METHODS AND TABLES FOR VERIFYING HINDU DATES, TITHIS, ECLIPSES, NAKSHATRAS, ETC.

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THE Tables[1] which are now placed before the public, are intended for the use of those who wish to verify dates of Indian documents, inscriptions, manuscripts, etc., chronicled according to the intricate Luni-Solar Calendar of the Hindus. The working of these Tables will be found easy, requiring only the computation of a few figures; and the operation to be gone through is almost mechanical, and will yield correct results, if the rules, to be explained in the sequel, be strictly adhered to. Nevertheless, to render more intelligible the process of calculation, it will be well to place before the reader the frame and outlines of the Luni-Solar Calendar.

PART I.—ON THE LUNI-SOLAR CALENDAR.

On the Lunar Months, Pakshas, and Tithis in general.

A lunar month is the time of one lunation. It consists of two *pakshas*, or fortnights,—the bright (*śukla*, *śuddha*) fortnight, or the time of the waxing moon; and the dark (*kṛishṇa*, *bahula*) fortnight, or the time of the waning moon. In the North, the dark fortnight precedes the bright fortnight; in the South, it follows it. But the bright fortnight is always the same, both in the South and the North of India.[2] The lunar month takes the name of that solar month, in which occurs the true new-moon forming the commencement of the bright fortnight of the lunar month under consideration. The new-moon (the first if there are two) in solar Chaitra, (or Kârttika for some eras) forms the beginning of the luni-solar year. Each *paksha* is divided into 15 *tithis*. A *tithi* is the time required by the combined motions of the sun and moon to increase (in the bright fortnight) or to diminish (in the dark fortnight) their relative distance by twelve degrees of the zodiac. The names of the *tithis* are the Sanskrit ordinals,—*prathamâ*, *dvitîyâ*, etc. The first *tithi* of either *paksha* is also called *pratipad* or *pratipadâ*; the last *tithi* of the bright fortnight is also called *pûrṇimâ*, as it ends with the moment of full-moon; and the last *tithi* of the dark fortnight, *amâvâsyâ*, as it ends with the moment of new-moon. The *tithis* furnish the names of the *civil* days, inasmuch as the civil day (being accounted to begin with true sunrise) is named after the *tithi that ends in it*. Thus, Mâghê *ba di* 9 is the usual abbreviation equivalent to "the civil day in which ended the 9th *tithi* of the dark fortnight of the lunar month Mâgha."

On Mean and True Lunar Months and Tithis.

The sun and the moon do not move with an even motion; *i.e.* they do not always move in the same time through the same space of the firmament. Yet, for the sake of calculation, it has been found convenient by astronomers to assume that the motion of all the heavenly bodies is proportional to time. This motion is called the *mean* motion, to distinguish it from the *true* motion.

The place in which the sun or moon would be, if they had the *mean* motion, is called their *mean* place. In the same way, *mean* lunations and *mean tithis* are spoken of. But, in the Hindu Calendar, only *true* lunations and *true tithis* are used; *i.e. true*, not as would be found by actual observation, but as calculated according to the astronomical theory of the *Siddhântas*. A *mean* lunation, or lunar month, is about 29 days, 13 hours; while the *true* lunar month varies in length between 29 days, 40 minutes, and 30 days, 1 hour, 15 minutes. The duration of a *mean tithi* is about 23 hours, 37 minutes; that of a *true tithi* varies between about 20 and 26 hours. It is very easy to

[1] Tables 5 to 11 are constructed on the plan of those of Largeteau, first published in the "Connaissance des temps" for 1846. By the Tables of Largeteau, the true place of the moon in relation to the sun can be found with a high degree of accuracy according to the lunar and solar theories of modern astronomy. In order to make the Tables of Largeteau serve our purpose, a part only of them could be used. The rest had to be altered according to the elements and theory of the *Sûrya-Siddhânta* as will be explained at the end of this paper. I have to thank Dr. Peters, Professor of Astronomy in Kiel, now in Königsberg, with whose kind assistance I have come to a thorough understanding of the construction of Largeteau's Tables.

[2] Compare the scheme, *ante*, Vol. XVI. p. 143.

calculate a *mean* date; but it is of course more difficult to find the *true* one.

On Intercalary and Expunged Months.

It sometimes happens that *two* new-moons occur in one solar month; all solar months being longer than 29 days, 40 minutes; some by more than one or two days; some by a fraction of a day only. In that case there will be, accordingly, two lunar months of the same name; of these two months the first is considered as the intercalated (*adhika*) month of that name, the second as the proper one (*nija*); or, in Northern India, the *adhika* month is inserted between the two *pakshas* of the *nija* month.

On the contrary, occasionally there occurs *no* new-moon within one solar month; in that case, the lunar month, synonymous with the solar month in question, is altogether omitted (*kshaya*); or else, according to Warren, the name of that month is compounded with that of the following one.

Example.—If new-moon occurs on, or between the limits of, the first and last days of the *solar* Kârttika, there will be two *lunar* months Kârttika; the first of which is *adhika* Kârttika, the second *nija*. On the contrary, if no new-moon occurs in the *solar* Pausha, there will be no *lunar* Pausha in that year; Pausha being in that case an expunged or *kshaya* month.

On Repeated and Expunged Tithis.

If two *tithis* end on the same civil day, that *tithi* which both begins and ends on that same day, is accounted to be expunged (*kshaya*); that is to say, though in the strict lunar reckoning the *kshaya tithi* is extant, yet in the *civil* reckoning, which is the only one used for dating, it is neglected. For instance, if, of the *tithis* 11, 12, 13, the 12th ends on the same day with the 11th, that day is called the 11th according to the usual rule; but the following day is called the 13th; the 12th *tithi* being expunged, and there being no day to take the number of it. If, on the other hand, a *tithi* begins on one day, runs over the next, and ends on the next but one, that day on which no *tithi* ends, takes the same number as the preceding day, which is thus repeated (*adhika*). For instance, if the 12th *tithi* began on one day and ended on the next but one, the corresponding days will be numbered 11, 12, *adhika* 12, 13.

It will be obvious that we cannot speak of repeated and expunged *tithis*, unless we understand by *tithi* the civil day corresponding to a *tithi*. Nor of repeated and expunged *days*, unless we mean by it the number given to the day by the *tithi*. Intercalation or expunction does not affect the week-days, which run on continuously uninterrupted.

On Solar Months.

From the preceding definitions, it will be evident that, in order to convert a luni-solar date into one of the English calendar, we must ascertain :—

(1) The space of time corresponding to the eponym solar month ;—

(2) The day on which the new-moon occurred within that space of time ;—

(3) The day on which ended that *tithi* after which the day given in the Hindu date is named.

The last two questions can be accurately answered with the help of Tables 5 to 11; the first approximately only. But, in most cases, an approximate answer to the two first questions will be sufficient. Only where it is doubtful whether there was an intercalary month,—*i.e.* when the new-moon falls on the approximate initial day of the solar month indicated by our lunar Tables,—the exact limits of that solar month should be ascertained by Tables 1 to 4.[3] To ascertain the exact time of the solar months, four Tables are wanted, one for each of the four years of our intercalary cycle: which Table applies, is shown by the superscription of those Tables. They give, under the name of each solar month, the year A.D. in which the initial date of that month advanced by one day. The corresponding English date will be found by adding, to the date written immediately below the name of the solar month, the number of days found in the first (or last) column on the same horizontal line with the year in question. Thus, we find, *e.g.*, by Table 2, that in A.D. 574 the solar Vaiśâkha began on the 20th March (Old Style). The 20th

[3] These Tables give the same result as Warren's Tables I. III. and V. They are based on the *Ârya-Siddhânta*.

March continued to be the initial day of Vaiśâkha till A.D. 690, for all years which, divided by four, leave as a remainder 2. The day thus found is, however, the *civil* beginning of the solar month, the day on which the astronomical beginning of the month, *i.e.* the *Saṁkrânti*, or entrance of the sun into a zodiacal sign, is usually celebrated. The *true instant* of the beginning of a solar month occurred, in any year entered in the Table, at or shortly after sunset of the day *preceding* the civil beginning of the solar month of that year; every four years it advances by 50 minutes. For example, the solar Vaiśâkha in A.D. 574 began astronomically on the 19th March at sunset in Laṅkâ, or 12 hours Laṅkâ time; and in A.D. 622, which year is separated from 574 by 48 (*i.e.* 12 × 4 years), 12 × 50 minutes = 10 hours later, *i.e.* on the 19th March, 22 hours, Laṅkâ time. The moment thus found is some minutes later than the true one, but this degree of accuracy will be found sufficient. The astronomical limits of the solar month are wanted for determining the name of the lunar months in cases where the true new-moon occurs near those limits. The initial days of the *solar* months are also the days of *saṁkrânti*; 1st Vaiśâkha, that of Mêsha; 1st Jyaishṭha, that of Vṛishabha; and so on (see at the foot of Table 7). The 1st Mâgha is the first day of the *uttarâyaṇa*, or the period during which the sun is moving from south to north; and the 1st Śrâvaṇa, that of the *dakshiṇâyana*, or the period during which the sun is moving from north to south.

PART II.—USE OF THE TABLES.

Description and Explanation of the Tables.

In Tables 5 to 8, the value of four quantities, *a. b. c. d.*, for different periods is given; *e.g.* in Table 5 we find that in A.D. 1801 (on the 1st January) $a = 5138$, $b = 566$, $c = 6$, $d = 479$. For calculating *tithis*, however, only *a. b. c.* are wanted; and we shall therefore, for the present, speak of *a. b. c.* only.

The quantity *a.* (plus the constant quantity 200)[4] gives the *mean* lunations expressed in 10,000th parts of the unit; or the difference of the mean longitudes of the sun and the moon expressed in 10,000th parts of the circle. And the value $a = 5138$ denotes that, at the moment in question, 0·5338 of the current *mean* lunation was gone.

b. and *c.* give, in thousandth parts of the unit, two other quantities on which depends the difference of the *true* longitudes of the sun and moon,[5] which we shall denote by *A.* With *b.* and *c.* turn to Tables 9 and 10; there, for the value of *b.* and *c.* as arguments, is given the equation which, added to *a.*, gives *A.*; *e.g.* for *b.* 566, we find by Table 9, as equation, 84; for *c.* 6 we find, by Table 10, as equation, 58. Adding 84 and 58 to $a = 5138$, we get $A = 5280$. The value of *A.* shows which *tithi* was current at the moment under consideration, as presented in the following table:—

Śukla-paksha.

1	Tithi;	*A.* is	between	1	&	333	
2	„	„	„	334	„	666	
3	„	„	„	667	„	1000	
4	„	„	„	1001	„	1333	
5	„	„	„	1334	„	1666	
6	„	„	„	1667	„	2000	
7	„	„	„	2001	„	2333	
8	„	„	„	2334	„	2666	
9	„	„	„	2667	„	3000	
10	„	„	„	3001	„	3333	
11	„	„	„	3334	„	3666	
12	„	„	„	3667	„	4000	
13	„	„	„	4001	„	4333	
14	„	„	„	4334	„	4666	
15	„	„	„	4667	„	5000	

Full-moon; *A.* = 5000

Kṛishṇa-paksha.

1	Tithi;	*A.* is	between	5001	&	5333
2	„	„	„	5334	„	5666
3	„	„	„	5667	„	6000
4	„	„	„	6001	„	6333
5	„	„	„	6334	„	6666
6	„	„	„	6667	„	7000
7	„	„	„	7001	„	7333
8	„	„	„	7334	„	7666
9	„	„	„	7667	„	8000
10	„	„	„	8001	„	8333
11	„	„	„	8334	„	8666
12	„	„	„	8667	„	9000
13	„	„	„	9001	„	9333
14	„	„	„	9334	„	9666
15	„	„	„	9667	„	10000 or 0

New-moon; *A.* = 0 or 10000

[4] 200·5 has been subtracted from the exact value of the *mean* lunation, in order that all corrections to be applied to it for finding the value of the *true* lunation shall be *additive* quantities, and not additive in one case, and subtractive in another.

[5] *b.* is the mean anomaly of the moon; and *c.* the mean anomaly of the sun.

A. = 5280 denotes, therefore, that, at the moment in question, the first *tithi* of the dark fortnight was current.

In Tables 5 to 7, the column superscribed *w.* contains the figures 0 to 7, which serve to find the day of the week, as will be shown below.

Table 5 gives the values of *a. b. c. d.* for all the years of the 19th century. If the year in question is not contained in the 19th century, the corresponding year of the 19th century has to be taken; *i.e.* the year of the 19th century which is separated from the given year by complete centuries. To find the corresponding year, add the last two figures of the given year to A.D. 1800; *e.g.* the corresponding year of A.D. 484 is A.D. 1884.

Table 6 gives the values of *a. b. c. d.* for the centuries intervening between the given year and the corresponding one of the 19th century. To find them, subtract the given year from the corresponding year of the 19th century; *e.g.* A.D. 1884 — 484 = 14 centuries.

Table 7 gives the value of *a. b. c. d.* for the hour 0 or sunrise at Laṅkâ, of all days of the English year, and the three first months of the next year. The days of the month are entered in two columns. In the first twelve subdivisions of Table 7, for January to December, the first column applies to common years, and the second to leap-years. In the continuation of this Table for the following year, the arrangement is different. In January and February, the first column applies if the English year, preceding that to which these months belong, was a common year; the second, if it was a leap-year. In March, the second column applies if the English year, in which that month occurred, was a leap-year, or followed after a leap-year. The first column applies to the remaining years of our intercalary cycle. These last three Tables are to be used for the last part of the Hindu year; *viz.* for that part of the Hindu year which falls in the English year following that in which the beginning of the Hindu year fell. Table 8 gives the values of *a. b. c. d.* for hours and minutes.

All the quantities taken from Tables 5 to 8, are to be summed up in due order; then the equation of the sum of *b.* and that of the sum of *c.* (Tables 9 and 10), are to be added to the sum of *a.* The result will be the *A.* for the moment in question, which is to be interpreted according to the *tithi* Table.

An example will set this in a clearer light. Let it be asked, what *tithi* was current on the 21st June, A.D. 484. We have

			w	*a*	*b*	*c*
Table 5	A.D. 1884		(3)	765	746	2
Table 6	14 cent.	...	(5)	4626	734	67
Table 7	21 June	...	(4)	8245	242	471
	Leap year.		—	—	—	—
			(12)	3636	722	540
Table 9	arg. *b.* 722, eq.	=		3		
Table 10	arg. *c.* 540 eq.	=		76		
		A. =		3715		

As *A.* is between 3667 and 4000, it follows from the *tithi* Table that the 12th *tithi* of the bright fortnight was current.

The Week-Day can be found from the sum of *w.* 12 (put in brackets). *Rule:*—If *w.* is smaller than, or equal to 7, the number indicates the week-day, counting from Sunday as 1. If *w.* is larger than 7, retrench 7; if larger than 14, retrench 14. The remainder, in both cases, indicates the week-day, counting from Sunday as 1. In our example *w.* = 12; subtract 7; remainder, 5 = Thursday.

If it be required to know when the 12th *tithi* ended, subtract 3715 from 4000; the remainder is 285. With this remainder, 285, apply to Table 11, in order to find approximately the difference in time between the time when *A.* was = 3715 and when it was 4000. We find 200 = 14 hours, 10 minutes; 85 = 6 hours, 1 minute; so, 285 = 20 hours, 11 minutes; therefore the 12th *tithi* ended about 20 hours, 11 minutes, after sunrise in Laṅkâ.

If this approximation should not be considered sufficient, we add to the above found sums of *a. b. c.*, the value of *a. b. c.* for 20 hours, 11 minutes, from Table 8. We have found:—

	a	*b*	*c*
21st June AD. 484 ...	3636	722	540
20 hours (Table 8) ...	282	30	2
11 min. „ ...	3	0	0
	3921	752	542
arg. *b.* 752	0		
arg. *c.* 542	76		
A. =	3997		

The difference between 4000 and 3997 being 3, shows (by Table 11) that the end of the *tithi* occurred 13 minutes after 20 hours, 11 minutes; or at 20 hours, 24 minutes, after sunrise at Laṅkâ.[6] Therefore, as the 12th *tithi* ended on the 21st June, A.D. 484, that day was *śu di* 12.

If we want to know the name of the month of which the 21st June, A.D. 484, was the *śu di* 12, we count 12 days back from the 21st June; the day obtained, the 10th June, was the beginning of the month; and, accordingly, the preceding day, the 9th June, was the day of new-moon, always supposing that there was no *kshaya* or *adhika tithi* between new-moon and *śu di* 12. Now, turning to Table 4, we find that the 9th June, A.D. 484, falls in the middle of the time assigned for the solar Âshâḍha (20th May to 20th June). Therefore, as the new-moon of the same month to which the *śu di* 12 under consideration belonged, fell within the solar Âshâḍha, we conclude that the 21st June, A.D. 484, was *śu di* 12 of the lunar month Âshâḍha.

On the Verification of Luni-Solar Dates.

Having shown how the Tables are worked, I shall now explain how, by their help, the most usual problem, that of converting a luni-solar date into one of our Calendar, can be solved.[7]

Let us suppose we had to verify the date A.D. 484, Âshâḍha *śu di* 12, Thursday. We first compute the *a. b. c.* for the beginning of A.D. 484, *viz.*:—

		a.	*b.*	*c.*	
1884 ...	(3)	765	746	2	Table 5.
14 cent.	(5)	4626	734	67	Table 6.
A.D. 484	(8)	5391	480	69	

On the day *śu di* 12, *A.* must be near, but something less than, 4000 (such being the equivalent for the end of the 12th *tithi*). Subtracting 5391 from 4000, or, as this would leave a negative quantity, from 14000, we have, as the remainder, 8609. Therefore, by adding 8609 to the *a.* of the beginning of A.D. 484, we get 4000; and all days, whose *a.* is 8609 or the next lower figure, are approximate dates for each *śu di* 12, the whole year round.

In the same way, by subtracting the *a.* for the beginning of A.D. 484, *viz.* 5391, from 10000, *i.e.* the equivalent of the new-moon, the remainder, in our example 4609, indicates approximately all the new-moon days of A.D. 484.

Now, with 4609, we turn to Table 7. Finding Âshâḍha at the foot of May, we select the days in May and June, whose *a.* is nearest to 4609. A.D. 484 being a leap-year, we find the 11th May and 10th June. We must now ascertain which of these two dates determines the beginning of the lunar Âshâḍha *śukla paksha.* This can be done with the help of Tables 1 to 4, as explained above; or, without using those Tables, the beginning and end of the *solar* months can be found in the following way:—At the foot of the Table we find that, on 1st *solar* Âshâḍha, *c.* is about (*i.e.* one smaller or larger than) 450. The *c.* of the beginning of A.D. 484 is 69. Adding 69 to the *c.* of the 11th May, 359 + 69 = 428. This (428) being lower than the *c.* for 1st solar Âshâḍha, we conclude that the new-moon, occurring on the 11th May, fell in the solar Jyaishṭha, and belonged, therefore, to the lunar month Jyaishṭha. Trying the 10th June, we find its *c.* to amount to 444 + 69 = 513. As this is between the *c.* for 1st Âshâḍha, *viz.* 450, and the *c.* for 1st Śrâvaṇa, *viz.* 536, we conclude that the new-moon occurring on the 10th June, or thereabouts, belongs to the lunar month Âshâḍha. Hence Âshâḍha *śu di* 12 must be later, by about 12 days, than the 10th June.

We have seen that, at the end of the 12th *tithi*, *a.* is equal to, or something less than, 8609. The 22nd June having for *a.*, 8583, which is nearest to 8609, the end of the 22nd *tithi* must have occurred either before or after the beginning of the 22nd June. To find the end

[6] Mr. Sh. B. Dikshit (*ante*, Vol. XVI. p. 120) has calculated the same moment according to the modern Tables of Chhatre, the *Sûrya-Siddhânta*, and the *Siddhânta-Sirômaṇi.* He found,—Chhatre, 48 *ghaṭis* 12 *palas*; *Sûrya-S.* 51 *gh.* 11 *p.*, *Siddh-Sir.* 53 *gh.* 21 *p.* Converting 20 hours, 24 minutes, into *ghaṭikâs* and *palas* we get as the equivalent amount 51 *gh.* Our result, therefore, agrees nearly with that calculated by Mr. Dikshit on the basis of the *Sûrya-Siddhânta.*

[7] As, by our Tables, only those Hindu dates can be converted into English ones, of which the concurrent English *year* is *known*, we are here concerned with the verification of the day only. However, in practice, the year will often be doubtful. In such cases, all years which come in question must be tried till that one is found in which the day fits in all particulars. Instead of calculating the date for all possible years, it will save time if we try the years according to the approximative method (Perpetual Lunar Calendar) which will be explained below.

of the *tithi*, we must add the *a. b. c.* of the 22nd June to the *a. b. c.* of the beginning of A.D. 484.

		a.	*b.*	*c.*
A.D. 484 (see above)	(8)	5391	480	69
22nd June	(5)	8583	278	474
	(13)	3974	758	543

arg. *b.* 758 0
arg. *c.* 543 76

A. = 4050

A. being larger than 4000, the end of the 12th *tithi* must have occurred before the beginning of Friday, the 22nd June. Table 11 shows that our surplus, 50, is equal to 3 hours, 33 minutes. Hence the 12th *tithi* ended on the 21st June (at about 20 h. 27 m.); and accordingly A.D. 484, Âshâḍha *su di* 12, was the 21st June.

It should be borne in mind that the time of any particular instant is reckoned from the mean sunrise at Laṅkâ. For any other place in India, two corrections are necessary:—

(1) The difference in time between the place in question and the meridian of Laṅkâ (on which lies Ujjain, 5 h. 3 m. 27 s. east of Greenwich), is to be added to or substracted from the result found by my Tables, according as that place lies east or west of the said meridian. Table 15 serves for converting Laṅkâ time into local time, for the principal places in India as explained in the note to that Table.[8] For instance:—if a *tithi* ended at Laṅkâ at 10 h. 54 m., it ended in Calcutta at 11 h. 44 m., in Multân at 10 h. 37 m. If the place under consideration is not contained in my List, take the most important one that is nearest to it.[9]

(2) The time at which the sun, at that place and on that day, rose before or after the completed sixth hour after mean midnight of that place.

The amount of this correction, for any given place and time, can be calculated with the help of Table 16. That Table shows how many minutes before or after sunrise at Laṅkâ (0 hour of my tables) the day began at places situated on the meridian of Laṅkâ or Ujjain at a Northern latitude of 5 to 30 degrees, on the days entered in the first and last columns of the Table. For places and days not entered in the Table, the amount may be calculated by a proportion. But it must be stated that the date may be wrong by one or two days.

The process by which we have obtained the result may be reduced to the following rules:—

1. Find the *a. b. c.* of the given year, by summing up the quantities for the corresponding year and the intervening centuries.
2. Find the Index of the new-moon days by subtracting from 10000 the *a.* of the given year.
3. Find the Index of the given *tithi*, by adding its equation (from the *tithi* Table) to the Index of new-moon.
4. Find the new-moon falling in the given solar Hindu month, by adding to the *c.* of the given year, the *c.* of the new-moon days in the English months corresponding to the given solar Hindu month. The footnote of Table 7 shows which new-moon day is to be selected. In doubtful cases determine the limits of the solar month, from Tables 1 to 4.
5. Try the day indicated by the Index of the *tithi*. If *A.* comes out larger than the equivalent of the proposed *tithi* (see *tithi* Table), it ended before sunrise; if smaller, after sunrise.
6. Apply the corrections due to the geographical site of the place, if necessary.

2*nd Example.*—In order to give a sample of the calculation, we shall convert into the corresponding English date, A.D. 1261, Jyaishṭha *ba di* 4, Gurau. I give the calculation without further remark:—

[8] This Table was suggested by Mr. Fleet, on the grounds that, in the majority of instances, the details of dates should be worked out, not for the actual place to which a record refers itself, but for the principal town in the neighbourhood; *i.e.* for the town at which the almanac from which the details were taken, was probably actually prepared. I have substituted the difference in time for the longitudes given by him, which were taken from Thornton's *Gazetteer of India.*

[9] The "difference in time" is obtained by multiplying the degrees of the difference of the longitudes of Ujjain and the different places by four. However, the amount thus found may differ in many cases from that assumed by the Hindus. The latter might easily be ascertained if someone would collect, from different places in India, old native almanacs or *Pañchâṅgs.* But they must refer to an epoch not yet influenced by modern geographical science. By these means it would be easy to draw a map of India as it appeared to the Hindus themselves.

		a.	*b.*	*c.*
A.D. 1861...	(3)	6257	896	4
6 Cent	(4)	2876	135	47
A.D. 1261...	(7)	9133	31	51
20th May ...	(6)	7070	45	381
	(13)	6264	76	432

● $a = 10000\text{-}9133 = 867$.
4th Tithi kṛishṇa paksha (1) 6333-9133 or 6333 + 867 = 7200

● Jyaishṭha about 1st May $a = 636$: $c = 329 + 51 = 380 > 364$.
4th Tithi a 7200 about 20th May: $a = 7070$.

arg. *b.*	76	204
arg. *c.*	432	35

A. = 6503 − 6333 = + 170 (or 100 = 7 h. 5 m., 70 = 4 h. 58 m.) 12 h. 3 m. before 20th May.

The 4th *tithi* of the *kṛishṇa paksha* ended on the 19th May, which was a Thursday, about 11h. 57m.

3*rd Example.*—I select the following date because its calculation offers matter for some consideration:—

Vikrama-Saṁvat 1288, Phâlguna *śu di* 10, Wednesday.

The year commenced in A.D. 1231; but the month Phâlguna fell in 1232. We can make either year the basis of our calculation, as will be seen in the sequel.

1st method; by starting from the English year in which the Hindu year *began*; *viz.* 1231. We proceed as in the above examples:—

A.D. 1831 ..	(7)	5528	213	4
6 Cent.	(4)	2876	135	47
A.D. 1231...	(11)	8404	348	51

● 1596. *śu di* 10 (1596 + 3333) = 4929.

The new-moons which come in question are to be looked for in January and February. But there are two Januaries and two Februaries in our Table 7. In this case, the Tables for the January and February at the end of Table 7 apply; those at the beginning of Table 7 applying to the same months of the preceding Christian year, *i.e.* to that part of A.D. 1231 which precedes the Hindu year. It will be seen that new-moon fell on the 24th January and 23rd February (or the preceding day), as the *a.* of these days is nearest to, but smaller than, 1596 (the index of new-moon). On the 24th January, the *c.* is 62 + 51 = 113, which is near the *c.* required for Phâlguna, *viz.* 114. It is therefore doubtful whether the lunar month, determined by the new-moon of the 24th February, is Mâgha, or Phâlguna. Turning to the 23rd February, we find *c.* = 195; *i.e.* it is near the *c.* required for 1st solar Chaitra (196.) Hence it is likewise doubtful whether a new-moon on the 23rd February inaugurated the month Phâlguna or Chaitra.

In order to fix with more definiteness the beginning of Chaitra, we must have recourse to Table 4 (for the date in question falls in the leap-year, A.D. 1232).

We find that the solar Phâlguna ran from the 25th January to the 23rd February, astronomically from 24th January 13 h. 40 m. to 23rd February 8 h. 50 m. As will be remembered, we have only approximately determined the dates of new-moon; we must now calculate them accurately.

A.D. 1231	8404	348	51
24th Jan.	1389	81	62
13 hours.	183	20	1
40 min.	9	1	0
	9985	450	114

arg. 450	184
arg. 114	20

189 = 13 hours, 23 minutes.

Accordingly new-moon occurred 13 h. 23 m. before solar Phâlguna, and belonged therefore to Mâgha. We calculate 0 Chaitra:—

A.D. 1231...	8404	348	51
23rd Feb. ...	1548	169	144
8 hours	127	14	1
50 min.	12	1	0
	91	532	196

arg. 532 112
arg. 196 2

205 = 14 hours, 31 minutes.

Accordingly, new-moon occurred 14 h. 31 m. before 0 solar Chaitra, and belonged therefore to Phâlguna. In order to find *śu di* 10, we proceed, as usual, by adding, to the *a. b. c.* of A.D. 1231, the *a. b. c.* of that day after the 22nd February, the *a.* of which is next below 4929 (or the index for *śu di* 10).

A. D. 1231 ...	(11) 8404	348	51
3rd March. ...	(0) 4596	496	169
	(11) 3000	844	220

arg. *b* 844, eq. 24
arg. *c* 220, eq. 1

A. = 3025 = 1 h. 46 m.

As *A.* for *śu di* 10 is between 3000 and 3333, we see that the 10th *tithi* was running at the beginning of the 3rd March. That it ended in the same day, is evident from the fact that the *a.* of the 4th March, *viz.* 4935, is, by itself, larger than the index for *śu di* 10, which we have found to be 4929, and will become still more so by adding the equations of *b.* and *c.* Let us calculate also the 4th March:—

A.D. 1231...	8404	348	51
4th March...	4935	532	171
	3339	880	222

arg. *b.* 880, eq. ...44
arg. *c.* 222, eq. ... 1

A. = 3384

Subtract 3333; the remainder 51 = 3 h. 37 m. Hence the 10th *tithi* ended 3 h. 37 m. before sunrise at Laṅkâ, on the 3rd March, which was a Wednesday, as required. The end of the 10th *tithi* being near the beginning of the day, we must now consider whether the result may be influenced by the geographical position of the locality to which the record belongs; *viz.*, Girnâr being about 21 minutes (of time) west of the meridian of Laṅkâ (or Ujjain), the day begins there about 21 minutes later than on the meridian of Ujjain. Hence the 10th *tithi* ended about 3 h. 58 m. before the end of the 3rd March. Again, the sun rises, before the 21st March, later on the circle of latitude of Girnâr, than on the equator, on which Laṅkâ is supposed to be situated. The difference still more removes the end of the 10th *tithi* from the end of the 3rd March, as compared with the same moment at Laṅkâ. The date, as we have found it, stands, therefore, proof against all doubts which can be raised against it. As regards the week day, the (11) shows that it was the fourth day or Wednesday as required.

2nd method. In calculating the date, we can also start from A.D. 1232, the Christian year in which the date fell. But, in that case, we must make use of the first part of Table 7. We shall sum up the figures for the 3rd March A.D. 1232:—

A.D. 1832 ...	(1) 9128	460	3
6 Cent	(4) 2876	135	47
3 March	(6) 995	250	170
	(11) 2999	845	220

Comparing this result with that found above, we see that *a.* is smaller, *b.* larger, by one, than found above.[10] This difference is caused by our neglecting fractions below $\frac{1}{2}$, and counting them as 1 if larger than $\frac{1}{2}$.

4th Example.—An intercalary month. As a month is intercalated when two new-moons occur within one solar month,—one soon after the beginning, and the other shortly before the end, of the solar month,—all that is required to decide any case, is, to calculate the phase of the moon on the beginning and the end of the solar month. If the moon was waning at the

[10] The last method must be followed in cases in which the Hindu year begins in Kârttika (Sept.-Oct.), and the date in question is later than March of the succeeding English year.

beginning, and waxing at the end, of the solar month, a month was intercalated.

In the year 958 of the Chêdi era, which has been identified with A.D. 1207 (the *Academy*, 14th January, 1888) there was an intercalary Âshâḍha. We must first ascertain the astronomical limits of solar Âshâḍha from Table 3. In A.D. 1199 Âshâḍha began on the 26th May, Laṅkâ time 12 hours; accordingly in 1207, *i.e.* 2 × 4 years afterwards, 2 × 50 minutes = 1 hour 40 minutes later, or on the 26th May, 13 h. 40 m. Again, in A.D. 1231 solar Śrâvaṇa began (or Âshâḍha ended) on the 26th June, at 12 hours; accordingly in 1307, *i.e.* 19 × 4 years afterwards, 19 × 50 min. = 15 h. 50 m. later, or on the 27th June, at 3 h. 50 m.

We calculate *A.* for both instants :—

A.D. 1807..	7080	81	4
6 Cent......	2876	135	47
A.D. 1207...	9956	216	51
26th May ...	9102	262	397
13 hours ...	183	20	1
40 min. ...	9	1	0
	9250	499	449
arg. 499	140		
arg. 449	41		
A. =	9431		

A.D. 1207 ..	9956	216	51
27th June ...	9938	424	485
3 hours	42	5	0
50 min.	12	1	0
	9948	646	536
arg. 646	28		
arg. 536	74		
A. =	50		

This calculation shows that the beginning of solar Âshâḍha occurred before, and the end after, new-moon (*A.* = 0 or 10000), *i.e.* two new-moons fell within solar Âshâḍha. Accordingly there was an intercalated lunar Âshâḍha as required.

5th Example.—A *Saṁkrânti* :—

Śaka 1126 (A.D. 1204) Pausha *śu di* 2, Saturday, at the *uttarâyaṇa*.

The *uttarâyaṇa* begins with the solar Mâgha. That month began, according to Table 4, in A.D. 1204, on the 25th December. Our calculation stands thus :—

A.D. 1804	(1)	5940	306	4
6 cent. ...	(4)	2876	135	47
25 Dec. ...	(2)	1569	29	983
	(7)	385	470	34
arg. 470		166		
arg. 34		47		
		598		

Accordingly the 25th December was a Saturday, its *w.* being 7; and, the second *tithi* ending in it, it was Pausha *śu di* 2, as required.

Before leaving this part of our subject, I will add a few remarks that may prove useful. It is obvious that every lunar date can be converted into the corresponding English one; but such lunar dates only can be *verified*, *i.e.* shewn to be correct notations of real and particular moments of time, which are coupled with some other chronological item not purely or chiefly derived from the position of the moon. In most cases the concurring notation will be the week-day. As the verification of the week-day is a much simpler process than, and can be done simultaneously with, ascertaining the date of the *tithi*, it will save time to calculate at once the correct week-day. Let us do so with our first example. We have found (8), 5391, 480, 69, as the (*w.*) *a. b. c.* of the 1st January, A.D. 484. As the figure (8) of the week-day is above 7, subtract 7, and put (1) instead of

(8). The 22nd June has been found to be the approximate day of Âshâḍha *śu di* 12. But the *w*. of the 22nd June is (5), which added to (1) from above makes (6) or Friday, instead of Thursday as required in the inscription. We therefore calculate the 21st June as the probable date of *śu di* 12. The result proves that we have guessed rightly. But if the *tithi* does not come out as required, we can, without further calculation, say that the *date* is *wrong*; provided we have singled out the correct month and *paksha* and overlooked no *adhika* month. For, say that, instead of the 12th *tithi*, the 11th would be found running at sunrise of the corresponding week-day, in that case the next day would be the 12th (or, if the 12th *tithi* was *kshaya*, the 13th), but the week-day would be wrong. In the assumed case, the date would be wrong, either because the inscription was a forgery, or because the scribe committed a blunder.

Correction due to the Moon's Latitude.

Probably common almanac-makers neglected this correction, which influences the result only when the end of a *tithi* occurs within a quarter of an hour off the beginning of the day. *Rule*:—Add to the tenth part of *a*., 20 + the half part of *d*. If the sum is above 500, subtract 500; the remainder is the Index for the following Table. If it is below 500, the remainder itself is the Index. The equation is according to its sign, to be added to or subtracted from *A*.

Index.	*Equation.*		*Index.*
from 0 to 10 or / „ 240 „ 250	0	0	from 250 to 260 or / „ 490 „ 500
„ 20 „ 30 or / „ 220 „ 230	-1	+1	„ 270 „ 280 or / „ 470 „ 480
„ 40 „ 70 or / „ 180 „ 210	-2	+2	„ 290 „ 320 or / „ 430 „ 460
„ 80 „ 170	-3	+3	„ 330 „ 420

On Mean Intercalations.

It is highly probable that in ancient times mean intercalations were used, *i.e.* a month was intercalated when two mean lunations fell within one mean solar month. As the mean lunation is smaller than the mean solar months, there could be no expunged months while mean intercalations were used. My Tables give the moment of mean new-moon with great accuracy. Mean new-moon happens when the sum of *a*. + 200 = 0 or 10000. But the beginning of a mean solar month is less accurately defined by *c*., which remains unchanged for many hours. The increase of *c*. in a mean lunar month being 80·89, and in a mean solar month 83·33, it follows that a mean intercalation is due when, at the time of mean new-moon, *c*. is equal to, or larger by one or two than, the *c*. required for the beginning of the given mean solar month, as shown in the following Table:—

Vaiś. 286	Bhâdr.... 619	Paush.... 952
Jyai. 369	Âśvi. ... 702	Mâgh. ... 36
Âsh. 452	Kârtt. ... 786	Phâlg.... 119
Śrâv. 536	Mârg. ... 869	Chaitr. .. 202

However, the calculation gives not absolutely reliable results; for it is just possible that, instead of the month that is actually obtained, the preceding or the next one was intercalated.

On Eclipses.

The *d*. of my Tables gives the equivalent for the distance of the sun from the nodes of the moon's orbit. The amount of *d*., therefore, shows whether, on the days of new-moon and full-moon, a solar or lunar eclipse was likely to occur. For any other days but those of new-moon or full-moon, *d*. is of interest for chronological purposes only when the correction for the moon's latitude is to be adhibited as explained under the Correction due to the Moon's Latitude.

The occurrence of an eclipse is ascertained by the following rules:—

At new-moon a solar eclipse is	certain	if *d.* is between	924	and	1000,	or	0	and	76.
	doubtful	,, ,, ,, ,,	894	,,	924,	or	76	,,	106.
	impossible	,, ,, ,, ,,	106	,,	894.				
At full-moon a lunar eclipse is	certain	if *d.* ,, ,,	950	and	1000,	or	0	and	50.
	doubtful	,, ,, ,, ,,	930	,,	950,	or	50	,,	70.
	impossible	,, ,, ,, ,,	70	,,	930.				

Example.—Was there a lunar eclipse in Śrâvaṇa, A.D. 1144?

	a.	*b.*	*c.*	*d.*
A.D. 1844	3352	526	3	97
7 cent......	4345	585	50	822
A.D. 1144	7697	111	53	919
17 July, l.y.	7049	186	542	142
	4746	297	595	61
eq. *b.*	274			
eq. *c.*	95			
A. =	5115			

● $a = 10000 - 7698 = 2302$. 2nd July (c 554) new moon Śrâvaṇa

⊙ $a = 2302 + 5000 = 7302$.

Full-moon occurred about 8 h. 13 m. before the beginning of the 17th July; or on the 16th July, about 15 h. 47 m. The increase of *d.* in eight hours being 2, 2 must be retrenched from 61. The remainder is 59. Therefore, as 59 falls within the limits of a doubtful lunar eclipse, it is likely that there was a small lunar eclipse; as will be found to be the fact by referring to the "Canon of Eclipses," the great work of Oppolzer (Denkschriften der Kaiserl. Akademie der Wissenschaften in Wien 1887, which has superseded the "L'art de vérifier les dates," from which is extracted Cunningham's List of Eclipses in his *Indian Eras.*) The example just given shows at once the advantage and the disadvantage of my method. The advantage consists in this,—that by the same calculation we come to know the moment of new-moon or full-moon, and whether at that time a solar or lunar eclipse has happened or not. The disadvantage consists in leaving some cases doubtful. The latter is especially the case with solar eclipses. For, our calculation does not show whether an eclipse of the sun was *visible* in India, even if the sun was, at the time of the eclipse, above the horizon.[11] But an eclipse of the moon is visible wherever the moon is above the horizon of the observer; *i.e.* wherever the eclipse of the moon occurs at night. To conclude,—if one of the above-named works on eclipses is available, they should be used in preference to the approximate calculation. But, if no other means are at hand, this calculation, which is an ingenious device of M. Largeteau, will be found useful.[12]

[11] For calculating such or any other particulars connected with solar eclipses, the reader is referred to Schram's Tables (Denkschriften d. K. A. d. W. Wien 1886) which are supplementary to the "Canon of Eclipses." With the help of these two works all problems referring to eclipses can now be solved by an easy calculation.

[12] It must be remarked, that eclipses, especially solar ones, instanced in historical documents, were, in many cases, not actually observed eclipses, but calculated ones. For the smaller solar eclipses, if not calculated beforehand, would pass unobserved; since even the larger ones (say up to 7 degrees) are seen only under favorable circumstances, as when the sun is setting or rising, or is seen through a fog or thin cloud. Therefore eclipses mentioned in inscriptions are generally to be interpreted as calculated, not as actually observed. As the result of a calculation of an eclipse varies with the different Siddhântas, and as it is correct only for a period within a few centuries off the composition of the Siddhânta used, it will be safest to identify the eclipses mentioned in inscriptions with such as actually occurred, but keeping in mind the eventuality that, within and near the limits of a *possible* eclipse, the Hindus may have predicted an eclipse when none did occur, or *vice versâ.*

On Karaṇas.

"Half the portion of a *tithi* is established as that of the *karaṇas*," (*Sûrya-Siddhânta*, ii. 69). There are, therefore, 60 *karaṇas* in one lunar month. Their names and numbers are given in the following table :—

Kiṁstughna...	1
Bava	2, 9, 16, 23, 30, 37, 44, 51,
Bâlava	3, 10, 17, 24, 31, 38, 45, 52,
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,
Baṇij	7, 14, 21, 28, 35, 42, 49, 56,
Vishṭi	8, 15, 22, 29, 36, 43, 50, 57,
Śakuni	58,
Nâga............	59,
Chatushpada..	60.

As we know how to calculate a *tithi*, we shall have no difficulty in verifying a *karaṇa*. For instance, suppose it be stated in a document,—*śu di* 5, in the *karaṇa* Bâlava. Bâlava, the tenth *karaṇa*, ended at the same moment with the 5th *tithi* ; being in fact the latter half of it. We therefore calculate, as explained above, the end of the 5th *tithi*. The *karaṇa* in question was the time of about 11 to 12 hours preceding the moment found by our calculation for the end of the 5th *tithi*.

On Nakshatras and Yôgas.

The *nakshatra*, in which the moon is at any given moment, can, by the help of my Tables, be found with sufficient accuracy. The *yôga*, an astrological element, will be found by the same operation required for the *nakshatras*. We treat, therefore, of the *nakshatras* and *yôgas* at the same time.

Rule for finding the Nakshatra.—From the *c.* of the date in question subtract 279·4 augmented by the tenth part of the equation of *c.* If *c.* is smaller than the sum to be subtracted, add 1000 to *c.* (This is the true longitude of the sun expressed in thousandth parts of the circle). Add to this, the tenth part of *A.* for the date in question. The result, taken as Index, shows, by Table 17, the *nakshatra* in which the moon is at the given moment.

Rule for finding the Yôga.—Add to the result, just found, the true longitude of the sun, calculated according to the above rule; the sum indicates as Index the *yôga*, current at the moment in question, by the same Table.

Example.—Find the *nakshatra* and *yôga* for sunrise on the 11th May, A.D. 1824 :—

A.D. 1824	9646	416	3	
11 May ...	4361	754	359	
	4007	170	362	+ 279·4
			$\frac{1}{10}$ eq. *c.*	1·3
eq. *b.*	263			——
eq. *c.*	13			280·7
A. =	4283	—	280·7	

Long. of ⊙ 81·3

428 + 81, = 509, Index of *nakshatra*, *viz.* Chitrâ
509 + 81, = 590, Index of *yôga*, *viz.* Siddhi.
And in the *Ravi-Pañchâṅgam* (Warren's *Kala-Sankalita*, p. 317) we find that, on the 11th May, A.D. 1824, the moon was in the *nakshatra* Chitrâ, and that the *yôga* Siddhi continued for 5 *ghaṭîs* after sunrise.

If it is required to know more accurately the beginning of a *nakshatra* or *yôga*, the Table for Differences must be applied. For instance, we found 590 as Index of the *yôga*. Subtracting 590 from 594 (the beginning of Vyatîpâta), we get as the remainder 4. The Table for Differences shows that the △ 4 is equal to about 2 h. 27 m. Accordingly, the *yôga* Vyatîpâta began about 2 h. 27 m. about 6 *ghaṭîs* after sunrise at Laṅkâ.

This calculation is not very accurate, as an error of one unit in the Index makes a difference of above half an hour. But, for chronological purposes, this degree of accuracy will be all that is wanted.

There is also another method of reckoning *yôgas* in use, for the particulars of which the reader is referred to Colebrooke, *Miscellaneous Essays*, Vol. II. p. 363 (new edition, p. 319).

In some inscriptions (e.g. *ante*, Vol. XII. pp. 18, 254,) the *nakshatra* is mentioned together with the date. But, on calculating the date, I have found that the *nakshatra* in which, by my method, the moon must have been at that time, does not agree with the *nakshatra* given in the inscription. Nor does the week-day come out right. It is therefore doubtful whether the dates of those inscriptions are correct. But I find that the date in Vol. XII. p. 258, is correct when calculated for the time of full-moon.

PART III.—THE PERPETUAL LUNAR CALENDAR.

Many chronological questions can be more readily solved if the whole lunar year, together with the corresponding English year, is exposed to our view. However, this cannot be done without a sacrifice of accuracy; *i.e.* we must rest satisfied with approximate results. Where no more than such an approximation is wanted, the Perpetual Lunar Calendar, exhibited in Table 12, will be found useful. In Table 12, every day is entered with a Roman cypher, the Epact, and one of the seven letters *a.* to *g.*, the Dominical Letter. To begin with the latter, the **Dominical Letters** serve to show on what day of the week fell any given date of any year, in which the week-day of one date is known. For instance, let us suppose that, in a certain year, the 5th March was a Wednesday. As the 5th March has the Dominical Letter *a.*, we know at once that all days having the same Dominical Letter *a.*, were Wednesdays. What were the week-days of the remaining Dominical Letters, will be found by the subsidiary Table 12, which needs no explanation. If no week-day is known from other sources, the week-day of the 1st March, or the value of the Dominical Letter *d.*, can easily be found by help of Table 14, which gives the value of the Dominical Letter *d.* from A.D. 0 to 2000, Old Style. The **Epacts** are arranged in such a way, that the same phase of the moon approximately occurred throughout one English year and the first four months of the next, on all days having the same Epact. For instance, if of some given year the 10th March, having the Epact X., was the day of a new-moon, a new-moon occurred on all days having the Epact X., throughout the year, *i.e.* on the 9th April, 8th May, etc. As the initial date of the lunar month immediately follows the day of new-moon, the initial day of all lunar months will be found by adding *one* to the Epact of the new-moon day of the year under consideration. As Cunningham's Table XVII. gives the initial day of the luni-solar years, the date taken out from that Table serves to find the beginning of all lunar months. But Cunningham's dates are, in many cases, apt to mislead; for they are calculated for mean midnight of Ujjain; whereas, in civil reckonings the days are accounted to begin with sunrise. Therefore, if the mean new-moon falls between midnight and sunrise, Cunningham couples it with the following day, whereas, actually, it belonged to the preceding one. Hence a fourth part of Cunningham's dates is a day too late. To find with perfect accuracy the date of mean new-moon, my Tables may be used thus,—Add 200 to the *a.* of the corresponding year, then add the *a.* for the intervening centuries. Subtract the *a.* thus found from 10000. The remainder is the *a.* on which the mean new-moon occurred throughout the whole year. For instance, in A.D. 1468 we have 10000—(1800 + 200 + 9936) = 10000—1936 = 8064. Hence, mean new-moon occurred, *e.g.*, late on the 23rd March, as that day has the next lower *a* (7768), and Chaitra *śu di* 1 fell, *i.e.* ended, on the 24th March. For the reasons stated above, Cunningham gives the 25th March for the beginning of the luni-solar year.

However, without reference to the Tables, the day of new-moon in March can be found for any given year, and, at the same time, for a good many years preceding and following it, by Table 13.

The second Part of this Table gives the date in March on which new-moon occurred in the years A.D. 304 (0) to 379 (75); the fraction gives the complete quarters of the day, after which the conjunction took place. The same dates, in the same order, are valid for the next 76 years; but a quarter of a day must be subtracted from each; after 152 years two quarters must be subtracted; after 228 years, three quarters, and after 304 years (in A.D. 608 etc.) a complete day must be retrenched from the date found.[13]

[13] The correctness of these rules can easily be demonstrated by the above Tables. The difference of the relative positions of the sun and the moon after 76 years, is found by subtracting the *a.* of A.D. 1801 (5138) from that of A.D. 1876 (5222). The remainder 84 is nearly equal to the fourth part of the increase of *a.* for one day 339 = 85. In 304 years it amounts to 335 instead of 339, which would be the increase of *a.* for one complete day. Our error, therefore, is about 20 minutes in 304 years; and even in the 19th century the error is only 1 h. 25 m., which may be neglected without any practical consequences.

Therefore, to find the date of new-moon in March for any year, *e.g.* A.D. 1468, subtract from it the next lower figure under I. in Part the first (1216), and put down apart the subtractive quantity in parenthesis (—3 ; see Table 13, example). From the remainder (252) subtract, if it is greater than 76, the next lower figure under II. of Part the First (228) and put apart the subtractive quantity. The second remainder (24) is to be looked out in Part the Second in the column *y*. From the date thus found ($27\frac{2}{4}$), subtract the sum of the subtractive quantities ($3\frac{3}{4}$) set apart ; the result will be the date of mean new-moon in March for the year in question. By adding or subtracting $14\frac{3}{4}$ we get the day of mean full-moon. Augment the date of new or full moon by *one*, to find the Epact of the beginning of the *śukla* or *kṛishṇa paksha*. If the Epact turns out to be above 30, deduct 30 from it, to find the correct Epact. Knowing the beginning of the month, it will be easy to verify, approximately, any day of it, by counting onwards, making the *śukla paksha* consist of 15 days, and the *kṛishṇa paksha* of 14 days and 15 days alternately, as done by Cunningham. The result, thus arrived at, is the same as that arrived at by Cunningham's method, if the initial day of the year falls in March. If it falls in February, there is sometimes a difference. For, if the date to be verified falls in a series of 30 Epacts, my date will be one day earlier than Cunningham's date ; but if the date falls in a series of 29 Epacts, Cunningham's method and mine yield the same result.[14]

It remains to ascertain the names of the Indian months, the initial days of which are indicated by the Epact as explained above. The name of the lunar month depending on the solar month in which new-moon occurred, all that is required, is, to know on which days the solar months commenced. This information is furnished by the following arrangement of my Table 12. The names of the solar months are placed above those of the English months in such a way that the first part of the Sanskrit name is written above the latter part of the English name of that English month in the *later* part of which (below the horizontal stroke) the solar Hindu month commenced.[15] For instance, the solar Śrâvaṇa begins in June and ends in July. The initial date of the solar month is marked by a number (4 to 19) placed between the Epact and the Dominical Letter. These numbers indicate the century A.D. in which, approximately, the solar month commenced on the day marked by the number of the century ; thus Śrâvaṇa, in A.D. 600 to 700, began on the 23rd June, that day being marked by 6.

It will be noticed that January and February in the large Table, and March and April in the Continuation-Table, have two columns ; one is to be used for common years, and the other for leap-years, as indicated by the headings of the column.

An example will set the application of my Table in a clear light. On what day, in A.D. 807, fell Pausha *śu di* 1 ? Cunningham's Table XVII. gives as the initial date of the Hindu year, Sunday, the 14th March. This day is marked XIVc. in my Table. The Epact XIV. occurs in December, on the 5th ; this day is Pausha śu di 1, because it fell in the solar Pausha which in A.D. 700 to 800 ran from the 23rd November to the 22nd December, as indicated by the number 7 placed after the Epact of those days. The 5th December has the Dominical Letter *c*., just as the 14th March, which was a Sunday. Therefore, in A.D. 807, Pausha *śu di* 1 fell on Sunday, the 5th December.

An additional advantage of my method, as will have been remarked, is, that no regard is taken of intercalary or expunged months intervening between the initial day of the Hindu year and the date to be verified.

I conclude with a practical hint. If a list of eclipses is at hand, some new and full moons of every year may be taken from it. For the day of a lunar eclipse is, of course, a full-moon day, and a solar eclipse coincides with new-moon. Taking the Epact of the date of an eclipse, may serve to check a result arrived at by starting from the initial day of the Hindu year as given in Cunningham's Table XVII.

[14] If Cunningham's date differs from mine, both are equally good ; for both are approximations only.

[15] In the more recent centuries preceding our time the beginning of the solar month has shifted to the first part of the next Christian month.

PART IV.—THE CONSTRUCTION OF TABLES 5 to 11.

As stated above, my Tables are those of M. Largeteau, adapted to the doctrines and elements of Hindu astronomy, especially those of the *Sûrya-Siddhânta*. The inaccuracy of the elements of Hindu astronomy becomes perceptible in calculations for long intervals of time; but, if the interval of time is only a few years, the result of the Hindu calculation may be considered correct for all practical purposes. Therefore Table 7, which gives the increase of *a. b. c.* for the 366 days of the year, could be adopted from the original Tables, without any change beyond omitting two columns not wanted, and adding one, *w.*, for finding the weekday. But Tables 5 and 6 had to be entirely recalculated. I shall explain how this was effected, in order to show that my Tables must yield correct results.

The epoch of Hindu astronomy is the beginning of the Kaliyuga; according to the *Sûrya-Siddhânta*, at midnight, at Laṅkâ, of the 17th-18th February, Old Style, B.C. 3102. As the civil day is usually reckoned to begin with sunrise at Laṅkâ, the beginning of the Kaliyuga according to the *Sûrya-Siddhânta* may be stated as B.C. 3102, 17th February, Old Style, 18 hours, Laṅkâ time. (According to the *Ârya-Siddhânta*, the Yuga began 6 hours later, or on the 18th February, 0 hour, Laṅkâ time.) At that epoch, according to the *Sûrya-Siddhânta*, the mean moon and sun were in the initial point of the Hindu zodiac; the longitude of the moon's perigee was 9 signs; and the sun's perigee was practically at the same place as at present, *i.e.* 257° 17′ of the initial point of the Hindu zodiac. Accordingly *a.* or the difference of the mean longitudes of the sun and the moon, was *nil*. But we must subtract the constant quantity 200·5 by which the difference of the longitude of the sun and the moon is diminished, in order that the equations of *b.* and *c.* may be always additive, and not additive in some cases, and subtractive in others.

Hence, *a.* was $10000 - 200{\cdot}5 = 9799{\cdot}5$.

b. or the moon's mean anomaly, was 90° = 0·250 of the circle, or in my notation 250.

c. or the sun's mean anomaly, was 102° 52′, or in my notation 285·8.

Instead of starting from this epoch and adding the increase of these quantities for the time elapsed between the epoch and the given date, as would be more in accordance with the practice of the Hindus, we start from the 1st January of the corresponding year of the 19th century, for the hundred years of which the value of *a. b. c.* had to be calculated. Suppose the correct value of *a. b. c.* for the corresponding year to be known, the same for the given year can be found, by subtracting the increase of *a. b. c.* for the complete elapsed centuries. But to convert the subtractive increase into an additive quantity, we subtract the increase from 1, and add the remainder. This remainder is entered in Table 6 as *a. b. c.* In the way thus explained, the *a. b. c.* for the 1st January of any year can be found. For any other date, we add to the *a. b. c.* for the 1st January the increase up to the given day as registered in Table 7.

According to the rules just laid down, we will now calculate the *a. b. c.* for the beginning of the Kaliyuga, the amount of which quantities has been specified above according to the *Sûrya-Siddhânta*.

The corresponding year of B.C. 3102 (beginning of the Kaliyuga) is A.D. 1899, the interval being 5000 years. Adding to the *a.* of Kaliyuga 0, the increase of *a.* in 5000 Julian years, we get the *a.* for A.D. 1899, 17th February, 18 hours, Old Style, or 1st March, 18 hours, New Style. Our Tables serve, however, for the inverse problem; thus, we start from *a.* for A.D. 1899, and add to this, *a.* for 5000 years, and *a.* for the 1st March, and *a.* for 18 hours. The two last positions are equal to the increase of *a.* for 59·75 days. Now we have the proportion:—As the synodical revolution of the moon in a Yuga is to the increase of *a*, in 5000 years, so the days in a Yuga are to the days in 5000 years; *viz.*—

$$\text{increase of } a = \frac{1826250 \times 53433336}{1577917828} = 61842{\cdot}65628$$

in 5000 Julian years.

Hence, increase in 1000 years is 12368·53126, and increase in 100 years is 1236·853126. In the same way the increase of *a.* in 59·75 days will be found to be 2·023326.

Now rejecting complete revolutions, and subtracting the fraction from 1, the remainder is to be used as *a.* for 5000 years, *viz.* 3437·2 ; *a.*

for 1000 years, *viz.* 4687·4; *a.* for 100 years, *viz.* 1468·7.

Our calculation will be as follows:—

A.D. 1899	...6129
5000 years	...3437·2
59·75 days	......233·26
Kaliyuga 0	... 9799·46

The difference from 9799·5 being smaller than can be expressed in my Tables, the calculation has proved that the *a.* for A.D. 1899 is correctly given.

From the *a.* of A.D. 1899 the *a.* for the remaining years of the 19th century was found by subtracting the increase of *a.* for the interval between A.D. 1899 and the particular years, rejecting the fraction, or counting it as 1, according as it was less or greater than a half. The *a.* in Table 6 was found as stated above. But, for 3 and more centuries, the increase of *a.* for 12 complete days, 4064, is to be added on account of the difference between the Old and the New Style: *e.g.* 10 cent. = 4687 + 4064 = 8751.[16]

In an analogous manner was found the *b.* of Tables 5 and 6. The proportion holds:— As the anomalistic months in the Yuga are to the increase of *b.* in 5000 years, so the days in the Yuga are to the days in 5000 years; *viz.*— increase of *b.* $= \frac{1826250 \times 57265133}{1577917828} = 66277{\cdot}5056$ in 5000 Julian years.

Hence the increase in 1000 years is 13255·5011; in 100 years, 1325·5501; and in 59·75 days, 2.1684. And *b.* for 5000 years is 494·4; for 1000 years, 498·9; and for 100 years, 449.9.

Therefore, as above:—

	b.
A.D. 1899	587·2
5000 years	494·4
59·79 days	168·4
Kaliyuga 0	250.0

Accordingly *b.* for A.D. 1899 is 587·2. But, as the fraction is smaller than ½, we reject it.

The remaining operations are the same as with *a.*[17]

For determining *c.* we say:—As the anomalistic revolutions of the sun in the Kalpa is to the increase of *c.* in 5000 years, so the days in the Kalpa are to the days in 5000 years; *viz.*— increase of *c.* in 5000 Julian years = $\frac{18262500 \times 4319999613}{1577917828000} = 4999{\cdot}8796$.

Hence the increase in 1000 years is 999·9759; in 100 years, 99·9976; in 59·75 days, 0·1636 and *c.* for 5000 years is 1204; for 1000 years, 24·1; and for 100 years, 2·4.

Therefore, as above:—

	c.
A.D. 1899	1·8
5000 years	120·4
59·75 days	163·6
Kaliyuga 0	285·8

Accordingly *c.* for A.D. 1899, *viz.* 2, is too large by only 0·2.

Tables 9 and 10 are calculated according to the rules of the *Sûrya-Siddhânta,* on which we need not enter here.

Possible Error.

As in the Tables fractions are neglected or counted as 1, according as they are less or larger than ½, the absolute error in every quantity may amount to ± 0·5. Usually the plus and the minus of the different figures will compensate for each other; but in extreme cases the neglected fractions may sum up to ± 2·5 or ± 3·5, according as five or seven figures are summed up to find *A.*, and the error in time will be 10 or 14 minutes respectively. In the same way, the error in the sums of *b.* and *c.* may mount up to ± 1·5 or ± 2·5, according as three or five figures are summed up. But the effect of these errors on the equations of *b.* and *c.*, and through them on *A.*, is not the same, but can be ascertained, in every case; generally, it is very small.

[16] In the way indicated Table 6 may easily be extended beyond the limits I have chosen, which were selected because the calendar now in use was not introduced before that time.

[17] Some centuries ago a *bîja* or correction was introduced, by which the *b.* of Table 5 would be diminished by 5. This correction should be applied in dates of the last three or four centuries.

TABLE 1.

Initial Dates of Hindu Months.

THE YEAR DIVIDED BY 4 LEAVES REMAINDER 1.

add days	Vaiś.	Jyai.	Âsh.	Śrâv.	Bhâdr.	Âśvi.	Kârtt.	Mârg.	Paush.	Mâgh.	Phâlg.	Chaitr.	add days
	18 Mar.	17 Apr.	19 May.	19 June.	21 July.	21 Aug.	20 Sept.	20 Oct.	19 Nov.	18 Dec.	17 Jan.	15 Feb.	
1	489	381	449	381	441	437	385	397	453	413	505	413	1
2	605	497	565	497	557	553	501	513	569	529	621	529	2
3	721	613	681	613	673	669	617	629	685	645	737	655	3
4	837	729	797	725	789	785	733	741	801	761	853	761	4
5	949	845	913	841	605	901	845	857	913	873	965	873	5
6	1065	957	1029	957	1017	1013	961	973	1029	989	1081	989	6
7	1181	1073	1141	1073	1133	1129	1067	1089	1145	1105	1197	1105	7
8	1297	1189	1257	1189	1249	1245	1183	1205	1261	1221	1313	1223	8
9	1413	1305	1373	1301	1365	1361	1309	1317	1377	1337	1429	1333	9
10	1525	1421	1489	1417	1481	1477	1421	1433	1489	1449	1541	1449	10
11	1641	1533	1605	1533	1593	1589	1537	1549	1605	1565	1657	1565	11
12	1757	1649	1717	1649	1719	1705	1653	1665	1721	1681	1773	1681	12
13	1873	1765	1833	1765	1825	1821	1769	1781	1837	1797	1885	1797	13

TABLE 2.

Initial Dates of Hindu Months.

THE YEAR DIVIDED BY 4 LEAVES REMAINDER 2.

add days	Vaiś.	Jyai.	Âsh.	Śrâv.	Bhâdr.	Âśvi.	Kârtt.	Mârg.	Paush.	Mâgh.	Phâlg.	Chaitr.	add days
	18 Mar.	17 Apr.	19 May.	19 June.	21 July.	21 Aug.	20 Sept.	20 Oct.	19 Nov.	18 Dec.	17 Jan.	15 Feb.	
1	462	354	422	354	414	410	358	366	426	386	478	386	1
2	574	470	538	466	530	526	470	482	538	498	594	498	2
3	690	586	654	582	642	638	586	598	654	614	706	614	3
4	806	698	770	698	758	754	702	714	770	730	822	730	4
5	922	814	882	814	874	870	818	830	886	846	938	846	5
6	1038	930	998	930	990	986	934	942	1002	962	1054	962	6
7	1150	1046	1114	1042	1106	1102	1046	1058	1114	1074	1170	1074	7
8	1266	1162	1230	1158	1218	1214	1162	1174	1230	1190	1282	1190	8
9	1382	1274	1346	1274	1334	1330	1278	1290	1346	1306	1398	1306	9
10	1498	1390	1458	1390	1450	1446	1394	1406	1462	1422	1514	1422	10
11	1614	1506	1574	1506	1566	1562	1510	1518	1578	1538	1630	1538	11
12	1726	1622	1690	1618	1682	1678	1626	1634	1690	1650	1746	1650	12
13	1842	1738	1806	1734	1794	1790	1738	1750	1806	1766	1858	1766	13

TABLE 3.

Initial Dates of Hindu Months.

THE YEAR DIVIDED BY 4 LEAVES REMAINDER 3.

add days	Vaiś. 19 Mar.	Jyai. 18 Apr.	Âsh. 20 May.	Śrâv. 20 June.	Bhâdr. 22 July.	Âśvi. 22 Aug.	Kârtt. 21 Sept.	Mârg. 21 Oct.	Paush. 20 Nov.	Mâgh. 19 Dec.	Phâlg. 17 Jan.	Chaitr. 15 Feb.	add days
1	547	439	507	439	499	495	443	455	511	471	447	355	1
2	663	555	623	555	615	611	559	571	627	587	563	471	2
3	779	671	739	667	731	727	675	683	743	703	679	587	3
4	891	787	855	783	847	843	787	799	855	815	795	703	4
5	1007	899	971	899	959	955	903	915	971	931	911	815	5
6	1123	1015	1083	1015	1075	1071	1019	1031	1087	1047	1022	931	6
7	1239	1131	1199	1131	1191	1187	1135	1147	1203	1163	1139	1047	7
8	1355	1247	1315	1243	1307	1303	1251	1259	1319	1279	1255	1163	8
9	1467	1363	1431	1359	1423	1419	1363	1375	1431	1391	1371	1279	9
10	1583	1475	1547	1475	1535	1531	1479	1491	1547	1507	1487	1391	10
11	1699	1591	1659	1591	1651	1647	1595	1607	1663	1623	1599	1507	11
12	1815	1707	1775	1707	1767	1763	1711	1723	1779	1739	1715	1623	12
13	1931	1823	1891	1819	1883	1879	1827	1839	1895	1855	1831	1739	13

TABLE 4.

Initial Dates of Hindu Months.

LEAP-YEARS.

add days	Vaiś. 18 Mar.	Jyai. 17 Apr.	Âshâ. 19 May.	Śrâv. 19 June.	Bhâdr. 21 July.	Âśvi. 21 Aug.	Kârtt. 20 Sept.	Mârg. 20 Oct.	Paush. 19 Nov.	Mâgh. 18 Dec.	Phâlg. 18 Jan.	Chaitr. 16 Feb.	add days
1	520	412	480	408	472	468	416	424	484	444	536	440	1
2	632	528	596	524	588	580	528	540	596	556	648	556	2
3	748	640	712	640	700	696	644	656	712	672	764	672	3
4	864	756	824	756	816	812	764	772	828	788	880	788	4
5	980	872	940	872	932	928	876	888	944	904	996	904	5
6	1092	988	1056	984	1048	1044	992	1000	1060	1020	1112	1016	6
7	1208	1104	1172	1100	1164	1156	1104	1116	1172	1132	1224	1132	7
8	1324	1216	1288	1216	1276	1272	1220	1232	1288	1248	1340	1248	8
9	1440	1332	1400	1332	1392	1388	1336	1348	1404	1364	1456	1364	9
10	1556	1448	1516	1448	1508	1504	1452	1464	1520	1480	1572	1480	10
11	1668	1564	1632	1564	1624	1620	1568	1576	1630	1596	1688	1592	11
12	1784	1680	1748	1676	1740	1732	1680	1692	1748	1708	1800	1708	12
13	1900	1792	1864	1792	1852	1848	1796	1808	1864	1824	1916	1824	13

TABLE 5.

Years of the 19th Century A.D.

Years.	w	a	b	c	d
1801	5	5178	566	6	479
1802	6	8738	813	5	585
1803	7	2349	59	4	691
L 1804	1	5940	306	4	797
1805	3	9880	588	6	909
1806	4	3480	835	5	15
1807	5	7080	81	4	121
L 1808	6	681	328	4	227
1809	1	4621	610	6	339
1810	2	8221	857	5	445
1811	3	1822	103	4	551
L 1812	4	5422	350	3	657
1813	6	9362	632	5	769
1814	7	2962	879	5	875
1815	1	6563	125	4	981
L 1816	2	163	372	3	87
1817	4	4103	654	5	199
1818	5	7703	901	5	305
1819	6	1304	147	4	411
L 1820	7	4905	394	3	517
1821	2	8845	676	5	629
1822	3	2445	923	5	735
1823	4	6045	169	4	841
L1824	5	9646	416	3	947
1825	7	3586	698	5	59
1826	1	7186	945	4	165
1827	2	787	191	4	271
L 1828	3	4387	438	3	377
1829	5	8327	720	5	489
1830	6	1927	967	4	595
1831	7	5528	213	4	701
L 1832	1	9128	460	3	807
1833	3	3068	742	5	919
1834	4	6668	989	4	25
1835	5	269	235	4	131
L 1836	6	3870	482	3	237
1837	1	7809	764	5	349
1838	2	1410	11	4	455
1839	3	5010	257	3	561
L 1840	4	8611	504	3	667
1841	6	2551	786	5	779
1842	7	6151	33	4	885
1843	1	9751	279	3	991
L 1844	2	3352	526	3	97
1845	4	7292	808	5	209
1846	5	892	55	4	315
1847	6	4493	301	3	421
L 1848	7	8093	548	3	527
1849	2	2033	830	5	639
1850	3	5633	77	4	745
1851	4	9234	323	3	851
L 1852	5	2835	570	2	957
1853	7	6775	852	4	69
1854	1	375	99	4	175
1855	2	3975	345	3	281
L 1856	3	7576	592	2	387
1857	5	1516	874	4	499
1858	6	5116	121	4	605
1859	7	8717	367	3	711
L 1860	1	2317	614	2	817
1861	3	6257	896	4	929
1862	4	9857	143	4	35
1863	5	3458	389	3	141
L 1864	6	7058	636	2	247
1865	1	998	918	4	359
1866	2	4598	165	3	465
1867	3	8199	411	3	571
L 1868	4	1800	658	2	677
1869	6	5740	940	4	789
1870	7	9340	187	3	895
1871	1	2940	433	3	1
L 1872	2	6541	680	2	107
1873	4	481	962	4	219
1874	5	4081	209	3	325
1875	6	7682	455	2	431
L 1876	7	1282	702	2	537
1877	2	5222	984	4	649
1878	3	8822	231	3	755
1879	4	2423	477	2	861
L 1880	5	6023	724	2	967
1881	7	9963	6	4	79
1882	1	3563	253	3	185
1883	2	7164	499	2	291
L 1884	3	765	746	2	397
1885	5	4705	28	4	509
1886	6	8305	275	3	615
1887	7	1905	521	2	721
L 1888	1	5506	768	1	827
1889	3	9446	50	3	939
1890	4	3046	297	3	45
1891	5	6647	543	2	151
L 1892	6	247	790	1	257
1893	1	4187	72	3	369
1894	2	7787	319	3	475
1895	3	1388	565	2	581
L 1896	4	4988	812	1	687
1897	6	8928	94	3	799
1898	7	2528	341	3	905
1899	1	6129	587	2	11
L 1900	2	9730	834	1	117

TABLE 6.

Centuries intervening between the given year and the corresponding one of the 19th Century.

Century.	w	a	b	c	d
15	6	6094	185	69	823
14	5	4626	734	67	573
13	4	3157	284	64	322
12	3	1688	834	62	73
11	2	220	384	59	823
10	1	8751	934	57	572
9	7	7282	484	55	322
8	6	5813	35	52	71
7	5	4345	585	50	822
6	4	2876	135	47	572
5	3	1407	685	45	321
4	2	9939	235	43	71
J. 3	1	8470	785	40	820
G. 2	4	3615	972	11	512
G. 1	2	1808	486	5	256

N.B.—Centuries 1 and 2 yield the date in the New Style; the other Centuries in the Old Style.

Equations for converting Hindu years into years A. D.

Kaliyuga-Saṁvat; — 3101. Vikrama-Saṁvat; — 56. Śaka-Saṁvat; + 78.

These equations give the commencement, A. D., of the *expired* Hindu year, *i.e.*, more properly, of the current year next after the expired year for which the equation is applied.

TABLE 7.

JANUARY.

Common. day.	Leap year.	w	a	b	c	d
1	1	0	...	...	...	...
2	2	1	339	36	3	6
3	3	2	677	73	5	12
4	4	3	1016	109	8	17
5	5	4	1355	145	11	23
6	6	5	1693	181	14	29
7	7	6	2032	218	16	35
8	8	0	2370	254	19	40
9	9	1	2709	290	22	46
10	10	2	3048	327	25	52
11	11	3	3386	363	27	58
12	12	4	3725	399	30	63
13	13	5	4064	436	33	69
14	14	6	4402	472	36	75
15	15	0	4741	508	38	81
16	16	1	5079	544	41	87
17	17	2	5418	581	44	92
18	18	3	5757	617	47	98
19	19	4	6095	653	49	104
20	20	5	6434	690	52	110
21	21	6	6773	726	55	115
22	22	0	7111	762	57	121
23	23	1	7450	798	60	127
24	24	2	7789	835	63	133
25	25	3	8127	871	66	138
26	26	4	8466	907	68	144
27	27	5	8804	944	71	150
28	28	6	9143	980	74	156
29	29	0	9482	16	77	162
30	30	1	9820	52	79	167
31	31	2	159	89	82	173

1 Phâlguna *c.* about 114
♒ Kumbha-saṁkrânti.

FEBRUARY.

Common. day.	Leap year.	w	a	b	c	d
1	1	3	498	125	85	179
2	2	4	836	161	88	185
3	3	5	1175	198	90	190
4	4	6	1513	234	93	196
5	5	0	1852	270	96	202
6	6	1	2191	306	99	208
7	7	2	2529	343	101	213
8	8	3	2868	379	104	219
9	9	4	3207	415	107	225
10	10	5	3545	452	110	231
11	11	6	3884	488	112	237
12	12	0	4243	524	115	242
13	13	1	4561	561	118	248
14	14	2	4900	597	120	254
15	15	3	5238	633	123	260
16	16	4	5577	669	126	265
17	17	5	5916	706	129	271
18	18	6	6254	742	131	277
19	19	0	6593	778	134	283
20	20	1	6932	815	137	288
21	21	2	7270	851	140	294
22	22	3	7609	887	142	300
23	23	4	7947	923	145	306
24	24	5	8286	960	148	312
25	25	6	8625	996	151	317
26	26	0	8963	32	153	323
27	27	1	9302	69	156	329
28	28	2	9641	105	159	335
...	29	3	9979	141	162	340

1 Chaitra *c.* about 196
♓ Mîna-saṁkrânti.

MARCH.

Common. day.	Leap year.	w	a	b	c	d
1	...	3	9979	141	162	340
2	1	4	318	177	164	346
3	2	5	657	214	167	352
4	3	6	995	250	170	358
5	4	0	1334	286	172	364
6	5	1	1672	323	175	369
7	6	2	2011	359	178	375
8	7	3	2350	395	181	381
9	8	4	2688	432	183	387
10	9	5	3027	468	186	392
11	10	6	3366	504	189	398
12	11	0	3704	540	192	404
13	12	1	4043	577	194	410
14	13	2	4382	613	197	415
15	14	3	4720	649	200	421
16	15	4	5059	686	203	427
17	16	5	5397	722	205	433
18	17	6	5736	758	208	439
19	18	0	6075	794	211	444
20	19	1	6413	831	214	450
21	20	2	6752	867	216	456
22	21	3	7091	903	219	462
23	22	4	7429	940	222	467
24	23	5	7768	976	224	473
25	24	6	8106	12	227	479
26	25	0	8445	48	230	485
27	26	1	8784	85	233	490
28	27	2	9122	121	235	496
29	28	3	9461	157	238	502
30	29	4	9800	194	241	508
31	30	5	138	230	244	514
...	31	6	477	266	246	519

1 Vaiśâkha *c.* about 279
♈ Mêsha-saṁkrânti.

w.; 1 = Sunday, 2 = Monday, 3 = Tuesday, 4 = Wednesday, 5 = Thursday, 6 = Friday, 7 or 0 = Saturday.

TABLE 7—continued.

APRIL.							MAY.							JUNE.						
Common.	Leap year.	w	a	b	c	d	Common.	Leap year.	w	a	b	c	d	Common.	Leap year.	w	a	b	c	d
day.							day.							day.						
1	...	6	477	266	246	519	1	...	1	636	355	329	692	1	...	4	1133	480	413	871
2	1	0	816	303	249	525	2	1	2	974	391	331	698	2	1	5	1472	516	416	877
3	2	1	1154	339	252	531	3	2	3	1313	428	334	704	3	2	6	1811	553	419	883
4	3	2	1493	375	255	537	4	3	4	1652	464	337	710	4	3	0	2149	589	422	889
5	4	3	1831	411	257	542	5	4	5	1990	500	339	715	5	4	1	2488	625	424	894
6	5	4	2170	448	260	548	6	5	6	2329	536	342	721	6	5	2	2827	661	427	900
7	6	5	2509	484	263	554	7	6	0	2668	573	345	727	7	6	3	3165	698	430	906
8	7	6	2847	520	266	560	8	7	1	3006	609	348	733	8	7	4	3504	734	433	912
9	8	0	3186	557	268	565	9	8	2	3345	645	350	739	9	8	5	3842	770	435	917
10	9	1	3525	593	271	571	10	9	3	3684	682	353	744	10	9	6	4181	807	438	923
11	10	2	3863	629	274	577	11	10	4	4022	718	356	750	11	10	0	4520	843	441	929
12	11	3	4202	665	277	583	12	11	5	4361	754	359	756	12	11	1	4858	879	444	935
13	12	4	4540	702	279	589	13	12	6	4699	790	361	762	13	12	2	5197	916	446	941
14	13	5	4879	738	282	594	14	13	0	5038	827	364	767	14	13	3	5536	952	449	946
15	14	6	5218	774	285	600	15	14	1	5377	863	367	773	15	14	4	5874	988	452	952
16	15	0	5556	811	287	606	16	15	2	5715	899	370	779	16	15	5	6213	24	454	958
17	16	1	5895	847	290	612	17	16	3	6054	936	372	785	17	16	6	6552	61	457	964
18	17	2	6234	883	293	617	18	17	4	6393	972	375	790	18	17	0	6890	97	460	969
19	18	3	6572	919	296	623	19	18	5	6731	8	378	796	19	18	1	7229	133	463	975
20	19	4	6911	956	298	629	20	19	6	7070	45	381	802	20	19	2	7567	170	465	981
21	20	5	7250	992	301	635	21	20	0	7408	81	383	808	21	20	3	7906	206	468	987
22	21	6	7588	28	304	640	22	21	1	7747	117	386	814	22	21	4	8245	242	471	992
23	22	0	7927	65	307	646	23	22	2	8086	153	389	819	23	22	5	8583	278	474	998
24	23	1	8265	101	309	652	24	23	3	8424	190	391	825	24	23	6	8922	315	476	4
25	24	2	8604	137	312	658	25	24	4	8763	226	394	831	25	24	0	9261	351	479	10
26	25	3	8943	174	315	664	26	25	5	9102	262	397	837	26	25	1	9599	387	482	16
27	26	4	9281	210	318	669	27	26	6	9440	299	400	842	27	26	2	9938	424	485	21
28	27	5	9620	246	320	675	28	27	0	9779	335	402	848	28	27	3	276	460	487	27
29	28	6	9959	282	323	681	29	28	1	118	371	405	854	29	28	4	615	496	490	33
30	29	0	297	319	326	687	30	29	2	456	407	408	860	30	29	5	954	532	493	39
...	30	1	636	355	329	692	31	30	3	795	444	411	865	...	30	6	1292	569	496	44
							...	31	4	1133	480	413	871							

1 Jyaishṭha *c.* about 364 — ♉ Vṛisha-saṁkrânti. || 1 Âshâḍha *c.* about 450 — II Mithuna-saṁkrânti. || 1 Śrâvaṇa *c.* about 536 — ♋ Karkaṭa-saṁkrânti.

w.; 1 = Sunday, 2 = Monday, 3 = Tuesday, 4 = Wednesday, 5 = Thursday, 6 = Friday, 7 or 0 = Saturday

TABLE 7—continued.

JULY.

Common.	Leap year.	w	a	b	c	d
day.						
1	...	6	1292	569	496	44
2	1	0	1631	605	498	50
3	2	1	1970	641	501	56
4	3	2	2308	678	504	62
5	4	3	2647	714	506	67
6	5	4	2986	750	509	73
7	6	5	3324	787	512	79
8	7	6	3663	823	515	85
9	8	0	4001	859	517	91
10	9	1	4340	895	520	96
11	10	2	4679	932	523	102
12	11	3	5017	968	526	108
13	12	4	5356	4	528	114
14	13	5	5695	41	531	119
15	14	6	6033	77	534	125
16	15	0	6372	113	537	131
17	16	1	6710	149	539	137
18	17	2	7049	186	542	142
19	18	3	7388	222	545	148
20	19	4	7726	258	548	154
21	20	5	8065	295	550	160
22	21	6	8404	331	553	166
23	22	0	8742	367	556	171
24	23	1	9081	403	559	177
25	24	2	9420	440	561	183
26	25	3	9758	476	564	189
27	26	4	97	512	567	194
28	27	5	435	549	569	200
29	28	6	774	585	572	206
30	29	0	1113	621	575	212
31	30	1	1451	658	578	217
...	31	2	1790	694	580	223

1 Bhâdrapada *c.* about 622
♌ Siṁha-saṁkrânti.

AUGUST.

Common.	Leap year.	w	a	b	c	d
day.						
1	...	2	1790	694	580	223
2	1	3	2129	720	583	229
3	2	4	2467	766	586	235
4	3	5	2806	803	589	241
5	4	6	3144	839	591	246
6	5	0	3483	875	594	252
7	6	1	3822	912	597	258
8	7	2	4160	948	600	264
9	8	3	4499	984	602	269
10	9	4	4838	20	605	275
11	10	5	5176	57	608	281
12	11	6	5515	93	611	287
13	12	0	5854	126	613	292
14	13	1	6192	169	616	298
15	14	2	6531	202	619	304
16	15	3	6869	238	621	310
17	16	4	7208	274	624	316
18	17	5	7547	311	627	321
19	18	6	7885	347	630	327
20	19	0	8224	383	632	333
21	20	1	8563	420	635	339
22	21	2	8901	456	638	344
23	22	3	9240	492	641	350
24	23	4	9578	529	643	356
25	24	5	9917	565	646	362
26	25	6	256	601	649	367
27	26	0	594	637	652	373
28	27	1	933	674	654	379
29	28	2	1272	710	657	385
30	29	3	1610	746	660	391
31	30	4	1949	783	663	396
...	31	5	2288	819	665	402

1 Âśvina *c.* about 708
♍ Kanyâ-saṁkrânti.

SEPTEMBER.

Common.	Leap year.	w	a	b	c	d
day.						
1	...	5	2288	819	665	402
2	1	6	2626	855	668	408
3	2	0	2965	891	671	414
4	3	1	3303	928	673	419
5	4	2	3642	964	676	425
6	5	3	3981	0	679	431
7	6	4	4319	37	682	437
8	7	5	4658	73	684	442
9	8	6	4997	109	687	448
10	9	0	5335	145	690	454
11	10	1	5674	182	693	460
12	11	2	6013	218	695	466
13	12	3	6351	254	698	471
14	13	4	6690	291	701	477
15	14	5	7028	327	704	483
16	15	6	7367	363	706	489
17	16	0	7706	400	709	494
18	17	1	8044	436	712	500
19	18	2	8383	472	715	506
20	19	3	8722	508	717	512
21	20	4	9060	545	720	518
22	21	5	9399	581	723	523
23	22	6	9737	617	726	529
24	23	0	76	654	728	535
25	24	1	415	690	731	541
26	25	2	753	726	734	546
27	26	3	1092	762	736	552
28	27	4	1431	799	739	558
29	28	5	1769	835	742	564
30	29	6	2108	871	745	569
...	30	0	2447	908	747	575

1 Kârttika *c.* about 791
♎ Tulâ-saṁkrânti.

w.; 1 = Sunday, 2 = Monday, 3 = Tuesday, 4 = Wednesday, 5 = Thursday, 6 = Friday, 7 or 0 = Saturday.

TABLE 7—continued.

October.						
Common.	Leap year.	w	a	b	c	d
day.						
1	...	0	2447	908	747	575
2	1	1	2785	944	750	581
3	2	2	3124	980	753	587
4	3	3	3462	16	756	593
5	4	4	3801	53	758	598
6	5	5	4140	89	761	604
7	6	6	4478	125	764	610
8	7	0	4817	162	767	616
9	8	1	5156	198	769	621
10	9	2	5494	234	772	627
11	10	3	5833	271	775	633
12	11	4	6171	307	778	630
13	12	5	6510	343	780	644
14	13	6	6849	379	783	650
15	14	0	7187	416	786	656
16	15	1	7526	452	788	662
17	16	2	7865	488	791	668
18	17	3	8203	525	794	673
19	18	4	8542	561	797	679
20	19	5	8881	597	799	685
21	20	6	9219	633	802	691
22	21	0	9558	670	805	696
23	22	1	9896	706	808	702
24	23	2	235	742	810	708
25	24	3	574	779	813	714
26	25	4	912	815	816	719
27	26	5	1251	851	819	725
28	27	6	1590	887	821	731
29	28	0	1928	924	824	737
30	29	1	2267	960	827	743
31	30	2	2605	996	830	748
...	31	3	2944	33	832	754

1 Mârgaśira *c* about 872
♏ Vṛiśchika-saṁkrânti.

November.						
Common.	Leap year.	w	a	b	c	d
day.						
1	...	3	2944	33	832	754
2	1	4	3283	69	835	760
3	2	5	3621	105	838	766
4	3	6	3960	142	840	771
5	4	0	4299	178	843	777
6	5	1	4637	214	846	783
7	6	2	4976	250	849	789
8	7	3	5315	287	851	794
9	8	4	5653	323	854	800
10	9	5	5992	359	857	806
11	10	6	6330	396	860	812
12	11	0	6669	432	862	818
13	12	1	7008	468	865	823
14	13	2	7346	504	868	829
15	14	3	7685	541	871	835
16	15	4	8024	577	873	841
17	16	5	8362	613	876	846
18	17	6	8701	650	879	852
19	18	0	9039	686	882	858
20	19	1	9378	722	884	864
21	20	2	9717	758	887	869
22	21	3	55	795	890	875
23	22	4	394	831	893	881
24	23	5	733	867	895	887
25	24	6	1071	904	898	893
26	25	0	1410	940	901	898
27	26	1	1749	976	903	904
28	27	2	2087	13	906	910
29	28	3	2426	49	909	916
30	29	4	2764	85	912	921
...	30	5	3103	121	914	927

1 Pausha *c* about 954
♐ Dhanuḥ-saṁkrânti.

December.						
Common.	Leap year.	w	a	b	c	d
day.						
1	...	5	3103	121	914	927
2	1	6	3442	158	917	933
3	2	0	3780	194	920	939
4	3	1	4119	230	923	944
5	4	2	4458	267	925	950
6	5	3	4796	303	928	956
7	6	4	5135	339	931	962
8	7	5	5473	375	934	968
9	8	6	5812	412	936	973
10	9	0	6151	448	939	979
11	10	1	6489	484	642	985
12	11	2	6828	521	945	991
13	12	3	7167	557	947	996
14	13	4	7505	593	950	2
15	14	5	7844	629	953	8
16	15	6	8183	666	955	14
17	16	0	8521	702	958	19
18	17	1	8860	738	961	25
19	18	2	9198	775	964	31
20	19	3	9537	811	966	37
21	20	4	9876	847	969	43
22	21	5	214	884	972	48
23	22	6	553	920	975	54
24	23	0	892	956	977	60
25	24	1	1230	992	980	66
26	25	2	1569	29	983	71
27	26	3	1907	65	986	77
28	27	4	2246	101	988	83
29	28	5	2585	138	991	89
30	29	6	2923	174	994	95
31	30	0	3262	210	997	100
...	31	1	3601	246	999	106

1 Mâgha *c* about 34
♑ Makara-saṁkrânti.

w.; 1 = Sunday, 2 = Monday, 3 = Tuesday, 4 = Wednesday, 5 = Thursday, 6 = Friday, 7 or 0 = Saturday.

TABLE 7—continued.

JANUARY OF THE YEAR CONTINUED.

Preced. y. common.	Preced. y. leap y.	w	a	b	c	d
day.						
1	...	1	3601	246	999	106
2	1	2	3939	283	2	112
3	2	3	4278	319	4	118
4	3	4	4617	355	7	123
5	4	5	4955	391	10	129
6	5	6	5294	428	13	135
7	6	0	5632	464	15	141
8	7	1	5971	500	18	146
9	8	2	6310	537	21	152
10	9	3	6648	573	24	158
11	10	4	6987	609	26	164
12	11	5	7326	645	29	169
13	12	6	7664	682	32	175
14	13	0	8003	718	35	181
15	14	1	8341	754	37	187
16	15	2	8680	791	40	192
17	16	3	9019	827	43	198
18	17	4	9357	863	46	204
19	18	5	9696	900	48	210
20	19	6	35	936	51	215
21	20	0	373	972	54	221
22	21	1	712	9	56	227
23	22	2	1051	45	59	233
24	23	3	1389	81	62	238
25	24	4	1728	117	65	244
26	25	5	2066	154	67	250
27	26	6	2405	190	70	256
28	27	0	2744	226	73	262
29	28	1	3082	263	76	267
30	29	2	3421	299	78	273
31	30	3	3760	335	81	279
...	31	4	4098	371	84	285

1 Phâlguna c. about 114
♒ Kumbha-saṁkrânti.

FEBRUARY OF THE YEAR CONTINUED.

Preced. y. common.	Preced. y. leap y.	w	a	b	c	d
day.						
1	...	4	4098	371	84	285
2	1	5	4437	408	87	290
3	2	6	4776	444	89	296
4	3	0	5114	480	92	302
5	4	1	5453	517	95	308
6	5	2	5791	553	98	313
7	6	3	6130	589	100	319
8	7	4	6469	625	103	325
9	8	5	6807	662	106	331
10	9	6	7146	698	109	337
11	10	0	7485	734	111	342
12	11	1	7823	771	114	348
13	12	2	8162	807	117	354
14	13	3	8500	843	119	360
15	14	4	8839	880	122	365
16	15	5	9178	916	125	371
17	16	6	9516	952	128	377
18	17	0	9855	988	130	383
19	18	1	194	25	133	388
20	19	2	532	61	136	394
21	20	3	871	97	139	400
22	21	4	1209	134	141	406
23	22	5	1548	170	144	412
24	23	6	1887	206	147	417
25	24	0	2225	242	150	423
26	25	1	2564	279	152	429
27	26	2	2903	315	155	435
28	27	3	3241	351	158	440
29	28	4	3580	388	161	446

1 Chaitra c. about 196
♓ Mîna-saṁkrânti.

MARCH OF THE YEAR CONTINUED.

Years 2, 3 *	Years 0, 1 *	w	a	b	c	d
day.						
1	...	4	3580	387	161	446
2	1	5	3918	423	163	452
3	2	6	4257	460	166	458
4	3	0	4596	496	169	464
5	4	1	4934	533	171	469
6	5	2	5273	569	174	475
7	6	3	5612	605	177	481
8	7	4	5950	642	180	487
9	8	5	6289	678	182	492
10	9	6	6628	714	185	498
11	10	0	6966	751	188	504
12	11	1	7305	787	191	510
13	12	2	7644	823	193	515
14	13	3	7982	859	196	521
15	14	4	8321	896	199	527
16	15	5	8659	932	202	533
17	16	6	8998	968	204	539
18	17	0	9337	5	207	544
19	18	1	9675	41	210	550
20	19	2	14	77	213	556
21	20	3	353	113	215	562
22	21	4	691	150	218	567
23	22	5	1030	186	221	573
24	23	6	1368	222	223	579
25	24	0	1707	259	226	585
26	25	1	2046	295	229	590
27	26	2	2384	331	232	596
28	27	3	2723	367	234	602
29	28	4	3062	404	237	608
30	29	5	3400	440	240	614
31	30	6	3739	476	243	619
...	31	0	4078	513	245	625

1 Vaiśâkha c. about 279
♈ Mêsha-saṁkrânti.

Note.—Divide the Christian year in which the date falls by 4; the Remainder shows which Index applies.

TABLE 8.

Hours and Minutes.

Hours.	a	b	c	d	Minutes.	a	b	c	d	Minutes.	a	b	c	d
1	14	2	0	0	1	0	0	0	0	31	7	1	0	0
2	28	3	0	0	2	0	0	0	0	32	8	1	0	0
3	42	5	0	1	3	1	0	0	0	33	8	1	0	0
4	56	6	0	1	4	1	0	0	0	34	8	1	0	0
5	71	8	1	1	5	1	0	0	0	35	8	1	0	0
6	85	9	1	1	6	1	0	0	0	36	8	1	0	0
7	99	11	1	2	7	2	0	0	0	37	9	1	0	0
8	113	12	1	2	8	2	0	0	0	38	9	1	0	0
9	127	14	1	2	9	2	0	0	0	39	9	1	0	0
10	141	15	1	2	10	2	0	0	0	40	9	1	0	0
11	155	17	1	3	11	3	0	0	0	41	10	1	0	0
12	169	18	1	3	12	3	0	0	0	42	10	1	0	0
13	183	20	1	3	13	3	0	0	0	43	10	1	0	0
14	198	21	2	3	14	3	0	0	0	44	10	1	0	0
15	212	23	2	4	15	4	0	0	0	45	11	1	0	0
16	226	24	2	4	16	4	0	0	0	46	11	1	0	0
17	240	26	2	4	17	4	0	0	0	47	11	1	0	0
18	254	27	2	4	18	4	0	0	0	48	11	1	0	0
19	268	29	2	5	19	4	0	0	0	49	12	1	0	0
20	282	30	2	5	20	5	1	0	0	50	12	1	0	0
21	296	32	2	5	21	5	1	0	0	51	12	1	0	0
22	310	33	3	5	22	5	1	0	0	52	12	1	0	0
23	325	35	3	6	23	5	1	0	0	53	12	1	0	0
24	339	36	3	6	24	6	1	0	0	54	13	1	0	0
					25	6	1	0	0	55	13	1	0	0
					26	6	1	0	0	56	13	1	0	0
					27	6	1	0	0	57	13	1	0	0
					28	7	1	0	0	58	14	1	0	0
					29	7	1	0	0	59	14	1	0	0
					30	7	1	0	0	60	14	2	0	0

TABLE 9.

Argument b.

Arg.	Equ.	Arg.	Equ.	Arg.	Equ.	Arg.	Equ.
0	140	250	280	500	140	750	0
10	149	260	280	510	131	760	0
20	158	270	279	520	122	770	1
30	166	280	277	530	114	780	3
40	175	290	276	540	105	790	4
50	184	300	273	550	96	800	7
60	192	310	270	560	88	810	10
70	200	320	267	570	80	820	13
80	208	330	263	580	72	830	17
90	215	340	258	590	65	840	22
100	223	350	253	600	57	850	27
110	230	360	248	610	50	860	32
120	236	370	242	620	44	870	38
130	242	380	236	630	38	880	44
140	248	390	230	640	32	890	50
150	253	400	223	650	27	900	57
160	258	410	215	660	22	910	65
170	263	420	208	670	17	920	72
180	267	430	200	680	13	930	80
190	270	440	192	690	10	940	88
200	273	450	184	700	7	950	96
210	276	460	175	710	4	960	105
220	277	470	166	720	3	970	114
230	279	480	158	730	1	980	122
240	280	490	149	740	0	990	131
						1000	140

TABLE 10.

Argument c.

Arg.	Eq.	Arg.	Eq.	Arg.	Eq.	Arg.	Eq.
0	60	250	0	500	60	750	121
10	57	260	0	510	64	760	121
20	53	270	0	520	68	770	120
30	49	280	1	530	72	780	120
40	45	290	2	540	76	790	119
50	41	300	3	550	79	800	117
60	38	310	4	560	83	810	117
70	34	320	6	570	86	820	115
80	31	330	7	580	90	830	113
90	28	340	9	590	93	840	112
100	25	350	11	600	96	850	109
110	22	360	14	610	99	860	107
120	19	370	16	620	102	870	105
130	16	380	19	630	105	880	102
140	14	390	22	640	107	890	99
150	11	400	25	650	109	900	96
160	9	410	28	660	112	910	93
170	7	420	31	670	113	920	90
180	6	430	34	680	115	930	86
190	4	440	38	690	117	940	83
200	3	450	41	700	118	950	76
210	2	460	45	710	119	960	76
220	1	470	49	720	120	970	72
230	0	480	53	730	120	980	68
240	0	490	57	740	121	990	64
250	0	500	60	750	121	1000	60

TABLE 11.

Differences.

Arg. △	H. M.	Arg. △	H. M.	Arg. △	H. M.
1	0. 4	36	2.33	71	5. 2
2	0. 9	37	2.37	72	5. 6
3	0.13	38	2.42	73	5.10
4	0.17	39	2.46	74	5.15
5	0.21	40	2.50	75	5.19
6	0.26	41	2.54	76	5.23
7	0.30	42	2.59	77	5.27
8	0.34	43	3. 3	78	5.32
9	0.38	44	3. 7	79	5.36
10	0.43	45	3.11	80	5.40
11	0.47	46	3.16	81	5.44
12	0.51	47	3.20	82	5.49
13	0.55	48	3.24	83	5.53
14	1. 0	49	3.28	84	5.57
15	1. 4	50	3.33	85	6. 1
16	1. 8	51	3.37	86	6. 6
17	1.12	52	3.41	87	6.10
18	1.17	53	3.45	88	6.14
19	1.21	54	3.50	89	6.18
20	1.25	55	3.54	90	6.23
21	1.29	56	3.58	91	6.27
22	1.34	57	4. 2	92	6.31
23	1.38	58	4. 7	93	6.35
24	1.42	59	4.11	94	6.40
25	1.46	60	4.15	95	6.44
26	1.51	61	4.19	96	6.48
27	1.55	62	4.24	97	6.52
28	1.59	63	4.28	98	6.57
29	2. 3	64	4.32	99	7.1
30	2. 8	65	4.36	100	7. 5
31	2.12	66	4.41		
32	2.16	67	4.45	200	4.10
33	2.20	68	4.49		
34	2.25	69	4.53	300	21.16
35	2.29	70	4.58		

TABLE 12.—Subsidiary.

Correspondence of Dominical Letters and Week-Days.

a	S	Mo	Tu	W	Th	Fr	Sat
b	Mo	Tu	W	Th	Fr	Sat	S
c	Tu	W	Th	Fr	Sat	S	Mo
d	**W**	**Th**	**Fr**	**Sat**	**S**	**Mo**	**Tu**
e	Th	Fr	Sat	S	Mo	Tu	W
f	Fr	Sat	S	Mo	Tu	W	Th
g	Sat	S	Mo	Tu	W	Th	Fr

S = Ravi, Sûrya-vâra.
Mo = Sôma, Chandra.
Tu = Bhauma, Maṅgala.
W = Budha.
Th = Guru.
Fr = Śukra.
Sat = Śani.

TABLE 12.

Perpetual Lunar Calendar.

Containing the Epacts and Dominical Letters.

Mâ	gha.		Phâlguna.				Chaitra.			Vaiśâkha.			Jyaishtha.			Â-		
Days.	January.				February.				March.			April.			May.			Days.
	Common year.		Leap year.		Common year.		Leap year.											
1	30 I	a	XXIX	g	II	d	I	c	30 I		d	II		g	III	18	b	1
2	II	b	30 I	a	III	e	II	d	II		e	III		a	IV	19	c	2
3	III	c	II	b	IV	f	III	e	III		f	IV		b	V		d	3
4	IV	d	III	c	V	g	IV	f	IV		g	V		c	VI		e	4
5	V	e	IV	d	VI	a	V	g	V		a	VI		d	VII		f	5
6	VI	f	V	e	VII	b	VI	a	VI		b	VII		e	VIII		g	6
7	VII	g	VI	f	VIII	c	VII	b	VII		c	VIII		f	IX		a	7
8	VIII	a	VII	g	IX	d	VIII	c	VIII		d	IX		g	X		b	8
9	IX	b	VIII	a	X	e	IX	d	IX		e	X		a	XI		c	9
10	X	c	IX	b	XI	f	X	e	X		f	XI		b	XII		d	10
11	XI	d	X	c	XII	g	XI	f	XI		g	XII		c	XIII		e	11
12	XII	e	XI	d	XIII	a	XII	g	XII		a	XIII		d	XIV		f	12
13	XIII	f	XII	e	XIV	b	XIII	a	XIII		b	XIV		e	XV		g	13
14	XIV	g	XIII	f	XV	c	XIV	b	XIV		c	XV		f	XVI		a	14
15	XV	a	XIV	g	XVI	d	XV	c	XV		d	XVI		g	XVII		b	15
16	XVI	b	XV	a	XVII	e	XVI	d	XVI		e	XVII		a	XVIII		c	16
17	XVII	c	XVI	b	XVIII	f	XVII	e	XVII		f	XVIII		b	XIX		d	17
18	XVIII	d	XVII	c	XIX	g	XVIII	f	XVIII	4	g	XIX		c	XX		e	18
19	XIX	e	XVIII	d	XX	a	XIX	g	XIX	5	a	XX	4	d	XXI		f	19
20	XX	f	XIX	e	XXI	b	XX	a	XX	7	b	XXI	5	e	XXII	4	g	20
21	XXI	g	XX	f	XXII	c	XXI	b	XXI	8	c	XXII	6	f	XXIII	5	a	21
22	XXII	a	XXI	g	XXIII	d	XXII	c	XXII	9	d	XXIII	7	g	XXIV	6	b	22
23	XXIII	b	XXII	a	XXIV	e	XXIII	d	XXIII	10	e	XXIV	8	a	XXV	7	c	23
24	XXIV	c	XXIII	b	XXV	f	XXIV	e	XXIV	11	f	XXV	10	b	XXVI	8	d	24
25	XXV	d	XXIV	c	XXVI	g	XXV	f	XXV	12	g	XXVI	11	c	XXVII	9	e	25
26	XXVI	e	XXV	d	XXVII	a	XXVI	g	XXVI	13	a	XXVII	12	d	XXVIII	10	f	26
27	XXVII	f	XXVI	e	XXVIII	b	XXVII	a	XXVII	14	b	XXVIII	13	e	XXIX	12	g	27
28	XXVIII	g	XXVII	f	XXIX	c	XXVIII	b	XXVIII	15	c	XXIX	14	f	XXX	13	a	28
29	XXIX	a	XXVIII	g	....		XXIX	c	XXIX	17	d	30 I	15	g	I	14	b	29
30	XXX	b	XXIX	a	....		....		XXX	18	e	II	16	a	II	15	c	30
31	I	c	XXX	b	....		....		I	19	f	....			III	16	d	31

TABLE 12.—Continued.

Perpetual Lunar Calendar.

Containing the Epacts and Dominical Letters.

shâḍha.	Śrâvaṇa.	Bhâdrapada.	Âśvina.	Kârttika.	Mârgaśira.	Pausha.	Mâ-	
Days.	June.	July.	August.	September.	October.	November.	December.	Days.
1	IV 17 e	V 16 g	VI 15 c	VIII 15 f	VIII 14 a	X 16 d	X 16 f	1
2	V 18 f	VI 17 a	VII 16 d	IX 16 g	IX 16 b	XI 17 e	XI 17 g	2
3	VI 19 g	VII 18 b	VIII 17 e	X 17 a	X 17 c	XII 18 f	XII 18 a	3
4	VII a	VIII 19 c	IX 18 f	XI 18 b	XI 18 d	XIII 19 g	XIII 19 b	4
5	VIII b	IX d	X g	XII 19 c	XII 19 e	XIV a	XIV c	5
6	IX c	X e	XI a	XIII d	XIII f	XV b	XV d	6
7	X d	XI f	XII b	XIV e	XIV g	XVI c	XVI e	7
8	XI e	XII g	XIII c	XV f	XV a	XVII d	XVII f	8
9	XII f	XIII a	XIV d	XVI g	XVI b	XVIII e	XVIII g	9
10	XIII g	XIV b	XV e	XVII a	XVII c	XIX f	XIX a	10
11	XIV a	XV c	XVI f	XVIII b	XVIII d	XX g	XX b	11
12	XV b	XVI d	XVII g	XIX c	XIX e	XXI a	XXI c	12
13	XVI c	XVII e	XVIII a	XX d	XX f	XXII b	XXII d	13
14	XVII d	XVIII f	XIX b	XXI e	XXI g	XXIII c	XXIII e	14
15	XVIII e	XIX g	XX c	XXII f	XXII a	XXIV d	XXIV f	15
16	XIX f	XX a	XXI d	XXIII g	XXIII b	XXV e	XXV g	16
17	XX g	XXI b	XXII e	XXIV a	XXIV c	XXVI f	XXVI a	17
18	XXI a	XXII c	XXIII f	XXV b	XXV d	XXVII g	XXVII b	18
19	XXII b	XXIII d	XXIV g	XXVI c	XXVI e	XXVIII a	XXVIII c	19
20	XXIII c	XXIV e	XXV a	XXVII d	XXVII f	XXIX b	XXIX d	20
21	XXIV 4 d	XXV f	XXVI b	XXVIII e	XXVIII g	XXX 4 c	30 I 4 e	21
22	XXV 5 e	XXVI 4 g	XXVII 4 c	XXIX 4 f	XXIX 4 a	I 6 d	II 6 f	22
23	XXVI 6 f	XXVII 5 a	XXVIII 5 d	XXX 5 g	30 I 5 b	II 7 e	III 7 g	23
24	XXVII 7 g	XXVIII 6 b	XXIX 6 e	I 6 a	II 6 c	III 8 f	IV 8 a	24
25	XXVIII 9 a	XXIX 7 c	30 I 7 f	II 8 b	III 8 d	IV 9 g	V 9 b	25
26	XXIX 10 b	XXX 8 d	II 8 g	III 9 c	IV 9 e	V 10 a	VI 10 c	26
27	30 I 11 c	I 9 e	III 9 a	IV 10 d	V 10 f	VI 11 b	VII 11 d	27
28	II 12 d	II 10 f	IV 10 b	V 11 e	VI 11 g	VII 13 c	VIII 12 e	28
29	III 13 e	III 12 g	V 11 c	VI 12 f	VII 12 a	VIII 14 d	IX 13 f	29
30	IV 14 f	IV 13 a	VI 13 d	VII 13 g	VIII 13 b	IX 15 e	X 15 g	30
31	....	V 14 b	VII 14 e	....	IX 14 c	....	XI 16 a	31

TABLE 12.—continued.

Perpetual Lunar Calendar.

Continued for the year following.

Mâ	gha. Phâlguna.	Phâlguna.	Chaitra.	Vaiśâkha.	Vaiśâkha.	Jyai.
Days.	January.	February.	March.		April.	
			Common year.	Leap year.	Common year.	Leap year.
1	XII 17 b	XIII e	XII 18 e	XIII 19 f	XIII a	XIV b
2	XIII 18 c	XIV f	XIII 19 f	XIV g	XIV b	XV c
3	XIV 19 d	XV g	XIV g	XV a	XV c	XVI d
4	XV e	XVI a	XV a	XVI b	XVI d	XVII e
5	XVI f	XVII b	XVI b	XVII c	XVII e	XVIII f
6	XVII g	XVIII c	XVII c	XVIII d	XVIII f	XIX g
7	XVIII a	XIX d	XVIII d	XIX e	XIX g	XX a
8	XIX b	XX e	XIX e	XX f	XX a	XXI b
9	XX c	XXI f	XX f	XXI g	XXI b	XXII c
10	XXI d	XXII g	XXI g	XXII a	XXII c	XXIII d
11	XXII e	XXIII a	XXII a	XXIII b	XXIII d	XXIV e
12	XXIII f	XXIV b	XXIII b	XXIV c	XXIV e	XXV f
13	XXIV g	XXV c	XXIV c	XXV d	XXV f	XXVI g
14	XXV a	XXVI d	XXV d	XXVI e	XXVI g	XXVII a
15	XXVI b	XXVII e	XXVI e	XXVII f	XXVII a	XXVIII b
16	XXVII c	XXVIII f	XXVII f	XXVIII g	XXVIII b	XXIX c
17	XXVIII d	XXIX 4 g	XXVIII g	XXIX a	XXIX c	30 I d
18	XXIX 4 e	30 I 5 a	XXIX a	XXX b	30 I d	II e
19	XXX 5 f	II 6 b	XXX b	I c	II e	III f
20	I 6 g	III 8 c	I c	II d	III f	IV g
21	II 7 a	IV 9 d	II d	III e	IV g	V a
22	III 8 b	V 10 e	III e	IV f	V a	VI b
23	IV 10 c	VI 11 f	IV f	V g	VI b	VII c
24	V 11 d	VII 12 g	V g	VI a	VII c	VIII d
25	VI 12 e	VIII 13 a	VI a	VII b	VIII d	IX e
26	VII 13 f	IX 14 b	VII b	VIII c	IX e	X f
27	VIII 14 g	X 15 c	VIII c	IX d	X f	XI g
28	IX 15 a	XI 17 d	IX d	X e	XI g	XII a
29	X 17 b	XII 18 e	X e	XI f	XII a	XIII b
30	XI 18 c	....	XI f	XII g	XIII b	XIV c
31	XII 19 d	....	XII g	XIII a	....	....

TABLE 13.

For finding the date of new-moon in March.

PART THE FIRST.

I.		II.	
0	(+1)	0	[+0]
304	(+0)	76	[—¼]
608	(—1)	152	[—½]
912	(—2)	228	[—¾]
1216	(—3)		
1520	(—4)		
1824	(—5)		

PART THE SECOND.

y	d	y	d	y	d	y	d
0	22¾	19	23¾	38	23¼	57	23
1	12¼	20	12	39	12¾	58	12¼
2	31¼	21	30¾	40	30¾	59	31¼
3	20¾	22	20¼	41	20	60	19¾
4	8¾	23	9¾	42	9¼	61	9
5	27¾	24	27¾	43	28¼	62	27¾
6	17¼	25	16¾	44	16¾	63	17¼
7	6¾	26	6¼	45	6	64	5¾
8	24¾	27	25¼	46	24¾	65	24¾
9	13¾	28	13¾	47	14¼	66	13¾
10	3¼	29	2¾	48	2¾	67	3¼
11	22	30	21¾	49	21¾	68	21
12	10¾	31	11	50	10¾	69	10¾
13	29¼	32	29	51	29¾	70	29¼
14	18¾	33	18¼	52	18	71	18¾
15	8	34	7¾	53	7¾	72	7
16	26	35	26¾	54	26¼	73	26
17	15¼	36	15	55	15¾	74	15¼
18	4¾	37	4¼	56	4	75	4¾

Example.—To find the day of new-moon in March, A.D. 1468.

1468
From I 1216
Remainder...... 252 (—3)
From II......... 228 (—¾)
Remainder ...... 24 (—3¾)
From second part. 24 = 27¾
Subtract...... 3¾
23¾

New-moon: in the last quarter of 23rd March. Chaitra *śu di* 1 on 24th March. Epact XXIV.

TABLE 14.

Tables giving the week-day of the 1st March (Old Style) = d. From A.D. 0 to 2100.

Years (0 to 24.)

Centuries.			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	13	19	20	21	22	23	24	Centuries.		
0	7	14	M	Tu	W	Th	Sa	S	M	Tu	Th	F	Sa	S	Tu	W	Th	F	S	M	Tu	W	F	Sa	S	M	W	0	7	14
1	8	15	S	M	Tu	W	F	Sa	S	M	W	Th	F	Sa	M	Tu	W	Th	Sa	S	M	Tu	Th	F	Sa	S	Tu	1	8	15
2	9	16	Sa	S	M	Tu	Th	F	Sa	S	Tu	W	Th	F	S	M	Tu	W	F	Sa	S	M	W	Th	F	Sa	M	2	9	16
3	10	17	F	Sa	S	M	W	Th	F	Sa	M	Tu	W	Th	Sa	S	M	Tu	Th	F	Sa	S	Tu	W	Th	F	S	3	10	17
4	11	18	Th	F	Sa	S	Tu	W	Th	F	S	M	Tu	W	F	Sa	S	M	W	Th	F	Sa	M	Tu	W	Th	Sa	4	11	18
5	12	19	W	Th	F	Sa	M	Tu	W	Th	Sa	S	M	Tu	Th	F	Sa	S	Tu	W	Th	F	S	M	Tu	W	F	5	12	19
6	13	20	Tu	W	Th	F	S	M	Tu	W	F	Sa	S	M	W	Th	F	Sa	M	Tu	W	Th	Sa	S	M	Tu	Th	6	13	20

Years (25 to 49.)

Centuries.			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	Centuries.		
0	7	14	Th	F	Sa	M	Tu	W	Th	Sa	S	M	Tu	Th	F	Sa	S	Tu	W	Th	F	S	M	Tu	W	F	Sa	0	7	14
1	8	15	W	Th	F	S	M	Tu	W	F	Sa	S	M	W	Th	F	Sa	M	Tu	W	Th	Sa	S	M	Tu	Th	F	1	8	15
2	9	16	Tu	W	Th	Sa	S	M	Tu	Th	F	Sa	S	Tu	W	Th	F	S	M	Tu	W	F	Sa	S	M	W	Tb	2	9	16
3	10	17	M	Tu	W	F	Sa	S	M	W	Th	F	Sa	M	Tu	W	Th	Sa	S	M	Tu	Th	F	Sa	S	Tu	W	3	10	17
4	11	18	S	M	Tu	Th	F	Sa	S	Tu	W	Th	F	S	M	Tu	W	F	Sa	S	M	W	Th	F	Sa	M	Tu	4	11	18
5	12	19	Sa	S	M	W	Th	F	Sa	M	Tu	W	Th	Sa	S	M	Tu	Th	F	Sa	S	Tu	W	Th	F	S	M	5	12	19
6	13	20	F	Sa	S	Tu	W	Th	F	S	M	Tu	W	F	Sa	S	M	W	Th	F	Sa	M	Tu	W	Th	Sa	S	6	13	20

Years (50 to 74.)

Centuries.			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	Centuries.		
0	7	14	S	M	W	Th	F	Sa	M	Tu	W	Th	Sa	S	M	Tu	Th	F	Sa	S	Tu	W	Th	F	S	M	Tu	0	7	14
1	8	15	Sa	S	Tu	W	Th	F	S	M	Tu	W	F	Sa	S	M	W	Th	F	Sa	M	Tu	W	Th	Sa	S	M	1	8	15
2	9	16	F	Sa	M	Tu	W	Th	Sa	S	M	Tu	Th	F	Sa	S	Tu	W	Th	F	S	M	Tu	W	F	Sa	S	2	9	16
3	10	17	Th	F	S	M	Tu	W	F	Sa	S	M	W	Th	F	Sa	M	Tu	W	Th	Sa	S	M	Tu	Th	F	Sa	3	10	17
4	11	18	W	Th	Sa	S	M	Tu	Th	F	Sa	S	Tu	W	Th	F	S	M	Tu	W	F	Sa	S	M	W	Th	F	4	11	18
5	12	19	Tu	W	F	Sa	S	M	W	Th	F	Sa	M	Tu	W	Th	Sa	S	M	Tu	Th	F	Sa	S	Tu	W	Th	5	12	19
6	13	20	M	Tu	Th	F	Sa	S	Tu	W	Th	F	S	M	Tu	W	F	Sa	S	M	W	Th	F	Sa	M	Tu	W	6	13	20

Years (75 to 99.)

Centuries.			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	Centuries.		
0	7	14	W	F	Sa	S	M	W	Th	F	Sa	M	Tu	W	Th	Sa	S	M	Tu	Th	F	Sa	S	Tu	W	Th	F	0	7	14
1	8	15	Tu	Th	F	Sa	S	Tu	W	Th	F	S	M	Tu	W	F	Sa	S	M	W	Th	F	Sa	M	Tu	W	Th	1	8	15
2	9	16	M	W	Th	F	Sa	M	Tu	W	Th	Sa	S	M	Tu	Th	F	Sa	S	Tu	W	Th	F	S	M	Tu	W	2	9	16
3	10	17	S	Tu	W	Th	F	S	M	Tu	W	F	Sa	S	M	W	Th	F	Sa	M	Tu	W	Th	Sa	S	M	Tu	3	10	17
4	11	18	Sa	M	Tu	W	Th	Sa	S	M	Tu	Th	F	Sa	S	Tu	W	Th	F	S	M	Tu	W	F	Sa	S	M	4	11	18
5	12	19	F	S	M	Tu	W	F	Sa	S	M	W	Th	F	Sa	M	Tu	W	Th	Sa	S	M	Tu	Th	F	Sa	S	5	12	19
6	13	20	Th	Sa	S	M	Tu	Th	F	Sa	S	Tu	W	Th	F	S	M	Tu	W	F	Sa	S	M	W	Th	F	Sa	6	13	20

TABLE 15.

Longitudes and Latitudes of principal places.

Latitude in degrees and first decimal. Longitude in minutes of time, being the difference in time between Laṅkâ and the place in question.

	Lat.	Long. m.
Âbû (Arbuda)	24·6	— 12
Âgrâ	23·2	+ 16
Ahmadâbâd	43·0	— 13
Ahmadnagar	19·1	— 4
Ajanta	20·5	— 0
Ajmêr	26·5	— 4
Allahâbâd (Prayâga)	25·4	+ 24
Alligaḍ	27·9	+ 9
Amṛitsar	31·6	— 4
Anhilwâḍ	23·9	— 15
Arcot	12·9	+ 14
Auraṅgâbâd	19·9	— 2
Bâdâmi	15·9	— 0
Balagâmi or Balagâmve	14·4	— 2
Banawâsi	14·6	— 3
Bardhwân	23·2	+ 48
Baroda (Baḍôda)	22·3	— 10
Bârśî	18·2	— 0
Belgaum	15·9	— 5
Benares	25·5	+ 29
Bhâgalpur	25·3	+ 45
Bharatpur	27·2	+ 7
Bhêlsâ	23·5	+ 8
Bhôpâl	23·3	+ 6
Bihâr or Behâr	25·2	+ 39
Bîjâpur	16·8	— 0
Bîjnagar or Hampe.	15·3	+ 3
Bîkânêr	28·0	— 10
Bombay	18·9	— 12
Broach (Bhṛigukachchha)	21·7	— 11
Bundi	25·5	— 1
Burhânpur	21·3	+ 3
Calcutta	22·6	+ 50
Cambay or Khambhât (Sthambhavatî)	23·5	+ 8
Cawnpore (Kânpur).	26·5	+ 18
Cochin	10·0	+ 2
Dacca (Ḍâkâ)	23·7	+ 58
Dehli	28·6	+ 6
Dêvagiri or Daulatâbâd	20·0	— 2
Dhârâ	22·6	— 2
Dhârwâḍ	15·5	— 3
Dhôlpur	26·7	+ 8

	Lat.	Long. m.
Dhulia (Dhuḷêṁ)	20·9	— 4
Dwârakâ	22·2	— 27
Ellôra (Vêlâpura)	20·0	— 3
Farakhâbâd	27·4	+ 15
Gayâ	24·8	+ 37
Ghâzîpur	25·4	+ 31
Girnâr	21·5	— 21
Goa (Gôpakapaṭṭana)	15·5	— 8
Gôrakhpur	26·7	+ 26
Gurkhâ	27·9	+ 34
Gwâlior	26·2	+ 9
Haidarâbâd (in the Deccan)	17·4	+ 11
Haidarâbâd (in Sindh)	25·4	— 26
Hardâ (in Gwâlior).	22·3	+ 5
Hardwâr	30·0	+ 9
Hôshaṅgâbâd	20·8	+ 8
Indôr	20·7	— 4
Jabalpur	23·2	+ 16
Jagannâthapurî	19·8	+ 40
Jalgaum	20·4	— 3
Jaypur	26·9	+ 0
Jhânsî	25·5	+ 11
Jôdhpur	26·3	— 11
Junâgaḍh	21·5	— 21
Kaliṅgapaṭam	18·3	+ 33
Kalyâṇ in Bombay.	19·2	— 11
Kalyâṇ in the Nizâm's Dominions.	17·9	+ 4
Kanauj	27·0	+ 16
Kâñchî, or Conjeveram	12·8	+ 16
Kaṭak	20·5	+ 40
Khâtmâṇḍu	27·2	+ 37
Kôlâpur	16·7	— 11
Lâhôr	31·6	+ 6
Lakhnau	26·9	— 20
Madhurâ	9·9	+ 9
Madras	13·1	+ 18

	Lat.	Long. m.
Maisûr	12·3	+ 3
Mâlkhêḍ (Mânyakhêṭa)	17·2	+ 6
Mâṇḍavî in Cutch	20·8	— 25
Maṅgalûr	12·9	+ 3
Mathurâ	27·5	+ 7
Moṅgîr or Muṅgêr	25·4	+ 43
Multân	30·2	— 17
Nâgpur	21·2	+ 13
Nâsik	20·0	— 12
Oudhe (Ayôdhyâ)	26·8	+ 26
Paithan	19·4	
Paṇḍharpur	17·7	— 2
Paṭiâlâ	30·3	+ 2
Pâtna	25·6	+ 37
Poona (Puṇêṁ)	18·5	— 8
Purṇiyâ	25·8	+ 47
Râmêśwar	9·3	+ 14
Ratnâgiri	17·0	— 10
Rêvâ (Rîwâṁ)	24·5	+ 22
Śâgar	23·8	+ 12
Sahêṭ-Mahêṭ (Śrâvastî)	27·5	+ 25
Sambhalpur	21·5	+ 33
Sâtârâ	17·7	+ 7
Seringapaṭam (Śrîraṅgapaṭṭana)	12·4	+ 4
Shôlâpur	17·7	+ 0
Sirôñj	24·1	+ 8
Sômnâthpâṭan	22·1	— 17
Śrînagar in Kaśmîr.	34·1	— 4
Surat	21·2	— 12
Tañjôr	10·8	+ 10
Thâṇâ	19·2	— 11
Travancore	8·2	+ 5
Trichinopoly	10·8	+ 12
Trivandram	8·5	+ 4
Udêpur or Oodeypore	24·6	— 8
Ujjain	23·2	+ 0
Umarâvatî or Amrâoti	20·9	+ 8

Note.—In order to convert Laṅkâ time into local time, add or subtract from the former the minutes of Longitude of the place in question as indicated by the sign of plus or minus in the above list.

TABLE 16.

Showing how many minutes the day begins in any place (from 0 to 30 degrees Latitude) before or after Sunrise at Laṅkâ (or 0 hour of the previous tables).

The day begins before Sunrise at Laṅkâ. New Style.		5°	10°	15°	20°	25°	30°	The day begins after Sunrise at Laṅkâ. New Style.	
		m.	m.	m.	m.	m.	m.		
21 March..	23 Sept....	0	0	0	0	0	0	23 Sept....	21 March
26 „ ...	18 „ ...	1	1	2	3	4	5	28 Sept....	16 „
31 March..	13 „ ...	1	3	4	6	7	9	3 Oct. ...	11 „
5 April ...	8 „ ...	2	4	6	9	11	14	8 „ ...	6 „
10 „ ...	3 „ ...	3	6	9	12	15	19	13 „ ...	1 March.
15 „ ...	28 Aug....	4	7	11	15	19	23	19 „ ...	23 Feb. ...
21 „ ...	22 „ ...	4	9	13	18	23	28	24 „ ...	18 „ ...
27 April ...	16 „ ...	5	10	15	21	27	33	29 Oct. ...	12 „ ...
3 May ...	10 „ ...	6	12	18	23	31	38	5 Nov....	6 Feb. ...
10 „ ...	3 „ ...	7	13	20	27	35	43	12 „ ...	30 Jan. ...
18 „ ...	26 July ...	7	15	22	31	39	49	18 „ ...	23 „ ...
25 „ ...	19 „ ...	8	16	25	34	43	54	25 Nov. ...	17 „ ...
29 May ...	15 „ ...	9	17	26	36	46	57	1 Dec. ...	12 Jan. ...
22 June ...	22 June ...	9	18	27	37	48	60	21 Dec. ...	21 Dec. ...

To convert Old Style into New Style :—

Between	add	days.
400 & 500	„ 1	„
500 „ 600	„ 2	„
600 „ 700	„ 3	„
700 „ 900	„ 4	„
900 „ 1000	„ 5	„
1000 „ 1100	„ 6	„
1100 „ 1300	„ 7	„
1300 „ 1400	„ 8	„
1400 „ 1500	„ 9	„
1500 „ 1700	„ 10	„

Note.—The days in this Table are registered in New Style, whereas in the previous Tables Old Style is used. Hence a date in Old Style must first be converted in the corresponding one in New Style.

TABLE 17.

Table of the Nakshatras and Yôgas.

No.	Nakshatra.	Index.	Index for the ending-points of the nakshatras according to Brahma S.	Garga.	Yôga.	No.
1	Aśvinî	0— 37	37	37	Vishkambha	1
2	Bharaṇî	38— 74	55	56	Prîti	2
3	Krittikâ	75—111	91	93	Ayushmat..	3
4	Rôhiṇî	112—148	147	148	Saubhâgya .	4
5	Mṛiga or Mṛiga-śirsha	149—185	183	185	Śôbhana ...	5
6	Ardrâ	186—222	201	204	Atigaṇḍa ...	6
7	Punarvasu	223—259	258	259	Sukarman ..	7
8	Pushya	260—296	293	296	Dhṛiti	8
9	Âślêshâ............	297—333	311	315	Śûla	9
10	Maghâ	334—370	348	352	Gaṇḍa	10
11	Pûrvâ-Phâlgunî.	371—407	382	389	Vṛiddhi ...	11
12	Uttarâ-Phâlgunî	408—444	439	444	Dhruva......	12
13	Hasta	445—481	476	481	Vyâghâta ...	13
14	Chitrâ	482—518	513	518	Harshaṇa...	14
15	Svâtî	519—556	531	537	Vajra	15
16	Viśâkhâ	557—593	586	593	Siddhi(Asrij)	16
17	Anurâdhâ	594—630	622	630	Vyatîpâta...	17
18	Jyêshṭhâ	631—667	641	648	Varîyas ...	18
19	Mûla	668—704	677	685	Parigha ...	19
20	Pûrvâ-Ashâḍhâ .	705—741	714	722	Śiva	20
21	Uttarâ-Ashâḍhâ	742—778	768	778	Siddha	21
22	Śravaṇa	779—815	817	815	Sâdhya	22
23	Śravishṭhâ, or Dhanishṭhâ ...	816—852	853	852	Śubha	23
24	Śatabhishaj, or Śatatârakâ......	853—889	872	876	Śukla.........	24
25	Pûrvâ-Bhadra-padâ...............	890—926	909	908	Brahman ...	25
26	Uttarâ-Bhadra-padâ	927—963	963	963	Indra	26
27	Rêvatî	964—1000	1,000	1,000	Vaidhṛiti ...	27

Table for Differences.

Δ	Naksh.	Yôga.
	H. M.	H. M.
1	0–39	0–37
2	1–19	1–13
3	1–58	1–50
4	2–38	2–27
5	3–17	3– 4
6	3–56	3–41
7	4–36	4–17
8	5–16	4–54
9	5–55	5 31
10	6–34	6– 6
20	13– 8	12–13
30	19–42	18-19

Note.—Sometimes an extraordinary *nakshatra*, Abhijit, is inserted between Uttarâ-Ashâḍhâ and Śravaṇa. In that case, Abhijit has as Index 769-782. The Index for the ending-point of Abhijit according to the Brahma-Siddhânta system, is 780.