśvina.				Kārttika.				Mārgaśīrṣa.				A.D.				Pauṣa.				A.D.				Māgha.				Phālguna.				Chaitra.			
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.				
1 O*	8	00	2 N	6 ●	54	4 D	6	07	53	5 Jr	4	80				7 F	3	13	1 Mr	4	06	3 Ap	8 ○	19											
5 S	27 ○	87	6 O	26 ●	80	1 N	25	43		2 D	24	96	54	4 Jr	23	49	6 F	22	02	7 Mr	23 ○	56													
2 S	10 ○	74	4 O	16	27	5 N	14	80		7 D	14	83	55	1 Jr	12	86	3 F	11	39	4 Mr	12 ○	92													
1 O	5	64	3 N	4	17	4 D	3	70	56	6 Jr	2	23				7 Jr	31	76	2 Mr	1 ●	29	3 Mr	30	82											
6 S	24	00	7 O	23	53	2 N	22	08		3 D	21	80	57	5 Jr	20 ○	13	6 F	18	06	1 Mr	20	19													
3 S	13	87	6 N	11	43	7 D	10	96	58	2 Jr	9 ○	49				4 F	8	02	5 Mr	9	55	7 Ap	8	08											
4 O	12	90								6 D	29 ●	86	59	1 Jr	28	39	2 F	26	02	4 Mr	28	45													
2 O	2	27	3 O	31	80	5 N	30	33		4 D	19	23	60	5 Jr	17	76	7 F	16	29	1 Mr	16	82													
6 S	21	64	1 O	21	17	2 N	19	70	61	3 Jr	6	12				4 F	4	06	6 Mr	6	19	7 Ap	4	72											
5 O	9	53	7 N	8 ○	06	1 D	7	59		7 D	26	49	62	2 Jr	25	02	3 F	23	55	5 Mr	25	08													
2 S	28	90	4 O	28 ○	43	5 N	26	96		4 D	15	88	63	6 Jr	14	39	7 F	12	02	2 Mr	14	45													
7 S	18	27	1 O	17 ●	80	3 N	16	33	64	3 Jr	3	76				5 F	2	29	6 Mr	2 ○	82	1 Ap	1 ●	85											
6 O	7 ●	16	7 N	5	70	2 D	5	23		1 D	23	12	65	2 Jr	21	65	4 F	20 ○	18	5 Mr	21	72													
3 S	25	53	5 O	25	06	6 N	23	59		5 D	12	49	66	7 Jr	11	02	1 F	9 ●	55	4 Ap	9	61													
7 S	14	90	2 O	14	43	3 N	12	98		4 D	31	39	67	5 Jr	29 ●	92	7 F	23	45	1 Mr	29	98													
6 O	3	80	1 N	2	33	2 D	1	86		1 D	20 ○	76	68	3 Jr	19	29	4 F	17	82	6 Mr	18	85													
4 S	23	16	5 O	22	69	7 N	21	22	61	7 Jr	7 ●	65				2 F	6	18	3 Mr	17	71	5 Ap	6	24											
3 O	11	06	4 N	9	59	6 D	9 ○	12		5 D	28	02	70	6 Jr	26	55	1 F	25	08	2 Mr	26	61													
7 S	30	43	1 O	29	96	3 N	28 ○	49		2 D	17	39	71	3 Jr	15	92	5 F	14	45	6 Mr	15	98													
4 S	19	80	6 O	19	33	7 N	17 ●	86	72	1 Jr	5	28				2 F	3	82	4 Mr	4	35	5 Ap	2 ○	88											
3 O	8 ○	69	5 N	7	22	6 D	6	75		5 D	24	65	73	7 Jr	23	19	1 F	21	71	3 Mr	23 ○	24													
1 S	27 ○	06	2 O	26 ●	59	4 N	25	12		3 D	14	02	74	4 Jr	12	55	6 F	11	08	7 Mr	12 ●	61													
5 S	10 ○	43	6 O	15	06	1 N	14	49	75	1 Jr	1	92				8 Jr	31 ○	45	4 Mr	1	98	6 Mr	31	51											
4 O	5	82	5 N	3	86	7 D	3	39		6 D	22	28	76	7 Jr	20 ●	81	2 F	19	34	3 Mr	19	88													
1 S	24	69	3 O	24	22	4 N	22	75	77	5 Jr	9 ○	18				6 F	7	71	1 Mr	9	24	2 Ap	7	77											
7 O	12	59	2 N	11	12	3 D	10	65		2 D	29	55	78	4 Jr	28	08	5 F	26	61	7 Mr	28	14													
4 O	1	96	6 O	31	49	1 N	30	02		6 D	18	92	79	1 Jr	17	45	2 F	15	98	4 Mr	17	51													
2 S	21	32	3 O	20	85	5 N	19 ○	38	80	5 Jr	6	81				7 F	5	34	1 Mr	5	87	3 Ap	4	40											
1 O	10	22	2 N	80	75	4 D	8	28		3 D	26	18	81	4 Jr	24	71	6 F	23	24	7 Mr	24	77													
6 S	28	59	7 O	28 ○	12	1 N	26	65		7 D	15	55	82	2 Jr	14	08	3 F	12	61	5 Mr	14 ○	14													
2 S	17	96	4 O	17 ●	49	6 N	16	02	83	6 Jr	3	44				7 F	1	98	2 Mr	3 ○	51	4 Ap	2	04											
1 O	6 ●	85	3 N	5	88	4 D	4	91		3 D	23	81	84	5 Jr	22	34	6 F	20 ○	87	1 Mr	21	40													
6 S	26	22	7 O	25	75	2 N	24	28		1 D	12	18	85	2 Jr	10	71	4 F	9 ●	24	5 Mr	10	77													
3 S	14	59	5 O	14	12	6 N	12	65		7 D	31 ○	08	86	1 Jr	29 ●	61	3 F	28	14	4 Mr	29	67													
2 O	3	43	4 N	2	02	5 D	1	55		4 D	20 ○	44	87	5 Jr	18	97	7 F	17	50	2 Mr	19	04													
6 S	22	85	1 O	22	38	2 N	20	91	88	3 Jr	8	34				4 F	6	87	6 Mr	7	40	7 Ap	5	93											
5 O	11	75	7 N	10	28	1 D	9 ○	81		7 D	27	71	89	2 Jr	26	24	3 F	24	77	5 Mr	26	30													
3 S	30	12	4 O	29	65	6 N	28	18		5 D	17	08	90	6 Jr	15	61	1 F	14	14	2 Mr	15	67													
7 S	19	48	2 O	19 ○	01	3 N	17 ●	54	91	3 Jr	4	97				5 F	3	50	7 Mr	5	03	1 Ap	3 ○	56											
6 O	8 ○	88	7 N	6	91	2 D	6	44		1 D	25	34	92	2 Jr	23	87	4 F	22	40	5 Mr	23	93													
3 S	27 ○	75	5 O	27	28	6 N	25	81		5 D	13	71	93	7 Jr	12	24	1 F	10 ○	77	3 Mr	12 ●	80													
1 S	16 ●	12	2 O	15	65	4 N	14	18	94	4 Jr	1	60				6 Jr	31 ○	14	7 Mr	1	67	2 Mr	31	20											
7 O	5	01	1 N	3	54	3 D	3	07		1 D	21	97	95	3 Jr	20 ○	50	5 F	19	03	6 Mr	20	56													
4 S	24	38	5 O	23	91	7 N	22	44	96	7 Jr	9 ●	87				2 F	8	40	3 Mr	8	93	5 Ap	7	46											
3 O	13	28	4 N	11	81	6 D	11	34		5 D	29	24	97	6 Jr	27	77	1 F	26	30	2 Mr	27	83													
7 O	1	64	2 O	31	18	3 N	29 ○	71		2 D	18	60	98	4 Jr	17	13	5 F	15	66	7 Mr	17	20													
5 S	21	01	6 O	20	54	1 N	19 ○	07		1 Jr	6	50				5 F	5	03	4 Mr	6	56	6 Ap	5	09											
3 O	9	91	5 N	8 ●	44	6 D	7	97	99	5 D	26	87	00	7 Jr	25	40	1 F	23	93	3 Mr	25 ○	46													
1 S	29	28	2 O	28	81	4 N	27	84	18	3 D	16	24	01	4 Jr	14	77	6 F	18	30	7 Mr	14 ○	83													
5 S	19 ○	64	7 O	18	17	1 N	16	70	02	2 Jr	4	18				3 F	2	66	5 Mr	4 ○	19	6 Ap	2	72											
4 O	7	54	6 N	6	07	7 D	5	60		6 D	24	50	03	1 Jr	23	03	2 F	21	56	4 Mr	23	09													
1 S	26	91	3 O	26	44	4 N	24	97		3 D	13	87	04	5 Jr	12 ○	40	6 F	10 ●	93	1 Mr	11	46													
6 S	16	28	7 O	15	81	2 N	14	84		2 D	31 ○	76	05	4 Jr	30	80	5 F	28	83	7 Mr	30	86													
5 O	4	17	6 N	2	70	1 D	2	23																											

* In this year A.D. 1752, the New Style was introduced by an Act of the British Parliament and 11 days were dropped out, that is, the next day after Wednesday, 2 September 1752 was declared to be Thursday, 14 September 1752. Hence the new moon after 28 August 1752 which ordinarily would have occurred on 26 September 1752 actually occurred on 8 October 1752.

TABLE II—

			Com- mence- ment of solar year.		First new-moon in solar year.		Anomaly of first new moon		Christian era		Vaisākha.			Jyeshtha.			Āshāḍha.			Śrāvaṇa.			Bhādrapada.				
Kaliyuga.	Vikrama era	Śaka era.	Month and day A.D.	Fraction of day.						Week-day. Month. Day.	Fraction Week-day Month. Day.																
A.D.																											
4906	1862	1727	11A	0395	17-8401	23-856	1805	1	Ap	28	89	3	My	28	42	4	Je	26	95	6	Jl	26	48	1	Au	25	01
4907	1863	1728	11A	2973	6-9574	20-018	1806	6	Ap	18	25	7	My	17	78	2	Je	16	32	3	Jl	15	85	6	S	12	91
4908	1864	1729	11A	5561	25-5963	18-147	1807	5	My	7	15	6	Je	5	68	1	Jl	5	21	2	Au	3	74	4	S	2	27
4909	1865	1730	10A	8148	14-7046	14-304	1808	2	Ap	25	52	4	My	25	05	5	Je	28	58	7	Jl	23	11	1	Au	21	64
4910	1866	1731	11A	0736	3-8129	10-461	1809	6	Ap	14	80	1	My	14	42	4	Jl	12	18	6	Au	11	01	7	S	9	54
4911	1867	1732	11A	3323	22-4518	8-594	1810	5	My	3	78	7	Je	2	31	1	Jl	1	84	3	Jl	31	37	4	Au	29	91
4912	1868	1733	11A	5911	11-5691	4-752	1811	3	Ap	23	15	4	My	22	68	6	Je	21	21	7	Jl	20	74	2	Au	19	27
4913	1869	1734	10A	8493	0-6684	0-909	1812	7	Ap	11	52	3	Je	9	58	5	Jl	9	11	6	Au	7	64	1	S	6	17
4914	1870	1735	11A	1086	19-3973	26-597	1813	6	Ap	30	12	7	My	29	95	2	Je	28	48	4	Jl	28	00	5	Au	26	54
4915	1871	1736	11A	3674	8-4156	22-754	1814	3	Ap	19	78	5	My	19	81	6	Je	17	84	1	Jl	17	37	2	Au	15	90
4916	1872	1737	11A	6261	27-0545	20-887	1815	2	My	8	88	4	Je	7	21	5	Jl	6	74	7	Au	5	27	1	S	3	80
4917	1873	1738	10A	8849	16-1628	17-044	1816	7	Ap	27	05	1	My	26	58	3	Je	25	11	4	Jl	24	64	6	Au	23	17
4918	1874	1739	11A	1436	5-2711	18-202	1817	4	Ap	16	41	5	My	15	94	7	Je	14	48	3	Au	12	54	5	S	11	07
4919	1875	1740	11A	4024	23-9099	11-385	1818	3	My	5	81	4	Je	3	84	6	Jl	3	37	7	Au	1	90	2	Au	31	48
4920	1876	1741	11A	6611	13-0182	7-492	1819	7	Ap	24	68	2	My	24	21	3	Je	22	74	5	Jl	22	27	6	Au	20	80
4921	1877	1742	10A	9199	2-1265	8-649	1820	5	Ap	13	05	1	Je	11	58	2	Jl	10	11	4	Au	9	17	5	S	7	70
4922	1878	1743	11A	1787	20-7654	1-783	1821	3	My	1	94	5	My	31	47	7	Je	30	00	1	Jl	29	54	3	Au	28	07
4923	1879	1744	11A	4374	9-8737	25-495	1822	1	Ap	21	31	2	My	20	84	4	Je	19	37	5	Jl	18	90	7	Au	17	43
4924	1880	1745	11A	6962	28-5126	23-628	1823	7	My	10	21	1	Je	8	74	3	Jl	8	27	4	Au	6	80	6	S	5	33
4925	1881	1746	10A	9549	17-0209	19-785	1824	4	Ap	28	58	6	My	28	11	7	Je	26	64	2	Jl	26	17	3	Au	24	70
4926	1882	1747	11A	2137	6-7292	15-942	1825	1	Ap	17	94	3	My	17	47	5	Je	16	00	6	Jl	15	58	2	S	12	60
4927	1883	1748	11A	4724	25-3681	14-076	1826	7	My	6	84	2	Je	5	37	3	Jl	4	90	5	Au	8	43	6	S	1	96
4928	1884	1749	11A	7312	14-4764	10-233	1827	5	Ap	26	21	6	My	25	74	1	Je	24	27	2	Jl	23	80	4	Au	22	83
4929	1885	1750	10A	9899	3-5847	6-390	1828	2	Ap	14	57	4	My	14	10	5	Je	12	61	1	Au	10	70	3	S	9	23
4930	1886	1751	11A	2487	22-2236	4-523	1829	1	My	3	47	3	Je	2	00	4	Jl	1	53	6	Jl	31	06	7	Au	29	59
4931	1887	1752	11A	5075	11-3319	0-681	1830	5	Ap	22	84	7	My	22	37	1	Je	20	90	3	Jl	20	43	4	Au	18	96
4932	1888	1753	11A	7662	0-4402	24-392	1831	3	Ap	12	21	6	Je	10	27	7	Jl	9	80	2	Au	8	33	3	S	6	86
4933	1889	1754	11A	0250	19-0791	22-526	1832	2	Ap	30	10	3	My	29	63	5	Je	28	16	6	Jl	27	70	1	Au	26	23
4934	1890	1755	11A	2837	8-1874	18-683	1833	6	Ap	19	47	1	My	19	00	2	Je	17	53	4	Jl	17	06	5	Au	15	59
4935	1891	1756	11A	5425	26-8268	16-816	1834	5	My	8	37	6	Je	6	90	1	Jl	6	43	2	Au	4	96	4	S	3	49
4936	1892	1757	11A	8012	15-9846	12-978	1835	2	Ap	27	74	4	My	27	27	5	Je	25	80	7	Jl	25	33	1	Au	23	86
4937	1893	1758	11A	0600	5-0429	9-131	1836	7	Ap	16	10	1	My	15	63	3	Je	14	18	6	Au	12	22	7	S	10	76
4938	1894	1759	11A	3183	23-6819	7-264	1837	6	My	5	00	7	Je	3	53	2	Jl	3	08	3	Au	1	59	5	Au	31	12
4939	1895	1760	11A	5775	12-7900	3-421	1838	3	Ap	24	37	4	My	23	90	6	Je	22	43	7	Jl	21	96	2	Au	20	49
4940	1896	1761	11A	8363	1-8983	27-133	1839	7	Ap	13	78	2	My	13	26	5	Jl	11	83	6	Au	9	86	1	S	8	39
4941	1897	1762	11A	0950	20-5372	25-266	1840	6	My	1	63	1	My	31	16	2	Je	29	60	4	Jl	29	22	5	Au	27	75
4942	1898	1763	11A	3538	9-6455	21-424	1841	4	Ap	21	00	5	My	20	53	7	Je	19	06	1	Jl	18	59	3	Au	17	12
4943	1899	1764	11A	6125	28-2844	19-557	1842	2	My	9	90	4	Je	8	43	5	Jl	7	32	7	Au	6	49	2	S	5	02
4944	1900	1765	11A	8713	17-3927	15-714	1843	7	Ap	29	26	1	My	28	79	3	Je	27	32	4	Jl	26	86	6	Au	25	39
4945	1901	1766	11A	1300	6-5010	11-871	1844	4	Ap	17	83	6	My	17	16	7	Je	15	89	3	Au	13	75	5	S	12	28
4946	1902	1767	11A	3888	25-1899	10-004	1845	3	My	6	58	5	Je	5	06	6	Jl	4	59	1	Au	3	12	2	S	1	66
4947	1903	1768	11A	6476	14-2182	6-162	1846	7	Ap	25	90	2	My	25	43	8	Je	23	96	5	Jl	23	49	7	Au	22	02
4948	1904	1769	11A	9063	3-3535	2-819	1847	5	Ap	15	26	1	Je	13	79	2	Jl	12	85	4	Au	11	38	5	S	9	92
4949	1905	1770	11A	1651	21-9954	0-452	1848	4	My	3	16	5	Je	1	69	7	Jl	1	22	1	Jl	30	75	3	Au	29	28
4950	1906	1771	11A	4238	11-1037	24-164	1849	1	Ap	22	53	3	My	22	06	4	Je	20	59	6	Jl	20	12	7	Au	18	65
4951	1907	1772	11A	6826	0-2120	20-321	1850	5	Ap	11	89	1	Je	9	96	3	Jl	9	49	5	Au	8	02	6	S	6	55
4952	1908	1773	11A	9413	18-8509	18-454	1851	4	Ap	30	79	6	My	30	32	7	Je	28	85	2	Jl	28	38	3	Au	26	91
4953	1909	1774	11A	2001	7-9592	14-612	1852	2	Ap	19	16	3	My	18	69	5	Je	17	22	6	Jl	16	75	2	Au	15	28
4954	1910	1775	11A	4589	26-5981	12-745	1853	1	My	8	06</																

N.B.—For tithis by other addhāntas add to the above algebraically as follows:—

Sūrya siddhānta—cont.

Āśvina.				Kārttika.				Mārgaśīrṣa.				A.D.				Pauṣa.				A.D.				Māgha.				Phālguna.				Chaitra.			
Week-day	Month	Day	Fraction.	Week-day	Month	Day	Fraction.	Week-day	Month	Day	Fraction.	Week-day	Month	Day	Fraction.	Week-day	Month	Day	Fraction.	Week-day	Month	Day	Fraction.	Week-day	Month	Day	Fraction.	Week-day	Month	Day	Fraction.				
2 S	28		54	4 O	23		07	5 N	21		60		7 D	21	13	06	1 Jr	19		66	3 F	18		19	4 Mr	19		72							
1 O	12		44	2 N	10		97	4 D	10		50	07	6 Jr	9	03		7 F	7		56	2 Mr	9		09	3 Ap	7		62							
5 O	1		80	7 O	31	10	34	1 N	28	10	87		3 D	29	40	08	4 Jr	27		93	6 F	26		46	7 Mr	26		99							
8 S	20		17	4 O	19	10	70	6 N	18	10	23		7 D	17	76	09	2 Jr	16		29	3 F	14		82	5 Mr	16		36							
2 O	9	10	07	3 N	7		60	5 D	7		18	10	6 Jr	5	66		1 F	4		19	2 Mr	5		72	4 Ap	4	10	25							
6 S	28		44	7 O	27		97	2 N	26		50		4 O	26	03	11	5 Jr	24		56	7 F	23	10	09	1 Mr	24		62							
3 S	17		80	5 O	17		38	6 N	15		86		1 D	15	40	12	2 Jr	13		93	1 F	12	10	46	5 Mr	12		99							
2 O	5		70	4 N	4		28	5 D	3		76	13	7 Jr	2	29		1 Jr	31	10	82	3 Mr	2		35	4 Mr	31		88							
7 S	25		07	1 O	24		60	3 N	23		18		4 D	22	66	14	6 Jr	21		19	7 F	19		72	2 Mr	21		25							
5 O	13		97	7 N	12		50	2 D	12	10	03	15	3 Jr	10	56		5 F	9		09	6 Mr	10		62	1 Ap	9		15							
8 O	3		33	4 N	1		86	6 D	1	10	39		7 D	30	92	16	2 Jr	29		46	3 F	27		99	5 Mr	28		52							
7 S	21		70	2 O	21		23	3 N	19	10	76		5 D	19	29	17	6 Jr	17		82	1 F	16		35	2 Mr	17		88							
6 O	10		60	1 N	9	10	13	2 D	8		66	18	4 Jr	7	19		5 F	5		72	7 Mr	7		25	1 Ap	5	10	78							
8 S	29	10	96	5 O	29		50	7 N	28		03		1 D	27	56	19	3 Jr	26		09	1 F	24		62	6 Mr	26	10	15							
1 S	19	10	33	2 O	18		86	4 N	17		89		5 D	16	92	20	7 Jr	15		45	1 F	13		98	3 Mr	14	10	52							
7 O	7		23	1 N	5		76	3 D	5		29	21	4 Jr	3	82		6 F	2		35	7 Mr	3	10	88	2 Ap	2		41							
4 S	26		60	6 O	26		13	7 N	24		66		2 D	24	19	22	3 Jr	22	10	72	5 F	21		25	6 Mr	22		78							
1 S	15		96	5 N	14		02	6 D	13		56		1 Jr	12	45	23	1 Jr	12	10	09	2 F	10	10	62	4 Mr	12		15							
3 O	15		19	2 N	3		39	3 D	2		92	24	5 Jr	1	82		6 Jr	30		98	1 F	29		51	3 Mr	30		04							
7 O	4		86	2 N	3		76	1 N	21		29		4 Jr	19	82	25	4 Jr	19		35	5 F	17		88	7 Mr	19		41							
5 S	28		23	6 O	22		66	7 D	10		19	26	1 Jr	8	72		3 F	7		25	4 Mr	8		78	6 Ap	7		31							
4 O	12		13	5 N	10	10	02	4 N	29		55		6 D	29	08	27	7 Jr	27		62	2 F	26		15	3 Mr	27		68							
1 O	1		49	3 O	31	10	39	1 N	18		92		3 D	18	45	28	4 Jr	16		98	6 F	15		51	1 Mr	16		04							
5 S	20		86	7 O	20	10	29	7 D	6		82	29	2 Jr	5	35		3 F	3		88	5 Mr	5	10	41	6 Ap	3		94							
4 O	8	10	76	6 N	7		66	5 N	26		19		6 D	25	72	30	1 Jr	24		25	2 F	22	10	78	4 Mr	24		31							
2 S	28	10	12	3 O	27		02	2 N	15		55		4 D	15	08	31	5 Jr	13		61	7 F	12	10	14	1 Mr	13		68							
6 S	17		49	1 O	17		92	1 D	4		45	32	2 Jr	2	98		4 F	1		51	6 Mr	2		04	7 Mr	31		57							
5 O	6		89	6 N	4		29	5 N	22		82		7 D	22	35	33	1 Jr	20		88	3 F	19		41	4 Mr	20		94							
2 S	24		76	4 O	24		18	4 D	11	10	72	34	6 Jr	10	25		7 F	8		78	2 Mr	10		31	3 Ap	8		84							
1 O	13		65	3 N	12		55	2 D	1	10	08		3 D	30	61	35	5 Jr	29		14	6 F	27		67	1 Mr	29		20							
6 O	3		02	7 N	1		92	6 N	20		45		7 D	19	98	36	2 Jr	18		51	4 F	17		04	5 Mr	17		57							
8 S	22		39	4 O	21		82	5 D	8		35	37	6 Jr	6	88		1 F	5		41	2 Mr	6		94	4 Ap	5	10	47							
2 O	10	10	09	3 N	8	10	18	2 N	27		71		4 D	27	24	38	5 Jr	25		78	7 F	24		31	1 Mr	25	10	84							
6 S	29	10	65	1 O	29		55	7 N	17		08		1 D	16	61	39	3 Jr	15		14	4 F	13		67	6 Mr	15		20							
4 S	19	10	02	5 O	18		45	5 D	5		98	40	7 Jr	4	51		2 F	3	10	04	3 Mr	3	10	57	5 Ap	2		10							
2 O	7		92	4 N	6		82	3 N	24		35		4 D	23	88	41	6 Jr	22	10	41	7 F	20		94	2 Mr	22		47							
7 S	26		28	1 O	25		71	2 D	13		24	42	3 Jr	11	77		5 F	10		30	6 Mr	11		84	1 Ap	10		37							
4 O	15		65	7 N	13		08	6 D	2		61	43	1 Jr	1	14		2 Jr	30		67	4 Mr	1		20	5 Mr	30		73							
3 O	4		55	5 N	3		45	3 N	21	10	98		5 D	21	51	44	7 Jr	20		04	1 F	18		57	3 Mr	19		10							
7 S	28		92	2 O	23		84	2 D	9		88	45	4 Jr	8	41		5 F	6		94	7 Mr	8		17	2 Ap	7		00							
6 O	11		81	1 N	10	10	71	7 N	29		24		1 D	28	77	46	3 Jr	27		30	4 F	25		83	6 Mr	27		36							
4 O	1		18	5 O	30	10	08	4 N	18		61		6 D	18	14	47	7 Jr	16		67	2 F	15		20	3 Mr	16	10	73							
1 S	20		55	3 O	20	10	98	3 D	7		51	48	5 Jr	6	04		6 F	4		57	1 Mr	5	10	10	2 Ap	3		63							
7 O	9	10	45	1 N	7		34	7 N	25		87		2 D	25	40	49	3 Jr	23		94	5 F	22	10	47	7 Mr	24		00							
4 S	27	10	18	3 O	16		71	5 N	15		24		6 D	14	77	50	1 Jr	13		30	2 F	11	10	83	4 Mr	13		86							
2 S	17		08	2 N	4		61	4 D	4		14	51	5 Jr	2	87		7 F	1		20	1 Mr	2		73	3 Ap	1		26							
5 S	25		44	6 O	24		98	1 N	23		51		3 D	23	04	52	4 Jr	21		57	6 F	20		10	7 Mr	20		63							
4 O	13		34	5 N	11		87	7 D	11	10	40	53	1 Jr	9	98		3 F	8		46	5 Mr	10		00	6 Ap	8		53							
1 O	2		71	3 N	1		24	4 N	30		77		6 D	30	80	54	7 Jr	28		83	2 F	27		36	3 Mr	28		89							
6 S	22		08	7 O	21	10	61	2 N	20		14		3 D	19	67	55	5 Jr	18		20	6 F	16		73	1 Mr	18		26							
4 O	10	10	97	6 N	9		50	1 D	9		04	56	2 Jr	7	57		4 F	6		10	5 Mr	6		63	7 Ap	5	10								

(1) for Ārya siddhānta + 06; (2) for Brahma siddhānta - 11; and (3) for Siddhānta Śirōmaṇi - 04.

			Com- mence- ment of solar year		First new-moon in Solar Year.		Anomaly of first new moon.		Christian era.		Vaiśākha.		Jyeshṭha.		Āshāḍha.		Śrāvaṇa.		Bhādrapada.			
Kaliyuga	Vikrama era.	Śaka era	Month and day A.D.	Fraction of day.							Week-day. Month. Day.	Fraction.	Week-day. Month. Day.	Fraction.	Week-day. Month. Day.	Fraction.	Week-day. Month. Day.	Fraction.	Week-day. Month. Day.	Fraction.		
											A.D.											
4960	1916	1781	12A	0114	20 3090	21 195	1859	2 My	2	32	3 My	31	85	5 Je	30	38	6 Ji	29	91	1 Au	28	44
4961	1917	1782	11A	2702	9 4173	17 352	1860	6 Ap	20	69	1 My	20	22	2 Je	18	75	4 Ji	18	28	5 Au	16	81
4962	1918	1783	11A	5289	28 0562	15 487	1861	5 My	9	58	7 Je	8	12	1 Ji	7	65	3 Au	6	18	4 S	4	71
4963	1919	1784	11A	7877	17 1645	11 643	1862	2 Ap	28	95	4 My	28	48	6 Je	27	01	7 Ji	26	54	2 Au	25	07
4964	1920	1785	12A	0464	6 2728	7 800	1863	7 Ap	18	32	1 My	17	85	3 Je	16	88	4 Ji	15	91	7 S	12	97
4965	1921	1786	11A	3052	24 9117	5 933	1864	6 My	6	22	7 Je	4	75	2 Ji	4	28	3 Au	2	81	5 S	1	84
4966	1922	1787	11A	5689	14 0200	2 091	1865	3 Ap	25	58	5 My	25	11	6 Je	23	64	1 Ji	23	18	2 Au	21	71
4967	1923	1788	11A	8227	3 1283	25 803	1866	7 Ap	14	95	2 My	14	44	5 Ji	12	54	7 Au	11	07	1 S	9	60
4968	1924	1789	12A	0814	21 7672	23 936	1867	6 My	3	85	1 Je	2	38	2 Ji	1	91	4 Ji	31	44	5 Au	29	97
4969	1925	1790	11A	3402	10 8755	20 093	1868	4 Ap	22	22	5 My	21	75	7 Je	20	28	1 Ji	19	81	3 Au	18	84
4970	1926	1791	11A	5990	20 5144	18 226	1869	1 Ap	11	58	4 Je	9	64	6 Ji	9	17	7 Au	7	70	2 S	6	24
4971	1927	1792	11A	8577	18 6227	14 384	1870	3 My	11	11	2 My	30	01	3 Je	28	51	5 Ji	28	07	6 Au	26	60
4972	1928	1793	12A	1165	7 7310	10 541	1871	4 Ap	19	85	6 My	19	38	7 Je	17	91	2 Ji	17	44	3 Au	15	97
4973	1929	1794	11A	3752	26 3698	8 674	1872	3 My	7	74	5 Je	6	28	6 Ji	5	81	1 Au	4	31	2 S	14	50
4974	1930	1795	11A	6340	15 4781	4 831	1873	1 Ap	27	11	2 My	26	64	4 Je	25	17	5 Ji	24	70	7 Au	23	23
4975	1931	1796	11A	8927	4 5864	0 989	1874	5 Ap	16	48	7 My	16	01	1 Je	14	54	4 Au	12	60	6 S	11	13
4976	1932	1797	12A	1515	23 2254	26 676	1875	4 My	5	38	5 Je	3	91	7 Ji	3	44	1 Au	1	97	3 Au	81	50
4977	1933	1798	11A	4103	12 3336	22 834	1876	1 Ap	23	74	3 My	23	27	4 Je	21	80	6 Ji	21	34	7 Au	19	87
4978	1934	1799	11A	6690	1 4419	18 991	1877	6 Ap	13	11	7 My	12	64	3 Ji	10	70	5 Au	9	23	6 S	7	76
4979	1935	1800	11A	9278	20 0808	17 124	1878	5 My	2	01	6 My	31	54	1 Je	30	07	2 Ji	29	60	4 Au	28	13
4980	1936	1801	12A	1885	9 1891	13 281	1879	2 Ap	21	38	3 My	20	91	5 Je	19	44	6 Ji	18	97	1 Au	17	50
4981	1937	1802	11A	4463	27 8280	11 415	1880	1 My	9	27	2 Je	7	80	4 Ji	7	33	5 Au	5	86	7 S	4	40
4982	1938	1803	11A	7040	16 9363	7 572	1881	5 Ap	28	64	7 My	28	17	1 Je	26	70	3 Ji	26	23	4 Au	24	76
4983	1939	1804	11A	9628	6 0446	3 729	1882	3 Ap	18	01	4 My	17	54	6 Je	16	07	7 Ji	15	60	3 S	12	66
4984	1940	1805	12A	2216	24 6835	1 862	1883	1 My	6	90	3 Je	5	44	4 Ji	4	97	6 Au	3	50	1 S	2	03
4985	1941	1806	11A	4803	13 7918	25 574	1884	6 Ap	25	27	7 My	24	80	2 Je	23	33	3 Ji	22	86	5 Au	21	39
4986	1942	1807	11A	7391	2 9008	21 732	1885	3 Ap	14	64	5 My	14	17	1 Ji	12	23	2 Au	10	76	4 S	9	29
4987	1943	1808	11A	9978	21 5890	19 885	1886	2 My	3	54	4 Je	2	07	5 Ji	1	60	7 Ji	31	13	1 Au	29	66
4988	1944	1809	12A	2566	10 6173	16 022	1887	6 Ap	22	90	1 My	22	43	2 Je	20	96	4 Ji	20	50	6 Au	19	03
4989	1945	1810	11A	5153	29 2562	14 155	1888	5 My	10	80	7 Je	9	33	1 Ji	8	86	3 Au	7	39	4 S	5	92
4990	1946	1811	11A	7741	18 3245	10 813	1889	3 Ap	30	17	4 My	29	70	6 Je	28	23	7 Ji	27	76	2 Au	26	29
4991	1947	1812	12A	0328	7 5028	6 470	1890	7 Ap	19	54	2 My	19	07	3 Je	17	60	5 Ji	17	13	6 Au	15	66
4992	1948	1813	12A	2916	26 1416	4 603	1891	6 My	8	43	7 Je	6	96	2 Ji	6	49	4 Au	5	02	5 S	3	55
4993	1949	1814	11A	5504	15 2499	0 760	1892	3 Ap	26	80	5 My	26	33	6 Je	24	86	1 Ji	24	39	2 Au	22	92
4994	1950	1815	11A	8091	4 3532	24 472	1893	1 Ap	16	17	2 My	15	70	4 Je	14	23	7 Au	12	29	1 S	10	82
4995	1951	1816	12A	0673	22 9971	22 605	1894	7 My	5	06	1 Je	3	59	3 Ji	3	13	4 Au	1	66	6 Au	31	19
4996	1952	1817	12A	3266	12 1054	18 763	1895	4 Ap	24	44	5 My	23	96	7 Je	22	49	2 Ji	22	02	3 Au	20	55
4997	1953	1818	11A	5854	1 2137	14 920	1896	1 Ap	12	80	3 My	12	33	6 Ji	10	39	7 Au	8	92	2 S	7	45
4998	1954	1819	11A	8441	19 8526	13 053	1897	7 My	1	70	2 My	31	28	3 Je	29	76	5 Ji	29	29	6 Au	27	82
4999	1955	1820	12A	1029	8 9609	9 210	1898	5 Ap	21	06	6 My	20	59	1 Je	19	12	2 Ji	18	95	4 Au	17	19
5000	1956	1821	12A	3617	27 5998	7 314	1899	3 My	9	96	5 Je	8	49	7 Ji	8	02	1 Au	6	55	3 S	5	08
5001	1957	1822	12A	6204	16 7081	5 504	1900	1 Ap	29	33	2 My	28	85	4 Je	27	39	5 Ji	26	92	7 Au	25	45
5002	1958	1823	12A	8792	5 8164	27 215	1901	5 Ap	18	69	7 My	18	23	1 Je	16	76	3 Ji	16	29	6 S	18	85
5003	1959	1824	13A	1379	24 4553	25 849	1902	4 My	7	59	6 Je	6	12	7 Ji	5	65	2 Au	4	18	3 S	2	71
5004	1960	1825	13A	3967	13 6636	21 506	1903	1 Ap	26	96	3 My	26	19	5 Je	25	02	6 Ji	24	55	1 Au	28	08
5005	1961	1826	12A	6554	2 6719	17 663	1904	6 Ap	15	33	7 My	14	86	3 Ji	12	92	5 Au	11	45	6 S	9	98
5006	1962	1827	12A	9142	21 3107	15 796	1905	5 My	4	22	6 Je	2	75	1 Ji	2	29	2 Ji	31	82	4 Au	30	85
5007	1963	1828	13A	1729	10 1190	11 954	1906	2 Ap	28	59	4 My	23	12	5 Je	21	65	7 Ji	21	18	1 Au	19	71
5008	1964	1829	13A	4317	29 0579	10 087	1907	1 My	12	48	3 Je	11	02	4 Ji	10	55	6 Au	9	08	7 S	7	61
5009	1965	1830	12A	6905	18 1662	6 214	1908	5 Ap	30	86	7 My	30	39	1 Je	28	92	3 Ji	28	45	4 Au	26	98
5010	1966	1831	12A	9492	7 2715	2 401	1909	3 Ap	20	22	4 My	19	75	6 Je	18	28	7 Ji	17	81	3 S	14	88
5011	1967	1832	13A	2080	25 9184	0 535	1910	2 My	9	13	3 Je	7	65	5 Ji	7	18	6 Au	5	71	1 S	4	24
5012	1968	1833	13A	4667	15 0217	24 246	1911	6 Ap	28	49	1 My	28	02	2 Je	26	55	4 Ji	26	08	5 Au	24	61
5013	1969	1834	12A	7255	4 1800	20 404	1912	3 Ap	16	85	5 My	16	39	6 Je	14	92	2 Au	12	98	4 S	11	51
5014	1970	1835	12A	9842	22 7689	18 537	1913	2 My	5	75	4 Je	4	28	5 Ji	3	81	7 Au	2	84	1 Au	31	87

Sūrya siddhānta—cont.

Āsaina.				Kārttika.				Mārgaśīrṣa.				A.D.				Pauṣa.				A.D.				Māgha.				Phalguṇa.				Chāitṛa.			
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.				
2 S	26		97	4 O	26		50	6 N	25		03		7 D	24		56		60	2 Jr	23	○	10	3 F	21		63	5 Mr	22		16					
7 S	15		34	3 N	13		40	4 D	12		93	61	6 Jr	11	●	48			7 F	9		99	2 Mr	11		52	4 Ap	10		05					
1 O	14		87										3 D	31		83		62	5 Jr	30		36	6 F	28		89	1 Mr	30		42					
6 O	4		24	7 N	2		77	2 D	2	○	80		1 D	21	●	20		63	2 Jr	19		73	4 F	18		26	5 Mr	19		79					
3 S	23		60	5 O	23		14	6 N	21	○	67	64	7 Jr	9		09			1 F	7		62	3 Mr	8		16	4 Ap	6		69					
2 O	12		50	4 N	11	○	03	5 D	10		56		4 D	28		46		65	5 Jr	26		99	7 F	25		52	2 Mr	27	○	05					
6 S	30		87	1 O	30		40	2 N	28		93		1 D	17		83		66	3 Jr	16		36	4 F	14		89	6 Mr	16	○	42					
4 S	20	○	24	5 O	19		77	7 N	18		30								2 F	4		26	3 Mr	5	○	79	5 Ap	4		32					
3 O	9		13	4 N	7		66	6 D	7		20	67	7 Jr	5		73		68	6 Jr	24		62	1 F	23		15	2 Mr	23		69					
7 S	28		50	2 O	28		03	3 N	26		56		5 D	26		09		69	3 Jr	12	○	99	5 F	11		52	7 Mr	13		05					
4 S	16		87	6 O	16		40	7 N	14		93		2 D	14		46		69	3 Jr	12	○														
3 O	5		77	5 N	4		30	6 D	3		83	70	1 Jr	2	○	36			2 Jr	31		89	4 Mr	2		42	5 Mr	31		95					
1 S	25		13	2 O	24		66	4 N	23		19		5 D	22	○	72		71	7 Jr	21		26	1 F	19		79	3 Mr	21		32					
7 O	14		03	1 N	12		56	3 D	12	●	09	72	4 Jr	10		62			6 F	9		15	7 Mr	9		68	2 Ap	8		21					
4 O	2		40	5 O	31	○	93	7 N	30		46		1 D	29		99		73	3 Jr	28		52	5 F	27		05	6 Mr	28		58					
1 S	21		76	3 O	21	○	30	4 N	19		83		6 D	19		36		74	7 Jr	17		89	2 F	16		42	3 Mr	17		95					
7 O	10	●	66	2 N	9		19	3 D	8		72	75	5 Jr	7		25			6 F	5		78	1 Mr	7		31	2 Ap	5	●	85					
5 S	30	●	08	6 O	29		56	1 N	28		09		2 D	27		62		76	4 Jr	26		15	5 F	24		68	7 Mr	25		21					
2 S	18		40	3 O	17		93	5 N	16		46		6 D	15		99		77	1 Jr	14		52	3 F	13	○	05	4 Mr	14		58					
1 O	7		29	2 N	5		82	4 D	5		26	78	5 Jr	3		89			7 F	2	○	42	1 Mr	3		95	3 Ap	2		48					
5 S	26		66	7 O	26		19	1 N	24		72		3 D	24		25		79	4 Jr	22	●	78	6 F	21		31	7 Mr	22		84					
3 S	16		03	6 N	14		09	7 D	13	○	62	80	2 Jr	12		15			3 F	10		68	5 Mr	11		21	6 Ap	9		74					
4 O	15		56										6 D	31		52		81	1 Jr	30		05	2 F	28		58	4 Mr	30		11					
1 O	3		93	3 N	2		46	4 D	1	○	99		3 D	20		88		82	5 Jr	19		42	6 F	17		95	1 Mr	19		48					
6 S	23		29	7 O	22		82	2 N	21	○	35	83	2 Jr	8		78			4 F	7		31	5 Mr	8		84	7 Ap	7	○	37					
5 O	12		19	6 N	10		72	1 D	10		25		7 D	29		15		84	1 Jr	27		68	3 F	26		21	4 Mr	26	○	74					
2 O	1	○	56	4 O	31		09	5 N	29		62		4 D	17		52		85	6 Jr	16		05	7 F	14		58	2 Mr	16	○	11					
6 S	19	○	92	1 O	19		46	2 N	17		99								4 F	3		94	6 Mr	5		48	1 Ap	4		01					
5 O	8		82	7 N	7		35	1 D	6		88	86	3 Jr	5		41			7 D	25		78				87	2 Jr	24	○						
3 S	28		19	4 O	27		72	6 N	26		25								5 D	15		15				88	6 Jr	13	○						
7 S	17		56	2 O	17		09	3 N	15		62								6 Jr	13	○	68	1 F	12		21	2 Mr	12		74					
6 O	5		45	7 N	3		98	2 D	3		52	89	4 Jr	2	○	05			5 Jr	31		58	7 Mr	2		11	1 Mr	31		64					
3 S	24		82	5 O	24		35	6 N	22		88		1 D	22		41		90	2 Jr	20		94	4 F	19		47	6 Mr	21		00					
2 O	13		72	4 N	12	○	25	5 D	11	●	78	91	7 Jr	10		31			1 F	8		84	3 Mr	10		37	4 Ap	8		90					
7 O	3		09	1 N	1	○	62	3 D	1		15		4 D	30		68		92	6 Jr	29		21	7 F	27		74	2 Mr	28		27					
4 S	21		45	5 O	20	○	98	7 N	19		51		2 D	19		04		93	3 Jr	17		57	5 F	16		11	6 Mr	17		64					
8 O	10		35	4 N	8		88	6 D	8		41	94	7 Jr	6		84			2 F	5		47	4 Mr	7	○	00	5 Ap	5	●	53					
7 S	29	●	72	2 O	29		25	3 N	27		78		5 D	27		31		95	6 Jr	25		84	1 F	24	○	87	2 Mr	25		90					
5 S	19		08	6 O	18		61	1 N	17		15		2 D	16		68		96	4 Jr	15		21	5 F	13	○	74	7 Mr	14		27					
3 O	6		98	5 N	5		51	7 D	5		04	97	1 Jr	3		57			3 F	2		10	4 Mr	3		63	6 Ap	2		17					
1 S	26		35	2 O	25		88	4 N	24		41		5 D	23	○	94		98	7 Jr	22	●	47	2 F	21		00	3 Mr	22		53					
5 S	15		72	1 N	13		78	3 D	13	○	31								6 F	10		37	7 Mr	11		90	2 Ap	10		43					
7 O	15		25																																
4 O	4		61	6 N	3		14	7 D	2	○	67	19	2 Jr	1		21		00	3 Jr	30		74	5 Mr	1		27	6 Mr	30		80					
1 S	23		98	3 O	23		51	5 N	22	○	04		6 D	21		57		01	1 Jr	20		10	2 F	18		68	4 Mr	20		16					
7 O	12	○	88	2 N	11	●	41	3 D	10		94								7 F	8		00	1 Mr	9		63	3 Ap	8	○	06					
5 O	2	○	25	6 O	31	●	78	1 N	30		31		2 D	29		84		03	4 Jr	28		37	5 F	26		90	7 Mr	28	○	43					
2 S	21	●	61	4 O	21		14	5 N	19		07		7 D	19		20		04	1 Jr	17		78	3 F	16		27	4 Mr	16	●	80					
1 O	9		51	3 N	8		04	4 D	7		57	05	6 Jr	6		10			7 F	4	○	63	2 Mr	6		16	3 Ap	4		69					
5 S	28		88	7 O	28		41	1 N	26		94		3 D	26		47		06	5 Jr	25	○	00	6 F	23		53	1 Mr	25		06					
3 S	18		24	4 O	17		77	6 N	16		81		7 D	15		84		07	2 Jr	14	●	37	3 F	12		90	5 Mr	14		43					
2 O	7		14	3 N	5		67	5 D	5		20	08	6 Jr	3		73			1 F	2		26	2 Mr	2		79	4 Ap	1		33					
6 S	25		51	1 O	25		04	2 N	23		57		4 D	23		10</																			

TABLE II.—

			Vaiśākha.			Jyeshṭha.			Ashāḍha.			Śrāvaṇa.			Bhādrapada.				
Kaliyuga.	Vikrama era.	Saka era.	Month and day A.D.	Fraction of day.	First new moon in solar year.	Anomaly of first new moon.	Christian era	Week-day	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
																			A.D.
5015	1971	1836	13A	2130	11 8772	14 694	1914	7	Ap	25	.12	1	My	24	.65	3	Je	23	.18
5016	1972	1837	13A	5018	0 9855	10 851	1915	4	Ap	14	.49	7	Je	12	.55	2	Ji	12	.08
5017	1973	1838	12A	7605	10 6244	8 985	1916	6	My	11	.02	4	My	31	.91	6	Je	30	.45
5018	1974	1839	13A	0198	8 7827	5 142	1917	7	Ap	21	.75	2	My	21	.28	3	Je	19	.81
5019	1975	1840	13A	2780	27 3715	3 275	1918	6	My	10	.85	1	Je	9	.18	2	Ji	8	.71
5020	1976	1841	13A	5338	16 4748	26 987	1919	4	Ap	30	.02	5	My	29	.55	7	Je	28	.08
5021	1977	1842	12A	7955	5 5881	23 144	1920	1	Ap	18	.38	2	My	17	.91	4	Je	16	.44
5022	1978	1843	13A	0543	24 2270	21 278	1921	7	My	7	.28	1	Je	5	.81	3	Ji	5	.34
5023	1979	1844	13A	3180	13 3353	17 435	1922	4	Ap	26	.05	6	My	26	.18	7	Je	24	.71
5024	1980	1845	13A	5718	2 4436	13 592	1923	2	Ap	16	.01	3	My	15	.55	6	Ji	13	.01
5025	1981	1846	12A	8306	21 0825	11 725	1924	7	My	3	.91	2	Je	2	.44	3	Ji	1	.97
5026	1982	1847	13A	0893	10 1908	7 883	1925	5	Ap	23	.28	6	My	22	.81	1	Je	21	.34
5027	1983	1848	13A	3481	28 8297	6 016	1926	4	My	12	.18	5	Je	10	.71	7	Ji	10	.21
5028	1984	1849	13A	6008	17 9380	2 173	1927	1	My	1	.54	3	My	31	.07	4	Je	29	.61
5029	1985	1850	12A	8656	7 0468	25 885	1928	5	Ap	19	.91	7	My	19	.44	1	Je	17	.97
5030	1986	1851	13A	1243	25 6852	24 018	1929	4	My	8	.81	6	Je	7	.34	7	Ji	6	.87
5031	1987	1852	13A	3831	14 7935	20 175	1930	2	Ap	28	.18	3	My	27	.71	5	Je	26	.24
5032	1988	1853	13A	6419	3 9018	16 333	1931	6	Ap	17	.51	1	My	17	.07	2	Je	15	.60
5033	1989	1854	12A	9006	22 5406	14 467	1932	5	My	5	.41	6	Je	3	.97	1	Ji	3	.50
5034	1990	1855	13A	1594	11 6489	10 623	1933	2	Ap	24	.81	4	My	24	.34	5	Je	22	.87
5035	1991	1856	13A	4181	0 7672	6 780	1934	7	Ap	14	.17	3	Je	12	.24	4	Ji	11	.77
5036	1992	1857	13A	6766	19 3963	4 914	1935	1	My	13	.71	3	Je	1	.60	2	Ji	1	.13
5037	1993	1858	12A	9356	8 5044	1 071	1936	3	Ap	21	.41	4	My	20	.97	6	Je	19	.50
5038	1994	1859	13A	1941	27 1433	26 759	1937	2	My	10	.31	3	Je	8	.87	5	Ji	8	.40
5039	1995	1860	13A	4531	16 2516	22 916	1938	6	Ap	29	.70	1	My	29	.23	2	Je	27	.77
5040	1996	1861	13A	7119	5 3539	19 073	1939	4	Ap	19	.07	5	My	18	.60	7	Je	17	.13
5041	1997	1862	12A	9707	23 8988	17 207	1940	2	My	6	.97	4	Je	5	.50	6	Ji	5	.03
5042	1998	1863	13A	2294	13 1071	13 364	1941	7	Ap	26	.34	1	My	25	.87	3	Je	24	.40
5043	1999	1864	13A	4882	2 2154	9 521	1942	4	Ap	15	.70	6	My	15	.23	2	Ji	13	.29
5044	2000	1865	13A	7409	20 8543	7 654	1943	3	My	4	.60	5	Je	3	.13	6	Ji	2	.68
5045	2001	1866	13A	0057	9 9626	3 812	1944	7	Ap	22	.97	2	My	22	.50	4	Je	21	.03
5046	2002	1867	13A	2644	28 6014	1 945	1945	6	My	11	.86	1	Je	10	.39	2	Ji	9	.93
5047	2003	1868	13A	5232	17 7097	25 657	1946	4	My	1	.23	5	My	30	.76	7	Je	29	.29
5048	2004	1869	13A	7820	6 8180	21 814	1947	1	Ap	20	.60	3	My	20	.13	4	Je	18	.68
5049	2005	1870	13A	0407	25 4569	13 947	1948	7	My	8	.50	2	Je	7	.08	3	Ji	6	.56
5050	2006	1871	13A	2995	14 6652	16 104	1949	4	Ap	27	.86	6	My	27	.39	7	Je	25	.92
5051	2007	1872	13A	5582	3 6735	12 262	1950	2	Ap	17	.23	3	My	16	.78	5	Je	15	.29
5052	2008	1873	13A	8170	22 3124	10 395	1951	1	My	6	.13	2	Je	4	.66	4	Ji	4	.19
5053	2009	1874	13A	0757	11 4207	6 552	1952	5	Ap	24	.49	7	My	24	.03	1	Je	22	.56
5054	2010	1875	13A	3345	0 5290	2 709	1953	2	Ap	18	.86	5	Je	11	.92	7	Ji	11	.45
5055	2011	1876	13A	5933	19 1679	0 843	1954	1	My	2	.76	3	Je	1	.29	4	Je	30	.82
5056	2012	1877	13A	8520	8 2762	24 554	1955	6	Ap	22	.18	7	My	21	.66	2	Je	20	.19
5057	2013	1878	13A	1108	26 9151	22 688	1956	5	My	10	.02	6	Je	8	.51	1	Ji	8	.09
5058	2014	1879	13A	3695	16 0231	18 845	1957	2	Ap	29	.39	3	My	28	.92	5	Je	27	.45
5059	2015	1880	13A	6283	5 1317	15 002	1958	6	Ap	18	.76	1	My	18	.29	2	Je	16	.82
5060	2016	1881	13A	8870	23 7705	13 135	1959	5	My	7	.66	7	Je	6	.19	1	Ji	5	.72
5061	2017	1882	13A	1458	12 6788	9 293	1960	8	Ap	26	.02	4	My	25	.55	6	Je	24	.08
5062	2018	1883	13A	4045	1 8871	5 450	1961	7	Ap	15	.39	3	Je	13	.45	4	Ji	12	.98
5063	2019	1884	13A	6633	20 6260	8 583	1962	6	My	4	.29	7	Je	2	.82	2	Ji	2	.35
5064	2020	1885	13A	9221	9 7843	27 295	1963	3	Ap	28	.65	5	My	28	.19	6	Je	21	.72
5065	2021	1886	13A	1808	28 3732	25 429	1964	2	My	11	.55	4	Je	10	.08	5	Ji	9	.61

Sūrya siddhānta—cont.

Āśvina.				Kārttika.				Mārgaśīrsha.				A.D.				Pauṣa.				A.D.				Māgha.				Phalguṇa.				Chaitra.			
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.				
7 8 19	·77	2 O 19	·30	3 N 17	·83			5 D 17	36			15 6 Jr 15	89	1 F 14	·43	2 M 15	·98																		
6 O 8	·67	1 N 7	·20	2 D 6	73			16 4 Jr 5	·26			5 F 3	·79	7 Mr 4	·32	1 Ap 2	·85																		
4 8 27	·04	5 O 26	·57	7 N 25	·10			1 D 24	·08			17 3 Jr 23	16	4 F 21	·69	6 Mr 23	·22																		
2 O 15	·93	4 N 14	·47	6 D 14	·00			18 7 Jr 12	53			2 F 11	06	8 Mr 12	·50	5 Ap 11	·12																		
7 O 5	·30	1 N 3	·83	3 D 3	·36			19 4 Jr 1	89			6 Jr 31	42	7 Mr 1	·95	2 Mr 31	·49																		
4 8 24	·07	6 O 24	·20	7 N 22	·73			2 D 22	26			20 3 Jr 20	79	5 F 19	·32	6 Mr 19	·85																		
3 O 12	·57	5 N 11	·10	6 D 10	63			21 1 Jr 9	16			2 F 7	69	4 Mr 9	·22	5 Ap 7	·75																		
7 O 1	·93	2 O 31	·46	3 N 29	99			5 D 29	53			22 7 Jr 28	06	1 F 26	·59	3 Mr 28	·12																		
5 8 21	·30	6 O 20	·83	1 N 19	86			2 D 18	89			23 4 Jr 17	42	5 F 15	·95	7 Mr 17	·48																		
4 O 10	·20	5 N 8	·73	7 D 8	28			24 1 Jr 6	79			3 F 5	32	4 Mr 5	·85	6 Ap 4	·38																		
1 8 28	·57	8 O 28	·10	4 N 26	63			6 D 26	·16			25 7 Jr 24	69	2 F 23	·22	3 Mr 24	·75																		
5 8 17	·93	7 O 17	·46	1 N 15	99			3 D 15	52			26 5 Jr 4	05	6 F 12	·59	1 Mr 14	·12																		
4 O 6	·83	6 N 5	·36	7 D 4	89			27 2 Jr 3	42			3 F 1	95	5 Mr 3	·48	7 Ap 2	·01																		
2 8 26	·20	3 O 25	73	5 N 24	26			6 D 23	79			28 1 Jr 22	32	2 F 20	·85	4 Mr 21	·38																		
1 O 14	09	2 N 12	·63	4 D 12	·16			29 5 Jr 10	69			7 F 9	·22	1 Mr 10	·75	8 Ap 9	·28																		
5 O 3	·46	6 N 1	·99	1 D 1	52			3 D 31	·05			30 4 Jr 29	58	6 F 28	·11	7 Mr 29	·65																		
2 8 22	·83	4 O 22	·36	5 N 20	89			7 D 20	42			31 1 Jr 18	95	3 F 17	·48	5 Mr 19	·01																		
1 O 11	·73	3 N 10	·26	4 D 9	79			32 6 Jr 8	32			7 F 6	85	2 Mr 7	·38	3 Ap 5	·91																		
6 8 30	·09	7 O 29	·62	2 N 28	15			3 D 27	69			33 5 Jr 26	22	6 F 24	·75	1 Mr 26	·28																		
3 8 19	·46	4 O 18	99	6 N 17	·52			1 D 17	05			34 2 Jr 15	58	4 F 14	·11	5 Mr 15	·64																		
2 O 8	·36	3 N 6	·89	5 D 6	42			35 6 Jr 4	·95			1 F 3	48	3 Mr 5	·01	4 Ap 3	·54																		
6 8 27	73	1 O 27	·26	2 N 25	·79			4 D 25	32			36 5 Jr 23	85	7 F 22	·88	1 Mr 22	·91																		
5 O 15	·62	7 N 14	·15	1 D 13	68			37 3 Jr 12	·21			4 F 10	75	6 Mr 12	·28	7 Ap 10	·81																		
2 O 4	·99	4 N 3	·52	6 D 3	·05			38 7 Jr 1	·58			2 Jr 31	·11	3 Mr 1	·64	5 Mr 31	·17																		
7 8 24	·36	1 O 23	·89	3 N 22	·42			4 D 21	·95			39 6 Jr 20	·48	1 F 19	·01	2 Mr 20	·54																		
6 O 18	·25	7 N 11	79	2 D 11	·32			40 3 Jr 9	·85			5 F 8	·88	6 Mr 8	·91	1 Ap 7	·44																		
3 O 1	·62	5 O 31	·15	6 N 29	·68			1 D 29	·21			41 2 Jr 27	74	4 F 26	·27	5 Mr 27	·81																		
7 8 20	·99	2 O 20	·52	4 N 19	·05			5 D 18	·58			42 7 Jr 17	·11	1 F 15	·64	3 Mr 17	·17																		
6 O 9	·89	1 N 8	·42	2 D 7	·95			43 4 Jr 6	·48			6 F 5	·01	7 Mr 6	·54	2 Ap 5	·07																		
4 8 29	·25	5 O 28	·78	7 N 27	·31			1 D 26	·85			44 3 Jr 25	38	4 F 23	·91	6 Mr 24	·44																		
1 8 17	·62	3 O 17	·16	4 N 15	·68			6 D 15	·21			45 7 Jr 13	·74	2 F 12	·27	3 Mr 13	·80																		
7 O 6	52	2 N 5	·05	3 D 4	·58			5 Jr 3	·11			6 F 1	·64	1 Mr 3	·17	2 Ap 1	·70																		
4 8 25	·82	6 O 25	·41	7 N 23	·95			2 D 23	·48			47 4 Jr 22	·01	5 F 20	·54	7 Mr 22	·07																		
3 O 14	·78	5 N 13	·31	6 D 12	·84			48 1 Jr 11	·37			2 F 9	·90	4 Mr 10	·43	5 Ap 8	·97																		
1 O 3	15	2 N 1	·68	4 D 1	·21			5 D 30	·74			49 7 Jr 29	·27	1 F 27	·80	3 Mr 29	·33																		
5 8 22	·52	7 O 22	·05	1 N 20	·58			3 D 20	·11			50 4 Jr 18	·64	6 F 17	·17	7 Mr 18	·70																		
4 O 11	·41	5 N 9	·94	7 D 9	·47			51 2 Jr 8	·01			3 F 6	·54	5 Mr 8	·07	6 Ap 6	·60																		
1 8 30	·78	3 O 30	·31	4 N 28	·84			6 D 28	·37			52 7 Jr 26	·90	2 F 25	·43	3 Mr 25	·96																		
6 8 19	·15	7 O 18	·68	2 N 17	·21			3 D 16	·74			53 5 Jr 15	·27	6 F 18	·80	1 Mr 15	·33																		
5 O 8	·05	6 N 6	·58	1 D 6	·11			54 2 Jr 4	·64			4 F 3	·17	5 Mr 4	·70	7 Ap 3	·23																		
2 8 27	·41	3 O 26	·94	5 N 25	·47			7 D 25	·00			55 1 Jr 23	·53	3 F 22	·07	4 Mr 23	·60																		
1 O 16	31	2 N 14	·84	4 D 14	·87			56 5 Jr 12	·90			7 F 11	·43	1 Mr 11	·96	3 Ap 10	·49																		
5 O 4	·68	7 N 3	·21	1 D 2	·74			57 3 Jr 1	·27			4 Jr 30	·80	6 Mr 1	·33	7 Mr 80	·86																		
3 8 24	·04	4 O 23	·57	6 N 22	·10			7 D 21	·04			58 2 Jr 20	·17	3 F 18	·70	5 Mr 20	·23																		
1 O 12	94	3 N 11	·47	5 D 11	·00			59 6 Jr 9	·53			1 F 8	·06	2 Mr 9	·59	4 Ap 8	·12																		
6 O 2	·31	7 O 31	·84	2 N 30	·37			3 D 29	·90			60 5 Jr 28	·43	6 F 28	·96	1 Mr 27	·49																		
3 8 20	·68	5 O 20	·21	6 N 18	·74			1 D 18	·37			61 2 Jr 16	·80	4 F 15	·88	5 Mr 16	·86																		
2 O 9	57	4 N 8	·10	5 D 7	·63			62 7 Jr 6	·17			1 F 4	·70	3 Mr 6	·23	4 Ap 4	·78																		
6 8 28	·94	1 O 28	·47	3 N 27	·00			4 D 26	53			63 6 Jr 25	·06	7 F 23	·59	2 Mr 25	·12																		
4 8 18	·31	7 N 16	·37	1 D 15	·90			Pauṣa Kṛhaya				64 3 Jr 14	·43	4 F 12	·96	6 Mr 13	·49																		
3 O 6	·21	4 N 4	·74	6 D 4	·27							2 F 1	·33	3 Mr 2	·86	5 Ap 1	·39																		
65 7 Jr 2	·80																																		

Note.—From A.D. 1900 to A.D. 1999 all eclipses of the sun, visible anywhere in the old world (northern part of eastern hemisphere) are shown. From 1 B.C. to A.D. 300 the same observation applies. Between A.D. 300 and A.D. 1900 only those eclipses of the sun which are visible in India are entered in this table.

TABLE II.—

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N.B.—For tithis by other siddhāntas add to the above algebraically as follows :—

Sūrya siddhānta.—cont.

Āsvina.				Kārttika.				Mārgaśīrṣa.				A.D. Pausa.				A.D. Māgha.				Phālguna.				Chaitra.			
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
7 S 25			·57	2 O 25			·10	3 N 23	●	·63		5 D 23		·16	66	6 Jr 21		·69	1 F 20		·28	2 Mr 21		·76			·76
6 O 14	○		·47	1 N 13	●		·00	2 D 12		·58	67	4 Jr 11		·06		5 F 9		·59	7 Mr 11		·12	1 Ap 9	○			·65	
3 O 8	○		·84	5 N 2			·87	6 D 1		·90		1 D 31		·43	68	2 Jr 29		·96	4 F 28		·49	6 Mr 29	○			·02	
1 S 22	○		·20	2 O 21			·73	4 N 20		·27		5 D 19		·80	69	7 Jr 18		33	1 F 16		·86	3 Mr 18	●			·39	
7 O 11			·10	1 N 9			·68	3 D 9		·16	70	4 Jr 7		·69		6 F 6	○	·22	7 Mr 7	●	·75	2 Ap 6				·29	
4 S 30			·47	6 O 30			·00	7 N 28		·53		2 D 28		·06	71	3 Jr 26	○	·59	5 F 25	●	·12	6 Mr 26				·65	
1 S 19			·84	3 O 19			·87	4 N 17		·90		6 D 17		·43	72	7 Jr 15	○	·96	2 F 14		·49	4 Mr 15				·02	
7 O 7			·73	2 N 6			·26	3 D 5		·79	73	5 Jr 4	●	·83		6 F 2		86	1 Mr 4		·39	2 Ap 2				·02	
5 S 27			·10	6 O 26			·63	1 N 25	○	·16		2 D 24	●	·69	74	4 Jr 23		·23	5 F 21		·75	7 Mr 23				·28	
4 O 16			·00	5 N 14	○		·53	7 D 14	●	·06	75	1 Jr 12		·59		3 F 11		·12	4 Mr 12		·65	6 Ap 11				·18	
1 O 5			·37	2 N 3	○		·90	4 D 3		·43	76	5 Jr 1		·96		7 Jr 31		·49	2 Mr 1		·02	3 Mr 30				·55	
5 S 23			·73	7 O 23	●		·26	1 N 21		·79		3 D 21		·32	77	4 Jr 19		·85	6 F 18		·30	7 Mr 19	○			·92	
4 O 12			·68	6 N 11			·16	7 D 10		·69	78	2 Jr 9		·22		3 F 7		·75	5 Mr 9	○	·28	6 Ap 7				·81	
2 O 2	●		·00	3 O 31			·53	5 N 30		·06		6 D 29		·59	79	1 Jr 28		·12	2 F 28	○	·65	4 Mr 28				·18	
6 S 21			·36	7 O 20			·89	2 N 19		·43		3 D 18		·96	80	5 Jr 17		·49	7 F 16	○	·02	1 Mr 16				·55	
5 O 9			·26	6 N 7			·79	1 D 7		·32	81	2 Jr 5		·85		4 F 4		·38	5 Mr 5		·91	7 Ap 4				·45	
2 S 28			·63	4 O 28			·16	5 N 26		·69		7 D 26	○	·22	82	1 Jr 24		·75	3 F 23		·28	4 Mr 24				·81	
7 S 18			·00	3 N 16			·06	4 D 15	○	·59	83	6 Jr 14		·12	Māgha Kṣhaya {				·7 F 12		·65	3 Ap 12				·71	
1 O 17			·53	8 N 16			·06	4 D 15	○	·59	84	3 Jr 3		·49		5 F 2		·02	6 Mr 2		·55	1 Ap 1				·08	
5 O 6			·89	7 N 5			·42	1 D 4	●	·95		7 D 22		·85	85	2 Jr 21		·38	3 F 19		·91	5 Mr 21				·44	
3 S 25			·26	4 O 24			·79	6 N 23		·82	86	6 Jr 10		·75		1 F 9		·28	2 Mr 10		·81	4 Ap 9	○			·34	
2 O 14	○		·16	3 N 12	●		·69	5 D 12		·22		4 D 31		·12	87	5 Jr 29		·65	7 F 28		·18	1 Mr 29	●			·71	
6 O 8	○		·53	1 N 2			·06	2 D 1		·59		1 D 20		·48	88	3 Jr 19		·01	4 F 17		·55	6 Mr 18	●			·08	
3 S 22	●		·39	5 O 22			·42	6 N 20		·95	89	7 Jr 7		·38		1 F 5	○	·91	3 Mr 7		·44	4 Ap 5				·97	
2 O 10			·79	4 N 9			·32	5 D 8		·85		4 D 27		·75	90	6 Jr 26	○	·28	7 F 24		·81	2 Mr 26				·84	
7 S 30			·16	1 O 29			·69	3 N 28		·23		2 D 17		·12	91	3 Jr 15	○	·65	5 F 14		·18	6 Mr 15				·71	
4 S 19			·52	6 O 19			·05	7 N 17		·59	92	1 Jr 5		·01		2 F 3		·54	4 Mr 4		·07	5 Ap 2				·61	
3 O 8			·42	4 N 6			·95	6 D 6	○	·48		5 D 24	●	·38	93	6 Jr 22		·91	1 F 21		·44	2 Mr 22				·97	
7 S 26			·79	2 O 26			·32	3 N 24	○	·85	94	4 Jr 12		·28		5 F 10		·81	7 Mr 12		·34	1 Ap 10				·87	
6 O 15			·69	1 N 14	○		·23	2 D 13		·75	95	1 Jr 1		·65		3 Jr 31		·18	4 Mr 1		·71	6 Mr 31	○			·24	
4 O 5			·05	5 N 3	●		·53	7 D 3		·11		6 D 22		·01	96	7 Jr 20		·54	2 F 19		·07	3 Mr 19	○			·60	
1 S 24			·42	2 O 23	●		·95	4 N 22		·48	97	4 Jr 8		·91		6 F 7		·44	7 Mr 8	●	·97	2 Ap 7				·50	
7 O 12	●		·32	1 N 10			·85	3 D 10		·88		2 D 29		·28	98	3 Jr 27		·81	5 F 26	●	·84	6 Mr 27				·87	
4 O 1			·69	6 O 31			·22	7 N 29		·75		6 D 18		·64	99	1 Jr 17		·17	2 F 15	●	·71	4 Mr 17				·24	
2 S 21			·05	3 O 20			·58	5 N 19		·11	20	5 Jr 6	○	·54	00	7 F 5		·07	1 Mr 5		·60	3 Ap 4				·13	
7 O 9			·95	2 N 8			·48	4 D 8		·01																	

(1) for Ārya siddhānta +·07; (2) for Brahma siddhānta -·12; and (3) for Siddhānta Śiromaṇi -·05.

TABLE III.—Sunrise from 8° to 12° N. latitude.

Day of solar year.	Lat. 8°			Lat. 9°			Lat. 10°			Lat. 11°			Lat. 12°		
	Long. + 300'' = + '008 of day.			Long. + 852'' = + '010 of day.			Long. + 504'' = + '007 of day.			Long. + 816'' = + '009 of day.			Long. + 212'' = + '003 of day.		
	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Trivandrum	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Rameswaram	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Madura	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Tanjore	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Maisur.
	A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.		
1	—447	+ 31	+ '003	—443	+ 32	+ 009	—439	+ 34	+ 006	—435	+ 36	+ '009	—431	+ 38	+ '003
2	445	61	...	441	65	...	437	68	...	433	72	+ '010	429	75	...
3	443	92	...	439	97	...	435	102	+ '007	431	108	...	428	113	+ '004
4	440	123	...	436	130	+ '010	433	135	...	430	144	...	426	150	...
5	438	153	...	434	162	...	431	170	...	428	179	...	424	188	...
6	436	184	+ '004	432	194	+ '011	429	205	+ 008	426	215	...	422	226	+ '005
7	434	215	+ 005	430	227	...	427	239	...	421	251	+ '012	420	263	...
8	433	245	...	429	259	...	425	273	+ '009	421	287	...	418	301	+ '006
9	429	276	+ '006	425	292	+ '012	422	307	...	419	323	+ '013	415	338	...
10	428	307	...	424	324	...	420	341	+ '010	416	359	...	413	376	+ '007
11	425	337	...	421	356	...	417	375	...	413	395	...	410	414	...
12	421	368	...	417	389	+ 013	414	409	...	411	431	...	407	451	...
13	418	399	+ '007	414	421	...	411	443	...	408	467	+ '015	404	489	...
14	415	429	...	411	454	...	408	477	...	405	503	...	401	526	+ '009
15	413	460	...	409	486	...	405	511	...	401	538	...	398	564	...
16	409	491	+ '008	405	518	...	402	546	+ '012	398	574	...	395	602	...
17	405	521	...	401	551	...	398	580	...	395	610	+ '016	391	639	...
18	402	552	...	398	583	+ '016	395	614	...	391	646	...	388	678	+ '010
19	398	583	+ '009	394	616	...	391	648	...	388	682	...	384	715	...
20	394	613	...	390	648	...	387	682	...	384	718	...	381	753	...
21	390	644	...	386	680	...	383	716	+ '014	380	754	...	377	791	...
22	387	675	+ '010	382	713	...	379	750	...	376	790	+ '018	373	828	...
23	384	705	...	379	745	+ '017	375	784	...	372	826	...	371	867	+ '012
24	381	736	...	377	778	...	373	818	...	370	862	...	369	903	...
25	378	767	+ '011	374	810	...	370	852	...	368	897	...	367	941	...
26	375	797	...	372	842	...	368	887	+ '015	366	933	+ '019	365	979	...
27	372	828	...	369	875	...	365	921	...	364	969	...	363	1016	+ '018
28	369	859	...	367	907	...	363	955	...	362	1005	...	360	1053	...
29	366	889	...	364	940	+ '018	360	989	...	359	1041	...	358	1091	...
30	363	920	...	362	972	...	358	1024	...	357	1076	...	356	1128	...
31	360	931	+ '012	360	984	...	356	1088	+ '016	354	1091	+ '020	353	1144	...
32	357	941	...	357	996	...	354	1052	...	352	1107	...	351	1161	+ '014
33	354	952	...	355	1009	...	352	1065	...	350	1122	...	348	1177	...
34	351	963	...	353	1021	...	350	1079	...	348	1138	...	346	1194	...
35	348	973	...	350	1033	+ '020	348	1093	...	346	1153	...	344	1210	...
36	346	984	...	344	1045	...	342	1107	+ '018	340	1168	+ '021	338	1227	+ '015
37	340	995	+ '013	338	1058	...	336	1121	...	334	1184	...	332	1243	...
38	334	1006	...	332	1070	...	330	1134	...	328	1199	...	326	1260	...
39	328	1016	...	326	1082	...	324	1148	...	322	1215	...	320	1276	...
40	321	1027	...	319	1095	+ '021	317	1162	...	315	1230	+ '022	313	1293	+ '016
41	315	1038	...	313	1107	...	311	1176	...	309	1245	...	307	1309	...
42	308	1048	...	306	1119	...	304	1190	...	302	1261	...	300	1326	...
43	301	1059	...	299	1131	...	297	1203	...	295	1276	...	294	1342	...
44	295	1070	...	293	1144	...	291	1217	+ '020	289	1282	...	287	1359	...
45	288	1081	...	286	1156	...	284	1231	+ '019	282	1307	...	280	1375	...
46	281	1091	...	279	1168	...	277	1245	...	275	1322	...	274	1392	...
47	274	1102	...	272	1180	+ '022	270	1259	...	268	1338	+ '024	267	1408	...
48	267	1113	...	265	1193	...	263	1272	...	261	1353	...	260	1425	...
49	260	1123	...	258	1205	...	256	1288	...	254	1369	...	253	1441	+ '018
50	252	1134	...	250	1217	...	248	1300	...	247	1384	...	245	1458	...
51	245	1145	...	243	1229	...	241	1314	...	240	1399	...	238	1474	...
52	238	1156	...	236	1242	...	234	1328	...	232	1415	...	231	1491	...
53	230	1166	...	228	1254	...	226	1341	...	225	1430	...	223	1507	...
54	223	1177	+ '014	221	1266	...	219	1355	...	217	1446	...	216	1524	...
55	215	1188	...	213	1278	...	211	1369	...	210	1461	...	208	1540	...
56	208	1198	...	206	1291	...	204	1383	...	202	1476	...	201	1557	...
57	199	1209	...	197	1303	...	195	1397	...	194	1492	...	193	1573	...
58	194	1220	...	192	1315	...	190	1410	...	190	1507	...	189	1590	...
59	189	1231	...	187	1327	...	186	1424	...	186	1523	...	185	1606	...
60	184	1241	...	182	1340	...	182	1438	...	182	1528	...	181	1623	...
61	179	1252	...	178	1352	...	178	1452	...	178	1552	...	177	1640	...
62	174	1239	...	174	1339	+ '021	174	1440	...	174	1540	+ '028	174	1629	...

TABLE III.—Sunrise from 8° to 12° N. latitude—cont.

Day of solar year.	Lat. 8°	Long. + 800" = + '008 of day.	Lat. 9°	Long. + 852" = + '010 of day.	Lat. 10°	Long. + 864" = + '007 of day.	Lat. 11°	Long. + 816" = + '009 of day.	Lat. 12°	Long. + 212" = + '002 of day.						
	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Trivandrum.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Rameswaram.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Madura.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Tanjore.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Maur.	
A.D. 1000— 1400.																
63	-165	+1226	+ '014	-165	+1827	+ '021	-165	+1427	+ '019	-165	+1528	+ '023	May. 26	-165	+1617	+ '018
64	156	1214	...	156	1314	...	156	1415	...	156	1516	...	27	156	1608	...
65	147	1201	...	147	1302	...	147	1402	...	147	1504	...	28	147	1595	...
66	138	1188	...	138	1289	...	138	1390	...	138	1492	...	29	138	1583	...
67	129	1176	...	129	1277	...	129	1378	...	129	1481	...	30	128	1572	...
68	120	1163	...	120	1264	...	120	1365	...	119	1469	...	31	119	1561	...
69	110	1150	...	110	1252	...	110	1353	...	110	1459	...	1	110	1550	+ '017
70	101	1137	...	101	1239	...	101	1340	...	101	1445	...	2	100	1538	...
71	91	1125	+ '013	91	1227	...	91	1328	...	91	1433	...	3	91	1527	...
72	82	1112	...	82	1214	...	82	1316	...	82	1421	...	4	81	1516	...
73	72	1099	...	72	1202	...	72	1303	...	72	1409	...	5	72	1504	...
74	63	1086	...	63	1189	...	63	1291	...	63	1397	...	6	62	1493	...
75	54	1074	...	54	1176	...	54	1278	...	54	1385	...	7	54	1482	...
76	48	1061	...	48	1164	...	48	1266	...	48	1373	...	8	48	1470	...
77	34	1048	...	34	1151	...	34	1254	...	34	1362	...	9	34	1459	...
78	25	1035	...	25	1139	...	25	1241	...	25	1350	...	10	24	1448	...
79	15	1023	...	15	1126	...	15	1229	...	15	1338	...	11	15	1437	...
80	5	1010	...	5	1114	...	5	1216	...	5	1326	...	12	5	1425	...
81	+ 4	997	...	+ 4	1101	...	+ 4	1204	+ '018	+ 4	1314	...	13	+ 4	1414	...
82	14	985	...	14	1089	...	14	1192	...	14	1302	+ '022	14	14	1403	...
83	23	972	...	23	1076	...	23	1179	...	23	1280	...	June. 15	23	1391	...
84	33	959	...	33	1064	...	33	1167	...	33	1278	...	16	33	1380	...
85	43	946	...	43	1051	...	43	1154	...	43	1266	...	17	43	1369	...
86	52	934	...	52	1039	...	52	1142	...	52	1254	...	18	52	1357	...
87	61	921	...	61	1026	...	61	1130	...	61	1243	...	19	61	1346	...
88	71	908	...	71	1014	...	71	1117	...	71	1231	...	20	71	1335	...
89	81	895	...	81	1001	+ '020	81	1105	...	81	1219	+ '021	21	81	1324	+ '016
90	90	883	...	90	988	...	90	1092	...	90	1207	...	22	90	1312	...
91	104	870	...	104	976	...	104	1080	...	104	1196	...	23	104	1300	...
92	114	847	+ '012	114	953	...	114	1057	...	114	1173	...	24	114	1276	...
93	124	825	...	124	931	...	124	1034	...	124	1149	...	25	124	1252	...
94	133	802	...	133	908	...	133	1012	+ '017	134	1126	...	26	134	1228	...
95	143	780	...	143	885	+ '018	143	989	...	143	1103	...	27	144	1204	...
96	153	757	...	153	862	...	153	966	...	153	1079	...	28	153	1180	+ '015
97	162	735	...	162	840	...	162	943	...	163	1056	...	29	163	1157	...
98	172	712	+ '011	172	817	...	172	920	...	172	1033	...	30	173	1133	...
99	182	690	...	182	794	...	182	898	...	182	1010	...	1	182	1109	...
100	191	667	...	191	772	...	191	875	...	191	988	...	2	191	1085	...
101	200	645	...	200	749	...	200	852	+ 016	200	963	...	3	201	1061	...
102	209	622	...	209	726	+ '017	209	829	...	210	940	+ '020	4	210	1037	+ '014
103	218	600	...	218	703	...	218	806	...	219	916	...	5	219	1018	...
104	228	577	...	228	681	...	228	784	...	228	893	...	6	229	999	...
105	237	555	+ '010	237	658	...	237	761	...	237	870	...	7	238	965	...
106	246	532	...	246	635	...	246	738	...	246	846	...	8	247	941	...
107	253	510	...	253	613	...	254	715	...	255	823	...	9	256	918	...
108	261	487	...	262	590	...	263	692	...	264	800	...	10	265	894	...
109	271	465	...	272	567	...	272	670	...	273	777	...	11	273	870	...
110	280	442	...	280	544	...	281	647	...	281	753	...	12	282	846	...
111	288	420	...	289	522	...	289	624	...	290	730	...	13	290	822	...
112	297	397	...	297	499	...	298	601	...	298	707	...	14	299	798	...
113	306	375	+ '009	306	476	...	306	578	...	307	683	...	15	307	774	+ '012
114	315	352	...	315	454	...	315	556	...	316	680	...	16	316	750	...
115	323	330	...	323	431	...	323	533	...	324	637	+ 018	July. 17	324	726	...
116	331	307	...	331	408	...	331	510	...	332	613	...	18	332	702	...
117	338	285	...	339	385	...	339	487	...	339	590	...	19	340	679	...
118	347	262	...	347	363	...	347	464	+ '014	348	567	...	20	348	655	...
119	353	239	...	354	340	...	354	442	...	355	544	...	21	356	631	...
120	356	217	...	357	317	...	358	419	...	359	520	...	22	360	607	...
121	359	194	...	360	295	...	362	396	...	363	497	...	23	364	583	...
122	362	172	...	363	272	...	366	372	...	367	472	...	24	369	560	...
123	365	152	...	367	251	+ '015	369	359	...	371	457	...	25	374	544	+ '011
124	372	152	...	374	249	...	376	346	...	379	443	...	26	380	529	...
125	379	143	...	381	238	...	383	338	...	385	428	+ '017	27	387	513	...

TABLE III.—SUNRISE AND INDIAN TERRESTRIAL LONGITUDES

TABLE III.—Sunrise from 8° to 12° N. latitude—cont.

Day of solar year.	Lat. 8°			Lat. 9°			Lat. 10°			Lat. 11°			Lat. 12°		
	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. + 800'' = + 003 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. + 852'' = + 010 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. + 864'' = + 007 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. + 816'' = + 009 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. + 812'' = + 002 of day.
			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.
126	+ 385	+ 133	+ 009	+ 387	+ 227	+ 015	+ 389	+ 820	+ 014	+ 392	+ 414	+ 017			
127	390	123		393	215		396	307		399	399				
128	398	114		399	204		402	295		405	385				
129	405	104		407	193		409	282		411	370				
130	409	94		412	181		415	269		418	356				
131	415	84		418	170		421	256		424	341				
132	421	75		424	159		427	243		430	327				
133	427	65		430	147		433	230	+ 018	436	312				
134	434	55		437	136		439	217		441	298				
135	438	45		441	125		444	204		447	283				
136	444	36		447	113		450	191		453	269				
137	449	26		452	102		455	178		458	254				
138	454	16		457	91		460	166		463	240				
139	461	6		464	79		466	153		468	225				
140	464	0		467	68		470	140		473	211				
141	469	0		472	57		475	127		478	196				
142	474	0		477	45		480	114		483	182				
143	478	0		481	34		484	101		487	167				
144	483	0		486	23		489	88		490	153				
145	484	0		487	11		490	75		492	138				
146	496	0		488	0		491	62		494	124				
147	487	0		490	0		493	49		495	109				
148	489	0		491	0		494	37		496	95				
149	490	0		492	0		495	24		497	80				
150	491	0		494	0		496	11		499	66				
151	492	0		495	0		498	0		500	51				
152	494	0		496	0		499	0		501	36				
153	495	0		497	0		500	0		502	35				
154	496	0		498	0		501	0		503	34				
155	498	0		499	0		502	0		504	32				
156	500	0		500	0		503	0		506	31				
157	501	0		501	0		504	0		508	30				
158	502	0		503	0		506	0		510	29				
159	503	0		505	0		508	0		512	28				
160	504	0		507	0		510	0		514	26				
161	505	0		509	0		512	0		515	25				
162	506	0		510	0		513	0		517	24				
163	508	0		512	0		514	0		518	23				
164	509	0		513	0		516	0		520	22				
165	510	0		514	0		517	0		521	20				
166	511	0		515	0		517	0		521	19				
167	512	0		515	0		519	0		522	18				
168	513	0		516	0		519	0		523	17				
169	513	0		516	0		520	0		524	16				
170	513	0		516	0		520	0		524	14				
171	514	0		517	0		521	0		524	13				
172	515	0		518	0		521	0		525	12				
173	515	0		518	0		521	0		524	11				
174	514	0		517	0		520	0		524	10				
175	513	0		516	0		520	0		524	8				
176	512	0		516	0		520	0		523	7				
177	511	0		515	0		519	0		523	6				
178	510	0		514	0		518	0		522	5				
179	509	0		513	0		517	0		521	4				
180	508	0		512	0		516	0	+ 012	520	2				
181	507	0		511	0		514	0		518	1				
182	506	0		510	0		513	0		517	0				
183	505	0		509	0		512	0		515	0				
184	504	0		508	0		511	0		514	-1				
185	503	0		508	0		509	0		512	2				
186	501	0		504	0		507	0		510	4				

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September.
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TABLE III.—Sunrise from 8° to 12° N. latitude—cont.

Day of solar year.	Lat. 8°			Lat. 9°			Lat. 10°			Lat. 11°			Lat. 12°			
	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. +300" = + '003 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. +352" = + '010 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. +354" = + '007 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. +316" = + '009 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. +212" = + '002 of day.	
Rameswaram																
Madura																
Tanjore																
Maur.																
A.D. 1000-1400.																
187	+499	+0	+ '003	+502	+0	+ '015	+505	+0	+ '013	+508	-5	+ '016	27	+512	-12	+ '008
188	497	0	...	500	0	...	503	0	...	506	6	...	28	510	14	...
189	494	0	...	497	0	...	500	0	...	503	7	...	29	507	17	+ '007
190	491	0	...	494	0	...	497	0	...	500	8	...	30	504	20	...
191	488	0	...	491	0	...	494	0	...	497	10	...	1	501	23	...
192	485	0	...	488	0	...	491	0	...	494	11	...	2	498	26	...
193	482	0	...	485	0	...	488	0	...	491	12	...	3	495	29	...
194	479	0	...	482	0	...	485	0	...	488	13	...	4	492	32	...
195	476	0	...	479	0	...	482	0	...	485	14	+ '015	5	489	35	...
196	473	0	...	476	0	...	479	0	...	482	16	...	6	486	38	...
197	469	0	...	472	0	...	475	0	...	478	17	...	7	482	41	...
198	466	0	...	469	0	...	471	0	+ '012	474	18	...	8	478	43	...
199	462	0	...	465	0	...	468	0	...	471	19	+ '014	9	475	46	...
200	458	0	...	461	0	...	464	0	...	467	20	...	10	471	49	...
201	454	0	...	457	0	...	460	0	...	463	22	...	11	467	52	+ '006
202	450	0	...	453	0	...	456	0	...	459	23	...	12	463	55	...
203	445	0	...	448	0	...	451	0	+ '011	454	24	...	13	458	58	...
204	440	0	...	443	0	...	446	0	...	449	25	+ '013	14	453	61	...
205	436	0	...	439	0	...	442	0	...	445	26	...	15	449	64	+ '005
206	431	0	...	434	0	...	437	0	...	440	28	...	16	444	67	...
207	427	0	...	430	0	...	433	0	...	436	29	...	17	440	70	...
208	422	0	...	425	0	...	428	0	+ '010	431	30	+ '012	18	435	72	...
209	417	0	...	420	0	+ '014	423	0	...	425	31	...	19	429	75	+ '004
210	413	0	...	416	0	...	419	0	...	420	32	...	20	424	78	...
211	411	0	...	414	0	...	417	0	...	418	34	...	21	422	81	...
212	409	0	+ '008	412	0	...	415	0	...	416	35	...	22	420	84	...
213	407	0	...	410	0	...	413	0	...	414	36	...	23	418	88	...
214	405	0	...	408	0	...	411	0	+ '009	412	50	...	24	416	104	...
215	403	0	...	406	0	...	409	-10	...	410	65	...	25	414	120	...
216	397	0	...	400	0	...	403	23	...	406	79	...	26	408	135	...
217	391	0	...	394	0	...	397	36	...	400	84	...	27	402	151	...
218	385	0	...	388	0	...	391	48	...	394	108	+ '011	28	396	166	+ '003
219	378	0	...	381	0	...	384	61	+ '008	387	123	...	29	389	182	...
220	372	0	...	375	-11	+ '012	378	74	...	381	137	...	30	383	198	...
221	365	0	...	368	23	...	371	87	...	374	152	...	31	376	214	...
222	358	0	...	361	34	...	364	100	...	367	166	+ '010	1	369	229	+ '002
223	351	0	...	354	45	...	357	113	...	360	181	...	2	362	245	...
224	344	0	+ '007	347	57	...	350	126	...	353	195	...	3	355	261	...
225	337	0	...	340	68	...	343	139	...	346	210	+ '009	4	348	276	+ '001
226	330	-6	...	333	79	...	336	152	+ '007	339	224	...	5	341	292	...
227	322	16	+ '006	325	91	+ '011	328	165	...	331	239	...	6	333	308	...
228	315	26	...	318	102	...	321	177	...	324	253	+ '008	7	326	323	+ '000
229	307	36	+ '005	310	113	...	313	190	+ '006	316	268	...	8	318	339	...
230	299	45	...	302	125	+ '010	305	203	...	308	282	...	9	310	355	...
231	291	55	...	294	136	...	297	216	...	300	297	...	10	302	371	- '001
232	283	65	+ '004	286	147	...	289	229	+ '005	292	311	...	11	294	386	...
233	275	75	...	278	159	+ '009	281	242	...	284	326	...	12	286	402	...
234	266	84	...	269	170	...	272	255	...	275	340	+ '007	13	277	418	...
235	258	94	+ '003	261	181	...	264	268	...	267	355	...	14	269	433	...
236	250	104	...	253	193	...	256	281	...	259	369	+ '006	15	261	449	- '002
237	242	114	...	245	204	...	248	294	+ '004	251	384	...	16	253	465	...
238	233	123	...	236	215	+ '008	239	306	...	242	398	...	17	244	480	...
239	224	133	...	227	227	...	230	319	...	233	413	+ '005	18	235	496	- '003
240	216	143	...	219	238	...	222	332	+ '003	225	427	...	19	227	512	...
241	207	152	+ '002	210	249	+ '007	213	345	...	216	442	...	20	218	528	...
242	199	162	...	201	261	...	204	358	...	207	456	+ '004	21	209	543	- '004
243	198	172	...	199	272	...	199	372	+ '002	199	472	...	22	199	560	...
244	190	184	+ '001	190	295	+ '006	190	395	...	190	495	...	23	190	584	- '005
245	180	217	...	180	317	...	180	418	...	180	519	+ '003	24	180	608	...
246	170	239	+ '000	170	340	...	170	440	+ '001	170	542	...	25	170	632	...

TABLE III.—SUNRISE AND INDIAN TERRESTRIAL LONGITUDES

TABLE III.—Sunrise from 8° to 12° N. latitude—cont.																														
Day of solar year.	Lat. 8°			Long. + 300" = + '003 of day.			Lat. 9°			Long. + 852" = + '010 of day.			Lat. 10°			Long. + 554" = + '007 of day.			Lat. 11°			Long. + 818" = + '009 of day.			Lat. 12°			Long. + 212" = + '002 of day.		
	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Trivandrum.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Rameswaram.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Madura.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Tanjore.	Eng. date.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Malabar.														
			A.D. 1000—1400.			A.D. 1000—1400.			A.D. 1000—1400.			A.D. 1000—1400.				A.D. 1000—1400.														
247	+160	-262	...	+160	-308	...	+160	-463	...	+160	-565	...	26	+160	-656	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
248	150	285	...	150	385	...	150	486	...	150	588	...	27	150	679	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
249	140	307	...	140	408	...	140	509	...	140	612	...	28	140	708	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
250	180	330	...	180	431	...	130	532	...	130	635	...	29	130	727	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
251	120	352	...	120	454	...	120	554	...	120	658	...	30	120	751	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
252	110	375	...	110	476	...	110	577	...	110	682	...	1	110	775	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
253	100	397	...	100	499	...	100	600	...	100	705	...	2	100	799	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
254	90	420	...	90	522	...	90	623	...	90	728	...	3	90	823	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
255	80	442	...	80	544	...	80	646	...	80	752	...	4	80	847	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
256	70	465	...	70	567	...	70	668	...	70	775	...	5	70	871	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
257	60	487	...	60	590	...	60	691	...	60	798	...	6	60	895	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
258	50	510	...	50	613	...	50	714	...	50	821	...	7	50	918	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
259	40	532	...	40	635	...	40	737	...	40	845	...	8	40	942	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
260	80	555	...	30	658	...	30	760	...	30	868	...	9	30	966	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
261	20	577	...	20	681	...	20	782	...	20	891	...	10	20	990	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
262	10	600	...	10	708	...	10	805	...	10	915	...	11	10	1014	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
263	0	622	...	0	728	...	0	828	...	0	938	...	12	0	1088	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
264	-10	645	...	-10	749	...	-10	851	...	-10	961	...	13	-10	1062	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
265	20	667	...	20	772	...	20	874	...	20	985	...	14	20	1086	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
266	29	690	...	28	794	...	28	896	...	28	1008	...	15	28	1110	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
267	38	712	...	37	817	...	37	919	...	37	1031	...	16	37	1134	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
268	48	735	...	47	840	...	47	942	...	47	1054	...	17	47	1157	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
269	59	757	...	57	862	...	57	965	...	57	1078	...	18	57	1181	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
270	68	780	...	66	885	...	66	988	...	66	1101	...	19	66	1205	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
271	78	802	...	77	908	...	77	1010	...	77	1124	...	20	77	1229	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
272	88	825	...	87	931	...	87	1033	...	87	1148	...	21	87	1253	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
273	98	847	...	97	953	...	97	1056	...	97	1171	...	22	97	1277	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
274	104	870	...	104	976	...	104	1080	...	104	1196	...	23	104	1300	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
275	111	893	...	111	988	...	111	1092	...	111	1208	...	24	111	1311	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
276	119	895	...	118	1001	...	118	1105	...	118	1220	...	25	118	1323	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
277	126	908	...	126	1014	...	125	1117	...	125	1232	...	26	125	1334	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
278	134	921	...	133	1026	...	133	1130	...	132	1246	...	27	132	1345	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
279	141	934	...	140	1039	...	140	1142	...	139	1255	...	28	139	1356	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
280	149	946	...	148	1051	...	147	1154	...	146	1267	...	29	146	1368	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
281	156	959	...	155	1064	...	154	1167	...	154	1279	...	30	153	1379	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
282	164	972	...	162	1076	...	162	1179	...	161	1291	...	31	160	1390	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
283	171	985	...	170	1089	...	169	1192	...	168	1303	...	1	167	1402	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
284	179	997	...	177	1101	...	176	1204	...	175	1315	...	2	174	1413	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
285	186	1010	...	184	1114	...	183	1216	...	182	1329	...	3	181	1424	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
286	194	1023	...	192	1126	...	191	1229	...	189	1339	...	4	188	1436	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
287	201	1035	...	199	1139	...	198	1241	...	196	1351	...	5	195	1447	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
288	209	1048	...	206	1151	...	205	1254	...	204	1363	...	6	202	1458	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
289	216	1061	...	214	1164	...	212	1266	...	211	1374	...	7	209	1469	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
290	224	1074	...	221	1176	...	220	1278	...	218	1386	...	8	216	1481	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
291	231	1086	...	228	1189	...	227	1291	...	225	1398	...	9	223	1492	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
292	239	1099	...	236	1202	...	234	1303	...	232	1410	...	10	230	1503	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
293	246	1112	...	243	1214	...	241	1316	...	239	1422	...	11	237	1515	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
294	254	1125	...	250	1227	...	249	1328	...	246	1434	...	12	244	1526	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
295	261	1137	...	258	1239	...	256	1340	...	254	1446	...	13	251	1537	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
296	269	1150	...	265	1252	...	263	1353	...	261	1458	...	14	258	1549	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
297	276	1163	...	272	1264	...	270	1365	...	268	1470	...	15	265	1560	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
298	284	1176	...	280	1277	...	278	1378	...	275	1482	...	16	273	1571	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
299	291	1188	...	287	1289	...	285	1390	...	282	1493	...	17	281	1582	...	...	...												

TABLE III.—Sunrise from 8° to 12° N. latitude—cont.

Day of solar year.	Lat. 8°			Lat. 9°			Lat. 10°			Lat. 11°			Lat. 12°			
	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. + 300'' = + '003 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. + 852'' = + '010 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. + 564'' = + '007 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. + 816'' = + '009 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. + 212'' = + '002 of day.	
			A.D. 1000— 1400			A.D. 1000— 1400			A.D. 1000— 1400			A.D. 1000— 1400			A.D. 1000— 1400	
306	-332	-1231	- '018	-380	-1327	- '008	-327	-1424	...	-324	-1521	- '010	...	-323	-1607	- '018
307	335	1220	...	333	1315	...	331	1411	- '011	329	1506	...	...	327	1590	...
308	339	1209	...	334	1303	...	334	1397	...	331	1490	...	...	330	1574	...
309	342	1198	...	340	1291	...	337	1388	...	334	1475	...	...	333	1557	...
310	346	1188	...	344	1278	...	341	1369	...	338	1460	...	...	337	1541	- '017
311	349	1177	...	347	1266	...	344	1355	...	341	1444	...	...	340	1524	...
312	353	1166	...	351	1254	...	347	1342	...	344	1429	...	...	343	1508	...
313	356	1156	...	354	1242	...	351	1328	...	348	1413	- '009	...	347	1491	...
314	360	1145	...	358	1229	...	354	1314	...	351	1398	...	...	350	1475	...
315	363	1134	...	361	1217	...	357	1300	...	354	1383	...	...	353	1458	...
316	367	1123	...	365	1205	- '007	361	1281	...	358	1367	...	...	357	1442	- '016
317	370	1113	...	368	1193	...	364	1273	...	361	1352	...	...	360	1455	...
318	374	1102	- '011	372	1180	...	367	1259	...	364	1336	...	...	363	1409	- '015
319	377	1091	...	375	1168	...	371	1245	...	368	1321	...	...	367	1392	...
320	381	1081	...	379	1156	...	374	1231	...	371	1306	- '008	...	370	1376	...
321	384	1070	...	382	1144	...	377	1217	- '010	374	1290	...	...	373	1359	...
322	388	1059	...	386	1131	- '006	381	1204	...	378	1275	...	...	377	1343	...
323	391	1048	...	389	1119	...	384	1190	...	381	1259	...	...	380	1326	...
324	395	1038	...	393	1107	...	387	1176	- '009	384	1244	...	...	383	1310	...
325	398	1027	...	396	1095	...	391	1162	...	388	1229	- '007	...	387	1293	...
326	402	1016	...	400	1082	...	394	1148	...	391	1213	...	...	390	1277	- '014
327	405	1006	...	403	1070	...	397	1135	...	394	1198	...	...	393	1260	...
328	409	995	- '010	407	1058	- '005	401	1121	...	398	1182	- '006	...	397	1244	...
329	412	984	...	410	1045	...	404	1107	- '008	401	1167	...	...	400	1227	- '013
330	415	973	...	414	1033	...	407	1098	...	404	1152	- '005	...	403	1211	...
331	418	963	- '009	417	1021	- '004	411	1079	...	408	1136	...	...	406	1194	- '012
332	422	952	...	419	1009	...	414	1066	- '007	411	1121	...	...	408	1178	...
333	425	941	...	422	998	...	417	1052	...	414	1105	- '004	...	411	1161	...
334	429	931	- '008	425	984	- '003	421	1038	...	418	1090	...	...	414	1145	- '011
335	432	920	...	428	972	...	424	1024	- '006	420	1076	...	...	417	1128	...
336	432	889	...	428	940	- '002	424	990	...	420	1040	- '003	...	417	1090	- '010
337	433	859	- '007	429	907	...	425	956	...	421	1004	...	...	418	1053	...
338	433	828	...	429	875	...	425	922	- '005	421	968	- '002	...	418	1015	- '009
339	434	797	...	430	842	- '001	426	888	...	422	932	...	...	419	978	...
340	434	766	...	430	810	...	426	854	- '004	422	896	...	...	419	940	...
341	435	735	- '006	431	778	...	427	820	...	423	861	- '001	...	420	902	- '008
342	435	705	...	431	745	- '000	427	785	...	423	825	...	...	420	865	...
343	436	675	- '005	432	713	...	428	751	- '003	424	789	- '000	...	421	827	- '007
344	436	640	...	432	680	...	428	717	...	424	753	...	...	421	790	...
345	437	613	...	433	648	+ '002	429	683	- '002	425	717	+ '001	...	422	752	- '006
346	437	583	- '004	433	616	...	429	649	...	425	681	...	...	422	714	...
347	438	552	...	434	583	...	430	615	...	426	645	...	...	423	677	...
348	438	521	...	434	551	...	430	581	- '001	426	609	+ '002	...	423	639	- '005
349	439	491	- '003	435	518	...	431	547	...	427	573	...	...	424	602	...
350	439	460	...	435	486	+ '003	431	513	- '000	427	537	+ '008	...	424	564	- '004
351	440	429	- '002	436	454	...	432	479	...	428	502	...	...	425	526	...
352	440	399	...	436	421	...	432	444	...	428	466	...	...	425	489	- '003
353	441	368	...	437	389	+ '004	433	410	+ '001	429	430	+ '004	...	426	451	...
354	441	337	- '001	437	356	...	433	376	...	429	394	...	...	426	414	...
355	442	307	...	438	324	...	434	342	...	430	358	+ '005	...	427	376	- '002
356	442	276	...	438	292	+ '005	434	308	...	430	322	...	...	427	338	...
357	443	245	- '000	439	259	...	435	274	...	431	286	...	...	428	301	- '001
358	443	215	...	439	227	+ '006	435	240	+ '003	431	250	+ '006	...	428	263	...
359	444	184	...	440	194	...	436	206	...	432	214	...	...	429	226	- '000
360	444	153	+ '001	440	162	...	436	172	...	432	178	+ '007	...	429	188	...
361	445	123	...	441	130	+ '008	437	138	+ '004	433	143	...	...	430	150	...
362	445	92	...	441	97	...	437	103	...	433	107	...	...	430	113	...
363	446	61	...	442	65	...	438	69	+ '005	434	71	+ '008	...	431	75	...
364	446	31	...	442	32	+ '009	438	35	...	434	36	...	...	431	38	+ '001
365	447	0	...	443	0	...	439	0	...	435	0	+ '009	...	432	0	...

TABLE III.—Sunrise from 13° to 17° N. latitude.

Day of solar year.	Lat. 13°			Lat. 14°			Lat. 15°			Lat. 16°			Lat. 17°			
	Long. + 1072" = + 012 of day.			Long. + 1008" = + 012 of day.			Long. + 168" = + 002 of day.			Long. + 800" = + 008 of day.			Long. + 648" = + 008 of day.			
	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Madras.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Melloré.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Visianagram.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Belgaum.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Hyderabad.	
A.D. 1000— 1400.																
1	-428	+89	+ 012	-424	+41	+ 012	-420	+48	+ 008	-417	+45	- 008	25	-418	+46	+ 008
2	426	78		422	82		418	86		415	89	- 002	26	411	98	+ 009
3	424	118	+ 013	420	123	+ 013	416	129	+ 004	418	133	- 001	27	409	139	+ 010
4	428	157		419	164		415	172		411	178		28	408	186	+ 011
5	421	196	+ 014	417	205	+ 014	413	215	+ 005	410	222	- 000	29	406	232	
6	419	235		415	246		411	258		407	267		30	404	278	+ 012
7	417	274	+ 015	413	287	+ 015	409	301	+ 006	406	311	+ 001	31	402	325	
8	414	314		410	328		407	344		403	351		1	399	371	
9	412	351	+ 016	406	369	+ 016	404	387		401	395	+ 002	2	397	418	
10	409	388		405	410		402	430		398	440		3	395	464	+ 013
11	407	428	+ 018	403	451		399	478	+ 007	396	484	+ 003	4	392	510	
12	404	467		400	492	+ 017	396	516		393	529		5	389	557	+ 015
13	401	506		397	533		394	559		391	573		6	387	603	
14	398	545		394	574		391	602		387	618	+ 004	7	384	650	
15	395	584		391	615	+ 019	388	645	+ 009	384	662		8	381	696	+ 016
16	392	624	+ 020	388	656		384	688		381	707		9	378	748	
17	388	663		385	697		381	731		378	751		10	374	790	+ 018
18	385	702		381	738		378	774	+ 011	375	796	+ 006	11	371	836	+ 019
19	382	741		378	779	+ 021	374	817	+ 012	371	840		12	368	883	
20	377	780	+ 022	374	820		370	860		367	885		13	364	929	
21	374	820		370	861		367	903		364	929	+ 008	14	360	973	
22	370	859		366	902		363	946	+ 014	360	974		15	358	1019	+ 020
23	368	898		364	943	+ 022	361	989		358	1019		16	356	1066	
24	366	937	+ 023	362	984		359	1032		356	1063		17	354	1113	
25	364	976		360	1025		357	1075		354	1107	+ 009	18	352	1159	+ 021
26	362	1016		358	1066		355	1118	+ 015	352	1152		19	350	1206	
27	360	1055		356	1107	+ 024	353	1161		350	1196		20	348	1252	
28	358	1094		354	1148		351	1204		349	1241	+ 010	21	347	1298	+ 023
29	356	1123		352	1189		349	1247		348	1285		22	346	1345	
30	354	1176		350	1232		347	1290	+ 016	347	1336		23	345	1392	
31	352	1194		348	1251	+ 025	346	1313		346	1358		24	344	1416	
32	350	1212	+ 024	347	1271		345	1334		345	1381	+ 011	25	343	1439	+ 024
33	348	1230		346	1290		344	1354		344	1403		26	342	1463	
34	347	1248		345	1309		343	1375	+ 017	340	1425		27	338	1487	
35	341	1266		339	1328	+ 026	337	1396		335	1447	+ 013	28	333	1510	
36	335	1285	+ 025	333	1348		331	1417		329	1470		29	326	1531	
37	329	1303		327	1367		325	1438	+ 018	323	1492		30	321	1558	
38	324	1321		322	1386		320	1458		317	1514	+ 014	1	315	1582	+ 025
39	317	1339		316	1406	+ 027	313	1479		311	1537		2	309	1605	
40	311	1357	+ 027	309	1425		307	1500	+ 019	305	1559		3	308	1629	
41	305	1375		303	1444		301	1521		299	1581		4	297	1658	+ 026
42	298	1393		296	1464		294	1542		292	1604		5	290	1676	
43	292	1411		290	1483		288	1562		286	1626	+ 015	6	284	1700	
44	285	1429		283	1502		282	1583		280	1648		7	278	1724	
45	278	1447		277	1521		275	1604		273	1670		8	271	1747	
46	272	1466		270	1541		268	1625		267	1693		9	265	1771	+ 028
47	265	1484		263	1560		261	1646		259	1715		10	258	1795	
48	258	1502	+ 029	256	1579		254	1666		253	1737		11	251	1819	
49	251	1520		249	1599		248	1687		246	1760		12	244	1842	
50	244	1538		242	1618	+ 028	241	1708		239	1782		13	237	1866	
51	237	1556		235	1637		234	1729		232	1804		14	230	1890	+ 030
52	229	1574	+ 030	228	1657		226	1750		225	1827		15	223	1913	
53	222	1592		220	1676		219	1770	+ 021	217	1849		16	216	1937	
54	214	1610		213	1695		212	1791		210	1871		17	209	1961	
55	207	1628		206	1714		204	1812		203	1893		18	201	1984	
56	200	1647		198	1734		197	1833		196	1916		19	194	2008	
57	192	1665		190	1753		189	1854		188	1938		20	186	2032	
58	188	1683		186	1772		184	1874		183	1960		21	182	2056	
59	184	1701		182	1792		180	1895		179	1983		22	178	2079	
60	180	1719		178	1811		176	1916		175	2005		23	174	2103	
61	176	1736		174	1832		172	1936		171	2028		24	171	2128	
62	172	1755		170	1852	+ 029	168	1956		167	2049		25	167	2150	

TABLE III.—Sunrise from 13° to 17° N. latitude—cont.

Day of solar year.	Lat. 13°			Lat. 14°			Lat. 15°			Lat. 16°			Lat. 17°			
	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. +1072" = +012 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. +1008" = +012 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. +168" = +002 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. +300" = +003 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. +648" = +008 of day.	
			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.	
63	-164	+1714	+029	-184	+1812	+029	-164	+1917	+021	-163	+2010	+017	26	-188	+2111	+029
64	155	1704	...	155	1802	...	155	1907	...	154	2001	...	27	154	2108	...
65	146	1693	...	146	1792	...	146	1898	...	145	1992	...	28	145	2094	...
66	137	1682	...	137	1781	...	137	1888	...	136	1983	...	29	136	2080	...
67	128	1671	...	128	1771	...	127	1878	...	126	1975	...	30	127	2078	...
68	119	1660	...	119	1761	...	118	1869	...	118	1966	...	31	118	2069	...
69	109	1650	...	109	1751	...	109	1859	...	109	1957	...	1	108	2060	...
70	100	1639	...	100	1741	...	100	1850	...	99	1948	...	2	99	2052	...
71	91	1628	...	91	1731	...	90	1840	...	90	1939	...	3	90	2044	...
72	81	1617	...	81	1721	...	81	1830	...	81	1930	...	4	80	2036	...
73	72	1606	...	72	1711	...	71	1821	...	71	1921	...	5	71	2027	...
74	62	1596	...	62	1701	...	62	1811	...	62	1912	...	6	62	2019	...
75	54	1585	...	54	1691	...	54	1802	...	54	1903	...	7	54	2010	...
76	48	1574	...	48	1680	...	48	1792	...	48	1894	...	8	48	2002	...
77	34	1563	...	33	1670	...	33	1782	...	33	1886	...	9	33	1994	...
78	24	1552	+028	24	1660	...	24	1778	...	24	1877	+016	10	24	1985	...
79	15	1542	...	15	1650	...	15	1768	...	15	1868	...	11	15	1977	...
80	5	1531	...	5	1640	...	5	1754	...	5	1859	...	12	5	1968	+028
81	+4	1520	...	+4	1630	...	+4	1744	...	+4	1850	...	13	+4	1960	...
82	14	1509	...	14	1620	...	14	1734	...	14	1841	...	14	14	1952	...
83	23	1498	...	23	1610	...	23	1725	...	23	1832	...	15	23	1943	...
84	33	1488	...	33	1600	...	33	1715	...	33	1823	...	16	33	1935	...
85	43	1477	...	43	1590	...	42	1706	+020	42	1814	...	17	42	1926	...
86	53	1466	...	52	1579	...	52	1696	...	52	1805	...	18	51	1918	...
87	61	1455	...	61	1569	+028	61	1686	...	61	1797	...	19	61	1910	...
88	71	1444	...	71	1559	...	71	1677	...	71	1788	...	20	70	1901	...
89	80	1434	...	80	1549	...	80	1667	...	80	1779	...	21	80	1893	...
90	90	1423	+027	89	1539	...	89	1658	+019	89	1770	+015	22	89	1884	+027
91	105	1412	...	105	1528	...	105	1648	...	105	1760	...	23	106	1876	...
92	115	1401	...	115	1518	...	115	1638	...	111	1734	...	24	116	1869	...
93	124	1393	...	125	1508	+027	125	1628	...	125	1744	...	25	126	1862	...
94	134	1389	...	134	1498	...	135	1618	...	135	1734	...	26	135	1854	...
95	144	1384	...	144	1488	...	144	1608	...	145	1724	+014	27	145	1846	+026
96	154	1379	+026	154	1493	...	154	1620	+018	155	1729	...	28	155	1838	...
97	163	1368	...	164	1478	...	164	1595	...	164	1703	...	29	165	1830	...
98	173	1358	...	173	1468	...	174	1585	...	174	1677	...	30	174	1822	...
99	183	1347	...	183	1458	+026	183	1444	...	184	1650	...	1	184	1814	...
100	192	1337	...	192	1448	...	193	1438	...	193	1640	+018	2	193	1806	+026
101	201	1327	...	202	1438	...	202	1428	...	202	1630	...	3	203	1798	...
102	210	1317	+025	211	1428	...	211	1418	+017	212	1620	...	4	212	1790	...
103	220	1307	...	221	1418	...	221	1408	...	221	1610	...	5	222	1782	...
104	229	1297	...	230	1408	...	230	1398	...	231	1600	...	6	231	1774	...
105	238	1287	...	239	1398	+024	239	1388	...	240	1593	...	7	240	1766	...
106	247	1277	...	248	1388	...	248	1378	...	249	1583	+011	8	249	1758	+024
107	256	1267	...	257	1378	...	257	1368	...	258	1573	...	9	258	1750	...
108	266	1257	...	266	1368	...	266	1358	...	267	1563	...	10	267	1742	...
109	274	1247	...	274	1358	...	275	1348	+016	276	1553	...	11	276	1734	...
110	283	1237	...	283	1348	...	284	1338	...	285	1543	...	12	285	1726	...
111	291	1227	...	292	1338	...	292	1328	...	293	1533	...	13	294	1718	...
112	300	1217	+023	300	1328	...	301	1318	...	301	1523	+010	14	302	1710	+022
113	308	1207	...	309	1318	...	309	1308	...	310	1513	...	15	311	1702	...
114	317	1197	...	318	1308	+023	318	1298	...	319	1503	...	16	320	1694	...
115	325	1187	...	326	1298	...	326	1288	...	327	1493	...	17	328	1686	...
116	333	1177	...	334	1288	...	334	1278	+015	335	1483	...	18	338	1678	...
117	341	1167	...	342	1278	...	342	1268	...	343	1473	...	19	344	1670	...
118	349	1157	...	350	1268	...	351	1258	...	352	1463	...	20	352	1662	+021
119	356	1147	...	355	1258	...	356	1248	...	358	1453	...	21	358	1654	...
120	360	1137	...	360	1248	...	361	1238	...	363	1443	...	22	364	1646	...
121	364	1127	+022	365	1238	+022	366	1228	...	369	1433	...	23	370	1638	...
122	368	1117	...	370	1228	...	372	1218	+013	375	1423	...	24	377	1630	...
123	375	1107	...	377	1218	...	379	1208	...	382	1413	...	25	384	1622	...
124	383	1097	...	385	1208	...	387	1198	...	389	1403	+008	26	391	1614	...
125	389	1087	...	391	1198	...	394	1188	...	396	1393	...	27	398	1606	...

TABLE III.—SUNRISE AND INDIAN TERRESTRIAL LONGITUDES

TABLE III.—Sunrise from 13° to 17° N. latitude—cont.

Day of solar year.	Lat. 13°			Lat. 14°			Lat. 15°			Lat. 16°			Lat. 17°				
	Long. + 1072" = + '012 of day.			Long. + 1008" = + '012 of day.			Long. + 188" = + '002 of day.			Long. + 300" = + '003 of day.			Long. + 648" = + '009 of day.				
	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Madras.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Nellore.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Visnagram.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Belgaum.	Eng. Date.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Hyderabad.	
	A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.				
126	+ 896	+ 587	+ '022	+ 898	+ 677	+ '022	+ 401	+ 775	+ '018	+ 408	+ 861	+ '008	July.	28	+ 405	+ 955	+ '021
127	403	569	...	405	658	...	408	754	...	410	839	...		29	412	932	...
128	409	552	...	412	640	...	414	734	...	416	818	...		30	419	909	+ '020
129	416	535	+ '021	418	621	+ '021	421	714	+ '012	423	796	...		31	425	886	...
130	422	518	...	425	602	...	427	694	...	430	774	+ '007		1	432	862	...
131	428	500	...	431	584	...	433	673	...	436	753	...		2	438	839	...
132	434	483	...	437	565	...	439	653	...	442	731	...	3	444	816	...	
133	440	466	...	443	546	...	446	633	...	448	709	...	4	451	793	...	
134	446	448	...	449	528	...	451	612	...	454	688	...	5	457	770	...	
135	452	431	...	454	509	...	457	592	...	460	666	...	6	462	746	...	
136	457	414	...	460	490	...	463	572	...	465	644	...	7	468	723	+ '018	
137	462	396	...	465	471	...	468	551	...	471	622	...	8	474	700	...	
138	468	379	...	471	453	...	474	531	...	476	601	...	9	479	677	...	
139	473	362	...	476	434	...	479	511	...	482	579	...	10	485	654	...	
140	478	345	...	481	415	+ '020	484	491	...	487	557	...	11	489	630	...	
141	483	327	...	486	397	...	489	470	...	492	536	...	12	494	607	...	
142	488	310	...	491	378	...	494	450	...	496	514	...	13	499	584	...	
143	492	298	...	495	359	...	498	430	...	501	492	...	14	504	561	...	
144	497	275	...	500	341	...	503	409	...	506	471	+ '005	15	509	538	...	
145	501	258	...	504	322	...	507	389	+ '010	510	449	...	16	514	518	...	
146	505	241	...	508	303	...	511	369	...	514	427	...	August.	17	517	491	...
147	509	223	...	512	284	...	516	348	...	518	405	...		18	521	468	...
148	513	206	...	517	266	...	520	328	...	523	384	...		19	526	445	...
149	517	189	...	520	247	...	523	308	...	526	362	...		20	529	422	+ '017
150	520	172	+ '019	524	228	...	527	288	...	530	340	...		21	533	398	...
151	523	154	...	527	210	...	530	267	...	533	319	...		22	536	375	...
152	501	136	...	505	192	+ '019	508	248	...	512	296	...	23	516	352	...	
153	504	122	...	508	186	...	512	240	...	515	286	...	24	519	341	...	
154	507	127	...	511	180	...	515	232	...	518	277	...	25	522	329	...	
155	510	123	...	514	173	...	518	224	...	527	267	...	26	525	318	...	
156	512	118	...	516	167	...	520	216	...	523	258	+ '004	27	527	307	...	
157	514	114	...	518	161	...	522	208	...	525	248	...	September.	28	529	295	+ '016
158	517	110	...	521	155	...	525	200	+ '009	528	239	...		29	532	284	...
159	519	105	...	523	149	...	527	192	...	530	229	...		30	534	273	...
160	521	101	...	525	142	...	529	184	...	532	220	...		31	536	262	...
161	523	96	...	527	136	...	531	176	...	534	210	...		1	538	250	...
162	524	92	...	528	130	...	532	168	...	535	201	...		2	539	239	...
163	525	88	+ '018	529	124	...	533	160	...	537	191	...	3	541	228	...	
164	527	83	...	531	118	...	535	152	...	538	182	...	4	543	216	...	
165	528	79	...	532	111	...	536	144	...	539	172	...	5	543	205	...	
166	528	74	...	532	105	...	536	136	...	540	163	+ '002	6	544	194	+ '015	
167	529	70	...	533	99	...	536	128	...	541	153	...	September.	7	545	182	...
168	530	66	...	534	93	+ '017	538	120	...	542	144	...		8	546	171	...
169	531	61	...	535	87	...	539	112	...	542	134	...		9	547	160	...
170	531	57	...	535	80	...	539	104	...	543	125	...		10	547	149	...
171	531	52	...	536	74	...	540	96	+ '008	543	115	...		11	547	137	...
172	531	48	...	536	68	...	540	88	...	543	106	...		12	547	126	...
173	531	44	...	536	62	...	540	80	...	543	96	...	13	547	115	+ '014	
174	531	39	...	535	56	...	539	72	...	543	87	...	14	547	108	...	
175	531	35	...	535	49	...	539	64	...	542	77	...	15	547	92	...	
176	531	30	...	535	43	...	539	56	...	542	68	...	16	546	81	...	
177	530	26	...	534	37	...	538	48	...	541	58	...	September.	17	545	69	...
178	529	22	...	533	31	...	537	40	...	540	49	...		18	544	58	...
179	528	17	...	532	25	...	536	32	...	539	39	...		19	543	47	...
180	527	13	...	531	18	...	535	24	...	538	30	...		20	543	36	+ '013
181	525	8	...	529	12	...	533	16	+ '007	536	20	...		21	541	24	...
182	524	4	+ '017	528	8	...	532	8	...	535	11	...		22	540	18	...
183	522	0	...	526	0	...	530	0	...	534	0	+ '001	23	538	0	...	
184	521	- 4	...	525	- 6	...	529	- 8	...	533	- 10	...	24	537	- 12	...	
185	519	9	...	523	13	...	527	17	...	531	20	...	25	535	23	...	
186	517	13	...	521	19	...	525	25	...	529	30	...	26	533	35	...	

TABLE III.—Sunrise from 13° to 17° N. latitude—cont.

Day of solar year.	Lat. 13°			Lat. 14°			Lat. 15°			Lat. 16°			Lat. 17°				
	Long. + 1072" = + '012 of day.			Long. + 1008" = + '012 of day.			Long. + 168" = + '002 of day.			Long. + 300" = + '003 of day.			Long. + 648" = + '008 of day.				
Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Madras.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Mellore.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Vizianagaram.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Belgaum.	Eng. date.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Hyderabad.		
A.D. 1000— 1400			A.D. 1000— 1400			A.D. 1000— 1400			A.D. 1000— 1400			A.D. 1000— 1400					
187	+515	-18	+ '017	+519	-26	+ '017	+523	-33	+ '007	+527	-40	+ '001	Rep. 27 28 29 30 1 2 3 4 5 6	+531	-47	+ '012	
188	518	22	...	517	32	...	521	41	...	525	49	...		28	529	58	...
189	510	27	...	514	38	...	518	50	+ '006	522	59	...		29	526	70	...
190	507	31	...	511	45	...	515	58	...	519	69	000		30	523	82	...
191	504	36	...	508	51	+ '016	512	66	...	516	79	...		1	520	94	...
192	501	40	...	505	58	...	509	75	...	518	89	...		2	517	105	...
193	498	45	...	502	64	...	506	83	...	510	99	...	3	514	117	+ '011	
194	495	49	...	499	70	...	503	91	...	507	109	...	4	511	129	...	
195	492	54	...	496	77	...	500	99	+ '005	504	119	- '001	5	508	140	...	
196	488	58	...	492	85	+ '015	496	108	...	500	129	...	6	504	1 52	+ '009	
197	484	63	...	488	90	...	492	116	...	496	139	...	October 7 8 9 10 11 12 13 14 15 16	500	164	...	
198	480	67	+ '016	484	96	...	488	124	...	492	148	...		8	496	175	...
199	476	72	...	480	102	...	484	133	...	488	158	...		9	492	187	...
200	472	76	...	476	109	...	479	141	...	483	168	...		10	487	199	...
201	468	81	...	472	115	...	475	149	...	479	178	...		11	483	211	...
202	464	85	...	468	122	...	471	158	...	475	188	- '002		12	479	222	...
203	460	90	...	463	128	...	466	166	...	470	198	...	November 13 14 15 16	474	234	+ '008	
204	454	94	...	458	134	+ '014	461	174	...	465	208	...		14	469	246	...
205	450	99	...	454	141	...	456	183	...	460	218	...		15	464	257	...
206	445	103	+ '015	449	147	...	451	191	+ '008	455	228	...		16	459	269	...
207	441	108	...	445	154	...	447	199	...	451	238	...		17	455	281	...
208	436	112	...	440	160	+ '013	442	207	...	446	247	...		18	450	292	...
209	430	117	...	434	166	...	436	216	+ '002	440	257	- '003	19	444	304	+ '007	
210	425	121	+ '014	429	173	...	431	224	...	433	267	...	20	439	316	...	
211	417	126	...	423	179	+ '012	425	232	...	429	277	...	21	433	328	...	
212	411	130	...	417	186	...	419	241	...	423	287	- '005	22	427	339	+ '006	
213	408	136	...	411	192	...	413	248	...	417	296	...	23	421	350	...	
214	402	141	...	405	197	...	407	255	...	411	305	...	24	415	361	...	
215	415	171	+ '013	418	229	...	420	289	...	423	339	- '006	25	425	398	+ '005	
216	408	188	...	411	248	+ '011	413	309	+ '001	416	361	...	26	418	422	...	
217	401	205	...	404	267	...	406	329	...	409	383	...	27	411	445	...	
218	394	222	+ '012	397	285	...	399	349	...	402	404	- '007	28	404	468	+ '004	
219	387	240	...	390	304	+ '010	392	370	000	395	426	...	29	397	491	...	
220	380	257	...	383	323	...	385	390	...	388	448	...	30	390	514	...	
221	373	274	...	376	342	...	378	410	...	381	470	...	31	383	538	+ '003	
222	366	292	+ '011	369	360	+ '009	371	431	...	374	491	...	1	376	561	...	
223	359	309	...	362	379	...	364	451	- '002	367	513	...	2	369	584	...	
224	352	326	...	354	398	...	356	471	...	359	535	- '008	3	361	607	+ '002	
225	345	344	+ '010	346	416	...	348	492	...	351	556	...	4	353	630	...	
226	338	361	...	338	435	...	340	512	...	343	578	...	5	345	654	+ '001	
227	330	378	+ '009	330	454	...	332	532	...	335	600	- '010	6	337	677	...	
228	323	395	...	322	472	+ '007	324	552	- '003	327	621	...	7	329	700	...	
229	315	413	...	314	491	...	316	573	...	319	643	...	8	321	723	000	
230	307	430	...	306	510	...	307	593	...	310	665	...	9	312	746	...	
231	299	447	...	298	529	...	299	613	- '005	302	687	...	10	304	770	- '001	
232	291	465	...	290	547	...	291	634	...	294	708	- '011	11	296	793	...	
233	283	482	+ '008	282	566	+ '006	283	654	...	286	730	...	12	288	816	...	
234	274	499	...	278	585	...	274	674	...	277	752	- '012	13	279	839	- '002	
235	266	517	+ '007	265	603	...	265	695	...	268	773	...	14	270	862	...	
236	258	534	...	257	622	+ '005	256	715	- '006	259	795	...	15	261	886	- '003	
237	250	551	...	249	641	...	247	735	...	250	817	- '018	16	252	909	...	
238	241	568	+ '006	240	659	+ '004	238	755	- '007	241	838	...	17	243	932	...	
239	232	586	...	231	678	...	229	776	...	232	860	- '014	18	234	955	- '004	
240	224	603	...	223	699	...	220	796	...	223	882	...	19	225	978	...	
241	215	620	+ '005	214	716	+ '003	211	816	- '008	213	904	...	20	215	1002	- '005	
242	206	638	...	205	734	...	202	837	...	204	925	- '015	21	206	1025	...	
243	200	656	+ '004	200	752	+ '002	201	856	- '009	201	948	...	22	202	1048	...	
244	191	680	...	191	777	...	192	881	...	192	974	- '016	23	193	1075	- '006	
245	181	705	...	181	802	...	182	907	...	182	1000	...	24	183	1101	...	
246	171	729	+ '002	171	827	+ '001	172	932	- '010	172	1027	...	25	173	1128	- '007	

TABLE III.—SUNRISE AND INDIAN TERRESTRIAL LONGITUDES

TABLE III.—Sunrise from 13° to 17° N. latitude—cont.																	
Day of solar year.	Lat. 13°			Lat. 14°			Lat. 15°			Lat. 16°			Lat. 17°				
	Long. +1072" = + 012 of day.			Long. +1008" = + 012 of day.			Long. +168" = + 002 of day.			Long. +300" = + 008 of day			Long. +648" = + 008 of day.				
	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day Madras.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Mellore.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Visianagaram	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Belgaum.	Eng. date.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day Hyderabad.	
	A.D. 1000— 1400			A.D. 1000— 1400			A.D. 1000— 1400			A.D. 1000— 1400				A.D. 1000— 1400			
247	+161	-754	+ 003	+161	-852	+ 001	+162	-858	- 010	+162	-1053	- 017	November	+163	-1155	- 007	
248	151	778	...	151	877	000	152	983	- 011	152	1079	.		27	153	1181	- 008
249	141	802	+ 002	141	902	...	142	1009	...	142	1105	- 018		28	143	1208	...
250	131	827	...	131	927	...	132	1034	...	132	1131	...		29	133	1235	...
251	121	851	+ 001	121	952	- 001	122	1060	- 012	122	1158	- 019		30	123	1262	- 009
252	111	876	...	111	977	...	112	1085	...	112	1184	...		1	113	1288	...
253	101	900	...	101	1002	- 002	102	1111	- 013	102	1210	...		2	103	1315	- 011
254	91	924	000	91	1027	...	92	1136	...	92	1236	- 021	3	93	1342	...	
255	81	949	...	81	1052	...	82	1162	...	82	1262	...	4	83	1368	...	
256	71	973	...	71	1077	.	72	1187	- 014	72	1289	...	5	73	1395	- 012	
257	61	998	- 002	61	1102	- 004	62	1213	...	62	1315	...	6	63	1422	...	
258	51	1022	...	51	1127	...	52	1238	...	52	1341	- 022	7	53	1448	...	
259	41	1046	...	41	1152	...	42	1264	...	42	1367	...	8	43	1475	...	
260	31	1071	...	31	1177	...	32	1289	...	32	1393	...	9	33	1502	...	
261	21	1095	- 003	21	1202	- 005	22	1315	- 016	22	1420	...	10	23	1529	- 013	
262	11	1120	...	11	1227	...	12	1340	...	12	1444	- 024	11	13	1555	...	
263	2	1144	...	2	1252	...	2	1366	...	2	1472	...	12	2	1582	...	
264	-10	1168	...	-10	1277	...	-10	1391	...	-10	1498	...	13	-10	1609	...	
265	20	1193	- 005	20	1302	- 006	20	1417	- 017	20	1524	...	14	20	1635	- 015	
266	29	1217	...	29	1327	...	30	1442	...	30	1551	...	15	31	1662	...	
267	38	1242	...	38	1352	...	39	1468	...	39	1577	- 025	December	40	1689	...	
268	48	1266	...	48	1377	...	49	1493	...	49	1603	...		17	50	1715	...
269	58	1290	...	58	1402	...	59	1519	...	59	1629	...		18	60	1742	...
270	67	1315	...	67	1427	- 008	68	1544	- 019	68	1655	...		19	69	1769	...
271	78	1339	...	78	1452	...	79	1570	...	79	1682	...		20	80	1796	...
272	88	1364	...	88	1477	...	89	1595	...	89	1708	- 026		21	90	1822	...
273	98	1388	...	98	1502	...	99	1621	...	99	1734	...		22	100	1849	...
274	103	1412	- 007	103	1528	- 009	103	1648	- 020	103	1760	...	23	102	1876	...	
275	110	1423	...	110	1538	...	109	1658	...	110	1769	...	24	109	1884	- 017	
276	117	1434	...	117	1548	...	116	1667	...	117	1778	...	25	116	1893	...	
277	124	1444	...	124	1558	...	122	1677	...	124	1787	- 027	26	123	1901	...	
278	131	1455	...	131	1568	...	129	1686	...	131	1796	...	27	130	1910	...	
279	138	1466	- 008	139	1578	- 010	135	1696	...	138	1804	...	28	137	1918	...	
280	145	1477	...	146	1589	...	142	1706	- 021	145	1813	...	29	144	1926	...	
281	152	1488	...	153	1599	...	148	1715	...	152	1822	...	30	151	1935	- 018	
282	159	1498	...	160	1609	...	155	1725	...	159	1831	- 028	31	158	1943	...	
283	166	1509	...	167	1619	...	161	1734	...	166	1840	...	1	165	1952	...	
284	173	1520	- 009	175	1629	- 011	168	1744	...	173	1849	...	2	172	1960	...	
285	180	1531	...	182	1639	...	174	1754	...	180	1858	...	3	179	1968	...	
286	187	1542	...	189	1649	...	181	1763	...	187	1867	...	4	186	1979	...	
287	194	1552	...	196	1659	...	187	1773	...	194	1876	...	5	193	1985	...	
288	201	1563	...	203	1669	...	194	1782	...	201	1885	...	6	200	1994	- 019	
289	208	1574	...	211	1679	...	200	1792	...	208	1893	...	7	207	2002	...	
290	215	1585	...	218	1690	...	207	1802	- 022	215	1902	...	8	214	2010	...	
291	222	1596	...	225	1700	...	213	1811	...	222	1911	...	9	221	2019	...	
292	229	1606	...	232	1710	- 012	220	1821	...	229	1920	...	10	228	2027	...	
293	236	1617	...	239	1720	...	227	1830	...	236	1929	- 029	11	235	2036	- 020	
294	243	1628	- 010	247	1730	...	235	1840	...	243	1938	...	12	242	2044	...	
295	250	1639	...	254	1740	...	242	1850	...	249	1947	...	13	248	2052	...	
296	257	1650	...	261	1750	...	249	1859	- 023	256	1956	...	January	255	2061	...	
297	264	1660	...	268	1760	...	257	1869	...	262	1965	...		15	261	2069	...
298	271	1671	...	275	1770	...	264	1878	...	269	1974	- 028		16	268	2078	- 019
299	278	1682	...	283	1780	...	272	1888	...	276	1982	...		17	274	2086	...
300	285	1693	...	290	1791	...	279	1898	...	282	1991	...		18	280	2094	...
301	292	1704	- 009	297	1801	...	287	1907	...	289	2000	...		19	286	2103	...
302	299	1714	...	304	1811	...	294	1917	...	295	2009	...		20	293	2111	...
303	307	1725	...	311	1821	...	302	1926	- 021	302	2018	...	21	300	2120	- 018	
304	315	1736	...	319	1832	...	310	1936	...	308	2028	...	22	306	2128	...	
305	318	1718	...	322	1813	...	313	1915	...	311	2006	...	23	309	2104	...	

TABLE III.—Sunrise from 13° to 17° N. latitude—cont.

Day of solar year.	Lat. 13°		Long. + 1072 " = + '012 of day.	Lat. 14°		Long. + 1008 " = + '012 of day.	Lat. 15°		Long. + 188 " = + '002 of day.	Lat. 16°		Long. - 300 " = - '003 of day.	Lat. 17°		Long. + 648 " = + '008 of day.	
	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn as fraction of a day. Madras.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn as fraction of a day. Nellore.	Eqn. of time in seconds.	☉'s trop long in seconds.	Total correctn. as fraction of a day. Vizianagaram.	Eqn of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Belgaum.	Eng. date.	Eqn. of time in seconds.	☉'s trop long in seconds.	Total correctn as fraction of a day. Hyderabad.
			A.D. 1000— 1400			A.D. 1000— 1400			A.D. 1000— 1400			A.D. 1000— 1400				A.D. 1000— 1400
306	-321	-1700	- '009	-325	-1793	- '010	-316	-1894	- '021	-314	-1983	- '027	24	-312	-2081	- '018
307	324	1682	...	328	1774	...	319	1874	...	317	1961	...	25	315	2057	- '017
308	327	1684	- '008	331	1765	...	322	1853	...	320	1939	...	26	318	2033	...
309	330	1645	...	334	1735	...	325	1832	...	323	1916	...	27	321	2009	...
310	333	1627	...	337	1716	...	328	1811	...	326	1894	...	28	324	1986	...
311	336	1609	...	340	1697	- '009	331	1790	...	329	1872	...	29	327	1962	...
312	339	1591	...	343	1678	...	334	1770	...	332	1850	...	30	330	1938	- '016
313	342	1573	...	346	1658	...	337	1749	- '019	334	1827	- '026	31	333	1915	...
314	345	1555	...	349	1639	...	340	1728	...	337	1805	...	1	336	1891	...
315	348	1537	...	352	1620	...	343	1707	...	340	1783	...	2	339	1867	...
316	351	1519	...	355	1600	...	346	1686	...	343	1760	- '025	3	342	1844	- '015
317	354	1501	- '007	358	1581	...	349	1666	...	346	1738	...	4	345	1820	...
318	357	1483	...	361	1562	- '008	352	1645	...	349	1716	- '024	5	348	1796	...
319	360	1464	...	364	1542	...	355	1624	- '018	352	1693	...	6	351	1772	...
320	363	1446	- '006	367	1523	- '007	358	1603	...	355	1671	- '028	7	354	1749	- '014
321	366	1428	...	370	1504	...	361	1582	...	358	1649	...	8	357	1725	...
322	369	1410	...	373	1485	...	364	1562	...	361	1627	...	9	360	1701	...
323	372	1392	...	376	1465	...	367	1541	- '017	364	1604	...	10	363	1678	...
324	375	1374	- '004	380	1446	...	370	1520	...	367	1582	...	11	367	1654	- '013
325	378	1356	...	383	1427	...	373	1499	- '016	370	1560	...	12	370	1630	...
326	381	1338	...	386	1407	...	376	1478	...	373	1537	...	13	374	1607	- '012
327	384	1320	...	389	1388	- '005	379	1458	...	376	1515	- '022	14	377	1583	...
328	387	1302	...	392	1369	...	382	1437	...	379	1493	...	15	380	1559	- '011
329	390	1283	...	395	1349	...	385	1416	...	382	1470	- '021	16	383	1536	...
330	393	1265	...	398	1330	...	388	1395	- '015	385	1448	...	17	386	1512	- '010
331	396	1247	- '003	401	1311	...	391	1374	...	388	1426	- '020	18	389	1488	...
332	400	1229	...	404	1292	- '004	394	1354	- '014	391	1404	...	19	392	1464	- '009
333	404	1211	- '002	406	1272	...	398	1333	...	395	1381	- '019	20	395	1441	...
334	408	1193	- '001	408	1253	- '003	402	1312	- '013	399	1359	...	21	397	1417	- '008
335	413	1176	...	410	1232	...	406	1292	...	402	1336	- '018	22	399	1392	...
336	413	1137	...	411	1191	- '002	407	1249	- '012	403	1291	...	23	400	1348	- '007
337	414	1098	+ '000	411	1150	...	407	1206	...	403	1247	- '017	24	400	1299	...
338	414	1058	...	412	1109	...	408	1163	- '011	404	1202	...	25	401	1258	...
339	415	1019	+ '001	412	1068	- '001	408	1120	...	404	1158	- '016	26	401	1200	- '006
340	415	980	...	413	1027	...	409	1077	- '010	405	1113	...	27	402	1160	...
341	416	941	+ '002	413	986	+ '000	409	1034	...	405	1069	- '015	28	402	1114	- '005
342	416	902	...	414	945	...	410	991	- '009	406	1024	...	1	403	1067	...
343	417	862	...	414	904	+ '001	410	948	...	406	980	- '014	2	403	1021	- '004
344	417	823	...	415	863	...	411	905	- '008	407	935	...	3	404	974	...
345	418	784	...	416	822	+ '002	411	862	...	407	891	- '013	4	404	928	- '002
346	418	745	+ '004	416	781	...	412	819	- '006	408	846	...	5	405	882	...
347	419	706	...	417	740	+ '003	412	776	...	408	802	- '012	6	405	835	- '001
348	419	666	+ '005	417	699	...	413	733	- '005	409	757	...	7	406	789	...
349	420	627	...	418	658	...	413	690	...	409	713	- '011	8	406	742	000
350	420	588	...	418	617	+ '004	414	647	...	410	668	...	9	407	696	...
351	421	549	...	419	576	...	414	604	...	410	624	- '010	10	407	650	+ '001
352	421	510	...	419	535	+ '005	415	561	- '004	411	579	...	11	408	603	...
353	422	470	+ '006	420	494	...	416	518	...	411	535	- '009	12	408	557	+ '002
354	422	431	...	420	453	+ '006	416	475	- '003	412	490	...	13	409	510	...
355	423	392	+ '007	421	412	...	417	432	...	413	446	- '008	14	409	464	...
356	423	353	...	422	371	+ '007	418	389	- '002	413	401	...	15	410	418	+ '004
357	424	314	+ '008	422	330	...	418	346	...	414	357	- '007	16	410	371	...
358	424	274	...	423	289	+ '008	419	303	- '001	414	312	...	17	411	325	+ '005
359	425	236	+ '009	424	248	...	419	260	...	415	268	- '006	18	412	278	...
360	426	196	...	424	207	+ '009	420	217	+ '000	416	223	...	19	413	232	+ '006
361	427	157	+ '010	425	166	...	421	174	...	417	179	- '005	20	414	186	...
362	428	118	...	426	125	+ '010	422	131	+ '001	418	134	...	21	415	139	+ '007
363	429	79	...	427	84	...	423	88	...	419	89	- '004	22	416	92	...
364	430	40	+ '011	428	41	+ '011	424	43	...	420	49	...	23	417	46	+ '008
365	432	0	...	429	0	...	425	0	+ '002	421	10	- '003	24	418	00	...

TABLE III.—Sunrise from 18° to 22° N. latitude—cont.

Day of solar year.	Lat. 18°			Lat. 19°			Lat. 20°			Lat. 21°			Lat. 22°			
	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. = - 428'' = - '005 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. = - 460'' = - '005 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. = - 476'' = - '0055 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. = + 800'' = + '009 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. = - 616'' = - '007 of day.	
			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.	
1	-409	+48	- '004	-406	+50	- '003	-401	+52	- '003	-397	+54	+ '011	25	-393	+56	- '005
2	407	98	- '003	404	100	..	399	104	..	395	107	+ '012	26	391	111	- '004
3	405	144	..	401	150	- '002	398	156	- '002	393	161	..	27	389	167	- '003
4	404	193	- '002	400	200	..	396	208	- '001	392	215	+ '013	28	388	223	..
5	402	241	- '001	398	250	- '001	394	259	..	390	269	+ '014	29	386	278	- '002
6	400	289	..	396	300	- '000	392	311	.. 000	388	323	..	30	384	334	- '001
7	398	338	'000	394	350	..	390	363	..	386	377	+ '015	31	382	390	..
8	396	386	..	392	400	+ '001	388	425	..	384	431	+ '016	1	380	445	'000
9	393	434	+ '001	390	450	..	386	477	+ '001	382	485	..	2	378	501	+ '001
10	391	483	..	387	500	+ '002	383	529	+ '002	379	539	+ '017	3	375	557	+ '002
11	388	531	+ '002	385	550	..	381	580	..	377	592	..	4	373	612	..
12	386	579	+ '003	382	600	+ '008	378	632	+ '003	374	646	+ '018	5	371	668	+ '003
13	383	627	..	380	650	+ '004	376	684	+ '004	372	700	+ '019	6	368	724	+ '004
14	380	676	+ '004	377	700	..	373	736	..	369	754	..	7	365	779	..
15	377	724	..	374	750	+ '005	370	788	+ '005	366	808	+ '020	8	362	835	+ '005
16	374	772	+ '005	371	800	..	367	840	+ '006	363	862	+ '021	9	359	861	..
17	371	821	..	367	850	..	364	892	..	360	916	..	10	356	946	+ '006
18	367	869	+ '006	364	900	+ '006	361	944	+ '007	357	970	+ '022	11	353	1002	+ '007
19	364	917	..	361	950	+ '007	357	996	..	353	1024	..	12	350	1058	+ '008
20	360	966	+ '007	357	1000	+ '008	354	1048	+ '008	350	1078	+ '023	13	346	1114	..
21	357	1014	..	354	1050	..	350	1099	+ '009	346	1131	+ '024	14	343	1169	..
22	353	1062	+ '008	350	1100	..	346	1152	..	343	1185	..	15	339	1225	+ '009
23	349	1110	..	346	1150	+ '009	342	1204	+ '010	339	1239	+ '025	16	335	1281	..
24	346	1159	+ '009	342	1200	..	339	1256	..	335	1298	..	17	332	1336	..
25	341	1207	..	338	1250	+ '010	335	1307	..	331	1347	..	18	328	1392	+ '010
26	337	1255	..	334	1300	..	331	1359	..	327	1401	+ '026	19	324	1448	..
27	333	1304	+ '010	330	1350	..	327	1411	..	323	1455	..	20	320	1503	+ '011
28	329	1352	..	326	1400	+ '011	323	1463	+ '011	319	1509	..	21	316	1559	..
29	324	1400	+ '011	322	1450	..	318	1515	..	315	1563	..	22	312	1615	..
30	357	1448	..	354	1500	..	352	1556	..	349	1616	+ '027	23	346	1672	+ '012
31	352	1473	..	349	1527	+ '012	347	1584	+ '012	344	1648	..	24	342	1703	..
32	346	1498	..	344	1553	..	342	1612	..	339	1675	+ '028	25	336	1734	..
33	341	1524	+ '012	339	1580	..	336	1640	..	334	1705	..	26	331	1768	+ '013
34	336	1549	..	333	1607	..	331	1668	+ '013	328	1735	..	27	326	1797	..
35	330	1574	..	328	1634	+ '013	325	1696	..	323	1764	+ '029	28	320	1828	..
36	324	1599	+ '013	322	1660	..	320	1725	..	317	1794	..	29	315	1859	+ '014
37	319	1624	..	316	1687	..	314	1758	+ '014	312	1824	..	30	309	1890	..
38	313	1650	..	311	1714	+ '014	309	1781	..	306	1854	+ '030	1	304	1922	+ '015
39	307	1675	+ '014	305	1740	..	303	1809	..	300	1883	..	2	298	1953	..
40	301	1700	..	299	1767	+ '015	296	1837	+ '015	294	1918	+ '031	3	292	1984	+ '016
41	295	1725	..	293	1794	..	291	1865	+ '016	288	1943	..	4	286	2015	..
42	288	1750	+ '015	286	1820	..	284	1893	..	282	1972	+ '032	5	280	2046	+ '017
43	282	1776	..	280	1847	+ '016	278	1921	..	276	2002	..	6	274	2078	..
44	276	1801	..	274	1874	..	272	1949	+ '017	270	2032	+ '033	7	268	2109	..
45	270	1826	..	267	1900	..	265	1977	..	263	2061	..	8	261	2140	+ '018
46	263	1851	+ '016	261	1927	+ '017	259	2006	+ '018	257	2091	..	9	255	2171	..
47	256	1876	+ '017	254	1954	..	252	2034	..	250	2121	+ '034	10	248	2202	+ '019
48	249	1902	..	247	1981	..	246	2062	..	244	2151	..	11	242	2234	..
49	243	1927	..	241	2007	+ '018	239	2090	+ '019	237	2180	..	12	238	2265	+ '020
50	236	1952	..	234	2034	..	232	2118	..	230	2210	+ '035	13	229	2296	..
51	229	1977	..	227	2061	..	226	2146	..	224	2240	..	14	222	2327	..
52	222	2002	..	220	2087	..	219	2174	..	217	2269	..	15	216	2358	+ '021
53	214	2028	+ '018	213	2114	..	211	2202	+ '020	210	2299	..	16	208	2390	..
54	207	2053	..	206	2141	+ '019	204	2230	..	203	2329	..	17	201	2421	..
55	200	2078	..	199	2167	..	197	2258	..	196	2358	..	18	194	2452	..
56	193	2103	..	192	2194	..	190	2287	..	189	2388	..	19	187	2483	..
57	185	2128	..	184	2221	..	183	2315	..	181	2418	..	20	180	2514	..
58	178	2154	..	177	2248	..	175	2343	..	174	2448	..	21	173	2546	..
59	170	2179	..	169	2274	..	168	2371	..	167	2477	..	22	165	2577	..
60	163	2204	..	162	2301	..	161	2399	..	159	2507	..	23	158	2608	..
61	180	2228	..	179	2328	..	179	2428	..	178	2536	..	24	178	2640	..
62	171	2250	..	171	2351	..	170	2452	..	170	2530	..	25	169	2635	..

TABLE III.—Sunrise from 18° to 22° N. latitude—cont.

Day of solar year.	Lat. 18°		Long. = - 428" = - '005 of day.	Lat. 19°		Long. = - 460" = - '005 of day.	Lat. 20°		Long. = - 476" = - '0055 of day.	Lat. 21°		Long. = + 800" = + '009 of day.	Lat. 22°		Long. = - 816" = - '007 of day.		
	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Satara.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Poona.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Nasik.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Nagpur.	Eng. date.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Baroda.	
	A.D. 1000 - 1400.			A.D. 1000 - 1400.			A.D. 1000 - 1400.			A.D. 1000 - 1400.				A.D. 1000 - 1400.			
63	-162	+2313	+ '018	-162	+2384	+ '019	-163	+2415	+ '020	-161	+2524	+ '035	May.	26	-161	+2680	+ '021
64	153	2206	...	153	2306	...	153	2409	...	152	2518	...		27	152	2624	...
65	145	2198	...	144	2300	...	144	2402	...	144	2512	...		28	143	2619	...
66	135	2190	...	135	2292	...	135	2396	...	135	2500	...		29	134	2614	...
67	126	2182	...	126	2285	...	126	2390	...	126	2501	...		30	125	2609	...
68	117	2175	...	117	2278	...	117	2383	...	117	2495	...		31	116	2604	...
69	108	2167	...	108	2271	...	107	2377	...	107	2489	...		1	107	2598	...
70	99	2160	...	99	2264	...	98	2370	...	98	2483	...		2	98	2593	...
71	90	2152	...	89	2257	...	89	2364	...	89	2477	+ '036	3	89	2588	...	
72	80	2144	...	80	2250	...	80	2358	...	80	2471	...	4	79	2583	...	
73	71	2137	...	71	2243	...	71	2351	...	70	2465	...	5	70	2578	...	
74	62	2129	...	61	2236	...	61	2345	...	61	2459	...	6	61	2573	...	
75	53	2122	...	53	2227	...	53	2338	...	53	2453	...	7	53	2567	...	
76	43	2114	...	42	2221	...	42	2332	...	42	2447	...	8	43	2562	...	
77	33	2106	...	33	2214	...	33	2326	...	33	2442	...	9	33	2557	...	
78	24	2099	...	24	2207	...	24	2319	...	24	2436	...	10	24	2552	...	
79	15	2091	...	15	2200	...	15	2313	...	15	2430	...	11	15	2546	...	
80	5	2084	...	5	2193	...	5	2306	+ '021	5	2424	...	12	5	2541	+ '022	
81	+4	2078	...	+4	2186	...	+4	2300	...	+4	2418	...	13	+4	2536	...	
82	14	2068	...	13	2179	...	13	2294	...	13	2412	...	14	13	2531	...	
83	23	2061	+ '017	23	2172	...	23	2287	...	23	2406	...	June.	15	23	2526	...
84	33	2053	...	32	2165	+ '018	32	2281	+ '020	32	2400	...		16	32	2520	+ '021
85	43	2046	...	42	2158	...	42	2274	...	42	2394	...		17	42	2515	...
86	51	2038	...	51	2150	...	51	2268	...	51	2388	+ '025		18	51	2510	...
87	60	2030	...	60	2143	+ '017	60	2262	+ '019	60	2383	...		19	60	2505	...
88	70	2023	+ '016	70	2136	...	70	2255	...	69	2377	...		20	69	2500	+ '020
89	79	2015	...	79	2129	...	79	2249	...	79	2371	+ '024		21	79	2494	...
90	88	2008	...	88	2122	+ '016	88	2242	+ '018	88	2365	...		22	88	2489	+ '019
91	106	2000	...	106	2116	...	106	2236	...	107	2380	...	23	107	2484	...	
92	116	1972	...	116	2088	...	117	2207	+ '017	117	2381	...	24	117	2454	...	
93	126	1945	+ '015	126	2060	...	126	2179	...	127	2302	...	25	127	2424	...	
94	136	1917	...	136	2038	...	136	2150	...	137	2272	...	26	137	2395	...	
95	146	1890	...	146	2004	...	146	2122	...	146	2243	+ '023	27	147	2365	...	
96	155	1862	...	156	1976	...	156	2098	...	156	2214	...	28	157	2335	+ '018	
97	165	1835	...	166	1948	...	166	2064	...	166	2185	...	29	167	2305	...	
98	175	1807	...	175	1920	...	176	2036	...	176	2153	...	30	177	2275	...	
99	185	1780	+ '014	185	1892	...	186	2007	...	186	2126	...	1	187	2246	...	
100	194	1752	...	194	1864	...	195	1979	+ '016	195	2097	+ '022	2	196	2216	...	
101	203	1725	...	204	1836	+ '015	204	1950	...	205	2068	...	3	205	2186	...	
102	213	1697	...	203	1808	...	214	1921	...	214	2039	...	4	215	2156	+ '017	
103	222	1670	...	223	1780	...	223	1893	+ '015	224	2010	+ '031	5	224	2126	...	
104	232	1642	...	232	1752	...	233	1864	...	233	1980	...	6	234	2097	...	
105	241	1615	+ '018	242	1724	...	242	1836	...	243	1951	+ '030	7	243	2067	...	
106	250	1587	...	251	1696	...	251	1807	...	252	1922	...	8	253	2037	+ '016	
107	259	1560	...	260	1668	+ '014	260	1778	...	261	1893	...	9	261	2007	...	
108	268	1532	+ '012	269	1640	...	269	1750	...	270	1864	...	10	271	1977	...	
109	277	1505	...	278	1620	...	278	1721	...	279	1834	...	11	280	1948	+ '015	
110	286	1477	...	287	1584	+ '018	287	1693	...	288	1805	...	12	289	1918	...	
111	294	1450	...	295	1556	...	296	1664	+ '014	296	1776	...	13	297	1888	...	
112	303	1422	...	304	1528	...	305	1635	...	305	1747	...	14	306	1858	...	
113	312	1395	...	312	1500	...	318	1607	...	314	1718	+ '029	15	315	1828	+ '014	
114	321	1367	...	321	1472	...	322	1578	...	323	1688	...	16	324	1799	...	
115	329	1340	+ '011	329	1444	+ '012	330	1550	...	331	1659	...	17	332	1769	...	
116	337	1312	...	338	1416	...	339	1521	+ '013	339	1630	+ '028	18	340	1739	+ '018	
117	345	1285	...	346	1388	...	346	1492	...	347	1601	...	19	348	1709	...	
118	353	1257	...	354	1360	...	354	1464	+ '012	356	1572	...	20	357	1679	...	
119	361	1230	...	362	1332	...	362	1435	...	363	1542	...	21	364	1650	...	
120	369	1202	+ '010	369	1304	+ '011	370	1407	...	371	1518	...	22	372	1620	...	
121	371	1175	...	378	1276	...	375	1378	...	377	1484	+ '027	23	379	1590	...	
122	379	1148	...	381	1248	...	383	1348	...	385	1456	...	24	387	1560	+ '012	
123	386	1123	...	388	1222	...	390	1320	+ '011	393	1427	+ '026	25	395	1529	...	
124	394	1099	...	396	1195	...	398	1293	...	401	1397	...	26	408	1498	...	
125	400	1073	+ '009	408	1169	+ '010	405	1265	+ '010	407	1368	...	27	410	1467	+ '011	

TABLE III.—Sunrise from 18° to 22° N. latitude—cont.

Day of solar year.	Lat. 18°			Lat. 19°			Lat. 20°			Lat. 21°			Lat. 22°		
	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. - 428" = - 005 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. - 430" = - 005 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. - 476" = - 0055 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. + 800" = + 009 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. - 816" = - 007 of day.
	A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.		
126	408	+1049	+ 009	+410 +1143	...	+ 010	+412 +1237	...	+ 010	+415 +1339	...	+ 025	28	+417 +1436	+ 011
127	415	1024	...	417 1116	...	...	419 1209	...	+ 009	422 1309	...	...	29	424 1405	+ 010
128	421	1000	...	424 1090	+ 009	...	426 1182	...	...	429 1280	...	...	30	431 1375	...
129	428	975	...	430 1064	...	...	433 1154	...	...	435 1251	...	...	31	438 1344	...
130	435	950	+ 008	437 1038	...	...	440 1126	...	...	442 1222	...	...	1	445 1313	...
131	441	926	...	443 1011	...	...	446 1099	+ 008	...	447 1192	...	...	2	451 1282	...
132	447	901	...	450 985	...	...	452 1071	...	...	455 1162	+ 024	...	3	457 1251	+ 009
133	453	876	...	456 959	+ 008	...	459 1043	...	...	461 1134	...	...	4	464 1220	...
134	459	852	...	462 932	...	...	464 1016	...	...	467 1104	...	...	5	470 1189	...
135	465	827	...	468 906	...	...	470 988	...	...	478 1075	...	...	6	476 1158	...
136	471	802	+ 007	474 880	...	...	476 960	...	...	479 1048	...	...	7	482 1127	+ 008
137	476	777	...	479 853	...	...	482 932	...	...	485 1016	+ 023	...	8	487 1086	...
138	482	753	...	485 827	+ 007	...	487 905	...	...	490 987	...	...	9	493 1066	...
139	487	728	+ 006	490 801	...	...	493 877	+ 007	...	496 958	...	...	10	499 1035	+ 007
140	492	703	...	495 775	...	...	498 849	...	...	501 929	+ 022	...	11	504 1004	...
141	497	679	...	500 748	+ 006	...	503 822	...	...	506 899	...	...	12	509 973	+ 006
142	502	654	...	505 722	...	...	508 794	+ 006	...	511 870	...	...	13	514 942	...
143	507	629	+ 005	510 696	...	...	513 766	...	...	516 841	+ 021	...	14	519 911	...
144	511	605	...	514 669	...	...	517 739	...	...	520 811	...	...	15	523 880	...
145	516	580	...	519 643	...	...	522 711	...	...	525 782	...	...	16	528 849	...
146	520	555	...	523 617	...	...	526 688	...	...	529 753	...	...	17	532 818	...
147	524	530	...	527 590	...	...	530 655	...	...	534 723	...	...	18	536 787	...
148	529	506	...	532 564	...	...	535 629	...	...	538 694	...	...	19	540 757	+ 005
149	532	481	...	536 538	...	...	539 600	...	...	542 665	...	...	20	544 726	...
150	536	456	...	539 512	+ 005	...	542 572	+ 005	...	545 636	+ 020	...	21	548 695	...
151	539	432	...	542 485	...	...	545 545	...	...	548 608	...	...	22	552 664	...
152	543	408	...	546 459	...	...	549 519	...	...	551 576	...	...	23	556 632	+ 004
153	547	383	...	549 432	...	...	552 492	...	...	554 549	...	...	24	560 601	...
154	550	358	+ 004	552 406	...	...	555 465	...	...	557 523	...	...	25	564 571	...
155	553	333	...	555 380	...	...	558 439	...	...	560 496	+ 019	...	26	568 540	...
156	556	308	...	558 354	+ 004	...	561 413	...	...	563 470	...	...	27	572 510	+ 003
157	560	283	...	561 328	...	...	564 387	...	...	566 444	...	...	28	576 480	...
158	563	258	...	564 302	...	...	567 361	...	...	569 418	...	...	29	580 450	...
159	566	233	...	567 276	...	...	570 335	...	...	572 395	...	...	30	584 420	...
160	569	208	+ 003	570 250	...	...	573 309	+ 003	...	575 369	...	...	31	588 390	+ 002
161	572	183	...	573 224	...	...	576 283	...	...	578 343	...	...	1	592 360	...
162	575	158	...	576 198	...	...	579 257	...	...	581 317	...	...	2	596 330	...
163	578	133	...	579 172	...	...	582 231	...	...	584 291	...	...	3	600 300	...
164	581	108	...	582 146	...	...	585 205	...	...	587 265	...	...	4	604 270	...
165	584	83	...	585 120	...	...	588 179	...	...	590 239	...	...	5	608 240	...
166	587	58	+ 002	588 94	...	...	591 153	...	...	593 213	+ 017	...	6	612 210	...
167	590	33	...	591 68	...	...	594 127	...	...	596 187	...	...	7	616 180	...
168	593	8	...	594 42	...	...	597 101	...	...	599 161	...	...	8	620 150	...
169	596	1	...	597 16	...	...	600 75	...	...	602 135	...	...	9	624 120	...
170	599	24	...	600 40	...	...	603 49	+ 002	...	605 109	...	...	10	628 90	...
171	602	49	...	603 14	...	...	606 23	...	...	608 83	...	...	11	632 60	...
172	605	74	...	606 38	...	...	609 47	...	...	611 103	...	...	12	636 30	...
173	608	99	+ 001	609 12	...	...	612 21	+ 001	...	614 31	...	...	13	640 0	...
174	611	124	...	612 36	...	...	615 45	...	...	617 61	...	...	14	644 30	...
175	614	149	...	615 60	...	...	618 69	...	...	620 85	+ 015	...	15	648 0	...
176	617	174	...	618 34	...	...	621 93	...	...	623 111	...	...	16	652 30	...
177	620	199	...	621 58	...	...	624 117	...	...	626 129	...	...	17	656 0	...
178	623	224	...	624 32	...	...	627 141	...	...	629 141	...	...	18	660 30	...
179	626	249	...	627 56	...	...	630 165	...	...	632 161	...	...	19	664 0	...
180	629	274	...	630 30	...	...	633 189	...	...	635 177	...	...	20	668 30	...
181	632	299	...	633 54	...	...	636 213	...	...	638 205	...	...	21	672 0	...
182	635	324	...	636 28	...	...	639 237	...	...	641 225	...	...	22	676 30	...
183	638	349	...	639 52	...	...	642 261	...	...	644 273	...	...	23	680 0	...
184	641	374	...	642 26	...	...	645 285	...	...	647 297	...	...	24	684 30	...
185	644	399	...	645 50	...	...	648 309	...	...	650 321	...	...	25	688 0	...
186	647	424	...	648 24	...	...	651 333	...	...	653 345	...	...	26	692 30	...
187	650	449	...	651 48	...	...	654 357	...	...	656 369	...	...	17	696 0	...
188	653	474	...	654 22	...	...	657 381	...	...	659 401	...	...	18	700 30	...
189	656	499	...	657 46	...	...	660 405	...	...	662 417	...	...	19	704 0	...
190	659	524	...	660 20	...	...	663 429	...	...	665 441	...	...	20	708 30	...
191	662	549	...	663 44	...	...	666 453	...	...	668 465	...	...	21	712 0	...
192	665	574	...	666 18	...	...	669 477	...	...	671 489	...	...	22	716 30	...
193	668	599	...	669 42	...	...	672 501	...	...	674 521	...	...	23	720 0	...
194	671	624	...	672 16	...	...	675 525	...	...	677 545	...	...	24	724 30	...
195	674	649	...	675 40	...	...	678 549	...	...	680 569	...	...	25	728 0	...
196	677	674	...	678 14	...	...	681 573	...	...	683 593	...	...	26	732 30	...
197	680	699	...	681 38	...	...	684 597	...	...	686 617	...	...	17	736 0	...
198	683	724	...	684 12	...	...	687 621	...	...	689 641	...	...	18	740 30	...
199	686	749	...	687 36	...	...	690 645	...	...	692 665	...	...	19	744 0	...
200	689	774	...	690 60	...	...	693 669	...	...	695 689	...	...	20	748 30	...
201	692	799	...	693 34	...	...	696 693	...	...	698 713	...	...	21	752 0	...
202	695	824	...	696 58	...	...	699 717	...	...	701 737	...	...	22	756 30	...
203	698	849	...	700 22	...	...	702 741	...	...	704 761	...	...	23	760 0	...
204	7011														

TABLE III.—Sunrise from 18° to 22° N. latitude—cont.

Day of solar year.	Lat. 18° = -428" = -005 of day.			Lat. 19° = -480" = -005 of day.			Lat. 20° = -476" = -0055 of day.			Lat. 21° = +800" = +009 of day.			Lat. 22° = -018" = -007 of day.			
	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Batare.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day Poona.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Masik.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Nagpur.	Eng. date.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day Baroda
	A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.				A.D. 1000— 1400.		
187	+535	-54	+000	+538	-61	-001	+541	-69	-001	+546	-77	+013	27	+550	-84	-004
188	533	68	...	536	76	...	539	86	-002	544	96	...	Sep. 28	548	105	...
189	530	82	-001	533	92	...	536	103	...	541	115	+012	29	545	127	...
190	527	95	...	530	107	-002	533	120	...	538	134	...	30	542	148	...
191	524	109	...	527	122	...	530	138	...	535	154	...	1	539	169	-005
192	521	122	-002	524	138	...	527	155	...	532	173	...	2	536	190	...
193	518	136	...	521	153	...	524	172	-003	529	192	+011	3	533	211	...
194	515	150	...	518	168	...	521	189	...	526	211	...	4	530	232	...
195	512	168	...	515	184	-003	518	206	...	523	230	...	5	527	253	-006
196	508	177	...	511	199	...	514	224	...	519	250	+010	6	523	274	...
197	504	190	...	507	214	...	510	241	...	515	269	...	7	519	295	...
198	500	204	...	503	229	...	506	258	-004	511	288	...	8	515	316	-007
199	496	218	...	499	245	...	502	275	...	507	307	...	9	511	338	...
200	491	231	...	494	260	...	497	292	...	502	326	+009	10	506	359	...
201	487	245	-003	490	275	-004	493	310	...	498	346	...	11	502	380	...
202	483	258	...	486	291	...	489	327	...	494	365	...	12	498	401	-008
203	478	272	...	481	308	...	484	344	-005	490	384	...	13	493	422	...
204	473	286	-004	476	321	-005	479	361	...	484	403	+008	14	488	443	...
205	468	299	...	471	337	...	474	378	-006	479	422	...	15	483	464	-009
206	463	313	-005	466	352	...	469	396	-007	474	442	...	16	478	485	...
207	459	326	-006	462	367	-006	465	413	...	470	461	+007	October. 17	474	506	-010
208	454	340	...	457	382	...	460	430	...	465	480	+006	18	469	527	...
209	448	354	...	451	398	...	454	447	-008	459	499	...	19	463	549	-011
210	443	367	...	446	413	-007	449	464	...	454	518	...	20	458	570	...
211	437	381	...	440	428	...	443	482	...	448	538	+005	21	452	591	...
212	431	394	-007	434	444	-008	437	499	...	442	557	+004	22	446	612	-012
213	441	408	...	443	460	...	446	516	...	449	576	...	23	451	632	-013
214	435	423	-008	437	486	...	440	544	-009	443	605	...	24	445	653	...
215	428	437	...	430	513	-009	433	571	...	436	635	...	5	438	694	...
216	421	452	...	423	539	...	426	599	-010	429	664	+003	26	431	725	-014
217	414	507	...	416	565	...	419	627	-011	422	693	...	27	424	756	...
218	407	531	-009	409	591	-010	412	654	...	415	722	...	28	417	786	...
219	400	556	...	402	618	...	405	682	-012	408	752	+002	29	409	817	-015
220	393	581	...	395	644	...	398	710	...	401	781	...	30	402	848	...
221	386	606	-010	388	670	...	391	738	...	394	810	...	31	394	879	-016
222	379	630	...	381	697	-011	384	765	-013	387	840	+001	1	386	910	...
223	372	655	-011	374	723	-012	377	793	...	380	869	000	2	378	941	-017
224	364	680	...	366	749	...	369	821	...	372	898	...	3	370	972	...
225	356	704	...	358	776	-013	361	848	-014	364	928	...	4	362	1003	...
226	348	729	-012	350	802	...	353	876	...	356	957	-001	5	354	1034	-018
227	340	754	...	342	828	...	345	904	...	348	986	...	6	345	1065	-019
228	332	778	-013	334	854	-014	337	931	-015	340	1015	-002	7	337	1096	...
229	324	803	...	326	881	...	329	959	...	332	1045	...	8	329	1126	...
230	315	828	...	317	907	-015	320	987	...	323	1074	...	9	320	1157	-020
231	307	853	...	309	933	...	312	1015	-016	315	1103	-003	10	311	1188	...
232	299	877	-014	301	960	...	304	1042	...	307	1133	...	11	303	1219	-021
233	291	902	...	293	986	-016	296	1070	-017	298	1162	-004	12	294	1250	...
234	282	927	-015	284	1012	...	287	1098	-018	290	1191	...	13	284	1280	-022
235	273	951	...	275	1039	...	278	1125	...	281	1221	-005	14	276	1312	...
236	264	976	...	266	1065	-017	269	1153	-019	272	1250	...	15	268	1343	-023
237	255	1001	-016	257	1091	...	260	1181	...	263	1279	...	16	257	1374	...
238	246	1025	-017	248	1117	-018	251	1208	...	254	1308	-006	17	248	1404	...
239	237	1050	...	239	1144	...	242	1236	-020	245	1338	...	18	238	1435	-024
240	228	1075	...	230	1170	...	233	1264	...	236	1367	-007	19	229	1466	-025
241	218	1100	-018	220	1196	-019	223	1292	-021	226	1396	-008	20	219	1497	...
242	209	1124	...	211	1223	-020	214	1319	...	217	1426	...	21	210	1528	...
243	202	1148	-019	203	1248	...	206	1348	-022	209	1456	...	22	204	1560	-026
244	193	1175	...	194	1276	...	197	1377	...	199	1485	-003	23	195	1590	...
245	183	1203	...	184	1304	-021	187	1405	-023	189	1514	...	24	185	1620	-027
246	173	1230	-020	174	1332	...	177	1434	...	179	1544	-010	25	175	1649	...

TABLE III.—Sunrise from 18° to 22° N. latitude—cont.

Day of solar year.	Lat. 18°			Lat. 19°			Lat. 20°			Lat. 21°			Lat. 22°			
	Long. -428" = -'005 of day.			Long. -460" = -'005 of day.			Long. -476" = -'0055 of day.			Long. +800" = +'009 of day.			Long. -616" = -'007 of day.			
	Eqn. of time in seconds	☉'s trop. long. in seconds	Total correctn. as fraction of a day. Satara.	Eqn. of time in seconds.	☉'s trop. long. in seconds	Total correctn. as fraction of a day. Poona.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Masik.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day Wagpur.	Eng. date.	Eqn. of time in seconds.	☉'s trop long. in seconds.	Total correctn. as fraction of a day. Baroda.
	A.D. 1000— 1400			A.D. 1000— 1400			A.D. 1000— 1400			A.D. 1000— 1400			A.D. 1000— 1400			
247	+168	-1258	- '020	-164	-1360	- '022	+164	-1462	- '023	+164	-1578	- '010	26	+165	-1679	- '028
248	153	1285	- '021	154	1388	...	154	1491	- '024	154	1602	- '011	27	155	1709	...
249	143	1313	...	144	1416	- '023	144	1520	...	144	1631	...	28	145	1739	...
250	133	1340	- '022	134	1444	...	134	1548	- '025	134	1660	- '012	29	135	1769	- '029
251	123	1368	...	124	1472	...	124	1577	...	124	1690	...	30	125	1798	...
252	118	1395	- '023	114	1500	- '024	114	1605	- '026	114	1719	...	1	115	1828	- '030
253	108	1423	...	104	1528	...	104	1634	...	104	1748	- '013	2	105	1858	...
254	93	1450	...	94	1556	- '025	94	1663	- '027	94	1777	- '014	3	95	1888	- '031
255	83	1478	- '024	84	1584	...	84	1691	...	84	1806	...	4	85	1918	...
256	73	1505	...	74	1612	- '026	74	1720	...	74	1836	...	5	75	1947	- '032
257	63	1533	- '025	64	1640	...	64	1748	- '028	64	1865	- '015	6	65	1977	...
258	53	1560	...	54	1668	- '027	54	1777	...	54	1894	...	7	55	2007	- '033
259	43	1588	- '026	44	1696	...	44	1806	- '029	44	1923	- '016	8	44	2037	...
260	33	1615	...	34	1724	...	34	1834	...	34	1952	...	9	34	2067	- '034
261	23	1643	- '027	24	1752	- '028	24	1863	- '030	24	1982	- '017	10	24	2096	...
262	13	1670	...	14	1780	...	14	1891	...	14	2011	...	11	14	2126	...
263	2	1698	- '028	2	1808	- '029	2	1920	- '031	2	2040	- '018	12	2	2156	- '035
264	-10	1725	...	-10	1836	...	-10	1949	...	-10	2069	...	13	-11	2186	...
265	20	1753	...	20	1864	...	20	1977	- '032	20	2098	...	14	20	2216	- '036
266	31	1780	...	32	1892	...	32	2006	...	32	2128	...	15	32	2245	...
267	40	1808	...	41	1920	- '030	41	2034	...	41	2157	- '019	16	42	2275	...
268	50	1835	- '030	51	1948	...	51	2063	...	51	2186	...	17	52	2305	...
269	60	1863	...	61	1976	...	61	2092	...	61	2215	...	18	63	2335	...
270	69	1890	...	70	2004	...	70	2120	...	70	2244	...	19	73	2365	...
271	80	1918	...	81	2032	...	81	2149	...	81	2274	...	20	84	2394	- '037
272	90	1945	- '030	91	2060	...	91	2177	- '033	91	2303	...	21	94	2424	...
273	100	1973	...	101	2088	...	101	2206	...	101	2332	...	22	104	2454	...
274	102	2000	...	102	2116	...	104	2236	...	101	2360	- '030	23	101	2484	...
275	109	2008	...	109	2123	...	108	2242	...	107	2366	...	24	107	2499	...
276	115	2015	...	115	2130	- '031	114	2249	...	114	2372	...	25	114	2494	- '038
277	123	2023	...	122	2137	...	121	2255	...	120	2378	...	26	120	2500	...
278	129	2030	...	129	2144	- '032	128	2262	...	127	2384	...	27	127	2505	...
279	135	2038	- '031	135	2151	...	134	2268	- '034	133	2389	...	28	133	2510	...
280	143	2046	...	142	2159	...	141	2274	...	140	2395	...	29	140	2515	...
281	149	2053	...	149	2166	...	148	2281	...	146	2401	...	30	146	2520	...
282	155	2061	...	155	2173	- '033	154	2287	...	153	2407	...	31	153	2526	...
283	162	2068	...	162	2180	...	161	2294	...	159	2413	...	1	159	2531	...
284	169	2076	...	169	2187	...	168	2300	...	166	2419	...	2	166	2536	...
285	175	2084	- '032	175	2194	...	174	2306	...	172	2425	- '021	3	172	2541	- '039
286	182	2091	...	182	2201	...	181	2313	- '035	179	2431	...	4	179	2546	...
287	189	2099	...	189	2208	...	188	2318	...	185	2437	...	5	185	2552	...
288	195	2106	...	195	2215	- '034	194	2326	...	192	2443	...	6	192	2557	...
289	202	2114	...	202	2222	...	201	2332	...	199	2448	...	7	198	2562	...
290	209	2122	...	209	2230	...	208	2338	...	205	2453	...	8	205	2567	...
291	215	2129	- '033	215	2237	...	214	2345	...	211	2460	...	9	211	2572	...
292	222	2137	...	222	2244	...	221	2351	- '036	216	2466	...	10	218	2578	...
293	228	2144	...	229	2251	...	228	2358	...	224	2472	...	11	224	2583	- '040
294	235	2152	...	235	2258	...	234	2364	...	231	2477	...	12	231	2588	...
295	242	2160	...	242	2265	...	241	2370	...	238	2484	...	13	237	2593	...
296	249	2167	...	249	2272	...	248	2377	...	245	2490	- '022	14	244	2598	- '039
297	255	2175	...	255	2279	...	254	2383	- '035	252	2496	...	15	250	2604	...
298	262	2182	...	262	2286	...	261	2390	...	259	2502	...	16	257	2609	...
299	269	2190	...	269	2296	...	268	2396	...	266	2508	...	17	263	2614	...
300	276	2198	- '032	275	2301	- '033	274	2402	...	272	2513	...	18	270	2619	...
301	283	2205	...	282	2308	...	281	2409	...	278	2519	- '021	19	276	2624	- '038
302	290	2213	...	289	2315	...	288	2415	- '034	284	2525	...	20	283	2630	...
303	297	2220	...	295	2322	...	294	2422	...	290	2531	...	21	289	2635	...
304	304	2228	...	302	2328	...	300	2428	...	297	2536	- '020	22	295	2640	- '037
305	307	2236	- '031	305	2331	- '032	303	2430	...	300	2536	...	23	298	2649	...

TABLE III.—Sunrise from 18° to 22° N. latitude—cont.

Day of solar year.	Lat. 18°.			Lat. 19°			Lat. 20°			Lat. 21°			Lat. 22°.			
	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. = - 428° = - '005 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. = - 460° = - '005 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. = - 476° = - '0055 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. = + 800° = + '009 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. = 616° = - '007 of day.	
			A.D. 1000— 1400			A.D. 1000— 1400			A.D. 1000— 1400			A.D. 1000— 1400			A.D. 1000— 1400	
306	-310	-2178	-031	-305	-2275	-032	-306	-2372	-034	-303	-2477	-020	24	-301	-2578	-087
307	813	2152	...	311	2268	...	309	2344	-083	306	2447	...	25	304	2546	...
308	816	2127	...	314	2221	-031	312	2316	...	309	2417	-019	26	307	2515	-036
309	819	2102	-030	317	2194	...	315	2287	...	312	2388	...	27	310	2484	...
310	822	2077	...	320	2168	...	318	2269	-032	315	2358	...	28	313	2453	...
311	825	2052	...	323	2141	...	321	2231	...	318	2328	-018	29	316	2422	-035
312	828	2026	-029	326	2114	-030	324	2208	...	321	2298	...	30	319	2390	...
313	831	2001	...	329	2088	...	327	2175	-031	324	2269	...	31	322	2359	...
314	834	1976	...	332	2061	...	330	2147	...	327	2239	-017	1	325	2328	-034
315	837	1951	...	335	2034	-029	333	2119	...	330	2209	...	2	328	2297	...
316	840	1926	...	338	2008	...	336	2091	-030	333	2180	...	3	331	2266	...
317	843	1900	-028	341	1981	...	339	2063	...	336	2150	-016	4	334	2224	-033
318	846	1875	...	344	1954	...	342	2035	...	339	2120	...	5	337	2203	...
319	849	1850	...	347	1927	...	345	2006	...	342	2090	...	6	340	2172	...
320	852	1825	...	350	1901	-028	343	1978	-029	345	2061	...	7	343	2141	-032
321	855	1800	-027	353	1874	...	351	1950	...	348	2031	-015	8	346	2110	...
322	858	1774	...	356	1847	...	354	1922	...	351	2001	...	9	349	2078	...
323	861	1749	...	359	1821	-027	357	1894	...	354	1972	...	10	352	2047	-031
324	864	1724	-026	362	1794	...	360	1866	-028	357	1942	-014	11	355	2016	...
325	867	1699	...	365	1767	...	363	1838	...	360	1912	...	12	358	1985	...
326	870	1674	...	368	1741	-026	366	1810	-027	363	1883	-013	13	361	1954	-030
327	873	1648	-025	371	1714	-025	369	1782	...	366	1853	...	14	363	1922	-029
328	876	1623	...	374	1687	...	372	1754	-026	369	1823	-012	15	365	1891	...
329	879	1608	-024	377	1660	-024	375	1725	-025	371	1793	-011	16	367	1860	-028
330	882	1573	...	380	1634	...	377	1697	...	373	1764	...	17	369	1829	-027
331	885	1548	-023	383	1607	...	379	1669	-024	375	1734	-010	18	371	1798	...
332	888	1522	-022	385	1580	-023	381	1641	...	377	1704	...	19	373	1766	-026
333	891	1497	...	387	1554	-022	383	1613	-023	379	1675	-009	20	375	1735	-025
334	892	1472	-021	389	1527	...	385	1585	...	381	1645	-008	21	377	1704	...
335	895	1448	...	391	1500	-021	387	1556	-022	383	1616	...	22	379	1672	-024
336	895	1400	-020	391	1450	...	387	1504	-021	383	1562	-007	23	379	1616	-023
337	896	1351	...	392	1400	-020	388	1452	-020	384	1508	-006	24	380	1561	...
338	896	1303	-019	392	1350	...	388	1400	...	384	1454	-005	25	380	1505	-022
339	897	1255	...	393	1300	-019	389	1348	-019	385	1400	...	26	381	1449	-021
340	897	1206	-018	393	1250	-018	389	1296	...	385	1346	...	27	381	1393	...
341	898	1159	...	394	1200	...	390	1246	-018	386	1293	-004	28	382	1338	-020
342	898	1110	-017	394	1150	-017	390	1193	-017	386	1239	-003	1	382	1282	...
343	899	1026	-016	395	1100	...	391	1141	...	387	1185	...	2	383	1226	-019
344	899	1013	...	395	1050	-016	391	1089	-016	387	1131	-002	3	383	1171	-018
345	400	965	-015	396	1000	...	392	1037	...	388	1077	-001	4	384	1115	...
346	400	917	...	396	950	-015	392	985	-015	388	1023	...	5	384	1059	-017
347	401	868	-014	397	900	-014	393	933	...	389	969	-000	6	385	1004	-016
348	401	820	...	397	850	...	393	881	-014	389	915	...	7	385	948	...
349	402	772	-013	398	800	-013	394	829	-013	390	861	+001	8	386	892	-015
350	402	723	...	398	750	...	394	779	...	390	807	...	9	386	836	-014
351	403	675	-012	399	700	-012	395	726	-012	391	754	+002	10	387	781	...
352	403	627	-011	399	650	-011	395	674	...	391	700	...	11	387	725	-013
353	404	579	...	400	600	...	396	622	-011	392	646	+003	12	388	669	...
354	404	530	-010	400	550	-010	396	570	-010	392	592	+004	13	388	614	-012
355	405	482	...	401	500	...	397	518	...	393	538	...	14	389	558	...
356	405	434	...	401	450	-009	397	466	...	393	484	+005	15	389	502	-011
357	406	385	-008	402	400	...	398	414	-009	394	434	...	16	390	447	...
358	406	337	...	402	350	-008	398	362	-008	394	376	+006	17	390	391	-010
359	407	289	...	403	300	-007	399	310	-007	395	322	+007	18	391	335	...
360	407	240	-007	403	250	...	399	258	...	395	268	...	19	391	279	-009
361	408	192	-006	404	200	-006	400	207	...	396	215	+008	20	392	224	-008
362	408	144	...	404	150	...	400	155	-006	396	161	+009	21	392	168	-007
363	409	96	-005	405	100	-005	401	103	-005	397	107	...	22	393	178	...
364	409	48	...	405	50	-004	401	51	-004	397	53	+010	23	393	57	-006
365	409	0	-004	405	0	...	401	0	...	397	0	+011	24	393	0	-005

TABLE III.—Sunrise from 23° to 27° N. latitude.

Day of solar year.	Lat. 23° Long. = -20'' = -'000 of day			Lat. 24° Long. = -876'' = -'010 of day.			Lat. 25° Long. = +1,738'' = + '020 of day.			Lat. 26° Long. = +2,264'' = + '031 of day.			Lat. 27° Long. = +1,544'' = + '018 of day.				
	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Indore.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Anhilwad.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day Benares.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day Patna	Eng. date	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Ondh.	
	A.D. 1000 - 1400			A.D. 1000 - 1400			A.D. 1000 - 1400			A.D. 1000 - 1400			A.D. 1000 - 1400				
1	-389	+58	+003	-384	+60	-'007	-380	+62	+028	-378	+64	+034	March.	25	-372	+66	+022
2	387	115	.	383	119	-'006	379	123	+024	374	128	+035		26	370	182	+023
3	385	178	+004	381	179	..	377	185	+025	373	192	+036		27	368	198	..
4	384	230	+005	380	238	-'005	375	247	...	372	256	+037		28	367	264	+024
5	382	288	...	378	298	-'004	374	308	+026	370	319	+038		29	365	329	+025
6	380	346	+006	376	358	..	372	370	+027	368	383	...		30	364	395	+026
7	379	403	+007	374	417	-'003	370	432	...	366	447	+039		31	362	461	+027
8	376	461	..	372	477	-'002	368	494	+028	364	511	+040		1	359	527	...
9	374	518	+008	370	536	-'001	365	555	+029	361	575	+041		2	357	593	+028
10	372	576	+009	368	596	..	363	617	+030	359	639	...		3	355	659	+029
11	369	634	...	365	656	'000	361	679	..	357	703	+042	4	353	725	+030	
12	367	691	+010	363	715	..	358	740	+031	355	767	+043	5	350	791	...	
13	364	749	+011	360	775	+001	356	802	+032	352	831	...	6	348	857	+031	
14	362	806	...	357	834	+002	353	864	+033	349	895	+044	7	345	923	+032	
15	359	864	+012	355	894	+003	350	925	..	347	958	+045	8	342	988	+033	
16	356	922	+013	352	954	...	348	967	+034	344	1022	+046	9	340	1054	+034	
17	353	979	...	349	1013	+004	345	1049	+035	341	1086	+047	10	338	1120	+035	
18	350	1037	+014	346	1073	+005	342	1111	+036	338	1150	+048	11	336	1186	...	
19	346	1094	+015	343	1132	+006	338	1172	+037	336	1214	...	12	334	1252	+036	
20	343	1152	+016	339	1192	..	336	1234	...	334	1278	+049	13	332	1318	+037	
21	340	1210	..	335	1252	+007	334	1296	+038	332	1342	+050	April.	14	330	1384	...
22	338	1267	...	333	1311	...	332	1357	..	330	1406	...		15	328	1450	+038
23	336	1325	+017	331	1371	+008	330	1419	...	328	1470	...		16	326	1516	...
24	334	1382	..	329	1430	...	328	1481	+039	326	1534	+051		17	324	1582	...
25	332	1440	+018	326	1490	...	326	1542	...	324	1597	...		18	322	1648	+039
26	330	1498	...	324	1550	+009	324	1604	+040	322	1661	+052		19	320	1714	...
27	328	1555	...	322	1609	..	322	1666	...	320	1725	...		20	318	1780	+040
28	326	1613	+019	320	1669	+010	320	1728	+041	318	1789	...		21	316	1846	...
29	324	1671	...	318	1728	..	318	1789	..	316	1853	+053		22	314	1912	+041
30	322	1728	...	316	1788	..	316	1852	..	314	1916	...		23	312	1976	..
31	320	1782	...	314	1823	+011	314	1888	+042	312	1954	+054	24	310	2015	+042	
32	318	1795	+020	312	1857	...	312	1924	..	310	1932	...	25	308	2054	...	
33	316	1827	...	310	1892	+012	310	1960	+043	308	2029	+055	26	306	2094	+043	
34	314	1859	+021	308	1926	..	308	1997	..	306	2067	+056	27	304	2133	+044	
35	312	1892	...	305	1960	..	306	2032	+044	304	2104	...	28	302	2172	..	
36	310	1925	..	303	1995	+013	304	2068	...	302	2142	...	29	300	2211	...	
37	307	1958	+022	301	2029	+014	302	2104	+045	299	2180	+057	30	297	2250	+045	
38	302	1990	...	299	2064	...	297	2141	...	294	2218	...	1	292	2290	...	
39	296	2024	+023	293	2098	..	291	2176	+046	288	2255	+058	2	286	2329	+046	
40	290	2057	+024	287	2132	+015	285	2212	...	283	2298	..	3	280	2368	...	
41	284	2090	...	282	2167	...	279	2248	..	277	2331	+059	May.	4	275	2407	+047
42	278	2123	+025	275	2201	+016	273	2284	+047	271	2368	..		5	269	2446	...
43	272	2155	...	269	2235	...	267	2320	..	265	2406	+060		6	263	2496	+048
44	266	2187	+026	263	2270	+017	261	2356	+048	259	2444	...		7	257	2525	+049
45	259	2220	..	257	2304	...	255	2392	+049	253	2481	+061		8	251	2564	...
46	253	2253	+027	251	2339	+018	249	2428	..	247	2519	...		9	245	2603	...
47	246	2286	...	244	2373	...	243	2464	..	240	2557	+062		10	239	2642	+050
48	240	2318	..	238	2407	+019	236	2500	+050	234	2595	...		11	232	2682	...
49	234	2352	+028	232	2442	...	230	2537	..	228	2632	+063		12	226	2721	+051
50	227	2385	...	225	2476	...	223	2572	+051	221	2670	...		13	220	2760	+052
51	220	2418	..	218	2411	..	217	2608	..	215	2708	+064	14	218	2799	..	
52	214	2451	...	212	2545	+020	210	2644	+052	208	2745	..	15	207	2838	...	
53	207	2483	+029	205	2579	+021	203	2681	...	201	2788	..	16	200	2878	...	
54	200	2515	...	198	2614	...	197	2716	...	195	2821	..	17	193	2917	..	
55	193	2548	...	191	2648	...	190	2752	..	188	2858	...	18	186	2966	...	
56	186	2581	...	184	2682	...	183	2788	..	181	2896	...	19	180	2995	...	
57	178	2614	...	177	2717	...	175	2824	...	174	2934	...	20	173	3034	+053	
58	174	2646	...	174	2752	...	171	2860	..	171	2972	...	21	170	3074	...	
59	171	2679	...	171	2786	...	168	2896	..	168	3009	...	22	167	3113	...	
60	167	2712	..	167	2820	..	165	2932	...	165	3047	...	23	164	3152	..	
61	163	2744	...	163	2856	...	162	2968	...	162	3084	...	24	161	3192	..	
62	159	2740	...	159	2852	...	159	2965	...	159	3082	..	25	158	3190	..	

TABLE III.—Sunrise from 23° to 27° N. latitude—cont.

Day of solar year.	Lat. 23° = -20" of day		Long. -20" of day		Lat. 24° = -178" of day		Long. -178" of day		Lat. 25° = +1736" of day		Long. +1736" of day		Lat. 26° = +2304" of day		Long. +2304" of day		Lat. 27° = +1544" of day		Long. +1544" of day	
	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Indore.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Anhilwad.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Benares.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Patna	Eng. date.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Oudh.				
A.D. 1000 - 1400	A.D. 1000 - 1400	A.D. 1000 - 1400	A.D. 1000 - 1400	A.D. 1000 - 1400	A.D. 1000 - 1400	A.D. 1000 - 1400	A.D. 1000 - 1400	A.D. 1000 - 1400	A.D. 1000 - 1400	A.D. 1000 - 1400	A.D. 1000 - 1400	A.D. 1000 - 1400	A.D. 1000 - 1400	A.D. 1000 - 1400	A.D. 1000 - 1400	A.D. 1000 - 1400	A.D. 1000 - 1400			
63	-155 +2735	+ '029	-155 +2848	+ '021	-156 +2962	+ '052	-156 +8079	+ '064	-155 +8189	+ '053	64	151 2731	...	150 2959	...	150 3077	...	150 3187	...	
64	143 2726	...	142 2840	...	142 2956	...	141 3074	...	147 3186	...	65	134 2722	...	133 2837	...	133 2952	...	132 3184	...	
65	125 2718	...	125 2833	...	124 2949	...	124 3070	...	123 3182	...	66	116 2713	...	116 2830	...	115 2946	...	115 3181	...	
66	107 2709	...	106 2825	...	106 2943	...	106 3065	...	105 3179	...	67	98 2704	...	97 2821	...	97 2940	...	97 3178	...	
67	88 2700	...	88 2817	...	88 2937	...	88 3060	+ '005	87 3176	...	68	79 2696	...	79 2813	...	79 2934	...	78 3174	...	
68	70 2691	...	70 2809	...	70 2981	...	70 3055	...	69 3173	+ '054	69	61 2686	...	61 2805	...	60 2928	+ '053	60 3058	...	
69	53 2682	...	53 2801	...	52 2925	...	52 3050	...	52 3170	...	70	42 2678	+ '030	42 2797	...	42 2921	...	42 3048	...	
70	33 2674	...	33 2794	...	33 2918	...	32 3046	...	32 3166	...	71	24 2669	...	24 2790	...	24 2915	...	24 3043	...	
71	15 2665	...	15 2786	...	14 2912	...	14 3041	...	14 3163	...	72	5 2660	...	5 2782	...	5 2909	...	5 3038	...	
72	+4 2656	...	+4 2778	...	+4 2906	...	+4 3036	...	+4 3160	...	73	23 2647	...	23 2770	...	22 2900	+ '052	22 3031	...	
73	13 2652	...	13 2774	...	13 2903	...	13 3034	...	13 3158	...	74	32 2643	...	32 2765	...	32 2897	...	32 3029	...	
74	23 2647	...	23 2770	...	22 2900	+ '052	22 3031	...	22 3157	...	75	42 2638	...	42 2762	...	41 2894	...	41 3026	...	
75	51 2634	+ '029	50 2758	...	50 2890	...	50 3024	...	50 3152	+ '053	76	51 2630	...	50 2755	+ '020	50 2887	...	50 3022	+ '064	
76	60 2630	...	59 2755	+ '020	59 2887	...	59 3022	+ '064	59 3150	...	77	69 2625	...	69 2751	...	69 2884	...	69 3019	+ '063	
77	78 2621	+ '028	78 2747	...	78 2881	+ '051	78 3017	...	77 3147	...	78	87 2616	...	87 2743	...	87 2878	...	87 3014	...	
78	107 2612	...	107 2740	...	108 2876	...	108 3012	+ '062	108 3144	...	79	117 2581	...	118 2709	+ '019	118 2844	...	118 2979	...	
79	127 2551	+ '027	128 2678	...	128 2812	...	128 2947	...	129 3077	...	80	137 2520	...	138 2647	...	138 2780	+ '050	138 2914	...	
80	147 2490	...	148 2618	+ '018	148 2748	...	148 2882	+ '061	149 3011	...	81	157 2459	...	158 2584	...	158 2717	+ '049	158 2849	...	
81	167 2428	...	168 2553	...	168 2685	...	168 2817	...	169 2944	...	82	177 2398	...	177 2522	...	178 2653	...	178 2784	...	
82	187 2368	+ '026	187 2491	+ '017	188 2621	...	188 2752	+ '060	189 2878	...	83	187 2368	+ '026	187 2491	+ '017	188 2621	...	188 2752	+ '060	
83	196 2337	...	197 2460	...	197 2589	...	198 2719	...	198 2844	+ '049	84	206 2306	...	206 2429	...	207 2557	+ '048	207 2687	...	
84	215 2275	...	216 2398	...	217 2525	...	217 2654	...	218 2778	...	85	225 2245	+ '025	226 2367	...	226 2493	...	227 2622	...	
85	235 2214	...	236 2336	+ '016	236 2461	...	236 2589	...	237 2711	+ '048	86	244 2184	...	244 2305	...	245 2429	+ '047	246 2557	...	
86	253 2153	+ '024	254 2273	...	254 2397	...	255 2524	...	256 2644	+ '047	87	262 2122	...	263 2242	...	263 2366	...	264 2492	+ '059	
87	262 2122	...	263 2242	...	263 2366	...	264 2492	+ '059	266 2611	...	88	271 2092	...	272 2211	+ '015	273 2334	...	273 2455	...	
88	280 2061	...	281 2180	...	282 2302	+ '046	283 2427	...	283 2545	...	89	280 2061	...	281 2180	...	282 2302	+ '046	283 2427	...	
89	291 2081	+ '023	290 2149	...	291 2270	...	292 2394	+ '058	292 2511	+ '046	90	298 2000	...	299 2118	...	299 2238	...	300 2362	...	
90	307 1969	...	308 2087	+ '014	308 2206	...	309 2329	...	310 2445	...	91	315 1889	...	316 2056	...	317 2174	+ '045	318 2297	...	
91	324 1908	+ '022	325 2025	...	326 2142	...	327 2264	+ '057	328 2378	+ '045	92	333 1878	...	333 1994	+ '013	334 2110	+ '044	335 2232	...	
92	341 1847	...	342 1963	...	343 2078	...	344 2199	...	344 2311	...	93	349 1818	...	350 1931	...	351 2047	...	352 2167	+ '056	
93	358 1786	+ '021	358 1900	...	359 2015	...	360 2134	...	361 2245	...	94	358 1786	+ '021	358 1900	...	359 2015	...	360 2134	...	
94	365 1755	...	366 1869	...	367 1983	+ '043	368 2102	+ '056	369 2212	...	95	365 1755	...	366 1869	...	367 1983	+ '043	368 2102	+ '056	
95	373 1725	+ '020	374 1838	+ '012	375 1951	...	376 2069	...	377 2178	+ '043	96	373 1725	+ '020	374 1838	+ '012	375 1951	...	376 2069	...	
96	382 1694	...	385 1807	...	387 1919	...	389 2037	...	391 2145	...	97	382 1694	...	385 1807	...	387 1919	...	389 2037	...	
97	390 1664	...	393 1776	+ '011	395 1888	+ '042	397 2004	...	400 2112	...	98	390 1664	...	393 1776	+ '011	395 1888	+ '042	397 2004	...	
98	397 1631	...	400 1742	...	402 1852	...	404 1966	+ '054	407 2078	+ '042	99	397 1631	...	400 1742	...	402 1852	...	404 1966	+ '054	
99	405 1599	...	408 1708	...	410 1816	...	412 1929	...	415 2034	...	100	405 1599	...	408 1708	...	410 1816	...	412 1929	...	
100	412 1566	+ '019	415 1673	+ '010	417 1780	+ '041	419 1891	+ '053	422 1994	+ '041	101	412 1566	+ '019	415 1673	+ '010	417 1780	+ '041	419 1891	+ '053	

TABLE III.—SUNRISE AND INDIAN TERRESTRIAL LONGITUDES

TABLE III.—Sunrise from 23° to 27° N. latitude—cont.

Day of solar year.	Lat. 23° = -20'' of day			Lat. 24° = -876'' of day.			Lat. 25° = +1,736'' of day.			Lat. 26° = +2,264'' of day.			Lat. 27° = +1,544'' of day.			
	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Indore	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Anhilwad.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Benares.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Patna.	Eng. date.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Oudh.
A.D. 1000—1400																
126	+420	+1534	+019	+422	+1632	+010	+424	+1741	+040	+426	+1853	+053	July	+429	+1955	+041
127	427	1501	+018	429	1604	..	431	1708	..	433	1815	..		436	1916	..
128	434	1469	..	436	1570	..	438	1673	..	440	1778	+052		443	1877	+040
129	441	1436	..	443	1536	+009	445	1637	..	447	1740	..		450	1838	..
130	448	1404	..	450	1502	..	452	1601	..	454	1702	..		457	1798	+039
131	454	1371	+017	456	1467	+008	458	1565	+039	460	1665	+051		463	1759	..
132	460	1339	..	462	1433	..	464	1529	..	466	1627	..		469	1720	..
133	467	1306	..	469	1399	..	471	1493	..	473	1589	+050	476	1681	..	
134	473	1274	..	475	1364	..	477	1457	+038	479	1552	..	482	1642	+038	
135	479	1241	+016	481	1330	+007	483	1421	..	485	1514	..	488	1602	..	
136	485	1209	..	487	1296	..	489	1385	..	491	1476	+049	August	494	1563	+037
137	490	1176	..	493	1261	+006	495	1349	+037	497	1438	..		500	1524	..
138	496	1144	+015	499	1227	..	501	1314	..	503	1401	..		506	1485	+036
139	502	1111	..	505	1193	..	507	1278	+036	509	1363	+048		512	1446	..
140	507	1079	..	510	1159	+005	512	1242	..	514	1325	..		517	1406	..
141	512	1046	+014	515	1124	..	517	1206	..	519	1288	..		522	1367	..
142	517	1014	..	520	1090	..	522	1170	..	524	1250	+047		527	1328	+035
143	522	981	..	525	1056	..	527	1134	+035	529	1212	..	532	1289	..	
144	527	949	..	530	1021	+004	532	1098	..	534	1175	..	537	1250	+034	
145	531	916	..	535	987	..	537	1062	..	539	1137	+046	542	1210	..	
146	536	884	+013	539	953	..	541	1026	+034	543	1099	..	September	546	1171	..
147	540	851	..	542	918	..	545	990	..	547	1061	..		550	1132	+033
148	544	819	..	546	884	+003	548	955	..	552	1024	+045		552	1093	..
149	546	786	..	548	850	..	547	919	..	554	986	..		554	1054	..
150	547	754	+012	550	816	..	548	883	+033	555	948	..		556	1014	+032
151	548	721	..	551	781	..	550	847	..	556	911	+044		558	975	..
152	549	688	..	552	748	+002	551	812	..	558	872	..		560	936	..
153	550	666	..	553	724	..	553	786	+032	559	844	..	562	906	..	
154	551	644	+011	555	700	..	554	760	..	560	816	..	564	876	+031	
155	552	621	..	556	676	+001	555	733	..	561	788	+043	566	845	..	
156	553	599	..	557	652	..	556	707	+031	563	760	..	568	815	..	
157	554	577	+010	558	627	..	558	681	..	565	731	..	October	570	785	+030
158	555	555	..	560	603	..	560	655	..	567	703	..		572	755	..
159	557	533	..	562	579	..	562	629	..	570	675	+042		574	725	..
160	559	510	..	564	555	..	564	602	..	572	647	..		576	694	+029
161	561	488	..	566	531	+000	566	576	..	574	619	+041		578	664	..
162	562	466	..	567	507	..	568	550	+030	575	591	..		579	634	..
163	564	444	..	569	483	..	570	524	..	577	562	..		581	604	+028
164	566	422	+009	571	459	+001	572	498	..	579	535	..	583	574	..	
165	567	399	..	572	435	..	574	471	+029	580	507	+040	584	543	..	
166	567	377	..	572	411	..	576	445	..	580	479	..	584	513	+027	
167	568	355	+008	573	386	..	577	419	..	581	450	..	November	585	483	..
168	569	333	..	574	362	-002	578	393	+028	582	422	+039		586	453	..
169	570	311	..	575	338	..	579	367	..	583	394	..		587	423	+026
170	570	288	..	576	314	..	579	310	..	583	366	..		587	392	..
171	570	266	+007	576	290	-003	579	314	+027	583	338	+038		587	362	..
172	570	244	..	576	266	..	579	288	..	583	310	..		587	332	+025
173	570	222	..	576	242	..	579	262	..	583	282	..		587	302	..
174	570	200	..	576	218	..	579	236	+026	583	254	..	587	272	+024	
175	570	177	+006	576	194	-004	579	209	..	583	226	+037	587	241	..	
176	570	155	..	576	170	..	579	183	..	583	198	..	587	211	..	
177	569	133	+005	574	145	..	578	157	..	582	169	+036	December	586	181	+023
178	568	111	..	573	121	-005	577	131	+025	581	141	..		585	151	..
179	567	89	..	572	97	..	576	105	..	580	113	..		584	121	..
180	566	66	..	571	73	..	575	78	..	579	85	+035		583	90	+022
181	564	44	..	569	49	..	573	52	+024	577	57	..		581	60	..
182	563	22	+004	568	25	-006	572	26	..	576	29	..		580	30	..
183	562	0	..	566	0	..	570	0	..	575	0	+034		579	0	+021
184	560	-28	..	564	-25	..	568	-27	+023	573	-29	..	577	-31	..	
185	558	46	..	562	50	-007	566	54	..	571	58	..	575	62	..	
186	556	69	+008	560	75	..	564	81	..	569	87	+033	573	94	+020	

TABLE III.—Sunrise from 23° to 27° N. latitude—cont.

Day of solar year.	Lat. 23°			Lat. 24°			Lat. 25°			Lat. 26°			Lat. 27°				
	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. - 20° = -'000 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. - '876" = -'010 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. + 1,786" = + '020 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. + 2,264" = + '031 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. + 1,544" = + '018 of day.		
			A.D. 1000 - 1400.			A.D. 1000 - 1400.			A.D. 1000 - 1400.			A.D. 1000 - 1400.			A.D. 1000 - 1400.		
187	+554	-92	+ '003	+558	-100	- '007	+562	-108	+ '022	+567	-116	+ '033	Sep. 27 28 29 30	+571	-125	+ '020	
188	551	114	...	555	124	...	559	135	...	564	145	...			568	156	+ '019
189	548	137	...	552	149	- '008	556	163	...	561	175	+ '032			565	187	...
190	545	160	+ '002	549	174	...	553	190	+ '021	558	204	...			562	218	...
191	542	183	...	546	199	...	550	217	...	555	232	...		1	559	250	+ '018
192	539	206	...	543	224	- '009	547	244	...	552	262	+ '031		2	556	281	...
193	536	229	...	540	249	...	543	271	...	548	291	...	3	552	312	...	
194	533	252	+ '001	537	274	...	540	298	+ '020	545	320	...	4	549	343	+ '017	
195	530	275	...	534	299	- '010	538	325	...	541	349	+ '030	5	545	374	...	
196	526	298	...	530	324	...	532	352	...	537	378	...	6	541	406	...	
197	522	321	'000	526	349	- '011	528	379	+ '019	533	407	...	7	537	437	+ '016	
198	518	343	...	522	373	...	524	406	...	529	436	+ '029	8	533	468	...	
199	514	366	- '001	518	398	...	520	434	+ '018	525	466	...	9	529	499	+ '015	
200	509	389	...	513	423	...	515	461	...	520	495	+ '028	10	524	530	...	
201	505	412	...	509	448	- '012	511	488	...	515	524	...	11	519	562	...	
202	501	435	...	505	473	...	507	515	+ '017	511	553	...	12	515	598	+ '014	
203	496	458	- '002	500	498	...	502	542	...	506	582	+ '027	13	510	624	+ '013	
204	491	481	...	495	528	- '013	497	569	+ '016	500	611	...	14	504	655	...	
205	486	504	...	490	548	...	492	596	...	495	640	+ '026	15	499	686	...	
206	481	527	- '003	485	573	- '014	487	623	...	490	669	...	16	494	718	+ '012	
207	477	550	- '004	481	598	...	483	650	+ '015	486	698	+ '025	October. 17 18 19 20 21 22 23 24 25 26	490	749	...	
208	472	572	...	476	622	- '015	478	677	+ '014	480	727	...			484	780	+ '011
209	466	595	...	470	647	...	473	705	...	474	757	+ '024			478	811	...
210	461	618	- '005	465	672	- '016	467	732	+ '013	468	786	...			472	842	+ '010
211	455	641	...	459	697	...	461	759	...	462	815	+ '023			466	874	+ '009
212	450	664	- '006	454	722	- '017	455	786	...	458	844	...			461	905	+ '008
213	446	688	...	450	748	...	452	812	+ '012	455	872	+ '022	23	458	936	...	
214	445	721	...	447	782	- '018	449	848	...	452	910	...	24	455	975	+ '007	
215	441	758	- '007	444	817	...	446	884	+ '011	449	947	+ '021	25	452	1014	...	
216	434	785	- '003	437	851	- '019	439	920	...	442	985	+ '020	26	445	1054	...	
217	427	818	...	430	885	...	432	956	+ '010	435	1023	...	27	438	1093	+ '006	
218	420	850	...	423	919	...	425	991	...	428	1060	...	28	431	1132	...	
219	412	883	- '009	415	954	- '020	417	1027	+ '009	420	1098	+ '019	29	423	1171	+ '005	
220	405	915	- '010	408	988	...	410	1063	...	413	1136	...	30	416	1210	...	
221	397	948	...	400	1023	- '021	402	1099	+ '008	405	1174	+ '018	31	408	1250	+ '004	
222	389	980	...	392	1057	...	394	1135	...	397	1211	...	1	400	1289	...	
223	381	1013	- '011	384	1091	- '022	386	1171	...	389	1249	+ '017	2	392	1328	+ '003	
224	373	1045	...	376	1125	...	378	1207	...	381	1287	+ '016	3	384	1367	+ '002	
225	365	1078	...	368	1160	...	370	1243	+ '006	373	1324	...	4	376	1406	...	
226	357	1110	- '012	360	1194	...	362	1279	...	365	1362	...	5	368	1446	+ '001	
227	348	1143	...	351	1228	- '023	353	1315	+ '005	356	1400	+ '015	6	359	1485	...	
228	340	1175	- '013	343	1262	- '024	345	1350	+ '004	348	1437	+ '014	7	351	1524	- '000	
229	332	1208	...	335	1297	- '025	337	1386	...	340	1475	...	8	343	1563	...	
230	323	1240	- '014	326	1331	...	328	1422	...	331	1513	+ '013	9	334	1602	- '001	
231	314	1273	...	317	1365	- '026	319	1458	+ '008	322	1551	...	10	325	1642	...	
232	306	1305	- '015	309	1400	...	311	1494	...	314	1588	+ '012	11	317	1681	- '002	
233	297	1338	...	300	1434	- '027	302	1530	...	305	1626	...	12	308	1720	- '003	
234	287	1370	- '016	290	1468	...	292	1566	...	295	1664	+ '010	13	298	1759	...	
235	278	1403	...	281	1503	...	282	1602	+ '001	286	1701	...	14	289	1794	...	
236	269	1435	- '017	272	1537	- '028	274	1638	...	277	1739	+ '009	15	280	1838	- '004	
237	260	1468	...	263	1571	- '029	265	1674	'000	268	1777	...	November. 16 17 18 19 20 21 22 23 24 25	271	1877	...	
238	251	1500	- '018	254	1605	...	256	1709	- '001	259	1814	...			262	1916	- '005
239	241	1533	...	245	1640	...	246	1745	...	249	1852	...			252	1955	...
240	232	1565	...	236	1674	- '030	237	1781	...	240	1890	+ '008			243	1994	- '006
241	222	1598	- '019	226	1708	- '031	227	1817	- '002	230	1928	...			233	2034	...
242	213	1630	- '020	217	1743	...	218	1853	...	221	1965	+ '007			224	2073	- '007
243	205	1664	...	205	1776	...	206	1888	- '003	206	2004	...	22	207	2113	- '008	
244	196	1695	...	196	1807	- '032	197	1920	...	197	2036	+ '006	23	198	2145	...	
245	186	1725	- '021	186	1838	- '033	187	1952	- '004	187	2069	...	24	188	2179	- '009	
246	176	1756	...	176	1869	...	177	1984	...	177	2101	+ '005	25	178	2212	...	

TABLE III.—Sunrise from 23° to 27° N. latitude—cont.

Day of solar year.	Lat. 23°			Lat. 24°			Lat. 25°			Lat. 26°			Lat. 27°			
	Eqn. of time in seconds.	Long. - 20° = - '000 of day.	☉'s trop. long. in seconds.	Eqn. of time in seconds.	Long. - 876° = - '010 of day.	☉'s trop. long. in seconds.	Eqn. of time in seconds.	Long. + 1,786° = + '020 of day.	☉'s trop. long. in seconds.	Eqn. of time in seconds.	Long. + 2,264° = + '081 of day.	☉'s trop. long. in seconds.	Eqn. of time in seconds.	Long. + 1,544° = + '018 of day.		
Total correctn. as fraction of a day.																
Indore.																
A.D. 1000—1400.																
247	+166	-1786	- '022	+166	-1800	- '033	+167	-2016	- '005	+167	-2134	+ '005	26	+168	-2245	- '010
248	156	1817	...	156	1931	- '034	157	2047	...	157	2168	+ '004	27	158	2278	...
249	146	1848	- '028	146	1963	- '035	147	2079	...	147	2190	...	28	148	2312	...
250	136	1878	...	136	1994	...	187	2111	- '006	187	2231	+ '003	29	188	2345	- '011
251	128	1909	- '024	128	2025	...	127	2143	- '007	127	2264	...	30	128	2378	- '012
252	116	1939	...	116	2056	- '036	117	2175	...	117	2296	+ '002	1	118	2412	...
253	106	1970	- '025	106	2087	...	107	2207	...	107	2329	...	2	108	2445	...
254	96	2001	...	96	2118	- '037	97	2239	- '008	97	2361	+ '001	3	98	2478	- '013
255	86	2031	- '026	86	2149	...	87	2271	- '009	87	2394	...	4	88	2512	- '014
256	76	2062	...	76	2180	- '038	77	2303	...	77	2426	- '000	5	78	2545	...
Nov.																
257	66	2092	...	66	2211	- '039	67	2335	...	67	2459	...	6	68	2578	...
258	56	2123	- '027	56	2242	...	57	2366	- '010	57	2491	- '001	7	58	2612	- '015
259	45	2154	- '028	45	2274	- '040	46	2398	- '011	46	2524	...	8	47	2645	...
260	35	2184	...	35	2305	...	36	2430	...	36	2556	...	9	37	2678	- '016
261	25	2215	...	25	2336	...	26	2462	...	26	2589	- '002	10	27	2711	...
262	15	2245	- '029	15	2367	- '041	16	2494	- '012	16	2621	...	11	17	2745	- '017
263	2	2276	- '030	2	2398	...	2	2526	- '013	2	2654	- '003	12	2	2778	- '018
264	- 11	2307	...	- 11	2429	...	- 11	2558	...	- 11	2686	...	13	- 11	2811	...
265	20	2337	...	21	2460	...	21	2590	...	21	2719	...	14	21	2846	...
266	38	2368	...	38	2491	...	34	2622	...	34	2751	...	15	36	2878	...
December.																
267	43	2398	...	43	2522	...	44	2654	...	44	2784	- '004	16	45	2911	...
268	53	2429	...	53	2553	...	54	2685	...	54	2816	...	17	55	2944	...
269	64	2460	...	64	2585	...	65	2717	...	65	2849	...	18	66	2978	...
270	74	2490	...	74	2616	- '042	75	2749	- '014	75	2881	- '005	19	76	3011	- '019
271	85	2521	- '041	85	2647	- '043	86	2781	...	86	2914	...	20	87	3044	...
272	95	2551	...	95	2678	...	96	2813	...	96	2946	...	21	97	3078	...
273	100	2582	...	100	2709	...	100	2845	...	100	2979	...	22	100	3111	...
274	101	2612	...	101	2740	...	101	2876	...	101	3012	...	23	101	3144	...
275	107	2616	...	107	2744	...	107	2879	...	107	3014	...	24	107	3146	...
January.																
276	113	2621	...	113	2748	...	113	2882	...	113	3017	...	25	113	3147	...
277	120	2625	...	120	2752	...	119	2885	...	119	3019	...	26	119	3149	...
278	126	2630	...	126	2756	...	126	2888	- '015	125	3022	...	27	125	3150	...
279	132	2634	- '082	132	2759	- '044	132	2891	...	131	3024	...	28	131	3152	...
280	139	2638	...	139	2763	...	138	2895	...	137	3026	...	29	137	3154	...
281	145	2643	...	145	2767	...	144	2898	...	143	3029	...	30	143	3155	...
282	151	2647	...	151	2771	- '045	151	2901	...	149	3031	...	31	149	3157	...
283	158	2652	...	158	2775	...	157	2904	...	155	3034	...	1	155	3158	...
284	164	2656	...	164	2779	...	163	2907	- '016	161	3036	...	2	161	3160	...
285	170	2660	- '083	170	2783	...	169	2910	...	167	3038	...	3	167	3162	...
February.																
286	177	2665	...	177	2787	...	176	2913	...	173	3041	- '006	4	173	3163	...
287	183	2669	...	183	2791	...	182	2916	...	179	3043	...	5	179	3165	...
288	189	2674	...	189	2795	...	188	2919	...	185	3046	...	6	185	3166	...
289	196	2678	- '034	196	2798	...	194	2922	...	191	3048	...	7	191	3168	...
290	202	2682	...	202	2802	...	201	2926	...	197	3050	...	8	197	3170	...
291	208	2687	...	208	2806	...	207	2929	...	203	3053	...	9	203	3171	...
292	215	2691	...	215	2810	...	213	2932	...	209	3055	...	10	209	3173	...
293	221	2696	...	221	2814	...	219	2935	...	215	3058	...	11	215	3174	...
294	227	2700	...	227	2818	...	226	2938	- '017	221	3060	- '007	12	221	3176	...
295	234	2704	...	234	2822	...	232	2941	...	227	3062	...	13	227	3178	- '020
March.																
296	240	2709	...	240	2826	...	238	2944	- '016	233	3065	...	14	233	3179	...
297	246	2713	- '083	246	2830	...	244	2947	...	239	3067	- '006	15	239	3181	...
298	253	2718	...	253	2834	- '044	251	2950	- '015	245	3070	...	16	245	3182	...
299	259	2722	...	259	2838	...	257	2953	...	251	3072	- '005	17	251	3184	- '019
300	265	2726	...	265	2841	...	263	2957	...	258	3074	...	18	257	3186	...
301	272	2731	- '032	272	2845	...	269	2960	...	265	3077	...	19	263	3187	...
302	278	2735	...	278	2849	- '043	276	2963	- '014	272	3079	- '004	20	270	3189	...
303	284	2740	...	284	2853	...	282	2966	...	279	3082	...	21	277	3190	- '018
304	292	2744	- '081	290	2856	- '042	288	2968	- '013	285	3084	- '008	22	283	3192	...
305	294	2711	...	292	2822	...	290	2982	...	287	3046	...	23	285	3158	- '017

TABLE III.—Sunrise from 23° to 27° latitude—cont.

Day of solar year.	Lat. 23°			Lat. 24°			Lat. 25°			Lat. 26°			Lat. 27°		
	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. = 20° = +000 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. = 876" = +010 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. = 1,736" = +020 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. = 2,264" = +031 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. = 1,544" = +018 of day.
			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.
306	297	2678	...	295	2787	...	293	2836	...	290	2909	...	288	3114	...
307	300	2646	...	297	2758	...	295	2860	...	292	2971	...	290	3074	...
308	303	2613	...	300	2718	...	298	2824	...	295	2933	...	293	3035	...
309	305	2580	...	302	2684	...	300	2788	...	297	2895	...	295	2996	...
310	308	2547	...	305	2650	...	303	2752	...	300	2858	...	298	2957	...
311	311	2514	...	307	2615	...	305	2716	...	302	2820	...	300	2918	...
312	314	2482	...	310	2581	...	308	2680	...	305	2782	...	303	2878	...
313	316	2449	...	312	2546	...	310	2644	...	307	2745	...	305	2839	...
314	319	2416	...	315	2512	...	313	2608	...	310	2707	...	308	2800	...
315	322	2383	...	317	2478	...	315	2572	...	312	2669	...	310	2761	...
316	325	2350	...	320	2443	...	318	2536	...	315	2632	...	313	2722	...
317	327	2318	...	322	2409	...	320	2500	...	317	2594	...	315	2682	...
318	330	2285	...	325	2374	...	323	2464	...	320	2556	...	318	2643	...
319	333	2252	...	327	2340	...	325	2428	...	322	2518	...	320	2604	...
320	336	2219	...	330	2306	...	328	2392	...	325	2481	...	323	2565	...
321	338	2196	...	332	2271	...	330	2356	...	327	2443	...	325	2526	...
322	341	2154	...	335	2237	...	333	2320	...	330	2405	...	328	2486	...
323	344	2121	...	337	2202	...	335	2284	...	332	2368	...	330	2447	...
324	347	2088	...	340	2168	...	338	2248	...	335	2330	...	333	2408	...
325	349	2055	...	342	2134	...	340	2212	...	337	2292	...	335	2369	...
326	352	2022	...	345	2099	...	343	2176	...	340	2255	...	338	2330	...
327	355	1990	...	347	2065	...	345	2140	...	342	2217	...	340	2290	...
328	358	1957	...	350	2030	...	348	2104	...	345	2179	...	343	2251	...
329	360	1924	...	353	1996	...	350	2068	...	347	2141	...	345	2212	...
330	363	1891	...	356	1962	...	353	2032	...	350	2104	...	348	2173	...
331	366	1858	...	359	1927	...	355	1996	...	352	2066	...	350	2134	...
332	369	1826	...	362	1893	...	358	1960	...	355	2028	...	353	2094	...
333	371	1793	...	365	1858	...	361	1924	...	357	1991	...	355	2055	...
334	374	1760	...	368	1824	...	364	1888	...	360	1953	...	357	2016	...
335	376	1728	...	371	1788	...	367	1852	...	363	1916	...	359	1978	...
336	376	1670	...	371	1728	...	367	1790	...	363	1852	...	359	1910	...
337	377	1613	...	372	1669	...	368	1729	...	364	1788	...	360	1844	...
338	377	1555	...	372	1609	...	368	1667	...	364	1724	...	360	1779	...
339	378	1498	...	373	1550	...	369	1605	...	365	1660	...	361	1712	...
340	378	1440	...	373	1490	...	369	1543	...	365	1596	...	361	1646	...
341	379	1382	...	374	1430	...	370	1482	...	366	1533	...	362	1581	...
342	379	1325	...	374	1371	...	370	1420	...	366	1469	...	362	1516	...
343	380	1267	...	375	1311	...	371	1358	...	367	1405	...	363	1449	...
344	380	1210	...	375	1252	...	371	1297	...	367	1341	...	363	1388	...
345	381	1152	...	376	1192	...	372	1235	...	368	1277	...	364	1317	...
346	381	1094	...	376	1132	...	372	1173	...	368	1213	...	364	1251	...
347	382	1037	...	377	1073	...	373	1112	...	369	1149	...	365	1185	...
348	382	979	...	377	1013	...	373	1050	...	369	1085	...	365	1119	...
349	383	922	...	378	954	...	374	988	...	370	1021	...	366	1053	...
350	383	864	...	378	894	...	374	926	...	370	957	...	366	987	...
351	384	806	...	379	834	...	375	865	...	371	894	...	367	922	...
352	384	749	...	379	775	...	375	803	...	371	829	...	367	856	...
353	385	691	...	380	715	...	376	741	...	372	766	...	368	790	...
354	385	634	...	380	656	...	376	670	...	372	702	...	368	724	...
355	386	576	...	381	596	...	377	618	...	373	638	...	369	659	...
356	386	518	...	381	536	...	377	556	...	373	574	...	369	592	...
357	387	461	...	382	477	...	378	495	...	374	510	...	370	526	...
358	387	403	...	382	417	...	378	433	...	374	446	...	370	460	...
359	388	346	...	383	358	...	379	371	...	375	382	...	371	394	...
360	388	288	...	383	298	...	379	309	...	375	318	...	371	328	...
361	389	230	...	384	238	...	380	248	...	376	255	...	372	263	...
362	389	172	...	384	179	...	380	186	...	376	191	...	372	197	...
363	390	115	...	385	119	...	381	125	...	377	127	...	373	131	...
364	390	58	...	385	60	...	381	63	...	377	64	...	373	65	...
365	391	0	...	386	0	...	382	0	...	378	0	...	374	0	...

TABLE III.—Sunrise from 28° to 32° N. latitude.

Day of solar year.	Lat. 28° Long. + 460" = + 005 of day.			Lat. 29° Long. + 352" = + 004 of day.			Lat. 30° Long. + 152" = + 002 of day.			Lat. 31° Long. + 382" = + 004 of day.			Lat. 32° Long. + 348" = + 004 of day.				
	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Mathura.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Delhi.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Patiala.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Simla.	Eng. date.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Lahore.	
	A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.				A.D. 1000— 1400.			
1	—387	+ 68	+ 009	—862	+ 70	+ 009	—357	+ 72	+ 007	—353	+ 75	+ 009	March.	25	—348	+ 77	+ 002
2	364	136	+ 010	360	140	+ 010	355	145	+ 008	351	149	+ 010		26	346	154	+ 003
3	368	204	+ 011	359	210	+ 011	354	217	+ 009	350	224	+ 011		27	345	230	+ 004
4	362	272	+ 012	358	280	...	353	290	+ 010	348	298	+ 012		28	344	307	+ 005
5	360	341	...	356	351	+ 012	351	362	+ 011	347	373	+ 013		29	342	384	+ 006
6	359	409	+ 013	354	421	+ 013	349	434	...	345	447	...		30	340	461	...
7	357	477	+ 014	352	491	+ 014	348	507	+ 012	343	522	+ 014		31	339	538	+ 007
8	355	545	+ 015	351	561	+ 015	346	580	+ 013	341	596	+ 015		1	337	614	+ 008
9	353	613	...	348	631	...	344	652	+ 014	339	671	+ 016		2	335	691	+ 009
10	351	681	+ 016	346	701	+ 016	342	724	+ 015	337	745	+ 017		3	333	768	+ 010
11	348	749	+ 017	344	771	+ 017	339	796	+ 016	335	820	+ 018	4	330	845	+ 011	
12	346	817	+ 018	342	841	...	337	869	...	333	894	+ 019	5	328	922	+ 012	
13	344	885	+ 019	339	911	+ 018	335	941	+ 017	331	969	+ 020	6	326	998	+ 013	
14	341	953	+ 020	337	981	+ 019	332	1014	+ 018	328	1043	...	7	324	1075	...	
15	338	1022	+ 021	334	1051	+ 020	329	1086	+ 019	325	1118	+ 021	8	321	1152	+ 014	
16	335	1090	+ 022	331	1122	+ 021	327	1158	+ 020	323	1192	+ 022	9	318	1229	+ 015	
17	333	1158	...	328	1192	+ 022	324	1231	+ 021	320	1267	+ 023	10	316	1306	+ 016	
18	330	1228	+ 023	324	1262	+ 023	322	1308	...	318	1341	+ 024	11	314	1382	+ 017	
19	327	1294	+ 024	322	1332	+ 024	320	1376	+ 022	316	1416	+ 025	12	312	1459	+ 018	
20	325	1362	...	320	1402	...	318	1448	+ 023	314	1490	+ 026	13	310	1536	+ 019	
21	323	1430	+ 025	318	1472	+ 025	316	1520	...	312	1565	...	14	308	1613	...	
22	321	1498	...	316	1542	...	314	1593	+ 024	310	1639	+ 027	15	306	1690	+ 020	
23	319	1566	+ 026	314	1612	+ 026	312	1665	...	308	1714	...	16	304	1768	+ 021	
24	317	1634	...	312	1682	...	310	1738	+ 025	306	1788	+ 028	17	302	1843	...	
25	315	1703	+ 027	310	1752	+ 027	308	1810	...	304	1868	...	18	300	1920	+ 022	
26	313	1771	...	308	1822	...	306	1882	+ 026	302	1937	+ 029	April.	19	298	1987	...
27	311	1839	+ 028	306	1893	+ 028	304	1955	...	300	2012	+ 030		20	296	2074	+ 023
28	309	1907	...	304	1963	+ 029	302	2027	+ 027	298	2086	...		21	294	2150	...
29	307	1975	+ 029	302	2033	...	300	2099	+ 028	296	2161	+ 031		22	292	2227	+ 024
30	305	2044	...	300	2104	+ 030	298	2172	+ 029	294	2236	+ 032		23	290	2304	+ 025
31	303	2085	+ 030	298	2147	...	296	2216	...	292	2283	...		24	288	2352	...
32	301	2126	+ 031	296	2189	+ 031	294	2261	+ 030	290	2329	+ 033		25	286	2401	+ 026
33	299	2167	...	294	2232	...	292	2305	...	288	2378	...		26	284	2449	...
34	297	2208	+ 032	292	2275	+ 032	290	2350	+ 031	286	2422	+ 034		27	282	2498	+ 027
35	295	2248	...	290	2317	...	288	2394	...	284	2469	...		28	280	2546	...
36	293	2289	+ 033	288	2360	+ 033	286	2439	+ 032	282	2516	+ 035	29	278	2595	+ 028	
37	291	2330	...	286	2403	...	284	2483	...	280	2562	...	30	276	2643	+ 029	
38	289	2371	...	284	2446	+ 034	282	2528	+ 033	278	2609	+ 036	1	274	2692	...	
39	284	2412	+ 034	281	2488	...	278	2572	...	275	2655	...	2	272	2740	+ 030	
40	278	2453	...	275	2531	+ 035	278	2617	+ 034	270	2702	+ 037	3	267	2789	...	
41	273	2494	+ 035	270	2574	...	267	2661	...	264	2749	+ 038	4	262	2837	+ 031	
42	266	2535	...	264	2616	+ 036	261	2706	+ 035	258	2795	...	5	256	2886	+ 032	
43	261	2576	+ 036	258	2659	...	256	2750	+ 036	253	2842	+ 039	6	250	2934	...	
44	255	2617	+ 037	252	2702	+ 037	250	2795	...	247	2888	+ 040	7	245	2983	+ 033	
45	249	2657	...	246	2744	...	244	2839	+ 037	241	2935	...	8	239	3031	...	
46	243	2698	+ 038	241	2787	+ 038	238	2884	...	236	2982	+ 041	9	233	3080	+ 034	
47	237	2739	...	234	2830	+ 039	232	2928	+ 038	229	3028	...	10	227	3128	+ 035	
48	231	2780	+ 039	228	2873	...	226	2978	...	223	3075	+ 042	11	221	3177	+ 036	
49	224	2821	+ 040	222	2915	+ 040	220	3017	+ 039	217	3121	+ 043	12	215	3225	...	
50	218	2862	...	216	2958	...	214	3062	+ 040	211	3168	...	13	209	3274	+ 037	
51	211	2903	+ 041	209	3001	+ 041	207	3106	+ 041	205	3215	+ 044	May.	14	203	3322	...
52	205	2944	...	203	3043	...	201	3161	...	199	3261	...		15	197	3371	+ 038
53	198	2985	...	196	3086	...	194	3195	...	192	3309	...		16	190	3419	...
54	192	3026	...	190	3129	...	188	3240	...	186	3354	...		17	184	3468	...
55	185	3066	...	183	3171	...	181	3284	...	179	3401	...		18	178	3516	...
56	182	3107	...	181	3214	...	179	3329	...	176	3448	...		19	174	3565	...
57	178	3148	...	177	3257	...	175	3373	...	173	3494	...		20	170	3613	...
58	174	3189	...	173	3300	...	171	3418	...	170	3541	...		21	166	3662	...
59	170	3230	...	169	3342	...	167	3462	...	167	3587	...		22	162	3710	...
60	166	3271	...	165	3385	...	163	3507	...	164	3634	...		23	158	3759	...
61	162	3312	...	161	3428	...	159	3552	...	161	3680	...	24	154	3808	...	
62	158	3351	...	157	3468	...	155	3593	...	163	3681	...	25	150	3810	...	

TABLE III.—Sunrise from 28° to 32° N. latitude—cont.

Day of solar year.	Lat. 28°			Lat. 29°			Lat. 30°			Lat. 31°			Lat. 32°			
	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. + 460" = + '005 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. + 852" = + '004 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. + 152" = + '002 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. + 342" = + '004 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. + 348" = + '004 of day.	
			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.	
63	-154	+3310	+ '041	-153	+3428	+ '041	-151	+3558	+ '041	-153	+3683	+ '045	26	-146	+3813	+ '038
64	150	3309	...	149	3428	...	147	3554	...	146	3684	...	27	142	3815	...
65	141	3308	...	140	3427	...	140	3555	...	139	3686	...	28	139	3817	...
66	132	3306	+ '042	131	3427	+ '042	131	3555	+ '042	131	3687	...	29	130	3819	+ '039
67	123	3305	...	123	3427	...	122	3556	...	122	3689	...	30	121	3822	...
68	114	3304	...	114	3427	...	118	3557	...	118	3690	...	31	118	3824	...
69	105	3303	...	105	3427	...	104	3558	...	104	3692	...	1	104	3826	...
70	96	3302	...	96	3427	...	96	3558	...	95	3693	...	2	95	3829	...
71	87	3301	...	87	3427	...	87	3559	...	86	3695	...	3	86	3831	...
72	78	3300	...	78	3427	...	78	3560	...	77	3696	...	4	77	3833	...
73	69	3299	...	69	3426	...	69	3560	...	69	3698	...	5	68	3836	...
74	60	3298	...	60	3426	...	59	3561	...	59	3699	+ '046	6	59	3838	...
75	52	3297	...	52	3426	...	52	3562	...	51	3701	...	7	51	3840	...
76	41	3295	...	41	3426	...	41	3562	...	41	3702	...	8	41	3 42	+ '040
77	32	3294	...	32	3426	...	32	3563	...	32	3704	...	9	32	3845	...
78	23	3293	...	23	3426	...	23	3564	...	23	3705	...	10	23	3847	...
79	14	3292	...	14	3426	...	14	3565	...	14	3707	...	11	14	3849	...
80	5	3291	+ '043	5	3425	...	5	3565	...	5	3708	...	12	5	3852	...
81	+ 4	3290	...	+ 4	3425	...	+ 4	3566	+ '043	+ 4	3710	+ '047	13	+ 4	3854	+ '041
82	13	3289	...	13	3425	...	13	3567	...	13	3711	...	14	13	3856	...
83	22	3288	+ '042	22	3425	...	22	3567	...	22	3713	+ '046	15	22	3859	+ '040
84	32	3287	...	32	3425	+ '043	31	3568	+ '042	31	3714	...	16	31	3861	...
85	41	3286	...	41	3425	...	41	3569	...	41	3716	...	17	41	3863	+ '039
86	50	3284	...	50	3425	+ '042	50	3569	...	49	3717	...	18	49	3865	...
87	59	3283	+ '041	59	3425	...	58	3570	...	58	3719	+ '045	19	58	3868	...
88	68	3282	...	68	3424	+ '041	68	3570	+ '041	67	3720	...	20	67	3870	...
89	77	3281	...	77	3424	...	77	3571	...	76	3722	+ '044	21	76	3872	+ '038
90	86	3280	...	86	3424	...	85	3572	...	85	3723	...	22	85	3875	...
91	109	3280	+ '040	109	3424	...	109	3572	+ '040	110	3724	...	23	110	3876	...
92	119	3246	...	119	3389	+ '040	120	3538	...	120	3688	...	24	120	3839	+ '037
93	129	3212	...	129	3355	...	130	3501	...	130	3652	...	25	131	3802	...
94	139	3178	...	140	3320	...	140	3465	...	140	3615	+ '043	26	141	3765	...
95	149	3144	+ '039	150	3285	...	150	3430	+ '039	150	3579	...	27	151	3728	...
96	159	3110	...	160	3250	+ '039	160	3394	...	161	3543	+ '042	28	161	3691	+ '036
97	169	3077	...	170	3216	...	170	3359	...	171	3507	...	29	171	3654	...
98	179	3043	...	180	3181	...	180	3323	...	181	3471	...	30	181	3617	...
99	189	3009	+ '038	190	3146	...	191	3288	+ '038	191	3431	...	1	192	3580	+ '035
100	199	2975	...	199	3112	+ '038	200	3252	...	201	3398	+ '041	2	201	3543	...
101	209	2941	+ '037	209	3077	+ '037	210	3217	...	210	3362	...	3	211	3509	...
102	218	2907	...	219	3042	...	220	3281	+ '037	220	3326	...	4	221	3469	...
103	228	2873	...	229	3008	...	229	3146	...	230	3290	...	5	231	3432	...
104	238	2839	+ '036	238	2973	...	239	3110	...	240	3253	+ '040	6	241	3395	+ '034
105	247	2805	...	248	2938	...	249	3075	+ '036	249	3217	...	7	250	3358	...
106	257	2771	...	257	2903	...	258	3039	...	259	3181	...	8	260	3321	+ '033
107	266	2738	...	266	2869	+ '036	267	3004	...	268	3145	+ '039	9	269	3284	...
108	275	2704	...	276	2834	...	277	2968	+ '035	277	3109	...	10	278	3247	...
109	284	2670	+ '035	285	2799	...	286	2933	...	287	3072	+ '038	11	287	3210	+ '032
110	293	2636	...	294	2765	+ '035	295	2897	...	296	3036	...	12	296	3173	...
111	302	2602	...	303	2730	...	304	2862	...	304	3000	...	13	305	3136	...
112	311	2568	+ '034	312	2695	...	313	2826	+ '034	314	2964	...	14	314	3099	+ '031
113	320	2534	...	320	2661	...	321	2791	...	322	2928	+ '037	15	323	3062	...
114	329	2500	...	330	2626	+ '034	330	2755	+ '033	331	2891	...	16	332	3025	+ '030
115	337	2466	+ '033	338	2591	...	339	2720	...	340	2855	...	17	341	2988	...
116	345	2432	...	346	2556	+ '033	347	2684	...	348	2819	+ '036	18	349	2951	+ '029
117	353	2399	...	354	2522	...	355	2649	+ '032	357	2783	...	19	358	2914	...
118	362	2365	+ '032	363	2487	+ '032	364	2613	...	365	2747	+ '035	20	366	2877	+ '028
119	370	2331	...	371	2452	...	372	2578	+ '031	373	2710	...	21	374	2840	...
120	378	2297	...	379	2418	...	380	2542	...	381	2674	+ '034	22	382	2803	+ '027
121	394	2263	+ '031	396	2383	...	399	2507	...	402	2638	...	23	399	2766	...
122	402	2228	...	405	2348	+ '031	407	2472	+ '030	410	2600	+ '033	24	413	2728	...
123	409	2187	+ '030	413	2305	+ '030	415	2427	...	418	2563	...	25	421	2679	+ '026
124	417	2146	...	421	2262	...	423	2383	+ '029	426	2508	+ '032	26	429	2630	...
125	424	2105	+ '029	428	2220	...	430	2338	...	433	2460	...	27	436	2582	+ '025

TABLE III.—Sunrise from 28° to 32° N. latitude—cont.

Day of solar year.	Lat. 28°			Lat. 29°			Lat. 30°			Lat. 31°			Lat. 32°				
	Eqn. of time in seconds	☉'s trop. long. in seconds	Long. + 460" = + '005 of day.	Eqn. of time in seconds	☉'s trop. long. in seconds	Long. + 352" = + '004 of day.	Eqn. of time in seconds	☉'s trop. long. in seconds	Long. + 152" = + '002 of day.	Eqn. of time in seconds	☉'s trop. long. in seconds	Long. + 882" = + '004 of day.	Eqn. of time in seconds	☉'s trop. long. in seconds	Long. + 848" = + '004 of day.		
	A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.				
126	+ 483	+ 2064	+ '029	+ 436	+ 2177	+ '029	+ 488	+ 2293	+ '029	+ 441	+ 2413	+ '032	July.	28	+ 444	+ 2533	+ '025
127	440	2023	...	444	2134	...	445	2248	+ '028	449	2306	+ '031		29	452	2484	+ '024
128	447	1983	...	451	2091	+ '028	453	2204	...	456	2319	...		30	459	2435	...
129	454	1942	+ '028	458	2048	...	460	2159	+ '027	463	2272	+ '030		31	466	2386	+ '023
130	461	1901	...	465	2006	+ '027	467	2114	...	470	2226	...		1	473	2338	...
131	467	1860	+ '027	471	1963	...	474	2070	...	477	2179	...		2	480	2289	...
132	473	1819	...	477	1920	...	481	2025	+ '026	484	2132	+ '029	3	487	2240	+ '022	
133	480	1778	...	484	1877	+ '026	488	1980	...	491	2085	...	4	494	2191	+ '021	
134	486	1737	+ '026	490	1834	...	494	1986	+ '025	497	2038	+ '028	5	500	2142	...	
135	492	1696	...	496	1792	+ '025	500	1891	+ '024	503	1992	+ '027	6	506	2094	+ '020	
136	498	1655	+ '025	502	1749	...	506	1846	...	509	1945	...	7	512	2045	...	
137	504	1614	...	508	1706	+ '024	512	1801	+ '023	515	1898	...	8	518	1996	...	
138	510	1574	+ '024	514	1668	...	518	1757	...	521	1851	+ '026	9	524	1947	+ '019	
139	516	1533	...	520	1620	...	524	1712	...	527	1804	...	10	530	1898	...	
140	521	1492	...	525	1578	+ '023	529	1667	+ '022	532	1758	+ '025	11	535	1850	+ '018	
141	526	1451	+ '023	530	1535	...	534	1624	...	538	1711	...	12	541	1801	...	
142	531	1410	...	536	1492	+ '022	539	1578	+ '021	543	1664	+ '024	13	546	1752	+ '017	
143	536	1369	+ '022	540	1449	...	544	1533	...	548	1617	...	14	551	1703	+ '016	
144	541	1328	...	545	1406	...	549	1489	+ '020	553	1570	+ '023	15	556	1654	...	
145	546	1287	...	550	1364	+ '021	554	1444	...	558	1524	...	16	561	1606	+ '015	
146	550	1246	+ '021	554	1321	...	558	1399	...	562	1477	...	August.	17	566	1557	...
147	554	1205	...	558	1278	+ '020	562	1354	+ '019	566	1430	+ '022		18	571	1508	...
148	556	1165	+ '020	560	1235	...	564	1310	...	568	1383	...		19	574	1459	+ '014
149	558	1124	...	562	1192	...	566	1265	...	570	1338	+ '021		20	576	1410	...
150	560	1083	...	564	1150	...	568	1220	+ '018	572	1290	...		21	578	1362	...
151	562	1042	...	566	1107	+ '019	570	1176	...	574	1243	+ '020		22	580	1313	+ '013
152	564	1000	...	568	1064	...	572	1132	...	576	1196	...	23	582	1264	...	
153	566	958	+ '019	570	1020	+ '018	574	1095	+ '017	578	1157	...	24	584	1223	+ '012	
154	568	916	...	572	975	...	576	1059	...	580	1119	+ '019	25	586	1182	...	
155	570	873	+ '018	574	931	...	578	1022	+ '016	582	1080	...	26	588	1142	...	
156	572	831	...	576	889	+ '017	580	986	...	586	1042	+ '018	27	590	1101	+ '011	
157	574	789	...	578	847	...	583	949	+ '015	587	1003	...	September.	28	592	1060	...
158	577	747	+ '017	581	805	...	586	913	...	590	964	+ '017		29	595	1019	+ '010
159	579	705	...	583	763	+ '016	588	876	...	592	926	...		30	597	978	...
160	581	663	...	585	721	...	590	840	...	594	887	...		31	599	938	+ '009
161	583	621	+ '016	587	679	...	592	803	+ '014	596	849	...		1	601	897	...
162	584	579	...	589	637	+ '015	593	767	...	597	810	+ '016		2	602	856	+ '008
163	586	537	...	590	595	...	595	730	+ '013	599	771	...	3	604	815	...	
164	588	495	+ '015	592	553	+ '014	597	694	...	601	733	+ '015	4	606	774	...	
165	589	451	...	593	511	...	598	657	...	602	694	...	5	607	734	+ '007	
166	589	409	+ '014	593	469	+ '013	598	621	+ '012	602	656	+ '014	6	607	693	...	
167	590	367	...	594	427	...	599	584	...	603	617	...	7	608	652	+ '006	
168	591	325	...	595	385	...	600	548	+ '011	604	578	+ '013	8	609	611	...	
169	592	283	+ '013	596	343	+ '012	601	511	...	605	540	...	9	610	570	+ '005	
170	592	240	...	596	301	...	601	475	+ '010	605	501	...	10	610	530	...	
171	592	198	...	596	259	...	601	438	...	605	463	+ '012	11	610	489	+ '004	
172	592	156	+ '012	596	217	+ '011	601	402	...	605	424	...	12	610	448	...	
173	592	114	+ '011	596	175	+ '010	601	365	+ '009	605	385	+ '011	13	610	407	+ '003	
174	592	72	+ '010	596	133	...	601	329	...	605	347	...	14	610	366	...	
175	592	29	...	596	91	...	601	292	+ '008	605	308	+ '010	15	610	326	+ '002	
176	592	-13	...	596	49	...	601	256	...	605	270	...	16	610	285	...	
177	591	195	+ '009	595	206	+ '009	600	219	...	604	231	+ '009	17	609	244	+ '001	
178	590	153	...	594	174	...	599	183	+ '007	603	192	...	18	605	203	...	
179	589	111	+ '008	593	138	+ '008	598	146	...	602	154	+ '008	19	607	162	+ '000	
180	588	69	...	592	104	...	597	110	+ '006	601	115	...	20	608	122	...	
181	586	27	...	590	62	+ '007	595	73	...	599	77	...	21	604	81	+ '001	
182	585	-15	+ '007	589	20	...	594	37	+ '005	598	38	+ '007	22	603	40	...	
183	584	-73	...	588	-22	...	593	0	...	598	0	...	23	603	0	+ '002	
184	582	-138	...	586	-35	+ '006	591	-38	+ '004	596	-40	+ '006	24	601	-42	...	
185	580	-187	+ '006	584	-71	...	589	-75	...	594	-80	...	25	599	-84	+ '003	
186	578	-245	...	582	-129	+ '005	587	-113	+ '003	592	-120	+ '005	26	597	-126	...	

TABLE III.—Sunrise from 28° to 32° N. latitude—cont.

Day of solar year.	Lat. 28°			Lat. 29°			Lat. 30°			Lat. 31°			Lat. 32°				
	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correct'n. as fraction of a day. Mathura.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correct'n. as fraction of a day. Delhi.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correct'n. as fraction of a day. Patiala.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correct'n. as fraction of a day. Simla.	Eng. date.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correct'n. as fraction of a day. Lahore.	
	A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.				A.D. 1000— 1400.			
187	+576	-133	+ '005	+ 580	-142	+ '005	+ 585	-151	+ '003	+ 590	-160	+ '005	Sep	27	+595	-168	- '004
188	573	166	...	577	177	...	582	188	...	587	199	+ '004		28	592	210	...
189	570	200	...	574	213	+ '004	579	226	+ '002	584	239	...		29	589	253	- '005
190	567	233	+ '004	571	248	...	576	264	...	581	279	+ '003		30	586	295	...
191	564	266	...	568	284	+ '003	573	302	+ '001	578	319	...		1	583	337	- '006
192	561	300	...	565	319	...	570	339	...	575	359	+ '002		2	580	379	...
193	557	333	...	561	355	...	566	377	'000	571	399	...	3	576	421	...	
194	554	366	...	558	390	+ '002	562	415	...	568	439	...	4	573	463	- '007	
195	550	400	+ '003	554	426	...	559	452	- '001	564	479	+ '001	5	569	505	...	
196	546	433	...	550	461	+ '001	555	490	...	560	519	...	6	565	517	- '008	
197	542	466	...	546	497	...	551	528	- '002	556	559	- '000	October	7	561	589	- '009
198	538	499	+ '002	542	532	...	547	565	...	552	598	- '001		8	557	631	...
199	534	533	...	538	568	'000	543	603	- '003	548	638	...		9	553	674	- '010
200	529	566	+ '001	533	603	...	538	641	...	543	678	...		10	548	716	...
201	524	599	...	528	639	- '001	533	679	- '004	538	718	+ '002		11	543	758	- '011
202	520	633	'000	524	674	- '002	529	716	...	534	758	- '003		12	539	800	...
203	515	666	...	519	710	...	524	754	- '005	529	798	...	13	534	842	- '012	
204	509	699	- '001	513	745	- '003	518	792	...	523	838	- '004	14	528	884	...	
205	504	733	...	508	781	...	513	829	- '006	518	878	- '005	15	523	926	- '013	
206	499	766	- '002	503	816	- '004	508	867	...	513	918	...	16	518	968	- '014	
207	495	799	...	499	852	...	504	905	- '007	509	958	- '006	November	17	514	1010	- '015
208	489	832	- '003	493	887	- '005	498	942	...	503	997	...		18	508	1052	...
209	483	866	...	487	923	...	492	980	- '008	497	1037	- '007		19	502	1095	- '016
210	477	899	- '004	481	958	...	486	1018	...	491	1077	...		20	496	1137	...
211	471	932	- '005	477	994	- '006	480	1056	- '009	485	1117	- '008		21	490	1179	- '017
212	468	966	...	473	1029	- '007	474	1093	- '010	479	1157	- '009		22	483	1221	...
213	465	1000	- '006	469	1064	...	473	1132	...	478	1196	- '010	23	481	1264	- '018	
214	462	1041	...	465	1107	- '008	467	1177	'011	471	1243	- '011	24	474	1313	- '019	
215	455	1082	- '007	458	1150	...	460	1221	- '012	464	1290	...	25	467	1362	- '020	
216	448	1123	...	451	1192	- '009	453	1266	...	457	1336	- '012	26	460	1410	...	
217	441	1164	...	444	1235	...	446	1311	- '013	450	1388	- '013	December	27	453	1459	- '021
218	434	1204	- '008	437	1278	- '010	439	1355	- '014	443	1430	...		28	446	1508	...
219	426	1245	...	429	1321	- '011	431	1400	...	435	1477	- '014		29	438	1557	- '022
220	419	1286	- '009	422	1364	...	424	1445	- '015	428	1524	...		30	431	1606	- '023
221	411	1327	...	414	1406	- '012	416	1490	...	420	1570	- '015		31	423	1654	- '024
222	403	1368	- '010	406	1449	...	408	1534	- '016	412	1617	- '016		1	415	1703	...
223	395	1409	- '011	398	1492	- '013	400	1579	- '017	404	1664	...	2	407	1752	- '025	
224	387	1450	- '012	390	1535	...	392	1624	...	396	1711	- '017	3	399	1801	- '026	
225	379	1491	...	382	1578	- '014	384	1668	- '018	388	1758	- '018	4	391	1850	...	
226	371	1532	- '013	374	1620	- '015	376	1713	...	380	1804	...	5	383	1898	- '027	
227	362	1573	...	365	1663	...	367	1758	- '019	371	1851	- '019	January	6	374	1947	...
228	354	1613	- '014	357	1706	- '016	359	1802	...	363	1898	- '020		7	366	1996	- '028
229	345	1654	...	348	1749	- '017	350	1847	- '020	354	1945	...		8	357	2045	- '029
230	338	1695	- '015	339	1792	...	341	1892	- '021	345	1992	- '021		9	348	2094	- '030
231	327	1736	...	330	1834	- '018	332	1937	...	336	2088	...		10	339	2142	...
232	318	1777	- '016	321	1877	...	323	1981	- '022	327	2085	- '022		11	330	2191	- '031
233	309	1818	- '017	312	1920	- '019	314	2026	- '023	318	2132	- '023	12	321	2240	...	
234	299	1859	...	302	1963	- '020	304	2071	...	308	2179	...	13	311	2289	- '032	
235	290	1900	- '018	293	2006	...	295	2115	- '024	299	2226	- '024	14	302	2338	- '033	
236	281	1941	...	284	2048	- '021	286	2160	...	290	2272	...	15	293	2386	...	
237	272	1982	- '019	275	2091	...	277	2205	- '025	281	2319	- '025	February	16	284	2435	...
238	262	2022	- '020	265	2134	- '022	267	2249	- '026	271	2366	- '026		17	274	2484	- '034
239	252	2063	...	255	2177	...	257	2294	...	261	2413	...		18	264	2533	...
240	243	2104	...	246	2220	- '023	248	2339	...	252	2460	...		19	255	2582	- '035
241	233	2145	- '021	236	2262	...	238	2384	- '027	242	2506	- '027		20	244	2630	...
242	223	2186	- '022	226	2305	- '024	228	2428	- '028	232	2553	- '028		21	234	2679	- '036
243	207	2228	...	208	2348	...	208	2472	...	209	2600	...	22	210	2728	- '037	
244	198	2269	...	199	2388	- '025	199	2507	...	200	2636	- '029	23	201	2775	- '038	
245	188	2296	- '028	189	2417	- '026	189	2543	- '029	190	2672	...	24	191	2802	...	
246	178	2330	- '024	179	2452	...	179	2578	- '030	180	2709	- '030	25	181	2839	- '039	

TABLE III.—Sunrise from 28° to 32° N. latitude—cont.

Day of solar year.	Lat. 28			Lat. 29			Lat. 30			Lat. 31			Lat. 32				
	E ^{qn.} of time in seconds.	☉'s trop. long. in seconds.	Long. +460" = + '005 of day.	E ^{qn.} of time in seconds.	☉'s trop. long. in seconds.	Long. +452" = + '004 of day.	E ^{qn.} of time in seconds.	☉'s trop. long. in seconds.	Long. +452" = + '002 of day.	E ^{qn.} of time in seconds.	☉'s trop. long. in seconds.	Long. +432" = + '004 of day.	E ^{qn.} of time in seconds.	☉'s trop. long. in seconds.	Long. +348" = - '004 of day.		
			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.		
247	+188	-2364	- '024	+169	-2487	- '027	+169	-2614	- '030	+170	-2745	- '030	November.	26	+171	-2876	- '039
248	158	2397	...	159	2521	...	159	2649	- '031	160	2781	- '...		27	161	2918	- '040
249	148	2481	- '025	149	2556	...	149	2685	...	150	2817	- '031		28	151	2950	...
250	138	2465	- '026	139	2591	- '028	139	2720	- '032	140	2853	- '032		29	141	2987	- '041
251	128	2499	...	129	2626	- '029	129	2756	...	130	2890	...		30	131	3024	- '042
252	118	2583	...	119	2660	...	119	2791	- '033	120	2926	...		1	121	3061	...
253	108	2567	- '027	109	2695	- '030	109	2827	...	110	2962	- '033	2	111	3098	...	
254	98	2601	- '028	99	2730	...	99	2862	- '034	100	2998	...	3	101	3135	- '043	
255	88	2685	...	89	2764	- '031	89	2895	...	90	3034	- '034	4	91	3172	- '044	
256	78	2689	...	79	2799	...	79	2933	- '035	80	3071	...	5	81	3209	- '045	
257	68	2703	- '029	69	2834	- '032	69	2969	...	70	3107	- '035	6	71	3246	...	
258	58	2786	- '030	59	2868	- '033	59	3004	- '036	60	3143	- '036	7	61	3283	- '046	
259	47	2770	...	48	2903	...	48	3040	- '037	49	3179	...	8	50	3320	...	
260	37	2804	- '031	38	2938	...	38	3075	...	39	3215	- '037	9	40	3357	...	
261	27	2838	...	28	2973	- '034	28	3111	...	29	3252	...	10	30	3394	- '047	
262	17	2872	...	18	3007	- '035	18	3146	- '038	19	3288	- '038	11	20	3431	...	
263	2	2906	- '032	2	3042	...	2	3182	...	2	3324	...	12	4	3468	- '048	
264	-11	2940	- '033	-11	3077	...	-11	3217	- '039	-11	3360	- '039	13	-12	3505	- '049	
265	21	2974	...	21	3111	...	21	3253	- '040	21	3396	...	14	28	3542	...	
266	35	3008	...	36	3146	...	36	3283	...	37	3433	...	15	38	3579	...	
267	45	3042	...	46	3181	- '036	46	3324	...	47	3469	...	December.	16	48	3616	...
268	55	3075	...	56	3215	...	56	3359	...	57	3506	...		17	58	3653	...
269	66	3109	...	67	3250	...	67	3395	...	68	3541	...		18	69	3690	...
270	76	3143	...	77	3285	...	77	3430	...	78	3577	...		19	79	3727	...
271	87	3177	...	88	3320	...	88	3468	...	89	3614	...		20	90	3764	...
272	97	3211	...	98	3354	...	98	3501	...	99	3650	...		21	100	3801	...
273	107	3245	...	108	3390	...	108	3537	...	109	3686	...	22	110	3838	...	
274	100	3280	...	100	3424	...	100	3572	...	98	3724	...	23	98	3876	...	
275	106	3281	...	106	3424	...	106	3571	...	104	3722	...	24	104	3874	...	
276	112	3282	...	112	3424	...	112	3571	...	110	3721	...	25	110	3871	...	
277	118	3283	...	118	3424	...	118	3570	...	116	3719	...	26	116	3869	- '050	
278	124	3284	...	124	3424	...	124	3569	...	122	3718	...	27	122	3867	...	
279	130	3285	- '034	130	3425	- '037	130	3568	...	128	3716	- '040	28	128	3864	...	
280	136	3287	...	136	3425	...	136	3568	...	134	3715	...	29	134	3862	...	
281	142	3288	...	142	3425	...	142	3567	...	140	3713	...	30	140	3860	...	
282	148	3289	...	148	3425	...	148	3566	...	146	3712	...	31	146	3858	...	
283	154	3290	...	154	3425	...	154	3566	...	152	3710	...	1	152	3856	...	
284	160	3291	...	160	3425	...	160	3565	...	158	3709	...	2	158	3853	...	
285	166	3292	...	166	3425	...	166	3564	...	164	3707	...	3	164	3850	...	
286	172	3293	...	172	3426	...	172	3564	...	170	3706	...	4	170	3848	...	
287	178	3294	...	178	3426	...	178	3563	...	176	3704	...	5	176	3846	...	
288	184	3295	...	184	3426	...	184	3562	...	182	3703	...	6	182	3844	...	
289	190	3296	...	190	3426	...	190	3561	...	188	3701	...	7	188	3841	...	
290	196	3298	...	196	3426	...	196	3561	...	194	3700	...	8	194	3839	...	
291	202	3299	...	202	3426	...	202	3560	...	200	3698	...	9	200	3837	...	
292	208	3300	...	208	3426	...	208	3559	...	206	3697	...	10	206	3835	...	
293	214	3301	...	214	3426	- '038	214	3559	...	212	3695	- '041	11	212	3832	...	
294	220	3302	...	220	3426	...	220	3558	...	218	3694	...	12	218	3830	...	
295	226	3303	...	226	3427	...	226	3557	- '041	224	3692	...	13	223	3828	...	
296	232	3304	- '035	232	3427	- '037	232	3557	...	230	3691	- '040	14	229	3825	...	
297	238	3305	...	238	3427	...	238	3556	- '010	235	3689	...	15	234	3823	- '049	
298	244	3306	- '034	244	3427	- '036	244	3555	...	240	3688	- '039	16	239	3821	...	
299	250	3307	...	250	3427	...	250	3554	- '039	245	3686	...	17	244	3818	- '048	
300	256	3309	...	256	3427	- '035	255	3554	...	250	3685	- '038	18	249	3816	- '047	
301	262	3310	- '033	262	3427	...	260	3553	...	255	3683	...	19	254	3814	...	
302	268	3311	...	268	3428	- '034	265	3552	- '038	260	3682	...	20	260	3812	...	
303	274	3312	- '032	273	3428	...	270	3552	...	266	3680	- '037	21	265	3809	- '046	
304	280	3313	...	278	3428	- '033	276	3552	- '037	272	3680	- '036	22	270	3808	...	
305	282	3271	- '031	280	3385	...	278	3507	...	274	3683	...	23	272	3759	- '045	

TABLE III.—SUNRISE AND INDIAN TERRESTRIAL LONGITUDES

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TABLE III.—Sunrise from 28° to 32° N. latitude—cont.

Day of solar year.	Lat. 28° Long. + 460" = + .005 of day.			Lat. 29° Long. + 359" = + .004 of day.			Lat. 30° Long. + 152" = + .002 of day.			Lat. 31° Long. + 332" = + .004 of day.			Lat. 32° Long. + 348" = + .004 of day.				
	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Mathura.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Delhi.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Patiala.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Simla.	Eng. date.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Lahore.	
	A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.				A.D. 1000— 1400.			
306	—285	—8230	—'031	—288	—3343	—'032	—280	—8463	—'036	—276	—8587	—'035	January.	24	—274	—8711	—'045
307	287	8189	—'030	285	8300	...	283	8418	...	279	8540	...		25	276	8662	—'044
308	290	8148	...	288	8257	—'031	285	8374	—'035	281	8494	—'034		26	278	8614	—'043
309	292	8107	—'029	290	8214	...	287	8329	...	283	8447	...		27	281	8565	...
310	295	8067	...	293	8172	—'030	290	8285	—'034	286	8400	—'033		28	283	8517	—'042
311	297	8026	...	295	8129	...	292	8240	...	288	8354	...		29	285	8468	...
312	300	2985	...	298	8086	...	294	8196	—'033	290	8307	—'032		30	287	8420	—'041
313	302	2944	—'028	300	8044	...	297	8151	...	288	8261	...		31	289	8371	...
314	305	2903	...	303	8001	...	299	8107	...	295	8214	—'031		1	292	8323	—'040
315	307	2862	—'027	305	2958	—'029	301	8062	—'032	297	8167	...		2	294	8274	—'039
316	310	2821	...	308	2916	...	304	8018	...	300	8121	—'030		3	296	8226	...
317	312	2780	—'026	310	2873	—'028	306	2973	—'031	302	8074	...		4	298	8177	—'038
318	315	2739	...	313	2830	...	308	2929	...	304	8028	—'029		5	300	8129	—'037
319	317	2698	—'025	315	2787	—'027	311	2884	—'030	307	2981	...		6	303	8080	...
320	320	2658	...	318	2745	...	313	2840	...	309	2934	—'028		7	305	8032	—'036
321	322	2617	—'024	320	2702	—'026	315	2795	—'029	311	2888	...	8	307	2983	...	
322	325	2576	...	323	2659	...	318	2751	...	314	2841	—'027	9	309	2935	—'035	
323	327	2535	—'023	325	2617	—'025	320	2708	—'028	316	2795	...	10	311	2886	...	
324	330	2494	...	328	2574	...	322	2662	...	318	2748	—'026	11	314	2838	—'034	
325	332	2453	—'022	330	2531	—'024	325	2617	—'027	321	2701	...	12	316	2789	—'033	
326	335	2412	—'021	332	2489	—'023	327	2578	—'026	323	2655	—'025	February.	13	318	2741	—'032
327	337	2371	...	334	2446	—'022	329	2528	...	325	2608	—'024		14	320	2692	—'031
328	340	2330	—'020	336	2408	—'021	331	2484	—'025	327	2562	—'023		15	322	2644	—'030
329	342	2289	—'019	338	2360	...	333	2439	—'024	329	2515	—'022		16	324	2595	...
330	345	2249	...	340	2318	—'020	335	2395	—'023	331	2468	—'021		17	326	2547	—'029
331	347	2208	—'018	342	2275	...	337	2350	—'022	333	2422	—'020		18	328	2498	—'028
332	349	2167	—'017	344	2232	—'019	339	2306	—'021	335	2375	...		19	330	2450	—'027
333	351	2126	—'016	346	2190	—'018	341	2261	—'020	337	2329	—'019		20	332	2401	—'026
334	353	2085	...	348	2147	—'017	343	2217	—'019	339	2282	—'018		21	334	2353	—'025
335	355	2044	—'015	350	2104	—'016	345	2172	...	341	2236	—'017		22	336	2304	—'024
336	356	1976	—'014	350	2034	—'015	345	2100	—'018	341	2161	—'016		23	336	2227	—'023
337	356	1908	—'013	351	1964	—'014	346	2027	—'017	342	2087	—'015		24	337	2150	—'022
338	356	1840	—'012	351	1894	...	346	1955	—'016	342	2012	—'014		25	337	2074	—'021
339	357	1772	...	352	1824	—'013	347	1882	—'015	343	1938	...		26	338	1997	...
340	357	1704	—'011	352	1753	—'012	347	1810	...	343	1863	—'013		27	338	1920	—'020
341	358	1635	—'010	353	1683	—'011	348	1738	—'014	344	1789	—'012	28	339	1843	—'019	
342	358	1567	—'009	353	1613	—'010	348	1665	—'013	344	1714	—'011	1	339	1766	—'018	
343	359	1499	—'008	354	1543	...	349	1593	—'012	345	1640	—'010	2	340	1690	—'017	
344	359	1431	...	354	1473	—'009	349	1520	—'011	345	1565	—'009	3	340	1613	—'016	
345	360	1363	—'007	355	1403	—'008	350	1448	—'010	346	1491	...	4	341	1536	—'015	
346	360	1295	—'006	355	1333	—'007	350	1376	—'009	346	1416	—'008	5	341	1459	—'014	
347	361	1227	...	356	1263	...	351	1308	...	347	1342	—'007	6	342	1382	—'013	
348	361	1159	—'005	356	1193	—'006	351	1231	—'008	347	1267	—'006	7	342	1306	...	
349	362	1091	—'004	357	1123	—'005	352	1158	—'007	348	1193	—'005	8	343	1229	—'012	
350	362	1023	—'003	357	1052	—'004	352	1086	—'006	348	1118	—'004	9	343	1152	—'011	
351	363	954	—'002	357	982	—'003	352	1014	—'005	349	1044	—'003	10	344	1175	...	
352	363	886	...	358	912	—'002	353	941	—'004	349	969	—'002	11	344	998	—'010	
353	364	818	—'001	358	842	—'001	353	869	...	349	895	—'001	12	344	922	...	
354	364	750	—'000	358	772	...	353	796	—'008	350	820	...	13	345	845	—'009	
355	365	682	+ '001	359	702	+ '000	354	724	—'002	350	746	+ '000	14	345	768	—'008	
356	365	614	+ '002	359	632	+ '001	354	652	—'001	350	671	+ '001	15	345	691	—'007	
357	366	546	+ '003	360	562	+ '002	354	579	+ '000	351	597	...	16	346	614	—'006	
358	366	478	...	360	492	...	355	507	+ '001	351	522	+ '002	17	346	538	—'005	
359	367	410	+ '004	360	422	+ '003	355	434	...	351	448	+ '003	18	346	461	—'004	
360	367	342	+ '005	361	351	+ '004	355	362	+ '002	352	373	+ '004	19	347	384	—'003	
361	368	273	+ '006	361	281	+ '005	356	290	+ '003	352	299	+ '005	20	347	307	—'002	
362	368	205	+ '007	361	211	+ '006	356	217	+ '004	352	224	+ '006	21	347	230	—'001	
363	368	137	...	362	141	...	356	145	+ '005	353	150	+ '007	22	348	154	+ '000	
364	367	69	+ '008	362	71	+ '007	357	72	+ '006	353	75	...	23	348	77	...	
365	367	0	...	362	0	+ '008	357	0	...	353	0	+ '008	24	348	0	+ '001	

TABLE III.—SUNRISE AND INDIAN TERRESTRIAL LONGITUDES

TABLE III.— Sunrise from 33° to 35° N. latitude.										
Day of solar year.	Lat. 33°			Lat. 34°			Lat. 35°			Eng. date.
	Long. —480" == -'0055 of day.			Long. —228" == -'003 of day.			Long. —1592" == -'0185 of day.			
	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day Jehlum.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Srinagar.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Kabul.	
			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.	
1	-343	+79	+ '001	-338	+82	+ '003	-333	+84	- '012	25
2	341	153	+ '002	336	163	+ '004	331	168	- '011	26
3	340	238	+ '003	335	245	+ '005	330	252	- '010	27
4	339	317	+ '004	334	326	+ '006	329	336	- '009	28
5	337	396	+ '005	332	408	+ '007	328	420	- '008	29
6	336	475	+ '006	331	490	+ '008	327	504	- '007	30
7	334	554	+ '007	330	571	+ '009	325	588	- '006	31
8	332	634	+ '008	328	653	+ '010	323	672	- '005	1
9	330	713	+ '009	326	734	+ '011	321	756	- '004	2
10	328	792	...	324	815	+ '012	319	840	- '003	3
11	326	871	+ '010	321	898	+ '013	317	924	- '002	4
12	324	950	+ '011	319	979	+ '014	315	1008	- '001	5
13	323	1030	+ '012	317	1061	...	313	1092	- '000	6
14	319	1109	+ '013	315	1142	+ '015	310	1176	+ '001	7
15	316	1188	+ '014	312	1224	+ '016	308	1260	+ '002	8
16	314	1267	+ '015	310	1306	+ '017	306	1344	+ '003	9
17	312	1346	+ '016	308	1387	+ '018	304	1428	+ '004	10
18	310	1426	+ '017	306	1469	+ '019	302	1512	+ '005	11
19	308	1505	+ '018	304	1550	+ '020	300	1596	+ '006	12
20	306	1584	...	302	1632	+ '021	298	1680	+ '007	13
21	304	1663	+ '019	300	1714	+ '022	296	1764	+ '008	14
22	302	1742	+ '020	298	1795	+ '023	294	1848	...	15
23	300	1822	...	296	1877	...	292	1932	+ '009	16
24	298	1901	+ '021	294	1958	+ '024	290	2016	...	17
25	296	1980	+ '022	292	2040	+ '025	288	2100	+ '010	18
26	294	2069	...	290	2122	...	286	2184	+ '011	19
27	292	2158	+ '023	288	2203	+ '026	284	2268	...	20
28	290	2218	...	286	2285	...	282	2352	+ '012	21
29	288	2297	+ '024	284	2366	+ '027	280	2436	+ '013	22
30	286	2376	+ '025	282	2448	+ '028	278	2520	...	23
31	284	2426	...	280	2500	...	276	2574	+ '014	24
32	282	2477	+ '026	278	2552	+ '029	274	2628	...	25
33	280	2527	...	276	2604	+ '030	272	2683	+ '015	26
34	278	2577	+ '027	274	2655	...	270	2737	+ '016	27
35	276	2628	+ '028	272	2707	+ '031	268	2791	...	28
36	274	2678	...	270	2759	...	266	2845	+ '017	29
37	272	2728	+ '029	268	2811	+ '032	264	2899	+ '018	30
38	270	2779	...	266	2863	...	262	2953	...	1
39	269	2829	+ '030	264	2915	+ '033	260	3008	+ '019	2
40	264	2879	+ '031	261	2967	+ '034	258	3062	+ '020	3
41	260	2929	+ '032	258	3019	+ '035	256	3116	+ '021	4
42	254	2980	...	252	3070	...	250	3170	...	5
43	247	3030	+ '033	245	3122	+ '036	243	3224	+ '022	6
44	242	3080	...	240	3174	+ '037	237	3279	+ '023	7
45	236	3131	+ '034	234	3226	...	231	3333	...	8
46	231	3181	...	228	3278	+ '038	226	3387	+ '024	9
47	224	3231	+ '035	222	3330	...	219	3441	...	10
48	218	3282	+ '036	216	3382	+ '039	213	3495	+ '025	11
49	212	3332	+ '037	210	3433	+ '040	208	3550	+ '026	12
50	207	3382	...	205	3485	+ '041	203	3604	+ '027	13
51	201	3433	+ '038	199	3537	...	197	3658	+ '028	14
52	195	3483	...	193	3589	+ '042	191	3712	...	15
53	188	3533	...	186	3641	...	184	3766	+ '029	16
54	182	3584	...	180	3693	...	178	3821	...	17
55	176	3634	...	177	3745	...	176	3875	...	18
56	172	3684	...	174	3797	...	172	3929	...	19
57	169	3735	...	171	3848	...	168	3983	...	20
58	166	3785	...	168	3900	...	164	4037	...	21
59	163	3835	...	165	3952	...	160	4092	...	22
60	160	3886	...	162	4004	...	156	4146	...	23
61	157	3936	...	159	4056	...	153	4200	...	24
62	154	3989	+ '039	156	4060	+ '043	148	4205	...	25

TABLE III.—Sunrise from 33° to 35° N. latitude—cont.

Day of solar year.	Lat. 33°			Lat. 34°			Lat. 35°			Eng. date
	Eqn. of time in seconds	☉'s trop. long. in seconds.	Long. — 480" — 0055 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. — 228" — 003 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. — 1592" — 0185 of day.	
			Total correctn. as fraction of a day. Jehlum. A.D. 1000 — 1400			Total correctn. as fraction of a day. Srinagar. A.D. — 1000 1400.			Total correctn. as fraction of a day. Kabul. A.D. — 1000 1400.	
63	—151	+ 3942	+ '039	—153	+ 4064	+ '043	—144	+ 4210	+ '029	26
64	148	3946	...	150	4068	...	140	4214	...	27
65	188	3949	...	138	4072	...	187	4219	...	28
66	130	3952	...	180	4076	...	130	4224	+ '030	29
67	121	3955	...	120	4080	...	120	4229	...	30
68	112	3958	...	112	4084	...	112	4234	...	31
69	108	3962	...	103	4088	...	108	4238	...	1
70	95	3965	...	94	4092	...	94	4243	...	2
71	86	3968	+ '040	85	4096	...	85	4248	...	3
72	77	3971	...	76	4100	...	76	4253	...	4
73	68	3974	...	68	4104	+ .044	68	4258	...	5
74	58	3978	...	58	4108	...	58	4262	...	6
75	51	3981	...	50	4112	...	50	4267	...	7
76	41	3984	+ '041	41	4116	...	41	4272	+ '031	8
77	32	3987	...	32	4120	...	32	4277	...	9
78	23	3990	...	23	4124	...	23	4282	...	10
79	14	3994	...	14	4128	...	14	4286	...	11
80	5	3997	...	5	4132	+ '045	5	4291	...	12
81	+ 4	4000	...	+ 4	4136	...	+ 4	4296	...	13
82	13	4003	...	13	4140	...	13	4301	+ '032	14
83	22	4006	...	22	4144	...	22	4306	...	15
84	30	4010	...	30	4148	+ '044	30	4310	+ '031	16
85	40	4013	...	40	4152	...	40	4315	...	17
86	49	4016	+ '040	49	4156	...	48	4320	+ '030	18
87	57	4019	...	57	4160	+ '043	57	4325	...	19
88	67	4022	+ '039	66	4164	...	66	4330	+ '029	20
89	76	4026	...	75	4168	+ '042	75	4334	...	21
90	84	4029	...	84	4172	...	84	4339	...	22
91	110	4032	...	111	4176	...	111	4344	+ '028	23
92	121	3994	+ '038	121	4187	...	121	4304	...	24
93	131	3956	...	132	4099	...	132	4265	...	25
94	141	3918	...	141	4060	+ '041	142	4225	...	26
95	151	3880	+ '037	151	4021	...	152	4186	+ '027	27
96	162	3842	...	162	3982	+ '040	163	4147	...	28
97	172	3804	...	172	3944	...	173	4107	...	29
98	182	3766	+ '036	182	3906	...	183	4068	+ '026	30
99	192	3728	...	193	3866	+ '039	193	4028	...	1
100	202	3691	+ '035	202	3828	...	203	3989	+ '025	2
101	211	3653	...	212	3789	...	212	3949	...	3
102	221	3615	...	222	3750	...	222	3910	...	4
103	231	3577	...	232	3711	+ '038	232	3870	+ '024	5
104	242	3539	+ '034	243	3673	...	244	3831	...	6
105	251	3501	...	252	3634	...	253	3791	...	7
106	261	3463	...	262	3595	+ '037	263	3752	...	8
107	270	3425	...	271	3557	...	272	3712	...	9
108	278	3387	+ '033	279	3518	+ '036	280	3673	+ '023	10
109	288	3349	...	288	3479	...	289	3633	...	11
110	297	3311	...	297	3440	...	298	3594	+ '022	12
111	305	3273	+ '032	305	3402	...	306	3554	...	13
112	315	3235	...	316	3363	+ '035	316	3515	+ '021	14
113	324	3197	+ '031	325	3324	...	326	3475	...	15
114	333	3159	...	334	3286	+ '034	335	3436	+ '020	16
115	342	3121	+ '030	343	3247	...	344	3396	...	17
116	350	3084	+ '029	351	3208	+ '033	352	3357	+ '019	18
117	359	3046	...	360	3169	...	361	3317	...	19
118	367	3008	...	368	3131	+ '032	369	3278	+ '018	20
119	375	2970	+ '028	376	3092	...	377	3238	...	21
120	383	2932	...	384	3053	+ '031	385	3199	+ '017	22
121	408	2894	...	411	3015	+ '030	414	3159	...	23
122	416	2856	+ '027	419	2976	...	423	3120	+ '016	24
123	424	2806	+ '026	427	2924	...	430	3066	...	25
124	432	2755	...	435	2872	+ '029	438	3011	+ '015	26
125	439	2705	...	442	2820	...	445	2957	...	27

TABLE III.—Sunrise from 33° to 35° N. latitude—cont.

Day of solar year.	Lat. 33°			Lat. 34°			Lat. 35°			Eng. date.	
	Long. — 480" = — 0065 of day.			Long. — 228" = — 003 of day.			Long. — 1592" = — 0185 of day.				
	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Jehlum.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Srinagar.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Total correctn. as fraction of a day. Kabul.		
			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.		
126	+ 447	+ 2654	+ '025	+ 450	+ 2768	+ '028	+ 453	+ 2902	+ '014	July. 28 29 30 31 1 2 3 4 5 6	
127	455	2604	...	458	2716	...	461	2848	+ '013		
128	462	2554	+ '024	465	2664	+ '027	468	2794	...		
129	469	2503	+ '023	472	2612	...	475	2789	...		
130	476	2453	+ '022	479	2560	+ '026	482	2685	+ '012		
131	483	2402	...	486	2508	...	489	2630	+ '011		
132	490	2352	+ '021	493	2456	+ '025	496	2576	+ '010		
133	497	2302	...	500	2404	...	503	2522	...	August. 21 22 23 24 25 26 27	
134	503	2251	+ '020	506	2352	+ '024	509	2467	+ '009		
135	509	2201	+ '019	512	2300	+ '023	515	2418	...		
136	515	2150	...	518	2248	...	521	2358	...		
137	521	2100	+ '018	524	2196	...	527	2304	+ '008		
138	527	2050	...	530	2144	+ '022	533	2250	+ '007		
139	533	1999	...	536	2092	+ '021	539	2195	...		
140	538	1949	...	541	2040	...	544	2141	+ '006	September. 10 11 12 13 14 15 16	
141	544	1898	+ '017	547	1988	+ '020	550	2086	...		
142	549	1846	...	552	1936	...	555	2032	+ '005		
143	554	1798	+ '016	557	1884	+ '019	560	1978	...		
144	559	1747	...	562	1832	...	565	1923	+ '004		
145	564	1697	+ '015	567	1780	...	570	1869	...		
146	569	1646	...	573	1728	+ '018	576	1814	+ '003		October. 17 18 19 20 21 22 23
147	576	1596	+ '014	580	1676	+ '017	585	1760	...		
148	578	1546	...	586	1624	...	591	1708	+ '002		
149	580	1495	+ '013	592	1572	+ '016	596	1651	...		
150	582	1445	...	595	1520	...	601	1597	+ '001		
151	584	1394	+ '012	596	1468	+ '015	602	1542	+ '000		
152	586	1344	...	597	1416	...	603	1488	...		
153	588	1301	...	598	1370	+ '014	604	1440	— '001	November. 24 25 26 27	
154	590	1257	+ '011	599	1325	...	605	1392	...		
155	592	1214	...	600	1279	+ '013	606	1344	...		
156	594	1171	+ '010	601	1233	...	607	1296	— '002		
157	596	1127	...	602	1188	+ '012	608	1248	...		
158	599	1084	+ '009	604	1142	...	609	1200	— '003		
159	601	1040	...	606	1096	...	610	1152	...		
160	603	997	...	608	1051	+ '011	612	1104	— '004	December. 31 1 2 3 4 5 6	
161	605	954	+ '008	610	1005	...	614	1056	— '005		
162	606	910	...	611	959	+ '010	615	1008	...		
163	608	867	+ '007	613	913	...	617	960	— '006		
164	610	824	...	615	868	+ '009	619	912	...		
165	611	780	+ '006	616	822	...	620	864	...		
166	611	737	...	616	776	+ '008	620	816	— '007		
167	612	694	+ '005	617	731	+ '007	621	768	...	January. 7 8 9 10 11 12 13	
168	613	650	...	618	685	...	622	720	— '008		
169	614	607	+ '004	619	639	+ '006	623	672	— '009		
170	614	564	...	619	594	...	623	624	...		
171	614	520	+ '003	619	548	+ '005	623	576	— '010		
172	614	477	...	619	502	...	623	528	...		
173	614	433	+ '002	619	457	+ '004	623	480	— '011		
174	614	390	...	619	411	...	623	432	...	February. 14 15 16	
175	614	347	+ '001	619	365	+ '003	623	384	— '012		
176	614	303	...	619	320	...	623	336	— '013		
177	613	260	— '000	618	274	+ '002	622	288	...		March. 17 18 19 20 21 22 23
178	612	217	...	617	228	...	621	240	— '014		
179	611	173	— '001	616	183	+ '001	620	192	...		
180	610	130	...	615	137	— '000	619	144	— '015		
181	608	87	— '002	613	91	...	617	96	...		
182	607	43	...	612	46	— '001	616	48	— '016		
183	607	0	— '003	612	0	...	616	0	— '017		
184	606	—45	...	611	—47	— '002	616	—50	...	April. 24 25 26	
185	604	90	— '004	609	94	...	614	99	— '018		
186	602	134	...	607	142	— '003	612	146	...		

TABLE III.—Sunrise from 33° to 35° N. latitude—cont.

Day of solar year.	Lat. 33°			Lat. 34°			Lat. 35°			Eng. date.
	Eqn. of time in seconds.	☉'s trop. long in seconds.	Long. —480" = —'0035 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. —228" = —'008 of day.	Eqn. of time in seconds.	☉'s trop. long in seconds.	Long. —1592" = —'0185 of day.	
			Total correctn. as fraction of a day. Jehlum.			Total correctn. as fraction of a day. Srinagar.			Total correctn. as fraction of a day. Kabal.	
			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.	
187	+ 600	—179	—'005	+ 605	—189	—'008	+ 610	—188	—'019	27
188	597	224	...	602	236	—'004	607	248	...	28
189	604	269	—'006	609	283	...	614	298	—'020	29
190	601	314	...	606	330	—'005	611	347	—'021	30
191	588	358	—'007	598	378	—'006	598	397	—'022	1
192	585	403	—'008	590	425	...	595	446	...	2
193	581	448	...	586	472	—'007	591	496	—'023	3
194	578	493	—'009	583	519	...	588	546	...	4
195	574	538	...	579	566	—'008	584	585	—'024	5
196	570	582	—'010	575	614	...	580	645	...	6
197	566	627	—'011	571	661	—'009	576	694	—'025	7
198	562	672	...	567	708	...	572	744	—'026	8
199	558	717	—'012	563	755	—'010	568	794	...	9
200	553	762	...	558	802	...	563	843	—'027	10
201	548	806	—'013	553	850	—'011	558	893	—'028	11
202	544	851	...	549	897	—'012	553	942	...	12
203	539	896	—'014	544	944	...	549	992	—'029	13
204	538	941	...	538	991	—'013	543	1042	—'030	14
205	528	986	—'015	533	1038	—'014	538	1091	...	15
206	523	1030	—'016	528	1086	...	533	1141	—'031	16
207	519	1075	...	524	1133	—'015	529	1191	—'032	17
208	518	1120	—'017	518	1180	—'016	523	1240	—'033	18
209	507	1165	—'018	512	1227	—'017	517	1290	...	19
210	501	1210	...	506	1274	...	511	1339	—'034	20
211	495	1254	—'019	500	1322	—'018	505	1389	—'035	21
212	488	1299	—'020	493	1369	—'019	498	1438	...	22
213	484	1344	—'021	487	1416	...	490	1488	—'036	23
214	477	1394	...	480	1468	—'020	483	1542	...	24
215	470	1445	—'022	473	1520	—'021	476	1597	—'037	25
216	463	1495	...	466	1572	—'022	469	1651	—'038	26
217	456	1546	—'023	459	1624	...	462	1706	...	27
218	449	1596	...	452	1676	—'023	455	1760	—'039	28
219	441	1646	—'024	444	1728	...	447	1814	—'040	29
220	434	1697	—'025	437	1780	—'024	440	1869	...	30
221	426	1747	—'026	429	1832	—'025	432	1923	—'041	31
222	418	1798	...	421	1884	—'026	424	1978	...	1
223	410	1848	—'027	413	1936	...	416	2032	—'042	2
224	402	1898	—'028	405	1988	—'027	408	2086	—'043	3
225	394	1949	...	397	2040	—'028	400	2141	—'044	4
226	386	1999	—'029	389	2092	—'029	392	2195	—'045	5
227	377	2050	—'030	380	2144	...	383	2250	—'046	6
228	369	2100	...	372	2196	—'030	375	2304	—'047	7
229	360	2150	—'031	363	2248	...	366	2358	...	8
230	351	2201	—'032	354	2300	—'031	357	2413	—'048	9
231	342	2251	—'033	345	2352	—'032	348	2467	—'049	10
232	333	2302	...	336	2404	—'033	339	2522	—'050	11
233	324	2352	—'034	327	2456	...	330	2576	...	12
234	314	2402	—'035	317	2508	—'034	320	2630	—'051	13
235	305	2453	...	308	2560	—'035	311	2685	—'052	14
236	296	2503	—'036	299	2612	...	302	2739	...	15
237	287	2554	...	290	2664	...	293	2794	—'053	16
238	277	2604	—'037	280	2716	—'036	283	2848	...	17
239	267	2654	...	270	2768	—'037	273	2902	—'054	18
240	258	2706	—'038	261	2820	...	264	2957	—'055	19
241	246	2755	...	248	2872	—'038	251	3011	...	20
242	236	2806	—'039	238	2924	—'039	241	3066	—'056	21
243	211	2856	—'040	212	2976	...	213	3120	...	22
244	202	2894	...	203	3016	—'040	204	3159	—'057	23
245	192	2932	—'041	193	3053	...	194	3199	...	24
246	182	2970	...	183	3092	—'041	184	3238	—'058	25

TABLE III.—Sunrise from 33° to 35° N. latitude—cont.

Day of solar year.	Lat. 33°			Lat. 34°			Lat. 35°			Eng. date.
	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. —480" = —'0055 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. —228" = —'008 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. —1592" = —'0185 of day.	
			Total correctn. as fraction of a day. Jehlum.			Total correctn. as fraction of a day. Srinagar.			Total correctn. as fraction of a day. Kabul.	
			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.	
247	+172	—3008	—042	+173	—3181	—'041	+174	—3278	—'059	26
248	162	3046	..	163	3169	—'042	164	3317	—'060	27
249	152	3084	—'043	153	3208	..	154	3357	—'061	28
250	142	3121	—'044	143	3247	—'043	144	3396	—'062	29
251	132	3159	..	133	3286	—'044	134	3436	..	30
252	122	3197	—'045	123	3324	..	124	3475	—'063	1
253	112	3235	..	113	3363	—'045	114	3515	..	2
254	102	3273	—'046	103	3402	..	104	3554	..	3
255	92	3311	..	93	3440	—'046	94	3594	—'063	4
256	82	3349	—'047	83	3479	..	84	3633	—'064	5
257	72	3387	..	73	3518	—'047	74	3673	..	6
258	62	3425	—'048	63	3557	..	64	3712	—'065	7
259	51	3463	—'049	52	3595	—'048	53	3752	—'066	8
260	41	3501	..	42	3634	—'049	43	3791	..	9
261	31	3539	—'050	32	3673	..	33	3831	—'067	10
262	21	3577	..	22	3711	—'050	23	3870	..	11
263	11	3615	—'051	12	3750	—'051	13	3910	—'068	12
264	—19	3653	..	—20	3789	..	—21	3949	—'069	13
265	29	3691	..	30	3828	—'052	31	3989	..	14
266	39	3728	..	40	3866	..	41	4028	..	15
267	49	3766	—'052	50	3905	..	51	4068	..	16
268	59	3804	..	60	3944	..	61	4107	..	17
269	70	3842	..	71	3982	..	72	4147	..	18
270	80	3880	..	81	4021	..	82	4186	..	19
271	91	3918	..	92	4060	..	93	4225	..	20
272	92	3956	..	93	4099	..	94	4265	..	21
273	93	3994	..	94	4137	..	95	4304	..	22
274	98	4032	—'053	97	4176	..	97	4344	..	23
275	103	4070	..	102	4172	..	102	4339	..	24
276	109	4026	..	108	4168	..	107	4334	..	25
277	115	4022	..	114	4164	..	113	4330	..	26
278	120	4019	..	119	4160	..	119	4325	..	27
279	126	4016	..	125	4156	..	124	4320	..	28
280	132	4013	..	131	4152	..	131	4315	..	29
281	137	4010	..	136	4148	..	136	4310	..	30
282	143	4006	..	142	4144	..	141	4306	..	31
283	149	4003	..	148	4140	..	146	4301	..	1
284	154	4000	..	153	4136	..	152	4296	..	2
285	160	3997	..	159	4132	..	158	4291	..	3
286	166	3994	..	165	4128	..	163	4286	..	4
287	171	3990	..	170	4124	..	168	4282	..	5
288	177	3987	..	176	4120	..	174	4277	..	6
289	183	3984	..	182	4116	..	180	4272	..	7
290	188	3981	..	187	4112	..	185	4267	..	8
291	194	3978	..	193	4108	..	191	4262	..	9
292	200	3974	..	199	4104	..	197	4258	..	10
293	205	3971	..	204	4100	..	202	4253	..	11
294	211	3968	..	210	4096	..	207	4248	..	12
295	216	3965	..	216	4092	..	213	4242	—'069	13
296	222	3962	—'052	221	4088	..	219	4238	..	14
297	228	3958	..	227	4084	—'051	224	4234	—'068	15
298	233	3955	—'051	233	4080	—'050	229	4229	—'067	16
299	239	3952	—'050	238	4076	..	235	4224	..	17
300	245	3949	..	244	4072	—'049	241	4219	—'066	18
301	250	3946	—'049	249	4068	—'048	246	4214	—'065	19
302	256	3942	..	254	4064	—'047	251	4210	..	20
303	262	3939	..	259	4060	..	256	4205	..	21
304	267	3936	—'048	264	4056	..	261	4200	—'064	22
305	269	3886	—047	266	4004	..	263	4146	—'063	23

TABLE III.—Sunrise from 33° to 35° N. latitude—cont.

Day of solar year.	Lat. 33°			Lat. 34°			Lat. 35°			Eng. date.
	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. —480° = —0055 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. —228° = —003 of day.	Eqn. of time in seconds.	☉'s trop. long. in seconds.	Long. —1592° = —0185 of day.	
			Total correctn. as fraction of a day. Jehlum.			Total correctn. as fraction of a day. Brinagar.			Total correctn. as fraction of a day. Kabul.	
			A.D. 1000— 1400.			A.D. 1000— 1400.			A.D. 1000— 1400.	
306	-271	-3835	—047	-268	-3852	—046	-265	-4092	—063	24
307	278	3785	—046	270	3900	—045	267	4037	—062	25
308	275	3735	..	272	3848	..	269	3983	—061	26
309	277	3684	—045	274	3797	—044	271	3929	..	27
310	280	3634	..	277	3745	..	273	3875	—060	28
311	282	3584	—044	279	3693	—043	275	3821	..	29
312	284	3533	—043	281	3641	—042	277	3766	—059	30
313	286	3483	..	283	3589	..	279	3712	—058	31
314	288	3433	—042	285	3537	—041	281	3658	..	1
315	290	3382	..	287	3485	..	283	3604	—057	2
January.										
316	298	3332	—041	289	3438	—040	285	3550	—056	3
317	295	3282	..	291	3382	..	287	3495	..	4
318	297	3231	—040	293	3330	—039	289	3441	—055	5
319	299	3181	..	295	3278	..	291	3387	..	6
320	301	3131	—039	297	3226	—038	293	3333	—054	7
321	308	3080	..	299	3174	—037	295	3279	—053	8
322	306	3030	—038	301	3122	..	297	3224	..	9
323	308	2980	—037	303	3070	—036	299	3170	—052	10
324	310	2929	..	305	3019	..	301	3116	..	11
325	312	2879	—036	307	2967	—035	303	3062	—051	12
February.										
326	314	2829	—035	309	2915	—034	305	3008	—050	13
327	316	2779	—034	311	2863	—033	307	2953	—049	14
328	318	2728	—033	313	2811	—032	309	2899	—048	15
329	320	2678	—032	315	2759	—031	311	2845	—047	16
330	322	2628	—031	317	2707	—030	313	2791	—046	17
331	324	2577	—030	319	2655	—029	315	2737	—045	18
332	326	2527	—029	321	2604	—028	317	2683	—044	19
333	328	2477	..	323	2552	—027	319	2628	—043	20
334	330	2426	—028	325	2500	—026	321	2574	—042	21
March.										
335	332	2376	—027	327	2448	—025	323	2520	—041	22
336	332	2297	—026	327	2366	—024	323	2436	—040	23
337	332	2218	—025	327	2285	—023	323	2352	—039	24
338	333	2138	—024	328	2203	—022	324	2268	—038	25
339	333	2059	—023	328	2122	—021	324	2184	—037	26
340	333	1980	—022	328	2040	—020	324	2100	—036	27
341	334	1901	—021	329	1958	—019	325	2016	—035	28
342	334	1822	—020	329	1877	—018	325	1932	—034	1
343	334	1742	—019	329	1795	..	325	1848	—033	2
344	335	1663	—018	330	1714	—017	326	1764	—032	3
April.										
345	335	1584	—017	330	1632	—016	326	1680	—031	4
346	335	1505	—016	330	1550	—015	326	1596	—030	5
347	336	1426	..	331	1469	—014	327	1512	—029	6
348	336	1346	—015	331	1387	—013	327	1423	—028	7
349	336	1267	—014	331	1306	—012	327	1344	—028	8
350	337	1188	—013	332	1224	—011	328	1260	—027	9
351	337	1109	—012	332	1142	—010	328	1176	—026	10
352	337	1030	—011	332	1061	—009	328	1092	—025	11
353	338	950	—010	333	979	—008	329	1008	—024	12
354	338	871	—009	333	898	—007	329	924	—023	13
May.										
355	338	792	..	333	816	..	329	840	—022	14
356	339	713	—008	334	734	—006	330	756	—021	15
357	339	634	—007	334	653	—005	330	672	—020	16
358	339	554	—006	334	571	—004	330	588	—019	17
359	340	475	—005	335	490	—003	331	504	—018	18
360	340	396	—004	335	408	—002	331	420	—017	19
361	340	317	—003	335	326	—001	331	336	—016	20
362	341	238	—002	336	245	—000	332	252	—015	21
363	341	158	—001	336	163	..	332	168	—014	22
364	341	79	..	336	82	+001	332	84	—013	23
365	342	0	000	337	0	+002	333	0	—012	24

TABLE III-A Latitudes and Longitudes of chief places in British India and the Feudatory States.

(Longitudes are expressed by the difference in seconds of time as compared with Ujjain.)

Serial No.	District.	Town.	Latitude in degrees and decimals of a degree.	Time difference in seconds.	Serial No.	District.	Town.	Latitude in degrees and decimals of a degree.	Time difference in seconds.
BRITISH TERRITORY.					Bombay Province—cont.				
Aden Province.					37	Nasik ...	Nasik ...	20°0	- 480
1	Aden ...	Aden ..	12°7	- 7848	38	Panoh Mahal ...	Godhra ...	22°7	- 520
Ajmere-Merwara Province.					39	Poona ...	Poona ..	18°5	- 464
2	Ajmere ...	{ Ajmere ...	26°5	- 280	40	Sholapur ...	{ Sholapur ...	17°7	+ 28
3	Merwara ...	{ Nazirabad ...	26°3	- 256			{ Pandharpur ...	17°7	- 84
		{ Bawar (Nayanagar). 26°0	- 852				{ Barsi ...	18°2	- 24
Baluchistan Province.					41	Satara ..	Satara ...	17°7	- 428
4	Quetta—Peshin...	Quetta ..	30°2	- 2104	42	Surat ..	Surat ...	12°2	- 708
Bengal Province.					43	Thana ...	Bandra ...	19°0	- 708
5	Balasore ...	Balasore ...	21°5	+ 2676	Burma Province.				
6	Bankura ..	Bankura ...	23°2	+ 2708	44	Akyab ...	Akyab ...	20°2	+ 4118
7	Bhagalpur ...	Bhagalpur ...	25°2	+ 2692	45	Amherst ...	Moulmein .	16°5	+ 5244
8	Burdwan ..	{ Bardwan ...	23°2	+ 2896	46	Bassein ...	Bassein .	16°7	+ 4566
		{ Howrah ...	22°5	+ 3016	47	Henzada ...	Henzada ...	17°7	+ 4732
9	Champaram ...	Bettiah ...	26°5	+ 2092	48	Mandalay ...	Mandalay ...	22°0	+ 4876
10	Cuttack ...	Cuttack ..	20°5	+ 2420	49	Prome ..	Prome .	18°8	+ 4684
11	Darbhanga ..	Darbhanga ...	26°2	+ 2428	50	Bangoon ...	Bangoon ...	16°7	+ 4896
12	Gaya ...	Gaya .	24°5	+ 2216	51	Tavoy ...	Tavoy ...	14°1	+ 5380
13	Hooghly ...	{ Hoogly and Chinsura. 23°0	+ 3028		Central Provinces.				
		{ Serampore ...	22°7	+ 3016	52	Jubbulpore ...	Jubbulpore ...	23°2	+ 1000
14	Midnapore ...	Midnapore ...	22°5	+ 2768	53	Nagpur ..	{ Kamptee ...	21°2	+ 820
15	Monghyr ...	Monghyr ...	25°3	+ 2564			{ Nagpur ...	21°2	+ 800
16	Murshidabad ...	Berhampore ...	24°0	+ 2996	54	Nimar ...	Burhanpur ...	21°8	+ 108
17	Muzaffarpur ...	Hajipur ...	25°7	+ 2260	55	Raipur ...	Raipur .	21°2	+ 1408
		{ Muzaffarpur ...	26°0	+ 2308	56	Saugor ...	Saugor ..	23°8	+ 712
18	Nadia ...	{ Krishnagar ...	23°5	+ 3056	Eastern Bengal and Assam Province.				
		{ Santipur ...	23°2	+ 3040	57	Chittagong ...	Chittagong ...	23°3	+ 3852
		{ Calcutta ...			58	Decca ...	{ Decca .	23°7	+ 3508
		{ Cossipur-Chitpur ...	22°5	+ 3020			{ Narayanganj .		
19	Twenty-four Parganas.	{ Garden Reach ..			59	Manipur ...	Imphal .	24°8	+ 4360
		{ Maniktala ..	23°0	+ 3032	60	Pabna ...	Sirajganj ..	24°5	+ 3352
		{ Naihati ..	22°7	+ 3020	61	Rajshahi ...	Rampur-Bolia ...	24°3	+ 3076
		{ Baranagar ...	23°0	+ 3032	Madras Province.				
		{ Bhatpara ...	25°7	+ 2252	62	Bellary ...	{ Adoni .	15°7	+ 360
20	Patna ..	{ Patna ...	25°2	+ 2836			{ Bellary ...	15°2	+ 256
		{ Dinapore ..	25°7	+ 2224	63	Chingleput ...	Conjeevaram ...	12°8	+ 940
21	Puri ...	Puri ...	19°8	+ 2408	64	Coimbatore ...	Coimbatore ...	11°0	+ 284
22	Ranchi ...	Ranchi ..	23°3	+ 2292	65	Ganjam ...	Berhampur ...	19°3	+ 2184
23	Saran ...	Chupra ...	25°8	+ 2148	66	Godāvari ...	Cocoanada ...	17°0	+ 1548
24	Shahabad ...	{ Sasaram ...	25°0	+ 1976			{ Rajahmundry ...	17°0	+ 1436
		{ Arrah ...	25°5	+ 2132			{ Bezwada ...	16°5	+ 1160
Berar Province.					67	Kistna ...	{ Ellore ...	16°2	+ 1280
25	Akola ..	Akola ...	20°7	+ 300			{ Masulipatam ...	16°2	+ 1284
26	Amraoti ...	Amraoti ...	21°0	+ 480	68	Guntūr ...	Guntūr ...	16°3	+ 1124
27	Ellichpur ...	Ellichpur ...	21°2	+ 424	69	Kurnool ...	Kurnool ...	15°8	+ 548
Bombay Province.					70	Madras ...	Madras ...	13°0	+ 1072
28	Ahmadabad ...	Ahmadabad ...	23°0	- 768			{ Madras ...	10°0	+ 560
29	Ahmadnagar ...	Ahmadnagar ..	19°0	- 208	71	Madura ...	{ Bodinayakanur ...	10°0	+ 376
30	Belgaum ...	Belgaum ...	16°0	- 304			{ Dindigul ...	10°3	+ 528
31	Bijapur ...	Bijapur ...	16°8	- 18			{ Calicut ...	11°2	+ 0
32	Bombay ...	Bombay ...	19°0	- 692	72	Malabar ..	{ Cannanore ...	11°8	- 100
33	Broach ...	Broach ...	21°7	- 672			{ Palghat ...	10°8	+ 208
		{ Hubli .	15°3	- 152			{ Tellicherry ...	11°7	- 72
34	Dharwar ...	Dharwar ...	15°5	- 184	73	Nellore ...	Nellore ...	14°5	+ 1008
		{ Gadag ...	15°6	- 36			{ Gudiyāttam ...	13°0	+ 744
35	Kaira ...	Nadiad ...	22°7	- 700	74	North Arcot ...	Vellore ...	12°9	+ 808
36	Khandesh ...	Dhulia ...	21°0	- 240	75	Salem ...	Salem .	11°7	+ 572
					76	South Arcot ...	Cuddalore ...	11°7	+ 956
					77	South Kanara ...	Mangalore ...	12°8	- 224
					78	Tanjore ...	{ Kumbakonam ...	11°0	+ 860
							{ Negapatam .	10°7	+ 976

TABLE III-A.—Latitudes and longitudes of chief places in British India and the Feudatory States—cont.

(Longitudes are expressed by the difference in seconds of time as compared with Ujjain.)

Serial No.	District.	Town.	Latitude in degrees and decimals of a degree.	Time difference in seconds.	Serial No.	District.	Town.	Latitude in degrees and decimals of a degree.	Time difference in seconds.
Madras Province—cont.					Bombay Native States—cont.				
78	Tanjore—cont.	Tanjore ...	10°7'	+ 804	112	Kathnwar—cont.	Junagarah ...	21°5'	— 1244
		Mannargudi ...	10°7'	+ 880			Navanagar ...	22°4'	— 1824
		Māvavaram ...	11°1'	+ 928			Porabandar ...	21°6'	— 1486
		Palamcottah ...	8°7'	+ 472			Rajkot ...	22°3'	— 1188
79	Tinnevely	Rajapalayam ...	9°5'	+ 424	113	Kolhapur	Wadhwan ...	22°6'	— 972
		Srivilliputtur ...	9°5'	+ 440			Kolhapur ...	16°6'	— 364
		Tinnevely ...	8°7'	+ 466					
		Tiruchendur ...	8°5'	+ 560					
		Tuticorin ...	8°8'	+ 568					
80	Trichinopoly	Trichinopoly ...	10°8'	+ 700	Central India Agency.				
81	Vizagapatnam	Srirangam ...	17°7'	+ 1804	114	Rewah ...	Rewah ...	24°5'	+ 1324
		Vizianagaram ..	18°2'	+ 1832	115	Bhopal ...	Bhopal ...	23°2'	+ 392
North-West Frontier Province.					116	Datia ...	Datia ...	25°6'	+ 844
82	Dera Ismail Khan	Dera Ismail Khan ...	31°8'	— 1168	117	Gwalior ...	Lashkar ...	26°2'	+ 572
83	Kohat ...	Kohat. ...	33°6'	— 1044			Ujjain ...	23°1'	+ 0
84	Peshawar ...	Peshawar ..	34°0'	— 1008	118	Indore ...	Indore ...	22°7'	+ 28
					119	Iaora ...	Iaora ...	23°6'	— 156
					120	Mandasar in Gwalior.	Mandasar ...	24°1'	— 168
					121	Ratlam ...	Ratlam .	23°3'	— 176
Punjab Province					Hyderabad State.				
85	Amritsar ...	Amritsar ...	31°7'	— 216	122	Aurangabad ...	Anrangabad } Jalna	19°8'	— 108
86	Delhi ...	Delhi... ..	28°7'	+ 852	123	Gulbarga ...	Gulbarga ...	17°8'	+ 256
87	Dera Ghazi Khan...	Dera Ghazi Khan ..	30°0'	— 1200	124	Hyderabad ...	Hyderabad ..	17°3'	+ 640
88	Ferozepore ...	Ferozepur ..	31°0'	— 280	125	Raichur ...	Raichur ...	16°2'	+ 376
89	Gurdaspur ...	Batala ...	30°8'	— 140	Kashmir State.				
90	Gujranwala ...	Gujranwala ...	32°2'	— 384	126	Jammu ...	Jammu ...	32°7'	— 208
91	Gurgaon ..	Rewari ..	28°2'	+ 204	127	Kashmir...	Srinagar ..	34°8'	— 228
92	Hissar ...	Bhiwani ...	28°8'	+ 84	Madras Native States.				
93	Jhang ...	Jhang-Maghiana ...	31°3'	— 828	128	Cochin ...	Ernakulam ...	10°0'	+ 120
94	Karnal ...	Karnal ...	29°7'	+ 288			Mattancheri ...	10°0'	+ 112
		Pemapat ...	29°4'	+ 288	129	Pudukkottai ...	Pudukkottai ...	10°3'	+ 728
95	Jullundur ...	Jullundur ...	31°3'	— 48			Alleppey ...	9°5'	+ 132
96	Lahore ..	Lahore ...	31°6'	— 348	130	Travancore ...	Nagercoil ...	8°1'	+ 400
		Kasur ...	31°1'	— 316			Trivandrum ...	8°5'	+ 280
97	Ludhiana ...	Ludhiana ...	31°0'	+ 20	Mysore State.				
98	Multan ...	Multan ...	30°2'	— 1024	131	Bangalore ...	Bangalore .	13°0'	+ 432
99	Rawalpandi ...	Rawalpandi ...	33°6'	— 640	132	Kolar ...	Kolar .	13°1'	+ 564
100	Rohtak ...	Rohtak ...	28°9'	+ 192	133	Mysore ...	Mysore .	12°3'	+ 212
101	Sialkot ...	Sialkot ...	32°5'	— 300	Punjab Native States.				
Sindh Province.					134	Malar Kotla ...	Malar Kotla ...	30°5'	+ 48
102	Hyderabad ...	Hyderabad ..	25°3'	— 1768	135	Patiala ...	Patiala ...	30°3'	+ 164
103	Karachi ...	Karachi ...	24°8'	— 2092	Rajputana Agency.				
104	Sukkur ...	Shikarpur ...	28°0'	— 1708	136	Alwar ...	Alwar ..	27°6'	+ 196
		Sukkur ...	27°7'	— 1652	137	Bharatpur ...	Bharatpur ..	27°2'	+ 412
United Provinces of Agra and Oudh.					138	Bikaner ...	Bikaner ...	28°0'	— 596
105	Harodi ...	Shahabad ...	27°7'	+ 1000	139	Jaipur ...	Sikar ..	27°6'	— 156
106	Sitapur ...	Sitapur ...	27°6'	+ 1172			Jaipur ...	26°9'	+ 12
NATIVE STATES.					140	Karauli ...	Karauli ...	26°5'	+ 300
Baroda State.					141	Kotah ...	Kotah... ..	25°1'	+ 16
107	Baroda ...	Baroda ..	22°3'	— 608	142	Jodhpur ...	Jodhpur ...	26°3'	— 664
108	Kadi ...	Patan (Anhilwad) ...	23°8'	— 898	143	Mewar or Udaipur	Udaipur ...	24°6'	— 500
109	Navasan ...	Navasan ...	21°0'	— 684	144	Tonk ...	Tonk ...	26°1'	+ 4
Bombay Native States.					United Provinces Native States.				
110	Cambay ...	Cambay ...	22°3'	— 748	145	Rampur ...	Rampur ...	28°8'	+ 780
111	Cutch ...	Bhuji ...	23°2'	— 1486					
112	Kathiawar	Bhaunagar ...	21°7'	— 860					
		Dhoraji ...	21°7'	— 1240					

TABLE IV.—Mars.

Data for calculating latitude and geocentric longitude of Mars from 1 B.C. to A.D. 2000.

Mars' mean motion for Centuries.

A.D.	Kaliyuga.	Mean longitude at commence- ment of solar year.	Longi- tude of apsis.	Longi- tude of node.	A.D.	Kaliyuga.	Mean longitude at commence- ment of solar year.	Longi- tude of apsis.	Longi- tude of node.
		Deg.	Deg.	Deg.			Deg.	Deg.	Deg.
1 B.C.	3101 K.Y.	254°7442	130°0274	40°0886	1000 A.D.	4101 K.Y.	140°0144	130°0444	40°0688
100 A.D.	3201	315°2712	130°0291	40°0848	1100	4201	260°5414	130°0481	40°0671
200	3301	15°7882	130°0308	40°0830	1200	4301	261°0684	130°0478	40°0653
300	3401	76°3252	130°0325	40°0813	1300	4401	321°5954	130°0495	40°0635
400	3501	136°8522	130°0342	40°0795	1400	4501	22°1224	130°0512	40°0618
500	3601	187°3793	130°0359	40°0777	1500	4601	82°6405	130°0529	40°0599
600	3701	257°9063	130°0376	40°0759	1600	4701	143°1765	130°0546	40°0581
700	3801	318°4333	130°0393	40°0741	1700	4801	203°7035	130°0563	40°0563
800	3901	18°9603	130°0410	40°0723	1800	4901	264°2305	130°0580	40°0545
900	4001	79°4873	130°0127	40°0706	1900	5001	324°7575	130°0597	40°0527
					2000	5101	25°2846	130°0614	40°0510

Mars' mean motion for odd years.

Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.
1	191°40	11	305°46	21	59°51	31	173°58	41	287°02	51	41°07	61	155°72	71	269°77	81	23°83	91	187°88		
2	22°81	12	136°88	22	250°92	32	4°97	42	119°02	52	238°07	62	347°13	72	101°18	82	215°23	92	329°29		
3	214°22	13	328°27	23	82°32	33	196°37	43	310°48	53	64°48	63	178°53	73	292°58	83	46°64	93	160°68		
4	45°62	14	159°67	24	273°73	34	27°37	44	141°88	54	255°88	64	9°94	74	123°99	84	238°04	94	352°06		
5	237°03	15	351°08	25	105°13	35	219°18	45	333°24	55	87°23	65	201°34	75	315°39	85	69°45	95	188°50		
6	68°43	16	182°48	26	296°54	36	70°59	46	164°64	56	278°69	66	32°75	76	146°80	86	260°85	96	14°91		
7	217°84	17	13°80	27	127°94	37	241°99	47	356°05	57	110°10	67	221°15	77	338°21	87	92°26	97	206°31		
8	91°24	18	205°29	28	319°35	38	73°40	48	187°45	58	301°51	68	55°56	78	169°61	88	238°66	98	37°72		
9	282°65	19	36°70	29	150°75	39	264°80	49	18°86	59	132°91	69	246°96	79	1°02	89	115°07	99	229°12		
10	114°05	20	228°10	30	342°16	40	96°21	50	210°28	60	324°32	70	78°37	80	192°42	90	306°47	100	60°53		

Mars' Annual Eqn. in Deg.

Mars' mean motion for days.														
Days.	0	1	2	3	4	5	6	7	8	9	0	+	+	-
											0	0°0	180°0	180°0
0	...	0°52	1°05	1°57	2°10	2°62	3°14	8°67	4°19	4°72	1	2°5	179°5	180°5
1	5°24	5°76	6°29	6°81	7°33	7°86	8°38	8°91	9°43	9°96	2	5°1	178°9	181°1
2	10°48	11°00	11°52	12°05	12°58	13°10	13°62	14°15	14°67	15°19	3	7°6	178°4	181°6
3	15°72	16°24	16°77	17°29	17°82	18°34	18°86	19°39	19°91	20°44	4	10°1	177°8	182°2
4	20°96	21°48	22°01	22°53	23°06	23°58	24°11	24°63	25°15	25°68	5	12°7	177°3	182°7
5	26°20	26°73	27°25	27°77	28°30	28°82	29°35	29°87	30°39	30°92	6	15°2	176°8	183°2
6	31°44	31°97	32°40	33°01	33°54	34°07	34°59	35°11	35°63	36°16	7	17°8	176°2	183°8
7	36°68	37°21	37°73	38°25	38°78	39°30	39°83	40°35	40°87	41°40	8	20°4	175°7	184°3
8	41°92	42°45	42°97	43°49	44°02	44°54	45°07	45°59	46°11	46°64	9	23°0	175°1	184°9
9	47°16	47°69	48°21	48°73	49°26	49°78	50°31	50°83	51°35	51°88	10	25°5	174°5	185°5
10	52°40	52°93	53°45	53°97	54°50	55°02	55°55	56°07	56°59	57°12	11	28°1	173°9	186°1
11	57°64	58°17	58°70	59°22	59°74	60°26	60°79	61°31	61°84	62°36	12	30°7	173°4	186°6
12	62°88	63°41	63°93	64°46	64°98	65°50	66°03	66°55	67°08	67°60	13	33°3	172°8	187°2
13	68°12	68°65	69°17	69°70	70°22	70°74	71°27	71°79	72°32	72°84	14	35°9	172°2	187°8
14	73°36	73°89	74°41	74°94	75°46	75°98	76°51	77°03	77°56	78°08	15	38°5	171°5	188°5
15	78°60	79°13	79°65	80°18	80°70	81°22	81°75	82°27	82°80	83°32	16	41°2	170°9	189°1
16	83°84	84°37	84°89	85°42	85°94	86°46	86°99	87°51	88°04	88°56	17	43°9	170°3	189°7
17	89°08	89°61	90°13	90°66	91°18	91°71	92°23	92°75	93°28	93°80	18	46°5	169°6	190°4
18	94°32	94°85	95°37	95°90	96°42	96°95	97°47	97°99	98°52	99°04	19	49°2	169°0	191°0
19	99°57	100°09	100°61	101°14	101°66	102°19	102°71	103°23	103°76	104°28	20	51°8	168°3	191°7
20	104°81	105°33	105°85	106°38	106°90	107°43	107°95	108°47	109°00	109°52	21	54°6	167°5	192°5
21	110°05	110°57	111°09	111°62	112°14	112°67	113°19	113°71	114°24	114°77	22	57°8	166°8	193°2
22	115°29	115°81	116°33	116°86	117°38	117°91	118°43	118°96	119°48	120°00	23	60°2	166°0	194°0
23	120°53	121°05	121°58	122°10	122°62	123°15	123°67	124°20	124°72	125°25	24	63°0	165°3	194°7
24	125°77	126°29	126°82	127°34	127°86	128°39	128°91	129°44	129°96	130°48	25	65°8	164°5	195°5
25	131°01	131°53	132°06	132°55	133°10	133°63	134°15	134°68	135°20	135°72	26	68°7	163°6	196°4
26	136°25	136°77	137°30	137°82	138°34	138°87	139°39	139°92	140°44	140°96	27	71°6	162°6	197°4
27	141°49	142°01	142°54	143°06	143°58	144°11	144°63	145°16	145°68	146°20	28	74°6	161°7	198°8
28	146°73	147°25	147°78	148°30	148°82	149°35	149°87	150°40	150°92	151°45	29	77°7	160°7	199°3
29	151°97	152°49	153°02	153°54	154°07	154°59	155°11	155°64	156°16	156°69	30	80°8	159°6	200°4
30	157°21	157°73	158°26	158°78	159°31	159°83	160°35	160°88	161°40	161°93	31	84°0	158°5	201°5
31	162°45	162°97	163°50	164°02	164°55	165°07	165°59	166°12	166°64	167°17	32	87°3	157°3	202°7
32	167°69	168°21	168°74	169°26	169°79	170°31	170°83	171°36	171°88	172°41	33	90°7	156°9	204°1
33	172°93	173°45	173°98	174°50	175°03	175°55	176°07	176°60	177°12	177°65	34	94°2	155°5	205°6
34	178°17	178°69	179°22	179°74	180°27	180°79	181°31	181°84	182°36	182°89	35	97°9	154°5	206°5
35	183°41	183°94	184°46	184°98	185°51	186°03	186°56	187°08	187°60	188°13	36	101°7	151°0	209°0
36	188°65	189°18	189°70	190°22	190°75	191°27	...	...	...	...	37	106°0	148°7	211°3
											38	110°6	146°2	213°8
											39	116°1	142°7	217°8
											40	124°2	136°5	223°5
											40°15	135°0	...	225°0

TABLE IV.—Mare—cont.

Mars' anomaly.

+	0	1	2	3	4	5	6	7	8	9	-	0	1	2	3	4	5	6	7	8	9
Degrees.											Degrees.										
0	0°0	0°5	0°9	1°4	1°9	2°4	2°9	3°4	3°9	4°4	0	180°0	180°5	180°9	181°4	181°9	182°4	182°9	183°4	183°9	184°0
1	4°8	5°3	5°8	6°3	6°7	7°2	7°7	8°2	8°7	9°2	1	184°8	185°3	185°8	186°3	186°7	187°2	187°7	188°2	188°7	189°0
2	9°7	10°2	10°7	11°2	11°7	12°2	12°7	13°2	13°7	14°2	2	189°7	190°2	190°7	191°2	191°7	192°2	192°7	193°2	193°7	194°0
3	14°7	15°2	15°7	16°2	16°7	17°3	17°8	18°3	18°8	19°4	3	194°7	195°2	195°7	196°2	196°7	197°3	197°8	198°3	198°8	199°0
4	19°9	20°4	20°9	21°4	22°0	22°5	23°0	23°6	24°1	24°7	4	199°9	200°4	200°9	201°4	202°0	202°5	203°0	203°6	204°1	204°7
5	25°2	25°7	26°3	26°9	27°4	28°0	28°6	29°1	29°7	30°2	5	205°2	205°7	206°3	206°9	207°4	208°0	208°6	209°1	209°7	210°0
6	30°8	31°4	32°0	32°6	33°2	33°7	34°4	35°0	35°6	36°2	6	210°8	211°4	212°0	212°6	213°2	213°7	214°4	215°0	215°6	216°0
7	36°9	37°5	38°1	38°7	39°4	40°1	40°7	41°4	42°1	42°7	7	216°9	217°5	218°1	218°7	219°4	220°1	220°7	221°4	222°1	222°7
8	48°4	44°1	44°8	45°5	46°3	47°0	47°7	48°5	49°2	50°0	8	223°4	224°1	224°8	225°5	226°3	227°0	227°7	228°5	229°2	229°8
9	50°8	51°6	52°4	53°2	54°2	55°0	55°9	56°8	57°7	58°7	9	230°8	231°6	232°4	233°2	234°2	235°0	235°9	236°8	237°7	238°6
10	59°7	60°7	61°8	62°9	64°0	65°2	66°5	67°7	69°2	70°6	10	239°7	240°7	241°8	242°9	244°0	245°2	246°5	247°7	249°2	250°6
11	72°2	74°1	76°1	78°4	81°2	85°7	90°0	95°0	100°0	105°0	11	352°2	254°1	256°1	258°4	261°2	265°7	270°0	274°0	278°0	282°0

Maximum equation 11.53 for anomaly of 90°00.

Maximum equation 11.53 for anomaly of 270.00.

[illegible]

TABLE IV.—Mercury.

Data for calculating latitude and geocentric longitude of Mercury from 1 B.C. to A.D. 2000

Mercury's mean motion for centuries.

A.D.	Kaliyuga.	Mean longitude at commence- ment of solar year.	Longi- tude of apsis.	Longi- tude of node	A.D.	Kaliyuga.	Mean longitude at commence- ment of solar year.	Longi- tude of apsis.	Longi- tude node
		Deg.	Deg.	Deg.			Deg.	Deg.	Deg.
1 B.C.	3101 K.Y.	200°38'43	220°41'18	20°75'80	1000 A.D.	4101 K.Y.	249°56'45	220°44'25	20°71
100 A.D.	3201	285°40'23	220°41'49	20°75'39	1100	4201	325°58'25	220°44'55	20°71
200	3301	1°42'03	220°41'80	20°74'99	1200	4301	41°00'05	220°44'88	20°70
300	3401	77°43'88	220°42'10	20°74'58	1300	4401	117°01'85	220°45'17	20°70
400	3501	163°45'63	220°42'41	20°74'17	1400	4501	193°08'65	220°45'47	20°70
500	3601	229°47'44	220°42'72	20°73'77	1500	4601	269°05'46	220°45'78	20°69
600	3701	305°49'24	220°43'02	20°73'36	1600	4701	345°07'28	220°46'09	20°69
700	3801	21°51'04	220°43'33	20°72'95	1700	4801	61°09'06	220°46'39	20°68
800	3901	97°52'84	220°43'63	20°72'55	1800	4901	137°10'86	220°46'70	20°68
900	4001	173°54'64	220°43'94	20°72'14	1900	5001	213°12'66	220°47'01	20°68
					2000	5101	289°14'47	220°47'31	20°67

Mercury's mean motion for odd years.

Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.
1	54°76	11	242°36	21	60°06	31	257°57	41	85°17	51	272°77	61	100°37	71	287°97	81	115°57	91	308°17	01	323°37
2	109°52	12	297°12	22	134°72	32	312°38	42	139°98	52	327°58	62	165°18	72	342°78	82	170°38	92	357°58	02	373°18
3	164°28	13	251°88	23	179°48	33	7°09	43	184°69	53	22°29	63	209°89	73	37°49	83	225°09	93	52°29	03	167°49
4	218°04	14	48°64	24	234°24	34	61°85	44	249°45	54	77°05	64	264°65	74	92°25	84	279°85	94	107°45	04	223°05
5	273°80	15	101°40	25	239°00	35	116°61	45	304°21	55	131°81	65	319°41	75	147°01	85	334°61	95	162°21	05	228°81
6	328°56	16	156°16	26	343°76	36	171°37	46	358°97	56	186°57	66	14°17	76	201°77	86	29°37	96	216°97	06	234°17
7	23°32	17	210°92	27	38°52	37	226°13	47	58°73	57	241°33	67	68°93	77	256°53	87	84°13	97	271°73	07	287°33
8	78°08	18	265°68	28	93°28	38	280°89	48	108°49	58	296°09	68	123°69	78	311°29	88	138°89	98	326°49	08	342°09
9	182°84	19	320°44	29	148°04	39	335°65	49	163°25	59	350°85	69	178°45	79	0°05	89	183°65	99	211°25	09	226°85
10	187°60	20	15°20	30	202°80	40	30°41	50	218°01	60	45°61	70	333°21	80	60°81	90	248°42	00	264°02	10	279°62

TABLE IV.—TABLES FOR CALCULATING GEOCENTRIC PLACE

TABLE IV.—Mercury—cont.

Mercury's mean motion for days.										Mercury's annual equation.		Mercury's anomaly.			
Days.	0	1	2	3	4	5	6	7	8	9	Degrees.	0 0	0 0	180 0	360 0
0	...	4 09	8 18	12 28	16 37	20 46	24 55	28 65	32 74	36 83	0 0	0 0	1 2	178 8	181 2
1	40 02	45 02	49 11	53 20	57 29	61 38	65 48	69 57	73 66	77 75	1 1	0 1	2 4	177 6	182 4
2	81 87	85 94	90 03	94 12	98 22	102 31	106 40	110 49	114 59	118 68	2 2	0 2	3 6	176 4	188 6
3	122 77	126 86	130 95	135 05	139 14	143 23	147 32	151 42	155 51	159 60	3 3	0 3	4 9	175 1	184 9
4	163 69	167 79	171 88	175 97	180 08	184 15	188 25	192 34	196 43	200 52	4 4	0 4	6 0	174 0	186 0
5	204 62	208 71	212 80	216 89	220 99	225 08	229 17	233 26	237 36	241 45	5 5	0 5	7 2	172 8	187 2
6	245 54	249 63	253 72	257 82	261 91	266 00	270 09	274 19	278 28	282 37	6 6	0 6	8 5	171 5	188 5
7	286 46	290 56	294 65	298 74	302 83	306 92	311 02	315 11	319 20	323 29	7 7	0 7	9 7	170 3	189 7
8	327 39	331 48	335 57	339 66	343 76	347 85	351 94	356 03	0 13	4 22	8 8	0 8	11 0	169 0	191 0
9	8 31	12 40	16 49	20 59	24 68	28 77	32 86	36 96	41 05	45 14	9 9	1 0	12 2	167 8	192 2
10	49 23	53 33	57 42	61 51	65 60	69 69	73 79	77 88	81 97	86 06	10 10	1 1	13 5	166 5	193 5
11	90 16	94 25	98 34	102 43	106 53	110 62	114 71	118 80	122 90	126 99	11 11	1 2	14 7	165 8	194 7
12	131 08	135 17	139 26	143 36	147 45	151 54	155 63	159 73	163 82	167 91	12 12	1 3	16 1	163 9	196 1
13	172 00	176 10	180 19	184 28	188 37	192 47	196 56	200 65	204 74	208 83	13 13	1 4	17 4	162 6	197 4
14	212 93	217 02	221 11	225 20	229 30	233 39	237 48	241 57	245 67	249 76	14 14	1 5	18 7	161 3	198 7
15	253 85	257 94	262 03	266 13	270 22	274 31	278 40	282 50	286 59	290 68	15 15	1 6	20 1	159 9	200 1
16	294 77	298 87	302 96	307 05	311 14	315 24	319 33	323 42	327 51	331 60	16 16	1 7	21 5	158 5	201 5
17	335 70	339 79	343 88	347 97	352 07	356 16	0 25	4 34	8 44	12 53	17 17	1 8	22 7	157 3	202 7
18	16 62	20 71	24 80	28 90	32 99	37 08	41 17	45 27	49 36	53 45	18 18	1 9	24 2	155 8	204 2
19	57 54	61 64	65 73	69 82	73 91	78 01	82 10	86 19	90 28	94 37	19 19	2 0	25 6	154 4	205 6
20	98 47	102 56	106 65	110 74	114 84	118 93	123 02	127 11	131 21	135 30	20 20	2 1	27 0	153 0	207 0
21	139 39	143 48	147 58	151 67	155 76	159 85	163 94	168 04	172 13	176 22	21 21	2 2	28 5	151 5	208 5
22	180 31	184 41	188 50	192 59	196 68	200 78	204 87	208 96	213 05	217 15	22 22	2 3	29 9	150 1	209 9
23	221 24	225 33	229 42	233 51	237 61	241 70	245 80	249 89	253 98	258 07	23 23	2 4	31 4	148 6	211 4
24	262 16	266 25	270 35	274 44	278 53	282 62	286 71	290 80	294 90	298 99	24 24	2 5	33 0	147 0	213 0
25	303 08	307 18	311 27	315 36	319 45	323 55	327 64	331 73	335 82	339 92	25 25	2 6	34 5	145 5	214 5
26	344 01	348 10	352 19	356 28	0 38	4 47	8 56	12 65	16 75	20 84	26 26	2 7	36 0	144 0	216 0
27	24 98	29 07	33 16	37 25	41 34	45 43	49 52	53 61	57 70	61 79	27 27	2 8	37 7	142 3	217 7
28	65 85	69 94	74 04	78 13	82 22	86 32	90 41	94 50	98 59	102 69	28 28	2 9	39 4	140 6	219 4
29	106 78	110 87	114 96	119 05	123 15	127 24	131 33	135 42	139 52	143 61	29 29	3 0	41 2	138 8	221 2
30	147 70	151 79	155 89	159 98	164 07	168 16	172 26	176 35	180 44	184 53	30 30	3 1	42 9	137 1	222 9
31	188 62	192 72	196 81	200 90	204 99	209 09	213 18	217 27	221 36	225 46	31 31	3 2	44 7	135 3	224 7
32	229 55	233 64	237 73	241 82	245 92	250 00	254 10	258 19	262 29	266 38	32 32	3 3	46 6	133 4	226 6
33	270 47	274 56	278 66	282 75	286 84	290 93	295 03	299 12	303 21	307 30	33 33	3 4	48 5	131 5	228 5
34	311 39	315 49	319 58	323 67	327 76	331 86	335 95	340 04	344 13	348 23	34 34	3 5	50 6	129 4	230 6
35	352 32	356 41	0 50	4 60	8 69	12 78	16 87	20 96	25 06	29 15	35 35	3 6	52 7	127 3	232 7
36	33 24	37 33	41 43	45 52	49 61	53 70	...	...	...	...	36 36	3 7	55 0	125 0	235 0
											37 37	3 8	57 5	122 5	237 5
											38 38	3 9	60 0	120 0	240 0
											39 39	4 0	63 0	117 0	243 0
											40 40	4 1	66 0	114 0	246 0
											41 41	4 2	69 7	110 2	249 7
											42 42	4 3	74 0	106 0	254 0
											43 43	4 4	80 5	99 5	260 5
											44 44	4 5	90 0	90 0	270 0
											45 45				

TABLE IV.—Jupiter.

Data for calculating latitude and geocentric longitude of Jupiter from B.C.1 to A.D. 2000.

Jupiter's mean motion for centuries.

A.D.	Kaliyuga.	Mean longitude at commencement of solar year.	Longi- tude of apsis.	Longi- tude of node.	A.D.	Kaliyuga.	Mean longitude at commencement of solar year.	Longi- tude of apsis.	Longi- tude of node.
		Deg	Deg.	Deg.			Deg.	Deg.	Deg.
1 B.C.	8101 K.Y.	168 1655	171 2250	79 6867	1000 A.D.	4101 K.Y.	270 6117	171 8001	79 6822
100 A.D.	3301	317 9101	171 2325	79 6952	1100	4201	65 3563	171 8076	79 6907
200	3801	112 6547	171 2400	79 6938	1200	4301	220 1009	171 8151	79 6793
300	3401	287 8993	171 2475	79 6923	1300	4401	14 8455	171 8226	79 6778
400	3501	62 1439	171 2550	79 6909	1400	4501	169 5901	171 8301	79 6764
500	3601	216 8885	171 2625	79 6894	1500	4601	324 3347	171 8376	79 6749
600	3701	11 6881	171 2700	79 6880	1600	4701	119 0793	171 8451	79 6735
700	3801	166 8778	171 2775	79 6865	1700	4801	278 8239	171 8526	79 6720
800	3901	321 1225	171 2851	79 6851	1800	4901	68 4685	171 8601	79 6706
900	4001	115 8671	171 2926	79 6836	1900	5001	223 3130	171 8676	79 6691
					2000	5101	18 0576	171 8752	79 6677

TABLE IV—Jupiter—cont.

Jupiter's mean motion for Odd Years. (Used at p. 97 of Text.)

Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.
1	80°35'	11	333°82'	21	277°80'	31	220°77'	41	164°24'	51	107°72'	61	51°19'	71	354°67'	81	298°14'
2	60°69'	12	4°17'	22	307°64'	32	251°12'	42	194°59'	52	138°07'	62	81°54'	72	25°02'	82	328°40'
3	91°04'	13	34°52'	23	337°99'	33	281°46'	43	224°94'	53	168°41'	63	111°89'	73	55°46'	83	353°84'
4	121°80'	14	64°86'	24	8°34'	34	311°81'	44	255°29'	54	198°76'	64	142°24'	74	85°71'	84	29°18'
5	151°74'	15	95°21'	25	38°69'	35	342°16'	45	285°63'	55	229°11'	65	172°58'	75	116°06'	85	59°53'
6	182°08'	16	125°56'	26	69°03'	36	12°51'	46	315°98'	56	259°46'	66	202°93'	76	146°41'	86	89°88'
7	212°43'	17	155°91'	27	99°38'	37	42°85'	47	346°33'	57	289°80'	67	233°28'	77	176°75'	87	120°23'
8	242°78'	18	186°25'	28	129°73'	38	73°20'	48	16°68'	58	320°15'	68	263°63'	78	207°10'	88	150°57'
9	273°13'	19	216°60'	29	160°07'	39	103°55'	49	47°02'	59	350°50'	69	293°97'	79	237°45'	89	180°92'
10	303°47'	20	246°95'	30	190°42'	40	133°90'	50	77°37'	60	20°85'	70	324°32'	80	267°80'	90	211°27'
																100	154°74'

Jupiter's mean motion for Days (Used at p. 97 of Text.)

Days.	0	1	2	3	4	5	6	7	8	9	Days.	0	1	2	3	4	5	6	7	8	9
	Degrees.											Degrees.									
0	0°00'	0°00'	0°17'	0°25'	0°33'	0°41'	0°50'	0°58'	0°66'	0°75'	19	15°70'	15°87'	15°95'	16°04'	16°12'	16°20'	16°29'	16°37'	16°45'	16°53'
1	0°83'	0°91'	1°00'	1°08'	1°16'	1°25'	1°33'	1°41'	1°50'	1°58'	20	16°62'	16°70'	16°78'	16°87'	16°95'	17°03'	17°12'	17°20'	17°28'	17°37'
2	1°66'	1°74'	1°83'	1°91'	1°99'	2°07'	2°16'	2°24'	2°33'	2°41'	21	17°15'	17°23'	17°31'	17°40'	17°48'	17°56'	18°05'	18°13'	18°21'	18°29'
3	2°40'	2°58'	2°66'	2°74'	2°82'	2°91'	2°99'	3°07'	3°16'	3°24'	22	18°18'	18°26'	18°34'	18°43'	18°51'	19°00'	19°08'	19°16'	19°24'	19°32'
4	3°32'	3°41'	3°49'	3°57'	3°66'	3°74'	3°82'	3°90'	3°99'	4°07'	23	19°11'	19°19'	19°28'	19°36'	19°44'	19°53'	20°01'	20°09'	20°17'	20°25'
5	4°15'	4°24'	4°32'	4°40'	4°49'	4°57'	4°65'	4°74'	4°82'	4°90'	24	19°91'	20°02'	20°11'	20°19'	20°27'	20°36'	20°44'	20°52'	20°61'	20°69'
6	4°99'	5°07'	5°15'	5°23'	5°32'	5°40'	5°48'	5°57'	5°65'	5°73'	25	20°77'	20°86'	20°94'	21°02'	21°11'	21°19'	21°27'	21°35'	21°44'	21°52'
7	5°82'	5°90'	5°98'	6°07'	6°15'	6°23'	6°31'	6°40'	6°48'	6°56'	26	21°60'	21°69'	21°77'	21°85'	21°94'	22°02'	22°10'	22°18'	22°27'	22°35'
8	6°65'	6°73'	6°81'	6°90'	6°98'	7°06'	7°15'	7°23'	7°31'	7°39'	27	22°43'	22°52'	23°00'	23°08'	23°17'	23°25'	23°33'	23°41'	23°49'	23°57'
9	7°48'	7°56'	8°04'	8°12'	8°20'	8°28'	8°36'	8°44'	8°52'		28	23°27'	23°35'	23°43'	23°51'	24°00'	24°08'	24°16'	24°24'	24°32'	24°40'
10	8°31'	8°39'	8°47'	8°55'	9°03'	9°11'	9°19'	9°27'	9°35'		29	24°10'	24°18'	24°26'	24°34'	24°42'	24°50'	24°58'	25°06'	25°14'	25°22'
11	9°14'	9°22'	9°30'	9°38'	9°46'	9°54'	10°02'	10°10'	10°18'		30	24°93'	25°01'	25°09'	25°17'	25°25'	25°33'	25°41'	25°49'	25°57'	26°05'
12	9°97'	10°05'	10°14'	10°22'	10°30'	10°38'	10°47'	10°55'	10°63'		31	25°76'	25°84'	25°92'	26°01'	26°09'	26°17'	26°25'	26°33'	26°41'	26°49'
13	10°80'	10°88'	10°97'	11°05'	11°13'	11°22'	11°30'	11°38'	11°47'		32	26°59'	26°67'	26°75'	26°84'	26°92'	27°00'	27°08'	27°17'	27°25'	27°33'
14	11°63'	11°72'	11°80'	11°88'	11°96'	12°05'	12°13'	12°21'	12°30'		33	27°12'	27°20'	27°29'	27°37'	27°45'	27°53'	28°01'	28°09'	28°17'	28°25'
15	12°46'	12°55'	12°63'	12°71'	12°80'	12°88'	12°96'	13°04'	13°13'		34	28°25'	28°33'	28°42'	28°50'	28°58'	29°07'	29°15'	29°23'	29°31'	29°39'
16	13°29'	13°38'	13°46'	13°54'	13°63'	13°71'	13°79'	13°88'	13°96'		35	29°08'	29°16'	29°25'	29°33'	29°41'	29°50'	29°58'	30°06'	30°14'	30°22'
17	14°13'	14°21'	14°29'	14°37'	14°46'	14°54'	14°62'	14°71'	14°79'		36	29°91'	29°99'	30°08'	30°16'	30°24'	30°33'	...	...	...	...
18	14°96'	15°04'	15°12'	15°21'	15°29'	15°37'	15°45'	15°54'	15°62'												

Jupiter's Annual Equation. (Used at p. 97 of Text.)

+	0	1	2	3	4	5	6	7	8	9	-	0	1	2	3	4	5	6	7	8	9
	Degrees.											Degrees.									
0	0°0'	0°6'	1°2'	1°8'	2°4'	3°1'	3°7'	4°3'	4°9'	5°5'	0	180°0'	180°4'	180°8'	181°3'	181°7'	182°1'	182°5'	182°9'	183°3'	183°7'
1	0°1'	0°7'	1°3'	1°9'	2°5'	3°2'	3°8'	4°4'	5°0'	5°6'	1	184°1'	184°5'	185°0'	185°4'	185°8'	186°2'	186°6'	187°0'	187°4'	187°8'
2	1°2'	1°2'	1°3'	1°4'	1°4'	1°5'	1°6'	1°6'	1°7'	1°7'	2	188°3'	188°7'	189°1'	189°6'	190°0'	190°4'	190°8'	191°3'	191°7'	191°1'
3	1°8'	1°9'	1°9'	2°0'	2°1'	2°1'	2°2'	2°2'	2°3'	2°4'	3	192°5'	193°0'	193°4'	193°8'	194°3'	194°7'	195°1'	195°5'	196°0'	196°4'
4	2°4'	2°5'	2°6'	2°7'	2°7'	2°8'	2°8'	2°9'	2°9'	3°0'	4	196°9'	197°3'	197°8'	198°2'	198°6'	199°1'	199°5'	200°0'	200°5'	200°9'
5	3°1'	3°1'	3°2'	3°3'	3°3'	3°4'	3°5'	3°5'	3°6'	3°7'	5	201°1'	201°8'	202°3'	202°8'	203°2'	203°7'	204°2'	204°7'	205°2'	205°6'
6	3°7'	3°8'	3°8'	3°9'	4°0'	4°0'	4°1'	4°2'	4°2'	4°3'	6	206°1'	206°6'	207°1'	207°6'	208°1'	208°6'	209°1'	209°6'	210°1'	210°7'
7	4°4'	4°5'	4°6'	4°7'	4°7'	4°8'	4°8'	4°9'	5°0'	5°0'	7	211°2'	211°7'	212°3'	212°8'	213°4'	213°9'	214°5'	215°1'	215°6'	216°2'
8	5°2'	5°3'	5°4'	5°4'	5°5'	5°6'	5°7'	5°8'	5°9'	5°9'	8	216°8'	217°4'	217°9'	218°6'	219°2'	219°8'	220°4'	221°1'	221°8'	222°4'
9	6°0'	6°1'	6°2'	6°3'	6°4'	6°5'	6°6'	6°7'	6°8'	6°9'	9	223°2'	223°8'	224°6'	225°3'	226°0'	226°8'	227°6'	228°3'	229°2'	229°9'
10	7°0'	7°1'	7°2'	7°3'	7°4'	7°5'	7°6'	7°7'	7°8'	8°0'	10	230°0'	231°8'	232°8'	233°8'	234°8'	235°0'	237°0'	238°1'	239°1'	240°8'
11	8°3'	8°5'	8°7'	9°0'	9°3'	9°6'	...	...	...	...	11	242°3'	243°8'	245°8'	247°8'	250°5'	255°0'	...	...	...	...

Maximum Equation 11°54' for Anomaly of 103°00.

+	9	8	7	6	5	4	3	2	1	0
	Degrees.									
11	...	...	...	...	105°0'	109°5'	112°2'	114°2'	116°2'	117°7'
10	119°2'	120°6'	121°9'	123°0'	124°0'	125°2'	126°2'	127°2'	128°2'	129°1'
9	130°1'	130°8'	131°7'	132°4'	133°2'	134°0'	134°7'	135°4'	136°2'	136°8'
8	137°6'	138°2'	138°9'	139°6'	140°2'	140°8'	141°4'	142°1'	142°6'	143°2'
7	143°8'	144°4'	144°9'	145°5'	146°1'	146°6'	147°2'	147°7'	148°3'	148°8'
6	149°3'	149°8'	150°4'	150°9'	151°4'	151°9'	152°4'	152°9'	153°4'	153°9'
5	154°4'	154°8'	155°3'	155°8'	156°3'	156°8'	157°2'	157°7'	158°2'	158°6'
4	159°1'	159°5'	160°0'	160°4'	160°9'	161°4'	161°8'	162°2'	162°7'	163°1'
3	163°6'	164°0'	164°5'	164°9'	165°3'	165°7'	166°2'	166°6'	167°0'	167°5'
2	167°9'	168°3'	168°7'	169°2'	169°6'	170°0'	170°4'	170°9'	171°3'	171°7'
1	172°1'	172°5'	173°0'	173°4'	173°8'	174°2'	174°6'	175°0'	175°5'	175°9'
0	176°3'	176°7'	177°1'	177°5'	177°9'	178°3'	178°7'	179°2'	179°6'	180°0'

Maximum Equation 11°54' for Anomaly of 267°00

-	9	8	7	6	5	4	3	2	1	0
	Degrees.									
11	...	...	...	...	262°5'	267°0'	270°0'	272°5'	274°5'	276°3'
10	278°0'	279°5'	281°0'	282°4'	283°6'	285°0'	286°4'	287°3'	288°5'	289°6'
9	290°6'	291°7'	292°8'	293°7'	294°7'	295°6'	296°6'	297°3'	298°5'	299°3'
8	300°2'	301°0'	301°8'	302°7'	303°6'	304°3'	305°2'	306°0'	306°8'	307°6'
7	308°3'	309°1'	309°8'	310°6'	311°4'	312°1'	312°8'	313°6'	314°3'	315°1'
6	315°8'	316°5'	317°2'	318°0'	318°6'	319°3'	320°0'	320°7'	321°4'	322°1'
5	323°8'	323°4'	324°1'	324°8'	325°5'	326°1'	326°8'	327°4'	328°1'	328°8'
4	329°4'	330°1'	330°8'	331°4'	332°0'	332°6'	333°3'	333°9'	334°6'	335°3'
3	335°8'	336°5'	337°1'	337°8'	338°4'	339°0'	339°6'	340°3'	340°9'	341°5'
2	342°1'	342°8'	343°4'	344°0'	344°6'	345°3'	345°9'	346°5'	347°1'	347°8'
1	348°3'	348°9'	349°6'	350°2'	350°8'	351°4'	352°0'	352°6'	353°3'	353°9'
0	354°5'	355°1'	355°7'	356°3'	356°9'	357°5'	358°2'	358°8'	359°4'	360°0'

TABLE IV—Jupiter—cont.

Jupiter's Anomaly. (Used at p. 97 of Text.)

+	0	1	2	3	4	5	6	7	8	9	-	0	1	2	3	4	5	6	7	8	9
Degrees											Degrees.										
0	00	11	22	32	44	55	66	77	88	99	0	180.0	181.1	182.2	183.2	184.4	185.5	186.6	187.7	188.8	189.9
1	11.0	12.2	13.3	14.5	15.6	16.7	17.9	19.1	20.2	21.5	1	191.0	192.2	193.3	194.5	195.6	196.7	197.9	199.0	200.2	201.5
2	22.6	23.9	25.1	26.4	27.6	28.9	30.2	31.5	32.9	34.1	2	202.6	203.9	205.1	206.4	207.6	208.9	210.2	211.5	212.9	214.1
3	35.5	37.0	38.4	39.9	41.4	42.9	44.5	46.1	47.7	49.5	3	215.5	217.0	218.4	219.9	221.4	222.6	224.5	226.1	227.7	229.5
4	51.2	53.1	55.0	57.1	59.2	61.7	64.0	67.0	70.0	74.0	4	231.2	233.1	235.0	237.1	239.2	241.7	244.0	247.0	250.2	254.0
5	77.5	80.0	...	...	...	...	...	...	...	...	5	257.5	270.0	...	...	...	...	...	...	...	...

Maximum Equation 5 0994 for Anomaly of 90°00

+	9	8	7	6	5	4	3	2	1	0
Degrees										
5	..		..	...		.	...	...	90°0	102°5
4	101°0	110°0	113°0	116°0	118°3	120°8	122°9	125°0	126°9	128°8
3	130°5	132°3	138°9	135°5	137°1	138°6	140°1	141°6	143°0	144°5
2	145°9	147°1	148°5	149°8	151°1	152°4	153°6	154°9	156°1	157°4
1	158°5	159°8	160°9	162°1	163°3	164°4	165°5	166°7	167°8	169°0
0	170°1	171°2	172°3	173°4	174°5	175°6	176°8	177°8	178°9	180°0

Maximum Equation 5 0994 for Anomaly of 270°00

-	9	8	7	6	5	4	3	2	1	0
Degrees										
5	..	..	..	..	..	..	..	..	270 0	282 5
4	286 0	290 0	293 0	296 0	298 3	300 8	302 0	305 0	306 0	308 8
3	310 5	312 3	313 0	315 5	317 1	318 6	320 1	321 6	323 0	324 5
2	325 9	327 1	328 5	329 8	331 1	332 4	333 6	334 0	336 1	337 1
1	338 5	339 8	340 0	342 1	343 3	344 4	345 5	346 7	347 8	349 0
0	350 1	351 2	352 3	353 4	354 5	355 6	356 8	357 8	358 9	360 0

TABLE IV—Venus.

Data for calculating Latitude and geocentric Longitude of Venus from BC 1 to AD 2000

(For Centuries B.C. see p. 331.)

Venus' mean motion for Centuries (Used at p. 95 of Text.)

A.D	Kahyuga		Mean long. at commence- ment of Solar Year	Longi- tude of apsis	Longi- tude of node	A.D	Kahyuga.		Mean long. at commence- ment of Solar Year.	Longi- tude of apsis.	Longi- tude of node.
			Deg	Deg	Deg				Deg	Deg	Deg.
1 BC	3101	K Y	303 2772	79 7837	59 8039	1000 AD	4101	K Y	133 1288	79 8283	59 7288
100 AD	3201		142 2621	79 7882	59 7964	1100	4201		332 1140	79 8328	59 7213
200	3301		341 2475	79 7926	59 7889	1200	4301		171 0691	79 8372	59 7138
300	3401		180 2327	79 7971	59 7814	1300	4401		10 0943	79 8417	59 7063
400	3501		19 2178	79 8016	59 7738	1400	4501		209 0894	79 8461	59 6988
500	3601		218 2030	79 8060	59 7663	1500	4601		18 0546	79 8506	59 6913
600	3701		57 1882	79 8105	59 7588	1600	4701		247 0398	79 8550	59 6838
700	3801		256 1733	79 8149	59 7513	1700	4801		86 0249	79 8595	59 6763
800	3901		95 1585	79 8194	59 7438	1800	4901		285 0101	79 8639	59 6687
900	4001		294 1436	79 8238	59 7363	1900	5001		123 0952	79 8684	59 6612
						2000	5101		322 9804	79 8728	59 6537

Venus' mean motion for Odd Years. (Used at p. 95 of Text.)

Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.
1	225 10	11	317 09	21	48 99	31	110 88	41	232 78	51	324 08	61	56 58	71	148 48	81	240 38	91	332 28				
2	90 38	12	182 28	22	274 18	32	6 07	42	97 97	52	189 87	62	281 77	72	13 67	82	105 57	92	197 47				
3	315 57	13	47 17	23	130 37	33	231 26	43	323 16	53	55 06	63	146 96	73	238 86	83	330 76	93	62 66				
4	180 78	14	272 66	24	4 56	34	96 15	44	188 35	54	280 25	64	12 15	74	104 05	84	195 95	94	287 85				
5	45 95	15	137 85	25	229 75	35	321 64	45	53 54	55	145 44	65	237 34	75	329 24	85	61 14	95	153 04				
6	271 14	16	3 04	26	94 94	36	186 83	46	278 73	56	10 63	66	102 53	76	194 43	86	286 33	96	18 23				
7	136 33	17	228 23	27	320 13	37	52 02	47	143 02	57	235 82	67	327 72	77	50 62	87	151 52	97	243 42				
8	1 52	18	93 42	28	185 32	38	277 21	48	9 11	58	101 01	68	192 31	78	284 81	88	16 71	98	108 60				
9	226 71	19	318 61	29	50 51	39	142 40	49	234 30	59	326 20	69	58 10	79	150 00	89	241 90	99	333 79				
10	91 90	20	183 80	30	275 70	40	7 59	50	99 49	60	191 39	70	283 29	80	15 19	90	107 09	100	198 98				

TABLE IV—Venus—cont.

Venus' mean motion for Days. (P. 95 of Text)										Venus' Annual Equation. (P. 96 of Text)				Venus' Anomaly. (P. 96 of Text)	
Days.	0	1	2	3	4	5	6	7	8	9	+ ' + — —				+ —
Degrees										Degrees.				Degrees.	
0		1 60	3 20	4 81	6 41	8 01	9 61	11 21	12 82	14 42	0	0'0	180'0	180'0	360'0
1	16'02	17'62	18'23	20'83	22'43	24'03	25'63	27'24	28'84	30'44	1	2'4	179'6	180'4	357'6
2	32'04	33'64	35'25	36'85	38'45	40'05	41'65	43'26	44'86	46'46	2	4'7	179'2	180'8	355'8
3	48'06	49'67	51'27	52'87	54'47	56'07	57'68	59'28	60'88	62'48	3	7'1	178'8	181'2	352'9
4	64'08	65'68	67'29	68'89	70'49	72'09	73'70	75'30	76'90	78'50	4	9'5	178'5	181'5	350'5
5	80'11	81'71	83'31	84'91	86'51	88'12	89'72	91'32	92'92	94'53	5	11'9	178'1	181'9	348'1
6	96'13	97'73	99'33	100'93	102'54	104'14	105'74	107'34	108'94	110'55	6	14'3	177'7	182'3	345'7
7	112'15	113'75	115'35	116'95	118'56	120'16	121'76	123'36	124'97	126'57	7	16'7	177'3	182'7	343'3
8	128'17	129'77	131'37	132'98	134'58	136'18	137'78	139'38	140'99	142'59	8	19'1	176'9	183'1	340'9
9	144'19	145'79	147'40	149'00	150'60	152'20	153'80	155'41	157'01	158'61	9	21'4	176'6	183'4	338'6
10	160'21	161'81	163'42	165'02	166'62	168'22	169'83	171'43	173'03	174'63	10	23'9	176'2	183'8	336'1
11	176'23	177'84	179'44	181'04	182'64	184'24	185'85	187'45	189'05	190'65	11	26'3	175'8	184'2	333'7
12	192'25	193'86	195'46	197'06	198'66	200'27	201'87	203'47	205'07	206'67	12	28'7	175'3	184'7	331'3
13	208'28	209'88	211'48	213'08	214'69	216'29	217'89	219'49	221'09	222'70	13	31'1	174'9	185'1	328'9
14	224'30	225'90	227'50	229'10	230'71	232'31	233'91	235'51	237'11	238'72	14	33'5	174'5	185'5	326'5
15	240'32	241'92	243'52	245'13	246'73	248'33	249'93	251'53	253'14	254'74	15	35'9	174'1	185'9	324'1
16	256'34	257'94	259'54	261'15	262'75	264'35	265'95	267'56	269'16	270'76	16	38'4	173'7	186'3	321'6
17	272'36	273'96	275'57	277'17	278'77	280'37	281'97	283'58	285'18	286'78	17	40'8	173'2	186'8	319'2
18	288'38	289'98	291'59	293'19	294'79	296'39	297'99	299'60	301'20	302'80	18	43'2	172'8	187'2	316'8
19	304'40	306'01	307'61	309'21	310'81	312'41	314'02	315'62	317'22	318'82	19	45'7	172'4	187'6	314'3
20	320'43	322'03	323'63	325'23	326'83	328'43	330'04	331'64	333'24	334'84	20	48'2	171'9	188'1	311'8
21	336'45	338'05	339'65	341'25	342'85	344'45	346'06	347'66	349'26	350'87	21	50'6	171'4	188'6	309'4
22	352'47	354'07	355'67	357'27	358'88	360'48	362'08	363'68	365'29	366'89	22	53'1	170'9	189'1	306'9
23	8'49	10'09	11'69	13'30	14'90	16'50	18'10	19'70	21'31	22'91	23	55'6	170'4	189'6	304'4
24	24'51	26'11	27'72	29'32	30'92	32'52	34'12	35'73	37'33	38'93	24	58'2	169'9	190'1	301'8
25	40'53	42'13	43'74	45'34	46'94	48'54	50'15	51'75	53'35	54'95	25	60'7	169'4	190'6	299'3
26	56'55	58'16	59'76	61'36	62'96	64'56	66'17	67'77	69'37	70'97	26	63'3	168'9	191'1	296'7
27	72'57	74'17	75'78	77'38	78'98	80'59	82'19	83'79	85'39	86'99	27	65'9	168'3	191'7	294'1
28	88'60	90'20	91'80	93'40	95'00	96'61	98'21	99'81	101'41	103'02	28	68'4	167'7	192'3	291'6
29	104'62	106'22	107'82	109'42	111'03	112'63	114'23	115'83	117'43	119'04	29	71'1	167'1	192'9	289'0
30	120'64	122'24	123'84	125'45	127'05	128'65	130'25	131'85	133'46	135'06	30	73'8	166'4	193'6	286'2
31	136'66	138'26	139'86	141'47	143'07	144'67	146'27	147'87	149'48	151'08	31	76'4	165'8	194'2	283'6
32	152'68	154'28	155'89	157'49	159'09	160'69	162'29	163'90	165'50	167'10	32	79'1	165'1	194'9	280'9
33	168'70	170'30	171'91	173'51	175'11	176'71	178'32	179'92	181'52	183'12	33	81'9	164'3	195'7	278'1
34	184'72	186'33	187'93	189'53	191'13	192'73	194'34	195'94	197'54	199'14	34	84'7	163'5	196'5	275'3
35	200'75	202'35	203'95	205'55	207'15	208'75	210'36	211'96	213'56	215'16	35	87'5	162'7	197'3	272'5
36	216'77	218'37	219'97	221'57	223'18	224'78	...	...	...	...	36	90'4	161'9	198'1	269'8
											37	93'4	161'0	199'0	266'6
											38	96'1	159'9	200'1	263'6
											39	99'6	158'8	201'2	260'4
											40	102'8	157'7	202'3	257'2
											41	106'2	156'2	203'8	253'8
											42	109'8	154'6	205'4	250'2
											43	113'6	152'8	207'2	246'4
											44	117'9	150'6	209'4	242'1
											45	122'9	147'8	212'2	237'1
											46	128'7	142'8	217'2	230'3
											46 38	135'0	...	225'0	...

TABLE IV—Saturn.

Data for calculating Latitude and geocentric Longitude of Saturn from B.C. 1 to A.D. 2000.
Saturn's mean motion for Centuries.

(For Centuries B.C. see p. 331.)

A.D.	Kaliyuga.	Mean Long. at commence- ment of Solar Year	Longi- tude of apsis.	Longi- tude of node	A.D.	Kaliyuga.	Mean Long. at commence- ment of Solar Year	Longi- tude of apsis.	Longi- tude of node.
		Deg.	Deg.	Deg.			Deg.	Deg.	Deg.
1 B.C.	3101 K.Y.	70°53'78	236°61'94	100°47'14	1000 A.D.	4101 K.Y.	49°00'72	236°62'26	100°41'62
100 A.D.	3201	212°44'47	236°61'97	100°46'59	1100	4201	191°51'41	236°62'29	100°41'07
200	3301	354°85'17	236°62'00	100°46'04	1200	4301	333°42'11	236°62'33	100°40'52
300	3401	136°25'86	236°62'03	100°45'48	1300	4401	115°32'80	236°62'36	100°39'97
400	3501	278°16'55	236°62'07	100°44'93	1400	4501	257°23'40	236°62'39	100°39'41
500	3601	60°07'25	236°62'10	100°44'38	1500	4601	39°14'19	236°62'42	100°38'86
600	3701	201°97'94	236°62'13	100°43'83	1600	4701	181°04'88	236°62'46	100°38'31
700	3801	343°88'64	236°62'16	100°43'28	1700	4801	322°95'58	236°62'49	100°37'76
800	3901	125°78'83	236°62'20	100°42'72	1800	4901	104°86'27	236°62'52	100°37'21
900	4001	267°70'02	236°62'23	100°42'17	1900	5001	246°76'96	236°62'55	100°36'66
					2000	5101	28°67'66	236°62'59	100°36'11

TABLE IV—Saturn—cont.

Saturn's mean motion for Odd Years. (Used at p. 97 of Text.)

Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.	Yrs.	Deg.
1	12:22	11	134 41	21	256 60	31	18 70	41	140 98	51	263 17	61	25 38	71	147 55	81	269 74	91	31 93
2	24 44	12	146 63	22	268 82	32	31 01	42	153 20	52	275 39	62	37 58	72	159 77	82	281 96	92	44 15
3	36 66	13	158 85	23	281 04	33	43 23	43	165 42	53	287 61	63	49 80	73	171 99	83	294 18	93	56 37
4	48 88	14	171 07	24	293 26	34	55 45	44	177 04	54	299 83	64	62 02	74	184 21	84	306 40	94	68 59
5	61 09	15	183 29	25	305 48	35	67 67	45	189 86	55	312 05	65	74 24	75	196 43	85	318 62	95	80 81
6	73 31	16	195 50	26	317 70	36	79 89	46	202 08	56	324 27	66	86 46	76	208 65	86	330 84	96	93 03
7	85 53	17	207 72	27	329 91	37	92 10	47	214 30	57	336 49	67	98 68	77	220 87	87	343 06	97	105 25
8	97 75	18	219 94	28	342 13	38	104 32	48	226 51	58	348 71	68	1 09 90	78	233 09	88	355 28	98	117 47
9	109 97	19	232 16	29	354 35	39	116 54	49	238 73	59	0 92	69	123 12	79	245 31	89	7 50	99	129 69
10	122 19	20	244 38	30	0 57	40	128 76	50	250 95	60	13 14	70	135 33	80	257 52	90	19 72	100	141 91

Saturn's mean motion for Days.

[illegible]

Saturn's Annual Equation. (Used at p 97 of Text)

	0	1	2	3	4	5	6	7	8	9		0	1	2	3	4	5	6	7	8	9
	Degrees											Degrees									
0	0 0	1 0	2 0	3 1	4 1	5 1	6 1	7 1	8 2	9 2	0	180 0	180 8	181 7	182 5	183 3	184 1	184 9	185 8	186 6	187 4
1	10 2	11 2	12 2	13 3	14 4	15 4	16 4	17 5	18 5	19 6	1	188 3	189 1	189 9	190 8	191 6	192 4	193 3	194 1	194 9	195 8
2	20 6	21 7	22 7	23 8	24 9	26 0	27 1	28 2	29 2	30 4	2	196 7	197 5	198 4	199 4	200 8	201 1	201 9	202 8	203 8	204 7
3	31 5	32 6	33 7	34 9	36 1	37 2	38 4	39 6	40 8	42 0	3	205 6	206 5	207 5	208 4	209 4	210 3	211 3	212 3	213 3	214 4
4	43 2	44 5	45 9	47 1	48 5	49 7	51 1	52 5	54 0	55 5	4	215 4	216 5	217 5	218 7	219 8	221 0	222 1	223 1	224 6	225 9
5	57 0	58 5	60 1	61 7	63 5	65 1	67 2	69 2	71 5	73 7	5	227 3	22 8	229 8	231 3	233 0	234 6	236 3	238 3	240 0	242 3
6	76 2	79 8	82 7	87 5	97 5						6	244 3	247 3	250 8	255 0	262 5					

Maximum Equation 6.3767^o for Anomaly of 97.50 .

	9	8	7	6	5	4	3	2	1	0
	Degrees									
6						97.5	105.0	109.2	112.7	115.7
5	117.7	120.6	121.7	123.7	125.4	127.0	128.7	130.2	131.5	132.7
4	134.1	135.4	136.6	137.9	139.0	140.2	141.3	142.5	143.5	144.6
3	145.6	146.7	147.7	148.7	149.7	150.6	151.6	152.5	153.5	154.4
2	155.3	156.2	157.2	158.1	158.9	159.2	160.7	161.6	162.5	163.3
1	164.2	165.1	165.9	166.7	167.6	168.4	169.2	170.1	170.9	171.7
0	172.6	173.4	174.2	175.1	175.9	176.7	177.5	178.3	179.2	180.0

Maximum Equation 6.3767 for Anomaly of 262.50

	9	8	7	6	5	4	3	2	1	0
	Degrees									
6						262.5	272.5	277.3	280.8	283.8
5	286.3	288.5	290.8	292.8	294.6	296.5	298.3	299.9	301.5	303.0
4	304.5	306.0	307.5	308.9	310.3	311.5	312.9	314.1	315.5	316.8
3	318.0	319.2	320.4	321.6	322.8	323.9	325.1	326.3	327.4	328.5
2	329.6	330.8	331.8	332.9	334.0	335.1	336.2	337.3	338.3	339.4
1	340.4	341.5	342.6	343.6	344.6	345.6	346.7	347.8	348.8	349.8
0	350.8	351.8	352.9	353.9	354.9	355.9	356.0	356.0	356.0	356.0

Saturn's Anomaly. (Used at p 97 of Text)

+	0	1	2	3	4	5	6	7	8	9	-	0	1	2	3	4	5	6	7	8	9
					Degrees.											Degrees.					
0	0 0	0 7	1 5	2 2	2 9	3 7	4 4	5 2	5 9	6 7	0	180 0	180 7	181 5	182 2	182 9	183 7	184 4	185 2	185 9	186 7
1	7 4	8 1	8 9	9 6	10 4	11 2	11 9	12 7	13 4	14 2	1	187 4	188 1	188 9	189 6	190 4	191 2	191 9	192 7	193 4	194 2
2	14 9	15 7	16 5	17 2	18 1	18 8	19 6	20 4	21 2	22 0	2	194 9	195 7	196 5	197 2	198 1	198 8	199 6	200 4	201 2	202 0
3	22 8	23 7	24 5	25 3	26 1	26 9	27 8	28 7	29 5	30 3	3	202 8	203 7	204 5	205 3	206 1	206 9	207 8	208 7	209 5	210 3
4	31 2	32 1	33 0	33 9	34 8	35 7	36 7	37 6	38 5	39 5	4	211 2	212 1	213 0	213 9	214 8	215 7	216 7	217 6	218 5	219 5
5	40 5	41 5	42 5	43 5	44 6	45 6	46 7	47 9	49 0	50 1	5	220 5	221 5	222 5	223 5	224 6	225 6	226 7	227 9	229 0	230 1
6	51 4	52 5	53 9	55 1	56 5	57 9	59 2	60 9	62 5	64 1	6	231 4	232 5	233 9	235 1	236 5	237 9	239 2	240 9	242 5	244 1
7	66 0	67 7	70 0	72 2	75 0	78 2	83 0	90 0			7	246 0	247 7	250 0	252 2	255 0	258 2	263 0	270 0		

Maximum Equation 7 6586 for Anomaly of 90°00'.

+ -9 8 -7 -6 5 -4 -3 2 -1 0										
	Degrees.									
7			90 0	97 0	101 8	105 0	107 8	110 0	112 3	114 0
6	115 0	117 5	119 1	120 8	122 1	123 5	124 9	126 1	127 5	128 6
5	129 9	131 0	132 1	133 3	134 4	135 1	136 5	137 5	138 5	139 5
4	140 5	141 5	142 4	143 3	144 3	145 2	146 1	147 0	147 9	148 8
3	149 7	150 5	151 3	152 2	153 1	153 9	154 7	155 5	156 3	157 2
2	158 0	158 8	159 6	160 4	161 2	161 9	162 8	163 5	164 3	165 1
1	165 8	166 6	167 3	168 1	168 8	169 6	170 4	171 1	171 9	172 6
0	173 3	174 1	174 8	175 5	176 3	177 1	177 8	178 5	179 3	180 0

Maximum Equation 7.6586⁷ for Anomaly of 270.00°.

—	9	8	7	6	5	4	3	2	1	0
Degrees.										
7			270.0	277.0	281.8	285.0	287.8	290.0	292.3	294.0
6	295.0	297.5	299.1	300.8	302.1	303.5	304.9	306.1	307.5	308.8
5	309.9	311.0	312.1	313.3	314.4	315.4	316.5	317.5	318.5	319.5
4	320.5	321.5	322.4	323.3	324.8	325.2	326.1	327.0	327.9	328.8
3	329.7	330.5	331.3	332.2	333.1	333.9	334.7	335.5	336.3	337.2
2	338.0	338.8	339.6	340.4	341.2	341.9	342.8	343.5	344.3	345.1
1	345.8	346.6	347.3	348.1	348.8	349.6	350.4	351.1	351.9	352.6
0	353.3	354.1	354.8	355.6	356.3	357.1	357.8	358.5	359.2	360.0

TABLE IV—Mercury eye-table.

Showing for every tenth day in the Indian Solar year

(1) in ordinary type, the mean longitude of Mercury for that day (indicated by M.L.) attained in a particular year—shown in Column 1. See explanation in paragraph 321, page 132 of the Text

(2) in heavy type, the corresponding actual geocentric place (indicated by G.P.) extracted from Table V.B.

N.B.—When using this table find first of all, under the appropriate day of the solar year, the place where the minimum mean longitude for that column, 1, 2, 3, 4, 5, etc., as the case may be, is entered in ordinary type, from this point any other desired longitude may be traced off consecutively. Supposing it is required to know the actual geocentric place of Mercury corresponding to mean longitude 13° on the 90th (completed) day of any solar year, working down the column “90 days” it will be found that the initial mean longitude 5° is entered in line with 157 in the column “90 days”, the mean longitude 13 is the next entry for which the corresponding geocentric place is 71 (11 in Altitude)

Year	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360
dys	dys	dys	dys	dys	dys	dys	dys	dys	dys	dys	dys	dys	dys	dys	dys	dys	dys	dys	dys	dys	dys	dys	dys	dys	dys	dys	dys	dys	dys	dys	dys	dys	dys	dys	dys	dys	dys
Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees
A.D.	M.L.	M.L.	G.P.	G.P.	G.P.	G.P.	G.P.	G.P.	G.P.	G.P.	G.P.	G.P.	G.P.	G.P.	G.P.	G.P.	G.P.	G.P.	G.P.	G.P.	G.P.	G.P.	G.P.	G.P.	G.P.	G.P.	G.P.	G.P.	G.P.	G.P.	G.P.	G.P.	G.P.	G.P.	G.P.	G.P.	G.P.
1834	200	241	282	323	364	405	446	487	528	569	610	651	692	733	774	815	856	897	938	979	1020	1061	1102	1143	1184	1225	1266	1307	1348	1389	1430	1471	1512	1553	1594	1635	1676
1835	251	292	333	374	415	456	497	538	579	620	661	702	743	784	825	866	907	948	989	1030	1071	1112	1153	1194	1235	1276	1317	1358	1399	1440	1481	1522	1563	1604	1645	1686	1727
1836	302	343	384	425	466	507	548	589	630	671	712	753	794	835	876	917	958	999	1040	1081	1122	1163	1204	1245	1286	1327	1368	1409	1450	1491	1532	1573	1614	1655	1696	1737	1778
1837	353	394	435	476	517	558	599	640	681	722	763	804	845	886	927	968	1009	1050	1091	1132	1173	1214	1255	1296	1337	1378	1419	1460	1501	1542	1583	1624	1665	1706	1747	1788	1829
1838	404	445	486	527	568	609	650	691	732	773	814	855	896	937	978	1019	1060	1101	1142	1183	1224	1265	1306	1347	1388	1429	1470	1511	1552	1593	1634	1675	1716	1757	1798	1839	1880
1839	455	496	537	578	619	660	701	742	783	824	865	906	947	988	1029	1070	1111	1152	1193	1234	1275	1316	1357	1398	1439	1480	1521	1562	1603	1644	1685	1726	1767	1808	1849	1890	1931
1840	506	547	588	629	670	711	752	793	834	875	916	957	998	1039	1080	1121	1162	1203	1244	1285	1326	1367	1408	1449	1490	1531	1572	1613	1654	1695	1736	1777	1818	1859	1900	1941	1982
1841	557	598	639	680	721	762	803	844	885	926	967	1008	1049	1090	1131	1172	1213	1254	1295	1336	1377	1418	1459	1500	1541	1582	1623	1664	1705	1746	1787	1828	1869	1910	1951	1992	2033
1842	608	649	690	731	772	813	854	895	936	977	1018	1059	1100	1141	1182	1223	1264	1305	1346	1387	1428	1469	1510	1551	1592	1633	1674	1715	1756	1797	1838	1879	1920	1961	2002	2043	
1843	659	700	741	782	823	864	905	946	987	1028	1069	1110	1151	1192	1233	1274	1315	1356	1397	1438	1479	1520	1561	1602	1643	1684	1725	1766	1807	1848	1889	1930	1971	2012	2053	2094	
1844	710	751	792	833	874	915	956	997	1038	1079	1120	1161	1202	1243	1284	1325	1366	1407	1448	1489	1530	1571	1612	1653	1694	1735	1776	1817	1858	1899	1940	1981	2022	2063	2104	2145	
1845	761	802	843	884	925	966	1007	1048	1089	1130	1171	1212	1253	1294	1335	1376	1417	1458	1499	1540	1581	1622	1663	1704	1745	1786	1827	1868	1909	1950	1991	2032	2073	2114	2155	2196	
1846	812	853	894	935	976	1017	1058	1099	1140	1181	1222	1263	1304	1345	1386	1427	1468	1509	1550	1591	1632	1673	1714	1755	1796	1837	1878	1919	1960	2001	2042	2083	2124	2165	2206		
1847	863	904	945	986	1027	1068	1109	1150	1191	1232	1273	1314	1355	1396	1437	1478	1519	1560	1601	1642	1683	1724	1765	1806	1847	1888	1929	1970	2011	2052	2093	2134	2175	2216	2257		
1848	914	955	996	1037	1078	1119	1160	1201	1242	1283	1324	1365	1406	1447	1488	1529	1570	1611	1652	1693	1734	1775	1816	1857	1898	1939	1980	2021	2062	2103	2144	2185	2226	2267	2308		
1849	965	1006	1047	1088	1129	1170	1211	1252	1293	1334	1375	1416	1457	1498	1539	1580	1621	1662	1703	1744	1785	1826	1867	1908	1949	1990	2031	2072	2113	2154	2195	2236	2277	2318	2359		
1850	1016	1057	1098	1139	1180	1221	1262	1303	1344	1385	1426	1467	1508	1549	1590	1631	1672	1713	1754	1795	1836	1877	1918	1959	2000	2041	2082	2123	2164	2205	2246	2287	2328	2369	2410		
1851	1067	1108	1149	1190	1231	1272	1313	1354	1395	1436	1477	1518	1559	1600	1641	1682	1723	1764	1805	1846	1887	1928	1969	2010	2051	2092	2133	2174	2215	2256	2297	2338	2379	2420	2461		
1852	1118	1159	1200	1241	1282	1323	1364	1405	1446	1487	1528	1569	1610	1651	1692	1733	1774	1815	1856	1897	1938	1979	2020	2061	2102	2143	2184	2225	2266	2307	2348	2389	2430	2471	2512		
1853	1169	1210	1251	1292	1333	1374	1415	1456	1497	1538	1579	1620	1661	1702	1743	1784	1825	1866	1907	1948	1989	2030	2071	2112	2153	2194	2235	2276	2317	2358	2399	2440	2481	2522	2563		
1854	1220	1261	1302	1343	1384	1425	1466	1507	1548	1589	1630	1671	1712	1753	1794	1835	1876	1917	1958	1999	2040	2081	2122	2163	2204	2245	2286	2327	2368	2409	2450	2491	2532	2573	2614		
1855	1271	1312	1353	1394	1435	1476	1517	1558	1599	1640	1681	1722	1763	1804	1845	1886	1927	1968	2009	2050	2091	2132	2173	2214	2255	2296	2337	2378	2419	2460	2501	2542	2583	2624	2665		
1856	1322	1363	1404	1445	1486	1527	1568	1609	1650	1691	1732	1773	1814	1855	1896	1937	1978	2019	2060	2101	2142	2183	2224	2265	2306	2347	2388	2429	2470	2511	2552	2593	2634	2675	2716		
1857	1373	1414	1455	1496	1537	1578	1619	1660	1701	1742	1783	1824	1865	1906	1947	1988	2029	2070	2111	2152	2193	2234	2275	2316	2357	2398	2439	2480	2521	2562	2603	2644	2685	2726	2767		
1858	1424	1465	1506	1547	1588	1629	1670	1711	1752	1793	1834	1875	1916	1957	1998	2039	2080	2121	2162	2203	2244	2285	2326	2367	2408	2449	2490	2531	2572	2613	2654	2695	2736	2777	2818		
1859	1475	1516	1557	1598	1639	1680	1721	1762	1803	1844	1885	1926	1967	2008	2049	2090	2131	2172	2213	2254	2295	2336	2377	2418	2459	2500	2541	2582	2623	2664	2705	2746	2787	2828	2869		
1860	1526	1567	1608	1649	1690	1731	1772	1813	1854	1895	1936	1977	2018	2059	2100	2141	2182	2223	2264	2305	2346	2387	2428	2469	2510	2551	2592	2633	2674	2715	2756	2797	2838	2879	2920		
1861	1577	1618	1659	1700	1741	1782	1823	1864	1905	1946	1987	2028	2069	2110	2151	2192	2233	2274	2315	2356	2397	2438	2479	2520	2561	2602	2643	2684	2725	2766	2807	2848	2889	2930	2971		
1862	1628	1669	1710	1751	1792	1833	1874	1915	1956	1997	2038	2079	2120	2161	2202	2243	2284	2325	2366	2407	2448	2489	2530	2571	2612	2653	2694	2735	2776	2817	2858	2899	2940	2981	3022		
1863	1679	1720	1761	1802	1843	1884	1925	1966	2007	2048	2089	2130	2171	2212	2253	2294																					

TABLE IV.—Mercury eye table—cont.

Showing for every tenth day in the Indian Solar year, etc.—cont.

Year A.D.	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260
M.L.	5	46	87	128	169	210	251	291	332	373	414	455	496	537	578	619	660	701	742	783	824	865	906	947	988	1029	1070
G.P.	357	51	33	48	58	57	41	57	57	71	88	106	125	142	158	177	177	174	167	177	191	207	223	242	258	272	286
M.L.	12	53	94	135	176	217	258	299	339	380	421	462	503	544	585	626	667	708	749	790	831	872	913	954	995	1036	1077
G.P.	359	18	35	49	56	55	48	48	58	73	90	108	126	144	160	171	175	170	164	167	178	192	209	226	244	259	272
M.L.	20	61	102	143	184	225	266	307	348	389	430	471	512	553	594	635	676	717	758	799	840	881	922	963	1004	1045	1086
G.P.	1	20	36	48	54	50	44	47	58	74	92	110	128	146	161	171	172	166	161	167	179	194	211	229	245	261	274
M.L.	28	69	110	151	192	233	274	314	355	396	437	478	519	560	601	642	683	724	765	806	847	888	929	970	1011	1052	1093
G.P.	4	21	37	48	51	45	41	46	59	76	94	112	131	149	167	182	193	186	180	186	196	213	231	247	262	272	282
M.L.	35	76	117	158	199	240	281	321	362	403	444	485	526	567	608	649	690	731	772	813	854	895	936	977	1018	1059	1100
G.P.	6	23	38	47	48	41	39	46	61	78	96	114	132	149	162	168	165	158	156	162	172	188	205	223	241	259	277
M.L.	44	85	126	167	208	249	290	331	372	413	454	495	536	577	618	659	700	741	782	823	864	905	946	987	1028	1069	1110
G.P.	7	24	38	46	43	36	37	47	62	80	98	116	134	152	166	161	154	148	143	150	167	184	201	219	237	255	273
M.L.	52	93	134	175	216	257	298	339	380	421	462	503	544	585	626	667	708	749	790	831	872	913	954	995	1036	1077	1118
G.P.	9	26	38	43	38	33	36	48	64	82	100	118	136	154	161	163	156	152	157	170	185	202	219	236	253	270	287
M.L.	60	101	142	183	224	265	306	347	388	429	470	511	552	593	634	675	716	757	798	839	880	921	962	1003	1044	1085	1126
G.P.	11	27	37	40	33	30	36	49	66	84	102	121	138	152	159	159	152	150	157	171	187	204	222	239	256	273	290
M.L.	67	108	149	190	231	272	313	354	395	436	477	518	559	600	641	682	723	764	805	846	887	928	969	1010	1051	1092	1133
G.P.	12	27	37	36	29	28	36	50	68	86	104	122	139	152	158	156	148	149	158	172	189	206	223	240	257	274	291
M.L.	75	116	157	198	239	280	321	362	403	444	485	526	567	608	649	690	731	772	813	854	895	936	977	1018	1059	1100	1141
G.P.	14	27	34	32	25	26	36	52	69	88	106	124	140	152	156	151	145	148	159	174	191	208	225	241	254	261	259
M.L.	83	124	165	206	247	288	329	370	411	452	493	534	575	616	657	698	739	780	821	862	903	944	985	1026	1067	1108	1149
G.P.	15	27	32	26	21	25	37	53	71	90	109	126	141	151	153	146	142	148	163	180	197	214	231	248	265	282	299
M.L.	90	131	172	213	254	295	336	377	418	459	500	541	582	623	664	705	746	787	828	869	910	951	992	1033	1074	1115	1156
G.P.	16	27	29	22	19	25	38	55	73	92	110	127	142	150	150	142	140	148	161	177	195	212	228	243	254	256	250
M.L.	98	139	180	221	262	303	344	385	426	467	508	549	590	631	672	713	754	795	836	877	918	959	1000	1041	1082	1123	1164
G.P.	17	26	25	18	17	25	40	57	76	94	112	129	142	148	146	138	137	148	163	180	197	214	231	248	265	282	299
M.L.	106	147	188	229	270	311	352	393	434	475	516	557	598	639	680	721	762	803	844	885	926	967	1008	1049	1090	1131	1172
G.P.	18	18	11	8	15	28	45	63	82	101	119	132	140	140	133	131	129	132	144	161	178	195	212	229	246	263	280
M.L.	114	148	189	230	271	312	353	394	435	476	517	558	599	640	681	722	763	804	845	886	927	968	1009	1050	1091	1132	1173
G.P.	19	24	20	14	15	26	41	59	78	96	114	130	142	146	141	135	138	149	164	181	199	216	233	250	267	284	297
M.L.	122	163	204	245	286	327	368	409	450	491	532	573	614	655	696	737	778	819	860	901	942	983	1024	1065	1106	1147	1188
G.P.	20	24	16	10	14	27	43	61	80	99	116	131	142	143	137	132	138	151	166	183	201	218	233	245	250	245	239
M.L.	130	171	212	253	294	335	376	417	458	499	540	581	622	663	704	745	786	827	868	909	950	991	1032	1073	1114	1155	1196
G.P.	21	24	17	11	15	28	45	63	82	101	119	132	140	140	133	131	129	132	144	161	178	195	212	229	246	263	280
M.L.	138	179	220	261	302	343	384	425	466	507	548	589	630	671	712	753	794	835	876	917	958	999	1040	1081	1122	1163	1204
G.P.	22	24	17	11	15	28	45	63	82	101	119	132	140	140	133	131	129	132	144	161	178	195	212	229	246	263	280
M.L.	146	186	227	268	309	350	391	432	473	514	555	596	637	678	719	760	801	842	883	924	965	1006	1047	1088	1129	1170	1211
G.P.	23	24	17	11	15	28	45	63	82	101	119	132	140	140	133	131	129	132	144	161	178	195	212	229	246	263	280
M.L.	154	194	235	276	317	358	399	440	481	522	563	604	645	686	727	768	809	850	891	932	973	1014	1055	1096	1137	1178	1219
G.P.	24	24	17	11	15	28	45	63	82	101	119	132	140	140	133	131	129	132	144	161	178	195	212	229	246	263	280
M.L.	162	202	243	284	325	366	407	448	489	530	571	612	653	694	735	776	817	858	899	940	981	1022	1063	1104	1145	1186	1227
G.P.	25	24	17	11	15	28	45	63	82	101	119	132	140	140	133	131	129	132	144	161	178	195	212	229	246	263	280
M.L.	170	210	251	292	333	374	415	456	497	538	579	620	661	702	743	784	825	866	907	948	989	1030	1071	1112	1153	1194	1235
G.P.	26	24	17	11	15	28	45	63	82	101	119	132	140	140	133	131	129	132	144	161	178	195	212	229	246	263	280
M.L.	178	218	259	300	341	382	423	464	505	546	587	628	669	710	751	792	833	874	915	956	997	1038	1079	1120	1161	1202	1243
G.P.	27	24	17	11	15	28	45	63	82	101	119	132	140	140	133	131	129	132	144	161	178	195	212	229	246	263	280
M.L.	186	226	267	308	349	390	431	472	513	554	595	636	677	718	759	800	841	882	923	964	1005	1046	1087	1128	1169	1210	1251
G.P.	28	24	17	11	15	28	45	63	82	101	119	132	140	140	133	131	129	132	144	161	178	195	212	229	246	263	280
M.L.	194	234	275	316	357	398	439	480	521	562	603	644	685	726	767	808	849	890	931	972	1013	1054	1095	1136	1177	1218	1259
G.P.	29	24	17	11	15	28	45	63	82	101	119	132	140	140	133	131	129	132	144	161	178	195	212	229	246	263	280
M.L.	202	242	283	324	365	406	447	488	529	570	611	652	693	734	775	816	857	898	939	980	1021	1062	1103	1144	1185	1226	1267
G.P.	30	24	17	11	15	28	45	63	82	101	119	132	140	140	133	131	129	132	144	161	178	195	212	229	246	263	280
M.L.	210	250	291	332	373	414	455	496	537	578	619	660	701	742	783	824	865	906	947	988	1029	1070	1111	1152	1193	1234	1275
G.P.	31	24	17	11	15	28																					

TABLE IV.—Venus Eye-Table.

Showing actual longitude (in ordinary type) corresponding to mean longitude (in heavy type) for every ten complete days of the Indian Solar year. (Text page 132)

[illegible]

TABLE IV-A.

Mean Places of Planets according to Indian Ephemeris at Commencement of each Century from 3102 B.C. to 1 B.C. (K.Y. 0 to K.Y. 3101.)

			Mars.	Mercury.	Jupiter.	Venus.	Saturn.
			Degrees	Degrees	Degrees.	Degrees	Degrees
B.C.	3102	K Y. 0	347°00	318°06	15°73	20°55	339°20
	3101	1	178°4072	12°8263	46°0929	254°7801	851°4239
	3001	101	288°0342	88°6463	200°8275	93°7242	183°3308
	2901	201	298°4612	164°8623	355°5721	292°7093	275°2377
	2801	301	359°9882	240°8803	150°3167	131°6944	57°1449
	2701	401	60°5152	316°8983	305°0613	330°6785	199°0515
	2601	501	121°0422	32°9163	99°8059	169°6646	340°9544
	2501	601	181°5692	108°9343	254°5505	8°6497	122°8653
	2401	701	242°1962	184°9523	49°2951	207°6348	264°7722
	2301	801	302°6232	260°9703	104°0367	40°6189	46°6791
	2201	901	3°1502	336°9883	358°7843	245°6050	188°5890
	2101	1001	63°6772	53°0063	153°5289	84°5901	330°4029
	2001	1101	124°2042	129°0243	308°2785	283°5752	112°3998
	1901	1201	184°7312	205°0423	103°0181	122°5608	254°3967
	1801	1301	245°2582	281°0603	267°7627	321°5454	36°2136
	1701	1401	305°7852	357°0783	52°5673	160°5305	178°1205
	1601	1501	6°3122	73°0963	167°2519	359°5156	320°0274
	1501	1601	66°8392	149°1143	199°65	198°5007	101°9343
	1401	1701	127°8662	225°1323	166°7411	37°4558	243°8412
	1301	1801	187°8932	301°1503	311°4857	236°4769	25°7481
	1201	1901	248°4202	17°1683	106°2803	75°4560	167°6550
	1101	2001	308°9472	93°1863	260°9749	274°4411	309°5619
	1001	2101	9°4742	169°2043	55°7195	113°4262	31°4688
	901	2201	70°0012	245°2223	210°4641	312°4113	283°3557
	801	2301	130°5282	321°2403	5°2087	151°3964	15°2826
	701	2401	191°0552	37°2583	159°9538	350°8815	157°1895
	601	2501	251°5822	113°2763	314°6979	189°3666	299°0964
	501	2601	312°1092	189°2943	109°4425	28°8517	81°0038
	401	2701	12°6362	265°3123	294°1871	227°3868	222°9102
	301	2801	73°1632	341°3303	58°9317	66°3219	4°5171
	201	2901	133°6902	57°8483	213°6768	265°3070	146°7240
	101	3001	194°2172	133°3663	8°4209	104°2821	288°6809
	1	3101	254°7442	209°3843	163°1655	308°2772	70°5378

TABLE IV-B.

Planets.—Revolutions and Increases of Longitude for different periods according to Surya Siddhanta and Indian Ephemeris. (See page 121, paragraph 297 of Text.)

	1,000 Years.			100 Years.			10 Years.			1 Year.		
	Revolutions and Fraction of Revolution.	Increase of Longitude.		Revolutions and Fraction of Revolution.	Increase of Longitude.		Revolutions and Fraction of Revolution.	Increase of Longitude.		Revolutions and Fraction of Revolution.	Increase of Longitude.	
		Degrees.	Ephemeris Degrees.		Degrees.	Ephemeris Degrees.		Degrees.	Ephemeris Degrees.		Degrees.	Ephemeris Degrees.
		Surya siddhānta.			Surya siddhānta			Surya siddhānta.			Surya siddhānta.	
Mars	531·674	242·64	245·27	53·1674	60·264	60·53	5·31674	114·0284	115·05	531·674	191·40284	191·40
Jupiter.	84·3102	111·672	107·447	8·43102	155·1672	154·74	84·3102	303·51672	301·47	84·3102	30·351672	30·35
Saturn.	33·928	334·08	339·069	3·3928	141·408	141·91	33·928	122·1408	122·19	33·928	12·21408	12·22
Venus.	1625·55	198·00	189·852	162·555	199·8	198·98	16·2555	91·98	91·90	1·62555	225·198	225·19
Mercury	4152·10	36·00	40·18	415·210	75·6	76·018	41·521	187·56	187·6	4·1521	54·75	54·76
		Mars.		Jupiter		Saturn		Venus		Mercury		
		Surya siddhānta Degrees.	Indian Ephemeris Degrees.	Surya siddhānta Degrees.	Indian Ephemeris Degrees.	Surya siddhānta Degrees.	Indian Ephemeris Degrees.	Surya siddhānta Degrees.	Indian Ephemeris Degrees.	Surya siddhānta Degrees.	Indian Ephemeris Degrees.	
B.C. 3102	K.Y. 0	358·86	347·00	359·82	15·73	359·93	339·20	356·52	29·55	351·12	318·06	
3101	1	190·26	178·41	30·17	46·06	12·14	351·42	221·72	254·74	45·87	12·83	
2101	1001	72·90	63·68	141·84	153·53	346·22	330·49	59·72	84·59	81·87	53·01	
1101	2001	315·54	308·95	253·51	260·87	320·80	309·56	257·72	274·44	117·87	98·19	
101	3001	198·18	194·22	5·18	8·42	294·38	288·68	95·72	104·29	153·87	183·37	
A.D. 900	4001	80·82	79·49	118·85	115·87	298·46	267·70	293·72	294·14	189·87	178·55	
1900	5001	323·48	324·76	228·52	223·31	242·54	246·77	181·72	123·99	225·87	213·78	

TABLE IV-C.

Sun's mean Longitude and Equation for every complete day of Indian Solar year.

Day	☉'s mean longitude	Eqn.	Day	☉'s mean longitude	Eqn.	Day	☉'s mean longitude	Eqn.	Day	☉'s mean longitude	Eqn.	Day	☉'s mean longitude	Eqn.
Degrees.			Degrees			Degrees.			Degrees.			Degrees.		
0	367°8608	+21378	74	70°7952	+2486	148	143°7288	-1°0880	222	218°0848	-1°4808	296	289°5984	+1°1814
1	368°2462	21333	75	71°7808	-2197	149	144°7154	2°0122	223	217°0498	1°4028	297	290°5846	1°2180
2	359°8318	21228	76	72°7664	-1717	150	145°7010	2°0253	224	218°0356	1°8733	298	291°5701	1°2439
3	0°8174	21133	77	73°7520	-1333	151	146°6866	2°0369	225	219°0212	1°8439	299	292°5558	1°2747
4	1°9089	21036	78	74°7376	-9975	152	147°6722	2°0482	226	220°0068	1°8114	300	293°5414	1°3086
5	2°7888	20967	79	75°7232	-6800	153	148°6578	2°0611	227	221°5924	1°2828	301	294°5270	1°3322
6	3°7742	20858	80	76°7088	-0203	154	149°6434	2°0739	228	222°5780	1°2533	302	295°5126	1°3623
7	4°7598	20767	81	77°6944	-0167	155	150°6290	2°0858	229	223°5636	1°2228	303	296°4982	1°3903
8	5°7454	20647	82	78°6800	-0560	156	151°6146	2°0955	230	224°5492	1°1905	304	297°4838	1°4197
9	6°7310	20514	83	79°6656	-0933	157	152°6002	2°1036	231	225°5348	1°1589	305	298°4694	+1°4482
10	7°7166	20394	84	80°6512	-1314	158	153°5858	2°1136	232	226°5204	1°1283	306	299°4550	1°4747
11	8°7022	20267	85	81°6368	-1692	159	154°5714	2°1228	233	227°5060	1°0967	307	300°4406	1°5012
12	9°6878	20122	86	82°6224	-2074	160	155°5570	2°1314	234	228°4916	1°0614	308	301°4262	1°5297
13	10°6734	19986	87	83°6080	-2444	161	156°5426	2°1383	235	229°4772	1°0253	309	302°4118	1°5567
14	11°6590	19833	88	84°5936	-2833	162	157°5282	2°1433	236	230°4628	-9953	310	303°3974	1°5833
15	12°6446	19667	89	85°5792	-3203	163	158°5138	2°1494	237	231°4484	-9622	311	304°3830	1°6093
16	13°6302	19500	90	86°5648	-3572	164	159°4994	2°1567	238	232°4340	-9280	312	305°3686	1°6344
17	14°6158	19333	91	87°5504	-3955	165	160°4850	2°1603	239	233°4196	-8928	313	306°3542	1°6589
18	15°6014	19167	92	88°5360	-4333	166	161°4706	2°1617	240	234°4052	-8597	314	307°3398	1°6819
19	16°5870	19000	93	89°5216	-4692	167	162°4562	2°1667	241	235°3908	-8224	315	308°3254	1°7050
20	17°5726	18833	94	90°5072	-5061	168	163°4418	2°1692	242	236°3764	-7894	316	309°3110	1°7280
21	18°5582	18622	95	91°4928	-5433	169	164°4274	2°1728	243	237°3620	-7536	317	310°2966	1°7497
22	19°5438	18419	96	92°4784	-5789	170	165°4130	2°1742	244	238°3476	-7203	318	311°2822	1°7728
23	20°5294	18217	97	93°4640	-6167	171	166°3986	2°1755	245	239°3332	-6833	319	312°2678	1°7992
24	21°5150	18025	98	94°4496	-6525	172	167°3842	2°1769	246	240°3188	-6469	320	313°2534	1°8153
25	22°5006	17814	99	95°4352	-6891	173	168°3698	2°1755	247	241°3044	-6097	321	314°2390	1°8317
26	23°4862	17600	100	96°4208	-7228	174	169°3554	2°1712	248	242°2900	-5749	322	315°2246	1°8530
27	24°4718	17383	101	97°4064	-7586	175	170°3410	2°1728	249	243°2756	-5369	323	316°2102	1°8725
28	25°4574	17167	102	98°3920	-7944	176	171°3266	2°1714	250	244°2612	-5000	324	317°1958	1°8917
29	26°4430	16933	103	99°3776	-8299	177	172°3122	2°1678	251	245°2468	-4686	325	318°1814	1°9111
30	27°4286	16680	104	100°3632	-8633	178	173°2978	2°1612	252	246°2324	-4253	326	319°1670	1°9269
31	28°4142	16455	105	101°3488	-8986	179	174°2834	2°1597	253	247°2180	-3883	327	320°1526	1°9453
32	29°3998	16192	106	102°3344	-9333	180	175°2690	2°1561	254	248°2036	-3509	328	321°1382	1°9611
33	30°3854	15955	107	103°3200	-9667	181	176°2546	2°1489	255	249°1892	-3122	329	322°1238	1°9758
34	31°3710	15692	108	104°3056	-10009	182	177°2402	2°1439	256	250°1748	-2753	330	323°1094	1°9917
35	32°3567	15455	109	105°2912	-10333	183	178°2258	2°1367	257	251°1604	-2369	331	324°0950	2°0064
36	33°3423	15167	110	106°2768	-10667	184	179°2114	2°1305	258	252°1460	-1992	332	325°0806	2°0211
37	34°3279	14914	111	107°2624	-11010	185	180°1970	2°1219	259	253°1316	-1597	333	326°0662	2°0317
38	35°3135	14633	112	108°2480	-11308	186	181°1827	2°1133	260	254°1172	-1228	334	327°0518	2°0493
39	36°2991	14358	113	109°2337	-11622	187	182°1683	2°1061	261	255°1029	-0817	335	328°0370	2°0597
40	37°2847	14081	114	110°2193	-11955	188	183°1539	2°0954	262	256°0885	-0469	336	329°0221	2°0708
41	38°2703	13778	115	111°2049	-12253	189	184°1395	2°0858	263	257°0741	-0086	337	330°0087	2°0819
42	39°2559	13480	116	112°1905	-12561	190	185°1251	2°0753	264	258°0597	+0394	338	330°9943	2°0930
43	40°2415	13180	117	113°1761	-12858	191	186°1107	2°0642	265	259°0453	+0761	339	331°9799	2°1017
44	41°2271	12894	118	114°1617	-13167	192	187°0963	2°0519	266	260°0309	+1111	340	332°9655	2°1114
45	42°2127	12586	119	115°1473	-13455	193	188°0819	2°0383	267	261°0165	+1469	341	333°9511	2°1211
46	43°1983	12297	120	116°1329	-13739	194	189°0675	2°0261	268	262°0021	+1817	342	334°9367	2°1283
47	44°1839	11967	121	117°1185	-14025	195	190°0531	2°0125	269	262°9877	+2239	343	335°9223	2°1369
48	45°1695	11617	122	118°1041	-14333	196	191°0387	1°9978	270	263°9733	+2586	344	336°9079	2°1430
49	46°1551	11347	123	119°0897	-14686	197	192°0243	1°9819	271	264°9589	+2992	345	337°8935	2°1480
50	47°1407	11014	124	120°0753	-14983	198	193°0099	1°9661	272	265°9445	+3369	346	338°8791	2°1542
51	48°1263	10703	125	121°0609	-15133	199	193°9955	1°9514	273	266°9301	+3739	347	339°8647	2°1592
52	49°1119	10369	126	122°0465	-15405	200	194°9811	1°9333	274	267°9157	+4122	348	340°8503	2°1628
53	50°0975	10025	127	123°0321	-15667	201	195°9667	1°9161	275	268°9013	+4500	349	341°8359	2°1653
54	51°0831	9703	128	124°0177	-15919	202	196°9523	1°9023	276	269°8869	+4869	350	342°8215	2°1689
55	52°0687	9358	129	125°0033	-16167	203	197°9379	1°8898	277	270°8725	+5238	351	343°8071	2°1703
56	53°0543	9025	130	125°9889	-16433	204	198°9235	1°8600	278	271°8581	+5511	352	344°7927	2°1717
57	54°0399	8667	131	126°9745	-16667	205	199°9091	1°8417	279	272°8437	+5980	353	345°7783	2°1730
58	55°0255	8333	132	127°9601	-16894	206	200°8947	1°8222	280	273°8293	+6347	354	346°7639	2°1755
59	56°0111	7964	133	128°9457	-17133	207	201°8803	1°8014	281	274°8149	+6692	355	347°7495	2°1764
60	56°9967	7622	134	129°9313	-17358	208	202°8659	1°7805	282	275°8005	+7081	356	348°7351	2°1739
61	57°9823	7267	135	130°9169	-17572	209	203°8515	1°7575	283	276°7861	+7419	357	349°7207	2°1714
62	58°9679	6919	136	131°9025	-17789	210	204°8371	1°7369	284	277°7717	+7764	358	350°7063	2°1700
63	59°9535	6561	137	132°8881	-18009	211	205°8227	1°7139	285	278°7573	+8122	359	351°6919	2°1688
64	60°9391	6192	138	133°8737	-18217	212	206°8083	1°6894	286	279°7429	+8469	360	352°6775	2°1650
65	61°9247	5847	139	134°8593	-18419	213	207°7939	1°6661	287	280°7285	+8848	361	353°6631	2°1625
66	62°9103	5480	140	135°8449	-18597	214	208°7795	1°6433	288	281°7141	+9147	362	354°6487	2°1599
67	63°8959	5111	141	136°8305	-18789	215	209°7651	1°6178	289	282°6997	+9500	363	355°6343	2°1528
68	64°8815	4739	142	137°8161	-18980	216	210°7507	1°5922	290	283°6853	+9833	364	356°6199	2°1467
69	65°8671	4369	143	138°8017	-19167	217	211°7363	1°5687	291	284°6709	+10192	365	357°6055	2°1405
70	66°8527	4000	144	139°7873	-19333	218	212°7219	1°5411	292	285°6565	+10508			
71	67°8383	3622	145	140°7729	-19500	219	213°7075	1°5130	293	286°6421	+10850			
72	68°8239	3192	146	141°7585	-19667	220	214°6931	1°4869	294	287°6277	+11167			
73	69°8096	2869	147	142°7441	-19825	221	215°6787	1°4689	295	288°6133	+11483			

TABLE IV-D.

Decimal parts of $\odot$'s L. corresponding to decimal parts of a day.

[illegible]

TABLE IV-E

Sun's Longitude in days ($360 = 365.25875648$ days).

Degrees.	Days	Degrees	Days	Minutes of degree	Fraction of day.	Minutes of degree	Fraction of day.	Minutes of degree	Fraction of day.	Minutes of degree	Fraction of day.	Minutes of degree	Fraction of day.
1	1 0148078	40	40 5843064	1	0189101	13	2198316	25	4227582	37	6256747	49	8288902
2	2 0292153	50	50 7308830	2	0334202	14	2367418	26	4396633	38	6425848	50	8456063
3	3 0438230	60	60 8764598	3	0507304	15	2536519	27	4565734	39	6594949	51	8624165
4	4 0584306	70	71 0225362	4	0676495	16	2705620	28	4734835	40	6764051	52	8793267
5	5 0730383	80	81 1686128	5	0845506	17	2874721	29	4903937	41	6933152	53	8962366
6	6 0876460	90	91 3146994	6	1014698	18	3043823	30	5073038	42	7102253	54	9131468
7	7 1022536	100	101 4607660	7	1183799	19	3212924	31	5242139	43	7271355	55	9300570
8	8 1168613	200	202 9215320	8	1352810	20	3382025	32	5411241	44	7440456	56	9469671
9	9 1314689	300	304 3822080	9	1521911	21	3551127	33	5580342	45	7609567	57	9638772
10	10 1460766	360	365 2587565	10	1691013	22	3720228	34	5749443	46	7778658	58	9807874
20	20 2921532			11	1860114	23	3889329	35	5918544	47	7947760	59	9976975
30	30 4382298			12	2029215	24	4058430	36	6087646	48	8116861	60	1 0148078

TABLE IV-F

Decimal parts of increase of C's L. corresponding to decimal parts of a nakshatra.

[illegible]

TABLE IV-K.

Mean place of Rahu at commencement of Kaliyuga and at Mesha Sankranti at the beginning of every century—B.C. 3201—A.D. 2000.

B.C.	Degrees.	Kaliyuga.	B.C.	Degrees.	Kaliyuga.	A.D.	Degrees.	Kaliyuga.
3102	201 6952	0	1601	304 9379	1501	100	153 8857	3201
3201	817 1635	—99	1501	169 1113	1601	200	20 0591	3301
						300	244 2325	3401
						400	103 4059	3501
						500	332 5793	3601
3101	182 3869	1	1401	33 2847	1701			
3001	46 5108	101	1301	257 4581	1801			
2901	270 6887	201	1201	121 6 415	1901	600	196 7527	3701
2801	134 8571	301	1101	345 8049	2001	700	60 9261	3801
2701	359 0345	401	1001	209 9783	2101	800	285 0995	3901
						900	149 2729	4001
						1000	13 4468	4101
2601	228 2039	501	901	74 1517	2201			
2501	87 3778	601	801	298 3251	2301	1100	237 6197	4201
2401	311 5507	701	701	162 4985	2401	1200	101 7931	4301
2301	175 7241	801	601	26 6719	2501	1300	325 9665	4401
2201	39 8975	901	501	250 8453	2601	1400	190 1399	4501
						1500	54 3133	4601
2101	264 0709	1001	401	115 0187	2701	1600	278 4867	4701
2001	128 2448	1101	301	339 1921	2801	1700	142 6601	4801
1901	352 4177	1201	201	203 3655	2901	1800	6 8335	4901
1801	216 5911	1301	101	67 5379	3001	1900	241 0069	5001
1701	80 7645	1401	1	291 7123	3101	2000	95 1803	5101

N.B.—0 Kaliyuga, as a civil Solar year began on February 15 5772, B.C. 3102 whereas 0 Kaliyuga, as the starting point of Indian planetary longitudes, was February 17 75, B.C. 3102. The mean place of Rahu at the former moment was 201° 69 52' and at the latter 201° 58 02'.

Mean motion of Rahu in sidereal longitude (Indian) for odd years of a century and for multiples of 100 years.

Years.	Degrees.	Years	Degrees	Years	Degrees.	Years.	Degrees.	Years.	Degrees.
1	19 3583	26	143 3149	51	267 2716	76	31 2282	200	271 6532
2	88 7165	27	162 6732	52	286 6295	77	50 5865	300	47 4798
3	58 0748	28	182 0314	53	305 9881	78	69 9447	400	183 3094
4	77 4331	29	201 3897	54	325 3464	79	89 3030	500	319 1830
5	96 7913	30	220 7480	55	344 7046	80	108 6613	600	94 9596
6	116 1496	31	240 1062	56	4 0629	81	128 0195	700	230 7862
7	135 5079	32	259 4645	57	23 4212	82	147 3778	800	6 6128
8	154 8661	33	278 8228	58	42 7794	83	166 7361	900	142 4394
9	174 2244	34	298 1810	59	62 1377	84	186 0943	1000	278 2680
10	193 5827	35	317 5393	60	81 4960	85	205 4526	2000	196 5320
11	212 9409	36	336 8976	61	100 8542	86	224 8109	3000	114 7980
12	232 2992	37	356 2558	62	120 2125	87	244 1691	4000	33 0640
13	251 6575	38	375 6141	63	139 5707	88	263 5274	5000	311 8300
14	271 0157	39	394 9724	64	158 9290	89	282 8857		
15	290 3740	40	414 3306	65	178 2873	90	302 2439		
16	309 7323	41	433 6889	66	197 6455	91	321 6021		
17	329 0905	42	453 0472	67	217 0038	92	340 9605		
18	348 4488	43	472 4054	68	236 3621	93	0 3187		
19	367 8070	44	491 7637	69	255 7203	94	19 6769		
20	387 1653	45	511 1220	70	275 0786	95	39 0352		
21	406 5236	46	530 4802	71	294 4369	96	58 3935		
22	425 8818	47	549 8385	72	313 7951	97	77 7518		
23	445 2401	48	569 1968	73	333 1534	98	97 1100		
24	464 5984	49	588 5550	74	352 5117	99	116 4683		
25	483 9566	50	607 9133	75	371 8699	100	135 8266		

N.B.—Rahu's motion is backward, not forward. Therefore, in deducing the place of Rahu for so many years or so many days (see below) subsequent to a given moment, the motion of Rahu for the required interval should be deducted from, (not added to), the given place. Thus: required to deduce from the place of Rahu at 0 Kaliyuga his place one day after Mesha Sankranti, A.D. 1909. From the given place, 201° 69 54' deduct motion for 5010 years and one day, i.e., 5000 years (311° 33 00') + 10 years (193° 58 27') + 1 day (0° 58 03'). Result 56° 72 95'.

Mean motion of Rahu for every 10 days and for fractions of a day.

Day.	Degrees.	Days.	Degrees.	Days.	Degrees.	Days.	Degrees.	Days.	Degrees.	Days.	Degrees.	Days.	Degrees.
1	0° 053	1	0° 530	10	0° 5300	100	5 2999	190	10° 06 98	280	14° 83 97	365	19 34 49
2	0° 108	2	1° 080	20	1° 0800	110	5 8299	200	10° 59 98	290	15° 86 96	366	19 39 79
3	0° 154	3	1° 590	30	1° 5900	120	6 3599	210	11° 12 97	300	16 89 96		
4	0° 212	4	2° 120	40	2° 1199	130	6 8899	220	11° 65 97	310	16° 42 96		
5	0° 265	5	2° 650	50	2° 6499	140	7 4199	230	12° 18 97	320	16° 95 96		
6	0° 318	6	3° 180	60	3° 1799	150	7 9498	240	12° 71 97	330	17° 48 96		
7	0° 371	7	3° 710	70	3° 7 99	160	8 4798	250	13° 24 97	340	18° 01 96		
8	0° 424	8	4° 240	80	4° 2399	170	9 0098	260	13° 77 97	350	18° 54 96		
9	0° 477	9	4° 770	90	4° 7699	180	9 5398	270	14° 30 97	360	19° 07 96		

KEY TO TABLE IV-L—cont

[illegible]

TABLE IV-L—cont.

Cycles of recurrence of Eclipses—Solar and Lunar—cont.

[illegible]

TABLE IV-L—cont.

Cycles of recurrence of Eclipses--Solar and Lunar--cont.

[illegible]

Cycles of recurrence of Eclipses--Solar and Lunar--cont.

[illegible]

Cycles of recurrence of Holipses—Solar and Lunar—cont.

[illegible]

TABLE IV-I—cont.

Cycles of recurrence of Eclipses—Solar and Lunar—cont.

[illegible]

TABLE IV-L—cont.
Cycles of recurrence of Eclipses—Solar and Lunar—cont.

[illegible]

TABLE IV. I—cont.

Cycles of recurrence of Eclipses—Solar and Lunar—cont

[illegible]

TABLE IV-L—cont.

[illegible]

TABLE IV-M—EXPLANATORY NOTES

Showing for each century A.D. the days of English calendar months corresponding to days of the Indian Solar year.

This table will be found equally useful for Table IV-L and for Tables V-A and V-B.

2. It shows, within a day or two, the English equivalent of the reckoning by completed days of the Indian Solar year.

3. The heavy type figures running horizontally are the centuries A.D. The heavy type figures running vertically are days of the Indian Solar year. Only every fourth day of the Indian Solar year is shown in order to economize space.

4. The century beginning with A.D. 1600 is shown twice, once to indicate the reckoning in the United Kingdom where the new style was not adopted till A.D. 1752, and again to indicate the reckoning in continental countries which adopted the new style on 15th October A.D. 1582.

5. For odd years in a century use the figure given in the table for the nearest century year. Thus for 1 January A.D. 640, use the figure which corresponds to 1 January A.D. 700, *i.e.*, 286 days of the Indian Solar year. The year A.D. 600 does not appear in the table and A.D. 550 which appears there was not so near to A.D. 640 as A.D. 700 was.

TABLE IV-M.
Correspondence of English calendar and days of the Indian Solar year A.D. 0 to A.D. 2000.

[illegible]

TABLE IV-M.—DAYS OF THE ENGLISH CALENDAR AND INDIAN SOLAR YEAR

[illegible]

TABLE V-A—EXPLANATORY NOTE.

Tables V-A and V-B together constitute a Perpetual Planetary Almanac.

2. For illustrations of the use of Table V-A in conjunction with Table V-B see sections ii and iii, pages 98 to 125, Chapter V of this work.

3. The table is composed of two parts: columns 2, 3 and 4 give the increase of longitudes of the three major planets Mars, Jupiter and Saturn for 1, 2, 3, 4, 5 . . . up to 2,005 years. If the years are reckoned from 1 B.C., or A.D. 0 the years 1, 2, 3, 4, . . . etc., up to 2005 in column 1 will be years A.D. and they are so marked; but the years may be reckoned from any year A.D. or B.C. For instance in paragraph 294 of this work the years in column 1 are reckoned from 3102 B.C. and on page 119 they are reckoned from 1101 B.C.

4. The years in column 1 of Table V-A may be reckoned backwards from any year B.C. or A.D. in which case the quantities in columns 2 to 4 will become decreases of longitude for so many years reckoned backwards. For an example see page 103, paragraph 255. In practice, however, as noted in paragraph 257, page 103, much inconvenience will be avoided by reckoning the years in column 1 of Table V-A always forward, as is done in paragraph 24, pages 118 and 119.

5. Columns 5 to 9 and 11 to 15 of Table V-A give the years of the current cycle (Table V-B) when each of the five planets Mars, Mercury, Jupiter, Venus and Saturn attained the same positions on successive days of the Indian solar year as they did in any given year A.D. entered in column 1 or in any B.C. year entered in column 10. For examples see pages 103, 118, 119 of text.

6. In applying the current cycle (Table V-B) in any given case, care should be taken to see that the day of the Indian solar year is not varied, see remarks in paragraph 3 of the explanatory note to Table V-B. It is for this reason that in the model problem of Rama's horoscope, worked out on pages 118, 119 of this work, the day of the Indian solar year corresponding to Mesha śukla navami is first ascertained in every case and entered in column 1 of the investigation tables on those pages.

7. For very accurate work, allowance should be made for the cyclic variations tabled below. Thus if we wish to know the position of the planet Jupiter on the 89th complete day of A.D. 634 (see paragraph 276, page 112 of the text) and use Tables V-A and V-B for that purpose, we shall find that against A.D. 634. Table V-A refers us to A.D. 1844 for information regarding Jupiter's places. From Table V-B we find that Jupiter's place on the 89th complete day of A.D. 1844 (by taking proportional parts as directed in explanatory note to Table V-B, paragraph 5) was $340^{\circ}9'$. The cyclic variation for the interval between A.D. 634 and A.D. 1844 or 1,210 years being $-2 \times .197$ or $-.394$, we deduct .4 from $340^{\circ}9'$ and conclude that Jupiter's place on 89th complete day of A.D. 634 was $340^{\circ}5'$.

8. The most convenient years from which a start may be made in Indian planetary investigations are 3201 B.C., 3102 B.C., 2101 B.C., 1101 B.C., 101 B.C., 1 B.C., A.D. 1000 A.D. 1800, and the mean longitudes of Mars, Jupiter and Saturn for every ten complete days in these years are therefore given at page 361 below. Suppose we wish to search for a horoscope for 4000 years beginning with 0 Kaliyuga, we make a start with 3102 B.C., and search for 2,000 years with the help of Table V-A and then make a start again with 1101 B.C., and search for another 2,000 years with the help of Table V-A. This is the plan followed in searching for Rama's horoscope—vide section iii, Chapter V of the text of this work.

TABLE V-A.—CYCLIC VARIATIONS

TABLE V-A—Cyclic Variations.

[N.B.—The signs given below are for forward cycles. For cycles reckoned backwards, reverse the sign + or -.]

Period forward yrs.	Cyclic variation.	Analysis of period.		Analysis of cyclic variation.	
	Degrees.	Years.	Mars.	Degrees.	
1	+191.4052				
79	+1.015				
284	-908				
363	+107	...	...	+1.015 - 908 = +107	
2099	-37	...	...	+64 - 1.01 = -37	
2462	-26	...	...	+75 - 1.01 = -26; or -27	
3551	+055	...	...	+1.070 - 1.015 = +055	
3914	+162	...	...	+055 + 107; or 1.070 - 908 = +162	
4277	+27	...	...	+162 + 107 = +269 or +27	
6739	+008	...	...	+27 - 26 = +008	

N.B. 726, 1089, 1452, 1815, 2178, 2541, 2904, 3267 years are multiples of 363.

Mercury.

1	+54.7603				
46	-1.0259				
263	+1.06				
309	+0.944				
355	-0.0150				
2439	+3854	...	...	+3844 - 5490 = +3854	
3859	+0194	...	...	-9150 + 9344 = 0194	
4214	-0721	...	...	-1.0980 + 1.0259 = -0721	

N.B.—710, 1065, 1420, 1775, 2130, 2485, 2840, 3195, 3550, 3905, 4260 are multiples of 355.

Jupiter.

1	+80.347				
12	+4.1682				
83	-1.1630				
95	+3.0062	...	...	+4.1682 - 1.1630 = +3.0062	
178	+1.8431	...	...	+3.0062 - 1.1630 = 1.8432	
261	+68009	...	...	+1.8431 - 1.1630 = 0.6801	
344	-48294	...	...	+68009 - 1.16304 = -48295	
605	+19714	...	...	+68009 - 48294 = +19715	
949	-28580	...	...	+19714 - 48294 = -28580	

N.B.—1210, 1815, 2420, 3025, 3630 years are multiples of 605 years.

1554	-08866	...	...	1210 + 344	...	+39428 - 48294 = -08866
1898	-5716	...	...	1815 + 83, or 3 x 605 + 83	...	+59144 - 1.1630 = -5716
2159	+1085	...	...	1898 + 261	...	-5716 + 6801 = +1085
2503	-2744	...	...	4 x 605 + 88	...	+78856 - 1.1630 = -2744
2764	+3056	...	...	4 x 605 + 344	...	+78856 - 48294 = +30562
3108	-17732	...	...	2 x 1554	...	-17732
3452	-68026	...	...	2 x 1554 + 344	...	-17732 - 48294 = 66026
3713	+01983	...	...	3452 + 261	...	-68026 + 68009 = +01983
4057	-46311	...	...	3713 + 344	...	+01983 - 48294 = 46311
4318	+21694	...	...	3 x 1554 - 344	...	-26600 + 48294 = +21694

Venus.

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N.B.—1896, 2844, 3792, 4740, 5688 years are multiples of 948 years.

Saturn.

1	12.2191001
59	+026906
265	-1.988474
324	-1.011568
393	-084662

Note.—766, 1149, 1532, 1915, 2298, 2681, 3064, 3447, 3830, 4213 are multiples of 393.

2357	+4187	...	...	...	...	-5062 + 9269 = +4187
2740	+3340	...	...	...	...	-5029 + 9269 = +3340
3123	+2493	...	...	...	...	-6776 + 9269 = +2493
3506	+1646	...	...	...	...	-7623 + 9269 = +1646
3889	+0808	...	...	...	...	-8466 + 9269 = +0803
4272	-0048	...	...	...	...	-9317 + 9269 = -0048

TABLE V.A.—Auxiliary Table.

Mean longitude of Mars, Jupiter and Saturn for every ten complete days in each of eight selected years from 3201 B.C. to A.D. 1800, which are suitable as fixed years for Table V.A and for investigations under Chapter V, section ii of the Text, pp. 98 to 109.

	Days.	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
Mars	...	...	117.9	123.1	128.4	133.6	138.9	144.1	149.3	154.6	159.8	165.1	170.3	175.5	180.8	186.0	191.3	196.5	201.7	207.0
	...	...	347.0	352.2	357.5	362.7	367.9	373.2	378.4	383.6	388.9	394.1	399.4	404.6	409.8	415.1	420.3	425.5	430.8	436.0
	...	...	617.7	622.9	628.1	633.3	638.5	643.7	648.9	654.1	659.3	664.5	669.7	675.0	680.2	685.4	690.6	695.8	701.0	706.2
	...	...	308.9	314.1	319.4	324.6	329.8	335.1	340.3	345.5	350.7	355.9	361.1	366.3	371.5	376.7	381.9	387.1	392.3	397.5
	...	...	124.2	129.4	134.6	139.8	145.0	150.2	155.4	160.6	165.8	171.0	176.2	181.4	186.6	191.8	197.0	202.2	207.4	212.6
Jupiter	...	...	254.7	259.9	265.1	270.3	275.5	280.7	285.9	291.1	296.3	301.5	306.7	311.9	317.1	322.3	327.5	332.7	337.9	343.1
	...	...	140.0	145.2	150.4	155.6	160.8	166.0	171.2	176.4	181.6	186.8	192.0	197.2	202.4	207.6	212.8	218.0	223.2	228.4
	...	...	264.2	269.4	274.6	279.8	285.0	290.2	295.4	300.6	305.8	311.0	316.2	321.4	326.6	331.8	337.0	342.2	347.4	352.6
	...	...	251.8	257.0	262.2	267.4	272.6	277.8	283.0	288.2	293.4	298.6	303.8	309.0	314.2	319.4	324.6	329.8	335.0	340.2
	...	...	153.5	158.7	163.9	169.1	174.3	179.5	184.7	189.9	195.1	200.3	205.5	210.7	215.9	221.1	226.3	231.5	236.7	241.9
Saturn	...	...	261.0	266.2	271.4	276.6	281.8	287.0	292.2	297.4	302.6	307.8	313.0	318.2	323.4	328.6	333.8	339.0	344.2	349.4
	...	...	5.4	6.2	7.0	7.8	8.6	9.4	10.2	11.0	11.8	12.6	13.4	14.2	15.0	15.8	16.6	17.4	18.2	19.0
	...	...	163.2	168.4	173.6	178.8	184.0	189.2	194.4	199.6	204.8	210.0	215.2	220.4	225.6	230.8	236.0	241.2	246.4	251.6
	...	...	270.6	275.8	281.0	286.2	291.4	296.6	301.8	307.0	312.2	317.4	322.6	327.8	333.0	338.2	343.4	348.6	353.8	359.0
	...	...	68.6	69.4	70.3	71.1	71.9	72.7	73.6	74.4	75.2	76.1	76.9	77.7	78.6	79.4	80.2	81.1	81.9	82.7
Mars	...	...	209.5	209.8	210.2	210.5	210.8	211.2	211.5	211.8	212.2	212.5	212.8	213.2	213.5	213.8	214.2	214.5	214.8	215.2
	...	...	339.2	339.5	339.9	340.2	340.5	340.9	341.2	341.5	341.8	342.2	342.5	342.8	343.2	343.5	343.8	344.2	344.5	344.8
	...	...	330.5	330.8	331.2	331.5	331.8	332.2	332.5	332.8	333.2	333.5	333.8	334.2	334.5	334.8	335.2	335.5	335.8	336.2
	...	...	308.6	308.9	309.3	309.6	310.0	310.3	310.6	310.9	311.3	311.6	311.9	312.3	312.6	312.9	313.3	313.6	313.9	314.3
	...	...	258.6	258.9	259.3	259.6	259.9	260.3	260.6	260.9	261.3	261.6	261.9	262.3	262.6	262.9	263.3	263.6	263.9	264.3
Jupiter	...	...	70.5	70.8	71.2	71.5	71.9	72.2	72.5	72.8	73.2	73.5	73.8	74.2	74.5	74.8	75.2	75.5	75.8	76.2
	...	...	4.6	4.9	5.2	5.5	5.8	6.1	6.4	6.7	7.0	7.3	7.6	7.9	8.2	8.5	8.8	9.1	9.4	9.7
	...	...	104.9	105.2	105.6	105.9	106.3	106.6	106.9	107.2	107.6	107.9	108.2	108.6	108.9	109.2	109.6	109.9	110.2	110.6
	...	...	209.5	209.8	210.2	210.5	210.8	211.2	211.5	211.8	212.2	212.5	212.8	213.2	213.5	213.8	214.2	214.5	214.8	215.2
	...	...	339.2	339.5	339.9	340.2	340.5	340.9	341.2	341.5	341.8	342.2	342.5	342.8	343.2	343.5	343.8	344.2	344.5	344.8
Saturn	...	...	330.5	330.8	331.2	331.5	331.8	332.2	332.5	332.8	333.2	333.5	333.8	334.2	334.5	334.8	335.2	335.5	335.8	336.2
	...	...	308.6	308.9	309.3	309.6	310.0	310.3	310.6	310.9	311.3	311.6	311.9	312.3	312.6	312.9	313.3	313.6	313.9	314.3
	...	...	258.6	258.9	259.3	259.6	259.9	260.3	260.6	260.9	261.3	261.6	261.9	262.3	262.6	262.9	263.3	263.6	263.9	264.3
	...	...	70.5	70.8	71.2	71.5	71.9	72.2	72.5	72.8	73.2	73.5	73.8	74.2	74.5	74.8	75.2	75.5	75.8	76.2
	...	...	4.6	4.9	5.2	5.5	5.8	6.1	6.4	6.7	7.0	7.3	7.6	7.9	8.2	8.5	8.8	9.1	9.4	9.7
Mars	...	...	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190
	...	...	217.5	222.7	227.9	233.1	238.3	243.5	248.7	253.9	259.1	264.3	269.5	274.7	279.9	285.1	290.3	295.5	300.7	305.9
	...	...	80.5	81.3	82.1	82.9	83.7	84.5	85.3	86.1	86.9	87.7	88.5	89.3	90.1	90.9	91.7	92.5	93.3	94.1
	...	...	163.3	168.5	173.7	178.9	184.1	189.3	194.5	199.7	204.9	210.1	215.3	220.5	225.7	230.9	236.1	241.3	246.5	251.7
	...	...	48.5	53.7	58.9	64.1	69.3	74.5	79.7	84.9	90.1	95.3	100.5	105.7	110.9	116.1	121.3	126.5	131.7	136.9
Jupiter	...	...	243.8	249.0	254.2	259.4	264.6	269.8	275.0	280.2	285.4	290.6	295.8	301.0	306.2	311.4	316.6	321.8	327.0	332.2
	...	...	354.3	359.5	364.7	369.9	375.1	380.3	385.5	390.7	395.9	401.1	406.3	411.5	416.7	421.9	427.1	432.3	437.5	442.7
	...	...	239.6	244.8	250.0	255.2	260.4	265.6	270.8	276.0	281.2	286.4	291.6	296.8	302.0	307.2	312.4	317.6	322.8	328.0
	...	...	3.8	9.0	14.2	19.5	24.7	30.0	35.2	40.4	45.7	50.9	56.2	61.4	66.6	71.9	77.1	82.4	87.6	92.8
	...	...	267.1	267.4	267.7	268.0	268.3	268.6	268.9	269.2	269.5	269.8	270.1	270.4	270.7	271.0	271.3	271.6	271.9	272.2
Saturn	...	...	81.5	82.3	83.1	83.9	84.7	85.5	86.3	87.1	87.9	88.7	89.5	90.3	91.1	91.9	92.7	93.5	94.3	95.1
	...	...	163.3	170.1	176.9	183.7	190.5	197.3	204.1	210.9	217.7	224.5	231.3	238.1	244.9	251.7	258.5	265.3	272.1	278.9
	...	...	276.8	277.4	278.0	278.6	279.2	279.8	280.4	281.0	281.6	282.2	282.8	283.4	284.0	284.6	285.2	285.8	286.4	287.0
	...	...	24.2	25.0	25.8	26.6	27.4	28.2	29.0	29.8	30.6	31.4	32.2	33.0	33.8	34.6	35.4	36.2	37.0	37.8
	...	...	179.0	179.5	180.0	180.5	181.0	181.5	182.0	182.5	183.0	183.5	184.0	184.5	185.0	185.5	186.0	186.5	187.0	187.5
Mars	...	...	256.4	257.2	258.0	258.8	259.6	260.4	261.2	262.0	262.8	263.6	264.4	265.2	266.0	266.8	267.6	268.4	269.2	270.0
	...	...	84.4	85.2	86.0	86.8	87.6	88.4	89.2	90.0	90.8	91.6	92.4	93.2	94.0	94.8	95.6	96.4	97.2	98.0
	...	...	267.1	267.4	267.7	268.0	268.3	268.6	268.9	269.2	269.5	269.8	270.1	270.4	270.7	271.0	271.3	271.6	271.9	272.2
	...	...	81.5	82.3	83.1	83.9	84.7	85.5	86.3	87.1	87.9	88.7	89.5	90.3	91.1	91.9	92.7	93.5	94.3	95.1
	...	...	163.3	170.1	176.9	183.7	190.5	197.3	204.1	210.9	217.7	224.5	231.3	238.1	244.9	251.7	258.5	265.3	272.1	278.9
Jupiter	...	...	276.8	277.4	278.0	278.6	279.2	279.8	280.4	281.0	281.6	282.2	282.8	283.4	284.0	284.6	285.2	285.8	286.4	287.0
	...	...	24.2	25.0	25.8	26.6	27.4	28.2	29.0	29.8	30.6	31.4	32.2	33.0	33.8	34.6	35.4	36.2	37.0	37.8
	...	...	179.0	179.5	180.0	180.5	181.0	181.5	182.0	182.5	183.0	183.5	184.0	184.5	185.0	185.5	186.0	186.5	187.0	187.5
	...	...	256.4	257.2	258.0	258.8	259.6	260.4	261.2	262.0	262.8	263.6	264.4	265.2	266.0	266.8	267.6	268.4	269.2	270.0
	...	...	84.4	85.2	86.0	86.8	87.6	88.4	89.2	90.0	90.8	91.6	92.4	93.2	94.0	94.8	95.6	96.4	97.2	98.0
Saturn	...	...	267.1	267.4	267.7	268.0	268.3	268.6	268.9	269.2	269.5	269.8	270.1	270.4	270.7	271.0	271.3	271.6	271.9	272.2
	...	...	81.5	82.3	83.1	83.9	84.7	85.5	86.3	87.1	87.9	88.7	89.5	90.3	91.1	91.9	92.7	93.5	94.3	95.1
	...	...	163.3	170.1	176.9	183.7	190.5	197.3	204.1	210.9	217.7	224.5	231.3	238.1	244.9	251.7	258.5	265.3	272.1	278.9
	...	...	276.8	277.4	278.0	278.6	279.2	279.8	280.4	281.0	281.6	282.2	282.8	283.4	284.0	284.6	285.2	285.8	286.4	287.0
	...	...	24.2	25.0	25.8	26.6	27.4	28.2	29.0	29.8	30.6	31.4	32.2	33.0	33.8	34.6	35.4	36.2	37.0	37.8

TABLE V-A.

Yearly increase of mean longitude of Mars, Jupiter and Saturn for 2005 years, also actual geocentric place of each planet with reference to Table V-B.

Years, also year A.D. if reckoned from 1 B.C.	Mars.	Jup.	Sat.	Mars	Merc	Jup.	Venus	Sat	B.C.	Mars.	Merc.	Jup.	Venus.	Sat.
	Degrees.			A.D.	A.D.	A.D.	A.D.	A.D.		A.D.	A.D.	A.D.	A.D.	A.D.
1	191	30	12	1816	1776	1816	1897	1916	1	1815	1775	1815	1896	1915
2	23	61	24	1817	1777	1817	1898	1917	2	1814	1774	1814	1895	1914
3	214	91	37	1818	1778	1818	1899	1918	3	1813	1773	1813	1894	1913
4	46	121	49	1819	1779	1819	1900	1919	4	1812	1772	1812	1893	1912
5	237	152	61	1820	1780	1820	1901	1920	5	1811	1771	1811	1892	1911
6	68	182	73	1821	1781	1821	1902	1921	6	1810	1770	1810	1891	1910
7	260	212	86	1822	1782	1822	1903	1922	7	1809	1769	1809	1890	1909
8	91	243	98	1823	1783	1823	1904	1923	8	1808	1768	1808	1889	1908
9	283	273	110	1824	1784	1824	1905	1924	9	1807	1767	1807	1888	1907
10	114	303	122	1825	1785	1825	1906	1925	10	1806	1766	1806	1887	1906
11	305	334	134	1826	1786	1826	1907	1926	11	1805	1765	1805	1886	1905
12	137	4	147	1827	1787	1827	1908	1927	12	1804	1764	1804	1885	1904
13	328	35	159	1828	1788	1828	1909	1928	13	1803	1763	1803	1884	1903
14	160	65	171	1829	1789	1829	1910	1929	14	1802	1762	1802	1883	1902
15	351	95	183	1830	1790	1830	1911	1930	15	1801	1761	1801	1882	1901
16	183	126	196	1831	1791	1831	1912	1931	16	1800	1760	1800	1881	1900
17	14	156	208	1832	1792	1832	1913	1932	17	1799	1759	1799	1880	1899
18	205	186	220	1833	1793	1833	1914	1933	18	1798	1758	1798	1879	1898
19	37	217	232	1834	1794	1834	1915	1934	19	1797	1757	1797	1878	1897
20	228	247	244	1835	1795	1835	1916	1935	20	1796	1756	1796	1877	1896
21	60	277	257	1836	1796	1836	1917	1936	21	1795	1755	1795	1876	1895
22	251	308	269	1837	1797	1837	1918	1937	22	1794	1754	1794	1875	1894
23	82	338	281	1838	1798	1838	1919	1938	23	1793	1753	1793	1874	1893
24	274	8	293	1839	1799	1839	1920	1939	24	1792	1752	1792	1873	1892
25	105	39	305	1840	1800	1840	1921	1940	25	1791	1751	1791	1872	1891
26	246	69	318	1841	1801	1841	1922	1941	26	1790	1750	1790	1871	1890
27	128	99	330	1842	1802	1842	1923	1942	27	1789	1749	1789	1870	1889
28	319	130	342	1843	1803	1843	1924	1943	28	1788	1748	1788	1869	1888
29	151	160	354	1844	1804	1844	1925	1944	29	1787	1747	1787	1868	1887
30	342	190	7	1845	1805	1845	1926	1945	30	1786	1746	1786	1867	1886
31	174	221	19	1846	1806	1846	1927	1946	31	1785	1745	1785	1866	1885
32	5	251	31	1847	1807	1847	1928	1947	32	1784	1744	1784	1865	1884
33	196	281	43	1848	1808	1848	1929	1948	33	1783	1743	1783	1864	1883
34	28	312	55	1849	1809	1849	1930	1949	34	1782	1742	1782	1863	1882
35	219	342	68	1850	1810	1850	1931	1950	35	1781	1741	1781	1862	1881
36	51	13	80	1851	1811	1851	1932	1951	36	1780	1740	1780	1861	1880
37	242	43	92	1852	1812	1852	1933	1952	37	1779	1739	1779	1860	1879
38	73	73	104	1853	1813	1853	1934	1953	38	1778	1738	1778	1859	1878
39	265	104	117	1854	1814	1854	1935	1954	39	1777	1737	1777	1858	1877
40	96	134	129	1855	1815	1855	1936	1955	40	1776	1736	1776	1857	1876
41	288	164	141	1856	1816	1856	1937	1956	41	1775	1735	1775	1856	1875
42	119	195	153	1857	1817	1857	1938	1957	42	1774	1734	1774	1855	1874
43	310	225	165	1858	1818	1858	1939	1958	43	1773	1733	1773	1854	1873
44	142	255	178	1859	1819	1859	1940	1959	44	1772	1732	1772	1853	1872
45	333	286	190	1860	1820	1860	1941	1960	45	1771	1731	1771	1852	1871
46	165	316	202	1861	1821	1861	1942	1961	46	1770	1730	1770	1851	1870
47	356	346	214	1862	1822	1862	1943	1962	47	1769	1729	1769	1850	1869
48	187	17	227	1863	1823	1863	1944	1963	48	1768	1728	1768	1849	1868
49	19	47	239	1864	1824	1864	1945	1964	49	1767	1727	1767	1848	1867
50	210	77	251	1865	1825	1865	1946	1965	50	1766	1726	1766	1847	1866
51	42	108	263	1866	1826	1866	1947	1966	51	1765	1725	1765	1846	1865
52	233	138	275	1867	1827	1867	1948	1967	52	1764	1724	1764	1845	1864
53	64	168	288	1868	1828	1868	1949	1968	53	1763	1723	1763	1844	1863
54	256	199	300	1869	1829	1869	1950	1969	54	1762	1722	1762	1843	1862
55	87	229	312	1870	1830	1870	1951	1970	55	1761	1721	1761	1842	1861
56	279	259	324	1871	1831	1871	1952	1971	56	1760	1720	1760	1841	1860
57	110	290	336	1872	1832	1872	1953	1972	57	1759	1719	1759	1840	1859
58	301	320	349	1873	1833	1873	1954	1973	58	1758	1718	1758	1839	1858
59	133	351	1	1874	1834	1874	1955	1974	59	1757	1717	1757	1838	1857
60	324	21	13	1875	1835	1875	1956	1975	60	1756	1716	1756	1837	1856
61	156	51	25	1876	1836	1876	1957	1976	61	1755	1715	1755	1836	1855
62	317	82	38	1877	1837	1877	1958	1977	62	1754	1714	1754	1835	1854
63	179	112	50	1878	1838	1878	1959	1978	63	1753	1713	1753	1834	1853
64	10	142	62	1879	1839	1879	1960	1979	64	1752	1712	1752	1833	1852
65	201	173	74	1880	1840	1880	1961	1980	65	1751	1711	1751	1832	1851
66	33	203	86	1881	1841	1881	1962	1981	66	1750	1710	1750	1831	1850
67	224	233	99	1882	1842	1882	1963	1982	67	1749	1709	1749	1830	1849
68	56	264	111	1883	1843	1883	1964	1983	68	1748	1708	1748	1829	1848
69	247	294	123	1884	1844	1884	1965	1984	69	1747	1707	1747	1828	1847
70	78	324	135	1885	1845	1885	1966	1985	70	1746	1706	1746	1827	1846
71	270	355	148	1886	1846	1886	1967	1986	71	1745	1705	1745	1826	1845
72	101	25	160	1887	1847	1887	1968	1987	72	1744	1704	1744	1825	1844
73	203	65	172	1888	1848	1888	1969	1988	73	1743	1703	1743	1824	1843
74	124	86	184	1889	1849	1889	1970	1989	74	1742	1702	1742	1823	1842
75	315	116	196	1890	1850	1890	1971	1990	75	1741	1701	1741	1822	1841
76	147	146	209	1891	1851	1891	1972	1991	76	1740	1700	1740	1821	1840
77	338	177	221	1892	1852	1892	1973	1992	77	1739	1699	1739	1820	1839
78	170	207	233	1893	1853	1893	1974	1993	78	1738	1698	1738	1819	1838
79	1	237	245	1894	1854	1894	1975	1994	79	1737	1697	1737	1818	1837
80	192	268	258	1895	1855	1895	1976	1995	80	1736	1696	1736	1817	1836

TABLE V-A.—cont.

Yearly increase of mean longitude, etc.—cont.

Years; also year A.D. if reckoned from 1 B.C.	Mars.	Jup.	Sat.	Mars.	Merc.	Jup.	Venus.	Sat.	B.C.	Mars.	Merc.	Jup.	Venus.	Sat.
	Degrees.			A.D.	A.D.	A.D.	A.D.	A.D.		A.D.	A.D.	A.D.	A.D.	A.D.
81	24	288	270	1896	1856	1896	1977	1996	81	1735	1695	1735	1816	1835
82	215	325	282	1897	1857	1897	1978	1997	82	1734	1694	1734	1815	1834
83	47	359	294	1898	1858	1898	1979	1998	83	1733	1693	1733	1814	1833
84	234	29	306	1899	1859	1899	1980	1999	84	1732	1692	1732	1813	1832
85	69	60	319	1900	1860	1900	1981	1617	85	1731	1691	1731	1812	1831
86	261	90	331	1901	1861	1901	1982	1618	86	1730	1690	1730	1811	1830
87	92	120	343	1902	1862	1902	1983	1619	87	1729	1689	1729	1810	1829
88	284	151	355	1903	1863	1903	1984	1620	88	1728	1688	1728	1809	1828
89	115	181	8	1904	1864	1904	1985	1621	89	1727	1687	1727	1808	1827
90	306	211	20	1905	1865	1905	1986	1622	90	1726	1686	1726	1807	1826
91	138	242	32	1906	1866	1906	1987	1623	91	1725	1685	1725	1806	1825
92	329	272	44	1907	1867	1907	1988	1624	92	1724	1684	1724	1805	1824
93	161	302	56	1908	1868	1908	1989	1625	93	1723	1683	1723	1804	1823
94	352	333	69	1909	1869	1909	1990	1626	94	1722	1682	1722	1803	1822
95	184	3	81	1910	1870	1910	1991	1627	95	1721	1681	1721	1802	1821
96	15	33	93	1911	1871	1911	1992	1628	96	1720	1680	1720	1801	1820
97	206	64	105	1912	1872	1912	1993	1629	97	1719	1679	1719	1800	1819
98	38	94	117	1913	1873	1913	1994	1630	98	1718	1678	1718	1799	1818
99	229	124	130	1914	1874	1914	1995	1631	99	1717	1677	1717	1798	1817
100	61	155	142	1915	1875	1915	1996	1632	100	1716	1676	1716	1797	1816
101	252	185	154	1916	1876	1916	1997	1633	101	1715	1675	1715	1796	1815
102	83	215	166	1917	1877	1917	1998	1634	102	1714	1674	1714	1795	1814
103	275	246	179	1918	1878	1918	1999	1635	103	1713	1673	1713	1794	1813
104	106	276	191	1919	1879	1919	1765	1636	104	1712	1672	1712	1793	1812
105	297	306	203	1920	1880	1920	1766	1637	105	1711	1671	1711	1792	1811
106	129	337	215	1921	1881	1921	1767	1638	106	1710	1670	1710	1791	1810
107	320	7	227	1922	1882	1922	1768	1639	107	1709	1669	1709	1790	1809
108	152	37	240	1923	1883	1923	1769	1640	108	1708	1668	1708	1789	1808
109	343	68	252	1924	1884	1924	1770	1641	109	1707	1667	1707	1788	1807
110	175	98	264	1925	1885	1925	1771	1642	110	1706	1666	1706	1787	1806
111	6	129	276	1926	1886	1926	1772	1643	111	1705	1665	1705	1786	1805
112	197	159	289	1927	1887	1927	1773	1644	112	1704	1664	1704	1785	1804
113	29	189	301	1928	1888	1928	1774	1645	113	1703	1663	1703	1784	1803
114	220	220	313	1929	1889	1929	1775	1646	114	1702	1662	1702	1783	1802
115	12	250	325	1930	1890	1930	1776	1647	115	1701	1661	1701	1782	1801
116	243	280	337	1931	1891	1931	1777	1648	116	1700	1660	1700	1781	1800
117	74	311	350	1932	1892	1932	1778	1649	117	1699	1659	1699	1780	1799
118	266	341	2	1933	1893	1933	1779	1650	118	1698	1658	1698	1779	1798
119	97	11	14	1934	1894	1934	1780	1651	119	1697	1657	1697	1778	1797
120	289	42	26	1935	1895	1935	1781	1652	120	1696	1656	1696	1777	1796
121	120	72	39	1936	1896	1936	1782	1653	121	1695	1655	1695	1776	1795
122	311	102	51	1937	1897	1937	1783	1654	122	1694	1654	1694	1775	1794
123	143	133	63	1938	1898	1938	1784	1655	123	1693	1653	1693	1774	1793
124	334	163	75	1939	1899	1939	1785	1656	124	1692	1652	1692	1773	1792
125	106	193	87	1940	1900	1940	1786	1657	125	1691	1651	1691	1772	1791
126	367	224	100	1941	1901	1941	1787	1658	126	1690	1650	1690	1771	1790
127	188	154	112	1942	1902	1942	1788	1659	127	1689	1649	1689	1770	1789
128	20	284	124	1943	1903	1943	1789	1660	128	1688	1648	1688	1769	1788
129	211	315	136	1944	1904	1944	1790	1661	129	1687	1647	1687	1768	1787
130	43	345	148	1945	1905	1945	1791	1662	130	1686	1646	1686	1767	1786
131	234	15	161	1946	1906	1946	1792	1663	131	1685	1645	1685	1766	1785
132	65	46	173	1947	1907	1947	1793	1664	132	1684	1644	1684	1765	1784
133	257	76	185	1948	1908	1948	1794	1665	133	1683	1643	1683	1764	1783
134	88	106	197	1949	1909	1949	1795	1666	134	1682	1642	1682	1763	1782
135	280	137	210	1950	1910	1950	1796	1667	135	1681	1641	1681	1762	1781
136	111	167	222	1951	1911	1951	1797	1668	136	1680	1640	1680	1761	1780
137	302	198	234	1952	1912	1952	1798	1669	137	1679	1639	1679	1760	1779
138	134	228	246	1953	1913	1953	1799	1670	138	1678	1638	1678	1759	1778
139	325	258	258	1954	1914	1954	1800	1671	139	1677	1637	1677	1758	1777
140	167	289	271	1955	1915	1955	1801	1672	140	1676	1636	1676	1757	1776
141	848	319	283	1956	1916	1956	1802	1673	141	1675	1635	1675	1756	1775
142	179	349	295	1957	1917	1957	1803	1674	142	1674	1634	1674	1755	1774
143	11	20	307	1958	1918	1958	1804	1675	143	1673	1633	1673	1754	1773
144	202	50	320	1959	1919	1959	1805	1676	144	1672	1632	1672	1753	1772
145	34	80	332	1960	1920	1960	1806	1677	145	1671	1631	1671	1752	1771
146	225	111	344	1961	1921	1961	1807	1678	146	1670	1630	1670	1751	1770
147	57	141	356	1962	1922	1962	1808	1679	147	1669	1629	1669	1750	1769
148	248	171	8	1963	1923	1963	1809	1680	148	1668	1628	1668	1749	1768
149	79	202	21	1964	1924	1964	1810	1681	149	1667	1627	1667	1748	1767
150	271	232	33	1965	1925	1965	1811	1682	150	1666	1626	1666	1747	1766
151	102	262	45	1966	1926	1966	1812	1683	151	1665	1625	1665	1746	1765
152	294	293	57	1967	1927	1967	1813	1684	152	1664	1624	1664	1745	1764
153	125	323	70	1968	1928	1968	1814	1685	153	1663	1623	1663	1744	1763
154	316	353	82	1969	1929	1969	1815	1686	154	1662	1622	1662	1743	1762
155	148	24	94	1970	1930	1970	1816	1687	155	1661	1621	1661	1742	1761
156	339	54	106	1971	1931	1971	1817	1688	156	1660	1620	1660	1741	1760
157	171	84	118	1972	1932	1972	1818	1689	157	1659	1619	1659	1740	1759
158	2	115	131	1973	1933	1973	1819	1690	158	1658	1618	1658	1739	1758
159	193	145	143	1974	1934	1974	1820	1691	159	1657	1617	1657	1738	1757
160	25	176	155	1975	1935	1975	1821	1692	160	1656	1616	1656	1737	1756

TABLE V-A.—PLANETS—YEARLY INCREASE OF MEAN LONGITUDE, ETC.

TABLE V-A—cont.

Years, also year A.D. if reckoned from 1 B.C.	Yearly increase of mean longitude, etc.—cont.													
	Mars.	Jup	Sat.	Mars.	Merc.	Jup	Venus	Sat	B C.	Mars.	Merc.	Jup.	Venus.	Sat
	Degrees			A D.	A.D.	A D.	A.D	A.D		A.D.	A.D	A D.	A.D.	A.D.
161	216	206	167	1976	1936	1976	1822	1693	161	1855	1970	1989	1971	1755
162	48	236	179	1977	1937	1977	1823	1694	162	1854	1969	1988	1970	1754
163	239	267	192	1978	1938	1978	1824	1695	163	1853	1968	1987	1969	1753
164	70	297	204	1979	1939	1979	1825	1696	164	1852	1967	1986	1968	1752
165	261	327	216	1980	1940	1980	1826	1697	165	1851	1966	1985	1967	1751
166	93	358	228	1981	1941	1981	1827	1698	166	1850	1965	1984	1966	1750
167	285	38	241	1982	1942	1982	1828	1699	167	1849	1964	1983	1965	1749
168	116	58	253	1983	1943	1983	1829	1700	168	1848	1963	1982	1964	1748
169	307	89	265	1984	1944	1984	1830	1701	169	1847	1962	1981	1963	1747
170	139	119	277	1985	1945	1985	1831	1702	170	1846	1961	1980	1962	1746
171	330	149	290	1986	1946	1986	1832	1703	171	1845	1960	1989	1961	1745
172	132	180	302	1987	1947	1987	1833	1704	172	1844	1959	1988	1960	1744
173	353	210	314	1988	1948	1988	1834	1705	173	1843	1958	1987	1959	1743
174	184	240	326	1989	1949	1989	1835	1706	174	1842	1957	1986	1958	1742
175	16	271	338	1990	1950	1990	1836	1707	175	1841	1956	1985	1957	1741
176	207	301	351	1991	1951	1991	1837	1708	176	1840	1955	1984	1956	1740
177	39	331	3	1992	1952	1992	1838	1709	177	1839	1954	1983	1955	1739
178	230	2	15	1993	1953	1993	1839	1710	178	1838	1953	1982	1954	1738
179	61	32	27	1994	1954	1994	1840	1711	179	1837	1952	1981	1953	1737
180	253	62	40	1995	1955	1995	1841	1712	180	1920	1951	1980	1952	1736
181	84	93	52	1996	1956	1996	1842	1713	181	1919	1950	1979	1951	1735
182	276	123	64	1997	1957	1997	1843	1714	182	1918	1949	1978	1950	1734
183	107	154	76	1998	1958	1998	1844	1715	183	1917	1948	1977	1949	1733
184	298	184	88	1999	1959	1999	1845	1716	184	1916	1947	1976	1948	1732
185	130	214	101	1999	1960	1999	1846	1717	185	1915	1946	1975	1947	1731
186	321	245	113	1998	1961	1998	1847	1718	186	1914	1945	1974	1946	1730
187	153	275	125	1999	1962	1999	1848	1719	187	1913	1944	1973	1945	1729
188	344	305	137	1999	1963	1999	1849	1720	188	1912	1943	1972	1944	1728
189	176	335	149	1999	1964	1999	1850	1721	189	1911	1942	1971	1943	1727
190	7	6	162	1999	1965	1999	1851	1722	190	1910	1941	1970	1942	1726
191	198	86	171	1999	1966	1999	1852	1723	191	1909	1940	1969	1941	1725
192	30	67	186	1999	1967	1999	1853	1724	192	1908	1939	1968	1940	1724
193	221	97	198	1999	1968	1999	1854	1725	193	1907	1938	1967	1939	1723
194	53	127	211	1999	1969	1999	1855	1726	194	1906	1937	1966	1938	1722
195	244	158	223	1999	1970	1999	1856	1727	195	1905	1936	1965	1937	1721
196	75	188	235	1998	1971	1998	1857	1728	196	1904	1935	1964	1936	1720
197	267	218	247	1998	1972	1998	1858	1729	197	1903	1934	1963	1935	1719
198	98	249	259	1998	1973	1998	1859	1730	198	1902	1933	1962	1934	1718
199	290	279	272	1998	1974	1998	1860	1731	199	1901	1932	1961	1933	1717
200	121	309	284	1998	1975	1998	1861	1732	200	1900	1931	1960	1932	1716
201	312	340	296	1998	1976	1998	1862	1733	201	1899	1930	1959	1931	1715
202	144	40	308	1998	1977	1998	1863	1734	202	1898	1929	1958	1930	1714
203	335	40	321	1998	1978	1998	1864	1735	203	1897	1928	1957	1929	1713
204	167	71	333	1998	1979	1998	1865	1736	204	1896	1927	1956	1928	1712
205	358	101	345	1998	1980	1998	1866	1737	205	1895	1926	1955	1927	1711
206	189	132	357	1998	1981	1998	1867	1738	206	1894	1925	1954	1926	1710
207	21	162	3	1998	1982	1998	1868	1739	207	1893	1924	1953	1925	1709
208	212	192	22	1998	1983	1998	1869	1740	208	1892	1923	1952	1924	1708
209	44	223	34	1998	1984	1998	1870	1741	209	1891	1922	1951	1923	1707
210	235	253	46	1998	1985	1998	1871	1742	210	1890	1921	1950	1922	1706
211	66	283	58	1998	1986	1998	1872	1743	211	1889	1920	1949	1921	1705
212	258	314	71	1998	1987	1998	1873	1744	212	1888	1919	1948	1920	1704
213	88	344	83	1998	1988	1998	1874	1745	213	1887	1918	1947	1919	1703
214	281	4	95	1998	1989	1998	1875	1746	214	1886	1917	1946	1918	1702
215	112	46	107	1998	1990	1998	1876	1747	215	1885	1916	1945	1917	1701
216	303	75	119	1998	1991	1998	1877	1748	216	1884	1915	1944	1916	1700
217	135	105	132	1998	1992	1998	1878	1749	217	1883	1914	1943	1915	1699
218	326	136	144	1998	1993	1998	1879	1750	218	1882	1913	1942	1914	1698
219	158	166	156	1998	1994	1998	1880	1751	219	1881	1912	1941	1913	1697
220	349	196	168	1998	1995	1998	1881	1752	220	1880	1911	1940	1912	1696
221	180	227	181	1998	1996	1998	1882	1753	221	1879	1910	1939	1911	1695
222	12	257	198	1998	1997	1998	1883	1754	222	1878	1909	1938	1910	1694
223	203	287	205	1998	1998	1998	1884	1755	223	1877	1908	1937	1909	1693
224	35	318	217	1998	1999	1998	1885	1756	224	1876	1907	1936	1908	1692
225	226	348	229	1998	1999	1998	1886	1757	225	1875	1906	1935	1907	1691
226	58	4	242	1998	1999	1998	1887	1758	226	1874	1905	1934	1906	1690
227	249	49	254	1998	1999	1998	1888	1759	227	1873	1904	1933	1905	1689
228	80	79	266	1998	1999	1998	1889	1760	228	1872	1903	1932	1904	1688
229	272	109	278	1998	1999	1998	1890	1761	229	1871	1902	1931	1903	1687
230	103	140	291	1998	1999	1998	1891	1762	230	1870	1901	1930	1902	1686
231	295	170	303	1998	1999	1998	1892	1763	231	1869	1900	1929	1901	1685
232	126	201	315	1998	1999	1998	1893	1764	232	1868	1899	1928	1900	1684
233	317	231	327	1998	1999	1998	1894	1765	233	1867	1898	1927	1899	1683
234	149	261	339	1998	1999	1998	1895	1766	234	1866	1897	1926	1898	1682
235	340	292	352	1998	1999	1998	1896	1767	235	1865	1896	1925	1897	1681
236	172	322	4	1998	1999	1998	1897	1768	236	1864	1895	1924	1896	1680
237	3	352	16	1998	1999	1998	1898	1769	237	1863	1894	1923	1895	1679
238	194	23	28	1998	1999	1998	1899	1770	238	1862	1893	1922	1894	1678
239	26	53	41	1998	1999	1998	1900	1771	239	1861	1892	1921	1893	1677
240	217	83	52	1998	1999	1998	1901	1772	240	1860	1891	1920	1892	1676

TABLE V.-A.—cont.

Yearly increase of mean longitude, etc.—cont.

Years; also year A.D. if reckoned from 1 B.C.	Mars.	Jup.	Sat.	Mars.	Mer.	Jup.	Venus	Sat.	B.C.	Mars.	Mer.	Jup.	Venus.	Sat.
	Degrees			A D	A.D.	A D.	A D.	A.D.		A.D	A D	A D	A D.	A D.
241	49	114	65	1693	1661	1795	1902	1773	241	1859	1890	1919	1891	1675
242	240	144	77	1694	1662	1796	1903	1774	242	1858	1889	1918	1890	1674
243	71	174	89	1695	1663	1797	1904	1775	243	1857	1888	1917	1889	1673
244	262	205	102	1696	1664	1798	1905	1776	244	1856	1887	1916	1888	1672
245	94	235	114	1697	1665	1799	1906	1777	245	1855	1886	1915	1887	1671
246	286	265	126	1698	1666	1800	1907	1778	246	1854	1885	1914	1886	1670
247	117	296	138	1699	1667	1801	1908	1779	247	1853	1884	1913	1885	1669
248	308	326	150	1700	1668	1802	1909	1780	248	1852	1883	1912	1884	1668
249	140	356	163	1701	1669	1803	1910	1781	249	1851	1882	1911	1883	1667
250	331	27	175	1702	1670	1804	1911	1782	250	1850	1881	1910	1882	1666
251	103	57	187	1703	1671	1805	1912	1783	251	1849	1880	1909	1881	1665
252	354	87	199	1704	1672	1806	1913	1784	252	1848	1879	1908	1880	1664
253	185	118	212	1705	1673	1807	1914	1785	253	1847	1878	1907	1879	1663
254	17	148	224	1706	1674	1808	1915	1786	254	1846	1877	1906	1878	1662
255	208	179	236	1707	1675	1809	1916	1787	255	1845	1876	1905	1877	1661
256	40	209	248	1708	1676	1810	1917	1788	256	1844	1875	1904	1876	1660
257	231	239	260	1709	1677	1811	1918	1789	257	1843	1874	1903	1875	1659
258	62	270	273	1710	1678	1812	1919	1790	258	1842	1873	1902	1874	1658
259	254	300	285	1711	1679	1813	1920	1791	259	1841	1872	1901	1873	1657
260	85	330	297	1712	1680	1814	1921	1792	260	1840	1871	1900	1872	1656
261	277	1	309	1713	1681	1815	1922	1793	261	1839	1870	1899	1871	1655
262	108	31	322	1714	1682	1816	1923	1794	262	1838	1869	1898	1870	1654
263	269	62	334	1715	1683	1817	1924	1795	263	1837	1868	1897	1869	1653
264	131	92	346	1716	1684	1818	1925	1796	264	1836	1867	1896	1868	1652
265	322	122	358	1717	1685	1819	1926	1797	265	1835	1866	1895	1867	1651
266	154	153	10	1718	1686	1820	1927	1798	266	1834	1865	1894	1866	1650
267	345	183	23	1719	1687	1821	1928	1799	267	1833	1864	1893	1865	1649
268	177	213	35	1720	1688	1822	1929	1800	268	1832	1863	1892	1864	1648
269	8	243	47	1721	1689	1823	1930	1801	269	1831	1862	1891	1863	1647
270	199	274	59	1722	1690	1824	1931	1802	270	1830	1861	1890	1862	1646
271	31	304	72	1723	1691	1825	1932	1803	271	1829	1860	1889	1861	1645
272	222	335	84	1724	1692	1826	1933	1804	272	1828	1859	1888	1860	1644
273	54	5	96	1725	1693	1827	1934	1805	273	1827	1858	1887	1859	1643
274	245	35	108	1726	1694	1828	1935	1806	274	1826	1857	1886	1858	1642
275	78	66	120	1727	1695	1829	1936	1807	275	1825	1856	1885	1857	1641
276	268	96	133	1728	1696	1830	1937	1808	276	1824	1855	1884	1856	1640
277	99	127	145	1729	1697	1831	1938	1809	277	1823	1854	1883	1855	1639
278	291	157	157	1730	1698	1832	1939	1810	278	1822	1853	1882	1854	1638
279	122	187	169	1731	1699	1833	1940	1811	279	1821	1852	1881	1853	1637
280	313	218	182	1732	1700	1834	1941	1812	280	1820	1851	1880	1852	1636
281	145	248	194	1733	1701	1835	1942	1813	281	1819	1850	1879	1851	1635
282	330	278	206	1734	1702	1836	1943	1814	282	1818	1849	1878	1850	1634
283	168	309	218	1735	1703	1837	1944	1815	283	1817	1848	1877	1849	1633
284	359	339	230	1736	1704	1838	1945	1816	284	1816	1847	1876	1848	1632
285	190	9	243	1737	1705	1839	1946	1817	285	1815	1846	1875	1847	1631
286	22	40	255	1738	1706	1840	1947	1818	286	1814	1845	1874	1846	1630
287	213	70	267	1739	1707	1841	1948	1819	287	1813	1844	1873	1845	1629
288	45	100	279	1740	1708	1842	1949	1820	288	1812	1843	1872	1844	1628
289	236	131	292	1741	1709	1843	1950	1821	289	1811	1842	1871	1843	1627
290	67	161	304	1742	1710	1844	1951	1822	290	1810	1841	1870	1842	1626
291	259	191	316	1743	1711	1845	1952	1823	291	1809	1840	1869	1841	1625
292	90	222	328	1744	1712	1846	1953	1824	292	1808	1839	1868	1840	1624
293	282	252	340	1745	1713	1847	1954	1825	293	1807	1838	1867	1839	1623
294	113	282	353	1746	1714	1848	1955	1826	294	1806	1837	1866	1838	1622
295	304	313	5	1747	1715	1849	1956	1827	295	1805	1836	1865	1837	1621
296	136	343	17	1748	1716	1850	1957	1828	296	1804	1835	1864	1836	1620
297	327	13	29	1749	1717	1851	1958	1829	297	1803	1834	1863	1835	1619
298	159	44	42	1750	1718	1852	1959	1830	298	1802	1833	1862	1834	1618
299	350	74	54	1751	1719	1853	1960	1831	299	1801	1832	1861	1833	1617
300	181	104	66	1752	1720	1854	1961	1832	300	1800	1831	1860	1832	1616
301	13	135	78	1753	1721	1855	1962	1833	301	1799	1830	1859	1831	1615
302	204	165	90	1754	1722	1856	1963	1834	302	1798	1829	1858	1830	1614
303	36	196	103	1755	1723	1857	1964	1835	303	1797	1828	1857	1829	1613
304	227	226	115	1756	1724	1858	1965	1836	304	1796	1827	1856	1828	1612
305	59	256	127	1757	1725	1859	1966	1837	305	1795	1826	1855	1827	1611
306	250	287	139	1758	1726	1860	1967	1838	306	1794	1825	1854	1826	1610
307	81	317	151	1759	1727	1861	1968	1839	307	1793	1824	1853	1825	1609
308	273	347	164	1760	1728	1862	1969	1840	308	1792	1823	1852	1824	1608
309	104	18	176	1761	1729	1863	1970	1841	309	1791	1822	1851	1823	1607
310	296	48	188	1762	1730	1864	1971	1842	310	1790	1821	1850	1822	1606
311	127	78	200	1763	1731	1865	1972	1843	311	1789	1820	1849	1821	1605
312	318	109	213	1764	1732	1866	1973	1844	312	1788	1819	1848	1820	1604
313	150	139	225	1765	1733	1867	1974	1845	313	1787	1818	1847	1819	1603
314	341	169	237	1766	1734	1868	1975	1846	314	1786	1817	1846	1818	1602
315	173	200	249	1767	1735	1869	1976	1847	315	1785	1816	1845	1817	1601
316	4	230	261	1768	1736	1870	1977	1848	316	1784	1815	1844	1816	1600
317	195	260	274	1769	1737	1871	1978	1849	317	1783	1814	1843	1815	1599
318	27	291	286	1770	1738	1872	1979	1850	318	1782	1813	1842	1814	1598
319	218	321	298	1771	1739	1873	1980	1851	319	1781	1812	1841	1813	1597
320	50	351	310	1772	1740	1874	1981	1852	320	1780	1811	1840	1812	1596

TABLE V-A—cont.

Yearly increase of mean longitude, etc.—cont.

Years; also year A.D. if reckoned from 1 B.C.	Mars.	Jup.	Sat.	Mars.	Merc.	Jup.	Venus.	Sat.	B.C.	Mars.	Merc.	Jup.	Venus.	Sat.
	Degrees.			A.D.	A.D.	A.D.	A.D.	A.D.		A.D.	A.D.	A.D.	A.D.	A.D.
321	241	22	323	1773	1741	1875	1982	1853	321	1770	1810	1889	1811	1878
322	72	52	335	1774	1742	1876	1983	1854	322	1778	1809	1888	1810	1977
323	263	82	347	1775	1743	1877	1984	1855	323	1777	1808	1887	1809	1976
324	95	113	359	1776	1744	1878	1985	1856	324	1776	1807	1886	1808	1975
325	287	143	11	1777	1745	1879	1986	1857	325	1775	1806	1885	1807	1974
326	118	174	24	1778	1746	1880	1987	1858	326	1774	1805	1884	1806	1973
327	309	204	36	1779	1747	1881	1988	1859	327	1773	1804	1883	1805	1972
328	141	234	48	1780	1748	1882	1989	1860	328	1772	1803	1882	1804	1971
329	332	265	60	1781	1749	1883	1990	1861	329	1771	1802	1881	1803	1970
330	161	295	73	1782	1750	1884	1991	1862	330	1770	1801	1880	1802	1969
331	355	325	85	1783	1751	1885	1992	1863	331	1769	1800	1829	1801	1968
332	186	356	97	1784	1752	1886	1993	1864	332	1768	1799	1828	1800	1967
333	18	26	109	1785	1753	1887	1994	1865	333	1767	1798	1827	1799	1966
334	209	56	121	1786	1754	1888	1995	1866	334	1766	1797	1826	1798	1965
335	41	87	134	1787	1755	1889	1996	1867	335	1765	1796	1825	1797	1964
336	232	117	146	1788	1756	1890	1997	1868	336	1764	1795	1824	1796	1963
337	63	147	158	1789	1757	1891	1998	1869	337	1763	1794	1823	1795	1962
338	255	178	170	1790	1758	1892	1999	1870	338	1762	1793	1822	1794	1961
339	86	208	183	1791	1759	1893	1765	1871	339	1761	1792	1821	1793	1960
340	278	238	195	1792	1760	1894	1766	1872	340	1760	1791	1820	1792	1959
341	109	269	207	1793	1761	1895	1767	1873	341	1759	1790	1819	1791	1958
342	300	299	219	1794	1762	1896	1768	1874	342	1758	1789	1818	1790	1957
343	132	329	231	1795	1763	1897	1769	1875	343	1757	1788	1817	1789	1956
344	323	0	244	1796	1764	1898	1770	1876	344	1756	1787	1816	1788	1955
345	155	30	256	1797	1765	1899	1771	1877	345	1755	1786	1815	1787	1954
346	346	61	268	1798	1766	1900	1772	1878	346	1754	1785	1814	1786	1953
347	178	91	280	1799	1767	1901	1773	1879	347	1753	1784	1813	1785	1952
348	9	121	293	1800	1768	1902	1774	1880	348	1752	1783	1812	1784	1951
349	200	152	305	1801	1769	1903	1775	1881	349	1751	1782	1811	1783	1950
350	82	182	317	1802	1770	1904	1776	1882	350	1750	1781	1810	1782	1949
351	223	212	329	1803	1771	1905	1777	1883	351	1749	1780	1809	1781	1948
352	55	243	341	1804	1772	1906	1778	1884	352	1748	1779	1808	1780	1947
353	246	273	354	1805	1773	1907	1779	1885	353	1747	1778	1807	1779	1946
354	77	303	0	1806	1774	1908	1780	1886	354	1746	1777	1806	1778	1945
355	269	334	18	1807	1775	1909	1781	1887	355	1745	1776	1805	1777	1944
356	100	4	30	1808	1776	1910	1782	1888	356	1744	1775	1804	1776	1943
357	292	34	43	1809	1777	1911	1783	1889	357	1743	1774	1803	1775	1942
358	123	65	55	1810	1778	1912	1784	1890	358	1742	1773	1802	1774	1941
359	314	95	67	1811	1779	1913	1785	1891	359	1741	1772	1801	1773	1940
360	146	126	79	1812	1780	1914	1786	1892	360	1740	1771	1800	1772	1939
361	337	156	91	1813	1781	1915	1787	1893	361	1739	1770	1799	1771	1937
362	169	186	104	1814	1782	1916	1788	1894	362	1738	1769	1798	1770	1936
363	0	217	116	1815	1783	1917	1789	1895	363	1737	1768	1797	1769	1935
364	191	247	128	1816	1784	1918	1790	1896	364	1736	1767	1796	1768	1934
365	23	277	140	1817	1785	1919	1791	1897	365	1735	1766	1795	1767	1933
366	214	308	152	1818	1786	1920	1792	1898	366	1734	1765	1794	1766	1932
367	40	338	165	1819	1787	1921	1793	1899	367	1733	1764	1793	1765	1931
368	237	8	177	1820	1788	1922	1794	1900	368	1732	1763	1792	1764	1930
369	68	39	189	1821	1789	1923	1795	1901	369	1731	1762	1791	1763	1929
370	260	69	201	1822	1790	1924	1796	1902	370	1730	1761	1790	1762	1928
371	91	99	214	1823	1791	1925	1797	1903	371	1729	1760	1789	1761	1927
372	283	130	226	1824	1792	1926	1798	1904	372	1728	1759	1788	1760	1926
373	114	160	238	1825	1793	1927	1799	1905	373	1727	1758	1787	1759	1925
374	305	190	250	1826	1794	1928	1800	1906	374	1726	1757	1786	1758	1924
375	137	221	262	1827	1795	1929	1801	1907	375	1725	1756	1785	1757	1923
376	328	251	275	1828	1796	1930	1802	1908	376	1724	1755	1784	1756	1922
377	160	281	287	1829	1797	1931	1803	1909	377	1723	1754	1783	1755	1921
378	351	312	299	1830	1798	1932	1804	1910	378	1722	1753	1782	1754	1920
379	183	342	311	1831	1799	1933	1805	1911	379	1721	1752	1781	1753	1919
380	14	12	324	1832	1800	1934	1806	1912	380	1720	1751	1780	1752	1918
381	205	43	336	1833	1801	1935	1807	1913	381	1719	1750	1779	1751	1917
382	37	73	348	1834	1802	1936	1808	1914	382	1718	1749	1778	1750	1916
383	228	103	0	1835	1803	1937	1809	1915	383	1717	1748	1777	1749	1915
384	59	134	12	1836	1804	1938	1810	1916	384	1716	1747	1776	1748	1914
385	251	164	24	1837	1805	1939	1811	1917	385	1715	1746	1775	1747	1913
386	82	195	37	1838	1806	1940	1812	1918	386	1714	1745	1774	1746	1912
387	274	225	49	1839	1807	1941	1813	1919	387	1713	1744	1773	1745	1911
388	105	255	61	1840	1808	1942	1814	1920	388	1712	1743	1772	1744	1910
389	298	286	73	1841	1809	1943	1815	1921	389	1711	1742	1771	1743	1909
390	128	316	85	1842	1810	1944	1816	1922	390	1710	1741	1770	1742	1908
391	319	346	98	1843	1811	1945	1817	1923	391	1709	1740	1769	1741	1907
392	151	17	110	1844	1812	1946	1818	1924	392	1708	1739	1768	1740	1906
393	342	47	122	1845	1813	1947	1819	1925	393	1707	1738	1767	1739	1905
394	174	77	134	1846	1814	1948	1820	1926	394	1706	1737	1766	1738	1904
395	5	108	147	1847	1815	1949	1821	1927	395	1705	1736	1765	1737	1903
396	196	138	159	1848	1816	1950	1822	1928	396	1704	1735	1764	1736	1902
397	28	168	171	1849	1817	1951	1823	1929	397	1703	1734	1763	1735	1901
398	219	199	183	1850	1818	1952	1824	1930	398	1702	1733	1762	1734	1900
399	51	229	195	1851	1819	1953	1825	1931	399	1701	1732	1761	1733	1899
400	212	259	208	1852	1820	1954	1826	1932	400	1700	1731	1760	1732	1898

TABLE V-A—cont.

Yearly increase of mean longitude, etc.—cont.

Years ; also year A.D. if reckoned from 1 B.C.	Mars.	Jup.	Sat.	Mars.	Merc.	Jup.	Venus.	Sat.	B.C.	Mars.	Merc.	Jup.	Venus.	Sat.
	Degrees.			A.D.	A.D.	A.D.	A.D.	A.D.		A.D.	A.D.	A.D.	A.D.	A.D.
401	73	290	220	1853	1821	1955	1827	1933	401	1699	1730	1759	1974	1957
402	265	320	232	1854	1822	1956	1828	1934	402	1698	1729	1758	1973	1956
403	96	350	244	1855	1823	1957	1829	1935	403	1697	1728	1757	1972	1955
404	298	21	257	1856	1824	1958	1830	1936	404	1696	1727	1756	1971	1954
405	119	51	269	1857	1825	1959	1831	1937	405	1695	1726	1755	1970	1953
406	310	81	281	1858	1826	1960	1832	1938	406	1694	1725	1754	1969	1952
407	142	112	293	1859	1827	1961	1833	1939	407	1693	1724	1753	1968	1951
408	333	142	305	1860	1828	1962	1834	1940	408	1692	1723	1752	1967	1950
409	165	173	318	1861	1829	1963	1835	1941	409	1691	1722	1751	1966	1949
410	356	203	330	1862	1830	1964	1836	1942	410	1690	1721	1750	1965	1948
411	187	233	342	1863	1831	1965	1837	1943	411	1689	1720	1749	1964	1947
412	1	264	354	1864	1832	1966	1838	1944	412	1688	1719	1748	1963	1946
413	210	294	7	1865	1833	1967	1839	1945	413	1687	1718	1747	1962	1945
414	42	324	19	1866	1834	1968	1840	1946	414	1686	1717	1746	1961	1944
415	233	355	31	1867	1835	1969	1841	1947	415	1685	1716	1745	1960	1943
416	64	25	43	1868	1836	1970	1842	1948	416	1684	1715	1744	1959	1942
417	256	55	55	1869	1837	1971	1843	1949	417	1683	1714	1743	1958	1941
418	87	86	68	1870	1838	1972	1844	1950	418	1682	1713	1742	1957	1940
419	279	116	80	1871	1839	1973	1845	1951	419	1681	1712	1741	1956	1939
420	110	146	92	1872	1840	1974	1846	1952	420	1680	1711	1740	1955	1938
421	301	177	104	1873	1841	1975	1847	1953	421	1679	1710	1739	1954	1937
422	133	207	116	1874	1842	1976	1848	1954	422	1678	1709	1738	1953	1936
423	324	237	129	1875	1843	1977	1849	1955	423	1677	1708	1737	1952	1935
424	156	268	141	1876	1844	1978	1850	1956	424	1676	1707	1736	1951	1934
425	347	298	153	1877	1845	1979	1851	1957	425	1675	1706	1735	1950	1933
426	178	328	165	1878	1846	1980	1852	1958	426	1674	1705	1734	1949	1932
427	10	359	178	1879	1847	1981	1853	1959	427	1673	1704	1733	1948	1931
428	201	29	190	1880	1848	1982	1854	1960	428	1672	1703	1732	1947	1930
429	33	59	202	1881	1849	1983	1855	1961	429	1671	1702	1731	1946	1929
430	224	90	214	1882	1850	1984	1856	1962	430	1670	1701	1730	1945	1928
431	56	120	226	1883	1851	1985	1857	1963	431	1669	1700	1729	1944	1927
432	247	151	239	1884	1852	1986	1858	1964	432	1668	1699	1728	1943	1926
433	78	181	251	1885	1853	1987	1859	1965	433	1667	1698	1727	1942	1925
434	270	211	263	1886	1854	1988	1860	1966	434	1666	1697	1726	1941	1924
435	101	242	275	1887	1855	1989	1861	1967	435	1665	1696	1725	1940	1923
436	293	272	288	1888	1856	1990	1862	1968	436	1664	1695	1724	1939	1922
437	124	302	300	1889	1857	1991	1863	1969	437	1663	1694	1723	1938	1921
438	315	333	312	1890	1858	1992	1864	1970	438	1662	1693	1722	1937	1920
439	147	3	324	1891	1859	1993	1865	1971	439	1661	1692	1721	1936	1919
440	338	33	336	1892	1860	1994	1866	1972	440	1660	1691	1720	1935	1918
441	170	64	349	1893	1861	1995	1867	1973	441	1659	1690	1719	1934	1917
442	1	94	1	1894	1862	1996	1868	1974	442	1658	1689	1718	1933	1916
443	192	124	13	1895	1863	1997	1869	1975	443	1657	1688	1717	1932	1915
444	24	155	25	1896	1864	1998	1870	1976	444	1656	1687	1716	1931	1914
445	215	185	38	1897	1865	1999	1871	1977	445	1655	1686	1715	1930	1913
446	47	215	50	1898	1866	1999	1872	1978	446	1654	1685	1714	1929	1912
447	238	246	62	1899	1867	1997	1873	1979	447	1653	1684	1713	1928	1911
448	69	276	74	1900	1868	1998	1874	1980	448	1652	1683	1712	1927	1910
449	261	306	86	1901	1869	1999	1875	1981	449	1651	1682	1711	1926	1909
450	92	337	99	1902	1870	1999	1876	1982	450	1650	1681	1710	1925	1908
451	284	7	111	1903	1871	1999	1877	1983	451	1649	1680	1709	1924	1907
452	115	37	123	1904	1872	1999	1878	1984	452	1648	1679	1708	1923	1906
453	306	68	135	1905	1873	1999	1879	1985	453	1647	1678	1707	1922	1905
454	138	98	147	1906	1874	1999	1880	1986	454	1646	1677	1706	1921	1904
455	329	129	160	1907	1875	1999	1881	1987	455	1645	1676	1705	1920	1903
456	161	159	172	1908	1876	1999	1882	1988	456	1644	1675	1704	1919	1902
457	352	189	184	1909	1877	1999	1883	1989	457	1643	1674	1703	1918	1901
458	188	220	196	1910	1878	1999	1884	1990	458	1642	1673	1702	1917	1900
459	15	250	209	1911	1879	1999	1885	1991	459	1641	1672	1701	1916	1899
460	206	280	221	1912	1880	1999	1886	1992	460	1640	1671	1700	1915	1898
461	38	311	233	1913	1881	1999	1887	1993	461	1639	1670	1699	1914	1897
462	229	341	245	1914	1882	1999	1888	1994	462	1638	1669	1698	1913	1896
463	60	11	257	1915	1883	1999	1889	1995	463	1637	1668	1697	1912	1895
464	252	42	270	1916	1884	1999	1890	1996	464	1636	1667	1696	1911	1894
465	83	72	282	1917	1885	1999	1891	1997	465	1635	1666	1695	1910	1893
466	275	102	294	1918	1886	1999	1892	1998	466	1634	1665	1694	1909	1892
467	106	133	306	1919	1887	1999	1893	1999	467	1633	1664	1693	1908	1891
468	297	163	319	1920	1888	1999	1894	1999	468	1632	1663	1692	1907	1890
469	129	193	331	1921	1889	1999	1895	1999	469	1631	1662	1691	1906	1889
470	320	224	343	1922	1890	1999	1896	1999	470	1630	1661	1690	1905	1888
471	152	254	355	1923	1891	1999	1897	1999	471	1629	1660	1689	1904	1887
472	343	284	7	1924	1892	1999	1898	1999	472	1628	1659	1688	1903	1886
473	175	315	20	1925	1893	1999	1899	1999	473	1627	1658	1687	1902	1885
474	6	345	32	1926	1894	1999	1900	1999	474	1626	1657	1686	1901	1884
475	197	15	44	1927	1895	1999	1901	1999	475	1625	1656	1685	1900	1883
476	29	46	56	1928	1896	1999	1902	1999	476	1624	1655	1684	1899	1882
477	220	76	69	1929	1897	1999	1903	1999	477	1623	1654	1683	1898	1881
478	52	106	81	1930	1898	1999	1904	1999	478	1622	1653	1682	1897	1880
479	243	137	93	1931	1899	1999	1905	1999	479	1621	1652	1681	1896	1879
480	74	167	105	1932	1900	1999	1906	1999	480	1620	1651	1680	1895	1878

TABLE V-A—cont.															
Yearly increase of mean longitude, etc.—cont.															
Years, also year A.D. if reckoned from 1 B.C.	Mars	Jup	Sat	Mars	Merc	Jup.	Venus	Sat	B.C.	Mars.	Merc.	Jup	Venus	Sat.	
		Degrees		A.D.	A.D.	A.D.	A.D.	A.D.		A.D.	A.D.	A.D.	A.D.	A.D.	
481	206	198	117	1833	1901	1891	1907	1630	481	1698	1650	1679	1894	1877	
482	97	228	130	1934	1902	1602	1908	1631	482	1697	1649	1678	1893	1876	
483	289	258	142	1935	1903	1693	1909	1632	483	1696	1648	1677	1892	1875	
484	120	289	154	1936	1904	1694	1910	1633	484	1695	1647	1676	1891	1874	
485	311	319	166	1937	1905	1695	1911	1634	485	1694	1646	1675	1890	1873	
486	143	349	179	1938	1906	1696	1912	1635	486	1693	1645	1674	1889	1872	
487	331	20	191	1939	1907	1697	1913	1636	487	1692	1999	1673	1888	1871	
488	168	50	203	1940	1908	1698	1914	1637	488	1691	1998	1672	1887	1870	
489	357	80	215	1941	1909	1699	1915	1638	489	1690	1997	1671	1886	1869	
490	188	111	227	1942	1910	1700	1916	1639	490	1689	1996	1670	1885	1868	
491	20	141	240	1943	1911	1701	1917	1640	491	1688	1995	1669	1884	1867	
492	211	171	252	1944	1912	1702	1918	1641	492	1687	1994	1668	1883	1866	
493	43	202	264	1945	1913	1703	1919	1642	493	1686	1993	1667	1882	1865	
494	234	232	276	1946	1914	1704	1920	1643	494	1685	1992	1666	1881	1864	
495	65	262	289	1947	1915	1705	1921	1644	495	1684	1991	1665	1880	1863	
496	257	293	301	1948	1916	1706	1922	1645	496	1687	1990	1664	1879	1862	
497	88	323	313	1949	1917	1707	1923	1646	497	1686	1989	1663	1878	1861	
498	280	353	325	1950	1918	1708	1924	1647	498	1685	1988	1662	1877	1860	
499	111	24	337	1951	1919	1709	1925	1648	499	1684	1987	1661	1876	1859	
500	302	54	350	1952	1920	1710	1926	1649	500	1683	1986	1660	1875	1858	
501	134	84	2	1953	1921	1711	1927	1650	501	1682	1985	1659	1874	1857	
502	325	115	14	1954	1922	1712	1928	1651	502	1681	1984	1658	1873	1856	
503	157	145	26	1955	1923	1713	1929	1652	503	1990	1983	1657	1872	1855	
504	348	176	39	1956	1924	1714	1930	1653	504	1989	1982	1656	1871	1854	
505	179	206	51	1957	1925	1715	1931	1654	505	1988	1981	1655	1870	1853	
506	11	236	63	1958	1926	1716	1932	1655	506	1987	1980	1654	1869	1852	
507	202	267	75	1959	1927	1717	1933	1656	507	1986	1979	1653	1868	1851	
508	34	297	87	1960	1928	1718	1934	1657	508	1985	1978	1652	1867	1850	
509	225	327	100	1961	1929	1719	1935	1658	509	1984	1977	1651	1866	1849	
510	57	358	112	1962	1930	1720	1936	1659	510	1983	1976	1650	1865	1848	
511	248	28	124	1963	1931	1721	1937	1660	511	1982	1975	1649	1864	1847	
512	79	58	136	1964	1932	1722	1938	1661	512	1981	1974	1648	1863	1846	
513	271	89	148	1965	1933	1723	1939	1662	513	1980	1973	1647	1862	1845	
514	102	119	161	1966	1934	1724	1940	1663	514	1949	1972	1646	1861	1844	
515	294	149	173	1967	1935	1725	1941	1664	515	1948	1971	1645	1860	1843	
516	125	180	185	1968	1936	1726	1942	1665	516	1917	1970	1644	1859	1842	
517	316	210	197	1969	1937	1727	1943	1666	517	1946	1969	1643	1858	1841	
518	148	240	210	1970	1938	1728	1944	1667	518	1945	1968	1642	1857	1840	
519	339	271	222	1971	1939	1729	1945	1668	519	1944	1967	1641	1856	1839	
520	171	301	234	1972	1940	1730	1946	1669	520	1943	1666	1640	1855	1838	
521	2	331	246	1973	1941	1731	1947	1670	521	1942	1665	1639	1854	1837	
522	103	2	258	1974	1942	1732	1948	1671	522	1941	1664	1638	1853	1836	
523	25	32	271	1975	1943	1733	1949	1672	523	1940	1663	1637	1852	1835	
524	216	62	283	1976	1944	1734	1950	1673	524	1939	1662	1636	1851	1834	
525	48	93	295	1977	1945	1735	1951	1674	525	1938	1661	1635	1850	1833	
526	239	123	307	1978	1946	1736	1952	1675	526	1937	1660	1634	1849	1832	
527	70	154	320	1979	1947	1737	1953	1676	527	1936	1659	1633	1848	1831	
528	260	184	332	1980	1948	1738	1954	1677	528	1935	1658	1632	1847	1830	
529	83	214	344	1981	1949	1739	1955	1678	529	1934	1657	1631	1846	1829	
530	285	245	356	1982	1950	1740	1956	1679	530	1933	1656	1630	1845	1828	
531	116	275	8	1983	1951	1741	1957	1680	531	1932	1655	1629	1844	1827	
532	307	305	21	1984	1952	1742	1958	1681	532	1931	1654	1628	1843	1826	
533	139	336	33	1985	1953	1743	1959	1682	533	1930	1653	1627	1842	1825	
534	330	6	45	1986	1954	1744	1960	1683	534	1929	1652	1626	1841	1824	
535	162	36	57	1987	1955	1745	1961	1684	535	1928	1651	1625	1840	1823	
536	353	67	70	1988	1956	1746	1962	1685	536	1927	1650	1624	1839	1822	
537	184	97	82	1989	1957	1747	1963	1686	537	1926	1649	1623	1838	1821	
538	16	127	94	1990	1958	1748	1964	1687	538	1925	1648	1622	1837	1820	
539	207	158	106	1991	1959	1749	1965	1688	539	1924	1647	1621	1836	1819	
540	39	188	118	1992	1960	1750	1966	1689	540	1923	1646	1620	1835	1818	
541	230	218	131	1993	1961	1751	1967	1690	541	1922	1645	1619	1834	1817	
542	61	249	143	1994	1962	1752	1968	1691	542	1921	1644	1618	1833	1816	
543	253	279	155	1995	1963	1753	1969	1692	543	1920	1643	1617	1832	1815	
544	84	309	167	1996	1964	1754	1970	1693	544	1919	1642	1616	1831	1814	
545	276	340	180	1997	1965	1755	1971	1694	545	1918	1641	1615	1830	1813	
546	107	370	192	1998	1966	1756	1972	1695	546	1917	1640	1614	1829	1812	
547	298	40	204	1999	1967	1757	1973	1696	547	1916	1639	1613	1828	1811	
548	130	71	216	1999	1968	1758	1974	1697	548	1915	1638	1612	1827	1810	
549	321	101	228	1998	1969	1759	1975	1698	549	1914	1637	1611	1826	1809	
550	153	132	241	1999	1970	1760	1976	1699	550	1913	1636	1610	1825	1808	
551	344	162	253	1940	1971	1761	1977	1700	551	1912	1935	1953	1824	1807	
552	176	192	265	1941	1972	1762	1978	1701	552	1911	1934	1952	1823	1806	
553	7	223	277	1942	1973	1763	1979	1702	553	1910	1933	1951	1822	1805	
554	198	253	290	1943	1974	1764	1980	1703	554	1909	1932	1950	1821	1804	
555	30	283	302	1944	1975	1765	1981	1704	555	1908	1931	1949	1820	1803	
556	221	314	314	1945	1976	1766	1982	1705	556	1907	1930	1948	1819	1802	
557	53	344	326	1946	1977	1767	1983	1706	557	1906	1929	1947	1818	1801	
558	244	14	338	1947	1978	1768	1984	1707	558	1905	1928	1946	1817	1800	
559	75	45	351	1948	1979	1769	1985	1708	559	1904	1927	1945	1816	1799	
560	257	75	3	1949	1980	1770	1986	1709	560	1903	1926	1944	1815	1798	

TABLE V-A—cont.

Yearly increase of mean longitude, etc.—cont

Years, also if reckoned from 1 B.C.	Mars.	Jup.	Sat.	Mars.	Merc.	Jup.	Venus	Sat.	B.C.	Mars	Mero.	Jup.	Venus	Sat.
	Degrees.			A.D.	A.D.	A.D.	A.D.	A.D.		A.D.	A.D.	A.D.	A.D.	A.D.
561	98	106	16	1650	1981	1771	1987	1710	561	1902	1925	1943	1814	1797
562	290	186	27	1651	1982	1772	1988	1711	562	1901	1924	1942	1813	1796
563	121	166	40	1652	1983	1773	1989	1712	563	1900	1923	1941	1812	1795
564	312	196	52	1653	1984	1774	1990	1713	564	1899	1922	1940	1811	1794
565	144	227	64	1654	1985	1775	1991	1714	565	1898	1921	1939	1810	1793
566	385	257	76	1655	1986	1776	1992	1715	566	1897	1920	1938	1809	1792
567	167	287	88	1656	1987	1777	1993	1716	567	1896	1919	1937	1808	1791
568	368	318	101	1657	1988	1778	1994	1717	568	1895	1918	1936	1807	1790
569	189	348	113	1658	1989	1779	1995	1718	569	1894	1917	1935	1806	1789
570	21	18	125	1659	1990	1780	1996	1719	570	1893	1916	1934	1805	1788
571	212	49	137	1660	1991	1781	1997	1720	571	1892	1915	1933	1804	1787
572	44	79	149	1661	1992	1782	1998	1721	572	1891	1914	1932	1803	1786
573	235	109	162	1662	1993	1783	1999	1722	573	1890	1913	1931	1802	1785
574	66	140	174	1663	1994	1784	1992	1723	574	1889	1912	1930	1801	1784
575	258	170	186	1664	1995	1785	1993	1724	575	1888	1911	1929	1800	1783
576	89	201	198	1665	1996	1786	1994	1725	576	1887	1910	1928	1799	1782
577	281	231	211	1666	1997	1787	1995	1726	577	1886	1909	1927	1798	1781
578	112	261	223	1667	1998	1788	1996	1727	578	1885	1908	1926	1797	1780
579	303	292	235	1668	1999	1789	1997	1728	579	1884	1907	1925	1796	1779
580	135	322	247	1669	1645	1790	1998	1729	580	1883	1906	1924	1795	1778
581	326	352	259	1670	1646	1791	1999	1730	581	1882	1905	1923	1794	1777
582	158	28	272	1671	1647	1792	1765	1731	582	1881	1904	1922	1793	1776
583	349	53	284	1672	1648	1793	1766	1732	583	1880	1903	1921	1792	1775
584	180	83	296	1673	1649	1794	1767	1733	584	1879	1902	1920	1791	1774
585	12	114	308	1674	1650	1795	1768	1734	585	1878	1901	1919	1790	1773
586	203	144	321	1675	1651	1796	1769	1735	586	1877	1900	1918	1789	1772
587	35	174	333	1676	1652	1797	1770	1736	587	1876	1899	1917	1788	1771
588	226	205	345	1677	1653	1798	1771	1737	588	1875	1898	1916	1787	1770
589	58	235	357	1678	1654	1799	1772	1738	589	1874	1897	1915	1786	1769
590	249	265	9	1679	1655	1800	1773	1739	590	1873	1896	1914	1785	1768
591	80	296	22	1680	1656	1801	1774	1740	591	1872	1895	1913	1784	1767
592	272	326	34	1681	1657	1802	1775	1741	592	1871	1894	1912	1783	1766
593	103	356	46	1682	1658	1803	1776	1742	593	1870	1893	1911	1782	1765
594	295	27	58	1683	1659	1804	1777	1743	594	1869	1892	1910	1781	1764
595	126	57	71	1684	1660	1805	1778	1744	595	1868	1891	1909	1780	1763
596	317	87	83	1685	1661	1806	1779	1745	596	1867	1890	1908	1779	1762
597	149	118	95	1686	1662	1807	1780	1746	597	1866	1889	1907	1778	1761
598	340	148	107	1687	1663	1808	1781	1747	598	1865	1888	1906	1777	1760
599	172	179	119	1688	1664	1809	1782	1748	599	1864	1887	1905	1776	1759
600	3	209	132	1689	1665	1810	1783	1749	600	1863	1886	1904	1775	1758
601	194	239	144	1690	1666	1811	1784	1750	601	1862	1885	1903	1774	1757
602	26	270	156	1691	1667	1812	1785	1751	602	1861	1884	1902	1773	1756
603	217	300	168	1692	1668	1813	1786	1752	603	1860	1883	1901	1772	1755
604	49	330	181	1693	1669	1814	1787	1753	604	1859	1882	1900	1771	1754
605	240	0	193	1694	1670	1815	1788	1754	605	1858	1881	1899	1770	1753
606	71	31	205	1695	1671	1816	1789	1755	606	1857	1880	1898	1769	1752
607	262	62	217	1696	1672	1817	1790	1756	607	1856	1879	1897	1768	1751
608	94	92	229	1697	1673	1818	1791	1757	608	1855	1878	1896	1767	1750
609	286	122	242	1698	1674	1819	1792	1758	609	1854	1877	1895	1766	1749
610	117	153	254	1699	1675	1820	1793	1759	610	1853	1876	1894	1765	1748
611	308	183	266	1700	1676	1821	1794	1760	611	1852	1875	1893	1900	1747
612	140	213	278	1701	1677	1822	1795	1761	612	1851	1874	1892	1900	1746
613	331	244	291	1702	1678	1823	1796	1762	613	1850	1873	1891	1907	1745
614	163	274	303	1703	1679	1824	1797	1763	614	1849	1872	1890	1906	1744
615	354	304	315	1704	1680	1825	1798	1764	615	1848	1871	1889	1905	1743
616	185	335	327	1705	1681	1826	1799	1765	616	1847	1870	1888	1904	1742
617	17	5	339	1706	1682	1827	1800	1766	617	1846	1869	1887	1903	1741
618	208	35	352	1707	1683	1828	1801	1767	618	1845	1868	1886	1902	1740
619	40	66	4	1708	1684	1829	1802	1768	619	1844	1867	1885	1901	1739
620	231	96	16	1709	1685	1830	1803	1769	620	1843	1866	1884	1900	1738
621	62	127	28	1710	1686	1831	1804	1770	621	1842	1865	1883	1900	1737
622	254	157	41	1711	1687	1832	1805	1771	622	1841	1864	1882	1900	1736
623	85	187	53	1712	1688	1833	1806	1772	623	1840	1863	1881	1907	1735
624	277	218	65	1713	1689	1834	1807	1773	624	1839	1862	1880	1906	1734
625	108	248	77	1714	1690	1835	1808	1774	625	1838	1861	1879	1905	1733
626	299	278	89	1715	1691	1836	1809	1775	626	1837	1860	1878	1904	1732
627	131	309	102	1716	1692	1837	1810	1776	627	1836	1859	1877	1903	1731
628	322	339	114	1717	1693	1838	1811	1777	628	1835	1858	1876	1902	1730
629	154	9	126	1718	1694	1839	1812	1778	629	1834	1857	1875	1901	1729
630	345	40	138	1719	1695	1840	1813	1779	630	1833	1856	1874	1900	1728
631	177	70	150	1720	1696	1841	1814	1780	631	1832	1855	1873	1900	1727
632	8	100	163	1721	1697	1842	1815	1781	632	1831	1854	1872	1900	1726
633	199	131	175	1722	1698	1843	1816	1782	633	1830	1853	1871	1907	1725
634	31	161	187	1723	1699	1844	1817	1783	634	1829	1852	1870	1906	1724
635	222	191	199	1724	1700	1845	1818	1784	635	1828	1851	1869	1905	1723
636	54	222	212	1725	1701	1846	1819	1785	636	1827	1850	1868	1904	1722
637	245	252	224	1726	1702	1847	1820	1786	637	1826	1849	1867	1903	1721
638	76	282	236	1727	1703	1848	1821	1787	638	1825	1848	1866	1902	1720

TABLE V-A.—PLANETS.—YEARLY INCREASE OF MEAN LONGITUDE, ETC.

TABLE V-A—cont.

Yearly increase of mean longitude, etc.—cont.

Years, also year A.D. if reckoned from 1 B.C.	Mars.	Jup.	Sat.	Mars.	Merc.	Jup.	Venus.	Sat.	B.C.	Mars.	Merc.	Jup.	Venus.	Sat.
	Degrees.			A.D.	A.D.	A.D.	A.D.	A.D.		A.D.	A.D.	A.D.	A.D.	A.D.
641	209	13	273	1730	1706	1851	1824	1790	641	1822	1845	1863	1869	1717
642	122	44	285	1731	1707	1852	1825	1791	642	1821	1844	1862	1868	1716
643	318	74	297	1732	1708	1853	1826	1792	643	1820	1843	1861	1867	1715
644	145	104	309	1733	1709	1854	1827	1793	644	1819	1842	1860	1866	1714
645	336	135	322	1734	1710	1855	1828	1794	645	1818	1841	1859	1865	1713
646	168	165	334	1735	1711	1856	1829	1795	646	1817	1840	1858	1864	1712
647	359	196	346	1736	1712	1857	1830	1796	647	1816	1839	1857	1863	1711
648	190	226	358	1737	1713	1858	1831	1797	648	1815	1838	1856	1862	1710
649	22	256	10	1738	1714	1859	1832	1798	649	1814	1837	1855	1861	1709
650	213	289	23	1739	1715	1860	1833	1799	650	1813	1836	1854	1860	1708
651	45	317	35	1740	1716	1861	1834	1800	651	1812	1835	1853	1859	1707
652	236	347	47	1741	1717	1862	1835	1801	652	1811	1834	1852	1858	1706
653	67	18	59	1742	1718	1863	1836	1802	653	1810	1833	1851	1857	1705
654	259	48	72	1743	1719	1864	1837	1803	654	1809	1832	1850	1856	1704
655	90	78	84	1744	1720	1865	1838	1804	655	1808	1831	1849	1855	1703
656	282	109	96	1745	1721	1866	1839	1805	656	1807	1830	1848	1854	1702
657	113	139	108	1746	1722	1867	1840	1806	657	1806	1829	1847	1853	1701
658	304	169	120	1747	1723	1868	1841	1807	658	1805	1828	1846	1852	1700
659	136	200	133	1748	1724	1869	1842	1808	659	1804	1827	1845	1851	1699
660	327	230	145	1749	1725	1870	1843	1809	660	1803	1826	1844	1850	1698
661	159	260	157	1750	1726	1871	1844	1810	661	1802	1825	1843	1849	1697
662	350	291	169	1751	1727	1872	1845	1811	662	1801	1824	1842	1848	1696
663	181	321	182	1752	1728	1873	1846	1812	663	1800	1823	1841	1847	1695
664	13	351	194	1753	1729	1874	1847	1813	664	1799	1822	1840	1846	1694
665	204	22	206	1754	1730	1875	1848	1814	665	1798	1821	1839	1845	1693
666	26	52	218	1755	1731	1876	1849	1815	666	1797	1820	1838	1844	1692
667	227	82	230	1756	1732	1877	1850	1816	667	1796	1819	1837	1843	1691
668	59	113	243	1757	1733	1878	1851	1817	668	1795	1818	1836	1842	1690
669	250	143	255	1758	1734	1879	1852	1818	669	1794	1817	1835	1841	1689
670	81	174	267	1759	1735	1880	1853	1819	670	1793	1816	1834	1840	1688
671	273	204	279	1760	1736	1881	1854	1820	671	1792	1815	1833	1839	1687
672	104	234	292	1761	1737	1882	1855	1821	672	1791	1814	1832	1838	1686
673	296	265	304	1762	1738	1883	1856	1822	673	1790	1813	1831	1837	1685
674	127	295	316	1763	1739	1884	1857	1823	674	1789	1812	1830	1836	1684
675	318	325	328	1764	1740	1885	1858	1824	675	1788	1811	1829	1835	1683
676	150	356	340	1765	1741	1886	1859	1825	676	1787	1810	1828	1834	1682
677	341	26	353	1766	1742	1887	1860	1826	677	1786	1809	1827	1833	1681
678	173	56	5	1767	1743	1888	1861	1827	678	1785	1808	1826	1832	1680
679	4	87	17	1768	1744	1889	1862	1828	679	1784	1807	1825	1831	1679
680	195	117	29	1769	1745	1890	1863	1829	680	1783	1806	1824	1830	1678
681	27	147	42	1770	1746	1891	1864	1830	681	1782	1805	1823	1829	1677
682	218	178	54	1771	1747	1892	1865	1831	682	1781	1804	1822	1828	1676
683	50	208	66	1772	1748	1893	1866	1832	683	1780	1803	1821	1827	1675
684	241	238	78	1773	1749	1894	1867	1833	684	1779	1802	1820	1826	1674
685	72	269	90	1774	1750	1895	1868	1834	685	1778	1801	1819	1825	1673
686	268	299	103	1775	1751	1896	1869	1835	686	1777	1800	1818	1824	1672
687	95	329	115	1776	1752	1897	1870	1836	687	1776	1799	1817	1823	1671
688	287	359	127	1777	1753	1898	1871	1837	688	1775	1798	1816	1822	1670
689	118	29	139	1778	1754	1899	1872	1838	689	1774	1797	1815	1821	1669
690	309	60	151	1779	1755	1900	1873	1839	690	1773	1796	1814	1820	1668
691	141	91	164	1780	1756	1901	1874	1840	691	1772	1795	1813	1819	1667
692	332	120	176	1781	1757	1902	1875	1841	692	1771	1794	1812	1818	1666
693	161	151	188	1782	1758	1903	1876	1842	693	1770	1793	1811	1817	1665
694	355	181	200	1783	1759	1904	1877	1843	694	1769	1792	1810	1816	1664
695	186	211	213	1784	1760	1905	1878	1844	695	1768	1791	1809	1815	1663
696	18	242	225	1785	1761	1906	1879	1845	696	1767	1790	1808	1814	1662
697	209	272	237	1786	1762	1907	1880	1846	697	1766	1789	1807	1813	1661
698	41	302	249	1787	1763	1908	1881	1847	698	1765	1788	1806	1812	1660
699	232	333	261	1788	1764	1909	1882	1848	699	1764	1787	1805	1811	1659
700	63	8	274	1789	1765	1910	1883	1849	700	1763	1786	1804	1810	1658
701	255	33	286	1790	1766	1911	1884	1850	701	1762	1785	1803	1809	1657
702	86	64	298	1791	1767	1912	1885	1851	702	1761	1784	1802	1808	1656
703	278	94	310	1792	1768	1913	1886	1852	703	1760	1783	1801	1807	1655
704	109	125	323	1793	1769	1914	1887	1853	704	1759	1782	1800	1806	1654
705	300	155	335	1794	1770	1915	1888	1854	705	1758	1781	1799	1805	1653
706	132	185	347	1795	1771	1916	1889	1855	706	1757	1780	1798	1804	1652
707	323	216	359	1796	1772	1917	1890	1856	707	1756	1779	1797	1803	1651
708	155	246	12	1797	1773	1918	1891	1857	708	1755	1778	1796	1802	1650
709	346	276	24	1798	1774	1919	1892	1858	709	1754	1777	1795	1801	1649
710	178	307	36	1799	1775	1920	1893	1859	710	1753	1776	1794	1800	1648
711	9	337	48	1800	1776	1921	1894	1860	711	1752	1775	1793	1899	1647
712	200	7	60	1801	1777	1922	1895	1861	712	1751	1774	1792	1898	1646
713	32	38	73	1802	1778	1923	1896	1862	713	1750	1773	1791	1897	1645
714	223	68	85	1803	1779	1924	1897	1863	714	1749	1772	1790	1896	1644
715	55	98	97	1804	1780	1925	1898	1864	715	1748	1771	1789	1895	1643
716	246	129	109	1805	1781	1926	1899	1865	716	1747	1770	1788	1894	1642
717	77	159	121	1806	1782	1927	1900	1866	717	1746	1769	1787	1893	1641
718	269	189	134	1807	1783	1928	1901	1867	718	1745	1768	1786	1892	1640
719	100	220	146	1808	1784	1929	1902	1868	719	1744	1767	1785	1891	1639
720	292	250	158	1809	1785	1930	1903	1869	720	1743	1766	1784	1890	1638

TABLE V-A.—PLANETS.—YEARLY INCREASE OF MEAN LONGITUDE, ETC.

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TABLE V-A—cont.

Yearly increase of mean longitude, etc.—cont

Years; also year A.D. if reckoned from 1 B.C.	Mars.	Jup.	Sat.	Mars.	Merc.	Jup.	Venus.	Sat.	B.C.	Mars.	Merc.	Jup.	Venus.	Sat.
Degrees.				A.D.	A.D.	A.D.	A.D.	A.D.		A.D.	A.D.	A.D.	A.D.	A.D.
721	123	280	170	1810	1786	1831	1904	1870	721	1742	1765	1783	1889	1901
722	314	311	183	1811	1787	1932	1905	1871	722	1741	1764	1782	1888	1900
723	146	341	195	1812	1788	1933	1906	1872	723	1740	1763	1781	1887	1899
724	887	11	207	1813	1789	1934	1907	1873	724	1739	1762	1780	1886	1898
725	169	42	219	1814	1790	1935	1908	1874	725	1738	1761	1779	1885	1897
726	0	72	231	1815	1791	1936	1909	1875	726	1737	1760	1778	1884	1896
727	191	102	244	1816	1792	1937	1910	1876	727	1736	1759	1777	1883	1895
728	23	183	256	1817	1793	1938	1911	1877	728	1735	1758	1776	1882	1894
729	214	163	268	1818	1794	1939	1912	1878	729	1734	1757	1775	1881	1893
730	46	194	280	1819	1795	1940	1913	1879	730	1733	1756	1774	1880	1892
731	237	224	293	1820	1796	1941	1914	1880	731	1732	1755	1773	1879	1891
732	68	254	305	1821	1797	1942	1915	1881	732	1731	1754	1772	1878	1890
733	259	285	317	1822	1798	1943	1916	1882	733	1730	1753	1771	1877	1889
734	91	315	329	1823	1799	1944	1917	1883	734	1729	1752	1770	1876	1888
735	283	345	341	1824	1800	1945	1918	1884	735	1728	1751	1769	1875	1887
736	114	16	354	1825	1801	1946	1919	1885	736	1727	1750	1768	1874	1886
737	305	46	6	1826	1802	1947	1920	1886	737	1726	1749	1767	1873	1885
738	137	73	18	1827	1803	1948	1921	1887	738	1725	1748	1766	1872	1884
739	328	107	30	1828	1804	1949	1922	1888	739	1724	1747	1765	1871	1883
740	160	137	43	1829	1805	1950	1923	1889	740	1723	1746	1764	1870	1882
741	551	167	55	1830	1806	1951	1924	1890	741	1722	1745	1763	1869	1881
742	182	198	67	1831	1807	1952	1925	1891	742	1721	1744	1762	1868	1880
743	14	228	79	1832	1808	1953	1926	1892	743	1720	1743	1761	1867	1879
744	205	258	91	1833	1809	1954	1927	1893	744	1719	1742	1760	1866	1878
745	37	289	104	1834	1810	1955	1928	1894	745	1718	1741	1759	1865	1877
746	228	319	116	1835	1811	1956	1929	1895	746	1717	1740	1758	1864	1876
747	59	349	128	1836	1812	1957	1930	1896	747	1716	1739	1757	1863	1875
748	251	20	140	1837	1813	1958	1931	1897	748	1715	1738	1756	1862	1874
749	82	50	152	1838	1814	1959	1932	1898	749	1714	1737	1755	1861	1873
750	274	80	165	1839	1815	1960	1933	1899	750	1713	1736	1754	1860	1872
751	105	111	177	1840	1816	1961	1934	1900	751	1712	1735	1753	1859	1871
752	296	141	189	1841	1817	1962	1935	1901	752	1711	1734	1752	1858	1870
753	128	172	201	1842	1818	1963	1936	1902	753	1710	1733	1751	1857	1869
754	319	202	214	1843	1819	1964	1937	1903	754	1709	1732	1750	1856	1868
755	151	232	226	1844	1820	1965	1938	1904	755	1708	1731	1749	1855	1867
756	342	263	238	1845	1821	1966	1939	1905	756	1707	1730	1748	1854	1866
757	174	293	250	1846	1822	1967	1940	1906	757	1706	1729	1747	1853	1865
758	5	323	262	1847	1823	1968	1941	1907	758	1705	1728	1746	1852	1864
759	193	354	275	1848	1824	1969	1942	1908	759	1704	1727	1745	1851	1863
760	26	24	287	1849	1825	1970	1943	1909	760	1703	1726	1744	1850	1862
761	219	54	299	1850	1826	1971	1944	1910	761	1702	1725	1743	1849	1861
762	51	85	311	1851	1827	1972	1945	1911	762	1701	1724	1742	1848	1860
763	242	115	324	1852	1828	1973	1946	1912	763	1700	1723	1741	1847	1859
764	73	145	336	1853	1829	1974	1947	1913	764	1699	1722	1740	1846	1858
765	205	176	348	1854	1830	1975	1948	1914	765	1698	1721	1739	1845	1857
766	98	206	0	1855	1831	1976	1949	1915	766	1697	1720	1738	1844	1856
767	288	236	12	1856	1832	1977	1950	1916	767	1696	1719	1737	1843	1855
768	119	267	24	1857	1833	1978	1951	1917	768	1695	1718	1736	1842	1854
769	310	297	37	1858	1834	1979	1952	1918	769	1694	1717	1735	1841	1853
770	142	327	49	1859	1835	1980	1953	1919	770	1693	1716	1734	1840	1852
771	383	358	61	1860	1836	1981	1954	1920	771	1692	1715	1733	1839	1851
772	165	28	73	1861	1837	1982	1955	1921	772	1691	1714	1732	1838	1850
773	856	58	85	1862	1838	1983	1956	1922	773	1690	1713	1731	1837	1849
774	187	89	98	1863	1839	1984	1957	1923	774	1689	1712	1730	1836	1848
775	19	119	110	1864	1840	1985	1958	1924	775	1688	1711	1729	1835	1847
776	210	150	122	1865	1841	1986	1959	1925	776	1687	1710	1728	1834	1846
777	42	180	134	1866	1842	1987	1960	1926	777	1686	1709	1727	1833	1845
778	283	210	147	1867	1843	1988	1961	1927	778	1685	1708	1726	1832	1844
779	64	241	159	1868	1844	1989	1962	1928	779	1684	1707	1725	1831	1843
780	256	271	171	1869	1845	1990	1963	1929	780	1683	1706	1724	1830	1842
781	87	301	183	1870	1846	1991	1964	1930	781	1682	1705	1723	1829	1841
782	279	332	195	1871	1847	1992	1965	1931	782	1681	1704	1722	1828	1840
783	110	2	208	1872	1848	1993	1966	1932	783	1680	1703	1721	1827	1839
784	301	32	220	1873	1849	1994	1967	1933	784	1679	1702	1720	1826	1838
785	133	63	232	1874	1850	1995	1968	1934	785	1678	1701	1719	1825	1837
786	324	93	244	1875	1851	1996	1969	1935	786	1677	1700	1718	1824	1836
787	163	123	257	1876	1852	1997	1970	1936	787	1676	1699	1717	1823	1835
788	347	154	269	1877	1853	1998	1971	1937	788	1675	1698	1716	1822	1834
789	179	184	281	1878	1854	1999	1972	1938	789	1674	1697	1715	1821	1833
790	10	214	293	1879	1855	1999	1973	1939	790	1673	1696	1714	1820	1832
791	201	245	305	1880	1856	1999	1974	1940	791	1672	1695	1713	1819	1831
792	84	275	318	1881	1857	1999	1975	1941	792	1671	1694	1712	1818	1830
793	224	305	330	1882	1858	1999	1976	1942	793	1670	1693	1711	1817	1829
794	56	336	342	1883	1859	1999	1977	1943	794	1669	1692	1710	1816	1828
795	247	6	354	1884	1860	1999	1978	1944	795	1668	1691	1709	1815	1827
796	78	36	7	1885	1861	1999	1979	1945	796	1667	1690	1708	1814	1826
797	270	67	19	1886	1862	1999	1980	1946	797	1666	1689	1707	1813	1825
798	101	97	31	1887	1863	1999	1981	1947	798	1665	1688	1706	1812	1824
799	293	128	43	1888	1864	1999	1982	1948	799	1664	1687	1705	1811	1823
800	124	158	55	1889	1865	1999	1983	1949	800	1663	1686	1704	1810	1822

TABLE V-A—cont.

Yearly increase of mean longitude, etc.—cont.

Years, also year A.D. if reckoned from 1 B.C.	Mars.	Jup	Sat.	Mars.	Merc	Jup.	Venus.	Sat.	B.C.	Mars.	Merc.	Jup.	Venus.	Sat.
		Degrees		A.D.	A.D	A.D.	A.D.	A.D.		A.D.	A.D.	A.D.	A.D.	A.D.
801	315	188	68	1890	1866	1750	1984	1950	801	1662	1685	1964	1809	1940
802	147	219	80	1891	1807	1751	1985	1951	802	1661	1684	1963	1808	1939
803	338	249	92	1892	1808	1752	1986	1952	803	1660	1683	1962	1807	1938
804	170	279	104	1893	1809	1753	1987	1953	804	1659	1682	1961	1806	1937
805	1	310	116	1894	1870	1754	1988	1954	805	1658	1681	1960	1805	1936
806	192	340	129	1895	1871	1755	1989	1955	806	1657	1680	1959	1804	1935
807	24	10	141	1896	1872	1756	1990	1956	807	1656	1679	1958	1803	1934
808	215	41	158	1897	1873	1757	1991	1957	808	1655	1678	1957	1802	1933
809	47	71	165	1898	1874	1758	1992	1958	809	1654	1677	1956	1801	1932
810	238	101	178	1899	1875	1759	1993	1959	810	1653	1676	1955	1800	1931
811	69	132	190	1900	1876	1760	1994	1960	811	1652	1675	1954	1799	1930
812	261	162	202	1901	1877	1761	1995	1961	812	1651	1674	1953	1798	1929
813	92	192	214	1902	1878	1762	1996	1962	813	1650	1673	1952	1797	1928
814	284	223	226	1903	1879	1763	1997	1963	814	1649	1672	1951	1796	1927
815	115	253	239	1904	1880	1764	1998	1964	815	1648	1671	1950	1795	1926
816	306	283	251	1905	1881	1765	1999	1965	816	1647	1670	1949	1794	1925
817	138	314	263	1906	1882	1766	1765	1966	817	1646	1669	1948	1793	1924
818	329	344	275	1907	1883	1767	1766	1967	818	1645	1668	1947	1792	1923
819	161	14	288	1908	1884	1768	1767	1968	819	1644	1667	1946	1791	1922
820	352	45	300	1909	1885	1769	1768	1969	820	1643	1666	1945	1790	1921
821	183	75	312	1910	1886	1770	1769	1970	821	1642	1665	1944	1789	1920
822	15	105	324	1911	1887	1771	1770	1971	822	1641	1664	1943	1788	1919
823	206	136	336	1912	1888	1772	1771	1972	823	1640	1663	1942	1787	1918
824	38	166	349	1913	1889	1773	1772	1973	824	1639	1662	1941	1786	1917
825	229	197	1	1914	1890	1774	1773	1974	825	1638	1661	1940	1785	1916
826	60	227	13	1915	1891	1775	1774	1975	826	1637	1660	1939	1784	1915
827	252	257	25	1916	1892	1776	1775	1976	827	1715	1659	1938	1783	1914
828	83	288	38	1917	1893	1777	1776	1977	828	1714	1658	1937	1782	1913
829	276	318	50	1918	1894	1778	1777	1978	829	1713	1657	1936	1781	1912
830	106	348	62	1919	1895	1779	1778	1979	830	1712	1656	1935	1780	1911
831	297	19	74	1920	1896	1780	1779	1980	831	1711	1655	1934	1779	1910
832	129	49	86	1921	1897	1781	1780	1981	832	1710	1654	1933	1778	1909
833	326	79	99	1922	1898	1782	1781	1982	833	1709	1653	1932	1777	1908
834	152	110	111	1923	1899	1783	1782	1983	834	1708	1652	1931	1776	1907
835	313	140	123	1924	1900	1784	1783	1984	835	1707	1651	1930	1775	1906
836	175	170	135	1925	1901	1785	1784	1985	836	1706	1650	1929	1774	1905
837	6	201	147	1926	1902	1786	1785	1986	837	1705	1649	1928	1773	1904
838	197	231	160	1927	1903	1787	1786	1987	838	1704	1648	1927	1772	1903
839	29	261	172	1928	1904	1788	1787	1988	839	1703	1647	1926	1771	1902
840	220	292	184	1929	1905	1789	1788	1989	840	1702	1646	1925	1770	1901
841	52	322	196	1930	1906	1790	1789	1990	841	1701	1645	1924	1769	1900
842	218	352	209	1931	1907	1791	1790	1991	842	1700	1999	1923	1768	1899
843	74	23	221	1932	1908	1792	1791	1992	843	1699	1998	1922	1767	1898
844	266	58	233	1933	1909	1793	1792	1993	844	1698	1997	1921	1766	1897
845	47	83	245	1934	1910	1794	1793	1994	845	1697	1996	1920	1765	1896
846	289	114	257	1935	1911	1795	1794	1995	846	1696	1995	1919	1764	1895
847	120	144	270	1936	1912	1796	1795	1996	847	1695	1994	1918	1763	1894
848	811	176	282	1937	1913	1797	1796	1997	848	1694	1993	1917	1762	1893
849	143	205	294	1938	1914	1798	1797	1998	849	1693	1992	1916	1761	1892
850	334	235	306	1939	1915	1799	1798	1999	850	1692	1991	1915	1760	1891
851	166	266	319	1940	1916	1800	1799	1617	851	1691	1990	1914	1904	1890
852	357	296	331	1941	1917	1801	1800	1618	852	1690	1989	1913	1903	1889
853	188	326	343	1942	1918	1802	1801	1619	853	1689	1988	1912	1902	1888
854	20	357	355	1943	1919	1803	1802	1620	854	1688	1987	1911	1901	1887
855	211	27	7	1944	1920	1804	1803	1621	855	1687	1986	1910	1900	1886
856	43	57	20	1945	1921	1805	1804	1622	856	1686	1985	1909	1899	1885
857	234	88	32	1946	1922	1806	1805	1623	857	1685	1984	1908	1898	1884
858	65	118	44	1947	1923	1807	1806	1624	858	1684	1983	1907	1897	1883
859	257	148	56	1948	1924	1808	1807	1625	859	1683	1982	1906	1896	1882
860	88	179	69	1949	1925	1809	1808	1626	860	1682	1981	1905	1895	1881
861	280	209	81	1950	1926	1810	1809	1627	861	1681	1980	1904	1894	1880
862	111	239	93	1951	1927	1811	1810	1628	862	1680	1979	1903	1893	1879
863	302	270	105	1952	1928	1812	1811	1629	863	1679	1978	1902	1892	1878
864	134	300	117	1953	1929	1813	1812	1630	864	1678	1977	1901	1891	1877
865	325	330	130	1954	1930	1814	1813	1631	865	1677	1976	1900	1890	1876
866	157	1	142	1955	1931	1815	1814	1632	866	1676	1975	1899	1889	1875
867	348	31	154	1956	1932	1816	1815	1633	867	1675	1974	1898	1888	1874
868	179	61	166	1957	1933	1817	1816	1634	868	1674	1973	1897	1887	1873
869	11	92	179	1958	1934	1818	1817	1635	869	1673	1972	1896	1886	1872
870	202	122	191	1959	1935	1819	1818	1636	870	1672	1971	1895	1885	1871
871	34	153	203	1960	1936	1820	1819	1637	871	1671	1970	1894	1884	1870
872	225	183	215	1961	1937	1821	1820	1638	872	1670	1969	1893	1883	1869
873	57	213	227	1962	1938	1822	1821	1639	873	1669	1968	1892	1882	1868
874	248	244	240	1963	1939	1823	1822	1640	874	1668	1967	1891	1881	1867
875	79	274	252	1964	1940	1824	1823	1641	875	1667	1966	1890	1880	1866
876	271	304	264	1965	1941	1825	1824	1642	876	1666	1965	1889	1879	1865
877	102	335	276	1966	1942	1826	1825	1643	877	1665	1964	1888	1878	1864
878	294	5	289	1967	1943	1827	1826	1644	878	1664	1963	1887	1877	1863
879	125	35	301	1968	1944	1828	1827	1645	879	1663	1962	1886	1876	1862
880	316	66	313	1969	1945	1829	1828	1646	880	1662	1961	1885	1875	1861

TABLE V-A—cont.

Yearly increase of mean longitude, etc.—cont.

Years; also year A.D. if reckoned from 1 B.C.	Mars.	Jup.	Sat.	Mars.	Merc.	Jup.	Venus	Sat.	B.C.	Mars.	Merc.	Jup.	Venus	Sat.
A.D.	Degree			A.D.	A.D.	A.D.	A.D.	A.D.		A.D.	A.D.	A.D.	A.D.	A.D.
881	148	96	325	1970	1946	1830	1829	1647	881	1661	1960	1884	1964	1860
882	339	126	337	1971	1947	1831	1830	1648	882	1666	1959	1883	1963	1859
883	171	157	350	1972	1948	1832	1831	1649	883	1669	1958	1882	1962	1858
884	2	187	2	1973	1949	1833	1832	1650	884	1668	1957	1881	1961	1857
885	193	217	14	1974	1950	1834	1833	1651	885	1667	1956	1880	1960	1856
886	25	248	26	1975	1951	1835	1834	1652	886	1666	1955	1879	1959	1855
887	216	278	39	1976	1952	1836	1835	1653	887	1665	1954	1878	1958	1854
888	48	308	51	1977	1953	1837	1836	1654	888	1664	1953	1877	1957	1853
889	239	339	63	1978	1954	1838	1837	1655	889	1663	1952	1876	1956	1852
890	70	9	75	1979	1955	1839	1838	1656	890	1662	1951	1875	1955	1851
891	261	39	87	1980	1956	1840	1839	1657	891	1661	1950	1874	1954	1850
892	93	70	100	1981	1957	1841	1810	1658	892	1660	1949	1873	1953	1849
893	285	100	112	1982	1958	1842	1841	1659	893	1649	1948	1872	1952	1848
894	116	131	124	1983	1959	1843	1842	1660	894	1648	1947	1871	1951	1847
895	307	161	136	1984	1960	1844	1843	1661	895	1647	1946	1870	1950	1846
896	139	191	148	1985	1961	1845	1844	1662	896	1646	1945	1869	1949	1845
897	330	222	161	1986	1962	1846	1845	1663	897	1645	1944	1868	1948	1844
898	162	252	173	1987	1963	1847	1846	1664	898	1644	1943	1867	1947	1843
899	353	282	185	1988	1964	1848	1847	1665	899	1643	1942	1866	1946	1842
900	184	313	197	1989	1965	1849	1848	1666	900	1642	1941	1865	1945	1841
901	16	343	210	1990	1966	1850	1849	1667	901	1641	1940	1864	1944	1840
902	207	13	222	1991	1967	1851	1850	1668	902	1640	1939	1863	1943	1839
903	89	44	234	1992	1968	1852	1851	1669	903	1639	1938	1862	1942	1838
904	230	74	246	1993	1969	1853	1852	1670	904	1638	1937	1861	1941	1837
905	61	104	258	1994	1970	1854	1853	1671	905	1637	1936	1860	1940	1836
906	253	135	271	1995	1971	1855	1854	1672	906	1636	1935	1859	1939	1835
907	84	165	283	1996	1972	1856	1855	1673	907	1635	1934	1858	1938	1834
908	276	195	295	1997	1973	1857	1856	1674	908	1634	1933	1857	1937	1833
909	107	226	307	1998	1974	1858	1857	1675	909	1633	1932	1856	1936	1832
910	298	256	320	1999	1975	1859	1858	1676	910	1632	1931	1855	1935	1831
911	130	286	332	1990	1976	1860	1859	1677	911	1631	1930	1854	1934	1830
912	321	317	344	1991	1977	1861	1860	1678	912	1630	1929	1853	1933	1829
913	153	347	356	1992	1978	1862	1861	1679	913	1629	1928	1852	1932	1828
914	844	17	8	1993	1979	1863	1862	1680	914	1628	1927	1851	1931	1827
915	176	48	21	1994	1980	1864	1863	1681	915	1627	1926	1850	1930	1826
916	7	78	33	1995	1981	1865	1864	1682	916	1626	1925	1849	1929	1825
917	198	108	45	1996	1982	1866	1865	1683	917	1625	1924	1848	1928	1824
918	80	139	57	1997	1983	1867	1866	1684	918	1624	1923	1847	1927	1823
919	221	169	70	1998	1984	1868	1867	1685	919	1623	1922	1846	1926	1822
920	53	200	82	1999	1985	1869	1868	1686	920	1622	1921	1845	1925	1821
921	244	230	94	1990	1986	1870	1869	1687	921	1621	1920	1844	1924	1820
922	75	260	106	1991	1987	1871	1870	1688	922	1620	1919	1843	1923	1819
923	267	291	118	1992	1988	1872	1871	1689	923	1619	1918	1842	1922	1818
924	98	321	131	1993	1989	1873	1872	1690	924	1618	1917	1841	1921	1817
925	290	351	143	1994	1990	1874	1873	1691	925	1617	1916	1840	1920	1816
926	121	22	155	1995	1991	1875	1874	1692	926	1616	1915	1839	1919	1815
927	312	52	167	1996	1992	1876	1875	1693	927	1615	1914	1838	1918	1814
928	144	82	180	1997	1993	1877	1876	1694	928	1614	1913	1837	1917	1813
929	395	113	192	1998	1994	1878	1877	1695	929	1613	1912	1836	1916	1812
930	167	143	204	1999	1995	1879	1878	1696	930	1612	1911	1835	1915	1811
931	358	173	216	1990	1996	1880	1879	1697	931	1611	1910	1834	1914	1810
932	189	204	228	1991	1997	1881	1880	1698	932	1610	1909	1833	1913	1809
933	21	234	241	1992	1998	1882	1881	1699	933	1609	1908	1832	1912	1808
934	212	264	253	1993	1999	1883	1882	1700	934	1608	1907	1831	1911	1807
935	44	295	265	1994	1990	1884	1883	1701	935	1607	1906	1830	1910	1806
936	235	325	277	1995	1991	1885	1884	1702	936	1606	1905	1829	1909	1805
937	66	355	290	1996	1992	1886	1885	1703	937	1605	1904	1828	1908	1804
938	258	26	302	1997	1993	1887	1886	1704	938	1604	1903	1827	1907	1803
939	89	56	314	1998	1994	1888	1887	1705	939	1603	1902	1826	1906	1802
940	281	86	326	1999	1995	1889	1888	1706	940	1602	1901	1825	1905	1801
941	112	117	338	1990	1996	1890	1889	1707	941	1601	1900	1824	1904	1800
942	308	147	351	1991	1997	1891	1890	1708	942	1600	1899	1823	1903	1799
943	135	178	3	1992	1998	1892	1891	1709	943	1599	1898	1822	1902	1798
944	326	208	15	1993	1999	1893	1892	1710	944	1598	1897	1821	1901	1797
945	158	238	27	1994	1990	1894	1893	1711	945	1597	1896	1820	1900	1796
946	349	269	40	1995	1991	1895	1894	1712	946	1596	1895	1819	1899	1795
947	180	299	52	1996	1992	1896	1895	1713	947	1595	1894	1818	1898	1794
948	12	329	64	1997	1993	1897	1896	1714	948	1594	1893	1817	1897	1793
949	203	0	76	1998	1994	1898	1897	1715	949	1593	1892	1816	1896	1792
950	85	30	88	1999	1995	1899	1898	1716	950	1592	1891	1815	1895	1791
951	226	61	101	1990	1996	1900	1899	1717	951	1591	1890	1814	1894	1790
952	58	91	113	1991	1997	1901	1900	1718	952	1590	1889	1813	1893	1789
953	240	121	125	1992	1998	1902	1901	1719	953	1589	1888	1812	1892	1788
954	80	152	137	1993	1999	1903	1902	1720	954	1588	1887	1811	1891	1787
955	272	182	149	1994	1990	1904	1903	1721	955	1587	1886	1810	1890	1786
956	108	212	162	1995	1991	1905	1904	1722	956	1586	1885	1809	1889	1785
957	295	243	174	1996	1992	1906	1905	1723	957	1585	1884	1808	1888	1784
958	126	273	186	1997	1993	1907	1906	1724	958	1584	1883	1807	1887	1783
959	317	303	198	1998	1994	1908	1907	1725	959	1583	1882	1806	1886	1782
960	149	334	211	1999	1995	1909	1908	1726	960	1582	1881	1805	1885	1781

TABLE V-A—cont.															
Yearly increase of mean longitude, etc—cont.															
Years: also year A.D. if reckoned from 1 B.C.	Mars.	Jup.	Sat.	Mars.	Merc.	Jup.	Venus.	Sat.	B.C.	Mars.	Merc.	Jup.	Venus.	Sat.	
Degrees.															
A.D.															
961	840	4	228	1687	1671	1910	1909	1727	961	1865	1880	1804	1884	1780	
962	172	34	285	1688	1672	1911	1910	1728	962	1864	1879	1803	1883	1779	
963	8	65	247	1689	1673	1912	1911	1729	963	1863	1878	1802	1882	1778	
964	194	95	259	1690	1674	1913	1912	1730	964	1862	1877	1801	1881	1777	
965	26	126	272	1691	1675	1914	1913	1731	965	1861	1876	1800	1880	1776	
966	217	156	284	1692	1676	1915	1914	1732	966	1860	1875	1799	1879	1775	
967	49	186	296	1693	1677	1916	1915	1733	967	1859	1874	1798	1878	1774	
968	240	217	308	1694	1678	1917	1916	1734	968	1858	1873	1797	1877	1773	
969	71	247	321	1695	1679	1918	1917	1735	969	1857	1872	1796	1876	1772	
970	262	277	334	1696	1680	1919	1918	1736	970	1856	1871	1795	1875	1771	
971	94	308	345	1697	1681	1920	1919	1737	971	1855	1870	1794	1874	1770	
972	266	338	357	1698	1682	1921	1920	1738	972	1854	1869	1793	1873	1769	
973	117	8	9	1699	1683	1922	1921	1739	973	1853	1868	1792	1872	1768	
974	808	39	22	1700	1684	1923	1922	1740	974	1852	1867	1791	1871	1767	
975	140	69	34	1701	1685	1924	1923	1741	975	1851	1866	1790	1870	1766	
976	331	99	46	1702	1686	1925	1924	1742	976	1850	1865	1789	1869	1765	
977	163	130	58	1703	1687	1926	1925	1743	977	1849	1864	1788	1868	1764	
978	354	160	71	1704	1688	1927	1926	1744	978	1848	1863	1787	1867	1763	
979	185	190	83	1705	1689	1928	1927	1745	979	1847	1862	1786	1866	1762	
980	17	221	95	1706	1690	1929	1928	1746	980	1846	1861	1785	1865	1761	
981	208	251	107	1707	1691	1930	1929	1747	981	1845	1860	1784	1864	1760	
982	40	281	119	1708	1692	1931	1930	1748	982	1844	1859	1783	1863	1759	
983	231	312	132	1709	1693	1932	1931	1749	983	1843	1858	1782	1862	1758	
984	62	342	144	1710	1694	1933	1932	1750	984	1842	1857	1781	1861	1757	
985	254	12	156	1711	1695	1934	1933	1751	985	1841	1856	1780	1860	1756	
986	85	43	168	1712	1696	1935	1934	1752	986	1840	1855	1779	1859	1755	
987	277	78	181	1713	1697	1936	1935	1753	987	1839	1854	1778	1858	1754	
988	108	103	193	1714	1698	1937	1936	1754	988	1838	1853	1777	1857	1753	
989	299	134	205	1715	1699	1938	1937	1755	989	1837	1852	1776	1856	1752	
990	131	164	217	1716	1700	1939	1938	1756	990	1836	1851	1775	1855	1751	
991	322	195	229	1717	1701	1940	1939	1757	991	1835	1850	1774	1854	1750	
992	154	225	242	1718	1702	1941	1940	1758	992	1834	1849	1773	1853	1749	
993	345	255	254	1719	1703	1942	1941	1759	993	1833	1848	1772	1852	1748	
994	177	286	266	1720	1704	1943	1942	1760	994	1832	1847	1771	1851	1747	
995	8	316	278	1721	1705	1944	1943	1761	995	1831	1846	1770	1850	1746	
996	199	346	291	1722	1706	1945	1944	1762	996	1830	1845	1769	1849	1745	
997	31	17	303	1723	1707	1946	1945	1763	997	1829	1844	1768	1848	1744	
998	222	47	315	1724	1708	1947	1946	1764	998	1828	1843	1767	1847	1743	
999	54	77	327	1725	1709	1948	1947	1765	999	1827	1842	1766	1846	1742	
1000	245	108	339	1726	1710	1949	1948	1766	1000	1826	1841	1765	1845	1741	
1001	76	138	352	1727	1711	1950	1949	1767	1001	1825	1840	1764	1844	1740	
1002	268	168	4	1728	1712	1951	1950	1768	1002	1824	1839	1763	1843	1739	
1003	99	198	16	1729	1713	1952	1951	1769	1003	1823	1838	1762	1842	1738	
1004	291	229	28	1730	1714	1953	1952	1770	1004	1822	1837	1761	1841	1737	
1005	122	259	40	1731	1715	1954	1953	1771	1005	1821	1836	1760	1840	1736	
1006	314	289	52	1732	1716	1955	1954	1772	1006	1820	1835	1759	1839	1735	
1007	145	320	65	1733	1717	1956	1955	1773	1007	1819	1834	1758	1838	1734	
1008	336	350	77	1734	1718	1957	1956	1774	1008	1818	1833	1757	1837	1733	
1009	168	21	89	1735	1719	1958	1957	1775	1009	1817	1832	1756	1836	1732	
1010	359	51	101	1736	1720	1959	1958	1776	1010	1816	1831	1755	1835	1731	
1011	191	81	113	1737	1721	1960	1959	1777	1011	1815	1830	1754	1834	1730	
1012	22	112	126	1738	1722	1961	1960	1778	1012	1814	1829	1753	1833	1729	
1013	213	142	138	1739	1723	1962	1961	1779	1013	1813	1828	1752	1832	1728	
1014	45	172	150	1740	1724	1963	1962	1780	1014	1812	1827	1751	1831	1727	
1015	236	203	162	1741	1725	1964	1963	1781	1015	1811	1826	1750	1830	1726	
1016	68	233	175	1742	1726	1965	1964	1782	1016	1810	1825	1749	1829	1725	
1017	259	263	187	1743	1727	1966	1965	1783	1017	1809	1824	1748	1828	1724	
1018	91	294	199	1744	1728	1967	1966	1784	1018	1808	1823	1747	1827	1723	
1019	282	324	211	1745	1729	1968	1967	1785	1019	1807	1822	1746	1826	1722	
1020	113	354	223	1746	1730	1969	1968	1786	1020	1806	1821	1745	1825	1721	
1021	305	25	236	1747	1731	1970	1969	1787	1021	1805	1820	1744	1824	1720	
1022	136	55	248	1748	1732	1971	1970	1788	1022	1804	1819	1743	1823	1719	
1023	328	86	260	1749	1733	1972	1971	1789	1023	1803	1818	1742	1822	1718	
1024	159	116	272	1750	1734	1973	1972	1790	1024	1802	1817	1741	1821	1717	

TABLE V-A—cont.

Yearly increase of mean longitude, etc.—cont.

Years; also year A.D. if reckoned from 1 B.C.	Mars.	Jup.	Sat.	Mars.	Merc.	Jup.	Ven.	Sat.	Years; also year A.D. if reckoned from 1 B.C.	Mars.	Jup.	Sat.	Mars.	Merc.	Jup.	Ven.	Sat.
Degrees.	A.D.	A.D.	A.D.	A.D.	A.D.	A.D.	A.D.	A.D.	Degrees.	A.D.	A.D.	A.D.	A.D.	A.D.	A.D.	A.D.	A.D.
1025	350	146	285	1751	1735	1974	1973	1791	1105	183	54	182	1831	1815	1710	1818	1871
1026	182	176	297	1752	1736	1975	1974	1792	1106	14	84	194	1832	1816	1711	1819	1872
1027	13	207	309	1753	1737	1976	1975	1793	1107	206	115	208	1833	1817	1712	1820	1873
1028	205	237	321	1754	1738	1977	1976	1794	1108	87	145	219	1834	1818	1713	1821	1874
1029	36	267	333	1755	1739	1978	1977	1795	1109	228	175	231	1835	1819	1714	1822	1875
1030	227	298	345	1756	1740	1979	1978	1796	1110	60	206	243	1836	1820	1715	1823	1876
1031	59	328	358	1757	1741	1980	1979	1797	1111	251	236	255	1837	1821	1716	1824	1877
1032	250	359	10	1758	1742	1981	1980	1798	1112	83	6	268	1838	1822	1717	1825	1878
1033	82	29	22	1759	1743	1982	1981	1799	1113	274	297	280	1839	1823	1718	1826	1879
1034	273	59	34	1760	1744	1983	1982	1800	1114	105	327	292	1840	1824	1719	1827	1880
1035	104	90	47	1761	1745	1984	1983	1801	1115	297	357	304	1841	1825	1720	1828	1881
1036	296	120	59	1762	1746	1985	1984	1802	1116	128	28	316	1842	1826	1721	1829	1882
1037	127	150	71	1763	1747	1986	1985	1803	1117	320	58	329	1843	1827	1722	1830	1883
1038	319	181	83	1764	1748	1987	1986	1804	1118	151	88	341	1844	1828	1723	1831	1884
1039	150	211	95	1765	1749	1988	1987	1805	1119	342	119	353	1845	1829	1724	1832	1885
1040	341	241	108	1766	1750	1989	1988	1806	1120	174	149	5	1846	1830	1725	1833	1886
1041	178	272	120	1767	1751	1990	1989	1807	1121	5	179	18	1847	1831	1726	1834	1887
1042	4	302	132	1768	1752	1991	1990	1808	1122	197	210	30	1848	1832	1727	1835	1888
1043	196	332	144	1769	1753	1992	1991	1809	1123	28	240	42	1849	1833	1728	1836	1889
1044	27	3	157	1770	1754	1993	1992	1810	1124	219	270	54	1850	1834	1729	1837	1890
1045	218	33	169	1771	1755	1994	1993	1811	1125	51	301	66	1851	1835	1730	1838	1891
1046	50	63	181	1772	1756	1995	1994	1812	1126	242	331	79	1852	1836	1731	1839	1892
1047	241	94	193	1773	1757	1996	1995	1813	1127	74	2	91	1853	1837	1732	1840	1893
1048	73	124	206	1774	1758	1997	1996	1814	1128	265	32	103	1854	1838	1733	1841	1894
1049	264	154	218	1775	1759	1998	1997	1815	1129	97	62	115	1855	1839	1734	1842	1895
1050	95	185	230	1776	1760	1999	1998	1816	1130	288	93	127	1856	1840	1735	1843	1896
1051	287	215	242	1777	1761	1999	1999	1817	1131	119	123	140	1857	1841	1736	1844	1897
1052	118	245	254	1778	1762	1997	1997	1818	1132	311	153	152	1858	1842	1737	1845	1898
1053	310	276	267	1779	1763	1998	1998	1819	1133	142	184	164	1859	1843	1738	1846	1899
1054	141	306	279	1780	1764	1999	1999	1820	1134	334	214	176	1860	1844	1739	1847	1900
1055	333	337	291	1781	1765	1999	1999	1821	1135	165	244	189	1861	1845	1740	1848	1901
1056	164	7	303	1782	1766	1999	1999	1822	1136	356	275	201	1862	1846	1741	1849	1902
1057	355	37	316	1783	1767	1999	1999	1823	1137	188	305	213	1863	1847	1742	1850	1903
1058	187	68	328	1784	1768	1999	1999	1824	1138	19	335	225	1864	1848	1743	1851	1904
1059	18	98	340	1785	1769	1999	1999	1825	1139	211	6	237	1865	1849	1744	1852	1905
1060	210	128	352	1786	1770	1999	1999	1826	1140	42	36	250	1866	1850	1745	1853	1906
1061	41	159	4	1787	1771	1999	1999	1827	1141	233	65	262	1867	1851	1746	1854	1907
1062	232	189	17	1788	1772	1999	1999	1828	1142	65	97	274	1868	1852	1747	1855	1908
1063	64	219	29	1789	1773	1999	1999	1829	1143	256	127	286	1869	1853	1748	1856	1909
1064	255	250	41	1790	1774	1999	1999	1830	1144	88	157	299	1870	1854	1749	1857	1910
1065	87	280	53	1791	1775	1999	1999	1831	1145	279	188	311	1871	1855	1750	1858	1911
1066	278	310	65	1792	1776	1999	1999	1832	1146	110	218	323	1872	1856	1751	1859	1912
1067	109	341	78	1793	1777	1999	1999	1833	1147	302	248	335	1873	1857	1752	1860	1913
1068	301	11	90	1794	1778	1999	1999	1834	1148	133	279	347	1874	1858	1753	1861	1914
1069	132	41	102	1795	1779	1999	1999	1835	1149	325	309	0	1875	1859	1754	1862	1915
1070	324	72	114	1796	1780	1999	1999	1836	1150	156	340	12	1876	1860	1755	1863	1916
1071	155	102	127	1797	1781	1999	1999	1837	1151	347	10	24	1877	1861	1756	1864	1917
1072	346	132	139	1798	1782	1999	1999	1838	1152	179	40	36	1878	1862	1757	1865	1918
1073	178	163	151	1799	1783	1999	1999	1839	1153	10	71	49	1879	1863	1758	1866	1919
1074	9	193	163	1800	1784	1999	1999	1840	1154	202	101	61	1880	1864	1759	1867	1920
1075	201	223	175	1801	1785	1999	1999	1841	1155	33	131	73	1881	1865	1760	1868	1921
1076	32	254	188	1802	1786	1999	1999	1842	1156	224	162	85	1882	1866	1761	1869	1922
1077	228	284	200	1803	1787	1999	1999	1843	1157	56	192	97	1883	1867	1762	1870	1923
1078	55	314	212	1804	1788	1999	1999	1844	1158	247	221	110	1884	1868	1763	1871	1924
1079	246	345	224	1805	1789	1999	1999	1845	1159	79	253	122	1885	1869	1764	1872	1925
1080	78	16	237	1806	1790	1999	1999	1846	1160	270	283	134	1886	1870	1765	1873	1926
1081	289	46	249	1807	1791	1999	1999	1847	1161	101	313	146	1887	1871	1766	1874	1927
1082	100	78	261	1808	1792	1999	1999	1848	1162	292	344	159	1888	1872	1767	1875	1928
1083	292	108	273	1809	1793	1999	1999	1849	1163	124	14	171	1889	1873	1768	1876	1929
1084	123	137	285	1810	1794	1999	1999	1850	1164	316	44	183	1890	1874	1769	1877	1930
1085	315	167	298	1811	1795	1999	1999	1851	1165	147	75	195	1891	1875	1770	1878	1931
1086	146	197	310	1812	1796	1999	1999	1852	1166	339	105	207	1892	1876	1771	1879	1932
1087	337	228	322	1813	1797	1999	1999	1853	1167	170	135	220	1893	1877	1772	1880	1933
1088	169	258	334	1814	1798	1999	1999	1854	1168	1	166	232	1894	1878	1773	1881	1934
1089	0	288	347	1815	1799	1999	1999	1855	1169	193	196	244	1895	1879	1774	1882	1935
1090	192	319	359	1816	1800	1999	1999	1856	1170	24	226	256	1896	1880	1775	1883	1936
1091	23	349	11	1817	1801	1999	1999	1857	1171	216	257	268	1897	1881	1776	1884	1937
1092	215	19	23	1818	1802	1999	1999	1858	1172	47	287	281	1898	1882	1777	1885	1938
1093	46	50	35	1819	1803	1999	1999	1859	1173	238	317	293	1899	1883	1778	1886	1939
1094	237	80	48	1820	1804	1999	1999	1860	1174	70	348	305	1900	1884	1779	1887	1940
1095	69	110	60	1821	1805	1999	1999	1861	1175	281	18	317	1901	1885	1780	1888	1941
1096	260	141	72	1822	1806	1999	1999	1862	1176	93	49	330	1902	1886	1781	1889	1942
1097	92	171	84	1823	1807	1999	1999	1863	1177	284	79	342	1903	1887	1782	1890	1943
1098	283	201	96	1824	1808	1999	1999	1864	1178	115	109	354	1904	1888	1783	1891	1944
1099	114	232	109	1825	1809	1999	1999	1865	1179	307	140	6	1905	1889	1784	1892	1945</

TABLE V-A.—PLANETS.—YEARLY INCREASE OF MEAN LONGITUDE, ETC.

TABLE V-A—cont.

Yearly increase of mean longitude, etc.—cont.

Years, also year A.D. if reckoned from 1 B.C.	Mars.	Jup.	Sat.	Mars.	Merc.	Jup.	Ven.	Sat.	Years, also year A.D. if reckoned from 1 B.C.	Mars.	Jup.	Sat.	Mars.	Merc.	Jup.	Ven.	Sat.
Degrees	A.D.	A.D.	A.D.	A.D.	A.D.	A.D.	A.D.	A.D.	Degrees	A.D.	A.D.	A.D.	A.D.	A.D.	A.D.	A.D.	A.D.
1185	15	322	80	1911	1895	1790	1898	1951	1265	208	229	837	1991	1975	1870	1978	1648
1186	207	352	92	1912	1896	1791	1899	1952	1266	39	260	849	1992	1976	1871	1979	1649
1187	38	22	104	1913	1897	1792	1900	1953	1267	280	290	2	1993	1977	1872	1980	1650
1188	229	53	116	1914	1898	1793	1901	1954	1268	62	321	14	1994	1978	1873	1981	1651
1189	61	83	128	1915	1899	1794	1902	1955	1269	253	351	26	1995	1979	1874	1982	1652
1190	252	113	141	1916	1900	1795	1903	1956	1270	85	21	38	1996	1980	1875	1983	1653
1191	81	114	153	1917	1901	1796	1904	1957	1271	276	52	50	1997	1981	1876	1984	1654
1192	275	174	165	1918	1902	1797	1905	1958	1272	107	82	63	1998	1982	1877	1985	1655
1193	108	201	177	1919	1903	1798	1906	1959	1273	299	112	75	1999	1983	1878	1986	1656
1194	298	235	190	1920	1904	1799	1907	1960	1274	130	143	87	1999	1984	1879	1987	1657
1195	120	265	202	1921	1905	1800	1908	1961	1275	322	173	99	1998	1985	1880	1988	1658
1196	321	295	214	1922	1906	1801	1909	1962	1276	153	203	111	1999	1986	1881	1989	1659
1197	152	326	226	1923	1907	1802	1910	1963	1277	344	234	124	1997	1987	1882	1990	1660
1198	343	356	238	1924	1908	1803	1911	1964	1278	176	264	136	1998	1988	1883	1991	1661
1199	175	27	251	1925	1909	1804	1912	1965	1279	7	294	148	1999	1989	1884	1992	1662
1200	6	57	263	1926	1910	1805	1913	1966	1280	199	325	160	1990	1990	1885	1993	1663
1201	198	87	275	1927	1911	1806	1914	1967	1281	30	355	173	1991	1991	1886	1994	1664
1202	29	118	287	1928	1912	1807	1915	1968	1282	221	25	185	1992	1992	1887	1995	1665
1203	220	148	299	1929	1913	1808	1916	1969	1283	58	56	197	1993	1993	1888	1996	1666
1204	52	178	312	1930	1914	1809	1917	1970	1284	244	86	209	1994	1994	1889	1997	1667
1205	243	209	324	1931	1915	1810	1918	1971	1285	76	116	221	1995	1995	1890	1998	1668
1206	75	239	336	1932	1916	1811	1919	1972	1286	267	147	234	1996	1996	1891	1999	1669
1207	266	269	348	1933	1917	1812	1920	1973	1287	99	177	246	1997	1997	1892	1999	1670
1208	98	300	1	1934	1918	1813	1921	1974	1288	290	207	258	1998	1998	1893	1999	1671
1209	289	330	13	1935	1919	1814	1922	1975	1289	121	238	270	1999	1999	1894	1999	1672
1210	120	0	25	1936	1920	1815	1923	1976	1290	313	268	283	1999	1999	1895	1999	1673
1211	312	31	37	1937	1921	1816	1924	1977	1291	144	298	295	1999	1999	1896	1999	1674
1212	143	61	49	1938	1922	1817	1925	1978	1292	336	329	307	1999	1999	1897	1999	1675
1213	335	91	62	1939	1923	1818	1926	1979	1293	167	359	319	1999	1999	1898	1999	1676
1214	106	122	74	1940	1924	1819	1927	1980	1294	358	30	331	1999	1999	1899	1999	1677
1215	357	152	86	1941	1925	1820	1928	1981	1295	190	60	344	1999	1999	1900	1999	1678
1216	189	182	98	1942	1926	1821	1929	1982	1296	21	90	356	1999	1999	1901	1999	1679
1217	20	213	111	1943	1927	1822	1930	1983	1297	118	121	8	1999	1999	1902	1999	1680
1218	212	243	123	1944	1928	1823	1931	1984	1298	44	151	20	1999	1999	1903	1999	1681
1219	43	273	135	1945	1929	1824	1932	1985	1299	235	181	33	1999	1999	1904	1999	1682
1220	231	304	147	1946	1930	1825	1933	1986	1300	67	212	45	1999	1999	1905	1999	1683
1221	66	334	159	1947	1931	1826	1934	1987	1301	258	242	57	1999	1999	1906	1999	1684
1222	257	4	172	1948	1932	1827	1935	1988	1302	90	12	69	1999	1999	1907	1999	1685
1223	89	35	184	1949	1933	1828	1936	1989	1303	281	303	81	1999	1999	1908	1999	1686
1224	280	65	196	1950	1934	1829	1937	1990	1304	112	333	94	1999	1999	1909	1999	1687
1225	111	96	208	1951	1935	1830	1938	1991	1305	301	3	106	1999	1999	1910	1999	1688
1226	303	126	221	1952	1936	1831	1939	1992	1306	135	34	118	1999	1999	1911	1999	1689
1227	134	156	233	1953	1937	1832	1940	1993	1307	327	64	130	1999	1999	1912	1999	1690
1228	326	187	245	1954	1938	1833	1941	1994	1308	158	94	142	1999	1999	1913	1999	1691
1229	157	217	257	1955	1939	1834	1942	1995	1309	349	125	155	1999	1999	1914	1999	1692
1230	318	247	269	1956	1940	1835	1943	1996	1310	181	155	167	1999	1999	1915	1999	1693
1231	180	278	282	1957	1941	1836	1944	1997	1311	12	185	179	1999	1999	1916	1999	1694
1232	11	308	294	1958	1942	1837	1945	1998	1312	204	216	191	1999	1999	1917	1999	1695
1233	203	338	306	1959	1943	1838	1946	1999	1313	35	246	204	1999	1999	1918	1999	1696
1234	34	9	318	1960	1944	1839	1947	1999	1314	226	277	216	1999	1999	1919	1999	1697
1235	225	39	331	1961	1945	1840	1948	1999	1315	54	307	228	1999	1999	1920	1999	1698
1236	57	69	343	1962	1946	1841	1949	1999	1316	249	337	240	1999	1999	1921	1999	1699
1237	248	100	355	1963	1947	1842	1950	1999	1317	81	8	252	1999	1999	1922	1999	1700
1238	80	130	7	1964	1948	1843	1951	1999	1318	272	38	265	1999	1999	1923	1999	1701
1239	271	160	19	1965	1949	1844	1952	1999	1319	104	68	277	1999	1999	1924	1999	1702
1240	102	191	32	1966	1950	1845	1953	1999	1320	294	99	289	1999	1999	1925	1999	1703
1241	293	221	44	1967	1951	1846	1954	1999	1321	126	129	301	1999	1999	1926	1999	1704
1242	125	251	56	1968	1952	1847	1955	1999	1322	318	159	314	1999	1999	1927	1999	1705
1243	317	282	68	1969	1953	1848	1956	1999	1323	149	190	326	1999	1999	1928	1999	1706
1244	148	312	80	1970	1954	1849	1957	1999	1324	341	220	338	1999	1999	1929	1999	1707
1245	340	343	98	1971	1955	1850	1958	1999	1325	172	250	350	1999	1999	1930	1999	1708
1246	171	13	105	1972	1956	1851	1959	1999	1326	3	281	362	1999	1999	1931	1999	1709
1247	2	43	117	1973	1957	1852	1960	1999	1327	195	311	15	1999	1999	1932	1999	1710
1248	194	74	129	1974	1958	1853	1961	1999	1328	26	341	27	1999	1999	1933	1999	1711
1249	25	104	142	1975	1959	1854	1962	1999	1329	218	12	39	1999	1999	1934	1999	1712
1250	217	134	154	1976	1960	1855	1963	1999	1330	49	42	51	1999	1999	1935	1999	1713
1251	45	165	166	1977	1961	1856	1964	1999	1331	240	72	64	1999	1999	1936	1999	1714
1252	239	195	178	1978	1962	1857	1965	1999	1332	72	108	76	1999	1999	1937	1999	1715
1253	71	224	190	1979	1963	1858	1966	1999	1333	263	133	88	1999	1999	1938	1999	1716
1254	202	255	203	1980	1964	1859	1967	1999	1334	95	163	100	1999	1999	1939	1999	1717
1255	94	286	215	1981	1965	1860	1968	1999	1335	286	194	112	1999	1999	1940	1999	1718
1256	285	316	227	1982	1966	1861	1969	1999	1336	117	224	125	1999	1999	1941	1999	1719
1257	116	347	239	1983	1967	1862	1970	1999	1337	309	254	137	1999	1999	1942	1999	1720
1258	308	17	252	1984	1968	1863	1971	1999	1338	140	285	149	1999	1999	1943	1999	1721
1259	139	47	264	1985	1969	1864	1972	1999	1339	332	315	161	1999	1999	1944	1999	1722

TABLE V-A—cont.

Yearly increase of mean longitude, etc.—cont.

Years, also year A.D. if reckoned from 1	B.C.	Mars.	Jup.	Sat.	Mars.	Merc.	Jup.	Ven.	Sat.	Years, also year A.D. if reckoned from 1	B.C.	Mars.	Jup.	Sat.	Mars.	Merc.	Jup.	Ven.	Sat.
Degrees.					A.D.	A.D.	A.D.	A.D.	A.D.	Degrees					A.D.	A.D.	A.D.	A.D.	A.D.
1345	40	137	235	1708	1700	1950	1823	1728		1425	232	45	182	1788	1780	1769	1903	1808	
1346	231	168	247	1709	1701	1951	1824	1729		1426	64	75	144	1789	1781	1770	1804	1809	
1347	63	198	259	1710	1702	1952	1825	1730		1427	255	106	157	1790	1782	1771	1905	1810	
1348	254	227	271	1711	1703	1953	1826	1731		1428	87	136	169	1791	1783	1772	1906	1811	
1349	86	259	283	1712	1704	1954	1827	1732		1429	278	168	181	1792	1784	1773	1907	1812	
1350	277	289	296	1713	1705	1955	1828	1733		1430	109	197	193	1793	1785	1774	1908	1813	
1351	108	319	308	1714	1706	1956	1829	1734		1431	301	227	205	1794	1786	1775	1909	1814	
1352	300	350	320	1715	1707	1957	1830	1735		1432	132	257	218	1795	1787	1776	1910	1815	
1353	131	20	332	1716	1708	1958	1831	1736		1433	324	288	230	1796	1788	1777	1911	1816	
1354	323	50	345	1717	1709	1959	1832	1737		1434	155	318	242	1797	1789	1778	1912	1817	
1355	154	81	357	1718	1710	1960	1833	1738		1435	347	349	254	1798	1790	1779	1913	1818	
1356	345	111	9	1719	1711	1961	1834	1739		1436	178	19	267	1799	1791	1780	1914	1819	
1357	177	141	21	1720	1712	1962	1835	1740		1437	9	49	279	1800	1792	1781	1915	1820	
1358	8	172	83	1721	1713	1963	1836	1741		1438	201	80	291	1801	1793	1782	1916	1821	
1359	200	202	46	1722	1714	1964	1837	1742		1439	32	110	303	1802	1794	1783	1917	1822	
1360	31	232	58	1723	1715	1965	1838	1743		1440	224	140	315	1803	1795	1784	1918	1823	
1361	223	263	70	1724	1716	1966	1839	1744		1441	55	171	328	1804	1796	1785	1919	1824	
1362	54	293	82	1725	1717	1967	1840	1745		1442	246	201	340	1805	1797	1786	1920	1825	
1363	245	324	95	1726	1718	1968	1841	1746		1443	78	230	352	1806	1798	1787	1921	1826	
1364	77	354	107	1727	1719	1969	1842	1747		1444	269	262	4	1807	1799	1788	1922	1827	
1365	285	24	119	1728	1720	1970	1843	1748		1445	101	292	17	1808	1800	1789	1923	1828	
1366	100	55	131	1729	1721	1971	1844	1749		1446	292	322	29	1809	1801	1790	1924	1829	
1367	291	85	143	1730	1722	1972	1845	1750		1447	123	353	41	1810	1802	1791	1925	1830	
1368	122	115	156	1731	1723	1973	1846	1751		1448	815	23	53	1811	1803	1792	1926	1831	
1369	314	146	168	1732	1724	1974	1847	1752		1449	146	53	65	1812	1804	1793	1927	1832	
1370	145	176	180	1733	1725	1975	1848	1753		1450	338	84	78	1813	1805	1794	1928	1833	
1371	337	206	192	1734	1726	1976	1849	1754		1451	169	114	90	1814	1806	1795	1929	1834	
1372	168	237	205	1735	1727	1977	1850	1755		1452	0	144	102	1815	1807	1796	1930	1835	
1373	359	267	217	1736	1728	1978	1851	1756		1453	192	175	114	1816	1808	1797	1931	1836	
1374	191	297	229	1737	1729	1979	1852	1757		1454	23	205	126	1817	1809	1798	1932	1837	
1375	22	328	241	1738	1730	1980	1853	1758		1455	215	235	139	1818	1810	1799	1933	1838	
1376	214	358	253	1739	1731	1981	1854	1759		1456	46	266	151	1819	1811	1800	1934	1839	
1377	45	28	266	1740	1732	1982	1855	1760		1457	237	296	163	1820	1812	1801	1935	1840	
1378	236	59	278	1741	1733	1983	1856	1761		1458	69	327	175	1821	1813	1802	1936	1841	
1379	68	89	290	1742	1734	1984	1857	1762		1459	260	357	188	1822	1814	1803	1937	1842	
1380	259	119	302	1743	1735	1985	1858	1763		1460	92	27	200	1823	1815	1804	1938	1843	
1381	91	150	315	1744	1736	1986	1859	1764		1461	283	58	212	1824	1816	1805	1939	1844	
1382	262	180	327	1745	1737	1987	1860	1765		1462	114	88	224	1825	1817	1806	1940	1845	
1383	113	210	339	1746	1738	1988	1861	1766		1463	306	118	236	1826	1818	1807	1941	1846	
1384	305	241	351	1747	1739	1989	1862	1767		1464	137	149	249	1827	1819	1808	1942	1847	
1385	136	271	3	1748	1740	1990	1863	1768		1465	329	179	261	1828	1820	1809	1943	1848	
1386	328	302	16	1749	1741	1991	1864	1769		1466	160	209	273	1829	1821	1810	1944	1849	
1387	159	332	28	1750	1742	1992	1865	1770		1467	351	240	285	1830	1822	1811	1945	1850	
1388	350	2	40	1751	1743	1993	1866	1771		1468	183	270	298	1831	1823	1812	1946	1851	
1389	182	48	52	1752	1744	1994	1867	1772		1469	14	300	310	1832	1824	1813	1947	1852	
1390	13	63	64	1753	1745	1995	1868	1773		1470	206	331	322	1833	1825	1814	1948	1853	
1391	205	93	77	1754	1746	1996	1869	1774		1471	37	1	334	1834	1826	1815	1949	1854	
1392	36	124	89	1755	1747	1997	1870	1775		1472	229	21	346	1835	1827	1816	1950	1855	
1393	227	154	101	1756	1748	1998	1871	1776		1473	60	62	359	1836	1828	1817	1951	1856	
1394	59	184	113	1757	1749	1999	1872	1777		1474	251	92	11	1837	1829	1818	1952	1857	
1395	250	215	126	1758	1750	1789	1873	1778		1475	83	122	23	1838	1830	1819	1953	1858	
1396	82	245	138	1759	1751	1740	1874	1779		1476	274	153	35	1839	1831	1820	1954	1859	
1397	278	15	150	1760	1752	1741	1875	1780		1477	106	183	48	1840	1832	1821	1955	1860	
1398	105	306	162	1761	1753	1742	1876	1781		1478	296	218	60	1841	1833	1822	1956	1861	
1399	295	336	174	1762	1754	1743	1877	1782		1479	128	244	72	1842	1834	1823	1957	1862	
1400	127	6	187	1763	1755	1744	1878	1783		1480	320	274	84	1843	1835	1824	1958	1863	
1401	319	37	199	1764	1756	1745	1879	1784		1481	151	305	96	1844	1836	1825	1959	1864	
1402	150	67	211	1765	1757	1746	1880	1785		1482	343	335	109	1845	1837	1826	1960	1865	
1403	342	67	223	1766	1758	1747	1881	1786		1483	174	5	121	1846	1838	1827	1961	1866	
1404	173	128	235	1767	1759	1748	1882	1787		1484	5	36	133	1847	1839	1828	1962	1867	
1405	4	158	248	1768	1760	1749	1883	1788		1485	196	66	145	1848	1840	1829	1963	1868	
1406	196	188	260	1769	1761	1750	1884	1789		1486	28	96	157	1849	1841	1830	1964	1869	
1407	27	219	272	1770	1762	1751	1885	1790		1487	230	127	170	1850	1842	1831	1965	1870	
1408	219	240	284	1771	1763	1752	1886	1791		1488	51	157	182	1851	1843	1832	1966	1871	
1409	80	280	297	1772	1764	1753	1887	1792		1489	242	187	194	1852	1844	1833	1967	1872	
1410	241	310	309	1773	1765	1754	1888	1793		1490	74	218	206	1853	1845	1834	1968	1873	
1411	73	340	321	1774	1766	1755	1889	1794		1491	265	248	219	1854	1846	1835	1969	1874	
1412	264	11	333	1775	1767	1756	1890	1795		1492	97	18	231	1855	1847	1836	1970	1875	
1413	98	41	345	1776	1768	1757	1891	1796		1493	288	309	243	1856	1848	1837	1971	1876	
1414	287	71	358	1777	1769	1758	1892	1797		1494	119	339	255	1857	1849	1838	1972	1877	
1415	118	102	10	1778	1770	1759	1893	1798		1495	311	9	267	1858	1850	1839	1973	1878	
1416	310	132	22	1779	1771	1760													

TABLE V A.—cont.
Yearly increase of mean longitude, etc.—cont.

Years; also year A.D. if re- coned from 1 B.C.	Mars.	Jup.	Sat.	Venus.	Years; also year A.D. if re- coned from 1 B.C.	Mars.	Jup.	Sat.	Venus.	Years; also year A.D. if re- coned from 1 B.C.	Mars.	Jup.	Sat.	Venus.	Years; also year A.D. if re- coned from 1 B.C.	Mars.	Jup.	Sat.	Venus.
Degrees.					Degrees.					Degrees.					Degrees.				
1656	167	215	75	1891	1684	126	345	57	1919	1712	86	115	89	1947	1740	45	244	21	1975
1657	358	246	87	1892	1685	318	15	69	1920	1713	277	145	51	1948	1741	237	275	83	1976
1658	190	276	99	1893	1686	149	46	81	1921	1714	109	175	63	1949	1742	68	305	46	1977
1659	21	306	111	1894	1687	341	76	94	1922	1715	299	206	76	1950	1743	259	336	58	1978
1660	213	337	124	1895	1688	172	106	106	1923	1716	131	236	88	1951	1744	91	6	70	1979
1661	44	7	136	1896	1689	3	137	118	1-24	1717	323	267	100	1952	1745	282	36	82	1980
1662	236	37	148	1897	1690	165	167	130	1925	1718	154	297	112	1953	1746	114	67	94	1981
1663	67	68	160	1898	1691	26	197	142	1926	1719	346	327	125	1954	1747	305	97	107	1982
1664	258	98	172	1899	1692	218	228	155	1927	1720	177	358	137	1955	1748	136	127	119	1983
1665	90	128	185	1900	1693	49	258	167	1928	1721	8	28	149	1956	1749	328	158	131	1984
1666	281	159	197	1901	1694	249	289	179	1929	1722	200	58	181	1957	1750	159	188	143	1985
1667	113	189	209	1902	1695	72	319	191	1930	1723	31	89	173	1958	1751	351	218	156	1986
1668	304	219	221	1903	1696	263	349	203	1931	1724	223	119	186	1959	1752	182	249	168	1987
1669	135	250	234	1904	1697	95	20	216	1932	1725	54	149	198	1960	1753	13	279	180	1988
1670	327	280	246	1905	1698	236	50	228	1933	1726	245	180	210	1961	1754	205	309	192	1989
1671	158	311	258	1906	1699	118	80	240	1934	1727	77	210	222	1962	1755	36	340	204	1990
1672	350	341	270	1907	1700	309	111	252	1935	1728	268	249	235	1963	1756	228	10	217	1991
1673	181	11	282	1908	1701	149	141	265	1936	1729	100	271	247	1964	1757	59	40	229	1992
1674	12	42	295	1909	1702	332	171	277	1937	1730	291	301	259	1965	1758	280	71	241	1993
1675	204	72	307	1910	1703	163	202	289	1938	1731	122	331	271	1966	1759	82	101	253	1994
1676	35	102	319	1911	1704	355	232	301	1939	1732	314	2	283	1967	1760	273	131	266	1995
1677	227	133	331	1912	1705	186	262	313	1940	1733	145	32	296	1968	1761	165	162	278	1996
1678	58	163	344	1913	1706	17	293	326	1941	1734	337	62	308	1969	1762	206	192	290	1997
1679	249	193	356	1914	1707	209	323	338	1942	1735	168	93	320	1970	1763	127	222	302	1998
1680	81	224	8	1915	1708	40	353	350	1943	1736	0	123	332	1971	1764	319	253	314	1999
1681	272	254	20	1916	1709	232	24	2	1944	1737	191	153	344	1972	1765	150	283	327	...
1682	104	284	32	1917	1710	63	54	15	1945	1738	22	184	357	1973	1766	342	314	339	..
1683	295	315	45	1918	1711	254	84	27	1946	1739	214	214	9	1974					

Years; also year A.D. if re- coned from 1 B.C.	Mars.	Jup.	Sat.	Years; also year A.D. if re- coned from 1 B.C.	Mars.	Jup.	Sat.	Years; also year A.D. if re- coned from 1 B.C.	Mars.	Jup.	Sat.	Years; also year A.D. if re- coned from 1 B.C.	Mars.	Jup.	Sat.	Years; also year A.D. if re- coned from 1 B.C.	Mars.	Jup.	Sat.
Degrees.				Degrees.				Degrees.				Degrees.				Degrees.			
1767	173	344	351	1815	0	1	218	1863	188	17	84	1911	15	84	311	1959	203	51	177
1768	4	14	3	1816	192	31	230	1864	19	48	96	1912	207	64	323	1960	34	81	189
1769	196	45	15	1817	23	61	242	1865	211	78	109	1913	38	95	335	1961	226	111	202
1770	27	75	24	1818	215	92	254	1866	42	108	121	1914	230	125	347	1962	57	142	214
1771	219	105	39	1819	46	122	266	1867	234	139	133	1915	61	155	359	1963	248	172	226
1772	50	136	52	1820	238	152	279	1868	65	169	145	1916	252	186	12	1964	80	202	238
1773	241	166	64	1821	69	183	291	1869	258	199	157	1917	84	216	24	1965	271	233	250
1774	73	196	77	1822	260	213	303	1870	88	230	170	1918	275	246	36	1966	108	263	263
1775	264	227	89	1823	92	342	315	1871	279	260	182	1919	107	277	48	1967	294	298	275
1776	96	257	101	1824	283	374	328	1872	111	290	194	1920	298	307	61	1968	126	324	287
1777	287	287	118	1825	115	304	340	1873	301	321	206	1921	129	337	73	1969	317	354	299
1778	119	318	125	1826	306	334	352	1874	133	351	218	1922	321	8	85	1970	148	24	312
1779	810	348	138	1827	137	5	4	1875	325	21	231	1923	152	38	97	1971	340	55	324
1780	141	18	150	1828	329	35	16	1876	156	52	243	1924	344	68	109	1972	171	85	336
1781	333	49	162	1829	160	65	29	1877	348	82	255	1925	175	89	122	1973	3	115	348
1782	164	79	174	1830	352	96	41	1878	179	112	267	1926	6	129	134	1974	194	146	0
1783	356	109	187	1831	183	126	53	1879	10	143	280	1927	198	159	146	1975	25	176	13
1784	187	140	199	1832	14	156	65	1880	202	173	292	1928	29	190	158	1976	217	207	25
1785	18	170	211	1833	206	187	78	1881	33	203	304	1929	221	220	171	1977	48	237	37
1786	210	200	223	1834	37	217	90	1882	225	234	316	1930	52	251	183	1978	240	267	49
1787	41	231	235	1835	229	248	102	1883	56	264	328	1931	241	281	195	1979	71	298	61
1788	233	261	248	1836	60	278	114	1884	247	295	341	1932	75	311	207	1980	262	328	74
1789	64	292	260	1837	251	308	126	1885	79	325	353	1933	266	342	219	1981	94	358	86
1790	255	322	272	1838	83	339	139	1886	270	355	5	1934	98	12	232	1982	285	28	98
1791	87	352	284	1839	274	9	151	1887	102	26	17	1935	289	42	244	1983	117	59	110
1792	278	23	297	1840	106	89	163	1888	298	56	30	1936	121	78	256	1984	308	89	123
1793	110	53	309	1841	297	70	175	1889	124	86	42	1937	312	103	268	1985	139	120	135
1794	300	83	321	1842	128	100	187	1890	316	117	54	1938	143	133	280	1986	331	150	147
1795	132	114	333	1843	320	130	200	1891	147	147	66	1939	335	161	293	1987	162	180	159
1796	324	144	345	1844	151	161	212	1892	339	177	78	1940	166	194	305	1988	354	211	171
1797	155	174	358	1845	843	191	224	1893	170	204	91	1941	358	224	317	1989	185	241	184
1798	347	205	10	1846	174	221	236	1894	2	238	103	1942	189	255	329	1990	16	271	196
1799	178	235	22	1847	5	252	249	1895	193	268	114	1943	20	285	342	1991	208	302	208
1800	9	265	34	1848	197	282	261	1896	24	299	127	1944	212	315	354	1992	39	332	220
1801	201	296	47	1849	28	312	273	1897	216	329	140	1945	43	346	6	1993	231	2	233
1802	32	328	59	1850	220	343	285	1898	47	359	152	1946	235	16	18	1994	62	33	245
1803	224	356	71	1851	51	18	297	1899	239	30	164	1947	68	46	30	1995	253	63	257
1804	55	37	88	1852	233	43	310	1900	70	60	176	1948	257	77	43	1996	85	98	269
1805	246	57	95	1853	74	74	322	1901	261	90	188	1949	89	107	55	1997	278	124	281
1806	78	87	108	1854	265	104	334	1902	93	121	201	1950	280	137	67	1998	108	154	294
1807	269	118	120	1855	97	134	346	1903	284	151	213	1951	112	168	79	1999	290	184	306
1808	101	148																	

TABLE V-B.

GEOCENTRIC PLACES OF PLANETS.

Introductory Note.

Table V-B is the second part of the Perpetual Planetary Almanac. It gives the actual geocentric places of each of the five planets Mars, Mercury, Jupiter, Venus and Saturn for every tenth day in the current cycle, which is three hundred and sixty-three years for Mars (A.D. 1637 to A.D. 1999), three hundred and fifty-five years for Mercury (A.D. 1645 to A.D. 1999), three hundred and forty-four years for Jupiter (A.D. 1656 to A.D. 1999), two hundred and thirty-five years for Venus (A.D. 1765 to A.D. 1999), and three hundred and eighty three years for Saturn (A.D. 1617 to A.D. 1999). The corresponding dates by the European calendar are given throughout and by means of these dates the tithi, nakshatra, solar month and day of month, and Muhammadan date can be found from the body of the Ephemeris. It has been shown in section iii of Chapter V of this work, pages 110, etc., that, given the actual movements of any planet for one cycle as above, its place at any moment on any day, past or future, can be ascertained very accurately with the help of Table V-A, or for very remote periods, with the help of the millennial cycles indicated in the explanatory note to Table V-A. Actual examples will be found on pages 118, 119, 123, 124 (section iii of Chapter V), showing how to use Tables V-A and V-B for the calculation of ancient positions of planets, such as those required for the Chinese Era *circa* 2500 B.C., for Rama's horoscope, and for the birth of Christ (according to Kepler), or of conjunctions of planets noticed in more modern times, e. g., the conjunction on 15th September, A.D. 1186.

2. For the years A.D. 1617 to A.D. 1636 inclusive, Table V-B gives the positions of Saturn alone, because the positions of the other planets in any of these years can be found from Table V-A which gives the corresponding year in the current cycle; or they may be found directly by applying a suitable cycle of recurrence. For instance, the successive positions of Mars in A.D. 1620 were, by Table V-A, practically the same as his positions in A.D. 1983 (= A.D. 1620 + 363).

For the years A.D. 1637 to 1644, Table V-B gives the positions of Mars and Saturn alone, and the position of any other planet can be found by applying a suitable cycle of recurrence. For instance, the successive positions of Jupiter in A.D. 1640 were the same as those in A.D. 1984 (= A.D. 1640 + 344).

From A.D. 1656 to A.D. 1764, the Table V-B gives the positions of all the planets except Venus because Venus' cycle is two hundred and thirty-five years and for any year before A.D. 1765 inclusive, Venus' positions can be found from Table V-A. Thus Venus' positions in A.D. 1700 were the same as her positions in A.D. 1935 (= A.D. 1700 + 235), which are given in Table V-B.

For the years A.D. 1765 to A.D. 1999, both inclusive, Table V-B gives the successive positions of all the five planets for every ten days in the year with the corresponding dates of the European calendar.

3. In applying any cycle of recurrence to any planetary position recorded in this Table, care should be taken to see that the day of the Indian solar year is not varied. For instance, suppose we want to find the position of Mercury on 1st January 2500 B.C., we should first of all find out what day of the Indian solar year corresponded to 1st January 2500 B.C. We know from the Eye-table, section **k**, that in 2501 B.C. the Indian solar year began on February 21-09: and from Eye-table, section **q**, that 1st January of 2500 B.C. was the 307th day reckoned from 1st March, 2501 B.C., or the 336th day reckoned from 1st February, 2501 B.C. (remembering that 2501 B.C. was a leap year). Reckoned from 21st February the 1st January 2500 B.C. was therefore the 316th complete day (= 336 - 20). Now, to find the year in Table V-B when Mercury had the same successive positions as in 2500 B.C. (or A.D. *minus* 2499), we apply one of the major cycles given at the beginning of Table V-A and proceed thus: 4214 years *minus* 2499 = A.D. 1715. Mercury, on 1st January 2500 B.C., had the same place as on the 316th complete day of the Indian solar year A.D. 1715 - 16, i.e., by Table V-B) 321°8'.

4. It will not do in this case to take Mercury's position on 1st January, A.D. 1715 according to Table V-B because though the successive positions of Mercury in 2501 B.C. were practically the same as his positions in A.D. 1715-16, still 1st January 2500 B.C. was a different day in the Indian solar year 2501 B.C. being then the 316th complete day, as we have seen, from what it was in A.D. 1715-16, when, as we may see from Table V-B, it was the 278th complete day.

5. Table V-B gives the planetary positions for every tenth complete day in each Indian solar year. For intermediate days proportional parts should be taken. For instance, in the example last given, we required to know the place of Mercury on the 316th complete day of the Indian solar year A.D. 1715. Table V-B gives the following places :—

A.D. 1715-16	310th complete day.	Place of Mercury	312°3'
„	320th	„	328°2'

Difference : 15°9'

For 10 days	Mercury's place advances by	15°9'
∴ For 1 day	„	1°59'
∴ For 6 days	„	6 × 1°59'
		= 9°54' or 9°5' nearly.

We conclude that Mercury's place for 316 complete days of Indian solar year A.D. 1715-16 was $312^{\circ}3' + 9^{\circ}5' = 321^{\circ}8'$.

6. Table V-B gives the places of planets on 0 day, on 10th complete day, on 20th complete day, etc. The 0 day is always the day of commencement of the Indian solar year which is marked (1) in the head lines of the body of the Ephemeris for every year from A.D. 700 to A.D. 1950 by Ārya as well as by Sūrya Siddhānta; (2) in Table II for every year from A.D. 0 to A.D. 2000 by Sūrya Siddhānta; and (3) for all Siddhāntas in their respective Eye-tables, sections **k** and **n**.

7. Taking again the last example, the 0 day of A.D. 1715 was by Table II or by "Ephemeris, Vol. VII," March 29·75. The 10th complete day would be March 39·75, i.e., April 8·75; the 20th complete day, April 18·75; and so on. The 316th complete day of A.D. 1715 was by Table V-B (vide entries against A.D. 1715), 2nd February + 6·75 = February 8·75; whereas the 316th complete day of 2500 B.C. was January 1·09, because the year 2501 B.C. began on February 21·09 (see paragraph 3 *supra*). We conclude that the position of Mercury on January 1·09, 2500 B.C. (i.e., at two hours after mean sunrise on 1st January 2500 B.C.) was the same as its position on February 7·75, i.e., at midnight between February 7 and February 8, A.D. 1716. The position was, as we have found already, $321^{\circ}8'$.

TABLE

Geocentric Places of Mars, Mercury, Jupiter, Venus and Saturn for every tenth day of current cycle.
Venus, A.D. 1765—A.D. 1999,

Day of L.S. Y.	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
Eng. date.*	Mr 28	Ap 7	Ap 17	Ap 27	My 7	My 17	My 27	Je 6	Je 16	Je 26	Jl 6	Jl 16	Jl 26	Au 5	Au 15	Au 25	S 4	S 14
Sat.	1617	220	233	246	260	273	286	300	312	324	335	344	352	359	362	365	369	366
	1618	84.4	35.7	87.0	38.4	39.7	41.0	42.4	43.7	45.0	46.2	47.3	48.4	49.6	50.1	50.5	51.0	51.1
	1619	47.3	48.7	49.9	51.1	52.4	53.7	55.0	56.3	57.7	59.0	60.3	61.4	62.7	63.4	64.3	65.1	65.4
	1620	60.5	61.5	62.7	63.7	65.0	66.3	67.6	68.9	70.3	71.7	73.0	74.3	75.5	76.5	77.5	78.5	79.1
	1621	78.8	74.7	75.6	76.5	77.6	78.9	80.1	81.4	82.8	84.1	85.4	86.7	88.2	89.2	90.3	91.5	92.4
	1622	87.3	88.0	88.7	89.3	90.4	91.4	92.6	93.7	95.1	96.3	97.7	98.9	100.3	101.6	102.9	104.1	105.1
	1623	101.1	101.5	101.9	102.3	103.1	104.0	104.9	106.0	107.2	108.5	109.7	111.0	112.3	113.6	114.9	116.2	117.8
	1624	115.0	115.1	115.2	115.3	116.0	116.7	117.3	118.4	119.4	120.4	121.7	123.0	124.2	125.5	126.8	128.1	129.3
	1625	128.9	128.7	128.5	128.4	128.8	129.1	129.6	130.5	131.4	132.2	133.4	134.5	135.7	137.0	138.4	139.5	140.7
	1626	142.6	142.2	141.8	141.5	141.6	141.8	141.9	142.6	143.3	143.9	144.9	145.9	147.0	148.2	149.4	150.7	152.0
	1627	156.2	155.6	155.0	154.4	154.2	154.2	154.1	154.6	155.0	155.4	156.3	157.2	158.1	159.2	160.3	161.4	162.7
	1628	169.4	168.7	168.0	167.3	167.0	166.7	166.4	166.6	166.8	166.9	167.7	168.5	169.2	170.2	171.3	172.3	173.5
	1629	182.3	181.5	180.7	180.0	179.3	179.0	178.5	178.5	178.5	178.4	178.9	179.4	180.0	180.9	181.8	182.7	183.8
	1630	194.9	194.1	193.3	192.5	191.9	191.3	190.6	190.4	190.2	189.8	189.2	189.5	190.8	191.6	192.4	193.1	194.2
Eng. date.	Mr 29	Ap 8	Ap 18	Ap 28	My 8	My 18	My 28	Je 7	Je 17	Je 27	Jl 7	Jl 17	Jl 27	Au 6	Au 16	Au 26	S 5	S 15
	1631	207.1	206.3	205.5	204.8	204.1	203.1	202.6	202.2	201.8	201.4	201.4	201.5	201.7	202.3	202.9	203.4	204.3
Eng. date.	Mr 28	Ap 7	Ap 17	Ap 27	My 7	My 17	My 27	Je 6	Je 16	Je 26	Jl 6	Jl 16	Jl 26	Au 5	Au 15	Au 25	S 4	S 14
	1632	218.9	218.2	217.5	216.8	216.0	215.2	214.5	213.9	213.3	212.8	212.6	212.6	212.5	212.9	213.8	214.6	215.5
	1633	230.4	229.9	229.3	228.7	227.9	227.1	226.4	225.7	225.0	224.0	223.7	223.7	223.5	223.7	223.9	224.2	224.9
	1634	241.8	241.4	241.0	240.6	239.9	239.2	238.4	238.6	238.9	238.1	238.5	238.5	238.1	238.7	238.8	239.4	239.9
Eng. date.	Mr 29	Ap 8	Ap 18	Ap 28	My 8	My 18	My 28	Je 7	Je 17	Je 27	Jl 7	Jl 17	Jl 27	Au 6	Au 16	Au 26	S 5	S 15
	1635	252.7	252.5	252.3	252.1	251.4	250.8	250.2	249.5	248.7	247.9	247.3	246.6	246.0	245.8	245.7	245.6	246.0
Eng. date.	Mr 28	Ap 7	Ap 17	Ap 27	My 7	My 17	My 27	Je 6	Je 16	Je 26	Jl 6	Jl 16	Jl 26	Au 5	Au 15	Au 25	S 4	S 14
	1636	263.9	263.8	263.7	263.7	263.2	262.7	262.1	261.3	260.5	259.8	259.1	258.4	257.7	257.4	257.0	256.6	256.8
1637 Mars	...	21.4	28.6	35.7	42.8	49.7	56.6	63.4	70.1	76.9	83.4	90.1	96.5	103.0	109.5	115.9	122.2	128.5
Sat.	...	274.6	274.8	275.0	275.2	274.8	274.5	274.2	273.4	272.6	271.9	271.2	270.5	269.7	269.2	268.7	268.1	268.1
1638 Mars	...	240.5	248.1	244.5	245.1	244.9	243.5	240.4	238.2	235.9	234.5	234.1	234.9	237.5	240.6	244.8	249.5	254.9
Sat.	...	285.5	285.8	286.1	286.6	286.4	286.2	286.1	285.5	284.9	284.3	283.5	282.7	282.0	281.3	280.6	280.0	279.6
Eng. date.	Mr 29	Ap 8	Ap 18	Ap 28	My 8	My 18	My 28	Je 7	Je 17	Je 27	Jl 7	Jl 17	Jl 27	Au 6	Au 16	Au 26	S 5	S 15
1639 Mars	...	36.1	42.8	49.6	56.3	63.0	69.7	76.2	82.8	89.2	95.8	102.3	108.5	115.1	121.4	127.8	134.1	140.5
Sat.	...	296.3	296.9	297.5	298.0	298.1	298.2	298.3	297.8	297.3	296.9	296.1	295.4	295.6	293.8	293.1	292.4	292.0
Eng. date.	Mr 28	Ap 7	Ap 17	Ap 27	My 7	My 17	My 27	Je 6	Je 16	Je 26	Jl 6	Jl 16	Jl 26	Au 5	Au 15	Au 25	S 4	S 14
1640 Mars	...	270.2	276.1	281.9	287.6	292.9	298.1	302.5	306.6	309.9	312.4	313.8	313.3	312.2	309.9	307.4	305.4	304.7
Sat.	...	307.3	308.0	308.7	309.5	309.9	310.2	310.4	310.1	309.6	309.6	309.0	308.4	307.7	306.9	306.1	305.2	304.6
1641 Mars	...	50.7	57.1	63.5	69.9	76.1	82.5	88.9	95.6	101.5	107.9	114.2	120.6	126.6	133.3	139.7	145.9	152.4
Sat.	...	318.3	319.2	320.1	321.1	321.6	322.2	322.7	322.6	322.5	322.5	322.0	321.5	321.0	320.2	319.4	318.6	317.9
1642 Mars	...	291.8	299.0	306.1	313.4	320.5	327.4	334.4	341.0	347.6	353.9	359.8	365.4	371.0	376.8	382.8	388.9	395.0
Sat.	...	329.4	330.5	331.6	332.7	333.4	334.1	334.8	335.0	335.3	335.5	335.2	334.9	334.5	333.8	333.0	332.3	331.5
Eng. date.	Mr 29	Ap 8	Ap 18	Ap 28	My 8	My 18	My 28	Je 7	Je 17	Je 27	Jl 7	Jl 17	Jl 27	Au 6	Au 16	Au 26	S 5	S 15
1643 Mars	...	65.7	71.6	77.4	83.3	89.4	95.4	101.5	107.6	113.7	119.9	126.3	132.4	138.9	145.1	151.6	158.1	164.4
Sat.	...	340.7	341.9	343.1	344.3	345.2	346.1	347.1	347.6	348.2	348.6	348.5	348.4	348.3	347.7	347.2	346.6	345.6
Eng. date.	Mr 28	Ap 7	Ap 17	Ap 27	My 7	My 17	My 27	Je 6	Je 16	Je 26	Jl 6	Jl 16	Jl 26	Au 5	Au 15	Au 25	S 4	S 14
1644 Mars	...	310.7	318.5	326.0	333.7	341.2	348.8	355.9	363.3	370.7	378.1	385.4	392.7	400.0	407.3	414.6	421.9	429.2
Sat.	...	352.4	353.7	355.0	356.3	357.4	358.5	359.5	0.2	0.9	1.7	2.5	3.2	3.9	4.6	5.3	6.0	6.7
1645 Mars	...	82.1	87.2	92.3	97.7	103.2	108.8	114.7	120.5	126.5	132.5	138.7	144.9	151.2	157.6	164.0	170.4	176.9
Merc.	...	338.1	355.8	373.5	391.2	408.9	426.6	444.3	462.0	479.7	497.4	515.1	532.8	550.5	568.2	585.9	603.6	621.3
Sat.	...	4.3	5.6	6.9	8.2	9.4	10.6	11.8	12.7	13.6	14.5	15.1	15.5	15.8	16.0	16.1	16.2	16.3
1646 Mars	...	328.2	336.0	343.7	351.4	359.0	366.6	374.2	381.8	389.4	396.9	404.5	412.1	419.7	427.3	434.9	442.5	450.1
Merc.	...	351.9	359.6	367.3	375.0	382.6	390.2	397.8	405.4	413.0	420.6	428.2	435.8	443.4	451.0	458.6	466.2	473.8
Sat.	...	16.4	17.7	19.0	20.4	21.7	23.0	24.3	25.4	26.5	27.6	28.6	29.0	29.7	30.3	30.8	31.3	31.8
Eng. date.	Mr 29	Ap 8	Ap 18	Ap 28	My 8	My 18	My 28	Je 7	Je 17	Je 27	Jl 7	Jl 17	Jl 27	Au 6	Au 16	Au 26	S 5	S 15
1647 Mars	...	102.4	105.6	108.8	112.0	115.2	118.4	121.6	124.8	128.0	131.2	134.4	137.6	140.8	144.0	147.2	150.4	153.6
Merc.	...	6.4	23.6	38.0	48.3	45.4	38.2	37.9	46.8	61.3	78.6	97.1	115.4	133.7	152.0	170.3	188.6	206.9
Sat.	...	28.7	30.0	31.3	32.5	33.9	35.3	36.7	37.9	39.1	40.4	41.4	42.3	43.2	43.6	44.0	44.5	44.4
Mesh Vrsch. Mith. Kat.	Sim.	Kan.	Tul.	Vrsch.	Dhan.	Mak.	Kum.	Min.	Asv.	Bhar.	Krit.	Rohi.	Mrig.	Ardh.	Punar.	Push.	Asles.	
30	60	90	120	150	180	210	240	270	300	330	360	390	420	450	480	510	540	570

* Note that citations in European writers between 5th October A.D. 1582 and 13th September A.D. 1752 may differ by 10 or 11 days. Russia, the NEW STYLE was introduced in A.D. 1582 by a bull of Pope Gregory XIII, by which the day following 4th October 1582, was declared Great Britain and its dependencies by an Act of Parliament in A.D. 1752 which declared the day following 3 September A.D. 1752 to be the work gives only English dates, but the reader will remember that, e.g., a continental writer citing 15 October A.D. 1582 has in view the day

V-B.

Mars, A.D. 1637—A.D. 1999; Mercury, A.D. 1645—A.D. 1999; Jupiter, A.D. 1656—A.D. 1999;
Saturn, A.D. 1617—A.D. 1999.

180	190	200	210	220	230	240	250	260	270		280	290	300	310	320	330	340	350	360
S 24	O 4	O 14	O 24	N 3	N 13	N 23	D 3	D 13	D 23		Ja 2	Ja 12	Ja 22	F 1	F 11	F 21	Mr 3	Mr 13	Mr 23
35.9	35.3	34.6	33.8	33.0	32.2	31.3	30.7	30.1	29.5	1618	29.5	29.4	29.3	29.9	30.4	30.9	31.9	32.8	33.8
51.0	50.4	49.9	49.4	48.6	47.8	46.9	46.2	45.4	44.6	1619	44.3	44.0	43.6	43.9	44.1	44.4	46.1	45.9	46.7
																	Mr 2	Mr 12	Mr 22
65.9	65.7	65.4	65.0	64.3	63.6	62.9	62.0	61.2	60.3	1620	59.7	59.1	58.5	58.5	58.4	58.3	58.9	59.6	60.0
																	Mr 3	Mr 13	Mr 23
80.1	80.1	80.1	80.1	79.5	78.9	78.4	77.5	76.7	75.9	1621	75.1	74.4	73.6	73.3	73.0	72.7	72.9	73.2	73.5
93.9	94.1	94.3	94.6	94.4	94.1	93.7	92.9	92.1	91.4	1622	90.7	89.8	88.9	88.4	87.9	87.3	87.3	87.2	87.1
107.0	107.5	108.1	108.5	108.5	108.4	108.4	107.9	107.3	106.6	1623	105.8	105.0	104.1	103.4	102.7	102.0	101.7	101.4	101.0
																	Mr 2	Mr 12	Mr 22
119.6	120.8	121.0	121.7	122.0	122.2	122.4	122.0	121.7	121.4	1624	120.7	120.0	119.2	118.4	117.6	116.7	116.2	115.7	115.1
																	Mr 3	Mr 13	Mr 23
181.6	182.6	183.5	184.4	184.9	185.4	185.8	185.7	185.7	185.5	1625	184.8	184.3	183.6	182.8	182.0	181.2	180.6	180.8	180.1
148.3	144.3	145.4	144.4	147.5	147.8	148.4	148.5	148.6	148.8	1626	148.4	148.0	147.6	146.8	146.0	145.3	144.5	143.7	142.9
154.5	155.6	157.6	157.8	158.6	159.4	160.8	160.7	161.1	161.4	1627	161.2	161.1	160.8	160.2	159.6	159.0	158.2	157.4	156.6
																	Mr 2	Mr 12	Mr 22
165.2	166.4	167.6	168.7	169.7	170.7	171.7	172.3	172.7	173.3	1628	173.4	173.5	173.6	173.0	172.6	172.1	171.3	170.7	169.8
																	Mr 3	Mr 13	Mr 23
175.8	177.0	178.2	179.5	180.5	181.6	182.7	183.4	184.1	184.9	1629	185.1	185.4	185.5	185.3	185.0	184.7	184.1	183.3	182.7
186.2	187.4	188.6	189.8	190.9	192.0	193.1	193.9	194.8	195.7	1630	196.2	196.7	197.1	197.0	196.9	196.9	196.3	195.7	195.2
196.8	197.5	198.7	199.8	201.0	202.2	203.3	204.3	205.3	206.2	1631	206.9	207.5	208.1	208.3	208.5	208.5	208.1	207.8	207.3
S 25	O 5	O 15	O 25	N 4	N 14	N 24	D 4	D 14	D 24		Ja 3	Ja 13	Ja 23	F 2	F 12	F 22	Mr 3	Mr 13	Mr 23
206.2	207.5	208.6	209.7	210.9	212.1	213.3	214.3	215.5	216.4	1632	217.2	217.9	218.7	219.0	219.4	219.7	219.6	219.5	219.1
S 24	O 4	O 14	O 24	N 3	N 13	N 23	D 3	D 13	D 23		Ja 2	Ja 12	Ja 22	F 1	F 11	F 21	Mr 3	Mr 13	Mr 23
216.4	217.5	218.5	219.6	220.9	222.2	223.4	224.5	225.6	226.7	1633	227.5	228.3	229.2	229.6	230.1	230.5	230.4	230.4	230.4
226.2	227.2	228.2	229.3	230.5	231.7	232.8	233.9	235.1	236.2	1634	237.2	238.2	239.5	239.8	240.5	241.2	241.4	241.6	241.7
236.4	237.3	238.2	239.1	240.2	241.3	242.5	243.7	244.9	246.0	1635	247.1	248.1	249.2	250.0	250.9	251.7	252.1	252.5	252.9
S 25	O 5	O 15	O 25	N 4	N 14	N 24	D 4	D 14	D 24		Ja 3	Ja 13	Ja 23	F 2	F 12	F 22	Mr 3	Mr 13	Mr 23
246.7	247.5	248.3	249.0	250.1	251.2	252.3	253.5	254.7	255.8	1636	256.9	258.0	259.1	260.1	261.0	262.0	262.5	263.1	263.7
S 24	O 4	O 14	O 24	N 3	N 13	N 23	D 3	D 13	D 23		Ja 2	Ja 12	Ja 22	F 1	F 11	F 21	Mr 3	Mr 13	Mr 23
257.1	257.8	258.4	259.1	260.1	261.1	262.1	263.3	264.5	265.6	1637	266.8	268.0	269.1	270.1	271.1	272.2	273.0	273.7	274.4
																	Mr 3	Mr 13	Mr 23
141.0	147.2	153.4	159.4	165.5	171.6	177.5	183.3	189.3	195.0	1638	200.8	206.2	211.5	216.9	221.9	226.3	231.2	235.2	238.9
268.0	268.5	269.0	269.5	270.4	271.3	272.2	273.3	274.3	275.4		276.6	277.8	278.9	280.0	281.2	282.3	283.2	284.1	285.6
268.5	272.9	279.4	286.3	293.3	300.2	307.4	314.5	321.7	328.9	1639	336.1	343.4	350.5	357.3	4.6	11.6	18.7	25.5	32.4
279.3	279.5	279.8	280.2	281.0	281.9	282.5	283.6	284.7	285.7		286.9	288.1	289.4	290.6	291.8	292.9	293.9	294.9	295.8
S 25	O 5	O 15	O 25	N 4	N 14	N 24	D 4	D 14	D 24		Ja 3	Ja 13	Ja 23	F 2	F 12	F 22	Mr 3	Mr 13	Mr 23
153.2	159.5	165.9	172.1	178.5	184.8	191.1	197.5	203.9	210.1	1640	216.6	222.9	229.2	235.7	242.0	248.2	254.6	260.8	267.0
201.1	201.2	201.3	201.3	201.9	202.6	203.2	204.2	205.2	206.1		207.3	208.5	209.6	210.8	212.0	213.3	214.4	215.5	216.7
S 24	O 4	O 14	O 24	N 3	N 13	N 23	D 3	D 13	D 23		Ja 2	Ja 12	Ja 22	F 1	F 11	F 21	Mr 3	Mr 13	Mr 23
306.6	309.3	313.1	317.2	322.1	327.3	332.6	338.4	344.3	350.4	1641	356.6	362.9	369.1	375.1	381.2	387.3	393.4	399.5	405.6
303.7	303.5	303.8	303.1	303.5	303.8	304.3	305.2	306.1	306.9		308.0	309.1	310.3	311.6	312.9	314.1	315.4	316.6	317.7
165.3	171.7	178.2	184.9	191.4	198.1	204.6	211.3	218.1	224.9	1642	231.8	238.8	245.6	252.7	259.6	266.7	273.9	281.0	288.1
316.4	316.1	315.7	315.3	315.5	315.7	316.0	316.6	317.3	318.0		319.1	320.2	321.2	322.4	323.6	324.9	326.2	327.5	328.8
28.7	21.6	19.1	16.1	14.7	13.6	13.3	14.4	16.6	19.4	1643	22.6	26.7	31.3	35.7	40.9	46.1	51.5	57.1	62.6
329.9	329.4	328.9	328.3	328.3	328.2	328.2	328.7	329.2	329.7		330.7	331.7	332.6	333.8	335.0	336.2	337.5	338.8	340.1
S 25	O 5	O 15	O 25	N 4	N 14	N 24	D 4	D 14	D 24		Ja 3	Ja 13	Ja 23	F 2	F 12	F 22	Mr 3	Mr 13	Mr 23
177.7	184.2	190.8	197.6	204.4	211.3	218.2	225.3	232.4	239.6	1644	246.8	254.1	261.4	268.8	276.3	283.8	291.4	299.0	306.8
344.1	343.4	342.7	341.9	341.6	341.3	341.1	341.4	341.7	342.0		342.7	343.5	344.3	345.4	346.5	347.7	349.0	350.3	351.6
S 24	O 4	O 14	O 24	N 3	N 13	N 23	D 3	D 13	D 23		Ja 2	Ja 12	Ja 22	F 1	F 11	F 21	Mr 3	Mr 13	Mr 23
69.1	78.0	75.7	77.4	78.4	77.7	75.9	72.8	69.3	65.7	1645	63.3	61.9	61.8	62.9	64.9	68.0	71.4	75.5	79.8
358.8	358.0	357.2	356.3	355.8	355.3	354.8	354.8	354.9	354.9		355.5	356.1	356.7	357.7	358.7	359.8	360.9	362.0	363.1
190.4	197.2	204.1	211.1	218.1	225.3	232.5	239.8	247.2	254.7	1646	262.1	269.6	277.3	285.1	292.8	300.7	308.5	316.3	324.2
198.3	198.4	199.0	197.8	194.7	207.0	222.7	240.0	257.4	274.4		289.6	300.8	304.9	299.1	293.4	287.3	280.4	272.3	264.1
13.8	13.0	12.2	11.3	10.6	9.9	9.2	9.0	8.7	8.4		8.8	9.2	9.5	10.4	11.2	12.0	13.2	14.4	15.6
92.4	97.4	102.1	106.6	110.0	113.0	115.4	118.4	121.7	125.5	1647	128.1	129.8	131.5	133.2	134.9	136.6	138.3	140.0	141.7
177.0	179.8	182.6	185.4	188.2	191.0	193.8	196.6	199.4	202.2		205.0	207.8	210.6	213.4	216.2	219.0	221.8	224.6	227.4
20.0	28.2	27.5	26.8	25.9	25.1	24.3	23.8	23.2	22.7		22.8	22.8	22.9	23.8	24.3	24.9	25.9	27.0	28.0
S 25	O 5	O 15	O 25	N 4	N 14	N 24	D 4	D 14	D 24		Ja 3	Ja 13	Ja 23	F 2	F 12				

TABLE

Geocentric Places of Mars, Mercury, Jupiter, Venus and Saturn for every tenth day of current cycle.
Venus, A.D. 1765—A.D. 1999;

Day of I.S. Y.		0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
Eng. date	...	Mr 28	Ap 7	Ap 17	Ap 27	My 7	My 17	My 27	Je 6	Je 16	Je 26	Je 16	Je 16	Je 26	Je 16	Je 16	Je 16	Je 16	Je 16
1648	Mars	...	341.7	352.6	01	67	15.2	22.6	30.0	37.1	44.4	51.3	58.2	64.9	71.5	78.1	84.7	90.9	97.1
	Merc.	...	16.2	26.4	27.2	20.3	17.6	25.0	39.3	56.2	74.5	93.2	111.4	128.2	142.1	149.3	147.9	140.3	139.7
	Sat.	...	41.4	42.7	44.0	45.2	46.5	47.8	49.2	50.5	51.8	53.1	54.3	55.4	56.5	57.2	57.9	58.6	58.8
1649	Mars	...	129.4	130.0	131.8	134.2	137.6	141.5	145.9	150.7	155.9	161.3	167.1	172.9	179.0	185.3	191.7	198.3	205.1
	Merc.	...	8.8	3.0	358.2	4.0	16.8	33.3	51.6	70.6	89.5	106.5	121.6	131.8	131.6	124.9	121.7	128.8	141.6
	Sat.	...	54.3	55.5	56.7	57.8	59.1	60.4	61.7	63.1	64.4	65.8	67.1	68.3	69.5	70.4	71.8	72.3	72.7
1650	Mars	...	0.3	8.1	15.6	22.9	30.2	37.3	44.5	51.6	58.5	65.4	72.1	78.7	85.4	91.8	98.4	104.6	110.8
	Merc.	...	340.0	342.7	355.1	10.7	28.7	47.5	66.6	84.6	100.2	111.7	114.6	108.5	108.7	108.2	121.1	186.5	153.8
	Sat.	...	67.5	68.5	69.5	70.5	71.7	73.0	74.2	74.6	76.9	78.2	79.5	80.8	82.2	83.8	84.4	85.5	86.2
1651	Eng. date	...	Mr 29	Ap 8	Ap 18	Ap 28	My 8	My 18	My 28	Je 7	Je 17	Je 27	Je 17	Je 17	Je 17	Je 17	Je 17	Je 17	Je 17
	Mars	...	170.8	167.6	165.7	164.5	164.8	166.3	168.9	172.2	176.1	180.6	185.6	191.0	198.8	202.7	208.9	215.3	222.0
	Merc.	...	333.4	348.5	6.1	25.0	44.0	62.3	78.6	91.3	96.4	91.9	85.8	88.7	100.1	115.3	132.6	150.6	168.3
	Sat.	...	81.2	82.0	82.7	83.4	84.5	85.6	86.8	88.1	89.5	90.8	92.1	93.4	94.8	96.0	97.2	98.4	99.3
1652	Eng. date	...	Mr 28	Ap 7	Ap 17	Ap 27	My 7	My 17	My 27	Je 6	Je 16	Je 26	Je 16	Je 16	Je 16	Je 16	Je 16	Je 16	Je 16
	Mars	...	16.5	22.7	30.0	37.1	44.1	51.2	58.0	64.9	71.7	78.3	85.1	91.7	98.0	104.6	111.0	117.4	123.7
	Merc.	...	343.6	2.1	20.9	39.4	56.5	70.2	77.1	74.9	67.7	68.7	78.4	98.7	110.9	127.1	147.1	164.2	179.2
	Sat.	...	94.8	95.3	95.8	96.3	97.3	98.3	99.2	100.4	101.6	102.9	104.3	105.6	106.9	108.2	109.4	110.7	111.7
1653	Mars	...	224.2	224.2	222.8	220.7	217.8	214.7	212.6	211.1	211.3	212.3	214.6	218.0	222.0	226.7	231.8	237.5	243.5
	Merc.	...	353.3	15.8	33.9	48.6	57.8	57.0	49.8	48.3	57.5	72.0	88.9	107.1	125.5	143.1	159.0	171.4	176.6
	Sat.	...	108.6	108.8	109.0	109.3	110.1	110.8	111.5	112.6	113.7	114.9	116.2	117.5	118.7	120.0	121.3	122.7	123.8
1654	Mars	...	30.3	37.4	44.1	50.9	57.7	64.5	71.2	77.8	84.2	90.9	97.4	103.9	110.3	116.7	123.1	129.4	135.7
	Merc.	...	11.7	27.2	37.4	38.3	31.3	28.8	30.2	49.8	66.5	84.5	103.2	121.5	138.2	152.0	158.6	157.7	150.0
	Sat.	...	122.5	122.4	122.3	122.3	122.8	123.4	123.9	124.8	125.7	126.7	127.9	129.1	130.4	131.7	133.0	134.2	135.4
1655	Eng. date	...	Mr 29	Ap 8	Ap 18	Ap 28	My 8	My 18	My 28	Je 7	Je 17	Je 27	Je 17	Je 17	Je 17	Je 17	Je 17	Je 17	Je 17
	Mars	...	259.9	265.1	269.8	274.1	278.0	281.1	283.2	284.8	285.1	284.0	281.8	279.3	274.2	275.7	275.4	277.0	279.4
	Merc.	...	16.3	19.9	13.8	9.1	14.3	27.4	43.8	62.1	81.1	99.5	116.8	131.6	141.2	142.0	134.8	131.5	138.2
	Sat.	...	136.3	136.0	135.7	135.5	135.7	136.0	136.3	137.1	137.9	138.5	139.6	140.7	141.9	143.1	144.3	145.6	146.9
1656	Eng. date	...	Mr 28	Ap 7	Ap 17	Ap 27	My 7	My 17	My 27	Je 6	Je 16	Je 26	Je 16	Je 16	Je 16	Je 16	Je 16	Je 16	Je 16
	Mars	...	45.0	51.5	58.0	64.6	71.1	77.5	83.9	90.2	96.8	103.1	109.5	115.7	122.1	128.5	134.9	141.4	147.6
	Merc.	...	356.6	350.4	338.5	5.4	21.1	39.1	58.1	76.8	94.7	110.4	128.8	149.9	119.0	114.0	118.6	130.6	146.1
	Jup.	...	17.0	19.6	22.0	24.4	26.6	29.0	31.3	33.8	36.0	37.8	39.9	41.5	43.0	44.4	45.3	46.1	46.4
	Sat.	...	150.0	149.5	149.0	148.4	148.4	148.5	148.5	149.1	149.7	150.1	151.1	152.0	153.0	154.2	155.4	156.6	157.9
1657	Mars	...	283.9	290.8	297.4	304.3	310.9	317.4	323.7	329.8	335.7	341.3	346.3	350.6	354.1	356.8	358.3	358.5	357.2
	Merc.	...	338.9	343.4	358.6	16.4	35.2	54.2	72.6	89.1	101.9	107.0	102.5	96.5	98.6	110.1	125.0	142.2	160.0
	Jup.	...	44.9	47.1	49.2	51.2	53.2	55.2	58.2	60.5	62.9	65.2	67.5	69.8	71.8	73.5	75.2	76.9	78.3
	Sat.	...	163.4	162.7	162.0	161.4	161.1	160.9	160.7	161.0	161.3	161.6	162.4	163.2	164.0	165.1	166.2	167.3	168.5
1658	Eng. date	...	Mr 29	Ap 8	Ap 18	Ap 28	My 8	My 18	My 28	Je 7	Je 17	Je 27	Je 17	Je 17	Je 17	Je 17	Je 17	Je 17	Je 17
	Mars	...	59.7	65.9	71.9	78.0	84.1	90.8	96.5	102.7	108.9	115.2	121.5	127.8	134.1	140.4	146.8	153.2	159.7
	Merc.	...	336.9	351.9	12.4	31.2	49.8	66.8	80.6	88.2	85.6	78.5	79.3	89.0	102.9	120.7	138.8	156.6	173.0
	Jup.	...	73.3	74.5	76.4	78.0	80.0	82.1	84.0	86.2	88.6	90.9	93.1	95.5	97.7	100.0	102.0	104.3	106.1
	Sat.	...	176.4	175.6	174.9	174.1	173.7	173.3	172.9	173.0	173.1	173.1	173.6	174.2	174.9	175.8	176.8	177.8	179.0
1659	Mars	...	303.5	311.0	318.6	326.0	333.6	340.9	348.4	355.3	2.4	9.3	15.9	22.2	28.5	34.3	39.9	44.9	49.3
	Merc.	...	349.6	34.5	27.0	44.8	59.1	68.3	68.2	60.9	59.5	67.7	81.9	98.8	116.9	135.2	152.6	168.3	180.7
	Jup.	...	103.1	103.7	104.3	105.3	106.7	107.9	109.8	111.8	113.7	115.8	118.0	119.9	122.1	124.6	126.5	128.8	131.2
	Sat.	...	189.0	188.2	187.4	186.6	186.1	185.6	185.0	184.9	184.8	184.5	184.9	185.3	185.0	185.8	187.4	189.3	190.5
1660	Eng. date	...	Mr 28	Ap 7	Ap 17	Ap 27	My 7	My 17	My 27	Je 6	Je 16	Je 26	Je 16	Je 16	Je 16	Je 16	Je 16	Je 16	Je 16
	Mars	...	75.6	80.9	86.4	92.1	97.8	103.6	109.5	115.5	121.4	127.5	133.7	139.9	146.3	152.6	158.9	165.5	172.0
	Merc.	...	4.5	22.1	37.5	47.9	49.9	42.9	39.6	46.2	60.1	76.6	94.8	113.4	131.4	147.9	161.7	168.9	167.4
	Jup.	...	135.0	134.5	134.2	134.4	134.6	135.4	136.5	137.5	138.0	140.6	142.4	144.4	146.4	148.5	150.6	152.8	155.0
	Sat.	...	201.4	200.6	199.8	199.1	198.4	197.7	197.1	196.8	193.4	196.0	196.2	196.4	196.7	197.4	198.1	198.7	199.7
1661	Mars	...	321.5	329.3	337.1	344.8	352.3	359.8	7.4	14.7	21.9	28.9	36.0	42.7	49.5	56.0	62.1	68.3	73.9
	Merc.	...	15.2	27.1	30.7	24.4	20.1	25.3	37.7	54.1	72.2	91.0	109.5	126.7	141.6	150.6	151.5	144.0	141.3
	Jup.	...	168.7	167.3	166.4	165.5	164.0	164.6	164.4	164.6	165.6	166.4	167.6	169.1	170.6	172.4	174.3	176.4	178.4
	Sat.	...	213.5	212.8	212.1	211.3	210.5	209.7	209.0	208.5	208.1	207.6	207.6	207.5	207.6	208.0	208.5	209.0	209.9
1662	Eng. date	...	Mr 29	Ap 8	Ap 18	Ap 28	My 8	My 18	My 28	Je 7	Je 17	Je 27	Je 17	Je 17	Je 17	Je 17	Je 17	Je 17	Je 17
	Mars	...	94.0	99.0	102.5	107.3	112.6	117.7	123.3	128.7	134.6	140.7	146.5	152.8	159.1	165.8	171.7	178.3	185.1
	Merc.	...	11.7	8.6	1.4	4.5	15.9	31.6	46.6	68.3	87.5	104.2	120.7	132.8	135.1	129.1	124.0	128.7	140.4
	Jup.	...	202.7	201.5	200.6	199.8	197.7	196.7	195.5	195.0	164.7	194.7	195.0	195.6	196.5	197.6	199.3	200.7	202.4
	Sat.	...	225.1	224.5	223.9	223.3	222.5	221.7	221.0	220.3	219.7	219.0	218.8	218.6	218.5	218.8	219.1	219.4	220.1
1663	Mars	...	388.4	346.1	353.9	1.6	9.2	16.6	23.9	31.2	38.4	45.5	52.2	59.0	65.9	72.3	78.7	84.9	91.3
	Merc.	...	343.4	344.0	354.0	9.0	26.7	45.6	64.6	82.9	99.3	112.0	117.6	113.3	106.7	109.0	120.0	134.8	151.8
	Jup.	...	236.3	235.5	234.8	234.1	232.8	230.8	230.1	228.4	227.6	226.8	225.3	225.6	226.6	228.0	229.6	231.4	233.1
	Sat.	...	236.5	236.3	236.1	235.1	234.3	233.5	232.8	232.1	231.4	230.6	230.3	229.8	229.4	229.6	229.8	230.5	231.1
Mesh. Vrish. Mith. Kat. Sim. Kan. Tul. Vrish. Dhan. Mak. Kam. Min. Asva. Bhar. Krit. Rohi. Mrig. Ardh. Punar. Push. Asles.		30	60	90	120	150	180	210	240	270	300	330	360	13.3	26.7	40.0	53.3	66.7	80.0
		30	60	90	120	150	180	210	240	270	300	330	360	13.3	26.7	40.0			

V-B—cont.

Mars, A.D. 1637—A.D. 1999; Mercury, A.D. 1645—A.D. 1999, Jupiter, A.D. 1656—A.D. 1999, Saturn, A.D. 1617—A.D. 1999—cont.

180	190	200	210	220	230	240	250	260	270		280	290	300	310	320	330	340	350	360
S 24	O 4	O 14	O 24	N 8	N 18	N 28	D 8	D 18	D 28		Ja 2	Ja 12	Ja 22	F 1	F 11	F 21	Mr 3	Mr 13	Mr 23
108.9	114.7	120.1	125.3	130.2	134.9	139.0	142.6	145.7	147.7	1649	148.9	148.7	147.3	144.8	140.9	137.5	134.0	131.0	129.9
162.1	178.3	195.8	212.9	229.5	248.9	253.4	254.9	248.3	244.1		249.0	261.4	277.1	294.6	312.8	330.6	347.4	361.0	37.7
59.0	58.6	58.3	57.8	57.0	56.2	55.4	54.6	53.8	53.0		52.6	52.1	51.6	51.7	51.8	51.8	52.5	53.2	53.9
218.6	225.9	238.1	240.4	247.8	255.4	268.0	270.7	278.5	286.2	1650	294.1	302.0	309.9	317.6	325.5	333.4	341.2	348.7	356.6
174.7	192.3	209.4	221.4	235.9	239.5	235.2	228.6	231.1	241.6		256.3	273.1	291.1	308.8	325.8	339.9	349.2	349.3	342.2
73.6	73.5	73.8	73.2	72.5	71.8	71.3	70.4	69.5	68.7		69.0	67.3	66.5	66.3	66.1	66.0	66.1	66.7	67.2
123.1	129.0	184.8	141.5	146.1	151.5	156.8	161.4	166.3	170.7	1651	174.4	177.8	180.4	181.8	182.6	181.9	179.8	176.4	172.5
189.1	204.8	217.7	223.9	221.8	213.8	218.4	221.3	226.2	252.3		269.8	287.6	304.6	319.6	329.7	333.1	325.8	321.1	326.3
87.6	87.7	87.8	87.9	87.5	87.1	86.6	85.8	85.0	84.3		88.5	82.7	81.8	81.4	81.0	80.5	80.6	80.6	80.7
S 25	O 5	O 15	O 25	N 4	N 14	N 24	D 4	D 14	D 24		Ja 3	Ja 13	Ja 23	F 2	F 12	F 22	Mr 3	Mr 13	Mr 23
285.9	242.9	250.2	257.4	265.9	272.4	280.0	287.8	295.5	303.2	1652	311.0	318.7	326.3	334.1	341.9	349.3	356.8	364.4	372.0
198.8	207.4	207.5	199.8	197.0	203.4	216.4	222.1	219.1	208.7		283.6	299.0	310.6	314.7	309.5	303.4	307.0	318.8	334.3
101.5	101.5	101.8	102.2	102.0	101.9	101.8	101.1	100.4	99.7		98.8	97.9	97.1	96.5	95.9	95.2	95.0	94.8	94.7
S 24	O 4	O 14	O 24	N 8	N 18	N 28	D 8	D 18	D 28		Ja 2	Ja 12	Ja 22	F 1	F 11	F 21	Mr 3	Mr 13	Mr 23
180.0	142.0	148.2	154.1	160.1	165.9	171.8	177.5	183.1	188.7	1653	194.0	198.9	203.9	208.4	212.6	216.5	219.8	222.2	225.8
192.6	184.4	181.1	184.9	190.8	211.8	228.1	246.0	263.1	278.9		291.4	297.5	294.3	287.1	288.0	297.0	312.5	330.0	348.3
113.3	114.4	115.1	115.8	115.9	116.0	116.0	115.4	115.1	114.6		113.8	113.0	112.3	111.5	110.7	109.9	109.5	109.1	108.6
256.4	263.1	270.1	277.1	284.4	291.8	299.1	306.6	313.9	321.4	1654	328.5	336.2	343.6	350.9	358.1	365.4	372.4	379.6	386.6
165.6	167.2	177.3	191.5	208.0	225.4	242.5	258.8	272.1	280.2		279.4	271.7	269.9	278.0	291.6	308.0	326.1	344.7	363.8
126.1	126.9	127.7	128.6	129.0	129.3	129.7	129.5	129.3	129.0		128.8	127.6	127.0	126.2	125.5	124.7	124.1	123.5	122.9
148.3	154.7	160.8	166.1	173.3	179.6	185.8	191.9	198.0	204.3	1655	210.4	216.6	222.7	228.6	234.6	240.5	246.1	251.8	257.2
157.7	171.5	187.6	205.0	222.3	238.6	253.1	268.0	284.0	297.2		253.3	258.8	270.9	286.5	304.0	322.5	340.1	357.4	374.5
137.9	138.9	139.9	140.9	141.6	142.2	142.6	142.6	142.7	142.7		142.2	141.7	141.2	140.5	139.6	138.8	137.1	137.4	136.4
S 25	O 5	O 15	O 25	N 4	N 14	N 24	D 4	D 14	D 24		Ja 3	Ja 13	Ja 23	F 2	F 12	F 22	Mr 3	Mr 13	Mr 23
287.2	292.0	297.6	303.1	309.2	315.4	321.7	328.5	335.0	341.5	1656	348.2	354.9	361.5	368.3	375.0	381.5	388.2	394.8	401.4
167.1	164.2	201.9	218.5	238.7	244.8	248.7	243.6	237.4	240.0		251.0	266.9	282.9	300.8	318.6	336.8	355.2	373.8	392.0
149.4	150.5	151.8	152.7	153.4	154.1	154.9	155.2	155.4	155.7		155.4	155.1	154.9	154.2	153.5	152.7	152.0	151.2	150.4
S 24	O 4	O 14	O 24	N 8	N 18	N 28	D 8	D 18	D 28		Ja 2	Ja 12	Ja 22	F 1	F 11	F 21	Mr 3	Mr 13	Mr 23
160.5	160.9	173.5	179.7	186.2	192.9	199.5	205.9	212.6	219.1	1657	225.8	232.7	239.4	246.0	252.8	259.6	266.5	273.5	280.4
180.7	198.3	214.0	226.6	233.1	230.5	222.6	222.6	231.5	245.5		281.8	279.7	297.2	314.3	329.2	343.9	342.4	335.9	331.8
46.1	45.6	44.6	43.4	42.0	40.1	39.4	38.0	37.1	36.3		36.0	35.8	36.1	36.9	37.9	38.8	40.8	42.0	43.3
160.4	161.5	162.6	163.8	164.7	165.6	166.5	166.9	167.4	167.9		167.8	167.8	167.7	167.1	166.6	166.1	165.3	164.5	163.7
353.2	349.9	348.7	348.5	349.7	351.7	354.5	358.1	361.2	364.5	1658	373.3	372.3	371.4	370.7	370.7	370.5	370.9	371.7	372.5
194.2	208.0	216.7	216.1	208.8	205.4	212.9	225.5	241.2	258.5		276.0	293.2	308.7	320.4	324.9	319.6	314.0	316.8	328.6
80.3	80.6	81.0	80.7	80.4	79.5	78.4	77.2	76.0	74.6		73.3	72.3	71.4	70.7	70.7	70.5	70.9	71.7	72.5
171.0	172.2	173.4	174.6	175.6	176.6	177.6	178.2	178.8	179.6		179.8	180.0	180.1	179.7	179.8	179.0	178.2	177.4	176.8
S 25	O 5	O 15	O 25	N 4	N 14	N 24	D 4	D 14	D 24		Ja 3	Ja 13	Ja 23	F 2	F 12	F 22	Mr 4	Mr 14	Mr 24
172.6	179.8	186.0	192.6	199.3	206.1	212.9	219.7	226.9	233.8	1659	240.8	248.1	255.2	262.5	269.7	277.8	284.7	292.1	299.8
199.0	201.5	195.1	190.3	194.5	205.8	220.6	237.7	255.1	272.4		288.2	301.0	307.2	303.8	296.8	297.9	307.9	322.6	339.9
109.4	110.9	111.9	112.9	113.4	113.8	113.7	113.3	112.6	111.6		110.5	109.0	107.8	106.7	105.3	104.3	103.7	103.4	103.2
181.3	182.5	183.7	185.0	186.1	187.2	188.3	189.1	189.9	190.7		192.1	191.4	190.8	191.6	191.4	191.8	190.7	190.1	189.5
50.3	58.4	59.5	59.1	57.5	54.7	51.7	48.6	46.2	45.1	1660	45.0	46.2	48.4	51.2	54.7	58.5	63.1	67.8	72.8
184.8	174.8	176.3	186.5	200.7	217.3	234.5	251.8	268.9	281.5		289.6	288.7	281.4	279.4	287.4	301.1	317.8	336.1	354.5
135.0	137.0	139.0	140.3	141.7	143.1	143.9	144.4	144.8	144.7		144.3	143.8	142.9	141.8	140.3	139.3	137.7	136.6	135.7
191.6	192.8	194.0	195.1	196.3	197.3	198.6	199.4	200.4	201.4		201.9	202.4	203.0	203.0	203.1	203.2	202.7	202.2	201.7
S 24	O 4	O 14	O 24	N 8	N 18	N 28	D 8	D 18	D 28		Ja 2	Ja 12	Ja 22	F 1	F 11	F 21	Mr 3	Mr 13	Mr 23
185.2	191.9	198.8	205.7	212.8	219.8	226.7	234.0	241.3	248.7	1661	256.0	263.4	271.0	278.6	286.4	294.1	301.9	309.7	317.4
158.6	166.6	180.8	196.8	214.1	231.4	247.9	262.3	272.0	278.4		286.7	282.6	267.6	280.5	296.8	314.2	332.5	350.6	368.9
150.4	161.6	168.6	165.6	167.5	169.1	170.6	172.2	173.2	174.2		174.7	175.1	175.0	174.5	174.1	173.0	171.9	170.6	169.4
201.7	202.9	204.1	205.2	206.4	207.6	208.7	209.7	210.7	211.8		212.4	213.1	213.9	214.2	214.4	214.6	214.4	214.0	213.8
84.6	89.2	98.4	97.0	100.0	102.1	103.0	102.7	101.3	98.4	1662	94.5	90.9	87.7	85.2	84.5	84.8	86.4	89.0	92.1
160.7	176.4	193.4	210.9	227.6	242.7	254.2	257.8	252.4	246.5		249.6	260.3	275.2	292.3	310.8	328.6	345.4	362.9	380.5
132.8	135.0	137.1	139.3	141.5	143.7	145.9	148.1	150.3	152.5		202.4	203.3	204.2	204.9	205.3	205.2	204.9	204.4	203.8
211.6	212.7	213.8	215.0	216.2	217.5	218.6	219.7	220.8	221.9		222.8	223.6	224.5	224.9	225.8	225.6	225.7	225.9	226.3
S 25	O 5	O 15	O 25	N 4	N 14	N 24	D 4	D 14	D 24		Ja 3	Ja 13	Ja 23	F 2	F 12	F 22	Mr 4	Mr 14	Mr 24
198.5	205.4	212.3	219.6	226.8	233.9	241.3	248.8	256.3	263.9	1663	271.5	279.8	287.1	294.9	302.8	310.6	318.5	326.5	334.3
171.8	189.3	207.6	223.2	235.9	241.9	239.5	231.6	231.3	240.8		254.7	271.1	288.9	306.7	324.0	339.8	350.3	352.9	348.5
206.6	208.5	210.6	212.9	215.1	217.3	219.5	221.7	223.8	225.9		228.0	229.7	231.3	232.8	234.2	235.1	236.0	236.8	236.3
221.6	222.7	223.7	224.7	225.9	227.1	228.2	229.3	230.4	231.6		232.6	233.6	234.6	235.1	235.7	236.1	236.5	236.6	236.6
102.8	108.4	113.7	118.5	123.2	127.2	130.9	133.6	135.6	136.6	1664	136.5	135.2	131.9	128.4	124.5	121.0	118.7	117.8	117.1
187.1	203.5	217.2	225.4	225.8	217.8	215.0	221.6	234.6	250.6		267.8	285.6	303.0						

V-B—cont.

Mars, A.D. 1637—A.D. 1999; Mercury, A.D. 1645—A.D. 1999, Jupiter, A.D. 1656—A.D. 1999, Saturn, A.D. 1617—A.D. 1999—cont.

180	190	200	210	220	230	240	250	260	270		280	290	300	310	320	330	340	350	360
S 24	O 4	O 14	O 24	N 3	N 13	N 23	D 3	D 13	D 23		Ja 2	Ja 12	Ja 22	F 1	F 11	F 21	Mr 3	Mr 13	Mr 23
212.9	219.8	227.0	234.3	241.8	249.2	256.7	264.4	271.9	279.8	1665	287.6	295.4	303.4	311.3	319.1	326.9	334.8	342.7	350.4
197.8	208.2	210.6	204.5	199.1	203.0	214.9	230.2	247.0	264.5		281.8	297.7	310.6	317.0	314.4	307.3	307.6	317.9	332.5
259.8	260.9	262.5	264.1	265.8	267.8	269.9	271.9	272.9	276.6		278.9	281.8	283.6	286.0	288.2	290.4	292.5	294.5	296.6
241.8	242.8	243.6	244.4	245.6	246.7	248.8	249.0	250.2	251.3		282.4	283.5	284.6	285.4	286.3	287.2	287.7	288.1	288.6
117.9	128.6	129.5	134.9	140.8	145.5	150.2	154.9	158.9	162.5	1666	165.5	167.7	168.9	168.6	167.1	164.6	161.0	157.1	153.3
195.1	191.8	184.0	185.8	195.9	210.0	226.4	243.9	261.0	277.4		291.0	299.1	298.9	290.9	289.0	297.4	310.4	327.8	346.2
292.4	292.4	292.9	293.7	294.9	295.9	297.5	299.2	300.5	303.8		305.4	307.8	310.1	312.4	315.1	317.3	319.7	322.1	324.4
252.3	253.0	253.7	254.5	255.5	256.6	257.6	258.7	259.9	261.1		262.3	263.5	264.6	265.5	266.5	267.5	268.1	268.7	269.4
S 25	O 5	O 15	O 25	N 4	N 14	N 24	D 4	D 14	D 24		Ja 3	Ja 13	Ja 23	F 2	F 12	F 22	Mr 4	Mr 14	Mr 24
228.9	236.0	243.2	250.6	258.0	265.7	273.8	280.9	288.7	296.5	1667	304.3	312.2	319.9	327.9	335.5	343.3	350.8	358.4	366.1
169.3	167.8	176.4	190.0	206.0	223.4	240.4	257.1	271.4	281.1		282.9	276.0	272.0	277.5	290.0	306.1	323.9	342.5	361.0
330.8	329.8	328.8	328.6	328.2	328.6	329.2	329.9	331.2	332.5		333.4	336.0	338.1	340.8	343.0	345.3	347.7	350.1	352.3
263.0	263.6	264.2	264.7	265.7	266.5	267.5	268.7	269.9	271.0		272.2	273.4	274.5	275.6	276.7	277.8	278.6	279.6	280.8
181.1	187.2	143.1	149.1	154.9	160.6	167.0	171.5	178.8	182.0	1668	186.8	191.4	195.6	199.3	202.2	204.7	206.0	206.5	206.6
157.3	170.1	185.8	202.8	220.3	236.9	252.0	263.1	267.2	261.9		255.8	258.7	269.7	284.7	302.0	320.2	338.4	355.8	373.1
12.8	10.9	9.5	8.8	7.1	6.1	5.5	4.8	4.8	5.8		5.7	6.8	8.0	9.4	11.2	13.0	15.2	17.4	19.4
274.1	274.4	274.9	275.3	276.1	277.0	277.8	278.9	280.0	281.0		282.3	283.5	284.6	285.8	287.1	288.2	289.1	290.0	291.0
S 24	O 4	O 14	O 24	N 3	N 13	N 23	D 3	D 13	D 23		Ja 2	Ja 12	Ja 22	F 1	F 11	F 21	Mr 3	Mr 13	Mr 23
247.7	254.6	261.8	269.1	276.6	283.9	291.4	299.0	306.6	314.2	1669	321.8	329.2	336.9	344.3	351.7	359.1	366.4	373.7	381.0
165.1	182.2	199.6	216.6	232.3	244.8	250.9	248.2	240.7	240.7		250.1	264.0	280.6	298.3	306.7	333.8	349.8	366.1	382.4
51.2	50.6	49.7	48.8	47.6	46.8	44.8	43.7	42.6	41.5		41.1	40.6	40.9	41.2	42.1	43.2	44.5	45.8	47.0
285.6	285.8	285.9	286.1	286.8	287.5	288.2	289.2	290.2	291.8		292.5	293.7	294.8	296.0	297.2	298.5	299.6	300.7	301.7
143.7	149.8	156.0	162.1	168.2	174.3	180.4	186.4	192.4	198.4	1670	204.3	209.9	215.7	221.2	226.6	232.0	236.9	241.6	245.6
175.0	186.3	212.6	226.1	234.7	234.3	227.3	223.6	230.2	244.0		259.8	277.4	295.2	312.5	328.4	340.2	345.5	349.7	354.9
84.5	85.0	85.7	85.5	85.1	84.5	83.5	82.3	81.0	79.8		78.5	77.4	76.1	75.5	75.2	74.9	75.1	75.6	76.6
297.7	297.6	297.6	297.6	298.5	299.1	299.0	300.0	300.9	301.8		303.0	304.2	305.3	306.5	307.7	308.9	310.2	311.4	312.6
S 25	O 5	O 15	O 25	N 4	N 14	N 24	D 4	D 14	D 24		Ja 3	Ja 13	Ja 23	F 2	F 12	F 22	Mr 4	Mr 14	Mr 24
273.0	279.0	285.3	291.9	298.6	305.4	312.2	319.2	326.3	333.2	1671	340.4	347.4	354.4	361.4	368.4	375.4	382.4	389.4	396.4
192.4	207.1	217.4	219.6	218.1	208.2	212.5	224.2	239.5	256.5		274.0	291.5	307.5	320.4	327.1	324.2	317.3	318.0	327.9
113.3	114.6	115.8	117.0	117.4	118.0	118.0	117.7	117.2	116.3		115.2	114.1	112.8	111.3	110.1	109.1	108.3	107.6	107.5
310.3	310.1	309.9	309.5	309.8	310.1	310.5	311.3	312.0	312.7		313.8	314.9	316.1	317.3	318.5	319.8	321.0	322.2	323.5
155.7	162.2	168.6	174.9	181.4	187.7	194.1	200.5	206.9	213.4	1672	220.0	226.5	233.0	239.4	245.0	252.4	258.9	265.5	271.9
199.3	204.2	199.9	193.2	194.6	204.8	219.2	235.7	253.1	270.5		286.9	300.7	308.7	308.4	301.0	299.2	306.8	321.0	337.8
138.5	140.6	142.4	143.9	145.7	146.6	147.5	148.4	149.1	149.1		148.7	148.4	147.5	146.4	145.1	143.9	142.5	141.2	140.5
323.6	323.1	322.7	322.2	322.3	322.4	322.4	323.0	323.6	324.3		325.3	326.8	327.3	328.6	329.7	331.0	332.3	333.6	334.9
S 24	O 4	O 14	O 24	N 3	N 13	N 23	D 3	D 13	D 23		Ja 2	Ja 12	Ja 22	F 1	F 11	F 21	Mr 3	Mr 13	Mr 23
320.7	321.6	323.8	326.7	330.6	334.9	339.5	344.8	350.0	355.8	1673	1.5	7.6	13.4	19.5	25.6	31.8	38.0	44.3	50.6
186.1	178.5	172.2	185.8	199.1	215.3	232.4	249.9	266.2	280.9		291.0	292.4	295.9	291.4	287.4	299.8	315.9	333.7	352.4
162.7	164.6	166.7	168.9	170.9	172.7	174.2	175.7	177.1	178.0		178.7	178.7	179.3	178.9	178.3	177.4	176.4	175.4	174.0
387.5	336.8	336.2	335.6	335.4	335.2	335.1	335.4	335.8	336.8		337.2	338.1	338.9	340.0	341.2	342.4	343.7	345.0	346.2
167.9	174.9	181.0	187.6	194.2	201.0	207.6	214.6	221.2	228.1	1674	235.0	242.0	249.1	256.2	263.2	270.5	277.7	285.1	292.4
160.3	166.9	179.2	195.0	212.0	229.3	246.0	261.2	272.6	276.8		271.6	265.1	268.3	278.9	294.4	311.7	330.0	348.4	366.1
185.8	188.3	190.2	192.8	194.5	196.9	198.9	200.9	202.6	204.2		205.7	207.2	208.1	208.7	209.2	209.5	209.1	208.6	207.9
352.0	351.2	350.4	349.6	349.2	348.7	348.4	348.6	348.8	348.9		349.5	350.2	350.9	351.9	353.1	354.1	355.4	356.7	358.0
S 25	O 5	O 15	O 25	N 4	N 14	N 24	D 4	D 14	D 24		Ja 3	Ja 13	Ja 23	F 2	F 12	F 22	Mr 4	Mr 14	Mr 24
37.8	37.4	35.7	33.4	30.5	28.3	26.1	23.3	20.1	17.6	1675	30.0	33.0	30.7	41.0	45.5	50.4	55.4	60.8	66.2
159.3	174.5	191.5	208.9	226.0	241.5	253.9	260.1	257.0	249.7		250.2	259.3	273.6	290.6	308.3	326.7	344.0	359.6	375.0
209.9	211.9	214.1	216.3	218.5	220.7	222.7	225.2	227.3	229.4		231.4	233.2	234.9	236.7	238.0	239.8	239.8	240.5	240.5
6.8	6.0	5.2	4.3	3.7	3.1	2.5	2.4	2.2	2.1		2.6	3.1	3.5	4.4	5.3	6.1	7.3	8.6	9.8
180.3	187.0	193.6	200.5	207.5	214.3	221.3	228.3	235.5	242.8	1676	249.1	257.5	265.0	272.4	279.9	287.6	295.2	302.9	310.7
170.7	188.0	205.6	221.8	235.3	243.5	243.2	235.6	232.9	239.8		253.3	269.3	286.9	304.2	322.5	339.8	350.8	365.8	381.8
235.4	236.8	238.8	240.9	242.9	245.2	247.4	249.7	252.0	254.3		256.6	258.7	260.9	263.2	265.1	267.0	268.6	269.9	271.2
22.0	21.2	21.3	19.6	18.8	18.1	17.8	16.8	16.4	16.1		16.2	16.4	16.6	17.4	18.2	18.9	20.0	21.1	22.2
S 24	O 4	O 14	O 24	N 3	N 13	N 23	D 3	D 13	D 23		Ja 2	Ja 12	Ja 22	F 1	F 11	F 21	Mr 3	Mr 13	Mr 23
76.9	79.4	82.8	85.6	87.0	87.8	87.1	84.8	81.7	78.1	1677	74.6	72.0	70.4	70.4	71.5	73.6	76.3	79.9	83.9
184.9	201.7	216.1	226.4	228.7	231.8	217.1	221.7	233.3	248.5		265.8	284.1	300.9	317.2	333.3	337.3	335.1	327.6	327.9
264.0	264.9	268.2	267.8	269.5	271.5	273.6	275.7	277.7	280.0		282.3	284.8	287.0	289.4	291.9	294.2	296.4	298.4	300.4
37.1	36.5	36.8	35.0	34.2	33.4	32.5	31.9	31.3	30.7		30.6	30.5	30.4	31.0	31.4	31.9	32.9	33.8	34.8
193.4	200.3	207.2	214.1	221.1	228.2	235.5	242.9	250.3	257.9	1678	265.5	273.1	280.8	288.6	296.4	304.1	312.1	320.1	327.8
196.8	208.7	218.2	208.7	202.1	203.5	213.6	228.2	244.0	262.5		279.8	296.4	310.2	319.1	318.3	311.8	309.5	317.3	330.8
297.3	297.1	297.5	298.2	299.0	300.2	301.7	303.3	305.1	307.1		309.3	311.6	313.9	316.3	318.5	321.2			

TABLE

Geocentric Places of Mars, Mercury, Jupiter, Venus and Saturn for every tenth day of current cycle
Venus, A.D. 1765—A.D. 1999

Day of I.S.V.		0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
Eng. date	Mr 29	Apr 8	Apr 18	Apr 28	My 8	My 18	My 28	Je 7	Je 17	Je 27	Jul 7	Jul 17	Jul 27	Aug 6	Aug 16	Aug 26	S 5	S 15	S 25
1678 Mars	...	331.9	330.8	347.5	355.2	2.7	10.3	17.6	25.0	32.3	39.3	46.1	53.1	59.7	66.4	72.6	78.9	84.9	90.7
Merc.	...	332.8	357.7	16.4	85.2	53.2	69.0	80.0	83.1	76.6	72.5	78.2	80.9	107.0	194.6	142.5	160.6	176.7	189.7
Jup.	...	329.4	331.7	333.8	335.7	337.9	339.5	340.8	342.2	343.1	343.8	344.0	343.8	343.5	342.6	341.6	340.3	339.2	337.7
Sat.	...	43.3	49.7	50.9	52.0	53.3	54.6	55.9	57.4	58.7	60.0	61.3	62.4	63.7	64.4	65.3	66.1	66.4	66.6
1679 Mars	...	107.5	110.3	118.9	118.0	122.5	127.3	132.4	137.9	143.4	149.2	155.1	161.0	167.5	173.7	180.3	186.7	193.3	205.3
Merc.	...	354.0	12.2	30.6	47.0	59.5	64.2	59.2	53.6	57.6	69.2	85.1	102.7	121.1	139.2	160.0	170.5	179.8	180.0
Jup.	...	357.1	359.2	1.6	4.0	6.6	8.8	10.8	12.9	14.9	16.4	17.8	19.1	19.8	20.3	20.5	20.2	19.8	18.9
Sat.	...	61.5	62.5	63.7	64.7	66.0	67.3	68.5	69.9	71.2	72.6	73.9	75.2	76.4	77.5	78.5	79.5	80.1	80.0
Eng. date	Mr 28	Apr 7	Apr 17	Apr 27	My 7	My 17	My 27	Je 6	Je 16	Je 26	Jul 6	Jul 16	Jul 26	Aug 5	Aug 15	Aug 25	S 4	S 14	S 24
1680 Mars	...	348.3	358.0	3.6	11.0	18.7	26.0	33.2	40.5	47.5	54.5	61.4	68.0	74.8	81.2	87.8	94.0	100.1	106.1
Merc.	...	7.9	24.7	38.1	45.8	41.7	34.7	36.9	47.2	62.6	80.4	98.8	117.2	135.0	150.2	161.5	164.7	159.2	153.1
Jup.	...	24.8	27.1	29.5	31.9	34.3	36.7	38.8	41.4	43.6	45.7	47.7	49.8	51.2	53.0	54.1	55.0	55.8	56.0
Sat.	...	74.9	75.7	76.6	77.5	78.6	79.9	81.1	82.4	83.7	85.0	86.4	87.7	89.2	90.2	91.3	92.5	93.4	94.1
1681 Mars	...	137.0	136.9	137.6	139.7	142.5	146.0	150.1	154.7	159.7	165.0	170.7	176.5	182.6	188.8	195.3	201.8	209.5	215.4
Merc.	...	16.7	24.9	23.3	16.2	16.1	25.6	40.5	57.9	76.5	95.2	113.2	129.5	142.2	147.7	143.9	137.0	137.8	148.1
Jup.	...	52.4	54.4	56.5	58.7	60.7	62.2	65.4	67.7	70.0	72.4	74.7	76.8	79.0	81.0	83.1	84.7	86.3	87.1
Sat.	...	88.4	89.0	89.7	90.3	91.4	92.4	93.5	94.5	95.0	97.2	98.6	99.9	101.3	102.5	103.8	105.0	106.0	107.1
Eng. date	Mr 29	Apr 8	Apr 18	Apr 28	My 8	My 18	My 28	Je 7	Je 17	Je 27	Jul 7	Jul 17	Jul 27	Aug 6	Aug 16	Aug 26	S 5	S 15	S 25
1682 Mars	...	3.9	11.5	18.7	26.1	33.2	40.4	47.6	54.6	61.5	68.3	75.0	81.8	88.2	94.8	101.3	107.6	113.8	119.1
Merc.	...	5.5	85.6	350.3	3.8	17.9	35.1	53.6	72.6	91.2	108.2	122.0	129.8	128.2	120.8	120.3	129.1	142.9	159.1
Jup.	...	81.3	82.3	83.8	85.2	87.0	89.1	91.0	93.2	95.5	97.8	100.0	102.3	104.6	106.7	108.9	111.1	113.1	114.6
Sat.	...	102.2	102.5	102.9	103.3	104.1	105.0	105.8	106.9	108.1	109.5	110.6	111.9	113.2	114.5	115.8	117.1	118.2	119.1
1683 Mars	...	182.4	178.9	175.8	173.9	178.0	173.6	175.8	178.4	181.8	186.0	190.7	195.7	201.5	207.3	213.2	219.6	226.1	232.6
Merc.	...	337.8	342.7	355.9	12.4	30.6	49.6	68.5	86.3	101.1	110.8	111.8	104.7	101.8	108.5	121.8	138.2	155.7	173.4
Jup.	...	111.7	111.9	113.2	113.0	114.2	115.5	117.1	118.8	120.4	122.4	124.6	126.8	128.9	131.1	133.4	135.6	137.7	139.9
Sat.	...	116.1	116.1	116.2	116.3	117.0	117.7	118.2	119.3	120.3	121.3	122.6	123.9	125.1	126.4	127.9	129.0	130.2	131.4
Eng. date	Mr 28	Apr 7	Apr 17	Apr 27	My 7	My 17	My 27	Je 6	Je 16	Je 26	Jul 6	Jul 16	Jul 26	Aug 5	Aug 15	Aug 25	S 4	S 14	S 24
1684 Mars	...	18.9	26.1	33.2	40.2	47.2	54.2	60.9	67.7	74.6	81.2	87.8	94.3	100.9	107.2	113.8	120.0	126.2	132.7
Merc.	...	334.2	349.8	7.9	23.1	45.1	64.0	79.0	91.1	93.8	87.9	83.1	88.7	101.1	116.9	134.3	152.4	170.0	188.1
Jup.	...	144.3	148.5	142.8	142.5	142.6	143.1	143.9	144.7	146.0	147.4	149.2	154.1	153.0	154.8	156.9	159.1	161.3	163.5
Sat.	...	130.0	129.7	129.5	129.4	129.8	130.1	130.6	131.4	132.3	133.1	134.3	135.4	136.6	137.9	139.2	140.4	141.6	142.6
1685 Mars	...	233.8	235.1	235.6	234.9	233.0	230.7	227.5	225.4	223.8	222.6	224.4	226.7	229.9	233.9	238.6	243.8	249.6	255.6
Merc.	...	345.4	3.9	22.8	41.1	57.4	70.0	75.1	70.4	64.5	57.9	79.6	95.1	112.6	130.9	148.9	165.7	179.9	189.1
Jup.	...	178.0	176.7	175.4	174.6	173.8	172.9	172.8	172.7	173.1	173.9	174.7	176.0	177.4	179.2	181.0	182.9	184.8	187.1
Sat.	...	143.7	143.2	142.8	142.5	142.6	142.8	142.8	143.5	144.2	144.8	145.8	146.8	147.9	149.1	150.3	151.5	152.8	154.1
Eng. date	Mr 29	Apr 8	Apr 18	Apr 28	My 8	My 18	My 28	Je 7	Je 17	Je 27	Jul 7	Jul 17	Jul 27	Aug 6	Aug 16	Aug 26	S 5	S 15	S 25
1686 Mars	...	33.4	40.4	47.2	54.0	60.6	67.4	74.0	80.5	87.0	93.6	100.1	106.5	112.9	119.5	125.7	132.0	138.3	144.7
Merc.	...	0.2	18.4	33.2	48.9	55.8	53.0	46.0	47.4	57.9	73.2	90.6	109.0	127.3	144.8	160.0	171.0	174.4	168.1
Jup.	...	212.1	211.0	209.7	208.4	207.0	205.9	204.9	204.0	203.2	203.0	203.1	203.3	204.1	205.2	206.4	208.7	209.3	211.2
Sat.	...	157.2	156.6	156.0	155.4	155.2	155.2	155.1	155.5	155.9	156.3	157.2	158.1	159.0	160.0	161.2	162.3	163.5	164.6
1687 Mars	...	265.8	271.6	276.9	281.9	286.7	291.1	294.9	297.9	300.0	301.0	301.1	298.9	296.4	293.8	291.8	281.4	292.1	298.9
Merc.	...	12.8	27.4	37.6	34.9	27.7	26.9	36.4	50.8	68.9	86.6	105.3	123.5	139.5	152.1	157.5	154.3	146.9	148.7
Jup.	...	245.2	244.8	244.4	243.6	242.6	241.3	240.2	238.8	237.6	236.5	235.3	234.8	234.8	234.6	234.6	235.5	236.5	237.5
Sat.	...	170.4	169.7	169.0	168.3	168.0	167.6	167.3	167.5	167.7	167.8	168.6	169.3	170.0	171.0	172.1	173.1	174.3	175.5
Eng. date	Mr 28	Apr 7	Apr 17	Apr 27	My 7	My 17	My 27	Je 6	Je 16	Je 26	Jul 6	Jul 16	Jul 26	Aug 5	Aug 15	Aug 25	S 4	S 14	S 24
1688 Mars	...	48.4	54.7	61.2	67.6	74.0	80.4	86.7	93.2	99.3	105.7	112.1	118.4	124.7	131.2	137.5	143.8	150.3	156.9
Merc.	...	15.1	16.5	9.5	6.8	14.8	28.4	45.7	68.9	82.9	101.5	118.3	132.1	139.8	138.3	131.9	120.2	138.9	152.4
Jup.	...	276.2	277.1	277.6	278.0	277.8	277.8	278.9	275.9	274.7	273.6	272.1	271.0	269.6	268.6	268.0	267.4	267.4	267.7
Sat.	...	183.3	182.5	181.7	180.9	180.4	179.9	179.4	179.4	179.3	179.8	180.3	180.3	180.8	181.7	182.6	183.5	184.6	185.8
Eng. date	Mr 29	Apr 8	Apr 18	Apr 28	My 8	My 18	My 28	Je 7	Je 17	Je 27	Jul 7	Jul 17	Jul 27	Aug 6	Aug 16	Aug 26	S 5	S 15	S 25
1689 Mars	...	288.7	295.7	302.6	309.8	316.3	323.4	330.1	336.6	342.8	348.9	354.5	359.6	364.1	368.1	371.0	373.9	376.8	379.7
Merc.	...	352.3	347.8	353.3	6.2	22.8	41.1	60.2	78.9	96.5	111.2	120.9	122.0	115.0	112.2	118.7	131.8	147.9	165.9
Jup.	...	305.9	306.9	308.8	310.1	311.1	312.2	312.5	312.9	312.6	312.3	311.5	309.2	307.8	306.8	305.0	303.9	303.9	302.9
Sat.	...	195.8	195.0	194.2	193.4	192.8	192.2	191.5	191.3	191.1	190.7	191.1	191.3	191.6	192.4	193.2	193.9	195.0	196.0
1690 Mars	...	68.0	69.1	74.9	81.0	87.1	93.1	99.2	105.4	111.6	117.9	124.0	130.3	136.6	143.0	149.4	155.8	162.3	168.8
Merc.	...	332.2	344.8	0.3	18.2	37.1	56.1	74.2	90.0	101.3	104.5	98.5	93.7	98.6	111.0	128.7	144.0	161.8	179.4
Jup.	...	332.3	335.5	337.7	339.7	341.7	343.6	345.2	346.4	347.7	348.4	349.0	348.9	348.9	348.1	347.4	346.9	344.9	343.5
Sat.	...	208.0	207.2	206.4	205.7	205.0	204.1	203.5	203.1	202.7	202.3	202.3	202.3	202.4	203.1	203.7	204.2	205.1	206.0
1691 Mars	...	307.6	315.2	322.8	330.3	337.8	345.3	352.7	359.9	367.0	374.0	381.0	387.7	394.7	401.5	408.0	414.5	421.0	427.5
Merc.	...	337.9	355.6	14.0	38.1	51.6	68.1	80.6	86.1	81.5	75.4	78.6	89.8	104.0	122.5	140.8	158.6	175.1	189.4
Jup.	...	0.9	3.3	5.4	8.8	10.6	12.7	15.1	17.1	19.1	20.6	22.1	23.6	24.5	25.0	25.5	25.4	24.9	24.4
Sat.	...	219.8	219.1	218.4	217.7	216.9	216.1	215.4	214.8	214.2	213.7	213.5	213.5	213.4	213.8	214.1	214.6	215.4	216.3
Eng. date	Mr 28	Apr 7	Apr 17	Apr 27	My 7	My 17	My 27	Je 6	Je 16	Je 26	Jul 6	Jul 16	Jul 26	Aug 5	Aug 15	Aug 25	S 4	S 14	S 24
1692 Mars																			

V-B—cont.

Mars, A.D. 1637—A.D. 1999; Mercury, A.D. 1645—A.D. 1999; Jupiter, A.D. 1656—A.D. 1999; Saturn, A.D. 1617—A.D. 1999—cont.

180	190	200	210	220	230	240	250	260	270		280	290	300	310	320	330	340	350	360
8 25	O 5	O 15	O 25	N 4	N 14	N 24	D 4	D 14	D 24		Ja 3	Ja 13	Ja 23	F 2	F 12	F 22	Mr 4	Mr 14	Mr 24
96.3	101.7	106.5	111.1	115.1	118.7	121.4	123.1	124.0	123.8	1679	122.1	119.3	116.6	119.9	108.4	105.7	104.9	104.9	106.6
197.0	194.9	187.4	186.6	195.0	206.3	224.5	241.8	259.2	275.8		290.3	300.8	302.1	295.2	291.8	297.2	309.5	326.0	343.8
336.2	335.1	334.2	333.5	333.2	333.4	333.7	335.4	335.6	336.7		338.2	340.2	342.1	344.1	346.3	348.6	351.0	353.4	355.6
67.0	66.8	66.5	66.2	65.5	64.8	64.1	63.2	62.4	61.5		60.9	60.8	59.6	59.6	59.5	59.4	60.0	60.5	61.0
																	Mr 3	Mr 13	Mr 23
207.1	214.1	221.2	228.3	235.7	243.2	250.6	258.2	265.8	273.6	1680	281.2	289.1	297.0	304.8	312.7	320.5	328.6	336.4	344.1
178.1	169.8	176.3	188.5	204.2	221.2	238.6	255.5	270.5	282.0		285.3	280.3	274.4	278.0	288.9	304.2	321.7	340.2	358.6
18.0	16.7	15.3	18.9	12.4	11.4	11.5	10.1	9.8	9.8		10.4	11.3	12.2	13.7	15.3	16.9	19.0	21.1	23.3
81.2	81.2	81.2	81.2	80.9	80.1	79.6	78.7	77.9	77.1		76.3	75.6	74.8	74.5	74.1	73.8	74.0	74.3	74.5
8 24	O 4	O 14	O 24	N 3	N 13	N 23	D 3	D 13	D 23		Ja 2	Ja 12	Ja 22	F 1	F 11	F 21	Mr 3	Mr 13	Mr 23
112.1	118.0	123.4	128.8	134.0	138.8	143.4	147.2	150.7	153.2	1681	155.2	156.0	155.6	153.6	150.4	146.8	142.9	139.8	137.8
157.5	168.9	183.8	200.6	218.1	235.0	250.7	263.2	270.2	266.5		259.3	259.6	268.6	283.0	299.9	318.0	339.4	354.0	369.7
56.2	55.7	54.9	54.1	52.9	51.6	50.2	48.9	47.8	46.6		45.9	45.6	45.4	45.7	46.2	47.2	48.5	49.8	51.4
94.9	95.2	95.4	95.7	95.5	95.2	94.9	94.1	93.3	92.6		91.9	91.0	90.1	89.7	89.0	88.4	88.4	88.3	88.2
222.3	229.4	236.6	243.9	251.4	258.9	266.5	274.3	282.0	289.8	1682	297.6	305.5	313.4	321.1	329.0	336.8	344.5	352.2	359.8
168.5	180.1	197.6	214.6	230.9	244.5	252.7	252.0	244.4	242.3		240.4	262.6	278.8	296.4	314.6	332.2	348.4	1.0	6.6
88.8	86.6	80.2	80.2	89.9	89.2	88.6	87.4	87.2	85.0		83.5	82.2	81.2	80.4	79.7	79.5	79.8	79.9	80.8
108.0	105.5	109.1	109.5	109.8	109.5	109.5	108.4	107.7			106.9	108.1	105.3	104.6	103.8	103.1	102.8	102.5	102.1
8 25	O 5	O 15	O 25	N 4	N 14	N 24	D 4	D 14	D 24		Ja 3	Ja 13	Ja 23	F 2	F 12	F 22	Mr 4	Mr 14	Mr 24
126.1	132.1	137.8	143.6	149.3	155.0	160.3	165.3	170.3	174.9	1683	179.1	183.0	186.1	188.7	190.4	190.7	189.9	187.2	184.4
176.9	194.2	211.0	225.4	237.3	251.0	266.1	280.6	292.6	242.6		258.0	275.3	293.1	310.7	327.2	340.4	347.8	345.5	338.4
116.7	118.5	119.7	120.8	121.6	122.3	122.3	122.4	121.9	121.0		120.0	119.0	117.7	116.4	114.9	114.0	112.8	112.3	112.0
120.5	121.2	122.0	122.7	123.0	123.2	123.4	123.1	122.8	122.5		121.8	121.1	120.3	119.5	118.8	117.9	117.3	116.8	116.2
																	Mr 3	Mr 13	Mr 23
239.0	247.0	254.1	261.4	268.8	276.6	284.0	291.7	299.5	307.1	1684	314.9	322.6	330.2	337.7	345.5	352.9	0.4	7.6	15.0
190.7	206.0	217.9	222.6	217.7	210.6	212.8	228.0	237.6	254.1		271.9	289.5	306.0	320.2	328.7	328.8	321.4	319.4	326.0
142.0	143.9	145.8	147.5	149.0	150.5	151.7	152.4	153.2	153.3		153.1	152.9	152.2	151.1	149.8	148.6	147.0	146.0	144.8
132.5	133.5	134.4	135.4	135.8	136.4	136.8	136.7	136.7	136.5		135.0	135.2	134.7	133.9	133.1	132.3	131.6	130.9	130.2
8 24	O 4	O 14	O 24	N 3	N 13	N 23	D 3	D 13	D 23		Ja 2	Ja 12	Ja 22	F 1	F 11	F 21	Mr 3	Mr 13	Mr 23
138.7	144.9	151.0	157.1	163.1	169.0	175.0	180.7	186.6	192.3	1685	197.8	203.1	208.3	213.3	218.0	222.4	228.5	229.7	232.6
199.3	208.0	204.4	196.5	195.5	204.1	217.5	238.8	250.9	268.4		285.3	300.0	310.2	311.9	305.6	301.1	307.2	319.6	336.0
165.7	167.8	169.9	172.0	174.2	176.0	177.7	179.2	180.5	181.6		182.6	183.0	183.2	183.3	180.0	182.1	181.2	181.0	178.6
144.2	145.2	146.3	147.3	148.3	148.7	149.4	149.5	149.6	149.5		149.4	149.0	148.6	147.9	147.1	146.4	145.6	144.8	144.0
261.9	268.4	275.1	282.1	289.2	296.4	303.7	311.0	318.7	325.6	1686	332.9	340.2	347.5	354.7	1.7	8.9	15.9	23.1	29.8
189.6	182.4	179.2	185.4	197.7	213.3	230.3	247.7	264.7	279.9		291.2	295.4	299.2	284.3	287.5	298.7	314.2	331.7	350.3
189.0	191.3	193.4	195.8	198.0	199.9	202.3	204.2	206.1	207.8		209.3	210.7	212.0	212.7	213.5	213.7	213.5	213.3	212.6
155.8	156.4	158.3	158.7	159.5	160.3	161.2	161.6	162.0	162.3		162.2	162.1	161.8	161.2	160.6	160.0	159.2	158.4	157.4
8 25	O 5	O 15	O 25	N 4	N 14	N 24	D 4	D 14	D 24		Ja 3	Ja 13	Ja 23	F 2	F 12	F 22	Mr 4	Mr 14	Mr 24
151.0	157.3	163.5	169.9	176.1	182.5	188.7	195.0	201.3	207.5	1687	213.8	220.1	226.2	232.5	238.7	244.9	250.8	256.9	262.8
162.8	169.9	178.1	193.2	209.9	227.1	244.8	260.0	272.6	278.8		275.7	288.8	298.8	278.6	293.1	309.8	328.0	346.3	4.3
218.2	215.0	217.4	219.6	221.6	224.1	226.2	228.3	230.7	232.8		234.7	236.8	238.5	240.1	241.4	242.9	244.0	244.7	244.9
166.0	167.2	168.4	169.5	170.5	171.5	172.5	173.1	173.6	174.2		174.3	174.4	174.4	174.0	173.6	173.1	172.3	171.7	170.8
																	Mr 3	Mr 13	Mr 23
297.1	301.1	305.7	310.5	315.9	321.8	327.7	333.9	340.0	346.6	1688	353.0	359.2	365.6	372.1	378.6	385.1	391.6	398.1	404.6
158.8	172.8	189.4	206.7	224.1	240.4	253.7	261.8	261.2	253.9		251.3	258.5	272.1	288.4	306.3	324.4	342.3	358.5	11.6
239.1	240.7	242.6	244.4	246.7	248.9	251.1	253.2	255.7	257.9		260.0	262.5	264.7	266.9	268.8	270.7	272.4	274.2	275.6
176.6	177.8	179.0	180.3	181.3	182.4	183.5	184.2	184.9	185.7		186.9	186.2	186.4	186.2	185.9	185.6	185.0	184.8	183.7
8 24	O 4	O 14	O 24	N 3	N 13	N 23	D 3	D 13	D 23		Ja 2	Ja 12	Ja 22	F 1	F 11	F 21	Mr 3	Mr 13	Mr 23
163.2	169.7	176.1	182.5	189.2	195.8	202.3	208.9	215.6	222.3	1689	229.1	236.0	243.0	249.7	256.6	263.6	270.6	277.6	284.7
198.7	184.9	208.6	220.2	234.7	244.8	262.8	280.7	295.1	240.3		251.8	267.6	284.6	302.6	321.2	339.9	350.5	358.0	356.1
268.2	269.1	270.3	271.7	273.3	275.2	276.0	276.1	281.5	288.8		285.9	288.5	290.6	293.0	295.6	297.9	299.9	302.6	304.2
187.0	188.2	184.4	190.6	191.7	192.8	193.9	194.7	195.6	196.5		197.0	197.5	197.9	197.9	197.8	197.8	197.2	196.6	196.1
8 25	O 5	O 15	O 25	N 4	N 14	N 24	D 4	D 14	D 24		Ja 3	Ja 13	Ja 23	F 2	F 12	F 22	Mr 4	Mr 14	Mr 24
10.3	7.8	5.2	8.5	2.9	3.2	4.4	8.7	9.8	13.4	1690	17.6	22.4	27.1	32.2	37.4	42.9	48.5	54.4	60.1
18.0	20.0	21.5	22.6	23.1	23.6	24.0	24.2	24.2	24.7		263.8	281.5	299.1	315.8	329.9	338.9	338.9	331.3	329.4
302.4	302.2	302.1	302.7	303.5	304.5	305.8	307.4	309.0	311.0		313.7	315.3	317.7	320.1	322.4	324.9	327.9	329.7	332.7
197.1	198.3	199.5	200.6	201.8	203.0	204.1	205.1	206.1	207.0		207.7	208.3	208.9	209.1	209.8	209.4	209.0	208.7	208.2
175.4	181.9	188.7	195.4	202.1	209.0	215.8	222.7	229.9	237.8	1691	244.3	251.4	258.7	266.1	273.5	281.0	288.4	296.0	303.6
195.4	208.4	215.2	213.0	205.4	214.0	226.8													

TABLE

Geocentric Places of Mars, Mercury, Jupiter, Venus and Saturn for every tenth day of current cycle
Venus, A.D. 1765—A.D. 1999

Day of I.S.Y.	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
Eng. date ..	Mar 29	Apr 8	Apr 18	Apr 28	May 8	May 18	May 28	Jun 7	Jun 17	Jun 27	Jul 7	Jul 17	Jul 27	Aug 6	Aug 16	Aug 26	Sep 5	Sep 1
1693 Mars ..	325.3	333.1	340.9	348.4	356.0	363.6	371.1	378.4	385.6	392.7	399.8	406.5	413.2	419.9	426.6	433.2	439.8	446.4
Merc. ..	6.2	23.4	37.9	48.5	56.0	61.8	66.9	71.2	73.6	75.9	78.2	80.4	82.8	84.8	86.6	88.6	90.2	91.1
Jup. ...	56.3	58.2	60.2	62.3	64.3	66.5	68.9	71.2	73.6	75.9	78.2	80.4	82.8	84.8	86.6	88.6	90.2	91.1
Sat. ...	242.7	242.8	241.9	241.5	240.8	240.1	239.8	238.5	237.8	237.0	236.5	235.0	235.6	235.5	235.6	235.6	236.2	236.8
1694 Mars ..	98.7	102.1	106.3	111.0	115.8	121.0	126.6	131.9	137.8	143.6	149.5	155.8	162.0	168.3	174.7	181.2	188.0	194.7
Merc. ...	16.1	26.5	27.6	20.7	17.9	25.1	39.1	55.9	74.2	92.9	111.2	128.0	142.1	149.5	148.4	140.8	139.9	147.7
Jup. ...	85.1	86.3	87.6	89.1	90.9	92.8	94.6	96.7	98.9	101.2	103.2	105.6	107.9	110.2	112.4	114.5	116.6	118.7
Sat. ...	253.6	253.4	253.2	252.0	252.3	251.7	251.1	250.4	249.6	248.8	248.2	247.5	246.9	246.7	246.6	246.4	246.8	247.7
1695 Mars ...	342.1	349.9	357.4	364.5	371.2	377.5	383.8	389.9	395.8	401.5	407.1	412.6	418.1	423.6	429.1	434.6	440.1	445.6
Merc. ...	9.2	3.6	35.6	4.1	16.7	33.1	51.4	70.3	89.2	108.2	121.5	131.4	132.1	125.4	122.0	128.8	141.5	157.7
Jup. ...	116.0	116.1	116.5	117.0	118.1	119.3	120.6	122.2	124.0	126.0	128.1	130.2	132.4	134.3	136.5	139.0	141.2	143.7
Sat. ...	264.7	264.7	264.6	264.6	264.1	263.6	263.0	262.2	261.4	260.7	260.0	259.3	258.6	258.3	259.9	257.5	257.7	257.7
Eng. date ..	Mar 28	Apr 7	Apr 17	Apr 27	May 7	May 17	May 27	Jun 6	Jun 16	Jun 26	Jul 6	Jul 16	Jul 26	Aug 5	Aug 15	Aug 25	Sep 4	Sep 1
1696 Mars ..	124.1	125.2	127.4	130.2	133.9	138.0	142.7	147.6	153.0	158.5	164.4	170.2	176.4	182.6	189.1	195.6	202.4	209.7
Merc. ...	340.4	342.9	345.0	347.0	348.5	349.8	350.8	351.4	351.6	351.7	351.8	351.9	352.0	352.1	352.2	352.3	352.4	352.5
Jup. ...	148.9	149.0	149.2	149.8	150.8	152.0	153.4	154.9	156.6	158.4	160.2	162.1	164.0	165.8	167.6	169.4	171.2	173.0
Sat. ...	275.4	275.7	275.9	276.1	275.7	275.4	275.1	274.3	273.6	272.9	272.2	271.4	270.6	270.1	269.6	269.0	268.9	269.9
Eng. date ..	Mar 29	Apr 8	Apr 18	Apr 28	May 8	May 18	May 28	Jun 7	Jun 17	Jun 27	Jul 7	Jul 17	Jul 27	Aug 6	Aug 16	Aug 26	Sep 5	Sep 1
1697 Mars ...	357.9	364.4	371.0	377.7	384.4	391.1	397.8	404.5	411.2	417.9	424.6	431.3	438.0	444.7	451.4	458.1	464.8	471.5
Merc. ...	333.4	338.3	343.2	348.1	353.0	357.9	362.8	367.7	372.6	377.5	382.4	387.3	392.2	397.1	402.0	406.9	411.8	416.7
Jup. ...	182.7	181.4	180.1	179.1	178.0	177.3	176.9	176.7	176.7	176.7	176.7	176.7	176.7	176.7	176.7	176.7	176.7	176.7
Sat. ...	286.4	286.7	287.0	287.5	287.8	287.1	287.0	286.4	285.8	285.3	284.5	283.7	283.0	282.3	281.6	280.9	280.7	280.0
1698 Mars ..	162.1	159.3	158.0	158.1	158.8	161.1	164.1	167.8	172.0	176.7	182.0	187.4	193.3	199.5	205.6	212.1	218.8	225.5
Merc. ...	313.4	318.3	323.2	328.1	333.0	337.9	342.8	347.7	352.6	357.5	362.4	367.3	372.2	377.1	382.0	386.9	391.8	396.7
Jup. ...	218.8	215.7	214.5	213.2	211.8	210.8	209.6	208.3	207.0	205.7	204.3	202.9	201.5	200.1	198.7	197.2	195.8	194.4
Sat. ...	297.2	297.8	298.4	298.9	299.0	299.1	299.2	298.7	298.3	297.9	297.1	296.4	295.6	294.8	294.1	293.4	293.0	292.2
1699 Mars ...	13.0	20.4	27.5	34.8	41.8	49.0	55.9	62.6	69.5	76.2	82.8	89.5	96.0	102.6	109.3	115.0	121.6	127.7
Merc. ...	358.0	357.7	357.7	357.7	357.5	357.3	357.0	356.7	356.4	356.1	355.8	355.5	355.2	354.9	354.6	354.3	354.0	353.7
Jup. ...	249.4	249.2	249.2	248.3	247.6	246.4	245.1	243.8	242.5	240.9	239.1	237.4	235.0	232.8	230.6	228.4	226.2	224.0
Sat. ...	308.1	308.9	309.6	310.4	310.8	311.1	311.3	311.1	310.8	310.6	310.0	309.4	308.7	307.9	307.1	306.2	305.6	305.0
Eng. date ..	Mar 28	Apr 7	Apr 17	Apr 27	May 7	May 17	May 27	Jun 6	Jun 16	Jun 26	Jul 6	Jul 16	Jul 26	Aug 5	Aug 15	Aug 25	Sep 4	Sep 1
1700 Mars ..	215.8	214.5	212.3	209.2	205.9	203.3	201.9	201.8	202.7	205.2	208.1	212.0	216.5	221.6	227.1	232.8	239.2	245.5
Merc. ...	11.5	27.1	37.4	48.8	56.0	61.8	66.9	71.2	73.6	75.9	78.2	80.4	82.8	84.8	86.6	88.6	90.2	91.1
Jup. ...	290.0	281.2	282.0	282.4	282.7	282.4	282.1	281.1	279.9	278.7	277.9	276.3	274.8	273.7	272.9	272.5	272.1	272.2
Sat. ...	319.1	320.1	321.0	322.0	322.5	323.1	323.6	323.6	323.5	323.5	323.0	323.5	323.0	321.2	320.4	319.6	318.9	318.1
Eng. date ..	Mar 29	Apr 8	Apr 18	Apr 28	May 8	May 18	May 28	Jun 7	Jun 17	Jun 27	Jul 7	Jul 17	Jul 27	Aug 6	Aug 16	Aug 26	Sep 5	Sep 1
1701 Mars ..	27.8	34.8	41.6	48.6	55.4	62.2	69.0	75.6	82.0	88.7	95.4	101.8	108.2	114.7	121.1	127.5	133.7	140.0
Merc. ...	16.4	20.3	14.4	9.5	14.3	27.3	43.5	61.8	80.9	99.2	116.5	131.4	141.3	142.4	135.4	128.8	138.2	151.1
Jup. ...	302.5	310.9	312.9	314.3	315.5	316.4	317.3	317.5	317.7	317.3	316.8	315.9	314.6	313.4	312.1	310.5	308.3	306.1
Sat. ...	380.3	381.4	382.5	383.6	384.3	385.1	385.8	386.0	386.3	386.5	386.2	386.0	385.6	384.9	384.9	383.4	382.6	381.1
1702 Mars ...	254.9	259.3	263.6	267.2	269.9	272.0	272.8	272.6	271.6	269.9	266.1	264.4	262.1	263.4	264.7	267.4	271.1	275.5
Merc. ...	357.2	355.8	353.6	351.3	349.9	348.5	347.8	347.8	348.3	349.0	349.6	350.3	351.0	351.7	352.4	353.1	353.8	354.5
Jup. ...	337.1	339.3	341.6	343.7	345.7	347.8	349.3	350.8	352.2	353.0	353.7	354.0	354.3	354.6	354.8	354.8	354.6	354.0
Sat. ...	341.6	342.8	344.0	345.2	346.2	347.1	348.1	348.6	349.2	349.6	349.5	349.5	349.4	348.8	348.3	347.7	346.9	346.0
1703 Mars ...	42.4	48.9	55.5	62.1	68.7	75.2	81.7	88.1	94.6	100.9	107.3	113.7	120.2	126.6	132.9	139.3	145.7	152.1
Merc. ...	334.0	343.1	352.4	361.7	371.0	380.3	389.6	398.9	408.2	417.5	426.8	436.1	445.4	454.7	464.0	473.3	482.6	491.9
Jup. ...	4.9	7.8	9.7	12.9	14.5	16.7	18.9	21.0	22.9	24.9	26.5	27.8	29.1	29.8	30.4	30.5	30.1	29.9
Sat. ...	353.3	354.6	355.9	357.2	358.3	359.4	360.5	361.2	361.9	362.7	363.5	364.3	365.1	365.9	366.7	367.5	368.3	369.1
Eng. date ..	Mar 28	Apr 7	Apr 17	Apr 27	May 7	May 17	May 27	Jun 6	Jun 16	Jun 26	Jul 6	Jul 16	Jul 26	Aug 5	Aug 15	Aug 25	Sep 4	Sep 1
1704 Mars ...	280.1	284.9	289.3	293.9	298.3	302.3	306.4	310.4	314.2	317.9	321.5	325.2	328.9	332.6	336.3	340.0	343.7	347.4
Merc. ...	346.7	353.6	360.5	367.4	374.3	381.2	388.1	395.0	401.9	408.8	415.7	422.6	429.5	436.4	443.3	450.2	457.1	464.0
Jup. ...	32.1	34.6	36.9	39.1	41.7	43.8	46.2	48.8	51.0	53.3	55.2	57.4	59.1	60.9	62.5	63.7	64.6	65.1
Sat. ...	6.2	6.5	7.8	9.1	10.3	11.5	12.8	13.7	14.6	15.6	16.1	16.6	17.1	17.0	16.9	16.8	16.2	15.1
Eng. date ..	Mar 29	Apr 8	Apr 18	Apr 28	May 8	May 18	May 28	Jun 7	Jun 17	Jun 27	Jul 7	Jul 17	Jul 27	Aug 6	Aug 16	Aug 26	Sep 5	Sep 1
1705 Mars ..	57.3	63.3	69.6	75.6	81.7	88.1	94.4	100.6	106.8	113.0	119.5	125.7	132.1	138.4	144.7	151.0	157.5	164.0
Merc. ...	349.3	352.8	356.3	359.8	363.3	366.8	370.3	373.8	377.3	380.8	384.3	387.8	391.3	394.8	398.3	401.8	405.3	408.8
Jup. ...	61.0	61.9	63.9	66.0	67.9	70.1	72.5	74.7	77.1	79.4	81.6	83.9	86.2	88.5	90.5	92.4	94.1	95.5
Sat. ...	17.3	18.6	19.9	19.8	22.6	23.9	25.3	26.4	27.5	28.6	29.3	30.0	30.7	31.0	31.3	31.4	31.1	30.0
1706 Mars ..	300.2	307.7	315.2	322.3	330.0	337.2	344.7	351.6	359.8	365.4	371.7	378.2	384.7	391.2	397.7	404.2	410.7	417.2
Merc. ...	4.2	21.9	37.4	48.0	50.3	43.5	40.0	46.3	59.9	76.3	94.5	113.1	131.1	147.7	161.6	169.1	167.9	160.0
Jup. ...	89.4	90.2	91.4	93.1	94.3	96.2	98.0	100.2	102.3	104.5	106.7	109.1	111.3	113.5	115.8	117.9	120.0	122.1
Sat. ...	29.7	31.0	32.3	33.5	34.0	34.3	34.7	35.1	35.5	35.9	36.3	36.7	37.1	37.5	37.9	38.3	38.7	39.1
Mesh. Vrah. Mith. Kal. Sim. Kan. Tul. Vrsch. Dhan. Mak. Kam. Min. Asvn. Bhar. Krit. Rohi. Mrig. Ardh. Punar. Push. Aale	30	60	90	120	150	180	210	240	270	300	330	360	390	420	450	480	510	540</

V-B—cont.

Mars, A.D. 1637—A.D. 1999, Mercury, A.D. 1645—A.D. 1999, Jupiter, A.D. 1656—A.D. 1999, Saturn, A.D. 1617—A.D. 1999—cont.

180	190	200	210	220	230	240	250	260	270		280	290	300	310	320	330	340	350	360
S 25 89.0	O 5 93.9	O 15 98.5	O 25 102.4	N 4 105.8	N 14 108.4	N 24 110.3	D 4 110.9	D 14 110.3	D 24 108.1	1694	Ja 3 105.1	Ja 13 101.4	Ja 23 97.6	F 2 94.5	F 12 92.6	F 22 91.9	Mr 4 92.5	Mr 14 94.3	Mr 24 96.9
157.9	167.8	182.3	198.6	216.0	233.2	249.3	262.9	271.1	270.2		262.8	260.8	268.1	281.6	298.0	316.0	334.3	352.4	367.4
198.0	93.8	94.1	94.9	94.6	93.9	93.4	92.6	90.7	90.0		88.7	87.4	86.3	85.3	84.4	84.1	83.9	84.2	84.9
237.2	238.1	239.0	239.9	241.0	242.1	243.3	244.5	245.7	246.8		247.9	248.9	250.0	250.8	251.7	252.5	252.9	253.3	253.7
201.9	208.5	215.4	222.7	229.8	237.1	244.5	252.1	259.6	267.3	1695	275.1	282.8	290.5	298.4	306.2	314.2	322.2	329.9	337.9
161.9	178.1	195.5	212.7	229.3	243.7	253.5	255.3	248.8	244.4		249.1	261.3	276.8	294.3	312.5	330.3	347.4	364.9	379.9
120.3	121.9	123.8	124.6	125.5	126.2	126.6	126.6	126.5	125.8		121.8	123.9	122.6	121.3	120.0	118.6	117.5	116.8	116.2
247.5	248.3	249.1	249.8	250.9	251.9	253.0	254.2	255.4	256.5		257.7	258.8	259.9	260.9	261.8	262.8	263.8	263.9	264.5
106.4	112.1	117.2	122.4	127.2	131.6	135.5	138.5	141.4	143.0	1696	143.9	142.7	140.7	137.7	134.7	130.3	Mr 3 127.0	Mr 13 121.6	Mr 23 124.1
174.3	191.9	209.2	224.2	235.9	239.8	235.8	229.0	231.1	241.5		256.1	272.9	290.8	308.0	325.6	343.8	349.4	349.8	342.8
145.4	147.5	149.4	151.1	152.6	154.0	155.2	156.3	157.0	157.5		157.4	157.1	156.7	155.7	154.4	153.1	152.1	150.5	149.5
258.0	258.6	259.2	259.9	260.9	261.9	262.9	264.1	265.3	266.4		267.5	268.8	269.9	270.9	271.9	273.0	273.8	273.8	275.2
S 24 216.1	O 4 223.3	O 14 230.3	O 24 237.7	N 3 245.1	N 13 252.5	N 23 260.2	D 3 267.8	D 13 275.5	D 23 283.3	1697	Ja 2 291.1	Ja 12 299.1	Ja 22 306.9	F 1 314.7	F 11 322.6	F 21 330.5	Mr 3 338.4	Mr 13 346.0	Mr 23 353.7
188.8	204.6	217.0	224.1	232.2	241.3	251.6	262.4	273.0	283.6		294.1	297.4	304.4	319.4	339.8	342.5	345.9	347.5	348.4
168.9	171.0	173.4	175.2	177.5	179.5	181.1	182.5	184.1	185.5		186.4	187.0	187.5	187.5	187.2	186.7	185.7	184.7	183.4
268.4	269.3	269.8	270.8	271.2	272.1	273.0	274.0	275.0	276.0		277.2	278.4	279.5	280.6	281.8	282.9	283.9	284.8	285.7
S 25 120.8	O 5 126.7	O 15 132.4	O 25 138.1	N 4 143.6	N 14 148.5	N 24 153.9	D 4 158.7	D 14 163.1	D 24 167.3	1698	Ja 3 170.6	Ja 13 173.4	Ja 23 175.5	F 2 176.2	F 12 176.2	F 22 174.3	Mr 4 171.3	Mr 14 167.6	Mr 24 163.7
198.7	207.5	207.9	209.3	197.2	203.4	216.2	231.9	248.9	266.4		283.4	298.9	310.6	315.0	310.1	303.9	307.1	318.7	334.1
192.4	194.7	196.9	198.8	201.0	203.7	205.3	207.6	209.5	211.3		212.9	214.5	215.7	216.6	217.3	217.8	217.3	217.8	217.2
280.2	280.4	280.7	281.1	281.8	282.9	283.3	284.4	285.6	286.5		287.7	288.9	290.2	291.4	292.6	293.7	294.7	295.7	296.7
232.8	239.8	247.1	254.4	261.8	269.3	277.0	284.7	292.4	300.2	1699	308.0	315.7	323.5	331.2	338.9	346.6	354.1	361.6	369.0
192.0	198.9	181.4	185.6	196.7	211.6	227.9	245.7	263.8	278.7		291.4	297.7	294.8	287.6	268.1	257.8	312.2	329.7	348.1
210.8	218.5	220.7	223.0	225.1	227.1	229.6	231.8	233.8	236.3		238.3	240.2	242.1	244.0	245.5	246.8	247.8	248.5	249.3
292.0	291.1	292.2	292.2	292.8	293.4	294.0	295.0	296.0	296.9		298.1	299.3	300.4	301.6	302.8	304.1	305.3	306.4	307.6
134.0	139.9	146.0	152.0	157.8	163.8	169.2	174.9	180.4	185.8	1700*	190.9	195.6	200.3	205.0	208.2	211.4	Mr 3 213.9	Mr 13 215.5	Mr 23 216.2
166.0	167.2	177.2	191.3	207.7	225.1	242.2	258.6	272.0	280.3		279.8	272.2	270.2	278.0	291.4	307.8	325.9	344.4	361.4
242.9	244.3	246.1	248.3	250.1	252.3	254.5	256.8	259.1	261.4		263.6	266.0	268.2	270.3	272.4	274.4	276.4	278.0	279.4
304.6	304.4	304.2	304.0	304.4	304.7	305.2	306.1	306.9	307.8		308.9	310.0	311.1	312.4	313.7	314.9	316.2	317.4	318.5
S 24 252.4	O 4 259.3	O 14 266.4	O 24 273.6	N 3 280.8	N 13 288.2	N 23 295.6	D 3 303.1	D 13 310.7	D 23 318.2	1701	Ja 2 325.6	Ja 12 333.2	Ja 22 340.5	F 1 347.9	F 11 355.3	F 21 362.5	Mr 3 369.9	Mr 13 377.2	Mr 23 384.4
157.6	171.3	187.4	204.7	222.1	238.3	252.9	268.0	284.4	297.8		253.1	258.7	270.7	286.3	303.8	323.2	340.1	357.2	374.4
272.4	273.6	274.5	275.5	277.2	278.9	280.9	283.0	285.0	287.4		289.7	291.9	294.2	296.8	299.0	301.6	304.8	308.0	311.2
317.4	317.1	316.7	316.3	316.5	316.6	316.9	317.5	318.2	318.9		320.0	321.1	322.1	323.4	324.5	325.8	327.1	328.4	329.6
S 25 146.2	O 5 152.5	O 15 158.7	O 25 164.9	N 4 171.1	N 14 177.3	N 24 183.4	D 4 189.5	D 14 195.5	D 24 201.8	1702	Ja 3 207.6	Ja 13 213.6	Ja 23 219.7	F 2 225.3	F 12 231.1	F 22 236.7	Mr 4 242.1	Mr 14 247.3	Mr 24 252.9
160.8	168.9	201.0	218.3	233.5	244.8	249.0	244.2	237.8	240.1		250.9	263.5	282.6	300.5	318.4	335.5	350.1	364.0	377.8
307.5	307.1	307.1	307.3	308.0	308.7	309.9	311.5	313.0	314.9		317.0	319.2	321.4	323.9	326.2	328.6	331.0	333.2	335.8
331.0	330.5	330.0	329.4	329.3	329.2	329.2	329.7	330.2	330.7		331.7	332.7	333.5	334.7	335.9	337.1	338.4	339.7	341.0
280.4	285.8	291.8	298.0	304.4	310.9	317.4	324.1	331.0	337.7	1703	344.7	351.5	358.4	365.2	372.0	378.8	385.5	392.1	398.8
180.8	193.0	213.8	226.5	238.3	251.0	262.4	272.7	281.3	285.3		261.6	279.4	297.0	314.1	329.1	339.9	348.8	356.5	363.1
347.9	346.6	345.2	344.3	343.8	343.4	343.4	343.8	344.5	345.3		344.8	344.4	344.2	344.3	344.0	343.6	343.1	342.6	342.1
345.2	344.5	343.8	343.0	342.7	342.4	342.1	342.4	342.7	343.0		343.7	344.5	345.3	346.4	347.5	348.6	349.9	351.2	352.5
158.4	164.8	171.2	177.7	184.1	190.6	197.0	203.5	210.1	216.5	1704	223.2	229.8	236.5	243.1	250.2	256.5	Mr 3 263.1	Mr 13 269.9	Mr 23 276.7
194.0	207.9	216.8	216.6	209.4	205.7	212.8	225.3	241.0	258.3		275.8	293.0	308.5	320.4	325.2	330.2	314.4	317.0	320.5
28.8	27.6	26.6	25.2	23.8	22.7	21.3	20.5	19.8	19.7		19.8	20.4	21.0	22.2	23.7	25.2	27.0	29.0	31.7
0.0	359.2	358.4	357.5	356.9	356.4	355.9	355.9	355.9	355.9		356.5	357.1	357.7	358.7	359.6	360.6	361.6	362.6	363.6
S 24 237.6	O 4 236.5	O 14 236.6	O 24 236.8	N 3 236.8	N 13 236.7	N 23 236.7	D 3 236.7	D 13 236.7	D 23 236.7	1705	Ja 2 236.7	Ja 12 236.7	Ja 22 236.7	F 1 236.7	F 11 236.7	F 21 236.7	Mr 3 236.7	Mr 13 236.7	Mr 23 236.7
199.1	201.9	195.7	190.7	184.5	205.7	220.4	237.4	254.9	272.2		288.0	301.0	307.4	304.4	297.8	298.1	307.7	322.4	339.6
66.5	65.0	65.1	64.5	63.6	62.5	61.1	59.7	58.5	57.3		56.1	55.5	54.9	54.9	55.8	55.8	56.7	58.0	59.3
15.0	14.2	13.4	12.5	11.8	11.1	10.4	10.1	9.8	9.5		9.8	10.2	10.5	11.4	12.2	13.0	14.2	15.4	16.6
S 25 170.5	O 5 177.1	O 15 183.8	O 25 190.4	N 4 197.1	N 14 203.8	N 24 210.5	D 4 217.3	D 14 224.4	D 24 231.2	1706	Ja 3 238.3	Ja 13 245.3	Ja 23 252.4	F 2 259.7	F 12 266.9	F 22 274.2	Mr 4 281.6	Mr 14 288.9	Mr 24 296.3
184.5	175.2	176.4	186.4	200.5	217.0	234.3	251.6	268.8	281.4		289.8	299.2	281.9	279.5	287.4	300.9	317.6	335.8	354.3
96.8	97.7	98.7	99.0	99.3	98.9	98.5	97.6	96.4	95.2		93.9	92.6	91.3	90.2	89.2	88.7	88.5	88.5	89.0
30.3	29.4	28.7	28.0	27.1	26.3	25.5	24.9	24.4	23.8		23.9	23.9	23.9	24.6	25.3	25.9	26.9	28.0	29.0
40.0	50.0	50.0	48.8	48.1	43.0	40.0	37.9	36.7	36.7	1707	38.0	40.0	42.9	46.4	50.5	54.8	59.6	64.7	69.8
158.8	166.7	180.6	196.6	213.8	231.1	247.7	262.2	272.0	273.8		267.2	262.9	267.7	280.3	296.1	313.9	332.2	350.3	368.3
123.8	125.7	127.2	128.5	129.5	130.4	130.9	131.0	130.7	130.5		129.6	128.5	127.8	126.2	124.8	123.5	122.3	121.5	120.8
46.3	44.7	44.1	43.5	42.6	41.8	40.9	40.2	39.5	38.5		38.6	38.3	38.1	38.4	38.7	39.1	39.9	40.8	41.7

Mag. P. Phal. U. Phal. Hasta. Chit. Svati. Visa. Anur. Jyesh. Mula. P. Ash. U. Ash. Śrav. Dhan. Satab. P. Bhad. U. Bhad. Revati.
133.8 140.7 160.0 173.8 186.7 200.0 213.8 226.7 240.0 253.3

TABLE

Geocentric Places of Mars, Mercury, Jupiter, Venus and Saturn for every tenth day of current cycle.
Venus, A.D. 1765—A.D. 1999;

Day of I.S.Y.	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
Eng. date	Mar 29	Apr 8	Apr 18	Apr 28	May 8	May 18	May 28	Jun 7	Jun 17	Jul 7	Jul 17	Jul 27	Aug 6	Aug 16	Aug 26	Sep 5	Sep 15	
1707 Mars	72.6	78.3	83.8	89.5	95.3	101.2	107.2	113.1	119.2	125.3	131.4	137.8	144.0	150.5	156.7	163.3	169.9	176.8
Merc.	15.1	27.2	31.1	25.1	20.5	25.4	37.6	53.8	72.0	90.7	109.2	126.5	141.5	150.7	151.9	144.7	141.6	148.1
Jup.	120.4	120.4	120.4	121.0	121.9	123.0	124.3	125.8	127.5	129.4	131.2	133.2	135.4	137.8	139.8	142.3	144.5	146.4
Sat.	42.4	43.7	45.0	46.2	47.5	48.8	50.2	51.5	52.8	54.1	55.3	56.4	57.5	58.3	59.0	59.7	59.9	60.1
Eng. date	Mar 28	Apr 7	Apr 17	Apr 27	May 7	May 17	May 27	Jun 6	Jun 16	Jun 26	Jul 6	Jul 16	Jul 26	Aug 5	Aug 15	Aug 25	Sep 4	Sep 14
1708 Mars	318.5	326.2	334.1	341.5	349.2	356.7	364.3	371.5	378.8	385.9	392.9	399.7	406.2	412.7	419.4	426.8	434.0	441.1
Merc.	12.0	8.4	1.9	4.6	16.8	31.3	49.4	68.1	87.2	104.1	120.5	132.3	135.4	129.7	124.4	128.7	140.3	155.4
Jup.	153.5	152.5	151.5	151.1	150.9	150.9	151.5	152.1	153.1	154.4	156.1	157.8	159.5	161.6	163.4	165.7	167.7	169.9
Sat.	55.3	56.5	57.7	58.8	60.1	61.4	62.7	64.0	65.4	66.8	68.1	69.3	70.5	71.4	72.4	73.4	73.8	74.2
Eng. date	Mar 29	Apr 8	Apr 18	Apr 28	May 8	May 18	May 28	Jun 7	Jun 17	Jun 27	Jul 7	Jul 17	Jul 27	Aug 6	Aug 16	Aug 26	Sep 5	Sep 15
1709 Mars	90.6	94.8	99.4	104.5	109.8	115.2	120.7	126.4	132.3	138.3	144.3	150.4	156.9	163.0	169.4	176.0	182.7	189.4
Merc.	345.9	344.2	353.8	8.8	26.4	45.3	64.3	82.6	99.1	112.1	117.9	114.0	107.2	100.1	119.9	134.6	151.5	169.2
Jup.	187.4	186.1	184.8	183.7	182.7	181.7	181.2	181.0	180.9	181.5	182.4	183.1	184.5	186.0	187.7	189.4	191.3	193.6
Sat.	68.6	69.5	70.5	71.5	72.7	74.0	75.2	76.6	77.9	79.2	80.6	81.8	83.2	84.3	85.4	86.5	87.2	88.0
1710 Mars	335.6	343.3	351.1	358.7	366.3	373.7	381.3	388.8	396.3	403.7	411.1	418.5	425.8	433.1	440.4	447.7	454.9	462.1
Merc.	832.9	346.6	3.7	22.3	41.2	60.0	77.1	91.2	99.0	97.2	90.0	89.6	99.3	113.4	130.3	148.0	165.8	183.0
Jup.	221.4	220.5	219.3	218.0	217.0	215.5	214.2	213.1	212.2	211.9	211.5	211.7	211.9	212.6	213.8	215.0	216.4	218.0
Sat.	82.2	83.0	83.7	84.4	85.5	86.6	87.8	89.0	90.4	91.7	93.0	94.3	95.7	97.0	98.2	99.4	100.3	101.2
Eng. date	Mar 28	Apr 7	Apr 17	Apr 27	May 7	May 17	May 27	Jun 6	Jun 16	Jun 26	Jul 6	Jul 16	Jul 26	Aug 5	Aug 15	Aug 25	Sep 4	Sep 14
1712 Mars	351.7	359.1	366.9	374.5	382.1	389.7	397.3	404.9	412.5	420.1	427.7	435.3	442.9	450.5	458.1	465.7	473.3	480.9
Merc.	355.7	14.4	32.2	47.7	58.6	61.3	54.9	51.1	57.2	70.2	86.6	104.6	122.9	141.0	157.2	171.0	178.7	177.2
Jup.	244.1	245.5	246.4	247.0	247.4	247.5	247.0	246.3	245.5	244.2	242.8	241.6	240.5	239.4	238.3	237.2	236.1	235.0
Sat.	109.7	109.9	110.0	110.3	111.1	111.8	112.5	113.6	114.7	115.8	117.1	118.4	119.6	120.9	122.2	123.6	124.7	125.9
Eng. date	Mar 29	Apr 8	Apr 18	Apr 28	May 8	May 18	May 28	Jun 7	Jun 17	Jun 27	Jul 7	Jul 17	Jul 27	Aug 6	Aug 16	Aug 26	Sep 5	Sep 15
1713 Mars	145.1	144.0	144.2	145.6	148.0	151.0	154.7	159.1	163.8	168.1	174.6	180.3	186.2	192.5	198.9	205.4	212.1	219.4
Merc.	9.8	25.9	37.9	42.5	37.2	31.8	36.1	48.3	64.3	82.3	100.9	119.3	136.4	151.1	160.9	162.0	154.9	151.3
Jup.	312.9	314.9	316.7	318.5	319.9	321.1	322.0	322.5	322.8	322.5	321.9	321.2	320.2	318.9	317.5	316.3	314.8	313.7
Sat.	124.6	123.5	123.3	123.3	123.8	124.4	124.9	125.8	126.7	127.6	128.8	130.0	131.3	132.6	133.9	135.1	136.3	137.6
1714 Mars	7.1	14.5	21.9	29.1	36.4	43.6	50.5	57.5	64.5	71.1	77.8	84.5	91.0	97.5	104.0	110.4	116.6	122.7
Merc.	16.7	23.1	19.3	12.9	14.8	26.2	41.7	59.7	78.4	96.9	114.7	130.5	142.1	145.8	140.1	134.3	138.2	149.6
Jup.	341.1	343.4	345.7	347.9	350.0	351.9	353.6	355.4	357.2	358.9	359.4	358.9	358.9	359.1	358.7	358.2	357.1	354.7
Sat.	137.4	137.0	136.7	136.5	136.7	137.0	137.2	138.0	138.8	139.4	140.5	141.6	142.8	144.0	145.2	146.5	147.8	149.1
1715 Mars	194.6	191.5	187.8	185.2	183.3	182.8	183.5	185.4	188.3	192.0	196.1	200.9	206.3	211.9	217.9	224.1	230.6	237.2
Merc.	1.7	354.4	354.9	4.4	19.4	36.8	54.9	73.9	92.0	109.4	121.4	127.7	134.1	141.4	148.5	155.6	162.6	169.6
Jup.	8.7	11.1	13.5	15.8	18.2	20.6	22.8	24.9	26.9	28.8	30.7	32.2	33.3	34.4	35.0	35.1	35.2	35.0
Sat.	151.0	150.5	150.0	149.4	149.4	149.5	149.4	150.0	150.6	151.0	152.0	152.9	153.9	155.0	156.2	157.4	158.7	160.0
1716 Mars	22.1	29.2	36.3	43.3	50.2	57.1	63.9	70.6	77.4	83.9	90.6	97.0	103.5	110.0	116.4	122.7	129.0	135.2
Merc.	335.4	343.0	350.9	14.2	32.8	51.9	70.4	87.6	101.4	109.5	107.9	100.7	100.3	108.1	123.4	140.0	157.8	175.3
Jup.	36.0	38.3	40.6	42.9	45.1	47.7	50.1	52.2	54.5	57.0	59.1	61.2	63.1	64.8	66.4	67.9	68.9	69.7
Sat.	164.4	163.7	163.0	162.4	162.1	161.9	161.7	161.9	162.2	162.5	162.8	163.4	164.1	164.9	166.0	167.1	168.2	169.4
1717 Mars	242.0	241.8	240.6	247.5	247.7	246.6	243.9	241.7	239.3	237.6	236.0	237.1	239.6	242.5	246.5	251.0	256.3	261.6
Merc.	335.2	351.5	9.6	28.6	48.0	65.1	80.2	90.0	90.7	83.4	80.9	88.4	102.0	118.5	136.2	154.1	171.6	187.8
Jup.	65.1	65.7	67.6	69.4	71.5	73.6	76.0	78.2	80.6	82.9	85.2	87.5	89.5	91.4	93.9	95.8	97.6	99.3
Sat.	177.4	176.6	175.9	175.1	174.7	174.3	173.8	173.9	174.0	174.0	174.5	175.1	175.8	176.7	177.6	178.6	179.8	181.0
1718 Mars	36.7	43.4	50.2	56.9	63.6	70.2	76.8	83.3	89.7	96.4	102.8	109.1	115.6	121.9	128.3	134.6	141.0	147.4
Merc.	347.2	5.8	24.7	42.7	58.5	69.8	72.6	68.4	61.8	68.0	80.4	96.6	114.5	132.7	150.6	166.3	180.5	188.0
Jup.	93.6	94.4	95.3	96.6	98.2	99.8	101.9	103.9	106.0	108.0	110.4	112.4	114.7	116.9	119.1	121.3	123.4	125.7
Sat.	190.0	189.2	188.4	187.6	187.1	186.6	185.9	185.8	185.7	185.4	185.8	186.2	186.0	186.8	188.2	189.1	190.2	191.3
1719 Mars	271.3	277.2	283.2	288.9	294.3	299.7	304.3	308.6	312.1	314.9	316.7	316.7	316.0	313.9	311.4	309.3	308.2	308.0
Merc.	1.8	20.0	36.2	48.3	53.4	48.9	42.8	46.9	58.6	74.4	92.2	110.9	129.0	146.0	161.4	170.5	171.5	164.7
Jup.	124.8	124.6	124.7	124.9	125.6	126.5	128.0	129.2	130.9	132.7	134.7	136.7	138.9	141.1	143.0	145.3	147.5	148.9
Sat.	202.4	201.6	200.8	200.1	199.4	198.7	198.0	197.7	197.3	196.9	197.1	197.3	197.5	198.2	198.9	199.5	200.5	201.5
1720 Mars	51.4	57.8	64.1	70.5	76.7	83.1	89.4	95.6	102.1	108.4	114.7	121.1	127.3	134.0	140.2	146.5	152.9	159.2
Merc.	14.1	27.5	33.8	30.6	23.9	26.0	36.7	52.2	69.9	89.7	107.1	124.8	140.4	151.7	155.3	149.8	144.1	147.9
Jup.	158.1	157.1	156.2	155.3	155.2	155.5	155.3	156.0	157.0	158.0	159.4	161.0	163.0	164.9	166.6	168.7	171.1	173.2
Sat.	214.4	213.7	213.0	212.3	211.4	210.6	209.9	209.4	209.0	208.5	208.4	208.8	208.3	208.8	209.3	209.8	210.7	211.6
1721 Mars	292.7	299.9	307.1	314.3	321.4	328.4	335.4	342.1	348.8	355.1	361.1	368.1	374.1	379.1	384.1	389.1	394.1	399.1
Merc.	14.0	12.9	5.7	5.3	15.0	29.7	47.3	65.9	84.8	103.1	119.4	132.3	138.2	134.6	128.1	129.0	139.5	153.6
Jup.	192.2	190.8	189.4	188.1	187.2	186.3	185.4	185.3	185.2	185.4	185.1	187.0	188.2	189.4	191.1	192.9	194.8	196.6
Sat.	226.0	225.4	224.8	224.2	223.4	222.6	221.9	221.2	220.6	219.9	219.7	219.5	219.3	219.6	219.9	220.2	220.9	221.7
Mesh. Vrs. Mith. Kat. Sim. Kan. Tul. Vrs. Dhan. Mak. Kum. Min. Asv. Bhar. Krit. Rohi. Mrig. Ardh. Punar. Push. Asles.	30	60	90	120	150	180	210	240	270	300	330	360	390	420	450	480	510	540

V-B—cont.

Mars, A.D. 1637—A.D. 1999; Mercury, A.D. 1645—A.D. 1999; Jupiter, A.D. 1656—A.D. 1999;
 Saturn, A.D. 1617—A.D. 1999—cont.

180	190	200	210	220	230	240	250	260	270		280	290	300	310	320	330	340	350	360
8 25	0 5	0 15	0 25	N 4	N 14	N 24	D 4	D 14	D 24	1708	Ja 3	Ja 13	Ja 23	F 2	F 12	F 22	Mr 3	Mr 13	Mr 23
182°9	189°6	196°4	203°4	210°3	217°3	224°3	231°4	238°7	246°1	253°4	260°8	268°3	276°0	283°5	291°3	298°9	306°7	314°5	321°5
160°5	176°2	193°2	210°7	227°4	242°6	254°1	258°1	253°0	246°9	249°7	260°2	275°0	292°0	310°1	328°4	345°2	362°0	378°8	395°6
148°8	160°8	162°8	154°6	156°2	157°8	158°9	160°2	160°8	161°4	161°6	161°4	160°8	160°0	159°1	157°9	156°7	155°3	154°0	152°8
60°2	59°8	59°5	59°0	58°2	57°5	56°7	55°9	55°1	54°3	53°8	53°3	52°8	52°8	52°9	52°9	53°6	54°3	54°9	55°6
8 24	0 4	0 14	0 24	N 3	N 13	N 23	D 3	D 13	D 23	1709	Ja 2	Ja 12	Ja 22	F 1	F 11	F 21	Mr 3	Mr 13	Mr 23
80°6	85°1	88°9	92°4	94°7	96°1	96°5	95°3	93°1	89°9	85°8	82°6	79°8	78°3	78°3	79°7	81°8	84°7	88°5	92°3
171°7	189°2	207°4	223°0	235°8	242°1	240°0	232°3	231°5	240°7	254°5	270°9	288°7	306°5	323°8	339°2	350°4	363°2	374°2	384°2
172°0	174°2	176°4	178°7	180°8	182°5	184°6	186°2	187°7	189°0	190°2	190°9	191°4	191°7	191°5	191°0	190°4	189°3	188°1	186°9
74°7	74°6	74°4	74°4	73°7	73°0	72°5	71°6	70°7	69°9	69°2	68°5	67°7	67°5	67°3	67°1	67°5	67°8	68°3	68°8
8 35	0 5	0 15	0 25	N 4	N 14	N 24	D 4	D 14	D 24	1710	Ja 3	Ja 13	Ja 23	F 2	F 12	F 22	Mr 4	Mr 14	Mr 24
196°1	203°0	210°0	217°1	224°3	231°4	238°7	246°1	253°6	261°2	268°8	276°5	284°4	292°0	300°1	307°7	315°5	323°5	331°5	339°5
186°9	203°3	217°1	225°5	225°7	218°3	215°3	211°6	204°4	200°3	267°5	285°4	302°8	318°3	334°0	349°2	363°8	377°5	390°3	402°1
196°7	197°7	200°1	202°2	204°2	206°7	208°8	210°9	212°6	214°7	216°3	217°9	219°6	220°5	221°3	221°8	222°1	222°3	222°5	222°6
88°7	88°8	88°9	89°0	88°7	88°3	87°8	87°0	86°2	85°5	84°7	83°9	83°0	82°6	82°2	81°6	81°7	81°7	81°8	81°8
99°9	103°5	110°5	115°3	119°6	123°6	127°1	129°4	130°7	131°1	130°3	128°1	125°1	121°8	117°2	114°2	112°2	111°7	112°2	112°2
197°7	208°3	210°9	205°1	199°5	203°1	214°8	230°9	246°7	264°2	281°5	297°5	310°5	317°3	314°9	307°6	300°8	293°7	287°3	281°3
220°0	221°9	224°1	226°0	228°4	230°6	232°7	235°2	237°3	239°5	241°7	243°7	245°6	247°5	249°3	250°6	251°8	252°4	253°6	254°6
102°1	102°5	102°9	103°3	103°1	103°0	102°9	102°2	101°6	100°9	100°0	99°1	98°3	97°7	97°0	96°8	96°2	95°9	95°8	95°8
210°3	217°2	224°4	231°6	238°9	246°5	253°9	261°6	269°2	277°0	284°9	292°6	300°5	308°5	316°3	324°2	332°1	339°9	347°8	355°6
193°3	191°4	184°5	185°9	195°8	209°8	226°1	243°6	260°8	277°2	290°9	299°3	299°3	291°4	280°3	267°3	250°3	232°5	214°9	197°3
246°7	248°2	249°7	251°7	253°6	255°7	258°0	260°2	262°5	264°9	267°1	269°4	271°7	274°0	276°3	278°3	280°2	281°9	283°4	284°9
114°4	115°4	116°1	116°8	116°9	117°0	117°1	116°3	116°2	115°4	115°0	114°2	113°5	112°7	111°9	111°0	110°6	110°2	109°7	109°7
8 24	0 4	0 14	0 24	N 3	N 13	N 23	D 3	D 13	D 23	1713	Ja 2	Ja 12	Ja 22	F 1	F 11	F 21	Mr 3	Mr 13	Mr 23
115°3	121°2	126°8	132°4	137°6	142°5	147°2	151°5	155°4	158°6	161°2	162°7	163°1	162°2	159°9	156°4	152°6	148°9	146°1	143°1
169°8	167°6	176°3	180°8	205°8	223°1	240°1	256°9	271°3	281°2	283°2	276°6	272°3	277°5	280°9	305°8	323°7	342°2	360°0	377°8
277°1	277°5	278°6	279°6	281°3	282°9	284°7	286°7	288°8	291°1	293°5	295°7	297°8	300°5	302°6	305°0	307°3	309°8	311°9	313°9
127°0	127°9	129°7	129°6	130°0	130°3	130°7	130°6	130°4	130°1	129°4	128°7	128°1	127°3	126°6	125°8	125°2	124°5	123°9	123°9
8 25	0 5	0 15	0 25	N 4	N 14	N 24	D 4	D 14	D 24	1714	Ja 3	Ja 13	Ja 23	F 2	F 12	F 22	Mr 4	Mr 14	Mr 24
220°0	233°0	240°3	247°6	255°1	262°7	270°3	277°8	285°8	293°5	301°3	309°2	317°0	324°8	332°5	340°3	348°0	355°8	363°6	371°4
157°3	170°0	185°6	202°5	220°0	236°7	251°8	263°1	267°7	262°5	264°2	258°8	249°6	234°5	301°8	320°0	338°2	355°6	373°0	390°3
312°9	312°2	312°0	312°2	312°5	313°1	314°2	315°6	317°0	318°8	320°8	323°0	325°3	327°6	329°7	332°3	334°7	337°4	339°6	341°8
138°8	139°8	140°8	141°8	142°6	143°1	143°6	143°6	143°7	143°7	143°2	142°8	142°3	141°6	140°7	139°9	139°2	138°5	137°7	136°9
128°9	134°9	140°8	146°7	152°4	158°2	163°4	168°9	174°1	178°8	183°6	187°7	191°6	194°8	197°1	198°9	199°1	198°5	196°3	193°3
161°9	181°9	199°3	216°4	232°1	244°7	251°1	248°8	241°1	240°9	250°1	263°8	280°3	298°1	316°4	333°6	349°2	364°7	379°1	392°1
353°6	352°0	349°8	349°7	348°8	348°3	348°3	348°4	349°1	350°0	351°0	352°5	354°2	356°1	358°0	359°4	360°0	359°4	357°8	356°2
150°3	151°4	152°8	153°6	154°3	155°0	155°8	156°1	156°4	156°7	156°4	156°1	155°9	155°2	154°5	153°8	153°0	152°2	151°4	150°6
244°1	251°2	258°8	265°7	273°1	280°6	288°3	295°9	303°5	311°1	319°4	326°4	333°9	341°5	348°9	356°4	363°8	371°2	378°6	385°9
177°9	196°0	212°4	226°0	234°8	234°7	227°7	223°9	230°8	248°8	259°6	277°1	294°9	312°3	328°2	340°2	345°8	341°3	335°3	329°3
342°2	33°1	82°1	30°6	29°2	27°9	26°7	25°8	25°0	24°7	24°5	25°0	25°7	26°5	27°9	29°4	31°0	32°9	35°0	37°1
161°2	162°3	163°4	164°6	165°5	166°5	167°4	167°8	168°3	168°8	168°7	168°8	168°7	168°1	167°6	167°1	166°3	165°5	164°7	163°9
141°5	147°7	153°9	159°9	166°0	172°1	178°1	183°9	189°9	195°7	201°5	206°9	212°4	217°8	222°8	227°9	232°4	236°5	240°3	244°0
192°2	207°0	217°4	220°0	213°7	208°6	212°5	224°1	249°3	256°2	273°7	291°2	307°3	320°4	327°3	324°8	317°8	318°2	327°8	337°8
70°3	70°8	70°2	69°9	69°0	67°8	66°3	65°2	63°8	62°4	61°8	60°5	60°0	59°6	59°6	60°1	61°0	62°1	63°4	64°4
171°8	173°0	174°2	175°4	176°4	177°4	178°5	179°1	179°7	180°5	180°7	180°9	181°0	180°6	180°3	180°0	179°2	178°4	177°8	177°3
267°7	274°1	280°6	287°4	294°3	301°2	308°4	315°4	322°6	329°8	336°9	344°2	351°3	358°1	365°3	372°5	379°7	386°9	394°1	401°3
140°3	204°5	200°4	193°0	194°7	204°7	219°0	235°4	252°9	270°3	286°7	300°6	308°9	308°8	301°6	299°4	306°9	320°8	337°5	354°1
100°8	102°0	102°9	103°8	103°5	103°7	103°1	102°6	101°6	100°3	98°9	97°6	96°8	95°2	94°3	93°4	93°1	92°8	92°3	91°8
182°1	183°3	184°5	185°8	186°9	188°0	189°1	189°9	190°7	191°5	192°0	192°3	192°7	192°5	192°3	192°2	191°6	191°0	190°5	190°0
158°7	160°1	166°4	172°6	179°1	185°4	191°7	198°1	204°5	210°8	217°8	223°6	230°0	236°4	242°8	249°1	255°5	261°7	268°0	274°3
186°6	178°0	177°4	185°9	198°9	215°1	232°1	249°6	266°0	280°3	291°1	292°8	286°4	281°8	287°4	299°6	315°7	333°4	351°1	368°8
127°6	129°1	130°9	132°2	133°4	134°2	135°1	135°4	135°1	135°0	134°2	133°4	132°0	130°8	129°5	128°2	127°0	125°8	125°0	124°2
192°4	193°6	194°8	195°9	197°1	198°1	199°4	200°2	201°2	202°2	202°7	203°7	203°9	203°9	204°0	204°6	203°6	203°6	202°8	202°8
309°3	311°6	315°2	319°0	323°7	328°8	333°9	339°7	345°4	351°5	357°6	363°8	369°9	376°0	382°1	388°2	394°3	400°4	406°5	412°6
160°6	163°9	179°0	194°9	211°7	229°0	245°8	261°0	272°5	276°6	272°1	265°5	268°4	278°8	294°2	311°5	329°7	348°2	366°7	384°2
151°8	153°8	156°0	157°9	159°7	161°2	162°8	163°9	164°8	165°3	165°6	165°7	165°2	164°7	163°8	162°6	161°3	160°1	158°7	157°3
202°5	203°7	204°9	206°0	207°2	208°4	209°5	210°5	211°5	212°6	213°2	213°9	214°7	215°0	215°2	215°5	215°8	216°3	216°9	217°4
165°8	172°3	178°7	185°4	191°9	198°7	205°2	211°9	218°7	225°6	232°5	239°4	246°3	253°4	260°3	267°5	274°6	281°8	289°0	296°1
159°2	174°3	191°2	208°6	225°8	241°4	253°9	260°3	257°6	250°2	250°4	259°2	274°4	290°3	308°0	326°4	343°8	359°5	375°1	390°6
175°2	177°4	179°8	181°7	183°8	186°0	187°9	189°7	191°2	192°2	193°8	194°8	1							

TABLE

Geocentric Places of Mars, Mercury, Jupiter, Venus and Saturn for every tenth day of current cycle.
Venus, A.D. 1765—A.D. 1939;

Day of I.S.Y.	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
Eng. date ...	Mr 29	Apr 8	Apr 18	Apr 28	May 8	May 18	May 28	Je 7	Je 17	Je 27	Je 7	Je 17	Je 27	Je 7	Je 17	Je 27	Je 7	Je 17
1722 Mars ...	66.4	72.2	78.0	83.9	89.0	96.0	102.1	108.2	114.3	120.4	126.8	133.0	139.4	145.6	152.1	158.6	164.9	171.4
Merc. ...	348.1	345.7	353.0	7.1	24.3	42.8	62.0	80.5	97.7	111.9	120.1	118.6	110.8	110.2	119.2	132.9	149.6	167.1
Jup. ...	226.0	225.1	224.1	222.8	221.6	220.2	218.0	217.8	217.0	216.1	215.8	215.8	216.2	216.6	217.5	218.7	220.2	221.9
Sat. ...	287.4	287.2	286.9	286.0	285.2	284.5	283.7	283.0	282.3	281.5	281.1	280.7	280.3	280.5	280.6	280.7	281.3	281.9
1723 Mars ...	311.5	319.2	326.8	334.5	342.0	349.6	358.8	4.2	11.5	18.5	25.8	32.1	38.4	44.6	50.7	56.2	60.9	66.2
Merc. ...	332.8	345.2	1.8	20.1	39.1	58.1	75.5	90.6	100.7	101.2	94.1	91.5	98.7	111.8	128.2	145.7	163.7	181.0
Jup. ...	258.1	258.3	258.5	258.0	257.5	256.5	255.3	253.9	252.5	251.8	250.1	248.9	248.3	247.9	247.6	248.0	248.4	249.3
Sat. ...	248.6	248.8	248.1	247.7	247.0	246.4	245.7	245.0	244.2	243.5	242.8	242.2	242.7	241.6	241.5	241.4	241.8	242.2
1724 Mars ...	82.8	88.0	93.0	98.4	103.8	109.4	115.3	121.1	127.1	133.1	139.2	145.5	151.7	158.1	164.5	171.0	177.5	184.2
Merc. ...	339.5	357.4	16.1	35.0	53.0	68.9	80.1	83.5	77.2	72.8	78.3	90.7	106.7	124.3	142.8	160.3	176.5	189.7
Jup. ...	288.1	289.7	290.7	291.7	292.0	292.4	292.1	291.4	290.6	289.7	288.3	287.0	285.6	284.4	283.8	283.8	281.8	281.3
Sat. ...	259.6	259.5	259.4	259.3	258.7	258.1	257.5	256.7	255.9	255.1	254.5	253.9	253.2	253.0	252.8	252.4	252.6	252.9
1725 Mars ...	328.9	336.7	344.5	352.2	359.7	367.3	374.7	382.0	389.1	395.8	402.4	408.9	415.4	421.9	428.4	434.9	441.4	447.9
Merc. ...	353.6	12.0	30.4	48.9	67.5	86.1	104.6	123.1	141.6	160.1	178.6	197.1	215.6	234.1	252.6	271.1	289.6	308.1
Jup. ...	316.9	318.9	320.7	322.6	324.1	325.3	326.5	327.1	327.4	327.5	327.4	327.3	327.2	327.1	327.0	326.9	326.8	326.7
Sat. ...	270.5	270.5	270.8	270.8	270.4	270.0	269.6	269.8	269.0	267.3	265.6	263.9	262.2	260.5	258.8	257.1	255.4	253.7
1726 Mars ...	103.4	109.5	116.4	123.7	130.8	137.4	143.9	150.1	156.1	161.8	167.2	172.5	177.7	182.8	187.8	192.7	197.5	202.2
Merc. ...	7.7	24.6	41.5	58.4	75.2	91.9	108.4	124.7	140.8	156.7	172.4	187.9	203.2	218.4	233.4	248.2	262.8	277.1
Jup. ...	341.9	346.2	349.5	351.8	353.9	355.8	357.9	359.6	360.9	361.8	362.3	362.4	362.3	362.1	361.8	361.4	360.9	360.3
Sat. ...	281.3	281.6	281.9	282.2	282.0	281.7	281.5	280.9	280.2	279.5	278.7	278.0	277.8	277.6	277.0	276.4	275.8	275.1
1727 Mars ...	345.4	353.2	360.8	368.3	375.8	383.3	390.7	397.8	404.5	410.8	416.8	422.5	427.9	433.1	438.1	442.9	447.5	451.9
Merc. ...	16.6	25.1	33.9	42.8	51.7	60.5	69.2	77.7	86.0	94.1	102.0	109.7	117.2	124.5	131.6	138.5	145.2	151.7
Jup. ...	12.4	14.8	17.2	19.6	21.9	24.3	26.6	28.8	30.8	32.8	34.5	36.3	37.7	38.7	39.6	39.9	40.4	40.0
Sat. ...	292.2	292.8	293.2	293.7	293.6	293.6	293.6	293.2	292.6	292.2	291.4	290.6	289.6	288.9	288.3	287.7	287.4	287.1
1728 Mars ...	130.9	131.4	132.9	135.3	138.5	142.4	146.7	151.5	156.7	162.0	167.8	173.6	179.7	186.0	192.4	199.0	205.8	212.5
Merc. ...	6.0	35.2	55.5	73.9	91.7	108.8	125.3	141.2	156.5	171.2	185.3	198.8	211.7	224.1	235.9	247.2	258.0	268.2
Jup. ...	39.9	41.0	44.0	46.6	49.7	51.1	53.5	55.8	58.1	60.4	62.9	65.4	67.9	70.4	72.9	75.4	77.9	80.4
Sat. ...	303.0	303.6	304.6	305.1	305.3	305.5	305.7	305.3	304.9	304.6	304.0	303.4	302.6	301.8	301.0	300.2	299.7	299.2
1729 Mars ...	1.0	8.8	16.2	23.5	30.8	37.9	45.1	52.2	59.1	66.0	72.7	79.3	85.9	92.4	98.9	105.2	111.4	117.7
Merc. ...	337.6	342.8	355.8	12.2	30.4	48.4	66.3	84.2	101.0	117.9	134.7	151.4	168.0	184.5	200.9	217.2	233.4	249.5
Jup. ...	68.0	69.6	71.4	73.3	75.1	77.2	79.5	81.7	84.1	86.6	89.1	91.6	94.1	96.6	99.1	101.6	104.1	106.6
Sat. ...	313.9	314.8	315.7	316.6	317.0	317.5	318.0	317.9	317.6	317.6	317.0	316.5	315.8	315.0	314.2	313.4	312.7	312.0
1730 Mars ...	173.2	170.0	167.8	166.3	164.4	162.7	160.2	157.8	155.4	153.0	150.6	148.2	145.8	143.4	141.0	138.6	136.2	133.8
Merc. ...	334.1	349.6	7.6	25.9	44.9	63.7	82.4	101.1	119.8	138.4	156.9	175.4	193.8	212.1	230.3	248.4	266.4	284.3
Jup. ...	97.6	98.3	99.2	100.5	101.8	103.7	105.3	107.4	109.4	111.5	113.5	115.6	117.6	119.6	121.6	123.6	125.6	127.6
Sat. ...	325.1	326.1	327.2	328.2	328.9	329.5	330.1	330.3	330.4	330.5	330.1	329.7	329.3	328.8	328.1	327.9	327.1	326.3
1731 Mars ...	16.2	23.4	30.6	37.7	44.7	51.8	58.6	65.4	72.8	79.9	86.7	93.2	99.6	105.1	111.7	117.9	124.2	130.3
Merc. ...	345.2	3.6	22.5	40.9	57.3	73.7	90.0	106.1	122.0	137.7	153.2	168.6	183.9	199.1	214.2	229.1	243.8	258.2
Jup. ...	129.2	128.0	128.9	128.9	129.6	130.4	131.4	132.8	134.4	136.1	138.1	140.1	142.2	144.1	146.2	148.7	150.7	152.9
Sat. ...	336.4	337.5	338.6	339.8	340.7	341.5	342.4	342.8	343.2	343.6	343.4	343.2	343.0	342.8	341.7	341.1	340.3	339.5
1732 Mars ...	226.1	226.4	225.4	228.6	230.8	232.9	235.0	237.1	239.2	241.3	243.4	245.5	247.6	249.7	251.8	253.9	256.0	258.1
Merc. ...	359.9	1.1	35.0	48.8	62.6	76.4	90.1	103.8	117.5	131.2	144.9	158.6	172.3	186.0	199.7	213.4	227.1	240.8
Jup. ...	162.7	161.6	160.6	159.7	159.3	159.3	159.2	159.0	158.7	158.4	158.0	157.6	157.2	156.8	156.4	156.0	155.6	155.2
Sat. ...	347.9	349.1	350.4	351.6	352.7	353.8	354.8	355.4	356.0	356.7	357.3	357.9	358.5	359.1	359.6	360.1	360.6	361.1
1733 Mars ...	30.9	38.0	44.7	51.5	58.3	65.1	71.8	78.3	84.7	91.4	97.9	104.4	110.8	117.3	123.6	129.9	136.2	142.6
Merc. ...	12.6	27.4	37.6	48.4	59.2	70.0	80.8	91.6	102.4	113.2	124.0	134.8	145.6	156.4	167.2	178.0	188.8	199.6
Jup. ...	190.8	194.5	194.3	192.9	191.7	190.5	189.3	188.1	186.9	185.7	184.5	183.3	182.1	180.9	179.7	178.5	177.3	176.1
Sat. ...	359.6	0.9	2.2	3.5	4.7	5.9	7.0	7.8	8.7	9.6	10.3	10.7	10.5	10.2	10.0	9.4	8.6	7.8
1734 Mars ...	201.1	206.4	211.2	215.2	219.3	223.4	227.5	231.6	235.7	239.8	243.9	248.0	252.1	256.2	260.3	264.4	268.5	272.6
Merc. ...	15.3	17.0	10.1	7.1	14.7	28.2	41.6	55.0	68.4	81.8	95.2	108.6	122.0	135.4	148.8	162.2	175.6	189.0
Jup. ...	203.5	229.8	228.8	227.0	226.6	226.8	227.2	227.7	228.1	228.5	228.9	229.3	229.7	230.1	230.5	230.9	231.3	231.7
Sat. ...	11.6	12.5	14.2	15.6	16.4	18.2	19.5	20.5	21.5	22.6	23.2	23.9	24.5	24.6	24.6	24.6	24.2	23.8
1735 Mars ...	45.7	52.1	58.7	65.1	71.6	78.0	84.5	90.8	97.3	103.7	110.1	116.5	122.7	129.1	135.5	141.8	148.2	154.6
Merc. ...	353.0	348.1	353.8	6.1	22.5	40.8	59.9	78.6	97.2	115.8	134.4	153.0	171.6	190.2	208.8	227.4	246.0	264.6
Jup. ...	262.4	262.7	263.0	262.7	262.1	261.4	260.2	259.0	257.7	256.3	255.0	253.7	252.4	251.1	250.0	248.8	247.6	246.4
Sat. ...	24.0	25.3	26.6	27.8	29.2	30.6	32.0	33.2	34.4	35.5	36.4	37.2	38.0	38.4	38.7	39.1	38.8	38.7
1736 Mars ...	284.9	291.7	298.4	305.3	312.0	318.6	325.0	331.2	337.1	342.9	348.7	354.4	360.2	365.9	371.6	377.3	383.0	388.7
Merc. ...	332.3	344.2	0.0	17.9	36.8	55.8	74.0	92.0	110.4	128.8	147.2	165.6	184.0	202.4	220.8	239.2	257.6	276.0
Jup. ...	292.1	293.8	294.9	295.9	296.7	297.4	298.0	298.5	298.8	299.0	299.1	299.2	299.3	299.4	299.5	299.6	299.7	299.8
Sat. ...	36.4	37.7	39.0	40.4	41.7	43.0	44.4	45.7	47.0	48.2	49.3	50.4	51.5	52.1	52.6	53.2	53.8	54.4
Mesh, Vrah. Mith. Kat. Sipt. Kan. Tul. Vrah. Dhan. Mak. Kum. Min. Asvn. Bhar. Krit. Rohi. Mrig. Ardh. Punar. Push. Anles.	20	60	90	120	150	180	210	240	270	300	330	360	390	420	450	480	510	540

V-B—cont

Mars, A.D. 1637—A.D. 1999; Mercury, A.D. 1645—A.D. 1999; Jupiter, A.D. 1656—A.D. 1999.
Saturn, A.D. 1617—A.D. 1999—cont.

180	190	200	210	220	230	240	250	260	270		280	290	300	310	320	330	340	350	360
S 25	O 5	O 15	O 25	N 4	N 14	N 24	D 4	D 14	D 24		Ja 3	Ja 13	Ja 23	F 2	F 12	F 22	Mr 4	Mr 14	Mr 24
178.2	184.8	191.4	198.2	205.0	212.0	218.8	225.9	233.0	240.2	1723	247.5	254.8	262.1	269.5	277.2	284.6	292.2	299.8	307.6
184.7	201.5	218.0	228.5	229.0	222.4	217.4	221.8	233.1	249.3		265.6	283.7	300.7	317.0	330.8	337.6	335.6	328.1	328.2
233.6	225.5	227.5	229.6	231.8	234.0	236.5	238.5	240.8	243.0		245.4	247.3	249.5	251.3	253.1	254.5	256.0	257.0	257.8
232.5	233.4	234.4	235.4	236.5	237.7	238.8	240.0	241.1	242.3		243.3	244.3	245.4	246.1	246.9	247.7	248.0	248.2	248.6
										1724							Mr 3	Mr 13	Mr 23
70.6	74.3	77.2	79.1	80.2	79.8	78.2	75.8	71.8	68.2		65.6	63.9	63.5	64.4	66.2	69.1	72.4	76.4	80.6
196.6	208.7	218.5	209.3	202.5	203.7	218.5	228.0	213.9	262.2		279.6	296.2	310.1	319.2	318.8	312.3	309.7	317.2	330.7
250.5	252.0	253.6	255.4	257.2	259.3	261.4	263.8	266.0	268.3		270.6	278.0	275.2	277.7	279.9	282.0	283.9	285.9	287.4
242.6	243.6	244.4	245.2	246.4	247.5	248.6	249.8	251.0	252.1		253.2	254.3	254.4	256.2	257.1	258.0	258.5	258.9	259.5
										1725							Mr 4	Mr 14	Mr 24
191.0	197.8	204.7	211.7	218.7	225.9	233.1	240.4	247.8	255.3		262.8	270.3	278.0	285.8	293.5	301.1	309.2	317.1	324.9
197.2	195.4	187.9	186.7	194.9	208.1	224.2	241.5	259.0	275.6		290.2	300.7	302.5	295.8	291.6	297.2	304.3	325.7	343.5
281.6	281.9	282.7	283.9	285.1	286.6	288.4	290.5	292.6	294.8		298.9	299.4	301.7	303.9	306.5	308.9	311.2	313.5	315.7
253.1	253.8	254.5	255.3	256.3	257.3	258.3	259.5	260.7	261.9		263.1	264.3	265.4	266.3	267.3	268.3	268.9	269.6	270.2
										1726							Mr 3	Mr 13	Mr 23
98.2	99.3	103.0	107.5	111.0	114.1	116.6	117.7	118.2	117.2		114.9	111.7	107.8	104.1	101.2	99.4	99.1	100.0	102.1
178.7	170.0	176.3	188.3	203.9	220.9	238.3	255.3	270.4	282.0		285.7	280.9	274.9	278.0	288.7	304.0	321.4	339.9	358.3
318.2	317.5	317.1	316.7	317.3	317.8	318.5	319.8	321.3	323.1		325.0	326.9	329.1	331.3	333.6	336.1	338.5	340.9	343.3
263.8	264.4	265.0	265.5	266.5	267.3	268.3	269.5	270.7	271.8		273.8	274.2	275.3	276.4	277.5	278.6	279.4	280.3	281.1
										1727							Mr 4	Mr 14	Mr 24
205.1	211.5	218.6	225.6	233.0	240.4	247.8	255.2	263.0	270.8		279.4	286.5	294.1	302.0	309.9	317.7	325.7	333.5	341.3
157.5	168.7	183.6	200.4	217.8	234.8	250.6	263.1	270.3	267.0		259.7	259.7	268.5	282.8	299.7	317.8	336.1	353.8	9.5
359.3	357.9	356.6	355.2	354.3	353.8	353.4	353.5	353.8	354.6		355.7	356.8	358.3	0.1	2.3	4.2	6.5	8.7	11.1
275.0	275.3	275.8	276.1	276.9	277.8	278.6	279.7	280.8	281.9		283.1	284.3	285.4	286.6	287.9	289.0	289.9	290.8	291.8
										1728							Mr 3	Mr 13	Mr 23
109.5	115.5	120.8	126.0	131.0	135.7	139.9	143.5	146.7	148.8		150.2	150.2	149.0	146.5	142.8	139.3	135.7	132.7	131.4
103.3	179.9	197.3	214.4	230.7	244.5	252.8	252.5	244.9	242.5		249.3	262.4	278.5	296.2	314.3	332.0	348.2	364.0	380.8
30.6	38.7	37.5	34.4	34.8	33.5	32.2	31.2	30.2	29.7		29.6	29.7	30.2	31.1	32.1	33.3	35.0	36.7	38.8
286.5	286.7	286.8	287.0	287.7	288.4	289.0	290.1	291.0	292.1		293.3	294.5	295.6	296.8	298.0	299.3	300.4	301.5	302.5
										1729							Mr 4	Mr 14	Mr 24
219.5	226.6	233.8	241.1	249.5	256.1	263.7	271.4	279.7	286.9		294.8	302.7	310.6	318.3	326.2	334.1	341.8	349.4	357.2
176.6	194.0	210.8	225.2	235.5	237.6	231.6	226.4	230.6	242.1		257.8	275.0	292.8	310.4	327.0	340.3	358.0	376.1	393.0
74.2	75.0	75.2	74.7	74.0	73.1	71.8	70.6	69.2	67.9		67.5	65.5	64.9	64.6	64.4	64.8	65.2	66.2	67.2
208.7	208.6	208.5	208.5	209.0	209.4	209.9	210.8	211.7	212.6		213.8	215.0	216.1	217.3	218.5	219.6	220.7	221.8	222.9
										1730							Mr 3	Mr 13	Mr 23
123.7	129.6	135.4	142.1	146.7	152.2	157.5	162.2	167.1	171.5		175.3	178.8	181.5	183.2	184.2	183.7	181.8	179.6	174.9
190.5	205.8	217.9	223.4	218.2	210.8	212.9	223.9	237.4	253.9		271.6	289.3	305.9	321.1	328.9	329.2	321.9	319.7	327.0
104.6	105.8	106.7	107.6	107.9	108.2	107.9	107.2	106.5	105.3		104.0	102.7	101.3	100.0	98.9	98.0	97.7	97.2	97.5
311.3	311.1	310.9	310.5	310.8	311.0	311.4	312.2	312.9	313.6		314.7	315.8	317.0	318.2	319.4	320.7	321.9	323.1	324.4
										1731							Mr 4	Mr 14	Mr 24
236.7	248.7	251.0	258.2	266.7	273.2	280.8	288.6	296.3	304.0		311.8	319.5	327.1	334.8	342.6	350.0	357.5	365.0	372.3
199.2	206.2	204.8	197.1	185.7	204.0	217.3	233.5	250.7	268.2		285.0	299.8	310.2	312.3	306.1	301.4	307.2	319.4	335.7
131.0	132.7	134.4	135.8	137.3	138.2	138.9	139.5	139.5	139.3		138.9	137.9	136.8	135.5	134.2	132.8	131.6	130.5	130.7
324.6	324.2	323.7	323.2	323.8	323.4	323.4	323.9	324.5	325.2		326.2	327.2	328.2	329.5	330.6	331.9	333.2	334.5	335.8
										1732							Mr 3	Mr 13	Mr 23
136.5	142.6	149.7	154.7	160.7	166.5	172.4	178.1	183.8	189.4		194.7	199.7	204.8	209.6	213.7	217.7	221.2	223.7	225.6
190.0	183.0	179.4	185.4	197.6	213.0	230.0	247.4	264.5	279.7		291.3	295.7	299.8	284.7	287.5	298.6	313.9	331.4	350.0
155.2	157.3	159.4	161.4	163.1	164.8	166.2	167.6	168.5	169.2		169.6	169.9	169.9	169.2	169.3	167.1	166.0	164.7	163.4
338.6	337.9	337.8	336.7	336.4	336.2	336.1	336.4	336.8	337.2		338.1	339.0	339.8	340.9	342.1	343.3	344.6	345.9	347.1
										1733							Mr 4	Mr 14	Mr 24
257.5	264.1	271.1	278.1	285.3	292.7	300.2	307.5	314.8	322.2		339.6	337.0	344.6	351.7	359.0	6.1	13.1	20.3	27.2
153.2	167.0	177.9	192.9	209.6	228.9	244.1	259.8	272.5	299.0		276.2	269.1	269.9	278.5	292.9	309.5	327.8	345.9	4.1
178.4	190.9	182.8	185.2	187.3	189.4	191.3	193.0	194.8	196.4		197.3	198.6	199.2	199.9	199.8	199.7	199.4	198.4	197.4
353.1	352.3	351.5	350.7	350.3	349.8	349.5	349.6	349.8	349.9		350.5	351.2	351.8	352.0	351.0	355.1	356.3	357.6	358.9
										1734							Mr 3	Mr 13	Mr 23
148.8	155.2	161.3	167.7	173.8	180.2	186.4	192.5	198.6	204.9		211.1	217.3	223.4	229.4	235.4	241.4	247.0	252.8	258.3
158.2	172.6	189.1	206.5	223.8	240.2	253.6	262.0	261.6	264.4		251.5	258.5	271.9	288.1	304.0	324.1	342.0	358.3	11.6
202.3	204.4	206.3	208.5	210.7	212.2	215.1	217.3	219.6	221.5		223.3	225.1	226.6	227.2	229.4	229.9	230.5	230.7	230.8
7.9	7.1	6.3	5.4	4.9	4.2	3.6	3.5	3.3	3.2		3.6	4.1	4.5	5.4	6.3	7.1	8.8	9.6	10.6
										1735							Mr 4	Mr 14	Mr 24
283.2	293.8	292.1	304.6	310.5	316.6	322.9	329.5	335.9	342.4		349.1	355.8	362.4	369.1	375.7	382.3	389.0	395.6	402.1
168.5	184.8	203.3	220.0	234.6	244.7	248.7	240.3	235.4	240.3		251.7	267.5	284.8	302.4	320.8	339.7	359.5	378.3	396.7
237.1	249.0	231.0	243.1	235.4	237.5	239.9	242.1	244.4	246.5		248.8	250.9	252.9	254.9	256.9	258.5	259.9	261.0	263.0
23.2	22.4	22.9	20.8	20.0	19.3	18.5	17.9	17.5	17.2		17.3	17.5	17.7	18.4	19.2	19.9	21.0	22.1	23.2
										1736							Mr 3	Mr 13	Mr 23
181.0	167.4	174.1	180.3	186.9	193.4	200.0	206.5	213.2	219.7		226.5	233.3	240.0	246.8	253.5	260.4	267.4	274.3	

TABLE

Geocentric Places of Mars, Mercury, Jupiter, Venus and Saturn for every tenth day of current cycle.
Venus, A.D. 1765—A.D. 1999;

Day of I.S.Y	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
Eng. date ..	Mr 29	Ap 8	Ap 18	Ap 28	My 8	My 18	My 28	Je 7	Je 17	Je 27	Jul 7	Jul 17	Jul 27	Aug 6	Aug 16	Aug 26	S 5	S 15
1737 Mars ...	60.4	66.5	72.5	79.6	84.7	90.8	97.1	103.3	109.4	115.8	121.9	128.3	134.6	141.0	147.4	153.7	160.3	166.7
Merc. ...	337.8	355.3	13.8	32.8	51.3	67.9	80.6	86.4	82.1	75.8	78.7	89.7	104.6	122.2	140.3	158.3	174.8	189.3
Jup. ...	320.7	322.7	324.7	326.8	328.3	329.7	331.0	331.8	332.2	332.4	332.4	332.0	331.2	330.3	329.0	327.5	326.2	324.7
Sat. ...	49.3	50.7	51.9	53.0	54.3	55.6	56.8	58.3	59.7	61.0	62.2	63.4	64.7	65.4	66.3	67.1	67.5	68.1
1738 Mars ..	304.4	311.8	319.4	326.8	334.4	341.8	349.2	356.3	3.3	10.3	16.8	23.3	29.5	35.4	41.1	46.1	50.7	54.8
Merc. ..	351.3	10.2	28.5	45.6	59.6	66.7	64.7	57.6	58.5	69.2	83.1	100.3	118.5	137.0	154.0	169.4	180.7	188.9
Jup. ..	348.6	351.0	353.3	355.6	357.7	359.9	2.1	8.8	5.3	6.8	7.8	8.6	8.8	9.1	8.7	8.3	7.8	6.2
Sat. ..	62.5	63.5	64.7	65.7	67.0	68.3	69.5	70.9	72.2	73.5	74.8	76.1	77.4	78.5	79.5	80.5	81.1	81.7
1739 Mars ..	76.3	81.6	87.0	92.7	98.5	104.1	110.0	116.0	121.9	128.1	134.2	140.5	146.8	153.2	159.5	166.1	172.5	179.1
Merc. ..	6.0	23.2	37.8	46.7	46.5	39.4	38.3	46.6	61.0	78.1	96.6	114.9	132.9	148.9	161.7	167.4	164.0	167.0
Jup. ..	15.9	18.4	20.8	23.2	25.5	27.9	30.2	32.6	34.8	36.6	38.7	40.3	41.8	43.1	44.0	44.8	45.1	46.1
Sat. ..	75.9	76.8	77.6	78.5	79.6	80.9	82.1	83.3	84.7	85.9	87.3	88.7	90.1	91.2	92.3	93.5	94.4	95.2
1740 Mars ...	322.2	330.0	337.8	345.6	353.0	0.6	8.1	15.4	22.6	29.7	36.7	43.4	50.2	56.7	62.8	68.9	74.8	80.3
Merc. ...	16.0	26.6	28.1	21.2	18.2	25.1	38.9	55.6	73.9	92.6	110.9	127.8	142.0	149.6	148.8	141.2	140.1	147.9
Jup. ...	43.8	46.0	48.1	50.2	52.3	54.9	57.2	59.5	61.9	64.2	66.5	68.7	70.7	72.4	74.1	75.8	77.2	78.2
Sat. ...	89.5	90.1	90.7	91.3	92.4	93.4	94.5	95.3	96.9	98.2	99.6	100.9	102.3	103.5	104.7	106.0	107.0	108.1
1741 Mars ...	85.0	98.8	103.2	109.0	113.2	118.3	124.0	129.4	135.3	141.2	147.1	153.4	159.6	165.9	172.3	178.8	185.7	192.3
Merc. ...	9.6	4.2	359.0	4.1	16.6	32.9	51.1	70.0	89.0	105.9	121.4	131.6	132.5	125.2	122.3	128.8	141.3	157.1
Jup. ...	72.1	73.4	75.2	76.9	78.9	81.0	83.0	85.2	87.6	89.9	92.1	94.5	96.7	99.0	101.0	103.2	105.0	106.8
Sat. ...	103.3	103.6	103.9	104.3	105.1	106.0	106.8	107.9	109.0	110.5	111.5	112.8	114.1	115.4	116.7	118.0	119.1	120.2
1742 Mars ..	339.1	346.6	354.6	2.3	9.9	17.3	24.6	31.9	39.1	46.2	52.9	59.7	66.5	73.0	79.4	85.6	91.9	97.9
Merc. ...	340.8	343.0	354.8	10.3	28.2	47.1	66.1	84.2	100.0	111.8	115.4	109.7	104.4	108.4	120.8	136.1	153.3	171.0
Jup. ...	101.9	102.5	103.2	104.2	105.6	106.9	108.8	110.8	112.7	114.8	117.0	119.0	121.2	123.6	125.6	127.9	130.2	132.1
Sat. ...	117.2	117.2	117.2	117.3	118.0	118.7	119.2	120.2	121.2	122.2	123.5	124.8	126.0	127.3	128.6	129.9	131.1	132.3
1743 Mars ...	119.1	120.7	123.3	126.5	130.3	134.7	139.6	144.7	150.1	155.7	161.6	167.4	172.8	179.9	186.5	193.0	199.8	206.7
Merc. ...	333.3	348.1	5.5	24.4	43.4	61.8	78.3	91.3	97.0	98.2	86.7	88.9	99.9	114.9	132.1	150.0	167.7	184.3
Jup. ...	133.8	133.3	133.1	133.2	133.5	134.3	135.4	136.5	138.0	139.6	141.4	143.4	145.4	147.5	149.6	151.8	154.0	156.2
Sat. ...	131.1	130.8	130.5	130.4	130.8	131.1	131.6	132.4	133.2	134.0	135.2	136.3	137.5	138.8	140.0	141.3	142.5	143.8
1744 Mars ...	355.2	2.6	10.3	17.7	25.4	32.4	39.7	46.7	53.7	60.5	67.5	74.2	80.8	87.3	93.7	100.0	106.2	112.4
Merc. ...	343.1	1.5	20.3	38.9	56.1	70.1	77.5	75.9	68.7	69.0	78.7	93.3	110.3	126.8	146.6	163.7	178.9	189.9
Jup. ...	167.4	166.1	165.1	164.2	163.5	163.4	163.8	163.5	164.5	165.4	166.6	168.1	169.7	171.5	173.4	175.5	177.5	179.7
Sat. ...	144.8	144.3	143.8	143.5	143.6	143.8	143.8	144.4	145.1	145.7	146.7	147.7	148.8	150.0	150.2	152.4	153.7	154.0
1745 Mars ...	154.0	152.2	151.6	152.1	151.8	150.4	150.8	163.9	168.3	173.8	178.6	184.2	190.0	196.3	202.5	209.1	215.9	227.7
Merc. ...	357.7	15.6	33.5	48.4	57.6	58.0	50.9	44.9	57.4	71.6	88.4	106.5	124.9	142.6	154.6	171.3	177.1	173.4
Jup. ...	201.4	200.2	199.4	197.5	196.4	195.4	194.3	193.8	193.6	193.6	193.9	194.6	195.5	196.7	198.3	199.8	201.5	203.5
Sat. ...	158.2	157.6	157.0	156.4	156.2	156.2	156.1	156.4	156.8	157.2	158.1	159.0	159.8	160.9	162.0	163.1	164.3	165.6
1746 Mars ...	10.4	17.8	25.1	32.3	39.5	46.6	53.5	60.4	67.3	73.9	80.6	87.3	93.9	100.8	106.9	113.0	119.3	125.5
Merc. ...	11.3	20.9	37.5	39.2	32.6	29.4	36.0	49.4	66.0	84.0	102.7	121.0	137.8	151.8	159.2	158.7	151.1	149.9
Jup. ...	235.0	234.0	233.4	232.7	231.4	230.1	228.7	227.6	226.3	225.5	224.8	224.4	224.4	224.8	225.5	226.4	227.6	229.0
Sat. ...	171.4	170.7	170.0	169.3	169.0	168.6	168.2	168.4	168.6	168.7	169.4	170.1	170.8	171.8	172.9	173.9	175.1	176.3
1747 Mars ...	206.7	204.4	201.3	198.2	195.1	192.4	189.0	184.0	185.9	188.9	192.5	206.8	211.8	217.0	222.0	228.9	235.3	242.0
Merc. ...	16.4	20.7	15.0	4.9	14.4	27.1	43.3	61.5	80.5	98.9	116.3	131.3	141.5	142.8	138.0	132.1	138.1	150.9
Jup. ...	266.4	267.2	267.4	267.3	267.0	266.4	265.4	264.2	262.9	261.5	260.3	259.1	258.1	257.3	257.0	256.8	257.0	257.7
Sat. ...	184.3	183.5	182.7	181.9	181.4	180.9	180.3	180.3	180.3	180.2	180.6	181.1	181.6	182.5	183.4	184.3	185.4	186.6
1748 Mars ...	25.3	32.3	39.2	46.3	53.0	59.9	66.7	73.3	80.0	86.6	93.3	99.6	106.1	112.6	118.9	125.4	131.7	137.8
Merc. ...	357.7	351.2	353.8	5.2	20.7	38.6	57.3	76.0	93.9	110.2	121.6	125.5	120.2	114.7	118.7	130.4	145.7	162.8
Jup. ...	296.1	297.8	299.1	300.3	301.3	301.6	301.8	301.4	300.9	300.2	299.2	297.9	296.6	295.3	294.0	292.9	292.0	291.3
Sat. ...	196.7	195.9	195.1	194.4	193.7	193.1	192.4	192.2	192.0	191.6	191.9	192.2	192.5	192.8	194.0	194.7	195.8	196.8
1749 Mars ...	249.4	253.2	256.6	259.1	260.8	261.3	260.9	259.0	257.0	254.3	252.1	250.5	251.5	253.1	255.9	259.4	264.0	269.0
Merc. ...	334.2	343.3	358.2	16.0	34.7	53.7	72.2	88.8	101.7	107.6	108.7	97.4	99.0	109.9	124.6	141.7	159.5	177.1
Jup. ...	324.4	326.6	328.8	330.6	332.4	334.0	335.2	336.3	337.0	337.4	337.7	337.2	336.7	335.7	334.5	333.2	331.8	330.4
Sat. ...	208.9	208.1	207.4	206.6	205.9	205.0	204.4	204.0	203.6	203.2	203.2	203.2	203.3	203.3	204.5	205.0	205.9	206.8
1750 Mars ...	39.9	46.5	53.1	59.7	66.5	73.0	79.5	85.1	92.5	98.9	105.3	111.7	118.2	124.5	130.9	137.3	143.6	150.0
Merc. ...	336.5	353.4	11.7	30.6	49.3	63.4	80.5	88.6	86.8	79.6	79.6	88.9	102.7	120.2	138.2	156.0	172.8	188.3
Jup. ...	352.1	354.5	356.9	359.3	1.5	3.8	5.7	7.7										

V-B—cont.

Mars, A.D. 1637—A.D. 1999; Mercury, A.D. 1645—A.D. 1999; Jupiter, A.D. 1656—A.D. 1999; Saturn, A.D. 1617—A.D. 1999.

180	190	200	210	220	230	240	250	260	270		280	290	300	310	320	330	340	350	360
8 35	O 5	O 15	O 25	N 4	N 14	N 24	D 4	D 14	D 24		Ja 3	Ja 13	Ja 23	F 2	F 12	F 22	Mr 4	Mr 14	Mr 24
173.1	179.8	186.5	193.2	199.9	206.7	213.5	220.4	227.4	234.4	1738	241.5	248.7	255.0	261.8	270.5	278.1	285.5	292.9	300.5
198.5	199.2	192.0	188.4	194.6	206.7	222.1	239.4	256.8	273.9		289.2	300.8	305.5	300.3	294.2	297.4	308.3	323.8	341.4
323.7	322.8	322.3	321.8	321.9	322.3	323.2	324.2	325.6	327.2		328.8	330.8	332.9	335.1	337.5	339.8	342.2	344.7	347.1
68.1	67.9	67.6	67.4	66.7	66.7	65.3	64.4	63.6	62.7		62.1	61.5	60.8	60.7	60.6	60.5	61.0	61.5	62.0
57.9	60.2	61.4	61.4	60.1	57.4	54.6	51.4	48.8	47.3	1739	46.8	47.8	49.7	52.4	55.8	59.6	63.9	68.7	73.6
178.2	172.6	176.2	187.2	202.1	219.0	236.2	253.3	269.1	281.9		288.5	285.6	278.5	278.8	287.8	302.2	319.4	337.7	356.8
5.0	3.6	2.3	0.7	359.7	359.1	358.4	358.4	358.5	359.1		359.9	1.1	2.6	4.4	6.1	8.1	10.2	12.6	14.9
82.3	82.3	82.3	82.3	81.8	81.8	80.8	79.9	79.1	78.3		77.5	76.6	76.0	75.7	75.3	74.9	75.1	75.4	75.5
185.7	192.5	199.4	206.2	213.3	220.4	227.4	234.7	242.0	249.4	1740	256.6	264.2	271.8	279.4	287.1	294.8	302.6	310.5	318.3
158.0	167.6	182.1	198.4	215.7	232.9	249.1	262.8	271.2	270.6		263.4	261.1	268.0	281.4	297.7	315.8	334.1	352.2	370.5
44.7	44.1	43.1	41.9	40.5	38.7	37.9	36.5	35.7	34.9		34.6	34.5	34.8	35.6	36.6	37.6	38.1	40.8	42.5
98.0	98.3	98.5	98.8	98.6	98.3	96.1	95.3	94.5	93.8		93.1	92.2	91.8	90.8	90.2	89.5	89.5	89.4	89.3
85.4	90.4	94.5	98.1	101.2	108.4	104.5	104.4	103.2	100.4	1741	96.7	98.0	99.7	101.0	102.1	103.0	103.0	102.4	101.0
161.7	177.9	195.2	212.5	229.0	245.5	253.7	255.7	249.3	244.7		249.2	261.1	276.6	294.0	312.2	330.0	346.9	363.8	380.7
79.1	79.4	79.7	79.4	79.0	78.1	77.0	75.7	74.5	73.2		71.9	70.9	70.0	69.4	69.4	69.3	69.7	70.5	71.3
109.0	109.5	110.1	110.6	110.7	110.6	110.6	110.1	109.5	108.9		108.1	107.3	106.5	105.8	105.0	104.2	103.9	103.6	103.2
199.1	206.0	213.0	220.3	227.4	234.6	242.0	249.4	257.0	264.5	1742	272.3	280.0	287.7	295.6	303.4	311.4	319.3	327.1	335.1
178.9	191.5	209.0	224.1	235.9	240.1	238.3	229.4	231.1	241.4		255.9	272.6	290.5	308.3	325.4	339.8	349.5	359.2	368.4
108.3	109.8	110.8	111.7	112.2	112.5	112.3	111.9	111.2	110.2		109.1	107.7	106.4	105.3	104.0	103.0	102.4	102.1	102.0
121.4	122.2	122.9	123.7	124.0	124.2	124.5	124.2	123.9	123.6		123.9	122.2	121.4	120.6	119.9	119.1	118.5	117.9	117.3
103.6	109.2	114.4	119.3	124.0	128.1	131.8	134.6	136.8	137.9	1743	138.0	136.7	138.7	130.3	116.3	122.9	120.3	118.7	118.5
148.6	204.5	217.5	224.3	222.7	214.8	213.8	221.4	225.8	251.9		269.3	287.1	304.2	319.3	329.9	332.8	326.5	321.8	320.6
134.1	136.0	137.9	139.3	140.7	142.0	142.8	143.3	143.6	143.5		143.1	142.5	141.5	140.4	139.0	137.9	136.4	135.3	134.4
133.4	134.4	135.3	136.3	136.8	137.4	137.8	137.7	137.7	137.5		137.0	136.3	135.6	135.0	134.2	133.4	132.7	132.0	131.3
218.6	220.5	227.6	234.9	242.4	249.8	257.4	265.0	272.6	280.5	1744	288.2	296.2	304.1	311.9	319.8	327.7	335.6	343.3	351.0
198.6	207.6	208.3	200.7	197.5	203.8	181.0	231.6	248.6	268.1		263.2	298.7	310.6	315.3	310.7	304.3	307.1	318.6	333.9
158.4	160.6	162.6	164.6	166.5	168.1	169.6	171.1	172.1	173.1		173.6	173.9	173.8	173.3	172.8	171.7	170.6	169.3	168.1
145.1	146.1	147.2	148.2	149.2	149.6	150.4	150.5	150.6	150.8		150.4	150.0	149.7	149.0	148.2	147.5	146.7	145.9	145.1
118.4	124.3	130.0	135.6	141.0	146.1	151.0	155.6	159.7	163.4	1745	166.6	168.8	170.2	170.2	168.9	166.5	163.0	159.1	153.3
193.2	187.5	181.8	185.2	196.6	211.4	227.7	245.4	262.6	278.5		291.8	297.9	295.3	288.0	288.2	297.8	311.9	324.4	347.8
181.9	184.1	186.2	188.4	190.6	192.7	194.6	196.6	198.3	199.9		201.4	202.3	203.2	203.8	204.1	204.0	203.7	203.1	202.1
156.2	157.3	159.0	159.5	160.4	161.2	162.1	162.5	162.9	163.2		163.1	163.0	162.8	162.2	161.6	161.0	160.2	159.4	158.5
229.6	236.7	243.9	251.4	258.8	266.5	274.1	281.6	289.5	297.3	1746	305.1	312.9	320.7	328.5	336.1	343.9	351.4	359.1	366.5
166.5	167.2	177.1	191.1	207.5	224.9	242.0	258.4	272.0	280.4		280.3	272.7	270.4	277.9	291.2	307.5	325.6	344.1	362.2
205.6	207.6	209.7	212.0	214.2	216.4	218.6	220.8	222.9	225.0		227.0	228.7	230.3	231.8	233.1	234.0	234.8	235.1	235.1
166.8	168.0	169.3	170.4	171.4	172.4	173.4	174.0	174.5	175.1		175.2	175.3	175.4	175.0	174.5	174.1	173.3	172.7	171.8
131.7	137.8	143.7	149.7	155.4	161.2	166.7	171.1	177.6	182.8	1747	187.7	192.3	196.5	200.3	203.4	206.1	207.6	208.4	207.7
157.6	171.1	187.2	204.4	221.8	238.1	252.8	268.0	284.8	298.4		253.8	258.7	270.6	286.1	303.6	321.9	339.9	357.0	373.8
203.6	232.4	234.4	236.5	238.5	240.9	243.1	245.3	247.7	249.9		252.1	254.3	256.8	258.3	260.2	262.1	263.7	265.0	266.0
177.4	178.6	179.8	181.1	182.1	183.2	184.3	185.0	185.7	186.6		180.7	187.1	187.3	187.1	186.8	186.6	186.0	185.8	184.7
248.6	255.6	262.8	270.0	277.4	284.7	292.3	299.9	307.5	315.0	1748	322.5	330.1	337.6	345.1	352.5	359.7	366.9	374.1	381.3
166.6	183.7	201.3	218.1	233.1	244.8	249.3	244.8	233.2	210.2		250.8	266.1	282.3	300.2	318.1	335.2	352.2	369.1	385.8
258.6	259.8	261.4	263.0	264.7	266.7	268.3	270.9	273.0	275.5		277.8	280.2	282.5	284.9	287.1	289.3	291.4	293.4	295.4
187.8	190.0	190.2	191.4	192.5	193.6	194.7	195.5	196.4	197.3		197.8	198.3	198.8	198.8	198.7	198.7	198.1	197.5	197.0
144.2	150.4	156.6	162.7	168.8	174.9	181.0	187.1	193.1	199.1	1749	204.9	210.7	216.4	222.1	227.5	232.9	237.9	242.7	247.3
179.9	197.8	213.6	228.5	233.5	231.5	224.0	222.8	231.1	245.1		261.3	279.1	296.7	313.9	329.0	339.9	343.2	337.1	332.4
291.1	291.2	291.7	292.5	293.7	294.8	296.4	298.1	301.0	302.8		304.4	306.8	309.1	311.4	314.0	316.3	318.7	321.1	323.4
197.9	199.1	200.3	201.4	202.6	203.8	204.9	205.9	206.9	207.8		208.5	209.1	209.8	210.0	210.2	210.3	209.9	209.6	209.1
274.4	280.4	286.5	293.2	299.8	306.6	313.3	320.1	327.3	334.1	1750	341.2	348.3	355.2	362.1	368.9	375.6	382.3	388.9	395.4
193.3	207.8	216.9	217.0	209.9	206.1	212.7	225.2	240.7	258.0		275.5	292.8	308.4	320.4	325.5	320.8	317.3	317.1	323.4
329.3	324.4	327.5	327.2	326.9	327.3	327.9	328.7	330.0	331.4		333.8	334.9	337.0	339.2	341.4	343.8	346.2	348.6	350.9
207.3	209.0	210.1	211.8	212.5	213.7	214.8	215.9	217.0	218.0		218.8	219.6	220.3	220.7	221.1	221.4	221.4	221.4	220.9
156.3	162.8	169.1	175.4	181.9	188.3	194.6	201.1	207.6	214.1	1751	220.6	227.1	233.6	240.2	246.7	253.3	259.8	266.3	272.6
199.1	202.2	196.3	191.0	194.5	205.5	220.2	237.2	254.6	271.9		287.9	300.9	307.8	305.0	297.8	298.2	307.6	322.2	339.4
10.8	9.4	8.0	6.8	5.6	4.7	4.0	3.5	3.5	4.0		4.5	5.6	6.8	8.3	10.1	11.9	14.1	16.3	18.4
317.9	319.0	320.0	321.0	322.8	323.6	324.8	325.9	327.0	328.1		328.9	329.8	330.7	331.2	331.7	332.2	332.2	332.2	332.2
8 26	O 6	O 16	O 26	N 5	N 15	N 25	D 5	D 15	D 25	1752	Ja 4	Ja 14	Ja 24	F 3	F 13	F 23	Mr 4	Mr 14	Mr 24
323.9	324.5	326.3	328.9	332.5	336.6	340.8	345.2	350.3	355.9		2.6	8.5	14.3	20.4	26.4	32.6	38.7	45.0	51.3
134.7	175.7	176.5	186.3	200.3	216.8	234.0	251.4	268.2	281.3		290.0	299.6	282.5	279.6	287.4	300.8	317.3	335.5	354.0
49.8	49.2	48.3	47.4	46.1	44.8	43.3	42.2	41.1	40.1		39.7	39.3	39.6	40.0	40.9	42.6	43.3		

TABLE

Geocentric Places of Mars, Mercury, Jupiter, Venus and Saturn for every tenth day of current cycle
Venus, A.D. 1765—A.D. 1999;

Day of I.S.Y.	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
Eng. date ...	Mar 29	Apr 8	Apr 18	Apr 28	May 8	May 18	May 28	Jun 7	Jun 17	Jun 27	Jul 7	Jul 17	Jul 27	Aug 6	Aug 16	Aug 26	Sep 5	Sep 15
752 Mars ...	54.7	60.8	67.1	73.3	79.4	85.9	92.2	98.3	104.7	110.9	117.4	123.6	129.8	136.3	142.6	149.0	155.4	161.3
Merc. ...	8.9	21.7	37.3	48.1	50.7	44.1	40.3	46.4	59.7	76.1	94.2	112.8	130.8	147.5	161.5	169.8	168.3	161.1
Jup. ...	47.5	49.5	51.6	53.8	55.9	58.4	60.9	63.2	65.4	67.9	70.2	72.2	74.4	76.8	78.0	79.7	81.8	82.4
Sat. ...	243.5	243.2	242.8	242.4	241.7	241.0	240.2	239.4	238.7	237.9	237.4	236.9	236.5	236.4	236.4	236.4	237.0	237.5
Eng. date ...	Apr 9	Apr 19	Apr 29	May 9	May 19	May 29	Jun 8	Jun 18	Jun 28	Jul 8	Jul 18	Jul 28	Aug 7	Aug 17	Aug 27	Sep 6	Sep 16	Sep 26
753 Mars ...	296.9	304.3	311.8	319.1	326.2	333.2	340.7	347.5	354.4	1.0	7.3	18.4	18.9	24.4	29.2	33.2	36.6	38.9
Merc. ...	15.0	27.2	31.4	25.6	20.9	25.4	37.5	53.6	71.7	90.6	108.9	126.8	141.4	150.9	152.4	145.8	141.8	148.0
Jup. ...	76.1	77.4	78.9	80.6	82.5	84.5	86.6	88.9	91.1	93.4	95.6	97.9	100.3	102.8	104.6	106.7	108.7	110.4
Sat. ...	254.5	254.3	254.1	253.9	253.2	252.6	252.0	251.3	250.5	249.7	249.1	248.4	247.8	247.6	247.5	247.3	247.6	248.0
1754 Mars ...	69.8	75.5	81.2	87.1	92.9	98.9	104.9	101.0	117.1	123.1	129.4	135.7	143.0	148.3	154.7	161.2	167.6	174.8
Merc. ...	12.3	9.0	2.3	4.6	15.7	31.1	49.2	67.8	86.9	104.0	120.4	132.3	145.7	139.4	124.8	128.7	140.2	155.2
Jup. ...	106.2	106.6	107.1	108.1	109.3	110.7	112.3	114.1	116.0	118.0	120.3	122.4	124.6	126.7	129.0	131.2	133.2	135.5
Sat. ...	265.5	265.6	265.5	265.5	265.0	264.5	263.9	263.1	262.3	261.6	260.9	260.2	259.6	259.2	258.8	258.4	258.6	259.7
Eng. date ...	Apr 10	Apr 20	Apr 30	May 10	May 20	May 30	Jun 9	Jun 19	Jun 29	Jul 9	Jul 19	Jul 29	Aug 8	Aug 18	Aug 28	Sep 7	Sep 17	Sep 27
755 Mars ...	315.4	323.0	330.9	338.4	345.1	353.6	1.1	9.8	15.6	22.7	29.5	36.5	42.9	49.2	55.2	61.2	66.7	71.7
Merc. ...	844.4	844.3	853.6	861.1	868.1	874.0	880.0	886.0	892.0	898.0	904.0	910.0	916.0	922.0	928.0	934.0	940.0	946.0
Jup. ...	188.4	187.6	187.3	187.2	187.6	188.2	189.1	190.2	191.4	192.6	193.8	195.0	196.2	197.4	198.6	199.8	201.0	202.2
Sat. ...	276.2	276.5	276.8	277.0	276.6	276.3	276.0	275.2	274.5	273.8	273.1	272.4	271.6	270.8	269.9	269.0	268.0	266.9
Eng. date ...	Apr 9	Apr 19	Apr 29	May 9	May 19	May 29	Jun 8	Jun 18	Jun 28	Jul 8	Jul 18	Jul 28	Aug 7	Aug 17	Aug 27	Sep 6	Sep 16	Sep 26
1756 Mars ...	56.8	61.7	66.5	71.3	76.1	80.9	85.7	90.5	95.3	100.1	104.9	109.7	114.5	119.3	124.1	128.9	133.7	138.5
Merc. ...	332.9	346.4	3.5	22.0	41.0	59.8	78.9	91.1	99.2	107.3	115.4	123.5	131.6	139.7	147.8	155.9	164.0	172.1
Jup. ...	172.0	170.7	169.6	168.8	168.0	167.5	167.5	167.7	168.3	169.1	170.2	171.4	172.6	173.8	175.0	176.2	177.4	178.6
Sat. ...	287.2	287.6	287.9	288.4	288.2	288.1	288.0	287.4	286.8	286.2	285.4	284.6	283.9	283.2	282.5	281.8	281.6	281.4
1757 Mars ...	332.6	340.5	348.2	355.9	3.4	11.0	18.3	25.7	33.0	40.0	47.0	53.7	60.4	67.1	73.3	79.6	85.6	91.4
Merc. ...	341.1	359.2	18.2	36.9	54.6	69.6	79.1	80.0	78.0	70.6	78.8	91.8	108.3	125.6	144.5	161.8	177.7	197.0
Jup. ...	206.1	204.9	203.7	202.3	201.1	199.9	198.9	198.1	197.7	197.7	197.7	198.4	199.3	200.3	201.6	203.2	204.9	206.9
Sat. ...	298.0	298.6	299.2	299.8	299.9	300.0	300.1	299.7	299.2	298.9	298.1	297.4	296.6	295.8	295.0	294.3	293.9	293.4
1758 Mars ...	108.6	111.3	114.8	118.9	123.3	128.1	133.1	138.6	144.1	149.8	155.7	161.6	168.1	174.3	180.9	187.4	193.9	200.9
Merc. ...	355.4	14.1	32.0	47.6	58.8	61.7	55.5	51.4	57.2	70.0	86.4	104.3	122.7	140.8	157.0	170.9	178.8	177.7
Jup. ...	239.3	239.1	238.9	237.6	236.4	235.5	234.8	234.2	231.3	230.1	229.4	229.0	228.7	228.9	229.5	230.2	231.4	232.7
Sat. ...	309.0	309.7	310.5	311.3	311.7	312.0	312.3	312.0	311.8	311.6	311.0	310.4	309.7	309.4	308.1	307.2	306.6	306.0
Eng. date ...	Apr 10	Apr 20	Apr 30	May 10	May 20	May 30	Jun 9	Jun 19	Jun 29	Jul 9	Jul 19	Jul 29	Aug 8	Aug 18	Aug 28	Sep 7	Sep 17	Sep 27
1759 Mars ...	349.0	356.7	4.2	11.7	19.3	26.7	33.8	41.1	48.1	55.2	62.0	68.6	75.4	81.8	88.4	94.6	100.7	106.9
Merc. ...	9.5	25.7	38.0	48.0	37.8	32.2	36.2	48.1	64.0	82.0	100.7	119.0	136.2	151.0	166.0	182.4	155.5	151.6
Jup. ...	270.8	271.5	272.0	272.1	272.0	271.4	270.6	269.4	268.1	266.7	265.5	264.1	263.9	262.3	261.6	261.4	261.6	262.0
Sat. ...	320.0	320.9	321.9	322.9	323.4	324.0	324.5	324.5	324.5	324.5	324.0	323.5	323.0	322.2	321.4	320.7	319.9	319.2
Eng. date ...	Apr 9	Apr 19	Apr 29	May 9	May 19	May 29	Jun 8	Jun 18	Jun 28	Jul 8	Jul 18	Jul 28	Aug 7	Aug 17	Aug 27	Sep 6	Sep 16	Sep 26
1760 Mars ...	138.6	138.3	138.9	140.9	143.6	147.0	151.0	155.5	160.5	165.8	171.5	177.2	183.2	189.5	196.0	202.5	209.2	216.2
Merc. ...	16.7	23.4	19.9	13.3	14.9	28.1	41.5	59.5	78.1	96.8	114.4	130.4	142.2	146.1	140.6	134.7	138.3	149.6
Jup. ...	300.1	301.8	303.5	304.6	305.5	306.3	306.5	306.6	306.1	305.4	304.5	303.3	302.0	300.5	299.2	298.1	297.0	296.3
Sat. ...	331.2	332.3	333.4	334.5	335.3	336.0	336.8	337.0	337.0	337.5	337.3	337.0	336.7	336.0	335.8	334.5	333.7	332.9
1761 Mars ...	4.6	12.1	19.3	26.7	33.8	41.0	48.2	55.2	62.1	68.8	75.6	82.4	88.7	95.3	101.9	108.2	114.4	120.4
Merc. ...	2.3	354.9	355.1	4.3	19.2	36.6	54.7	73.8	91.9	109.2	121.6	128.3	124.7	117.8	109.6	129.4	144.2	160.9
Jup. ...	328.3	330.6	332.7	334.6	336.7	338.3	339.6	340.9	341.8	342.4	342.6	342.4	342.0	341.1	340.1	338.8	337.6	336.1
Sat. ...	342.5	343.7	344.9	346.2	347.1	348.1	349.1	349.6	350.2	350.6	350.6	350.5	350.4	349.9	349.4	348.8	348.0	347.2
1762 Mars ...	184.8	181.4	178.1	176.1	175.0	175.4	177.1	179.7	183.0	187.1	191.8	196.7	202.5	208.3	214.1	220.5	227.0	233.7
Merc. ...	335.6	342.9	356.7	13.9	32.5	51.6	70.1	87.4	101.3	109.7	108.5	101.3	100.4	109.0	123.2	139.7	157.5	175.0
Jup. ...	356.0	358.2	0.6	3.0	5.5	7.7	9.7	11.8	13.7	15.2	16.6	17.8	18.5	19.0	19.1	18.8	18.3	17.4
Sat. ...	354.2	355.5	356.8	358.1	359.2	0.4	1.4	2.2	2.9	3.7	3.9	4.1	4.4	4.0	3.7	3.3	2.6	1.8
Eng. date ...	Apr 10	Apr 20	Apr 30	May 10	May 20	May 30	Jun 9	Jun 19	Jun 29	Jul 9	Jul 19	Jul 29	Aug 8	Aug 18	Aug 28	Sep 7	Sep 17	Sep 27
1763 Mars ...	19.5	26.7	33.8	40.9	47.8	54.8	61.5	68.3	75.2	81.8	88.4	94.9	101.5	107.8	114.3	120.6	126.8	133.3
Merc. ...	335.0	351.3	9.8	28.3	48.0	64.9	80.1	90.2	91.2	84.0	81.2	84.4	101.8	118.2	135.9	153.9	171.4	187.1
Jup. ...	28.7	26.0	28.4	30.8	33.2	35.6	37.8	40.3	42.5	44.6	46.6	48.6	50.1	57.8	52.9	53.8	54.5	54.7
Sat. ...	6.1	7.4	8.7	10.0	11.2	12.5	13.7	14.6	15.6	16.6	17.1	17.0	18.1	18.1	18.0	17.9	17.4	16.8
Eng. date ...	Apr 9	Apr 19	Apr 29	May 9	May 19	May 29	Jun 8	Jun 18	Jun 28	Jul 8	Jul 18	Jul 28	Aug 7	Aug 17	Aug 27	Sep 6	Sep 16	Sep 26
1764 Mars ...	236.5	237.1	237.9	237.5	236.0	233.9	230.6	228.5	226.7	225.2	223.7	222.7	221.7	220.5	219.1	217.5	215.9	214.3
Merc. ...	346.9	5.5	24.4	42.4	58.3	69.9	78.0	86.9	92.1	98.0	104.0	110.0	116.0	122.0	128.0	134.0	140.0	146.0
Jup. ...	51.3	53.3	55.4	57.6	59.7	61.9	64.4	66.7	69.0	71.4	73.7	75.8	78.0	80.0	82.0	83.6	85.2	86.3
Sat. ...	18.3	19.6	20.9	22.3	23.6	24.9	26.2	27.4	28.5	29.6	30.3	31.1	31.8	32.0	32.3	32.5	32.2	31.8
1765 Mars ...	34.1	41.0	47.8	54.6	61.2	68.0	74.8	81.1	87.5	94.2	100.7	107.0	113.5	120.0	126.2	132.5	138.9	145.3
Merc. ...	1.6	19.8	36.1	48.4	58.7	49.4	43.3	40.9	58.5	74.2	92.0	110.6	128.8	145.8	161.2	170.6	171.9	165.2
Jup. ...	80.1	81.4	82.7	84.2	86.0	88.1	90.0	92.2	94.5	96.8	99.0	101.3	103.6	105.7	107.9	110.1	112.1	113.9
Ven. ...	344.0	356.5	9.0	21.1	33.6	46.0	58.3	70.5	82.7	94.9	107.4	119.2	131.5	143.7	155.1	168.2	180.8	193.0
Sat. ...	30.6	31.9	33.2	34.5	35.9	37.2	38.6	39.8	41.1	42.4	43.4	44.4	45.4	45.8	46.2	46.7	46.7	

V-E—cont.

Mars, A.D. 1637—A.D. 1999; Mercury, A.D. 1645—A.D. 1999; Jupiter, A.D. 1656—A.D. 1999;

Saturn, A.D. 1617—A.D. 1999—cont.

180	190	200	210	220	230	240	250	260		270	280	290	300	310	320	330	340	350	360
O 6	O 16	O 26	N 5	N 15	N 25	D 5	D 15	D 25		Jy 4	Jy 14	Jy 24	F 3	F 13	F 23	Mr 5	Mr 15	Mr 25	Ap 4
168.4	175.0	181.5	188.2	194.7	201.5	208.1	215.0	221.8	1753	228.7	235.7	242.7	249.7	256.8	261.0	270.2	278.4	285.8	293.1
169.0	168.7	180.4	196.3	213.5	230.9	247.4	262.0	272.1		274.2	287.7	293.2	297.8	290.1	295.8	313.6	331.9	360.0	7.0
183.8	83.7	84.4	84.2	83.8	83.1	82.0	80.9	79.6		78.4	77.1	76.0	74.8	74.2	73.9	73.7	73.9	74.5	75.5
238.0	238.9	239.8	240.7	241.8	242.9	244.0	245.2	246.4		247.5	248.6	249.7	250.8	251.6	252.5	253.3	253.7	254.1	254.5
O 6	O 16	O 26	N 5	N 15	N 25	D 5	D 15	D 25	1754	Ja 4	Ja 14	Ja 24	F 3	F 13	F 23	Mr 5	Mr 15	Mr 25	Ap 4
40.2	40.0	38.7	36.6	33.6	31.1	28.8	27.8	26.1		29.8	31.5	34.3	35.0	42.0	46.4	51.2	56.3	61.5	67.0
180.3	175.9	193.0	210.4	227.2	242.4	254.1	258.4	253.6		247.3	249.7	260.1	274.8	291.8	308.8	328.2	345.0	0.2	10.4
112.2	113.5	114.7	115.8	116.8	116.8	116.8	116.5	115.9		115.0	113.9	112.7	111.4	110.0	108.8	107.8	107.0	106.4	105.3
248.3	249.1	249.8	250.6	251.6	252.7	253.8	254.9	256.2		257.3	258.5	259.6	260.7	261.7	262.6	263.6	264.1	264.7	265.3
180.9	187.6	194.2	201.1	208.0	214.9	221.9	229.0	236.2	1755	243.4	250.8	258.1	265.6	273.2	280.6	288.4	296.0	303.7	311.4
171.6	189.1	197.1	222.8	235.8	242.3	240.4	232.8	231.7		240.5	254.3	270.7	288.4	306.3	323.6	339.1	350.4	353.6	347.8
137.5	139.6	141.4	142.9	144.7	145.6	146.5	147.3	147.9		147.9	147.5	147.1	146.2	145.1	143.8	142.6	141.8	139.9	139.2
258.8	259.4	260.0	260.7	261.7	262.7	263.6	264.8	266.0		267.1	268.3	269.5	270.6	271.7	272.7	273.8	274.6	276.3	276.0
O 7	O 17	O 27	N 6	N 16	N 26	D 6	D 16	D 26	1756	Ja 5	Ja 15	Ja 25	F 4	F 14	F 24	Mr 5	Mr 15	Mr 25	Ap 4
76.8	80.6	84.1	87.0	89.7	89.5	89.1	87.0	84.1		80.6	76.7	74.1	72.3	71.9	72.9	74.8	77.5	80.9	84.9
168.6	203.1	216.9	225.7	226.1	218.8	215.5	221.6	234.2		250.0	267.3	285.2	302.5	318.1	330.4	335.5	341.4	345.0	327.4
161.7	163.7	163.8	167.9	169.9	171.7	173.3	174.7	176.0		176.9	177.6	177.7	178.1	177.7	177.1	176.2	175.1	174.1	172.7
269.7	270.2	270.6	271.1	272.0	272.9	273.8	274.7	275.7		276.6	277.8	279.0	280.1	281.2	282.4	283.5	284.5	285.5	286.4
O 6	O 16	O 26	N 5	N 15	N 25	D 5	D 15	D 25	1757	Ja 4	Ja 14	Ja 24	F 3	F 13	F 23	Mr 5	Mr 15	Mr 25	Ap 4
194.0	200.9	207.8	214.7	221.7	228.8	236.1	243.5	250.9		258.6	266.2	273.8	281.5	289.3	297.2	304.8	312.8	320.2	328.5
197.6	206.4	211.3	205.6	199.9	203.1	214.6	229.8	246.4		264.0	281.3	297.4	310.4	317.5	315.4	308.3	307.9	317.7	332.1
184.9	187.3	189.3	191.4	193.6	195.9	197.9	199.9	201.6		203.3	201.7	206.1	207.0	207.6	208.1	208.8	207.9	207.4	206.6
281.1	281.3	281.6	281.9	282.6	283.9	284.2	285.2	286.3		287.3	288.5	289.7	291.0	292.2	293.4	294.5	295.5	296.6	297.5
87.0	102.5	107.8	111.9	116.0	119.7	122.6	124.4	125.3	1758	125.3	123.8	121.0	117.5	114.0	110.2	107.4	106.3	106.2	107.7
195.5	192.0	184.9	186.0	195.6	209.5	225.9	243.8	260.6		277.0	290.8	299.4	299.7	292.0	283.6	297.2	310.2	327.3	345.6
208.9	210.9	213.1	215.3	217.5	219.7	222.8	224.2	226.3		228.4	240.4	232.2	233.9	235.6	236.9	237.8	238.7	239.8	239.8
292.9	293.0	293.1	293.1	293.7	294.3	294.9	295.9	296.9		297.8	299.0	300.2	301.8	302.5	303.7	305.0	306.1	307.3	308.4
207.8	214.7	221.9	229.0	236.3	243.9	251.8	258.9	266.5	1759	274.3	282.0	289.8	297.7	305.5	313.4	321.2	329.3	337.1	344.8
170.3	167.9	176.2	189.6	205.6	222.8	239.9	256.7	271.2		281.2	283.6	277.2	272.6	277.5	289.7	305.8	323.4	341.9	0.0
234.3	235.8	237.8	239.9	241.9	244.9	246.4	243.7	261.0		253.3	255.6	257.7	259.9	262.1	264.0	265.9	267.5	268.8	270.1
305.5	305.3	305.1	304.9	305.3	305.6	306.1	306.9	307.8		308.6	309.7	310.8	312.0	313.2	314.5	315.7	317.0	318.2	319.4
O 7	O 17	O 27	N 6	N 16	N 26	D 6	D 16	D 26	1760	Ja 5	Ja 15	Ja 25	F 4	F 14	F 24	Mr 5	Mr 15	Mr 25	Ap 4
112.7	118.7	124.0	129.5	134.7	139.5	144.2	148.1	151.7		154.3	156.4	157.3	157.1	155.4	152.3	148.7	144.8	141.6	139.5
157.4	169.8	185.3	202.2	219.7	236.5	251.6	268.2	283.2		263.1	256.6	258.9	269.5	284.3	301.5	319.7	338.0	355.4	10.6
202.8	203.8	205.1	206.7	208.4	210.4	212.5	214.6	216.6		219.0	221.3	223.8	226.0	228.4	230.8	233.1	235.3	237.8	239.3
318.4	318.1	317.7	317.3	317.4	317.6	317.8	318.4	319.1		319.8	320.9	322.0	323.0	324.2	325.4	326.6	327.9	329.2	330.5
O 6	O 16	O 26	N 5	N 15	N 25	D 5	D 15	D 25	1761	Ja 4	Ja 14	Ja 24	F 3	F 13	F 23	Mr 5	Mr 15	Mr 25	Ap 4
223.0	230.1	237.3	244.6	252.1	259.6	267.2	275.0	282.8		290.5	298.3	306.2	314.1	321.8	329.7	337.5	345.2	352.9	0.4
164.7	181.6	199.0	216.1	231.9	244.6	251.6	248.3	241.6		241.0	250.0	268.6	280.1	297.8	316.1	333.4	349.1	0.8	4.4
295.9	295.8	296.2	296.9	297.8	299.0	300.5	302.2	304.0		306.0	308.2	310.5	312.8	315.2	317.5	320.1	322.4	324.8	327.2
382.1	331.6	331.0	330.4	330.3	330.3	330.2	330.7	331.2		331.7	332.6	333.6	334.4	335.6	336.8	338.0	339.3	340.6	341.9
126.7	132.7	138.3	144.2	149.9	155.6	160.9	166.0	171.1	1762	175.7	180.0	184.0	187.2	190.0	191.8	192.3	191.8	189.5	186.8
177.8	185.8	212.2	225.9	234.9	235.1	228.1	224.2	230.3		243.6	259.4	276.9	294.7	312.0	328.0	340.3	346.1	341.9	335.6
334.7	333.6	332.7	332.1	331.8	332.0	332.4	333.8	334.3		335.5	337.2	339.0	340.9	343.0	345.2	347.6	349.9	352.3	354.5
346.4	345.6	344.9	344.1	343.7	343.4	343.2	343.4	343.7		344.0	344.7	345.5	346.2	347.3	348.4	349.6	350.9	352.1	353.5
120.7	247.8	254.9	262.2	269.6	277.4	284.8	292.5	300.3	1763	307.9	315.7	323.4	330.9	338.5	346.2	353.6	1.1	8.2	15.6
190.2	206.8	217.5	220.3	214.3	208.9	212.5	228.9	249.1		255.9	273.5	290.9	307.1	320.3	327.5	325.4	318.8	318.3	327.6
16.4	15.1	13.7	12.8	10.3	9.9	10.1	8.6	8.4		8.5	9.1	10.0	11.0	12.5	14.1	15.8	17.9	20.0	22.1
1.1	0.3	359.5	358.6	358.0	357.5	357.0	357.0	356.9		356.9	357.5	358.1	358.7	359.6	0.6	1.6	2.8	4.0	5.3
O 7	O 17	O 27	N 6	N 16	N 26	D 6	D 16	D 26	1764	Ja 5	Ja 15	Ja 25	F 4	F 14	F 24	Mr 5	Mr 15	Mr 25	Ap 4
139.3	145.5	151.6	157.7	163.7	169.7	175.6	181.3	187.3		193.0	198.6	203.9	209.1	214.2	219.0	223.5	227.7	231.1	234.2
199.3	204.7	201.0	194.0	194.8	204.6	218.7	235.1	252.6		270.0	286.5	300.5	309.1	309.3	302.2	299.6	306.9	320.6	337.3
54.8	54.3	53.7	52.6	51.4	50.1	48.7	47.4	46.3		45.2	44.5	44.2	44.1	44.4	45.0	46.0	47.3	48.7	50.3
16.1	15.3	14.5	13.6	12.9	12.2	11.5	11.2	10.9		10.6	10.9	11.2	11.5	12.4	13.2	14.0	15.1	16.3	17.5
O 6	O 16	O 26	N 5	N 15	N 25	D 5	D 15	D 25	1765	Ja 4	Ja 14	Ja 24	F 3	F 13	F 23	Mr 5	Mr 15	Mr 25	Ap 4
263.0	269.5	276.2	283.1	290.2	297.8	304.6	311.9	319.1		326.4	333.7	341.0	348.2	355.4	2.4	9.6	16.6	23.7	30.4
187.0	179.5	177.6	185.9	198.7	214.8	231.8	249.3	265.8		280.7	291.2	293.2	287.0	282.1	287.5	290.4	315.4	334.1	351.8
87.6	88.4	88.9	88.9	88.6	88.9	87.2	86.0	85.8		83.4	83.1	80.9	79.8	79.0	78.4	78.2	78.4	78.7	79.6
31.8	30.6	29.9	29.2	28.3	27.5	26.6	26.1	25.5		25.0	25.0	25.0	25.0	25.7	26.3	26.9	27.9	28.9	29.9
151.6	157.9	164.1	170.4	176.7	183.1	189.3	195.6	202.0	1766	208.2	214.5	220.8	227.0	233.3	239.5	245.7	251.8	257.9	263.9
160.9	168.8	178.9	194.6	211.5	228.8	245.6	262.9	279.5		276.9	272.8	265.9	268.4	278.7	294.8	311.3	329.5		

TABLE

Geocentric Places of Mars, Mercury, Jupiter, Venus and Saturn for every tenth day of current cycle:
Venus, A.D. 1765—A.D. 1999.

Day of I.S.Y.	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
Eng. date ...	Ap 9	Ap 19	Ap 29	My 9	My 19	My 29	Je 8	Je 18	Je 28	Je 8	Je 18	Je 28	Je 8	Je 18	Je 28	Je 8	Je 18	Je 28
1766 Mars ...	289.9	272.7	278.2	243.3	248.3	292.9	296.9	300.2	302.6	304.0	304.1	302.6	300.4	297.8	295.7	294.3	295.1	296.5
Merc. ...	14.0	27.5	34.0	31.2	24.4	20.1	38.6	52.0	69.7	83.4	106.8	124.6	140.3	151.8	155.6	150.4	144.5	147.9
Jup. ...	110.5	110.7	111.1	111.9	113.1	115.4	116.0	117.6	119.4	121.4	123.6	125.8	127.9	130.1	132.4	134.6	136.7	138.9
Ven. ...	339.2	338.2	340.8	346.3	353.9	2.5	11.8	22.1	32.8	43.7	54.9	66.5	78.1	89.8	101.5	113.6	125.7	137.6
Sat. ...	43.4	44.7	46.0	47.2	48.5	49.8	51.2	52.5	53.8	55.1	56.3	57.4	58.6	59.3	60.1	60.8	61.0	61.2
Eng. date ...	Ap 10	Ap 20	Ap 30	My 10	My 20	My 30	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29
1767 Mars ...	49.0	55.3	61.8	68.2	74.5	80.9	87.2	93.6	99.9	106.3	112.6	119.0	125.2	131.7	138.1	144.3	150.6	157.3
Merc. ...	14.1	13.4	6.2	5.5	15.0	29.5	47.0	65.6	84.5	102.8	119.2	132.2	138.4	135.3	128.8	120.2	139.4	153.4
Jup. ...	143.0	142.2	141.6	141.3	141.5	142.0	142.8	143.7	145.0	146.4	148.2	150.1	152.0	153.9	156.0	158.2	160.4	162.6
Ven. ...	21.6	34.0	46.1	58.1	70.2	82.0	93.8	105.5	117.1	128.2	139.4	149.4	159.7	170.6	180.0	188.0	194.9	199.1
Sat. ...	56.4	57.5	58.7	59.8	61.1	62.4	63.7	65.0	66.4	67.6	68.1	70.8	71.5	72.5	73.4	74.4	74.9	75.3
Eng. date ...	Ap 9	Ap 19	Ap 29	My 9	My 19	My 29	Je 8	Je 18	Je 28	Je 8	Je 18	Je 28	Je 8	Je 18	Je 28	Je 8	Je 18	Je 28
1768 Mars ...	289.5	296.5	303.5	310.7	317.6	324.4	331.2	337.7	344.0	350.2	355.8	1.1	5.8	10.0	13.2	15.4	16.1	15.6
Merc. ...	348.7	346.0	353.0	6.9	24.1	42.6	61.7	80.2	97.5	111.9	120.3	119.0	111.4	110.4	119.2	132.7	149.3	166.8
Jup. ...	176.7	175.4	174.1	173.8	172.5	171.7	171.6	171.6	172.0	172.8	173.7	175.0	176.4	178.2	180.0	181.9	183.9	186.1
Ven. ...	326.8	338.8	351.0	3.1	15.3	27.5	39.8	52.0	64.1	76.3	88.4	100.6	112.8	125.4	137.8	150.1	162.4	174.9
Sat. ...	68.6	70.6	71.5	72.5	73.7	75.0	76.2	76.6	78.9	80.2	81.5	82.8	84.2	85.3	86.4	87.5	88.3	89.0
Eng. date ...	Ap 9	Ap 19	Ap 29	My 9	My 19	My 29	Je 8	Je 18	Je 28	Je 8	Je 18	Je 28	Je 8	Je 18	Je 28	Je 8	Je 18	Je 28
1769 Mars ...	337.7	345.1	353.5	361.8	369.8	377.7	385.8	393.7	401.5	409.2	416.8	424.3	431.7	439.0	446.2	453.4	460.6	467.8
Merc. ...	332.8	345.1	353.5	361.8	369.8	377.7	385.8	393.7	401.5	409.2	416.8	424.3	431.7	439.0	446.2	453.4	460.6	467.8
Jup. ...	210.8	209.7	208.4	207.1	205.7	204.6	203.6	202.7	202.0	201.8	201.9	202.2	203.0	204.1	205.3	207.7	208.3	209.2
Ven. ...	44.8	52.6	58.6	62.2	62.1	58.5	52.6	47.8	45.1	48.2	53.4	60.8	69.5	79.0	89.2	100.0	110.9	122.3
Sat. ...	83.2	84.0	84.7	85.4	86.5	87.6	88.7	89.9	91.4	92.6	93.9	95.2	96.6	97.9	99.1	100.8	101.2	102.2
Eng. date ...	Ap 9	Ap 19	Ap 29	My 9	My 19	My 29	Je 8	Je 18	Je 28	Je 8	Je 18	Je 28	Je 8	Je 18	Je 28	Je 8	Je 18	Je 28
1770 Mars ...	308.4	316.0	323.6	331.2	338.7	346.2	353.5	360.7	367.9	375.1	382.2	389.2	396.2	403.1	409.9	416.6	423.3	430.0
Merc. ...	339.3	357.1	375.8	394.5	413.2	431.9	450.6	469.3	488.0	506.7	525.4	544.1	562.8	581.5	600.2	618.9	637.6	656.3
Jup. ...	243.9	243.6	243.1	242.3	241.8	240.0	238.8	237.4	236.2	235.1	234.0	233.5	233.3	233.5	234.3	235.8	237.4	239.0
Ven. ...	3.4	15.8	28.1	40.5	52.7	64.8	77.1	89.3	101.4	113.2	125.4	137.4	149.3	161.1	172.9	184.7	196.3	207.5
Sat. ...	98.9	97.8	97.8	98.3	99.3	100.2	101.1	102.3	103.4	104.7	106.1	107.4	108.7	110.0	111.2	112.5	113.6	114.7
Eng. date ...	Ap 10	Ap 20	Ap 30	My 10	My 20	My 30	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29
1771 Mars ...	79.9	85.0	90.3	95.9	101.4	107.1	113.0	118.8	124.8	130.9	137.0	143.2	149.6	155.9	162.3	168.7	175.3	182.0
Merc. ...	353.3	11.8	30.1	46.8	64.8	83.8	102.8	121.8	140.8	159.8	178.8	197.8	216.8	235.8	254.8	273.8	292.8	311.8
Jup. ...	275.0	275.9	276.4	276.7	276.7	276.4	275.5	274.5	273.3	272.1	270.8	269.5	268.2	267.2	266.6	266.1	266.1	266.4
Ven. ...	314.2	325.0	336.4	347.7	359.7	11.2	23.0	34.9	46.9	58.9	70.7	82.8	94.8	107.2	119.2	131.9	144.1	156.3
Sat. ...	110.8	110.9	111.1	111.8	112.1	112.8	113.5	114.6	115.7	116.8	118.1	119.4	120.5	121.9	123.2	124.5	125.7	126.8
Eng. date ...	Ap 9	Ap 19	Ap 29	My 9	My 19	My 29	Je 8	Je 18	Je 18	Je 18	Je 18	Je 18	Je 18	Je 18	Je 18	Je 18	Je 18	Je 18
1772 Mars ...	326.0	333.8	341.6	349.2	356.8	364.4	372.0	379.6	387.2	394.8	402.4	409.9	417.5	425.0	432.6	440.1	447.7	455.2
Merc. ...	7.5	24.4	38.1	45.6	42.7	35.6	28.5	21.4	14.3	7.2	0.1	11.6	23.1	34.6	46.1	57.6	69.1	80.6
Jup. ...	304.1	305.8	307.6	309.9	310.9	311.2	311.5	311.2	310.8	310.0	308.8	307.6	306.1	304.8	303.5	302.4	301.5	300.5
Ven. ...	38.5	49.9	61.6	72.5	83.3	93.4	103.1	112.1	119.6	125.1	129.1	132.5	135.5	138.0	140.0	141.5	142.5	143.4
Sat. ...	124.7	124.5	124.4	124.3	124.8	125.3	125.8	126.7	127.6	128.5	129.7	130.9	132.2	133.5	134.8	136.0	137.2	138.4
Eng. date ...	Ap 9	Ap 19	Ap 29	My 9	My 19	My 29	Je 8	Je 18	Je 18	Je 18	Je 18	Je 18	Je 18	Je 18	Je 18	Je 18	Je 18	Je 18
1773 Mars ...	99.6	103.0	107.1	111.7	116.5	121.7	127.4	132.6	138.4	144.2	150.2	156.4	162.6	168.9	175.3	181.8	188.6	195.3
Merc. ...	10.6	25.3	41.4	58.1	75.4	93.1	111.2	129.7	148.6	167.9	187.6	207.6	227.9	248.4	269.1	289.9	310.8	331.8
Jup. ...	332.2	334.4	336.6	338.6	340.6	342.4	344.0	345.2	346.4	347.1	347.8	348.5	349.2	349.8	350.4	351.0	351.6	352.2
Ven. ...	344.6	357.2	370.8	384.4	398.0	411.6	425.2	438.8	452.4	466.0	479.6	493.2	506.8	520.4	534.0	547.6	561.2	574.8
Sat. ...	138.4	139.1	137.7	137.5	137.7	138.0	138.2	138.9	139.7	140.3	141.4	142.5	143.6	144.8	146.0	147.3	148.6	149.9
Eng. date ...	Ap 10	Ap 20	Ap 30	My 10	My 20	My 30	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29
1774 Mars ...	342.8	350.6	358.1	365.8	373.5	381.2	388.9	396.6	404.3	412.0	419.7	427.4	435.1	442.8	450.5	458.2	465.9	473.6
Merc. ...	6.5	35.9	50.8	65.8	80.9	96.0	111.1	126.2	141.3	156.4	171.5	186.6	201.7	216.8	231.9	247.0	262.1	277.2
Jup. ...	359.6	2.2	4.6	7.2	9.4	11.6	13.9	16.9	19.4	22.4	25.4	28.4	31.4	34.4	37.4	40.4	43.4	46.4
Ven. ...	333.4	336.4	339.7	343.7	348.7	353.7	358.7	363.7	368.7	373.7	378.7	383.7	388.7	393.7	398.7	403.7	408.7	413.7
Sat. ...	152.1	151.5	151.0	150.4	150.4	150.4	150.4	150.9	151.5	152.1	152.8	153.7	154.7	155.9	157.0	158.2	159.5	160.8
Eng. date ...	Ap 10	Ap 20	Ap 30	My 10	My 20	My 30	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29
1775 Mars ...	125.4	128.4	128.5	131.2	134.8	138.9	143.5	148.4	153.7	159.2	165.1	170.9	177.1	183.3	189.8	196.3	203.1	209.9
Merc. ...	338.0	344.9	353.6	362.3	371.0	380.0	389.0	398.0	407.0	416.0	425.0	434.0	443.0	452.0	461.0	470.0	479.0	488.0
Jup. ...	27.5	29.8	32.1	34.5	36.9	39.3	41.6	44.0	46.3	48.4	50.5	52.5	54.1	55.9	57.1	58.2	59.9	61.4
Ven. ...	22.3	31.6	46.7	58.7	70.8	82.6	94.3	106.0	117.5	128.6	139.7	149.8	159.9	170.5	179.5	187.2	193.6	198.8
Sat. ...	165.4	164.7	164.0	163.4	163.1	162.9	162.6	162.8	163.1	163.4	164.2	165.0	165.8	166.9	167.9	169.0	170.2	171.4
Eng. date ...	Ap 9	Ap 19	Ap 29	My 9	My 19	My 29	Je 8	Je 18	Je 28	Je 8	Je 18	Je 28	Je 8	Je 18	Je 28	Je 8	Je 18	Je 28
1776 Mars ...	358.5	361.1	363.7	366.3	368.9	371.5	374.1	376.7	379.3	381.9	384.5	387.1	389.7	392.3	394.9	397.5	400.1	402.7
Merc. ...	333.9	349.4	365.9	382.4	398.9	415.4	431.9	448.4	464.9	481.4	497.9	514.4	530.9	547.4	563.9	580.4	596.9	613.4
Jup. ...	55.2	57.1	59.1	61.2	63.6	66.5	69.7	72.2	74.8	77.4	79.9	82.4	84.9	87.4	89.9	92.4	94.9	97.4
Ven. ...	327.4	339.4	351.8	364.8	378.3	392.3	406.8	421.8	437.3	453.3	469.8	486.8	504.3	522.3	540.8	559.8	579.3	599.3
Sat. ...	178.4	177.6	176.9															

V-B—cont.

Mars, A.D. 1637—A.D. 1999; Mercury, A.D. 1645—A.D. 1999; Jupiter, A.D. 1656—A.D. 1999; Saturn, A.D. 1617—A.D. 1999—cont.

180	190	200	210	220	230	240	250	260		270	280	290	300	310	320	330	340	350	360
O 6	O 16	O 26	N 5	N 15	N 25	D 5	D 15	D 25		Ja 4	Ja 14	Ja 24	F 3	F 13	F 23	Mr 5	Mr 15	Mr 25	Ap 4
299.4	303.0	307.5	312.1	317.4	323.1	328.9	334.9	341.1	1767	347.5	354.2	0.1	6.5	13.0	19.4	25.9	32.5	38.8	45.3
150.1	174.1	191.0	208.3	225.5	241.2	253.9	260.5	2.8		250.7	250.5	259.0	273.2	290.0	307.8	326.1	343.8	359.3	11.1
141.0	142.9	144.8	146.5	148.0	149.4	150.6	151.3	152.0		152.1	151.9	151.6	150.9	149.8	148.5	147.3	145.7	144.7	143.5
150.2	162.3	174.9	187.1	199.7	212.2	224.8	237.5	250.1		262.8	275.3	288.1	300.6	313.2	325.7	338.2	350.6	3.1	15.4
61.4	61.0	60.7	60.2	59.5	59.7	57.9	57.1	56.8		55.5	55.0	54.5	53.9	54.0	54.0	54.0	54.0	53.3	55.9
O 7	O 17	O 27	N 6	N 16	N 26	D 6	D 16	D 26		Ja 5	Ja 15	Ja 25	F 4	F 14	F 24	Mr 5	Mr 15	Mr 25	Ap 4
163.7	170.2	176.8	183.1	189.7	196.4	202.9	209.5	216.2	1768	223.0	229.8	236.7	243.6	250.5	257.4	264.4	271.4	278.5	285.5
170.1	187.0	205.1	221.4	235.1	243.8	244.0	236.6	233.4		239.9	252.9	268.7	286.8	304.2	321.9	337.9	350.7	356.2	358.0
164.8	168.9	169.0	171.1	173.2	175.0	176.7	178.2	179.5		180.6	181.5	181.9	182.1	182.1	181.7	180.8	179.9	178.7	177.8
200.1	198.1	192.8	187.8	185.3	186.7	191.6	198.8	207.0		217.0	227.4	238.2	249.4	260.9	272.5	284.5	296.5	308.4	320.5
75.8	75.7	75.6	75.5	74.9	74.2	73.7	72.8	71.9		71.1	70.4	69.7	68.9	68.7	68.4	68.2	68.6	68.9	69.3
O 6	O 16	O 26	N 5	N 15	N 25	D 5	D 15	D 25		Ja 4	Ja 14	Ja 24	F 3	F 13	F 23	Mr 5	Mr 15	Mr 25	Ap 4
13.8	11.8	8.7	6.5	5.8	5.7	6.5	8.6	11.4	1769	14.9	18.8	24.8	28.0	33.0	38.3	43.6	49.2	55.1	60.7
184.5	201.2	215.9	226.5	229.3	222.9	217.7	221.8	233.0		218.0	265.4	293.8	300.4	316.8	330.2	347.8	366.1	328.6	328.4
183.1	180.4	192.5	194.8	197.0	199.0	201.3	203.2	2.5		208.8	208.3	209.7	210.9	211.7	212.3	212.5	212.3	212.0	211.8
187.8	199.7	212.2	224.6	237.1	249.4	262.1	274.4	296.9		299.1	311.2	323.2	335.2	346.8	356.3	3.5	20.2	30.6	40.1
89.7	89.9	90.0	90.2	89.8	89.5	89.0	88.2	87.4		86.7	85.9	85.1	84.2	83.8	83.3	82.8	82.8	82.8	82.9
176.0	182.5	189.2	196.0	202.7	209.6	216.4	223.4	230.5	1770	237.7	244.9	252.1	259.4	266.8	274.3	281.7	289.1	296.7	304.4
196.4	206.6	218.7	229.9	240.9	249.8	253.4	257.8	243.8		261.9	279.4	296.0	310.0	319.8	319.3	312.7	309.9	317.1	320.5
212.2	214.1	216.4	218.6	220.7	223.1	225.2	227.4	2.9		231.8	233.7	235.8	237.5	239.1	240.7	241.8	242.8	243.5	243.7
184.0	145.8	157.7	169.7	181.9	194.3	206.5	219.1	231.8		244.1	256.8	269.4	281.6	294.5	307.1	319.6	332.1	344.5	357.0
103.1	103.5	103.9	104.3	104.2	104.1	104.0	103.4	102.7		102.0	101.2	100.3	99.5	98.8	98.2	97.5	97.8	97.0	96.8
65.5	68.6	70.8	72.1	72.1	70.7	68.2	65.0	61.6	1771	58.5	56.8	56.4	57.0	58.8	61.3	64.8	68.5	72.9	77.5
197.4	195.9	188.4	180.9	194.9	207.9	224.0	241.3	258.7		275.4	290.1	300.7	302.9	296.3	291.9	297.2	309.1	325.5	343.2
238.0	239.6	241.5	243.4	245.6	247.8	250.0	252.2	254.6		256.8	259.0	261.4	263.6	265.8	267.7	269.6	271.8	273.0	274.3
218.7	229.7	240.0	249.8	258.7	266.4	272.2	276.5	276.0		271.2	266.1	261.6	261.8	265.0	271.3	278.9	288.2	297.9	308.5
115.5	116.4	117.1	117.8	117.9	118.0	118.2	117.2	117.3		116.9	116.1	115.4	114.6	113.8	113.0	112.2	111.7	111.3	110.8
O 7	O 17	O 27	N 6	N 16	N 26	D 6	D 16	D 26		Ja 5	Ja 15	Ja 25	F 4	F 14	F 24	Mr 5	Mr 15	Mr 25	Ap 4
188.7	195.5	202.8	209.2	216.2	223.4	230.6	237.8	245.2	1772	252.7	260.0	267.6	275.3	282.9	290.6	298.5	306.3	314.0	321.9
174.2	170.8	176.2	182.2	208.7	220.7	238.0	255.1	270.2		282.0	296.1	281.5	275.8	278.0	286.6	300.7	321.2	339.6	358.0
267.0	267.9	269.1	270.6	272.2	274.1	275.0	278.1	280.4		282.6	284.9	287.4	289.6	292.0	294.5	296.8	298.9	301.9	303.1
168.8	181.2	193.8	206.4	218.9	231.4	244.1	256.7	269.4		282.0	294.5	306.9	319.3	331.9	344.0	356.4	3.1	20.5	32.5
128.0	128.8	129.7	130.6	131.0	131.4	131.8	131.6	131.5		131.2	130.5	129.8	129.2	128.4	127.7	126.9	126.2	125.6	125.0
O 6	O 16	O 26	N 5	N 15	N 25	D 5	D 15	D 25		Ja 4	Ja 14	Ja 24	F 3	F 13	F 23	Mr 5	Mr 15	Mr 25	Ap 4
89.9	94.8	99.4	103.4	109.9	109.6	111.8	112.3	112.0	1773	110.0	107.2	108.5	99.7	96.5	94.3	93.4	93.8	95.4	97.9
157.5	168.6	183.4	200.1	217.6	234.6	250.5	263.1	270.4		267.4	280.1	299.8	298.5	292.6	299.5	317.6	335.9	351.6	3.4
301.0	300.8	300.8	301.4	302.2	303.3	304.6	306.2	307.9		309.9	312.0	314.2	316.6	319.0	321.2	323.8	326.6	328.6	330.7
128.2	187.2	147.2	157.3	168.5	179.6	191.1	205.1	215.0		228.9	249.3	261.7	264.0	276.3	288.6	301.1	313.6	325.9	338.4
189.7	140.7	141.7	142.7	143.6	144.0	144.6	144.6	144.7		144.7	144.3	143.8	143.1	142.6	141.8	141.0	140.3	139.5	138.7
203.7	209.1	216.1	223.8	230.4	237.7	245.1	252.8	260.3	1774	268.0	275.8	283.5	291.2	299.1	307.0	314.9	322.9	330.8	338.6
181.1	179.6	197.1	214.1	230.5	244.4	253.0	252.9	245.5		242.8	249.2	262.2	278.3	295.9	314.1	331.8	348.1	3.0	7.2
340.5	339.2	338.2	337.4	336.9	336.9	337.0	337.7	338.6		339.8	341.3	343.1	344.8	346.8	349.1	351.3	353.7	356.0	358.5
205.7	217.8	230.0	242.1	253.9	265.7	277.4	288.9	300.1		310.9	320.9	330.3	338.4	344.9	348.8	349.3	349.9	342.2	337.1
151.1	152.2	153.8	154.4	155.2	155.9	156.7	157.0	157.3		157.6	157.4	157.4	156.9	156.2	155.6	154.8	154.1	153.3	152.4
O 7	O 17	O 27	N 6	N 16	N 26	D 6	D 16	D 26		Ja 5	Ja 15	Ja 25	F 4	F 14	F 24	Mr 5	Mr 15	Mr 25	Ap 5
107.0	112.8	118.0	123.2	128.0	132.5	136.4	139.2	142.5	1775	144.2	145.2	144.2	142.4	139.5	135.5	132.1	128.8	126.2	123.5
178.8	183.7	210.6	225.1	235.6	237.9	232.2	226.8	230.7		242.2	247.5	274.7	292.5	310.2	326.9	340.2	348.2	346.6	339.5
21.9	20.6	19.2	17.8	16.5	15.4	14.4	13.7	13.8		13.7	13.7	14.5	15.5	16.7	17.9	20.0	21.9	23.9	26.1
150.9	168.0	175.7	187.7	200.4	212.8	225.5	238.2	250.8		263.5	276.0	288.8	301.3	313.9	326.4	338.9	351.3	3.7	16.1
162.0	163.1	164.3	165.4	166.4	167.3	168.3	168.7	169.2		169.7	169.7	169.7	169.7	169.1	168.6	168.1	167.3	166.6	165.8
O 7	O 17	O 27	N 6	N 16	N 26	D 6	D 16	D 26		Ja 5	Ja 15	Ja 25	F 4	F 14	F 24	Mr 5	Mr 15	Mr 25	Ap 4
216.8	224.0	231.0	238.4	245.8	253.3	260.9	268.5	276.3	1776	284.0	291.9	299.9	307.7	315.5	323.3	331.3	339.1	346.7	354.5
190.3	205.7	218.0	228.5	238.6	248.0	253.0	252.8	237.2		253.7	271.3	289.1	305.7	329.1	329.1	329.6	322.5	319.9	327.0
59.5	59.5	58.8	57.9	56.8	55.5	54.1	52.9	51.6		50.5	49.6	49.1	48.9	49.1	49.4	50.2	51.4	52.6	54.3
196.8	194.0	188.7	184.6	183.2	185.4	190.9	198.5	208.9		217.1	227.6	238.5	249.8	261.4	273.0	285.1	297.0	309.0	321.1
172.6	173.8	175.0	176.3	177.3	178.3	179.3	179.9	180.6		181.4	181.6	181.8	181.9	181.6	181.2	180.9	180.2	179.4	178.8
O 6	O 16	O 26	N 5	N 15	N 25	D 5	D 15	D 25		Ja 4	Ja 14	Ja 24	F 3	F 13	F 23	Mr 5	Mr 15	Mr 25	Ap 4
121.4	127.3	133.0	138.7	144.2	149.5	154.6	159.4	163.9	1777	168.2	171.6	174.5	176.8	177.8	177.8	176.3	174.5	169.8	165.0
199.1	206.4	205.2	197.5	190.0	204.0	217.1	233.3	250.4		207.9	234.8	259.7	310.3	312.7	306.6	301.7	307.2	319.3	335.5
91.8	92.6	93.0	93.6	93.8	92.6	92.1	91.2	89.5		88.6	87.3	86.0	84.9	83.9	83.1	82.8	82.7	83.0	83.7
188.0	200.4	212.9	225.3	237.8	250.1	262.7	275.1	287.5		299.7	311.8	323.8	335.7	347.3	358.7	3.9	20.4	30.6	40.7
183.0	184.2	185.4	186.6																

TABLE

Geocentric Places of Mars, Mercury, Jupiter, Venus and Saturn for every tenth day of current cycle.
Venus, A.D. 1785—A.D. 1989;

Day of I.S.Y.	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
Eng. date ...	Ap 10	Ap 20	Ap 30	My 10	My 20	My 30	Je 9	Je 19	Je 29	Ji 9	Ji 19	Ji 29	An 8	An 18	An 28	S 7	S 17	S 27
1778 Mars ...	13.6	21.0	28.1	35.4	47.4	49.8	58.4	63.2	70.1	76.7	83.4	90.1	96.5	103.1	109.4	116.6	122.2	128.3
Merc. ...	359.6	17.9	34.9	48.8	56.3	54.2	47.1	47.6	57.8	72.8	90.1	108.5	126.8	144.4	159.8	171.1	175.0	169.4
Jup. ...	114.8	114.9	115.8	115.9	117.0	118.2	119.6	121.2	123.0	125.0	127.1	129.2	131.4	133.4	135.6	138.0	140.2	142.4
Ven. ...	4.1	16.5	24.8	41.2	53.4	65.5	77.8	89.9	102.0	113.9	126.0	138.0	149.9	161.7	173.4	185.2	196.7	207.8
Sat. ...	208.3	202.5	201.7	201.0	200.3	199.6	198.9	198.6	198.2	197.8	198.0	198.1	198.4	199.0	199.7	200.3	201.2	202.2
Eng. date ...	Ap 10	Ap 20	Ap 30	My 10	My 20	My 30	Je 9	Je 19	Je 29	Ji 9	Ji 19	Ji 29	An 8	An 18	An 28	S 7	S 17	S 27
1779 Mars ...	218.0	217.0	214.9	212.1	208.2	206.1	204.5	204.0	204.8	206.9	209.7	213.4	217.8	222.9	228.2	234.0	240.3	246.7
Merc. ...	12.5	27.4	37.5	35.9	28.7	27.4	36.3	50.5	68.2	86.0	104.7	122.8	139.1	152.1	157.8	155.3	147.8	149.0
Jup. ...	147.6	146.7	146.0	145.6	145.5	145.9	146.6	147.5	148.6	150.0	151.6	153.4	155.2	157.8	159.4	161.4	163.7	165.9
Ven. ...	314.5	325.4	336.8	348.2	0.2	1.8	23.6	35.5	47.5	59.5	71.3	83.5	95.5	107.8	119.9	132.5	144.8	157.0
Sat. ...	215.3	214.6	213.9	213.1	212.8	211.5	210.8	210.3	209.8	209.3	208.8	208.3	207.8	207.3	206.8	210.1	211.5	212.4
Eng. date ...	Ap 9	Ap 19	Ap 29	My 9	My 19	My 29	Je 8	Je 18	Je 28	Ji 8	Ji 18	Ji 28	An 7	An 17	An 27	S 6	S 16	S 26
1780 Mars ...	28.4	35.5	42.2	49.2	56.0	62.8	69.6	76.2	82.6	89.8	95.9	102.3	108.7	115.2	121.6	128.0	134.2	140.6
Merc. ...	15.5	17.5	10.7	7.4	14.7	28.1	45.5	63.4	82.4	101.3	117.9	131.9	149.4	139.4	132.6	130.5	138.8	132.1
Jup. ...	181.4	180.1	179.8	177.3	176.8	176.7	175.7	175.6	175.9	176.4	177.5	178.5	179.4	181.5	183.4	185.1	187.2	189.2
Ven. ...	39.0	50.4	62.0	72.8	83.5	93.5	103.0	111.6	118.8	123.7	125.7	124.1	119.5	113.9	110.2	110.3	118.9	120.0
Sat. ...	226.9	226.8	225.7	225.1	224.3	223.5	222.8	222.1	221.5	220.8	220.6	220.3	22.2	220.4	220.7	221.0	221.7	223.4
Eng. date ...	Ap 9	Ap 19	Ap 29	My 9	My 19	My 29	Je 8	Je 18	Je 28	Ji 8	Ji 18	Ji 28	An 7	An 17	An 27	S 6	S 16	S 26
1781 Mars ...	258.2	260.7	265.2	269.0	272.0	274.4	275.5	275.7	275.1	272.8	270.0	268.1	264.4	266.6	267.2	269.7	273.1	277.2
Merc. ...	353.6	348.5	353.3	6.0	22.3	40.5	59.6	78.3	98.0	111.0	121.2	122.9	116.2	112.7	118.6	131.4	147.3	164.6
Jup. ...	215.5	214.4	213.2	211.9	210.5	209.4	208.3	207.3	206.6	206.1	205.4	204.9	204.9	207.8	209.0	210.2	211.9	213.8
Ven. ...	345.0	357.9	10.4	22.5	35.0	47.4	59.6	71.8	84.0	96.3	108.7	120.6	132.8	145.0	157.6	169.7	182.0	194.3
Sat. ...	238.3	238.0	237.7	236.9	236.2	235.4	234.7	234.0	233.3	232.5	232.0	231.6	231.2	231.3	231.5	231.5	232.1	232.7
Eng. date ...	Ap 10	Ap 20	Ap 30	My 10	My 20	My 30	Je 9	Je 19	Je 29	Ji 9	Ji 19	Ji 29	An 8	An 18	An 28	S 7	S 17	S 27
1782 Mars ...	43.1	49.6	56.1	62.7	69.3	75.8	82.3	88.6	95.2	101.5	107.9	114.2	120.7	127.1	133.4	139.8	146.2	152.5
Merc. ...	332.4	344.0	355.8	17.8	38.5	55.5	73.8	89.8	101.5	105.3	99.6	94.5	88.9	110.8	126.2	143.5	161.3	178.9
Jup. ...	248.2	248.0	247.8	247.0	245.2	244.9	243.7	242.4	241.1	239.6	238.8	238.1	237.7	237.6	237.7	238.4	239.2	240.4
Ven. ...	332.6	334.6	338.8	345.1	353.5	2.5	11.8	22.6	33.5	44.6	55.8	67.6	79.2	90.8	102.6	114.8	126.9	138.9
Sat. ...	249.4	249.1	248.0	246.6	247.9	247.3	246.6	245.9	245.1	244.4	243.7	243.2	243.4	242.5	242.3	242.8	242.6	243.1
Eng. date ...	Ap 9	Ap 19	Ap 29	My 9	My 19	My 29	Je 8	Je 18	Je 28	Ji 8	Ji 18	Ji 28	An 7	An 17	An 27	S 6	S 16	S 26
1783 Mars ...	281.1	287.9	294.3	301.0	307.5	313.8	319.8	325.6	331.3	336.8	340.9	344.5	349.2	348.8	349.2	348.1	340.0	343.5
Merc. ...	337.6	355.1	13.6	42.5	51.1	67.7	80.6	86.7	82.7	76.3	78.8	69.6	104.3	122.0	140.1	158.0	174.5	189.2
Jup. ...	278.9	280.0	280.8	281.2	281.4	281.1	280.7	279.4	278.5	277.3	276.8	274.8	278.4	272.3	271.5	271.1	270.8	270.9
Ven. ...	22.9	35.2	47.3	59.3	71.4	83.1	94.8	106.5	117.9	128.9	140.0	150.1	160.2	170.3	179.1	188.4	197.3	194.5
Sat. ...	260.4	260.3	260.3	260.2	259.6	259.0	258.4	257.6	256.8	256.1	255.4	254.8	254.1	253.9	253.7	253.2	253.5	253.7
Eng. date ...	Ap 9	Ap 19	Ap 29	My 9	My 19	My 29	Je 8	Je 18	Je 28	Ji 8	Ji 18	Ji 28	An 7	An 17	An 27	S 6	S 16	S 26
1784 Mars ...	57.9	63.9	70.2	76.2	82.3	88.6	94.9	101.1	107.3	113.6	120.0	126.2	132.6	138.9	145.2	151.6	158.1	164.6
Merc. ...	351.0	9.9	22.2	45.4	59.5	67.0	65.3	58.2	58.7	69.3	82.9	100.1	118.2	136.7	153.8	169.3	187.7	184.2
Jup. ...	308.0	309.8	312.7	313.1	314.3	315.2	316.0	316.2	316.3	315.9	315.3	314.4	313.1	311.8	310.5	309.0	307.8	306.9
Ven. ...	328.0	310.1	325.5	4.6	16.7	28.9	41.1	53.5	65.6	77.7	89.8	102.3	114.0	126.8	139.2	151.5	163.9	176.3
Sat. ...	271.3	271.4	271.6	271.7	271.3	270.9	270.5	269.7	268.9	268.2	267.5	266.8	266.0	265.6	265.1	264.5	264.6	264.6
Eng. date ...	Ap 9	Ap 19	Ap 29	My 9	My 19	My 29	Je 8	Je 18	Je 28	Ji 8	Ji 18	Ji 29	An 7	An 17	An 27	S 6	S 16	S 26
1785 Mars ...	301.0	308.5	316.0	323.2	330.9	338.1	345.6	352.5	359.6	36.4	12.8	19.2	25.1	30.9	36.3	40.8	45.0	48.6
Merc. ...	5.8	23.0	37.8	46.9	47.1	40.0	38.5	46.5	60.9	77.9	96.3	114.7	132.7	148.8	161.7	167.7	164.6	157.4
Jup. ...	339.0	338.2	310.5	342.8	344.6	346.6	348.1	349.6	350.9	351.7	352.4	352.6	352.5	352.1	351.8	350.2	349.1	347.7
Ven. ...	44.0	51.0	55.9	57.7	55.6	50.6	45.2	42.0	39.3	46.1	52.3	60.4	68.6	79.2	89.6	100.7	111.7	123.3
Sat. ...	282.1	282.4	282.8	283.1	282.9	282.6	282.4	281.8	281.1	280.5	279.7	278.9	278.2	277.5	276.9	276.3	276.1	276.0
Eng. date ...	Ap 10	Ap 20	Ap 30	My 10	My 20	My 30	Je 9	Je 19	Je 29	Ji 9	Ji 19	Ji 29	An 8	An 18	An 28	S 7	S 17	S 27
1786 Mars ...	73.3	78.9	84.4	90.1	95.9	101.8	107.8	113.7	119.7	125.8	132.0	138.3	144.6	151.0	157.3	163.9	170.4	176.9
Merc. ...	15.8	26.7	28.5	21.6	18.6	25.1	38.7	55.3	73.6	92.3	110.7	127.7	141.9	149.8	149.8	141.7	140.3	148.0
Jup. ...	3.8	6.2	8.6	10.9	13.4	15.6	17.8	19.9	21.8	23.7	25.3	26.6	27.8	28.5	29.0	29.1	28.7	28.1
Ven. ...	4.8	17.2	29.5	41.9	54.1	66.2	78.0	90.6	102.6	114.5	126.6	138.6	150.4	162.2	173.9	185.6	197.1	208.2
Sat. ...	293.0	293.6	294.1	294.6	294.5	294.6	294.6	294.1	293.6	293.2	292.3	291.5	290.6	289.9	289.3	288.7	288.4	288.0
Eng. date ...	Ap 9	Ap 19	Ap 29	My 9	My 19	My 29	Je 8	Je 18	Je 28	Ji 8	Ji 18	Ji 28	An 7	An 17	An 27	S 6	S 16	S 26
1787 Mars ...	819.2	327.0	334.8	342.4	350.0	357.5	5.1	12.3	19.6	26.7	33.7	38.4	47.0	53.5	59.6	65.7	71.4	76.7
Merc. ...	10.0	4.7	35.9	4.2	16.5	32.6	50.9	69.7	88.7	105.6	121.3	131.7	133.0	128.4	122.6	128.8	141.2	159.9
Jup. ...	31.1	33.5	35.8	38.1	40.6	42.8	45.2	47.7	49.9	52.2	54.2	56.3	58.0	59.8	61.3	62.5	63.4	64.1
Ven. ...	314.8	325.9	337.3	348.7	0.7	12.3	24.2	36.1	48.1	60.2	72.0	84.2	96.2	108.5	120.6	133.2	145.5	157.7
Sat. ...	303.8	304.5	305.4	306.0	305.2	306.4	306.6	306.2	305.9	305.6	305.0	304.4	303.6	302.8	302.0	301.2	300.7	300.2
Eng. date ...	Ap 9	Ap 19	Ap 29	My 9	My 19	My 29	Je 8	Je 18	Je 28	Ji 8	Ji 18	Ji 28	An 7	An 17	An 27	S 6	S 16	S 26
1788 Mars ...	91.4	95.6	100.2	105.2	110.5	116.8	121.4	127.0	132.9	138.9	144.8	151.0	157.4	163.6	170.0	176.0	183.3	190.0
Merc. ...	341.2	343.2	354.7	10.1	28.0	46.8	65.9	84.0	99.9	111.8	115.8	110.8	104.8	108.5	110.6	135.9	153.0	170.7
Jup. ...	59.4	60.8	62.8	64.4	66.9	69.1	71.5	73.7	76.1	78.4	80.6	82.9	85.2	87.4	89.4	91.3	93.0	94.4
Ven. ...	39.5	50.9	62.4	73.1	83.7	93.6	102.9	111.1	117.9	122.8	123.2	120.7	115.5	110.2	107.4	105.5	112.9	119.4
Sat. ...	314.8																	

V-B.—cont.

Mars, A.D. 1637—A.D. 1999; Mercury, A.D. 1645—A.D. 1999; Jupiter, A.D. 1656—A.D. 1999;
Saturn, A.D. 1617—A.D. 1999—cont.

180	190	200	210	220	230	240	250	260		270	280	290	300	310	320	330	340	350	360
O 7	O 17	O 27	N 6	N 16	N 26	D 6	D 16	D 26		Ja 5	Ja 15	Ja 25	F 4	F 14	F 24	Mr 6	Mr 16	Mr 26	Ap 5
184.5	140.4	148.6	152.5	158.4	164.2	169.9	175.6	181.1	1779	185.5	191.7	197.4	201.2	206.5	209.8	212.7	215.4	217.2	218.2
168.6	167.0	177.8	192.7	209.8	226.7	248.9	269.6	272.5		279.2	276.8	269.6	260.1	278.4	292.6	309.8	327.5	345.5	349
144.4	146.5	148.4	150.1	151.6	153.0	154.2	155.2	155.9		156.3	156.2	155.9	155.4	151.4	153.1	151.9	150.7	149.2	143.2
219.0	229.8	239.9	249.5	258.1	265.8	270.4	272.7	271.1		266.8	262.0	258.8	259.9	261.9	270.9	278.7	288.1	298.1	308.7
208.2	204.4	205.6	206.7	207.9	209.1	210.2	211.3	212.9		213.4	214.0	214.7	215.5	215.8	216.0	216.8	216.2	215.8	216.6
																Mr 5	Mr 15	Mr 25	Ap 4
258.4	260.2	267.3	274.5	281.7	289.1	296.5	304.0	311.5	1780	319.0	326.4	333.9	341.3	348.7	356.0	363.2	370.5	377.8	385.1
158.1	173.4	188.9	206.2	223.6	240.0	253.5	262.2	262.0		254.8	251.8	258.5	271.7	287.8	305.7	323.8	341.7	358.1	374.6
168.0	170.1	172.4	174.3	176.5	178.2	180.1	181.8	183.1		184.4	185.3	185.9	186.3	186.8	186.0	185.5	184.4	183.4	182.1
169.5	181.9	194.5	207.1	219.6	232.1	244.8	257.4	270.1		282.7	295.2	307.6	320.1	332.5	344.7	357.0	369.3	381.6	393.9
213.2	214.3	215.4	216.6	217.8	219.1	220.3	221.4	222.5		223.5	224.4	225.2	226.1	226.5	226.9	227.2	227.3	227.3	227.0
O 6	O 16	O 26	N 5	N 15	N 25	D 5	D 15	D 25		Ja 4	Ja 14	Ja 24	F 3	F 13	F 23	Mr 5	Mr 15	Mr 25	Ap 4
146.7	153.1	159.2	165.5	171.7	176.9	184.0	190.1	196.1	1781	202.4	203.3	214.4	220.7	226.2	232.0	237.7	243.1	248.5	254.0
168.8	184.7	203.1	219.8	234.5	244.7	247.0	240.8	235.7		240.3	251.6	267.5	284.1	302.2	320.4	336.6	350.5	358.5	357.4
191.3	193.7	195.9	197.9	200.2	202.4	204.4	206.6	208.5		210.3	211.9	213.4	214.6	215.5	216.2	216.6	216.3	216.5	215.9
129.0	137.1	147.5	157.6	169.1	180.0	191.6	203.6	215.5		227.5	239.9	252.3	264.6	276.9	289.8	301.7	314.2	326.6	339.0
223.1	224.2	225.2	226.2	227.4	228.6	229.7	230.8	232.0		233.1	234.1	235.1	236.1	236.7	237.3	238.0	238.1	238.8	238.3
282.0	287.3	293.2	299.2	305.6	312.0	318.4	325.2	332.0	1782	338.6	345.6	352.4	359.2	366.0	372.7	379.3	386.2	393.0	399.5
182.4	199.5	214.8	226.7	231.7	227.6	220.7	222.0	223.1		246.5	253.2	261.0	268.6	315.4	329.7	349.2	369.9	393.0	390.3
215.7	217.5	219.7	222.0	224.1	226.2	228.6	230.8	232.9		235.3	237.3	239.2	241.1	242.9	244.4	245.7	246.7	247.4	248.1
206.4	218.5	230.6	242.7	254.4	266.1	277.8	289.8	300.8		311.0	320.8	329.9	337.5	343.4	346.4	348.8	349.5	349.8	349.4
233.3	234.2	235.1	236.1	237.3	238.4	239.6	240.7	241.8		243.0	244.0	245.0	246.1	246.9	247.7	248.5	248.8	248.9	249.4
O 7	O 17	O 27	N 6	N 16	N 26	D 6	D 16	D 26		Ja 5	Ja 15	Ja 25	F 4	F 14	F 24	Mr 6	Mr 16	Mr 26	Ap 5
168.9	165.3	171.8	178.2	184.6	191.2	197.6	204.1	210.7	1783	217.1	223.9	230.5	237.2	243.8	250.8	257.3	264.0	270.8	277.6
195.0	208.3	215.6	213.9	206.4	204.6	213.0	226.4	242.5		259.8	277.3	294.2	309.4	320.1	329.9	340.9	352.0	363.0	374.0
241.8	243.3	245.1	247.2	249.1	251.3	253.5	255.8	258.1		260.4	262.6	265.0	267.2	269.3	271.4	273.4	275.3	276.9	278.8
151.5	163.6	176.4	188.4	201.0	213.5	226.2	238.9	251.5		264.2	276.7	289.4	301.9	314.6	327.0	339.5	351.9	364.3	376.7
243.4	244.4	245.2	246.0	247.2	248.2	249.3	250.6	251.8		252.9	254.0	255.1	256.2	257.0	257.9	258.8	259.3	259.7	260.3
341.6	339.7	339.5	340.5	342.7	345.6	349.2	353.3	357.8	1784	365.5	370.0	374.4	378.8	383.2	387.6	391.9	396.2	400.5	404.8
198.6	199.0	192.6	188.7	184.6	206.6	221.8	239.1	256.5		273.7	280.0	300.0	305.8	300.9	294.6	297.5	308.2	323.6	341.2
271.2	272.1	273.8	274.4	276.1	277.8	279.8	281.9	284.0		286.3	288.6	290.9	293.2	295.7	298.0	300.5	302.7	304.9	306.7
193.5	189.9	184.7	181.4	181.0	184.1	190.2	198.2	206.8		217.9	227.8	238.8	250.1	261.8	273.5	285.6	297.6	309.5	321.7
253.9	254.6	255.3	256.1	257.1	258.1	259.1	260.3	261.4		262.6	263.8	265.1	266.2	267.1	268.1	269.1	269.7	270.5	271.0
O 6	O 16	O 26	N 5	N 15	N 25	D 5	D 15	D 25		Ja 4	Ja 14	Ja 24	F 3	F 13	F 23	Mr 5	Mr 15	Mr 25	Ap 4
171.0	177.6	184.3	190.9	197.6	204.4	211.1	217.9	224.2	1785	231.8	238.9	246.0	253.1	260.4	267.6	275.0	282.4	289.7	297.2
178.7	172.9	176.3	187.1	201.9	218.7	235.9	253.0	268.9		281.8	288.7	296.2	303.9	311.9	320.0	328.1	336.2	344.3	352.4
396.1	305.7	305.7	306.0	306.9	307.6	308.7	310.3	311.9		313.8	315.9	318.1	320.3	322.8	325.1	327.5	329.9	332.2	334.7
198.7	201.1	213.6	226.0	238.5	250.8	263.3	275.7	288.1		300.3	312.4	324.4	336.2	347.8	359.1	370.1	381.6	393.1	404.6
264.7	265.2	265.8	266.3	267.3	268.1	269.1	270.3	271.5		272.6	273.8	275.0	276.1	277.2	278.3	279.4	280.2	281.1	281.9
Q 6	O 16	O 26	N 5	N 15	N 25	D 5	D 15	D 25		Ja 4	Ja 14	Ja 24	F 3	F 13	F 23	Mr 5	Mr 15	Mr 25	Ap 4
50.9	52.2	52.5	51.5	49.1	46.0	43.0	40.6	38.0	1786	38.8	39.7	41.5	44.3	47.6	51.6	55.7	60.5	65.5	70.5
158.1	167.4	181.9	198.1	215.4	232.7	248.9	262.7	271.4		271.1	263.9	261.8	267.9	281.8	297.5	315.6	333.8	351.5	369.1
346.3	345.0	343.9	342.8	342.3	342.0	342.0	342.4	343.2		344.1	345.6	347.2	348.8	350.8	352.9	355.1	357.5	359.9	362.3
135.2	147.0	158.9	170.9	183.2	195.5	207.7	220.3	233.5		245.4	258.2	270.8	282.9	295.8	308.5	321.0	333.4	345.9	358.4
276.9	276.2	276.6	276.9	277.7	278.6	279.4	280.5	281.6		282.7	283.9	285.1	286.2	287.4	288.7	289.8	290.7	291.6	292.6
O 7	O 17	O 27	N 6	N 16	N 26	D 6	D 16	D 26		Ja 5	Ja 15	Ja 25	F 4	F 14	F 24	Mr 6	Mr 16	Mr 26	Ap 5
183.5	190.2	197.0	204.0	210.9	217.9	224.9	232.1	239.4	1787	246.8	254.0	261.4	269.0	276.6	284.2	292.0	299.6	307.5	315.2
161.5	177.6	194.9	212.3	229.8	247.4	265.0	282.6	249.8		245.0	249.3	261.0	275.3	293.7	311.9	329.8	347.7	365.6	383.5
27.8	26.7	26.1	23.6	22.9	20.9	19.8	19.0	18.4		18.3	18.5	19.1	19.8	21.0	22.5	24.1	25.9	27.9	30.0
219.2	229.9	239.9	249.2	257.5	264.9	268.6	270.0	267.2		262.4	258.0	255.9	258.1	263.9	270.5	278.5	288.1	298.2	308.9
287.4	287.6	287.7	287.8	288.5	289.2	289.9	290.8	291.8		292.9	294.1	295.3	296.4	297.6	298.8	300.1	301.2	302.3	303.8
81.6	86.1	90.1	93.6	96.1	97.7	98.2	97.2	95.2	1788	92.1	88.3	84.7	81.8	80.0	79.8	80.9	82.9	85.8	89.4
173.5	191.1	208.8	223.9	236.0	240.4	236.9	229.8	231.1		241.3	255.7	272.4	290.2	308.1	325.2	343.7	362.6	381.9	401.6
64.2	64.3	63.4	63.1	62.1	61.0	59.8	58.2	57.0		55.8	54.7	54.1	53.6	53.6	54.0	54.6	55.5	56.8	58.2
170.2	182.6	195.2	207.8	220.3	232.4	245.5	258.1	270.7		283.3	295.8	308.3	320.7	333.1	345.4	357.6	369.8	382.0	394.2
299.7	299.6	299.4	299.4	299.9	300.3	300.8	301.7	302.6		308.4	304.6	305.8	306.9	308.1	309.4	310.6	311.9	313.1	314.2
O 6	O 16	O 26	N 5	N 15	N 25	D 5	D 15	D 25		Ja 4	Ja 14	Ja 24	F 3	F 13	F 23	Mr 5	Mr 15	Mr 25	

TABLE

Geocentric Places of Mars, Mercury, Jupiter, Venus and Saturn for every tenth day of current cycle.
Venus, A.D. 1765—A.D. 1999;

Day of I.S.Y.	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
Eng. date ...	Ap 10	Ap 10	Ap 20	My 10	My 20	My 30	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29
1790 Mars ...	114.3	115.4	119.3	123.0	127.1	131.7	136.6	141.9	147.4	153.1	158.9	164.8	171.2	177.4	183.9	190.5	197.2	204.1
Merc. ...	342.9	1.1	20.0	88.7	55.9	70.1	77.7	76.4	69.2	61.2	78.8	93.1	110.0	126.7	146.4	168.5	178.8	190.9
Jup. ...	114.2	119.2	119.3	119.9	120.8	121.9	123.2	124.8	126.5	128.4	130.8	132.3	134.5	136.8	138.9	141.3	143.5	145.5
Ven. ...	330.8	332.8	337.5	344.5	353.2	2.5	11.8	22.9	33.8	45.0	56.3	68.1	79.8	91.3	103.2	115.4	127.6	139.6
Sat. ...	337.2	338.4	339.5	340.7	341.6	342.4	343.3	343.8	344.2	344.6	344.4	344.2	344.1	343.4	342.8	342.2	341.4	340.6
1791 Mars ...	352.4	0.0	7.6	15.1	22.5	29.8	37.1	44.3	51.2	58.3	65.0	71.7	78.3	84.9	91.4	97.7	103.9	110.0
Merc. ...	357.4	15.5	33.3	48.3	57.8	58.5	51.5	49.2	57.4	71.4	88.1	106.2	124.6	142.4	158.4	171.3	177.4	174.0
Jup. ...	152.2	151.2	150.8	149.9	149.7	149.8	150.4	151.1	152.1	153.4	155.1	156.8	158.5	160.6	162.5	164.7	166.8	168.9
Ven. ...	28.0	35.8	47.9	59.9	72.0	83.7	95.3	107.0	118.3	129.3	140.8	150.4	160.5	170.2	178.6	186.6	191.0	193.2
Sat. ...	348.8	350.1	351.3	352.5	353.6	354.7	355.7	356.4	357.0	357.7	357.7	357.9	358.0	357.6	357.2	356.9	355.8	355.0
Eng. date ...	Ap 9	Ap 19	Ap 29	My 9	My 19	My 29	Je 8	Je 18	Je 28	Je 8	Je 18	Je 28	Je 8	Je 18	Je 28	Je 8	Je 18	Je 28
1792 Mars ...	146.8	145.6	145.7	146.8	149.2	152.0	155.7	160.1	164.7	169.9	175.4	181.1	187.0	193.2	199.6	206.2	212.9	220.0
Merc. ...	11.1	26.7	37.5	39.7	33.8	29.7	36.0	49.3	65.7	83.3	102.4	120.7	137.6	151.7	159.5	153.2	151.6	150.1
Jup. ...	180.1	184.8	183.5	182.4	181.4	180.5	180.0	179.8	179.8	180.4	181.3	182.1	183.5	185.0	186.7	188.4	190.5	192.0
Ven. ...	328.6	340.8	353.1	5.3	17.4	29.6	41.7	54.2	66.8	78.4	90.5	103.0	114.5	127.5	139.9	153.3	164.7	177.0
Sat. ...	0.5	1.8	3.1	4.4	5.6	6.8	8.0	8.8	9.7	10.6	10.9	11.3	11.8	11.6	11.3	11.1	10.5	9.8
1793 Mars ...	7.8	15.2	22.6	29.7	37.0	44.2	51.1	58.1	65.1	71.7	78.4	85.0	91.6	98.1	104.5	110.9	117.1	123.3
Merc. ...	18.5	21.1	15.7	10.3	14.4	27.0	44.0	61.2	80.2	98.6	116.1	131.2	141.6	143.2	136.8	132.4	138.1	150.7
Jup. ...	220.1	219.2	218.0	216.7	215.6	214.2	212.9	211.8	211.0	210.6	210.3	210.5	210.8	211.5	212.7	213.8	215.4	217.0
Ven. ...	43.7	50.2	54.8	55.4	52.3	46.7	41.5	38.1	36.4	46.1	51.7	60.2	69.6	79.4	89.9	101.0	112.2	123.8
Sat. ...	12.5	13.3	15.1	16.5	17.2	19.1	20.4	21.5	22.5	23.6	24.2	24.9	25.5	25.7	25.7	25.7	25.8	24.9
Eng. date ...	Ap 10	Ap 20	Ap 30	My 10	My 20	My 30	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29
1794 Mars ...	197.1	194.1	190.4	187.7	185.5	184.8	185.3	187.0	189.7	193.3	197.3	202.0	207.4	212.9	218.9	225.1	231.5	238.3
Merc. ...	353.3	351.6	353.9	5.1	20.5	38.4	56.9	75.7	98.6	110.1	121.5	125.8	120.8	115.1	118.1	130.3	145.5	162.5
Jup. ...	252.6	252.8	252.4	252.0	251.0	250.0	248.7	247.4	246.0	244.8	243.7	242.8	242.2	242.0	242.0	242.5	243.3	244.3
Ven. ...	5.5	17.9	30.2	42.6	54.8	66.9	79.2	91.2	103.8	116.2	127.2	139.2	151.0	162.8	174.4	186.1	197.5	208.6
Sat. ...	24.9	26.2	27.5	28.7	30.1	31.5	32.9	34.1	35.8	36.5	37.4	38.2	39.0	39.4	39.8	40.2	39.9	39.8
1795 Mars ...	22.7	29.8	36.9	43.9	50.8	57.7	64.5	71.2	77.9	84.4	91.2	97.5	104.0	110.5	116.9	123.2	129.5	135.8
Merc. ...	334.3	343.3	358.0	15.8	34.4	53.5	72.0	88.8	101.7	107.9	104.3	97.9	99.2	109.8	124.4	141.5	159.3	176.9
Jup. ...	283.0	284.8	285.4	285.8	286.1	286.1	285.6	284.9	284.0	282.7	281.5	280.1	278.8	277.5	276.6	275.9	275.4	275.5
Ven. ...	315.1	326.3	337.7	349.2	1.2	12.9	24.8	36.7	48.7	60.8	72.6	84.9	96.9	109.1	121.3	133.8	146.2	158.4
Sat. ...	37.4	38.7	40.0	41.4	42.7	44.0	45.4	46.7	48.0	49.2	50.3	51.4	52.5	53.1	53.7	54.3	54.4	54.3
Eng. date ...	Ap 9	Ap 19	Ap 29	My 9	My 19	My 29	Je 8	Je 18	Je 28	Je 8	Je 18	Je 28	Je 8	Je 18	Je 28	Je 8	Je 18	Je 28
1796 Mars ...	243.5	246.6	244.7	243.9	240.5	240.7	247.5	245.2	242.7	240.7	239.7	239.8	241.8	244.4	248.2	252.5	257.7	263.1
Merc. ...	83.3	85.3	11.4	30.8	49.0	67.2	80.5	88.9	87.4	80.2	78.8	88.8	102.6	120.0	137.9	155.7	172.7	188.1
Jup. ...	311.8	313.8	315.6	317.3	318.7	319.8	320.7	321.2	321.4	321.1	320.5	319.7	318.7	317.4	315.0	314.7	313.3	312.2
Ven. ...	40.0	51.4	62.8	73.4	83.9	93.7	102.8	110.6	117.1	120.8	120.8	117.3	111.5	106.5	104.6	106.7	111.8	118.9
Sat. ...	50.8	51.6	52.8	53.9	55.2	56.5	57.7	58.2	60.6	62.0	63.2	64.4	65.6	66.4	67.8	68.1	68.5	69.2
1797 Mars ...	37.8	44.0	50.8	57.5	64.2	70.8	77.3	83.9	90.3	96.9	103.8	109.6	116.1	122.4	128.9	135.1	141.8	147.9
Merc. ...	348.8	7.6	26.3	43.7	59.0	68.9	69.7	62.8	60.2	67.8	81.4	98.1	116.0	134.3	152.0	167.4	180.7	196.6
Jup. ...	339.9	342.2	344.5	346.7	348.8	350.7	352.4	354.1	355.4	356.4	357.1	357.5	357.7	357.3	356.7	355.8	354.6	353.2
Ven. ...	340.1	359.8	11.8	23.9	36.4	48.7	61.0	73.0	85.8	97.7	109.9	122.0	134.1	146.4	159.0	171.2	183.4	195.6
Sat. ...	63.5	64.5	65.6	66.6	67.9	69.2	70.4	71.8	73.1	74.4	75.7	77.0	78.3	79.4	80.5	81.5	82.1	82.7
Eng. date ...	Ap 10	Ap 20	Ap 30	My 10	My 20	My 30	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29
1798 Mars ...	272.4	278.3	284.4	290.3	295.8	301.3	306.0	310.5	314.3	317.4	319.6	320.1	319.8	317.9	315.4	313.2	311.7	311.2
Merc. ...	5.6	21.4	37.1	48.2	51.1	44.6	40.7	46.5	59.5	75.8	83.9	112.5	130.6	147.3	161.4	169.5	16.8	161.6
Jup. ...	7.6	10.0	12.4	14.7	17.1	19.5	21.7	23.8	25.8	27.7	29.5	31.0	32.1	33.1	33.7	33.8	33.8	33.5
Ven. ...	328.0	331.0	336.4	344.0	353.0	2.5	11.7	29.1	34.1	45.4	56.8	68.6	80.2	91.8	103.8	116.0	128.2	140.3
Sat. ...	77.0	77.8	78.6	79.5	80.6	81.8	83.0	84.3	85.6	86.9	88.3	89.6	91.1	92.2	93.3	94.5	95.4	96.2
1799 Mars ...	62.0	58.4	64.7	71.1	77.2	83.7	90.0	96.1	102.6	108.9	115.2	121.6	127.8	134.6	140.7	147.0	153.4	159.7
Merc. ...	14.9	27.3	31.8	26.5	21.8	25.5	37.4	53.4	71.5	90.2	108.7	126.1	141.2	151.0	158.8	146.0	142.1	148.0
Jup. ...	349.9	372.2	39.5	41.8	44.4	46.6	49.0	51.2	53.5	55.9	58.0	60.1	62.0	63.7	65.8	66.7	67.7	68.5
Ven. ...	24.2	36.4	48.5	60.5	72.8	84.3	95.8	107.5	118.7	129.7	140.8	150.7	160.7	170.0	178.2	185.8	189.7	190.9
Sat. ...	90.6	91.1	91.7	92.3	93.4	94.4	95.4	96.1	97.9	99.1	100.5	101.9	103.2	104.4	105.1	106.9	107.9	109.0
1800 Mars ...	293.5	300.8	308.0	315.3	322.4	329.4	336.5	343.2	350.0	356.8	363.8	2.4	8.2	18.5	18.5	22.8	26.1	28.5
Merc. ...	12.6	9.6	2.8	4.7	15.6	30.9	48.9	67.6	86.6	103.9	120.2	132.3	136.0	131.0	125.2	128.7	140.1	155.0
Jup. ...	64.0	64.6	69.5	68.4	70.5	72.6	75.0	77.2	79.6	81.9	84.2	86.5	88.6	90.9	92.9	94.8	96.6	98.2
Ven. ...	329.3	341.4	353.7	6.0	18.1	30.8	42.4	54.9	67.0	79.1	91.2	103.7	115.0	128.2	140.6	151.1	165.5	177.7
Sat. ...	104.4	104.6	104.9	105.3	106.1	107.0	107.7	108.8	110.0	111.6	112.5	113.8	115.0	116.3	117.6	119.9	120.0	121.1
Eng. date ...	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
1801 Mars ...	67.1	72.8	78.6	84.5	90.6	96.8	102.7	108.8	114.9	120.9	127.3	133.5	139.5	146.1	152.6	159.1	165.4	172.1
Merc. ...	345.0	344.5	353.5	8.4	25.8	44.7	63.7	82.0	98.8	112.1	118.4	115.2	108.2	109.8	119.7	134.2	151.0	168.7
Jup. ...	92.4	93.2	94.2	95.5	97.1	98.8	100.8	102.8	104.9	107.0	109.8	111.4	113.7	115.9	118.1	120.3	122.4	124.6
Ven. ...	48.3	49.5	53.1	58.2	69.0	82.8	97.7	112.1	126.1	140.1	154.1	168.1	182.1	196.1	210.1	224.1	238.1	252.1
Sat. ...	11																	

V-B—cont.

Mars, A.D. 1637—A.D. 1999; Mercury, A.D. 1645—A.D. 1999; Jupiter, A.D. 1656—A.D. 1999;
Saturn, A.D. 1617—A.D. 1999—cont.

180	190	200	210	220	230	240	250	260		270	280	290	300	310	320	330	340	350	360
O 7	O 17	O 27	N 6	N 16	N 26	D 6	D 16	D 26		Ja 5	Ja 15	Ja 25	F 4	F 14	F 24	Mr 6	Mr 16	Mr 26	Ap 5
211.0	217.8	225.0	232.3	239.0	247.2	254.6	262.3	269.9	1791	277.7	285.6	293.8	301.2	309.2	317.0	324.9	332.8	340.6	348.5
198.5	188.0	182.1	185.3	196.5	211.2	227.5	245.2	262.3		278.3	291.3	298.1	295.8	288.5	288.3	297.7	311.0	329.2	347.6
147.8	149.8	151.8	158.6	155.2	156.6	167.9	159.1	159.7		160.3	160.4	160.2	159.7	158.8	157.8	156.6	155.4	154.0	152.7
152.2	164.8	177.2	189.0	201.6	214.1	228.8	239.6	252.2		264.9	277.4	290.1	302.6	315.3	327.7	340.1	352.6	364.9	17.3
839.7	839.0	838.4	837.7	837.4	837.2	837.1	837.4	837.8		338.2	339.0	339.9	340.7	341.8	343.0	344.2	345.5	346.8	348.0
116.0	121.8	127.5	133.0	138.3	143.3	148.0	152.4	156.3	1792	159.6	162.3	164.0	164.6	163.8	161.7	158.5	154.7	150.9	147.8
106.9	167.2	177.0	180.9	207.2	224.6	241.7	258.2	271.9		280.5	280.7	273.2	270.7	277.8	291.0	307.3	325.3	343.8	1.9
171.1	173.3	175.5	177.7	179.8	181.6	183.6	185.2	186.7		188.0	189.1	189.8	190.3	190.5	190.3	189.8	189.1	188.0	186.8
190.2	185.8	180.6	178.2	178.8	182.8	189.4	197.9	206.8		217.3	228.0	239.1	250.4	262.2	274.0	286.1	298.1	310.0	322.3
354.2	353.4	350.6	351.8	351.4	350.9	350.6	350.6	350.8		350.9	351.5	352.2	352.8	353.9	355.0	356.0	357.2	358.5	359.8
O 6	O 16	O 26	N 5	N 15	N 25	D 5	D 15	D 25	1793	Ja 4	Ja 14	Ja 24	F 3	F 13	F 23	Mr 5	Mr 15	Mr 25	Ap 4
226.7	233.7	241.0	248.4	255.8	263.5	271.1	278.6	286.5		294.3	302.1	310.0	317.7	325.6	333.3	341.0	348.7	356.3	3.8
157.5	170.9	187.0	204.1	221.6	237.9	252.6	263.0	265.2		259.0	254.1	258.6	270.4	285.9	303.3	321.6	339.6	356.8	11.2
194.7	196.8	199.1	201.2	203.3	205.7	207.8	209.9	211.7		213.7	215.3	216.9	218.4	219.4	220.2	220.7	220.9	221.0	220.3
181.5	201.8	214.3	229.7	239.2	251.5	263.9	276.4	288.7		300.9	313.0	325.0	336.7	348.3	359.5	370.4	381.1	391.7	39.1
8.1	8.3	7.5	6.6	6.0	5.3	4.7	4.6	4.4		4.2	4.6	5.1	5.5	6.4	7.3	8.1	9.8	10.6	11.8
129.4	135.5	141.4	147.3	153.0	158.8	164.1	169.5	174.8	1794	179.6	184.4	188.7	192.6	195.9	198.4	200.4	202.9	206.6	198.7
166.6	183.4	201.0	217.8	233.8	244.9	249.6	245.4	238.6		210.3	250.7	263.7	282.9	299.9	317.9	335.0	349.9	372.1	1.5
219.0	220.9	228.1	225.1	227.4	229.6	231.8	234.2	236.3		238.5	240.7	242.7	244.6	246.5	248.2	249.5	250.7	251.4	252.4
135.8	147.6	159.6	171.5	183.8	196.1	208.3	220.9	234.1		246.1	258.9	271.5	283.6	296.4	309.2	321.7	334.1	346.6	359.1
21.4	23.6	24.5	22.0	21.2	20.5	19.6	19.1	18.7		18.3	18.4	18.6	18.7	19.1	20.2	20.9	22.0	23.1	24.2
O 7	O 17	O 27	N 6	N 16	N 26	D 6	D 16	D 26	1795	Ja 5	Ja 15	Ja 25	F 4	F 14	F 24	Mr 6	Mr 16	Mr 26	Ap 5
245.0	252.0	259.2	266.5	274.0	281.4	289.1	296.7	304.3		311.9	319.0	327.1	335.7	344.2	349.6	357.1	364.4	371.6	18.9
179.6	197.5	213.4	226.4	237.7	247.0	254.6	262.9	270.9		244.9	261.1	278.8	296.5	313.7	328.9	340.0	349.6	357.7	332.7
245.6	247.1	248.7	250.7	252.6	254.7	257.0	259.2	261.5		263.9	266.1	268.4	270.7	273.0	275.0	277.2	279.1	280.8	282.3
219.5	230.0	239.8	248.9	256.9	263.1	268.8	274.2	279.3		280.0	283.9	288.1	292.6	296.8	300.7	304.4	307.9	311.4	309.1
39.5	38.9	38.2	37.4	36.6	35.8	34.9	34.3	33.7		33.0	32.8	32.7	32.6	33.1	33.5	33.9	34.9	35.8	36.8
142.1	148.2	154.5	160.5	166.5	172.6	178.7	184.6	190.5	1796	191.4	202.2	207.7	213.2	218.7	224.8	228.9	233.5	237.8	241.7
193.6	207.7	217.0	217.5	210.5	206.4	212.7	225.0	240.5		257.8	275.3	292.6	308.2	320.4	325.8	329.3	331.5	331.7	329.3
275.8	276.8	277.4	278.5	280.1	281.6	283.6	285.6	287.7		290.0	292.4	294.6	296.8	298.4	301.6	304.0	306.3	308.7	310.8
170.9	183.3	195.9	208.5	221.0	233.5	246.2	258.8	271.1		284.0	296.5	309.0	321.4	333.7	346.0	358.2	370.4	382.6	394.7
54.1	54.0	53.5	53.0	52.2	51.4	50.5	49.8	49.0		48.2	47.9	47.5	47.0	47.2	47.4	47.6	48.3	49.0	49.7
O 6	O 16	O 26	N 5	N 15	N 25	D 5	D 15	D 25	1797	Ja 4	Ja 14	Ja 24	F 3	F 13	F 23	Mr 5	Mr 15	Mr 25	Ap 4
269.0	275.3	281.7	288.5	295.1	302.2	309.3	316.3	323.5		330.6	337.8	345.0	352.1	359.0	361.1	368.0	374.9	381.8	388.7
199.2	202.6	206.9	211.4	214.5	218.0	221.0	224.9	228.4		271.7	287.7	300.9	307.8	305.5	298.4	298.4	307.4	322.0	339.1
311.4	310.8	310.6	310.8	311.2	311.9	313.0	314.4	315.9		317.5	319.7	321.9	324.2	326.5	328.7	331.2	333.6	336.0	338.5
127.6	137.0	148.2	158.2	170.3	180.8	192.6	204.6	216.7		228.7	241.1	254.6	268.2	278.2	290.7	303.0	315.5	328.0	340.3
69.2	69.0	68.7	68.6	67.9	67.2	66.5	65.6	64.8		63.9	63.3	62.6	61.9	61.8	61.7	61.6	62.1	62.5	63.0
151.2	160.6	167.6	173.2	179.7	186.6	192.8	198.7	205.7	1798	211.4	218.0	224.3	230.7	237.2	243.6	249.9	256.4	262.7	269.0
184.9	176.1	176.6	186.2	200.1	216.5	233.8	251.2	267.9		281.3	290.2	298.1	293.0	279.7	267.4	250.0	237.1	225.2	213.8
852.0	830.5	848.8	848.2	847.4	846.9	846.9	847.1	847.8		348.7	349.8	351.3	353.0	354.9	356.9	359.2	361.5	363.8	366.1
207.8	219.8	231.9	243.9	255.5	267.1	278.6	290.1	300.8		311.2	322.6	332.1	338.7	344.3	349.3	353.7	357.7	361.8	365.0
83.4	83.4	83.4	83.1	82.9	82.5	82.0	81.1	80.3		79.5	78.7	78.0	77.2	76.8	76.4	76.0	76.2	76.4	76.5
O 7	O 17	O 27	N 6	N 16	N 26	D 6	D 16	D 26	1799	Ja 5	Ja 15	Ja 25	F 4	F 14	F 24	Mr 6	Mr 16	Mr 26	Ap 5
312.0	314.0	317.3	320.9	325.4	330.3	335.3	341.0	346.5		352.6	358.6	364.7	370.9	377.1	383.3	389.5	395.7	401.9	408.1
159.2	166.8	180.2	196.1	213.2	230.6	247.2	261.9	272.2		274.5	288.2	293.5	297.9	299.9	295.6	293.3	291.6	289.8	288.0
327.7	31.6	30.5	29.1	27.7	26.4	25.2	24.8	23.6		23.8	23.2	22.7	22.4	22.3	22.7	22.2	21.9	21.8	21.9
152.8	161.9	178.0	189.7	202.3	214.8	227.5	240.3	252.9		265.6	278.1	290.7	303.3	315.9	328.3	340.7	353.2	365.6	377.9
97.0	97.3	97.5	97.9	97.7	97.4	97.2	96.5	95.7		95.0	94.2	93.3	92.5	91.9	91.3	90.6	90.6	90.5	90.4
166.3	172.8	179.3	186.0	192.5	199.3	205.8	212.6	219.3	1800*	226.2	233.1	240.1	247.0	254.1	261.0	268.2	275.4	282.6	289.9
160.1	175.6	182.7	210.2	227.0	242.3	254.0	258.7	254.2		247.7	249.8	260.9	274.6	291.6	309.6	327.9	344.9	361.9	378.9
89.0	69.0	68.8	68.4	67.5	65.3	64.9	63.7	62.3		61.0	59.9	59.7	58.6	58.3	58.5	58.9	59.8	60.9	62.2
187.0	181.7	176.6	175.0	176.6	181.5	188.7	197.6	206.8		217.4	228.1	239.5	250.8	262.6	274.5	286.6	298.7	310.6	322.9
110.0	110.5	111.1	111.6	111.7	111.7	111.7	111.2	110.6		110.0	109.2	108.4	107.7	106.9	106.1	105.3	105.0	104.7	104.3
29.6	28.2	25.9	23.1	21.0	19.4	18.3	18.6	20.3	1801	22.6	25.5	29.1	33.2	37.8	42.7	47.8	53.1	58.5	64.0
171.5	189.0	208.9	222.6	235.7	242.5	240.9	233.3	231.9		240.8	254.1	270.5	288.1	306.0	323.4	339.0	350.5	353.9	348.5
99.3	100.8	101.7	102.1	102.3	102.1														

TABLE

Geocentric Places of Mars, Mercury, Jupiter, Venus and Saturn for every tenth day of current cycle.
Venus, A.D. 1765—A.D. 1999;

Day of I S Y	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
Eng. date	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
1802 Mars	312.3	319.0	327.6	335.3	342.8	350.4	357.7	5.1	12.3	19.4	26.1	33.0	39.8	45.6	51.7	57.2	62.2	67.8
Merc.	332.8	340.2	348.2	356.5	365.0	373.5	382.0	390.5	399.0	407.5	416.0	424.5	433.0	441.5	450.0	458.5	467.0	475.5
Jup.	123.6	128.4	133.2	138.0	142.8	147.6	152.4	157.2	162.0	166.8	171.6	176.4	181.2	186.0	190.8	195.6	200.4	205.2
Ven.	6.2	1.5	30.9	43.3	55.5	67.6	79.9	91.8	103.9	115.9	127.8	139.8	151.5	163.3	174.9	186.6	197.9	208.9
Sat.	132.1	131.8	131.8	131.4	131.8	132.1	132.5	132.8	133.1	133.4	133.7	134.0	134.3	134.6	134.9	135.2	135.5	135.8
Eng. date	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
1803 Mars	83.5	86.8	90.7	95.1	100.4	106.0	111.9	117.7	123.7	129.7	135.7	141.7	147.7	153.6	159.5	165.4	171.3	177.2
Merc.	340.9	350.0	359.0	368.0	377.0	386.0	395.0	404.0	413.0	422.0	431.0	440.0	449.0	458.0	467.0	476.0	485.0	494.0
Jup.	156.8	155.8	154.9	154.1	153.2	152.4	151.5	150.6	149.7	148.8	147.9	147.0	146.1	145.2	144.3	143.4	142.5	141.6
Ven.	315.4	326.7	338.1	349.7	361.3	372.9	384.5	396.1	407.7	419.3	430.9	442.5	454.1	465.7	477.3	488.9	500.5	512.1
Sat.	145.8	145.3	144.8	144.5	144.6	144.4	144.7	145.3	146.0	146.6	147.3	148.0	148.6	149.3	149.9	150.6	151.3	151.9
Eng. date	Ap 10	Ap 20	Ap 30	My 10	My 20	My 30	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29
1804 Mars	329.6	337.5	345.3	353.0	360.5	368.1	375.4	382.8	390.1	397.4	404.7	411.9	419.1	426.3	433.5	440.7	447.9	455.1
Merc.	355.2	363.8	372.4	381.0	389.6	398.2	406.8	415.4	424.0	432.6	441.2	449.8	458.4	467.0	475.6	484.2	492.8	501.4
Jup.	190.9	189.5	188.1	186.7	185.3	183.9	182.5	181.1	179.7	178.3	176.9	175.5	174.1	172.7	171.3	169.9	168.5	167.1
Ven.	40.5	51.9	63.2	73.7	84.1	94.5	104.9	115.3	125.7	136.1	146.5	156.9	167.3	177.7	188.1	198.5	208.9	219.3
Sat.	159.3	158.6	158.0	157.4	156.7	156.1	155.5	154.9	154.3	153.7	153.1	152.5	151.9	151.3	150.7	150.1	149.5	148.9
Eng. date	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
1805 Mars	104.5	107.1	111.3	115.5	120.1	125.1	130.5	135.9	141.4	147.2	153.3	159.2	165.6	171.8	178.4	184.8	191.5	198.4
Merc.	9.3	25.6	38.0	43.5	50.1	56.8	63.5	70.2	76.9	83.6	90.3	97.0	103.7	110.4	117.1	123.8	130.5	137.2
Jup.	224.7	223.8	222.8	221.5	220.3	219.1	217.9	216.5	215.2	213.9	212.6	211.3	210.0	208.7	207.4	206.1	204.8	203.5
Ven.	346.6	358.0	369.4	380.8	392.2	403.6	415.0	426.4	437.8	449.2	460.6	472.0	483.4	494.8	506.2	517.6	529.0	540.4
Sat.	172.4	171.7	171.0	170.3	169.9	169.5	169.2	168.9	168.6	168.3	168.0	167.7	167.4	167.1	166.8	166.5	166.2	165.9
Eng. date	Ap 10	Ap 20	Ap 30	My 10	My 20	My 30	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29
1806 Mars	340.1	353.9	368.0	382.1	396.2	410.3	424.4	438.5	452.6	466.7	480.8	494.9	509.0	523.1	537.2	551.3	565.4	579.5
Merc.	10.7	23.6	36.5	43.8	51.1	58.4	65.7	73.0	80.3	87.6	94.9	102.2	109.5	116.8	124.1	131.4	138.7	146.0
Jup.	256.9	257.1	257.2	256.7	255.1	253.5	251.9	250.3	248.7	247.1	245.5	243.9	242.3	240.7	239.1	237.5	235.9	234.3
Ven.	325.4	329.2	335.5	343.5	352.7	361.9	371.1	380.3	389.5	398.7	407.9	417.1	426.3	435.5	444.7	453.9	463.1	472.3
Sat.	185.2	184.4	183.6	182.8	182.3	181.8	181.2	180.7	180.1	179.6	179.0	178.5	177.9	177.4	176.8	176.3	175.7	175.2
Eng. date	Ap 10	Ap 20	Ap 30	My 10	My 20	My 30	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29
1807 Mars	132.4	132.8	134.1	136.4	139.5	143.3	147.6	152.3	157.5	162.7	168.5	174.3	180.4	186.7	193.1	199.7	206.5	213.2
Merc.	2.9	35.5	55.2	62.2	70.1	78.0	85.9	93.8	101.7	109.6	117.5	125.4	133.3	141.2	149.1	157.0	164.9	172.8
Jup.	297.0	298.5	299.5	299.4	299.7	299.0	298.7	298.0	297.2	296.5	295.8	295.1	294.4	293.7	293.0	292.3	291.6	290.9
Ven.	24.9	37.0	49.1	61.1	73.1	84.8	96.4	107.9	119.1	130.1	140.9	151.1	161.0	170.9	180.8	190.7	200.6	210.5
Sat.	197.7	196.9	196.0	195.3	194.6	194.0	193.3	192.9	192.5	192.2	191.9	191.6	191.3	191.0	190.7	190.4	190.1	189.8
Eng. date	Ap 10	Ap 20	Ap 30	My 10	My 20	My 30	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29
1808 Mars	1.7	9.5	16.8	24.2	31.4	38.5	45.7	52.8	59.7	66.5	73.3	79.9	86.5	93.0	99.5	106.8	112.0	118.3
Merc.	335.8	342.8	350.5	358.0	365.5	373.0	380.5	388.0	395.5	403.0	410.5	418.0	425.5	433.0	440.5	448.0	455.5	463.0
Jup.	315.8	317.8	319.6	321.4	322.9	324.1	325.2	326.3	327.4	328.5	329.6	330.7	331.8	332.9	334.0	335.1	336.2	337.3
Ven.	329.8	342.0	354.2	366.4	378.6	390.8	403.0	415.2	427.4	439.6	451.8	464.0	476.2	488.4	500.6	512.8	525.0	537.2
Sat.	204.8	209.1	208.3	207.6	206.8	205.9	205.3	204.9	204.5	204.1	203.7	203.3	202.9	202.5	202.1	201.7	201.3	200.9
Eng. date	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
1809 Mars	175.7	172.1	169.9	168.1	166.0	164.2	162.5	160.8	159.1	157.4	155.7	154.0	152.3	150.6	148.9	147.2	145.5	143.8
Merc.	334.9	351.0	367.1	383.2	399.3	415.4	431.5	447.6	463.7	479.8	495.9	512.0	528.1	544.2	560.3	576.4	592.5	608.6
Jup.	343.8	345.1	346.4	347.7	348.9	350.1	351.3	352.5	353.7	354.9	356.1	357.3	358.5	359.7	360.9	362.1	363.3	364.5
Ven.	42.5	47.9	50.7	49.9	45.4	39.4	31.4	21.4	11.4	1.4	9.4	19.4	29.4	39.4	49.4	59.4	69.4	79.4
Sat.	221.6	220.9	220.3	219.6	218.8	218.0	217.3	216.6	216.0	215.5	215.0	214.5	214.0	213.5	213.0	212.5	212.0	211.5
Eng. date	Ap 10	Ap 20	Ap 30	My 10	My 20	My 30	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29
1810 Mars	15.9	24.1	31.2	38.3	45.3	52.4	59.2	65.0	72.9	79.5	86.3	92.7	99.2	105.6	112.4	118.4	124.7	130.9
Merc.	346.6	352.2	358.0	363.8	369.6	375.4	381.2	387.0	392.8	398.6	404.4	410.2	416.0	421.8	427.6	433.4	439.2	445.0
Jup.	11.3	13.7	16.1	18.5	20.8	22.2	23.5	24.7	25.9	27.1	28.3	29.5	30.7	31.9	33.1	34.3	35.5	36.7
Ven.	6.9	19.1	31.5	43.9	56.3	68.7	81.1	93.5	105.9	118.3	130.7	143.1	155.5	167.9	180.3	192.7	205.1	217.5
Sat.	233.1	232.7	232.3	231.4	230.6	229.8	229.1	228.4	227.7	226.8	226.7	226.3	226.0	225.6	225.2	224.8	224.4	224.0
Eng. date	Ap 10	Ap 20	Ap 30	My 10	My 20	My 30	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29
1811 Mars	228.1	228.6	229.0	229.5	229.9	230.1	230.5	230.7	231.3	231.6	232.4	232.4	232.0	232.5	233.4	234.0	234.9	235.0
Merc.	1.4	19.6	35.9	48.5	54.1	60.0	65.7	71.4	77.1	82.8	88.5	94.2	100.0	105.7	111.4	117.1	122.8	128.5
Jup.	38.8	40.9	43.0	45.1	47.2	49.3	51.4	53.5	55.6	57.7	59.8	61.9	64.0	66.1	68.2	70.3	72.4	74.5
Ven.	315.8	327.0	338.5	350.2	361.9	373.6	385.3	397.0	408.7	420.4	432.1	443.8	455.5	467.2	478.9	490.6	502.3	514.0
Sat.	244.4	244.0	243.7	243.4	243.0	242.6	242.1	241.7	241.3	240.9	240.5	240.1	239.7	239.3	238.9	238.5	238.1	237.7
Eng. date	Ap 10	Ap 20	Ap 30	My 10	My 20	My 30	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29
1812 Mars	31.5	38.6	45.3	52.1	58.9	65.7	72.4	78.8	85.3	91.9	98.4	104.9	111.3	117.0	122.4	128.4	134.7	141.1
Merc.	13.8	27.5	41.2	54.9	68.6	82.3	96.0	109.7	123.4	137.1	150.8	164.5	178.2	191.9	205.6	219.3	233.0	246.7
Jup.	68.9	68.5	70.3	72.2	74.1	76.2	78.3	80.4	82.5	84.6	86.7	88.8	90.9	93.0	95.1	97.2	99.3	101.4
Ven.	40.8	52.2	63.4	73.9	84.1	94.3	104.5	114.7	124.9	135.1	145.3	155.5	165.7	175.9	186.1	196.3	206.5	216.7
Sat.	253.3	255.1	254.9	254.8	254.1</													

V-B—cont.

Mars, A.D. 1637—A.D. 1999; Mercury, A.D. 1645—A.D. 1999; Jupiter, A.D. 1656—A.D. 1999;
Saturn, A.D. 1617—A.D. 1999—cont.

180	190	200	210	220	230	240	250	260		270	280	290	300	310	320	330	340	350	360
O 8	O 18	O 28	N 7	N 17	N 27	D 7	D 17	D 27		Ja 6	Ja 16	Ja 26	F 5	F 15	F 25	Mr 7	Mr 17	Mr 27	Ap 6
71.8	75.6	78.7	80.8	82.0	81.9	80.5	77.8	74.3	1803	70.7	67.9	65.9	65.2	65.9	67.5	70.2	73.4	77.3	81.4
197.4	208.4	211.6	206.1	200.3	203.2	214.4	229.5	246.1		263.7	281.0	297.2	310.4	317.8	315.9	308.8	308.0	317.6	331.9
150.9	152.9	155.0	156.9	158.7	160.2	161.7	162.8	163.7		164.2	164.5	164.5	164.0	163.4	162.5	161.3	160.0	158.8	157.4
219.7	230.1	239.8	248.6	256.3	262.0	265.0	264.2	259.4		253.6	249.8	240.3	254.4	260.7	269.7	278.1	288.0	298.5	309.3
146.0	147.0	148.1	149.1	150.0	150.5	151.2	151.4	151.5		161.8	151.4	151.0	150.7	150.0	149.8	149.5	147.8	147.0	146.2
									1804										
191.6	198.4	205.3	212.3	219.3	226.5	233.7	241.0	248.4		255.9	263.5	271.0	278.7	286.5	294.2	302.1	310.1	317.9	325.6
185.7	192.6	195.3	196.1	195.4	209.3	225.7	243.0	260.4		276.8	290.7	299.6	300.1	292.6	289.9	287.1	310.1	327.0	345.3
174.3	178.5	178.8	180.8	182.9	185.0	186.9	188.7	190.2		191.5	192.7	193.7	194.2	194.6	194.6	191.1	193.5	192.6	191.4
171.8	184.0	190.6	209.2	221.7	234.2	246.9	259.5	272.0		284.6	297.2	309.7	322.0	334.3	346.6	358.8	371.0	383.2	395.4
157.0	158.1	159.7	160.4	161.3	162.1	163.0	163.4	163.8		164.2	164.1	164.0	163.8	163.2	162.6	162.0	161.2	160.4	159.6
O 7	O 17	O 27	N 6	N 16	N 26	D 6	D 16	D 26		Ja 5	Ja 15	Ja 25	F 4	F 14	F 24	Mr 6	Mr 16	Mr 26	Ap 5
94.0	99.2	103.9	108.4	112.1	115.3	117.9	119.1	119.7	1805	118.9	116.7	113.7	109.8	106.0	103.0	100.9	100.5	101.2	103.2
170.8	168.2	176.1	189.4	205.4	222.5	239.7	256.5	271.1		281.3	283.9	277.8	272.9	277.5	289.6	305.3	323.2	341.6	359.8
197.8	200.1	202.2	204.4	206.7	208.8	211.1	213.2	215.1		217.1	218.9	220.5	222.1	224.2	224.1	224.9	225.2	225.3	224.9
127.4	137.1	148.5	158.5	170.9	181.2	193.1	205.1	217.2		229.3	241.7	254.2	266.5	278.9	291.4	303.7	316.2	328.7	341.0
167.7	168.9	170.1	171.2	172.2	173.2	174.2	174.8	175.4		176.0	176.1	176.2	176.3	176.9	175.5	175.1	174.8	173.6	172.8
O 8	O 18	O 28	N 7	N 17	N 27	D 7	D 17	D 27		Ja 6	Ja 16	Ja 26	F 5	F 15	F 25	Mr 7	Mr 17	Mr 27	Ap 6
295.5	212.2	219.2	226.3	233.7	241.1	248.5	255.7	263.7	1806	271.5	279.1	287.0	294.8	302.7	310.6	318.4	326.4	334.2	342.0
157.4	169.6	185.1	202.0	219.1	236.3	251.5	268.2	285.7		268.7	257.0	250.0	269.1	284.1	301.3	319.5	337.8	355.2	372.5
222.1	224.5	226.6	228.5	230.6	233.0	235.4	237.5	239.8		242.0	244.3	246.3	248.4	250.2	252.0	253.4	254.8	255.8	256.6
208.5	220.4	232.5	244.4	256.1	267.6	279.1	290.4	301.1		311.3	320.5	328.6	336.9	345.7	354.3	363.3	372.2	381.0	389.8
178.2	179.1	180.5	181.9	182.9	184.0	185.1	185.8	186.6		187.4	187.5	187.9	188.2	188.0	187.7	187.5	186.9	186.8	185.7
110.2	116.0	121.5	126.7	131.8	136.5	140.8	144.4	147.7	1807	149.9	151.5	151.7	150.7	148.3	144.7	141.2	137.5	134.5	133.0
164.5	181.3	198.7	215.9	231.7	248.0	261.6	279.8	292.0		241.2	249.9	263.4	279.8	297.5	315.8	334.2	349.0	364.0	378.8
249.4	250.9	252.6	254.3	256.2	258.3	260.4	262.8	265.0		267.3	269.6	272.0	274.2	276.6	278.8	280.9	282.8	284.8	286.3
153.4	165.6	178.9	190.4	202.9	215.5	228.1	240.9	253.5		266.2	278.7	291.3	304.0	316.6	328.9	341.4	353.9	366.4	378.6
188.5	189.7	190.9	192.1	193.2	194.5	195.5	196.3	197.2		198.1	198.6	199.1	199.6	199.6	199.6	199.6	199.6	198.5	198.0
220.2	227.3	234.8	241.8	249.2	256.8	264.4	272.2	279.9	1808	287.6	295.5	303.4	311.3	319.0	326.9	334.8	342.5	350.1	357.9
177.7	185.5	212.0	225.8	235.0	245.5	256.5	267.5	278.3		243.4	259.2	276.6	294.4	311.8	327.8	344.3	360.4	375.3	389.0
280.3	280.7	281.5	282.7	284.0	285.5	287.3	289.4	291.5		298.7	295.9	298.3	300.6	302.9	305.4	307.8	310.1	312.4	314.6
183.8	177.4	172.5	171.8	174.5	180.2	187.9	197.2	206.8		217.4	228.3	239.8	251.3	263.1	275.0	287.2	299.3	311.2	323.4
198.7	199.9	201.1	202.2	203.4	204.6	205.7	206.7	207.7		208.6	209.3	209.9	210.6	211.3	211.8	211.1	210.8	210.5	210.0
O 7	O 17	O 27	N 6	N 16	N 26	D 6	D 16	D 26		Ja 5	Ja 15	Ja 25	F 4	F 14	F 24	Mr 6	Mr 16	Mr 26	Ap 5
124.3	130.2	136.0	142.7	147.1	152.9	158.2	163.0	167.9	1809	172.4	176.3	179.9	182.7	184.6	185.8	185.5	183.9	180.8	177.3
191.8	206.7	215.7	220.7	214.9	209.3	212.5	223.7	238.8		256.6	273.2	290.6	306.9	320.3	327.7	326.0	318.8	315.6	312.7
316.7	316.0	315.7	315.4	316.9	316.5	317.3	318.6	320.1		321.9	323.8	325.8	328.0	330.2	332.5	335.0	337.4	339.8	342.2
190.9	203.1	215.6	228.0	240.5	252.7	265.1	277.6	289.8		302.0	314.0	325.9	337.6	349.1	360.1	368.0	375.8	383.6	391.4
208.6	209.7	210.8	212.0	213.2	214.4	215.6	216.6	217.7		218.8	219.6	220.4	221.2	221.5	221.9	222.2	222.3	222.3	221.8
O 8	O 18	O 28	N 7	N 17	N 27	D 7	D 17	D 27		Ja 6	Ja 16	Ja 26	F 5	F 15	F 25	Mr 7	Mr 17	Mr 27	Ap 6
247.5	244.5	251.8	259.0	266.5	274.1	281.6	289.4	297.1	1810	304.8	312.6	320.3	327.9	335.8	343.3	350.7	358.2	365.7	373.0
199.3	205.0	201.5	194.4	194.9	204.5	218.5	234.8	252.3		262.8	286.3	300.4	309.3	308.3	304.8	299.8	307.0	320.4	337.0
357.7	355.3	355.0	353.7	352.8	352.3	352.0	352.1	352.5		353.3	354.4	355.6	357.2	359.0	361.1	363.5	366.0	368.5	371.0
136.8	148.6	160.8	172.7	185.1	197.3	209.7	222.2	235.6		247.4	260.1	272.8	285.0	297.7	310.4	323.0	335.3	347.7	360.0
215.6	219.7	229.7	221.8	223.0	224.3	225.5	226.6	227.7		228.8	229.6	230.6	231.5	232.0	232.5	233.0	233.1	233.1	233.1
137.0	143.2	149.3	155.3	161.3	167.1	173.1	178.8	184.5	1811	190.1	195.5	200.6	205.7	210.4	214.8	218.9	222.6	225.8	227.4
187.5	189.5	177.8	186.0	198.4	214.6	231.5	249.0	265.6		280.6	291.2	293.6	297.5	282.5	287.5	280.2	315.2	342.8	351.5
38.1	37.2	36.0	34.8	33.3	32.0	30.7	29.7	28.8		28.3	28.2	28.4	28.9	29.8	30.9	32.2	33.9	35.6	37.7
219.4	230.1	239.4	247.9	255.3	260.1	262.0	260.4	255.6		250.2	247.1	248.8	253.5	260.1	269.1	278.0	288.1	298.7	309.0
228.6	229.6	230.6	231.6	232.8	234.0	235.1	236.1	237.3		238.5	239.5	240.5	241.6	242.2	242.9	243.6	243.9	244.1	244.8
255.6	265.2	271.1	279.1	286.3	293.6	301.9	308.4	315.7	1812	323.1	330.5	337.8	345.2	352.5	359.9	367.3	374.7	382.1	389.5
161.2	166.8	178.7	194.4	211.2	228.6	245.4	263.7	272.1		277.2	273.1	268.3	268.4	278.6	290.8	311.1	329.2	347.7	365.1
73.6	73.7	73.8	73.3	72.6	71.6	70.3	69.7	67.7		66.4	65.1	64.1	63.5	63.2	63.1	63.5	64.0	65.0	66.1
172.2	184.7	197.3	209.8	222.3	234.8	247.5	260.1	272.7		285.2	297.8	310.3	322.6	334.8	347.2	359.3	371.4	383.5	395.6
238.7	239.6	240.5	241.4	242.5	243.6	244.8	246.0	247.2		248.3	249.4	250.4	251.5	252.4	253.3	254.1	254.6	254.9	255.3
O 7	O 17	O 27	N 6	N 16	N 26	D 6	D 16	D 26		Ja 5	Ja 15	Ja 25	F 4	F 14	F 24	Mr 6	Mr 16	Mr 26	Ap 5
149.4	155.7	161.8	168.3	174.4	180.0														

TABLE

Geocentric Places of Mars, Mercury, Jupiter, Venus and Saturn for every tenth day of current cycle.
Venus, A.D. 1765—A.D. 1999;

Day of I. S. Y.	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
Eng. date ..	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
1814 Mars ..	46 3	52 7	59 3	65 7	72 2	78 6	85 0	91 4	97 8	104 2	110 6	116 8	123 2	129 6	136 0	142 3	148 7	155 2
Merc.	349 3	346 3	353 1	6 7	23 8	42 3	61 4	80 0	97 8	111 8	120 5	119 5	112 0	110 6	110 1	132 5	149 1	166 5
Jup.	128 0	127 7	127 7	127 8	128 5	129 3	130 4	131 8	133 4	135 1	137 1	139 1	141 2	143 2	145 3	147 7	149 8	152 0
Ven.	323 9	328 3	335 0	343 8	352 7	2 5	12 1	23 7	34 9	46 8	57 9	69 5	81 3	92 9	104 9	117 1	129 8	141 6
Sat.	277 1	277 4	277 6	277 8	277 5	277 2	276 9	276 2	275 5	274 8	274 1	273 3	272 5	271 9	271 4	270 8	270 7	270 7
Eng. date ..	Ap 10	Ap 20	Ap 30	My 10	My 20	My 30	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29
1815 Mars ..	285 8	292 7	299 4	307 4	313 1	319 7	326 2	332 5	338 5	344 4	349 0	354 2	358 2	1 5	8 6	4 4	3 9	2 0
Merc.	332 8	335 0	1 3	10 3	38 5	57 5	75 1	90 4	100 9	102 2	95 4	92 1	98 6	111 5	127 7	145 2	163 2	180 6
Jup.	161 4	160 3	159 4	158 5	158 1	158 1	158 8	159 6	160 6	161 9	163 5	165 8	167 1	169 1	171 2	173 2	175 8	
Ven.	25 5	37 6	49 6	61 6	73 7	85 3	96 8	108 4	119 5	130 5	141 2	151 1	160 8	169 4	178 7	182 3	185 0	184 2
Sat.	288 1	288 4	288 8	289 3	289 1	289 0	288 9	288 3	287 7	287 2	286 4	285 6	284 9	284 2	283 5	282 8	282 5	282 3
Eng. date ..	Ap 10	Ap 20	Ap 30	My 10	My 20	My 30	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29
1816 Mars ..	61 0	67 2	73 1	79 2	85 3	91 4	97 6	103 8	110 0	116 3	122 4	128 8	135 1	141 5	147 9	154 2	160 8	167 3
Merc.	339 0	336 8	15 5	34 5	52 6	68 7	80 3	84 3	78 5	73 3	78 4	90 4	106 2	123 8	141 8	159 8	176 2	189 7
Jup.	195 5	193 2	193 0	191 6	190 4	189 3	188 6	188 2	188 2	188 4	188 8	189 7	190 0	191 9	194 2	195 2	197 1	199 1
Ven.	330 4	342 6	354 7	7 1	19 3	31 5	43 8	56 0	68 1	80 6	92 6	105 0	116 9	129 5	141 7	154 2	166 7	178 9
Sat.	298 9	299 5	300 1	300 7	300 8	300 9	301 0	300 6	300 2	299 8	299 1	298 4	297 6	296 8	296 0	295 8	294 9	294 4
Eng. date ..	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
1817 Mars ..	305 2	312 7	320 3	327 7	335 3	342 7	350 1	357 2	4 2	11 2	17 8	24 3	30 6	36 5	42 2	47 3	52 0	55 2
Merc.	352 9	11 6	29 9	46 6	59 6	65 2	61 1	54 8	57 9	68 7	84 4	101 8	120 1	138 3	155 0	170 2	180 2	181 6
Jup.	229 2	228 5	227 5	226 5	225 2	223 8	222 5	221 3	220 3	219 5	219 0	218 8	219 1	219 5	220 4	221 5	222 9	224 8
Ven.	41 6	46 4	48 3	46 6	41 7	36 0	30 5	33 0	36 6	43 1	50 9	59 9	69 8	80 2	90 8	102 1	113 5	125 4
Sat.	309 8	310 6	311 3	312 2	312 6	312 9	313 2	313 0	312 8	312 6	312 0	311 4	310 7	309 9	309 1	308 2	307 6	307 0
Eng. date ..	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
1818 Mars ..	77 1	82 3	87 7	93 4	99 1	104 7	110 6	116 6	122 5	128 7	134 8	141 0	147 4	153 7	160 0	166 6	173 1	179 7
Merc.	7 3	24 3	38 1	45 7	43 3	38 1	37 3	47 0	62 0	79 6	98 1	116 4	134 3	149 9	161 6	165 7	160 7	154 4
Jup.	261 2	261 5	261 7	261 4	260 8	260 0	258 8	257 6	256 3	254 9	253 7	252 6	251 8	251 1	251 0	251 2	251 5	252 2
Ven.	7 6	19 8	32 1	44 5	56 7	68 9	81 0	92 9	105 1	117 0	128 9	140 9	152 6	164 2	175 9	187 3	198 5	209 4
Sat.	320 8	321 8	322 7	323 7	324 3	324 9	325 4	325 5	325 5	325 5	325 0	324 5	324 0	323 2	322 4	321 7	320 9	320 2
Eng. date ..	Ap 10	Ap 20	Ap 30	My 10	My 20	My 30	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29
1819 Mars ..	323 0	330 8	338 6	346 3	353 8	1 3	8 9	16 2	23 4	30 4	37 4	44 2	51 0	57 5	63 6	69 7	75 6	81 4
Merc.	18 6	25 6	25 0	18 0	10 6	25 3	39 9	57 1	75 6	94 3	112 4	128 9	142 2	148 4	145 8	138 4	136 6	148 3
Jup.	291 0	292 6	293 7	294 7	295 4	295 5	295 1	294 1	293 5	292 2	290 8	289 4	288 2	287 1	286 2	285 4	285 0	
Ven.	316 1	327 4	339 0	350 8	2 8	14 7	26 5	38 4	50 4	62 6	74 5	86 7	98 7	111 1	123 3	135 6	148 1	160 4
Sat.	332 1	333 2	334 3	335 4	336 2	337 0	337 8	338 0	338 3	338 5	338 8	338 1	337 7	337 0	336 7	335 6	334 8	334 0
Eng. date ..	Ap 10	Ap 20	Ap 30	My 10	My 20	My 30	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29
1820 Mars ..	95 9	99 6	103 0	108 8	113 8	119 0	124 6	130 0	135 9	141 8	147 7	154 0	160 2	166 5	172 9	179 1	186 3	192 9
Merc.	7 0	0 5	35 0	3 3	17 3	34 3	52 7	71 7	90 4	107 5	124 8	140 3	152 6	164 2	175 9	187 3	198 5	209 4
Jup.	319 6	321 6	323 6	325 6	327 1	328 5	329 7	330 5	330 9	331 1	331 0	330 5	329 7	328 7	327 4	326 0	324 6	323 2
Ven.	11 2	52 5	63 6	74 1	84 0	93 5	101 7	108 5	113 0	114 5	112 3	106 3	101 1	98 2	98 8	103 2	108 6	117 7
Sat.	343 4	344 6	345 8	347 1	348 1	349 0	350 0	350 6	351 2	351 6	351 6	351 6	351 5	351 0	350 5	349 9	349 1	348 3
Eng. date ..	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
1821 Mars ..	339 9	347 7	355 3	3 0	10 6	18 0	25 3	32 6	39 8	46 9	53 6	60 4	67 1	73 7	80 1	86 3	92 6	98 6
Merc.	338 8	343 0	355 5	11 8	29 9	48 9	67 8	86 1	100 8	111 1	113 0	106 2	102 8	108 6	121 2	137 6	155 2	172 7
Jup.	347 5	349 9	352 2	354 5	356 0	358 8	0 9	2 6	4 1	5 5	6 5	7 3	7 5	7 7	7 3	6 8	5 8	4 6
Ven.	348 2	1 2	13 7	26 8	38 5	50 8	62 9	75 2	87 3	99 5	111 8	124 0	136 1	148 2	160 8	173 0	185 1	197 2
Sat.	355 1	356 4	357 7	359 0	0 1	1 3	2 4	3 1	3 9	4 7	4 9	5 2	5 4	5 1	4 8	4 4	3 7	3 0
Eng. date ..	Ap 10	Ap 20	Ap 30	My 10	My 20	My 30	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29
1822 Mars ..	120 3	121 8	124 3	127 4	131 2	135 5	140 4	145 4	150 8	156 4	162 3	168 1	174 4	180 6	187 2	193 7	200 4	207 3
Merc.	333 8	349 2	7 0	25 6	44 6	63 2	78 8	91 1	94 9	89 5	84 2	88 9	100 6	116 2	133 5	151 5	169 3	185 5
Jup.	14 8	17 2	10 6	22 0	24 4	26 8	29 1	31 4	33 6	35 4	37 5	39 1	40 6	41 8	42 7	43 5	43 8	43 7
Ven.	322 5	327 5	334 6	343 1	352 7	2 7	12 5	24 1	35 8	46 8	58 4	70 0	81 8	93 5	105 5	117 7	129 9	142 7
Sat.	7 0	8 3	9 6	10 9	12 1	13 4	14 7	16 6	16 6	17 6	18 1	18 7	19 2	19 2	19 1	19 0	18 5	18 0
Eng. date ..	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
1823 Mars ..	355 0	3 3	11 0	18 4	25 7	33 0	40 3	47 3	54 3	61 7	68 1	74 8	81 4	87 9	94 3	100 6	106 8	113 0
Merc.	344 7	3 0	22 0	40 4	57 1	70 1	78 1	72 8	65 9	68 2	79 1	94 5	111 9	130 1	148 1	165 1	179 6	189 4
Jup.	42 7	44 9	47 0	49 2	51 4	53 9	56 2	58 5	60 9	63 2	65 5	67 6	69 6	71 3	73 0	74 7	76 1	77 1
Ven.	24 1	38 2	50 2	62 3	74 2	85 8	97 3	108 8	119 9	130 8	141 4	151 2	160 6	168 9	175 8	180 7	182 6	180 8
Sat.	19 2	20 5	21 8	23 2	24 5	25 8	27 2	28 3	29 5	30 6	31 3	32 1	32 8	33 1	33 4	33 6	33 3	32 9
Eng. date ..	Ap 10	Ap 20	Ap 30	My 10	My 20	My 30	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29
1824 Mars ..	156 0	153 9	153 1	153 6	155 9	157 6	160 8	164 9	169 2	174 1	179 4	185 0	190 8	197 1	203 3	209 8	216 6	223 4
Merc.	359 8	17 6	34 7	48 8	58 5	54 8	47 6	47 7	57 7	73 6	89 8	108 2	126 5	144 2	161 6	179 2	195 4	210 0
Jup.	70 9	72 4	74 0	75 8	77 8	79 9	82 0	84 2	86 6	88 9	91 1	93 5	95 7	98 0	100 0	102 1	103 9	105 7
Ven.	331 0	343 2	355 2	7 7	19 9	32 1	44 4	56 6	68 7	81 8	93 8	105 6	117 9	130 1	142 2	154 8	167 8	179 5
Sat.	31 6	32 9	34 2	35 5	36 9	38 2	39 6	40 8	42 1	43 3	44 4	45 4	46 4	47 3				

V-B—cont.

Mars, A.D. 1637—A.D. 1999; Mercury, A.D. 1645—A.D. 1999; Jupiter, A.D. 1656—A.D. 1999;
Saturn, A.D. 1617—A.D. 1999—cont.

180	190	200	210	220	230	240	250	260		270	280	290	300	310	320	330	340	350	360
O 8	O 18	O 28	N 7	N 17	N 27	D 7	D 17	D 27		Ja 6	Ja 16	Ja 26	F 5	F 15	F 25	Mr 7	Mr 17	Mr 27	Ap 6
161.6	168.0	174.6	180.8	187.5	194.0	200.6	207.1	213.8	1815	220.4	227.1	234.0	240.7	247.5	254.3	261.2	268.4	275.1	282.1
184.8	201.0	215.8	226.6	229.0	223.5	218.0	221.8	232.8		247.8	255.1	262.9	260.2	316.6	330.2	338.1	336.6	329.1	328.7
154.2	150.3	158.4	160.4	162.1	163.8	165.2	168.5	167.5		168.1	168.5	168.7	168.6	167.9	167.0	165.9	164.7	163.4	162.1
159.9	166.2	179.4	191.1	208.6	216.2	228.8	241.4	254.2		266.8	279.4	291.9	304.7	317.1	329.6	342.0	354.6	36.9	19.1
270.6	271.0	271.4	271.9	272.8	273.7	274.5	275.4	276.8		277.2	278.4	279.6	280.7	281.8	283.0	284.1	285.2	286.1	287.1
																Mr 6	Mr 16	Mr 26	Ap 5
0 1	357.2	355.3	354.5	351.8	356.2	358.4	1.5	5.1	1816	9.2	13.6	18.6	23.9	29.2	34.6	40.8	46.2	52.0	5.1
196.2	208.6	214.0	210.5	208.4	204.0	213.8	227.6	243.7		261.6	279.2	295.8	309.9	319.4	319.8	313.2	310.1	317.0	330.4
177.5	179.9	181.9	184.2	186.3	188.4	190.8	192.0	193.7		196.3	196.3	197.3	198.1	198.7	198.7	198.5	198.1	197.1	195.1
179.9	173.9	170.0	170.0	173.4	179.6	187.6	197.0	208.9		217.6	228.7	240.2	251.8	263.5	275.6	287.8	299.9	311.7	324.0
282.0	282.2	282.4	282.8	283.5	284.9	285.0	286.0	287.1		288.1	289.3	290.5	291.8	293.0	294.2	295.3	296.3	297.4	298.4
O 7	O 17	O 27	N 6	N 16	N 26	D 6	D 16	D 26		Ja 5	Ja 15	Ja 25	F 4	F 14	F 24	Mr 6	Mr 16	Mr 26	Ap 5
173.7	180.4	187.1	193.6	200.5	207.3	214.1	221.0	228.0	1817	235.2	242.2	249.4	256.7	264.0	271.2	278.8	286.2	293.7	301.3
197.2	198.4	188.9	187.1	194.8	207.7	223.7	241.0	258.5		275.2	290.0	300.7	308.3	296.9	292.2	297.3	309.0	325.3	348.0
201.2	203.4	205.4	207.6	209.8	212.2	214.2	216.4	218.6		220.5	222.3	224.1	225.6	226.1	228.0	228.8	229.3	229.5	229.5
191.5	203.7	216.2	228.6	241.1	253.2	265.7	278.1	290.8		302.5	314.5	326.3	338.0	349.4	0.3	10.9	20.9	30.1	37.6
293.9	293.9	294.0	294.0	294.5	295.1	295.7	296.7	297.7		298.6	299.8	301.0	302.1	303.3	304.5	305.8	307.0	308.1	309.3
O 8	O 18	O 28	N 7	N 17	N 27	D 7	D 17	D 27		Ja 6	Ja 16	Ja 26	F 5	F 15	F 25	Mr 7	Mr 17	Mr 27	Ap 6
59.5	62.0	63.4	63.7	62.6	60.2	57.4	54.1	51.3	1818	49.5	48.7	49.5	51.1	53.7	56.8	60.6	64.8	69.5	74.4
174.8	170.6	176.2	188.0	203.4	220.4	237.8	254.8	270.1		282.1	288.5	292.1	275.8	278.1	288.4	303.5	320.9	339.3	357.8
226.1	228.0	231.0	232.1	234.4	236.5	238.9	241.1	243.4		245.5	247.8	249.9	251.9	253.9	255.8	257.4	258.8	259.9	261.8
137.3	140.1	161.3	173.3	185.7	197.9	210.3	222.8	236.0		248.0	260.7	273.4	285.6	298.4	311.6	323.6	335.9	348.4	0.9
806.4	306.2	306.0	305.8	306.2	306.5	306.9	307.8	308.6		309.5	310.6	311.7	312.8	314.0	315.3	316.5	317.8	319.0	320.2
186.3	193.1	200.0	206.8	213.9	221.0	228.0	235.3	242.6	1819	250.0	257.8	264.9	272.5	280.1	287.8	295.6	303.4	311.2	318.9
157.6	168.4	183.2	199.9	217.3	234.4	250.3	263.0	270.5		287.9	296.5	306.0	308.4	282.4	294.2	317.3	335.6	353.4	9.2
263.3	254.6	256.3	258.0	260.0	262.0	264.0	266.8	268.5		270.9	273.1	275.4	277.8	280.1	282.5	284.6	286.6	288.5	290.4
219.9	230.0	239.1	247.2	254.3	257.9	259.0	256.4	251.9		246.8	245.0	247.4	250.6	259.6	268.5	277.9	288.3	299.0	310.1
319.4	319.1	318.7	318.2	318.4	318.5	318.7	319.3	319.9		320.6	321.7	322.8	323.8	325.0	326.2	327.5	328.8	330.1	331.3
86.8	91.1	95.5	99.2	102.4	104.7	106.0	106.1	105.0	1820	192.3	98.8	95.1	91.6	88.9	87.7	87.6	88.8	91.1	94.0
162.9	179.3	196.8	213.9	230.3	244.3	253.1	253.4	246.1		248.0	249.1	262.0	278.0	295.7	313.8	331.6	347.9	1.0	7.5
284.9	285.3	285.9	286.8	289.2	289.5	291.3	293.1	295.2		297.4	299.6	301.9	304.2	306.7	309.1	311.3	313.7	316.1	318.5
172.9	185.4	198.0	210.4	222.9	235.4	248.1	260.7	273.4		285.8	298.4	310.9	323.2	335.4	347.8	359.8	1.1	23.5	35.9
333.2	332.6	332.1	331.5	331.4	331.3	331.2	331.7	332.2		332.7	333.6	334.5	335.3	336.5	337.7	338.9	340.2	341.5	342.8
O 7	O 17	O 27	N 6	N 16	N 26	D 6	D 16	D 26		Ja 5	Ja 15	Ja 25	F 4	F 14	F 24	Mr 6	Mr 16	Mr 26	Ap 5
190.8	206.7	213.6	220.9	228.0	235.2	242.6	251.1	257.6	1821	265.2	273.0	280.7	288.4	296.3	304.1	312.1	320.0	327.8	335.8
176.0	193.5	210.3	224.9	235.1	243.2	232.8	227.1	230.8		242.0	257.3	274.4	294.2	309.9	326.7	344.1	361.4	378.2	394.0
322.2	321.3	320.8	329.4	320.6	321.0	321.9	323.0	324.4		328.0	327.7	329.7	331.8	334.0	336.4	338.7	341.1	343.6	346.0
127.8	137.3	148.6	158.7	171.2	182.0	193.9	206.0	218.2		230.6	242.7	255.2	267.6	280.0	292.6	304.9	317.4	329.9	342.2
347.5	346.7	346.0	345.2	344.8	344.5	344.2	344.4	344.7		345.0	345.7	346.4	347.2	348.3	349.4	350.5	351.8	353.1	354.4
O 8	O 18	O 28	N 7	N 17	N 27	D 7	D 17	D 27		Ja 6	Ja 16	Ja 26	F 5	F 15	F 25	Mr 7	Mr 17	Mr 27	Ap 6
104.3	109.9	116.1	120.1	121.8	129.0	132.7	135.7	138.0	1822	139.2	139.6	138.2	135.5	132.2	128.2	124.8	121.9	120.1	118.9
190.1	205.5	218.0	224.0	219.1	211.2	213.2	222.7	237.0		253.4	271.0	288.8	305.5	320.0	329.3	330.1	323.0	320.2	327.1
3.4	2.0	0.7	359.2	354.2	367.8	357.0	357.0	357.2		357.8	358.7	359.9	1.4	3.2	5.0	7.0	9.1	11.5	13.8
209.1	221.2	233.2	245.2	256.9	268.3	279.6	290.6	301.1		311.0	319.5	326.9	332.3	334.6	333.0	332.8	323.8	319.6	319.5
2.3	1.5	0.7	359.8	350.2	355.6	358.1	358.0	358.0		358.0	358.5	359.1	359.6	0.6	1.5	2.5	3.7	4.9	6.2
214.2	221.2	228.3	235.6	243.1	250.5	258.1	265.7	273.3	1823	281.2	288.9	296.9	304.8	312.6	320.5	328.4	336.3	344.0	351.7
190.0	206.6	205.6	198.0	196.2	203.9	217.0	233.0	250.2		267.7	284.5	299.5	310.3	318.1	307.1	302.0	307.4	319.1	335.2
43.3	42.6	41.6	40.4	39.0	37.3	36.4	35.0	34.3		33.5	33.2	33.2	33.5	34.3	35.3	36.4	37.9	39.6	41.4
154.5	166.8	179.8	191.7	204.2	216.8	229.4	242.0	254.8		267.5	280.0	292.5	305.3	317.7	330.2	342.7	355.2	7.5	19.7
17.8	16.5	15.7	14.8	14.1	13.4	12.7	12.3	12.0		11.7	12.0	12.2	12.5	13.4	14.2	14.9	15.1	17.2	18.4
119.0	124.9	130.6	136.2	141.3	146.8	151.7	156.4	160.6	1824	164.2	167.6	170.0	171.6	171.7	170.8	168.5	165.1	161.2	157.4
191.0	181.0	179.9	185.3	197.3	212.6	229.3	246.9	261.1		279.4	291.4	296.3	292.0	285.5	278.6	268.4	254.4	239.9	224.9
77.9	78.2	78.4	78.1	77.6	76.7	75.6	74.2	73.0		71.8	70.5	69.5	68.6	68.1	68.1	68.1	68.5	69.3	70.1
176.1	170.5	167.4	168.3	172.4	179.1	187.4	196.9	207.0		217.8	229.0	240.5	252.2	264.0	276.1	288.3	300.4	312.5	324.6
32.5	31.8	31.1	30.3	29.4	28.7	27.8	27.2	26.7		26.2	26.1	26.1	26.1	26.7	27.3	27.9	28.9	29.9	30.9
O 7	O 17	O 27	N 6	N 16	N 26	D 6	D 16	D 26		Ja 5	Ja 15	Ja 25	F 4	F 14	F 24	Mr 6	Mr 16	Mr 26	Ap 5
230.4	237.5	244.7	252.1	259.5	267.2	274.8	282.4	290.2	1825	298.0	305.8	313.6	321.4	329.2	336.8	344.6	352.1	359.7	3.7
163.9	167.1	177.6	192.4	209.1															

TABLE

Geocentric Places of Mars, Mercury, Jupiter, Venus and Saturn for every tenth day of current cycle.
Venus, A.D. 1765—A.D. 1990;

Day of 18 Y.	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
Eng. date	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
1826 Mars	209 0	206 9	204 1	200 9	197 7	195 8	195 1	195 9	197 5	200 4	203 8	208 1	212 9	218 1	223 9	228 8	236 8	242 9
Merc	15 7	18 0	11 3	7 7	14 7	27 9	45 8	68 1	82 1	101 2	117 7	131 8	140 4	139 9	138 0	130 7	128 7	151 9
Jup.	132 6	132 1	132 0	132 0	132 1	133 2	134 3	135 5	137 0	138 6	140 4	142 4	144 4	146 5	148 6	150 8	153 0	155 2
Ven.	8 2	20 4	32 7	45 1	57 8	69 5	81 6	93 5	105 6	117 5	129 4	141 4	153 1	164 6	176 4	187 6	198 8	209 7
Sat.	57 4	58 5	59 7	60 8	62 1	63 4	64 7	66 0	67 4	68 8	70 1	71 3	72 5	73 5	74 5	75 5	76 0	76 4
Eng. date	Ap 11	Ap 20	Ap 30	My 10	My 20	My 30	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29
1827 Mars	25 9	32 9	39 8	46 9	53 6	60 5	67 3	73 9	80 5	87 1	93 8	100 2	106 6	113 1	119 5	125 9	132 2	138 5
Merc.	354 3	348 8	353 3	358 8	363 3	368 8	373 3	378 8	383 3	388 8	393 3	398 8	403 3	408 8	413 3	418 8	423 3	428 8
Jup.	166 1	164 9	163 8	162 9	162 3	162 2	162 4	163 4	164 4	165 6	167 1	168 8	170 6	172 5	174 6	176 8	178 8	180 8
Ven.	316 4	327 8	339 5	351 3	363 1	374 9	386 7	398 5	410 3	422 1	433 9	445 7	457 5	469 3	481 1	492 9	504 7	516 5
Sat.	70 7	71 6	72 5	73 5	74 7	75 9	77 1	78 5	79 9	81 2	82 5	83 8	85 2	86 5	87 8	89 1	90 4	91 7
Eng. date	Ap 10	Ap 20	Ap 30	My 10	My 20	My 30	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29	Je 9	Je 19	Je 29
1828 Mars	250 8	254 8	258 4	261 2	263 1	264 1	264 0	262 5	260 7	257 9	255 5	253 9	251 2	248 5	245 8	243 1	240 4	237 7
Merc.	332 5	343 8	355 5	367 3	379 1	390 9	402 7	414 5	426 3	438 1	449 9	461 7	473 5	485 3	497 1	508 9	520 7	532 5
Jup.	200 1	198 9	198 2	198 2	198 1	198 1	198 1	198 2	198 5	198 8	199 1	199 4	199 7	200 0	200 3	200 6	200 9	201 2
Ven.	41 6	52 8	63 8	74 8	85 0	95 8	106 2	117 1	127 6	138 1	148 6	159 1	169 6	180 1	190 6	201 1	211 6	222 1
Sat.	84 2	85 0	85 7	86 3	87 4	88 5	89 7	90 8	92 3	93 5	94 8	96 1	97 5	98 8	100 1	101 3	102 5	103 8
Eng. date	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
1829 Mars	40 5	47 1	53 7	60 3	67 0	73 5	80 0	86 6	93 0	99 4	105 8	112 2	118 7	125 0	131 4	137 8	144 1	150 5
Merc.	337 5	354 9	371 3	387 7	404 1	420 5	436 9	453 3	469 7	486 1	502 5	518 9	535 3	551 7	568 1	584 5	600 9	617 3
Jup.	233 7	232 5	232 0	231 3	230 6	229 7	228 7	227 5	226 2	225 0	223 8	222 5	221 2	220 0	218 8	217 5	216 3	215 1
Ven.	349 1	360 4	371 7	383 0	394 3	405 6	416 9	428 2	439 5	450 8	462 1	473 4	484 7	496 0	507 3	518 6	529 9	541 2
Sat.	98 0	98 4	98 8	99 3	100 3	101 2	102 0	103 2	104 4	105 6	107 0	108 3	109 6	110 9	112 1	113 4	114 5	115 6
Eng. date	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
1830 Mars	277 3	283 8	290 1	296 5	302 6	308 5	314 0	319 1	324 3	328 6	332 4	334 9	336 3	336 2	335 0	332 8	330 2	328 4
Merc.	350 7	366 6	382 0	397 2	412 5	427 8	443 1	458 4	473 7	489 0	504 3	519 6	534 9	550 2	565 5	580 8	596 1	611 4
Jup.	265 2	265 9	266 9	267 0	267 0	267 0	267 0	267 0	267 0	267 0	267 0	267 0	267 0	267 0	267 0	267 0	267 0	267 0
Ven.	321 1	326 7	334 2	342 9	352 6	362 3	371 9	381 6	391 3	401 0	410 7	420 4	430 1	439 8	449 5	459 2	468 9	478 6
Sat.	111 8	112 0	112 1	112 3	113 1	113 8	114 4	115 5	116 6	117 7	119 0	120 3	121 4	122 8	124 1	125 4	126 6	127 8
Eng. date	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
1831 Mars	55 8	61 4	67 7	73 9	80 0	86 1	92 7	98 9	105 2	111 4	117 9	124 1	130 4	136 8	143 1	149 4	155 9	162 5
Merc.	366 3	382 8	399 3	415 8	432 3	448 8	465 3	481 8	498 3	514 8	531 3	547 8	564 3	580 8	597 3	613 8	630 3	646 8
Jup.	295 0	296 6	297 9	299 0	300 1	300 3	300 5	300 6	300 5	299 7	297 7	296 4	295 1	293 8	292 6	291 5	290 6	290 0
Ven.	26 7	38 8	50 7	62 7	74 7	86 3	97 7	109 2	120 3	131 1	141 6	151 2	160 4	169 1	177 8	186 5	195 2	203 9
Sat.	125 7	125 6	125 4	125 3	125 8	126 3	126 8	127 7	128 6	129 4	130 6	131 8	133 1	134 4	135 7	136 9	138 1	139 3
Eng. date	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
1832 Mars	297 7	305 1	312 5	320 0	327 2	334 3	341 7	348 5	355 5	362 1	368 4	374 6	380 8	386 9	393 0	399 1	405 2	411 3
Merc.	15 7	26 8	37 9	48 0	58 1	68 2	78 3	88 4	98 5	108 6	118 7	128 8	138 9	149 0	159 1	169 2	179 3	189 4
Jup.	323 3	325 5	327 6	329 5	331 2	332 8	334 0	335 0	335 7	336 1	336 3	336 5	336 7	336 9	337 1	337 3	337 5	337 7
Ven.	331 6	343 6	355 8	368 1	380 4	392 7	405 0	417 3	429 6	441 9	454 2	466 5	478 8	491 1	503 4	515 7	528 0	540 3
Sat.	139 5	139 1	138 7	138 5	138 7	139 0	139 1	139 8	140 6	141 2	142 3	143 3	144 3	145 3	146 9	148 2	149 5	150 8
Eng. date	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
1833 Mars	70 5	76 2	81 9	87 7	93 5	99 4	105 5	111 5	117 6	123 7	129 8	136 2	142 5	148 9	155 2	161 7	168 2	174 8
Merc.	10 1	5 3	359 8	4 2	16 4	32 1	50 6	69 4	88 5	105 3	121 2	131 9	143 4	155 0	166 5	178 0	189 5	201 0
Jup.	351 0	353 4	355 8	358 2	360 6	363 0	365 4	367 8	370 2	372 6	375 0	377 4	379 8	382 2	384 6	387 0	389 4	391 8
Ven.	39 8	43 4	47 0	50 6	54 2	57 8	61 4	65 0	68 6	72 2	75 8	79 4	83 0	86 6	90 2	93 8	97 4	101 0
Sat.	153 1	152 5	152 0	151 4	151 3	151 4	151 3	151 8	152 4	153 1	153 8	154 6	155 6	156 7	157 8	159 0	160 3	161 6
Eng. date	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
1834 Mars	81 6	87 3	93 0	98 7	104 4	110 1	115 8	121 5	127 2	132 9	138 6	144 3	150 0	155 7	161 4	167 1	172 8	178 5
Merc.	341 6	353 3	365 0	376 7	388 4	399 1	410 8	422 5	434 2	445 9	457 6	469 3	481 0	492 7	504 4	516 1	527 8	539 5
Jup.	18 8	21 2	23 6	26 0	28 4	30 8	33 1	35 5	37 9	40 2	42 6	44 9	47 3	49 6	52 0	54 3	56 7	59 0
Ven.	8 8	21 1	33 3	45 7	57 9	70 2	82 1	94 1	106 1	118 1	129 9	141 9	153 6	165 1	176 9	188 0	199 1	210 9
Sat.	166 4	165 7	165 0	164 4	164 1	163 8	163 6	163 8	164 0	164 3	165 1	165 9	166 6	167 7	168 8	169 9	171 1	172 8
Eng. date	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
1835 Mars	87 7	92 4	97 2	102 5	107 8	113 3	118 9	124 6	130 6	136 6	142 6	148 7	155 0	161 5	167 9	174 5	181 0	187 5
Merc.	333 1	347 6	361 1	374 6	388 1	399 6	411 1	422 6	434 1	445 6	457 1	468 6	480 1	491 6	503 1	514 6	526 1	537 6
Jup.	46 4	48 5	50 6	52 8	54 8	57 4	59 8	62 1	64 4	66 8	69 1	71 2	73 3	75 4	77 5	79 6	81 7	83 8
Ven.	81 6	92 8	104 0	115 2	126 4	137 6	148 8	160 0	171 2	182 4	193 6	204 8	216 0	227 2	238 4	249 6	260 8	272 0
Sat.	179 4	178 6	177 8	177 1	176 6	176 2	175 7	175 7	175 8	175 8	176 8	176 8	177 5	178 4	179 3	180 2	181 4	182 6
Eng. date	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
1836 Mars	333 3	341 2	348 9	356 6	364 1	371 7	379 3	386 9	394 5	402 1	409 7	417 3	424 9	432 5	440 1	447 7	455 3	462 9
Merc.	342 6	358 0	373 4	388 8	404 2	419 6	435 0	450 4	465 8	481 2	496 6	512 0	527 4	542 8	558 2	573 6	589 0	604 4
Jup.	75 0	76 3	77 9	79 6	81 5	83 5	85 6	87 8	90 1	92 4	94 6	96 9	99 3	101 4	103 8	105 7	107 7	109 4
Ven.	42 0	53 1	64 0	74 5	84 9	95 3	105 7	116 1	126 5									

V-B—cont.

Mars, A.D. 1637—A.D. 1999; Mercury, A.D. 1645—A.D. 1999; Jupiter, A.D. 1656—A.D. 1999;
Saturn, A.D. 1617—A.D. 1999—cont.

180	190	200	210	220	230	240	250	260		270	280	290	300	310	320	330	340	350	360
O 8	O 18	O 28	N 7	N 17	N 27	D 7	D 17	D 27		Ja 6	Ja 16	Ja 26	F 5	F 15	F 25	Mr 7	Mr 17	Mr 27	Ap 6
249.6	256.6	263.7	270.9	278.3	285.6	293.1	300.7	308.3	1827	315.8	323.3	330.9	338.3	345.8	353.2	0.4	7.9	15.0	22.2
168.1	184.7	202.8	219.5	234.3	244.7	247.4	241.4	236.0		240.2	251.5	267.4	283.8	301.9	320.1	338.4	350.4	358.8	357.9
167.4	159.6	161.6	163.6	165.5	167.1	168.6	170.0	171.0		172.0	172.5	172.7	172.6	172.1	171.5	170.4	169.3	168.0	166.8
220.0	230.0	238.8	246.5	253.2	255.9	256.0	252.4	248.2		243.4	242.6	245.9	251.7	259.1	267.9	277.8	288.4	299.2	310.4
76.9	76.8	76.7	76.7	76.0	75.4	74.9	74.0	73.1		72.8	71.6	70.9	70.1	69.8	69.6	69.8	69.7	70.0	70.4
																Mr. 6	Mr 16	Mr 26	Ap 5
144.7	150.9	157.1	163.2	169.4	175.5	181.6	187.7	193.7	1828	199.8	205.6	211.4	217.2	222.9	228.4	233.9	239.0	243.9	248.5
182.1	199.2	214.6	226.7	231.9	238.2	241.1	222.1	232.0		246.3	263.9	280.7	298.3	315.2	329.6	339.3	340.4	333.6	330.6
181.0	183.2	185.8	187.5	189.7	191.8	193.7	195.6	197.3		198.9	200.4	201.3	202.2	202.7	202.9	202.8	202.5	201.8	200.8
173.5	186.0	198.7	211.0	223.5	236.0	248.7	261.4	274.0		286.4	299.0	311.5	323.8	336.0	348.4	0.3	11.8	24.1	35.8
90.8	91.0	91.1	91.3	91.0	90.6	90.2	89.4	88.6		87.9	87.1	86.3	85.4	84.9	84.5	83.9	83.9	83.0	84.0
																Mr 6	Mr 16	Mr 26	Ap 5
O 7	O 17	O 27	N 6	N 16	N 26	D 6	D 16	D 26	1829	Ja 5	Ja 15	Ja 25	F 4	F 14	F 24	Mr 6	Mr 16	Mr 26	Ap 5
275.9	281.7	287.8	294.4	300.9	307.7	314.3	321.1	328.2		335.0	342.1	349.1	356.0	2.9	9.8	16.5	23.4	30.1	37.0
194.9	208.2	215.9	214.8	206.9	204.7	212.9	226.2	242.2		259.5	277.0	294.0	309.3	320.2	323.3	317.4	312.4	316.7	329.0
204.7	206.7	208.8	211.1	213.3	215.5	217.7	219.9	222.0		224.1	226.0	227.7	229.3	230.8	232.0	232.9	233.6	233.9	233.0
127.8	137.4	149.6	159.0	171.8	182.4	194.3	208.5	218.7		231.0	243.2	255.7	268.2	280.6	293.2	305.5	318.0	330.5	342.8
104.1	104.5	105.0	105.4	105.3	105.2	105.1	104.5	103.9		103.2	102.3	101.5	100.6	100.0	99.3	98.6	98.4	98.1	97.9
O 8	O 18	O 28	N 7	N 17	N 27	D 7	D 17	D 27	1830	Ja 6	Ja 16	Ja 26	F 5	F 15	F 25	Mr 7	Mr 17	Mr 27	Ap 6
156.8	163.8	169.6	174.0	182.5	188.9	195.2	201.7	208.2		214.7	221.3	227.8	234.3	240.9	247.5	254.1	260.6	267.2	273.8
198.7	200.0	193.1	189.0	194.6	200.4	211.5	228.8	256.2		273.4	288.9	301.0	308.1	301.5	295.0	297.6	308.2	323.4	340.9
229.6	231.4	233.4	235.5	237.6	239.9	242.1	214.3	246.7		248.9	251.1	253.3	255.3	257.3	259.2	261.0	262.6	263.9	264.8
209.9	221.7	233.0	245.6	257.2	268.7	279.9	290.8	301.0		310.8	319.1	326.1	330.9	332.4	330.0	314.8	319.6	317.2	318.1
118.6	117.4	118.1	118.8	118.9	119.1	119.3	118.1	118.4		118.0	117.3	116.6	115.8	115.0	114.2	113.3	112.8	112.4	111.8
327.1	327.4	328.8	331.1	334.6	338.3	342.7	347.6	352.6	1831	358.0	3.7	9.5	15.2	20.3	27.2	33.4	39.4	45.7	51.9
179.3	173.2	170.3	177.0	201.6	218.4	235.6	252.8	268.7		281.8	288.9	296.7	279.4	279.0	287.6	301.8	318.9	337.2	355.7
257.4	258.7	260.3	261.9	263.6	265.6	267.7	269.9	272.0		274.4	276.7	279.1	281.4	283.8	286.0	288.2	290.3	292.3	294.3
155.1	167.4	180.2	192.3	204.8	217.4	230.0	242.6	255.4		268.1	280.6	293.1	305.9	318.3	330.8	343.3	355.8	3.1	20.8
128.9	129.8	130.6	131.5	132.0	132.4	132.8	132.7	132.5		132.3	131.6	130.9	130.3	129.5	128.7	127.9	127.3	126.6	126.0
168.9	175.5	182.1	188.7	195.3	202.1	208.7	215.6	222.1	1832	229.3	236.3	243.3	250.1	257.5	264.7	272.0	279.2	286.6	293.9
158.2	167.2	181.7	197.9	215.2	232.4	249.7	267.2	271.5		271.6	264.5	261.6	267.8	281.1	297.2	315.3	333.6	351.7	3.8
289.8	290.0	290.5	291.3	292.5	293.7	295.3	297.0	298.6		301.3	303.1	305.8	308.1	310.1	312.9	315.3	317.7	320.1	322.4
172.3	167.0	164.8	166.5	171.3	178.5	187.1	196.8	207.1		218.0	224.1	230.8	237.7	244.5	251.6	258.8	266.0	273.9	282.2
140.6	141.6	142.6	143.6	144.6	145.0	145.5	145.6	145.7		145.7	145.3	144.9	144.1	143.6	142.8	142.1	141.3	140.6	139.8
42.5	42.6	41.6	39.8	36.8	34.1	31.6	30.3	30.2	1833	31.1	33.1	35.7	39.2	43.1	47.4	52.1	57.1	62.3	67.7
161.3	177.4	194.6	212.0	228.5	243.2	258.9	276.4	290.3		245.3	249.5	260.8	276.1	293.4	311.6	329.5	346.4	361.4	374.4
327.8	327.0	326.2	325.8	325.6	326.0	326.6	327.5	328.8		330.3	332.2	333.8	335.9	338.1	340.3	342.7	345.1	347.5	349.8
192.7	205.1	217.4	229.8	242.2	254.5	266.9	279.1	291.5		303.5	315.2	327.1	338.8	350.0	0.7	10.8	20.7	29.5	36.8
152.0	153.1	154.8	155.3	156.0	156.8	157.6	157.9	158.3		158.6	158.3	158.1	157.9	157.2	156.6	155.9	155.1	154.3	153.4
181.4	188.1	194.7	201.7	208.6	215.5	222.5	229.6	236.8	1834	241.1	251.4	258.8	266.3	273.9	281.3	289.1	296.7	304.4	312.2
178.1	190.7	208.6	223.8	236.0	240.7	237.4	230.2	231.2		241.2	255.5	272.1	289.0	307.8	325.0	339.6	349.8	351.1	344.4
9.8	7.9	6.5	5.3	4.1	3.1	2.5	2.2	2.2		2.7	3.3	4.4	5.6	7.2	9.0	10.8	13.0	15.2	17.4
138.4	150.1	162.3	174.5	186.9	199.1	211.5	224.0	236.8		249.2	261.9	274.6	286.9	299.7	312.2	324.8	337.3	349.7	2.1
162.8	163.9	165.1	166.2	167.2	168.2	169.1	169.6	170.1		170.6	170.6	170.7	170.6	170.1	169.6	169.1	168.3	167.8	166.8
77.4	81.7	85.8	88.4	90.2	91.2	91.0	89.1	86.4	1835	88.0	78.9	76.3	74.1	73.5	74.2	76.1	78.5	81.9	8.8
188.1	201.2	217.4	224.7	223.6	215.8	214.2	211.5	205.4		251.5	268.8	286.6	303.9	319.0	330.1	333.5	327.7	322.5	326.9
48.4	47.8	46.9	45.8	44.6	43.8	41.8	40.7	39.6		38.7	38.4	38.0	38.3	38.8	39.7	40.8	42.1	43.6	45.4
220.1	229.9	238.5	245.8	252.2	258.8	265.0	271.4	274.5		210.0	240.3	244.5	250.0	258.6	267.3	277.7	288.6	299.5	310.6
173.4	174.6	175.8	177.7	178.1	180.1	180.2	180.8	181.5		182.3	182.5	182.7	182.8	182.5	182.2	181.9	181.1	180.4	179.8
O 8	O 18	O 28	N 7	N 17	N 27	D 7	D 17	D 27	1836	Ja 6	Ja 16	Ja 26	F 5	F 15	F 25	Mr 6	Mr 16	Mr 26	Ap 5
196.6	201.5	208.4	215.3	222.3	229.4	236.7	244.1	251.8		259.3	266.9	277.5	282.2	290.0	298.0	305.5	313.5	321.5	329.2
198.4	207.8	209.1	201.6	198.0	203.2	215.6	231.1	248.1		265.5	282.8	298.4	310.6	315.9	311.9	305.4	307.2	318.4	333.5
82.1	82.4	83.1	82.9	82.5	81.7	80.5	79.5	78.2		77.0	75.7	74.6	73.5	72.9	72.6	72.5	72.7	73.4	74.4
174.1	186.7	199.4	211.6	224.1	236.6	249.3	262.0	274.6		287.0	299.6	312.1	324.4	336.5	349.0	0.9	12.5	24.6	36.3
188.8	185.0	185.2	187.4	188.5	189.6	190.7	191.5	192.3		193.2	193.6	194.1	194.5	194.3	194.2	194.1	193.5	192.9	192.4
97.7	108.8	108.1	112.7	116.9	120.7	123.8	125.7	126.6	1837	126.8	125.5	122.7	119.4	118.2	112.0	109.1	107.7	107.5	108.8
193.8	188.6	182.5	185.4	190.1	211.0	227.3	244.9	262.1		278.1	291.2	298.8	296.3	298.9	288.4	297.7	311.3	328.9	347.3
111.1	112.4	118.6	114.6	115.2	115.6	115.6	115.8	114.6		113.7	112.6	111.3	110.0	108.7	107.5	106.5	105.7		

TABLE

Geocentric Places of Mars, Mercury, Jupiter, Venus and Saturn for every tenth day of current cycle.
Venus, A.D. 1765—A.D. 1999;

Day of L. S. Y.	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
Eng. date	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Jul 10	Jul 20	Jul 30	Aug 9	Aug 19	Aug 29	S 8	S 18	S 28
1839 Mars	140 2	139 7	140 2	142 1	144 7	148 0	151 9	156 4	161 8	166 6	172 8	178 0	184 0	190 8	196 7	203 2	209 9	217 1
Merc.	16 5	21 5	16 3	10 7	14 4	26 5	42 8	60 9	79 9	98 3	115 9	131 1	141 8	148 6	187 2	182 7	188 9	150 5
Jup.	170 7	169 4	168 3	167 5	166 7	166 3	166 3	166 5	167 2	168 0	169 1	170 4	172 1	173 8	175 7	177 6	179 7	181 8
Ven.	27 3	39 4	51 3	63 3	75 2	86 8	98 2	109 6	120 7	131 4	141 8	151 3	160 2	167 9	173 9	177 8	177 8	174 0
Sat.	227 8	227 2	226 6	226 0	225 2	224 4	223 7	223 0	222 8	221 7	221 4	221 2	221 0	221 2	221 5	221 8	222 5	223 2
1840 Mars	5 3	12 7	19 9	27 3	34 1	41 6	48 8	55 8	62 7	69 3	76 2	83 0	89 2	95 8	102 5	108 8	115 0	120 9
Merc.	358 8	352 0	354 1	5 0	20 8	38 1	56 5	75 3	93 2	110 9	121 4	126 1	121 3	115 4	118 9	130 2	145 3	162 3
Jup.	204 8	203 6	202 1	201 0	199 8	198 6	197 6	196 9	196 5	196 6	197 8	198 1	199 2	200 6	202 2	203 9	205 9	205 9
Ven.	332 2	314 4	356 5	8 9	21 1	38 3	45 6	57 8	69 7	82 4	94 6	106 9	119 1	131 4	143 2	156 0	168 5	180 7
Sat.	239 2	238 9	238 5	237 8	237 1	236 4	235 6	234 0	234 2	233 4	232 9	232 5	232 1	232 2	232 3	232 3	232 9	233 5
1841 Mars	187 2	183 9	180 4	178 3	177 0	177 2	178 6	181 0	184 8	188 3	192 9	197 7	203 5	209 8	215 0	221 4	227 9	234 5
Merc.	334 5	343 8	357 8	15 5	34 2	53 2	71 7	88 5	101 6	116 2	130 5	144 8	159 4	174 3	189 7	205 8	221 9	238 6
Jup.	238 1	237 8	237 0	236 2	235 0	233 7	232 4	231 1	229 9	228 8	228 1	227 7	227 5	227 7	228 8	229 1	230 3	231 6
Ven.	38 9	41 9	41 1	36 6	30 6	25 8	25 0	28 2	33 9	41 5	50 3	59 8	70 1	80 8	92 0	103 8	115 0	126 9
Sat.	250 3	250 0	249 8	249 5	248 8	248 2	247 5	246 8	246 0	245 3	244 6	244 0	244 4	243 3	243 2	243 1	243 4	243 9
1842 Mars	20 1	27 3	34 4	41 6	48 4	55 4	62 1	68 9	75 8	82 4	89 0	95 5	102 0	108 4	115 8	126 1	127 4	133 9
Merc.	336 1	352 9	11 0	30 0	48 8	66 0	80 5	89 1	88 0	80 7	79 9	88 7	102 5	119 7	137 6	155 5	172 5	188 0
Jup.	269 6	270 3	270 7	270 8	270 6	270 0	269 2	268 0	266 7	265 3	264 0	262 7	261 6	260 9	260 8	260 1	260 3	260 8
Ven.	9 4	21 7	34 0	46 2	58 4	70 8	82 7	94 7	106 6	118 6	130 4	142 4	154 1	165 5	177 4	188 3	199 4	210 2
Sat.	261 3	261 2	261 2	261 1	260 5	259 9	259 3	258 5	257 7	257 0	256 5	255 7	255 0	254 8	254 5	254 1	254 3	254 5
1843 Mars	237 3	239 2	240 2	240 1	239 0	237 1	233 7	231 6	229 6	228 8	229 9	230 7	233 5	237 1	241 6	246 6	252 2	257 9
Merc.	348 6	7 3	26 0	44 6	58 9	69 1	70 2	63 4	60 5	67 9	81 3	97 8	115 8	134 1	151 8	167 2	180 6	186 9
Jup.	299 0	300 7	302 3	303 4	304 3	305 0	305 2	305 2	304 7	304 0	303 0	301 8	300 5	299 0	297 7	296 6	295 6	294 9
Ven.	317 0	328 6	340 5	352 4	4 4	16 4	28 1	40 1	52 2	64 4	76 5	88 3	100 5	112 9	125 1	137 5	149 9	162 3
Sat.	272 1	272 3	272 4	272 5	272 2	271 8	271 4	270 6	269 8	269 1	268 4	267 7	266 9	266 5	265 0	265 4	265 5	265 4
1844 Mars	34 8	41 6	48 4	55 2	61 8	68 6	75 1	81 6	88 0	94 8	101 3	107 5	114 1	120 5	126 7	133 0	139 4	145 9
Merc.	3 3	21 2	36 9	48 3	51 5	45 2	41 0	46 6	59 3	75 6	93 6	112 2	130 3	147 1	161 8	169 7	169 2	162 2
Jup.	327 2	329 5	331 6	333 5	335 5	337 1	338 4	339 6	340 5	341 0	341 2	341 0	340 5	339 6	338 3	337 3	336 0	334 5
Ven.	42 5	53 5	64 2	74 7	84 0	93 1	100 2	105 8	108 4	107 1	102 1	95 1	81 5	61 4	34 5	10 4	108 4	117 0
Sat.	283 0	283 2	283 6	283 9	283 8	283 5	283 3	282 7	282 1	281 4	280 6	279 9	279 2	278 5	277 9	277 2	277 0	276 9
1845 Mars	268 0	273 9	279 5	284 7	289 8	294 7	298 9	302 4	306 1	309 9	307 6	306 3	304 4	301 8	299 5	298 2	298 1	299 1
Merc.	14 8	27 3	32 1	27 7	21 7	25 5	37 3	53 2	71 2	90 0	108 4	125 9	141 0	151 2	153 2	146 7	142 3	148 0
Jup.	354 9	357 2	359 6	2 0	4 4	6 6	8 6	10 7	12 5	14 0	15 4	16 5	17 2	17 7	17 7	17 4	16 8	15 9
Ven.	850 7	8 2	15 5	28 0	40 4	52 4	64 7	77 3	89 4	101 2	113 8	125 9	138 0	150 0	162 8	174 5	186 6	198 6
Sat.	293 8	294 4	295 0	295 5	295 2	295 5	295 5	295 0	294 5	294 1	293 3	292 5	291 6	290 9	290 2	289 7	289 3	288 9
1846 Mars	49 6	55 9	62 3	68 7	75 0	81 4	87 7	94 0	100 4	106 8	113 1	119 6	125 7	132 2	138 6	145 3	151 2	157 8
Merc.	12 8	10 2	3 2	4 7	15 5	30 7	48 6	67 3	86 3	103 8	120 1	132 4	145 4	131 7	125 6	128 7	140 0	154 8
Jup.	22 6	23 9	27 3	29 7	32 1	34 5	36 8	39 2	41 4	43 5	45 5	47 4	49 0	50 6	51 7	52 6	53 2	53 4
Ven.	318 3	325 1	333 4	342 5	352 6	3 3	13 9	25 1	36 8	48 1	59 9	71 5	83 3	95 2	107 2	119 6	131 7	144 0
Sat.	304 7	305 4	306 2	306 9	307 1	307 3	307 5	307 2	306 9	306 6	306 9	305 4	304 6	303 8	303 0	302 2	301 7	301 2
1847 Mars	290 3	297 9	304 4	311 5	318 5	325 1	332 3	338 8	345 2	351 4	357 1	2 3	7 5	11 8	15 3	17 9	18 9	18 7
Merc.	345 5	344 7	353 3	8 2	25 6	44 3	63 4	81 7	98 6	112 0	118 7	115 8	108 7	109 4	119 6	134 0	150 7	168 4
Jup.	50 2	52 2	54 3	56 5	58 7	60 9	63 4	65 7	68 0	70 4	72 7	74 8	77 0	79 0	80 9	82 5	84 1	85 8
Ven.	27 9	40 0	51 9	63 9	75 7	87 3	98 7	110 0	121 1	131 7	142 0	151 3	160 0	167 4	173 0	175 8	175 4	175 6
Sat.	315 7	316 6	317 5	318 4	318 8	319 4	319 9	319 8	319 6	319 6	319 0	318 5	317 9	317 1	316 3	315 5	314 8	314 1
1848 Mars	64 4	70 3	76 1	82 2	88 3	94 3	100 3	106 5	112 6	118 9	125 2	131 3	137 7	144 1	150 4	157 0	163 3	169 9
Merc.	332 8	340 0	3 0	21 4	40 5	59 3	76 5	91 0	99 7	98 7	91 7	90 2	99 0	112 8	129 5	147 1	165 0	182 2
Jup.	78 9	80 1	81 6	83 2	85 0	87 1	89 0	91 2	93 5	95 8	98 0	100 8	102 6	104 7	106 9	109 1	111 1	112 9
Ven.	382 6	345 0	357 2	9 6	21 7	33 9	46 1	58 0	70 7	83 0	95 1	107 1	119 7	132 0	144 0	156 6	169 1	181 8
Sat.	329 9	327 9	329 0	330 0	330 7	331 3	332 0	332 2	332 4	332 5	332 1	331 8	331 4	330 7	330 6	329 1	328 3	327 5
1849 Mars	309 2	316 8	324 4	332 1	339 5	347 0	354 3	1 7	9 0	15 8	22 7	29 4	35 6	41 7	47 6	53 0	57 4	62 7
Merc.	340 6	358 7	17 6	36 3	54 2	69 1	79 6	81 0	74 2	71 2	78 5	91 4	107 9	125 3	143 9	161 3	177 3	190 0
Jup.	109 3	109 5	110 0	110 8	112 0	113 3	114 9	116 6	118 4	120 4	122 6	124 8	126 9	129 1	131 4	133 6	135 7	137 9
Ven.	87 5	39 6	38 1	32 6	26 7	22 8	28 3	27 0	33 1	41 2	50 1	59 0	70 4	81 2	92 2	103 6	115 4	127 1
Sat.	338 1	339 3	340 4	341 6	342 5	343 3	344 3	344 8	345 3	345 6	345 4	345 3	345 2	344 5	343 9	343 3	342 5	341 7
1850 Mars	80 6	85 7	90 9	96 5	101 9	107 9	113 6	119 3	125 4	131 4	137 5	143 8	150 1	156 1	162 9	169 2	175 8	182 5
Merc.	354 9	13 5	31 6	47 4	59 1	62 6	58 8	52 0	57 1	63 8	85 9	103 8	122 2	140 4	156 7	170 8	179 1	178 7
Jup.	141 7	149 9	140 4	140 1	140 4	140 9	141 7	142 7	144 0	145 4	147 2	149 1	151 0	153 0	155 1	157 8	159 5	161 7
Ven.	10 0	22 3	34 5	46 8	59 2	71 4	83 2	95 4	107 2	119 2	131 2	142 7	154 4	166 1	177 7	188 7	199 6	210 2
Sat.	349 7	351 0	352 3	353 5	354 6	355 7	356 7	357 4	358 0	358 7	358 8	359 0	359 0	358 6	358 2	357 7	356 9	356 1
1851 Mars	326 7	334 5	342 3	349 9	357 5	5 2	12 5	19 8	27 1	34 3	41 5	48 1	54 6	61 2	67 6	73 7	79 7	85 3
Merc.	9 0	25 4	38 1	44 0	49 1	53 1	56 4	47 8	68 5	81 5	100 2	118 4	136 8	150 8	161 2	163 2	158 7	152 2
Jup.	175 4	174 1	172 8	172 0	171 2	170 5	170 4	170 5	170 9	171 7	172 7	174 0	175 4	177 2	179 0	180 9	183 0	185 1
Ven.	317 3	329 2	341 0	352 9	4 7	16 9	28 6	40 6	52 7	64 9								

V-B—cont.

Mars, A.D. 1637—A.D. 1999; Mercury, A.D. 1645—A.D. 1999; Jupiter, A.D. 1656—A.D. 1999;
Saturn, A.D. 1617—A.D. 1999—cont.

180	190	200	210	220	230	240	250	260		270	280	290	300	310	320	330	340	350	360
O 8	O 18	O 28	N 7	N 17	N 27	D 7	D 17	D 27		Ja 6	Ja 16	Ja 26	F 5	F 15	F 25	Mr 6	Mr 16	Mr 26	Ap 5
223.8	230.8	238.1	245.3	252.9	260.4	268.4	275.7	283.6	1840	291.8	299.1	307.0	314.8	322.5	330.4	338.2	345.9	353.6	1.1
166.1	183.2	200.7	217.6	232.9	244.9	249.9	246.0	239.0		240.4	250.6	265.3	281.7	299.6	317.6	334.7	349.8	363.0	2.0
184.0	186.8	188.4	190.5	192.7	194.9	196.9	198.9	200.6		202.2	203.7	205.0	205.9	206.5	207.0	207.1	206.7	206.2	205.8
168.5	168.6	162.2	164.8	170.8	178.0	186.9	196.7	207.2		218.2	229.7	241.1	253.1	265.0	277.1	289.3	301.4	313.5	325.8
223.9	225.0	226.0	227.0	228.2	229.4	230.5	231.6	232.8		233.9	234.9	235.9	236.9	237.5	238.1	238.8	238.9	239.1	239.2
																Mr 7	Mr 17	Mr 27	Ap 6
127.3	138.3	139.0	144.8	150.5	156.2	161.5	166.7	171.9	1841	176.5	180.0	185.0	188.3	191.3	193.2	193.9	193.7	191.8	189.2
179.2	197.3	213.8	226.8	238.9	252.5	265.2	273.0	280.7		244.7	260.8	278.5	296.2	313.5	328.8	340.0	344.0	338.8	333.0
207.9	209.9	212.1	214.3	216.5	218.7	220.9	223.2	225.3		227.4	229.4	231.2	232.9	234.5	235.8	236.7	237.6	238.1	238.1
198.2	205.8	218.0	230.5	242.8	255.2	267.5	279.8	292.1		304.0	315.6	327.5	339.2	350.8	362.0	372.7	382.7	392.3	401.8
234.1	235.0	235.9	236.9	238.0	239.1	240.3	241.5	242.6		243.8	244.8	245.8	246.9	247.7	248.5	249.3	249.6	249.7	250.8
241.5	246.6	255.7	268.0	270.4	278.2	285.6	293.3	301.1	1842	308.7	316.5	324.2	331.8	339.3	346.9	354.3	361.8	369.2	376.5
193.4	197.6	217.1	217.9	211.0	206.8	212.6	224.9	240.3		257.5	275.0	292.4	308.1	320.5	328.1	331.9	315.6	317.4	324.2
233.2	234.8	236.8	238.9	240.9	242.2	245.4	247.7	250.0		252.3	254.6	256.7	258.9	261.0	262.9	264.8	266.4	267.7	269.0
198.9	150.6	162.8	175.1	187.5	199.8	212.2	224.6	237.2		249.8	262.5	275.2	287.6	300.3	312.8	325.4	338.0	350.8	363.0
244.2	246.2	246.0	246.7	248.0	249.0	250.1	251.8	252.5		253.6	254.7	255.8	257.0	257.8	258.7	259.6	260.1	260.6	261.3
189.9	146.1	152.2	158.3	164.8	170.4	176.2	181.9	188.9	1843	198.7	199.4	204.7	209.9	215.1	220.0	224.6	228.9	232.5	235.8
194.2	202.9	197.5	191.7	184.6	176.2	166.9	156.7	145.1		271.4	287.6	300.8	308.0	306.1	298.9	298.5	307.3	321.8	338.9
261.6	262.7	264.0	265.6	267.3	269.3	271.4	273.5	275.5		278.0	280.3	282.8	285.0	287.4	289.7	292.0	294.2	296.2	298.2
210.2	221.9	238.2	246.1	251.1	251.8	250.1	244.1	240.8		236.6	238.1	243.0	250.0	258.0	266.6	277.6	288.7	299.7	310.9
254.7	255.4	256.1	256.9	257.9	258.9	259.9	261.1	262.2		263.4	264.6	265.8	267.0	267.9	268.9	269.9	270.5	271.8	271.8
204.1	270.6	277.2	284.1	291.2	298.2	305.5	312.7	319.9	1844	327.2	334.5	341.8	348.9	356.1	363.1	369.8	376.1	382.0	387.5
185.1	176.6	170.7	166.1	161.9	158.3	155.2	152.0	148.5		281.2	280.4	280.5	280.6	280.7	280.8	280.9	281.0	281.1	281.2
204.5	204.5	204.9	205.6	206.6	207.8	209.3	211.0	212.9		304.9	307.1	309.4	311.7	314.1	316.5	319.0	321.3	323.7	326.1
174.8	187.8	200.0	212.3	224.7	237.8	249.8	262.7	275.3		287.7	300.3	312.6	325.0	337.1	349.6	361.4	372.8	383.7	394.1
205.5	206.0	206.6	207.1	208.1	208.9	209.9	211.1	212.3		278.4	274.6	275.8	276.9	278.0	279.1	280.2	281.0	281.9	282.7
152.1	158.4	164.7	170.9	177.3	183.7	189.9	196.2	202.7	1845	205.9	215.2	221.5	227.7	234.1	240.3	246.5	252.7	258.9	265.0
150.4	166.8	180.0	195.8	213.0	230.4	246.9	261.7	272.8		274.9	268.7	263.8	268.0	279.7	295.3	313.0	331.3	349.5	367.5
333.2	332.1	331.2	330.7	330.4	330.6	331.1	331.2	331.0		334.3	336.0	337.8	339.7	341.9	344.1	346.4	348.8	351.2	353.4
127.2	137.8	148.7	159.9	171.7	183.5	195.2	207.6	219.9		232.1	244.4	256.8	269.4	281.9	294.5	306.9	319.1	331.7	344.1
278.7	277.0	277.4	277.7	278.5	279.4	280.2	281.3	282.4		283.4	284.7	285.9	287.0	288.2	289.5	290.6	291.5	292.4	293.4
301.7	304.9	309.3	313.7	318.9	324.5	330.1	336.0	342.2	1846	348.4	355.4	361.0	367.3	373.8	380.1	386.1	391.8	397.1	402.0
159.9	175.4	192.5	209.9	226.8	242.1	254.0	269.0	284.8		248.1	249.8	259.8	274.4	291.4	309.8	327.7	344.7	361.7	378.7
14.8	13.5	12.1	10.7	9.4	8.4	7.7	7.1	7.0		7.2	7.8	8.7	9.8	11.3	12.9	14.7	16.8	18.9	21.1
210.8	222.6	234.4	246.4	257.9	269.4	280.4	291.1	300.9		310.4	318.2	324.5	328.2	332.5	334.1	317.9	313.1	312.5	315.4
236.3	238.5	241.6	245.7	249.4	253.1	256.6	260.1	263.6		268.7	274.9	281.1	287.2	293.4	299.6	305.9	312.0	318.7	325.1
164.2	170.7	177.1	185.7	190.2	197.0	203.4	210.0	216.8	1847	223.6	230.5	237.4	244.2	251.3	258.1	265.2	272.2	279.4	286.8
171.4	188.9	208.6	222.5	235.7	242.7	241.3	233.8	232.1		240.2	254.0	270.8	287.9	305.8	323.3	338.9	350.5	354.1	349.1
53.4	52.9	52.2	51.1	49.9	48.6	47.2	45.9	44.8		43.8	43.1	42.8	42.8	43.1	43.8	44.8	46.1	47.6	49.2
156.3	168.6	181.0	193.5	206.0	218.6	231.2	243.8	256.6		269.5	281.8	294.8	307.1	319.5	332.0	344.7	357.0	369.1	381.5
300.7	300.6	300.4	300.3	300.8	301.2	301.7	302.6	303.5		304.3	305.4	306.6	307.7	309.0	310.3	311.5	312.8	314.0	315.1
17.2	14.8	12.2	9.5	6.7	3.9	1.6	10.4	13.0	1848	16.3	20.0	24.2	28.9	33.8	39.1	44.3	49.9	55.8	61.8
180.1	202.6	216.6	226.0	227.0	218.9	216.0	221.7	233.8		240.5	268.7	284.9	301.9	317.8	333.3	348.1	362.7	376.0	387.5
86.4	87.2	87.6	87.6	87.3	86.7	85.8	84.6	83.4		82.0	80.7	79.5	78.4	77.6	77.1	76.9	77.1	77.5	78.4
164.7	180.2	196.6	213.1	229.3	245.3	261.0	276.3	291.3		218.4	230.0	241.4	253.5	265.5	277.6	289.8	301.9	314.1	326.4
313.8	313.1	312.9	312.5	312.7	312.9	313.2	314.0	314.7		315.4	316.5	317.6	318.7	319.9	321.1	322.4	323.6	324.9	326.2
176.6	183.0	189.7	196.5	203.2	210.2	217.0	224.0	231.1	1849	238.3	245.5	252.8	260.0	267.4	275.1	282.4	289.8	297.4	305.2
197.3	208.5	212.0	208.6	200.7	203.2	214.8	224.3	245.8		263.5	280.8	297.1	310.4	318.0	316.4	309.2	308.2	317.5	331.7
114.7	116.8	117.5	118.6	119.4	119.9	119.9	119.8	119.3		118.4	117.4	116.2	114.9	113.6	112.3	111.2	110.2	109.7	109.4
194.0	206.4	218.8	231.2	243.4	255.8	267.9	280.4	292.4		304.5	316.2	328.0	339.4	350.4	361.1	371.0	380.5	389.7	398.5
326.8	326.3	325.8	325.2	325.3	325.3	325.3	325.8	326.3		327.0	328.0	329.0	330.0	331.2	332.4	333.6	334.9	336.2	337.5
66.9	70.1	72.5	74.0	74.3	73.2	70.8	67.7	64.2	1850	60.8	58.9	58.2	58.5	60.1	62.5	65.9	69.4	73.8	78.2
195.9	193.1	186.7	186.2	195.3	208.1	225.4	242.7	265.2		276.6	290.6	299.7	300.5	293.2	290.2	297.0	310.0	326.8	345.0
140.2	141.9	148.8	145.5	147.0	148.3	149.5	150.2	150.8		150.9	150.7	150.3	149.6	148.5	147.2	146.0	144.4	143.4	142.2
188.6	181.2	183.2	175.4	187.9	190.2	212.6	225.2	237.9		250.3	263.0	275.6	288.3	300.8	313.5	326.9	339.5	351.0	363.4
340.8	340.1	339.5	338.8	338.5	338.2	338.1	338.4	338.8		339.1	339.9	340.8	341.6	342.7	343.9	345.1	346.1	347.7	3

V-B—cont.

Mars, A.D. 1637—A.D. 1999; Mercury, A.D. 1645—A.D. 1999; Jupiter, A.D. 1656—A.D. 1999;
Saturn, A.D. 1617—A.D. 1999—cont.

180	190	200	210	220	230	240	250	260		270	280	290	300	310	320	330	340	350	360
08	018	028	N 7	N 17	N 27	D 7	D 17	D 27		Ja 6	Ja 16	Ja 26	F 5	F 15	F 25	Mr 7	Mr 17	Mr 27	Ap 6
208.6	209.6	210.7	223.9	231.0	238.3	245.7	253.6	261.0	1853	268.7	276.5	284.2	291.9	299.8	307.7	315.6	323.6	331.3	339.8
164.8	181.0	198.4	215.7	231.6	244.5	251.9	260.8	242.6		241.8	249.8	258.2	270.6	297.3	315.5	333.0	348.9	09	5.2
211.2	213.2	215.4	217.6	219.8	222.1	224.2	226.6	228.7		230.8	232.7	234.8	236.6	238.1	239.6	240.7	241.6	242.3	243.5
127.4	138.3	149.3	160.4	172.0	184.1	196.0	208.3	220.6		232.7	245.0	257.7	270.1	282.6	295.2	307.6	319.8	332.4	344.8
25.6	24.8	26.1	23.2	22.4	21.7	20.8	20.3	19.8		19.4	19.5	19.7	19.8	20.5	21.2	21.9	23.0	24.1	25.2
107.6	113.5	118.7	124.0	128.8	133.3	137.3	139.9	143.6	1854	145.4	146.4	145.7	144.0	141.3	137.3	133.9	130.6	127.8	126.9
177.6	195.8	211.8	225.7	235.1	235.9	228.9	224.8	230.3		243.2	250.0	276.4	294.2	311.5	327.6	340.3	349.7	343.1	336.3
230.9	238.5	240.4	242.4	244.5	246.7	248.9	251.2	253.5		255.7	268.0	260.8	262.5	264.7	266.6	268.5	270.2	271.8	273.1
210.2	222.9	234.9	246.8	258.3	269.6	280.4	291.1	300.7		309.8	317.2	323.1	325.8	324.7	320.3	315.3	310.8	310.8	314.0
40.7	40.1	39.4	38.7	37.8	37.0	36.1	35.5	34.9		34.2	34.0	33.8	33.7	34.2	34.6	34.9	35.9	36.8	37.8
217.6	224.7	231.7	239.1	246.5	254.0	261.6	269.2	277.1	1855	284.7	292.7	300.6	308.4	316.2	324.0	332.0	339.8	347.4	355.2
191.6	206.6	217.5	221.0	215.6	209.6	212.5	223.5	238.5		255.3	273.0	290.3	306.7	320.2	337.0	356.6	319.3	318.6	327.3
266.8	266.7	267.9	269.5	271.1	273.0	274.0	277.1	279.3		281.6	283.9	286.3	288.6	291.0	293.4	295.7	297.9	300.0	302.0
156.8	169.1	181.6	194.1	206.5	219.3	231.7	244.4	257.1		270.1	282.5	295.0	307.6	320.0	332.5	345.2	357.5	6.8	22.0
55.6	55.2	54.7	54.2	53.4	52.6	51.7	51.0	50.2		49.4	49.1	48.7	48.2	48.3	48.5	48.7	49.4	50.1	50.8
122.0	127.9	133.6	139.3	144.8	150.1	155.3	160.1	164.7	1856	169.1	172.5	175.6	178.0	179.0	179.4	178.2	175.6	172.0	168.0
199.3	205.2	202.1	194.8	195.0	204.4	218.2	234.5	252.0		269.5	286.1	300.8	309.6	310.2	303.4	300.0	307.0	320.2	336.8
269.8	299.4	299.5	300.1	300.9	302.1	303.4	305.0	306.8		308.8	310.9	313.1	315.5	317.9	320.2	322.7	325.5	327.5	329.8
161.3	158.3	158.1	163.0	169.2	177.3	186.7	196.8	207.5		218.8	230.3	241.9	254.0	266.2	278.1	290.1	302.5	314.6	326.9
70.3	70.1	69.9	69.8	69.1	68.4	67.7	66.8	66.0		65.1	64.5	63.8	63.1	62.9	62.8	62.7	63.2	63.6	64.1
234.4	241.4	248.7	256.0	263.4	270.8	278.5	286.3	294.0	1857	301.8	309.6	317.2	324.9	332.6	340.4	347.9	355.4	8.0	10.8
167.9	180.5	178.1	186.0	198.2	214.3	231.2	248.7	265.4		280.5	291.3	294.0	298.0	292.8	287.5	299.0	314.9	332.6	351.2
338.9	337.7	336.7	335.9	335.5	335.5	335.7	336.5	337.4		338.6	340.1	341.9	343.7	345.7	348.0	350.2	352.6	354.9	357.4
194.5	208.7	219.1	231.6	248.7	265.8	286.6	280.7	292.9		304.7	316.7	328.5	339.8	350.7	1.3	10.1	19.8	30.1	84.0
84.5	84.5	84.5	84.5	84.1	83.7	83.2	82.8	81.5		80.7	79.9	79.2	78.4	78.0	77.6	77.1	77.3	77.5	77.6
195.0	140.9	147.1	153.0	159.0	164.8	170.5	176.3	181.8	1858	187.3	192.5	197.2	202.1	208.0	210.5	214.0	217.0	216.9	220.9
161.5	160.8	178.6	194.1	211.0	228.8	245.2	260.6	272.4		277.5	273.8	266.7	268.5	278.6	293.6	310.9	329.0	347.4	5.0
20.4	19.1	17.7	16.3	15.0	13.9	12.9	12.3	11.9		12.0	12.4	13.2	14.2	15.5	16.6	18.8	20.7	22.8	25.0
139.8	152.0	164.0	176.2	188.7	201.0	213.4	226.2	238.6		251.0	263.7	276.4	289.0	301.5	312.7	326.6	339.2	351.7	4.1
98.1	84.4	98.6	99.0	98.8	98.5	98.4	97.7	96.9		96.2	95.4	94.5	93.7	93.1	92.5	91.8	91.7	91.6	91.5
254.8	261.1	268.2	275.4	282.5	290.0	297.3	304.8	312.3	1859	319.8	327.2	334.6	342.1	349.5	356.6	3.9	11.1	18.2	25.8
158.9	173.7	190.5	207.7	225.0	240.9	253.8	260.9	259.2		251.7	250.8	259.7	272.8	289.4	307.3	325.5	343.2	359.0	11.8
58.2	58.1	57.4	56.5	55.3	54.0	52.6	51.4	50.1		49.0	48.2	47.7	47.5	47.8	48.2	49.0	50.2	51.5	53.2
220.1	229.6	236.7	243.1	249.0	246.4	242.2	238.4	231.5		231.1	234.8	240.7	248.8	257.9	267.8	278.1	289.2	300.7	311.8
111.0	111.6	112.1	112.7	112.8	112.8	112.8	112.8	111.7		111.2	110.4	109.6	108.9	108.1	107.8	106.5	106.1	105.8	105.4
0.9	0.19	0.29	N 8	N 18	N 28	D 8	D 18	D 28	1860	Ja 7	Ja 17	Ja 27	F 6	F 16	F 26	Mr 7	Mr 17	Mr 27	Ap 6
147.2	158.6	169.7	186.1	172.1	178.5	184.6	190.7	196.7		203.0	200.0	215.2	221.7	227.0	232.9	238.6	244.1	249.6	255.0
169.5	166.0	244.6	221.0	234.9	244.2	244.8	237.6	238.9		240.0	252.5	268.2	285.7	303.6	321.4	337.5	350.6	365.7	354.9
90.6	91.4	91.9	92.3	92.0	91.4	90.8	89.8	88.3		87.2	86.9	84.6	83.5	82.5	81.8	81.5	81.5	81.8	82.5
176.1	168.4	200.9	213.4	226.0	238.6	251.0	264.0	276.7		288.9	301.5	313.8	326.1	338.5	350.8	3.3	14.0	25.9	37.4
123.3	124.1	124.9	125.7	126.0	126.2	126.6	126.4	126.1		125.8	125.1	124.4	123.6	122.9	122.2	121.4	120.8	120.2	119.6
0.8	0.18	0.28	N 7	N 17	N 27	D 7	D 17	D 27	1861	Ja 6	Ja 16	Ja 26	F 5	F 15	F 25	Mr 7	Mr 17	Mr 27	Ap 6
283.6	288.7	294.6	300.4	306.9	313.0	319.4	326.3	333.0		339.5	346.5	353.2	0.0	6.8	18.4	20.0	26.9	33.5	40.1
184.1	200.7	215.7	226.6	229.9	224.0	215.3	221.9	232.7		247.5	264.9	282.5	299.9	316.4	330.2	338.3	337.1	329.6	329.0
118.8	119.9	121.3	122.4	123.3	124.0	124.2	124.2	123.9		128.2	122.2	121.1	119.8	118.5	117.2	116.0	114.9	114.2	113.8
127.6	138.8	149.5	160.6	172.6	184.6	196.4	208.6	220.9		233.3	245.7	258.1	270.8	283.1	295.6	308.1	320.5	333.1	345.3
185.2	186.2	137.1	136.2	138.7	139.3	189.4	138.7	139.7		139.6	189.1	188.5	188.0	187.2	186.4	135.6	184.9	184.9	183.5
159.4	165.8	172.4	178.7	185.1	191.7	198.2	204.7	211.8	1862	217.7	224.5	231.2	238.0	244.6	251.4	258.0	264.8	271.7	278.5
196.3	208.0	214.4	210.7	203.5	204.4	213.6	227.4	243.8		261.4	278.8	295.8	309.9	319.2	320.2	313.2	307.1	312.2	330.3
148.4	146.5	147.4	149.1	150.1	152.0	153.2	154.1	154.8		155.1	155.0	154.7	154.1	153.1	151.8	150.6	149.8	147.6	146.9
211.7	223.4	235.2	247.2	258.8	269.8	280.5	290.8	300.6		300.3	316.2	331.5	343.1	351.3	315.5	310.2	307.5	308.9	312.0
146.8	147.9	149.0	150.0	150.9	151.4	152.2	152.4	152.5		152.8	152.4	152.1	151.8	151.1	150.4	149.6	148.9	148.1	147.3
345.6	342.9	342.4	343.0	344.9	347.5	350.9	354.8	359.1	1863	3.9	9.1	14.4	20.0	25.7	31.2	37.3	43.8	49.1	55.1
197.8	196.9	189.4	187.2	194.8	207.5	223.5	240.8	258.2		275.0	289.9	304.8	303.7	297.4	292.5	297.3	308.8	325.1	342.7
167.1	169.2	171.4	178.4	175.5	177.3	179.1	180.8	182.1		183.3	184.2	184.8	185.1	185.1	184.8	184.2	183.1	182.1	180.8
167.6	169.8	182.2	194.8	207.2	219.9	232.3	245.0	257.9		270.6	283.1	295.6	308.9	320.6	333.2	345.7	358.0	10.8	22.5
157.9	159.0	160.4	161.3	162.2	163.0	163.9	164.3	164.7		165.1	165.0	165.0	164.8	164.2	163.6	163.0	162.8	161.4	160.6
0.9	0.19	0.29	N 8	N 18	N 28	D 8	D 18	D 28	1864	Ja 7	Ja 17	Ja 27	F 6	F 16	F 26	Mr 7	Mr 17	Mr 27	Ap 6
171.5	178.2	184.9	191.5	198.2	205.0	211.7	218.5	225.0		232.5	239.5	246.7	253.8	261.1	268.3	275.8	283.2	290.5	298.1
175.8	170.9	176.2	187.9	203.2	220.2	237.5	254.6	269.9		282.1	286.9	282.7	276.3	278.2	288.3	308.2	320.7	339.0	3.7.5
190.4	192.7	194.9	197.0	199.2	201.4	203.5	205.6												

V-B—cont.

Mars, A.D. 1637—A.D. 1999; Mercury, A.D. 1645—A.D. 1999; Jupiter, A.D. 1656—A.D. 1999; Saturn, A.D. 1617—A.D. 1999—cont.

180	190	200	210	220	230	240	250	260		270	280	290	300	310	320	330	340	350	360
O 8	O 18	O 28	N 7	N 17	N 27	D 7	D 17	D 27		Ja 6	Ja 16	Ja 26	F 5	F 15	F 25	Mr 7	Mr 17	Mr 27	Ap 6
203.6	209.6	216.7	223.9	231.0	238.3	245.7	253.5	261.0	1853	268.7	276.5	284.2	291.9	299.8	307.7	315.6	323.6	331.3	339.3
164.3	181.0	198.4	215.7	231.5	244.5	251.9	258.8	242.5		241.3	249.8	253.2	279.6	297.3	315.5	333.0	349.9	0.9	5.2
211.2	213.2	215.4	217.6	219.8	222.1	224.2	226.5	228.7		230.8	232.7	234.8	236.5	238.1	239.6	240.7	241.6	242.3	242.5
127.4	138.3	149.3	160.4	172.0	184.1	196.0	208.3	210.6		232.7	245.0	257.7	270.1	282.6	295.2	307.6	319.8	332.4	344.8
35.6	24.8	26.1	23.2	22.4	21.7	20.8	20.3	19.8		19.4	18.5	19.7	19.8	20.5	21.2	21.9	23.0	24.1	25.2
107.6	113.5	118.7	124.0	128.8	133.3	137.3	139.9	143.6	1854	145.4	146.4	145.7	144.0	141.3	137.3	133.9	130.6	127.8	126.9
177.6	195.3	211.8	225.7	235.1	238.9	228.9	224.8	230.3		243.2	250.0	276.4	294.2	311.5	327.6	340.3	349.7	348.1	336.3
230.9	238.5	240.4	242.4	244.5	246.7	248.9	251.2	253.5		255.7	258.0	260.3	262.5	264.7	266.6	268.5	270.2	271.8	273.1
210.2	222.9	234.9	246.8	258.3	269.6	280.4	291.1	300.7		308.8	317.2	323.1	325.8	324.7	320.3	315.3	310.8	310.8	314.0
40.7	40.1	39.4	38.7	37.8	37.0	36.1	35.5	34.9		34.2	34.0	33.8	33.7	34.2	34.6	34.9	35.9	36.8	37.8
217.6	224.7	231.7	239.1	246.5	254.0	261.6	269.2	277.1	1855	284.7	292.7	300.6	308.4	316.2	324.0	332.0	339.8	347.4	355.2
191.6	206.5	217.5	221.0	215.6	209.6	212.5	223.5	238.5		255.3	273.0	290.3	306.7	320.2	327.0	326.6	319.3	318.6	327.8
265.8	269.7	267.9	269.5	271.1	273.0	274.0	277.1	279.3		281.6	283.9	286.3	288.6	291.0	293.4	295.7	297.9	300.0	302.0
156.8	169.1	181.5	194.1	206.6	219.3	231.7	244.4	257.1		270.1	282.5	295.0	307.6	320.0	332.5	345.2	357.5	9.8	22.0
65.6	55.2	54.7	54.2	53.4	52.6	51.7	51.0	50.2		49.4	49.1	48.7	48.2	48.3	48.5	48.7	48.4	50.1	50.8
122.0	127.9	133.8	139.3	144.8	150.1	155.3	160.1	164.7	1856	169.1	172.5	175.6	178.0	179.0	179.4	180.0	180.0	180.0	180.0
199.3	205.2	202.1	194.8	195.0	204.4	218.2	234.5	252.0		269.5	286.1	300.8	309.6	310.2	303.4	300.0	307.0	320.2	336.8
269.4	299.4	299.5	300.1	300.9	302.1	303.4	305.0	306.8		308.8	310.9	313.1	315.5	317.9	320.2	322.7	325.5	327.5	329.8
161.3	158.3	158.1	168.0	169.2	177.3	186.7	196.8	207.5		218.8	230.3	241.9	254.0	266.2	278.1	290.1	302.5	314.6	326.9
70.3	70.1	69.9	69.8	69.1	68.4	67.7	66.8	66.0		65.1	64.5	63.8	63.1	62.9	62.8	62.7	63.2	63.6	64.1
234.4	241.4	248.7	256.0	263.4	270.8	278.5	286.3	294.0	1857	301.8	309.6	317.2	324.9	332.6	340.4	347.9	355.4	8.0	10.8
157.9	180.5	178.1	186.0	198.2	214.3	231.2	248.7	265.4		280.5	291.3	294.0	288.0	282.8	287.5	299.0	314.9	332.8	351.2
338.9	337.7	339.7	335.9	335.5	335.5	335.7	336.5	337.4		338.6	340.1	341.9	343.7	345.7	348.0	350.2	352.6	354.9	357.4
194.5	206.7	219.1	231.6	248.7	265.8	286.6	280.7	292.9		304.7	316.7	328.5	339.8	350.7	1.3	10.1	19.8	30.1	84.0
84.5	84.5	84.5	84.5	84.1	83.7	83.2	82.3	81.5		80.7	79.9	76.2	78.4	78.0	77.6	77.1	77.8	77.5	77.6
135.0	140.9	147.1	153.0	159.0	164.8	170.5	176.3	181.8	1858	187.3	192.5	197.2	202.1	208.0	210.5	214.0	217.0	218.9	220.9
161.5	166.8	178.6	194.1	211.0	228.3	245.2	260.6	272.4		177.5	273.6	286.7	298.5	278.6	298.6	310.9	329.0	347.4	6.0
20.4	19.1	17.7	16.8	15.0	18.9	12.9	12.3	11.9		12.0	12.4	13.2	14.2	15.5	16.6	18.6	20.7	22.8	25.0
139.8	152.0	164.0	176.2	188.7	201.0	213.4	226.2	238.6		251.0	263.7	276.4	289.0	301.5	312.7	326.6	339.2	351.7	4.1
98.1	88.4	98.6	99.0	98.8	98.5	98.4	97.7	96.9		96.2	95.4	94.5	93.7	93.1	92.5	91.8	91.7	91.6	91.5
254.8	261.1	268.2	275.4	282.5	289.0	297.3	304.8	312.3	1859	319.8	327.2	334.6	342.1	349.5	356.6	3.9	11.1	18.2	25.3
158.9	173.7	190.5	207.7	225.0	240.0	253.8	260.9	259.2		251.7	260.8	253.7	272.8	289.4	307.3	325.5	343.2	359.0	11.8
58.2	58.1	57.4	56.5	55.3	54.0	52.6	51.4	50.1		49.0	48.2	47.7	47.5	47.8	48.2	49.0	50.2	51.5	53.2
220.1	229.6	236.7	243.1	246.0	246.4	242.2	236.4	231.5		231.1	234.8	240.7	248.8	257.9	267.8	278.1	289.2	300.7	311.8
111.0	111.5	112.1	112.7	112.8	112.8	112.8	112.3	111.7		111.2	110.4	109.6	108.9	108.1	107.3	106.5	106.1	105.8	105.4
O 9	O 19	O 29	N 8	N 18	N 28	D 8	D 18	D 28	1860	Ja 7	Ja 17	Ja 27	F 6	F 16	F 26	Mr 7	Mr 17	Mr 27	Ap 6
147.2	153.6	159.7	166.1	172.1	178.5	184.6	190.7	196.7		203.0	209.0	215.2	221.7	227.0	232.9	238.6	244.1	249.6	255.0
169.5	166.0	264.6	221.0	234.9	244.2	244.8	237.6	238.9		240.0	252.5	268.2	285.7	303.6	321.4	337.5	350.6	364.7	354.2
90.6	91.4	91.0	92.3	92.0	91.4	90.8	89.8	88.3		87.2	85.9	84.6	83.5	82.5	81.8	81.5	81.8	81.8	82.5
176.1	188.4	200.9	213.4	229.0	238.6	251.0	264.0	276.7		258.9	301.5	313.8	326.1	338.1	350.8	2.8	14.0	25.9	37.4
128.3	124.1	124.9	125.7	126.0	126.2	126.6	126.4	126.1		125.8	126.1	124.4	123.6	122.9	122.2	121.4	120.8	120.2	119.6
O 8	O 18	O 28	N 7	N 17	N 27	D 7	D 17	D 27	1861	Ja 6	Ja 16	Ja 26	F 5	F 15	F 25	Mr 7	Mr 17	Mr 27	Ap 6
283.6	288.7	294.6	300.4	306.8	313.0	319.4	326.3	333.0		339.5	346.5	353.2	0.0	6.8	13.4	20.0	26.9	33.5	40.1
184.1	200.7	215.7	226.6	235.9	242.0	248.3	251.9	232.7		247.5	264.0	282.5	299.9	316.4	330.2	338.3	337.1	329.6	329.0
118.3	119.9	121.3	122.4	123.3	124.0	124.2	124.2	123.9		128.2	122.2	121.1	119.8	118.5	117.2	116.0	114.9	114.2	113.8
127.6	138.3	149.5	160.6	172.6	184.6	196.4	208.6	220.9		238.3	245.7	258.1	270.8	283.1	295.6	308.1	320.5	333.1	345.3
135.2	136.2	137.1	138.2	138.7	139.3	139.4	139.7	139.7		139.6	139.1	138.5	138.0	137.2	136.4	135.6	134.9	134.9	133.5
159.4	165.8	172.4	178.7	185.1	191.7	198.2	204.7	211.3	1862	217.7	224.5	231.2	238.0	244.6	251.4	258.0	264.8	271.7	278.5
196.8	208.0	214.4	219.7	208.5	204.4	213.6	227.4	243.8		26.4	278.8	295.8	309.9	319.2	320.2	318.2	310.3	317.2	330.3
143.4	145.5	147.4	149.1	150.0	152.0	153.2	154.1	154.8		155.1	155.0	154.7	154.1	153.1	151.6	150.6	149.3	147.4	146.9
211.7	223.4	235.2	247.2	258.8	269.8	280.5	290.8	300.6		300.3	316.2	332.5	348.1	361.8	375.5	389.2	402.8	416.9	431.0
146.8	147.9	149.0	150.0	150.9	151.4	152.2	152.4	152.5		152.8	152.4	152.1	151.8	151.1	150.4	149.6	148.9	148.1	147.3
345.6	342.9	342.4	343.0	344.9	347.5	350.9	354.8	359.1	1863	3.9	9.1	14.4	20.0	25.7	31.2	37.3	43.8	49.1	55.1
167.8	166.9	169.4	167.2	164.8	162.5	160.3	158.0	155.8		275.0	289.9	304.6	308.7	297.4	292.5	297.3	306.8	325.1	342.7
167.1	169.2	171.4	173.4	175.5	177.3	179.1	180.8	182.1		183.3	184.2	184.8	185.1	185.1	184.8	184.2	183.1	182.1	180.8
167.6	169.8	182.2	184.8	207.2	219.9	232.3	245.0	257.6		270.6	284.1	295.6	308.9	320.6	333.2	345.7	358.0	370.3	382.5
167.9	169.0	169.4	161.3	162.2	163.0	163.9	164.3	164.7		165.1	165.0	165.0	164.8	164.2	163.6	163.0	162.8	161.4	160.6
O 19	O 29	N 8	N 18	N 28	D 8	D 18	D 28		1864	Ja 7	Ja 17	Ja 27	F 6	F 16	F 26	Mr 7	Mr 17	Mr 27	Ap 6
173.2	184.9	191.5	198.2	205.0	211.7	218.5	225.0	231.3		232.5	239.5	246.7	253.8	261.1	268.8	275.8	283.2	290.5	298.1
170.9	176.2	187.9	203.2	220.2	237.5	251.6	269.9	289.9		282.1	296.9	312.7	328.3	343.8	358.3	370.2	380.7	389.0	397.5
192.7	194.9	197.0	199.2	201.4	203.5	205.6	207.5	209.5	</										

Geocentric Places of Mars, Mercury, Jupiter, Venus and Saturn for every tenth day of current cycle.
Venus, A.D. 1765—A.D. 1999 ;

Day of I.S.V.	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
Eng. date ...	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
1865 Mars ...	740	79.6	85.1	90.7	96.5	102.4	108.4	114.3	120.2	126.3	132.5	138.8	145.1	151.5	157.8	164.5	170.9	177.4
Merc. ...	16.5	25.8	25.5	18.6	16.8	25.2	39.7	56.9	75.8	94.0	112.2	128.7	142.2	149.6	146.4	138.9	136.3	148.1
Jup. ...	247.0	246.8	246.4	245.7	244.8	243.4	242.3	241.0	239.7	238.3	237.5	236.8	236.4	236.5	237.2	238.1	239.3	
Ven. ...	34.4	34.8	31.3	22.5	19.5	18.1	20.0	26.1	32.3	40.9	50.2	60.1	70.9	81.7	93.1	104.6	116.5	128.2
Sat. ...	186.2	185.4	184.6	183.8	183.8	182.8	182.2	182.1	182.1	182.0	182.3	182.8	183.3	184.1	185.0	185.9	187.0	188.1
1866 Mars ...	319.9	327.8	335.5	343.2	350.7	358.3	5.9	18.1	20.4	27.5	34.5	39.1	47.8	54.3	60.4	66.5	72.2	77.6
Merc. ...	7.5	1.1	357.3	4.0	17.1	34.1	52.4	71.4	90.2	107.3	121.7	130.7	138.2	123.1	121.1	128.9	142.0	158.8
Jup. ...	277.8	278.8	279.6	280.0	280.1	279.8	279.3	278.8	277.1	276.9	274.7	273.0	270.9	270.1	269.7	269.5	269.5	269.5
Ven. ...	11.8	23.7	35.7	48.0	60.3	72.5	84.4	96.4	108.2	120.2	132.2	143.7	155.4	166.9	178.3	189.3	200.0	210.4
Sat. ...	198.6	197.8	197.0	196.3	195.6	194.9	194.3	194.0	193.8	193.4	193.6	193.9	194.2	194.9	195.6	196.3	197.4	198.4
1867 Mars ...	Ap 12	Ap 22	My 2	My 12	My 22	Je 1	Je 11	Je 21	Je 11	Je 11	Je 21	Je 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
Mars ...	92.2	96.4	100.9	105.9	111.2	116.4	122.0	127.5	133.5	139.5	145.3	151.3	157.9	164.1	170.5	177.1	183.9	190.5
Merc. ...	338.6	348.1	355.4	11.6	29.7	48.6	67.8	86.1	100.7	111.2	118.4	126.7	135.1	143.1	150.7	157.9	164.7	172.5
Jup. ...	308.9	308.7	310.5	311.9	313.1	314.0	314.7	314.9	314.9	314.5	313.8	312.9	311.6	310.2	308.9	307.5	306.3	305.4
Ven. ...	318.3	330.0	342.0	353.8	5.9	17.8	29.8	41.8	53.7	66.0	78.9	90.3	102.4	115.1	127.0	139.4	151.8	164.0
Sat. ...	210.7	210.0	209.3	208.5	207.7	206.9	206.8	205.8	205.4	205.0	205.0	205.0	205.0	205.0	205.5	206.1	206.6	207.4
1868 Mars ...	Ap 11	Ap 21	My 1	My 11	My 21	Je 1	Je 11	Je 21	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
Mars ...	337.0	344.7	352.5	0.1	7.7	15.2	22.7	29.8	37.0	44.1	50.9	57.8	64.6	71.0	77.4	83.6	89.8	95.9
Merc. ...	333.6	349.0	6.7	25.5	44.5	63.0	78.8	91.1	95.3	90.1	84.5	88.9	100.5	116.0	133.3	151.3	169.0	185.8
Jup. ...	334.9	337.1	339.4	341.5	343.5	345.4	346.9	348.9	350.4	351.7	351.7	351.7	351.7	351.7	351.7	351.7	351.7	351.7
Ven. ...	43.5	54.2	64.8	74.7	84.7	94.7	104.7	114.7	124.7	134.7	144.7	154.7	164.7	174.7	184.7	194.7	204.7	214.7
Sat. ...	222.5	221.8	221.2	220.6	219.8	219.0	218.2	217.6	217.0	216.4	216.2	216.1	216.0	216.3	216.6	217.0	217.8	218.6
1869 Mars ...	115.6	117.5	120.2	123.8	127.8	132.4	137.3	142.6	148.1	153.7	159.5	165.4	171.9	178.0	184.6	191.1	197.8	204.8
Merc. ...	344.4	2.8	21.8	40.2	57.0	70.2	76.4	73.0	68.3	63.3	58.3	53.3	48.3	43.3	38.3	33.3	28.3	23.3
Jup. ...	2.7	5.9	7.5	9.9	12.3	14.5	16.7	18.8	20.7	22.5	24.1	25.4	26.5	27.2	27.6	27.7	27.8	27.7
Ven. ...	852.5	5.0	17.5	29.8	41.9	54.4	66.5	78.8	90.9	103.2	115.4	127.7	139.8	151.8	164.1	176.1	188.2	200.2
Sat. ...	233.9	233.6	233.8	234.3	234.5	234.7	234.8	234.9	235.0	235.1	235.2	235.3	235.4	235.5	235.6	235.7	235.8	235.9
1870 Mars ...	353.0	0.6	8.3	15.7	23.1	30.4	37.7	44.9	51.8	58.9	65.6	72.8	79.9	85.5	92.0	98.3	104.5	110.6
Merc. ...	359.0	17.4	34.5	48.7	58.8	55.4	48.2	47.8	57.7	72.4	89.6	107.9	126.2	144.0	162.5	171.3	175.7	170.6
Jup. ...	30.1	32.4	34.7	37.1	39.5	41.8	44.2	46.6	48.8	51.1	53.2	55.2	56.9	58.7	60.1	61.3	62.2	62.8
Ven. ...	315.8	323.5	332.8	342.5	352.2	4.1	15.0	26.4	37.9	49.7	61.5	73.3	85.3	96.9	109.3	121.4	133.6	145.9
Sat. ...	245.2	244.9	244.6	244.2	243.5	242.8	242.0	241.2	240.4	239.7	239.2	238.7	238.2	237.7	237.2	236.7	236.2	235.7
1871 Mars ...	Ap 12	Ap 22	My 2	My 12	My 22	Je 1	Je 11	Je 21	Je 11	Je 11	Je 21	Je 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
Mars ...	148.4	147.1	147.2	148.0	150.3	153.0	156.7	161.1	165.6	170.7	176.2	181.9	187.7	193.9	200.3	207.0	213.7	220.6
Merc. ...	12.2	27.3	37.4	36.9	29.7	27.9	36.2	50.2	67.4	85.4	104.1	122.3	138.7	152.1	158.1	156.3	148.7	149.2
Jup. ...	58.0	59.7	61.7	63.8	65.9	68.1	70.5	72.7	75.1	77.5	79.6	81.9	84.2	86.3	88.3	90.2	91.9	93.8
Ven. ...	29.6	41.6	53.3	65.4	77.1	88.5	99.9	110.9	121.5	131.9	141.5	150.7	158.6	164.5	168.1	169.7	164.4	158.2
Sat. ...	250.2	250.0	250.8	251.7	252.0	252.4	252.8	253.1	253.3	253.5	253.7	253.9	254.1	254.3	254.5	254.7	254.9	255.1
1872 Mars ...	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
Mars ...	8.5	15.8	23.3	30.3	37.6	44.8	51.6	58.7	65.7	72.3	78.9	85.5	92.2	98.7	105.0	111.4	117.6	123.9
Merc. ...	15.9	18.5	11.9	8.0	14.6	27.8	45.2	62.9	81.9	101.1	117.5	131.7	140.6	140.5	138.4	130.9	138.7	151.8
Jup. ...	87.0	88.0	89.2	90.7	92.8	94.2	96.0	98.2	100.3	102.5	104.7	107.1	109.8	111.5	113.8	115.9	118.0	120.1
Ven. ...	334.6	346.9	359.1	11.4	23.5	35.7	48.0	60.2	72.5	84.8	97.0	109.2	121.7	133.8	146.2	158.4	170.9	183.3
Sat. ...	267.1	267.2	267.3	267.3	266.8	266.3	265.8	265.0	264.2	263.4	262.7	262.0	261.3	260.6	260.0	259.2	258.4	257.6
1873 Mars ...	199.8	198.7	193.0	190.2	187.7	186.8	187.1	188.6	191.1	194.6	198.5	203.1	208.5	213.8	219.9	226.0	232.4	239.2
Merc. ...	354.9	349.2	353.3	5.8	21.7	39.9	59.0	77.7	95.5	110.8	121.5	123.8	117.4	118.2	118.5	131.1	146.8	164.0
Jup. ...	118.0	118.0	118.2	118.8	119.7	120.8	122.1	123.8	125.5	127.4	129.4	131.4	133.6	135.8	138.0	140.3	142.5	144.6
Ven. ...	32.6	32.1	28.2	20.2	16.8	15.9	19.0	24.4	31.9	40.9	50.1	60.5	71.0	82.1	93.4	105.1	116.9	128.6
Sat. ...	277.9	278.2	278.5	278.7	278.4	278.1	277.8	277.1	276.4	275.1	274.2	273.4	272.8	272.3	271.7	271.6	271.6	271.6
1874 Mars ...	28.4	30.4	37.5	44.5	51.3	58.2	65.0	71.7	78.4	84.9	91.7	98.0	104.5	111.0	117.4	123.7	130.9	138.3
Merc. ...	332.6	343.7	359.3	17.1	36.0	54.9	73.4	89.6	101.7	106.0	100.7	95.3	90.2	110.5	125.7	143.0	160.7	178.4
Jup. ...	150.9	149.9	149.1	148.7	148.5	148.7	149.3	150.1	151.1	152.4	154.1	155.8	157.5	159.6	161.6	163.7	165.9	168.1
Ven. ...	11.9	24.3	36.3	48.6	61.0	73.1	85.1	97.2	108.8	120.7	132.7	144.2	155.9	167.6	178.6	189.6	200.1	210.3
Sat. ...	288.9	289.3	289.7	290.2	290.0	289.9	289.8	289.2	288.6	288.1	287.3	286.5	285.8	285.1	284.4	283.1	281.4	279.2
1875 Mars ...	Ap 12	Ap 22	My 2	My 12	My 22	Je 1	Je 11	Je 21	Je 11	Je 11	Je 21	Je 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
Mars ...	245.0	218.3	250.8	252.3	253.3	252.8	251.0	248.7	246.1	243.8	242.5	241.5	238.9	236.3	233.9	231.0	227.6	224.5
Merc. ...	337.4	354.6	13.2	32.0	50.6	67.3	80.6	87.3	93.9	77.2	79.0	89.4	108.6	121.4	139.6	157.5	173.8	189.0
Jup. ...	184.8	183.5	182.2	181.1	180.1	179.3	178.8	178.6	178.7	179.3	180.2	181.1	182.5	184.0	185.7	187.4	189.5	191.6
Ven. ...	318.8	330.5	342.5	354.5	6.4	18.3	30.4	42.5	54.2	66.7	78.9	90.9	103.1	115.4	127.7	140.1	152.5	164.9
Sat. ...	299.7	300.3	300.9	301.6	301.7	301.8	301.9	301.5	301.1	300.8	300.1	299.4	298.6	297.8	297.0	296.3	295.5	294.8
1876 Mars ...	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
Mars ...	37.9	44.6	51.4	58.1	64.8	71.4	77.9	84.4	90.8	97.5	103.8	110.2	116.6	122.9	129.4	136.1	142.0	148.4
Merc. ...	250.4	9.3	27.7	45.0	69.3	67.5	66.5	59.2	59.0	69.5	82.5	99.6	117.7	136.1	153.3	169.0	180.7	184.9
Jup. ...	218.8	217.9	216.7	215.4	214.2	212.9	211.6	210.5	209.8	209.3	209.1	209.3	209.1	209.3	210.4	211.6	212.8	214.4
Ven. ...	43.8	54.8	65															

V-B.—cont.

Mars, A.D. 1637—A.D. 1999; Mercury, A.D. 1645—A.D. 1999; Jupiter A.D. 1656—A.D. 1999; Saturn, A.D. 1617—A.D. 1999—cont.

180	190	200	210	220	230	240	250	260		270	280	290	300	310	320	330	340	350	360
O 8	O 18	O 28	N 7	N 17	N 27	D 7	D 17	D 27		Ja. 6	Ja. 16	Ja. 26	F 5	F 15	F 25	Mr 7	Mr 17	Mr 27	Ap 6
184.0	190.7	197.6	204.5	211.5	218.5	225.5	232.7	240.1	1866	247.5	254.7	262.0	269.7	277.3	285.0	292.7	300.3	307.8	316.0
162.7	179.0	196.6	213.6	230.1	244.2	253.3	253.8	246.7		243.3	249.0	261.8	277.8	295.4	313.6	331.4	347.8	364.8	382.0
240.7	212.3	244.1	246.1	248.1	250.3	252.5	254.8	257.1		259.4	261.6	264.0	266.2	268.3	270.4	272.4	274.2	275.8	277.2
140.4	152.4	164.6	176.8	189.1	201.6	214.0	226.7	239.1		252.1	264.8	277.0	289.7	302.1	314.8	327.4	339.8	352.3	364.7
189.3	190.5	191.7	192.5	194.0	195.1	196.3	197.1	198.0		198.9	199.4	199.9	200.5	200.5	200.5	200.5	199.9	199.4	198.9
82.6	87.2	91.2	94.8	97.5	99.2	99.9	99.1	97.3	1867	94.3	90.8	86.7	83.8	81.6	81.3	82.1	84.0	86.8	90.2
175.7	183.2	210.1	224.8	235.7	248.5	253.4	227.5	230.9		241.8	257.0	274.1	291.9	309.7	326.5	340.1	349.6	347.8	340.5
270.0	270.9	272.1	273.8	275.0	276.7	278.7	280.8	283.0		285.2	287.5	289.9	292.2	294.3	297.0	299.4	301.6	303.8	305.7
220.0	223.6	235.8	242.7	244.2	243.2	238.5	232.2	228.7		229.2	232.9	239.8	248.2	257.3	267.6	278.1	289.1	300.6	312.0
199.4	200.6	201.8	202.9	204.1	205.3	206.4	207.4	208.4		209.4	210.1	210.7	211.5	211.7	211.9	212.0	211.7	211.4	211.0
O 9	O 19	O 29	N 8	N 18	N 28	D 8	D 18	D 28		Ja. 7	Ja. 17	Ja. 27	F 6	F 16	F 26	Mr 7	Mr 17	Mr 27	Ap 6
197.3	204.1	211.1	218.8	225.5	232.6	240.1	247.5	255.0	1868	202.6	270.1	277.9	285.8	293.4	301.5	309.1	317.0	325.0	332.9
189.9	205.4	218.1	224.5	219.6	211.4	213.8	222.6	236.8		253.2	270.8	288.6	306.3	324.0	339.5	350.6	323.6	320.4	317.2
304.7	304.3	304.3	304.7	305.4	306.8	307.5	309.1	310.8		312.7	314.8	317.0	319.2	321.7	324.0	326.4	328.8	331.2	333.6
176.7	189.0	201.7	214.0	226.7	239.2	251.8	264.4	277.1		289.5	301.9	314.3	326.7	339.7	350.9	27	14.6	26.3	37.8
209.3	210.5	211.6	212.8	214.0	215.2	216.3	217.4	218.5		219.5	220.4	221.2	222.0	222.4	222.8	223.1	223.2	223.3	222.7
O 8	O 18	O 28	N 7	N 17	N 27	D 7	D 17	D 27		Ja. 6	Ja. 16	Ja. 26	F 5	F 15	F 25	Mr 7	Mr 17	Mr 27	Ap 6
101.3	106.9	112.1	116.8	121.5	125.4	129.1	131.6	133.3	1869	133.9	138.4	141.8	128.5	125.0	120.8	117.6	115.4	114.5	114.6
198.9	206.8	206.0	198.4	196.4	203.9	216.8	232.8	249.9		267.4	284.3	299.4	310.5	313.4	307.6	302.4	307.3	319.0	335.0
344.7	343.4	342.2	341.3	340.8	340.5	340.6	341.1	341.9		342.9	344.4	346.0	347.7	349.7	351.8	354.0	356.3	358.8	361.1
127.5	138.6	149.6	161.3	172.9	185.1	197.1	209.8	221.7		233.6	246.2	258.7	271.3	283.8	296.4	308.6	321.2	333.5	346.0
219.4	220.5	221.5	222.5	223.7	225.0	226.1	227.2	228.3		229.5	230.4	231.3	232.2	232.8	233.3	233.9	233.9	234.0	234.0
211.4	218.4	225.6	232.9	240.3	247.8	255.3	263.0	270.6	1870	278.4	286.3	294.0	301.9	309.9	317.7	325.6	333.5	341.3	349.2
191.4	164.6	180.2	185.3	197.1	212.3	229.0	246.7	263.9		279.3	291.4	298.6	292.6	285.9	287.7	298.3	313.2	330.7	349.1
25.8	24.6	23.6	22.0	20.6	19.5	18.3	17.5	17.0		16.9	17.2	17.8	18.6	19.8	21.3	22.0	24.8	26.9	28.9
213.1	224.0	215.7	247.6	259.1	270.0	280.8	290.7	300.5		308.7	315.3	319.9	320.8	317.7	311.8	306.6	304.9	307.0	311.8
229.3	230.3	231.3	232.3	233.5	234.7	235.8	236.9	238.1		239.2	240.2	241.2	242.3	243.0	243.1	244.4	244.7	245.0	245.2
116.6	122.4	128.2	133.6	139.0	144.0	148.7	153.2	157.2	1871	160.6	163.4	165.3	166.1	165.4	163.5	160.5	156.8	152.9	149.5
164.3	167.1	177.4	192.2	208.8	226.2	243.4	259.3	272.4		279.6	277.8	270.6	269.4	278.2	292.0	308.8	327.0	344.7	361.7
62.9	63.0	62.5	61.7	60.6	59.5	58.1	56.7	55.5		54.3	53.3	52.7	52.3	52.3	52.7	53.4	54.8	55.6	57.1
158.3	170.5	182.9	195.5	207.8	220.5	233.0	245.7	258.2		271.0	283.7	296.2	308.9	321.2	334.0	346.3	358.7	371.0	383.0
239.5	240.4	241.3	242.2	243.3	244.4	245.5	246.7	247.9		249.0	250.1	251.2	252.3	253.2	254.1	254.9	255.3	255.7	256.1
O 9	O 19	O 29	N 8	N 18	N 28	D 8	D 18	D 28		Ja. 7	Ja. 17	Ja. 27	F 6	F 16	F 26	Mr 7	Mr 17	Mr 27	Ap 6
227.4	231.4	241.7	249.2	256.5	264.3	271.9	279.3	287.2	1872	205.0	302.8	310.7	318.4	326.4	334.0	341.7	349.4	357.0	364.7
157.9	172.0	188.3	205.7	223.1	239.4	253.3	262.8	262.8		255.6	262.3	268.7	271.3	287.2	305.0	323.3	341.2	357.9	374.6
94.6	95.5	96.3	96.6	96.7	96.3	95.7	94.8	93.6		92.4	91.1	89.8	88.5	87.4	86.6	86.1	85.0	86.1	86.6
153.5	152.4	154.6	160.3	167.8	176.8	186.5	197.0	208.1		219.3	231.0	242.7	254.8	267.3	279.2	291.2	303.5	315.7	328.1
249.9	250.6	251.8	252.1	253.1	254.1	255.2	256.4	257.6		258.6	260.0	261.3	262.3	263.2	264.1	265.1	265.7	266.3	266.9
O 8	O 18	O 28	N 7	N 17	N 27	D 7	D 17	D 27		Ja. 6	Ja. 16	Ja. 26	F 5	F 15	F 25	Mr 7	Mr 17	Mr 27	Ap 6
129.9	136.1	141.9	147.9	153.6	159.4	164.7	170.1	175.5	1873	180.4	185.2	189.6	193.6	197.0	199.7	201.9	202.6	202.6	201.0
167.9	184.6	202.6	219.3	234.2	247.8	247.8	242.0	236.3		240.2	251.3	267.3	283.6	301.7	319.7	338.0	355.4	369.1	358.5
121.8	123.5	125.0	126.3	127.3	128.0	128.5	128.6	128.3		127.9	127.0	125.9	124.7	123.4	122.0	120.7	119.7	118.9	118.2
195.8	208.2	220.2	232.7	245.0	257.0	269.7	281.8	293.9		305.7	317.4	329.2	340.2	351.2	361.3	371.3	381.3	391.3	401.3
260.5	261.0	261.6	262.2	263.2	264.2	265.1	266.8	267.5		268.6	269.7	271.0	272.1	273.2	274.3	275.4	276.2	276.9	277.6
245.0	252.8	260.0	267.3	274.8	282.2	289.9	297.5	305.1	1874	312.7	320.5	327.8	335.5	342.9	350.3	357.8	365.1	372.3	379.5
181.8	199.0	214.5	226.7	232.2	238.8	241.5	222.8	231.9		248.1	262.6	280.5	298.0	315.0	329.5	339.5	340.9	331.2	330.8
146.8	148.8	150.8	152.6	154.2	155.6	156.9	158.0	158.6		151.2	159.2	169.0	185.5	197.5	155.5	155.3	154.1	152.7	151.4
140.7	152.9	164.9	177.3	189.6	202.6	214.5	227.1	239.5		252.2	264.8	277.3	290.2	302.8	314.8	327.3	339.9	352.4	364.9
271.4	271.8	272.2	272.7	273.6	274.5	275.3	276.1	277.1		277.8	279.0	280.2	281.3	282.4	283.6	284.7	285.8	286.8	287.8
143.6	148.7	155.0	161.0	167.0	173.2	179.3	185.2	191.1	1875	197.1	202.9	208.4	214.1	219.6	224.8	229.9	234.6	239.1	243.1
194.7	208.2	216.1	214.8	207.4	204.8	212.9	220.0	227.0		239.2	276.8	293.8	309.2	320.3	323.7	318.0	312.8	316.7	320.9
170.2	172.4	174.6	176.7	178.8	180.7	182.6	184.2	185.7		187.0	188.0	188.7	188.2	189.3	189.1	188.6	187.8	186.7	185.5
219.6	228.2	231.9	240.2	241.6	239.8	233.4	228.2	225.9		227.5	234.2	242.8	248.2	257.4	267.9	278.6	289.7	301.2	312.5
282.9	283.1	283.3	283.6	284.3	285.9	286.8	287.9		288.9	290.1	291.3	292.6	293.8	295.0	296.1	297.1	298.2	299.2	
O 9	O 19	O 29	N 8	N 18	N 28	D 8	D 18	D 28		Ja. 7	Ja. 17	Ja. 27	F 6	F 16	F 26	Mr 7	Mr 17	Mr 27	Ap 6
270.2	276.5	282.0	289.6	296.4	303.2	310.2	317.2	324.4	1876	331.5	336.7	345.8	352.9	359.8	369	377	384.7	391.6	398.5
198.9	200.4	193.6	189.3	194.5	208.3	221.3	238.5	255.9		278.2	288.7	301.0	306.4	302.1	293.4	287.7	308.1	323.2	340.7
193.7	195.9	198.1	200.2	202.4	204.7	206.8	208.9	210.8		212.7	214.8	216.9	217.3	218.3	219.1	219.6	219.7	219.7	219.1
177.4	187.7	202.2	214.7	227.4	240.0	252.3	265.2	277.7		299.2	302.6	315.0	327.2	339.4	351.6	364	374	384	394
294.8	294.8	294.9	294.9	295.9	296.5	297.5	298.5		299.4	300.6	301.8	302.9	304.1	305.3	306.6	307.8	309.0	310.1	
O 8	O 18	O 28	N 7	N 17															

TABLE

Geocentric Places of Mars, Mercury, Jupiter, Venus and Saturn for every tenth day of current cycle.
Venus, A.D. 1765—A.D. 1999;

Day of I.S.Y.	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
Eng. date ..	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
1878 Mars ...	52.7	59.1	65.3	71.7	77.8	84.3	90.5	96.7	102.8	109.4	115.7	122.1	128.3	135.3	141.2	147.6	153.9	160.3
Merc. ...	15.6	26.9	29.6	22.5	19.2	25.2	38.3	54.8	73.0	91.8	110.2	127.3	141.8	150.1	150.2	142.6	140.7	148.0
Jup. ...	281.9	283.1	284.0	284.6	284.8	284.7	284.2	283.5	282.5	281.2	280.0	278.6	277.3	276.1	275.2	274.5	274.1	274.2
Ven. ...	315.2	323.3	332.6	342.1	353.5	4.3	15.8	26.7	38.2	50.4	62.0	73.6	85.6	97.6	109.8	122.0	134.1	146.4
Sat. ...	338.0	334.1	335.2	336.8	337.1	337.9	338.7	339.0	339.3	339.5	339.8	339.1	338.8	338.1	337.6	336.7	335.9	335.1
Eng. date ..	Ap 12	Ap 22	My 2	My 12	My 22	Je 1	Je 11	Je 21	Je 31	Je 11	Je 21	Je 31	Je 11	Je 21	Je 31	Je 11	Je 21	Je 31
1879 Mars ...	244.4	301.7	309.0	316.2	323.3	330.4	337.5	344.3	351.2	357.5	3.7	9.6	15.0	21.1	24.8	28.0	30.8	32.3
Merc. ...	10.8	5.8	0.2	4.8	16.8	32.1	50.4	69.1	88.2	105.0	121.1	132.0	138.9	127.4	123.2	128.7	140.9	156.4
Jup. ...	310.7	312.7	314.5	316.1	317.5	318.5	319.4	319.9	320.0	319.7	319.1	318.2	317.2	315.9	314.5	313.1	311.8	310.7
Ven. ...	30.1	42.1	53.9	65.9	77.4	89.0	100.2	111.4	121.9	132.1	141.7	150.4	157.7	163.4	165.6	165.4	160.7	154.9
Sat. ...	344.3	345.5	346.7	348.0	349.0	350.0	351.6	351.6	352.6	352.6	352.6	352.6	352.6	352.1	351.6	351.0	350.2	349.4
Eng. date ..	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
1880 Mars ...	67.8	73.4	79.2	85.1	91.2	97.2	103.3	109.4	115.5	121.4	127.8	134.0	140.4	146.6	153.1	159.6	165.9	172.6
Merc. ...	342.0	343.5	354.5	9.7	27.5	46.3	65.4	83.6	99.7	112.0	116.6	111.5	105.5	108.7	120.3	135.5	152.5	170.2
Jup. ...	338.7	341.0	343.8	345.5	347.6	349.5	351.2	352.8	354.1	355.1	355.8	356.1	356.3	355.9	355.2	354.3	353.1	351.7
Ven. ...	334.7	340.7	349.7	12.0	24.1	36.5	48.6	61.0	73.1	85.4	97.7	109.8	122.3	134.4	146.7	159.0	171.5	183.9
Sat. ...	356.0	357.8	358.6	359.9	1.0	2.2	3.3	4.1	4.9	5.7	6.2	6.2	6.5	6.2	5.9	5.5	4.8	4.1
Eng. date ..	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
1881 Mars ...	813.1	820.6	828.4	836.1	843.0	851.2	858.6	8.0	13.1	20.8	26.9	33.9	40.2	46.5	52.7	58.2	63.5	68.4
Merc. ...	333.0	347.8	4.8	23.5	42.5	61.1	77.9	91.3	97.9	105.0	112.0	116.6	111.5	105.5	108.7	120.3	135.5	152.5
Jup. ...	6.5	8.9	11.8	13.6	16.0	18.4	20.9	22.7	24.7	26.6	28.3	29.8	30.9	31.8	32.4	32.5	32.4	32.0
Ven. ...	30.6	28.1	24.0	17.5	13.8	14.1	18.2	23.8	31.7	40.9	50.4	60.7	71.2	82.4	94.1	105.6	117.5	129.8
Sat. ...	7.9	9.2	10.5	11.8	13.0	14.3	15.6	16.6	17.6	18.6	19.1	19.7	20.3	20.8	20.2	20.1	19.6	19.1
Eng. date ..	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
1882 Mars ...	84.2	89.6	94.8	99.8	105.0	110.6	116.5	122.3	128.3	134.3	140.2	146.7	152.7	159.1	165.5	172.2	178.7	185.4
Merc. ...	342.4	0.5	19.4	38.2	55.5	70.0	78.1	77.4	70.2	69.5	79.1	92.7	109.5	126.4	145.9	163.0	178.6	190.1
Jup. ...	33.8	36.1	38.4	40.7	43.1	45.5	47.9	50.2	52.5	54.8	56.9	59.0	60.9	62.6	64.2	65.5	66.5	67.3
Ven. ...	12.4	24.9	37.0	49.5	63.2	73.6	85.7	97.6	109.9	121.3	133.8	144.6	156.8	168.0	178.8	189.8	200.5	210.1
Sat. ...	20.2	21.5	22.8	24.2	25.5	26.8	28.1	29.3	30.5	31.6	32.3	33.1	33.9	34.1	34.4	34.7	34.4	34.0
Eng. date ..	Ap 12	Ap 22	My 2	My 12	My 22	Je 1	Je 11	Je 21	Je 31	Je 11	Je 21	Je 31	Je 11	Je 21	Je 31	Je 11	Je 21	Je 31
1883 Mars ...	330.3	336.2	346.0	353.7	1.2	8.8	16.1	23.5	30.8	37.9	44.8	51.7	58.2	64.9	71.2	77.4	83.4	89.2
Merc. ...	356.8	15.3	32.9	48.1	61.1	69.5	52.6	49.8	57.3	71.0	87.7	105.6	124.0	141.9	158.0	171.2	177.9	175.1
Jup. ...	62.9	63.5	65.4	67.4	69.5	71.6	74.0	76.2	78.6	80.9	83.2	85.5	87.6	89.9	91.9	93.8	95.6	97.1
Ven. ...	319.1	331.0	343.0	355.0	6.9	18.8	30.8	43.0	55.1	67.2	80.1	91.5	103.6	115.9	128.2	140.6	153.1	165.4
Sat. ...	32.5	33.8	35.1	36.5	37.8	39.1	40.5	41.8	43.1	44.3	45.4	46.4	47.6	48.0	48.4	48.9	48.9	48.8
Eng. date ..	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
1884 Mars ...	106.5	108.3	112.1	116.3	120.9	125.8	131.0	136.5	142.0	147.9	153.9	159.8	165.2	172.4	179.0	185.4	192.1	190.0
Merc. ...	10.7	26.4	37.7	49.6	61.8	80.3	95.9	109.0	120.2	130.3	140.1	149.2	157.2	164.1	169.1	172.2	175.6	178.5
Jup. ...	91.2	92.0	93.1	94.4	96.0	97.8	99.7	101.7	103.8	106.0	108.2	110.4	112.7	114.9	117.1	119.3	121.4	123.5
Ven. ...	44.2	55.1	65.1	74.6	83.4	90.2	95.1	97.2	95.5	89.9	84.2	79.6	76.1	81.6	88.8	96.6	104.5	117.9
Sat. ...	45.4	46.7	48.0	49.2	50.5	51.8	53.1	54.4	55.7	57.1	58.3	59.4	60.6	61.4	62.2	63.0	63.2	63.5
Eng. date ..	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
1885 Mars ...	346.8	354.5	2.2	9.6	17.3	24.6	31.9	39.2	46.2	53.1	60.1	66.7	73.5	79.9	86.5	92.7	98.9	105.0
Merc. ...	16.6	21.9	16.9	11.1	14.5	26.7	42.5	60.6	79.6	98.0	115.7	131.0	141.9	144.0	137.8	133.0	128.0	150.8
Jup. ...	122.4	122.2	122.8	122.7	123.4	124.5	125.8	127.2	128.9	130.7	132.7	134.7	136.9	139.1	141.2	143.5	145.7	147.9
Ven. ...	353.8	8.8	18.6	30.9	43.2	55.7	67.6	79.9	92.1	104.3	116.7	128.8	140.9	152.9	165.0	177.0	189.1	201.2
Sat. ...	58.4	59.5	60.7	61.8	63.1	64.4	65.7	67.0	68.4	69.8	71.1	72.3	73.5	74.5	75.5	76.5	77.0	77.5
Eng. date ..	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
1886 Mars ...	139.9	134.1	135.2	137.5	140.4	143.2	148.6	153.1	158.2	163.4	169.2	175.0	181.1	187.4	193.8	200.4	207.1	213.9
Merc. ...	359.4	352.4	354.2	4.9	20.1	37.9	56.1	73.0	92.9	109.9	121.3	116.4	121.9	115.8	119.0	180.1	145.1	162.2
Jup. ...	155.5	154.5	153.6	152.9	153.8	154.9	156.1	157.3	158.4	159.6	160.7	161.0	161.0	162.0	164.8	169.9	169.1	171.2
Ven. ...	314.8	324.1	332.6	343.1	354.1	4.9	15.8	27.2	38.9	50.7	62.4	74.3	86.2	98.1	110.4	122.6	134.8	147.1
Sat. ...	71.7	72.6	73.5	74.5	75.7	76.9	78.1	79.5	80.9	82.2	83.5	84.8	86.2	87.3	88.4	89.5	90.3	91.1
Eng. date ..	Ap 12	Ap 22	My 2	My 12	My 22	Je 1	Je 11	Je 21	Je 31	Je 11	Je 21	Je 31	Je 11	Je 21	Je 31	Je 11	Je 21	Je 31
1887 Mars ...	2.4	10.2	17.4	24.8	32.0	39.1	46.3	53.4	60.3	67.2	73.8	80.5	87.0	93.6	100.0	106.4	112.6	118.8
Merc. ...	334.6	343.2	357.6	15.8	33.9	53.0	71.5	88.3	101.6	108.5	105.0	98.8	109.6	109.6	124.1	141.0	158.8	176.4
Jup. ...	189.6	188.2	186.8	185.9	184.6	183.7	183.0	182.9	182.8	183.2	183.9	184.8	186.0	187.0	189.1	190.9	192.8	194.6
Ven. ...	3.8	42.7	54.8	66.6	77.7	89.5	100.7	111.7	122.2	132.4	141.7	150.2	157.0	161.9	164.8	162.5	159.8	156.6
Sat. ...	85.2	86.0	86.7	87.3	88.4	89.5	90.6	91.7	93.3	94.4	95.7	97.0	98.4	99.7	101.0	102.2	103.2	104.2
Eng. date ..	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
1888 Mars ...	1.8.1	174.7	172.0	168.9	169.6	170.6	172.8	175.8	179.4	183.7	188.6	193.7	199.5	205.6	211.5	217.1	224.4	231.1
Merc. ...	355.9	352.6	10.7	29.7	48.6	65.6	80.4	8.8	88.6	81.3	80.1	84.9	102.5	119.5	137.3	155.2	172.4	187.8
Jup. ...	223.4	222.5	221.5	220.2	219.0	217.6	216.4	215.2	214.3	213.7	213.4	213.4	213.8	214.4	215.3	216.5	218.0	219.7
Ven. ...	334.7	34.0	0.2	12.7	24.7	37.0	49.3	61.5	73.6	86.1	98.2	110.5	122.9	134.9	147.4	159.5	172.0	184.7
Sat. ...	99.0	99.4	99.8	100.3	101.2	102.1	102.9	104.1										

V-B—cont.

Mars, A.D. 1637—A.D. 1999; Mercury, A.D. 1645—A.D. 1999; Jupiter, A.D. 1656—A.D. 1999;
Saturn, A.D. 1617—A.D. 1999—cont.

180	190	200	210	220	230	240	250	260		270	280	290	300	310	320	330	340	350	360
O 8	O 18	O 28	N 7	N 17	N 27	D 7	D 17	D 27		Ja 6	Ja 16	Ja 26	F 5	F 15	F 25	Mr 7	Mr 17	Mr 27	Ap 6
166.8	178.4	178.8	186.5	193.0	199.9	208.4	213.8	219.9	1879	226.9	233.8	240.7	247.7	251.8	261.7	279.0	276.1	283.4	290.8
161.1	177.1	184.3	211.7	228.3	243.1	254.0	256.9	250.8		215.6	249.6	260.7	275.8	293.1	311.3	324.3	340.2	0.6	9.6
274.5	275.1	276.2	277.4	278.9	280.7	282.5	284.5	286.6		289.9	291.3	293.5	295.8	298.8	300.6	308.0	305.3	307.6	309.7
158.7	171.0	183.4	196.4	208.5	221.2	232.7	246.3	259.0		271.8	281.8	290.9	309.6	321.8	334.5	347.0	359.4	11.5	28.5
334.3	338.7	348.1	332.5	332.4	332.3	332.2	332.7	333.2		333.7	334.5	335.4	336.2	337.4	338.6	339.8	341.1	342.4	343.7
O 9	O 19	O 29	N 8	N 18	N 28	D 8	D 18	D 28		Ja 7	Ja 17	Ja 27	F 6	F 16	F 26	Mr 7	Mr 17	Mr 27	Ap 6
32.5	81.5	29.8	20.6	24.1	22.3	20.8	20.7	22.1	1880	24.2	25.9	30.3	34.3	38.9	43.6	48.6	53.9	59.2	64.7
172.7	190.8	206.4	223.6	238.0	241.0	238.0	230.6	231.2		241.1	255.1	271.9	289.0	307.8	324.8	339.6	351.0	351.6	345.0
309.9	309.4	309.2	309.4	309.9	310.7	311.8	313.2	314.8		316.8	318.6	320.8	323.1	325.4	327.7	330.1	332.5	334.9	337.4
15.12	159.3	163.5	159.6	167.5	174.9	186.4	197.2	208.2		219.7	231.5	243.4	255.4	267.7	279.9	291.9	304.1	316.4	328.8
346.6	347.8	347.1	346.3	345.9	345.5	345.2	345.4	345.7		348.0	348.7	347.4	348.1	349.2	350.3	351.4	352.7	354.0	355.3
O 8	O 18	O 28	N 7	N 17	N 27	D 7	D 17	D 27		Ja 6	Ja 16	Ja 26	F 5	F 15	F 25	Mr 7	Mr 17	Mr 27	Ap 6
179.2	189.0	192.6	199.4	206.2	213.2	220.0	227.1	234.2	1881	241.4	244.9	256.2	263.5	270.9	278.6	286.2	293.8	301.4	309.2
187.8	204.0	217.4	224.9	224.0	219.3	214.4	221.5	225.2		251.3	268.5	286.8	303.6	318.8	330.2	333.9	328.8	322.9	327.0
350.4	349.0	347.8	346.7	346.0	345.6	345.5	345.8	346.5		347.4	348.6	350.1	351.8	353.7	355.9	358.2	0.3	2.5	4.8
198.2	208.6	221.0	233.8	246.6	257.8	270.1	282.4	294.5		306.3	317.8	329.4	340.4	351.2	1.2	10.6	19.0	25.4	29.6
3.4	2.6	1.8	0.9	0.3	359.7	359.2	359.1	359.0		359.0	359.5	0.1	0.6	1.5	2.4	3.4	4.6	5.8	7.1
73.0	78.9	80.2	82.5	83.8	84.0	82.8	80.3	78.8	1882	73.2	70.2	67.9	66.9	67.4	68.4	71.3	74.4	78.2	82.2
198.3	207.9	209.5	202.1	198.2	203.1	215.4	230.9	247.9		265.2	282.6	298.3	310.6	316.2	312.5	305.9	307.3	318.3	333.8
31.2	30.1	28.9	27.5	26.2	24.9	23.7	22.8	22.2		21.9	21.9	22.4	23.1	24.1	25.5	27.0	28.8	30.7	32.3
141.5	153.6	165.6	178.0	190.3	202.8	215.2	227.8	240.4		253.9	265.5	278.8	290.9	303.5	316.0	328.6	341.0	353.1	36.0
18.5	17.7	16.9	16.0	15.3	14.6	13.8	13.4	13.1		12.8	13.0	13.2	13.5	14.4	15.2	15.9	17.0	18.1	19.3
192.2	199.0	205.9	212.9	219.9	227.1	234.3	241.6	249.0	1883	256.5	264.2	271.7	279.4	287.2	294.9	302.6	310.6	318.7	326.3
194.1	189.1	182.9	185.5	190.3	210.8	227.1	244.7	261.8		277.9	291.2	298.5	306.8	289.4	288.5	297.6	311.0	328.6	347.1
67.7	67.7	67.4	66.9	63.0	64.8	63.5	62.2	60.8		59.6	58.5	57.7	57.2	57.0	57.8	57.7	58.6	59.7	61.0
219.7	228.0	234.0	239.3	238.9	235.6	229.1	224.2	223.4		225.5	231.4	238.8	247.7	257.3	267.7	278.7	290.0	301.8	313.3
38.6	32.9	32.3	31.5	30.6	29.9	28.9	28.4	27.8		27.8	27.2	27.2	27.2	27.7	28.3	28.9	29.9	30.9	31.9
O 9	O 19	O 29	N 8	N 18	N 28	D 8	D 18	D 28		Ja 7	Ja 17	Ja 27	F 6	F 16	F 26	Mr 7	Mr 17	Mr 27	Ap 6
94.8	100.0	104.8	109.3	113.1	116.4	119.0	120.4	121.1	1884	120.6	118.5	115.6	111.8	107.9	104.8	102.4	101.9	102.4	104.3
167.8	167.1	176.8	190.5	206.7	223.1	241.2	257.8	271.7		280.4	281.7	274.2	271.2	277.6	290.6	306.8	324.7	343.8	1.8
98.8	99.6	100.5	100.9	101.1	101.1	100.5	99.8	98.8		97.6	96.1	94.8	93.5	92.4	91.5	90.8	90.5	90.4	90.9
177.9	190.4	202.8	215.2	227.9	240.5	253.0	267.7	278.2		290.7	303.1	315.4	327.7	339.7	351.9	3.7	15.6	27.3	38.8
48.7	48.1	47.5	47.0	46.2	45.4	44.5	43.8	43.1		42.3	42.0	41.7	41.4	41.7	42.0	42.2	43.0	43.8	44.7
O 8	O 18	O 28	N 7	N 17	N 27	D 7	D 17	D 27		Ja 6	Ja 16	Ja 26	F 5	F 15	F 25	Mr 7	Mr 17	Mr 27	Ap 6
205.9	212.8	219.8	226.9	234.4	241.8	249.2	256.3	264.4	1885	272.2	279.7	287.7	295.5	303.4	311.3	319.1	326.1	334.9	342.7
157.4	170.5	186.6	203.7	221.1	237.5	254.8	263.1	268.0		260.2	254.7	258.5	270.1	285.5	302.8	321.0	339.1	356.4	11.0
125.4	127.1	128.7	130.0	131.2	132.0	132.7	133.0	132.7		132.4	131.6	130.7	129.4	128.2	126.9	125.6	124.4	123.4	122.6
128.2	139.6	150.6	162.2	173.9	186.1	198.1	209.7	222.7		235.0	247.5	259.9	272.5	285.0	297.6	309.8	322.4	334.8	347.2
68.7	63.4	63.1	63.5	61.9	61.2	60.4	59.6	58.8		57.9	57.4	56.8	56.2	56.2	56.2	56.2	56.8	57.4	57.9
110.8	116.6	122.1	127.4	132.5	137.3	141.7	145.3	148.7	1886	151.0	152.7	153.2	152.4	150.0	148.6	143.0	139.2	136.2	134.5
165.8	182.9	200.4	217.3	232.7	244.9	256.2	266.6	280.4		240.5	250.5	264.9	281.4	298.3	317.4	334.4	349.7	0.4	2.5
150.0	152.0	154.0	155.9	157.7	159.2	160.6	161.7	162.8		163.1	163.4	163.8	163.8	162.1	161.2	160.0	158.7	157.5	156.1
218.0	224.9	230.5	248.1	259.7	270.3	280.8	290.6	299.5		307.0	312.9	315.9	316.8	309.6	303.1	299.6	300.2	303.9	310.0
78.0	77.9	77.8	77.8	77.2	76.6	76.1	75.2	74.8		73.5	72.8	72.1	71.3	71.0	70.7	70.4	70.8	71.1	71.4
220.9	228.0	235.2	242.5	249.1	257.5	265.1	272.9	280.8	1887	288.3	298.2	304.1	312.0	319.7	327.6	335.5	343.6	350.8	358.5
178.9	197.0	213.1	226.3	234.1	233.0	225.8	223.1	230.5		245.5	260.6	278.2	296.0	313.3	328.7	340.1	344.4	338.9	333.8
173.4	175.6	177.8	179.9	182.0	184.0	185.9	187.7	189.2		190.5	191.7	192.6	193.1	193.4	193.4	192.9	192.3	191.3	190.1
159.4	171.7	184.1	196.7	209.3	221.8	234.8	247.1	259.8		272.5	285.0	307.6	310.2	322.5	335.2	347.7	0.0	12.5	24.1
91.8	92.0	92.2	92.4	92.1	91.8	91.4	90.6	89.8		89.1	88.3	87.5	86.6	86.1	85.6	85.0	85.0	85.0	85.0
O 9	O 19	O 29	N 8	N 18	N 28	D 8	D 18	D 28		Ja 7	Ja 17	Ja 27	F 6	F 16	F 26	Mr 7	Mr 17	Mr 27	Ap 6
124.9	130.8	136.6	142.3	148.0	153.6	159.9	163.8	168.7	1888	173.2	177.2	180.9	183.8	186.0	187.4	187.3	185.9	182.9	179.6
198.2	207.5	217.2	218.4	211.5	207.1	212.6	224.7	240.1		257.3	274.8	292.2	307.9	320.5	328.4	322.5	316.0	317.6	328.1
194.9	199.1	201.3	203.5	205.7	207.9	210.1	212.2	214.1		216.1	217.9	219.5	221.0	222.1	223.0	223.7	221.0	224.1	223.6
147.7	148.4	152.4	158.9	167.4	179.3	189.8	197.5	208.7		220.1	232.0	243.9	256.0	268.2	280.5	292.6	304.7	317.0	329.4
105.1	105.5	106.0	106.4	106.4	106.3	106.2	106.6	105.0		104.3	103.5	102.7	101.8	101.1	100.4	99.7	99.5	99.2	98.9
O 8	O 18	O 28	N 7	N 17	N 27	D 7	D 17	D 27		Ja 6	Ja 16	Ja 26	F 5	F 15	F 25	Mr 7	Mr 17	Mr 27	Ap 6
338.3	345.8	352.5	359.8	367.3	374.9	382.4	390.1	397.1	1889	305.5	313.3	321.0	328.7	336.2	344.0	351.4	358.9	363	13.7
199.3	208.3	198.1	192.1	194.6	205.1	219.7	236.4	253.9		271.2	287.4	300.8	308.2	306.7	299.4	298.7	307.1	321.6	334.6
221.4	234.4	225.5	227.5	229.9	232.0	234.3	236.5	238.8		241.0	243.2	245.3	247.3	249.1	250.0	252.3	253.6	254.6	255.4
196.7	209.1	221.5	233.8	246.9	258.3	270.5	282.7	294.8		305.5	318.0	329.7	340.4	351.3	1.0	10.3	18.3	24.5	27.8
117.6	118.4	119.1	119.8	119.9	120.1	120.3	119.0	119.5		119.1	118.4	117.7	116.9	116.1	115.3	114.4	113.9	113.5	112.9
187.5	148.7	149.8	155.9	161.9	167.7														

TABLE

Geocentric Places of Mars, Mercury, Jupiter, Venus and Saturn for every tenth day of current cycle.
Venus, A.D. 1765—A.D. 1999;

Day of I.S.Y.	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
Eng. date ...	Ap 12	Ap 22	My 2	My 12	My 22	Je 1	Je 11	Je 21	Je 31	Je 11	Je 21	Je 31	Je 11	Je 21	Je 31	Je 11	Je 21	Je 31
1891 Mars ...	82.1	89.2	45.9	52.7	59.4	66.2	72.9	79.3	85.8	92.4	98.9	105.4	111.8	118.4	124.6	130.9	137.2	143.6
Merc. ...	14.7	27.4	32.5	28.3	22.1	25.6	37.2	53.0	71.0	80.7	108.2	123.7	140.9	151.4	153.6	147.4	142.6	147.9
Jup. ...	314.7	316.7	318.5	320.2	321.7	322.9	323.9	324.6	324.8	324.7	324.4	323.7	323.6	321.4	320.1	318.3	317.4	316.2
Ven. ...	319.9	331.8	345.6	355.6	7.7	19.6	31.7	43.8	55.9	68.0	80.3	92.2	104.0	116.7	129.0	141.4	153.8	166.2
Sat. ...	140.5	140.1	139.7	139.5	139.7	139.9	140.0	140.7	141.5	142.1	142.8	143.2	143.5	143.6	143.7	143.9	144.0	144.1
Eng. date ...	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
1892 Mars ...	262.9	269.0	274.1	278.4	282.9	286.9	290.1	293.4	294.8	294.5	294.0	290.8	287.3	283.3	284.7	285.2	286.7	288.2
Merc. ...	13.1	10.8	3.7	4.8	15.3	30.5	48.4	67.1	86.0	103.7	119.9	132.4	137.0	132.5	126.0	128.7	130.9	154.7
Jup. ...	342.7	345.0	347.3	349.6	351.7	353.7	355.5	357.2	358.5	359.7	0.6	1.1	1.2	1.1	0.6	359.7	358.8	357.3
Ven. ...	44.6	55.2	65.3	75.4	82.8	89.3	94.0	94.4	91.9	85.7	80.1	77.2	78.3	82.9	89.5	98.3	107.7	117.3
Sat. ...	154.1	153.5	153.0	152.4	152.3	152.3	152.2	152.7	153.3	153.7	154.6	155.5	156.4	157.6	158.6	159.8	161.1	162.4
Eng. date ...	Ap 12	Ap 22	My 2	My 12	My 22	Je 1	Je 11	Je 21	Je 31	Je 11	Je 21	Je 31	Je 11	Je 21	Je 31	Je 11	Je 21	Je 31
1893 Mars ...	47.0	53.3	59.9	66.3	72.7	79.1	85.5	92.0	98.3	104.7	111.1	117.3	123.7	130.2	136.5	142.8	149.3	155.7
Merc. ...	346.0	344.8	353.2	7.9	25.4	44.0	63.1	81.4	98.5	112.1	119.0	115.8	109.2	109.5	118.5	133.8	150.5	168.2
Jup. ...	10.2	12.6	15.0	17.4	19.7	21.1	24.4	26.6	28.6	30.6	32.3	33.9	35.3	36.3	37.0	37.3	37.6	37.2
Ven. ...	354.8	7.1	19.0	31.3	44.0	56.3	68.5	80.7	92.9	105.1	117.5	129.6	141.6	152.7	163.6	177.8	189.8	201.6
Sat. ...	167.4	166.7	166.0	165.4	165.1	164.8	164.5	164.7	164.9	165.2	166.0	166.8	167.5	168.6	169.7	170.7	171.9	173.1
Eng. date ...	Ap 12	Ap 22	My 2	My 12	My 22	Je 1	Je 11	Je 21	Je 31	Je 11	Je 21	Je 31	Je 11	Je 21	Je 31	Je 11	Je 21	Je 31
1894 Mars ...	286.7	293.7	300.4	307.4	314.2	320.9	327.4	333.9	339.9	345.9	351.2	356.0	360.2	363.8	367.4	370.4	372.8	375.6
Merc. ...	332.8	345.8	2.7	21.1	40.2	59.0	76.3	91.0	103.0	112.2	121.1	129.4	136.9	143.6	149.3	154.8	159.3	163.9
Jup. ...	37.7	39.8	42.0	44.4	46.7	49.1	51.5	53.8	56.1	58.4	60.7	62.7	64.8	66.6	68.2	69.6	70.8	71.6
Ven. ...	314.3	323.0	332.8	342.3	352.0	5.1	16.4	27.7	39.2	51.3	63.0	74.8	86.6	98.7	110.9	123.2	135.5	147.6
Sat. ...	180.4	179.6	178.8	178.1	177.6	177.1	176.6	176.6	176.7	176.7	177.2	177.7	178.3	179.2	180.1	181.0	182.2	183.4
Eng. date ...	Ap 12	Ap 22	My 2	My 12	My 22	Je 1	Je 11	Je 21	Je 31	Je 11	Je 21	Je 31	Je 11	Je 21	Je 31	Je 11	Je 21	Je 31
1895 Mars ...	61.7	67.8	73.7	79.8	85.9	91.9	98.2	104.4	110.5	116.9	122.9	129.3	135.6	142.0	148.4	154.7	161.4	167.6
Merc. ...	340.4	354.5	17.3	36.0	54.0	69.3	79.8	81.5	74.8	71.5	78.3	91.2	107.7	125.2	143.6	161.0	177.1	192.9
Jup. ...	65.8	67.4	69.2	71.1	73.1	75.2	77.5	79.7	82.1	84.4	86.6	89.0	91.2	93.3	95.4	97.4	99.3	100.9
Ven. ...	31.8	43.1	55.8	68.7	78.4	89.3	100.8	111.8	122.1	132.1	141.4	149.6	156.2	160.6	161.7	158.9	152.9	147.5
Sat. ...	193.0	192.2	191.4	190.6	190.0	189.4	188.7	188.5	188.4	188.1	188.4	188.7	189.0	189.8	190.7	191.5	192.6	193.7
Eng. date ...	Ap 11	Ap 21	My 1	My 11	My 21	My 31	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30	Je 10	Je 20	Je 30
1896 Mars ...	308.0	313.5	321.1	324.5	331.1	334.6	350.9	358.2	5.1	12.2	18.7	25.4	31.7	37.6	43.4	49.5	53.3	57.6
Merc. ...	354.7	13.2	31.4	47.3	69.2	63.0	57.5	52.3	57.1	69.6	85.6	103.6	121.9	140.2	158.6	170.8	179.3	178.2
Jup. ...	95.4	98.1	97.0	98.3	99.8	101.5	103.3	105.4	107.4	109.5	111.7	113.9	116.2	118.4	120.7	122.9	124.9	127.1
Ven. ...	333.4	348.6	0.9	13.4	25.4	37.7	49.8	62.2	74.4	86.8	98.9	111.2	123.4	135.6	148.1	160.2	172.7	185.1
Sat. ...	205.2	204.4	203.8	203.9	202.2	201.5	200.7	200.4	200.0	199.6	199.7	199.8	200.0	200.5	201.3	201.8	202.7	203.7
Eng. date ...	Ap 12	Ap 22	My 2	My 12	My 22	Je 1	Je 11	Je 21	Je 31	Je 11	Je 21	Je 31	Je 11	Je 21	Je 31	Je 11	Je 21	Je 31
1897 Mars ...	77.8	83.0	88.4	94.0	99.7	105.3	111.2	117.2	123.0	128.3	135.4	141.5	147.9	154.2	160.6	167.2	173.6	180.2
Merc. ...	8.8	25.3	38.2	44.5	39.8	33.5	38.5	47.7	63.3	81.3	100.0	118.1	135.6	150.7	161.3	169.8	167.3	152.5
Jup. ...	126.8	126.5	126.5	126.7	127.4	128.4	129.4	130.8	132.4	134.1	136.1	138.1	140.2	142.3	144.4	146.7	148.9	151.1
Ven. ...	25.8	22.1	15.4	10.6	6.8	10.7	15.8	22.9	31.3	40.7	50.8	61.4	72.0	83.3	94.9	106.6	118.5	130.4
Sat. ...	217.1	216.4	215.7	214.9	214.1	213.3	212.6	212.1	211.5	211.0	210.9	210.8	210.8	211.2	211.7	212.2	212.8	213.4
Eng. date ...	Ap 12	Ap 22	My 2	My 12	My 22	Je 1	Je 11	Je 21	Je 31	Je 11	Je 21	Je 31	Je 11	Je 21	Je 31	Je 11	Je 21	Je 31
1898 Mars ...	823.8	831.6	839.4	847.0	854.5	2.1	9.6	16.9	24.1	31.2	38.1	44.9	51.7	58.2	64.4	70.5	76.5	82.0
Merc. ...	16.7	24.1	21.7	14.7	15.5	25.8	40.9	56.7	73.3	95.7	113.6	129.8	142.3	147.0	142.7	135.8	138.6	149.0
Jup. ...	160.1	159.0	158.2	157.8	156.9	156.9	157.0	157.7	158.1	159.0	160.9	162.5	164.3	166.1	168.1	170.2	172.3	174.4
Ven. ...	14.8	26.1	38.4	50.2	62.7	74.7	86.8	98.7	110.5	122.3	134.0	145.6	157.0	168.3	179.3	190.0	200.3	209.7
Sat. ...	228.7	228.1	227.5	226.9	226.1	225.3	224.6	223.9	223.2	222.6	222.3	222.0	221.8	222.0	222.3	222.6	223.3	224.0
Eng. date ...	Ap 12	Ap 22	My 2	My 12	My 22	Je 1	Je 11	Je 21	Je 31	Je 11	Je 21	Je 31	Je 11	Je 21	Je 31	Je 11	Je 21	Je 31
1899 Mars ...	96.9	106.4	104.7	109.5	114.5	119.6	125.2	130.6	136.6	142.4	148.3	154.6	160.8	167.1	173.5	180.0	186.9	193.5
Merc. ...	4.1	86.6	85.6	4.0	18.6	35.8	54.2	73.3	91.6	108.6	121.8	129.2	136.5	143.8	151.2	158.6	166.0	173.4
Jup. ...	194.2	191.9	191.7	190.3	189.1	188.1	187.4	187.0	187.0	187.2	187.7	188.6	189.0	189.0	189.4	189.4	189.1	189.1
Ven. ...	320.3	331.4	344.2	356.2	8.1	20.2	32.2	44.4	56.0	68.6	80.9	92.8	105.2	117.3	129.8	142.0	154.0	166.8
Sat. ...	240.1	239.7	239.3	238.7	238.0	237.3	236.6	235.8	235.1	234.3	233.6	233.4	233.0	233.0	233.1	233.1	233.7	234.3
Eng. date ...	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Je 32	Je 12	Je 22	Je 32	Je 12	Je 22	Je 32	Je 12	Je 22	Je 32
1900 Mars ...	340.6	348.5	356.0	3.7	11.3	18.6	25.9	33.2	40.5	47.5	54.2	61.1	67.7	74.4	80.8	87.0	93.8	99.3
Merc. ...	336.2	342.6	356.1	18.0	31.6	50.7	69.4	86.8	101.2	110.3	119.3	129.9	140.9	150.7	158.2	165.6	172.8	174.8
J. p. ...	227.9	227.2	226.2	225.1	223.8	222.4	221.1	219.9	219.0	218.2	217.7	217.6	217.9	218.4	219.3	220.4	221.8	223.3
Ven. ...	44.7	55.1	65.1	74.3	82.5	89.5	92.2	92.5	88.6	82.8	76.7	74.9	77.0	82.0	89.4	97.7	107.6	117.6
Sat. ...	251.1	250.8	250.6	250.3	249.7	249.1	248.4	247.7	246.9	246.2	245.5	244.9	245.2	244.1	244.0	243.9	244.3	244.8
Eng. date ...	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Je 32	Je 12	Je 22	Je 32	Je 12	Je 22	Je 32	Je 12	Je 22	Je 32
1901 Mars ...	121.6	122.9	125.3	128.4	132.1	136.3	141.1	146.1	151.5	157.1	163.0	168.8	175.1	181.2	187.8	194.3	201.1	208.0
Merc. ...	334.6	350.5	8.6	27.4	48.1	64.3	79.8	90.6	92.5	85.8	82.1	88.6	101.2	117.5	135.0	153.1	170.8	186.7
Jup. ...	260.0	260.3	260.4	260.1	259.5	258.6	257.4	256.2	254.9	253.5	252.3	251.0	250.4	249.8	249.7	249.9	250.3	251.1
Ven. ...	355.2	7.6	20.0	32.3	44.2	56.9	69.2	81.3	93.5	105.7	118.1	130.0	142.3	1				

V-B—cont.

Mars, A.D. 1637—A.D. 1999; Mercury, A.D. 1645—A.D. 1999; Jupiter, A.D. 1656—A.D. 1999;
Saturn, A.D. 1617—A.D. 1999—cont.

180	190	200	210	220	230	240	250	260		270	280	290	300	310	320	330	340	350	360
O 9	O 19	O 29	N 8	N 18	N 28	D 8	D 18	D 28		Ja 7	Ja 17	Ja 27	F 6	F 16	F 26	Mr 7	Mr 17	Mr 27	Ap 6
149.9	156.2	162.3	168.9	174.9	181.3	187.5	193.7	199.9	1892	206.1	212.4	218.7	224.8	230.9	237.0	243.2	248.9	254.8	260.6
160.8	176.2	192.2	209.7	226.6	242.0	254.2	259.3	255.4		248.5	249.9	250.7	274.2	291.2	309.1	327.4	344.6	359.9	10.8
315.2	314.5	314.3	314.1	314.5	315.2	316.9	317.4	318.9		320.7	322.6	324.7	326.9	329.1	331.4	333.4	336.3	338.7	344.1
178.7	191.2	203.6	216.2	228.7	241.8	253.8	266.5	279.0		291.5	303.9	316.2	328.3	340.7	352.7	364.3	375.4	385.8	396.3
162.8	158.9	155.8	156.1	156.9	157.7	158.5	158.8	159.2		159.5	159.3	159.1	158.9	158.2	157.6	156.9	156.1	155.3	154.4
O 8	O 18	O 28	N 7	N 17	N 27	D 7	D 17	D 27		Ja 6	Ja 16	Ja 26	F 5	F 15	F 25	Mr 7	Mr 17	Mr 27	Ap 6
293.0	297.4	302.8	307.5	313.1	319.1	325.3	331.6	337.9	1893	344.3	350.9	357.5	4.0	10.6	17.2	23.7	30.5	36.8	43.3
171.2	188.7	208.4	228.3	235.6	242.9	241.8	234.2	232.3		240.0	253.8	270.1	287.7	305.6	323.1	338.7	350.6	354.7	349.8
356.1	354.7	353.4	352.2	351.3	350.8	350.6	350.7	351.2		352.0	353.1	354.4	356.1	357.9	359.9	2.0	4.3	6.5	8.9
128.5	139.9	150.9	162.7	174.6	186.6	198.8	211.2	223.2		235.8	248.3	260.7	275.3	286.8	298.5	310.6	325.2	335.6	347.2
163.6	164.7	165.9	167.0	168.0	169.0	170.0	170.5	171.0		171.5	171.5	171.6	171.6	171.1	170.6	170.1	169.3	168.6	167.8
162.1	168.6	175.1	181.4	188.1	194.6	201.2	207.7	214.4	1894	221.0	227.8	234.6	241.4	248.2	255.1	262.0	269.0	275.9	283.0
185.8	202.4	216.5	226.1	227.4	220.5	216.3	221.7	223.7		249.3	266.5	281.7	301.7	317.7	330.3	339.4	333.3	326.5	327.5
36.6	35.7	34.5	33.2	31.8	30.5	29.2	28.2	27.4		26.9	26.8	27.1	27.6	28.5	29.7	31.1	32.8	34.5	36.6
213.4	225.5	237.0	248.4	259.7	270.5	280.7	290.5	299.1		306.0	311.4	313.0	311.1	304.7	299.7	299.6	298.2	303.2	300.3
174.2	176.4	176.6	177.9	178.9	179.9	181.0	181.7	182.4		183.2	183.4	183.6	183.7	183.4	183.1	182.8	182.1	181.4	180.8
O 9	O 19	O 29	N 8	N 18	N 28	D 8	D 18	D 28		Ja 7	Ja 17	Ja 27	F 6	F 16	F 26	Mr 8	Mr 18	Mr 28	Ap 7
3.5	0.8	358.4	357.5	357.4	358.5	0.8	3.2	6.6	1895	10.5	14.7	19.7	24.9	30.1	35.4	41.1	46.9	52.7	58.5
197.1	208.6	212.3	207.5	201.1	203.3	214.1	228.8	245.6		263.3	280.5	296.9	310.3	318.3	316.9	307.6	308.4	317.5	331.4
72.3	72.4	72.4	71.9	71.2	70.1	68.8	67.4	66.2		64.9	64.7	62.7	62.1	61.8	61.8	62.2	62.8	63.8	65.0
169.9	172.4	184.8	197.3	209.9	222.3	235.1	247.7	260.3		272.9	285.6	290.4	310.4	323.3	336.0	348.4	360.3	371.0	381.4
184.6	185.8	187.0	188.2	189.3	190.4	191.5	192.3	193.1		194.0	194.5	195.0	195.4	195.2	195.1	195.0	194.4	193.8	193.8
O 9	O 19	O 29	N 8	N 18	N 28	D 8	D 18	D 28		Ja 7	Ja 17	Ja 27	F 6	F 16	F 26	Mr 7	Mr 17	Mr 27	Ap 6
174.2	180.9	187.7	194.4	201.1	207.9	214.7	221.6	228.6	1896	235.7	242.9	250.0	257.4	264.7	271.9	279.6	286.9	294.5	302.0
196.2	193.6	180.1	180.3	195.1	208.9	225.2	242.4	260.0		276.4	290.6	299.9	300.9	299.8	299.5	296.9	300.9	326.5	341.7
102.4	103.6	104.5	105.2	105.6	105.6	103.8	104.6	103.7		102.5	101.2	99.9	98.5	97.4	96.3	95.4	95.1	94.8	95.1
145.0	146.7	151.5	158.4	166.6	176.5	186.6	197.8	209.1		220.4	232.5	244.3	256.4	268.6	280.9	293.1	305.3	317.6	330.1
194.8	196.0	197.2	198.3	199.5	200.5	201.8	202.6	203.7		204.6	205.2	205.8	206.4	206.6	206.7	206.8	206.3	205.9	205.4
O 8	O 18	O 28	N 7	N 17	N 27	D 7	D 17	D 27		Ja 6	Ja 16	Ja 26	F 5	F 15	F 25	Mr 7	Mr 17	Mr 27	Ap 6
61.1	63.8	65.4	66.0	65.2	62.9	60.2	56.9	53.9	1897	51.7	50.6	51.1	52.5	54.9	57.9	61.6	65.7	70.3	75.2
171.8	168.8	175.9	189.0	204.9	225.9	239.2	256.1	270.9		281.5	287.9	279.0	273.5	277.6	289.3	304.8	322.7	341.0	359.3
129.0	130.7	132.4	133.8	135.1	136.0	136.7	137.1	137.1		136.9	136.3	135.3	134.2	132.9	131.6	130.2	128.0	127.9	127.1
197.4	209.8	222.2	234.5	243.6	259.0	271.2	283.2	295.7		307.6	318.6	330.0	340.8	351.2	361.1	370.0	378.1	385.8	393.0
204.7	205.9	207.1	208.2	209.4	210.6	211.7	212.8	213.9		214.9	215.6	216.8	217.1	217.4	217.6	218.0	217.9	217.6	217.4
166.9	193.7	200.6	207.4	214.4	221.6	228.7	236.0	243.2	1898	250.7	257.9	265.6	273.2	280.8	288.5	296.3	304.1	311.9	319.7
157.5	169.2	184.6	205.5	218.8	235.9	251.1	263.3	269.7		264.9	257.8	259.3	269.7	283.7	300.8	318.9	337.3	354.8	369.3
168.2	155.3	157.4	159.4	161.1	162.8	164.2	165.4	166.4		167.0	167.4	167.5	167.3	166.6	165.7	164.7	163.4	162.1	160.8
142.4	154.6	166.7	179.2	191.6	204.0	216.6	227.0	241.7		254.4	267.0	279.6	292.1	304.7	317.3	329.9	342.8	354.7	366.2
314.8	215.9	217.3	218.1	219.4	220.7	221.9	223.0	224.1		225.1	226.0	226.8	227.7	228.1	228.5	228.8	228.8	228.7	228.7
O 9	O 19	O 29	N 8	N 18	N 28	D 8	D 18	D 28		Ja 7	Ja 17	Ja 27	F 6	F 16	F 26	Mr 8	Mr 18	Mr 28	Ap 7
87.2	92.0	96.6	100.3	103.6	106.0	107.5	107.8	106.9	1899	104.3	100.9	97.2	93.6	90.7	89.3	89.0	90.0	92.1	94.9
164.1	180.7	198.1	215.4	231.8	244.5	256.1	269.9	282.3		241.5	249.7	263.0	279.3	297.0	315.2	332.8	348.8	364.1	378.5
176.0	178.9	181.0	183.2	185.3	187.4	189.3	191.0	192.7		194.2	195.3	196.4	197.0	197.5	197.6	197.3	196.8	195.8	194.8
218.5	225.9	231.8	238.7	245.6	252.5	259.0	265.5	271.0		223.3	230.0	238.4	247.7	257.7	268.3	279.5	290.8	302.4	314.0
224.7	225.7	226.7	227.8	229.0	230.2	231.3	232.4	233.6		234.7	235.7	236.7	237.7	238.3	238.9	239.6	239.7	239.9	240.0
200.4	207.3	214.2	221.5	228.6	235.9	243.8	250.7	258.3	1900	265.9	273.7	281.4	289.1	297.0	304.8	312.8	320.3	328.5	336.6
177.5	195.0	211.6	225.6	238.2	249.3	259.3	265.1	270.4		243.0	258.8	276.1	293.9	311.3	327.4	344.0	361.0	378.7	396.7
200.2	202.4	204.5	206.7	208.9	211.2	213.8	216.5	217.6		219.5	221.3	223.1	224.6	225.0	225.9	227.7	228.1	228.3	228.2
178.8	191.8	204.2	216.8	229.3	241.9	254.6	267.0	279.7		292.1	304.5	316.6	328.9	341.1	353.1	364.7	375.8	386.1	395.2
234.9	235.8	236.7	237.6	238.4	239.3	240.2	241.0	241.8		244.5	245.6	246.6	247.7	248.5	249.3	250.1	250.4	250.5	251.2
105.1	110.6	115.8	120.8	125.6	129.9	133.6	136.7	139.1	1901	140.5	141.1	139.7	137.3	134.0	130.4	126.6	123.5	121.5	121.3
191.4	206.4	217.6	221.4	216.1	210.0	212.5	223.3	238.3		255.0	272.7	290.0	306.5	320.2	328.1	327.7	319.8	318.8	327.2
225.1	227.0	229.0	231.1	233.4	235.5	237.9	240.1	242.4		244.5	246.8	248.9	250.9	252.9	254.7	256.3	257.7	258.8	259.6
128.4	139.9	151.3	163.1	174.1	187.1	199.3	211.5	223.7		235.9	248.8	261.1	273.7	286.3	298.8	311.2	323.6	336.2	348.6
245.1	246.0	246.8	247.5	248.7	249.7	250.8	252.0	253.2		254.3	255.4	256.5	257.7	258.6	259.5	260.4	260.9	261.4	262.0
214.8	221.9	228.9	236.3	243.7	251.1	258.8	266.4	274.0	1902	281.9	289.6	297.7	305.5	313.3	321.2	329.1	337.0	344.6	352.3
199.3	205.5	202.6	195.2	195.1	204.3	218.0	234.2	251.7		269.3	285.9	300.3	309.7	310.6	304.0	300.2	307.1	320.0	336.6
252.2	253.5	255.2	256.9	258.9	260.9	263.0	265.3	267.5		269.9	272.1	274.3	276.8	279.1	281.4	283.5	285.5	287.4	289.2
214.0	226.0	237.4	248.8	259.9	270.7	280.5	290.3	298.6		305.0	309.7	310.8	307.3	301.0	296.0	295.5	297.0	301.5	308.6
255.6	256.2	256.9	257.6	258.6	259.7	260.7	261.8	263.0		264.1	265.3	266.5	267.7	268.7	269.6	270.7	271.3	272.1	272.7
O 10	O 20	O 30	N 9	N 19	N 29	D 9	D												

TABLE

Geocentric Places of Mars, Mercury, Jupiter, Venus and Saturn for every tenth day of current cycle.
Venus, A.D. 1765—A.D. 1999

Day of I.S.V.	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
Eng. date	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Jl 2	Jl 12	Jl 22	Au 1	Au 11	Au 21	Au 31	S 10	S 20	S 30
1908 Mars	153.0	155.6	154.6	155.1	156.2	158.7	161.9	163.8	170.1	176.0	180.3	185.7	191.6	197.9	204.0	210.5	217.3	224.2
Merc.	09	19.2	35.6	48.7	54.7	51.1	44.6	47.1	58.2	73.6	91.2	105.8	128.0	145.2	160.6	170.9	173.2	166.7
Jup.	318.5	320.5	322.5	324.4	325.9	327.3	328.4	329.2	329.6	329.8	329.6	329.0	328.2	327.1	325.8	324.5	323.0	321.7
Ven.	31.8	44.0	55.7	67.4	79.1	90.5	101.3	112.1	122.3	132.1	141.3	149.8	155.5	158.7	159.4	155.6	149.0	144.8
Sat.	283.8	284.1	284.5	284.8	284.7	284.4	284.2	283.6	283.0	282.4	281.6	280.8	280.1	279.4	278.8	278.1	277.9	277.8
Eng. date	Ap 12	Ap 22	My 2	My 12	My 22	Je 1	Je 11	Je 21	Jl 1	Jl 11	Jl 21	Jl 31	Au 10	Au 20	Au 30	S 9	S 19	S 29
1904 Mars	11.7	19.6	20.8	33.6	40.7	47.8	54.8	61.5	68.4	75.1	81.7	88.5	94.9	101.5	107.8	114.1	120.5	126.7
Merc.	13.5	27.4	34.8	33.2	25.9	26.4	38.1	51.3	68.9	87.6	103.9	124.0	140.0	152.0	156.6	152.2	145.7	147.9
Jup.	340.4	349.8	351.1	353.4	355.5	357.7	359.7	361.4	362.9	364.2	365.2	366.0	366.6	367.0	367.3	367.5	367.6	367.7
Ven.	337.0	349.3	1.4	18.8	26.0	33.3	50.0	62.8	70.0	87.4	99.5	111.8	125.0	138.2	149.7	160.8	173.3	185.7
Sat.	294.6	295.2	295.9	296.4	296.3	296.5	296.5	296.0	295.5	295.0	294.2	293.4	292.6	291.9	291.3	290.6	290.2	289.8
1905 Mars	211.3	209.5	208.9	203.6	200.4	195.2	197.2	197.8	199.1	202.0	205.2	209.3	214.1	219.2	225.0	230.8	237.2	243.8
Merc.	14.6	15.1	7.9	6.1	14.8	28.9	46.1	64.7	83.6	101.9	118.6	132.1	139.1	136.7	130.6	129.8	139.1	152.8
Jup.	13.7	16.0	18.4	20.3	23.3	25.7	28.0	30.2	32.4	34.2	36.3	37.9	39.4	40.5	41.4	42.2	42.5	42.3
Ven.	22.6	18.3	11.8	7.2	6.1	9.2	15.0	22.1	31.3	40.8	50.9	61.6	72.5	84.2	94.1	107.3	118.9	131.3
Sat.	305.6	306.8	307.0	307.8	308.0	308.3	308.5	308.2	307.9	307.6	307.0	306.4	305.6	304.8	304.0	303.2	302.7	302.2
Eng. date	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Jl 2	Jl 12	Jl 22	Au 1	Au 11	Au 21	Au 31	S 10	S 20	S 30
1906 Mars	26.6	33.5	40.4	47.5	54.2	61.0	67.8	74.5	81.0	87.7	94.4	100.7	107.2	113.7	120.0	126.5	132.7	139.9
Merc.	350.5	346.9	353.3	6.3	23.3	41.8	60.8	79.5	96.9	111.8	120.9	120.4	113.2	111.0	119.0	132.1	148.6	165.9
Jup.	41.6	43.8	45.1	48.2	50.5	52.9	55.2	57.5	59.9	62.2	64.5	66.5	68.5	70.2	71.9	73.6	75.0	76.2
Ven.	14.4	26.7	39.0	51.3	63.4	75.4	87.4	99.2	111.0	122.8	134.5	146.2	157.7	168.6	179.6	190.2	200.3	209.5
Sat.	316.6	317.5	318.4	319.3	319.8	320.3	320.8	320.7	320.6	320.6	320.0	319.5	318.9	318.1	317.3	316.5	315.8	315.1
1907 Mars	252.2	256.3	260.2	263.3	265.5	266.8	267.1	268.0	264.4	261.5	253.9	257.3	256.9	257.9	260.1	263.2	267.4	272.1
Merc.	332.7	314.8	0.9	19.1	37.9	56.9	74.7	90.2	101.1	108.2	96.7	92.7	98.5	111.2	127.3	144.7	162.6	180.2
Jup.	69.7	71.2	72.8	74.7	76.7	78.8	81.0	83.2	85.6	87.9	90.1	92.5	94.7	97.0	99.0	101.0	102.8	104.6
Ven.	320.6	332.6	344.7	356.7	368.6	380.3	392.0	403.7	415.4	427.1	438.8	450.5	462.2	473.9	485.6	497.3	509.0	520.7
Sat.	327.7	328.8	329.9	330.9	331.6	332.2	332.9	333.1	333.3	333.5	333.1	332.8	332.4	331.7	331.9	330.2	329.4	328.6
Eng. date	Ap 12	Ap 22	My 2	My 12	My 22	Je 1	Je 11	Je 21	Jl 1	Jl 11	Jl 21	Jl 31	Au 10	Au 20	Au 30	S 9	S 19	S 29
1908 Mars	41.1	47.7	54.3	60.9	67.6	74.1	80.6	87.1	93.5	99.9	106.3	112.7	119.2	125.6	131.9	138.3	144.7	151.0
Merc.	338.5	356.2	14.9	34.0	52.2	69.5	80.5	85.1	79.8	74.1	78.5	90.1	105.7	123.2	141.3	159.3	176.8	189.6
Jup.	99.5	100.1	101.0	102.0	103.4	104.9	106.8	108.8	110.7	112.8	115.0	117.2	119.4	121.6	123.8	126.1	128.2	130.3
Ven.	45.0	55.6	64.9	74.0	81.3	87.7	89.4	89.8	85.1	78.7	73.7	72.7	75.8	81.6	89.1	97.9	107.7	118.2
Sat.	338.9	340.1	341.3	342.5	343.4	344.2	345.2	345.7	346.2	346.6	346.4	346.3	346.2	345.6	345.0	344.4	343.6	342.8
1909 Mars	278.2	284.9	291.2	297.6	303.9	309.8	315.5	326.6	326.2	330.7	334.7	337.5	339.3	339.7	338.9	336.7	334.1	332.0
Merc.	352.2	11.2	29.4	46.4	59.8	65.8	62.3	55.6	58.0	64.3	84.0	101.2	119.5	137.7	155.0	170.0	180.5	182.4
Jup.	131.4	130.9	130.9	130.8	131.3	132.1	133.2	134.5	136.0	137.6	139.4	141.4	143.4	145.3	147.6	149.8	152.0	154.2
Ven.	355.7	8.8	20.5	32.8	45.1	57.4	69.7	81.8	94.0	106.2	118.6	130.5	142.8	154.8	166.7	177.9	190.8	202.6
Sat.	350.6	351.9	353.2	354.4	355.5	356.6	357.6	358.3	359.0	359.7	359.8	359.8	359.8	359.8	359.8	359.8	359.8	359.2
Eng. date	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Jl 2	Jl 12	Jl 22	Au 1	Au 11	Au 21	Au 31	S 10	S 20	S 30
1910 Mars	58.0	62.0	68.4	74.4	80.5	87.0	93.3	99.4	105.7	112.0	118.4	124.6	130.9	137.3	143.6	149.9	156.4	163.0
Merc.	6.9	24.0	34.1	46.0	44.3	37.0	37.6	46.9	61.7	79.1	97.6	115.9	133.9	149.7	161.7	168.4	161.7	155.2
Jup.	164.8	163.7	162.5	161.6	161.1	161.0	161.1	161.3	161.4	161.4	161.4	161.4	161.4	161.4	161.4	161.4	161.4	161.4
Ven.	313.6	322.9	333.1	343.8	354.5	365.2	375.9	386.6	397.3	408.0	418.7	429.4	440.1	450.8	461.5	472.2	482.9	493.6
Sat.	2.4	3.7	5.0	6.3	7.5	8.7	9.9	10.8	11.7	12.6	13.0	13.4	13.9	13.8	13.6	13.4	12.8	12.2
1911 Mars	298.5	300.0	313.4	326.0	338.2	335.8	342.7	349.6	356.5	363.4	370.3	377.2	384.1	391.0	397.9	404.8	411.7	418.6
Merc.	16.5	26.0	26.1	19.2	17.0	25.1	39.5	56.6	75.0	93.7	111.9	128.5	143.2	148.9	147.0	139.4	135.6	147.9
Jup.	198.8	197.6	197.0	194.9	193.8	192.8	191.9	191.4	191.4	191.4	191.7	192.6	193.5	194.4	195.3	196.2	197.1	198.0
Ven.	32.4	44.4	56.3	67.8	79.5	90.9	101.6	112.3	122.8	133.1	143.4	153.7	164.0	174.3	184.6	194.9	205.2	215.5
Sat.	14.4	14.9	17.0	18.4	18.8	21.0	22.3	23.4	24.5	25.6	26.7	27.0	27.3	27.8	27.9	28.0	27.6	27.2
Eng. date	Ap 12	Ap 22	My 2	My 12	My 22	Je 1	Je 11	Je 21	Jl 1	Jl 11	Jl 21	Jl 31	Au 10	Au 20	Au 30	S 9	S 19	S 29
1912 Mars	71.2	76.9	82.5	88.3	94.1	100.0	106.0	112.0	118.2	124.2	130.4	136.8	143.0	149.4	155.7	162.2	168.8	175.3
Merc.	8.0	1.7	35.7	4.0	16.9	33.8	51.1	71.1	84.9	107.1	121.6	130.9	130.7	123.7	121.3	128.0	141.8	158.0
Jup.	232.4	231.0	230.6	229.9	229.6	229.3	229.0	228.7	228.4	228.1	227.8	227.5	227.2	226.9	226.6	226.3	226.0	225.7
Ven.	337.5	349.8	2.1	14.3	23.5	37.8	51.1	63.3	75.5	87.7	99.9	112.1	124.3	136.5	148.7	160.9	173.1	185.3
Sat.	28.8	28.1	29.4	30.1	32.0	33.4	34.8	35.0	37.2	38.5	39.4	40.2	41.1	41.5	41.9	42.4	42.2	42.1
1913 Mars	317.0	324.6	332.5	339.8	347.7	355.1	362.0	368.9	375.8	382.7	389.6	396.5	403.4	410.3	417.2	424.1	431.0	437.9
Merc.	339.0	348.2	355.8	11.4	29.4	48.4	67.4	86.0	100.6	111.8	113.8	107.2	103.4	108.8	120.9	137.2	154.8	172.3
Jup.	264.0	264.6	264.8	264.7	264.4	263.6	262.6	261.4	260.1	258.8	257.5	256.3	255.5	254.7	254.4	254.4	254.6	255.3
Ven.	19.5	14.2	8.3	4.2	4.1	8.1	14.3	22.1	31.0	41.0	51.4	61.9	73.0	84.8	96.0	107.8	119.7	131.6
Sat.	39.4	40.7	42.0	43.3	44.6	45.9	47.3	48.6	49.9	51.2	52.3	53.4	54.4	55.1	55.8	56.5	56.6	56.6
Eng. date	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Jl 2	Jl 12	Jl 22	Au 1	Au 11	Au 21	Au 31	S 10	S 20	S 30
1914 Mars	88.6	93.1	97.9	103.2	108.5	113.8	119.5	125.2	131.2	137.2	143.2	149.2	155.6	162.1	168.5	175.1	181.6	188.3
Merc.	338.5	348.8	6.4	25.3	44.3	62.7	78.7	91.1	95.7	90.7	84.9	89.0	100.3	115.8	133.0	151.0	168.8	185.1
Jup.	268.8	265.4	266.7	267.7	268.9	269.0	269.2	269.6	269.1	268.7	268.2	267.7	267.2	266.7	266.2	265.7	265.2	264.7
Ven.	15.1	27.3	39.8	51.9	64.0	76.0	87.9	99.8	111.4	123.4	135.0	146.6	157.9	169.2	180.0	190.4	200.1	209.4
Sat																		

V-B—cont.

Mars, A.D. 1637—A.D. 1999; Mercury, A.D. 1645—A.D. 1999; Jupiter, A.D. 1656—A.D. 1999; Saturn, A.D. 1617—A.D. 1999—cont.

180	190	200	210	220	230	240	250	260		270	280	290	300	310	320	330	340	350	360
O 10	O 20	O 30	N 9	N 19	N 29	D 9	D 19	D 29		Ja 8	Ja 18	Ja 28	F 7	F 17	F 27	Mr 8	Mr 18	Mr 28	Ap 7
231.2	238.2	245.5	252.9	260.3	267.9	275.6	283.1	290.9	1904	298.7	306.6	314.3	321.1	328.8	337.5	345.3	352.8	0.8	7.8
161.8	168.7	178.4	188.9	210.7	228.1	245.0	260.4	272.4		277.8	274.1	267.1	258.6	248.5	239.4	230.7	222.7	214.2	4.8
820.7	819.8	819.3	819.0	819.8	819.7	820.8	821.8	823.2		824.8	826.6	828.6	830.7	832.9	835.3	837.6	840.0	842.5	344.9
142.9	144.2	150.6	158.1	167.1	176.8	187.1	198.0	209.4		220.9	233.0	245.0	257.1	269.2	281.5	293.6	306.0	318.2	830.7
277.5	277.9	278.2	278.6	279.4	280.2	281.0	282.1	283.2		284.2	285.4	286.6	287.8	289.0	290.3	291.8	292.8	293.2	294.2
O 9	O 19	O 29	N 8	N 18	N 28	D 8	D 18	D 28		Ja 7	Ja 17	Ja 27	F 6	F 16	F 26	Mr 8	Mr 18	Mr 28	Ap 7
182.9	188.9	144.0	150.9	156.6	162.4	168.0	173.5	179.0	1905	184.3	189.3	194.0	198.4	202.4	205.8	208.6	210.8	212.0	212.8
158.8	178.4	190.2	207.4	224.8	240.7	253.8	261.1	259.7		252.2	250.9	258.6	272.6	289.1	307.0	325.2	343.0	358.9	11.4
1.8	0.4	359.1	357.7	356.7	356.1	355.8	355.6	355.9		356.5	357.5	358.7	0.2	2.0	8.9	5.9	8.0	10.4	12.7
196.0	210.4	222.6	234.9	247.2	259.4	271.6	283.8	295.9		307.6	319.0	330.2	341.0	351.4	0.7	9.6	16.7	21.5	23.1
289.2	289.4	289.5	289.5	290.2	290.9	291.5	292.5	293.5		294.5	295.7	296.9	298.0	299.2	300.4	301.7	302.8	303.9	305.0
250.5	257.5	264.6	271.8	279.4	286.4	294.0	301.5	309.1	1906	316.6	324.0	331.7	339.0	346.5	354.0	1.1	8.6	15.7	22.8
169.2	185.5	204.3	220.8	234.8	244.3	245.2	238.1	234.2		240.0	252.3	267.9	285.4	303.3	321.2	337.3	350.6	357.0	354.8
41.9	41.1	40.1	38.9	37.5	35.9	34.9	33.5	32.9		32.1	31.8	31.9	32.2	33.0	34.0	35.2	36.7	38.4	40.3
143.3	155.1	167.3	179.7	192.0	204.5	217.5	230.6	242.1		254.8	267.5	280.0	292.8	305.2	317.8	330.3	342.9	355.4	7.6
301.7	301.6	301.4	301.2	301.7	302.1	302.6	303.5	304.4		305.2	306.3	307.4	308.6	309.9	311.2	312.4	313.7	314.9	316.0
O 10	O 20	O 30	N 9	N 19	N 29	D 9	D 19	D 29		Ja 8	Ja 18	Ja 28	F 7	F 17	F 27	Mr 8	Mr 18	Mr 28	Ap 8
145.2	151.5	157.7	163.8	170.8	178.1	182.2	188.3	194.3	1907	200.5	206.2	212.1	217.9	223.7	229.3	234.8	240.0	245.0	249.9
188.9	200.5	215.6	226.7	230.2	224.6	218.6	221.9	225.5		247.3	261.6	282.1	299.7	316.2	339.1	358.5	387.6	880.1	329.2
76.7	77.0	77.1	76.8	76.2	75.8	74.2	72.7	71.5		70.4	69.1	68.1	67.2	66.8	66.8	66.9	67.8	68.1	68.9
218.0	224.8	229.3	230.8	228.3	222.7	217.3	215.1	217.1		221.8	229.2	237.9	247.4	257.7	268.6	279.7	291.0	302.7	314.4
814.8	814.1	818.9	818.4	813.6	818.8	814.1	814.9	815.6		816.3	817.4	818.5	819.5	820.7	821.9	822.2	824.5	825.8	827.1
277.8	283.1	289.1	295.6	302.1	308.8	315.4	322.0	329.1	1908	335.9	342.9	347.9	356.8	8.7	10.6	17.2	24.1	30.8	37.6
195.8	208.5	214.5	211.6	204.2	204.3	213.1	227.2	243.5		261.0	278.8	295.4	309.7	319.6	329.8	314.1	310.5	316.8	330.1
106.1	107.6	108.6	109.3	109.8	109.9	109.5	109.1	108.4		107.4	108.3	105.1	103.6	102.5	101.4	100.4	99.8	99.5	99.6
179.8	192.3	204.7	217.3	229.8	242.6	255.1	267.4	280.0		292.4	305.0	317.1	329.4	341.6	353.6	5.2	16.9	23.4	29.3
327.8	327.8	326.8	326.1	326.3	326.2	326.2	326.7	327.2		327.9	328.9	329.9	330.8	332.1	333.2	334.4	335.7	337.0	338.8
O 9	O 19	O 29	N 8	N 18	N 28	D 8	D 18	D 28		Ja 7	Ja 17	Ja 27	F 6	F 16	F 26	Mr 8	Mr 18	Mr 28	Ap 7
157.4	163.8	170.1	176.6	183.0	189.5	195.8	202.8	208.9	1909	215.3	221.9	228.4	235.0	241.6	248.2	255.0	261.5	268.1	274.8
198.0	197.4	189.9	187.4	194.7	207.3	223.2	240.5	258.0		274.8	289.8	306.6	324.1	342.0	359.8	297.3	308.6	321.9	342.4
132.3	134.0	135.7	137.3	138.7	139.6	140.6	141.1	141.2		141.1	140.7	139.9	138.7	137.6	136.4	135.1	133.8	132.7	131.8
129.0	140.3	151.9	163.6	175.3	187.6	199.9	212.2	224.4		236.8	249.5	261.8	274.5	286.8	299.5	311.9	324.3	336.9	349.1
341.9	341.2	340.5	339.8	339.5	339.2	339.1	339.4	339.7		340.0	340.8	341.7	342.5	343.6	344.7	345.9	347.2	348.5	349.8
380.3	380.3	382.2	383.3	386.3	340.0	344.2	348.9	353.9	1910	359.1	4.7	10.4	16.1	22.1	28.0	34.6	40.1	46.3	52.5
175.9	171.2	176.2	187.7	202.9	219.9	237.2	254.4	269.8		282.1	287.3	283.3	276.7	278.3	288.1	303.0	320.4	338.7	357.2
156.4	158.6	160.6	162.6	164.5	166.1	167.6	168.9	169.9		170.9	171.4	171.5	171.4	170.9	170.2	169.1	168.0	166.7	165.5
214.5	226.4	237.6	249.1	260.0	270.7	280.4	289.8	297.7		304.0	307.2	307.2	303.3	297.0	292.4	291.8	294.8	300.7	308.2
856.5	355.7	354.8	354.0	353.6	353.1	352.7	352.7	352.8		352.9	353.5	354.1	354.8	355.8	356.8	357.9	359.1	0.3	1.6
O 10	O 20	O 30	N 9	N 19	N 29	D 9	D 19	D 29		Ja 8	Ja 18	Ja 28	F 7	F 17	F 27	Mr 8	Mr 18	Mr 28	Ap 8
169.4	176.0	182.6	189.3	195.9	202.6	209.2	216.1	223.0	1911	229.9	237.0	243.9	251.1	258.2	265.5	272.7	280.0	287.3	294.6
157.6	168.1	182.9	199.4	216.8	234.0	250.0	262.9	273.7		268.8	281.3	290.2	298.3	307.0	315.8	324.0	331.5	339.0	8.9
180.1	182.3	184.4	186.6	188.8	190.9	192.8	194.6	196.3		197.9	199.4	200.3	201.2	201.6	201.7	201.6	201.3	200.5	199.5
161.2	173.7	186.2	199.2	211.2	223.9	236.3	248.2	261.7		274.8	286.8	299.5	312.0	324.6	337.1	349.4	1.9	14.1	25.9
11.5	10.7	9.9	9.0	8.3	7.6	6.9	6.8	6.6		6.8	6.7	7.1	7.5	8.4	9.3	10.1	11.8	12.5	13.7
44.9	45.2	44.6	43.0	40.0	37.0	34.5	32.8	32.3	1912	32.9	34.7	37.1	40.4	44.1	48.4	53.0	57.9	63.1	68.4
162.5	178.7	196.3	213.4	229.9	244.1	255.4	254.2	247.2		243.5	248.9	261.6	277.5	295.2	313.3	331.2	347.6	0.9	8.2
208.8	205.8	207.9	210.2	213.4	214.6	216.8	219.0	221.1		223.2	225.0	226.7	228.3	229.8	230.9	231.8	232.4	232.7	232.7
140.5	143.0	150.0	157.7	166.8	176.8	187.1	198.2	209.7		221.8	233.7	245.4	257.6	269.7	282.1	294.1	306.4	318.8	331.3
26.7	25.9	27.7	24.4	23.6	22.8	21.9	21.4	20.9		20.5	20.6	20.7	20.8	21.5	22.2	22.9	24.0	25.1	26.1
O 9	O 19	O 29	N 8	N 18	N 28	D 8	D 18	D 28		Ja 7	Ja 17	Ja 27	F 6	F 16	F 26	Mr 8	Mr 18	Mr 28	Ap 7
181.9	188.6	195.3	202.3	209.1	216.1	223.1	230.2	237.4	1913	244.7	254.1	269.5	286.9	274.6	282.0	289.9	297.5	305.2	312.9
175.4	193.0	209.9	224.6	235.8	248.8	264.0	277.8	291.0		241.6	256.8	273.8	291.0	309.4	326.4	346.0	348.6	348.4	341.0
228.6	230.4	232.4	234.5	236.7	238.9	241.1	243.3	245.7		247.9	250.1	253.8	254.3	256.3	258.2	259.9	261.5	262.8	263.6
198.5	210.8	223.8	235.4	247.7	260.1	272.1	284.2	296.1		307.9	320.1	330.5	341.2	351.3	0.9	9.4	15.6	18.8	21.3
41.9	41.3	40.6	39.9	39.0	38.2	37.3	36.7	36.1		35.3	35.1	34.9	34.8	35.2	35.6	35.9	36.9	37.8	38.8
78.5	82.9	86.6	89.8	91.8	92.9	91.3	88.7	86.7	1914	85.4	81.1	79.4	76.0	75.1	75.5	77.3	79.6	82.8	86.8
189.7	205.2	218.1	225.0	220.1	211.6	213.5	222.5	236.6		252.9	270.5	288.3	305.1	319.9	329.7	331.1	324.1	320.7	327.8
256.2	257.6	259.2	260.8	262.5	264.5	266.6	268.9	271.0		273.3	275.6	278.0	280.3	282.7	284.9	287.1	289.2	291.2	293.2
143.6	155.8	168.2	180.7	193.0	205.3	217.9	230.3	242.6		255.8	268.2	280.7	293.5	306.0	318.0	331.0	343.7	356.5	8.6
56.7	56.9	55.9	55.4	54.6	53.8	52.9	52.2	51.4		50.6	50.2	49.8	49.3	49.4	49.6	49.7	50.8	51.1	51.8
O 10	O 20	O 30	N 9	N 19	N 29	D 9	D 19	D 29		Ja 8	Ja 18	Ja 28	F 7	F 17	F 27	Mr 8	Mr 18	Mr 28	Ap 8
195.3	202.1	209.1																	

TABLE

Geocentric Places of Mars, Mercury, Jupiter, Venus and Saturn for every tenth day of current cycle.
Venus, A.D. 1765—A.D. 1999;

Day of I.S.Y.	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
Eng. date	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Je 1	Je 11	Je 21	Je 1	Je 11	Je 21	Je 1	Je 11	Je 21	Je 1
1915 Mars	334.0	341.9	349.6	357.8	366.0	374.2	382.4	390.6	398.8	407.0	415.2	423.4	431.6	439.8	448.0	456.2	464.4	472.6
Merc.	344.2	2.5	21.5	40.0	58.9	77.7	96.6	115.4	134.3	153.1	171.9	190.8	209.6	228.5	247.3	266.2	285.0	303.9
Jup.	322.2	334.4	346.6	358.8	371.0	383.2	395.4	407.6	419.8	432.0	444.2	456.4	468.6	480.8	493.0	505.2	517.4	529.6
Ven.	321.3	333.1	344.9	356.7	368.5	380.3	392.1	403.9	415.7	427.5	439.3	451.1	462.9	474.7	486.5	498.3	510.1	521.9
Sat.	65.5	66.5	67.5	68.5	69.5	70.5	71.5	72.5	73.5	74.5	75.5	76.5	77.5	78.5	79.5	80.5	81.5	82.5
Eng. date	Ap 12	Ap 22	My 2	My 12	My 22	Je 1	Je 11	Je 21	Je 1	Je 11	Je 21	Je 1	Je 11	Je 21	Je 1	Je 11	Je 21	Je 1
1916 Mars	110.8	113.8	116.8	119.8	122.8	125.8	128.8	131.8	134.8	137.8	140.8	143.8	146.8	149.8	152.8	155.8	158.8	161.8
Merc.	358.7	17.1	34.3	48.7	63.1	77.5	91.9	106.3	120.7	135.1	149.5	163.9	178.3	192.7	207.1	221.5	235.9	250.3
Jup.	319.9	352.3	384.7	417.1	449.5	481.9	514.3	546.7	579.1	611.5	643.9	676.3	708.7	741.1	773.5	805.9	838.3	870.7
Ven.	45.2	55.6	65.1	73.8	82.5	91.2	99.9	108.6	117.3	126.0	134.7	143.4	152.1	160.8	169.5	178.2	186.9	195.6
Sat.	79.1	79.9	80.7	81.5	82.3	83.1	83.9	84.7	85.5	86.3	87.1	87.9	88.7	89.5	90.3	91.1	91.9	92.7
Eng. date	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Je 1	Je 11	Je 21	Je 1	Je 11	Je 21	Je 1	Je 11	Je 21	Je 1
1917 Mars	350.4	358.1	365.8	373.5	381.2	388.9	396.6	404.3	412.0	419.7	427.4	435.1	442.8	450.5	458.2	465.9	473.6	481.3
Merc.	12.0	27.3	37.3	47.3	57.3	67.3	77.3	87.3	97.3	107.3	117.3	127.3	137.3	147.3	157.3	167.3	177.3	187.3
Jup.	17.7	20.1	22.5	24.9	27.3	29.7	32.1	34.5	36.9	39.3	41.7	44.1	46.5	48.9	51.3	53.7	56.1	58.5
Ven.	356.5	8.8	21.2	33.6	45.9	58.3	70.7	83.1	95.5	107.9	120.3	132.7	145.1	157.5	169.9	182.3	194.7	207.1
Sat.	92.7	93.2	93.7	94.3	94.8	95.4	95.9	96.5	97.0	97.6	98.1	98.7	99.2	99.8	100.3	100.9	101.4	102.0
Eng. date	Ap 12	Ap 22	My 2	My 12	My 22	Je 1	Je 11	Je 21	Je 1	Je 11	Je 21	Je 1	Je 11	Je 21	Je 1	Je 11	Je 21	Je 1
1918 Mars	141.8	141.1	141.4	143.2	145.8	149.0	152.8	157.2	162.1	167.4	173.0	178.7	184.4	190.1	195.8	201.5	207.2	212.9
Merc.	16.0	19.0	12.5	8.3	14.6	27.6	45.1	62.6	80.1	97.6	115.1	132.6	150.1	167.6	185.1	202.6	220.1	237.6
Jup.	45.3	47.5	49.6	51.8	53.7	55.4	57.1	58.8	60.5	62.2	63.9	65.6	67.3	69.0	70.7	72.4	74.1	75.8
Ven.	313.4	323.1	333.2	343.0	352.9	362.8	372.7	382.6	392.5	402.4	412.3	422.2	432.1	442.0	451.9	461.8	471.7	481.6
Sat.	106.5	106.7	106.9	107.3	107.8	108.3	108.8	109.3	109.8	110.3	110.8	111.3	111.8	112.3	112.8	113.3	113.8	114.3
Eng. date	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Je 1	Je 11	Je 21	Je 1	Je 11	Je 21	Je 1	Je 11	Je 21	Je 1
1919 Mars	6.0	13.3	20.5	27.9	35.0	42.2	49.4	56.6	63.8	70.9	78.1	85.3	92.5	99.7	106.9	114.1	121.3	128.5
Merc.	355.5	349.5	353.3	35.6	21.4	39.6	58.7	77.4	95.2	113.0	130.8	148.6	166.4	184.2	202.0	219.8	237.6	255.4
Jup.	73.9	75.2	76.9	78.6	80.5	82.5	84.6	86.8	89.1	91.4	93.6	95.9	98.2	100.5	102.8	105.1	107.4	109.7
Ven.	32.9	44.8	56.6	68.3	79.8	91.0	102.2	112.6	122.5	131.9	140.4	147.8	155.2	162.6	170.0	177.4	184.8	192.2
Sat.	120.4	120.3	120.2	120.3	120.9	121.5	122.0	122.9	123.9	124.9	126.1	127.3	128.6	129.9	131.2	132.4	133.6	134.8
Eng. date	Ap 12	Ap 22	My 2	My 12	My 22	Je 1	Je 11	Je 21	Je 1	Je 11	Je 21	Je 1	Je 11	Je 21	Je 1	Je 11	Je 21	Je 1
1920 Mars	189.6	196.4	203.2	210.0	216.8	223.6	230.4	237.2	244.0	250.8	257.6	264.4	271.2	278.0	284.8	291.6	298.4	305.2
Merc.	332.7	341.5	350.0	358.5	367.0	375.5	384.0	392.5	401.0	409.5	418.0	426.5	435.0	443.5	452.0	460.5	469.0	477.5
Jup.	103.8	104.2	104.9	105.9	107.1	108.5	110.0	111.5	113.0	114.5	116.0	117.5	119.0	120.5	122.0	123.5	125.0	126.5
Ven.	338.2	350.5	362.8	375.1	387.4	399.7	412.0	424.3	436.6	448.9	461.2	473.5	485.8	498.1	510.4	522.7	535.0	547.3
Sat.	134.2	133.9	133.6	133.4	133.8	134.1	134.4	134.8	135.2	135.6	136.0	136.4	136.8	137.2	137.6	138.0	138.4	138.8
Eng. date	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Je 1	Je 11	Je 21	Je 1	Je 11	Je 21	Je 1	Je 11	Je 21	Je 1
1921 Mars	20.8	28.0	35.1	42.2	49.1	56.0	62.8	69.5	76.2	82.9	89.6	96.3	103.0	109.7	116.4	123.1	129.8	136.5
Merc.	337.2	354.4	371.6	388.8	406.0	423.2	440.4	457.6	474.8	492.0	509.2	526.4	543.6	560.8	578.0	595.2	612.4	629.6
Jup.	135.8	135.2	134.9	135.0	135.2	135.4	135.6	135.8	136.0	136.2	136.4	136.6	136.8	137.0	137.2	137.4	137.6	137.8
Ven.	16.2	10.8	4.9	1.7	3.2	7.1	13.7	21.9	31.1	41.0	51.4	62.2	73.4	84.7	96.4	107.8	119.1	130.4
Sat.	147.9	147.4	146.9	146.5	146.5	146.6	146.6	147.2	147.8	148.4	149.0	149.6	150.2	150.8	151.4	152.0	152.6	153.2
Eng. date	Ap 12	Ap 22	My 2	My 12	My 22	Je 1	Je 11	Je 21	Je 1	Je 11	Je 21	Je 1	Je 11	Je 21	Je 1	Je 11	Je 21	Je 1
1922 Mars	239.0	241.3	243.6	245.9	248.2	250.5	252.8	255.1	257.4	259.7	262.0	264.3	266.6	268.9	271.2	273.5	275.8	278.1
Merc.	350.2	9.0	27.4	44.8	62.2	79.6	97.0	114.4	131.8	149.2	166.6	184.0	201.4	218.8	236.2	253.6	271.0	288.4
Jup.	169.4	168.1	167.0	166.2	165.4	164.6	163.8	163.0	162.2	161.4	160.6	159.8	159.0	158.2	157.4	156.6	155.8	155.0
Ven.	16.7	27.9	40.2	52.2	64.4	76.3	88.4	100.3	112.1	123.8	135.3	146.8	158.3	169.8	181.3	192.8	204.3	215.8
Sat.	161.3	160.6	160.0	159.4	159.2	159.0	158.9	159.1	159.5	159.9	160.3	160.7	161.1	161.5	161.9	162.3	162.7	163.1
Eng. date	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Je 1	Je 11	Je 21	Je 1	Je 11	Je 21	Je 1	Je 11	Je 21	Je 1
1923 Mars	35.5	42.2	49.0	55.7	62.4	69.1	75.7	82.3	88.8	95.3	101.8	108.3	114.8	121.3	127.8	134.3	140.8	147.3
Merc.	5.1	22.4	37.6	47.5	48.8	41.8	39.1	46.2	60.4	77.1	95.3	113.9	131.9	149.2	165.8	181.8	197.3	212.3
Jup.	203.5	202.3	201.1	199.7	198.5	197.3	196.1	194.9	193.7	192.5	191.3	190.1	188.9	187.7	186.5	185.3	184.1	182.9
Ven.	321.7	333.6	345.6	357.6	369.6	381.6	393.6	405.6	417.6	429.6	441.6	453.6	465.6	477.6	489.6	501.6	513.6	525.6
Sat.	174.4	173.7	173.0	172.2	171.8	171.4	171.0	171.1	171.3	171.5	171.7	171.9	172.1	172.3	172.5	172.7	172.9	173.1
Eng. date	Ap 12	Ap 22	My 2	My 12	My 22	Je 1	Je 11	Je 21	Je 1	Je 11	Je 21	Je 1	Je 11	Je 21	Je 1	Je 11	Je 21	Je 1
1924 Mars	269.1	275.0	280.7	286.4	292.1	297.8	303.5	309.2	314.9	320.6	326.3	332.0	337.7	343.4	349.1	354.8	360.5	366.2
Merc.	16.5	27.0	30.0	33.1	36.5	39.9	43.3	46.7	50.1	53.5	56.9	60.3	63.7	67.1	70.5	73.9	77.3	80.7
Jup.	236.9	236.5	236.7	236.8	236.9	237.0	237.1	237.2	237.3	237.4	237.5	237.6	237.7	237.8	237.9	238.0	238.1	238.2
Ven.	46.1	55.5	61.9	73.1	80.1	84.4	88.7	93.0	97.3	101.6	105.9	110.2	114.5	118.8	123.1	127.4	131.7	136.0
Sat.	187.1	186.3	185.5	184.7	184.2	183.7	183.1	182.6	182.0	181.5	181.0	180.5	180.0	179.5	179.0	178.5	178.0	177.5
Eng. date	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Je 1	Je 11	Je 21	Je 1	Je 11	Je 21	Je 1	Je 11	Je 21	Je 1
1925 Mars	50.1	56.5	62.9	69.3	75.6	81.9	88.3	94.6	100.9	107.2	113.5	119.8	126.1	132.4	138.7	145.0	151.3	157.6
Merc.	11.2	6.4	0.6	4.4	18.2	31.9	45.6	59.3	73.0	86.7	100.4	114.1	127.8	141.5	155.2	168.9	182.6	196.3
Jup.	204.4	209.1	209.6	209.8	209.9	210.0	210.1	210.2	210.3	210.4	210.5	210.6	210.7	210.8	210.9	211.0	211.1	211.2
Ven.	357.2	9.6	21.9	34.2	46.6	58.7	70.9	83.2	95.5	107.8	120.1	132.4	144.7	157.0	169.3	181.6	193.9	206.2
Sat.	199.5	198.7	197.9															

V-B—cont.

Mars, A.D. 1637—A.D. 1999, Mercury, A.D. 1645—A.D. 1999, Jupiter, A.D. 1656—A.D. 1999, Saturn, A.D. 1617—A.D. 1999—cont.

180	190	200	210	220	230	240	250	260		270	280	290	300	310	320	330	340	350	360
O 10	O 20	O 30	N 9	N 19	N 29	D 9	D 19	D 29		Ja 8	Ja 18	Ja 28	F 7	F 17	F 27	Mr 8	Mr 18	Mr 28	Ap 7
98.4	101.1	108.9	113.5	117.8	121.7	125.0	127.0	127.9	1916	128.3	127.2	124.4	121.3	118.9	118.8	110.8	109.1	108.8	109.9
191.8	185.2	180.5	185.3	197.0	212.1	228.7	246.4	263.7		279.1	291.5	296.9	293.2	286.3	287.7	298.2	312.9	330.4	348.8
324.3	325.6	324.9	324.4	324.3	324.7	325.3	324.3	327.6		329.2	329.8	332.7	334.8	337.0	339.2	341.6	344.0	346.4	348.8
180.6	193.0	205.8	219.1	231.1	243.7	256.2	268.7	281.0		298.7	306.0	311.2	330.2	342.5	354.5	361.1	378.8	394.8	408.8
86.6	85.6	85.6	85.6	85.2	84.8	84.3	83.5	82.7		81.9	81.1	80.3	79.5	79.1	78.7	78.2	78.4	78.5	78.6
O 9	O 19	O 29	N 8	N 18	N 28	D 8	D 18	D 28		Ja 7	Ja 17	Ja 27	F 6	F 16	F 26	Mr 8	Mr 18	Mr 28	Ap 7
209.2	215.9	223.3	230.4	237.5	245.3	252.7	260.8	267.9	1917	275.7	283.6	291.2	299.1	306.9	314.8	322.6	330.7	338.5	346.3
164.7	167.2	177.2	191.9	208.6	225.9	243.1	259.1	272.3		279.8	278.4	271.1	269.5	278.1	291.7	308.5	326.8	344.3	358.8
7.8	6.4	5.0	3.8	2.6	1.7	1.0	0.9	0.9		1.4	2.1	3.2	4.4	6.1	7.9	9.7	11.9	14.1	16.4
129.5	140.8	152.5	164.2	176.8	188.3	200.5	212.7	225.0		237.5	250.2	262.5	275.2	288.0	300.0	312.6	325.1	337.8	350.0
99.1	99.4	99.7	100.1	99.9	99.6	99.5	98.8	98.1		97.4	96.5	95.6	94.8	94.2	93.6	92.9	92.8	92.7	92.6
O 10	O 20	O 30	N 9	N 19	N 29	D 9	D 19	D 29		Ja 8	Ja 18	Ja 28	F 7	F 17	F 27	Mr 9	Mr 19	Mr 29	Ap 8
118.9	120.1	125.2	130.9	136.1	140.9	145.8	149.9	153.7	1918	156.5	158.8	159.9	160.1	159.0	156.1	152.5	148.6	145.2	142.9
157.8	171.8	188.0	205.5	222.8	239.2	253.2	262.8	263.2		256.0	252.5	258.8	271.1	286.9	304.7	323.0	340.9	357.8	371.6
47.0	48.4	45.5	41.3	43.1	40.8	40.3	38.2	38.1		37.3	36.9	36.7	37.0	37.6	38.5	39.6	40.9	42.5	44.3
215.0	228.7	237.8	249.2	260.1	270.5	280.2	289.2	298.8		302.2	304.8	303.7	298.4	292.1	289.1	280.8	264.1	300.8	308.7
111.9	112.5	113.1	113.7	113.8	113.9	113.9	113.4	112.8		112.3	111.5	110.7	110.0	109.2	108.4	107.6	107.2	106.9	106.5
224.5	231.5	235.8	246.0	253.6	261.1	268.7	276.4	284.3	1919	292.0	299.8	307.7	315.5	323.2	331.1	338.9	346.6	354.2	361.7
167.7	184.6	202.8	219.0	234.1	244.0	248.2	242.5	236.6		240.2	251.2	267.2	283.3	301.4	319.4	336.1	350.3	359.3	369.0
80.9	81.1	81.8	81.6	81.2	80.3	79.0	78.1	76.8		75.6	74.3	73.2	72.2	71.6	71.3	71.3	71.5	72.3	73.3
161.9	174.4	186.8	199.7	211.9	224.6	237.0	249.8	262.4		275.1	287.6	300.0	312.7	325.3	337.8	350.1	362.4	374.7	386.6
124.2	125.0	125.8	128.7	127.0	127.2	127.6	127.4	127.2		126.9	126.2	125.5	124.7	124.0	123.8	122.5	121.9	121.3	120.7
127.9	133.9	139.6	145.4	151.1	156.8	162.1	167.4	172.7	1920	177.3	181.8	186.0	189.4	192.6	194.6	195.5	195.6	194.1	191.6
181.5	198.7	214.3	226.7	232.5	229.4	221.9	222.3	231.8		246.9	262.4	280.2	297.7	314.8	329.4	339.6	341.4	334.8	331.1
110.0	111.3	112.5	113.4	114.1	114.4	114.4	114.1	113.3		112.4	111.3	109.9	108.6	107.4	106.2	105.2	104.4	104.0	103.9
138.9	142.5	149.1	157.4	166.4	176.7	187.5	198.6	209.9		221.6	234.3	245.9	258.1	270.2	282.6	294.7	307.2	319.4	331.8
138.1	137.1	138.0	139.1	139.6	140.2	140.7	140.7	140.7		140.6	140.1	139.6	139.1	138.8	137.5	136.7	136.0	135.3	134.5
O 9	O 19	O 29	N 8	N 18	N 28	D 8	D 18	D 28		Ja 7	Ja 17	Ja 27	F 6	F 16	F 26	Mr 8	Mr 18	Mr 28	Ap 7
242.3	249.4	255.5	263.8	271.2	279.0	286.4	294.1	301.9	1921	309.3	317.3	325.0	332.3	340.1	347.6	355.0	362.5	369.4	376.8
194.5	208.1	216.3	215.2	207.9	204.9	212.9	225.8	241.7		258.9	276.5	293.6	301.1	320.4	324.1	318.5	313.1	316.7	328.7
135.5	137.6	139.4	140.9	142.3	143.6	144.5	145.1	145.5		145.5	145.1	144.5	143.6	142.5	141.2	140.0	138.6	137.3	135.8
199.4	211.7	224.3	236.2	248.4	260.5	272.8	284.7	296.6		308.2	319.7	330.8	341.2	351.4	361.4	371.4	381.4	391.4	401.4
147.7	148.8	149.9	150.9	151.7	152.3	153.1	153.3	153.5		153.8	153.4	153.1	152.8	152.1	151.4	150.6	149.9	149.1	148.3
O 10	O 20	O 30	N 9	N 19	N 29	D 9	D 19	D 29		Ja 8	Ja 18	Ja 28	F 7	F 17	F 27	Mr 9	Mr 19	Mr 29	Ap 8
140.4	146.7	152.8	158.8	164.9	171.0	176.9	182.6	188.7	1922	194.3	200.1	205.4	210.7	216.0	220.9	225.8	230.1	233.9	237.5
199.0	200.8	194.1	189.6	194.5	206.1	221.0	238.2	255.6		272.9	288.6	301.1	306.7	302.7	295.8	287.8	308.0	323.0	340.4
159.7	161.9	164.0	165.9	167.9	169.7	171.2	172.7	173.8		174.7	175.4	175.7	175.7	175.3	174.7	173.8	172.6	171.5	170.1
143.6	156.4	168.6	181.0	193.3	204.7	218.3	230.9	242.4		256.1	268.7	281.5	294.1	306.6	318.1	331.6	344.2	356.6	368.2
158.7	159.8	161.1	162.1	163.0	163.9	164.8	165.2	165.6		166.0	165.9	165.9	165.8	165.2	164.6	164.0	163.2	162.4	161.6
265.2	271.7	278.3	285.2	292.2	299.2	306.5	313.8	320.5	1923	328.1	335.2	342.6	349.7	356.9	363.8	370.9	378.0	384.8	391.7
180.5	174.0	176.3	186.6	201.1	217.8	235.0	252.2	268.4		281.6	298.3	315.8	333.3	350.7	367.4	384.4	401.4	418.4	435.4
183.1	185.3	187.5	189.6	191.8	193.9	195.9	197.9	199.6		201.2	202.7	203.9	204.8	205.4	205.9	205.9	205.5	205.0	204.0
216.5	222.5	225.8	225.2	221.3	215.1	210.8	210.3	214.0		220.2	228.2	237.5	247.4	258.1	268.9	280.3	291.7	303.6	315.3
169.3	170.5	171.7	172.9	173.9	174.9	175.9	176.5	177.1		177.8	177.9	178.1	178.2	177.8	177.4	177.1	176.3	175.5	174.8
152.7	159.0	165.3	171.5	177.9	184.2	190.5	196.9	203.3	1924	209.5	215.0	222.2	228.5	234.9	241.2	247.4	253.7	259.8	266.0
158.4	166.8	181.3	197.4	214.6	231.9	248.3	262.5	271.8		272.6	285.6	292.0	297.8	303.8	309.7	314.8	318.1	321.2	324.3
208.9	208.9	211.1	213.3	215.5	217.7	220.0	222.2	224.3		226.4	228.4	230.2	231.9	233.4	234.7	235.6	236.5	236.9	236.9
181.2	193.5	206.2	218.6	231.1	243.7	256.2	268.7	281.0		293.7	306.0	318.2	330.2	342.5	354.5	366.5	378.5	390.5	402.5
179.7	180.9	182.1	183.4	184.5	185.6	186.7	187.4	188.2		189.0	189.1	189.6	190.0	189.8	189.5	189.4	189.8	189.2	187.6
O 9	O 19	O 29	N 8	N 18	N 28	D 8	D 18	D 28		Ja 7	Ja 17	Ja 27	F 6	F 16	F 26	Mr 8	Mr 18	Mr 28	Ap 7
303.9	306.9	311.0	315.3	320.4	325.8	331.2	337.1	343.2	1925	349.3	355.6	361.9	368.2	374.5	380.8	387.1	393.4	399.7	406.0
180.9	176.9	184.0	211.5	224.0	242.9	254.1	257.2	251.3		245.9	249.7	250.5	275.6	292.8	310.9	329.0	347.1	365.2	383.3
232.1	233.8	235.8	237.9	239.9	242.4	244.4	246.7	249.0		251.3	253.6	255.7	257.9	259.9	261.8	263.7	265.5	266.6	267.9
139.8	141.2	152.8	164.7	176.4	188.6	200.7	213.0	225.4		227.8	250.5	263.0	275.4	287.9	300.5	313.1	325.6	338.1	350.5
190.0	191.2	192.4	193.6	194.7	195.8	197.0	197.9	198.8		189.7	200.2	200.7	201.8	201.3	201.4	201.4	200.8	200.3	199.8
O 10	O 20	O 30	N 9	N 19	N 29	D 9	D 19	D 29		Ja 8	Ja 18	Ja 28	F 7	F 17	F 27	Mr 9	Mr 19	Mr 29	Ap 8
164.8	171.2	177.6	184.3	190.8	197.5	204.0	210.6	217.5	1926	224.3	231.2	238.1	244.9	252.0	258.9	266.0	273.1	280.2	287.2
173.3	189.9	208.2	223.6	238.0	241.3	238.5	231.0	231.2		241.0	255.1	271.6	289.8	307.3	324.5	339.5	350.1	352.1	348.5
260.4	261.6	261.9	264.5	266.2	268.2	270.3	272.4	274.4		277.0	277.8	281.8	284.0	286.4	288.6	290.9	293.1	295.1	297.1
215.3	228.8	238.3	249.4	260.2	270.5	280.1	288.8	296.0		300.9	302.3	300.3	305.0	308.4	308.8	308.5	308.0	307.8	308.4
200.3	201.4	202.6	203.7	204.9	206.1	207.2	208.2	209.2											

TABLE

Geocentric Places of Mars, Mercury, Jupiter, Venus and Saturn for every tenth day of current cycle.
Venus, A.D. 1765—A.D. 1999;

Day of I.S.Y.	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
Eng. date ...	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Jl 2	Jl 12	Jl 22	Au 1	Au 11	Au 21	Au 31	S 10	S 20	S 30
1927 Mars ...	05.0	70.9	76.8	82.7	88.8	94.9	100.9	107.1	113.2	119.4	125.8	131.9	138.3	144.6	151.0	157.5	163.8	170.5
Merc. ...	832.9	847.1	4.6	21.2	42.2	60.8	77.7	91.8	98.2	95.6	88.6	89.3	99.5	114.1	131.1	148.8	166.5	183.5
Jup. ...	326.1	328.4	330.5	332.4	334.3	335.9	337.2	338.3	339.2	339.6	339.8	339.6	339.0	338.1	337.1	335.8	334.4	332.9
Ven. ...	38.5	45.2	57.0	68.7	80.1	91.2	102.3	112.6	122.6	131.8	140.2	147.0	151.5	152.0	150.0	144.0	138.5	135.9
Sat. ...	223.4	222.7	222.1	221.5	220.7	219.9	219.1	218.5	217.9	217.8	217.1	216.9	216.8	217.1	217.4	217.8	218.6	219.4
Eng. date ...	Ap 12	Ap 22	My 2	My 12	My 22	Je 1	Je 11	Je 21	Jl 1	Jl 11	Jl 21	Jl 31	Au 10	Au 20	Au 30	S 9	S 19	S 29
1928 Mars ...	809.9	817.7	825.2	832.9	840.4	847.9	855.1	862.4	869.0	875.7	882.6	889.3	896.0	902.7	909.4	916.1	922.8	929.5
Merc. ...	342.1	0.2	19.1	37.9	55.8	69.9	78.8	77.9	70.7	69.5	79.8	92.5	109.3	126.2	145.6	162.7	178.4	190.1
Jup. ...	353.8	356.2	358.6	1.0	3.3	5.5	7.5	9.6	11.8	12.8	14.2	15.2	15.9	16.4	16.8	16.0	15.3	14.4
Ven. ...	388.2	350.5	2.9	15.1	27.4	39.6	52.0	64.2	76.4	88.9	101.0	113.2	125.4	137.8	150.0	162.4	174.7	187.1
Sat. ...	234.8	234.5	234.3	233.2	232.4	231.6	230.9	230.2	229.5	228.7	228.4	228.0	227.7	227.9	228.1	228.2	228.9	229.5
Eng. date ...	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Jl 2	Jl 12	Jl 22	Au 1	Au 11	Au 21	Au 31	S 10	S 20	S 30
1929 Mars ...	81.4	86.4	91.6	97.1	102.5	108.2	114.1	119.9	126.0	132.0	138.1	144.4	150.7	157.0	163.4	169.8	176.4	183.0
Merc. ...	856.5	15.2	32.7	48.0	58.3	60.0	53.1	50.1	57.2	70.8	87.4	105.8	123.7	141.6	157.8	171.1	178.1	175.6
Jup. ...	21.5	23.8	26.2	28.6	31.0	33.4	35.8	38.1	40.3	42.4	44.4	46.2	47.9	49.4	50.5	51.4	51.9	52.1
Ven. ...	12.5	6.6	1.8	359.5	1.4	6.2	18.3	21.7	31.1	41.1	51.7	62.5	73.7	85.2	96.9	108.2	120.5	132.6
Sat. ...	240.1	245.8	245.5	245.1	244.4	243.7	242.9	242.1	241.3	240.6	240.1	239.6	239.1	239.0	238.9	238.9	239.4	239.9
Eng. date ...	Ap 12	Ap 22	My 2	My 12	My 22	Je 1	Je 11	Je 21	Jl 1	Jl 11	Jl 21	Jl 31	Au 10	Au 20	Au 30	S 9	S 19	S 29
1930 Mars ...	327.5	335.3	343.0	350.7	358.3	365.9	373.5	381.1	388.7	396.3	403.9	411.5	419.1	426.7	434.3	441.9	449.5	457.1
Merc. ...	10.5	26.3	37.8	41.1	35.3	30.6	35.9	48.8	65.0	83.0	101.7	120.0	137.0	151.4	160.4	160.7	153.1	150.5
Jup. ...	49.1	51.1	53.2	55.4	57.7	59.9	62.4	64.7	67.0	69.4	71.7	73.8	76.0	78.0	79.8	81.4	83.0	84.8
Ven. ...	16.3	28.5	40.8	52.9	65.1	77.1	89.1	100.9	112.7	124.3	135.8	147.3	158.5	169.5	180.3	190.4	199.9	208.7
Sat. ...	257.1	256.9	256.7	256.6	256.9	255.3	254.7	254.0	253.2	252.4	251.8	251.2	250.5	250.3	250.1	249.8	250.1	250.4
Eng. date ...	Ap 12	Ap 22	My 2	My 12	My 22	Je 1	Je 11	Je 21	Jl 1	Jl 11	Jl 21	Jl 31	Au 10	Au 20	Au 30	S 9	S 19	S 29
1931 Mars ...	101.4	104.7	108.7	113.1	117.8	123.0	128.0	134.0	139.6	145.3	151.5	157.5	163.8	170.1	176.5	183.1	189.7	196.6
Merc. ...	16.7	22.3	17.5	11.5	14.5	26.5	42.3	60.3	79.3	97.7	115.5	130.9	142.0	144.5	138.4	133.2	137.9	150.1
Jup. ...	77.7	79.0	80.5	82.2	84.0	86.1	88.0	90.2	92.5	94.8	97.0	99.3	101.6	103.7	105.9	108.1	110.1	111.9
Ven. ...	322.2	334.1	346.1	358.1	10.2	22.3	34.5	46.6	58.8	70.9	83.0	95.3	107.5	119.8	132.1	144.4	156.9	169.4
Sat. ...	268.0	268.1	268.2	268.2	267.2	266.8	266.0	265.2	264.4	263.7	263.0	262.3	261.9	261.5	261.1	261.2	261.2	261.8
Eng. date ...	Ap 12	Ap 22	My 2	My 12	My 22	Je 1	Je 11	Je 21	Jl 1	Jl 11	Jl 21	Jl 31	Au 10	Au 20	Au 30	S 9	S 19	S 29
1932 Mars ...	344.1	351.9	359.4	367.1	374.6	382.0	389.4	396.8	404.3	411.7	419.1	426.5	433.9	441.3	448.7	456.1	463.5	470.9
Merc. ...	0.0	852.8	354.4	4.8	19.9	37.6	55.7	74.6	92.5	109.3	121.2	126.7	122.5	116.1	119.1	180.0	144.9	161.8
Jup. ...	108.1	108.3	108.9	109.7	110.9	112.2	113.8	115.6	117.4	119.4	121.6	123.8	125.9	128.1	130.4	132.6	134.7	136.9
Ven. ...	45.4	55.5	64.8	72.7	79.3	82.9	83.4	79.7	73.8	68.4	66.1	67.6	72.4	80.0	88.4	97.9	108.3	119.1
Sat. ...	278.8	278.1	279.4	279.6	279.3	279.0	278.8	278.1	277.4	276.7	276.0	275.2	274.4	273.8	273.2	272.6	272.5	272.4
Eng. date ...	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Jl 2	Jl 12	Jl 22	Au 1	Au 11	Au 21	Au 31	S 10	S 20	S 30
1933 Mars ...	127.9	128.7	130.7	133.1	136.7	140.6	145.1	150.0	155.2	160.6	166.4	172.2	178.4	184.7	191.1	197.8	204.5	211.2
Merc. ...	334.8	343.2	357.4	15.1	38.7	52.7	71.2	88.2	101.5	108.8	106.2	99.2	99.8	109.5	123.9	140.7	158.5	176.1
Jup. ...	140.4	139.6	139.2	138.9	139.3	139.8	140.6	141.7	143.0	144.4	146.2	148.1	150.0	152.1	154.2	156.4	158.2	160.8
Ven. ...	351.8	10.2	22.5	34.9	47.2	59.4	71.7	83.8	95.9	108.1	120.2	132.4	144.4	156.3	168.4	180.4	192.3	203.9
Sat. ...	289.8	290.2	290.3	291.1	291.0	290.9	290.3	290.2	289.6	289.1	288.3	287.5	286.8	286.1	285.4	284.7	284.4	284.1
Eng. date ...	Ap 12	Ap 22	My 2	My 12	My 22	Je 1	Je 11	Je 21	Jl 1	Jl 11	Jl 21	Jl 31	Au 10	Au 20	Au 30	S 9	S 19	S 29
1934 Mars ...	359.7	7.4	15.0	22.8	29.7	36.7	43.9	51.0	57.9	64.8	71.6	78.1	84.9	91.2	97.8	104.1	110.3	116.5
Merc. ...	386.7	352.4	10.4	29.4	48.3	65.6	80.4	89.5	88.2	81.8	80.2	88.5	103.4	119.2	137.0	154.9	172.2	187.6
Jup. ...	174.1	172.8	171.5	170.7	169.9	169.3	169.2	169.4	169.8	170.6	171.7	173.0	174.4	176.2	178.0	179.9	182.1	184.1
Ven. ...	313.4	323.1	333.8	344.5	355.7	7.0	18.4	30.2	41.9	53.7	65.7	77.5	89.7	101.9	113.9	126.1	138.4	150.6
Sat. ...	300.6	301.2	301.8	302.5	302.6	302.7	302.9	302.5	302.1	301.8	301.1	300.4	299.6	298.8	298.0	297.3	296.8	296.3
Eng. date ...	Ap 12	Ap 22	My 2	My 12	My 22	Je 1	Je 11	Je 21	Jl 1	Jl 11	Jl 21	Jl 31	Au 10	Au 20	Au 30	S 9	S 19	S 29
1935 Mars ...	168.4	165.3	163.6	162.8	163.2	164.9	167.6	171.1	175.0	179.6	184.7	190.1	196.0	201.8	208.0	214.7	221.3	228.1
Merc. ...	348.1	6.7	25.5	43.2	58.8	69.5	71.2	64.6	61.0	67.9	81.0	97.3	115.2	138.5	151.4	166.6	180.6	187.4
Jup. ...	208.2	207.1	205.8	204.5	203.1	202.0	201.0	200.1	199.6	199.4	199.5	200.0	200.8	201.9	203.1	204.7	206.3	208.2
Ven. ...	34.1	45.8	57.5	69.1	80.5	91.7	102.4	112.9	122.6	131.6	139.8	145.9	149.2	149.6	146.4	140.6	135.0	133.4
Sat. ...	311.5	312.3	313.1	314.0	314.4	314.8	315.1	314.9	314.7	314.6	314.0	313.4	312.8	312.0	311.2	310.3	309.6	308.9
Eng. date ...	Ap 12	Ap 22	My 2	My 12	My 22	Je 1	Je 11	Je 21	Jl 1	Jl 11	Jl 21	Jl 31	Au 10	Au 20	Au 30	S 9	S 19	S 29
1936 Mars ...	14.9	22.1	29.4	36.5	43.5	50.7	57.5	64.4	71.2	77.8	84.5	91.2	97.5	104.1	110.4	116.9	123.3	129.2
Merc. ...	2.7	20.8	36.6	48.5	52.3	48.4	41.7	46.8	58.9	75.1	93.0	111.6	129.7	147.7	161.1	170.1	170.1	168.2
Jup. ...	241.3	241.2	240.5	239.7	238.7	237.4	236.0	234.6	233.4	232.3	231.4	230.9	230.7	230.7	231.8	231.9	232.9	234.2
Ven. ...	339.3	351.6	3.9	16.8	29.5	40.8	53.2	65.5	77.6	89.9	102.2	114.3	126.7	138.9	151.2	163.6	175.8	188.1
Sat. ...	322.5	323.5	324.5	325.5	326.1	326.7	327.3	327.4	327.5	327.5	327.0	326.5	326.1	325.3	324.5	323.8	323.0	322.2
Eng. date ...	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Jl 2	Jl 12	Jl 22	Au 1	Au 11	Au 21	Au 31	S 10	S 20	S 30
1937 Mars ...	223.3	222.0	220.2	217.8	214.8	211.6	209.7	208.3	206.9	210.2	213.8	216.4	220.5	225.4	230.5	236.3	242.4	247.7
Merc. ...	14.6	27.5	32.9	28.6	22.5	25.7	37.1	52.8	70.7	89.5	107.9	125.5	140.7	151.5	154.1	147.9	142.9	147.9
Jup. ...	272.6	273.5	274.0	274.1	274.1	273.6	272.7	271.7	270.5	269.1	267.8	266.5	265.4	264.4	263.8	263.5	263.5	263.8
Ven. ...	9.0	14.4	35.9	55.0	0.0	5.4	12.9	21.7	31.1	41.5	52.0	62.2	72.3	82.8	97.3	108.9	121.3	133.1
Sat. ...	333.9	335.0	336.1	337.3	338.1	338.9	339.7	340.0	340.3									

V-B—cont.

Mars, A.D. 1637—A.D. 1999; Mercury, A.D. 1645—A.D. 1999; Jupiter, A.D. 1656—A.D. 1999;
 Saturn, A.D. 1617—A.D. 1999—cont.

180	190	200	210	220	230	240	250	260		270	280	290	300	310	320	330	340	350	360
O 10	O 20	O 30	N 9	N 19	N 29	D 9	D 19	D 29		Ja 8	Ja 18	Ja 28	F 7	F 17	F 27	Mr 8	Mr 18	Mr 28	Ap 7
177.1	183.6	190.3	197.1	203.8	210.8	217.6	224.7	231.8	1928	238.9	246.1	253.4	260.7	268.1	275.8	283.1	290.6	298.2	306.0
198.2	208.0	209.9	202.5	198.5	203.0	215.2	230.6	247.6		284.9	282.4	298.1	310.6	316.5	313.1	306.4	307.3	318.2	333.1
331.7	330.6	329.7	329.3	329.0	329.2	329.8	330.6	331.7		333.1	331.8	331.6	333.5	340.8	343.0	345.3	347.7	350.1	352.3
136.6	141.8	148.7	157.2	168.7	177.1	187.6	199.0	210.5		222.2	234.6	246.4	258.5	27.8	283.1	295.2	307.6	320.0	332.2
230.1	231.2	222.2	228.2	224.4	225.7	226.8	227.9	229.0		239.2	231.1	232.1	233.0	233.6	234.1	234.7	234.8	234.9	234.9
O 9	O 19	O 29	N 8	N 18	N 28	D 8	D 18	D 28		Ja 7	Ja 17	Ja 27	F 6	F 16	F 26	Mr 8	Mr 18	Mr 28	Ap 7
68.3	71.6	74.3	75.8	76.6	75.6	73.5	70.4	66.8	1929	63.2	61.1	59.9	60.1	61.4	63.6	65.9	70.4	74.7	79.0
194.5	189.6	183.2	185.6	190.2	210.5	224.9	244.4	261.6		277.4	291.1	298.7	297.3	289.8	288.6	297.5	310.7	328.3	346.8
13.2	11.9	10.5	9.1	7.9	6.9	6.8	5.6	5.6		5.4	6.5	7.4	8.6	10.1	11.7	13.6	15.7	17.8	20.0
199.4	211.7	224.8	236.2	248.4	260.5	272.8	284.7	296.6		308.2	319.7	330.8	341.2	351.4	0.5	8.4	14.7	18.0	18.0
230.1	231.1	232.1	233.1	234.3	235.5	236.6	237.7	238.8		240.0	241.0	242.0	243.8	243.8	244.5	245.2	245.5	245.8	246.0
O 10	O 20	O 30	N 9	N 19	N 29	D 9	D 19	D 29		Ja 8	Ja 18	Ja 28	F 7	F 17	F 27	Mr 9	Mr 19	Mr 29	Ap 8
189.8	198.6	203.4	210.5	217.5	224.7	231.9	239.1	246.5	1930	254.0	261.4	268.9	276.6	284.4	292.1	300.0	307.7	315.5	323.4
168.3	167.1	176.7	190.8	206.5	223.9	241.0	257.6	271.6		281.0	282.1	274.8	271.4	277.5	290.4	306.5	324.4	343.1	361.0
52.0	51.5	50.7	49.6	48.4	47.1	45.7	44.4	43.3		42.4	41.7	41.4	41.5	41.8	42.6	43.6	44.9	46.5	48.1
143.2	156.8	167.2	181.6	198.9	208.4	210.0	231.5	244.3		259.8	269.6	283.1	294.7	307.4	319.9	332.4	344.8	357.3	369.8
240.8	241.2	242.1	243.0	244.1	245.2	246.3	247.5	248.7		249.8	250.9	252.0	253.1	254.0	254.9	255.7	256.1	256.5	257.0
91.6	98.6	101.3	105.4	109.0	111.9	114.2	115.1	115.3	1931	113.9	111.8	107.8	103.8	100.4	97.0	96.4	96.4	97.7	99.9
157.4	170.8	186.8	203.4	220.8	237.3	252.2	268.1	283.4		260.8	255.0	258.5	270.0	285.3	302.5	320.7	338.9	356.2	373.0
85.2	86.0	86.3	86.3	86.0	85.4	84.4	83.2	82.0		80.6	79.3	78.1	77.0	76.2	75.8	75.6	75.8	76.8	77.2
215.9	221.0	228.5	232.1	217.1	211.1	207.7	205.5	212.9		215.9	227.8	237.5	247.4	258.3	269.8	280.8	292.3	304.1	315.8
260.7	251.4	232.1	252.9	258.9	264.9	268.0	257.2	258.4		259.6	260.8	262.0	263.1	264.0	264.9	265.9	266.5	267.1	267.8
204.3	210.2	217.4	224.4	231.7	239.0	246.4	254.2	261.7	1932	269.4	277.1	284.9	292.7	300.6	309.5	318.3	324.3	332.1	340.0
165.6	182.7	200.1	217.1	232.5	244.9	250.5	247.1	239.8		240.6	250.4	261.5	281.1	299.0	317.1	334.2	359.6	0.5	8.0
113.7	115.2	116.4	117.5	118.3	118.7	118.7	118.5	118.0		117.1	116.1	114.8	113.5	112.2	111.0	109.8	108.9	108.4	108.1
181.6	194.1	208.7	219.1	231.6	244.2	256.7	269.2	281.8		294.2	306.6	318.7	331.0	343.0	354.8	366.4	377.9	389.9	401.9
261.4	261.9	262.4	263.0	264.0	265.0	265.9	267.1	268.3		269.4	270.5	271.8	272.9	274.0	275.1	276.2	277.0	277.8	278.5
O 9	O 19	O 29	N 8	N 18	N 28	D 8	D 18	D 28		Ja 7	Ja 17	Ja 27	F 6	F 16	F 26	Mr 8	Mr 18	Mr 28	Ap 7
104.8	114.1	119.5	124.7	129.5	134.2	138.2	141.7	144.7	1933	146.6	147.7	147.8	145.7	143.1	139.0	135.7	132.3	129.3	125.4
178.5	196.8	212.9	226.2	234.3	233.5	226.3	228.2	230.8		244.3	260.8	277.0	295.7	313.1	328.6	340.1	344.8	339.5	333.6
139.0	140.9	142.8	144.5	146.0	147.2	148.4	149.7	149.6		149.7	149.5	149.0	148.3	147.2	145.9	144.7	143.4	142.1	140.9
130.1	141.5	153.2	165.0	177.0	189.0	201.3	213.5	225.9		238.2	251.0	263.6	276.0	288.6	301.0	313.7	326.0	338.6	351.0
272.3	272.7	273.1	273.5	274.4	275.3	276.1	276.9	277.9		278.4	279.6	280.8	281.9	283.0	284.2	285.4	286.5	287.5	288.5
O 10	O 20	O 30	N 9	N 19	N 29	D 9	D 19	D 29		Ja 8	Ja 18	Ja 28	F 7	F 17	F 27	Mr 9	Mr 19	Mr 29	Ap 8
218.1	225.8	232.4	239.8	247.1	254.8	262.4	270.0	277.8	1934	285.5	293.4	301.4	309.2	317.0	324.8	332.5	340.6	348.0	355.0
193.0	207.4	217.3	215.9	212.1	207.5	212.5	224.6	239.8		257.0	274.5	292.0	307.8	320.5	328.7	328.1	316.4	317.7	328.1
163.0	165.1	167.2	169.2	171.2	173.0	174.7	176.2	177.5		178.6	179.8	179.7	179.9	179.7	178.2	177.2	176.7	176.1	174.7
215.7	227.8	238.6	249.6	260.2	270.5	279.9	288.3	295.0		299.1	300.0	29.6	291.1	285.6	284.4	286.8	292.1	299.4	308.3
238.8	234.0	234.2	234.5	235.2	236.9	236.7	237.7	238.7		239.8	241.0	242.2	243.4	244.6	245.8	246.9	248.0	249.1	250.1
122.5	128.4	134.2	139.9	145.5	150.8	156.1	160.7	165.5	1935	169.9	173.5	176.8	179.3	180.5	181.0	180.2	177.8	174.3	170.2
199.3	203.6	198.7	192.4	194.6	204.9	219.5	236.2	253.6		270.9	287.3	303.7	320.4	337.8	355.2	372.8	390.4	408.0	425.4
166.3	186.6	190.7	192.8	195.0	197.2	199.3	201.2	203.1		204.8	206.8	207.7	208.7	209.4	209.9	210.1	209.9	209.4	208.7
168.2	175.7	188.0	200.6	218.2	225.8	238.3	250.9	263.7		276.2	288.9	301.6	314.1	326.5	338.9	351.3	363.7	376.1	388.5
295.8	295.8	295.8	295.8	296.8	296.8	297.4	298.4	299.4		300.3	301.5	302.7	303.8	305.0	306.2	307.5	308.7	309.9	311.0
235.1	242.1	249.5	256.7	264.2	271.6	279.3	287.1	294.7	1936	302.5	310.3	318.0	325.6	333.4	341.2	348.6	356.1	363.6	371.0
185.5	177.5	176.9	185.9	199.5	215.8	233.0	250.5	268.8		281.1	290.8	291.4	284.7	280.0	287.4	300.2	316.3	334.3	353.0
210.2	212.8	214.4	216.6	218.9	221.1	223.2	225.6	227.7		229.8	231.7	233.8	235.5	237.1	238.5	239.6	240.4	241.1	241.3
135.2	140.9	144.3	157.1	166.8	177.1	188.0	199.5	210.9		222.7	234.9	246.7	258.9	271.8	283.5	295.8	308.2	320.5	332.8
308.3	308.1	307.9	307.7	308.0	308.8	308.7	309.5	310.3		311.2	312.3	313.4	314.5	315.7	316.9	318.2	319.4	320.6	321.9
O 9	O 19	O 29	N 8	N 18	N 28	D 8	D 18	D 28		Ja 7	Ja 17	Ja 27	F 6	F 16	F 26	Mr 8	Mr 18	Mr 28	Ap 7
135.5	141.5	147.7	153.6	159.6	165.4	171.2	176.9	182.4	1937	188.0	198.3	198.1	203.1	209.5	211.6	216.8	218.5	220.7	222.1
159.8	166.9	179.6	195.3	212.4	229.9	246.4	261.4	272.5		275.7	289.7	284.4	26.2	279.3	294.8	312.8	330.7	349.0	367.0
235.8	237.4	239.3	241.4	243.4	245.6	247.8	250.2	252.4		254.6	257.0	259.2	261.4	263.6	265.6	267.4	269.1	270.6	271.9
200.3	212.7	224.9	237.3	249.3	261.5	273.5	285.5	297.4		308.9	320.2	331.1	341.5	351.0	359.6	369.9	380.5	391.8	403.0
321.5	321.1	320.7	320.2	320.8	320.4	320.5	321.1	321.7		322.4	323.5	324.6	325.6	326.8	328.0	329.2	330.5	331.8	333.0
O 10	O 20	O 30	N 9	N 19	N 29	D 9	D 19	D 29		Ja 8	Ja 18	Ja 28	F 7	F 17	F 27	Mr 9	Mr 19	Mr 29	Ap 8
255.3	263.1	269.1	276.2	283.4	290.9	298.2	305.7	313.1	1938	320.5	328.0	335.4	342.8	350.2	357.3	364.7	372.1	379.5	386.9
159.6	174.9	192.0	209.4	226.4	241.8	253.9	259.6	256.0		249.9	250.0	259.6	273.9	291.0	308.8	327.2	344.4	359.8	375.0
264.6	265.5	264.7	268.4	270.0	271.9	274.0	276.1	278.2		280.6	282.9	285.2	287.6	290.0	292.3	294.6	296.9	299.2	301.5
145.4	157.4	169.9	182.2	194.7	207.1	219.6	232.1	244.8		257.5	270.2	282.8	295.3	308.1	320.5	333.1	345.4	357.9	370.4
335.4	334.8	334.2	333.6	333.5	333.4	333.3	333.												

TABLE

Geocentric Places of Mars, Mercury, Jupiter, Venus and Saturn for every tenth day of current cycle.
Venus, A.D. 1768—A.D. 1999;

Day of I.S.Y.	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
Eng. date ..	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Ji 2	Ji 12	Ji 22	An 1	An 11	An 21	An 31	S 10	S 20	S 30
1989 Mars ..	258.7	208.6	288.3	272.5	276.2	279.1	280.8	281.9	282.0	280.5	277.7	275.6	269.8	272.9	272.3	274.2	277.0	280.9
Merc. ..	346.6	344.9	353.0	7.7	25.1	43.7	62.8	81.1	98.3	112.0	119.3	117.3	109.7	109.6	119.4	133.5	150.2	167.9
Jup. ..	330.0	332.2	334.4	336.4	338.4	340.0	341.6	342.8	343.8	344.5	344.8	344.7	344.4	343.6	342.6	341.4	340.1	338.7
Ven. ..	322.7	334.6	346.6	355.7	10.9	22.9	35.1	47.2	59.4	71.5	83.6	96.0	108.3	120.5	132.7	145.2	157.5	170.0
Sat. ..	356.9	358.2	359.5	0.8	2.0	3.2	4.3	5.1	5.9	6.7	7.0	7.3	7.6	7.3	7.0	6.7	6.0	5.3
Eng. date ..	Ap 12	Ap 22	My 2	My 12	My 22	Je 1	Je 11	Je 21	Ji 1	Ji 11	Ji 21	Ji 31	An 10	An 20	An 30	S 9	S 19	S 29
1910 Mars ..	44.4	50.9	57.4	64.0	70.5	76.9	83.4	89.6	96.3	102.6	109.0	115.2	121.6	128.0	134.4	140.9	147.1	153.5
Merc. ..	332.8	345.6	2.5	20.8	40.0	58.8	76.1	90.9	100.2	99.7	92.5	90.6	98.8	112.4	129.0	146.5	164.5	181.7
Jup. ..	357.6	0.0	2.4	4.8	7.0	9.4	11.5	13.5	15.5	17.0	18.5	19.7	20.0	21.1	21.8	21.2	20.7	19.9
Ven. ..	45.6	55.6	64.6	72.2	78.0	80.7	80.2	76.6	69.9	65.2	63.8	66.7	71.5	79.6	88.7	98.3	108.5	119.2
Sat. ..	8.8	10.1	11.4	12.7	14.0	15.3	16.6	17.6	18.6	19.6	20.2	20.8	21.4	21.4	21.3	21.3	20.8	20.3
Eng. date ..	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Ji 2	Ji 12	Ji 22	An 1	An 11	An 21	An 31	S 10	S 20	S 30
1941 Mars ..	284.0	239.0	296.4	303.2	309.8	316.3	322.5	328.5	334.3	339.8	344.6	348.8	352.1	354.5	355.7	355.5	353.9	351.2
Merc. ..	310.1	338.2	16.9	35.8	53.8	69.2	80.0	82.0	75.4	71.8	78.1	91.0	107.5	125.0	143.8	160.8	177.0	189.9
Jup. ..	25.3	27.6	29.9	32.3	34.7	37.1	39.4	41.8	44.1	46.2	48.3	50.3	51.9	53.5	54.7	55.8	56.5	56.8
Ven. ..	358.3	10.8	23.0	35.4	47.7	59.9	72.3	84.4	96.5	108.7	120.7	132.9	144.9	156.9	168.9	180.9	192.7	204.3
Sat. ..	21.1	22.4	23.7	25.1	26.4	27.7	29.1	30.3	31.5	32.6	33.4	34.2	34.9	35.2	35.5	35.8	35.5	35.2
Eng. date ..	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Ji 2	Ji 12	Ji 22	An 1	An 11	An 21	An 31	S 10	S 20	S 30
1943 Mars ..	59.1	65.2	71.3	77.4	83.5	89.7	96.0	102.2	108.3	114.7	121.0	127.3	133.6	139.9	146.3	152.7	159.2	165.6
Merc. ..	354.4	12.9	31.2	47.2	63.4	79.6	95.8	112.0	128.2	144.4	160.6	176.8	193.0	209.2	225.4	241.6	257.8	274.0
Jup. ..	53.0	54.4	56.9	59.1	61.8	63.5	65.4	68.2	70.6	72.9	75.2	77.4	79.5	81.6	83.6	85.3	86.9	88.3
Ven. ..	318.2	323.2	333.8	344.7	356.2	7.4	19.1	30.8	42.5	54.4	66.3	78.2	90.3	102.4	114.4	126.7	139.1	151.4
Sat. ..	33.5	34.8	36.1	37.5	38.8	40.1	41.5	42.8	44.1	45.3	46.4	47.5	48.7	49.1	49.1	50.0	50.0	49.9
Eng. date ..	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Ji 2	Ji 12	Ji 22	An 1	An 11	An 21	An 31	S 10	S 20	S 30
1948 Mars ..	302.7	310.1	317.7	325.1	332.7	340.0	347.5	354.4	1.5	8.4	14.9	21.2	27.4	33.2	38.8	43.7	48.0	51.9
Merc. ..	8.5	25.1	38.3	45.0	40.4	33.9	30.6	47.5	63.0	81.0	99.8	117.8	135.4	150.6	161.4	164.0	157.9	152.8
Jup. ..	81.8	83.0	84.8	85.8	87.6	89.5	91.6	93.7	95.9	98.2	100.5	102.6	104.9	107.2	109.4	111.5	113.6	115.5
Ven. ..	34.5	46.3	58.1	69.6	81.0	92.0	102.5	113.0	122.8	131.5	139.2	144.8	147.4	147.5	143.6	136.7	132.2	131.4
Sat. ..	46.4	47.7	49.0	50.2	51.5	52.8	54.1	55.4	56.7	58.1	59.3	60.5	61.7	62.5	63.3	64.1	64.4	64.7
Eng. date ..	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Ji 2	Ji 12	Ji 22	An 1	An 11	An 21	An 31	S 10	S 20	S 30
1944 Mars ..	74.8	80.2	85.7	91.4	97.2	103.0	108.9	114.9	120.8	126.9	132.1	138.4	145.7	152.1	158.4	165.0	174.4	178.0
Merc. ..	16.7	24.3	22.3	15.1	15.8	25.7	40.7	58.4	77.1	95.4	113.4	129.7	145.4	147.2	142.6	136.3	133.7	143.9
Jup. ..	112.4	112.5	112.9	113.7	114.8	116.0	117.6	119.2	121.0	123.0	125.1	127.2	129.6	131.6	133.8	136.0	138.2	140.4
Ven. ..	339.9	352.2	4.6	17.1	29.4	41.6	53.8	66.0	78.4	90.6	102.8	115.2	127.3	139.6	151.8	164.2	176.4	188.9
Sat. ..	59.5	60.6	61.7	62.8	64.1	65.4	66.7	68.0	69.4	70.8	72.1	73.4	74.6	75.6	76.6	77.6	78.1	78.6
Eng. date ..	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Ji 2	Ji 12	Ji 22	An 1	An 11	An 21	An 31	S 10	S 20	S 30
1945 Mars ..	320.7	328.5	336.3	344.1	351.5	359.1	6.6	13.9	21.1	28.2	35.3	41.9	48.7	55.2	61.3	67.4	73.1	78.6
Merc. ..	4.7	35.7	1.8	35.7	8.9	18.4	35.6	54.0	73.2	91.5	108.4	121.9	139.4	127.1	119.7	120.0	128.8	143.4
Jup. ..	145.0	144.1	143.6	143.2	143.3	143.7	144.4	145.3	146.6	148.0	149.6	151.4	153.4	155.3	157.4	159.6	161.7	163.9
Ven. ..	5.2	35.8	354.9	355.1	358.8	4.8	12.7	21.7	31.3	41.5	52.4	63.3	74.7	86.2	98.0	109.8	121.7	133.7
Sat. ..	72.8	73.7	74.6	75.5	76.7	77.9	79.1	80.5	81.9	83.2	84.5	85.8	87.2	88.3	89.6	90.6	91.4	92.2
Eng. date ..	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Ji 2	Ji 12	Ji 22	An 1	An 11	An 21	An 31	S 10	S 20	S 30
1946 Mars ..	93.1	97.2	101.7	106.5	111.9	117.0	122.7	128.1	134.0	140.1	145.9	152.2	158.5	164.7	171.1	177.7	184.5	191.1
Merc. ..	336.4	342.5	355.9	12.7	31.3	50.4	69.1	86.6	101.2	110.5	110.9	108.5	101.1	108.6	122.4	138.7	156.3	174.1
Jup. ..	178.8	177.5	176.2	175.2	174.1	173.7	173.3	173.4	173.7	174.4	175.3	176.5	177.9	179.5	181.4	183.3	185.2	187.4
Ven. ..	17.5	29.8	42.1	54.1	66.3	78.2	90.1	101.8	113.7	125.2	136.8	148.1	159.1	169.9	180.3	190.4	199.4	207.4
Sat. ..	86.3	87.0	87.7	88.3	89.4	90.5	91.6	92.6	94.2	95.4	96.7	98.0	99.4	100.7	102.0	103.2	104.2	105.2
Eng. date ..	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Ji 2	Ji 12	Ji 22	An 1	An 11	An 21	An 31	S 10	S 20	S 30
1947 Mars ..	337.7	345.4	353.2	0.9	8.5	16.0	23.3	30.6	37.7	44.9	51.6	58.4	65.3	71.7	78.1	84.3	90.5	96.6
Merc. ..	334.4	350.3	8.3	27.1	48.1	64.1	79.7	90.8	98.0	86.4	82.4	88.6	101.0	117.2	134.7	152.9	170.6	188.6
Jup. ..	212.9	211.8	210.6	209.3	207.9	206.6	205.7	204.7	204.0	203.7	203.7	204.0	204.7	205.6	206.8	208.2	209.9	211.6
Ven. ..	323.2	335.2	347.3	359.4	11.4	23.7	35.8	48.0	60.1	72.2	84.5	96.6	108.9	121.2	133.5	145.9	158.3	170.7
Sat. ..	100.1	100.5	100.9	101.3	102.2	103.1	103.9	105.1	106.3	107.5	108.8	110.1	111.4	112.7	114.0	115.3	116.4	117.5
Eng. date ..	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Ji 2	Ji 12	Ji 22	An 1	An 11	An 21	An 31	S 10	S 20	S 30
1948 Mars ..	116.6	118.5	121.2	124.6	128.6	133.2	138.1	143.4	148.8	154.4	160.2	166.1	172.5	178.6	185.2	191.7	198.5	205.4
Merc. ..	345.7	4.3	23.2	41.4	57.7	70.3	74.6	69.2	63.5	68.2	79.4	95.3	113.0	131.2	149.1	166.0	180.1	189.0
Jup. ..	245.8	245.6	245.1	244.4	243.4	241.9	240.9	239.6	238.3	237.2	236.2	235.5	235.1	235.2	235.8	236.0	237.0	238.2
Ven. ..	45.5	55.8	64.0	71.3	76.5	79.1	77.3	72.4	66.0	61.9	61.8	65.4	71.4	77.4	83.4	89.3	95.2	101.0
Sat. ..	114.0	114.1	114.3	114.4	115.1	115.8	116.4	117.5	118.6	119.6	120.9	122.2	123.4	124.7	126.0	127.3	128.5	129.7
Eng. date ..	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Ji 2	Ji 12	Ji 22	An 1	An 11	An 21	An 31	S 10	S 20	S 30
1949 Mars ..	353.7	1.3	9.0	16.4	23.8	31.1	38.4	45.5	52.5	59.4	66.3	73.0	79.6	86.2	92.5	98.9	105.1	111.3
Merc. ..	0.6	19.0	35.5	48.8	55.0	51.7	45.1	47.2	58.1	73.4	91.0	109.6	127.7	145.0	160.4	171.0	178.7	187.3
Jup. ..	276.7	277.6	278.4	278.8	278.5	277.9	276.9	275.7	274.5	273.1	271.8	270.6	269.5	268.7	268.3	268.2	268.2	268.2
Ven. ..	359.1	11.5	23.7	36.2	48.5	60.6	73.0	85.0	97.2	109.3	121.4	133.6	145.4	157.6	169.4	181.4	193.3	204.9
Sat. ..	127.9	127.7	127.5	127.4	127.8	128.2	128.7	129.6	130.5	131.3	132.6	133.7	134.9	136.2	137.5	138.7	139.9	141.2
Eng. date ..	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Ji 2	Ji 12	Ji 22	An 1	An 11	An 21	An 31	S 1		

V-B—cont.

Mars, A.D. 1637—A.D. 1999, Mercury, A.D. 1645—A.D. 1999, Jupiter, A.D. 1656—A.D. 1999, Saturn, A.D. 1617—A.D. 1999—cont.

180	190	200	210	220	230	240	250	260		270	280	290	300	310	320	330	340	350	360
O 10	O 20	O 30	N 9	N 19	N 29	D 9	D 19	D 29		Ja 8	Ja 18	Ja 28	F 7	F 17	F 27	Mr 8	Mr 18	Mr 28	Ap 7
285.3	290.2	298.0	301.7	307.9	314.1	320.5	327.4	334.0	1940	340.5	347.3	354.1	0.7	7.6	14.2	20.8	27.5	34.2	40.8
185.5	202.2	216.4	226.3	227.8	221.1	216.5	221.7	238.5		240.0	266.2	284.6	301.4	317.5	330.3	336.7	333.9	327.0	327.6
337.3	336.2	335.2	334.4	334.1	334.1	334.4	334.1	336.2		337.4	338.9	340.7	342.6	344.6	346.9	349.1	351.5	353.8	356.3
182.6	194.7	207.4	219.7	232.3	244.8	257.4	269.8	282.4		294.6	307.0	319.3	331.4	343.5	355.2	6.9	18.3	29.4	40.1
4.6	8.8	3.0	2.1	1.5	0.9	0.3	0.2	0.1		0.1	0.6	1.1	1.6	2.5	3.4	4.4	5.6	6.8	8.1
O 9	O 19	O 29	N 8	N 18	N 28	D 8	D 18	D 28	1941	Ja 7	Ja 17	Ja 27	F 6	F 16	F 26	Mr 8	Mr 18	Mr 28	Ap 7
159.9	166.3	173.0	179.2	185.6	192.3	198.9	205.3	212.0		218.4	225.2	232.0	238.7	245.3	252.0	258.8	265.7	272.7	279.5
197.0	208.6	212.7	207.6	201.5	203.4	214.0	228.6	245.3		263.0	280.3	296.8	310.3	318.6	317.4	310.1	308.5	317.4	331.2
18.9	17.6	16.2	14.8	13.5	12.4	11.4	10.9	10.5		10.7	11.1	11.9	12.9	14.3	15.9	17.6	19.6	21.7	23.9
130.4	141.8	153.5	165.4	177.3	189.6	201.8	214.1	226.4		239.1	251.7	264.3	276.7	289.3	301.8	314.4	326.8	339.3	351.8
19.7	18.9	18.1	17.2	16.5	15.8	15.0	14.6	14.2		13.9	14.1	14.3	14.6	15.4	16.2	16.9	18.0	19.1	20.3
O 10	O 20	O 30	N 9	N 19	N 29	D 9	D 19	D 29	1942	Ja 8	Ja 18	Ja 28	F 7	F 17	F 27	Mr 9	Mr 19	Mr 29	Ap 8
349.7	346.2	345.4	345.6	347.2	349.5	352.6	356.4	0.5		5.2	10.2	15.4	20.9	26.5	30.0	38.0	44.1	49.9	55.8
196.4	194.1	186.5	188.4	195.0	208.7	229.9	242.1	259.8		276.2	290.5	300.1	301.3	294.3	290.8	296.8	300.8	306.3	314.4
58.9	56.7	56.0	55.1	53.8	52.5	51.5	49.9	48.6		47.5	46.8	46.3	46.1	46.5	47.0	47.8	49.0	50.4	52.4
216.1	227.5	238.8	249.8	260.3	270.3	279.4	287.4	293.5		297.2	297.0	292.6	286.8	282.5	281.9	285.3	291.3	299.1	308.1
34.8	34.1	33.4	32.6	31.8	31.0	30.1	29.5	28.9		28.4	28.4	28.3	28.3	28.8	29.3	29.9	30.9	31.9	32.9
172.0	178.7	185.4	192.0	198.7	205.5	212.3	219.1	226.8	1943	233.1	240.1	247.4	254.5	261.8	269.0	276.6	284.0	291.3	298.0
172.3	169.1	175.8	188.8	204.7	221.6	238.9	255.9	270.8		281.6	285.1	279.6	273.8	277.6	289.1	304.6	322.4	340.7	359.0
89.4	90.2	90.8	90.9	90.7	90.2	89.5	88.4	87.1		85.8	84.5	83.2	82.1	81.1	80.5	80.2	80.3	80.6	81.3
163.9	176.1	188.7	201.2	213.7	226.3	239.0	251.5	264.2		277.0	289.4	302.2	314.7	327.2	339.5	351.8	364.0	376.2	388.3
49.9	48.3	48.7	48.2	47.4	46.6	45.7	45.0	44.3		43.5	43.2	42.9	42.5	42.8	43.1	43.3	44.1	44.9	45.7
54.7	56.6	57.5	58.8	59.0	51.9	48.9	45.9	43.7	1944	42.9	43.1	44.5	47.0	49.9	53.7	57.5	62.2	67.0	72.0
157.5	169.0	184.8	201.2	218.5	235.7	251.0	263.4	270.1		265.5	258.2	259.3	260.0	263.4	300.5	318.7	337.1	354.6	372.0
117.3	118.9	120.3	121.3	122.2	122.9	123.0	123.0	122.6		121.9	120.9	119.7	118.4	117.1	115.8	114.7	113.6	112.9	112.6
131.0	140.5	143.1	157.1	166.8	177.5	188.2	199.8	211.3		223.2	235.3	247.2	259.6	271.7	284.1	296.4	308.7	321.0	333.5
64.9	64.6	64.3	63.9	63.2	62.5	61.7	60.9	60.1		59.2	58.6	58.0	57.4	57.4	57.3	57.3	57.9	58.5	59.0
184.6	191.3	198.2	205.1	212.2	219.2	226.1	233.4	240.7	1945	248.1	255.3	262.7	270.3	277.9	285.7	293.3	301.1	309.0	316.7
163.9	180.4	197.8	215.2	231.1	244.4	252.3	251.5	243.3		241.6	249.6	262.8	279.1	296.8	314.9	332.6	348.7	364.0	379.0
142.4	144.5	146.4	148.1	149.6	151.0	152.2	153.0	153.7		153.9	153.8	153.5	152.8	151.8	150.5	149.3	147.9	146.6	145.6
200.6	213.3	225.5	237.7	250.1	262.2	274.2	286.0	297.8		310.1	320.5	331.1	341.4	350.8	359.3	368.0	376.0	383.0	389.0
79.1	79.1	79.0	79.0	78.4	77.8	77.3	76.4	75.5		74.7	74.0	73.3	72.5	72.2	71.9	71.6	71.9	72.2	72.5
O 10	O 20	O 30	N 9	N 19	N 29	D 9	D 19	D 29	1946	Ja 8	Ja 18	Ja 28	F 7	F 17	F 27	Mr 9	Mr 19	Mr 29	Ap 8
88.7	88.2	82.4	95.9	98.8	100.8	101.5	101.0	99.5		96.5	92.4	88.8	85.8	83.3	82.9	83.4	85.2	87.9	91.1
177.4	194.8	211.4	225.5	235.8	244.7	229.7	225.1	230.5		242.8	258.6	275.8	293.7	311.0	327.2	340.4	347.2	344.3	337.1
166.2	168.3	170.4	172.5	171.5	176.4	178.1	179.8	181.1		182.2	183.1	183.7	183.9	183.6	182.9	181.8	180.8	179.5	177.5
145.9	158.1	170.6	183.0	195.3	207.8	220.3	232.9	246.2		258.3	270.7	283.5	296.0	308.8	321.3	333.8	346.2	358.6	371.0
92.9	93.1	93.3	93.8	93.3	93.0	92.6	91.8	91.0		90.3	89.5	88.7	87.8	87.3	86.9	86.2	86.2	86.1	86.1
197.8	204.7	211.7	219.0	226.2	233.3	240.7	248.1	255.7	1947	263.2	270.8	278.6	286.4	294.2	302.1	309.9	317.8	325.8	333.6
191.2	200.2	217.7	221.7	216.7	210.3	212.5	223.1	238.0		254.7	272.5	289.7	306.3	320.1	328.3	327.8	320.3	315.9	327.0
189.5	191.7	193.9	196.1	198.3	200.4	202.6	204.6	206.5		208.3	209.9	211.2	212.4	213.3	214.0	214.2	214.3	213.4	213.3
213.8	217.7	218.4	214.7	208.9	203.7	202.5	205.1	210.9		218.4	227.5	237.2	247.8	258.6	269.9	281.6	293.2	304.9	316.8
106.1	106.6	107.1	107.5	107.5	107.4	107.4	106.8	106.2		105.5	104.7	103.9	103.0	102.3	101.6	100.9	100.6	100.3	100.0
102.1	107.7	113.0	117.8	122.5	126.8	130.0	132.6	134.5	1948	135.4	135.0	133.7	130.2	126.6	122.7	119.2	117.1	115.9	115.8
199.8	205.7	203.2	195.6	195.2	204.2	217.7	233.9	251.4		269.0	285.7	300.2	301.9	311.1	304.6	300.4	307.1	319.8	336.3
213.5	215.5	217.7	220.0	222.1	224.4	226.6	228.8	231.1		232.2	235.3	237.2	239.1	240.7	242.2	243.5	244.5	245.2	245.7
183.2	195.4	208.1	220.4	233.0	245.5	258.1	270.6	282.9		295.4	307.7	319.9	331.9	344.0	355.9	7.4	18.9	29.9	40.5
118.7	119.4	120.1	120.8	121.0	121.2	121.4	120.0	120.6		120.8	119.6	118.9	118.1	117.3	116.5	115.6	115.1	114.6	114.0
212.3	215.1	226.3	233.6	241.1	248.5	256.0	263.7	271.2	1949	279.1	286.9	294.7	302.7	310.6	318.4	326.2	334.1	342.0	349.7
166.8	181.1	178.6	186.1	197.6	213.8	230.6	248.1	265.0		280.3	291.5	294.8	289.0	263.5	287.6	298.6	314.8	331.9	350.6
239.6	241.8	243.1	245.0	247.1	249.3	251.5	253.8	256.1		258.4	260.6	263.0	265.2	267.3	269.4	271.4	273.1	274.7	278.1
180.9	142.4	154.2	166.1	178.0	190.3	202.3	214.9	227.2		239.8	252.3	264.9	277.3	289.8	302.6	314.9	327.6	340.0	352.3
130.8	131.7	132.6	133.5	134.0	134.5	134.9	134.8	134.7		134.5	133.8	133.1	132.5	131.7	130.9	130.1	129.4	128.7	128.1
117.3	123.0	128.9	134.3	139.7	144.8	149.5	154.1	158.0	1950	161.5	164.5	166.5	167.5	167.1	165.2	162.6	158.9	155.0	151.3
162.1	166.7	178.8	193.6	210.5	227.8	244.8	260.3	272.4		278.1	274.6	267.5	268.7	278.4	293.2	310.5	328.5	346.9	365.7
268.8	269.7	270.9	272.2	273.9	275.6	277.6	279.7	282.0		284.1	286.4	288.9	291.2	293.5	295.0	298.3	300.5	302.7	304.7
218.5	227.9	239.2	249.9	260.4	270.1	279.2	289.6	299.2		294.6	293.4	288.8	280.9	279.0	280.0	283.8	290.6	298.7	308.1
142.5	143.5	144.5	145.5	146.7	146.9	147.5	147.6	147.7		147.8	147.4	147.0	146.6	145.8	145.0	144.3	143.5	142.7	141.9
238.1	235.2	242.4	249.9	257.3	265.0	272.6	280.1	288.0	1951	295.8	303.6	311.5	319.2	327.2	334.8	342.5	350.1	357.8	365.5
158.7	173.2	190.0	207.1	224.5	240.6	253.8	261.3	269.2		252.7	251.0	258.4	272.4	288.8	306.8	324.9	342.8	358.7	375.7
308.8	302.9	302.9	303.4	304.1	305.1	306.3	307.9	309.7		311.6	313.7	315.9	318.1	32					

TABLE

Geocentric Places of Mars, Mercury, Jupiter, Venus and Saturn for every tenth day of current cycle.
Venus, A.D. 1765—A.D. 1999;

Day of 1.8 Y	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
Eng. date ...	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Je 12	Je 12	Je 12	Au 1	Au 11	Au 21	Au 31	S 10	S 20	S 30
1951 Mars ..	91	165	239	310	388	453	522	593	662	723	785	860	928	992	1055	1119	1181	1244
Merc. ..	147	156	84	68	148	287	458	644	833	1016	1184	1320	1394	1372	1312	1299	1390	1526
Jup. ...	333.8	336.0	338.3	340.4	342.4	344.2	345.7	347.2	348.3	349.1	349.8	349.8	349.7	349.1	348.3	347.0	345.8	344.5
Ven. ...	85.1	46.9	58.6	70.0	81.4	92.3	103.0	113.0	122.7	131.0	138.3	143.5	145.1	144.5	139.8	133.2	120.1	120.6
Sat. ...	153.2	154.6	154.0	153.4	153.3	153.3	153.2	153.7	154.2	154.6	155.5	156.4	157.8	158.4	159.5	160.6	161.9	163.2
1952 Mars ..	202.2	199.3	195.7	192.7	189.1	188.7	188.9	190.2	192.6	195.8	199.8	204.3	209.5	214.8	220.8	227.0	233.4	240.1
Merc. ..	351.0	347.2	353.4	6.1	23.1	41.6	60.5	79.2	96.7	111.7	121.1	120.9	113.8	111.2	119.0	131.9	118.3	165.6
Jup. ...	1.6	4.0	6.4	8.9	11.2	13.4	15.6	17.7	19.6	21.3	22.9	24.2	25.2	25.9	26.2	26.3	25.9	25.8
Ven. ...	310.6	353.0	5.2	17.7	30.0	42.2	54.4	66.7	79.0	91.3	103.4	115.8	127.9	140.2	152.4	164.8	177.1	189.8
Sat. ...	168.5	167.8	167.1	166.4	166.1	165.8	165.5	165.7	165.9	166.1	166.9	167.7	168.4	169.5	170.6	171.8	172.8	174.0
1953 Mars ...	24.0	31.0	38.0	45.0	51.8	58.8	65.6	72.2	78.9	85.5	92.2	99.5	105.0	111.5	117.8	124.8	130.6	136.8
Merc. ...	332.7	344.7	0.6	18.8	37.6	56.6	74.5	90.1	101.2	103.7	97.8	92.9	98.4	111.0	127.0	144.5	162.8	180.0
Jup. ...	29.1	31.3	33.6	36.1	38.4	40.8	43.2	45.5	47.7	50.0	52.1	54.1	55.8	57.6	58.9	60.1	61.0	61.5
Ven. ...	1.2	355.0	352.1	353.3	357.8	4.0	12.8	21.5	31.5	41.8	52.6	63.6	75.2	86.6	98.3	110.3	122.3	134.8
Sat. ...	181.4	180.6	179.8	179.1	178.6	178.1	177.6	177.6	177.6	177.6	175.1	178.6	179.2	180.1	181.0	181.9	183.1	181.3
1954 Mars ...	246.6	250.1	252.9	254.8	256.1	255.8	254.8	252.1	249.5	247.0	245.3	243.8	241.1	248.3	251.6	255.6	260.6	265.9
Merc. ...	338.3	356.0	1.6	33.7	52.0	68.5	80.6	85.4	80.4	74.5	78.5	90.0	105.5	123.0	141.0	159.1	175.7	189.6
Jup. ...	56.9	58.6	60.6	62.7	64.9	67.1	69.5	71.7	74.1	76.4	78.6	80.9	83.2	85.2	87.2	89.1	90.8	92.2
Ven. ...	18.1	30.5	42.7	54.6	66.8	79.0	90.7	102.5	114.1	125.7	137.0	148.5	159.5	170.3	180.4	190.2	199.2	206.8
Sat. ...	194.0	193.2	192.4	191.6	191.0	190.4	189.7	189.5	189.3	189.0	189.3	189.6	190.0	190.8	191.6	192.3	193.4	194.5
1955 Mars ...	38.6	45.2	52.0	58.6	65.4	71.9	78.4	85.0	91.4	98.0	104.4	110.7	117.1	123.4	130.0	136.2	142.5	148.9
Merc. ...	351.9	11.1	29.1	46.2	59.8	66.1	62.9	56.0	58.1	68.2	83.7	100.9	119.1	137.5	154.7	169.9	180.6	182.8
Jup. ...	85.8	88.9	88.1	89.6	91.3	93.2	95.0	97.2	99.3	101.5	103.7	106.1	108.3	110.5	112.4	114.9	117.0	119.1
Ven. ...	323.8	335.8	347.7	359.9	12.0	24.3	36.4	48.6	60.8	72.8	85.2	97.3	109.6	121.8	134.1	146.5	158.9	171.3
Sat. ...	206.2	205.4	204.6	203.9	203.2	202.5	201.7	201.3	200.9	200.5	200.6	200.7	200.9	201.5	202.1	202.6	203.5	204.5
1956 Mars ...	274.6	280.6	286.9	293.0	298.7	304.4	309.5	314.4	318.7	322.4	325.3	326.4	327.3	328.8	329.4	321.0	318.6	317.5
Merc. ...	6.6	23.8	38.1	46.2	44.8	37.5	37.7	46.9	61.6	78.9	97.3	115.7	133.6	149.5	161.7	166.7	162.2	155.6
Jup. ...	116.8	116.8	117.1	117.7	118.6	119.7	121.0	122.8	124.5	126.4	128.5	130.5	132.7	134.8	137.1	139.3	141.5	143.7
Ven. ...	45.6	55.1	63.7	70.4	75.4	76.8	74.6	65.7	62.5	59.2	60.2	64.3	71.0	79.2	88.3	98.5	108.9	119.9
Sat. ...	218.0	217.3	216.6	215.9	215.1	214.3	213.6	213.0	212.4	211.9	211.8	211.7	211.7	212.1	212.5	213.0	213.9	214.8
1957 Mars ...	53.4	59.7	65.8	72.2	78.8	84.8	91.1	97.2	103.7	109.8	116.3	122.6	128.7	135.9	141.7	148.1	154.5	160.8
Merc. ...	16.5	26.2	26.7	19.8	17.2	25.0	39.0	56.4	74.8	93.5	111.7	128.4	142.2	149.2	147.5	139.9	135.5	147.8
Jup. ...	149.6	148.6	147.9	147.5	147.3	147.6	148.2	149.1	150.1	151.4	153.1	154.8	156.5	158.1	160.7	162.7	165.0	167.2
Ven. ...	359.7	12.1	24.4	36.7	49.1	61.3	71.5	85.7	97.8	109.9	122.0	134.0	146.1	158.1	170.1	182.9	193.8	205.3
Sat. ...	228.6	229.0	228.4	227.8	227.0	226.2	225.5	224.8	224.1	223.5	223.2	222.9	222.7	222.9	223.1	223.4	224.1	224.8
1958 Mars ...	295.2	302.6	309.9	317.2	324.3	331.5	338.6	345.1	352.3	358.7	365.0	371.9	378.4	384.7	390.9	397.0	403.1	408.8
Merc. ...	8.5	2.3	35.7	4.0	16.7	33.6	51.9	70.9	89.7	108.8	127.6	146.1	164.1	181.2	197.5	213.8	229.8	245.8
Jup. ...	183.5	182.2	180.9	179.8	178.8	178.1	177.6	177.4	177.0	176.2	175.1	173.9	172.6	171.3	170.0	168.7	167.4	166.1
Ven. ...	313.2	323.6	334.3	345.5	356.7	367.8	378.9	389.9	400.9	411.9	422.9	433.9	444.9	455.9	466.9	477.9	488.9	499.9
Sat. ...	241.0	240.6	240.2	239.7	239.0	238.3	237.5	236.8	236.1	235.3	234.8	234.3	233.9	233.9	234.0	234.0	234.0	234.2
1959 Mars ...	68.5	71.1	79.9	85.8	91.7	97.7	103.8	109.9	116.0	122.0	128.3	134.6	141.0	147.2	153.7	160.2	166.5	173.2
Merc. ...	339.3	313.3	355.1	11.1	29.2	48.1	67.1	86.0	104.4	111.4	114.2	107.7	103.7	108.8	120.8	137.0	154.7	172.0
Jup. ...	217.5	216.6	215.4	214.1	212.8	211.6	210.3	209.0	208.6	208.0	207.9	208.1	208.6	209.3	210.5	211.8	213.4	215.0
Ven. ...	35.6	47.8	59.0	70.4	81.8	92.5	103.1	113.1	122.6	130.7	137.7	142.4	142.5	141.6	135.6	129.8	126.7	127.0
Sat. ...	251.9	251.7	251.5	251.2	250.6	250.0	249.3	248.6	247.9	247.1	246.4	245.7	245.1	245.0	244.9	244.8	245.2	245.6
1960 Mars ...	313.8	321.4	329.3	336.9	344.4	352.1	359.4	366.8	374.0	381.1	388.2	395.3	402.4	409.5	416.6	423.7	430.8	437.9
Merc. ...	333.3	318.7	6.2	25.2	44.2	62.5	78.7	91.1	96.1	91.2	85.3	89.1	100.2	115.5	132.8	150.8	168.5	184.9
Jup. ...	250.0	250.2	249.8	249.2	248.3	247.2	245.9	244.6	243.2	242.0	240.7	239.4	238.6	237.4	236.6	235.4	234.2	233.0
Ven. ...	311.2	353.6	5.8	18.2	30.6	42.8	55.1	67.5	79.6	91.9	104.1	116.4	128.6	140.8	153.1	165.4	177.7	189.9
Sat. ...	263.1	263.0	262.9	262.8	262.3	261.8	261.2	260.4	259.6	258.9	258.2	257.5	256.8	256.5	256.2	255.8	256.0	256.2
1961 Mars ...	85.0	90.3	95.1	100.1	105.7	111.3	117.1	122.8	128.8	134.8	140.8	147.2	153.2	159.7	166.1	172.7	179.2	185.9
Merc. ...	843.9	2.3	21.3	39.7	56.7	70.3	77.0	74.3	67.8	68.5	78.7	93.8	111.1	129.4	147.8	164.5	178.8	189.7
Jup. ...	250.8	281.9	282.8	283.4	283.5	283.3	282.8	282.1	281.0	279.7	278.5	277.1	275.8	274.7	273.8	273.1	272.8	272.9
Ven. ...	357.1	351.6	349.8	351.7	358.8	3.6	12.1	21.5	31.7	42.0	53.0	64.1	7.7	87.3	99.0	110.9	122.4	134.8
Sat. ...	273.8	274.0	274.2	274.4	274.0	273.6	273.3	272.5	271.7	271.0	270.3	269.6	268.8	268.3	267.8	267.2	267.2	267.2
1962 Mars ...	331.1	339.0	345.8	354.5	362.0	369.6	377.1	384.6	392.1	399.6	407.1	414.6	422.1	429.6	437.1	444.6	452.1	459.6
Merc. ...	358.5	18.9	31.2	48.7	57.2	56.6	49.8	45.1	57.6	72.0	89.1	107.4	125.8	143.5	159.2	171.5	176.3	171.8
Jup. ...	309.6	311.6	313.4	314.9	316.3	317.2	318.1	318.4	318.6	318.3	317.7	316.7	315.7	314.4	313.0	311.5	310.3	309.2
Ven. ...	18.7	31.0	43.1	55.3	67.3	79.3	91.1	103.1	114.6	126.1	137.6	148.9	159.8	170.5	180.7	190.3	199.0	205.8
Sat. ...	284.7	285.0	285.3	285.7	285.5	285.3	285.2	284.5	284.0	283.4	282.8	281.8	281.1	280.4	279.7	279.1	278.9	278.7
Mosh. 30	60	90	120	150	180	210	240	270	300	330	360	390	420	450	480	510	540	570
Vrsch. 60	90	120	150	180	210	240	270	300	330	360	390	420	450	480	510	540	570	600
Kat. 90	120	150	180	210	240	270	300	330	360	390	420	450	480	510	540	570	600	630
Sim. 120	150	180	210	240	270	300	330	360	390	420	450	480	510	540	570	600	630	660
Kan. 150	180	210	240	2														

Mars, A.D. 1637—A.D. 1999. Mercury, A.D. 1645—A.D. 1999; Jupiter, A.D. 1656—A.D. 1999; Saturn, A.D. 1617—A.D. 1999—*cont.*

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TABLE

Geocentric Places of Mars, Mercury, Jupiter, Venus and Saturn for every tenth day of current cycle.
Venus A.D. 1765—A.D. 1999;

Day of U.S.Y.	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
Eng. date ...	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Jul 2	Jul 12	Jul 22	Aug 1	Aug 11	Aug 21	Aug 31	S 10	S 20	S 30
1963 Mars	106.6	109.3	118.0	117.1	121.7	126.5	131.6	137.2	142.7	148.6	154.5	160.4	166.8	173.0	179.7	186.0	192.7	199.7
Merc.	11.9	27.3	87.3	87.9	30.7	28.4	86.2	40.9	66.7	84.8	108.5	121.8	138.7	152.1	158.3	157.3	149.5	149.4
Jup.	337.5	339.8	342.1	344.8	346.4	348.3	350.0	354.5	352.8	353.8	354.5	354.7	354.9	354.5	353.7	352.8	351.6	350.2
Ven.	321.1	336.2	343.2	0.4	12.6	24.8	37.0	49.1	61.3	73.3	85.7	97.7	110.1	122.4	134.8	147.0	159.4	171.9
Sat.	295.5	296.1	296.7	297.2	297.8	297.4	297.4	296.9	296.4	296.0	295.2	294.4	293.6	292.9	292.2	291.5	291.1	290.7
1964 Mars	347.5	355.2	2.0	10.9	18.0	25.8	32.6	39.9	46.9	53.8	60.6	67.4	74.2	80.6	87.2	93.4	99.5	105.7
Merc.	16.8	19.5	18.1	8.6	14.6	27.5	44.1	62.4	81.4	100.8	117.0	131.6	141.0	141.5	134.6	131.3	138.6	151.5
Jup.	5.4	7.8	10.2	12.5	14.9	17.3	19.5	21.6	23.6	25.5	27.1	28.6	29.7	30.5	31.1	31.2	31.0	30.5
Ven.	45.8	55.1	63.3	69.5	73.7	74.3	70.7	65.0	59.3	57.1	58.7	63.3	70.3	78.0	88.4	98.7	109.4	120.4
Sat.	306.5	307.2	307.9	308.7	309.0	309.3	309.5	309.2	308.9	308.6	308.0	307.4	306.7	305.0	305.1	304.2	303.7	303.2
1965 Mars	135.4	135.5	136.4	138.6	141.4	145.1	149.3	153.9	159.0	164.2	170.0	175.8	181.8	188.1	194.5	201.1	207.8	214.5
Merc.	356.1	349.9	353.3	5.5	21.2	39.4	58.5	77.2	95.0	110.5	121.9	124.7	118.6	113.7	118.5	130.8	146.3	163.5
Jup.	32.7	35.0	37.3	39.6	42.1	44.4	46.8	49.2	51.5	53.7	55.8	51.9	59.8	61.5	63.1	64.3	65.3	66.1
Ven.	0.2	12.6	24.9	37.4	49.6	61.8	74.1	86.2	98.4	110.4	122.6	134.5	146.6	158.5	170.5	182.4	194.2	205.8
Sat.	317.5	318.4	319.3	320.3	320.8	321.3	321.8	321.7	321.6	321.5	321.1	320.6	320.0	319.2	318.4	317.6	316.9	316.2
1966 Mars	3.1	10.9	18.1	25.5	32.8	39.8	47.0	54.0	60.9	67.8	74.4	81.2	87.6	94.3	100.6	107.0	113.2	119.6
Merc.	338.8	343.4	358.8	16.6	35.5	54.4	72.9	89.3	101.9	106.8	101.9	96.1	99.5	110.2	125.2	142.5	160.2	177.9
Jup.	60.8	62.4	61.3	68.4	68.5	70.6	73.0	75.2	77.6	79.9	82.2	84.5	86.6	88.9	90.9	92.8	94.6	96.0
Ven.	313.4	323.6	334.8	345.8	357.2	8.8	20.5	32.2	44.0	55.9	67.8	80.0	91.9	104.1	116.2	128.6	140.8	153.2
Sat.	328.6	329.7	330.8	331.8	332.5	333.2	333.9	334.1	334.3	334.5	334.2	333.9	333.5	332.8	333.1	331.3	330.5	329.7
1967 Mars	180.6	177.1	176.1	171.7	171.2	172.1	174.1	177.1	180.5	184.8	189.6	194.7	200.5	206.3	212.3	218.7	225.2	232.1
Merc.	337.1	354.2	12.7	31.6	50.1	67.0	89.6	87.9	85.1	78.0	79.2	89.2	102.9	120.9	139.1	156.9	178.1	188.9
Jup.	90.0	90.8	92.0	93.3	94.9	96.8	98.6	100.8	102.7	105.0	107.1	109.4	111.7	113.9	116.1	118.3	120.4	122.4
Ven.	39.1	47.8	59.4	70.9	82.0	93.0	103.2	113.2	122.2	130.2	136.5	140.7	140.1	138.0	131.8	126.0	124.7	125.6
Sat.	339.8	341.0	342.2	343.4	344.3	345.2	346.2	346.7	347.2	347.6	347.5	347.4	347.3	346.7	346.1	345.5	344.7	343.9
1968 Mars	18.2	25.4	32.5	39.5	46.6	53.6	60.3	67.1	74.0	80.7	87.6	93.7	100.4	106.6	113.7	119.5	125.6	132.1
Merc.	349.9	8.8	27.2	44.5	59.2	68.1	67.7	60.2	59.2	67.7	82.1	99.1	117.2	135.5	152.8	168.6	180.7	185.6
Jup.	121.2	121.0	121.1	121.6	122.3	123.5	124.7	126.2	127.9	129.7	131.7	133.7	135.9	138.1	140.3	142.6	144.8	146.9
Ven.	341.7	354.2	6.3	18.7	31.2	43.3	55.7	68.0	80.2	92.4	104.8	116.9	129.1	141.3	153.6	166.0	178.2	190.5
Sat.	351.6	352.9	354.2	355.4	356.5	357.6	358.6	359.3	0.0	0.7	0.9	1.1	1.2	0.8	0.4	0.0	359.2	358.4
1969 Mars	232.0	233.1	238.3	232.3	230.0	227.5	224.4	222.8	220.9	220.9	222.2	224.7	228.1	232.3	237.0	242.5	248.3	254.2
Merc.	4.8	22.3	37.6	47.7	49.4	42.4	39.3	48.1	60.3	76.9	95.1	113.7	131.7	148.1	161.8	168.6	167.0	159.4
Jup.	154.2	153.2	162.3	151.7	151.6	151.6	152.0	152.7	153.7	155.0	156.4	158.1	159.9	161.9	163.9	166.0	168.1	170.2
Ven.	353.1	348.4	346.8	350.3	356.0	3.2	12.1	21.5	31.7	42.5	53.4	64.5	76.1	87.7	99.5	111.3	123.5	135.5
Sat.	3.4	4.7	6.0	7.3	8.5	9.7	10.9	11.8	12.7	13.7	14.1	14.6	15.0	14.9	14.8	14.6	14.0	13.4
1970 Mars	32.7	39.8	46.6	53.4	60.0	66.8	73.5	79.9	86.4	92.9	99.4	105.9	112.3	119.0	125.2	131.5	137.8	144.1
Merc.	15.3	27.1	30.4	23.7	19.8	25.8	37.9	54.3	72.5	91.3	109.7	127.0	141.7	156.5	151.5	148.4	141.1	148.1
Jup.	188.8	186.9	185.5	184.5	183.3	182.4	181.8	181.7	181.6	182.1	182.8	183.7	184.9	186.4	188.1	189.9	191.8	193.9
Ven.	19.8	31.6	43.7	55.9	67.9	80.1	91.9	103.6	115.8	126.8	138.2	149.2	160.1	170.6	180.5	190.0	198.3	204.9
Sat.	15.4	15.7	18.0	19.4	19.7	22.0	23.4	24.4	25.5	26.6	27.3	28.1	28.7	28.9	29.1	29.2	28.8	28.4
1971 Mars	264.7	270.3	275.6	280.5	285.2	289.3	293.0	296.0	297.4	298.0	298.0	294.7	291.7	289.8	287.8	288.0	289.1	291.3
Merc.	11.5	6.9	0.8	4.4	16.1	31.7	49.9	68.8	87.8	104.3	120.8	132.3	134.8	128.4	123.7	128.7	140.5	155.8
Jup.	222.1	221.2	220.2	218.9	217.7	216.3	215.1	213.9	213.0	212.5	212.2	212.2	212.6	213.3	214.2	215.4	216.9	218.6
Ven.	321.8	336.8	348.9	1.0	13.2	25.4	37.6	49.8	61.7	74.0	86.3	98.4	110.7	123.0	135.4	147.7	160.0	172.5
Sat.	27.8	29.1	30.4	31.6	32.0	31.4	35.8	37.0	38.2	39.5	40.4	41.3	42.2	42.6	43.0	43.5	43.4	43.3
1972 Mars	47.6	51.9	60.5	66.9	73.3	79.7	86.0	92.6	98.8	105.2	111.6	117.8	124.2	130.7	137.0	143.3	149.8	156.3
Merc.	312.9	343.8	354.2	9.2	27.0	45.9	64.9	83.1	99.4	112.1	117.3	112.7	106.3	109.0	120.1	135.0	152.1	169.8
Jup.	254.6	254.7	251.6	254.1	253.3	252.3	251.1	249.7	248.8	247.1	245.9	245.0	244.4	244.0	244.0	244.4	245.1	246.0
Ven.	45.7	54.8	62.5	68.6	71.8	71.8	67.7	61.1	56.1	54.8	57.3	62.9	70.0	79.0	88.6	98.9	109.6	120.7
Sat.	40.4	41.7	48.0	44.3	45.6	46.9	48.8	49.6	50.9	52.2	53.3	54.4	55.5	56.2	56.9	57.6	57.7	57.8
1973 Mars	287.6	294.7	301.4	308.5	315.3	322.0	328.6	335.2	341.3	347.4	352.9	357.8	2.2	6.1	8.8	10.4	10.5	9.2
Merc.	322.9	346.9	4.2	22.9	41.8	60.5	77.5	91.3	98.5	96.3	89.0	80.4	99.4	113.8	130.8	148.5	166.3	183.4
Jup.	284.8	286.1	287.1	287.8	288.1	288.2	287.9	287.2	286.4	285.2	283.8	282.5	281.1	279.1	278.8	278.1	277.6	277.4
Ven.	0.8	18.2	25.6	38.0	50.3	62.4	74.8	86.8	99.0	111.0	123.2	135.2	147.2	159.1	171.0	182.9	194.6	206.2
Sat.	53.3	54.5	55.7	56.8	58.1	59.4	60.8	62.1	63.5	64.9	66.1	67.3	68.5	69.4	70.3	71.3	71.9	72.7
1974 Mars	62.8	68.5	74.3	80.4	86.5	92.5	98.7	104.9	111.1	117.4	123.4	129.8	136.1	142.5	148.9	155.2	161.9	168.4
Merc.	341.9	0.0	18.9	37.6	55.2	69.9	78.5	78.5	71.2	69.8	79.4	92.4	109.0	126.0	145.8	162.5	178.3	190.2
Jup.	313.6	315.6	317.4	319.0	320.5	321.7	322.6	323.2	323.5									

V-B—cont.

Mars, A.D. 1637—A.D. 1999; Mercury, A.D. 1645—A.D. 1999, Jupiter, A.D. 1656—A.D. 1999, Saturn, A.D. 1617—A.D. 1999—cont.

180	190	200	210	220	230	240	250	260		270	280	290	300	310	320	330	340	350	359
O 10	O 20	O 30	N 9	N 19	N 29	D 9	D 19	D 29		Ja 8	Ja 18	Ja 28	F 7	F 17	F 27	Mr 8	Mr 18	Mr 28	Ap 7
206.4	218.5	230.5	227.6	235.1	242.5	249.9	257.1	265.1	1964	272.9	280.4	288.4	296.3	304.1	312.0	319.8	327.9	335.7	343.4
151.8	171.7	187.8	205.2	222.6	238.9	253.2	268.0	283.6		286.5	292.8	298.8	304.3	309.7	314.6	319.1	323.4	327.6	331.7
348.8	347.5	346.3	345.2	344.6	344.1	344.1	344.5	345.2		346.1	347.4	348.9	350.6	352.5	354.7	356.8	358.1	359.4	360.7
184.3	190.8	208.2	221.7	234.1	246.7	259.3	271.7	284.2		296.5	308.7	320.8	332.9	344.9	356.7	368.2	379.4	390.3	401.0
290.2	290.8	290.4	290.4	291.1	291.8	292.4	293.4	294.4		295.8	296.5	297.7	298.8	300.0	301.2	302.5	303.8	304.7	305.9
111.5	117.3	122.8	128.1	133.3	138.1	142.6	146.8	149.7	1965	152.2	154.0	154.7	154.1	151.8	148.5	144.9	141.0	138.0	136.1
187.4	184.5	202.1	218.8	233.9	244.8	248.6	243.1	236.9		240.2	251.0	267.2	283.1	301.2	319.0	336.0	359.3	359.6	359.8
29.7	28.6	27.8	26.1	24.7	23.4	22.2	21.3	20.8		20.5	20.8	21.1	21.8	22.9	24.3	25.8	27.7	29.6	31.7
181.8	143.4	158.1	167.1	179.1	191.3	205.6	215.9	228.5		246.0	253.5	266.2	278.5	291.0	303.8	316.2	328.8	341.8	353.8
302.8	302.6	302.4	302.2	302.6	303.0	303.5	304.4	305.3		306.1	307.2	308.3	309.5	310.8	312.1	313.3	314.6	315.8	316.9
221.6	228.7	235.9	243.2	250.7	258.2	265.8	273.7	281.3	1966	289.1	296.9	304.8	312.7	320.4	328.3	336.2	343.8	351.6	359.1
181.2	198.5	214.2	226.7	232.8	238.9	242.8	242.4	231.7		245.6	262.1	280.0	297.5	314.5	329.4	339.8	341.9	335.4	331.1
66.4	66.4	66.0	65.5	64.5	63.8	62.1	60.7	59.3		58.2	57.1	56.8	55.8	55.7	55.9	56.5	57.4	58.5	59.4
217.3	228.6	239.0	250.1	260.2	269.7	278.0	284.8	288.8		289.4	298.2	280.5	275.0	275.2	276.4	281.8	289.4	299.2	307.9
315.4	315.1	314.8	314.4	314.0	314.8	315.1	315.8	316.5		317.2	318.3	319.4	320.4	321.6	322.9	324.1	325.4	326.7	328.0
125.5	131.5	137.2	143.0	148.7	154.4	159.7	164.6	169.5	1967	174.1	178.2	182.0	185.0	187.4	189.0	189.1	188.0	185.1	182.0
194.4	208.1	216.5	215.7	208.3	195.0	172.9	145.7	121.5		258.7	276.3	293.4	308.9	320.4	324.5	319.1	318.5	316.7	328.6
97.3	98.4	99.3	99.7	99.9	99.8	99.2	98.4	97.4		96.1	94.7	93.4	92.1	91.0	90.1	89.5	89.2	89.2	89.7
165.6	178.1	190.7	203.0	215.7	228.2	240.8	253.5	266.2		278.8	291.4	303.9	316.5	328.8	341.1	353.5	365.7	377.0	388.0
328.9	328.4	327.9	327.3	327.3	327.2	326.9	327.7	328.2		328.8	329.8	330.8	331.7	332.9	334.1	335.3	336.6	337.9	339.2
289.1	246.2	253.3	260.6	268.1	275.8	283.2	290.9	298.7	1968	306.3	314.1	321.8	329.5	336.9	344.8	352.2	359.7	367.0	374.4
199.0	201.2	194.6	189.9	194.5	206.0	220.8	238.0	255.4		272.7	288.4	301.1	307.0	303.3	296.2	297.8	308.0	322.8	340.2
124.3	126.1	127.6	128.9	130.1	130.9	131.5	131.8	131.5		131.1	130.3	129.4	128.1	126.9	125.6	124.3	123.1	122.2	121.4
131.4	138.5	147.3	156.9	167.2	178.3	189.4	201.0	212.6		224.5	236.4	248.7	261.0	273.8	285.8	298.0	310.4	322.8	335.3
343.1	342.3	341.6	340.9	340.6	340.3	340.1	340.4	340.7		341.0	341.8	342.6	343.4	344.6	345.6	346.8	348.1	349.4	350.7
138.1	144.3	150.4	156.5	162.5	168.3	174.4	180.1	185.9	1969	191.6	197.0	202.3	207.5	212.4	217.0	221.3	225.3	228.4	230.9
181.1	174.3	176.3	186.6	200.9	217.6	234.8	252.0	268.3		281.6	298.5	288.3	280.8	279.3	287.4	301.3	318.1	336.4	354.8
149.1	151.1	153.1	154.9	156.7	158.2	159.5	160.6	161.5		162.0	162.3	162.1	161.6	160.8	159.9	158.7	157.4	156.2	154.8
202.7	215.0	227.1	239.3	251.4	263.4	275.4	287.2	298.8		309.9	320.9	331.1	340.9	349.7	356.9	362.0	366.0	369.0	371.0
357.7	356.9	356.0	355.2	354.7	354.2	353.8	353.8	353.9		353.9	354.5	355.1	355.8	356.8	357.8	358.9	359.9	360.9	361.9
260.8	267.3	274.1	281.1	288.2	295.5	302.8	310.8	317.4	1970	324.8	332.2	339.4	346.8	354.0	361.2	368.3	375.4	382.5	389.6
158.6	166.6	181.0	197.1	214.4	231.7	248.1	262.5	272.0		273.1	266.2	262.2	267.5	280.7	296.5	314.5	332.8	350.9	368.0
172.5	174.7	176.8	179.0	181.2	183.0	184.9	186.7	188.2		189.5	190.6	191.5	192.0	192.2	192.4	191.7	191.1	190.0	188.8
147.7	159.9	172.4	184.7	197.1	209.5	222.1	234.9	247.5		260.2	272.7	285.4	298.0	310.6	323.0	335.6	348.0	360.4	372.8
12.7	11.9	11.1	10.2	9.5	8.8	8.1	7.9	7.7		7.4	7.8	8.2	8.5	9.4	10.3	11.1	12.3	13.5	14.7
150.5	156.8	162.9	169.5	175.5	181.9	188.1	194.4	200.6	1971	206.8	213.1	219.4	225.5	231.7	237.9	244.1	249.9	255.9	261.7
160.8	170.6	198.8	211.2	227.8	242.8	254.2	267.6	281.8		246.2	249.8	260.4	275.4	292.6	310.6	328.8	346.7	364.0	381.0
196.0	198.1	200.4	202.6	204.7	207.0	209.1	211.2	213.1		215.1	216.9	218.5	219.9	221.0	221.9	222.5	222.8	222.9	223.3
209.7	210.5	208.8	202.6	197.3	194.6	196.8	201.6	208.7		217.3	227.3	237.4	248.3	259.4	271.1	282.8	294.6	306.4	318.6
27.9	27.1	26.8	25.6	24.8	24.0	23.1	22.6	22.1		21.6	21.7	21.8	21.9	22.6	23.3	23.9	25.0	26.1	27.1
294.9	292.2	303.9	308.9	314.4	320.4	326.5	332.7	338.9	1972	345.3	351.8	358.3	364.8	371.3	377.8	384.3	390.8	397.3	403.8
172.0	189.5	207.9	223.4	239.0	241.7	239.1	231.4	231.2		240.9	254.8	271.3	289.1	307.0	324.2	339.5	350.2	359.6	368.1
220.3	222.3	224.5	226.5	228.8	231.0	233.2	235.5	237.8		240.0	242.1	244.3	246.5	248.0	249.8	251.2	252.4	253.4	254.2
185.0	197.4	209.9	222.3	234.8	247.3	259.7	272.3	284.8		297.0	309.3	321.5	333.5	345.4	357.1	368.6	379.9	391.0	402.0
43.1	42.5	41.9	41.2	40.3	39.4	38.6	37.9	37.2		36.5	36.3	36.1	35.9	36.3	36.7	37.0	37.9	38.8	39.8
162.7	169.2	175.6	181.9	188.7	195.2	201.8	208.3	215.0	1973	221.7	228.4	235.3	242.1	248.9	255.9	262.8	269.8	276.7	283.6
187.4	203.8	217.3	225.3	224.9	217.3	211.8	221.6	234.8		250.9	268.1	285.9	303.3	318.8	330.4	344.6	360.5	373.6	382.3
247.2	248.7	250.3	252.1	254.2	256.3	258.4	260.8	263.0		265.3	267.6	270.0	272.2	274.4	276.6	278.7	280.8	282.6	284.1
182.2	143.8	155.7	167.7	179.7	191.5	204.2	216.6	229.1		241.6	254.8	268.5	282.3	296.1	309.8	323.4	336.9	349.4	361.9
57.9	57.6	57.1	56.6	56.8	55.0	54.2	53.4	52.6		51.8	51.4	51.0	50.5	50.6	50.7	50.8	50.9	51.0	51.1
7.0	4.5	1.7	0.5	359.9	0.7	2.2	4.9	8.1	1974	11.8	15.8	20.8	25.9	31.0	36.8	41.9	47.6	53.4	59.2
198.0	208.2	210.3	204.0	198.8	203.0	215.1	230.3	247.3		264.7	282.1	297.9	310.6	316.8	313.8	306.8	307.4	318.0	322.8
277.7	278.3	279.1	280.3	281.8	283.3	285.1	287.2	289.3		291.5	293.9	296.1	298.4	300.9	303.2	305.6	307.9	310.2	312.4
217.6	228.9	239.8	250.3	260.1	269.4	277.3	283.2	286.5		286.5	282.5	276.1	272.1	271.5	274.9	281.0	289.0	298.1	307.9
72.5	72.4	72.2	72.1	71.4	70.7	70.1	69.2	68.3		67.5	66.8	66.1	65.4	65.2	65.0	64.9	65.3	65.7	66.2
174.8	181.5	188.3	195.0	201.7	208.5	215.3	222.2	229.2	1975	236.4	243.6	250.7	258.1	265.4	272.6	280.3	287.6	295.3	302.8
194.9	190.1	182.6	185.7	196.0	210.2	226.7	244.2	261.3		277.6	291.1	299.0	297.8	290.3	288.8	297.5	310.5	328.0	346.5
318.7	318.0	312.9	312.8	313.1	313.9	314.9	316.2	317.7		319.5	321.4	323.6	325.8	328.0	330.3	332.8	335.2	337.6	340.0
106.4	178.8	191.4	203.7	216.4	228.9	241.6	254.1	266.8		279.4	292.0	304.6	317.1	329.4	341.7	354.1	366.4	378.6	390.9
86.0	86.7	86.8	86.8	86.4	86.0	85.5	84.7	83.9		83.1	82.3	81.5	80.7	80.3	79.9				

TABLE

Geocentric Places of Mars, Mercury, Jupiter, Venus and Saturn for every tenth day of current cycle.
Venus, A.D. 1768—A.D. 1999;

Day of I.S.Y.	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
Eng. date ..	Ap 14	Ap 24	My 4	My 14	My 24	Je 3	Je 13	Je 23	Jl 3	Jl 13	Jl 23	Au 2	Au 12	Au 22	S 1	S 11	S 21	O 1
1975 Mars ...	306.8	314.4	322.0	329.4	337.0	344.5	351.8	359.1	366.0	372.8	379.5	386.2	392.8	399.5	406.2	412.8	419.5	426.2
Merc. ...	356.2	15.0	32.6	40.0	47.4	54.8	62.2	69.6	77.0	84.4	91.8	99.2	106.6	114.0	121.4	128.8	136.2	143.6
Jup. ...	341.6	348.9	356.2	363.5	370.8	378.1	385.4	392.7	400.0	407.3	414.6	421.9	429.2	436.5	443.8	451.1	458.4	465.7
Ven. ...	38.6	48.2	57.8	67.4	77.0	86.6	96.2	105.8	115.4	125.0	134.6	144.2	153.8	163.4	173.0	182.6	192.2	201.8
Sat. ...	80.2	81.0	81.8	82.5	83.6	84.7	85.9	87.2	88.5	89.5	91.2	92.5	93.9	95.1	96.3	97.4	98.4	99.3
Eng. date ..	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Jl 2	Jl 12	Jl 22	Au 1	Au 11	Au 21	S 1	S 10	S 20	S 30
1976 Mars ...	78.6	83.7	89.1	94.7	100.3	105.9	111.8	117.8	123.6	129.9	136.0	142.0	148.5	154.7	161.1	167.7	174.2	180.8
Merc. ...	10.3	26.2	37.8	41.6	45.9	50.9	55.8	60.7	65.6	70.5	75.4	80.3	85.2	90.1	95.0	100.0	104.9	109.8
Jup. ...	9.1	11.5	13.9	16.3	18.6	21.0	23.3	25.5	27.5	29.5	31.2	32.7	34.1	35.1	36.7	38.0	39.2	40.4
Ven. ...	342.4	354.8	367.2	379.6	391.9	404.3	416.7	429.0	441.4	453.8	466.2	478.6	490.9	503.3	515.7	528.0	540.4	552.8
Sat. ...	93.8	94.3	94.8	95.4	96.4	97.4	98.3	99.5	100.7	102.0	103.4	104.8	106.1	107.8	108.5	109.8	110.8	111.9
Eng. date ..	Ap 14	Ap 24	My 4	My 14	My 24	Je 3	Je 13	Je 23	Jl 3	Jl 13	Jl 23	Au 2	Au 12	Au 22	S 1	S 11	S 21	O 1
1977 Mars ...	324.6	332.4	340.2	347.5	355.3	362.8	370.4	378.1	385.8	393.5	401.2	408.9	416.6	424.3	432.0	439.7	447.4	455.1
Merc. ...	16.7	22.7	28.7	34.7	40.7	46.7	52.7	58.7	64.7	70.7	76.7	82.7	88.7	94.7	100.7	106.7	112.7	118.7
Jup. ...	36.6	38.7	41.1	43.3	45.7	48.1	50.5	52.8	55.1	57.4	59.6	61.6	63.7	65.5	67.0	68.5	69.6	70.4
Ven. ...	349.1	346.3	343.5	340.8	338.1	335.4	332.7	330.0	327.3	324.6	321.9	319.2	316.5	313.8	311.1	308.4	305.7	303.0
Sat. ...	107.6	107.8	108.0	108.3	108.6	108.9	109.2	109.5	109.8	110.1	110.4	110.7	111.0	111.3	111.6	111.9	112.2	112.5
Eng. date ..	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Jl 2	Jl 12	Jl 22	Au 1	Au 11	Au 21	S 1	S 10	S 20	S 30
1978 Mars ...	97.8	101.2	105.5	110.1	115.1	120.3	125.8	131.2	137.2	143.0	148.9	155.2	161.4	167.7	174.1	180.6	187.5	194.1
Merc. ...	0.5	35.3	34.6	4.6	19.8	37.4	55.3	74.3	92.2	109.7	121.1	12.0	123.0	116.5	119.2	129.8	144.8	161.6
Jup. ...	61.7	66.3	68.1	70.0	72.1	74.2	76.5	78.7	81.1	83.4	85.6	88.0	90.2	92.3	94.4	96.4	98.2	99.8
Ven. ...	19.9	32.2	44.1	56.5	68.6	80.4	92.2	104.0	115.8	127.2	138.5	149.6	160.2	170.8	180.7	189.7	197.8	204.0
Sat. ...	121.5	121.4	121.3	121.3	121.0	122.5	123.0	123.9	124.8	125.8	127.0	128.2	129.5	130.8	132.1	133.3	134.5	135.7
Eng. date ..	Ap 14	Ap 24	My 4	My 14	My 24	Je 3	Je 13	Je 23	Jl 3	Jl 13	Jl 23	Au 2	Au 12	Au 22	S 1	S 11	S 21	O 1
1979 Mars ...	341.4	349.3	357.8	365.8	374.5	382.8	391.0	399.1	407.2	415.2	423.1	431.0	438.9	446.8	454.7	462.6	470.5	478.4
Merc. ...	334.9	343.2	351.4	359.6	367.8	376.0	384.2	392.4	400.6	408.8	416.9	425.1	433.3	441.5	449.7	457.9	466.1	474.3
Jup. ...	94.8	95.0	95.9	97.2	98.8	100.4	102.3	104.4	106.4	108.5	110.8	113.0	115.2	117.4	119.7	121.9	123.9	126.1
Ven. ...	325.2	337.5	349.5	361.5	373.5	385.5	397.5	409.5	421.5	433.5	445.5	457.5	469.5	481.5	493.5	505.5	517.5	529.5
Sat. ...	185.3	185.0	184.7	184.5	184.8	185.1	185.4	185.7	186.0	186.3	186.6	186.9	187.2	187.5	187.8	188.1	188.4	188.7
Eng. date ..	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Jl 2	Jl 12	Jl 22	Au 1	Au 11	Au 21	S 1	S 10	S 20	S 30
1980 Mars ...	122.8	124.0	126.3	129.3	133.0	137.1	141.9	146.8	152.2	157.8	163.7	169.5	175.7	181.9	188.5	195.0	201.7	208.6
Merc. ...	335.6	352.1	368.6	385.1	401.6	418.1	434.6	451.1	467.6	484.1	500.6	517.1	533.6	550.1	566.6	583.1	599.6	616.1
Jup. ...	125.6	125.3	125.3	125.6	126.3	127.1	128.4	129.8	131.1	133.1	135.1	137.1	139.2	141.1	143.5	145.7	148.0	150.2
Ven. ...	45.5	54.5	61.9	67.4	70.0	72.6	75.2	77.8	80.4	83.0	85.6	88.2	90.8	93.4	96.0	98.6	101.2	103.8
Sat. ...	149.0	148.5	148.0	147.5	147.5	147.6	147.6	148.2	148.8	149.3	150.3	151.2	152.2	153.4	154.6	155.8	157.1	158.4
Eng. date ..	Ap 14	Ap 24	My 4	My 14	My 24	Je 3	Je 13	Je 23	Jl 3	Jl 13	Jl 23	Au 2	Au 12	Au 22	S 1	S 11	S 21	O 1
1981 Mars ...	357.3	364.7	372.1	379.5	386.9	394.3	401.7	409.1	416.5	423.9	431.3	438.7	446.1	453.5	460.9	468.3	475.7	483.1
Merc. ...	347.8	354.2	360.6	367.0	373.4	379.8	386.2	392.6	399.0	405.4	411.8	418.2	424.6	431.0	437.4	443.8	450.2	456.6
Jup. ...	158.8	157.7	156.8	156.1	155.7	155.7	155.9	156.6	157.4	158.6	159.9	161.5	163.3	165.1	167.1	169.2	171.4	173.6
Ven. ...	1.7	13.8	26.4	38.6	51.2	63.3	75.4	87.5	99.6	111.7	123.8	135.8	147.6	159.8	171.5	183.3	195.0	206.6
Sat. ...	162.1	161.7	161.0	160.4	160.2	160.0	159.8	160.1	160.4	160.8	161.6	162.4	163.2	164.3	165.4	166.5	167.7	168.9
Eng. date ..	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Jl 2	Jl 12	Jl 22	Au 1	Au 11	Au 21	S 1	S 10	S 20	S 30
1982 Mars ...	160.0	167.3	176.1	185.6	195.7	206.0	216.9	228.2	239.8	251.5	263.2	275.0	286.8	298.7	310.8	323.0	335.2	347.4
Merc. ...	2.4	20.5	36.5	51.6	66.6	81.6	96.6	111.6	126.6	141.6	156.6	171.6	186.6	201.6	216.6	231.6	246.6	261.6
Jup. ...	192.9	191.6	190.4	189.0	187.8	186.9	186.2	185.8	185.8	186.0	186.6	187.5	188.6	189.9	191.4	193.2	195.1	197.1
Ven. ...	213.6	324.0	335.3	346.6	358.1	369.6	381.1	392.6	404.1	415.6	427.1	438.6	450.1	461.6	473.1	484.6	496.1	507.6
Sat. ...	175.4	174.7	174.0	173.2	172.8	172.4	172.0	172.1	172.2	172.2	172.8	173.4	174.1	175.0	176.0	177.0	178.2	179.4
Eng. date ..	Ap 14	Ap 24	My 4	My 14	My 24	Je 3	Je 13	Je 23	Jl 3	Jl 13	Jl 23	Au 2	Au 12	Au 22	S 1	S 11	S 21	O 1
1983 Mars ...	12.4	19.8	26.9	34.2	41.3	48.4	55.4	62.0	69.0	75.7	82.3	89.1	95.4	102.1	108.4	114.6	121.1	127.3
Merc. ...	14.5	27.5	33.3	39.3	45.3	51.3	57.3	63.3	69.3	75.3	81.3	87.3	93.3	99.3	105.3	111.3	117.3	123.3
Jup. ...	226.6	225.9	224.9	223.7	222.4	221.0	219.7	218.5	217.5	216.6	215.8	215.0	214.2	213.4	212.6	211.8	211.0	210.2
Ven. ...	37.1	48.7	60.2	71.5	82.5	93.2	103.2	112.8	121.2	128.3	135.5	142.8	150.1	157.4	164.7	172.0	179.3	186.6
Sat. ...	188.1	187.3	186.5	185.7	185.2	184.7	184.1	183.9	183.7	183.4	183.1	182.8	182.5	182.2	181.9	181.6	181.3	181.0
Eng. date ..	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Jl 2	Jl 12	Jl 22	Au 1	Au 11	Au 21	S 1	S 10	S 20	S 30
1984 Mars ...	213.6	212.0	209.7	206.3	203.0	200.6	199.3	197.7	195.7	193.5	191.2	188.9	186.6	184.3	182.0	179.7	177.4	175.1
Merc. ...	13.7	11.8	4.6	5.0	15.1	30.2	47.9	66.6	85.4	103.6	119.7	132.4	137.7	143.5	149.7	156.3	163.3	170.7
Jup. ...	258.8	259.1	259.1	258.8	258.1	257.2	256.0	254.8	253.6	252.1	250.9	249.8	248.5	247.0	245.5	244.0	242.5	241.0
Ven. ...	343.1	354.4	365.7	377.0	388.3	399.6	410.9	422.2	433.5	444.8	456.1	467.4	478.7	489.9	501.2	512.5	523.8	535.1
Sat. ...	200.5	199.7	198.9	198.2	197.5	196.8	196.2	195.9	195.6	195.2	195.4	195.6	195.9	196.6	197.3	198.0	198.7	199.0
Eng. date ..	Ap 14	Ap 24	My 4	My 14	My 24	Je 3	Je 13	Je 23	Jl 3	Jl 13	Jl 23	Au 2	Au 12	Au 22	S 1	S 11	S 21	O 1
1985 Mars ...	27.2	34.1	41.0	47.9	54.8	61.6	68.4	75.1	81.5	88.2	94.9	101.3	107.7	114.2	120.6	127.0	133.4	139.8
Merc. ...	347.1	345.1	342.9	340.6	338.3	336.0	333.7	331.4	329.1	326.8	324.5	322.2	320.0	317.7	315.4	313.1	310.8	308.5
Jup. ...	288.8	290.2	291.3	292.3	293.2	294.0	294.8	295.6	296.4	297.2	298.0	298.8	299.6	300.4	301.2	302.0	302.8	303.6
Ven. ...	345.5	342.4	343.5	347.9	354.5	361.1	367.7	374.3	380.9	387.5								

V-B—cont.

Mars, A.D. 1637—A.D. 1999; Mercury A.D. 1645—A.D. 1999; Jupiter, A.D. 1656—A.D. 1999;
Saturn, A.D. 1617—A.D. 1999—cont.

180	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	
O 11	O 21	O 31	N 10	N 20	N 30	D 10	D 20	D 30	1976	Ja 9	Ja 19	Ja 29	F 8	F 18	F 28	Mr 9	Mr 19	Mr 29	Ap 8
62.7	65.6	67.4	68.3	67.7	65.7	63.0	54.6	56.4	58.9	52.5	52.8	53.9	56.2	58.9	62.6	66.6	71.1	76.0	
168.8	167.1	176.5	190.2	208.2	228.8	240.7	257.3	271.6	281.1	282.6	275.3	271.7	277.5	290.2	306.8	324.2	342.8	362.8	
354.5	353.1	351.8	350.7	349.8	344.3	349.2	349.3	349.9	350.7	351.8	358.2	355.0	356.8	358.7	359.9	361.2	362.5	363.8	
130.1	138.0	147.0	156.7	167.3	178.2	189.6	201.3	213.1	225.0	237.3	249.2	261.7	274.0	286.4	298.6	311.1	323.5	335.9	
100.2	100.5	100.8	101.2	101.0	100.8	100.7	100.0	99.3	98.6	97.7	96.8	96.0	95.4	94.8	94.1	93.9	93.8	93.7	
O 10	O 20	O 30	N 9	N 19	N 29	D 9	D 19	D 29	1977	Ja 8	Ja 18	Ja 28	F 7	F 17	F 27	Mr 9	Mr 19	Mr 29	Ap 8
187.5	194.3	201.2	208.0	215.0	222.2	229.3	236.6	243.8	251.3	258.6	265.8	273.9	281.5	289.2	297.1	304.9	312.6	320.4	
157.3	170.2	186.1	203.2	220.6	237.1	252.1	268.1	286.8	261.4	265.3	258.5	269.9	285.0	302.3	320.5	338.6	356.0	374.8	
35.1	34.2	33.0	31.8	30.3	29.0	27.7	26.7	26.0	25.5	25.4	25.8	26.3	27.2	28.5	30.0	31.6	33.4	35.5	
203.4	215.6	227.8	239.9	252.1	264.0	275.8	287.6	299.2	310.4	321.3	331.2	340.8	349.1	355.9	361.3	367.1	373.5	380.4	
112.9	113.5	114.1	114.8	114.9	115.0	115.0	114.5	114.0	113.5	112.7	111.9	111.2	110.4	109.6	108.8	108.4	108.0	107.6	
88.1	83.0	97.6	101.4	104.8	107.3	109.0	109.5	108.7	106.2	103.0	99.3	95.5	92.6	90.9	90.4	91.2	93.2	95.9	
165.3	182.4	199.9	216.6	232.4	244.9	250.7	247.7	240.2	210.6	250.2	264.2	280.9	298.6	316.9	334.0	350.4	366.6	382.8	
71.0	71.1	71.0	70.5	69.8	68.6	67.3	66.1	64.7	63.4	62.3	61.3	60.7	60.4	60.5	61.9	61.6	62.6	63.9	
148.3	160.6	172.7	185.1	197.7	210.2	222.7	235.6	248.2	260.9	273.5	286.1	298.9	311.2	324.4	336.8	349.8	363.1	376.0	
125.2	126.0	126.8	127.7	128.0	128.3	128.7	128.5	128.3	128.0	127.8	126.6	125.9	125.2	124.5	123.7	123.1	122.5	121.9	
201.1	208.0	214.8	222.1	229.2	236.5	243.9	251.4	258.9	266.6	274.4	282.1	289.8	297.7	305.5	313.5	321.5	329.2	337.2	
178.2	196.6	212.8	226.2	234.5	234.0	226.9	223.3	230.2	241.2	250.1	257.6	265.5	272.8	280.5	288.5	296.3	304.1	312.0	
101.3	102.5	103.4	104.0	104.3	104.8	104.0	103.3	102.3	101.1	99.8	98.5	97.1	96.1	95.0	94.1	93.8	93.6	93.9	
207.4	208.1	204.7	198.9	193.7	192.3	194.7	201.0	208.4	217.1	227.1	237.5	248.1	259.9	271.4	283.0	294.8	306.7	318.5	
187.0	138.0	189.0	140.0	140.6	141.2	141.7	141.7	141.7	141.7	141.2	140.7	140.2	139.4	138.6	137.8	137.1	136.1	135.6	
O 11	O 21	O 31	N 10	N 20	N 30	D 10	D 20	D 30	1980	Ja 9	Ja 19	Ja 29	F 8	F 18	F 28	Mr 9	Mr 19	Mr 29	Ap 8
105.8	111.1	116.5	121.6	126.4	130.8	134.8	137.8	140.3	141.8	142.7	141.2	139.1	135.9	131.9	128.5	125.2	123.0	122.7	
192.7	207.2	217.4	219.3	212.2	207.9	212.5	224.4	239.7	256.8	274.3	291.7	307.6	320.5	327.0	323.7	316.8	317.9	328.0	
128.0	129.7	131.4	132.8	134.0	134.9	135.6	135.9	135.9	135.7	135.0	134.0	132.9	131.6	130.3	128.9	127.7	126.6	125.8	
185.6	198.1	210.5	223.0	235.5	248.1	260.4	272.9	285.2	297.7	309.8	321.9	333.9	345.8	357.6	369.4	381.2	393.0	404.7	
148.6	149.7	150.8	151.9	152.6	153.3	154.1	154.3	154.5	154.8	154.5	154.2	153.9	153.2	152.5	151.7	151.0	150.2	149.4	
O 10	O 20	O 30	N 9	N 19	N 29	D 9	D 19	D 29	1981	Ja 8	Ja 18	Ja 28	F 7	F 17	F 27	Mr 9	Mr 19	Mr 29	Ap 8
215.4	222.6	229.6	237.0	244.4	251.8	259.5	267.1	274.7	282.6	290.3	298.4	306.2	314.0	321.3	329.8	337.7	345.3	353.0	
199.3	204.0	199.3	192.7	194.6	204.8	219.4	235.9	258.1	270.7	287.1	300.7	308.6	307.9	300.4	298.9	306.8	321.1	338.1	
152.2	154.3	156.1	158.3	160.1	161.8	163.2	164.3	165.3	165.9	164.3	163.3	163.0	163.3	164.4	163.5	162.1	160.8	159.5	
132.5	144.2	156.0	168.1	180.2	192.5	204.8	217.2	229.8	212.2	254.8	267.2	280.0	292.5	305.1	317.7	330.1	342.6	355.0	
159.6	160.7	161.8	163.0	163.9	164.8	165.7	166.1	166.5	167.0	166.9	166.9	166.8	166.2	165.6	165.1	164.3	163.5	162.7	
127.2	128.1	131.8	137.5	142.9	148.5	153.2	158.0	162.3	168.4	169.7	172.3	174.3	174.8	174.6	172.4	169.2	165.4	161.6	
185.7	178.0	177.0	185.8	193.4	201.2	209.2	216.8	224.5	232.1	240.1	248.3	256.3	264.1	271.8	279.5	287.2	294.9	302.6	
175.7	177.9	180.1	182.2	184.3	186.4	188.3	190.0	191.7	193.1	194.3	195.3	195.9	196.3	196.5	196.1	195.5	194.6	193.5	
218.0	229.2	240.1	250.3	260.0	269.9	279.3	288.8	298.2	283.0	278.1	272.3	268.7	269.8	273.6	280.4	288.6	298.0	307.9	
170.2	171.4	172.6	173.8	174.8	175.8	176.8	177.4	178.0	178.7	178.9	179.1	179.2	178.8	178.4	178.1	177.3	176.5	175.8	
232.0	239.0	246.3	253.6	261.0	268.6	276.3	283.9	291.6	299.4	307.3	315.0	322.8	330.5	338.2	346.0	353.5	361.0	368.4	
160.0	167.0	173.8	181.1	212.2	220.8	246.2	261.3	272.6	276.1	270.2	264.7	268.3	279.0	294.6	311.9	330.3	348.7	367.1	
109.2	201.4	203.6	205.8	208.0	210.2	212.4	214.6	216.8	218.5	220.3	222.0	223.6	224.9	225.8	226.6	226.9	227.1	226.9	
167.0	179.4	191.9	204.5	216.9	229.5	242.2	254.8	267.4	280.5	292.7	305.2	317.6	330.0	342.3	354.6	366.9	379.2	391.5	
180.5	181.4	182.9	184.2	185.3	186.4	187.5	188.3	189.1	189.9	190.8	190.5	190.9	190.7	190.5	190.4	190.8	190.2	189.6	
O 11	O 21	O 31	N 10	N 20	N 30	D 10	D 20	D 30	1984	Ja 9	Ja 19	Ja 29	F 8	F 18	F 28	Mr 9	Mr 19	Mr 29	Ap 8
133.5	139.4	145.5	151.5	157.2	163.0	168.6	174.2	179.7	185.0	190.1	194.8	199.4	203.5	207.0	210.1	212.4	213.8	214.2	
159.4	174.7	191.8	209.2	226.2	241.7	253.9	269.9	285.6	249.3	250.1	259.5	273.7	290.8	308.6	326.9	344.2	359.7	374.1	
224.1	226.0	228.0	230.1	232.1	234.5	236.9	239.1	241.4	243.5	245.8	247.9	249.9	251.9	253.6	255.2	256.6	257.7	258.4	
129.5	137.5	147.0	156.9	167.5	178.6	190.1	201.7	213.5	225.4	237.6	249.7	262.2	274.6	286.9	299.2	311.7	324.1	336.5	
160.8	192.0	193.2	194.4	195.5	196.6	197.8	198.7	199.6	200.6	201.1	201.6	202.2	202.2	202.3	202.3	201.8	201.3	200.8	
O 10	O 20	O 30	N 9	N 19	N 29	D 9	D 19	D 29	1985	Ja 8	Ja 18	Ja 28	F 7	F 17	F 27	Mr 9	Mr 19	Mr 29	Ap 8
251.5	258.4	265.5	272.7	280.0	287.3	294.8	302.3	309.9	317.4	324.8	332.5	340.7	347.2	354.7	362.1	369.4	376.7	384.0	
171.0	188.5	205.9	222.0	235.5	248.3	261.2	273.5	285.2	296.9	308.5	319.6	330.7	341.2	351.8	362.3	372.8	383.3	393.8	
251.1	252.4	254.1	255.8	257.8	259.8	262.0	264.3	266.5	268.9	271.1	273.4	275.8	278.1	280.3	282.4	284.4	286.3	288.0	
203.8	216.0	228.3	240.8	252.5	264.5	276.2	288.1	299.4	310.6	321.1	331.4	340.6	348.6	354.9	358.4	358.7	354.7	348.4	
201.0	202.2	203.4	204.5	205.7	206.9	208.0	209.0	210.0	211.0	211.7	212.4	213.2	213.4	213.6	213.8	213.5	213.2	212.9	
145.7	152.0	158.2	164.3	170.6	176.7	182.8	188.2	194.9	201.2	206.9	212.8	218.7	224.5	230.2	235.8	241.1	246.2	251.9	
185.3	202.0	216.3	226.4	238.3	251.7	266.8	281.7	293.4	248.8	266.0	284.1	301.2	317.4	330.3	347.1	363.6	379.4	394.7	
242.3	282.7	283.5	284.4	285.8	287.3	289.1	291.9	293.0	295.2	297.4	299.9	302.2	304.5	306.9	309.3	311.7	313.9	316.8	
148.8	161.1	178.3	185.9	198.4	211.8	223.3	235.8	248.8	261.3	273.9	286.5	299.4	311.8	324.4	336.8	349.3	361.6	374.0	
210.9	212.0	213.1	214.3	215.5	216.7	217.8	218.9	220.0	221.1	222.0	222.9	223.7	224.1	224.5	224.8	225.0	225.2	224.5	
278.3	284.4	290.4	296.8	303.2	309.9	316.4	323.0	330.0	336.8	343.8	350.7	357.6	364.4	371.3	378.1	384.9	391.7	398.2	
196.9	208.7	213.0	208.1	201.9	193.4	183.8	1												

TABLE

Geocentric Places of Mars, Mercury, Jupiter, Venus and Saturn for every tenth day of current cycle.
Venus, A.D. 1765—A.D. 1999;

Day of I.S.Y.	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
Eng. date ...	Ap 14	Ap 24	My 4	My 14	My 24	Je 3	Je 13	Je 23	Ji 3	Ji 13	Ji 23	An 2	An 12	An 22	S 1	S 11	S 21	O 1
1987 Mars ...	41 7	48 3	54 9	61 5	68 1	74 6	81 1	87 6	94 0	100 4	106 8	113 2	119 7	126 1	132 4	138 8	145 2	151 5
Merc. ...	339 9	358 0	16 7	35 5	53 5	69 1	80 2	82 4	78 0	72 1	78 0	80 8	107 2	124 9	143 1	160 6	176 9	189 9
Jup. ...	345 3	347 7	350 0	352 3	354 4	356 6	358 5	0 2	1 7	2 9	3 9	4 7	4 9	4 9	4 5	3 8	2 8	1 4
Ven. ...	325 7	327 8	350 0	2 2	14 2	26 5	38 8	50 9	63 0	75 3	87 4	99 7	111 9	124 2	136 5	148 0	161 2	173 7
Sat. ...	235 7	235 5	235 8	234 2	233 4	232 6	231 9	231 2	230 5	229 7	229 3	228 9	228 6	228 0	227 0	226 1	225 7	225 3
Eng. date ...	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Ji 2	Ji 12	Ji 22	An 1	An 11	An 21	An 31	S 10	S 20	S 30
1988 Mars ...	279 2	286 0	292 3	298 8	305 2	311 2	317 1	322 8	328 1	332 8	337 1	340 2	342 4	343 2	342 8	340 7	338 0	335 7
Merc. ...	354 2	12 5	30 9	47 1	58 4	68 9	58 8	52 9	57 1	63 3	85 1	103 0	121 4	139 6	156 3	170 7	179 3	180 2
Jup. ...	12 8	15 2	17 3	20 1	22 5	24 8	27 1	29 4	31 5	33 4	35 2	36 9	38 3	39 5	40 4	40 8	41 1	41 0
Ven. ...	45 5	54 2	61 3	66 0	67 8	66 1	60 1	53 8	50 4	51 0	55 0	61 2	69 5	78 8	88 8	99 3	110 3	121 5
Sat. ...	246 9	246 6	246 3	245 9	245 3	244 7	244 0	243 2	242 4	241 7	241 1	240 5	240 0	239 9	239 3	238 8	240 2	240 6
Eng. date ...	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Ji 2	Ji 12	Ji 22	An 1	An 11	An 21	An 31	S 10	S 20	S 30
1989 Mars ...	56 6	62 6	69 0	75 0	81 1	87 5	93 8	100 0	106 2	112 5	118 9	125 1	131 5	137 8	144 1	150 4	156 9	163 6
Merc. ...	8 3	25 0	38 3	45 5	41 1	34 3	30 7	47 4	62 8	80 8	99 6	117 6	135 3	150 5	161 1	164 4	158 6	153 1
Jup. ...	40 1	42 5	44 7	47 0	49 3	51 7	54 1	56 4	58 7	61 0	63 3	65 4	67 4	69 3	71 1	72 6	73 8	74 7
Ven. ...	2 1	14 7	27 0	39 3	51 5	63 9	76 0	85 1	100 1	112 2	12 3	14 2	148 3	160 1	172 0	178 7	195 4	207 0
Sat. ...	257 9	257 8	257 6	257 5	256 9	256 3	255 7	254 9	254 1	253 3	252 7	252 1	251 4	251 2	251 0	250 7	251 0	251 3
Eng. date ...	Ap 14	Ap 24	My 4	My 14	My 24	Je 3	Je 13	Je 23	Ji 3	Ji 13	Ji 23	An 2	An 12	An 22	S 1	S 11	S 21	O 1
1990 Mars ...	299 3	306 8	314 3	321 3	328 2	336 2	343 7	350 6	357 6	4 3	10 6	17 1	22 8	28 6	33 7	38 0	42 0	45 2
Merc. ...	16 7	24 6	22 8	15 6	18 0	25 7	40 1	58 2	76 8	95 2	113 3	129 6	142 4	147 4	143 2	136 6	138 8	148 7
Jup. ...	68 6	70 0	71 8	73 7	75 7	77 8	80 0	82 2	84 5	86 9	89 1	91 3	93 6	95 8	97 9	99 9	101 9	103 8
Ven. ...	318 8	324 3	335 5	347 0	358 6	10 2	22 1	33 7	45 6	57 5	69 6	81 6	93 8	106 0	118 1	130 4	142 7	155 1
Sat. ...	268 9	269 0	269 1	268 1	268 7	268 3	267 8	267 0	266 2	265 5	264 8	264 1	263 3	262 9	262 5	262 0	262 1	262 1
Eng. date ...	Ap 14	Ap 24	My 4	My 14	My 24	Je 3	Je 13	Je 23	Ji 3	Ji 13	Ji 23	An 2	An 12	An 22	S 1	S 11	S 21	O 1
1991 Mars ...	71 9	77 6	83 1	88 9	94 7	100 6	106 6	112 5	118 7	124 8	130 9	137 3	140 5	150 0	156 2	162 7	169 4	175 8
Merc. ...	5 3	35 7	355 0	3 9	18 1	35 3	58 9	73 0	91 5	105 3	122 0	129 6	127 7	120 2	120 2	128 7	143 1	159 8
Jup. ...	98 4	99 0	99 9	101 0	102 4	104 1	105 9	107 7	109 8	111 9	114 0	116 2	118 6	120 8	123 0	125 2	127 3	129 4
Ven. ...	37 5	40 1	60 6	71 9	82 7	93 3	103 4	112 6	120 7	127 6	132 4	133 7	131 0	125 3	119 3	116 5	117 7	122 2
Sat. ...	279 7	280 0	280 3	280 5	280 2	279 9	279 7	279 0	278 8	277 6	276 8	276 0	275 3	274 7	274 1	273 5	273 4	273 3
Eng. date ...	Ap 18	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Ji 2	Ji 12	Ji 22	An 1	An 11	An 21	An 31	S 10	S 20	S 30
1992 Mars ...	317 8	325 4	338 3	340 7	348 5	355 9	3 5	10 7	18 8	25 1	32 1	39 0	45 4	51 9	58 0	64 0	69 7	74 6
Merc. ...	336 8	342 5	356 8	12 5	30 9	50 1	68 9	88 4	101 2	110 7	111 4	104 0	101 2	108 4	122 2	138 4	156 1	173 8
Jup. ...	130 0	129 6	129 5	129 6	130 1	130 9	132 0	133 3	134 9	136 6	138 4	140 5	142 5	144 6	146 7	149 0	151 2	153 3
Ven. ...	343 5	355 8	8 3	20 4	32 9	45 3	57 5	69 8	82 1	94 2	106 8	118 6	130 9	143 1	155 4	167 5	180 0	192 3
Sat. ...	280 6	291 0	291 4	291 9	291 8	291 7	291 7	291 2	290 7	290 2	289 4	288 6	287 7	287 0	286 3	285 7	285 4	285 1
Eng. date ...	Ap 18	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Ji 2	Ji 12	Ji 22	An 1	An 11	An 21	An 31	S 10	S 20	S 30
1993 Mars ...	89 7	94 0	98 7	103 8	109 1	114 6	120 1	125 9	131 7	137 7	143 8	149 8	156 4	162 5	168 9	175 5	182 1	188 9
Merc. ...	334 3	350 0	8 1	26 0	48 1	63 8	79 6	91 0	98 5	87 0	82 7	88 7	100 9	117 0	134 5	152 6	170 3	186 4
Jup. ...	163 6	162 3	161 2	160 4	160 0	159 8	159 4	160 4	161 1	162 1	163 4	164 9	166 6	168 4	170 4	172 5	174 5	176 7
Ven. ...	342 0	340 0	341 9	346 9	354 1	2 8	11 9	21 9	32 5	43 8	54 5	66 0	77 5	89 3	101 0	113 0	125 1	137 0
Sat. ...	304 1	302 0	302 6	303 3	303 5	303 7	303 8	303 5	303 1	302 8	302 1	301 4	300 6	299 8	299 0	298 2	297 7	297 2
Eng. date ...	Ap 14	Ap 24	My 4	My 14	My 24	Je 3	Je 13	Je 23	Ji 3	Ji 13	Ji 23	An 2	An 12	An 22	S 1	S 11	S 21	O 1
1994 Mars ...	334 9	342 6	350 4	358 0	5 6	13 0	20 6	27 6	35 1	42 0	49 0	55 7	62 5	69 1	75 5	81 7	87 9	93 5
Merc. ...	345 5	4 0	22 8	41 2	57 6	70 4	75 0	69 7	63 9	68 3	79 3	95 1	112 7	131 0	148 9	166 9	180 1	189 2
Jup. ...	187 7	196 4	195 0	193 7	192 6	191 3	190 6	190 1	189 9	190 1	190 4	191 2	192 2	193 5	194 9	196 6	198 6	200 5
Ven. ...	21 0	33 4	45 5	57 5	69 6	81 4	93 3	105 0	116 6	127 9	138 1	149 1	160 6	170 8	180 4	188 9	196 2	201 4
Sat. ...	312 2	313 1	314 0	314 8	315 2	315 6	316 1	315 9	315 7	315 6	315 0	314 4	313 8	313 0	312 0	311 4	310 7	310 0
Eng. date ...	Ap 14	Ap 24	My 4	My 14	My 24	Je 3	Je 13	Je 23	Ji 3	Ji 13	Ji 23	An 2	An 12	An 22	S 1	S 11	S 21	O 1
1995 Mars ...	112 0	114 2	117 1	121 4	125 6	130 3	135 1	140 5	146 0	151 8	157 7	163 6	169 8	176 2	182 5	188 9	195 9	202 7
Merc. ...	0 4	18 7	35 1	48 9	55 5	62 2	45 5	47 3	58 0	73 3	90 7	109 4	127 5	144 9	160 2	171 1	176 1	187 7
Jup. ...	231 2	230 5	229 7	228 6	227 3	225 9	224 6	223 4	222 2	221 5	220 9	220 2	220 0	221 3	222 0	223 0	224 4	225 9
Ven. ...	326 2	338 2	350 3	2 4	14 7	26 9	39 2	51 3	63 4	75 7	87 8	100 2	112 5	124 7	137 1	149 3	161 6	174 8
Sat. ...	823 4	824 4	825 4	826 5	827 1	827 7	828 3	828 4	828 5	828 5	828 6	828 1	827 7	827 2	826 4	825 6	824 8	823 2
Eng. date ...	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Ji 2	Ji 12	Ji 22	An 1	An 11	An 21	An 31	S 10	S 20	S 30
1996 Mars ...	351 1	358 8	6 2	13 9	21 2	28 6	35 8	43 1	49 9	57 1	63 7	70 5	77 1	83 7	90 2	96 5	102 7	108 7
Merc. ...	13 2	27 4	35 3	44 4	26 9	26 6	35 8	50 8	64 4	87 1	105 1	123 5	138 8	152 1	167 3	183 5	146 5	147 9
Jup. ...	263 0	263 5	263 7	263 5	163 0	262 3	261 2	259 9	258 6	257 3	256 0	254 8	253 9	253 3	253 0	253 1	253 4	254 1
Ven. ...	45 3	53 8	60 2	64 6	65 3	62 5	56 3	50 7	48 0	49 3	63 9	61 0	69 5	78 8	89 0	99 7	110 5	121 3
Sat. ...	334 7	336 8	338 9	338 1	338 9	339 7	340 6	340 9	341 2	341 6	341 4	341 2	340 9	340 2	339 5	338 9	338 1	337 3
Eng. date ...	Ap 13	Ap 23	My 3	My 13	My 23	Je 2	Je 12	Je 22	Ji 2	Ji 12	Ji 22	An 1	An 11	An 21	An 31	S 10	S 20	S 30
1997 Mars ...	143 5	142 5	142 7	144 4	146 9	150 0	153 7	158 1	162 9	168 3	173 8	179 5	185 5	191 8	198 2	204 6	211 3	218 8
Merc. ...	14 9	16 1	9 0	6 4	14 8	28 4	45 6	64 0	83 1	101 4	118 3	132 0	139 7	137 7	131 9	130 0	138 9	152 3
Jup. ...	292 3	294 4	295 6	296 5	297 4	297 7	297 7	297 5	296 8	295 8	294 7	293 0	291 9	290 6	289 4	288 3	287 6	287 2
Ven. ...	2 8	15 2	27 5	39 8	52 1	64 2	76 5	88 5	100 7	112 6	124 8	136 7	148 8	160 6	172 4	184 3	196 9	207 2
Sat. ...	346 1	347 3	348 5	349 8	350 9	351 0	352 9	353 5	354 1	354 7	354 7	354 8	354 8	354 4	354 0	353 3	352 5	351 7
Eng. date ...																		

V-B—cont.

Mars, A.D. 1637—A.D. 1999; Mercury, A.D. 1645—A.D. 1999; Jupiter, A.D. 1656—A.D. 1999; Saturn, A.D. 1617—A.D. 1999—cont.

180	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	
O 11	O 21	O 31	N 10	N 20	N 30	D 10	D 20	D 30	Ja 9	Ja 19	Ja 29	F 8	F 18	F 28	Mr 9	Mr 19	Mr 29	Ap 8	
167.0	164.8	170.6	177.2	183.6	190.1	196.4	202.9	209.5	1988	215.9	222.6	229.1	235.7	242.3	249.6	256.8	262.8	269.0	275.8
196.7	194.6	186.9	186.5	194.8	208.4	224.7	241.7	259.5	276.0	290.5	300.2	301.8	294.8	291.1	296.8	309.7	326.1	344.1	361.1
0.3	358.8	357.5	356.2	355.2	354.4	354.2	354.2	354.6	355.2	356.3	357.5	359.0	0.8	2.8	4.8	6.9	9.3	11.6	14.0
186.1	198.7	211.0	223.5	236.0	248.6	260.9	273.4	285.8	298.0	310.4	323.4	334.8	346.1	357.9	369.1	380.0	390.6	400.7	410.3
230.9	231.9	232.9	233.9	235.1	236.3	237.4	238.5	239.6	240.8	241.8	242.8	243.9	244.6	245.3	246.1	246.4	246.7	246.9	247.0
O 10	O 20	O 30	N 9	N 19	N 29	D 9	D 19	D 29	Ja 8	Ja 18	Ja 28	F 7	F 17	F 27	Mr 9	Mr 19	Mr 29	Ap 8	
333.6	333.3	333.7	335.5	338.3	341.8	345.8	350.3	355.2	1989	0.3	5.8	11.4	17.0	23.0	28.8	34.9	40.9	47.0	53.2
172.8	169.4	175.8	188.6	204.4	221.4	238.7	255.7	270.7	281.7	285.5	289.3	274.1	277.6	289.0	304.4	322.1	340.4	358.8	377.2
40.4	39.6	38.5	37.8	35.8	34.4	33.2	32.1	31.1	30.6	30.3	30.4	30.8	31.7	32.7	34.0	35.6	37.4	39.2	41.0
183.0	144.8	156.7	168.6	180.8	193.0	206.8	217.8	230.3	242.8	255.4	267.9	280.6	293.2	305.7	318.3	330.7	343.2	355.6	368.0
241.0	241.9	242.8	243.7	244.8	245.9	247.0	248.2	249.4	250.5	251.6	252.7	253.8	254.7	255.6	256.4	256.9	257.3	257.8	258.3
169.9	176.5	183.2	189.8	196.5	203.2	209.8	216.7	223.6	1990	230.5	237.6	244.5	251.8	258.9	266.1	273.5	280.8	288.1	295.4
167.5	188.8	184.1	201.0	218.8	235.4	252.8	269.4	270.6	286.1	295.6	304.9	314.8	324.2	333.2	342.3	351.4	360.5	369.6	378.7
75.5	75.8	75.9	75.5	74.8	73.9	72.8	71.4	70.2	68.7	67.4	66.3	65.7	65.3	65.1	65.4	65.9	66.7	67.9	69.1
218.3	229.4	240.1	250.4	259.8	268.2	275.0	280.4	281.6	279.5	278.5	278.5	266.1	267.6	272.6	279.8	288.5	298.0	308.0	318.0
251.5	252.2	252.9	253.7	254.7	255.7	256.7	257.9	259.1	260.3	261.5	262.7	263.8	264.7	265.7	266.7	267.8	267.9	268.6	269.6
47.1	47.8	47.5	46.2	45.2	44.0	42.7	41.3	39.8	1991	34.7	36.3	38.5	41.6	45.2	49.4	53.9	58.7	63.9	69.1
168.6	180.2	197.6	215.0	231.0	244.4	252.6	252.0	243.7	241.8	249.6	262.5	273.8	286.5	301.7	314.7	328.3	343.6	359.6	376.4
105.1	106.5	107.4	108.2	108.7	108.8	108.6	108.0	107.2	108.1	104.8	103.5	102.2	100.9	99.8	98.9	98.8	98.0	96.2	94.4
167.6	180.0	192.5	205.1	217.6	230.1	242.9	255.5	268.1	280.7	293.8	305.7	318.2	330.6	342.9	355.2	367.2	379.3	391.4	403.5
262.3	262.8	263.4	263.9	264.8	265.7	266.7	267.9	269.1	270.2	271.4	272.6	273.7	274.8	275.9	277.0	277.8	278.6	279.5	280.6
O 11	O 21	O 31	N 10	N 20	N 30	D 10	D 20	D 30	Ja 9	Ja 19	Ja 29	F 8	F 18	F 28	Mr 9	Mr 19	Mr 29	Ap 8	
182.4	189.1	195.8	202.9	209.7	216.7	223.7	230.8	238.0	1992	245.4	252.7	260.2	267.6	275.3	282.7	290.6	298.2	305.9	313.7
177.2	184.5	211.1	225.6	235.5	237.0	230.2	226.7	230.6	242.7	258.3	275.6	298.4	310.8	327.1	340.4	347.5	344.9	337.6	330.6
131.5	138.8	134.9	136.4	137.8	138.8	139.5	140.1	140.2	140.0	139.6	138.7	137.6	136.4	135.1	133.7	132.4	131.4	130.4	129.4
129.0	137.4	146.9	157.0	168.0	178.8	189.3	200.2	210.9	225.9	238.8	250.5	262.7	275.0	287.5	299.8	312.2	324.7	337.2	349.7
273.2	278.6	274.0	274.4	275.3	276.2	277.0	278.1	279.2	280.8	281.5	282.7	283.9	285.1	286.3	287.4	288.3	289.2	290.1	291.0
O 10	O 20	O 30	N 9	N 19	N 29	D 9	D 19	D 29	Ja 8	Ja 18	Ja 28	F 7	F 17	F 27	Mr 9	Mr 19	Mr 29	Ap 8	
79.6	84.0	87.4	91.2	93.8	94.6	94.8	93.4	91.0	87.7	83.8	80.6	77.8	76.7	76.8	78.5	80.7	83.7	87.7	91.7
190.9	206.1	217.7	222.0	217.2	210.6	212.5	223.0	237.8	254.3	272.2	289.5	306.2	323.1	338.4	353.8	369.0	384.1	399.1	414.1
155.5	157.6	159.7	161.7	163.6	165.1	166.6	168.0	169.1	169.8	170.3	170.5	170.8	169.9	169.0	167.9	166.8	165.5	164.1	162.7
204.3	216.6	228.7	240.9	252.8	264.8	276.5	288.2	299.6	310.7	321.1	331.1	340.2	347.9	353.6	358.4	363.7	368.0	372.3	376.6
284.7	284.9	285.1	285.3	285.0	286.7	287.4	288.4	289.4	290.5	291.7	292.9	294.1	295.3	296.5	297.7	298.8	299.9	300.9	301.9
195.6	202.5	209.5	216.5	223.7	230.8	238.0	245.4	252.9	268.6	285.4	300.2	310.0	311.6	313.2	314.8	316.4	317.9	319.5	321.0
199.3	206.0	203.6	196.1	195.3	194.2	193.7	193.7	195.1	196.8	198.0	199.1	199.9	200.4	20.5	200.4	200.0	199.2	198.2	197.2
178.9	181.3	183.3	185.5	187.5	189.6	191.6	193.5	195.1	202.1	214.6	227.6	240.2	252.4	264.2	275.6	286.6	297.2	307.6	317.9
149.6	161.7	174.1	186.4	198.1	211.5	224.2	236.8	249.4	262.1	274.6	287.5	300.0	312.5	325.1	337.6	350.0	362.5	374.9	387.4
290.7	296.7	296.7	296.7	297.2	297.7	298.3	299.2	300.1	301.0	302.2	303.4	304.5	305.7	306.9	308.2	309.4	310.6	311.8	312.9
99.2	104.8	109.7	114.5	118.7	122.7	126.1	128.3	129.4	129.7	128.8	126.3	123.4	120.2	115.4	112.5	110.6	110.3	111.0	111.0
189.8	181.9	175.9	186.1	197.4	213.6	230.2	247.1	264.7	280.1	291.5	305.2	318.3	328.7	337.6	345.1	351.4	357.2	362.9	368.6
203.6	204.7	206.8	209.0	211.2	213.5	215.6	217.8	219.9	220.0	223.8	225.7	227.2	228.6	229.6	230.6	231.1	231.4	231.4	231.4
203.4	202.2	196.8	191.0	187.4	188.0	192.4	199.1	207.1	216.9	227.2	237.9	248.1	260.5	272.6	283.9	295.9	307.9	319.9	331.9
309.8	309.1	308.9	308.6	308.9	309.2	309.6	310.4	311.2	311.9	313.0	314.1	315.3	316.5	317.7	319.0	320.2	321.4	322.7	323.9
O 11	O 21	O 31	N 10	N 20	N 30	D 10	D 20	D 30	Ja 9	Ja 19	Ja 29	F 8	F 18	F 28	Mr 9	Mr 19	Mr 29	Ap 8	
200.7	216.6	228.8	231.0	238.2	245.9	253.2	260.9	268.5	1996	276.3	284.2	291.9	299.8	307.8	315.6	323.5	331.4	339.2	347.1
162.4	166.7	178.2	193.8	210.3	227.6	244.6	260.1	274.2	278.4	275.1	267.9	258.8	248.4	239.1	230.2	328.2	340.7	353.2	365.7
227.6	229.5	231.5	233.5	235.8	238.0	240.2	242.4	244.8	246.9	249.2	251.4	253.5	255.5	257.4	259.3	260.4	261.6	262.6	263.6
186.5	199.1	211.5	223.9	236.5	248.8	261.4	273.8	286.2	298.4	310.6	322.7	334.7	346.4	357.9	369.2	380.5	391.8	403.1	414.4
322.5	322.1	321.7	321.2	321.3	321.4	321.5	321.6	321.7	322.4	324.4	326.5	328.6	330.7	332.8	334.9	337.0	339.1	341.2	343.3
O 10	O 20	O 30	N 9	N 19	N 29	D 9	D 19	D 29	Ja 8	Ja 18	Ja 28	F 7	F 17	F 27	Mr 9	Mr 19	Mr 29	Ap 8	
114.7	120.6	126.1	131.8	136.9	141.8	146.5	150.7	154.5	157.8	160.1	161.4	161.6	160.6	158.6	154.4	150.5	146.9	144.4	141.9
168.6	172.9	189.7	209.9	224.8	240.4	253.8	261.5	268.8	253.2	251.1	248.3	242.3	238.6	235.6	232.7	229.8	226.9	224.0	221.1
255.1	256.4	257.8	259.5	261.5	263.5	265.5	267.8	270.0	272.3	274.7	277.0	279.3	281.6	284.0	286.1	288.2	290.2	292.3	294.4
133.4	145.2	157.1	169.1	181.3	193.7	205.9	218.5	231.0	243.5	256.1	268.7	281.0	293.8	306.4	318.9	331.4	343.8	356.3	368.8
336.4	335.8	335.2	334.6	334.1	334.2	334.1	334.5	334.9	335.4	336.3	337.2	338.0	339.2	340.4	341.6	342.9	344.2	345.4	346.6
225.3	232.3	239.6	246.8	254.4	261.9	269.5	277.1	285.1	1998	292.8	299.6	306.5	313.3	320.0	326.8	333.6	340.3	347.0	353.8
168.7	184.6	203.8	223.3	234.5	244.6	248.0	239.0	234.7	240.1	254.0	267.5	284.8	302.8	320.7	338.6	356.6	374.6	392.6	410.6
287.0	287.2	287.8	288.7	289.9	291.3	293.0	294.8	296.7	299.0	301.2	303.5	305.8	308.2	310.6	312.9	315.4	317.8	320.0	322.0
218.5	229.6	240.0	250.2	259.4	267.5	274.0	278.2	279.0	275.5	270.1	264.5	258.6	252.0	245.8	239.2	232.5	225.8	219.0	212.3
350.9	3																		

TABLE VI.

Ghatikās and Palas (Naligais and Vinadis) as Fractions of a day.

N.B.—The same table will serve for minutes and seconds as fractions of an Hour or a Degree.

Ghaṭikās.					Palas.	Ghaṭikās.					Palas.	Ghaṭikās.					Palas.	Ghaṭikās.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
0	1	2	3	4		5	6	7	8	9		10	11	12	13	14		15	16	17	18	19																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
	0167	0387	0500	0667	0	0833	1000	1167	1333	1500	0	1637	1833	2000	2167	2333	0	2500	2667	2833	3000	3167																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														

TABLE VI.—cont.

Ghatikās and Palas (Naligais and Vinadis) as Fractions of a day—cont.

N.B.—The same table will serve for minutes and seconds as fractions of an Hour or a Degree.

Ghaṭikāḥ.					Palas.	Ghaṭikāḥ.					Palas.	Ghaṭikāḥ.					Palas.	Ghaṭikāḥ.				
30	31	32	33	34		25	26	27	28	29		30	31	32	33	34		35	36	37	38	39
3323	3500	3667	3833	4000	0	4167	4333	4500	4667	4833	0	5000	5167	5333	5500	5667	0	5833	6000	6167	6333	6500
3326	3503	3669	3836	4003	1	4169	4336	4503	4669	4836	1	5003	5169	5336	5503	5669	1	5836	6003	6169	6336	6503
3329	3505	3672	3839	4005	2	4172	4339	4505	4672	4839	2	5005	5172	5339	5505	5672	2	5839	6005	6172	6339	6505
3342	3508	3675	3842	4008	3	4175	4342	4508	4675	4842	3	5008	5175	5342	5508	5675	3	5842	6008	6175	6342	6508
3344	3511	3678	3844	4011	4	4178	4344	4511	4678	4844	4	5011	5178	5344	5511	5678	4	5844	6011	6178	6344	6511
3347	3514	3680	3847	4014	5	4180	4347	4514	4680	4847	5	5014	5180	5347	5514	5680	5	5847	6014	6180	6347	6514
3350	3517	3683	3850	4017	6	4183	4350	4517	4683	4850	6	5017	5183	5350	5517	5683	6	5850	6017	6183	6350	6517
3353	3519	3686	3853	4019	7	4186	4353	4519	4686	4853	7	5019	5186	5353	5519	5686	7	5853	6019	6186	6353	6519
3355	3522	3689	3855	4022	8	4189	4355	4522	4689	4855	8	5022	5189	5355	5522	5689	8	5855	6022	6189	6355	6522
3358	3525	3692	3858	4025	9	4192	4358	4525	4692	4858	9	5025	5192	5358	5525	5692	9	5858	6025	6192	6358	6525
3361	3528	3694	3861	4028	10	4194	4361	4528	4694	4861	10	5028	5194	5361	5528	5694	10	5861	6028	6194	6361	6528
3364	3530	3697	3864	4030	11	4197	4364	4530	4697	4864	11	5030	5197	5364	5530	5697	11	5864	6030	6197	6364	6530
3367	3533	3700	3867	4033	12	4200	4367	4533	4700	4867	12	5033	5200	5367	5533	5700	12	5867	6033	6200	6367	6533
3369	3536	3703	3869	4036	13	4203	4369	4536	4703	4869	13	5036	5203	5369	5536	5703	13	5869	6036	6203	6369	6536
3372	3539	3706	3872	4039	14	4205	4372	4539	4705	4872	14	5039	5205	5372	5539	5705	14	5872	6039	6205	6372	6539
3375	3542	3708	3875	4042	15	4208	4375	4542	4708	4875	15	5042	5208	5375	5542	5708	15	5875	6042	6208	6375	6542
3378	3544	3711	3878	4044	16	4211	4378	4544	4711	4878	16	5044	5211	5378	5544	5711	16	5878	6044	6211	6378	6544
3380	3547	3714	3880	4047	17	4214	4380	4547	4714	4880	17	5047	5214	5380	5547	5714	17	5880	6047	6214	6380	6547
3383	3550	3717	3883	4050	18	4217	4383	4550	4717	4883	18	5050	5217	5383	5550	5717	18	5883	6050	6217	6383	6550
3386	3553	3719	3886	4053	19	4219	4386	4553	4719	4886	19	5053	5219	5386	5553	5719	19	5886	6053	6219	6386	6553
3389	3555	3722	3889	4055	20	4222	4389	4555	4722	4889	20	5055	5222	5389	5555	5722	20	5889	6055	6222	6389	6555
3392	3558	3725	3892	4058	21	4225	4392	4558	4725	4892	21	5058	5225	5392	5558	5725	21	5892	6058	6225	6392	6558
3394	3561	3728	3894	4061	22	4228	4394	4561	4728	4894	22	5061	5228	5394	5561	5728	22	5894	6061	6228	6394	6561
3397	3564	3730	3897	4064	23	4230	4397	4564	4730	4897	23	5064	5230	5397	5564	5730	23	5897	6064	6230	6397	6564
3400	3567	3733	3900	4067	24	4233	4400	4567	4733	4900	24	5067	5233	5400	5567	5733	24	5900	6067	6233	6400	6567
3403	3569	3736	3903	4069	25	4236	4403	4569	4736	4903	25	5069	5236	5403	5569	5736	25	5903	6069	6236	6403	6569
3405	3572	3739	3905	4072	26	4239	4405	4572	4739	4905	26	5072	5239	5405	5572	5739	26	5905	6072	6239	6405	6572
3408	3575	3742	3908	4075	27	4242	4408	4575	4742	4908	27	5075	5242	5408	5575	5742	27	5908	6075	6242	6408	6575
3411	3578	3744	3911	4078	28	4244	4411	4578	4744	4911	28	5078	5244	5411	5578	5744	28	5911	6078	6244	6411	6578
3414	3580	3747	3914	4080	29	4247	4414	4580	4747	4914	29	5080	5247	5414	5580	5747	29	5914	6080	6247	6414	6580
3417	3583	3750	3917	4083	30	4250	4417	4583	4750	4917	30	5083	5250	5417	5583	5750	30	5917	6083	6250	6417	6583
3419	3586	3753	3919	4086	31	4253	4419	4586	4753	4919	31	5086	5253	5419	5586	5753	31	5919	6086	6253	6419	6586
3422	3589	3756	3922	4089	32	4256	4422	4589	4756	4922	32	5089	5256	5422	5589	5756	32	5922	6089	6256	6422	6589
3425	3592	3758	3925	4092	33	4258	4425	4592	4758	4925	33	5092	5258	5425	5592	5758	33	5925	6092	6258	6425	6592
3428	3594	3761	3928	4094	34	4261	4428	4594	4761	4928	34	5094	5261	5428	5594	5761	34	5928	6094	6261	6428	6594
3430	3597	3764	3930	4097	35	4264	4431	4597	4764	4930	35	5097	5264	5431	5597	5764	35	5930	6097	6264	6431	6597
3433	3600	3767	3933	4100	36	4267	4433	4600	4767	4933	36	5100	5267	5433	5600	5767	36	5933	6100	6267	6433	6600
3436	3603	3769	3936	4103	37	4269	4436	4603	4769	4936	37	5103	5269	5436	5603	5769	37	5936	6103	6269	6436	6603
3439	3605	3772	3939	4105	38	4272	4439	4605	4772	4939	38	5105	5272	5439	5605	5772	38	5939	6105	6272	6439	6605
3442	3608	3775	3942	4108	39	4275	4442	4608	4775	4942	39	5108	5275	5442	5608	5775	39	5942	6108	6275	6442	6608
3444	3611	3778	3944	4111	40	4278	4444	4611	4778	4944	40	5111	5278	5444	5611	5778	40	5944	6111	6278	6444	6611
3447	3614	3780	3947	4114	41	4280	4447	4614	4780	4947	41	5114	5280	5447	5614	5780	41	5947	6114	6280	6447	6614
3450	3617	3783	3950	4117	42	4283	4450	4617	4783	4950	42	5117	5283	5450	5617	5783	42	5950	6117	6283	6450	6617
3453	3619	3786	3953	4119	43	4286	4453	4619	4786	4953	43	5119	5286	5453	5619	5786	43	5953	6119	6286	6453	6619
3455	3622	3789	3955	4122	44	4289	4455	4622	4789	4955	44	5122	5289	5455	5622	5789	44	5955	6122	6289	6455	6622
3458	3625	3792	3958	4125	45	4292	4458	4625	4792	4958	45	5125	5292	5458	5625	5792	45	5958	6125	6292	6458	6625
3461	3628	3794	3961	4128	46	4294	4461	4628	4794	4961	46	5128	5294	5461	5628	5794	46	5961	6128	6294	6461	6628
3464	3630	3797	3964	4130	47	4297	4464	4630	4797	4964	47	5130	5297	5464	5630	5797	47	5964	6130	6297	6464	6630
3467	3633	3800	3967	4133	48	4300	4467	4633	4800	4967	48	5133	5300	5467	5633	5800	48	5967	6133	6300	6467	6633
3469	3636	3803	3969	4136	49	4303	4469	4636	4803	4969	49	5136	5303	5469	5636	5803	49	5969	6136	6303	6469	6636
3472	3639	3805	3972	4139	50	4305	4472	4639	4805	4972	50	5139	5305	5472	5639	5805	50	5972	6139	6305	6472	6639
3475	3642	3808	397																			

TABLE VI.—cont.

Ghatikās and Palas (Walgais and Vinadis) as Fractions of a day—cont.

N.B.—The same table will serve for minutes and seconds as fractions of an Hour or a Degree.

Ghatikās.					Palas.	Ghatikās.					Palas.	Ghatikās.					Palas.	Ghatikās.				
40	41	42	43	44		45	46	47	48	49		50	51	52	53	54		55	56	57	58	59
6667	6833	7000	7167	7333	0	7500	7667	7833	8000	8167	0	8333	8500	8667	8833	9000	0	9167	9333	9500	9667	9833
6669	6836	7003	7169	7336	1	7503	7669	7836	8003	8169	1	8336	8503	8669	8836	9003	1	9169	9336	9503	9669	9836
6672	6839	7006	7172	7339	2	7505	7672	7839	8005	8172	2	8339	8505	8672	8839	9005	2	9172	9339	9505	9672	9839
6675	6842	7008	7175	7342	3	7508	7675	7842	8008	8175	3	8342	8508	8675	8842	9008	3	9175	9342	9508	9675	9842
6678	6844	7011	7178	7344	4	7511	7678	7844	8011	8178	4	8344	8511	8678	8844	9011	4	9178	9344	9511	9678	9844
6680	6847	7014	7180	7347	5	7514	7680	7847	8014	8180	5	8347	8514	8680	8847	9014	5	9180	9347	9514	9680	9847
6683	6850	7017	7183	7350	6	7517	7683	7850	8017	8183	6	8350	8517	8683	8850	9017	6	9183	9350	9517	9683	9850
6686	6853	7019	7186	7353	7	7519	7686	7853	8019	8186	7	8353	8519	8686	8853	9019	7	9186	9353	9519	9686	9853
6689	6855	7022	7189	7355	8	7522	7689	7855	8022	8189	8	8355	8522	8689	8855	9022	8	9189	9355	9522	9689	9855
6692	6858	7025	7192	7358	9	7525	7692	7858	8025	8192	9	8358	8525	8692	8858	9025	9	9192	9358	9525	9692	9858
6694	6861	7028	7194	7361	10	7528	7694	7861	8028	8194	10	8361	8529	8694	8861	9028	10	9194	9361	9529	9694	9861
6697	6864	7030	7197	7364	11	7530	7697	7864	8030	8197	11	8364	8530	8697	8864	9030	11	9197	9364	9530	9697	9864
6700	6867	7033	7200	7367	12	7533	7700	7867	8033	8200	12	8367	8533	8700	8867	9033	12	9200	9367	9533	9700	9867
6703	6869	7036	7203	7369	13	7536	7703	7869	8036	8203	13	8369	8536	8703	8869	9036	13	9203	9369	9536	9703	9869
6705	6872	7039	7205	7372	14	7539	7705	7872	8039	8205	14	8372	8539	8705	8872	9039	14	9205	9372	9539	9705	9872
6708	6875	7041	7208	7375	15	7542	7708	7875	8042	8208	15	8375	8542	8708	8875	9042	15	9208	9375	9542	9708	9875
6711	6878	7044	7211	7378	16	7544	7711	7878	8044	8211	16	8378	8544	8711	8878	9044	16	9211	9378	9544	9711	9878
6714	6880	7047	7214	7380	17	7547	7714	7880	8047	8214	17	8380	8547	8714	8880	9047	17	9214	9380	9547	9714	9880
6717	6883	7050	7217	7383	18	7550	7717	7883	8050	8217	18	8383	8550	8717	8883	9050	18	9217	9383	9550	9717	9883
6719	6886	7053	7219	7386	19	7553	7719	7886	8053	8219	19	8386	8553	8719	8886	9053	19	9219	9386	9553	9719	9886
6722	6889	7055	7222	7389	20	7555	7722	7889	8055	8222	20	8389	8555	8722	8889	9055	20	9222	9389	9555	9722	9889
6725	6892	7058	7225	7392	21	7558	7725	7892	8058	8225	21	8392	8558	8725	8892	9058	21	9225	9392	9558	9725	9892
6728	6894	7061	7228	7394	22	7561	7728	7894	8061	8228	22	8394	8561	8728	8894	9061	22	9228	9394	9561	9728	9894
6730	6897	7064	7230	7397	23	7564	7730	7897	8064	8230	23	8397	8564	8730	8897	9064	23	9230	9397	9564	9730	9897
6733	6900	7067	7233	7400	24	7567	7733	7900	8067	8233	24	8400	8567	8733	8900	9067	24	9233	9400	9567	9733	9900
6736	6903	7069	7236	7403	25	7569	7736	7903	8069	8236	25	8403	8569	8736	8903	9069	25	9236	9403	9569	9736	9903
6739	6905	7072	7239	7405	26	7572	7739	7905	8072	8239	26	8405	8572	8739	8905	9072	26	9239	9405	9572	9739	9905
6742	6908	7075	7242	7408	27	7575	7742	7908	8075	8242	27	8408	8575	8742	8908	9075	27	9242	9408	9575	9742	9908
6744	6911	7078	7244	7411	28	7578	7744	7911	8078	8244	28	8411	8578	8744	8911	9078	28	9244	9411	9578	9744	9911
6747	6914	7080	7247	7414	29	7580	7747	7914	8080	8247	29	8414	8580	8747	8914	9080	29	9247	9414	9580	9747	9914
6750	6917	7083	7250	7417	30	7583	7750	7917	8083	8250	30	8417	8583	8750	8917	9083	30	9250	9417	9583	9750	9917
6753	6919	7086	7253	7419	31	7586	7753	7919	8086	8253	31	8419	8586	8753	8919	9086	31	9253	9419	9586	9753	9919
6755	6922	7089	7255	7422	32	7589	7755	7922	8089	8255	32	8422	8589	8755	8922	9089	32	9255	9422	9589	9755	9922
6758	6925	7092	7258	7425	33	7592	7758	7925	8092	8258	33	8425	8592	8758	8925	9092	33	9258	9425	9592	9758	9925
6761	6928	7094	7261	7428	34	7594	7761	7928	8094	8261	34	8428	8594	8761	8928	9094	34	9261	9428	9594	9761	9928
6764	6930	7097	7264	7430	35	7597	7764	7930	8097	8264	35	8430	8597	8764	8930	9097	35	9264	9430	9597	9764	9930
6767	6933	7100	7267	7433	36	7600	7767	7933	8100	8267	36	8433	8600	8767	8933	9100	36	9267	9433	9600	9767	9933
6769	6936	7103	7269	7436	37	7603	7770	7936	8103	8269	37	8436	8603	8769	8936	9103	37	9269	9436	9603	9769	9936
6772	6939	7105	7272	7439	38	7606	7772	7939	8105	8272	38	8439	8605	8772	8939	9105	38	9272	9439	9605	9772	9939
6775	6942	7108	7275	7442	39	7608	7775	7942	8108	8275	39	8442	8608	8775	8942	9108	39	9275	9442	9608	9775	9942
6778	6944	7111	7278	7444	40	7611	7778	7944	8111	8278	40	8444	8611	8778	8944	9111	40	9278	9444	9611	9778	9944
6780	6947	7114	7280	7447	41	7614	7780	7947	8114	8280	41	8447	8614	8780	8947	9114	41	9280	9447	9614	9780	9947
6783	6950	7117	7283	7450	42	7617	7783	7950	8117	8283	42	8450	8617	8783	8950	9117	42	9283	9450	9617	9783	9950
6786	6953	7119	7286	7453	43	7619	7786	7953	8119	8286	43	8453	8619	8786	8953	9119	43	9286	9453	9619	9786	9953
6789	6955	7122	7289	7455	44	7622	7789	7955	8122	8289	44	8455	8622	8789	8955	9122	44	9289	9455	9622	9789	9955
6792	6958	7125	7292	7458	45	7625	7792	7958	8125	8292	45	8458	8625	8792	8958	9125	45	9292	9458	9625	9792	9958
6794	6961	7128	7294	7461	46	7628	7794	7961	8128	8294	46	8461	8628	8794	8961	9128	46	9294	9461	9628	9794	9961
6797	6964	7130	7297	7464	47	7630	7797	7964	8130	8297	47	8464	8630	8797	8964	9130	47	9297	9464	9630	9797	9964
6800	6967	7133	7300	7467	48	7633	7800	7967	8133	8300	48	8467	8633	8800	8967	9133	48	9300	9467	9633	9800	9967
6803	6969	7136	7303	7469	49	7636	7803	7969	8136	8303	49	8469	8636	8803	8969	9136	49	9303	9469	9636	9803	9969
6805	6972	7139	7305	7472	50	7639	7805	7972	8139	8305	50	8472	8639	8805	8972	9139	50	9305	9472	9639	9805	9972
6808																						

TABLE VI.—cont.

Hours and Minutes as Fractions of a Day—cont.

Minutes.	Hours.				Minutes.	Hours.				Minutes.	Hours.				Minutes.	Hours.				Minutes.	Hours.				Minutes.	Hours.				
	0	1	2	3		4	5	6	7		8	9	10	11		0	1	2	3		0	1	2	3		0	1	2	3	
0	000000	041666	083333	125000	0	166666	208333	250000	291666	0	333333	375000	416666	458333	0	000000				0	000000					0	000000			
1	000694	042361	084027	125694	1	167361	209027	250694	292361	1	334027	375694	417361	459027	1	000694				1	000694					1	000694			
2	001388	043055	084722	126388	2	168055	209722	251388	293055	2	334722	376388	418055	459722	2	001388				2	001388					2	001388			
3	002083	043750	085416	127083	3	168750	210416	252083	293750	3	335416	377083	418750	460416	3	002083				3	002083					3	002083			
4	002777	044444	086111	127777	4	169444	211111	252777	294444	4	336111	377777	419444	461111	4	002777				4	002777					4	002777			
5	003472	045138	086805	128472	5	170138	211805	253472	295138	5	336805	378472	420138	461805	5	003472				5	003472					5	003472			
6	004166	045833	087500	129166	6	170833	212500	254166	295833	6	337500	379166	420833	462500	6	004166				6	004166					6	004166			
7	004861	046527	088194	129861	7	171527	213194	254861	296527	7	338194	379861	421527	463194	7	004861				7	004861					7	004861			
8	005555	047222	088888	130555	8	172222	213888	255555	297222	8	338888	380555	422222	463888	8	005555				8	005555					8	005555			
9	006250	047916	089583	131250	9	172916	214583	256250	297916	9	339583	381250	422916	464583	9	006250				9	006250					9	006250			
10	006944	048611	090277	131944	10	173611	215277	256944	298611	10	340277	381944	423611	465277	10	006944				10	006944					10	006944			
11	007638	049305	090972	132638	11	174305	215972	257638	299305	11	340972	382638	424305	465972	11	007638				11	007638					11	007638			
12	008333	050000	091666	133333	12	175000	216666	258333	300000	12	341666	383333	425000	466666	12	008333				12	008333					12	008333			
13	009027	050694	092361	134027	13	175694	217361	259027	300694	13	342361	384027	425694	467361	13	009027				13	009027					13	009027			
14	009722	051388	093055	134722	14	176388	218055	259722	301388	14	343055	384722	426388	468055	14	009722				14	009722					14	009722			
15	010416	052083	093750	135416	15	177083	218750	260416	302083	15	343750	385416	427083	468750	15	010416				15	010416					15	010416			
16	011111	052777	094444	136111	16	177777	219444	261111	302777	16	344444	386111	427777	469444	16	011111				16	011111					16	011111			
17	011805	053472	095138	136805	17	178472	220138	261805	303472	17	345138	386805	428472	470138	17	011805				17	011805					17	011805			
18	012500	054166	095833	137500	18	179166	220833	262500	304166	18	345833	387500	429166	470833	18	012500				18	012500					18	012500			
19	013194	054861	096527	138194	19	179861	221527	263194	304861	19	346527	388194	429861	471527	19	013194				19	013194					19	013194			
20	013888	055555	097222	138888	20	180555	222222	263888	305555	20	347222	388888	430555	472222	20	013888				20	013888					20	013888			
21	014583	056250	097916	139583	21	181250	222916	264583	306250	21	347916	389583	431250	472916	21	014583				21	014583					21	014583			
22	015277	056944	098611	140277	22	181944	223611	265277	306944	22	348611	390277	431944	473611	22	015277				22	015277					22	015277			
23	015972	057638	098305	140972	23	182638	224305	265972	307638	23	349305	390972	432638	474305	23	015972				23	015972					23	015972			
24	016666	058333	100000	141666	24	183333	225000	266666	308333	24	350000	391666	433333	475000	24	016666				24	016666					24	016666			
25	017361	059027	100694	142361	25	184027	225694	267361	309027	25	350694	392361	434027	475694	25	017361				25	017361					25	017361			
26	018055	059722	101388	143055	26	184722	226388	268055	309722	26	351388	393055	434722	476388	26	018055				26	018055					26	018055			
27	018750	060416	102083	143750	27	185416	227083	268750	310416	27	352083	393750	435416	477083	27	018750				27	018750					27	018750			
28	019444	061111	102777	144444	28	186111	227777	269444	311111	28	352777	394444	436111	477777	28	019444				28	019444					28	019444			
29	020138	061805	103472	145138	29	186805	228472	270138	311805	29	353472	395138	436805	478472	29	020138				29	020138					29	020138			
30	020833	062500	104166	145833	30	187500	229166	270833	312500	30	354166	395833	437500	479166	30	020833				30	020833					30	020833			
31	021527	063194	104861	146527	31	188194	229861	271527	313194	31	354861	396527	438194	479861	31	021527				31	021527					31	021527			
32	022222	063888	105555	147222	32	188888	230555	272222	313888	32	355555	397222	438888	480555	32	022222				32	022222					32	022222			
33	022916	064583	106250	147916	33	189583	231250	272916	314583	33	356250	397916	439583	481250	33	022916				33	022916					33	022916			
34	023611	065277	106944	148611	34	190277	231944	273611	315277	34	356944	398611	440277	481944	34	023611				34	023611					34	023611			
35	024305	065972	107638	149305	35	190972	232638	274305	315972	35	357638	399305	440972	482638	35	024305				35	024305					35	024305			
36	025000	066666	108333	150000	36	191666	233333	275000	316666	36	358333	400000	441666	483333	36	025000				36	025000					36	025000			
37	025694	067361	109027	150694	37	192361	234027	275694	317361	37	359027	400694	442361	484027	37	025694				37	025694					37	025694			
38	026388	068055	109722	151388	38	193055	234722	276388	318055	38	359722	401388	443055	484722	38	026388				38	026388					38	026388			
39	027083	068750	110416	152083	39	193750	235416	277083	318750	39	360416	402083	443750	485416	39	027083				39	027083					39	027083			
40	027777	069444	111111	152777	40	194444	236111	277777	319444	40	361111	402777	444444	486111	40	027777				40	027777					40	027777			
41	028472	070138	111805	153472	41	195138	236805	278472	320138	41	361805	403472																		

TABLE VI—cont.

Hours and Minutes as Fractions of a Day—cont.

Hours.					Hours.					Hours.					Minutes.		Seconds of hours as fractions of a day.	
12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3	4	5	
0	5000000	5416666	5833333	6250000	0	6666666	7083333	7500000	7916666	0	8333333	8750000	9166666	9583333	0	00000	0	
1	5006944	5423611	5840277	6256944	1	6673611	709 277	7506944	7923611	1	8340277	8756944	9173611	9590277	1	00001	1	
2	5013888	5430555	5847222	6263888	2	6680555	7097222	7513888	7930555	2	8347222	8763888	9180555	9597222	2	00002	2	
3	5020833	5437500	5854166	6270833	3	6687500	7104166	7521333	7937500	3	8354166	8770833	9187500	9604166	3	00003	3	
4	5027777	5444444	5861111	6277777	4	6694444	7111111	7527777	7944444	4	8361111	8777777	9194444	9611111	4	00004	4	
5	5034722	5451388	5868055	6284722	5	6701388	7118055	7534722	7951388	5	8368055	8784722	9201388	9618055	5	00005	5	
6	5041666	5458333	5875000	6291666	6	6708333	7125000	7541666	7958333	6	8375000	8791666	9208333	9625000	6	00006	6	
7	5048611	5465277	5881944	6298611	7	6715277	7131944	7548611	7965277	7	8381944	8798611	9215277	9631944	7	00007	7	
8	5055555	5472222	5888888	6305555	8	6722222	7138888	7555555	7972222	8	8388888	8805555	9222222	9638888	8	00008	8	
9	5062500	5479166	5895833	6312500	9	6729166	7145833	7562500	7979166	9	8395833	8812500	9229166	9645833	9	00009	9	
10	5069444	5486111	5902777	6319444	10	6736111	7152777	7569444	7986111	10	8402777	8819444	9236111	9652777	10	00010	10	
11	5076388	5493055	5909722	6326388	11	6743055	7159722	7576388	7993055	11	8409722	8826388	9243055	9659722	11	00011	11	
12	5083333	5500000	5916666	6333333	12	6750000	7166666	7583333	8000000	12	8416666	8833333	9250000	9666666	12	00012	12	
13	5090277	5506944	5923611	6340277	13	6756944	7173611	7590277	8006944	13	8423611	8840277	9256944	9673611	13	00013	13	
14	5097222	5513888	5930555	6347222	14	6763888	7180555	7597222	8013888	14	8430555	8847222	9263888	9680555	14	00014	14	
15	5104166	5520833	5937500	6354166	15	6770833	7187500	7604166	8020833	15	8437500	8854166	9270833	9687500	15	00015	15	
16	5111111	5527777	5944444	6361111	16	6777777	7194444	7611111	8027777	16	8444444	8861111	9277777	9694444	16	00016	16	
17	5118055	5534722	5951388	6368055	17	6784722	7201388	7618055	8034722	17	8451388	8868055	9284722	9701388	17	00017	17	
18	5125000	5541666	5958333	6375000	18	6791666	7208333	7625000	8041666	18	8458333	8875000	9291666	9708333	18	00018	18	
19	5131944	5548611	5965277	6381944	19	6798611	7215277	7631944	8048611	19	8465277	8881944	9298611	9715277	19	00019	19	
20	5138888	5555555	5972222	6388888	20	6805555	7222222	7638888	8055555	20	8472222	8888888	9305555	9722222	20	00020	20	
21	5145833	5562500	5979166	6395833	21	6812500	7229166	7645833	8062500	21	8479166	8895833	9312500	9729166	21	00021	21	
22	5152777	5569444	5986111	6402777	22	6819444	7236111	7652777	8069444	22	8486111	8902777	9319444	9736111	22	00022	22	
23	5159722	5576388	5993055	6409722	23	6826388	7243055	7659722	8076388	23	8493055	8909722	9326388	9743055	23	00023	23	
24	5166666	5583333	6000000	6416666	24	6833333	7250000	7666666	8083333	24	8500000	8916666	9333333	9750000	24	00024	24	
25	5173611	5590277	6006944	6423611	25	6840277	7256944	7673611	8090277	25	8506944	8923611	9340277	9756944	25	00025	25	
26	5180555	5597222	6013888	6430555	26	6847222	7263888	7680555	8097222	26	8513888	8930555	9347222	9763888	26	00026	26	
27	5187500	5604166	6020833	6437500	27	6854166	7270833	7687500	8104166	27	8520833	8937500	9354166	9770833	27	00027	27	
28	5194444	5611111	6027777	6444444	28	6861111	7277777	7694444	8111111	28	8527777	8944444	9361111	9777777	28	00028	28	
29	5201388	5618055	6034722	6451388	29	6868055	7284722	7701388	8118055	29	8534722	8951388	9368055	9784722	29	00029	29	
30	5208333	5625000	6041666	6458333	30	6875000	7291666	7708333	8125000	30	8541666	8958333	9375000	9791666	30	00030	30	
31	5215277	5631944	6048611	6465277	31	6881944	7298611	7715277	8131944	31	8548611	8965277	9381944	9798611	31	00031	31	
32	5222222	5638888	6055555	6472222	32	6888888	7305555	7722222	8138888	32	8555555	8972222	9388888	9805555	32	00032	32	
33	5229166	5645833	6062500	6479166	33	6895833	7312500	7729166	8145833	33	8562500	8979166	9395833	9812500	33	00033	33	
34	5236111	5652777	6069444	6486111	34	6902777	7319444	7736111	8152777	34	8569444	8986111	9402777	9819444	34	00034	34	
35	5243055	5659722	6076388	6493055	35	6909722	7326388	7743055	8159722	35	8576388	8993055	9409722	9826388	35	00035	35	
36	5250000	5666666	6083333	6500000	36	6916666	7333333	7750000	8166666	36	8583333	9000000	9416666	9833333	36	00036	36	
37	5256944	5673611	6090277	6506944	37	6923611	7340277	7756944	8173611	37	8590277	9006944	9423611	9840277	37	00037	37	
38	5263888	5680555	6097222	6513888	38	6930555	7347222	7763888	8180555	38	8597222	9013888	9430555	9847222	38	00038	38	
39	5270833	5687500	6104166	6520833	39	6937500	7354166	7770833	8187500	39	8604166	9020833	9437500	9854166	39	00039	39	
40	5277777	5694444	6111111	6527777	40	6944444	7361111	7777777	8194444	40	8611111	9027777	9444444	9861111	40	00040	40	
41	5284722	5701388	6118055	6534722	41	6951388	7368055	7784722	8201388	41	8618055	9034722	9451388	9868055	41	00041	41	
42	5291666	5708333	6125000	6541666	42	6958333	7375000	7791666	8208333	42	8625000	9041666	9458333	9875000	42	00042	42	
43	5298611	5715277	6131944	6548611	43	6965277	7381944	7798611	8215277	43	8631944	9048611	9465277	9881944	43	00043	43	
44	5305555	5722222	6138888	6555555	44	6972222	7388888	7805555	8222222	44	8638888	9055555	9472222	9888888	44	00044	44	
45	5312500	5729166	6145833	6562500	45	6979166	7395833	7812500	8229166	45	8645833	9062500	9479166	9895833	45	00045	45	
46	5319444	5736111	6152777	6569444	46	6986111	7402777	7819444	8236111	46	8652777	9069444	9486111	9902777	46	00046	46	
47	5326388	5743055	6159722	6576388	47	6993055	7409722	7826388	8243055	47	8659722	9076388	9493055	9909722	47	00047	47	
48	5333333	5750000	6166666	6583333	48	7000000	7416666	7833333	8250000	48	8666666	9083333	9500000	9916666	48	00048	48	
49	5340277	5756944	6173611	6590277	49	7006944	7423611	7840277	8256944	49	8673611	9090277	9506944	9923611	49	00049	49	
50	5347222	5763888	6180555	6597222	50	7013888	7430555	7847222	8263888	50	8680555	9097222	9513888	9930555	50	00050	50	
51	5354166	5770833	6187500	6604166	51	7020833	7437500	7854166	8270833	51	8687500	9104166	9520833	9937500	51	00051	51	
52	5361111	5777777	6194444	6611111	52	7027777	7444444	7861111	8277777	52	8694444	9111111	9527777	9944444	52	00052	52	
53	5368055	5784722	6201388	6618055	53	7034722	7451388	7868055	8284722	53	8701388	9118055	95347222					

APPENDIX (i)

THE VEDĀNGA JYOTISHA CALENDAR.

(The substance of Sir S. Subrahmanyam Lectures delivered by the author for the Madras University in March 1916.)

Varāhamihira, to whom we owe largely the beginnings of modern Indian astronomy as well as of modern Indian astrology, says in *Bṛihat Samhita*, 3, 2 :—

āsleshārdhāt dakshinam, uttaram ayanam raveḥ dhanishthādyam
nūnam kadācit āsīt : yenoktam pūrvaśāstreshu
sāmpratam ayanam savituh karkāṭakādyam mṛgāditascanyat ;
uktā bhāvo vikṛitih ; pratyaksha parikṣaṇaiḥ vyaktih.

Translation.

“ The southward journey of the sun is from the half of Asleshā ; his northward journey is from the beginning of Dhanishthā : it was so at one time as stated in old treatises : now the dakshināyana is from the beginning of Karkāṭaka and the other ayana is from the beginning of Makara, as may be plainly seen by the eye ”

and in *Panchasiddhāntika* (translated by Dr. Thibaut and by Bāpu Devaśāstri), to the same effect :—

āsleshārdhāt āsīt yadā nivrittih kiloshnakiranasya ;
yuktam ayanam tadāsīt : sāmpratam ayanam punarvasutah :

In these two passages Varāhamihira states that at one time Dakshināyana, or the summer solstice, took place when the sun was in the middle of Āśleṣha nakshatra, and Uttarāyana or the winter solstice when the sun was at the beginning of Dhanishthā nakshatra, whereas in Varāhamihira's own time, the Dakshināyana, “ as any one may see, ” so he says, occurred when the sun was in the beginning of Karkāṭaka rāśi or Punarvasu nakshatra. Nevertheless, he says, the previous observations, recorded by ancient writers, were correct for *their* time : *yuktamayanam tadāsīt*.

2. The ancient observation referred to by Varāhamihira is obviously that recorded in the Vedāṅga Jyotisha, which, as we shall presently see, was just as ancient to Varāhamihira as Varāhamihira is to us ; in other words Varāhamihira's work stands at the centre of a period of astronomy whose span is 3,000 years, at one end of which we stand and at the other end the Vedāṅga Jyotisha.

Description of the Vedāṅga Jyotisha.—The Vedāṅga Jyotisha, a set of rules for ascertaining the year, month and day and fraction of a day, is well known to Indian teachers and students of the Veda who learn and recite it as part of the Veda. It is obscure as to a good deal of its contents, and has not been translated into English, but it was edited by Weber,—see paragraph 4 below,—and practically the whole of it (about 35 slokas, with omissions) is given in Dikshit's *History of Indian Astronomy* (in Mahrāṭṭi). Nevertheless, no one has endeavoured to construct or reconstruct the Vedāṅga Jyotisha system as a connected and consistent whole, just in the way, for instance, in which we are now able to construct the Sūrya Siddhānta scheme of years, months and days for any period to which that system might be applied, currently, retrospectively or prospectively.

3. Before Varāhamihira's time, only two methods of dividing the ecliptic were known to, and practised by, Indian astronomers. These methods were, first by the *ritus* or six seasons of the year, and secondly by the *nakshatras* or lunar mansions, of which 27 (sometimes 28) are, as is well known reckoned in the Indian calendar. The nakshatras are a natural division of the ecliptic, because each of them, measuring $\frac{360}{27}$ degrees = $13\frac{1}{3}$ degrees, is the space travelled by the

moon along the stars in the course of a single day and night, so that a nakshatra is practically equal in length of time to a day and a night—see paragraph 27, page 7 of the text.

4. The chief works of reference on the subject of the nakshatras are Weber's two treatises in German (*Die Vedischen Nachrichten von den Nakshatra*, and *Ueber den Veda Kalender namens Jyotisha*), published respectively in 1860 and 1862, which do not appear to have been translated into English. Dr. Thibaut's monograph on *Mathematics, Astronomy and Astrology* in the German *Encyclopædia of Indo-Aryan Research*, and the late Śankara Bālakrishna Dīkshīt's *Bhāratiya Jyotiṣśāstra* or "History of Indian Astronomy" (published in Mahratti in 1896) are two other important works, dealing with nakshatras, which may be mentioned in this connexion as still awaiting translation into English. In *Macdonnell and Keith's Vedic Index*, however, there are very good summaries in English of nearly all that is known at present about the ancient observations of nakshatras in vedic times.

5. *The Yuga of five years.*—We have information from two or three ancient sources on the subject of the synodical system of the Vedāṅga Jyotisha. All of it comes to this, that once in a yuga of 5 years the sun and moon must return to the same position that they occupied at the beginning of the yuga, and that position is the beginning of nakshatra *Dhanishṭhā* and *Māgha śukla 1*.

6. *Difference between the sidereal and the tropical year.*—We have to study with some care the meaning of the expressions "a year" and "5 years" in this definition of a yuga. In the Vedāṅga Jyotisha period, the Hindus seem to have been acquainted with only one kind of year, viz., the tropical. The tropical year is not a difficult kind of year for us to understand, since the European year which we all observe, is a nearly perfect tropical year. "Tropical year" means the kind of year which brings back the same seasons after the same number of days. At present the summer solstice, when the sun reaches his extreme limit in his northern course, falls on June 22; and we know that on June 22 we in India may expect rain every year and with the rain cultivation begins. Similarly, on December 22, when the sun is in the winter solstice or at his southernmost limit, we know that it is the coldest part of the year, and every year we expect the cold weather to return at that time and we are not disappointed.

7. Now, we have in use in the Tamil country another kind of year, that is, one which begins at present on April 13 or 14, but which 50 years ago used to begin on April 11; and which 5000 years ago, if any reckoning had been then kept, would have begun on 15 February (3102 B.C.) page 2, paragraph 4 of text. This year which at present imperceptibly gets away further and further from the tropical year, is called a sidereal year, and its initial day moves so slowly because every year the difference between it and the tropical year is only a few minutes of time; about a ghaṭika. (See paper No. ii in this appendix — *On luni-solar precession in Indian Astronomy*.) It naturally takes a long time for this difference to amount to a month or to two months.

8. Naturally, also, it took a long time for the ancient Hindus to understand the practical difference between the two kinds of years, and if we wish to enter into the details of ancient Indian chronology, it is necessary that we should realize clearly the consequences of the confusion in their minds. When Varāhamihira says that in his time the return of the sun was from *Punarvasu* nakshatra or from *Karkāṭaka rāśi*, whereas of old the sun returned from the half of *Āśleṣa* nakshatra, and that this ancient observation was correct at that epoch, he gives us in fact a first glimpse of the effect of the precession of equinoxes, a phenomenon, however, as to which he himself was entirely in the dark.

9. At present *Dakṣiṇāyana*, or the summer solstice, falls on June 22, and according to Table IV-C, Volume I of *Indian Ephemeris*, the sun's mean longitude on 22nd June 1916, or the 71st completed day of the Indian solar year, is 67·8 degrees or 68·1 degrees, if we include the equation. Now, since each nakshatra is $13\frac{1}{3}$ degrees in extent, it follows that the sun's nakshatra, when he has attained 67·8 degrees of longitude, is past the fifth

nakshatra and in the beginning of the sixth or Ārdrā nakshatra. It is a simple sum in arithmetic, that when the sun's nakshatra at Dakshināyana was Āśleshārdha or Sārpārdha, i.e., the middle of Āśleshā, his longitude must have been $113\frac{1}{2}$ degrees (since the longitude of the commencement of Āśleshā nakshatra is, by Eye-table s, page 156 supra, $106^{\circ} 40'$ and its end 120°).

10. *Practical application of precessional chronology.*—We know from modern astronomy that the movement of the precession is $50''$ of an arc per annum to the west (see next paper in this appendix), or one degree for every 72 years. Accordingly, for the precession to have moved through an arc corresponding to the interval between $113\frac{1}{2}$ and $67\frac{1}{2}$ degrees, i.e., $45\frac{1}{2}$ degrees, it must have taken $45\frac{1}{2} \times 72 = 547 \times 6 = 3,282$ years. Roughly, according to this calculation, the Vedānga Jyotisha observation must have been made 3,300 years before A.D. 1916, i.e., about 1400 B.C.

11. *Limitations of precessional chronology.*—Now, supposing we had no information from Varāhamihira himself as to when he lived, but only knew from his works that at the summer solstice in his day the sun was at 90 degrees and in Punarvasu nakshatra, whereas now he is in Ārdrā nakshatra and in 68 degrees longitude, we might argue that the difference between these longitudes, i.e., 22 degrees, multiplied by 72 , i.e., 1584 , would give us the number of years before A.D. 1916, when Varāhamihira lived. The result would be A.D. 332, or *circa* A.D. 300, whereas Varāhamihira actually wrote about A.D. 550. Allowing the same proportion of error for previous epochs, the antiquity of the Vedānga Jyotisha observation, noted above in paragraph 10, may also have to be reduced by $250/1620$, i.e., $\frac{1}{6.48}$; in other words, from 3,300 years to 2,792 years before now, i.e., from B.C. 1400 to B.C. 850. Using the precessional factor of modern astronomy, one degree for 72 years, Mr. Tilak in his *Orion*, and Professor Jacobi in an article first published in a German scientific journal and reproduced in the *Indian Antiquary* for 1894 (page 158), simultaneously declared that the Vedānga Jyotisha preceded Varāhamihira's time by 1896 years, and that there was a still earlier period when correct astronomic observations had been made in India, and that was when the Vernal Equinox was in Mrigaśīra nakshatra, longitude $53^{\circ} 20'$, instead of in Āśvinī, 0° longitude, as in Varāhamihira's time, and that that epoch must have preceded Varāhamihira's own epoch by $53\frac{1}{2} \times 72 = 160 \times 24 = 3,960$ years, i.e., that the observation was made, and the Veda in which it is supposed to be alluded to, was composed (not *written*, because writing came long after), about B.C. 3500, i.e., 5,400 years before now. This period also may have to be cut down by $2/13$, 5,400 years being reduced to the tune of 900 or 1,000 years, and the vedic antiquity brought down from B.C. 3500 to the region of B.C. 2500. The latter date more nearly approximates what we might call the philologist's vedic period (according to Max Muller, Weber, Macdonnell's *Ind. Lit.*, 1909, page 11, etc.), as distinguished from the astronomers' vedic period.

12. In the controversy which raged in the pages of the *Indian Antiquary* round the speculations of Messrs. Jacobi and Tilak referred to above, it does not seem to have been noticed that what we have called precessional chronology or the system of reckoning past years at the rate of 72 years to a degree of precession is apt to fail under certain conditions. We said, in paragraph 9 above, that if at the present day we tried to make a statement like what the author of the Vedānga Jyotisha and Varāhamihira respectively made regarding the date of return of the sun to the south in his annual course, we should say, following our principal guide in these matters, the Sūrya siddhānta, that the sun returned on June 22 when his mean longitude was 67.8 degrees. We would make the statement that the sun returned southwards on June 22 by observing the solstice with our own eyes, whereas we would make the statement that his longitude then was 67.8 degrees by calculating it from the first day of the Indian solar year 1916 A.D. (April 12.7605) when the sun, according to Sūrya siddhānta, attained 0° true sidereal longitude. But we know from paragraph 217 of the text (page 90) that owing to the sidereal error of Indian astronomy, the true sidereal longitude of the sun on April 12, A.D. 1916 (if by true sidereal longitude we understand the state of things which existed *circa* A.D. 530) was $3\frac{1}{2}$ degrees and not 0° . Now the precession moves

$3\frac{1}{2}$ degrees in $\frac{1}{3}^\circ \times 72 = 240$ years: and that is why we made a mistake of nearly 240 years when we attempted in paragraph 11 to calculate Varāhamihira's date by means of precessional chronology. And a similar mistake of greater or less magnitude, in proportion to the actual sidereal error, is likely to underlie all statements made by writers, ancient or modern, as to the sun's mean longitude, or, which is the same thing, the sun's nakshatra, at the time of the summer or of the winter solstice. We have to realize that the sun's *solstice* may be found from direct observation, but the sun's *nakshatra* would generally be determined by calculation from the day in the year when the sun is assumed to have reached 0 degree true or mean longitude, and that any error in that day would affect the results of precessional chronology.

13. The fundamental notion of the Vedāṅga Jyotisha is that the Sun at winter solstice should be at Dhanishthā nakshatra, at the beginning thereof, and at the summer solstice he should have reached the middle of Śārpa or Āśleshā nakshatra. The Vedāṅga Jyotisha or rather Garga Samhita, which embodies the same ideas but in plainer language lays down as follows:—

Garga's Scheme of the Calendar (Dikshit).

		Uttarāyaṇa = Winter solstice.			Dakṣiṇāyaṇa = Summer solstice.		
		Month and thithi.	Sun's nakshatra.	Moon's nakshatra.	Month and thithi.	Sun's nakshatra.	Moon's nakshatra.
1. Samvatsara	...	Māgha ś. 1	Dhanishthā ...	Dhanishthā ...	Śrāv. ś. 7 ...	† Āśleshā ...	Chitrā.
2. Parivatsara	...	.. ś. 13	.. ...	Ārdrā ...	.. b. 4 ...	.. ...	P. Bhādra- pada.
3. Idavatsara	...	.. b. 10	.. ...	Anurādhā ...	.. ś. 1 ...	.. ...	Āśleshā.
4. Annvatsara	...	.. ś. 7	.. ...	Āśvini ...	.. ś. 13 ..	.. ...	P. Ashāḍha.
5. Idvatsara	...	.. b. 4	.. ...	Utt. Phalguṇī.	.. b. 10 .	.. ...	Rohiṇī.

14. Dr. J. BURGESS in his "*Notes on Hindu Astronomy*" (J.R.A.S. 1893), after making the observation that "the figures give, for the moon's sidereal revolution 27·313433 days and for the synodical month 29·516129 days," notes that for every 19 years the synodical months according to the *Vedāṅga Jyotisha* must be in defect by 3·399 days, while the sidereal months would be in defect by 2·093 days and the solar years themselves would be in excess by 14·084 days. Dr. Burgess concludes that the *Vedāṅga Jyotisha* betrays a "primitive and rough method of observation." Similar remarks occur in the *Vedic Index* of Messrs. Macdonnell and Keith.

15. Mr. Dikshit (page 89) quotes the following from *Garga Samhita*:—

yadā nivartate aprāptah Śravishthām Uttarāyaṇē,
āśleshām dakṣiṇē (a) prāptah tadā vidyān mahadbhayam.

"When the sun turns back without having attained *Śravishthā* in his northward journey, or without having attained *Āśleshā* in his southward journey, then know that there will be a great disaster."

Clearly, in Varāhamihira's time, according to his own statement (paragraph 1 supra), the sun was so far from having attained *Śravishthā* and *Āśleshā* at his winter and summer solstices respectively, that the solstitial turning took place fully $23^{\circ}20'$ before *Śravishthā* and *Āśleshārdha*. Evidently, therefore, the above passage in Garga, if Garga was a real author, must have been composed at a time when the Sun was still visiting *Dhanishthā* and *Āśleshā* at the two solstices and before there was any likelihood of his turning back without visiting them. At the same time, the passage indicates that this contingency was feared in Garga's time either because something similar had happened before, that is, the Sun had, in still more ancient times, been in the habit of visiting the nakshatra *Satabhishaj* or *Pūrva Bhādrapada* before turning north, but a change had taken place in this respect which change had been marked by great disaster; or because the change or tendency to change had already begun to operate. A third inference may with some certainty be drawn from the passage, namely, that there was not even a

suspicion that the gradual shrinking of the Sun's path was in the order of nature; in other words, we may infer that the nature and effect of the precession of equinoxes was not then perceived.

16. We know that the Vedāṅga Jyotisha was still the current system at the time of Kautilya's *Arthasāstra* which seems to have been composed about 300 B.C.; but at that time the Sun's solstices must have been at points which, by modern calculation, could have been only 11 degrees to the east of their positions in Varāhamihira's time; that is, already by 300 B.C. there was no sign of the Sun entering either Āśleshā or Dhanishthā nakshatra at the solstices. The time when the abortive return of the Sun became first noticeable must have been when his solstices were about 20 degrees to the east of where they were in Varāhamihira's time, i.e., $20 \times 72 = 1,440$ years before his time, or about 900 B.C., provided (as observed in paragraph 12 supra) there was no sidereal error. At that time the sun at summer solstice would have just fallen short of Āśleshā and would have turned south at 110 degrees instead of at 113 degrees (the middle of Āśleshā); and he would have turned northward at 290 degrees, instead of at $293^\circ, 20'$ (Dhanishthā) at winter solstice, i.e., 3 degrees short of (Dhanishthā) or Śravishtā. We may hence infer that the Vedāṅga Jyotisha must have been current before 900 B.C. (provided always there was no sidereal error), and that it continued to be current almost till Varāhamihira's time. If there was a sidereal error of the same sign and quantity as the modern sidereal error (.002361 degree per annum, vide page 90 of text), then the date 900 B.C. would have to be made proportionately later.

17. If, to be on the safe side, we suppose the Vedāṅga Jyotisha was current for even 600 years before the Christian era how did it happen that the primitive and rough method adverted to by Dr. Burgess (vide paragraph 14 supra) did not land its followers in confusion and disaster? Since, as he points out, after 19 years, tithis under the Vedāṅga Jyotisha must occur $3\frac{1}{2}$ days late, it must follow that after 19 years people would either have kept new-moon day when a moon 3 days old was shining in the sky or have given up the Vedāṅga Jyotisha altogether. Again it is probably unheard of that any people, however primitive, who follow the lunar calendar, would be so regardless of lunar phases as to keep full-moon when the moon was in the fourth day of her waning.

18. In handling such a system as the *Vedāṅga Jyotisha*, we must first of all assume, as an axiom, that no material deviation from the actual recurrence of tithis and nakshatras was contemplated under it: otherwise, the whole scheme was bound to collapse in 20 years. The scheme was intended to be worked in such a way that once in 5 years Māgha śukla 1 should coincide with "moon in Dhanishthā nakshatra" and "Sun in Dhanishthā nakshatra" at the time of Uttarāyana. Such schemes in substance are found all over the world. A scheme of this description is called a *tied* lunar calendar; i.e., a lunar calendar so constructed that it may periodically fall into line with the solar year. The Jews and the Greeks, among ancient nations of whose calendars we have precise information, had each of them a tied lunar calendar, but without the special Indian detail of nakshatras. In all such calendars the essential thing is that the recurrence of lunar tithis, as we call them in India, or lunar *phases* as they are called in Greek, should correspond to actual fact; and in India, under the Vedāṅga Jyotisha as well as under the later Sūrya siddhānta, which we now observe, there is another tie, that of the nakshatras whose actual recurrence also the calendar should faithfully represent. Such a calendar is subject to a very ready and natural test, because the scheme of tithis can be tested every fortnight by comparison with the full moon and the new moon: there may be an error of a single day, the first *phase* or appearance of the moon after she has become new being for instance declared by the calendar a day too late or a day too early, but the error would never be permitted to exceed a single day, and would be rectified by dropping a tithi in the count, which we now call a *kshaya* tithi, or by adding a day to the lunar month, making it consist of 30 instead of 29 tithis. The advantage of the Indian *nakshatra* system is that it provides a safeguard and a remedy against an error of even a single day which might occur, as just shown, under a pure tithi system. The moon covers a whole nakshatra space of $13\frac{1}{2}$ degrees in the heavens in the course

of a single day; and if the calendar shows her to be in a nakshatra different from that which she actually occupies, we do not want to wait until new moon or until full moon to discover the error, and could rectify it at once by dropping a nakshatra or by prolonging the duration of a nakshatra.

19. The only difference between such a system and the present Sūrya siddhānta system is that under the latter the computation is so perfect that agreement between lunar *phases* or tithis and the daily lunar motion among the nakshatras is secured without the need of adjusting it from month to month by ocular observation, *pratyaksha parikshanaiḥ*. But supposing an adjustment was necessary under the Vedāṅga Jyotisha, it was effected without any practical trouble and the calendar was effectually safeguarded from error just as it is under the present system. Such adjustments in the Jewish and Muhammadan calendars are effected by a kind of judicial process, upon the ocular testimony of persons who declare on oath that they have seen the first crescent or lunar phasis on a particular evening (see Text, page 70, paragraph 163).

20. The same remark applies to the connected solar calendar of the Vedāṅga Jyotisha, though here the correction may have had to be deferred for a longer period; but here again, in the long run, there could have been no material deviation from solar phenomena. The ancient Indians of the *Vedāṅga Jyotisha* period kept two distinct reckonings of the sun's motion, although they were unconscious of the distinction. They noticed the four principal stages of the sun's motion, the summer and winter solstices (dakṣiṇāyana and uttarāyana) and the two equinoxes (vernal and autumnal, called *Vishu*), especially the solstices, and they also noticed the nakshatra occupied by the sun from fortnight to fortnight, just as they noticed the nakshatra occupied by the moon from day to day, and the *pakṣa* or half lunar month from fortnight to fortnight. The sun moves through a nakshatra space in 13.528013 days, according to modern European astronomy, and in 13.528102 days according to the second Sūrya siddhānta. Although we cannot visibly see the sun occupying a particular nakshatra space by day, we know from the nakshatra coming to the zenith at midnight that the sun must *then* be in a nakshatra 180 degrees removed from the zenith nakshatra; so that, if we have previously mapped out the ecliptic into 27 nakshatra spaces (whether equal or unequal does not matter for our present purpose), we should know, from the zenith nakshatra at midnight, what nakshatra the sun was in at that moment; and since the nakshatra space or any part of it can occupy the zenith for only $13\frac{1}{2}$ days, it follows that an error in the calendar regarding the sun's position among the nakshatras can be detected after $13\frac{1}{2}$ days, in any case after 27 days, or after the sun has done two nakshatra spaces. We have an illustration of this method of observation in the Tamil anthology, *Purāṇānūru* (selection No. 229), which says that the nakshatra Pūrva Phalguni (long. $133^{\circ}0'$) was on a particular day declining from the zenith at midnight, which means that the sun was then past $133^{\circ}+180^{\circ}=313^{\circ}$ longitude, in other words, that it was then solar Panguni-Kumbha month.

21. We may say a word about the tied lunar year, as now observed in India. Neglecting for the moment the solar year and solar months observed in the Tamil country, what takes place over the rest of India, is this. The lunar year is tied to the solar year, but it is tied loosely, that is, in such a way that the lunar year may begin from 1 to 29 days before the solar year, but it must begin before the solar year and within one month before the commencement of the solar year.

22. Similarly, although the Vedāṅga Jyotisha says that 5 years should consist of 1,830 days, or 62 synodical months, or 61 sidereal months, it did not mean that any extensive deviations from the *actual* solar and lunar phenomena should be permitted for the sake of the 1,830 days. What actually took place under the Vedāṅga Jyotisha may be ascertained by studying the actual decursus of solar and lunar phenomena under such a system over a long series of years.

23. Tables A and B giving this information for periods of 5, 30, 35, 160, 315, 480 and 540 years are appended below. The figures for the first 30 years are simply those for the years A.D. 1897 to A.D. 1927 extracted from "*Indian Ephemeris*,

A.D. 1800 to A.D. 2000.” It will be seen that on 2nd February 1897, the first year of the first cycle of five years began, as required by the Vedāṅga Jyotisha, on Māgha śukla 1 with the sun and the moon in nakshatra Dhanishthā. Every year, up to and exclusive of 1926, contains 365, 366 or 367 days, so that by the end of 29 years the sun at winter solstice has advanced 29 days from the point whence he started in 1897. In the last year 1926 if, as usual at the end of every cycle, an *adhika* month were inserted, the sun would be found to have passed from Dhanishthā into Satabhishaj and from Satabhishaj into Pūrva Bhādrapada. If, on the other hand, the usual *adhika* month was *not* added at the end of the sixth yuga of five years, a new yuga would begin on 3 February 1927, Māgha śukla 1, when the moon was in Dhanishthā and the sun’s longitude at sunset would be 292 degrees, that is, practically, the beginning of Dhanishthā. Seeing that the indispensable rule was to begin a new cycle on Māgha śukla 1 with the sun and moon in Dhanishthā nakshatra, and it was not and could not be an indispensable rule to have 366 days to a year, this course would have suggested itself to the astronomers and almanac framers of the day automatically in any period of 30 years or six yugas under the Vedāṅga Jyotisha; by “automatically” we mean, quite naturally, and without deliberately infringing any of the rules of the Vedāṅga Jyotisha. In this sense we need not call the procedure a correction, because a correction is a deliberate innovation. Our illustration in Table A, page 14, applied to a 30-year period, shows that the rule about reckoning 366 days to a solar year has to be subordinated in practice to the rule about beginning every new cycle with Māgha śukla 1 when the sun and moon should both be in *Dhanishthā*. A glance at the *Indian Ephemeris* for the 30 years A.D. 1897 to A.D. 1927 (Table A, pages 454–55 below) will show that even during the course of the 30 years the year is occasionally one of 365 days and sometimes 367, and we should realize that in the Indian calendar at all times, including our own, the length of the year, whether lunar or solar, cannot be restricted to a certain number of integral days. We are accustomed now-a-days to the European calendar which is tied *fast* to the New Style, just as it was tied fast for 1,600 years before to the Julian or Old Style, while its months January to December are very loose; in fact the months correspond only roughly to the passage of the sun through each successive sign of the zodiac, or for the matter of that, through the successive constellations of the zodiac. The sun enters the *signs* about the 21st of each month and the *constellations* at the present time about the 15th of each month, but the European system of solar months represents neither the entry of the sun into the signs of the zodiac, nor his entry into the successive constellations of the zodiac or nakshatras.

24. The Sūrya siddhānta system at present observed all over the country and the Vedāṅga Jyotisha, which preceded the Sūrya siddhānta and which appears to have been observed for an equally long time, and over an equally large extent of country, both lay stress on the precise ascertainment of the days of new moon and full moon and of the intermediate tithis or stages, and they also lay stress on the nakshatra which the moon occupies each day. They do not, and could not, play fast and loose with the moon’s phases and the moon’s nakshatras. They do not seem to have been, or to be, equally precise about the number of integral days to be reckoned to a year. The Sūrya siddhānta only stipulates that the lunar year shall begin within $29\frac{1}{2}$ days before the Mēsha sankrānti, while the Vedāṅga Jyotisha stipulated that the year should begin at uttarāyana, i.e., at or after winter solstice when the sun should have at least reached *Dhanishthā* nakshatra.

25. A period of 15 years would have been enough to show the calendar makers under the Vedāṅga Jyotisha that after that period, i.e., after only three yugas of five years each, the sun would be 13 or 14 days *past* Dhanishthā when he reached winter solstice. It is an inevitable postulate under a scheme like that of the Vedāṅga Jyotisha where so many coincidences are necessary for a cycle of five years, viz., (1) Māgha śukla 1, (2) Moon in Dhanishthā, (3) Sun in Dhanishthā, and (4) Sun in winter solstice, that some of the mutual concomitants must be regarded as indispensable and the others must be treated somewhat loosely. That the

moon should be in Dhanishthā and that the day or tithi should be Māgha śukla 1, were no doubt regarded as indispensable items, and in fact the length of a cycle was fixed at 1,830 days with full knowledge that that was the whole number of days constituting 62 synodical and 67 sidereal months, respectively (1,830·896 days and 1,830·552 days), and with equally full knowledge that it did *not* correctly represent five tropical years, that is, five returns of the sun to the same solstice. A tropical year, according to modern astronomy, consists of 365·2422408 days. Five such years would be completed in 1826·211204 days, that is, $4\frac{3}{4}$ days short of the period necessary for the completion of 62 synodical months. We might at first think it strange that the framers of the Vedāṅga Jyotisha calendar should have been so ignorant or so careless as to perpetrate an error of $4\frac{3}{4}$ days for every five years, or nearly one day for every year, and this is what Dr. Burgess and other writers on the subject have assumed. But the error is so palpable that we are driven to conclude that there was some explanation which is not on the surface. We shall find a satisfactory explanation if we view the matter from a practical standpoint. For their purpose, it was necessary to observe the return of new moons and full moons and it was also necessary to observe the intermediate tithis and nakshatras of the moon very strictly. By "strictly," we do not mean that they allowed for the moon's anomaly, which at that time they seem to have been unaware of, but they evidently saw to it that the calendar brought out the mean tithis and mean nakshatras correctly. Accuracy in these respects was sufficiently assured by a cycle of 62 lunar synodical months and 67 lunar sidereal months. An excess of one day per annum in the solar year meant the movement of the sun through one nakshatra space in excess of 360 degrees once in $13\frac{1}{3}$ years and in 30 years the excess would be two nakshatra spaces. We must assume, though we are not so told, that a system which was current for at least 1,000 years made some provision to guard against an error of two nakshatra spaces in the sun's position accumulating after barely 30 years.

26. The Vedāṅga Jyotisha scheme supposes the insertion of an adhika or intercalary lunar month in the middle of the third year and at the end of the fifth year of every yuga. This intercalation was necessary, since otherwise the sun would not reach at the end of the first five lunar years of 12 lunar months each, the nakshatra whence he started. But if at the end of six yugas or 30 years the sun was already in the nakshatra from which he had started at the beginning of the first yuga without the need of intercalating a lunar month, then obviously it was not necessary to intercalate the second *adhika* month at the end of that yuga. The principle, now observed under the Sūrya siddhānta, of inserting an adhika month only when necessary to bring the sun to his expected nakshatra must have been observed at least to this extent under the Vedāṅga Jyotisha.

30 true tropical years (modern) = 10,957·27 days.

30 true sidereal years (modern) = 10,957·69 days.

371 synodical months (6×62 less 1) = 10,955·85 days.

At the end of this latter period the sun would be 1·84 days short of the nakshatra from which he had started on his first yuga. In five cycles of 30 years each or 150 years, the sun would be $5 \times 1·84 = 9·2$ days short of the nakshatra from which he is assumed to start at the beginning of each five year period. This deficiency would be made up, however, at the end of two more yugas of five years each when the sun would have been $2 \times 4·64 = 9·28$ days further on his nakshatra-path than he had been at the beginning of the yuga following 150 years.

27. The net result, as we may see more precisely from the printed Table B, page 456 below, was that the Vedāṅga Jyotisha year, by the natural and spontaneous device of dropping the adhika month when it was not required, that is, at least once in 30 years, could, after 160 years, be converted in practice into a true modern sidereal year, not differing from the latter up to four decimal places.

28. *Comparison with the Julian and Gregorian Calendars.*—The Julian calendar, as modified by Pope Gregory XIII, established a standard of accuracy by counting 365 days to a year, and making the requisite periodical adjustments by (1) adding an

extra day for every four years, and (2) dropping these extra days three times in the course of 400 years. The Vedāṅga Jyotisha attained the same end by treating every year as a year of 366 days and making the necessary adjustments once in 30 and once in 480 years. In the case of the Julian and Gregorian calendars, the reforms had to be carried out by statute, or by papal bull; in the case of the Vedāṅga Jyotisha the reform operated in virtue of the very necessities of the case, viz., the necessity of bringing the sun up to Dhanishṭhā nakshatra (once in 480 years) and the necessity of bringing him back to nakshatra Dhanishṭhā once in 30 years.

29. It thus happens that 30 years' and 160 years' cycles are also nearly perfect cycles of nakshatra or sidereal months under the Vedāṅga Jyotisha system. For, the 30-year period or 371 synodical months, or 10,955·85 days comprise 401 complete sidereal months less ·14 of a day—see printed Table A (page 455); while the 160-year period or 58,441·03 days contain 6,417 sidereal months less ·02 of a day. This shows that at the end of the periods in question the moon as well as the sun would enter its original nakshatra, Dhanishṭhā.

30. We have made the calculation on the assumption that the correct modern or Sūrya siddhānta periods for the synodical month and sidereal month were observed under the Vedāṅga Jyotisha, and we are justified in doing this, because the Vedāṅga calendar had continually in sight the lunar phases and the nakshatras of both sun and moon. It might go wrong occasionally by a tithi or a nakshatra, but it would be set right at once by comparison with the heavens.

31. It is otherwise with the Vedāṅga tropical year, because the Vedāṅga Jyotisha astronomer had not the same opportunity and the same practice of frequently setting right his calendar with reference to the sun's nakshatra. There was nothing absolutely to prevent his doing so, because he could ascertain the sun's nakshatra by watching the nakshatra which came to the zenith at midnight (see paragraph 20 supra), but if he made a correction in the sun's nakshatra before a synodical or sidereal month became complete, the sun's movements would cease to keep pace with those of the moon, and the jyotishya (or astronomer) ran the risk of disturbing the daily lunar reckoning which in his estimation was of far more importance than the solar reckoning. Therefore, before making a correction in the solar reckoning, he would wait until the lunar reckoning was brought up by at least one complete circuit. We saw above that he probably adopted this plan once in 30 years. He may have effected the correction at other times, but the point is that *whatever corrections were effected would be reducible to this standard.*

32. This leads us to the second reflection. If after 160 years, and by virtue of corrections made every 30 years, the Vedāṅga Jyotisha year was brought to the same standard of accuracy as a modern sidereal year, whereas what that system was in search of, though unconsciously, was a tropico-sidereal year, then like the Julian year, the Jyotisha year also needed a Gregorian reform. Precisely so: but before we mention the reform, it will be instructive, and it will serve to test our knowledge of first principles, to realize what exactly were the difficulties which confronted the Vedāṅga Jyotisha astronomers after 480 years.

33. In the first year after the lapse of 160 years, the sun and moon had to be in nakshatra Dhanishṭhā at uttarāyana or winter solstice. We have seen that after 160 such years as we have supposed, the moon would exactly reach nakshatra Dhanishṭhā. For the sun to reach exactly Dhanishṭhā as in year 0, it would take by modern astronomy, $160 \times 365 \cdot 236354 = 58,441 \cdot 02$ days.

For the sun to reach exactly uttarāyana, it would take 160 tropical years (modern) = $160 \times 365 \cdot 2422408 = 58,438 \cdot 76$ days.

We saw above that the cycle of 160 luni-solar Vedāṅga years would be completed in 58,441·03 days.

Difference between 160 Vedāṅga years and 160 true tropical years, 2·26 days.

Difference between 160 Vedāṅga years and 160 true sidereal years, ·01 day or 15 minutes of time.

That is, after 160 years, the Vedāṅga Jyotisha astronomer would announce the sun as entering nakshatra Dhanishṭhā on the exact day on which this entry would take place according to modern astronomy, with a difference of only 15 minutes of time, and he would be thinking of proclaiming the advent of *uttarāyana* or winter solstice at the same moment when, however, the sun would have turned back from the solstice and have done $2\frac{1}{4}$ days on his northward journey, instead of merely starting just then on that journey, as prescribed in the Vedāṅga scheme. If he noticed the latter phenomenon, namely, the acceleration of the solstice, for really it was such, the jyotishya or astronomer would have become aware that the sun had done that which Garga had predicted would be the forerunner of disaster (page 446, paragraph 14 supra), viz., he had turned on his northward journey $2\frac{1}{4}$ days before reaching Dhanishṭhā. After 12 times 160 years, or 1,920 years, the divergence between the nakshatra and the solstice and the probability of impending disaster would become quite patent, because by then the sun would have turned back from the solstice some 27 days before either Māgha śukla 1, or the official *uttarāyana* was announced, although the official almanac would correctly represent the sun as having just reached Dhanishṭhā. The error was corrected in Varāhamihira's time by finally abandoning the solstitial or tropical year for purposes of civil reckoning and adopting the sidereal year instead. It will be shown in the next paper that this change of practice must have been adopted with reference to A.D. 532 as an epoch or new starting point.

34. We might similarly compare the state of things under the Vedāṅga Jyotisha after 30 years.

The sun's return to winter solstice would be accomplished in 30 tropical years = 10,957·267 days.

30 true sidereal years which would bring back the sun to nakshatra Dhanishṭhā = 10,957·691 days.

Difference, ·42 of a day.

30 Vedāṅga Jyotisha years or 371 synodical months (vide paragraph 26 supra) which were expected to bring back winter solstice and nakshatra Dhanishṭhā, according to Jyotisha reckoning, would take 10,955·85 days.

35. We are now in a position to understand the statements made by Varāhamihira in regard to Vedāṅga Jyotisha. He says that in his time the sun's longitude at summer solstice was in the Karkāṭaka rāśi (90 degrees) while his longitude at winter solstice was in Makara rāśi (270 degrees); that formerly the solstices were in the middle of Āśleshā (113 degrees, 20 minutes), and the beginning of Dhanishṭhā (290 degrees, 20 minutes), and that these positions were correct at that time. It is inferrible from this passage that though the Vedāṅga Jyotisha still assigned the same longitudes as before (Āśleshārdha and Dhanishṭhādi) to the sun at the two solstices, these positions were no longer correct, in Varāhamihira's time "as any one might see with his own eyes" (*pratyaksha parikshanaiḥ*).

36. We have seen that taking a long period of 160 years the Vedāṅga Jyotisha was probably correct as to the length of the sidereal year, the length of the synodical month and the length of the sidereal month, in other words, that when it said that a yuga of 5 years should begin with Māgha śukla 1 at the winter solstice, with the sun and moon in nakshatra Dhanishṭhā, all these items, except as to the solstice, came out quite correct once in 160 years, and that in the opinion of Varāhamihira, the solstice was also correctly recorded by the Vedāṅga Jyotisha at one time. What that time was would not be a matter involved in doubt if we knew for certain that the equinox had moved through an arc equal to the interval between the beginning of Dhanishṭhā ($293^{\circ} 20'$) and the beginning of Makara (270° degrees), or which is the same thing, and which we also hold on the authority of Varāhamihira, between the half of Āśleshā ($113^{\circ} 20'$) and the beginning of Karkāṭaka rāśi (90° degrees). Applying these intervals to the summer solstices, we may infer that when Varāhamihira says the sun turned south in his time from Punarvasu nakshatra (80° to $93^{\circ} 20'$) he means that in his day the summer solstice was at 90° degrees of the sun's longitude, i.e., in the last quarter or pāda of Punarvasu; first, because anything before 90° degrees would not be in Karkāṭaka rāśi, where also he says the sun was

at summer solstice in his time, and secondly because 90 degrees is the result of deducting $23^{\circ} 20'$ from $\text{\AA}śleshārdha$, $118^{\circ} 20'$, the position in Vedāṅga Jyotisha. But supposing the solstices in Varāhamihira's time were at 93 degrees and 273 degrees, respectively, and these more ancient solstices, i.e., those under the Vedāṅga Jyotisha were at $118^{\circ} 20'$, and $293^{\circ} 20'$, respectively; the statements made by Varāhamihira would still be strictly correct, although we cannot but observe that a longitude of 93 degrees would be correctly described by a lay observer as being in Pushya rather than in *Punarvasu* nakshatra.

37. Supposing, for argument's sake, that we took the full $23^{\circ} 20'$ to be the movement of precession between the two epochs, that would not be accounted for except by conceding an interval of 1,680 years between Varāhamihira and the Vedāṅga Jyotisha. We may determine Varāhamihira's epoch for our purposes as being A.D. 532 (See paper ii in this appendix, page 458, paragraph 7) according to Sūrya siddhānta methods, and we may do so on considerations independent of Varāhamihira's own statements, though his statements present no serious divergence from our determination. If so, the period of the Vedāṅga Jyotisha observation may be safely taken as not later than A.D. 1680 minus 531 = 1149 B.C., provided, as before, there was no sidereal error in the Vedāṅga Jyotisha calculation of the sun's mean longitude.

38. The statement about the winter solstice being in Māgha lunar month occurs in several ancient works.

VEDĀNGA JYOTISHA: verse 74.

Prapadyete śravishthādaṁ sūryacandramasā vudak
sārpārdhe dakṣiṇārkāstu māgha śrāvāṇayoh sadā.

i.e., "Uttarāyaṇam takes place when sun and moon join in Śravishthā at the beginning of Māgha. In Śrāvana month at the half of $\text{\AA}śleshā$ the sun has his dakṣiṇāyana."

GARGASAMHITA (quoted by Dikshit) verses 4, 5.

yadā māghasya śuklasya pratipadi uttarāyaṇam
sahodayam śravishthābhil somārkau pratipadyataḥ
tadatra nabhasaḥ śukla saptamyām dakṣiṇāyanaṁ
sārpārdhe krute yuktim chitrāyāmcha niśakare

"When sun and moon join in Śravishthā or śukla 1 of Māgha, it is uttarāyaṇa, and then dakṣiṇāyana is on śukla 7 of Śrāvana month, when the sun is the middle of $\text{\AA}śleshā$ and moon is in Chitrā nakshatra."

Baudhāyana Śrauta Sūtra (cited by Mr. Shāmaśāstri in his *Gavamāyana*).

māghe māsi dhanishthābhil uttareṇaiti bhānuman
ardhāśleṣhaśravanasya dakṣiṇe upanivartate

"In the month of Māgha the sun goes north with the asterism Dhanishthās; in the month of Śrāvana he returns south in the middle of the asterism $\text{\AA}śleshā$."

39. Probably the earliest reference to the fact that the winter solstice coincided with Māgha śukla 1 is that in the Kaushītaka Brahmana (quoted from Weber in *Macdonnell and Keith's Vedic Index*) which says that the solstice falls *Māghasya amāvāsyaṅyām*.

Probably again the latest reference to the Vedāṅga Jyotisha arrangement is to be found in Kautilya's *Arthaśāstra*, whose date has been placed by Dr. Fleet as well as by Mr. K. V. Rangaswami Ayyangar about 300 B.C. In the *Arthaśāstra* the remark is made that the seasons from *śiśira* (Māgha and Phālguna) are uttarāyaṇa, and those from *varsha* (Śrāvana and Proshthapada) are dakṣiṇāyana. Surely in 300 B.C. the winter solstice was not in the same nakshatra on Māgha śukla 1 as it had been in 1100 B.C.; but here again, if we reflect carefully on the Indian practice when speaking of the calendar, we shall be convinced that the retention in the *Arthaśāstra* of the ancient solstitial coincidence was not unjustifiable.

40. To the Indian still, as in the Vedāṅga Jyotisha period, the essential thing is the lunar month and tithi and the moon's nakshatra. During the currency of the Vedāṅga Jyotisha, there was a further preoccupation, that the

sun's *uttarāyana* should not occur *before* he had reached *Dhanishṭhā* nakshatra. That *uttarāyana* was announced late, i.e., a few days *after* the sun had turned north, provided he had reached nakshatra *Dhanishṭhā*, was a matter of little consequence. It is outraging the common sense of the people who constructed the *Jyotisha* to suppose that they did not know that in a 5 year period of 1830 days and 366 days to a year, the sun would not be entering into *uttarāyana* on the same day each year, but must enter it a day earlier each year. Moreover, "*uttarāyana*" means the northward journey of the sun and not merely his entry on the northward journey; and provided the sun and the moon had reached their respective nakshatras at or before the commencement of the year, it did not matter if *uttarāyana* in the sense of the *entry* into *uttarāyana*, was some days past.

41. We can account for a year of 366 days only on the supposition that a correction was made, though at long intervals, and we have seen that on the principles of the calendar, a correction would naturally suggest itself once at the end of every 30 years and again at the end of every 480 years. It may be that the first correction was made at the end of 35 or 40 years and the second correction at the end of 510 or 540 years. For Indian purposes, a correct sidereal year is, and was probably at all times, not excluding the vedic period, more useful than a correct tropical year. That it should have been so even during the period when a tropical calendar was in use may appear surprising, but the Vedic and Vedāṅga *Jyotisha* calendars were not tropical but tropico-sidereal. A strictly tropical calendar would very soon necessitate a deviation from the scheme of nakshatras for the different *ayanas* in the different years of a *yuga*: Hindu usage abhorred any such deviation. Why they abhorred it is another question. *Varāhamihira* says in his *Bṛhat-saṃhita* that if the sun should turn north without reaching *Dhanishṭhā* it portends disaster to people in the north and if he turns south without reaching the half of *Āśleshā*, he portends disaster to those in the south. This statement seems to establish 1) that the solstice had at some previous time actually got away from its then nakshatra and that the Vedāṅga *Jyotisha* then made a last endeavour to tie the solstitial sun firmly to the nakshatra *Dhanishṭhā*; (2) that men in those days did not, as we do now, expect the precession to move definitely at a certain pace every year, but that at long intervals of years they woke up dimly to the discovery that the solstices had got away somehow and unaccountably from their fast friends the nakshatras; (3) that a divergence of a solstice from its nakshatra was noticed only when the nakshatra was not reached, not when the nakshatra having been reached, *uttarāyana* was kept for civic and religious purposes a few days or even whole weeks late.

THE VEDĀṅGA JYOTISHA CALENDAR—TABLE A.

Annuary for 30 years applied to the years A.D. 1897—A.D. 1927.

Garga's Scheme of the Calendar (Dikshīt).

	Uttarāyana = Winter solstice			Dakshināyana = Summer solstice.		
	Month and tithi.	Sun's nakshatra.	Moon's nakshatra	Month and tithi.	Sun's nakshatra.	Moon's nakshatra.
1. Samvatsara ...	Māgha s. 1.	Dhanishṭhā.	Dhanishṭhā.	Śrāv. ś 7.	Āśleshā.	Chitrā.
2. Parivatsara ...	" 6. 13.	"	Ādrā.	" b 4.	"	P. Bhādra-padā.
3 Idavatsara ...	" b. 10	"	Anurādhā.	" ś. 1.	"	Āśleshā.
4. Anuvatsara ..	" s. 7.	"	Aśvini.	" ś. 18	"	P. Āśadhā.
5. Idvatsara ..	" b. 4.	"	Utt Phalguni.	" b. 10.	"	Robhiṇi.

1 {	(1) A.D. 1897	February	2 Māgha	Śukla 1,	Moon in Phan.	Sun in Dhanishṭhā.
	(2) A.D. 1898	"	8 "	" 13,	" Ādrā.	
	(3) A.D. 1899	"	4 "	Bahula 10,	" Anurādhā.	
	(4) A.D. 1900	"	5 "	Śukla 7,	" Aśvini.	
	(5) A.D. 1901	"	6 "	Bahula 4,	" Uttara Phalguni.	

2	(6)	A.D. 1902	February 8	Māgha Śukla 1,	Moon in Dhanishṭhā.
	(7)	A.D. 1903	" 9	" " 13,	Ārdrā.
	(8)	A.D. 1904	" 10	" Bahula 10,	Anurādhā.
	(9)	A.D. 1905	" 10	" Śukla 7,	Aśvini.
3	(10)	A.D. 1906	" 12	" Bahula 4,	Uttara Phalguni.
	(11)	A.D. 1907	" 12	" Śukla 1,	Dhanishṭhā.
	(12)	A.D. 1908	" 13	" " 13,	Ārdrā.
	(13)	A.D. 1909	" 14	" Bahula 10,	Anurādhā.
4	(14)	A.D. 1910	" 15	" Śukla 7,	Aśvini.
	(15)	A.D. 1911	" 16	" Bahula 4,	Uttara Phalguni.
	(16)	A.D. 1912	" 18	" Śukla 1,	Dhanishṭhā.
	(17)	A.D. 1913	" 18	" " 13,	Punarvasu (not Ārdrā)
5	(18)	A.D. 1914	" 18	" Bahula 10,	Anurādhā.
	(19)	A.D. 1915	" 20	" Śukla 7,	Bharanī (not Aśvini).
	(20)	A.D. 1916	" 22	" Bahula 4,	Hastā (not Uttara Phalguni).
	(21)	A.D. 1917	" 21	" Śukla 1,	Dhanishṭhā.
6	(22)	A.D. 1918	" 22	" " 13,	Punarvasu (not Ārdrā).
	(23)	A.D. 1919	" 24	" Bahula 10,	Jyeshṭhā (not Anurādhā).
	(24)	A.D. 1920	" 25	" Śukla 7,	Bharanī (not Aśvini).
	(25)	A.D. 1921	" 25	" Bahula 4,	Hastā (not Uttara Phalguni).
(31)	(26)	A.D. 1922	" 26	" Śukla 1,	Dhanishṭhā.
	(27)	A.D. 1923	" 28	" " 13,	Pushya (not Ārdrā).
	(28)	A.D. 1924	" 28	" Bahula 10,	Jyeshṭhā (not Anurādhā).
	(29)	A.D. 1925	" 28	" Śukla 7,	Bharanī (not Aśvini).
(31)	(30)	A.D. 1926	March 2	" Bahula 4,	Hastā (not Uttara Phalguni).
			" 3	" Śukla 1,	Satābh. (not Dhanishṭhā).
					N.B. —Sun's Long. on March 3 = 319° = nearly P. Bhad. (320°) not Dhanishṭhā = 293 8°.
					February 8 " " 1, " Dhanishṭhā
					N.B. —Sun's Long. on February 8 = 292°, i.e., practically, Dhanishṭhā (= 293 3°).

30 YEARS' CYCLE (VEDĀṄGA JYOTISHA).

- (1) 30 true tropical years (modern) = 10957·27 days. (365·2422408 d. a year).
- (2) 30 true sidereal years (modern) = 10957·69 days. (365·256354 d. a year).
- (3) 371 synodical months (6 × 62 less 1) = 10955·85 days. (Sūrya siddhānta, at 29·530588 days per month).

Difference between (2) and (3) = 1·84 days for every 30 years.

- (4) 401 sidereal lunar months (6 × 67 less 1) = 10955·99 days. (Sūrya siddhānta at 27·32167 days to each sidereal month)

Difference between (3) and (4) = ·14 of a day.

480 YEARS' CYCLE (VEDĀṄGA JYOTISHA).

- (5) 480 true tropical years (modern) = 175,316·275584 days.
- (6) 480 true sidereal years (modern) = 175,323·0432 days.
- (7) 480 Vedāṅga Jyotisha years (16 × 371 months + 1 month) = 175,323·100956 days.
- (8) Difference between (5) and (7) = 6·8·6 days.
- (9) " (6) and (7) = ·057 day = 1 hr. 26' for 480 years, or 10 seconds of time per annum.
- (10) " (5) and (7) for 1440 (= 3 × 480) years is 20·478 days.
- (11) 6417 lunar sidereal months (16 × 401 + 1 month) = 175,323·156 days.
- (12) Difference between (7) and (11) = ·05543 of a day.

Conclusion (a) The Vedāṅga Jyotisha year would, in the course of 480 years, become a true sidereal year, differing from the modern true sidereal year by 208 palas for 480 years, or by less than half a pala or 10 seconds of time per annum.

(b) From differences (9) and (12) it follows that after 480 such Vedāṅga Jyotisha years as are here supposed, the yuga of 5 years must begin once more with Māgha śukla 1, the Moon in Dhanishṭhā, and sun in Dhanishṭhā.

(c) From difference (10) it follows that a period of at least 1440 years must, other considerations apart, separate the commencement of the Vedāṅga Jyotisha era from Varāhamihira's epoch.

THE VHDĀNGA JYO HA TABLE B--Examples of Yaga, Cycle and Bxeligmos.

[illegible]

Explanatory Note

The working of the Vedāṅga Jyotiṣa calendar was very much like the working of the modern Indian calendar in that during the currency of a normal *yuga* of 5 years, i.e. a *yuga* beginning when the Sun as well as the Moon was in nakṣatra Dhanishthā on Māgha Śukla 1, the lunar month of Māgha might begin any time from 0 to 29.50 days before the Sun had reached Dhanishthā 250th *h* just as the modern lunar year (Chaitra *prati-pada*) begins at intervals varying from 0 to 29.5 days before the Sun reaches Aśvinādi or Mēṣādī (0), but after the expiry of the first normal *yuga*, the month of Māgha would begin at varying intervals, from 4 to 2 1/2 days after the Sun had reached Dhanishthā 250th *h*. A year in which the month of Māgha was going to begin 2 1/2 days after the Sun had reached Dhanishthā 250th *h* would be a year when the 62nd month would begin *uṣṭ*, the Sun in Dhanishthā. In such a case all that was necessary to rectify the calendar was to drop the Adhika Dhanishthā. In such a case all that was necessary to rectify the calendar was to drop the Adhika month, viz., the 62nd month and make the month of Māgha begin at once, i.e. without being preceded by an Adhika month. This procedure would follow *automatically* from the very notion of an Adhika month.

What is indicated in the *Vedānga Jyotiṣa* is only a first outline of the general calendar. We must remember that at the time writing was not known and the rules had to be committed entirely to memory. As usual such rules were brief and apophthegmatic, laying down principles rather than formulas.

It has not hitherto been suspected that the rule about inserting an adhika month, twice in the course of five years, must have been subject to exceptions. A little reflection will show, however, that an adhika month had to be inserted only when necessary. It is clearly laid down in Kautilya's *Arthashastra* that against a month of 30 civil days the Moon loses $\frac{1}{2}$ day and the Sun gains $\frac{1}{2}$ day, and that when the difference between the Sun's and the Moon's movements amounts to a month, an adhika month is added. The deviation at any moment from the standard *yuga* could be measured by the Sun's nakshatra, no deviation except of a trivial nature being permitted in regard to the Moon's tithi and the Moon's nakshatra. If the Sun's nakshatra was 29 days short of Dhanishthā, then an adhika month was added, and the same consideration would lead to the converse rule (though this is not expressly stated) that if the Sun had reached Dhanishthā 29½ days before Magha sukla 1, the lunar calendar should lose an adhika month.

Examples are given above of different periods after which a rectification of the Jyotiṣa calendar might have been effected by dropping or adding an adhika month.

The shortest period within which the error could have been rectified was 30 years or 6 cycles. If an ad hoc month (synodic as well as sidereal) shows that as the immediate result the length of the year would have become almost identical with the actual length of 365·252198 days. By continuing this correction for 53 cycles of 80 years each, we reach a surprising result, viz. an excellent approximation after 2½ ordinary years of 5 years each, a perfect synodical month, an almost perfect sidereal month, and an almost perfect sidereal year. The mean errors of the Vedanga jyotishas, thus adjusted, are so perfect that they could have been observed for 10,000 years without the year going wrong by a single day.

Compared with this evulsion of 180 years, those for 315 and 540 years are less interesting, but they offer alternative adjustments of the Vedānga Jyotiṣha calendar, and they are exhibited for the purpose of showing that whether the makers of an almanac under the Vedānga Jyotiṣha had, or had not, an idea of an exeligmos, they would have been led, by the very notion of an adhika month, to drop an adhika month once in 30 or once in 35 years, and restore it again when necessary.

All the cycles converge to about 1,600 years by Varāhamihira's time, when the Śūta at uttarāyaṇa was short of Dhanshtha by about 2.4 days. This is exactly the difference between B and C under col. 1V for 1,600 years. For $10 \times 2.25 = 22.5$ days.

The difference for 5 periods (1,575 years) under col. V between B and C would be $5 \times 4.35 = 21.75$ days.

The difference under col. VI for 3 periods of 540 years each (1,620 years) would be 12.08 days between lunar and tropical years (A and B) and 10.71 days between lunar and sidereal years (A and C). Total 22.77 days.

But under a 540 years exeligmos, as developed in col. VI, the difference due to precession or to sidereal error would be about the same (i.e. some 7 days) for any thing less than a millennium and the falling back of the tropical, with reference to the sidereal or nakshatra year may not have been perceived so early as under an exeligmos of 140 years.

APPENDIX (ii).

LUNI-SOLAR PRECESSION AS APPLIED TO INDIAN ASTRONOMY.

The year of Sūrya ayanāmsa A.D. 533 how determined
(page 94, paragraph 229 of text).

The existence of the error adverted to in paragraph 217 of the Text (page 90) furnishes us with a simple means of determining, according to Sūrya Siddhānta, the year of sūrya ayanāmsa, that is, the year when the degree of precession was zero in other words, the point in the heavens at which the commencement of the tropical year coincided with that of the Sūrya Siddhānta sidereal year, or when, according to the expressions used at page 94, paragraph 229, the European and Indian celestial longitudes coincided. We know from the *Nautical Almanac* that in the year A.D. 1909, the apparent vernal equinox at Greenwich occurred on March 21 at 5·46 minutes after 6 A.M. To this time we make the addition of ·2105 of a day in order to arrive at Lanka time, so that the moment of apparent vernal equinox at Lanka was March 21·2143. The beginning of the Indian sidereal year at Lanka was on April 12·9492 according to Table II of *Indian Chronology* (2nd edition), page 25. The difference between the two moments 22·7349 days was the time taken by the Sun to advance along the ecliptic from 0° tropical longitude to 0° Indian sidereal longitude in the year A.D. 1909. We know that this time increases every year at the rate of 365·25876 days (length of Indian sidereal year) minus 365·24221 days (length of European tropical year) or ·016556 of a day, roughly 1 ghatika per annum. Therefore the difference of 22·7349 days must have accumulated in $22·7349 \div ·016556 = 1373·2$ years. (Roughly, we might say that $22\frac{3}{4}$ days or 1865 ghatikas correspond to as many lapsed years). Therefore the year of sūrya ayanāmsa according to Sūrya Siddhānta was A.D. 1909 minus 1373 years = A.D. 536. There is a slight error in this method which assumes the same rate of precession in A.D. 536 as in A.D. 1909.

2. We can arrive at an exact result by another method.

The commencement of Sūrya Siddhānta year A.D. 1909-10 (vide Messrs. Sewell and Dikshit's *Indian Calendar* or author's *Indian Chronology*, 2nd edition, Table II, page 258) was on April 12·9492.

3. For Greenwich equivalent of this, we deduct ·2105 day and for interval after Greenwich noon we again deduct ·25 day. Therefore Greenwich time corresponding to Lanka time = $·9492 \text{ minus } ·4605 = ·4887$ of a day after noon.

4. At noon at Greenwich on April 12 A. D. 1909 Sun's longitude, by *Nautical Almanac*, was $21^{\circ}, 56', 0·5''$. Increase of Sun's longitude on 12 April A. D. 1909 was by *Nautical Almanac*, 147 seconds of a degree per hour.

5. Therefore for ·4887 of a day = 11·7288 hours, increase of Sun's longitude was $11·7288 \times 147'' = 1724·1336''$.

$21^{\circ}, 56', 0·5'' = 78960''$ 5 of a degree.

Total = $80684''·6336 = 22^{\circ}, 24', 44·6'' = 22·4124^{\circ}$.

6. This, by the *Nautical Almanac*, was the Sun's longitude at the commencement of the Indian sidereal year, 1909-10, viz., on April 12·9492 (Lanka time) when by Sūrya Siddhānta the Sun's true sidereal longitude was exactly 0°. The difference between the two longitudes, $22·4124^{\circ}$ must be held to have accumulated by gradual increments since the year of sūrya ayanāmsa or the year when the difference between the two longitudes was 0°.

7. Now the difference between the Sun's longitude, according to the *Nautical Almanac*, and that according to Sūrya Siddhānta arises from two causes:—

(1) The precession properly so called, the rate of which, according to Newcomb, Ball, Young and other authorities, was in A.D. 1909, $50''·2585$ per annum, (=·013961 degree), while its rate for a past year removed by an interval of t years from A.D. 1909 was $50''·2585 - t \times ·000225''$ per annum; or (in degrees), $·013961^{\circ} - t \times ·00000062^{\circ}$ per annum.

APPENDIX (iii).

THE CHRONOLOGY OF EARLY TAMIL LITERATURE.

(Abridged from contributions made to St. Joseph's College Magazine,
Trichinopoly.)

வான்கண் விழியா வைகறை யாமத்து
மீன் திகழ் விசும்பின் வெண்மதி நீங்கக்
காரிரு ணின்ற கடைநாட் கங்குல்.

சிலப்பதிகாரம், 10-வது ஈடுகாண் காதை, வரி 1-3.

TRANSLATION.

“In the dark part of the last night called *Vaigarai* (in the fortnight) following the dark fortnight, after the moon had set, and before the sun had risen.”

ஆடித் தங்கட் பேரிருட் பக்கத்
தழல்சேர் குட்டத் தட்டமி ஞான்று
வெள்ளிவாரத் தொள்ளெரி யுண்ண
வுரைசான் மதுரை யோடரசுகே டுமெனு
முரையு முண்டே.

சிலப்பதிகாரம், 23-வது கட்டுரைகாதை, வரி 133-137

TRANSLATION.

“It has been foretold that Madura as well as its reigning dynasty must perish when the city is destroyed by fire on Friday, the 8th tithi in the dark fortnight, on a day of the nakshatras Bharani and Krittika in the month of Āḍi (Solar month of Karkāṭaka).”

Silappadhikaram is of prime importance to the chronologist of Tamil literature for the following reasons:—

(1) It is the earliest work in extant Tamil literature, of which the commentary furnishes a clue to the exact date of its composition;

(2) It is the earliest work in extant Tamil literature which contains a citation of a date in the style now current, *viz.*, by *tithi*, *vāra* and *nakshatra*; and

(3) For the reason (1) above given, it is an important datum in determining the age of the Third Tamil Sangam,* and thereby the age of many of the Tamil poets known collectively as *Sangam* poets.

2. *Adiyarkunallar's* commentary on the first of the passages given in paragraph 1 supra (line 3 of canto X of *Silappadhikāram*) may be translated as follows:—

“The month of Chittirai in that year began on a day of ‘*Svāti*’ nakshtra, a third thithi (முன்றும், third, is probably a wrong transcription, as will be presently

*Note.—As observed on page 105 of the Text, the earliest Tamil works that have come down to us are the result of very careful compilation and redaction. To the body of scholars, critics and editors to whom we owe that redaction we should now apply the title of a Sangam, i.e., a literary court or academy but they themselves modestly declined the appellation, and they would rather have us believe that the kind of service they performed had always been normally performed for Tamil literature by a series of three sangams dating from a hoary antiquity and spread over many centuries, hundreds of poets being included in each sangam. (Commentary on *Irayanar-agup-porul*.) This fiction is of no use to us, except as indicating that after the lapse of a very few centuries a Tamil work like *Tolkāppiyam*—vide page 19 of the Text,—possibly belonging only to the sixth century A.D., was apt to be regarded as dating from a hoary antiquity, perhaps because of its being a recension of earlier Tamil grammars of the same name. (*Tolkāppiyam* claims to have been composed in the very first age of the Tamil race, by Tolkāppiyar, one of the twelve disciples of Agastya, the mythical and Brahmanic founder of the Tamil language and of Tamil letters.) The reference to any work as a “Sangam” work must be understood to mean that it was one of the works recognized as standard or classical at a period (perhaps 8th to 10th century) when the general recension or redaction of such works was carried out: the dates of the works themselves must be judged independently on the evidence available.

We are able to elicit two dates respectively from *Parappādal* (A.D. 634—vide page 108 of the Text) and *Silappadhikāram* (A.D. 756,—the present paper): a third date, or something akin to a date (beginning of 6th century A.D.) has been evolved by the labours of the late Mr. Venkaiva from the Velvikūḍi grant (*Madras Epigraphical Report* for 1907-1908, page 66) for Mudukudumi Peruvaludi Palyāgāsūlai, the Pāṇḍya king in whose honour we have a few pieces in *Pūrandūru* and who is referred to in *Maduraikkāṇchi* (one of the pieces in the *Pattupāṭṭu* anthology) as an ancestor of Nedunjeliyan. From these three dates we may infer that some of the so-called sangam works were composed during a period ranging from the 6th to the 8th century A.D. and to these we may add Jivāka Chintamani which from chronological as well as other evidence we must place in 9th century A.D. (page 469 *infra*). So far only these four dates have been evolved from early Tamil literature.

We may place Nedunjeliyan of *Silappadhikāram* as well as his namesake of *Talayāḷḷanganam* fame and their contemporaries Karikāla (Chola) and Senguttuvan (Chera) in 6th century A.D. These three names of kings figure so often in Sangam literature and there are so many references to their age and achievements by evidently contemporary poets (Māṇḍi Maruthanār, Parapar, Naṅkiyar, Kaḷāt-talayār, Kaḍiyalar Uritirankannanār, Mudattāmakanniyaṛ, etc.), that we are justified in assigning to them a period, as just stated, somewhere in 6th century A.D., on the ground that the kings in question were the centre of the main literary cycle in Sangam literature, just as Arthur and Charlemagne were in Western romance. Senguttuvan with whom we are chiefly

shown, for *ஒன்றாம்*, first); Sunday. On the 25th day of that Chittirai, which was a Saturday, when full moon joined with nakshatra 'Chitrā', the flag (of Indra) was hoisted; the festival went on for 'four times seven days,' that is for twenty eight days; then the flag was taken down; then on Monday, the 28th day of Vaigāsi, the *thirteenth* day of the first lunar fortnight and a day of 'Anurādhā' nakshatra, there was a general bath in the sea, at which the lovers quarrelled; then on the 29th day of Vaigāsi which was a *Nāsa Yogu*, or destructive combination, of Tuesday, with 'Jyeshtha' nakshatra, on the last night of the waxing moon before it was full, in the portion of the early dawn, called *vaigara*, after the setting of the moon, when it was quite dark [the hero and heroine left the paternal abode in *Kāvirippattinam*]."

3. At this stage it may be well for us to recall briefly the story of *Silappadhikāram*, so as to be able to understand the bearing of the dates on the rest of the story.

Kōvalan, the son of a rich merchant of Kāvirippattinam, the maritime capital of the Cholas, had wasted all his substance, like a prodigal son, on an actress called Mādhavi, deserting his faithful and loving wife Kāṇṇaki. On one occasion, according to their yearly custom, Kōvalan and Mādhavi went to the beach to watch, from their gilded canopy, the sea-bathing festival which brought to a close the 28 days' celebration in honour of Indra. The festival began, we are told, on a Saturday near the full moon at the end of Chittirai (this year, the commentator tells us, the first Saturday of the festival was the 25th of Chittirai) and was kept up for four weeks: on the Sunday following the last Saturday of the feast, the flag was taken down, and on Monday the people went to bathe in the sea. On the present occasion Kōvalan sang to the accompaniment of his lute a song as though he were pining for an absent love. Presently Mādhavi took the lute from him and sang in turn a similar song. Kōvalan was stung to the quick by the actress' behaviour and left her abruptly. In vain she implored him to return, but the commentator tells us that the next day, Tuesday, the 29th day of Vaigāsi, was a bad day for parted friendships, the nakshatra being 'Jyeshtha' (the proverb *செவ்வாயும் கேட்டையும் சேர்க்கதர்ப்போல்* is still current in Tamil). Kōvalan, instead of returning to the actress, returned in the evening of the Monday to his own wife

concerned in *Silappadhikāram* is the hero of the fifth canto of *Padirupattu* and the poet *Paranar* has there sung his praises.

This particular literary cycle appears to have been celebrated by the Tamil poets, as a sort of golden age of Tamil literature, long after the kings themselves and their generation had passed away, and in this assumption will probably be found the real explanation of a good deal that has puzzled critics in regard to *Silappadhikāram* and *Maṇimekhalai*. These two poems are centred round the Kōvalan-Kāṇṇaki legend which, from the antiquity of Pattini worship in Ceylon, we may perhaps date from the second or third century A.D. so far as that island is concerned, but which in India is perhaps not older than the seventh century A.D., since it first appears there as a *reminiscence* of the golden age, rather than as an episode falling within the *time-limits* of that age. The legend was probably associated from the first with Madura and the Pāṇḍyans, but we need not wonder that so attractive a legend, with so much of the supernatural woven into it, was linked, as a next step, with the Cholas, it apparently remained for poets of the 7th and 8th centuries A.D. to connect it further with the Chera king Senguttuvan, by depicting Kāṇṇaki, as journeying (somewhat as Orpheus did after the death of Eurydice), for fourteen days without food and drink, due west, to seek her end in the mountains of the Chera kingdom, and as having been there immortalized by Ilango-adigaḷ, a prince of the Chera line. To the eighth century poet, Senguttuvan of the sixth century A.D. was as legendary a figure as Gajabāhu of the second; and by an anachronism which will not surprise any one who knows how legends shape themselves, he brings Gajabāhu into the court of Senguttuvan; and further, being a dramatist (*Silappadhikāram*, teeming as it does, with action songs and choruses by actors and actresses, is throughout dramatic in conception), he also brings in the supposed author Ilango-adigaḷ, as a sort of Prospero, a character in this own drama addressing the audience in the first person, along with his friend Sattanār,—a wholly unnecessary procedure unless the object was to sustain the identity of a feigned authorship. The fiction of writing a romantic poem under the pen-name of Ilango-adigaḷ was cleverly conceived, and it was probably thoroughly appreciated by the eighth century Tamil audience as a happy reminiscence of the Senguttuvan cycle and the golden age. Sittalai Sattanār, in his *Maṇimekhalai*, does not introduce himself into the legend, as does the author of *Silappadhikāram*, and Sattanār was probably a real historical critic and poet of the seventh century A.D. who used the Senguttuvan cycle and the Kāṇṇaki legend, which evidently had attained full growth before his time; but owing to the utter absence of a literary chronology in Tamil there was nothing unusual in his being associated in the imagination of an eighth century poet with Ilango-adigaḷ, as the latter's contemporary. The Nedunjeliyan of *Silappadhikāram* is believed by some writers to have reigned somewhat earlier than Nedunjeliyan of Talayāḷ-ṅganam fame, since each seems to have a different title in *Puṇarāṇḍu*, but the former is a somewhat shadowy character who is merely introduced in one canto of the poem in order to be got rid of in the next, and poets who lived in subsequent centuries may well have used the name merely to connect it with the golden age. Karikāḷan, though better known to us through poems in his honour, is himself but faintly delineated in *Maṇimekhalai*, and Senguttuvan is the only name of a king standing out in bold relief in both the poems.

Apart from chronological indications, it is apparent from the *patikam* or poetical summary prefixed to *Silappadhikāram* that *Maṇimekhalai* was written first and *Silappadhikāram* afterwards in order to complete it, and while it is apparent that the authors of *Silappadhikāram* and *Maṇimekhalai* worked upon previously existing materials, we may take it that the main details of the Kāṇṇaki-Kōvalan legend were not familiarly known to the Tamil people for more than about a hundred years before the earlier of these works was written; and that is why, in all probability it was associated in Tamil literature with the golden age of Chinguttuvan. Karikāḷan and the greater Nedunjeliyan, though in Ceylon it had apparently been current for a longer time, and it is not impossible that the legend dates, so far as that island is concerned, from the epoch of Gajabāhu (2nd century A.D.).

Kannaki, who sat moaning and pining for him, and surprised her with an invitation to proceed with him to Madura where he hoped to sell one of her anklets, his last bit of property but a valuable item, and rehabilitate his fortunes by trading on this capital. She readily complied, and they left their home secretly before the dawn of Tuesday and while it was yet quite dark, the moon near full having set; (we are told it was the *fourteenth* tithi of the bright fortnight, and we shall see presently how it was possible for the same day, Monday, to be the 13th tithi in the morning, as stated by the commentator in the passage translated *supra*, and the 14th at night, as mentioned expressly in the text of the poem quoted at the head of this article). Madura, the Pāṇḍya capital, was a long way off, but the pair had good company in the person of Kavunti, an aged female Jain ascetic who entertained them with stories all along the way. Leaving Kāvīripattinam, let us say, early morning on Tuesday, 17th May (it was not yet quite the beginning of Tuesday according to Indian reckoning, because Tuesday's sun had not yet risen), they arrived in Madura on or about the 20th July of the same year. Kōvalan left his wife to be cared for by a shepherdess called Mādhavi and by Kavunti and went into the city to sell the anklet (Tamil, *silambu*). Presently he met a company of goldsmiths, headed by the King's own goldsmith, and he offered them his *silambu*. Now the King's goldsmith had been recently charged with stealing his royal mistress' gold anklet, and he thought this a good opportunity to turn the suspicion against the poor stranger. He therefore ran to the palace and informed the Pāṇḍya that the man who had stolen the queen's anklet had been found: whereupon the Pāṇḍya, although not a tyrant, ordered his soldiers to behead the thief if indeed he was such. Without much ceremony and without any trial, poor Kōvalan's head was cut off by an executioner, whose excuse was that, if the offender was not cut down at once, he might effect his escape by magic. The terrible news reached Kannaki's ears. She rushed to the spot where her dead husband lay, and after her first wail, took an oath that she would be revenged for the unjust execution of her husband. At the same moment a voice in the air proclaimed that the city was doomed to destruction by fire. Kannaki ran to the Pāṇḍya and poured forth her wrath in his presence, easily proving her husband's innocence, because the queen's other anklet was filled with pearls, whereas her own other anklet, which she broke in the Pāṇḍya's presence, was filled with diamonds. The Pāṇḍya was so shocked by his single act of injustice that he swooned to death and his wife died immediately after on account of grief: presently, the city took fire simultaneously on all sides, and although the goddess of Madura appeared in person before Kannaki and pleaded for the city which, she owned, had been already doomed to destruction by an old oracle on "*Friday, kṛishṇa aṣṭamī, the day of Bharaṇī and Kṛittikā, in the month of Ādi*" the wrathful Kannaki, bent on revenge, would not relent, and pronouncing her curse on the city, withdrew from it to the adjoining forest of the Chera king: in this forest on the 14th day, she was seen by the shepherds taking her flight to *swarga* with her husband. The Chera king had a costly temple and statue erected in her honor: the Chola and Pāṇḍya did the same: and so did Gajabāhu, King of Ceylon "girt by the sea."

4. Although the poem itself does not give any other detail as to the time of flight of Kōvalan and Kannaki from the Chola capital, than that it took place on the last day of a bright fortnight, after the moon had set, when it was quite dark, day not having dawned, the commentator Aḍiyārkunallār (who may have lived in the 11th or 12th century A.D.) confidently supplies other details, viz., that it was the night between Monday and Tuesday, which was a day of "Jyeshṭha" nakshatra and the 29th day of Vaikāśī. He adds that as the festival of Indra began that year on Saturday 28th Chittirai, the 1st Chittirai must have been a Sunday; also that the 1st day of Chittirai was a day of "Svāti" nakshatra. Lastly, it is inferrible from these statements that the month of Chittirai, which usually contains 31 days, had only 30 days in this particular year. The investigation will turn naturally on the answers to the following questions:—

(1) How often between A.D. 1 and A.D. 1900 was the month of Chittirai limited to 30 days?

(2) Out of the number of years furnishing an answer to (1), how many years had Chittirai beginning on a Sunday?

(3) Out of the number of years answering question (2), how many had the thirteenth tithi in a bright fortnight combining with nakshatra "Anurādhā" on a Monday?

5. The answer to question (3) which is also the solution of our problem, is that between A.D. 1 and A.D. 1900 there was only one year, one month, and one day, satisfying all the conditions, and that was Monday, 17 May, A.D. 756, on which day, as will be seen from Vol. I, Part II, of this Ephemeris, the thirteenth tithi in the bright fortnight of Lunar Jyeshtha month combined with nakshatra "Anurādhā," the tithi ending at $3\frac{1}{2}$ ghaṭikas after sunrise, and the nakshatra being current all Monday and coming to an end at 8 ghaṭikas after sunrise on Tuesday. *Jyeshtha* nakshatra, the next after "Anurādhā" was of course current for practically the whole of Tuesday and it came to end an hour after sunrise on Wednesday. On the day when Kānnaki and Kōvalan left their home on their fateful flight, the unlucky *Jyeshtha*, so the astrologers thought, exerted its influence in conjunction with *Tuesday*. According to Garga, but not according to Brahma Siddhānta nakshatra Jyeshtha would have begun 12 ghaṭikas earlier, i.e., just as the couple were leaving home.

6. The reader may ask: How came it that, in the general dearth of historical records, this unique date was preserved from the year A.D. 756 when the events are supposed to have occurred, until the year, some centuries later, when the commentator wrote? The particular astrological combination of Tuesday with nakshatra Jyeshtha occurs, we may suppose, at least once in every twelve months, but the facts, that (1) the combination occurred in Kōvalan's case on the Tuesday after the conclusion of the Indra festival, which in that particular year came to an end on 28th Vaikāśi, and (2) that Chittirai in the same year began on a Sunday and ended on a Monday, were not unlikely to have been recorded in the earliest commentaries on the poem. To render this possible, we have only to assume that it was a well understood rule that the festival should begin on a Saturday as near as possible both to the full moon and to the 28th day of Chittirai. It is undeniable that a very few curious and unique dates like this are to be found here and there in Tamil literature, howsoever they may have been preserved. One thing is practically certain: it would have required an extraordinary effort to calculate all the details of date for an imaginary occurrence, and our Tamil authors do not appear to have performed such exercises in calculation, if indeed they were capable of executing them. After all, they do not seem to have cared for the dates, *as dates*, because they invariably omit the *years*. They gave the details, partly because the latter were astrologically interesting, and partly because what was not astrological had somehow always formed part of the record. If they cared to invent, they could have invented a date near their own time or taken it out of current panchangas.

7. We have yet to furnish the curious reader with the method by which a problem of this kind is worked out so as to yield a satisfactory solution. First of all, a table like Table II of *Indian Chronology*, 2nd Edn., pp. 200 to 279, is necessary for its solution.

8. Given Table II, how are we to find the years in which Chittirai had only 30 days? Remembering the rule that Chittirai begins on the day of Mēsha sankrānti, if that sankrānti occurs at or before .50 of a day, but that otherwise Chittirai begins on the next day (p. 30 of the text) and that Vaikāśi follows the same rule with reference to Rishaba sankrānti, we easily deduce the corollary that *Chittirai will have only 30 days if Mēsha sankrānti occurs between .51 and .58 of the day*. In addition, in order that the 28th Vaikāśi may be a day of "Anurādhā," or, which is the same thing, in order that the first of Chittirai may be a day of "Svāti," it is necessary that the first new moon in the solar year should occur, according to Table II about 14.75 days after Mēsha sankrānti, not much earlier nor much later.

9. The following are the only years between A.D. 1 and A.D. 1900 in which Chittirai had only 30 days and in which it was possible for Chittirai 1 to be a day of "Svāti" :—

A.D.	Occurrence of Mēsha sankrānti.		Interval in days between Mēsha sankrānti and 1st new moon in solar year.	Remarks.
	Sūry. Sid.	Āry. Sid.		
	<i>March.</i>	<i>March.</i>	<i>Days.</i>	
208	16-51	16-53	13-78	1st Chittirai was Thursday.
211	16-58	16-60	15-23	1st Chittirai was Sunday but 28 Vaikāṣi was Tuesday, 14th May; and Jyeshtha Sukla 13 was Monday 13 May.
280	18-50	18-52	15-01	1st Chittirai was Wednesday by Ārya, Sid.
466	18-56	18-57	13-72	" Saturday Jyesh. Sukla 13 was Sat. 14 May; while 28 Vaikāṣi was 15 May
485	18-48	18-48	13-50	1st Chittirai was Monday.
498	18-55	18-55	14-95	" Friday.
729	20-6166	20-5990	13-68	" Monday.
743	20-58	20-51	13-46	" Thursday.
756	20-6030	20-5833	14-92	" Sunday. (This is the year answering our problem.)
775	21-5194	21-4913	14-69	" Wednesday.
802	21-50	21-48	15-93	" Wednesday.
1011	23-59	23-55	13-40	" Saturday.
1080	23-50	23-46	13-17	" Monday by Ārya Sid. and Tue. by Sūry. Sid.
1038	20-58	20-57	14-68	1st Chittirai was Friday.
1066	23-56	23-52	15-86	" Saturday.
1301	25-6253	25-5642	14-58	By Ārya Siddhānta 1st Chittirai was Sunday; but Jyeshtha Sukla 13 ended on Sunday, May 21-25.
1320	25-54	25-48	14-35	1st Chittirai was Wednesday.
1347	26-53	26-49	15-68	" Tuesday.
1533	28-59	28-55	14-30	" Friday.
1591	28-66	28-58	15-76	" Monday.
1602	28-51	28-47	14-07	" Sunday by Ārya Sid. and Monday by Sūrya Sid: but the Ārya Sid. Chittirai had 31 days, not 30 only, as required.
1610	28-58	28-50	15-53	1st Chittirai was Thursday.
1846	Ap. 11-65	11-55	14-25	" Sunday and Chittirai had only 30 days; but Jyeshtha Sukla 13 and "Anurādhā" nakshatra ended on Sunday, June 7-71 and Monday June 8-85 respectively so that Monday was not 13th tithi.

10. In this investigation we have to remember that the Ārya Siddhānta sankrāntis which are followed in Southern India are not the same as the Sūrya Siddhānta sankrāntis. The following table shows by what interval the Ārya Siddhānta sankrānti followed or preceded the Sūrya Siddhānta sankrānti. It also shows us that up to A.D. 500 the Sūrya Siddhānta sankrānti was earlier than the Ārya Siddhānta sankrānti and that after A.D. 600 the former occurred later than the latter.

Table showing the interval (fraction of a day) to be added to or deducted from the moment of sankrānti by Sūrya Siddhānta to obtain the corresponding moment by Ārya Siddhānta :—

A.D. 1	...	...	+	04	A.D. 1000	...	...	-	04
A.D. 100	...	...	+	08	A.D. 1100	...	...	-	04
A.D. 200	...	...	+	02	A.D. 1200	...	...	-	05
A.D. 300	...	...	+	01	A.D. 1300	...	...	-	06
A.D. 400	...	...	+	01	A.D. 1400	...	...	-	07
A.D. 500	...	...	+	00	A.D. 1500	...	...	-	08
A.D. 600	...	...	-	01	A.D. 1600	...	...	-	08
A.D. 700	...	...	-	02	A.D. 1700	...	...	-	09
A.D. 800	...	...	-	02	A.D. 1800	...	...	-	10
A.D. 900	...	...	-	03	A.D. 1900	...	...	-	11

11. We have also to remember that by Ārya Siddhānta only 30-92 days have to be added to the moment of Mēsha sankrānti in order to obtain the moment of Rishabha sankrānti (*vide* Table II of *Indian Chronology*), p. 182, whereas the corresponding addition by Sūrya Siddhānta is 30-93 days. We shall see presently how this fact affects the problem.

12. We see that the test whether Chittirai 1 of any year in the above list was a Sunday is enough to dismiss all the years in which Chittirai had 30 days and coincided with "Svāti" nakshatra, with the exception of 4 years, viz., A.D. 211,

A.D. 756, A.D. 1301 and A.D. 1846. In all the other years 1 Chittirai was not Sunday. In A.D. 1602 the 1st Chittirai was Sunday by Ārya Siddhānta and Monday by Sūrya Siddhānta but the Ārya Siddhānta Chittirai had 31 days, not 30 days only as required. We give this only as a sample of many other cases that we must reject *in limine* as cases in which Mēsha sankrānti did not occur between the limits required, namely between .51 and .58 of the day.

13. We see that the years A.D. 211, 756, 1301, 1846 occurred at regular intervals of 545 years. This is important as indicating that years such as the one we are in search of, can occur *only* once in 545 years. (If we had only to deal with solar day of month, vara, tithi and nakshatra, the cycle would be 423, 301, 122, or 101 years: the present cycle is really a compound of two cycles of 423 and 122 years.)

The curious reader who has the patience to make the necessary calculations from "Indian Chronology" will find similar dates in A.D. 211 *minus* 545 years, that is in 330 B.C., and 545 years later than A.D. 1846, i.e., in A.D. 2391.

But there is one year, and one only, throughout the period with which we are concerned which satisfies all our conditions, and that is the year A.D. 756. Only two other dates, A.D. 211 and A.D. 1301, *seem* at first sight to offer possible alternatives, but neither of these will satisfy *all* the conditions arising out of the problem.

14. The objection to A.D. 211 is that in that year, Tuesday, the day of flight, was, by Sūrya Siddhānta and *a fortiori* by Ārya Siddhānta, 28th Vaikāsi only and not 29th Vaikāsi, as the commentator says it was, judging by the duration of the Indra festival. It is a much more serious objection to A.D. 211 that in that year the 15th tithi ended on Wednesday, at 24 ghaṭikas after sunrise and that in the night between Tuesday and Wednesday which was the last night of the bright fortnight, the moon could have set only 20 minutes before mean sunrise (6 a.m. local time). It could not have been dark then. We know that the flight took place in the last night of the bright fortnight, after the moon had set, and *when it was quite dark*, the night being one *between Monday and Tuesday*. The conditions italicized were not fulfilled in A.D. 211.

15. Nor were they fulfilled in A.D. 1301, although they came nearer to fulfilment in that year than in A.D. 211. In A.D. 1301, *Sunday*, the first of Chittirai, was a day of "Svāti" nakshatra which ended at .79 the same day: it was bahula 1 (as in A.D. 756), not bahula 3, which, as shown below, is either an error or an erroneous reading in the commentary. In A.D. 1301, *Saturday*, the first day of the Indra festival, 28th Chittirai (= 22 April), a day of "Chitra" nakshatra (.06) and very near full moon; for, full moon tithi commenced at .73 on that day, ending next day (Sunday) at .75. In A.D. 1301, again, *Tuesday*, the day of flight, was 29 Vaikāsi (= 23 May), as required, and the night between Monday and Tuesday was the last night in the bright fortnight in which the moon set; (though it must have set only about a quarter of an hour before mean sunrise, and it could not have been dark at 5-45 a.m. in May). On Tuesday, 23 May, A.D. 1301, full moon tithi ended at .33 and "Jyeshtha" nakshatra at .63 of the day. On *Monday* 22 May, A.D. 1301, Sukla 14 ended at .28; and as Sukla 13 had ended on *Sunday*, 21 May at .22, the commentator's statement that *Sukla 13 was current on Monday morning was not fulfilled in A.D. 1301*.

16. We are left with a single year (A.D. 756) in the whole range of 2,000 years, which it is possible for us to examine with the help of Table II in *Indian Chronology*; and this year alone satisfies the given conditions. In that year Chittirai began on Sunday, on a day of "Svāti" nakshatra, in the sense that on that day nakshatra "Svāti" began at 38 ghaṭikas after sunrise, ending at 35½ ghaṭikas after sunrise the next day. Ordinarily, such a day would be called a day of "Chitrā" nakshatra, but the nakshatra noted by the commentator appears to have been obtained by backward calculation from "Jyeshtha," the nakshatra, under whose influence, combining with that of Tuesday, Kōvalan and Kannaki left their home in Kāvīripattinam. In the same way, the tithi of Sunday the first Chittirai is noted as 3rd tithi, whereas it is evident that 57 days later, the tithi

must have been at least 58 tithis forward, i.e., at least *bahula* 1 (supposing Chittirai 1 was *bahula* 3). Now we know that 57 days afterwards, i.e., on the Monday of the sea-bathing, the tithi was the 13th of the bright fortnight, and therefore the tithi on the 1st of the previous Chittirai could not have been earlier than the 15th of the bright fortnight. In other words, between a 3rd tithi in one dark fortnight and a 13th tithi in the bright fortnight of the next but one lunar month the interval cannot be more than 55 days, whereas the actual interval in this case was 57 days. On the 1st day of Chittirai in A.D. 756, full moon ended at 12½ ghaṭikas after sunrise and at the same moment the 1st tithi or *prathamai* of the dark fortnight commenced. On the whole we may conclude rather that the reading ஒன்றாம் பக்கம் is a mistake for ஒன்றாம் பக்கம், “the 1st tithi in the dark fortnight,” than that the date “third tithi” was arrived at by retrospective or any other calculation.

17. Lower down, the commentator Adiyarkunallar notes that the 28th day of Chittirai in that year was Saturday, a day of “Chitrā” nakshatra and full moon. We find that in A.D. 756 in the month of Chittirai, the full moon tithi commenced (i.e., the 14th tithi ended) at 41½ ghaṭikas after sunrise on Sunday 18th April, while nakshatra “Chitrā” ended about sunrise on the same day; so that Saturday 17th April A.D. 756, which was the 28th day of Chittirai combined with nakshatra “Chitrā” and the fourteenth tithi or the tithi previous to full moon: the 14th tithi, however, commenced so late on Saturday that, properly speaking, Saturday, the 28th Chittirai, should have been described as the day of the tithi which was current at its sunrise, viz., the 13th tithi. Tamil writers seem occasionally to speak of a day as combining with full moon in the sense that it was very near full moon. In this particular case there was perhaps special justification for this loose manner of writing. A festival occurring in a particular month must to a certain extent be moveable if it is tied not only to a day of the month, but also, and simultaneously, to a week-day, a tithi and a nakshatra. In this case, there is reason to believe that the festival of Indra was so tied. It was apparently proclaimed by the flag being “up” (as stated by the commentator) for five Saturdays and the four intervening seven-day weeks, the first Saturday of the festival being so selected as to be near a full moon and also near the end of the Tamil month of Chittirai. On this supposition, the festival might happen to begin on a Saturday which was six days removed from the full moon, and nevertheless it might be permissible to refer to it as a Saturday fixed in conjunction with the full moon.

18. Another instance of a moveable festival in the sense just explained is to be found in the Kāman (Cupid) festival referred to in lines 5, 6 of canto 6 of *Silappadhikāram*, Kadalāḍukatai. Here the commentary refers to the 29th day of Paṅguni (preceding the Chittirai of our story) and says that 29 Paṅguni as well as “Chitrā” nakshatra was “fixed for the end of the festival.”

Now we have already seen that the 1st day of Chittirai in the year of our story was itself a day of “Chitrā” nakshatra, and therefore 29 Paṅguni must have been day of “Pūrva Phalguni” because when Chittirai has only 30 days, the previous month Paṅguni would have 31 days. The commentator could not have been unaware of this fact: and therefore, when he says that the Kāman festival “closed on 29 Paṅguni, a day of Chitrā nakshatra,” he must be taken to mean that the festival was so regulated that its end might coincide, normally and as nearly as possible, with the 29th day of Paṅguni and “Chitrā” nakshatra.

19. We now come to the actual day of departure of Kōvalan and Kannaki from Kāvīripattinam. The commentator says that they left on Tuesday, 29th Vaikāṣi, a day of nakshatra “Jyeshtha,” and the fourteenth tithi in the bright fortnight, after the moon had set, and before sunrise. One is inclined to suppose from this statement that they left in the night between Tuesday and Wednesday, and before the Wednesday’s sun rose; both the text of the poem and astronomical calculation lead us to the conclusion that they left in the night between Monday and Tuesday, in what we should call in English the small hours of the morning on Tuesday. In ordinary Hindu usage, a day does not begin till sunrise; and the interval from sunrise on Monday to sunrise on Tuesday, including what we should

call the small hours of the morning on Tuesday, would be called Monday. If therefore, we took in its literal and ordinary sense the commentator's statement that the couple left on *Tuesday*, then, knowing that according to the text of the poem they left "before sunrise and after the moon had set," we should be driven to conclude that they left in the night between Tuesday and Wednesday.

20. Canto IX of *Silappadhikāram*, however, leaves us no option but to conclude that, in the evening of the *Monday* when Kōvalan abandoned Mādhavi, the latter sent him a note pressing him to return, that the messenger met Kōvalan near the market, that Kōvalan would not look at the message and spurned it as well as the sender, and that he went in the same evening after nightfall to the private apartments of his wife Kānnaki and induced her to leave home with him *early next morning*. Therefore they must have left in the small hours of the morning *before the sun rose on Tuesday*: and the astrological condemnation of the day of their departure as a day of "Jyeshṭha" combining with Tuesday, must be referred to Tuesday, as the day which rose *on the first day of their journey*, rather than to Tuesday as the civil day at the close of which they commenced that journey.

21. Astronomical considerations lead us to the same conclusion. The 13th tithi of the bright fortnight, which coincided with Monday, 28th Vaikāṣi, came to an end at $3\frac{1}{2}$ ghaṭikas after sunrise on Monday 17th May, A.D. 756. The 14th tithi began at the same moment and ended at 58 ghaṭikas after sunrise, i.e., at what we should call 5 a.m. on Tuesday. The next tithi, the 15th or full moon, came to end on Tuesday night at $51\frac{1}{2}$ ghaṭikas after sunrise, i.e., at what we should call 3 a.m. on Wednesday. [There was an eclipse at this full moon, but it need not concern us, as neither text nor commentary refers to that phenomenon.]

22. All night between Tuesday and Wednesday, there was a full moon (except for the eclipse), and the express reference in the text to the *brief interval of darkness* between the setting of the moon and the breaking of day on the last tithi of the bright fortnight, would oblige us, even if the 14th tithi had been current on Tuesday, just as the 13th tithi was current on Monday, to conclude that the couple left their home *in the night between Monday and Tuesday*, not in the night between Tuesday and Wednesday.

23. But the story requires (and this also is a very unusual condition, which, together with the other conditions stated above, is satisfied by A.D. 756) a *Monday* in the *morning* of which the 13th tithi of the bright fortnight was current, and *at the end* of which the 14th tithi was not only current *but had come to an end*; for, if the 14th tithi had been one that came to end by day on Tuesday (as it did in A.D. 211), then the 15th tithi or full moon would have come to end by day on Wednesday and the night between Tuesday and Wednesday would have been the last night of the waxing moon when it would be possible for the moon to set, whereas we understand from the story as unfolded in the text and commentary, that the night between Monday and Tuesday was the *last* of the waxing moon *before* it was full. (The commentator was evidently not unaware of the fact that the 14th tithi was *Kṣhaya*, i.e., that it began and ended between one sunrise and the next; in fact, this is implied in his statement that Monday morning was the 13th tithi and Monday night was the 14th and that the *same* Monday night was the last night in which the moon set during the bright fortnight.)

24. The apparently meagre details given partly in the text and partly in the commentary of *Silappadhikāram* suffice to lead us *almost* infallibly to the date intended by the author as well as the commentator, viz., A.D. 756. We say "*almost* infallibly," because we have had so far to assume, for the correct solution of the problem, that the Rishaba sankrānti in A.D. 756 fell not later than mean sunset, i.e., on March $20\cdot58 + 30\cdot93 =$ March $51\cdot50 =$ April $20\cdot50$. [The figure $\cdot50$ means at $\cdot50$ of a day of 24 hours or at 30 ghaṭikās counted from sunrise.]

25. The actual moment of Rishabha sankrānti, according to the first *Ārya* *Siddhānta* was, however, in A.D. 756 (as will be seen from Tables I and II of *Indian Chronology*), March $20\cdot5833 + 30\cdot9250 =$ March $51\cdot5083 = 30$ ghaṭikās, 30 palas (= 12 minutes) after mean sunrise on 20th April A.D. 756; in other words, the sankrānti was *later* than mean sunset by 30 palas or 12 minutes. Now the rule in

Southern India (p. 4 of the text) is that if sankrānti occurs *before* sunset, the civil month begins *on the same day*, and that otherwise the civil month begins on the next day. Nowadays almanac-makers probably do not consider the actual moment of sunset in working this rule, since they seem always to postpone the beginning of the civil month when the sankrānti falls after 30 ghaṭikās from *mean* local sunrise, i.e., from 6 a.m. (mean local time). It is just possible, however, that in former times they may have considered the sankrānti with reference to the *actual* moment of sunset. If they did this in A.D. 756, then the moment of sunset on the 31st day of the solar year in lat. 11° (Tanjore, which is fairly near the site of Kāvirippaṭṭinam, the ancient Chōla capital), must have occurred 6 minutes or 15 palas after mean sunset 6 p.m. (see art. 80 of *Indian Chronology*). This fact, however, would not by itself account for the non-postponement of the beginning of the civil month because the moment of Rishabha sankrānti would still be 6 minutes or 15 palas latter than actual sunset. But in fact we have to apply, not the present rules as to local sunrise and sunset which are based on the *Siddhānta Śirōmaṇi* (A.D. 1150), but the rules which were in force before that work was published by Bhāskarachārya. The effect of those rules is stated in section 62 of Prof. Jacobi's article at page 436 of *Epigraphia Indica*, Volume I, and in accordance with the ancient practice as there stated, we have to add the *chara*, i.e., 130 *asus* or $130 \times 4 = 520$ seconds = nearly 9 minutes of time, to the moment already obtained (6'6" p.m.) in order to obtain the actual moment of sunset, as it was probably computed by the almanac maker at Tanjore in the year A.D. 756. With this addition we find that the Rishabha sankrānti would in that year have occurred about 3 minutes *before* actual sunset, so that the month Rishabha or Vaikāśi would have begun *on the day* of sankrānti, and Chittirai would have been a month with only 30 days, and our problem would be fully satisfied in every respect.

26. Incidentally, the present case shows that, in verifying solar month dates of this period, we should take into consideration, not only the First Ārya Siddhānta and the actual moment of sunset, but also the rule stated by Bhāskarachārya as to the ancient practice in calculating the local time of sunrise and sunset.

27. **The full date with vara, tithi and nakshatra, in Silappadhikāram.**—Perhaps the most interesting passage in *Silappadhikāram* from a chronologist's point of view is the second one quoted at the head of this paper. "There is a prophecy that in the month of Ādi, in the dark fortnight, on a day of 'Bharani' and 'Kṛittikā' nakshatras, on the 8th tithi, on a *Friday*, Maḍura must be destroyed by fire and the royal line of kings come to an end." In the first place, the clear reference to a week-day postpones the date of composition of the poem (in the present state of our knowledge) to a period subsequent, at any rate not anterior, to the 5th century A.D.—vide page 15 of the text. Secondly, the details of tithi, vāra and nakshatra given in this passage enable us to satisfy ourselves whether the date arrived at by us on the strength of earlier passages in the poem and the commentary thereon is borne out, or whether there is still a chance for either of the competing dates A.D. 211 and 1301. Our object in examining dates in A.D. 1301 is to meet a possible view that, supposing this was the epoch of the commentator Adiyārkunallār, he may have based his comments on a *contemporary* date similar in all respects to that mentioned in the poem but obtained from a *panchanga* of his own time (*cf.* remarks on the Ālvār dates, paper vi, p. 487 below).

28. On Friday 23 July A.D. *756, which was the last day of the Tamil month Ādi, Śrāvapa (lunar month) *bahula* 7 (= 7th tithi in the dark fortnight) ended, and the 8th tithi in the dark fortnight began, at 21 ghaṭikās after mean sunrise, i.e., at or about 2-30 p.m.; while nakshatra "Bharani" ended, and nakshatra "Kṛittikā" began, 6 ghaṭikās after mean sunset, which divides the Indian civil day into equal halves. According to Brahma and Garga, Bharani would have come to end 30 ghaṭikās earlier, i.e., 6 ghaṭikās after sunrise. The nakshatra is indicated in Tamil by the words அழல் சேர் குட்டத்த meaning Kṛittikā nakshatrā. But the commentator on *Silappadhikāram*, called அரும் பதவுரை யாசிரியர் (i.e., "the author of the glossary"), interprets அழல் சேர் குட்டம் by "Kṛittikā Bharani," more, we may suppose, out of regard for facts than in view of the literal meaning of the words.

The nakshatra of a day is, properly speaking, the nakshatra current at sunrise, which, in this case, was *Bharani*: but *Krittikā* is the nakshatra of fire (Tamil அழல் = fire), thence the prophecy that Madura was destined to be destroyed by fire on a day of “*Krittikā*”; but inasmuch as it was more properly a day of “*Bharani*,” the commentator has thought fit to mention this fact. Madura was probably burnt in the night when “*Krittikā*” nakshatra was current.

29. So far, the year A.D. 756, for the *res gesta* of the poem, tallies exactly with the second as well as the first date which we have had to investigate in order to determine the date of its composition. We have now to see whether A.D. 211 or A.D. 1301 which, we found, would not satisfy the first date would answer at least the second.

30. In A.D. 211 the tithi Śrāvana (lunar month) *bahula saptami* ended, and *ashtami* began, at $47\frac{1}{2}$ ghatikās after sunrise, i.e., about 1 a.m. in the night between Friday and Saturday, the Friday being 19th July, the last day of the month of Ādi. Nakshatra “*Bharani*” ended about sunrise on Saturday 20th July, the 1st of Āvani. We have here three objections to accepting A.D. 211 as a likely date. In the first place, the tithi was *saptami*, not *ashtami* at the time when the town began to be ablaze, i.e., in the night between Friday and Saturday; in the second place, the nakshatra was *Bharani* not *Krittikā* (அழல் சேரி குட்டம்) at all: and thirdly, the nakshatra *Krittikā* was current on Saturday, 1st of Āvani, and not on Friday in Ādi. We have already seen that A.D. 211 will not suit also the day of departure of Kōvalan and Kaṇṇaki from Kāvīripattinam.

31. Nor could the commentator have had in mind A.D. 1301 as a year similar in all respects to the year when Madura was burnt. In A.D. 1301, Śrāvana (lunar month) *bahula saptami* ended, and *ashtami* began, at $35\frac{1}{2}$ ghatikās after mean sunrise, i.e., about 8 p.m., while nakshatra “*Bharani*” ended, and nakshatra “*Krittikā*” began, at $48\frac{1}{2}$ ghatikās after mean sunrise, i.e., about 1-30 a.m., in the night between Friday and Saturday. The Friday was 28th July, the last day of Ādi. Here again Friday 28th July could not have been referred to as “*Krittikā*” unless the fire happened after 1-30 a.m.

32. The Madras Epigraphists have gradually come to adopt the view presented in this paper, though on quite different grounds. In his *South Indian Inscriptions*, Volume II, part III, page 378 (1895), Dr. E. Hultzsch wrote: “In one of his interesting contributions to the history of ancient Tamil Literature, the Hon’ble P. Kumāraswāmi allots Karikāla to the first century A.D. This opinion is based on the fact that the commentators on the *Silappadhikāram* represent Karikāla as the maternal grandfather of the Chēra king Senguttuvan, a contemporary of Gajabāhu of Ceylon. Mr. Kumāraswāmi identifies the latter with Gajabāhu I who, according to the *Mahāvamsa*, reigned from A.D. 113 to A.D. 135. With due respect to Mr. Kumāraswāmi’s sagacity, I am not prepared to accept this view, unless the identity of the two Gajabāhus is not only supported by the mere identity of the name, but proved by internal reasons, and until the chronology of the earlier history of Ceylon has been subjected to a critical examination.”

33. Twelve years later, at page 66 of his annual report for 1906-07, the Madras Epigraphist, the late Rai Bahadur V. Venkayya, as the result of his examination of the larger and smaller Sinnamanur plates, recorded his opinion that the last Madura College or Academy (*Kaḍaiichchanyam*) must have come into existence prior to the middle of the 8th century A.D. If we are right in concluding that the date of composition of *Silappadhikāram* was somewhere about A.D. 756, then it follows that Rai Bahadur V. Venkayya made a very shrewd guess, for the middle of the 8th century A.D. which witnessed the composition of *Silappadhikāram* became by that very fact the highwater mark of Sangam literature.

34. Notwithstanding the hint thrown out by Dr. Hultzsch in 1895, no one seems to have thought it worth while to probe the alleged identity of Gajabāhu of *Silappadhikāram* with Gajabāhu I of *Mahāvamsa*: but Dr. Kumāraswāmi’s suggestion referred to by Dr. Hultzsch was accepted and most rigidly carried to its logical conclusions by that great Tamil scholar the late Mr. V. Kanagasabhai Pillai in his “*Tamil* 1,800 years ago,” a work which enjoys a deservedly high reputation.

but which, if reprinted, as it ought to be, would have to be re-named "*Tamils 1200 years ago*," for the whole work is concerned with events, persons and poems centred in the last Sangam which, we have seen flourished not more than 1200 years ago. Mr. Kanagasabhai Pillai's views, accompanied and enforced by copious illustrations from Sangam literature, have been adopted by almost every subsequent writer on the subject, e.g., Mr. M. S. Purnalingam Pillai, B.A., in his "*Primer of Tamil Literature*" (1904), Mr. S. Anavaradavinayakam Pillai, M.A., in the Introduction to his Edition of *Nālaḍi*, Mr. T. A. Ramalinga Chettiyar, B.A., B.L., in his *Age of Pattupāṭṭu*, contributed to the *Tamil Antiquary*, and by most magazine writers in *Sen Tamiz* and other periodicals devoted to Tamil literature. All the same, these somewhat overdrawn pictures of the state of civilization in Southern India 1800 years ago will have to be revised in the light of our present day knowledge of epigraphy and chronology, and the scenes of the Madura Sangam will have to be transferred from the first century A.D. to the late 7th and early part of the 8th century A.D., the period which witnessed, along with the decay of Buddhism, the rise of the Śaivite and Vaiṣṇavite teachers, Tiruṇānasambandar, Śaṅkarāchārya, Nammālvār, etc.

35. Incidentally, this readjustment of dates will enable us to understand why Tiruttakkadevar's *Jivaka Chintāmaṇi* has always been classed in Tamil literary tradition with the other great works of the Sangam period. Those who have adopted the "Gajabāhu" or "2nd century" theory have been obliged to place in their imagination a gulf of some 600 years between the date of composition of *Silappadhikāram* and that of *Jivaka Chintāmaṇi*, because it is well known that the latter poem was founded on *Mahāpurāṇam*, the first part of which, *Pūrvapurāṇam*, was written by Jina Senachārya, the preceptor of the Rāshtrakūṭa king Amōghavarsha I, who ascended the throne in A.D. 813, while the second part or *Uttarapurāṇam* was the work of Jina Senachārya's disciple Gunabhadraḥchārya.

36. Now it is a fact that the text and commentary of *Jivaka Chintāmaṇi* contain a date which can be stated with certainty as A.D. 813, the very year of accession of Amoghavarsha I. From the canto of the poem called *Gandarūva Tattayār Ilambakam* and the commentary thereon we extract as many as five identities :

(Commentary on stanza No. 493).

(1) Māsi 1 = Māgha bahula 10 ;

(2) Māsi 6 = Māgha amāvāsyā.

(3) Panguni 4 = Phālguna bahula 14.

(Stanza 599) (4) Simha lagna on Friday, Phālguna sukla 3 = nakshatra "Uttara Bhādrapada."

(Stanza 621) (5) Thursday in the week following = "Rohini."

We have to find a single solution to these five equations. We may try the years A.D. 813, A.D. 840, A.D. 935, A.D. 992, A.D. 1114, A.D. 1019, A.D. 1236, which are all years that contain likely elements; viz., in these years the first new moon in the solar year was more or less 14·35 days removed from Mesha sankranti, and Māgha Amāvāsyā fell at a late hour on Tuesday or an early hour on Wednesday; but only A.D. 813 satisfies all the conditions. In that year as we may see from the Ephemeris, Vol. II, Māsi 1 = Māgha, bahula 10 = 20 January A.D. 814 (Friday). Māgha Amāvāsyā fell on 25th January A.D. 814 (Wednesday), which was 6 Māsi. Phālguna sukla 3 and nakshatra "Uttara Bhādrapada" ended on Saturday 28th January 814 at 23 and 33 ghatikās, respectively, after sunrise; so that on Friday about sunset, when the lagna was Simha, the nakshatra current was "Uttara Bhādrapada" and the tithi current was sukla 3. In the following week, nakshatra "Rohini" ended at 18½ ghatikās after sunrise on Thursday, 2 February A.D. 814. Lastly Panguni 4 in the same year was 22 February A.D. 814 (Wednesday), on which day Phālguna bahula 14 was current throughout the day, ending very shortly after sunrise next day. All this may be verified from Ephemeris, Vol. II.

37. We need not enter upon detailed calculations of other competing years; but any one curious to investigate the subject may satisfy himself that none of

the other years will suit our requirements in all respects, including "Simha" *lagna* which occurred about sunset.

38. It must not be supposed that the author of *Jivaka Chintāmani* wished it to be understood that that romance happened in the year A.D. 813-14. Had such been his sole intent and purpose in the passages cited above, nothing would have been easier for him than to have given us the Kaliyuga or Śaka year, or at least the Cyclic year (Prabhava, Vibhava, etc.) But in the astrological craze which overtook the country at a very early period, it became the fashion to attach an astrological causation to the principal events in the life of every hero or heroine: and of course the full astrological influence exerted by the planets at any time could not be brought out without mentioning the *lagna*, *vara*, *tithi* and *nakshatra*, or at least the *tithi* and *nakshatra*, or *vara* and *nakshatra*. Had some work been in existence during the Sangam period that gave *varas*, *tithis* and *nakshatras* in a sort of ephemeris for several hundreds or thousands of years, nothing would have suited better a Sangam poet who wished to compose or improve a romance and locate it, say, in 3000 B.C.; but in the absence of such a work of reference, the poet was driven to resort to *contemporary panchangas* and we are thus entitled to infer that any particular astrological combination mentioned by a poet and referrible to only one date, must have been obtained by him from a contemporaneous panchanga of that date. The reader may be disposed to doubt whether this explanation can be held to account for the way in which commentators like Adiyarkunallar and Nachinarkiniyar, who composed their commentaries some centuries after the date of composition of the poems commented on fill up, as they do, *lacunae* in their authors' astrological references. The answer is that commentaries in Southern India generally spring up almost simultaneously with the publication of a poem of any importance; because, although the language of *Silappadhikāram* was far more intelligible to contemporaries than it is to us, yet it was the language of poetry and, in accordance with a practice as old as the *Tolkappium*, it had to be introduced to the world *obstetricante manu*, that is, through the mediation of a commentator. We know that *Silappadhikāram* had a commentary from the very beginning. The best commentaries no doubt survived in course of time, but in the great commentaries on the great Tamil poems, there seems to have been maintained a continuous unbroken tradition of annotation, dating from the date of each poem, and astrological peculiarities, whether alluded to in the text of a poem or supplied by the ingenuity of an early scholiast, would be just the sort of curious learning that would be handed down scrupulously from commentator to commentator.

39. In line 85 of the 26th Canto of *Silappadhikāram* it is stated that the Chera King Chenguttuvan, after hearing the story of Kannaki from the shepherds or Kuravas, visited the "Nilagiri" mountain for a day with his forces, and then proceeded to the North of India whence he procured stone for the image of Kannaki, which he solemnly installed in his capital Vanchi. What became of Kannaki-worship, thus instituted, is only partially known: for students of Tamil literature have searched in vain for any trace on the *continent* of Southern India, of this worship which became popular, and has remained so to this day, in *Ceylon*. The Nilgiri District, therefore, may be said to possess an additional interest for students of *Silappadhikāram*, in that not only is it alluded to by name in the text of the poem, but there still exists in that district a place called *Kannagimand*, (Rivers' *Todas*, page 734), which is a *mand* or village belonging to the Toda clan of *Kerāḍr* (itself an echo of *Kerala*), and situated in Meknad, very near the Sisipara route, leading from Malabar into the Nilgiris, one of the probable routes by which, according to Mr. Rivers (page 704), the Todas themselves entered the Nilgiris. At Fair Lawn, which is at no great distance from Kannagimand, are the ruins of an extensive fort, erected possibly either by Chera Kings or by those who subsequently wrested from them the Nilgiris. For, three centuries later than the time we have been dealing with, we find copious epigraphic evidence of the conquest of the Nilgiris by the Hoysala King Vishnuvardhana (A.D. 1117), whose general "frightened the Todas, offered up the Nilgiri peak to the goddess of victory, and pursuing the Malayalis, made himself master of Kerala"—*Annual Report of Madras Epigraphist for 1906-07*, page 81.

APPENDIX (iv).

THE TRUE AND EXACT DAY OF BUDDHA'S DEATH.

(Reprinted from Indian Antiquary, 1914.)

The object of the subjoined chart is to show that the true date of Buddha's death (Tuesday, 1 April, 478 B.C.), is deducible from the eight week-day dates cited in Bishop Bigandet's *Life of Gaudama* (*Trübner's Oriental Series*). The demonstration is accomplished by selecting 5 out of the many dates which have from time to time been associated with Buddha (see a long list of such dates at p. 165 of Vol. II of Prinsep's *Tables*) and testing the week-days of the several occurrences with reference to each of these dates. The dates selected were:—

(1) 1027 B.C., which is the most frequently occurring among the dates collected by Prinsep;

(2) 901 B.C., corresponding to 980 B.C. for the birth, and to 901 B.C. for the death; which is said to be quoted by Jachrig from Pallas' *Mongol Chronology* (Prinsep, *loc. cit.*);

(3) 846 B.C., corresponding to 835 B.C., which is said by Prinsep to be the era adopted at Lhassa and founded on an average of 9 dates: 846 B.C. appears to be the date of "Buddha's appearance" alluded to in a well-known Tamil Buddhist poem of 8th cent. A.D. called "Manimēkhalai";

(4) 638 B.C., known as the Peguan date; and lastly,

(5) 478 B.C., Cunningham's second date, which, at page 22 of *J. R. A. S.*, 1909, Dr. Fleet admits to be an alternative to his own date, 483 B.C., Kārttika śukla 8.

In selecting supposed dates for trial, I have endeavoured to limit myself to typical ones, i.e., to those which have at least *some* points in their favour. I made an exception in favour of 846 B.C., because, though wide of the mark, it is a curious date and seems to have been adopted by Tamil Buddhists of the 8th century A.D., who appear, according to indications in the Tamil poem Manimēkhalai to have believed that Buddha was born on the 14th day of Rishabha month and on a day of nakshatra Viśākha. The same poem refers to the year 1116 of an era, apparently a Buddha era, having been reached circa A.D. 770. Other dates, which might have been selected, had to be rejected *in limine*, because the week-days were obviously unsuitable. This remark applies to 544 B.C., which would give a *Sunday* (instead of Tuesday) as the day of Buddha's death, as well as to 543 B.C., in which the tithi and nakshatra of Buddha's death concurred on a *Friday*. As

[Continued on page 474 *infra*]

N.B.—The following abbreviations are used in the chart below.

1. *su.* for *śukla*, the bright fortnight of a lunar month. *Bahula paksha* is not referred to even once in the chart.
2. *f. d. t.* and *f. d. n.* These symbols indicate respectively that a *tithi* or a *nakshatra* ended on the *following* day after that cited as the day of the *tithi* or the day of the *nakshatra*. Ordinarily a *tithi* or a *nakshatra* is cited as belonging to the day on which it comes to end but occasionally, it is cited as belonging to the day when it only commences. "*F. d. t.*" and "*f. d. n.*" mean accordingly "*following day's tithi*" and "*following day's nakshatra*."
3. The ending moments of *tithis* and *nakshatras* are generally given correct to two decimal places of a day. The key to this system will be found in the author's *Eye-tells*. Thus *12.20* means 12 *ghatikas* after sunrise.
4. When both *tithi* and *nakshatra* are cited, the ending moment of the *tithi* is given first, and then the ending moment of the *nakshatra*.
5. The English calendar years cited in pairs run from 1 March to 0 March, (i.e. the last day of February). Thus 1096-95 B. C. is the period from 1 March 1096 to 28 February 1095. At the epoch we are considering, this period coincided very nearly with an Indian solar siceréal year.
6. The expression "preceded by an *adhika* month" draws attention to the circumstance that the lunar year under consideration was one of 13, not of 12, months.

Chart to show that the true and exact day of Buddha's death (1 April 478 B.C.; Tuesday)

8. Week-Day dates in Bigandet's Life of Gaudama.	Supposed central date 1027 B.C.	Supposed central date 901 B.C.
1. Kausda Era given up on Saturday 1st of the moon of Tabsong (= Phālg.). Reference: Vol I, p. 13. 2. Commencement of Eetsana Era—Sunday, 1st of the waxing moon of Tagu (= Chaitra). Vol. I, p. 13. In Vol. II, p. 133, footnote, Bigandet is in obvious error as to this date: see para. (6) of explanatory note. 3. Birth of Buddha, year 68; Vaisākha Purnimā; Nakshatra "Viśākha," Friday. Vol. I, p. 28; Vol. II, p. 71. Conception having taken place under Nak. "Utt. Āshāḍha" in śrāvana month and birth under "Viśākha," Vaisākha su. 15 is the implied date of birth. 4. Buddha leaves Kapilavasru—year 98, Sunday, Āshāḍha Full Moon-Nakshatra "Uttara Āshāḍha"; and enters into solitude next day, Monday. Vol. I, pp. 62-64 (year 97.) Vol. II, p. 72 (year 98.) 5. Attainment of perfect wisdom—year 103, Vaisākha full moon; Viśākha Nakshatra; Wednesday. Vol. I, p. 97 "a little before the break of day." Vol. II, p. 78. 6. Death of Buddha's father Sudhodana, year 107, full moon of Wakaong (= Śrāvana); at sunrise on Saturday. Vol. I, p. 208. 7. Death of Buddha.—year 148; Vaisākha full-moon. Nak. "Viśākha" Tuesday: a little before day break. Vol. II, pp. 69, 73. 8. The new religious era commenced in the year of Buddha's death 148 on Monday, first of the moon of Tabsong (= Phālguna). Vol. II, p. 113. The week-day was possibly Sunday which appears in another version recorded by Bigandet; vide footnote to p. 133, Vol. II, and para. (6) of explanatory note.	1098-95 B.C. Phālguna (preceded by adhika month) śukla 1 was Wed. Jany. 30, 1095 B.C.; '39. N.B.—Abolition of last year of old Kausda Era. 1095-94 B.C. Chaitra Śukla 1= Friday, Mar. 1, 12, 1095 B.C. N.B.—Eetsana Era, year 0, marked by Phālguna śukla 1 in 1098-95 B.C. 1027-26 B.C. Friday, April 11; 1027 B.C.; '34; '16. N.B.—Phālguna śukla 1 in 1028-27 B.C. marked year 68, expired, of Eetsana Era, (1096 less 1028). 999-98 B.C. Tithi ended on Sunday June 29, 999 B.C. at '31 and Nakshatra had ended on Sat. at '49. This was Śrāvana full-moon. N.B.—1. Nak on Sund. was not Uttara Āshāḍha. 2. Phālguna śukla 1 in 1000-999 B.C. marked year 98, expired, of Eetsana Era (1096 less 1000) and 97 current. 992-91 B.C.; Wednesday, April 14-17, 992 B.C.—purnimā; but nakshatra Viśākha had ended on Tuesday at '77 of day. N.B.—1. Nak. on Wed. was not Viśākha. 2. Phālguna śukla 1 in 993-92 B.C. marked year 103 expired of Eetsana Era (1093 less 993). 988-87 B.C. Friday, June 27-55, 988 B.C.; Śrāvana full-moon. N.B.—Phālguna śukla 1 in 989-88 B.C. marked Eetsana year 107 expired (1096 less 989). 948-47 B.C.; Tuesday, 7 April, 948 B.C.; '84; '97. N.B.—Phālguna śukla 1 in 949-48 B.C. marked Eetsana 148 current or Eetsana 147 expired. 949-48 B.C.; Phālg. su. 2=Monday, Jan. 26 '64, 948 B.C. N.B.—This was the Phālguna before Buddha's death and marked new era, year 0 Phālguna śukla 1 in 948-47 B.C. marked year 1 expired of new religious era.	1050-49 B.C.; Phālguna (preceded by adhika month), su. 1 was Sat. Feb. 1, 1049 B.C. Tithi ended at '21. N.B.—Abolition of last year of Kausda Era. Sat. was prob. Ādi Chandrodaya. 1049-48 B.C.; Chaitra śukla 1= Sunday, 1 Mar. 1049 B.C.; '71. N.B.—Monday was prob. Ādi Chandrodaya. 2. Eetsana Era, year 0 marked by Phālguna śukla 1 in 1049-48 B.C. 980-79 B.C.; Friday, April 1, 980 B.C.; '96; f. d. n. '45. N.B.—1. Nak. "Viśākha" was current on Friday and ended on Sat. at '45. 2. Phālg. śukla 1 in 981-80 B.C. marked Eetsana 68 expired (1049 less 981). 952-51 B.C., Sunday, 19 June, 952 B.C.; '88; '80. N.B.—1. This was Āshāḍha full-moon (preceded by adhika month). 2. Phālg. śukla 1 in 953-52 B.C. marked Eetsana 96 expired (1049 less 953) and 97 current. 945-44 B.C.; Wed. 4 April 945 B.C.; '61; '91. N.B.—Phālguna śukla 1 in 946-45 B.C. marked Eetsana year 103 expired (1049 less 946). 941-40 B.C.; Sunday, July 17-90, 941 B.C.; full-moon of Śrāvana (preceded by adhika month.) N.B.—Phālguna śukla 1 in 942-41 B.C. marked Eetsana, 107 expired (1049 less 942). 901-00 B.C.; Wed. Mar. 29; 901 B.C.; '21; '99. N.B.—1. Nak. "Viśākha" commenced at '04 on Wed and was not current on Tuesday. 2. Phālg. su. 1 in 902-01 B.C. marked Eets. 148 current and 147 expired. 902-01 B.C. Phālg. su. 1 was Sunday, Jany. 16, 901 B.C.; '34; the same day was Ādi Chandrodaya. N.B.—This was the Phālguna before Buddha's death and marked year 0 of the new religious Era. Phālg. śukla 1 in 901-00 B.C. marked year 1 expired of new religious era.

is deducible from the week-day dates cited in Bishop Bigandet's *Life of Gaudama*.

Supposed central date 846 B.C.	Supposed central date 688 B.C.	Correct central date 478 B.C.
916-15 B.C.; Phālguna Sūkṣa 1 was Monday, 20 Jany. 915 B.C.; 71. N.B.—1. Sat. was not Phālguna Sūkṣa 1 or 2. 2. Abolition of old Kausda Era. 916-15 B.C.; Chaitra Śu. 1=Wed. Feb. 19, 10, 915 B.C. N.B.—Sunday was not Ādi Chandrōdaya. 2. Eetsana year 0 marked by Phālguna Sūkṣa 1 in B.C. 915-14. 846-45 B.C.; Tuesday, April 20; 846 B.C.; 89, 21. N.B.—1 Solar and lunar year began at practically the same moment. The Tuesday was 14 Bishabha; u 14 ended on Tuesday at 08 (2) Phālguna Śu 1 in 847-46 B.C. marked Eetsana 68 (915 less 847). 818-17 B.C.; Wed. 9 June, 818 B.C.; 48; f. d. n. 28. N.B.—This was Āshāḍha full moon but neither tithi nor nak. fell on Sunday. 2. Phālg. Śu. 1 in 819-18 B.C. marked Eetsana 96 expired (915 less 819) and 97 current. 811-10 B.C.; Sat. 25 Mar.; 811 B.C.; 19; f. d. n. 32. N.B.—Week day was not, Wednesday. 2. Phālg. Śu. 1 in 812-11 B.C. marked Eetsana 103 expired (915 less 812) 807-06 B.C., Wed 7 July 807 B.C. 17 N.B.—Śrāvana full moon, but week-day was not Sat. 2. Phālg. Śu 1 in 808-07 B.C. Eetsana marked 107 expired (915 less 808). 767-66 B.C.; Sund. 17 Ap. 767 B.C.; 14-Nak. "Visakha" ended on Sat at 74. N.B.—Phālg. Śu. 1 in 768-67 B.C. marked Eetsana 148 current and 147 expired (915 less 768). 768-67 B.C.; Phālg. (preceded by adhika month), Sūkṣa 1 was Wed 2 Feb.; 90. N.B.—Phālg. Śu. 1 in 768-67 B.C. marked year 0 of new religious era and Phālg. Śu. 1 in 767-66 B.C. marked year 1 expired of new era.	637-36 B.C.; Phālguna Sūkṣa 2 ended on Sat. Jan 36 '90 636 B.C. N.B.—Abolition of old Kausda Era 637-36 B.C.; Chaitra Sūkṣa 1 ended on Sunday Feb. 24 '57, 636 B.C. N.B.—Eetsana Era, year 0 began B.C. on Phālguna Śu 1 in 636-35. 567-66 B.C.; Thursday, March 26, 567 B.C.; 38; Nak. ended on Sat. at 17 N.B.—1 Friday was not Vaisākha Śu 15. 2 Phālguna Śu 1 in 568-67 B.C. marked Eetsana year 68 expired (636 less 568). 539-28. B.C. Śrāvana full moon ended on Monday, 13th July 539 B.C. at 44 and Nak. "Uttara Āshāḍha" had ended at 58 on Sunday. Āshāḍha full moon was Sat. Jun 13 '97 Nak. "Uttara Āshāḍha" in that month was Monday, June 15 '28. N.B.—Phālguna Śu. 1 in 540-39 B.C. marked Eetsana year 96 expired (636 less 540). 532-31 B.C.; Tuesday, 29 March 532 B.C.; 46; f. d. n. 77. N.B.—Phālguna Śu. 1 in 533-32 B.C. marked Eetsana 103 expired, (636 less 533). 528-27 B.C.; Saturday 11 July, 528 B.C. 53. N.B.—Phālguna Śu. 1 in 529-28 B.C. marked Eetsana 107 expired (636 less 529). 498-87 B.C.; Wednesday, April 21, '97; 29. 12th day of Bishabha (Solar month). Note 1. Tuesday was not Vais. Śu. 15. 2. Phālg. Śu. 1 in 487-88 B.C. marked Eetsana 147 expired, 148 current (636 less 489). 489-88 B.C. Phālguna Sūkṣa 1 (preceded by adhika month) ended on Monday Feb. 8, 488 B.C. at 72. Note.—Phālguna Śu 1 in 489 B.C. marked year 0 of new religious era. Year 1 expired was marked by Phālg. Śu. 1 in 488-87 B.C.	627-26 B.C.; Phālguna Śu. 1, (preceded by adhika month) ended on Sat. Feb. 4, 626 B.C. at 32. N.B.—Abolition of Kausda Era. 626-25 B.C. New moon at the beginning of Chaitra month was Sat. March 4 '99 626 B.C. Sūkṣa 1 ended on Monday, March 4 at 05 and this was first Chandrōdaya. Sūkṣa 1 was current throughout Sunday. N.B.—Phālguna Śu. 1 in 626-25 B.C. marks Eetsana year 0 (abt. 25 Jany. 625 B.C.). 557-56 B.C.; Friday, 4 Ap. 557 B.C.; 69; f. d. n. 31. N.B.—Phālguna Śu. 1 in 558-57 B.C. marks Eetsana year 68 expired (626 less 558). 529-28 B.C.; Nija Āshāḍha full Moon and Nakshatra "Uttara Āshāḍha" ended at 59 and 62 respectively of Sunday 22 June, 529 B.C. N.B.—Phālguna Śu. 1 in 530-29 B.C. marks Eetsana 96 expired (626 less 530) and 97 current. 522-521 B.C.; Wednesday, 8 April 522 B.C.; 36; 74. N.B.—Phālguna Śu. 1 in 523-22 B.C. marks Eetsana 103 expired, (626 less 523). 518-17 B.C.; full moon tithi of Śrāvana commenced on Sat. 20 July, 518 B.C. at 61 and ended on Sund. 21 July at 51 of day. Saturday, at sunrise of which Suddhodana died, was loosely called full Moon, although this description was properly applicable to night between Sunday and Monday. N.B.—Phālg. Śu 1 in 519-18 B.C. marks Eetsana 107 expired (626 less 519). 478-77 B.C.; "Vaisākha" nakshatra commenced at 87 on Tuesday, 1 Ap. 478 B.C. and ended at 89 on Wed.; Sūkṣa 15 was current all Tuesday and ended on Wednesday about sunrise. N.B.—Phālguna Śu. 1 in 479-78 B.C. marks Eetsana 147 expired, 148 current. 479-78 B.C. Phālguna Sūkṣa 2=Monday Jany. 20 '98, 478 B.C. Phālguna Sūkṣa 1 ended on Sunday 19 Jany. 478 B.C. at 89 of the day. N.B.—Phālguna Śu. 1 in 479-78 B.C. marks year 0 of new religious era. Year 1 expired is therefore marked by Phālguna Śu. 1 in 478-77 B.C.=Eetsana 148 expired (626 less 478).

regards 483 B.C., I must say, with reference to Bigandet's week-days, that a more improbable year would be difficult to find, since in that year Vaisākha pūrṇimā ended on Saturday March 28·90, while Nak. "Viśākha" commenced on Sunday, March 29·02 and came to end on Sunday, March 29·98: in other words, pūrṇimā and "Vaiśākha" Nak., did not concur in Vaisākha month of that year for even one second of time. The year, 484 B.C. is a more probable year, because both Vaisākha Śu. 15 and "Vaiśākha" Nak. ended in that year on a Tuesday.

An additional reason for selecting (2) 901 B.C., was that if any year was likely to yield week-days identical with those yielded by 478 B.C., it was 901 B.C., on account of a well-known cycle in Indian Chronology by which week-days, tithis and nakshatras generally repeat themselves on the same days of the Indian sidereal year once in 423 years. The year 901 B.C. does yield week-days closely similar to those yielded by 478 B.C., except that it fails at the most important point and brings out the week-day of Buddha's death as Wednesday instead of Tuesday.

It will be seen that the only year for Buddha's death which brings out all the week-days correctly is 478 B.C. The number of tests could be multiplied, but we may be fairly certain that the result would always go to confirm 478 B.C.

This being so, it becomes an important question when these week-days were first recorded. Evidently, not during Buddha's life time or shortly after his death, because the week-day, as a detail used for ordinary citation was not known in Europe till the 3rd century A.D. and probably was not known in India till least the 5th century A.D.: indeed, week-day citations are not commonly met with in India till the 8th century A.D.—[See on the whole subject of the Indian week-day, Dr. Fleet's valuable article in Oct. issue of *J.R.A.S.* for 1912 pp. 1039–1052].

The Burmese chronicle, translated by Bishop Bigandet, is called *Malla-linkara wouttoo* and was composed about A.D. 1773, but Prof. Rhys Davids testifies to the substantial, even verbal, identity of that chronicle with the Jataka commentary current in Ceylon in 5th century A.D. (Prof. Rhys Davids, cited by Mr. Harry C. Norman in *J. R. A. S.* 1908 p. 15). We may, therefore, assume that the week-days in Bigandet's *Life of Gaudama* were calculated¹ retrospectively by some one between the 5th and the 8th century A.D.: but even so, we are led to infer that the true date of Buddha's death, though forgotten, as Dr. Fleet has shown, by 1200 A.D. in Ceylon, had been preserved in the traditions of Buddhists for at least a thousand years after the death of Buddha.

There are certain points worthy of note in the calendar system disclosed by an investigation of these week-days:—

(1) In this calendar there runs throughout an implied distinction between the commencement of an *era*, and the commencement of a *year*. The commencement of eras was shifted from time to time, it was śukla 1 of Chaitra of a particular year under the Eetzana Era, and under the New Religious Era, it was associated with the date of Buddha's death; but what is clear is, that the commencement of the *year* was always the same, i.e., śukla 1 of Tabaong or Phālguna. As an analogous case, we may cite the era of the reformed English calendar which began on 14 Sep. A. D. 1752, though the commencement of the year was always the same as before, the 1st of January.

(2) Secondly, it is apparent, except in the case of the last date on the chart, that the commencement of the lunar month under this ancient calendar, was śukla 1 or pratipada, as in the present day Indian calendar, and not the first heliacal rising of the moon, as in the Jewish and the Muhammadan calendar.

¹ At the time when this article was first contributed to the *Indian Antiquary* (1914), there was just a possibility (though it seemed highly improbable), that the author of *Malla-linkarawouttoo* might have himself calculated the weekdays in accordance with the modern Burmese Calendar, which has been in use in Burma since 1738 A.D. In *Ind. Ant.*, Vol. xxxix (1910), Sir Alfred Irwin has given the elements of the Burmese calendar from A.D. 638 to A.D. 1752, but adds: "it is not certain what calendars were actually observed in Burma before the year 1100 Burmese Era = A.D. 1738." After a good deal of study of the relevant documents it has been found impossible to verify whether, according to the modern Burmese calendar, the week-days in Bigandet could be located anywhere else than in the years shown in the last column of my chart. Bigandet is certainly in error in supposing, in footnote to p. 188, Vol. II, and elsewhere, that they can be located with reference to 543 B.C. as the central date.

From the Introduction to Part II of Vol. I of the *Epimeria*, it will be seen that Burmese dates before 1738 A.D. were in all probability calculated according to the Sorya Siddhānta. Examples are given at the end of Section ii of Part II of Vol. I.

In the excepted case I suspect, as observed in paragraph (6) of this note, a wrong reading in Bigandet's English Translation (Vol. II, p. 113) of *Monday* for *Sunday*. On the other hand, the phrase *ādi chandrōdaya dinē* quoted by Dr. Fleet from *Dīpavaṃsa* (J. R. A. S. 1909), seems to refer, not necessarily to śukla 1, as assumed by him, but to the first day when the crescent was actually visible, and in 242 B.C., as shown below, this was actually śukla 2. The ordinary rule (p. 70 of the Text) is, that if śukla 1, ends before 42 of a day, (25 ghaṭikās after sunrise) the crescent will rise the same evening and that if śukla 1 ends later than 58 of a day, (35 ghaṭikās after sunrise), the crescent will only appear next day. Between these limits, the day of the first appearance of the crescent is a matter of calculation.

Among other indications going to show that the "first of the moon" or "the first of the waxing moon" in Bishop Bigandet's translation is meant for śukla 1 is the following, which is also otherwise interesting. We are told at p. 107 of Vol. I that for 49 days from the attainment of perfect Buddhahood, i.e., from Vaiśākha pūrṇimā, Buddha did not taste food, and that on the 50th day which was the 5th of the moon of Watso he was hungry. [Bigandet's translation in this place "5th after the full moon of Watso" is an obvious mistake, since (1) 49 days from Vaiśākha pūrṇimā can only take us to śukla 5 ($29\frac{1}{2} + 14\frac{1}{2} + 5 = 49$) in Watso or Āshāḍha, and (2) we know from p. 118 of Vol. I that some days after the conclusion of the 49 days fast, Buddha preached a sermon at *exact* full moon and *exact* sunset; this we may identify as Āshāḍha pūrṇimā or Watso full moon—which tithi, in 522 B.C., ended on 6 June at 40 of the day or a little while before sunset.] The 50th day from Vaiśākha pūrṇimā in 522 B.C. was Wednesday, 27 May = Āshāḍha (or Watso) śukla 5, which tithi ended at 78 of the day. In this case, śukla 1 was first moon rise, but as śukla 1 ended on May 24.18, the 5th tithi, if it had been counted from first moon rise, would have been Thursday, May 28, the 51st day, not Wednesday the 50th day counted from Vaiśākha pūrṇimā. It is clear, therefore, that tithis in the text translated by Bigandet were calculated, as now, from new moon and not from the first moon-rise.

(3) On the relative merits of 483 B.C. and 478 B.C. as years of Buddha's death, Dr. Fleet remarked, at p. 22 of J. R. A. S. 1909: "For the latter occurrence" (the anointment of Devānāmpiya Tissa), "the mention of the Āshāḍha nakshatra indicates 247 B.C. or 242 B.C. The choice thus lies between $247 + 236$ B.C. = 483 and $242 + 236$ B.C. = 478 B.C. The earlier year is preferentially supported by a consideration of the circumstances which paved the way to the acquisition of sovereignty by Chandragupta."

It will be seen from the author's "Eye-table" that Nakshatra Pūrva Āshāḍha can coincide with Mārgaśīra śukla 1 or śukla 2 (on either of which days Devānāmpiya Tissa was anointed) only in a year in which some month previous to Mārgaśīra was *adhika*. This was the case with the years 247 B.C. and 242 B.C., and Dr. Fleet is, therefore, perfectly right in observing that the choice lies between these years. There is, however, this noteworthy difference between these two years. In 242 B.C., the year of anointment of Devānāmpiya Tissa, corresponding to 478 B.C. for Buddha's death, Mārgaśīra śukla 2 ended on November 14, at $51\frac{1}{2}$ ghaṭikās (in Lanka time), after mean sunrise, and as śukla 1 had ended at the corresponding part of the previous day, it is clear, from the rule cited above, that śukla 2, Nov. 14, was *ādi chandrōdaya dina* or first moon-rise in the month. Nakshatra Pūrva Āshāḍha was current all through Nov. 14 and came to end at $2\frac{1}{2}$ ghaṭikās after mean sunrise next day. The case was very different in 247 B.C. Since, in that year, Mārgaśīra śukla 1 ended at 9 ghaṭikās after mean sunrise on 6 November, it is evident that, that was *ādi chandrōdaya dina* or the day when the crescent first appeared. Nakshatra Pūrva Āshāḍha, however, commenced only at $50\frac{1}{2}$ ghaṭikās after sunrise on the same day, i.e., 2 hours after midnight and was current for only about $8\frac{1}{2}$ ghaṭikās at the very end of the day. The anointment could, of course, have been performed in what we should call the small hours of the morning of 7 November, 247 B.C. so as to bring the ceremony within the influence of Pūrva Āshāḍha, but generally speaking, such a day would not be called a day of Pūrva Āshāḍha, whereas 14 Nov. 242 B.C. was strictly a

day when Pūrva Āshāḍha joined with the *ādi chandrōdaya dina* of Mārgaśīra. So far, the calculation of *nakṣatras* appears to point to 242 B.C. rather than to 247 B.C. as the year of anointment of Devānāmpiya Tissa; and consequentially, to 478 B.C. rather than to 483 B.C., as the year of Buddha's death. Dr. Fleet promised to exhibit in a separate article, the process of determining the *nakṣatras*, but to the best of my belief he has not done so yet. The determination is very easy by the tables and method of my *Indian Chronology*.

(4) One of the reasons which led Dr. Fleet to adopt Kārttika śukla 8 rather than the traditional Vaiśākha śukla 15 as the day of Buddha's death, was that, on the latter assumption, it was not possible to place the two anointments of Devānāmpiya Tissa 247 B.C. Mārgaśīra śukla. 1, and 246 B.C., Vaiśākha śukla 15, as well as the arrival of Mahindo in Ceylon (B.C. 247 Jyāishtha śukla 15) within the year designated by *Dīpanāmsa* as "236 years after the death of Buddha," i.e., after 483 B.C., Vaiśākha śukla 15. He argued rightly that if each "Vaiśākha śukla 15" was the commencement of a new year, the arrival of Mahindo at any rate must belong to a year later than 236 expired of the Buddha era, which would be complete on Vaiśākha śukla 15, 247 B.C. Now, if as I have shown above, the ancient Buddhist year always took its departure from śukla 1 of Phālguna, then it follows (a) that year 236 expired of the religious era would be marked by Phālguna śukla 1 in (479 B.C. less 236 =) 243 B.C., and (b) that the second and third events, referred to above would both fall within the space designated by a single year, 236 expired, (running from 243 B.C. Phālguna Śukla 1 to 242 B.C. Māgha Amāvāsyā). Such being the case, the necessity for adopting Kārttika śukla 8 as the day of Buddha's death, in great measure, ceases. Dr. Fleet seems to think that both the anointments of Devānāmpiya-Tissa should be placed within the 237th year current after the death of Buddha. I do not know if the text of *Dīpanāmsa* requires this construction. The text, as quoted by him (*J.R.A.S.* 1909, p. 11) makes two statements, (1) that Devānāmpiya-Tissa was anointed 236 years after the death of Buddha; (2) that he was twice anointed. It may be that the first anointment was in the 236th year current, towards its close, and the second in the 237th year current.

(5) It follows from an examination of these week-day dates that Buddha's age at the time of his death was 79 complete years, not 80 years, and that supposing he was born in the year 68 of the Eetzana Era, he could be said to have died in the year 148 of that era only in the sense that the year 148 was *varttamāna* or current. See, however, division (8) below of this note.

(6) Bishop Bigandet remarks in a footnote on p. 133 of Vol. II that the Kauzda Era was abolished on a certain Saturday which was the new moon of Tabaong (March) and that the Eetzana Era commenced next day Sunday the first after the same new moon. This of course is not correct, since the old era was abolished with effect from Phālguna (Tabaong) śukla 1 (See Vol. I, page 13), while the new era was brought into force with effect from śukla 1 of the next month Chaitra (= Tagu).

On the other hand, while referring to the commencement of the New Religious Era (the era of Nirvāṇa), Bigandet has made a mistake just the converse of the above. He says (footnote on the same page 133 of Vol. II): "In the year 148, the first day of the month of Tagoo (April), which fell on a Sunday, was fixed as the beginning of the new computation, emphatically called the era of religion, 543 B.C." We need not concern ourselves with 543 B.C. (As a matter of fact, the first of the new moon of Chaitra or Tagoo in 543 B.C. was Wednesday, not Sunday.) But it will be seen from a comparison of this passage with those at page 13 of Vol. I and page 113 of Vol. II, (1) that where Bigandet affirms Phālguna Su. 1 to have been the beginning of the Kauzda Era, he should have said this of Chaitra su. 1; and (2) that where he affirms Chaitra su. 1 to have been the beginning of the New Religious Era, he should have said this of Phālguna su. 1. So far, there may have been, on his part, a mere mistake of transposition of months, but in saying (in footnote to page 133, Vol. II,) that *Sunday* was the beginning of the new religious era (Era of Buddha's death), he is backed by the calculations exhibited in my chart against the 8th date; and contradicted by his

own statement in the text (page 113 of Vol. II), that the New Religious Era began on a *Monday*. Should my conjecture that *Sunday* was the proper week-day in this case prove justified by a reference to the Burmese manuscript used by Bigandet or to any other original text, then it will follow that "first of the waxing moon" throughout the chronicle translated by Bigandet means "*Śukla pratipada*," and not the first heliacal rising of the moon.

(7) In one or two instances, details of dates, not explicitly affirmed by Bigandet, have had to be supplied from other circumstances stated by him. Thus, as regards the birth of Buddha, we are told, in the first place (Vol. I, page 28), that he entered the womb of his mother Māyā at a full moon under the constellation "Oottarathan" (= "Uttara Āshāḍha"). Reference to the Eye-Table appended to my *Indian Chronology* will show that this must have been the Full Moon of Śrāvana. As Buddha was born 9 months later under the constellation "Withaka" ("Viśākha"), (Vol. II, page 71), the birth, as may be seen from the same table, must have taken place at the Vaiśākha full moon, not 6 days after the same full moon (as stated erroneously in the footnote to page 47, Vol. I), when Nakshatra "Vaiśākha" would be an impossibility.

Similarly, when we are told (Vol. I, pages 62—64) that Buddha, preparatory to embracing the life of an ascetic, left Kapilavastu at the full moon of "July" under the constellation "Oottarathan," we may infer that it was the full moon of Āshāḍha month, because elsewhere Bigandet has rendered the Burmese "Watso" (= Āshāḍha month) by "July" (see, for instance, Vol. I, page 200). July is no doubt the English equivalent of Āshāḍha at the present time; but it was not so in Buddha's time when the equivalent of Watso or Āshāḍha was May-June. The reader has to be reminded that English months, in 477 B.C. meant, in comparison with Indian months, a time of the sidereal year more than one month in advance of what they now mean. This result is due (1) to the forward movement of the Indian sidereal, as compared with the European tropical, year, and (2) to the dropping of 10 days in the Gregorian Calendar. In support of my statement that the departure from Kapilavastu took place on a *Sunday*, I may refer to Vol. II, page 72, where the next day when he entered into solitude is given as *Monday*.

Lastly, the year when Buddha left his home to lead a hermit's life is given as "Eetzāna 97" in Vol. I, page 62, and as "Eetzāna 96" in Vol. II, page 72. This is not a discrepancy, because we may understand the former to be an *expired*, the latter a *current*, year. Similarly, the Eetzāna year of Buddha's death, 148, has, I believe, to be understood only as a *current* year, equivalent of *expired* year 147.

(8) I have reserved for the last place the discussion of the important question, whether, admitting the correctness of the dates shown for Buddha's life, in the last column of the chart, the date of his death may not be 477 B.C., as conjectured, first by Cunningham, and more recently by Prof. Charpentier of Upsala in the July 1914 issue of *Indian Antiquary*. I am bound to say that two sets of considerations are in favour of 477 B.C.: in the first place, this date would make him fully 80 years old when he died, which indeed is the commonly received age, attained by Buddha when he passed into *Nirvāṇa*; and in the second place, although the week day of Vaiśākha śu. 15 and Nak. "Viśākha" in 477 B.C. was *Monday* (April 19; '90; '44), yet the next day was *Tuesday*, and as he is said to have died "on Tuesday, a little before day break", this may mean, though not strictly, "a little before the daybreak of Tuesday": that is, in the early morning hours of what we should call Tuesday (in the Indian Calendar, in the last hour or two of Monday).

The real difficulty, however, about 477 B.C. is in harmonizing with this date the statement that the new religious era began on the 1st of the waxing moon of Tabaong (Phālguna) "in the year of Buddha's death," the week-day being either Sunday, as stated in Bigandet's note on page 133 of Vol. II, or Monday, as stated at page 113 of Vol. II of his text. The following are all the relevant Phālgunas:—

Phālguna śukla 1 of 479—78 B.C.	fell on Sunday,	19 Jan. 478, B.C.	ending at '88 of day.
" " " 478—77	" fell on a Friday.		
" " " 477—76	" " " Wednesday.		
" " " 476—75	" " " Sunday (ending at '78 of day).		

We cannot possibly adopt the Phālguna śu. 1 of either 478-77 B.C. or 477-76 B.C. as the commencement of New Religious Era, because in neither case was the week-day Sunday or Monday. We are driven, therefore, to conclude that the 12 months beginning with Phālguna of 479-78 B.C. (19 January 478 B.C. were the 12 months constituting "the year on which Buddha died," i.e., that he died on Vaiśākha śu. 15 of 478 B.C., not on Vaiśākha śu. 15 of 477 B.C.

(9) The Eetzāna Era is no doubt, as observed by Dr. Fleet in *J. R. A. S.* 1912, page 239, "a late invention"; but it is, nevertheless, a true invention,

- (a) because the dates expressed in that era are, *astronomically*, true dates; and
- (b) because they include, by implication, one *historically* true date, the year, 478 B.C. of the death of Buddha.

The week-days, coupled with tithis and nakshatras, direct our attention, with almost absolute certainty, to one and *only one* series of years which, thanks to them, can be verified and identified with as much confidence as if they had been recorded in 478 B.C. Knowing, then, from other sources, the historical probability of the central year, 478 B.C. (that it is approximate, according to Dr. Fleet, within 5 years, does not detract much from its historical value), we need not be disturbed by the reflection that this and other surrounding dates must have been laboriously calculated, and for the first time fitted out with the full dress of *vāra*, *tithi* and *nakshatra*, by some astronomer in the 5th, 6th, 7th or a later century A.D. The later the century, the more genuinely do the historian, the chronologist and the critic become interested in the discovery that, for a thousand years, if not more, after Buddha's death, the true *year* of its occurrence was, notwithstanding many contradictory traditions, faithfully preserved somewhere in Buddhistic sacred lore.

APPENDIX (v).

ASTRONOMICAL REFERENCES IN THE MAHĀBHĀRATA.

(Originally delivered as a lecture under the auspices of the Madras Literary Society.)

(1) *Bhīshma Parva, Chapter 2, verse 23.*

ālakshé prabhayā hīnām paurnamāsīmcha kārtikīm
Chandro bhūdognavarnaścha padmavarne nabhastale.

Even in the night of the Kārtika full moon, the moon, having lost all its splendour, became invisible (or looked like fire), the sky looking like lotus.

(2) *Bhīshma Parva, Chapter 2, verse 32.*

rōhinīm pīdayannesha sthito rājan sanaiścharah
vyāvṛittam lakshma somasya bhavishyati mahadbhayam.

O ! King, the planet Śani oppresses Rohini. The sign of the deer in the moon has shifted from its position. A great evil is foreboded by all this.

(3) *Bhīshma Parva, Chapter 3, verse 12*

śveto grahastathā chitrām samatikramya tishthati
abhavam hi viśeshēṇa kurūnām tatra paśyati.

Ketu, the white planet, stops on passing beyond the constellation Chitrā. All this forebodes total destruction of the Kurus.

(4) *Bhīshma Parva, Chapter 3, verse 13.*

dhūmaketuḥ mahaghorah pushyam chākramya tishthati
senayoraśivam ghoram karishyati mahagrahah.

A fearful comet is rising and is distressing Pushya; this great planet will cause great havoc to both armies.

(5) *Bhīshma Parva, Chapter 3, verses 14 to 16.*

maghāsvangārako vakrah śravaṇecha bṛihaspatih
bhagam nakshatramākramya sūryaputreṇa pīdyate.
śukrah proshthapade pūrve samāruhya virochate
uttare tu parikramya sahitah samudīkshyate
śveto grahah prajvalitah sadhūma iva pāvakah
endram tejasvi nakshatram jyeshthām ākramya tishthati.

Mars is retrograde in Maghā and Brihaspati in Śravaṇa. The sun's offspring Śani advances towards Bhaga and afflicts it. The planet Śukra rises towards Pūrva Bhādra, shining brilliantly and looking towards Uttara Bhādra (Dutt's translation). Ketu, blazing like smoky fire, stops and afflicts the effulgent constellation of Indra.

(6) *Bhīshma Parva, Chapter 3, verse 17.*

dhruvah prajvalito ghoramapasavyam pravartate
rohinīm pīdayantan tavubhau cha śaśibhāskarau
chitrā svātyantare chaiva dhishthatah parushagrahah.

The constellation Dhruva, fearfully blazing, advances towards the right. Both the sun and the moon distress Rohini. A terrible planet (Rahu?) has taken up its position between Chitrā and Svāti.

(7) *Bhīshma Parva, Chapter 3, verse 18.*

vakrānuvakram kṛtvā cha śravaṇam pāvakaprabhah
brahmarāśim samāvṛitya lohitāṅgo vyavasthitah.

The red bodied planet, effulgent like fire, passing in a round and round way, stops encircling Śravaṇa overridden by Brihaspati.

(8) *Bhīshma Parva, Chapter 3, verse 27.*

samvatsarasthāyinau cha grahau prajvalitāvubhau
(viśākhāyāḥ samīpasthau) bṛihaspatīśanaiścharau.

Those two burning planets, Brihaspati and Śani, have become fixed for a year.

- (9) *Bhāshma Parva, Chapter 3, verse 29.*

kṛittikām pidayanstikshuāih nakshatram prithivīpate
abhikshnavātā vāyante dhūnaketumavasthitāh.

O King, Rahu of terrible deeds afflicts Kṛittikā. Rough winds, foreboding terrible danger, are continually blowing.

- (10) *Bhāshma Parva, Chapter 3, verse 32.*

chaturdaśīm panchadaśīm bhūtapūrvām cha shodaśīm
imāntu nābhijanami amāvāsyām trayodaśīm.

A lunar fortnight has hitherto consisted of fourteen days or fifteen days or sixteen days. But on the 13th day and in the course of the same month two eclipses have taken place.

- (11) *Bhāshma Parva, Chapter 3, verse 33.*

chandrasūryavubhau grastavekahne hi trayodaśīm
aparvani grahāvetau prajā samkshayayishyatah.

- (12) *Udyoga Parva, Chapter 142, verse 18.*

saptamācēpi divasāt amāvāsyā bhavishyati
sangrāmo yujyatām tasyam tāmāhuh sakradevatām.

In 7 days there will be full moon and on that day let us engage in fight, for this is the day favourite to Sakra.

- (13) *Udyoga Parva, Chapter 143, verse 8.*

prajāpatyam hi nakshatram grahastikshno mahādyutih
śanaīścharah pīdayati pīdayan prānino adhika.

That active planet of great effulgence, śani, troubles the star Prajāpatya, indicating greater trouble to living creatures.

- (14) *kṛitvācchāngārako vakram jyeshthāyam madhusūdana
anurādhām prārthayate maitram sangamayanniva.*

The planet Angaraka travels retrograde to the constellation Jyeshthā, O! slayer of Madhu, and goes towards Anurādhā as if seeking its friendship.

- (15) *nūnam mahadbhayam kṛishṇa kurūnām samupasthitam
visesheṇa hi vārshṇēya chitrām pīdayate grahah.*

Surely, O! Krishna, a great calamity for the Kurus is at hand, especially as the planets go against Chitra.

- (16) *somasya lakshma vyāvṛittam rāhurarkamupaiticha
divaścholkāh patantyetaḥ sanirghātaḥ sakampanāh.*

Rahu comes to the sun which has covered the path of the moon and from the heavens fall down meteors with loud noise and making the earth shake.

* * * * *

The foregoing passages of the Mahābhārata contain the principal astronomical references to be found in that epic, but for the reasons stated in paragraph 246, page 100 of the text, it was not possible to deal with them methodically along with Rāmā's horoscope. The popular impression concerning these references is that the observations in question were made at the time of occurrence of the events described in the Mahābhārata, while the pious hope of even the well-informed portion of readers and hearers of the Mahābhārata is that it may be possible, by means of these references, to determine the date of those events, or at least of the composition of the poem. The remarks made in paragraph 246, page 100 of the text, will have prepared the reader for the conclusion that there is absolutely no scientific or historic warrant for either the popular impression or the pious hope. The astronomical details given in the Mahābhārata differ in one important respect from those in the Rāmāyana. Rāmā's horoscope, even though the framer thereof may not have had in view any particular year, month, or date, can be located in time, if we regard it, as we did in section iii of Chapter V of the text, as the subject of a purely astronomical problem; whereas the Mahābhārata references cannot possibly yield a date, because (1) they are mutually repugnant, as has been stated already at page 100 of the text, (2) they are the evident result of interpolation by subsequent writers, and (3) they seem to have been interpolated at different times and in different centuries A.D.

2 The general opinion of modern critics regarding the date of composition of the Mahābhārata is that it must have taken four or five centuries for its composition, viz., from about 300 B.C. to about A.D. 200 and, that the main part of the work may be held to have been composed during this period. But the Mahābhārata, apart from its being a national epic like the Iliad, has also been used by successive generations since the inception of its composition, as a repository, or rather an encyclopædia, of all kinds of knowledge, legal, philosophical and religious. At the same time, the poem suffered the usual fate of literary works conceived and executed in ancient times, in that it has been altered or amplified in minor details by scribes, scholiasts and editors. The astronomical references, consisting as they do of a line or two each, belong to the minor class of interpolations. An estimate of the epoch when some of these interpolations became possible is all that can be attempted. In particular, the omen connected with the 13 days' fortnight (see 10th and 11th passages quoted above), which was commented on in paragraph 29, page 8 of the text, could not have been conceived earlier than the time when the rules for determining the ending moments of tithis, with reference to the sun's and the moon's anomalies and equations, were in full operation and this could not have been earlier than the 6th century A.D., when the writings of Varāhamihira were published. The other interpolations about the positions of planets may be referred to more or less the same epoch.

3. A pertinent question in regard to these interpolations as well as those in the Rāmāyana is, whether the framers of them intended merely to give utterance to certain astrological combinations of planets supposed to produce good fortune or the reverse, or whether they intended to designate a particular epoch of time as corresponding to the planetary positions. There is no ground for supposing the second alternative and we are left with the first as furnishing the sole motive for the interpolations. The *Paripādāl* horoscope, which we treated in section (ii) of Chapter V of the text as pure chronology, is not in terms astrological and must, therefore, be regarded as quite an exceptional passage in ancient Indian literature. Of course there is nothing to prevent a chronological interpretation being put upon an astrological combination of planets; but a mere astrologer is apt to be reckless or ignorant in regard to the astronomical possibility of the positions stated by him; and if the positions are in fact astronomically impossible, it must be equally impossible to put a chronological interpretation upon his statements. A very good illustration of this observation is afforded by the ancient commentary on the *Paripādāl* horoscope itself, where the commentor Parmēlalagar treats the references as merely an astrological question, ignoring altogether the astronomical possibility of the positions assigned by the poet to Venus and Mercury when the sun was according to the comentator in Simha, whereas the poet, as shown in *extenso* in section (ii) of Chapter V, evidently intended this horoscope as a piece of chronology no less than of astrology.

4. Some of the Mahābhārata references to astronomy afford an even better illustration of reckless astrological statements made without due regard to astronomical possibilities. Certain well-known passages quoted above, especially No. 5 state that Mars was retrograde in Maghā nakshatra at or shortly before the time of the great battle which is supposed by all authorities to have taken place during the month of Mārgaśīra. So far as the author is aware, neither Mr. Vaidya in his "*Mahābhārata, A criticism*," nor the late Mr. Gopala Ayyar, nor any of the other writers on the subject of Mahābhārata chronology, have adverted to the circumstance that it is not astronomically possible for the planet Mars to retrograde in the Maghā nakshatra about the time of Kārtika Amāvāsyā or for some days later. An examination of Mars' retrograde positions in Table V-B will make this clear. The impossibility appears, also to be recognized in Indian works of astronomy, such as the Tamil *Jyotishaganita Śāstram* by Mūnāmpannai Krishna jyoshyar, paragraph II, page 95. In the same passage of the Mahābhārata it is stated that at the same time Venus was in Pūrva Bhādrapada. This also is an impossible position for Venus when the sun is in Kārtika solar month, or Mārgaśīra lunar month. To get over these difficulties, Mr. Vaidya supposes that the positions of Mars and Venus are to be taken in the sense of vedhas or astrological

cross aspects ; but the present writer has very little doubt but that whoever framed these positions of Mars and Venus in the Mahābhārata thought that they were possible astronomical positions and was ignorant that the reverse was the case.

5 It remains to notice the capital drawback of these astronomical references in the Mahābhārata, viz., that owing to the fact of their having been introduced by different writers and at different times, the same planet is supposed to have occupied a number of different rāsis, for instance, Mars is in one passage going back from Jyeshtha towards Anurādhā ; in another, as already stated, he is retrograde in Maghā. Saturn in the first passage is oppressing Rohini and in the second passage Pūrva Phalguni. Jupiter is in one passage near Viśākha nakshatra and in another in Śravaṇa nakshatra. The only consistent series of references appears to be that in the sixth and eighth passages (Bhīshmaparva 3, verses 17 and 27) which place Jupiter and Saturn near Viśākā and an evil planet, possibly Mars, retrograding between Svāti and Chitrā. The idea seems to be that the three chief planets were retrograding at the same time and were, therefore, exercising a very baneful influence. Mars is not mentioned by name in this passage which only refers to "an evil planet," but since in each of the astronomical passages in the Mahābhārata the three principal planets Mars, Jupiter and Saturn are referred to, we may presume that in the sixth passage which we have selected as being self-consistent, Mars is the planet intended by the description "the evil planet." If we look for a date when all these three planets were retrograding in the positions referred to, we shall probably not find any date in Mārgaśīra month, but about the forty-first day of the Indian solar year, i.e., about Vaiśākha month, we find a certain number of dates, first 3084 B.C. in which on or about the fortieth day, Mars, Jupiter and Saturn occupied positions corresponding to 179 degrees (Chitra), 200 degrees (Viśākha) and 203 degrees (Viśākha) of longitude. In 1316 B.C. on the fortieth day of the Indian solar year the planets' positions were 190 degrees (Svāti), 215 degrees (Anurādhā) and 206 degrees (Vaiśākha). Lastly, in 1079 B.C. their positions were 195 degrees (Svāti), 207 degrees (Viśākha) and 222 degrees (Anurādhā). In all these positions the planets were retrograde. As we have already remarked, there is absolutely no reason to suppose that either these or any other dates were actually contemplated by those responsible for the interpolation of astronomical references in the Mahābhārata.

6 The date first mentioned, 3084 B.C., might seem to be a plausible date because it is only 18th years distant from the first year of Kaliyuga 3102 B.C. But in all probability the Kaliyuga of Mahābhārata was not the same as the Kaliyuga (18th February 3102 B.C.) which was devised by the astronomers of Varāhamihira's time in the fifth or sixth century A.D. and which was the assumed date when all the planets were in mean longitude 0. We have the Sūrya siddhānta as an authority for the statement (Sūrya siddhānta I—57) that "at the end of the golden age (Tretāyuga) all the planets by their mean motion, excepting, however, their nodes and apsides, are in conjunction in the 0 degree of longitude." What is true of the golden age must be equally true of the beginning of Kaliyuga, because according to the assumptions of Indian astronomy in the various siddhāntas, every planet completes an integral number of revolutions between the beginning of one yuga and the end of the same. Such was the reason why the astronomers of Varāhamihira's time fixed upon the midnight between the 17th and 18th February, 3102 B.C. as the date of 0 Kaliyuga, according to Sūrya-siddhānta, and sun rise on 18th February, 3102 B.C. as 0 Kaliyuga according to the other siddhāntas. Of course these astronomers knew that the Mahābhārata referred to the Kaliyuga as the beginning of a new order of things. But they probably thought that as the date of the Mahābhārata Kaliyuga was left in vacuo, it was open to them to fill it up in any manner they pleased, provided it suited the purposes of astronomical computation. Varāhamihira alone in a well-known passage, which he professes to quote from Garga, appears to have held a definite opinion as to the period of Yudhishtira's reign, but unfortunately the verses in which he states this opinion have been the subject of numerous and divergent interpretations. The apparent meaning is that "Yudhishtira's reign preceded the Śaka era by 2,526 years," that is, that Yudhishtira flourished *circa* A.D. 78 *minus*

2,526 years = 2448 B.C. This figure has been controverted by Mr. Gopala Ayyar, as well as by Mr. Vaidya, but there is one consideration in favour of it. Varāhamihira, or rather his authority, says that the *Sapta Rishis* were at that time in Maghā Nakshatra and no body has attempted to discover what this means. The *Sapta Rishis* were supposed to spend 100 years in each nakshatra in succession. This is a pure convention, equivalent to a reckoning by centuries, because the ancient astronomers knew very well that the *Sapta Rishis*, i.e., the constellation Ursa Major or Great Bear had no motion of the kind. It is exceedingly probable that the conventional motion of the *Sapta Rishis* through the nakshatras was made to start like the motions of the planets, with the first nakshatra at the date of 0 Kaliyuga. That first nakshatra was in all probability Kṛittikā and not Āśvinī according to the modern usage. The astronomers of Varāhamihira's time knew that Kṛittikā was the first nakshatra in vedic times, and in quoting a nakshatra for the *Saptarishis* in the reign of Yudhishtira, they probably * conformed to the ancient usage, rather than to their own fixation of Āśvinī as the first nakshatra. If so, Maghā would be the eighth nakshatra, beginning from Kṛittikā; that is, the entry of the *Rishis* into Maghā nakshatra would mean the beginning of the eighth century reckoned from 0 Kaliyuga, i.e., from 3102 B.C. This takes us to 2402 B.C., which is not very distant from 2448 B.C., the date recorded in Varāhamihira's verse.

“āsan maghāsu munayah śasati prithivīm yudhishtire nṛpatau shad dvika panchadvutah śakakālah tasya rājnaśya.”

7. A perusal of the chapter in the Bhishma Parva, in which the majority of the astronomical references occur, will show that that chapter teems with prodigies and portents, all of an extraordinary character, and is conceived in the same spirit as the passages in which the Roman historians Livy, Tacitus and Plutarch have recorded similar prodigies as having been the forerunners of great events in Roman history; and the astronomical details in the Mahābhārata were presumably added by subsequent writers with no other motive than to add astrological terrors to those already conceived by Vyāsa or whoever first assumed that pen-name.

8. It has generally been considered that there were two eclipses before the great battle, one at the time of new moon, and the other at the time of full moon. Such a succession of eclipses, with no other indication of the probable time, is not, however, sufficient for the verification of any date; because two eclipses, one solar and the next lunar, succeeding each other within a fortnight, is quite an ordinary phenomenon.

* Footnote — This view becomes all the more probable if Varāhamihira did actually quote the verses in question from an ancient writer, in whose time the practice of reckoning the nakshatras from Kṛittikā, as the first, was still in vogue. We find elsewhere such reminiscences by a later generation of the same tradition regarding the priority of Kṛittikā among the nakshatras. In the Tamil *Manimekhalai* (date probably, seventh or eighth century A.D.), the nakshatra in which Buddha was born, Viśākhā, now the 16th among the 27 nakshatras, is referred to as

மினத்திடைநிலை மினத்தகவையில்

minattitainilai minattakavayil

i.e., “in that nakshatra which is the middle one of the nakshatras”; in other words, the Tamil author of *Manimekhalai*, who was probably writing in the seventh century A.D., long after the astronomers had begun to regard Āśvinī as the first nakshatra, alludes to Buddha's nakshatra of birth, Viśākhā, as the 16th or the middle one among the nakshatras, which it could only be, if the reckoning started with Kṛittikā as the first nakshatra.

APPENDIX (vi).

DATES OF ĀLVĀRS (REVISED).

The Ālvārs and Āchāryas were Vaishnavite authors, preachers, reformers, singers, and ascetics who worked either individually or in groups at the epoch of the general Hindu religious revival from seventh century A.D. onwards. The numerous popular accounts of them which pass under the names of *gurupparam-paras* (order of succession of religious teachers) *tirumudiadaivu*, etc., are full of dates with all manner of details of Kaliyuga year, cyclic year, solar month and day, vāra, tithi and nakshatra, which at first sight promise a rich harvest to the chronologist. Accordingly the author was at one time inclined to take these dates seriously, and he published the results of his investigation in a pamphlet entitled "Dates of Ālvārs," copies of which he will be glad to furnish to any one interested in research. Even in that pamphlet he was obliged to recognize that the Kaliyuga years furnished in the popular accounts down to, and excluding, the date of Rāmānuja, were fictitious and more or less imaginary, but it seemed to him then that the other details of tithi, vāra and nakshatra were capable of being independently calculated; and such independent calculation yielded results which were apparently in agreement with general critical considerations. The dates and the verification, as set out in the pamphlet, are reproduced in columns 3 and 4 of the table at the end of this paper.

2. Subsequent reflection and further experience with South Indian dates have, however, led the author to a very different conclusion: in fact these Ālvār dates afford a typical illustration of the Will o' the Wisp nature of Indian chronology when one relies too much on the dates presented in a certain class of compositions, and in this category one may include the numerous spurious plates examined and exposed by Dr. Fleet and Professor Kielhorn in the pages of the *Indian Antiquary* and the *Cholapattayams* published by Mr. V. Rangachari of Madras in the *Journal of the Royal Asiatic Society*.

3. The question, when and by whom were these Ālvār dates first announced to the world, is a most important one, upon the answer to which will mainly depend our verdict as to their genuineness. The *Dīvyā Sūricharita* of Garuḍa-vāhanapāṇḍita is said to be the oldest extant work on the subject, to which the traditional details of Ālvār dates have been traced, and the author of that work professes to have been a contemporary of Rāmānuja (12th century A.D.). Now, if the earliest Ālvārs are shown either by a calendrical examination of their dates, or on general critical considerations, to belong to the 7th or the 8th century A.D., then we have to enquire carefully and establish when and by whom those dates were first recorded and by what means they were handed down to at least Rāmānuja's time (12th century A.D.).

4. Let us consider first what the dates themselves have to tell us, and then what the critics tell us about them. It will be instructive to deal first with a typical date, say, that of Tiruppānālṅvār who was an Ālvār originally belonging to the caste of pānar, a low caste of singing mendicants.

5. We are told in the popular account that Tiruppānālṅvār was born in Kaliyuga 342 ("Kaliyuga 120" is a variant), i.e., somewhere about 2800 B.C., in "Durmāti" year, in Kārttigai solar month, on pūrṇimā or full moon day ("bahula 2," which is two days later than pūrṇimā is a variant), under nakshatra "Rohini" and on a Wednesday. The late Mr. T. A. Gopinatha Rao, in a manuscript entitled "*A critical account of the Śrīvaishnavas*," which, we are glad to note, the University of Madras has undertaken to publish, tells us that Tiruppānālṅvār must be placed between Tirumangaiālṅvār and Tondaradip-pōdiālṅvār, the former of whom was a contemporary of Nandivarman Pallavamalla (A.D. 717-779) and of Dantivarman (A.D. 779-830). There is nothing to prevent our extending the search for Tiruppānālṅvār's date, if we please, to centuries earlier than the 7th, but we shall first exhaust the more probable period, i.e., that since the 7th century A.D. Between A.D. 700 and A.D. 1201 there are only nine Durmāti years (A.D. 721, 781, 841, 901, 961, 1021, 1081, 1141 and 1201) and we may easily satisfy ourselves from the present *Ephemeris* that the only date corresponding to either of the alternatives for

Tiruppānālvār, always excluding the Kaliyuga year from consideration, is A.D. 841, Wednesday 2nd November (=10th day of Kārttigai solar month), on which day Margaśīra śukla 15 or full moon tithi ended at 90 of the day while Nakshatra "Rohini" began at 94, ending at 91 next day.

6. There is no date during this period, satisfying the alternative "Durmati Kārttigai solar month, Bahula 2, Rohini, Wednesday" (Wednesday, 25th October, A.D. 1021, satisfies all conditions except Kārttigai month, for it was the 30th day of Tula or Aippaśi month).

7. The next question is, is it probable that the chronicler of Rāmānuja's time (12th century A.D.) had in mind either the A.D. 841 date for Tiruppānālvār, or an earlier date, Wednesday, 15th November, A.D. 601, when Mārgasīra śu. 15 and "Rohini" ended respectively at 87 and 77, or still earlier dates which may, with some trouble, be proved to correspond to the given details? If he had any of these dates in his mind, he need not have written at random, as he evidently did, "Kaliyuga 120 or 342." In dealing with such dates, we no doubt dismiss the Kaliyuga years readily from consideration, because really it was not usual at any time during what we may call the epigraphical period (i.e., the period down to the 14th century A.D. in which epigraphy is almost our only safe guide in chronology) to quote Kaliyuga years; and of course Kaliyuga 342 or 2800 B.C. is too early for citations of week-days or solar months, apart from the impossibility of any such date having been preserved by record or tradition for 4,000 years from 2,800 B.C. to A.D. 1200.

8. Supposing the date of birth of Tiruppānālvār was the earliest we found above, viz., 15 November A.D. 601, and supposing further that the details of vāra, tithi and nakshatra were handed down regularly from that date to that of the 12th century chronicle in which we find them recorded for the first time, then it is possible to assume that the chronicler, not being able to tell in what Durmati the Ālvār was born, fixed on a Durmati 4,020 years before his own time, instead of a Durmati, only 600 years before. If we make this assumption, in which there is nothing intrinsically absurd, then we may make a similar assumption in regard to other Ālvār dates also, and obtain the following dates, as set out in column 3 of the statement below:—

Serial number in table at the end of this paper.	Names of Ālvārs.	Dates which more or less satisfy critical considerations.	Remarks.
4	Tirumalīśai Ālvār	A.D. 720, 2 January	Mr. Gopinatha Rao assigns this Ālvār to middle of 7th century A.D.
5	Periyālvār	A.D. 725, 27 May	According to Mr. Gopinatha Rao, middle 9th century A.D.
6	Āṇḍāl	A.D. 776, 25 June	Do. do.
7	Tirumangaiālvār	A.D. 776, 31 October	Mr. Gopinatha Rao accepts this.
8	Kulaśekharaālvār	A.D. 767, 12 February	First-half of 9th century according to Mr. Gopinatha Rao.
9	Tondaradippudiālvār	A.D. 787, 11 December	Mr. Gopinatha Rao accepts this.
10	Maḍḍirakkaviālvār	A.D. 797, 14 April	Do.
11	Nammālvār	A.D. 798, 4 May	Do.
12	Nāthamuniālvār	A.D. 823, 27 May	Last quarter of 9th and major portion of 10th century A.D. (Gopinatha Rao).
13	Uiyakkonḍar	{ A.D. 828, 17 April, or A.D. 848, 23 March.	Most critics would prefer the date in A.D. 601 because the Ālvārs preceded Āchāryas like Nāthamuni and Uiyakkonḍar.
14	Tiruppānālvār	{ A.D. 601, 15 November, A.D. 841, 2 November.	
15	Ālavandar	{ A.D. 918, 26 June (born). A.D. 1028, 28 April (died).	Not a single date in any Virodhi Samvat from A.D. 749 to A.D. 1409 suits the given details: the first suitable date is A.D. 1470, 14 February.
16	Maṇakkālnambi	A.D. 929, 25 February (but this was 22 days short of Virodhi Samvat).	
17	Periyanambi	A.D. 937, 11 October	Either Tithi śu. 5 given in the traditional account is an error for śu. 12 or Mārgaśīra is an error for Tula.
18	Rāmānuja	A.D. 1017, 4 April (born). A.D. 1137-8 (died).	

9. We seem to have got hold of a number of useful dates which also are more or less likely to satisfy the critics; but somehow we feel that we are not so sure of our ground with the early Ālvārs as we are with Rāmānuja and his immediate predecessors; this is because between Rāmānuja and the Āchāryas who immediately preceded him there are a number of chronological links, whereas our date for Tiruppānālvar for instance depends on a single chronological clue, the *Ephemeris*. Change any of the details of such a date, e.g., cyclic year, vāra, tithi, or nakshatra, and we may have to shift the date itself by hundreds of years. We become diffident as we reflect that for the details of so many dates of the 7th and subsequent centuries we depend, not upon contemporary records, but upon records which could not have come into existence much before the 12th century A.D. Our confidence in the complete accuracy of these details which we have relied on so far, is not strengthened, but rather the reverse, when we find, as we shall do presently, that for the Āchāryas subsequent to Rāmānuja certain minor calendrical details in the traditional account are positively untrustworthy although we are able to supplement them by information obtained from other sources. For instance

Serial number.	Names of Āchāryas.	Calendrical details according to popular account	Defect, error or irregularity.
19	Mudaliyāṇḍan	The calendrical details, are Sri-mukha, Chittirai 18, śu. 6, "Punarvasu," Monday or "Prabhava; Chittirai 25, śu. 10, Punarvasu, Monday.	This exact combination does not occur even once between A.D. 700 and A.D. 2000.
20	Kurattālvār	Kaliyuga 4181 Pramodhuta, Tai. śu. 5; "Hasta" Sunday. A.D. 1080-91; 12 Jan. A.D. 1091 or A.D. 1030-81, 16 Jan. A.D. 1031.	A combination of śu. 5 with "Hasta" in Tai month is an impossibility. We are obliged to substitute "ba. 5."
21	Anandālvār	Kaliyuga 4154, Vijaya, Chittirai, 10 "śu. 15"; "Chitrā," Friday A.D. 1048, 1 April.	If we follow up the other details, then "Vijaya" and K.Y. 4154 must be an error for "Śarvadhārī," and K.Y. 4149.
22-23	Peria Bhattar, Srirāmpillai, twin sons of Kurattālvār.	Kaliyuga 4175; Ānanda; Vaigāsi; śu. 15, "Anurādhā" Wednesday, Variant "Sabbhakrit" A.D. 1063 (=K.Y. 4164, Sabbhakrit), Wednesday 14 May.	The correct details are found in a year corresponding, not to Ānanda, or Sabbhakrit, or K.Y. 4175, but to K.Y. 4164 = Sabbhakrit.
24	Māṇavālamūnigaḷ	Kaliyuga 4471, Sādharaṇa; Aiyppai, "Mūlā," Friday, Thursday, 24 Oct. A.D. 1370.	The correct week-day is Thursday not Friday. We should not have been able to correct the error if we had not been sure of the Kaliyuga and cyclic years, 4471 and Sādharaṇa.

10. The above are not cases purposely picked out from a number, but simply the records of the six immediate followers of Rāmānuja. Everyone of these recorded dates is, as we have just seen, erroneous: and we are able to rectify them merely because we are confident of the accuracy of certain other details included in the same records. In the records of the earlier Ālvārs we have no such means of correcting errors. Proceeding from the known to the unknown, we reason that we are not justified in pinning our faith absolutely on the details of dates (even after excluding the Kaliyuga years from consideration) which are contained in the popular accounts.

11. The last and most difficult question still remains to be answered, how were the details of birth of so many persons who were all alike *sannyāsins*, and who were drawn from different stations in life, *originally ascertained*? The case of the early Ālvārs is different from that of Rāmānuja, a voluminous writer and a famous teacher and preacher, who died early in the twelfth century A.D., full of years and full of honour, and upon whose death his admirers and followers would be eager to gather up every scrap of information about his early career, in order to satisfy the natural curiosity of their posterity. We may, if we please, assume for the sake of argument that each of the early Ālvārs may have been as famous in his day as Rāmānuja was in his; but the same stimulus of curiosity could not have existed in the early days of Vaishnavism as it did in the twelfth century A.D. and supposing it did exist, it could not have been as easy to satisfy it in the case of a dozen different Ālvārs as it turned out to be in the unique case of Rāmānuja.

The demand for such information would generally be in proportion to the means available for supplying it; and in early times there would be no means at all of supplying information as to the exact day of even a *great* man's birth. If we take the cases of the founders of the world's three greatest religions, we know that the followers of Buddha, Christ and Mahomet were alike actuated by an intense desire to hand down to posterity the essential details of their masters' lives: and as a result of this desire, we have more or less exact information as to the day of death of each of the three founders: but in the case of all three, information as to the days of their birth is utterly lacking (see as to Christ, page 127 *supra*, paragraph 310, and as to Buddha, paper No. iv on the subject in the present appendix: the day of Muhammad's death was the 7th June, A.D. 632; it is only known that he was either 63 or 65 years of age at the time of his death). In India, at the present time, and for some hundreds of years past every Hindu has, or has had, a recorded horoscope; but this was not the case even in India in the sixth or seventh century A.D., since no horoscope of any person of that time has come down to us, with the possible exception of Śāṅkara's horoscope (see page 122, paragraph 301 *supra*), but such an exception only proves the general rule. In ancient Rome where every great man found a biographer, the year of birth was usually stated as So-and-So's consulship: but not till we reach the age of parish registers and baptismal records were means forthcoming in Europe even for an industrious biographer to trace the day when a celebrated person first saw the light. In our own day, only royal personages, whose coming into the world is announced through Reuter, have a chance of having the hour of their birth recorded; while it is a privilege of being born in Bharatavarsha (India) that the poorest person there nowadays may claim to have been born so many hours, minutes and seconds after sunrise on a particular day. In the case of the Ālvārs, apart from the notoriously humble origin of some of them, there were special difficulties in the way of any one wishing to ascertain the day of their birth. They were sanyāsins and a sanyāsin cannot be questioned as to his pūrvāśrama or the time before he assumed the religious garb, as he is supposed not to remember that time any more than his previous birth. The veil of obscurity surrounding the days of birth of these Ālvārs was, therefore, we may take it, absolutely impenetrable, and we may extend this observation to Rāmānuja himself in whose case the utmost we can concede is that some biographer of his, probably in the twelfth century A.D. may have retrospectively calculated the day of his birth and in so doing allotted to him 120 years as his span of life, the same having been done in the case of Ālavandār; (other Ālvārs who had lived in more spacious times had had 200 and 300 years allotted to them by biographers who were not worried with historical considerations such as in the case of Rāmānuja clogged the flight of the imagination).

12. We reach a conclusion which may be seriously disappointing to the majority of readers, but which is the only one that historical criticism will warrant; viz., that when the biography of Rāmānuja began to be composed, public curiosity was equally exercised about the lives of the Ālvārs and the early Āchāryas, and that then and not till then, i.e., not till the twelfth or thirteenth century A.D. were such meagre details as tradition had handed down amplified for the first time into calendrical shape. The aim of the Indian biographer would in such cases be to fill out the calendrical details so as to attain at least a passable standard of verisimilitude. The combination of a tithi, nakshatra and week-day cannot be invented offhand, like "12th February 1895"; and the biographers of the Ālvārs naturally thought that any details taken from contemporary panchāngas would suit previous times also. If this was the method adopted, we should find all the details of the Ālvār dates in one subsequent period of 60 to 100 years, the period for which panchāngas would ordinarily be available at any time. How far this hypothesis is tenable in the case of the Ālvārs and the earlier Āchāryas, the reader may judge for himself by examining the contents of column 5 of the table at the end of this paper, which is also partially reproduced below, and which gives the years, in the period between A.D. 1130 and A.D. 1260, when the Ālvār details were repeated, according to the *Ephemeris*. We have, first of all, the year A.D. 1139 the very next year after Rāmānuja's death, when people's minds would naturally be set

thinking about the dates of the early Ālvārs as well; in the *Ephemeris* for this very year A.D. 1139 will be found the somewhat crude details adopted in the traditional account for the first three Ālvārs, Poygaiālvār, Pūdatālvār and Peyālvār; namely,

Aippāsi śu. 8, "Śravana," Tuesday for the first Ālvār (3 Oct. 1139)
Do. 9, "Dhanishṭha," Wednesday for the second Ālvār (4 Oct. 1139)
Do. 10, "Satabhishaj," Thursday for the third Ālvār (5 Oct. 1139)
all in the cyclic year Siddhārthi (= A.D. 1139-40)

Tirumaliśaiālvār: the date, 4 January A.D. 1200, suits the traditional details better than the eighth century date 2 January A.D. 720; because the former is ba. 1, as required, and the latter is only ba. 2.

Periyālvār and Āṇḍāl: The date, A.D. 1256, 27 June, suits Āṇḍāl better than the eighth century date, A.D. 776, 25 June, because the former was Śu. 4 as stated in the popular account whereas the latter was Śu. 5.

Kulaśēkhara Ālvār: The date, A.D. 1208, 31 January, is in Prabhava samvat, as stated in the popular account, whereas the eighth century date, 12 February A.D. 767, was in Parābhava samvat.

Madhurakkavi: There are two dates, A.D. 1217, 21 April, and A.D. 1220, 17 April, corresponding to the two samvats, Īśvara and Vikrama appearing as variants in the traditional account, whereas only the Īśvara date can be found in the eighth century 14 April A.D. 797.

Nummālvār: Just as there is a date in Bahudhānya A.D. 798, 4 May, there is another in Bahudhānya, A.D. 1218, May.

Mudaliyāṇḍān: The date, Monday 9 April A.D. 1033 (= Śrīmukha) ignores śu. 6 and "Punarvasu," whereas these details could very well have been suggested in A.D. 1266 (= Kshaya) when śu. 6 and "Punarvasu" joined on Monday 12 April which was 18 Chittirai. Apparently Śrīmukha was the cyclic year in which Mudaliyāṇḍān was born, but the details śu. 6 and Punarvasu were suggested to the biographer by a panchāṅga of the year A.D. 1266.

Serial No.	Names of Ālvārs.	Details of date given in the popular accounts.	Details of date verified from the Ephemeris so as to suit the conclusions arrived at by historical critics	Details of date furnished by the Ephemeris in confirmation of the hypothesis that the details were copied from contemporary panchāṅgas in 12 or 13th cent. A.D.	Remarks.
(1)	(2)	(3)	(4)	(5)	(6)
1	Poygaiālvār	Dvāpara 862,900, Siddārthi, Aippasi, śu. 8, "Śravana," Tuesday.	Siddārthi = A.D. 719. The choice of three successive tithis and week-days indicates the fictitious character of these dates of birth.	In A.D. 1139, śu. 8, 9 and 10 in Aippasi month fell respectively on Wednesday, Thursday and Friday. In A.D. 1139 (= Siddārthi), śu. 8, 9 and 10, and nakshatras Śravana, Dhanishṭha and Satabhishaj fell on Tuesday, Wednesday and Thursday, as required in column (2). Curiously A.D. 1139 was the year after Rāma-nuja's death. See No. 18 below.	Mr. Gopinatha Rao suggests middle of 7th cent. A.D.
2	Pūdatālvār	Dvāpara 862,900, Siddārthi, Aippasi, śu. 9, "Dhan," Wednesday.			
3	Peyālvār	Dvāpara 862,900, Siddārthi, Aippasi, śu. 10, "Satab," Thursday.			
4	Tirumaliśai Ālvār.	Dvāpara 862,900, Siddārthi, Tai, ba. 1, "Magha," Tuesday. Variants: "ba. 10" and "Thursday."	Tuesday, 2nd January A.D. 720, was ba. 2 (not ba. 1) and nakshatra "Magha."	A.D. 1200, Tuesday, 4th, January; nakshatra "Magha" began on Tuesday at 98 and ba. 1 ended at 27.	Mr. Gopinatha Rao assigns this Ālvār also to middle of 7th cent. A.D.

Serial No.	Names of Ālvāra.	Details of date given in the popular accounts.	Details of date verified from the Ephemeris so as to suit the conclusions arrived at by historical critics.	Details of date furnished by the Ephemeris in confirmation of the hypothesis that the details were copied from contemporary panchāngas in 12th or 13th cent. A.D.	Remarks.
(1)	(2)	(3)	(4)	(5)	(6)
5	Periyālvār ...	Kaliyuga 46, "Krodhana" Āṇi; śu. 11, Svāti, Sunday. Additional information is supplied in another manuscript that he lived 67 years.	Sunday, 27th May, A.D. 725 (=Krodhana); '38; '66.	A.D. 1205, Sunday, 29th May (=4 Āṇi); f.d.t. 47; f.d.n. 76.	According to Mr. Gopinatha Rao Periyālvār and Āṇḍal were contemporaries of a certain Māravarman Srivallabha, mid. 9th cent. A.D.
6	Āṇḍal ...	Kaliyuga 97, "Nala," Āṇi; śu. 4 "Per Phalg," Tuesday.	A.D. 776, Tuesday, 25th June; f.d.t. '04; '47. Though 5th tithi ended at '04 on Wednesday it was not the 4th that was current on Tuesday, but the 5th which had begun on Monday.	A.D. 1256; Tuesday, 27th June (=1 Āṇi); '74; f.d.n. '34.	
7	Tirumāṅgai Ālvār.	Kaliyuga 397, Nala, Kārttigai, śu. 15, "Kṛittikā," Thursday.	A.D. 776, Thursday, 31st Oct.; '62; '75.	A.D. 1196, Thursday, 7th November; '73; '61.	
8	Kulaśekhara Ālvār	Kaliyuga 27, Māsi, śu. 12, "Punarvasu," Thursday, Prabhava, Variant: "śu. 10."	A.D. 767 (=Parābhava), Thursday, 12th February; f.d.t. 27; f.d.n.	A.D. 1207-08 (=Prabhava), Thursday, 31st January 1208 (=Māsi) '64; '72.	
9	Tondaradypodi Ālvār, Kaliyuga 208.	Kaliyuga 208, Prabhava, Mārgaśi, ba. 14, "Jyeshtha," Tuesday.	A.D. 787-88 (=Prabhava); On Tuesday, "Dec. A.D. 787, Mārgaśi, ba. 18 as well as nakshatra Jyeshtha" commenced, ending next day at '34 and '68 respectively.	A.D. 1207-08 (=Prabhava), Tuesday, 18th December 1207; f.d.t. '90; f.d.n. '07.	According to Mr. Gopinatha Rao, this Ālvār and Tirumāṅgai Ālvār were co-eval, Tiruppālvār being between them: Tirumāṅgai was contemporary with Nandivarman Pallavamalla, A.D. 717-779, and of Dantivarman, A.D. 779-830.
10	Madhurarakkavi Ālvār.	Dvāpara 863, 876; "Īvara," Chittirai, śu. "Chitra" Friday. Variants: śu. 10 and śu. 14, "Vikrama."	A.D. 797 (=Īvara), Friday, 14th April; śu. 14 f.d.t. '03; Chitrā ended at '62.	A.D. 1217 (=Īvara), Friday, 12 Ap., śu. 14, f.d.t. '22; Chitra ended on Friday at '57. A.D. 1220 (=Vikrama); Friday, 17th April, śu. 14; f.d.t. '34; '93.	
11	Nammālvār ...	Pramāthi, Vaiṣāṣi 12; śu. 15; "Viśākha," Friday; 43rd day of Kaliyuga. Variant: Bahudhānya, Vaiṣāṣi month, Vasantaritu, poornami.	A.D. 798, Friday, 4th May.	A.D. 1218-19; Friday 11th May (=11 Vaiṣāṣi); f.d.t. '07; '11.	Mr. Gopinatha Rao notes that that the date A.D. 798 for Nammālvār falls in the reign of Parāntaka Pāṇḍya and before A.D. 908 the date of Chōḷa Aditya.
12	Nāthamunigal ...	Kaliyuga 3224, 3324, etc., Sobhakrit or Subhakrit, Āṇi, śu. 15, "Anurādhā," Wednesday. Variant: Āṇi 1.	A.D. 823 (=Sobhakrit); Wednesday, 27th May (=5 Āṇi); f.d.t. '55; '06.	A.D. 1182 (=Subhakrit), Wednesday, 19th May (=25 Vaiṣāṣi, not yet Āṇi); '85; '32.	
13	Uiyākoṇḍār ...	Kaliyuga 3027 or 3927, Parābhava, Chittirai, śu. 15, "Chitra," Friday. Variants: "Pūrṇamāṣi" and Kṛittikā."	A.D. 828 (Kṛitaka, 2 years after Parābhava), Friday 17th April; '99 (ba. 15 not śu. 15); nakshatra "Kṛittikā" began at '07 of the day. A.D. 848 (=Prabhava, not Parābhava), Friday, 23rd March; nakshatra "Chitra" was current throughout Friday and came to end at '02 on Saturday, A.D. 920 (=Vikrama), Saturday, 22nd April.	A.D. 1186 (=Parābhava), Friday, 4th April (=11 Chittirai); f.d.t. 70; f.d.n. 88. [There was a lunar eclipse next day.]	According to Mr. Gopinatha Rao it is very probable that Nāthamunigal flourished in the last quarter of the 9th and major portion of 10th century. Details of date have evidently been much altered from manuscript to manuscript.
14	Tiruppālvār ...	Kaliyuga 342 (or 120), Durmati, Kārttigai, ba. 2, Rohini, Wednesday. Variant: "Purnima."	A.D. 801, Wednesday, 15th November; '87; '77; or A.D. 841, Wednesday, 2nd November (=10 Kārttigai), Mārgaśi, śu. 15 ended at '40 and nakshatra "Rohini" began at '94, ending on Thursday at '91.	A.D. 1261 (=Durmati), Wednesday, 9th November (=13 Kārttigai); ba. 2 began at '64, ending next day at '71; "Rohini" ended at 52.	

Week-day does not suit A.D. 901, 961, 1021, 1081, 1144, 1201. According to Mr. Gopinatha Rao, this Ālvār was between Nos. 7 and 9. In 801 there is a date, none in 721, 781.

Serial No.	Names of Ālvārs.	Details of date given in the popular accounts.	Details of date verified from the Ephemeris so as to suit the conclusions arrived at by historical critics.	Details of date furnished by the Ephemeris in confirmation of the hypothesis that the details were copied from contemporary pañchāngas in 12th or 13th cent. A.D.	Remarks.
(1)	(2)	(3)	(4)	(5)	(6)
15	Ālavandār ...	Born Kaliyuga 4017, Dhātu, Ādi, śu. 15; Uttarāshāḍha, Friday. Died on 6th Vaiṣāḥ, "Śravana" day; no week-day.	A.D. 918 (= Bahadhānya, not Dhātu Samvat), Friday, 26th June. Date of death, A.D. 1038, Friday, 28th April.	A.D. 1216, Friday, 1st July (= 5 Ādi), '05; '48.	According to Mr. Gopinatha Rao, Ālavandār was born sometime after Nāthamuni's death.
16	Maṇakkāl Nambi.	Kaliyuga 3970 (or 3900, 3910 or 4080), Virōdhi, Māsi, śu. 14, "Maghā," Wednesday.	A.D. 929-930 (= Virōdhi); Māsi, śu. 14 joined with nakshatra "Maghā" on Monday (not Wednesday), 15th February A.D. 930. A.D. 929, February 25th, Wednesday which was 22 short of Virōdhi.	A.D. 1230 (= Virōdhi), Wednesday, 30th January (= 7 Māsi); purṇima, not śu. 14 ended at '81 and "Maghā" at '81.	No suitable week day in A.D. 740-80, 809-10, 869-70, 984-90, 1049-50, 1109-10, 1169-70, 1249-50, etc. In fact not a single date from 749-50 to 1409-50 suits exactly A.D. 1470, Wednesday 14th, Friday (= 20 Māsi), '80; f.d.n. 28 alone suits. Tithi śu. 5 cannot join with nakshatra Jyeshtha in Mārgaḥi month.
17	Periya Nambi ...	Kaliyuga 4098; Hēvilambi; Mārgaḥi, śu. 5; "Jyeshtha," Wednesday.	A.D. 937 (= Hēvilambi); on Wednesday, 11th October, śu. 4 ended and śu. 5 commenced at '56 of the day while nakshatra Jyeshtha ended at '21 on Wednesday. śu. 5 ended next day at '64. The month was Tula, not Mārgaḥi.	In A.D. 1237 (= Hēvilambi), on Wednesday, 16th December (= 21 Mārgaḥi), "Jyeshtha" commenced at 18, but tithi was śu. 12 not śu. 5.	
18	Rāmānuja ...	Kaliyuga 4118, Piṅgala, Chittirai 12, śu. 5; "Ārdra," Thursday. Date of death of Rāmānuja is given by the chronogram <i>Dharmānashṭa</i> = Śaka 1059 (= A.D. 1137-8).	A.D. 1017, Thursday, 4th April (= 13 Chittirai); śu. 5 ended at 17 of day and nakshatra "Ārdra" at '75 of day.	According to Mr. Gopinatha Rao, Rāmānuja when two-thirds of his great work <i>Mahābhāṣya</i> was finished escaped from persecution by the Chōla king Kulōttunga I and sought refuge in the Hoysala country.	
19	Mudaliyāṇḍān ...	Śrīmukha, Chittirai 18; śu. 6, "Punarvasu," Monday.	Monday, 9th April, A.D. 1038 (= Śrīmukha) was 18 Chittirai but it was not a day of śu. 6 or "Punarvasu."	Chittirai 18, śu. 6, Punarvasu, Monday, is a possible combination but there is no actual example of it in a Śrīmukha year for 1,300 years. One actual instance in another year is A.D. 1266 (= Kāṣya); Monday, 12th April (= 18 Chittirai); '58; '83. See paragraph 12 of the paper.	According to tradition Mudaliyāṇḍān, the nephew of Rāmānuja, was born when the latter was 19 years of age and day of month's week-day does not suit in 733, 793, 858, 913, 1033, 1153, 1213, 1273, 1333, 1393, etc., up to A.D. 1993, śu. 10 can combine with Punarvasu only in Māsi, Panguṇi, while ba. 10 can concur with Punarvasu only in Āvaṇi.
20	Kurattālvār ...	Prabhava, Māsi 25; ba. 10, "Punarvasu," Thursday. Prabhava, Chittirai 25, śu. 10, "Punarvasu," Thursday. Note.—No Kaliyuga year is quoted.	In A.D. 1041 (= Vṛiṣha), on Thursday 9th April, which was 18 Chittirai, śu. 6 joined with Punarvasu but the cyclic year was Vṛiṣha not Śrīmukha.	A.D. 1090-1091 is a calendrically correct year for the birth of Kurattālvār, but according to Mr. Gopinatha Rao, Kurattālvār and Periyarāmbi had their eyes graced out by the Chōla king Kulōttunga I in Kalyāṇṭi = A.D. 1078-79. Moreover tradition has it that Kurattālvār was 3 years older than Mudaliyāṇḍān. The dates of their birth in column (8), viz., A.D. 1081 January and April 1083, are supported by tradition, though not by the calendrical details furnished by the traditional account. See paragraph 12 of the paper.	

Serial No.	Names of Ālvārs.	Details of date given in the popular accounts.	Details of date verified from the Ephemeris so as to suit the conclusions arrived at by historical critics.	Details of date furnished by the Ephemeris in confirmation of the hypothesis that the details were copied from contemporary panchāṅgas in 12th or 13th cent. A.D.	Remarks.
(1)	(2)	(3)	(4)	(5)	(6)
21	Ānandālvār ...	Kaliyuga 4154, Vijaya, Chittirai, 10, śu. 15, "Chitra," Friday.	A.D. 1046-49 (= Sarva-dhāri, which is 5 years earlier than Vijaya); Friday, 1st April (= 10 Chittirai); '68; '44.	Note error in cyclic year in cases 21, 22 and 23, and see paragraph 12 of the paper. Mr. Gopinatha Rao remarks that	
22, 23	Periya Bhattar and Śrīrāmpillai, twin sons of Kūṛattālvār.	Kaliyuga 4175, Ānanda, Vaigāṣi, śu. 15, "Ānuraḍha," Wednesday. Variant: Subhākrit.	In A.D. 1068 (= Sobakrit, Kaliyuga 4184), on Wednesday, 14th May, śu. 15 commenced ending next day at '13, while nakṣatra Ānuraḍha came to end at '65 on Wednesday.	Bhattar must have been over 88 at the time of his death, A.D. 1165; that Nanjiyar succeeded him, to be succeeded in turn by Nampillai or Lokāchārya: the latter's successor was Pillai Lokāchārya, in whose time the Muhammadans invaded the south of India.	
24	Maṇavālamūnigal.	Kaliyuga 4471, Sādhāraṇa, Aippaṣi, "Mūlā," Friday.	In A.D. 1270 (= Sādhāraṇa), on Thursday (not Friday), 24th October, śu. 4 and nakṣatra "Mūlā" ended both at '62 of the day.	Note error in week-day and see paragraph 12 of the paper.	

APPENDIX (vii)

THE USE OF CYCLES OF RECURRENCE IN INDIAN CHRONOLOGICAL INVESTIGATION.

[Paper read before the Second Oriental Conference, Calcutta, 30th January 1922.]

The most interesting and at the same time the most complicated problems in chronological investigation may arise when we wish to ascertain the exact position of the sun or moon or one or more of the planets on an ancient date or to verify an alleged ancient eclipse. The problem which confronts the chronologist in practice is usually the converse of this. That is, he may have come across an ancient record indicating that the sun or moon or one or more of the planets stood in a particular position or that there was a solar or a lunar eclipse, and he may wish to make use of these astronomical facts to discover, establish or verify an ancient date.

2. The following are instances of such problems :—

(1) Vālmiki's Rāmāyana states that Rāma was born on the 9th tithi of the lunar month Chaitra, when five planets were in exaltation, and these planets are assumed to be the Sun, Mars, Jupiter, Venus and Saturn. The houses of exaltation of these five planets are Mēsha (or Aries), Karkāṭaka (or Cancer), Mīna (or Pisces) and Tula (or Libra). The chronologist may put himself the question; were these planets at any time in the positions named, on the 9th tithi of Chaitra, and if so when? Whether the casting of such a horoscope was possible at any date which might be assigned on general considerations to Rāma's birth, is a distinct question which the chronologist may have to answer by way of supplementing his answer to the first question. (*Indian Chronology*, Second Edition, pages 109—122).

(2) When Sankara was born, four out of the same five planets, i.e., all excepting Venus, are supposed to have been in exaltation. Nobody doubts but that the casting of a horoscope was possible when Sankara was born but the other question corresponding to that raised by Rāma's horoscope, viz., for what date Sankara's horoscope was true, must be answered by the chronologist. (*Indian Chronology*, Second Edition, pages 109—122.)

(3) Various collocations of the planets are referred to in the Mahābhārata as having been noticed at the time of the great battle in the months of Kārttika-Mārgaśīra: (i) Were these observations possible at any date which could be assigned to the Mahābhārata? (ii) Are these so-called observations consistent with one another? (iii) Was any particular alleged observation, e.g., that about Mars retrograding in Maghā nakshatra in the month of Kārttika, astronomically impossible, and what bearing has this fact on the other observations supposed to have been made at the same time? (iv) Can a definite date be assigned to any of the collocations?

These are a few of the many tantalizing issues raised by the astronomical references in the Mahābhārata. (*Indian Chronology*, Second Edition, Appendix, Paper V.)

(4) An ancient Chinese observation is said to refer to five planets, the Moon, Mars, Mercury, Jupiter and Saturn, which were in the same constellation "Shi" (perhaps Krittikā) between 250 B.C. and 2400 B.C. Was there such a conjunction? Did it happen more than once during the period in question? And if it happened only once, would that enable us to fix the date? The Chinese civilization is, by all accounts, very ancient, and for aught we know, such an observation may well have been made at the time alleged, and it would be interesting if the chronologist could discover, establish, or verify, the date. (*Indian Chronology*, Second Edition, pages 123—124.)

(5) Coming to times more distinctly modern, an ancient Jewish tradition connected the birth of the Messaiah with a conjunction of Jupiter and Saturn. Was there such a conjunction at any date which could with any probability be assigned to the birth of Christ, and would such a conjunction throw a light on the state of the heavens at the time of the birth of Christ, as narrated in St. Luke's Gospel? (*Indian Chronology*, Second Edition, pages 125—127.)

(6) The Jews in Cochin on the West Coast of the Madras Presidency are in possession of an ancient copper-plate grant which is still shown to visitors at the Jewish synagogue in Cochin, and their belief is that the grant was made by a king of Cochin called Bhaskara Ravi-Varman in the 1st century A.D. The date of the copper plate is the 2nd year opposite the 36th year. This so-called opposition of years is itself a chronological problem. Fortunately within the last few years of the twentieth century A.D., other copper-plate grants by a king or kings bearing the same name Bhaskara Ravi-varman have come to light in a part of the country not far from Cochin and they refer to a position of Jupiter in Tulā rāsi along with other astronomical details. The chronologist may feel disposed to review the Cochin Jews' grant in the light of these positions of Jupiter, and then he may have to relegate it to the 11th or 12th century A.D. (*Indian Ephemeris*, Volume I, Part II, page 120.)

(Travancore
Archæologi-
cal Series,
Vol. II, No.
7.)

(7) Lastly, in the very heart of Tamil Sangam literature, where one would least expect it (if, according to the late Mr. Kanagasabhai Pillai in his *Tamils 1800 years ago* and the present Dr. S. Krishnaswami Ayyangar in his *Ancient India*, that literature is stamped with clear reminiscences of the 1st and 2nd centuries A.D.), there is a complete horoscope (see *Paripādal*, Canto XI), giving the positions of Sun, Moon, Mars, Mercury, Jupiter, Venus and Saturn on a particular day which was also a day of Lunar Eclipse early in the morning. Without reference to theories about the time of appearance of the Sangam literature, the chronologist may attempt to locate this horoscope in time. (*Indian Chronology*, Second Edition, pages 98—109.)

3. Solutions of problems (1) to (6) have been presented to the public by various writers, but so far as I am aware, no one has presented a rigorous *method* of solving them such as will satisfy a mathematician and at the same time one which anybody could study and thereafter apply to a criticism of the solutions of different critics, so as to be able in turn to criticize or challenge them. In this century when even the Newtonian law of gravitation has been challenged, it has become incumbent on an author voluntarily to provide what are euphemistically termed *pros* and *cons*, i.e., every facility for the dissection and public criticism of his scientific conclusions. In the Second Edition of "*Indian Chronology*" I have fully stated my method of solving such problems.

4. There is one essential difference between ordinary or civil chronology and those extraordinary chronological investigations with which we are now concerned. The ordinary civil chronology of all nations, except the Hindus, occupies itself with the mean or average movements of the two heavenly bodies which among all peoples and at all times have served as the measures of time, the sun and the moon: in India alone, in the period since about A.D. 500 the actual positions, rather than the mean, of these heavenly bodies as well as of others have to be taken into account. In the exceptional chronological investigations we are now discussing the *actual* positions of the sun, moon and planets are in question, and it is in the determination of *actual* positions, without actual calculation, that we find cycles of recurrence to be of real practical value. In India owing to the peculiarity noted above, the actual positions of the heavenly bodies dealt with, whether sun, moon or the planets, are the normal topic of chronology and the only way of determining those positions, if we wish to keep in the background the details of astronomical calculation which repel even investigators, is by using cycles of recurrence. The very long cycles of 432,000 years and 4,320,000 years which are used in Indian astronomical works are not useful for our purpose, and indeed they are meant for a different purpose altogether.

5. For tithis and nakshatras, for which Indian chronology postulates minute accuracy as regards ending moments, we have to employ quite a number of cycles of recurrence :—

For the mean ending moment of tithis we use successively—

(A) 64 tithis = 63 days — .001 day.

(B) 703 tithis = 692 days + .0001 day.

(C) 9,203 tithis = 9,059 days + .00002 day.

For the moon's tithi equation we use—

(A) 28 tithis = 1 anomalistic month — .007 day.

(B) 3,779 tithis = 135 anom. months — .001 day.

For the mean ending moments of nakshatras, we use—

(A) 84 nakshatras = 85 days + .0008 day.

(B) 1,343 nakshatras = 1,359 days + .0003 day.

For the moon's nakshatra equation we use—

(A) 354 nakshatras = 13 anomalistic months + .008 day.

(B) 3,431 nakshatras = 126 anomalistic months + .003 day.

After 550 years less 19 days, the mean and actual ending moments of nakshatras and the nakshatra equation of every successive nakshatra will be the same; the serial number of each nakshatra being + 4, and week-day + 1.

6. So far as can be perceived, there is no similar cycle connecting the mean ending moment of a tithi and the two equations which, in Indian astronomy, determine its actual ending moment. The cycles defined above enable us, however, to write down, or print, successively for any number of years, the mean ending moments and the two equations of successive tithis; the labour saved in this way enables us to calculate the actual ending moments of successive tithis and nakshatras for ten years in a single day, or for 1,500 years in 150 days, whereas the ordinary Indian panchanga-maker spends not less than a whole month in calculating the tithis of a single year and he spends on the whole three months for preparing a single year's panchanga. (*Indian Ephemeris*, Volume I, Part II, page 2.)

7. In regard to planets, the Indian system enables the chronologist to obtain the actual positions of planets practically for all time with sufficient accuracy for his purposes, by using appropriate cycles, but neither the fact that such cycles exist nor the possibility of using them for arriving at the actual positions of planets on any ancient date has, so far as I am aware, been ever brought to public notice, any more than the possibility of calculating by means of appropriate cycles the actual ending moments of tithis and nakshatras for any date past, present or future. It is for this reason that I crave the indulgence of the conference for my present note. As in the case of tithis, the Indian system uses only two equations for determining the actual geocentric place of a planet, and this process gives results which seldom differ from the absolutely correct result by as much as two degrees. The two equations depend, the one on the mean longitude of the planet, and the other on the mean longitude of the sun for the moment in question. (This statement overlooks certain minor details of calculation but it is in the main correct.) By using certain long period cycles for the different planets (363 years for Mars, 355 years for Mercury, 605 years for Jupiter, 235 years for Venus, 383 years for Saturn, and 1,711 years (less two days) for Rāhu or the moon's ascending node), we are able to set down at once without calculation the date when the same planet was in the same position any number of years before the present time.

8. For determining the movements of the several planets during the single cycle, we do not need to calculate the movements of Mars for 363 years, of Mercury for 355 years, of Jupiter for 605 years, of Venus for 235 years, of Saturn for 383 years and of Rāhu for 1,711 years. Each one of these long cycles is connected with certain shorter cycles which have been known for a long time (Mars, 79 years; Mercury, 46 years; Jupiter, 83 years; Venus, 8 years; Saturn, 59 years, and Rāhu, 18 years and 10 days) in such a way that out of each shorter cycle the corresponding longer one may be evolved by a simple arithmetical process. The exact way in which this is done may be best understood from the illustrations given in the Second Edition of *Indian Chronology* (pages 127—131).

9. In addition to the cyclic tables referred to above, we want, for the investigation of horoscopes in which years are omitted, which is the case with all ancient Indian horoscopes, also a table giving in parallel columns for Mars, for Jupiter and Saturn, the increase of mean longitude for one year, for two years, for three years, and so on, up to, say, 2,000 years; and we also want, at any rate for Mars, an eye-table giving for each day of the Indian solar year, or for every ten days, the actual geocentric longitude corresponding to every successive degree of mean longitude. (*Indian Chronology*, Second Edition, Tables IV, V-A and V-B.)

10. Armed with these three tables, we may with confidence approach the solution of any of the planetary problems set out in paragraph 2 *supra*: the actual solutions of all the problems, or a proof that a solution does not exist, will be found in the Second Edition of *Indian Chronology* and the appendices thereto.

11. We may conclude with a remark about eclipses. The well-known eclipse cycle, called the Saros of 18 years and 10 days, has to be combined for our purposes with another cycle of 58 years less 41 days, after which the sun returns to almost exactly the same position with reference to the moon's ascending node. The combination can be carried on for 1,711 years less two days, after which the whole series is repeated without alteration. For lunar eclipses this cycle gives good results and for solar eclipses certain considerations as to visibility of solar eclipses which are explained in the second edition of my *Indian Chronology* have to be borne in mind.

12. On the general subject of the investigation of ancient dates in India it is well to bear in mind the results of recent historical research in India as well as in Europe:

While Indian literature is undoubtedly ancient, every part of it is not equally ancient. Particularly in the department of Indian astrology, a number of patently modern compositions pass for the works of rishis dating from the dawn of Kaliyuga or earlier. They are simply forgeries in the sense that they profess to be very ancient, whereas they are not, and an astronomical analysis of their contents, which is possible whenever they contain horoscopes, will reveal their absolutely modern character. A circumstance of which astrologers do not seem to be aware, but which the public at any rate is interested in knowing, is that a genuine horoscope containing the positions of five or six planets in rāsis (i.e., in multiples of 30°, without specification of the particular degree), provided the time of year is indicated even in general terms, should enable an investigator working on the lines indicated in *Indian Chronology*, Second Edition, to verify its date in such a manner that the same horoscope would not be applicable to more than one date, at most to two, during a period of several thousand years. This principle may be shortly enunciated as "one horoscope, one date." I would go so far as to throw out a challenge that the entire contents of the collections of horoscopes, known by the name of *grantha nādi* in southern India and by other names elsewhere, can be proved mathematically to be concerned exclusively with the lives of persons born within the last hundred years. Why should the *maharshis* who wrote in the dawn of Kaliyuga have concerned themselves exclusively with people living within the last hundred years from, say, A.D. 1820 to A.D. 1920?

13. I have in my possession a Tamil pamphlet giving Rāma's horoscope in most minute detail, but without the year. I do not enter into the question whence these details were derived, but it does not seem to have occurred to the learned author of the pamphlet that a horoscope with so many details can be referred only to one year, month, day, hour, and minute in a million years, and nevertheless he has made no attempt to find out the year, which would at least have been interesting as a speculation.

1. BOUCHÉ LECLERCQ *L'Astrologie Grecque*, Paris, 1899.

2. FRANZ CUMONT, "*Catalogus codicum astrologorum Graecorum*," Brussels, 1898; 7 parts, published up to 1909.

3. FRANZ BOLL, "*Die Erforschung der antiken Astrologie*."

14. If we approach the question from the historian's point of view, we find (*Encyclopædia Britannica*, Vol. 2, page 797, Article *Astrology*) that "the theory of the ecliptic does not appear to have been perfected until after 539 B.C."

The researches of Bouché-Leclercq, Cumont and Boll have enabled us to fix

4. CH. VIROLLEAUD, "*L'astrologie chaldéenne*," Paris, 1905, to be completed in 8 parts, transliteration and translation of cunei-form texts.

with a considerable degree of definiteness the middle of the fourth century B.C. as the period when Babylonian astrology began its triumphal march to the West, invading the domain of Greek and Roman culture and destined to exercise a strong hold on all nations and groups—more particularly in Egypt—that came within the sphere of Greek and Roman influence." (Astronomy proper was just dawning in Babylonia at the downfall of the Babylonian empire, 539 B.C.) . . . "In the hands of the Greeks and of the later Egyptians astrology and astronomy were carried far beyond the limits attained by the Babylonians" (The Babylonian astrology was confined to inspecting the heavens in order to foretell their influence on kings and public events). . . . "The endeavour to trace the horoscope of the *individual* from the position of the planets and stars at the time of birth (or as was attempted by other astrologers at the time of conception) represents the most significant contribution of the Greeks to astrology."

15. A perusal of the article from which the above passage is extracted will convince any one that the astrology which we find reflected in classical works (Livy, Tacitus, Plutarch, etc.) as well as in Shakespeare's references to celestial prodigies in *Hamlet* and *Julius Caesar* (reproduced partly from Plutarch and partly perhaps from the contemporary astrological writers of Queen Elizabethan's time, whose name was legion), is the astrology of empires, prognosticating revolutions among mankind, and not the fortunes of private individuals; that the later kind of astrology, called judicial, was probably invented by the Greeks and Chaldeans in the two or three centuries preceding the Christian era, that from Greece it spread to Rome probably within the last 150 years B.C. and that in the first 150 years A.D. it was actively cultivated at Rome as testified to by Juvenal and other writers, and in the Roman Empire, chiefly at Alexandria, becoming associated about 150 A.D. with the illustrious name of Klandios Ptolemy.

16. An examination on the other hand, of dated early Indian astrological works by Varāhamihira and others (see Dr. Burgess' *Notes* in J.R.A.S., 1893, on *Hindu astronomy and the sources of our knowledge of it*) will convince us that Varāhamihira freely borrowed his astronomical constants, terms and phrases from the Greek writers; and that the true genesis of Indian astrology is from the Greek writers on astrology between A.D. 150 and A.D. 300, so that Varāhamihira is an intellectual descendant of Ptolemy, while astrologers like Garga who were earlier in date than Varāhamihira and whom we know of only by name could not have been more ancient than the Chaldean and Greek astrologers who were the progenitors of judicial astrology. We are confronted also by the fact that the early Indian literature (Sanskrit or Dravidian) before A.D. 300 does not refer to the signs of the zodiac, to the movements of the planets or to planetary horoscopes, which are as it were the tripod of astrology. And we have the valuable indirect evidence furnished by Juvenal that at Rome in the 1st century A.D. when there was a general craze for astrology and divination, Indian professionals were imported into Rome, as *augurs*, not as *astrologers*.

17. The allusions to astrology which are to be found in ancient Indian works, like the Rāmāyana and the Mahābhārata, are as a rule, mere astrological tit-bits introduced or rather interpolated into the text by subsequent copyists, editors or scholiasts. Other ancient Indian works simply ignore planetary astrology, though they refer to good and bad days as determined by the movements of the Sun and the Moon. Where a literary work, like Śudraka's *Mricchakatika*, or Subandhu's *Vāsavadatta*, refers to planets, its composition may be safely referred to a date later than the 5th century A.D. The probable dates of these important works, as determined by critics on other data, agree with this presumption.

18. Eclipses are no doubt alluded to in ancient Indian works, but an eclipse, unconnected with any other indication of date, is of as little use for chronological investigation as the references to lunar months and tithis in the Brahmi inscriptions in India of the third and second centuries B.C.

19. As a rule, either a horoscope or an allusion to a week-day is necessary for verifying an Indian date and both horoscopes and week-days (as the writer has shown elsewhere) are in India posterior to 300 A.D.

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