The Star Almanac for Land Surveyors
Her Majesty's Almanac Office

NP321 - 2017

electronic edition

United Kingdom
Hydrographic Office

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ABOUT the e-SA 2017

This electronic edition of *The Star Almanac for Land Surveyors* (e-SA) is the paper edition in electronic form which is produced by H.M. Nautical Almanac Office part of the UK Hydrographic Office.

The e-SA is the SA with bookmarks and extra "pages" that provide links that allows easy navigation to all the tables, examples and sections of the explanation.

The pages are most usefully viewed as facing pages so both left-hand and right-hand pages are visible at the same time. If the option 'Return to the previous page viewed' is readily available, then this will make returning to the previous page e.g. the Book mark pages that lists all the sections and tables or the Page Finder, which gives links to all the tabular material, easy. The list of stars by constellations with Bayer letter and star number gives links for navigating to the correct left-hand page that lists the right ascensions. This star finder is listed over two pages. There are also navigation boxes to these initial pages at the bottom of each page. Pages may also be navigated to from the bookmark-sidebar.

H.M. Nautical Almanac Office
United Kingdom Hydrographic Office

UNITED KINGDOM

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THE STAR ALMANAC 2017 — BOOKMARKS

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THE STAR ALMANAC 2017 — PAGE FINDER

JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
R & Sun Declination, E, SD & Rise and Set Times											
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17-31	17-31	17-31	17-31	17-31	17-31	17-31	17-31	17-31	17-31	17-31	17-31
Rise	Rise	Rise	Rise	Rise	Rise	Rise	Rise	Rise	Rise	Rise	Rise
Set	Set	Set	Set	Set	Set	Set	Set	Set	Set	Set	Rise
Phases of the Moon											
1-16	1-16	1-16	1-16	1-16	1-16	1-16	1-16	1-16	1-16	1-16	1-16
17-31	17-31	17-31	17-31	17-31	17-31	17-31	17-31	17-31	17-31	17-31	17-31
JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC

Star Nos.	Coordinate
1– 50	RA Dec
51–100	RA Dec
101–150	RA Dec
151–200	RA Dec
201–250	RA Dec
251–300	RA Dec
301–350	RA Dec
351–400	RA Dec
401–450	RA Dec
451–500	RA Dec
501–550	RA Dec
551–600	RA Dec
601–650	RA Dec
>650	RA Dec
Northern Circumpolar	
Southern Circumpolar	

Brighter and Daylight (d) Stars

Name	Number	Name	Number	Name	Number
Achernar α Eri	32 d	*Canopus α Car*	179 d	*Pollux β Gem*	216 d
Aldebaran α Tau	116 d	*Capella α Aur*	136 d	*Procyon α CMi*	212 d
Algol	70	*Castor*	210		
Altair α Aql	548 d			*Regulus α Leo*	273 d
Antares α Sco	441 d	*Deneb α Cygni*	571 d	*Rigel β Ori*	135 d
Arcturus α Boo	369 d	*Denebola*	316		
		Dubhe	298	*Sirius α CMa*	185 d
Bellatrix	140			*Spica α Vir*	353 d
Betelgeuse α Ori	162 d	*Fomalhaut α PsA*	632 d		
				Vega α Lyrae	514 d
α Crucis	328 d	*Polaris*	NP		
α Centauri	379 d	*Polaris* Table			
β Centauri	364 d	*σ Octantis*	SP		

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ζ 15 ι 646
κ 649 λ 645
μ 19 ν 17
ο 634 υ 30
51 31

Antliae
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η 679 *R* 681

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η 619 θ 611
ι 605 λ 630
τ 627 φ 639
88 637 98 642

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ε 526 ζ 529
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λ 530

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BS4646 661
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BS4050 279
BS4114 286
BS4140 287
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BS4889 341
BS5485 384

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BS0285 NP
BS0961 653
BS1230 654
BS1523 655
BS2609 NP
BS8546 NP
BS8702 668

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π^2 602 ρ 594
σ 585 τ 583
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ρ 208 υ 211
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γ 603 δ^1 615
ε 626 ζ 633
ι 638

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The

STAR
Almanac

for land surveyors

FOR THE YEAR 2017

Prepared by

HM Nautical Almanac Office

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CONTENTS

GREEK ALPHABET

α	alpha	ϵ	epsilon	ι	iota	ν	nu	ρ	rho	ϕ	phi
β	beta	ζ	zeta	κ	kappa	ξ	xi	σ	sigma	χ	chi
γ	gamma	η	eta	λ	lambda	o	omicron	τ	tau	ψ	psi
δ	delta	θ	theta	μ	mu	π	pi	υ	upsilon	ω	omega

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PREFACE, 2017

This sixty-seventh edition of the *Star Almanac* follows closely the model introduced for the year 1951, with some additions and changes introduced in the editions for 1973, 1977 and 1979.

This is the sixteenth edition that includes a CD-ROM which contains the *electronic version*. This e-book contains the almanac itself stored in Adobe's portable document format, and the coefficients that compactly represent the positions of the Sun and stars in ASCII files. Readers unable to use the CD-ROM and require the ASCII data files should contact this office.

The Star Almanac for Land Surveyors has been prepared by H.M. Nautical Almanac Office under the supervision of S.A. Bell; suggestions for additions and modifications should be sent to him at the address below.

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April 2016

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THE STAR ALMANAC

The *Star Almanac for Land Surveyors* has been expressly designed to provide in a convenient form, and in a compact volume, the astronomical data required by surveyors. The time-argument is universal time (UT1), and so the tabulated values may differ slightly from those in *The Astronomical Almanac*, in which the time-argument is dynamical time.

The main features of the Almanac are the tabulation of:

(a) R, the difference between Greenwich sidereal time (GHA Aries) and universal time;

(b) the declination of the Sun and E, the difference between the Greenwich hour angle of the Sun and universal time;

(c) the right ascensions and declinations of 695 stars, including all stars brighter than magnitude 4·0;

(d) extended refraction and other auxiliary tables.

The precision of tabulation varies between $1''$ and $0'.1$, and corresponds to the requirements of the land surveyor.

The following explanation is restricted to a brief outline of fundamental concepts and definitions, together with a description of the tabulated quantities and illustrations of how they are to be extracted from the Almanac. Reference must be made to the standard text-books for a description and illustrations of the method of use of the tabulated data.

TIME AND HOUR ANGLE

The position of a heavenly body in the sky, as seen by an observer on the Earth's surface, is most conveniently specified by its *altitude* above the horizon and its *azimuth* from the north. It is essentially a comparison between the observed and calculated values of altitude and azimuth that makes possible the determination of position and direction on the Earth's surface from astronomical observations. It is not practicable to tabulate the rapidly changing altitudes and azimuths of the heavenly bodies for all positions on the Earth, but they can be calculated for any position, by tables or by direct solution of a spherical triangle, from a knowledge of the geocentric position of the heavenly body referred to the Earth's equator.

In fact the quantities which the observer requires from the almanac are the *Greenwich hour angle* (GHA), namely the arc of the equator (or the angle at the pole) *westwards* from the Greenwich meridian, and the *declination* (Dec), or arc of the meridian from the equator to the body. Both are independent of the observer's position and can be tabulated directly. The GHA thus obtained will in practice either be combined with a known, or assumed, longitude to give *local hour angle* (LHA) or be used to derive longitude from a value of LHA deduced from observation.

The rotation of the Earth on its axis from *west* to *east* causes the heavenly bodies to *appear* to revolve round the Earth from *east* to *west*. Owing to the real motion of the Earth in its annual orbit about the Sun, the latter appears to alter its position with respect to the stars and so appears to revolve in a different period; moreover, owing to the varying motions of the Earth in its orbit, this period is not constant. UT1, which is nominally the mean solar time of the meridian of Greenwich, is such that the average period of rotation of the Earth with respect to the Sun taken throughout the year is 24^h; this is the *mean solar day*. (The mean solar day is now slightly longer

than a day of 86 400 atomic seconds; the accumulated effect of this difference currently amounts to less than 1 second each year.) The hour angle of the Sun increases at a rate which is, on the average, precisely that of mean solar time. The difference between the Greenwich hour angle of the Sun and universal time oscillates slowly and with small amplitude; it is convenient to tabulate this difference (denoted by E) and to obtain the Greenwich hour angle of the Sun from the relation:

$$\text{GHA Sun} = \text{UT1} + E \qquad (1)$$

in which multiples of 24^h may be omitted. The Sun transits over the Greenwich meridian when $\text{UT1} = 24^h - E$.

The period of rotation of the Earth with respect to the stars is approximately $23^h\ 56^m\ 04^s.1$ of mean solar time, so that the hour angles of the stars increase more rapidly than that of the Sun. It is convenient to relate the positions of the stars to the point known as the vernal equinox, or the *first point of Aries* (abbreviated to "Aries"), which is the intersection of the Earth's equator and the ecliptic. The hour angle of this point increases by approximately $24^h\ 03^m\ 56^s.6$ each mean solar day. By analogy with the treatment of the Sun, a quantity R is defined such that it is the difference between GHA Aries and UT1; R increases by $3^m\ 56^s.6$ a day. Thus

$$\text{GHA Aries} = \text{UT1} + R \qquad (2)$$

and is *Greenwich (apparent) sidereal time* (GST).

The hour angle of a star differs from that of Aries by the arc of the equator, or the angle at the pole, between the meridian of Aries and the meridian of the star; this difference is measured *eastwards* from the meridian of Aries to that of the star and is known as *right ascension* (RA).

The apparent right ascensions (and declinations) of stars are nearly constant, varying slightly owing to the real motions of the stars and to precession, and periodically owing to nutation and aberration. The GHA of a star is obtained from that of Aries by *subtracting* the right ascension:

$$\text{GHA Star} = \text{GHA Aries} - \text{RA Star} = \text{GST} - \text{RA Star} \qquad (3)$$

whence the formula for the GHA of a star is

$$\text{GHA Star} = \text{UT1} + R - \text{RA Star} \qquad (4)$$

It will be seen that when a star (or other heavenly body) is on the Greenwich meridian, its right ascension is equal to the Greenwich sidereal time.

A knowledge of UT1 will enable the GHA of the Sun and stars to be calculated from tabulated values of E, R and RA of the stars. Standard radio time-signals give coordinated universal time (UTC), which differs from the international atomic-time scale by an exact number of seconds. Step adjustments are made as required (normally at 0^h on January 1 and July 1) so that the difference between the time-signal and UT1 does not exceed $0^s.9$. The user of this Almanac who requires to make and reduce observations to a precision of $0^s.1$ must therefore obtain the correction to the time-signal from coding in the signal or from other sources. Further information about time-signals is given on pages 60–61.

In the same way as UT1, GHA and GST are related to the meridian of Greenwich, there exist mean solar times, hour angles and sidereal times related to the meridian of the observer and termed *local mean time* (LMT), *local hour angle* (LHA) and *local sidereal time* (LST). Each of these differs from the corresponding UT1, GHA and GST by the longitude of the observer, if necessary expressed in time. Thus

$$\text{Longitude} = \text{LMT} - \text{UT1} = \text{LHA} - \text{GHA} = \text{LST} - \text{GST} \qquad (5)$$

where the sign convention east longitude is positive is used. Similarly,

$$\text{LMT} = \text{UT1} + \text{longitude (east)}; \qquad \text{UT1} = \text{LMT} - \text{longitude (east)} \qquad (6)$$

$$\text{LHA} = \text{GHA} + \text{longitude (east)}; \qquad \text{LST} = \text{GST} + \text{longitude (east)} \qquad (7)$$

Combination of (5) and (7) with (1) and (4), together with the tabulated declinations, will provide the data to enable positions to be determined from astronomical observations.

In practice, local mean and sidereal times are used primarily in connection with local phenomena such as rising and setting and meridian passage; as such they are mainly used for planning programmes. Just as the Greenwich meridian passage of the Sun occurs when UT1 = $24^h - E$, the local meridian passage occurs when LMT is $24^h - E$; similarly a star transits over the local meridian when LST = RA. However, LHA Aries or LST, corresponding to the LHA of a star whose right ascension is zero, is frequently used as an argument for such tables as the Pole Star Table; it may be obtained by combining longitude with R and UT1 as:

$$\text{LST} = R + \text{UT1} + \text{longitude (east)} \qquad (8)$$

If mean time (UT1 or LMT) is required for a given sidereal time (GST or LST) it may be obtained from:

$$\text{UT1} = \text{GST} - R; \quad \text{LMT} = \text{LST} - R \qquad (9)$$

where R is to be taken for the (approximate) UT1 concerned, as explained at top of page xiii.

In *The Star Almanac* all hour angles are measured in time, so that longitudes expressed in arc must be converted to time, at the rate of 1^h for each 15°, before being used in equations (5) to (8). 24^h may be added or subtracted as necessary in any of the equations (1) to (9); west longitudes may be treated as negative or subtracted from 24^h (360°) before use.

CRITICAL TABLES

Several of the tables in this volume are arranged as "critical" tables in which the tabulated values of the argument are those at which the respondent has a value midway between two tabular values; thus, each printed value of the respondent corresponds to the whole interval between two adjacent tabulated values of the argument. No interpolation is needed and the error cannot greatly exceed half the adopted interval, usually one unit. The "critical" tabular values are calculated in such a way that the upper of the two possible values of the respondent is to be taken.

For example, in the table for the interpolation of R on page 70, the increment of $16^s.6$ corresponds to (on the left) any solar time interval between $1^h\ 40^m\ 44^s.7$ and $1^h\ 41^m\ 21^s.2$; if the solar time interval is the critical value $1^h\ 41^m\ 21^s.2$, then the upper (i.e. $16^s.6$) of the two possible values of the respondent is to be taken.

INTRODUCTION

DESCRIPTION OF CONTENTS

Ephemeris of the Sun (Pages 2–25)

On the upper part of these pages are tabulated for every 6^h of UT1: the excess (R) of Greenwich sidereal time (GHA Aries) over universal time; the apparent declination of the Sun; and the excess (E) of GHA Sun over universal time. Since the mean difference of R is constant, provision for interpolation is made by a critical table on pages 70 to 72. The declination and E can be interpolated, by means of the table on the upper part of page 73 using the tabulated differences. These differences are printed in a column to the right of the function, on the half-line between consecutive rows, and are given in units of the last figure of the corresponding function, namely $0'.1$ for the declination and $0^s.1$ for E.

The average value of the Sun's semi-diameter is given for the half-month concerned, and should be used without interpolation.

The lower part of the page contains the local mean times of sunrise (left-hand page) or sunset (right-hand page) on every fifth day for latitudes between S 60° and N 60°. In order to permit tabulation for sufficient latitudes, the times are given to the nearest tenth of an hour only. This accuracy will be found adequate for most purposes.

The dates and times of the Moon's phases are given to assist in planning night observations.

Apparent Places of Stars (Pages 26–53)

Pages 26–51 contain the apparent right ascensions and declinations of 650 stars at monthly intervals throughout the year. They include all stars brighter than magnitude 4·0, and such other stars brighter than magnitude 4·5 as are tabulated in *Apparent Places of Fundamental Stars*, except close circumpolar stars; a few stars of magnitudes between 4·0 and 4·5 have been omitted, and the remainder included, to make the number exactly 650. Stars considered bright enough to be observed in daylight are indicated by the letter d following the star number on the left-hand page.

Pages 52–53 contain the apparent right ascensions and declinations of 35 supplementary fainter stars of declinations between 74° and 85°, together with 15 stars in this range already given on pages 26–51. Northern stars are given on the upper half of the page and southern stars on the lower half. No stars fainter than 5·5 have been included.

The positions given — to $0^s.1$ in right ascension and $1''$ in declination — are those for times near the beginning of the month, so chosen as to reduce to a minimum the error caused by using, for interpolation purposes, a fixed (nominal) month. An interpolation table is given on the lower part of page 73. It is to be entered with the day of the month as the vertical argument, and with the difference between the values for the month of observation and the following month as the horizontal argument.

Even though second differences are in some places large enough to be significant, their neglect will never lead to serious error; linear interpolation, as described, should invariably be used.

The stars are arranged in order of their right ascensions for 1975·0 and it is intended to keep this order unchanged for many years in spite of precessional changes. An index giving the number of a star whose name is known is given on pages 78–80.

The magnitudes and distances of fainter companions in double or multiple systems are given as footnotes on these pages.

Apparent Places of Circumpolar Stars (Pages 54–55)

On these pages are given, at 0^h UT1 for every ten days, the apparent positions of five northern and five southern circumpolar stars and also the Greenwich sidereal time.

The time of upper transit is found as the time (UT1) when

$$\text{GST} = \text{RA} - \text{longitude (east)}$$

Since the GST is only tabulated to the nearest minute this equation may be used if the time is only required to the nearest minute. For greater accuracy use

$$\text{UT1} = \text{RA} - R - \text{longitude (east)}$$

Polaris Table (Pages 56–59)

In this table are combined the data for obtaining latitude from an observed altitude of *Polaris* (suitably corrected for instrumental errors and refraction) and the azimuth of this star (measured from north, positive to the east and negative to the west), for all hour angles and northern latitudes. The six tabulated quantities, each given to a precision of $0'.1$, are a_0, a_1, a_2, referring to the correction to altitude, and b_0, b_1, b_2 to the azimuth.

$$\text{latitude} = \text{corrected observed altitude} + a_0 + a_1 + a_2$$
$$\text{azimuth} = (b_0 + b_1 + b_2)\sec(\text{latitude})$$

These quantities are based on the following formulae;

$$a_0 + a_1 + a_2 = -p\cos t + \frac{1}{2}p\sin p\sin^2 t\tan(\text{latitude})$$
$$b_0 + b_1 + b_2 = -p\sin t - p\sin p\sin t\cos t\tan(\text{latitude})$$

where

p = polar distance of *Polaris* = 90° − declination

t = local hour angle of *Polaris* = LST − RA

a_0, b_0, which depend upon LST only, include both terms of the above expressions for mean values of the position of *Polaris* and for a mean latitude of 50°. a_1, b_1 cater for the changes in the values of the second terms for latitudes differing from 50°, and are dependent on both LST and latitude. a_2, b_2 cater for the effects in the first terms of changes in the position of *Polaris* from its adopted mean, and are dependent on both LST and date.

The arrangement of the table is designed to avoid the necessity for entering, with the same LST, three separate tables, one of single entry and two of double entry. a_0, b_0 are tabulated for every 3^m of local sidereal time, and the remaining quantities for the mid-point of each hour of LST. a_1, b_1 are given for a range of latitude, and a_2, b_2 for each month during the year. In the latter case mean values are adopted for each month and no interpolation is necessary.

The table is to be entered with the LST of observation, which gives the values of a_0, b_0 directly; interpolation, with maximum differences of 8, can be done mentally. In the same vertical column, the values a_1, b_1 are found with the latitude, and those of a_2, b_2 with the date, as argument. Thus all six quantities can, if desired, be extracted together. The errors due to the adoption of a mean value of the LST for each of the subsidiary tables have been reduced to a minimum, and the total error is not likely to exceed $0'.2$. Interpolation between columns should not be attempted.

The observed altitude must be corrected for refraction (see pages 62–64) before being used for the determination of latitude. A table of natural secants is given on page 65 primarily to facilitate the calculation of the azimuth, which is measured from the north, positive to the east and negative to the west.

Radio Time Signals (Pages 60–61)

These pages contain a list of the principal radio time signals used by surveyors.

Refraction Tables (Pages 62–64)

These tables give the correction for refraction in the form:

$$r = r_0 \times f$$

where r_0 is the mean refraction, taken with argument observed (strictly, apparent) altitude from the table on page 62, and f is a correcting factor to be found from the tables on pages 63 and 64 with arguments temperature and pressure. The tables of f are arranged so that for each tabulated value of pressure a critical table gives the corresponding factor with argument temperature. Interpolation of the tabulated temperatures to intermediate values of pressure may easily be performed, but is generally unnecessary.

The pressure is given in millibars; for pressures less than 970 millibars an equivalent height in metres is also given.

These tables are based on those of Harzer in *Publikation der Sternwarte in Kiel*, XIV, 1924; the values of mean refraction apply to a standard pressure of 754 mm and a standard temperature of 7° C. Within the range of altitude for which tabulations are given, there is no significant difference between the various theories that are extant.

Natural Secants (Page 65)

This table is intended mainly for use in the determination of azimuth from an observation of *Polaris* (see example on page xvi), for which purpose full three-decimal accuracy is not required. For angles less than 30° the table is given in critical form; above 30° values are tabulated for every 5′ and interpolation offers no difficulty.

Conversion to Degrees and to Days (Pages 66–67)

The first table enables minutes and seconds of arc to be converted to decimals of a degree; the second table facilitates conversion of hours, minutes and seconds into decimals of a day.

Table for Circum-Meridian Observations (Page 68)

This table gives the factor m for use in the reduction to the meridian of circum-meridian observations. The full correction is $A\ m$, where $A = \cos\phi \cos\delta \operatorname{cosec}\zeta$ and ϕ, δ, ζ are approximate values of latitude, declination, and zenith distance respectively. The factor m should be determined from this table for the time of each observation and, for each star, the mean of the values of m so found should be multiplied by the expression A above. Alternatively the expression $m = 0{\cdot}0005454\ t^2$, where t is the hour angle in seconds of time, may be used to calculate m with a pocket calculator. The product $A\ m$ is then to be applied to the mean of the observed altitudes.

It should be noted that, particularly in low latitudes, the use of stars within 10° of the zenith is to be avoided.

Conversion of Time to Arc (Page 69)

This table needs no explanation; it can also easily be used for conversion of arc to time. An example of the use is given on page xiv.

Interpolation Table for R (Pages 70–72)

The principal purpose of this table is to provide for the interpolation of the quantity R, which is tabulated for every 6^h of UT1 in the ephemeris of the Sun (pages 2–25). The table gives, in critical form with respect to the left-hand argument (in bold type), the increment to be added to a tabular value of R for any given interval of UT1. The interpolated value of R is added to the universal time to give the Greenwich sidereal time, as illustrated in the example on page xv.

This table also provides for the mutual conversion of intervals of mean solar and sidereal time. The increment corresponding to the left-hand argument is, in fact, the quantity to be added to that interval of mean solar time to convert it to the equivalent interval of mean sidereal time. The right-hand argument gives the decrement to be *subtracted* from that interval of mean sidereal time to convert it to the equivalent interval of mean solar time. (It is important to note that the right-hand argument does *not* give the sidereal-time interval corresponding to the left-hand solar-time argument, or vice-versa.)

Interpolation Table for Sun (Page 73)

This table serves for the interpolation of the values of the Sun's declination and E given on pages 2–25. The nearest value to the printed difference may usually be taken as the horizontal argument, and the time interval as the vertical argument. Interpolation for intermediate values of either argument may easily be performed, if required.

Interpolation Table for Stars (Page 73)

This table is to be used for interpolation of the apparent places of stars on pages 26–53. The day of the month on which the observation is made is to be used as the vertical argument, and the difference to the following month as the horizontal argument. The variation in length of the month is to be ignored, as mentioned on page x.

Polynomial Coefficients for R and Sun (Pages 74–75)

This table, for use with small programmable electronic calculators, provides polynomial coefficients of R, Dec, E and SD for the Sun, together with appropriate formulae to evaluate the data at any instant of time to an accuracy of $1''$ of arc. Explanatory notes and numerical illustrations are given on the left-hand page.

Star Charts (Pages 76–77)

The charts show the relative positions, as seen from the Earth, of all the stars tabulated in this Almanac. Stars of magnitude 3·5 or brighter, and some fainter stars, are identified by their Bayer letter. The numbers of such stars can be obtained directly from the index on pages 78–80. For other stars it is necessary to estimate the RA and Dec from the chart and then search the main tabulations to find the corresponding number. A fixed magnitude has been adopted for each variable star on the charts.

Index to Places of Stars (Pages 78–80)

This index, arranged in alphabetical order of constellations (genitive case), affords a rapid means of finding the number and thus the apparent place of a star known only by its name. Twenty-three stars having proper names in general use are listed on page 78, but no attempt has been made to give a complete list of such names.

ILLUSTRATIONS

The following examples illustrate the extraction from the Almanac of the data required by a surveyor when making astronomical observations.

A surveyor, whose approximate position is

longitude E 33° 32′, latitude N 35° 11′

makes a series of observations on 2017 January 19. On this date the Moon (from page 3) is at last quarter and will not therefore interfere with evening observations.

Sunrise, sunset. From pages 2 and 3, interpolating for latitude and date, the local mean times of sunrise and sunset are found to be $7^h.1$ and $17^h.3$ respectively. The approximate duration of nautical twilight in this latitude in winter is about an hour so that stellar observations are not likely to be possible after 6^h or before 18^h. Using the formula

$$\text{LST} = \text{LMT} + R$$

and taking out, from page 3, an approximate value of R ($= 8^h.0$), it is seen that the earliest LST of evening observation is

$$\text{LST} = 18^h.0 + 8^h.0 = 26^h.0 \; (= 2^h.0)$$

An examination of the right ascensions and declinations of the stars on pages 26–55 will indicate which are the most suitable for observation on the meridian during the evening.

Sun. The Sun transits the local meridian when LMT $= 24^h - E$, i.e. $12^h\ 10^m\ 47^s$ approximately, where E is taken out for 12^h UT1 on January 19. To find the corresponding UT1, the longitude must be converted to time and applied to LMT; using the time-arc conversion table on page 69,

$$33^\circ\ 30' = 2^h\ 14^m; \quad 02' = 08^s; \quad \text{thus } 33^\circ\ 32' = 2^h\ 14^m\ 08^s$$

whence, since the longitude is east,

$$\text{UT1} = 12^h\ 10^m\ 47^s - 2^h\ 14^m\ 08^s = 9^h\ 56^m\ 39^s$$

It should be noted that this time is in error (in the present case by 2^s), as the value of E used should have been taken out for the UT1 of meridian passage; it is rarely necessary to apply any correction since the time is required only approximately.

Suppose that a meridian altitude of the Sun's lower limb is observed as $34^\circ\ 19'.2$ at UT1 $9^h\ 56^m\ 13^s$, the temperature being 6° C and the pressure 969 millibars. From page 3, the Sun's semi-diameter is found to be $16'.2$ and the declination is obtained by interpolation as:

		d	h	m		°	′
page 3; 2017 January		19	06		S	20	17·0
page 73;			3	56			−2·1
	Sun's declination				S	20	14·9

The correction to the value for 6^h is obtained by entering the interpolation table on page 73 with $3^h\ 56^m$, the excess of UT1 over the previous tabular value, and 32, the tabular difference; the sign is obtained by inspection.

The mean refraction r_0 is seen from page 62 to be $85''$, while the correcting factor f is found from page 63 to be 0·97: the refraction correction, to be subtracted from the observed altitude, is thus $85'' \times 0{\cdot}97 = 82'' = 1'.4$. Strictly, a correction should be applied for the Sun's parallax, which may, for this purpose, be regarded as a constant; it suffices to add $0'.1$ to all altitudes less than 70°.

Thus the corrected observed altitude of the Sun's centre is

$$34^\circ\ 19'.2 + 16'.2 - 1'.4 + 0'.1 = 34^\circ\ 34'.1$$

whence the deduced latitude is

$$90^\circ - 20^\circ\ 14'.9 - 34^\circ\ 34'.1 = 35^\circ\ 11'.0$$

Later in the day an observation of the Sun is made at UT1 January $19^d\ 13^h\ 23^m\ 49^s.3$; its GHA and Dec are found from page 3 as follows:

		d	h	m		h	m	s			°	′
2017	January	19			UT1	13	23	49·3				
	page 3;		12		*E*	11	49	13·3	Dec	S	20	13·8
	page 73;		1	24	diff. 45			−1·0	diff. 32			−0·7
					GHA	1	13	01·6	Dec	S	20	13·1

The signs of the corrections from page 73 have been put in by inspection; 24^h has been subtracted from the GHA.

Stars. For transit observations the LST of transit is equal to the right ascension; the corresponding approximate mean times of transit may be obtained as follows. The earliest UT1 for evening observations on 2017 January 19, is about 16^h; to a UT1 of 16^h there corresponds an LST of $2^h\ 11^m\ 04^s$ calculated as follows:

On 2017 January 19^d 16^h R = $7^h\ 56^m\ 17^s$ (page 3) + 39^s (page 71) = $7^h\ 56^m\ 56^s$
GST = R + UT1 = $23^h\ 56^m\ 56^s$
LST = GST + east long = $23^h\ 56^m\ 56^s + 2^h\ 14^m\ 08^s = 2^h\ 11^m\ 04^s$

For a particular star, say α Ceti (No. 66), the RA is found from page 28, by simple interpolation, to be $3^h\ 3^m\ 10^s.4$; transit therefore occurs later than 16^h UT1 by a sidereal time interval of $0^h\ 52^m\ 06^s$; reference to the table on page 70 shows that the equivalent solar time interval is 9^s less than this, so that transit occurs at $16^h\ 51^m\ 57^s$ UT1.

Alternatively the UT1 of transit may be found as follows:

		h	m	s
GST of transit = RA − east long = $3^h\ 3^m\ 10^s - 2^h\ 14^m\ 08^s$	=	00	49	02
GST on 2017 January 19^d 12^h UT1 = R + UT1	=	19	56	17
Hence GST of transit is later than 12^h UT1 by a ST interval of		4	52	45
The decrement (page 72 using the right-hand argument) is				48
Hence UT1 of transit = $12^h + 4^h\ 52^m\ 45^s - 48^s$	=	16	51	57

From page 29 the declination N 4° 9′ 10″ may be taken out without reference to the interpolation table on page 73.

The observed meridian altitude of α Ceti is 58° 58′ 41″, and the observed temperature and pressure are 8° C and 957 millibars, respectively. The mean refraction r_0 corresponding to the observed altitude is 35″; entering the column on page 63 corresponding to the observed pressure of 957 millibars, it is seen that the observed temperature of 8° C is a critical value, so that the upper of the two possible values of f, namely 0·95, is taken. The refraction correction is thus 35″ × 0·95 = 33″ and the deduced latitude is

$$90° + 4° 9′ 10″ - 58° 58′ 08″ = 35° 11′ 02″.$$

Later in the evening of 2017 January 19 several stars are observed out of the meridian; two of these are No. 2, *β* Cassiopeiæ, observed at $17^h\ 56^m\ 19^s.1$ UT1, and No. 212, *Procyon* (α CMi) observed at $18^h\ 53^m\ 26^s.7$ UT1.

Their GHA and Dec are obtained as:

		No. 2				No. 212		
		h	m	s		h	m	s
UT1 2017 January 19^d		17	56	19·1		18	53	26·7
R (page 3)	12^h	7	56	17·0	18^h	7	57	16·1
Increment (pages 72, 70)	$5^h\ 56^m\ 19^s.1$			58·5	$0^h\ 53^m\ 26^s.7$			8·8
GST = GHA Aries		25	53	34·6		26	50	51·6
RA January (pages 26, 34)		0	10	06·0		7	40	12·4
Interpolation to January 19	(diff. −10)			−0·7	(diff. +2)			0·1
GHA = GHA Aries − RA		1	43	29·3		19	10	39·1
		°	′	″		°	′	″
Dec, January (pages 27, 35)		N 59	14	51		N 5	10	40
Interpolation to January 19	(diff. −4)			−3	(diff. −4)			−3
Declination		N 59	14	48		N 5	10	37

In practice the increment to the RA and Dec will almost certainly be applied mentally, so that only the final values are written down.

Circumpolar stars. The time of upper transit of ζ Octantis on 2017 January 19, in longitude E 33° 32′ is found as follows:

	h	m
Approximate RA (page 55)	8	54
− Longitude (east)	−2	14
GST of upper transit = RA− longitude (east)	6	40
− GST on 2017 January $19^d\ 00^h$ (page 55)	−7	54
ST interval from 0^h UT1 to upper transit (add 24^h because negative)	22	46
$-\Delta R$, the correction* for an interval of $22^h\ 46^m$ in ST (pages 70–72)		−4
UT1 of upper transit	22	42

* This correction is obtained using the right-hand argument of the table on pages 70–72 by combining three times the value of ΔR for 6^h with the value of ΔR for $4^h\ 46^m$.

For greater accuracy the value of R must be used as follows:

	h	m	s
RA (page 55)	8	54	17
$-R$ on 2017 January $19^d\ 00^h$ (page 3)	−7	54	19
− Longitude (east)	−2	14	08
ST interval (add 24^h because negative)= RA − R − longitude (east)	22	45	50
$-\Delta R$, the correction for an interval of $22^h\ 45^m\ 50^s$ in ST (pages 70–72)		−3	44
UT1 of upper transit	22	42	06

Pole Star. Earlier, observations had been made of *Polaris* for determination of latitude and azimuth; under the same conditions as the observation of α Ceti, the observed altitude was 35° 50′ 22″ at UT1 $17^h\ 46^m\ 36^s$.

The factor f is 0·95, the mean refraction (from page 62) is 80″ and the refraction correction is 76″.

		d	h	m	s
UT1 2017	January	19	17	46	36
R	12^h		7	56	17
Increment	$5^h\ 46^m\ 36^s$				57
GST			25	43	50
Longitude (east)			+2	14	08
LST			3	57	58

		°	′		′
LST $3^h\ 57^m\ 58^s$	a_0	−	38·2	b_0	− 11·1
Latitude 35°	a_1		0·0	b_1	0·0
January	a_2	+	0·1	b_2	0·0
Sum		−	38·1		− 11·1
Obs. Alt.		35	50·4	sec (lat)	
Refraction		−	1·3	= 1·223	
				Azimuth	
Latitude		N 35	11·0	= −13·6	

The calculation of LST requires no explanation; it may be remarked, however, that an accuracy of 1^s is ample. The Pole Star Table on page 56 is entered with the LST just obtained; the LST of $3^h\ 57^m$ is the twentieth entry in the fourth column on the top portion of the page and interpolation of a_0, b_0, for the $0^m\ 58^s$ is done mentally. In the same column a_1 and b_1 are taken out, with simple interpolation, with argument latitude (here 35°); a_2 and b_2 are taken out directly with argument month (here January).

The sum of the corrections to altitude is added to the corrected observed altitude to give latitude. Similarly the contributions to the azimuth are summed and multiplied by sec (latitude) from page 65, to give the azimuth, which is positive to the east and negative to the west.

If greater accuracy is desired the RA and Dec of *Polaris* may be taken from page 54:

$$\text{RA} = 2^h\ 53^m\ 58^s \qquad \text{Dec} = \text{N}\ 89^\circ\ 20'\ 22''$$

and the observation reduced by direct calculation.

MERCURY can be seen for a few days around greatest elongation, in the morning sky around January 19, May 17, September 12 and January 1 of the next year (the best conditions in northern latitudes occur in mid-September and in late December and in southern latitudes in the second half of May) and in the evening sky around April 1, July 30 and November 24 (the best conditions in northern latitudes occur from late March to early April and in southern latitudes from mid-July to mid-August).

VENUS is a brilliant object in the evening sky until the second half of March when it becomes too close to the Sun for observation. It reappears in late March as a morning star and can be seen in the morning sky until late November when it again becomes too close to the Sun for observation.

MARS can be seen only in the evening sky until early June passing through Aquarius, Pisces from late January, into Aries in early March, Taurus in mid-April (passing 6° N of Aldebaran on May 7) and into Gemini in early June. From the start of the second week of June it becomes too close to the Sun for observation and reappears in the morning sky in mid-September in Leo, moves into Virgo in mid-October (passing 3° N of Spica on November 28) and then into Libra in late December.

JUPITER can be seen in Virgo from the beginning of the year and from mid-January can be seen for more than half the night (passing 4° N of Spica on January 20 and again 4° N of Spica on February 23). It is at opposition on April 7 when it can be seen throughout the night. From early July it can only be seen in the evening sky (passing 3° N of Spica on September 5) and from mid-October it becomes too close to the Sun for observation. It reappears in the morning sky in the second week of November and passes into Libra in mid-November.

SATURN rises shortly before sunrise at the beginning of the year in Ophiucus, passing into Sagittarius in late February and can only be seen in the morning sky until mid-March. Its westward elongation gradually increases, passing into Ophiucus again in the second half of May, and is at opposition on June 15, when it can be seen throughout the night. Its eastward elongation gradually decreases, and from mid-September until early December it can only be seen in the evening sky. It returns into Sagittarius in mid-November and in early December it becomes too close to the Sun for observation for the remainder of the year.

ECLIPSES, 2017

1. An annular eclipse of the Sun on February 26. The path of annularity begins over the south-eastern part of the Pacific Ocean and crosses southern parts of Peru and Argentina, the South Atlantic Ocean, central Angola, the north-western tip of Zambia and ends over the southernmost part of the Democratic Republic of Congo. The partial phase is visible from the south-east Pacific Ocean, the southern half of South America, the South Atlantic Ocean, most of Antarctica and most of Africa except the northern and easternmost parts. The eclipse begins at $12^{h}\ 11^{m}$ and ends at $17^{h}\ 36^{m}$; the annular phase begins at $13^{h}\ 16^{m}$ and ends at $16^{h}\ 31^{m}$. The maximum duration of annularity is $1^{m}\ 17^{s}$.

2. A partial eclipse of the Moon on August 7 is visible from the western Pacific Ocean, Australasia, Asia, Antarctica, Africa and most of Europe excluding the British Isles. The umbral eclipse begins at $17^{h}\ 22^{m}$ and ends at $19^{h}\ 19^{m}$. The time of maximum eclipse is $18^{h}\ 20^{m}$ when 0·25 of the Moon's diameter is obscured.

3. A total eclipse of the Sun on August 21. The path of totality begins over the northern Pacific Ocean south of the Aleutian Islands and crosses the United States of America and ends over the North Atlantic Ocean south of the Cape Verde Islands. The partial phase is visible from the Americas except the southern half of South America, Greenland and parts of the United Kingdom. The eclipse begins at $15^{h}\ 47^{m}$ and ends at $21^{h}\ 04^{m}$; the total phase begins at $16^{h}\ 49^{m}$ and ends at $20^{h}\ 02^{m}$. The maximum duration of totality is $2^{m}\ 45^{s}$.

UT1		*R*			Dec			*E*			UT1		*R*			Dec			*E*		
d	h	h	m	s	°	′		h	m	s	d	h	h	m	s	°	′		h	m	s
1	**0**	6	43	20·7	S 22	59·9	12	11	56	33·5	**9**	**0**	7	14	53·1	S 22	06·1	22	11	52	59·5
Sun.	**6**		44	19·9		58·7	13		56	26·4	**Mon.**	**6**		15	52·3		03·9	21		52	53·3
	12		45	19·0		57·4	13		56	19·4		**12**		16	51·4		01·8	22		52	47·2
	18		46	18·1		56·1	13		56	12·3		**18**		17	50·6		59·6	23		52	41·1
2	**0**	6	47	17·3	S 22	54·8	14	11	56	05·3	**10**	**0**	7	18	49·7	S 21	57·3	22	11	52	35·0
Mon.	**6**		48	16·4		53·4	14		55	58·3	**Tues.**	**6**		19	48·9		55·1	23		52	29·0
	12		49	15·5		52·0	14		55	51·3		**12**		20	48·0		52·8	23		52	23·0
	18		50	14·7		50·6	14		55	44·3		**18**		21	47·1		50·5	23		52	17·0
3	**0**	6	51	13·8	S 22	49·2	15	11	55	37·4	**11**	**0**	7	22	46·3	S 21	48·2	24	11	52	11·1
Tues.	**6**		52	13·0		47·7	15		55	30·5	**Wed.**	**6**		23	45·4		45·8	23		52	05·2
	12		53	12·1		46·2	15		55	23·6		**12**		24	44·6		43·5	24		51	59·3
	18		54	11·2		44·7	16		55	16·8		**18**		25	43·7		41·1	25		51	53·5
4	**0**	6	55	10·4	S 22	43·1	16	11	55	09·9	**12**	**0**	7	26	42·8	S 21	38·6	24	11	51	47·7
Wed.	**6**		56	09·5		41·5	16		55	03·1	**Thur.**	**6**		27	42·0		36·2	25		51	42·0
	12		57	08·7		39·9	16		54	56·4		**12**		28	41·1		33·7	25		51	36·3
	18		58	07·8		38·3	17		54	49·6		**18**		29	40·3		31·2	26		51	30·6
5	**0**	6	59	06·9	S 22	36·6	17	11	54	42·9	**13**	**0**	7	30	39·4	S 21	28·6	25	11	51	25·0
Thur.	**6**	7	00	06·1		34·9	17		54	36·2	**Fri.**	**6**		31	38·5		26·1	26		51	19·4
	12		01	05·2		33·2	18		54	29·5		**12**		32	37·7		23·5	26		51	13·9
	18		02	04·3		31·4	18		54	22·9		**18**		33	36·8		20·9	27		51	08·4
6	**0**	7	03	03·5	S 22	29·6	18	11	54	16·3	**14**	**0**	7	34	36·0	S 21	18·2	26	11	51	02·9
Fri.	**6**		04	02·6		27·8	18		54	09·7	**Sat.**	**6**		35	35·1		15·6	27		50	57·5
	12		05	01·8		26·0	19		54	03·2		**12**		36	34·2		12·9	27		50	52·1
	18		06	00·9		24·1	19		53	56·7		**18**		37	33·4		10·2	28		50	46·8
7	**0**	7	07	00·0	S 22	22·2	19	11	53	50·2	**15**	**0**	7	38	32·5	S 21	07·4	27	11	50	41·5
Sat.	**6**		07	59·2		20·3	20		53	43·7	**Sun.**	**6**		39	31·7		04·7	28		50	36·2
	12		08	58·3		18·3	19		53	37·3		**12**		40	30·8		01·9	29		50	31·0
	18		09	57·4		16·4	20		53	30·9		**18**		41	29·9		59·0	28		50	25·8
8	**0**	7	10	56·6	S 22	14·4	21	11	53	24·6	**16**	**0**	7	42	29·1	S 20	56·2	29	11	50	20·7
Sun.	**6**		11	55·7		12·3	20		53	18·3	**Mon.**	**6**		43	28·2		53·3	29		50	15·6
	12		12	54·9		10·3	21		53	12·0		**12**		44	27·3		50·4	29		50	10·5
	18		13	54·0		08·2	21		53	05·7		**18**		45	26·5		47·5	29		50	05·5
	24	7	14	53·1	S 22	06·1		11	52	59·5		**24**	7	46	25·6	S 20	44·6		11	50	00·6

Sun's SD 16′·3

SUNRISE

Date	South Latitude									North Latitude								
	60°	55°	50°	45°	40°	30°	20°	10°	0°	10°	20°	30°	40°	45°	50°	55°	60°
Jan.	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
1	2·7	3·4	3·9	4·3	4·6	5·0	5·4	5·7	6·0	6·3	6·6	6·9	7·4	7·6	8·0	8·4	9·0
6	2·9	3·6	4·0	4·4	4·7	5·1	5·5	5·8	6·0	6·3	6·6	6·9	7·4	7·6	8·0	8·4	9·0
11	3·0	3·7	4·1	4·5	4·7	5·2	5·5	5·8	6·1	6·3	6·6	6·9	7·4	7·6	7·9	8·3	8·9
16	3·2	3·8	4·3	4·6	4·8	5·2	5·6	5·8	6·1	6·4	6·6	6·9	7·3	7·6	7·9	8·2	8·8
21	3·4	4·0	4·4	4·7	4·9	5·3	5·6	5·9	6·1	6·4	6·6	6·9	7·3	7·5	7·8	8·1	8·6
26	3·7	4·2	4·5	4·8	5·0	5·4	5·7	5·9	6·2	6·4	6·6	6·9	7·2	7·4	7·7	8·0	8·4
31	3·9	4·3	4·7	4·9	5·1	5·5	5·7	6·0	6·2	6·4	6·6	6·8	7·2	7·3	7·6	7·9	8·3

Moon's Phases: First Quarter $5^{d}\ 19^{h}\ 47^{m}$ Full Moon $12^{d}\ 11^{h}\ 34^{m}$

UT1		*R*			Dec			*E*			UT1		*R*			Dec			*E*		
d	h	h	m	s	°	′		h	m	s	d	h	h	m	s	°	′		h	m	s
17	**0**	7	46	25·6	S 20	44·6	30	11	50	00·6	**25**	**0**	8	17	58·1	S 18	57·9	37	11	47	45·4
Tues.	**6**		47	24·8		41·6	30		49	55·6	**Wed.**	**6**		18	57·2		54·2	37		47	42·0
	12		48	23·9		38·6	30		49	50·8		**12**		19	56·3		50·5	38		47	38·6
	18		49	23·0		35·6	30		49	45·9		**18**		20	55·5		46·7	38		47	35·3
18	**0**	7	50	22·2	S 20	32·6	31	11	49	41·1	**26**	**0**	8	21	54·6	S 18	42·9	38	11	47	32·0
Wed.	**6**		51	21·3		29·5	31		49	36·4	**Thur.**	**6**		22	53·8		39·1	38		47	28·7
	12		52	20·4		26·4	31		49	31·7		**12**		23	52·9		35·3	38		47	25·5
	18		53	19·6		23·3	31		49	27·0		**18**		24	52·0		31·5	39		47	22·4
19	**0**	7	54	18·7	S 20	20·2	32	11	49	22·4	**27**	**0**	8	25	51·2	S 18	27·6	39	11	47	19·3
Thur.	**6**		55	17·9		17·0	32		49	17·8	**Fri.**	**6**		26	50·3		23·7	39		47	16·2
	12		56	17·0		13·8	32		49	13·3		**12**		27	49·5		19·8	39		47	13·2
	18		57	16·1		10·6	32		49	08·8		**18**		28	48·6		15·9	39		47	10·3
20	**0**	7	58	15·3	S 20	07·4	33	11	49	04·4	**28**	**0**	8	29	47·7	S 18	12·0	40	11	47	07·4
Fri.	**6**	7	59	14·4		04·1	33		49	00·0	**Sat.**	**6**		30	46·9		08·0	40		47	04·6
	12	8	00	13·6		00·8	33		48	55·6		**12**		31	46·0		04·0	40		47	01·8
	18		01	12·7		57·5	33		48	51·3		**18**		32	45·2		00·0	40		46	59·0
21	**0**	8	02	11·8	S 19	54·2	33	11	48	47·1	**29**	**0**	8	33	44·3	S 17	56·0	40	11	46	56·3
Sat.	**6**		03	11·0		50·9	34		48	42·9	**Sun.**	**6**		34	43·4		52·0	41		46	53·7
	12		04	10·1		47·5	34		48	38·7		**12**		35	42·6		47·9	41		46	51·1
	18		05	09·2		44·1	34		48	34·6		**18**		36	41·7		43·8	41		46	48·6
22	**0**	8	06	08·4	S 19	40·7	35	11	48	30·5	**30**	**0**	8	37	40·8	S 17	39·7	41	11	46	46·1
Sun.	**6**		07	07·5		37·2	34		48	26·5	**Mon.**	**6**		38	40·0		35·6	41		46	43·6
	12		08	06·7		33·8	35		48	22·5		**12**		39	39·1		31·5	42		46	41·3
	18		09	05·8		30·3	35		48	18·6		**18**		40	38·3		27·3	42		46	38·9
23	**0**	8	10	04·9	S 19	26·8	36	11	48	14·7	**31**	**0**	8	41	37·4	S 17	23·1	42	11	46	36·6
Mon.	**6**		11	04·1		23·2	35		48	10·9	**Tues.**	**6**		42	36·5		18·9	42		46	34·4
	12		12	03·2		19·7	36		48	07·1		**12**		43	35·7		14·7	42		46	32·2
	18		13	02·4		16·1	36		48	03·4		**18**		44	34·8		10·5	43		46	30·1
24	**0**	8	14	01·5	S 19	12·5	36	11	47	59·7	**32**	**0**	8	45	33·9	S 17	06·2	43	11	46	28·0
Tues.	**6**		15	00·6		08·9	37		47	56·1	**Wed.**	**6**		46	33·1		01·9	43		46	26·0
	12		15	59·8		05·2	36		47	52·5		**12**		47	32·2		57·6	43		46	24·1
	18		16	58·9		01·6	37		47	48·9		**18**		48	31·4		53·3	43		46	22·1
	24	8	17	58·1	S 18	57·9		11	47	45·4		**24**	8	49	30·5	S 16	49·0		11	46	20·3

Sun's SD 16′·2

SUNSET

Date	South Latitude									North Latitude								
	60°	55°	50°	45°	40°	30°	20°	10°	0°	10°	20°	30°	40°	45°	50°	55°	60°
Jan.	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
1	21·4	20·7	20·2	19·8	19·5	19·1	18·7	18·4	18·1	17·8	17·5	17·2	16·8	16·5	16·2	15·7	15·1
6	21·3	20·6	20·2	19·8	19·5	19·1	18·7	18·4	18·2	17·9	17·6	17·3	16·8	16·6	16·2	15·8	15·2
11	21·2	20·6	20·1	19·8	19·5	19·1	18·8	18·5	18·2	17·9	17·6	17·3	16·9	16·7	16·4	16·0	15·4
16	21·1	20·5	20·1	19·7	19·5	19·1	18·8	18·5	18·2	18·0	17·7	17·4	17·0	16·8	16·5	16·1	15·6
21	20·9	20·4	20·0	19·7	19·4	19·1	18·8	18·5	18·2	18·0	17·8	17·5	17·1	16·9	16·6	16·3	15·8
26	20·7	20·2	19·9	19·6	19·4	19·0	18·7	18·5	18·3	18·0	17·8	17·5	17·2	17·0	16·7	16·4	16·0
31	20·5	20·1	19·8	19·5	19·3	19·0	18·7	18·5	18·3	18·1	17·9	17·6	17·3	17·1	16·9	16·6	16·2

Moon's Phases: Last Quarter $19^{d}\ 22^{h}\ 13^{m}$ New Moon $28^{d}\ 00^{h}\ 07^{m}$

UT1		*R*		Dec		*E*		UT1		*R*		Dec		*E*	
d	h	h m s		° ′		h m s		d	h	h m s		° ′		h m s	
1	**0**	8 45 33·9		S 17 06·2	43	11 46 28·0	20	**9**	**0**	9 17 06·4		S 14 40·7	48	11 45 49·1	3
Wed.	**6**	46 33·1		17 01·9	43	46 26·0	19	**Thur.**	**6**	18 05·5		14 35·9	49	45 48·8	4
	12	47 32·2		16 57·6	43	46 24·1	20		**12**	19 04·7		14 31·0	48	45 48·4	2
	18	48 31·4		16 53·3	43	46 22·1	18		**18**	20 03·8		14 26·2	49	45 48·2	3
2	**0**	8 49 30·5		S 16 49·0	43	11 46 20·3	18	**10**	**0**	9 21 03·0		S 14 21·3	48	11 45 47·9	1
Thur.	**6**	50 29·6		16 44·7	44	46 18·5	18	**Fri.**	**6**	22 02·1		14 16·5	49	45 47·8	2
	12	51 28·8		16 40·3	44	46 16·7	17		**12**	23 01·2		14 11·6	49	45 47·6	1
	18	52 27·9		16 35·9	44	46 15·0	16		**18**	24 00·4		14 06·7	50	45 47·5	0
3	**0**	8 53 27·0		S 16 31·5	44	11 46 13·4	16	**11**	**0**	9 24 59·5		S 14 01·7	49	11 45 47·5	0
Fri.	**6**	54 26·2		16 27·1	45	46 11·8	16	**Sat.**	**6**	25 58·6		13 56·8	50	45 47·5	1
	12	55 25·3		16 22·6	44	46 10·2	15		**12**	26 57·8		13 51·8	49	45 47·6	1
	18	56 24·5		16 18·2	45	46 08·7	14		**18**	27 56·9		13 46·9	50	45 47·7	2
4	**0**	8 57 23·6		S 16 13·7	45	11 46 07·3	14	**12**	**0**	9 28 56·1		S 13 41·9	50	11 45 47·9	2
Sat.	**6**	58 22·7		16 09·2	45	46 05·9	14	**Sun.**	**6**	29 55·2		13 36·9	50	45 48·1	2
	12	8 59 21·9		16 04·7	45	46 04·5	13		**12**	30 54·3		13 31·9	50	45 48·3	3
	18	9 00 21·0		16 00·2	46	46 03·2	12		**18**	31 53·5		13 26·9	51	45 48·6	3
5	**0**	9 01 20·2		S 15 55·6	45	11 46 02·0	12	**13**	**0**	9 32 52·6		S 13 21·8	50	11 45 48·9	4
Sun.	**6**	02 19·3		15 51·1	46	46 00·8	11	**Mon.**	**6**	33 51·7		13 16·8	51	45 49·3	5
	12	03 18·4		15 46·5	46	45 59·7	11		**12**	34 50·9		13 11·7	51	45 49·8	4
	18	04 17·6		15 41·9	46	45 58·6	10		**18**	35 50·0		13 06·6	50	45 50·2	6
6	**0**	9 05 16·7		S 15 37·3	46	11 45 57·6	10	**14**	**0**	9 36 49·2		S 13 01·6	51	11 45 50·8	5
Mon.	**6**	06 15·9		15 32·7	47	45 56·6	10	**Tues.**	**6**	37 48·3		12 56·5	52	45 51·3	7
	12	07 15·0		15 28·0	46	45 55·6	8		**12**	38 47·4		12 51·3	51	45 52·0	6
	18	08 14·1		15 23·4	47	45 54·8	9		**18**	39 46·6		12 46·2	51	45 52·6	7
7	**0**	9 09 13·3		S 15 18·7	47	11 45 53·9	7	**15**	**0**	9 40 45·7		S 12 41·1	52	11 45 53·3	8
Tues.	**6**	10 12·4		15 14·0	47	45 53·2	8	**Wed.**	**6**	41 44·8		12 35·9	52	45 54·1	8
	12	11 11·6		15 09·3	47	45 52·4	6		**12**	42 44·0		12 30·7	51	45 54·9	8
	18	12 10·7		15 04·6	48	45 51·8	7		**18**	43 43·1		12 25·6	52	45 55·7	9
8	**0**	9 13 09·8		S 14 59·8	47	11 45 51·1	5	**16**	**0**	9 44 42·3		S 12 20·4	52	11 45 56·6	9
Wed.	**6**	14 09·0		14 55·1	48	45 50·6	6	**Thur.**	**6**	45 41·4		12 15·2	53	45 57·5	10
	12	15 08·1		14 50·3	48	45 50·0	4		**12**	46 40·5		12 09·9	52	45 58·5	10
	18	16 07·3		14 45·5	48	45 49·6	5		**18**	47 39·7		12 04·7	52	45 59·5	10
	24	9 17 06·4		S 14 40·7		11 45 49·1			**24**	9 48 38·8		S 11 59·5		11 46 00·5	

Sun's SD 16′·2

SUNRISE

Date	South Latitude									North Latitude							
	60°	55°	50°	45°	40°	30°	20°	10°	0°	10°	20°	30°	40°	45°	50°	55°	60°
Feb.	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
1	3·9	4·4	4·7	4·9	5·2	5·5	5·7	6·0	6·2	6·4	6·6	6·8	7·1	7·3	7·6	7·8	8·2
6	4·2	4·6	4·8	5·1	5·3	5·6	5·8	6·0	6·2	6·4	6·6	6·8	7·1	7·2	7·4	7·7	8·0
11	4·4	4·7	5·0	5·2	5·4	5·6	5·8	6·0	6·2	6·3	6·5	6·7	7·0	7·1	7·3	7·5	7·8
16	4·6	4·9	5·1	5·3	5·5	5·7	5·9	6·0	6·2	6·3	6·5	6·6	6·9	7·0	7·1	7·3	7·6
21	4·9	5·1	5·3	5·4	5·6	5·8	5·9	6·0	6·2	6·3	6·4	6·6	6·7	6·9	7·0	7·1	7·4
26	5·1	5·3	5·4	5·6	5·7	5·8	5·9	6·1	6·2	6·3	6·4	6·5	6·6	6·7	6·8	6·9	7·1
31	5·3	5·5	5·6	5·7	5·7	5·9	6·0	6·1	6·1	6·2	6·3	6·4	6·5	6·6	6·6	6·7	6·9

Moon's Phases: First Quarter $4^{d}\ 04^{h}\ 19^{m}$ Full Moon $11^{d}\ 00^{h}\ 33^{m}$

UT1		*R*			Dec			*E*				UT1		*R*			Dec			*E*			
d	h	h	m	s	°	′		h	m	s		d	h	h	m	s	°	′		h	m	s	
17	**0**	9	48	38·8	S 11	59·5	53	11	46	00·5	11	**25**	**0**	10	20	11·2	S 9	06·0	56	11	46	55·6	23
Fri.	**6**		49	37·9	11	54·2	53		46	01·6	12	**Sat.**	**6**		21	10·4	9	00·4	56		46	57·9	24
	12		50	37·1	11	48·9	52		46	02·8	12		**12**		22	09·5	8	54·8	56		47	00·3	24
	18		51	36·2	11	43·7	53		46	04·0	12		**18**		23	08·7	8	49·2	56		47	02·7	25
18	**0**	9	52	35·4	S 11	38·4	53	11	46	05·2	13	**26**	**0**	10	24	07·8	S 8	43·6	56	11	47	05·2	25
Sat.	**6**		53	34·5	11	33·1	53		46	06·5	13	**Sun.**	**6**		25	06·9	8	38·0	56		47	07·7	25
	12		54	33·6	11	27·8	54		46	07·8	13		**12**		26	06·1	8	32·4	57		47	10·2	25
	18		55	32·8	11	22·4	53		46	09·1	14		**18**		27	05·2	8	26·7	56		47	12·7	26
19	**0**	9	56	31·9	S 11	17·1	53	11	46	10·5	14	**27**	**0**	10	28	04·3	S 8	21·1	57	11	47	15·3	27
Sun.	**6**		57	31·0	11	11·8	54		46	11·9	15	**Mon.**	**6**		29	03·5	8	15·4	56		47	18·0	26
	12		58	30·2	11	06·4	54		46	13·4	15		**12**		30	02·6	8	09·8	57		47	20·6	27
	18	9	59	29·3	11	01·0	53		46	14·9	16		**18**		31	01·8	8	04·1	56		47	23·3	27
20	**0**	10	00	28·5	S 10	55·7	54	11	46	16·5	15	**28**	**0**	10	32	00·9	S 7	58·5	57	11	47	26·0	28
Mon.	**6**		01	27·6	10	50·3	54		46	18·0	17	**Tues.**	**6**		33	00·0	7	52·8	57		47	28·8	28
	12		02	26·7	10	44·9	54		46	19·7	17		**12**		33	59·2	7	47·1	57		47	31·6	28
	18		03	25·9	10	39·5	55		46	21·4	17		**18**		34	58·3	7	41·4	57		47	34·4	29
21	**0**	10	04	25·0	S 10	34·0	54	11	46	23·1	17	**29**	**0**	10	35	57·4	S 7	35·7	57	11	47	37·3	29
Tues.	**6**		05	24·2	10	28·6	54		46	24·8	18	**Wed.**	**6**		36	56·6	7	30·0	57		47	40·2	29
	12		06	23·3	10	23·2	55		46	26·6	18		**12**		37	55·7	7	24·3	57		47	43·1	29
	18		07	22·4	10	17·7	55		46	28·4	19		**18**		38	54·9	7	18·6	57		47	46·0	30
22	**0**	10	08	21·6	S 10	12·2	54	11	46	30·3	19		**24**	10	39	54·0	S 7	12·9	57	11	47	49·0	
Wed.	**6**		09	20·7	10	06·8	55		46	32·2	19												
	12		10	19·9	10	01·3	55		46	34·1	20												
	18		11	19·0	9	55·8	55		46	36·1	20												
23	**0**	10	12	18·1	S 9	50·3	55	11	46	38·1	21												
Thur.	**6**		13	17·3	9	44·8	55		46	40·2	21												
	12		14	16·4	9	39·3	56		46	42·3	21												
	18		15	15·6	9	33·7	55		46	44·4	22												
24	**0**	10	16	14·7	S 9	28·2	55	11	46	46·6	22												
Fri.	**6**		17	13·8	9	22·7	56		46	48·8	22												
	12		18	13·0	9	17·1	56		46	51·0	23												
	18		19	12·1	9	11·5	55		46	53·3	23												
	24	10	20	11·2	S 9	06·0		11	46	55·6													

Sun's SD 16′.2

SUNSET

Date	South Latitude									North Latitude							
	60°	55°	50°	45°	40°	30°	20°	10°	0°	10°	20°	30°	40°	45°	50°	55°	60°
Feb.	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
1	20·5	20·1	19·7	19·5	19·3	19·0	18·7	18·5	18·3	18·1	17·9	17·6	17·3	17·1	16·9	16·6	16·2
6	20·3	19·9	19·6	19·4	19·2	18·9	18·7	18·5	18·3	18·1	17·9	17·7	17·4	17·3	17·1	16·8	16·5
11	20·0	19·7	19·5	19·3	19·1	18·8	18·6	18·5	18·3	18·1	18·0	17·8	17·5	17·4	17·2	17·0	16·7
16	19·8	19·5	19·3	19·1	19·0	18·8	18·6	18·4	18·3	18·1	18·0	17·8	17·6	17·5	17·3	17·1	16·9
21	19·6	19·3	19·1	19·0	18·9	18·7	18·5	18·4	18·3	18·2	18·0	17·9	17·7	17·6	17·5	17·3	17·1
26	19·3	19·1	19·0	18·9	18·8	18·6	18·5	18·4	18·3	18·2	18·1	18·0	17·8	17·7	17·6	17·5	17·3
31	19·1	18·9	18·8	18·7	18·6	18·5	18·4	18·3	18·3	18·2	18·1	18·0	17·9	17·8	17·8	17·7	17·5

Moon's Phases: Last Quarter $18^{d}\ 19^{h}\ 33^{m}$ New Moon $26^{d}\ 14^{h}\ 58^{m}$

UT1		*R*				Dec			*E*		
d	h	h	m	s		°	′		h	m	s
1	**0**	10	35	57·4	S	7	35·7	57	11	47	37·3 29
Wed.	**6**		36	56·6		7	30·0	57		47	40·2 29
	12		37	55·7		7	24·3	57		47	43·1 29
	18		38	54·9		7	18·6	57		47	46·0 30
2	**0**	10	39	54·0	S	7	12·9	58	11	47	49·0 30
Thur.	**6**		40	53·1		7	07·1	57		47	52·0 31
	12		41	52·3		7	01·4	57		47	55·1 31
	18		42	51·4		6	55·7	58		47	58·2 31
3	**0**	10	43	50·5	S	6	49·9	57	11	48	01·3 31
Fri.	**6**		44	49·7		6	44·2	58		48	04·4 32
	12		45	48·8		6	38·4	58		48	07·6 32
	18		46	48·0		6	32·6	57		48	10·8 32
4	**0**	10	47	47·1	S	6	26·9	58	11	48	14·0 33
Sat.	**6**		48	46·2		6	21·1	58		48	17·3 33
	12		49	45·4		6	15·3	58		48	20·6 33
	18		50	44·5		6	09·5	58		48	23·9 33
5	**0**	10	51	43·6	S	6	03·7	58	11	48	27·2 34
Sun.	**6**		52	42·8		5	57·9	58		48	30·6 34
	12		53	41·9		5	52·1	58		48	34·0 34
	18		54	41·1		5	46·3	58		48	37·4 35
6	**0**	10	55	40·2	S	5	40·5	58	11	48	40·9 35
Mon.	**6**		56	39·3		5	34·7	58		48	44·4 35
	12		57	38·5		5	28·9	59		48	47·9 35
	18		58	37·6		5	23·0	58		48	51·4 36
7	**0**	10	59	36·8	S	5	17·2	58	11	48	55·0 36
Tues.	**6**	11	00	35·9		5	11·4	59		48	58·6 36
	12		01	35·0		5	05·5	58		49	02·2 36
	18		02	34·2		4	59·7	58		49	05·8 37
8	**0**	11	03	33·3	S	4	53·9	59	11	49	09·5 37
Wed.	**6**		04	32·5		4	48·0	59		49	13·2 37
	12		05	31·6		4	42·1	58		49	16·9 37
	18		06	30·7		4	36·3	59		49	20·6 38
	24	11	07	29·9	S	4	30·4		11	49	24·4

UT1		*R*				Dec			*E*		
d	h	h	m	s		°	′		h	m	s
9	**0**	11	07	29·9	S	4	30·4	58	11	49	24·4 38
Thur.	**6**		08	29·0		4	24·6	59		49	28·2 38
	12		09	28·2		4	18·7	59		49	32·0 38
	18		10	27·3		4	12·8	59		49	35·8 39
10	**0**	11	11	26·4	S	4	06·9	58	11	49	39·7 39
Fri.	**6**		12	25·6		4	01·1	59		49	43·6 38
	12		13	24·7		3	55·2	59		49	47·4 40
	18		14	23·8		3	49·3	59		49	51·4 39
11	**0**	11	15	23·0	S	3	43·4	59	11	49	55·3 40
Sat.	**6**		16	22·1		3	37·5	59		49	59·3 39
	12		17	21·3		3	31·6	59		50	03·2 40
	18		18	20·4		3	25·7	59		50	07·2 40
12	**0**	11	19	19·5	S	3	19·8	59	11	50	11·2 41
Sun.	**6**		20	18·7		3	13·9	59		50	15·3 40
	12		21	17·8		3	08·0	59		50	19·3 41
	18		22	16·9		3	02·1	59		50	23·4 41
13	**0**	11	23	16·1	S	2	56·2	59	11	50	27·5 41
Mon.	**6**		24	15·2		2	50·3	59		50	31·6 41
	12		25	14·3		2	44·4	59		50	35·7 41
	18		26	13·5		2	38·5	59		50	39·8 41 42
14	**0**	11	27	12·6	S	2	32·6	59	11	50	44·0 41
Tues.	**6**		28	11·8		2	26·7	60		50	48·1 42
	12		29	10·9		2	20·7	59		50	52·3 42
	18		30	10·0		2	14·8	59		50	56·5 42
15	**0**	11	31	09·2	S	2	08·9	59	11	51	00·7 43
Wed.	**6**		32	08·3		2	03·0	59		51	05·0 42
	12		33	07·4		1	57·1	60		51	09·2 43
	18		34	06·6		1	51·1	59		51	13·5 42
16	**0**	11	35	05·7	S	1	45·2	59	11	51	17·7 43
Thur.	**6**		36	04·9		1	39·3	59		51	22·0 43
	12		37	04·0		1	33·4	60		51	26·3 43
	18		38	03·1		1	27·4	59		51	30·6 43
	24	11	39	02·3	S	1	21·5		11	51	34·9

Sun's SD 16′·1

SUNRISE

Date	South Latitude									North Latitude							
	60°	55°	50°	45°	40°	30°	20°	10°	0°	10°	20°	30°	40°	45°	50°	55°	60°
Mar.	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
1	5·2	5·4	5·5	5·6	5·7	5·8	6·0	6·1	6·1	6·2	6·3	6·4	6·6	6·6	6·7	6·8	7·0
6	5·4	5·6	5·7	5·7	5·8	5·9	6·0	6·1	6·1	6·2	6·3	6·3	6·4	6·5	6·5	6·6	6·7
11	5·6	5·7	5·8	5·8	5·9	6·0	6·0	6·1	6·1	6·2	6·2	6·2	6·3	6·3	6·4	6·4	6·5
16	5·8	5·9	5·9	6·0	6·0	6·0	6·0	6·1	6·1	6·1	6·1	6·1	6·2	6·2	6·2	6·2	6·2
21	6·0	6·1	6·1	6·1	6·1	6·1	6·1	6·1	6·1	6·1	6·1	6·0	6·0	6·0	6·0	6·0	6·0
26	6·2	6·2	6·2	6·2	6·2	6·1	6·1	6·1	6·0	6·0	6·0	5·9	5·9	5·9	5·8	5·8	5·7
31	6·4	6·4	6·3	6·3	6·2	6·2	6·1	6·1	6·0	6·0	5·9	5·8	5·8	5·7	5·6	5·6	5·5

Moon's Phases: First Quarter $5^{d}\ 11^{h}\ 32^{m}$ Full Moon $12^{d}\ 14^{h}\ 54^{m}$

UT1		R				Dec			E			UT1		R				Dec			E		
d	h	h	m	s		°	′		h	m	s	d	h	h	m	s		°	′		h	m	s
17	**0**	11	39	02·3	S	1	21·5	59	11	51	34·9	**25**	**0**	12	10	34·7	N	1	48·0	59	11	53	57·1
Fri.	**6**		40	01·4		1	15·6	60		51	39·2	**Sat.**	**6**		11	33·8		1	53·9	59		54	01·6
	12		41	00·5		1	09·6	59		51	43·6		**12**		12	33·0		1	59·8	59		54	06·1
	18		41	59·7		1	03·7	59		51	47·9		**18**		13	32·1		2	05·7	58		54	10·6
18	**0**	11	42	58·8	S	0	57·8	59	11	51	52·3	**26**	**0**	12	14	31·2	N	2	11·5	59	11	54	15·1
Sat.	**6**		43	58·0		0	51·9	60		51	56·6	**Sun.**	**6**		15	30·4		2	17·4	59		54	19·6
	12		44	57·1		0	45·9	59		52	01·0		**12**		16	29·5		2	23·3	59		54	24·2
	18		45	56·2		0	40·0	59		52	05·4		**18**		17	28·7		2	29·2	59		54	28·7
19	**0**	11	46	55·4	S	0	34·1	60	11	52	09·8	**27**	**0**	12	18	27·8	N	2	35·1	58	11	54	33·2
Sun.	**6**		47	54·5		0	28·1	59		52	14·2	**Mon.**	**6**		19	26·9		2	40·9	59		54	37·7
	12		48	53·6		0	22·2	59		52	18·6		**12**		20	26·1		2	46·8	59		54	42·2
	18		49	52·8		0	16·3	59		52	23·0		**18**		21	25·2		2	52·7	58		54	46·7
20	**0**	11	50	51·9	S	0	10·3	59	11	52	27·5	**28**	**0**	12	22	24·3	N	2	58·5	59	11	54	51·2
Mon.	**6**		51	51·1	S	0	04·4	59		52	31·9	**Tues.**	**6**		23	23·5		3	04·4	59		54	55·7
	12		52	50·2	N	0	01·5	59		52	36·3		**12**		24	22·6		3	10·3	58		55	00·2
	18		53	49·3		0	07·4	60		52	40·8		**18**		25	21·8		3	16·1	59		55	04·7
21	**0**	11	54	48·5	N	0	13·4	59	11	52	45·2	**29**	**0**	12	26	20·9	N	3	22·0	58	11	55	09·2
Tues.	**6**		55	47·6		0	19·3	59		52	49·7	**Wed.**	**6**		27	20·0		3	27·8	58		55	13·7
	12		56	46·8		0	25·2	59		52	54·2		**12**		28	19·2		3	33·6	59		55	18·2
	18		57	45·9		0	31·1	59		52	58·6		**18**		29	18·3		3	39·5	58		55	22·7
22	**0**	11	58	45·0	N	0	37·1	59	11	53	03·1	**30**	**0**	12	30	17·4	N	3	45·3	58	11	55	27·2
Wed.	**6**	11	59	44·2		0	43·0	59		53	07·6	**Thur.**	**6**		31	16·6		3	51·1	58		55	31·7
	12	12	00	43·3		0	48·9	59		53	12·1		**12**		32	15·7		3	56·9	59		55	36·1
	18		01	42·5		0	54·8	59		53	16·5		**18**		33	14·8		4	02·8	58		55	40·6
23	**0**	12	02	41·6	N	1	00·7	59	11	53	21·0	**31**	**0**	12	34	14·0	N	4	08·6	58	11	55	45·1
Thur.	**6**		03	40·7		1	06·6	59		53	25·5	**Fri.**	**6**		35	13·1		4	14·4	58		55	49·6
	12		04	39·9		1	12·5	60		53	30·0		**12**		36	12·3		4	20·2	58		55	54·0
	18		05	39·0		1	18·5	59		53	34·5		**18**		37	11·4		4	26·0	58		55	58·5
24	**0**	12	06	38·1	N	1	24·4	59	11	53	39·0	**32**	**0**	12	38	10·5	N	4	31·8	58	11	56	02·9
Fri.	**6**		07	37·3		1	30·3	59		53	43·5	**Sat.**	**6**		39	09·7		4	37·6	58		56	07·4
	12		08	36·4		1	36·2	59		53	48·1		**12**		40	08·8		4	43·4	57		56	11·8
	18		09	35·6		1	42·1	59		53	52·6		**18**		41	08·0		4	49·1	58		56	16·2
	24	12	10	34·7	N	1	48·0		11	53	57·1		**24**	12	42	07·1	N	4	54·9		11	56	20·7

Sun's SD 16′.0

SUNSET

Date	South Latitude									North Latitude							
	60°	55°	50°	45°	40°	30°	20°	10°	0°	10°	20°	30°	40°	45°	50°	55°	60°
Mar.	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
1	19·2	19·0	18·9	18·8	18·7	18·6	18·4	18·3	18·3	18·2	18·1	18·0	17·9	17·8	17·7	17·6	17·5
6	18·9	18·8	18·7	18·6	18·6	18·5	18·4	18·3	18·2	18·2	18·1	18·0	18·0	17·9	17·8	17·8	17·7
11	18·7	18·6	18·5	18·5	18·4	18·4	18·3	18·3	18·2	18·2	18·1	18·1	18·0	18·0	18·0	17·9	17·9
16	18·4	18·4	18·3	18·3	18·3	18·3	18·2	18·2	18·2	18·2	18·2	18·1	18·1	18·1	18·1	18·1	18·1
21	18·2	18·2	18·2	18·2	18·2	18·2	18·2	18·2	18·2	18·2	18·2	18·2	18·2	18·2	18·2	18·3	18·3
26	17·9	18·0	18·0	18·0	18·0	18·1	18·1	18·1	18·1	18·2	18·2	18·3	18·3	18·3	18·4	18·4	18·5
31	17·7	17·7	17·8	17·8	17·9	18·0	18·0	18·1	18·1	18·2	18·2	18·3	18·4	18·4	18·5	18·6	18·7

Moon's Phases: Last Quarter $20^{d}\ 15^{h}\ 58^{m}$ New Moon $28^{d}\ 02^{h}\ 57^{m}$

UT1		*R*				Dec			*E*		
d	h	h	m	s		°	′		h	m	s
1	**0**	12	38	10·5	N	4	31·8	58	11	56	02·9
Sat.	**6**		39	09·7		4	37·6	58		56	07·4
	12		40	08·8		4	43·4	57		56	11·8
	18		41	08·0		4	49·1	58		56	16·2
2	**0**	12	42	07·1	N	4	54·9	58	11	56	20·7
Sun.	**6**		43	06·2		5	00·7	57		56	25·1
	12		44	05·4		5	06·4	58		56	29·5
	18		45	04·5		5	12·2	57		56	33·9
3	**0**	12	46	03·7	N	5	17·9	58	11	56	38·3
Mon.	**6**		47	02·8		5	23·7	57		56	42·7
	12		48	01·9		5	29·4	57		56	47·1
	18		49	01·1		5	35·1	58		56	51·4
4	**0**	12	50	00·2	N	5	40·9	57	11	56	55·8
Tues.	**6**		50	59·4		5	46·6	57		57	00·1
	12		51	58·5		5	52·3	57		57	04·5
	18		52	57·6		5	58·0	57		57	08·8
5	**0**	12	53	56·8	N	6	03·7	57	11	57	13·2
Wed.	**6**		54	55·9		6	09·4	57		57	17·5
	12		55	55·1		6	15·1	57		57	21·8
	18		56	54·2		6	20·8	57		57	26·1
6	**0**	12	57	53·3	N	6	26·4	57	11	57	30·3
Thur.	**6**		58	52·5		6	32·1	57		57	34·6
	12	12	59	51·6		6	37·8	56		57	38·9
	18	13	00	50·7		6	43·4	56		57	43·1
7	**0**	13	01	49·9	N	6	49·0	57	11	57	47·4
Fri.	**6**		02	49·0		6	54·7	56		57	51·6
	12		03	48·2		7	00·3	56		57	55·8
	18		04	47·3		7	05·9	56		58	00·0
8	**0**	13	05	46·4	N	7	11·5	57	11	58	04·2
Sat.	**6**		06	45·6		7	17·2	56		58	08·3
	12		07	44·7		7	22·8	55		58	12·5
	18		08	43·8		7	28·3	56		58	16·6
	24	13	09	43·0	N	7	33·9		11	58	20·7

UT1		*R*				Dec			*E*		
d	h	h	m	s		°	′		h	m	s
9	**0**	13	09	43·0	N	7	33·9	56	11	58	20·7
Sun.	**6**		10	42·1		7	39·5	56		58	24·8
	12		11	41·3		7	45·1	55		58	28·9
	18		12	40·4		7	50·6	56		58	33·0
10	**0**	13	13	39·5	N	7	56·2	55	11	58	37·1
Mon.	**6**		14	38·7		8	01·7	55		58	41·1
	12		15	37·8		8	07·2	56		58	45·1
	18		16	36·9		8	12·8	55		58	49·1
11	**0**	13	17	36·1	N	8	18·3	55	11	58	53·1
Tues.	**6**		18	35·2		8	23·8	55		58	57·1
	12		19	34·3		8	29·3	55		59	01·1
	18		20	33·5		8	34·8	55		59	05·0
12	**0**	13	21	32·6	N	8	40·3	54	11	59	08·9
Wed.	**6**		22	31·8		8	45·7	55		59	12·8
	12		23	30·9		8	51·2	54		59	16·7
	18		24	30·0		8	56·6	55		59	20·6
13	**0**	13	25	29·2	N	9	02·1	54	11	59	24·4
Thur.	**6**		26	28·3		9	07·5	54		59	28·2
	12		27	27·4		9	12·9	55		59	32·0
	18		28	26·6		9	18·4	54		59	35·8
14	**0**	13	29	25·7	N	9	23·8	54	11	59	39·5
Fri.	**6**		30	24·9		9	29·2	53		59	43·3
	12		31	24·0		9	34·5	54		59	47·0
	18		32	23·1		9	39·9	54		59	50·7
15	**0**	13	33	22·3	N	9	45·3	53	11	59	54·3
Sat.	**6**		34	21·4		9	50·6	54	11	59	58·0
	12		35	20·6		9	56·0	53	12	00	01·6
	18		36	19·7		10	01·3	53		00	05·2
16	**0**	13	37	18·8	N	10	06·6	54	12	00	08·8
Sun.	**6**		38	18·0		10	12·0	53		00	12·3
	12		39	17·1		10	17·3	53		00	15·8
	18		40	16·2		10	22·6	52		00	19·3
	24	13	41	15·4	N	10	27·8		12	00	22·8

Sun's SD 16′·0

SUNRISE

Date	South Latitude									North Latitude							
	60°	55°	50°	45°	40°	30°	20°	10°	0°	10°	20°	30°	40°	45°	50°	55°	60°
Apr.	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
1	6·5	6·4	6·3	6·3	6·3	6·2	6·1	6·1	6·0	6·0	5·9	5·8	5·7	5·7	5·6	5·5	5·4
6	6·7	6·6	6·5	6·4	6·3	6·2	6·1	6·1	6·0	5·9	5·8	5·7	5·6	5·5	5·4	5·3	5·2
11	6·9	6·7	6·6	6·5	6·4	6·3	6·2	6·1	6·0	5·9	5·8	5·6	5·5	5·4	5·3	5·1	4·9
16	7·1	6·9	6·7	6·6	6·5	6·3	6·2	6·1	5·9	5·8	5·7	5·5	5·3	5·2	5·1	4·9	4·7
21	7·3	7·0	6·9	6·7	6·6	6·4	6·2	6·1	5·9	5·8	5·6	5·4	5·2	5·1	4·9	4·7	4·4
26	7·5	7·2	7·0	6·8	6·7	6·4	6·2	6·1	5·9	5·7	5·6	5·4	5·1	4·9	4·8	4·5	4·2
31	7·7	7·4	7·1	6·9	6·8	6·5	6·3	6·1	5·9	5·7	5·5	5·3	5·0	4·8	4·6	4·3	4·0

Moon's Phases: First Quarter $3^{d}\ 18^{h}\ 39^{m}$ Full Moon $11^{d}\ 06^{h}\ 08^{m}$

UT1		*R*			Dec			*E*		
d	h	h	m	s	°	′		h	m	s
17	**0**	13	41	15·4	N 10	27·8	53	12	00	22·8
Mon.	**6**		42	14·5		33·1	53		00	26·3
	12		43	13·7		38·4	52		00	29·7
	18		44	12·8		43·6	53		00	33·1
18	**0**	13	45	11·9	N 10	48·9	52	12	00	36·5
Tues.	**6**		46	11·1		54·1	52		00	39·8
	12		47	10·2		59·3	52		00	43·2
	18		48	09·4	11	04·5	52		00	46·5
19	**0**	13	49	08·5	N 11	09·7	52	12	00	49·7
Wed.	**6**		50	07·6		14·9	52		00	53·0
	12		51	06·8		20·1	51		00	56·2
	18		52	05·9		25·2	52		00	59·4
20	**0**	13	53	05·1	N 11	30·4	51	12	01	02·5
Thur.	**6**		54	04·2		35·5	51		01	05·7
	12		55	03·3		40·6	52		01	08·8
	18		56	02·5		45·8	51		01	11·9
21	**0**	13	57	01·6	N 11	50·9	50	12	01	14·9
Fri.	**6**		58	00·7		55·9	51		01	17·9
	12		58	59·9	12	01·0	51		01	20·9
	18	13	59	59·0		06·1	50		01	23·9
22	**0**	14	00	58·2	N 12	11·1	51	12	01	26·8
Sat.	**6**		01	57·3		16·2	50		01	29·8
	12		02	56·4		21·2	50		01	32·6
	18		03	55·6		26·2	50		01	35·5
23	**0**	14	04	54·7	N 12	31·2	50	12	01	38·3
Sun.	**6**		05	53·8		36·2	50		01	41·1
	12		06	53·0		41·2	49		01	43·9
	18		07	52·1		46·1	50		01	46·6
24	**0**	14	08	51·3	N 12	51·1	49	12	01	49·3
Mon.	**6**		09	50·4		56·0	50		01	52·0
	12		10	49·5	13	01·0	49		01	54·6
	18		11	48·7		05·9	49		01	57·2
	24	14	12	47·8	N 13	10·8		12	01	59·8

UT1		*R*			Dec			*E*		
d	h	h	m	s	°	′		h	m	s
25	**0**	14	12	47·8	N 13	10·8	49	12	01	59·8
Tues.	**6**		13	46·9		15·7	48		02	02·3
	12		14	46·1		20·5	49		02	04·9
	18		15	45·2		25·4	48		02	07·3
26	**0**	14	16	44·4	N 13	30·2	48	12	02	09·8
Wed.	**6**		17	43·5		35·0	49		02	12·2
	12		18	42·6		39·9	48		02	14·6
	18		19	41·8		44·7	47		02	17·0
27	**0**	14	20	40·9	N 13	49·4	48	12	02	19·3
Thur.	**6**		21	40·0		54·2	48		02	21·6
	12		22	39·2		59·0	47		02	23·9
	18		23	38·3	14	03·7	48		02	26·1
28	**0**	14	24	37·5	N 14	08·5	47	12	02	28·3
Fri.	**6**		25	36·6		13·2	47		02	30·5
	12		26	35·7		17·9	47		02	32·6
	18		27	34·9		22·6	46		02	34·8
29	**0**	14	28	34·0	N 14	27·2	47	12	02	36·8
Sat.	**6**		29	33·2		31·9	46		02	38·9
	12		30	32·3		36·5	46		02	40·9
	18		31	31·4		41·1	47		02	42·9
30	**0**	14	32	30·6	N 14	45·8	45	12	02	44·8
Sun.	**6**		33	29·7		50·3	46		02	46·8
	12		34	28·9		54·9	46		02	48·6
	18		35	28·0		59·5	45		02	50·5
31	**0**	14	36	27·1	N 15	04·0	46	12	02	52·3
Mon.	**6**		37	26·3		08·6	45		02	54·1
	12		38	25·4		13·1	45		02	55·9
	18		39	24·6		17·6	45		02	57·6
	24	14	40	23·7	N 15	22·1		12	02	59·3

Sun's SD 15′·9

SUNSET

Date	South Latitude									North Latitude								
	60°	55°	50°	45°	40°	30°	20°	10°	0°	10°	20°	30°	40°	45°	50°	55°	60°
Apr.	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
1	17·6	17·7	17·8	17·8	17·9	17·9	18·0	18·1	18·1	18·2	18·2	18·3	18·4	18·5	18·5	18·6	18·7
6	17·4	17·5	17·6	17·7	17·7	17·8	17·9	18·0	18·1	18·2	18·3	18·4	18·5	18·6	18·7	18·8	18·9
11	17·1	17·3	17·4	17·5	17·6	17·7	17·9	18·0	18·1	18·2	18·3	18·4	18·6	18·7	18·8	18·9	19·1
16	16·9	17·1	17·2	17·4	17·5	17·7	17·8	17·9	18·1	18·2	18·3	18·5	18·7	18·8	18·9	19·1	19·3
21	16·6	16·9	17·1	17·2	17·4	17·6	17·7	17·9	18·0	18·2	18·3	18·5	18·7	18·9	19·1	19·3	19·6
26	16·4	16·7	16·9	17·1	17·2	17·5	17·7	17·9	18·0	18·2	18·4	18·6	18·8	19·0	19·2	19·4	19·8
31	16·2	16·5	16·8	17·0	17·1	17·4	17·6	17·8	18·0	18·2	18·4	18·6	18·9	19·1	19·3	19·6	20·0

Moon's Phases: Last Quarter $19^{d}\ 09^{h}\ 57^{m}$ New Moon $26^{d}\ 12^{h}\ 16^{m}$

UT1		*R*			Dec			*E*			UT1		*R*			Dec			*E*		
d	h	h	m	s	°	′		h	m	s	d	h	h	m	s	°	′		h	m	s
1	**0**	14	36	27·1	N 15	04·0	46	12	02	52·3	18	**9**	**0**	15	07	59·6	N 17	20·9	40	12	03	33·1	7
Mon.	**6**		37	26·3	15	08·6	45		02	54·1	18	**Tues.**	**6**		08	58·7	17	24·9	39		03	33·8	7
	12		38	25·4	15	13·1	45		02	55·9	17		**12**		09	57·8	17	28·8	40		03	34·5	6
	18		39	24·6	15	17·6	45		02	57·6	17		**18**		10	57·0	17	32·8	39		03	35·1	6
2	**0**	14	40	23·7	N 15	22·1	44	12	02	59·3	17	**10**	**0**	15	11	56·1	N 17	36·7	39	12	03	35·7	6
Tues.	**6**		41	22·8	15	26·5	45		03	01·0	16	**Wed.**	**6**		12	55·3	17	40·6	39		03	36·3	5
	12		42	22·0	15	31·0	44		03	02·6	16		**12**		13	54·4	17	44·5	39		03	36·8	5
	18		43	21·1	15	35·4	45		03	04·2	15		**18**		14	53·5	17	48·4	39		03	37·3	5
3	**0**	14	44	20·3	N 15	39·9	44	12	03	05·7	16	**11**	**0**	15	15	52·7	N 17	52·3	38	12	03	37·8	4
Wed.	**6**		45	19·4	15	44·3	43		03	07·3	15	**Thur.**	**6**		16	51·8	17	56·1	38		03	38·2	4
	12		46	18·5	15	48·6	44		03	08·8	14		**12**		17	51·0	17	59·9	38		03	38·6	3
	18		47	17·7	15	53·0	44		03	10·2	15		**18**		18	50·1	18	03·7	38		03	38·9	4
4	**0**	14	48	16·8	N 15	57·4	43	12	03	11·7	14	**12**	**0**	15	19	49·2	N 18	07·5	38	12	03	39·3	2
Thur.	**6**		49	16·0	16	01·7	43		03	13·1	13	**Fri.**	**6**		20	48·4	18	11·3	37		03	39·5	3
	12		50	15·1	16	06·0	43		03	14·4	14		**12**		21	47·5	18	15·0	38		03	39·8	2
	18		51	14·2	16	10·3	43		03	15·8	13		**18**		22	46·6	18	18·8	37		03	40·0	2
5	**0**	14	52	13·4	N 16	14·6	43	12	03	17·1	12	**13**	**0**	15	23	45·8	N 18	22·5	37	12	03	40·2	1
Fri.	**6**		53	12·5	16	18·9	43		03	18·3	12	**Sat.**	**6**		24	44·9	18	26·2	36		03	40·3	1
	12		54	11·6	16	23·2	42		03	19·5	12		**12**		25	44·1	18	29·8	37		03	40·4	1
	18		55	10·8	16	27·4	42		03	20·7	12		**18**		26	43·2	18	33·5	36		03	40·5	0
6	**0**	14	56	09·9	N 16	31·6	42	12	03	21·9	11	**14**	**0**	15	27	42·3	N 18	37·1	36	12	03	40·5	0
Sat.	**6**		57	09·1	16	35·8	42		03	23·0	11	**Sun.**	**6**		28	41·5	18	40·7	36		03	40·5	1
	12		58	08·2	16	40·0	42		03	24·1	11		**12**		29	40·6	18	44·3	36		03	40·4	1
	18	14	59	07·3	16	44·2	41		03	25·2	10		**18**		30	39·8	18	47·9	35		03	40·3	1
7	**0**	15	00	06·5	N 16	48·3	41	12	03	26·2	10	**15**	**0**	15	31	38·9	N 18	51·4	36	12	03	40·2	1
Sun.	**6**		01	05·6	16	52·4	42		03	27·2	9	**Mon.**	**6**		32	38·0	18	55·0	35		03	40·1	2
	12		02	04·7	16	56·6	41		03	28·1	10		**12**		33	37·2	18	58·5	35		03	39·9	3
	18		03	03·9	17	00·7	40		03	29·1	8		**18**		34	36·3	19	02·0	34		03	39·6	2
8	**0**	15	04	03·0	N 17	04·7	41	12	03	29·9	9	**16**	**0**	15	35	35·5	N 19	05·4	35	12	03	39·4	3
Mon.	**6**		05	02·2	17	08·8	40		03	30·8	8	**Tues.**	**6**		36	34·6	19	08·9	34		03	39·1	4
	12		06	01·3	17	12·8	41		03	31·6	8		**12**		37	33·7	19	12·3	34		03	38·7	3
	18		07	00·4	17	16·9	40		03	32·4	7		**18**		38	32·9	19	15·7	34		03	38·4	4
	24	15	07	59·6	N 17	20·9		12	03	33·1			**24**	15	39	32·0	N 19	19·1		12	03	38·0	

Sun's SD 15′·8

SUNRISE

Date	South Latitude									North Latitude								
	60°	55°	50°	45°	40°	30°	20°	10°	0°	10°	20°	30°	40°	45°	50°	55°	60°
May	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
1	7·7	7·4	7·1	6·9	6·8	6·5	6·3	6·1	5·9	5·7	5·5	5·3	5·0	4·8	4·6	4·3	4·0
6	7·9	7·5	7·2	7·0	6·8	6·5	6·3	6·1	5·9	5·7	5·5	5·2	4·9	4·7	4·5	4·2	3·7
11	8·1	7·7	7·4	7·1	6·9	6·6	6·3	6·1	5·9	5·7	5·4	5·2	4·8	4·6	4·3	4·0	3·5
16	8·3	7·8	7·5	7·2	7·0	6·6	6·4	6·1	5·9	5·6	5·4	5·1	4·7	4·5	4·2	3·8	3·3
21	8·4	7·9	7·6	7·3	7·1	6·7	6·4	6·1	5·9	5·6	5·4	5·1	4·7	4·4	4·1	3·7	3·1
26	8·6	8·1	7·7	7·4	7·1	6·7	6·4	6·2	5·9	5·6	5·3	5·0	4·6	4·3	4·0	3·6	3·0
31	8·8	8·2	7·8	7·5	7·2	6·8	6·5	6·2	5·9	5·6	5·3	5·0	4·6	4·3	3·9	3·5	2·8

Moon's Phases: First Quarter $3^{d}\ 02^{h}\ 47^{m}$ Full Moon $10^{d}\ 21^{h}\ 42^{m}$

UT1		*R*			Dec			*E*			UT1		*R*			Dec			*E*		
d	h	h	m	s	°	′		h	m	s	d	h	h	m	s	°	′		h	m	s
17	**0**	15	39	32·0	N19	19·1	34	12	03	38·0	**25**	**0**	16	11	04·4	N20	56·5	26	12	03	06·4
Wed.	**6**		40	31·2		19	22·5	33		03	37·5	**Thur.**	**6**		12	03·6		20	59·1	27		03	04·9
	12		41	30·3		19	25·8	34		03	37·0		**12**		13	02·7		21	01·8	26		03	03·3
	18		42	29·4		19	29·2	33		03	36·5		**18**		14	01·9		21	04·4	27		03	01·7
18	**0**	15	43	28·6	N19	32·5	33	12	03	36·0	**26**	**0**	16	15	01·0	N21	07·1	25	12	03	00·1
Thur.	**6**		44	27·7		19	35·8	32		03	35·4	**Fri.**	**6**		16	00·1		21	09·6	26		02	58·5
	12		45	26·9		19	39·0	33		03	34·8		**12**		16	59·3		21	12·2	26		02	56·8
	18		46	26·0		19	42·3	32		03	34·1		**18**		17	58·4		21	14·8	25		02	55·1
19	**0**	15	47	25·1	N19	45·5	32	12	03	33·4	**27**	**0**	16	18	57·6	N21	17·3	25	12	02	53·3
Fri.	**6**		48	24·3		19	48·7	32		03	32·7	**Sat.**	**6**		19	56·7		21	19·8	25		02	51·5
	12		49	23·4		19	51·9	32		03	31·9		**12**		20	55·9		21	22·3	24		02	49·7
	18		50	22·5		19	55·1	31		03	31·1		**18**		21	55·0		21	24·7	24		02	47·9
20	**0**	15	51	21·7	N19	58·2	31	12	03	30·3	**28**	**0**	16	22	54·1	N21	27·1	24	12	02	46·0
Sat.	**6**		52	20·8		20	01·3	31		03	29·4	**Sun.**	**6**		23	53·3		21	29·5	24		02	44·1
	12		53	20·0		20	04·4	31		03	28·5		**12**		24	52·4		21	31·9	24		02	42·2
	18		54	19·1		20	07·5	31		03	27·6		**18**		25	51·6		21	34·3	23		02	40·3
21	**0**	15	55	18·2	N20	10·6	30	12	03	26·6	**29**	**0**	16	26	50·7	N21	36·6	23	12	02	38·3
Sun.	**6**		56	17·4		20	13·6	30		03	25·6	**Mon.**	**6**		27	49·8		21	38·9	23		02	36·3
	12		57	16·5		20	16·6	30		03	24·6		**12**		28	49·0		21	41·2	23		02	34·3
	18		58	15·6		20	19·6	30		03	23·5		**18**		29	48·1		21	43·5	22		02	32·3
22	**0**	15	59	14·8	N20	22·6	29	12	03	22·4	**30**	**0**	16	30	47·3	N21	45·7	23	12	02	30·2
Mon.	**6**	16	00	13·9		20	25·5	29		03	21·2	**Tues.**	**6**		31	46·4		21	48·0	21		02	28·1
	12		01	13·1		20	28·4	29		03	20·0		**12**		32	45·5		21	50·1	22		02	26·0
	18		02	12·2		20	31·3	29		03	18·8		**18**		33	44·7		21	52·3	22		02	23·8
23	**0**	16	03	11·3	N20	34·2	29	12	03	17·6	**31**	**0**	16	34	43·8	N21	54·5	21	12	02	21·6
Tues.	**6**		04	10·5		20	37·1	28		03	16·3	**Wed.**	**6**		35	43·0		21	56·6	21		02	19·4
	12		05	09·6		20	39·9	28		03	15·0		**12**		36	42·1		21	58·7	21		02	17·2
	18		06	08·8		20	42·7	28		03	13·7		**18**		37	41·2		22	00·8	20		02	15·0
24	**0**	16	07	07·9	N20	45·5	28	12	03	12·3	**32**	**0**	16	38	40·4	N22	02·8	20	12	02	12·7
Wed.	**6**		08	07·0		20	48·3	27		03	10·9	**Thur.**	**6**		39	39·5		22	04·8	20		02	10·4
	12		09	06·2		20	51·0	28		03	09·4		**12**		40	38·6		22	06·8	20		02	08·1
	18		10	05·3		20	53·8	27		03	08·0		**18**		41	37·8		22	08·8	20		02	05·7
	24	16	11	04·4	N20	56·5		12	03	06·4		**24**	16	42	36·9	N22	10·8		12	02	03·4

Sun's SD 15′·8

SUNSET

Date	South Latitude									North Latitude								
	60°	55°	50°	45°	40°	30°	20°	10°	0°	10°	20°	30°	40°	45°	50°	55°	60°
May	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
1	16·2	16·5	16·8	17·0	17·1	17·4	17·6	17·8	18·0	18·2	18·4	18·6	18·9	19·1	19·3	19·6	20·0
6	16·0	16·4	16·6	16·9	17·0	17·3	17·6	17·8	18·0	18·2	18·4	18·7	19·0	19·2	19·4	19·8	20·2
11	15·8	16·2	16·5	16·8	17·0	17·3	17·5	17·8	18·0	18·2	18·5	18·7	19·1	19·3	19·6	19·9	20·4
16	15·6	16·1	16·4	16·7	16·9	17·2	17·5	17·8	18·0	18·2	18·5	18·8	19·2	19·4	19·7	20·1	20·6
21	15·4	15·9	16·3	16·6	16·8	17·2	17·5	17·8	18·0	18·3	18·5	18·8	19·2	19·5	19·8	20·2	20·8
26	15·3	15·8	16·2	16·5	16·8	17·2	17·5	17·7	18·0	18·3	18·6	18·9	19·3	19·6	19·9	20·3	20·9
31	15·2	15·7	16·1	16·5	16·7	17·1	17·5	17·8	18·0	18·3	18·6	18·9	19·4	19·6	20·0	20·4	21·1

Moon's Phases: Last Quarter $19^{d}\ 00^{h}\ 33^{m}$ New Moon $25^{d}\ 19^{h}\ 44^{m}$ First Quarter $32^{d}\ 12^{h}\ 42^{m}$

SUN – JUNE, 2017

UT1		*R*			Dec			*E*			UT1		*R*			Dec			*E*		
d	h	h	m	s	°	′		h	m	s	d	h	h	m	s	°	′		h	m	s
1	**0**	16	38	40·4	N 22	02·8	20	12	02	12·7	23	**9**	**0**	17	10	12·8	N 22	55·5	13	12	00	48·9	29
Thur.	**6**		39	39·5	22	04·8	20		02	10·4	23	**Fri.**	**6**		11	11·9	22	56·8	12		00	46·0	29
	12		40	38·6	22	06·8	20		02	08·1	24		**12**		12	11·1	22	58·0	11		00	43·1	30
	18		41	37·8	22	08·8	20		02	05·7	23		**18**		13	10·2	22	59·1	12		00	40·1	29
2	**0**	16	42	36·9	N 22	10·8	19	12	02	03·4	24	**10**	**0**	17	14	09·4	N 23	00·3	11	12	00	37·2	30
Fri.	**6**		43	36·1	22	12·7	19		02	01·0	24	**Sat.**	**6**		15	08·5	23	01·4	12		00	34·2	30
	12		44	35·2	22	14·6	19		01	58·6	25		**12**		16	07·6	23	02·6	10		00	31·2	30
	18		45	34·3	22	16·5	19		01	56·1	24		**18**		17	06·8	23	03·6	11		00	28·2	30
3	**0**	16	46	33·5	N 22	18·4	18	12	01	53·7	25	**11**	**0**	17	18	05·9	N 23	04·7	10	12	00	25·2	30
Sat.	**6**		47	32·6	22	20·2	18		01	51·2	25	**Sun.**	**6**		19	05·1	23	05·7	10		00	22·2	31
	12		48	31·8	22	22·0	18		01	48·7	25		**12**		20	04·2	23	06·7	10		00	19·1	30
	18		49	30·9	22	23·8	17		01	46·2	25		**18**		21	03·3	23	07·7	10		00	16·1	31
4	**0**	16	50	30·0	N 22	25·5	18	12	01	43·7	26	**12**	**0**	17	22	02·5	N 23	08·7	9	12	00	13·0	31
Sun.	**6**		51	29·2	22	27·3	17		01	41·1	26	**Mon.**	**6**		23	01·6	23	09·6	9		00	09·9	30
	12		52	28·3	22	29·0	17		01	38·5	26		**12**		24	00·8	23	10·5	9		00	06·9	31
	18		53	27·4	22	30·7	16		01	35·9	26		**18**		24	59·9	23	11·4	9		00	03·8	32
5	**0**	16	54	26·6	N 22	32·3	17	12	01	33·3	26	**13**	**0**	17	25	59·0	N 23	12·3	8	12	00	00·6	31
Mon.	**6**		55	25·7	22	34·0	16		01	30·7	27	**Tues.**	**6**		26	58·2	23	13·1	8	11	59	57·5	31
	12		56	24·9	22	35·6	16		01	28·0	27		**12**		27	57·3	23	13·9	8		59	54·4	31
	18		57	24·0	22	37·2	15		01	25·3	27		**18**		28	56·5	23	14·7	7		59	51·3	32
6	**0**	16	58	23·1	N 22	38·7	16	12	01	22·6	27	**14**	**0**	17	29	55·6	N 23	15·4	7	11	59	48·1	32
Tues.	**6**	16	59	22·3	22	40·3	15		01	19·9	27	**Wed.**	**6**		30	54·7	23	16·1	7		59	44·9	31
	12	17	00	21·4	22	41·8	15		01	17·2	28		**12**		31	53·9	23	16·8	7		59	41·8	32
	18		01	20·5	22	43·3	14		01	14·4	27		**18**		32	53·0	23	17·5	7		59	38·6	32
7	**0**	17	02	19·7	N 22	44·7	15	12	01	11·7	28	**15**	**0**	17	33	52·2	N 23	18·2	6	11	59	35·4	32
Wed.	**6**		03	18·8	22	46·2	14		01	08·9	28	**Thur.**	**6**		34	51·3	23	18·8	6		59	32·2	32
	12		04	18·0	22	47·6	14		01	06·1	28		**12**		35	50·4	23	19·4	6		59	29·0	32
	18		05	17·1	22	49·0	13		01	03·3	29		**18**		36	49·6	23	20·0	5		59	25·8	32
8	**0**	17	06	16·2	N 22	50·3	14	12	01	00·4	28	**16**	**0**	17	37	48·7	N 23	20·5	5	11	59	22·6	32
Thur.	**6**		07	15·4	22	51·7	13		00	57·6	29	**Fri.**	**6**		38	47·9	23	21·0	5		59	19·4	33
	12		08	14·5	22	53·0	13		00	54·7	29		**12**		39	47·0	23	21·5	5		59	16·1	32
	18		09	13·7	22	54·3	12		00	51·8	29		**18**		40	46·1	23	22·0	5		59	12·9	32
	24	17	10	12·8	N 22	55·5		12	00	48·9			**24**	17	41	45·3	N 23	22·5		11	59	09·7	

Sun's SD 15′·8

SUNRISE

Date	South Latitude									North Latitude							
	60°	55°	50°	45°	40°	30°	20°	10°	0°	10°	20°	30°	40°	45°	50°	55°	60°
June	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
1	8·8	8·2	7·8	7·5	7·2	6·8	6·5	6·2	5·9	5·6	5·3	5·0	4·6	4·3	3·9	3·5	2·8
6	8·9	8·3	7·9	7·5	7·3	6·8	6·5	6·2	5·9	5·6	5·3	5·0	4·5	4·2	3·9	3·4	2·7
11	9·0	8·4	7·9	7·6	7·3	6·9	6·5	6·2	5·9	5·6	5·3	5·0	4·5	4·2	3·8	3·4	2·6
16	9·1	8·4	8·0	7·6	7·3	6·9	6·5	6·2	6·0	5·7	5·3	5·0	4·5	4·2	3·8	3·3	2·6
21	9·1	8·4	8·0	7·6	7·4	6·9	6·6	6·3	6·0	5·7	5·4	5·0	4·5	4·2	3·8	3·3	2·6
26	9·1	8·5	8·0	7·7	7·4	6·9	6·6	6·3	6·0	5·7	5·4	5·0	4·5	4·2	3·9	3·4	2·6
31	9·1	8·4	8·0	7·7	7·4	6·9	6·6	6·3	6·0	5·7	5·4	5·0	4·6	4·3	3·9	3·4	2·7

Moon's Phases: First Quarter $1^{d}\ 12^{h}\ 42^{m}$ Full Moon $9^{d}\ 13^{h}\ 10^{m}$

UT1		*R*			Dec			*E*		
d	h	h	m	s	°	′		h	m	s
17	**0**	17	41	45·3	N23	22·5	4	11	59	09·7
Sat.	**6**		42	44·4	23	22·9	4		59	06·4
	12		43	43·5	23	23·3	3		59	03·2
	18		44	42·7	23	23·6	4		58	59·9
18	**0**	17	45	41·8	N23	24·0	3	11	58	56·6
Sun.	**6**		46	41·0	23	24·3	3		58	53·4
	12		47	40·1	23	24·6	2		58	50·1
	18		48	39·2	23	24·8	3		58	46·8
19	**0**	17	49	38·4	N23	25·1	2	11	58	43·6
Mon.	**6**		50	37·5	23	25·3	2		58	40·3
	12		51	36·6	23	25·5	1		58	37·0
	18		52	35·8	23	25·6	2		58	33·7
20	**0**	17	53	34·9	N23	25·8	1	11	58	30·4
Tues.	**6**		54	34·1	23	25·9	1		58	27·1
	12		55	33·2	23	26·0	0		58	23·9
	18		56	32·3	23	26·0	1		58	20·6
21	**0**	17	57	31·5	N23	26·1	0	11	58	17·3
Wed.	**6**		58	30·6	23	26·1	1		58	14·0
	12	17	59	29·8	23	26·0	0		58	10·7
	18	18	00	28·9	23	26·0	1		58	07·4
22	**0**	18	01	28·0	N23	25·9	1	11	58	04·2
Thur.	**6**		02	27·2	23	25·8	1		58	00·9
	12		03	26·3	23	25·7	1		57	57·6
	18		04	25·5	23	25·6	2		57	54·3
23	**0**	18	05	24·6	N23	25·4	2	11	57	51·1
Fri.	**6**		06	23·7	23	25·2	2		57	47·8
	12		07	22·9	23	25·0	3		57	44·5
	18		08	22·0	23	24·7	3		57	41·3
24	**0**	18	09	21·2	N23	24·4	3	11	57	38·0
Sat.	**6**		10	20·3	23	24·1	3		57	34·8
	12		11	19·4	23	23·8	4		57	31·6
	18		12	18·6	23	23·4	3		57	28·3
	24	18	13	17·7	N23	23·1	3	11	57	25·1

UT1		*R*			Dec			*E*		
d	h	h	m	s	°	′		h	m	s
25	**0**	18	13	17·7	N23	23·1	4	11	57	25·1
Sun.	**6**		14	16·9	23	22·7	5		57	21·9
	12		15	16·0	23	22·2	4		57	18·7
	18		16	15·2	23	21·8	5		57	15·5
26	**0**	18	17	14·3	N23	21·3	5	11	57	12·3
Mon.	**6**		18	13·4	23	20·8	6		57	09·1
	12		19	12·6	23	20·2	5		57	06·0
	18		20	11·7	23	19·7	6		57	02·8
27	**0**	18	21	10·9	N23	19·1	6	11	56	59·7
Tues.	**6**		22	10·0	23	18·5	7		56	56·5
	12		23	09·1	23	17·8	6		56	53·4
	18		24	08·3	23	17·2	7		56	50·3
28	**0**	18	25	07·4	N23	16·5	7	11	56	47·2
Wed.	**6**		26	06·5	23	15·8	8		56	44·1
	12		27	05·7	23	15·0	7		56	41·1
	18		28	04·8	23	14·3	8		56	38·0
29	**0**	18	29	04·0	N23	13·5	8	11	56	35·0
Thur.	**6**		30	03·1	23	12·7	9		56	31·9
	12		31	02·2	23	11·8	8		56	28·9
	18		32	01·4	23	11·0	9		56	25·9
30	**0**	18	33	00·5	N23	10·1	10	11	56	23·0
Fri.	**6**		33	59·7	23	09·1	9		56	20·0
	12		34	58·8	23	08·2	10		56	17·0
	18		35	57·9	23	07·2	10		56	14·1
31	**0**	18	36	57·1	N23	06·2	10	11	56	11·2
Sat.	**6**		37	56·2	23	05·2	10		56	08·3
	12		38	55·3	23	04·2	11		56	05·4
	18		39	54·5	23	03·1	11		56	02·6
	24	18	40	53·6	N23	02·0		11	55	59·7

Sun's SD 15′·7

SUNSET

Date	South Latitude									North Latitude							
	60°	55°	50°	45°	40°	30°	20°	10°	0°	10°	20°	30°	40°	45°	50°	55°	60°
June	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
1	15·1	15·7	16·1	16·5	16·7	17·1	17·5	17·8	18·0	18·3	18·6	18·9	19·4	19·7	20·0	20·5	21·1
6	15·1	15·7	16·1	16·4	16·7	17·1	17·5	17·8	18·0	18·3	18·6	19·0	19·4	19·7	20·1	20·6	21·3
11	15·0	15·6	16·1	16·4	16·7	17·1	17·5	17·8	18·1	18·3	18·7	19·0	19·5	19·8	20·1	20·6	21·4
16	15·0	15·6	16·1	16·4	16·7	17·1	17·5	17·8	18·1	18·4	18·7	19·0	19·5	19·8	20·2	20·7	21·4
21	15·0	15·6	16·1	16·4	16·7	17·1	17·5	17·8	18·1	18·4	18·7	19·1	19·5	19·8	20·2	20·7	21·5
26	15·0	15·6	16·1	16·4	16·7	17·2	17·5	17·8	18·1	18·4	18·7	19·1	19·5	19·8	20·2	20·7	21·5
31	15·1	15·7	16·1	16·5	16·8	17·2	17·5	17·8	18·1	18·4	18·7	19·1	19·5	19·8	20·2	20·7	21·4

Moon's Phases: Last Quarter $17^{d}\ 11^{h}\ 33^{m}$ New Moon $24^{d}\ 02^{h}\ 31^{m}$ First Quarter $31^{d}\ 00^{h}\ 51^{m}$

UT1		*R*			Dec			*E*		
d	h	h	m	s	°	′		h	m	s
1	**0**	18	36	57·1	N 23	06·2	10	11	56	11·2
Sat.	**6**		37	56·2	23	05·2	10		56	08·3
	12		38	55·3	23	04·2	11		56	05·4
	18		39	54·5	23	03·1	11		56	02·6
2	**0**	18	40	53·6	N 23	02·0	11	11	55	59·7
Sun.	**6**		41	52·8	23	00·9	11		55	56·9
	12		42	51·9	22	59·8	12		55	54·1
	18		43	51·0	22	58·6	12		55	51·3
3	**0**	18	44	50·2	N 22	57·4	12	11	55	48·5
Mon.	**6**		45	49·3	22	56·2	13		55	45·8
	12		46	48·4	22	54·9	12		55	43·1
	18		47	47·6	22	53·7	13		55	40·3
4	**0**	18	48	46·7	N 22	52·4	14	11	55	37·7
Tues.	**6**		49	45·9	22	51·0	13		55	35·0
	12		50	45·0	22	49·7	14		55	32·3
	18		51	44·1	22	48·3	14		55	29·7
5	**0**	18	52	43·3	N 22	46·9	14	11	55	27·1
Wed.	**6**		53	42·4	22	45·5	14		55	24·5
	12		54	41·6	22	44·1	15		55	22·0
	18		55	40·7	22	42·6	15		55	19·5
6	**0**	18	56	39·8	N 22	41·1	15	11	55	16·9
Thur.	**6**		57	39·0	22	39·6	15		55	14·5
	12		58	38·1	22	38·1	16		55	12·0
	18	18	59	37·3	22	36·5	16		55	09·6
7	**0**	19	00	36·4	N 22	34·9	16	11	55	07·1
Fri.	**6**		01	35·5	22	33·3	17		55	04·7
	12		02	34·7	22	31·6	16		55	02·4
	18		03	33·8	22	30·0	17		55	00·0
8	**0**	19	04	33·0	N 22	28·3	17	11	54	57·7
Sat.	**6**		05	32·1	22	26·6	18		54	55·4
	12		06	31·2	22	24·8	17		54	53·1
	18		07	30·4	22	23·1	18		54	50·9
	24	19	08	29·5	N 22	21·3		11	54	48·7

UT1		*R*			Dec			*E*		
d	h	h	m	s	°	′		h	m	s
9	**0**	19	08	29·5	N 22	21·3	18	11	54	48·7
Sun.	**6**		09	28·7	22	19·5	18		54	46·5
	12		10	27·8	22	17·7	19		54	44·3
	18		11	26·9	22	15·8	19		54	42·2
10	**0**	19	12	26·1	N 22	13·9	19	11	54	40·1
Mon.	**6**		13	25·2	22	12·0	19		54	38·0
	12		14	24·4	22	10·1	20		54	35·9
	18		15	23·5	22	08·1	19		54	33·9
11	**0**	19	16	22·6	N 22	06·2	20	11	54	31·9
Tues.	**6**		17	21·8	22	04·2	21		54	29·9
	12		18	20·9	22	02·1	20		54	28·0
	18		19	20·1	22	00·1	21		54	26·0
12	**0**	19	20	19·2	N 21	58·0	21	11	54	24·1
Wed.	**6**		21	18·3	21	55·9	21		54	22·3
	12		22	17·5	21	53·8	21		54	20·4
	18		23	16·6	21	51·7	22		54	18·6
13	**0**	19	24	15·8	N 21	49·5	22	11	54	16·8
Thur.	**6**		25	14·9	21	47·3	22		54	15·1
	12		26	14·0	21	45·1	22		54	13·4
	18		27	13·2	21	42·9	23		54	11·7
14	**0**	19	28	12·3	N 21	40·6	23	11	54	10·0
Fri.	**6**		29	11·4	21	38·3	23		54	08·4
	12		30	10·6	21	36·0	23		54	06·8
	18		31	09·7	21	33·7	24		54	05·2
15	**0**	19	32	08·9	N 21	31·3	23	11	54	03·6
Sat.	**6**		33	08·0	21	29·0	24		54	02·1
	12		34	07·1	21	26·6	24		54	00·6
	18		35	06·3	21	24·2	25		53	59·2
16	**0**	19	36	05·4	N 21	21·7	25	11	53	57·8
Sun.	**6**		37	04·5	21	19·2	24		53	56·4
	12		38	03·7	21	16·8	26		53	55·0
	18		39	02·8	21	14·2	25		53	53·7
	24	19	40	02·0	N 21	11·7		11	53	52·4

Sun's SD 15′·7

SUNRISE

Date	South Latitude									North Latitude							
	60°	55°	50°	45°	40°	30°	20°	10°	0°	10°	20°	30°	40°	45°	50°	55°	60°
July	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
1	9·1	8·4	8·0	7·7	7·4	6·9	6·6	6·3	6·0	5·7	5·4	5·0	4·6	4·3	3·9	3·4	2·7
6	9·0	8·4	8·0	7·6	7·4	6·9	6·6	6·3	6·0	5·7	5·4	5·1	4·6	4·3	4·0	3·5	2·8
11	8·9	8·3	7·9	7·6	7·3	6·9	6·6	6·3	6·0	5·8	5·5	5·1	4·7	4·4	4·1	3·6	2·9
16	8·8	8·2	7·8	7·5	7·3	6·9	6·6	6·3	6·0	5·8	5·5	5·2	4·7	4·5	4·1	3·7	3·1
21	8·6	8·1	7·8	7·5	7·2	6·9	6·6	6·3	6·0	5·8	5·5	5·2	4·8	4·6	4·2	3·8	3·3
26	8·5	8·0	7·7	7·4	7·2	6·8	6·5	6·3	6·0	5·8	5·6	5·3	4·9	4·6	4·4	4·0	3·5
31	8·3	7·9	7·5	7·3	7·1	6·8	6·5	6·3	6·0	5·8	5·6	5·3	5·0	4·7	4·5	4·1	3·6

Moon's Phases: First Quarter $1^{d}\ 00^{h}\ 51^{m}$ Full Moon $9^{d}\ 04^{h}\ 07^{m}$ Last Quarter $16^{d}\ 19^{h}\ 26^{m}$

UT1		*R*			Dec			*E*			UT1		*R*			Dec			*E*		
d	h	h	m	s	°	′		h	m	s	d	h	h	m	s	°	′		h	m	s
17	**0**	19	40	02·0	N21	11·7	25	11	53	52·4	13	**25**	**0**	20	11	34·4	N19	39·2	33	11	53	28·5	1
Mon.	**6**		41	01·1		21	09·2	26		53	51·1	12	**Tues.**	**6**		12	33·6		19	35·9	32		53	28·4	1
	12		42	00·2		21	06·6	26		53	49·9	12		**12**		13	32·7		19	32·7	33		53	28·3	1
	18		42	59·4		21	04·0	26		53	48·7	12		**18**		14	31·8		19	29·4	33		53	28·2	1
18	**0**	19	43	58·5	N21	01·4	27	11	53	47·5	11	**26**	**0**	20	15	31·0	N19	26·1	33	11	53	28·1	0
Tues.	**6**		44	57·6		20	58·7	26		53	46·4	11	**Wed.**	**6**		16	30·1		19	22·8	34		53	28·1	1
	12		45	56·8		20	56·1	27		53	45·3	11		**12**		17	29·3		19	19·4	33		53	28·2	0
	18		46	55·9		20	53·4	27		53	44·2	10		**18**		18	28·4		19	16·1	34		53	28·2	1
19	**0**	19	47	55·1	N20	50·7	28	11	53	43·2	11	**27**	**0**	20	19	27·5	N19	12·7	34	11	53	28·3	2
Wed.	**6**		48	54·2		20	47·9	27		53	42·1	9	**Thur.**	**6**		20	26·7		19	09·3	34		53	28·5	2
	12		49	53·3		20	45·2	28		53	41·2	10		**12**		21	25·8		19	05·9	35		53	28·7	2
	18		50	52·5		20	42·4	28		53	40·2	9		**18**		22	24·9		19	02·4	34		53	28·9	3
20	**0**	19	51	51·6	N20	39·6	28	11	53	39·3	9	**28**	**0**	20	23	24·1	N18	59·0	35	11	53	29·2	3
Thur.	**6**		52	50·8		20	36·8	29		53	38·4	8	**Fri.**	**6**		24	23·2		18	55·5	35		53	29·5	3
	12		53	49·9		20	33·9	28		53	37·6	8		**12**		25	22·4		18	52·0	35		53	29·8	4
	18		54	49·0		20	31·1	29		53	36·8	8		**18**		26	21·5		18	48·5	36		53	30·2	4
21	**0**	19	55	48·2	N20	28·2	29	11	53	36·0	7	**29**	**0**	20	27	20·6	N18	44·9	35	11	53	30·6	5
Fri.	**6**		56	47·3		20	25·3	29		53	35·3	7	**Sat.**	**6**		28	19·8		18	41·4	36		53	31·1	5
	12		57	46·5		20	22·4	30		53	34·6	7		**12**		29	18·9		18	37·8	36		53	31·6	5
	18		58	45·6		20	19·4	30		53	33·9	6		**18**		30	18·0		18	34·2	36		53	32·1	6
22	**0**	19	59	44·8	N20	16·4	30	11	53	33·3	6	**30**	**0**	20	31	17·2	N18	30·6	37	11	53	32·7	6
Sat.	**6**	20	00	43·9		20	13·4	30		53	32·7	6	**Sun.**	**6**		32	16·3		18	26·9	36		53	33·3	7
	12		01	43·0		20	10·4	30		53	32·1	5		**12**		33	15·5		18	23·3	37		53	34·0	7
	18		02	42·2		20	07·4	31		53	31·6	5		**18**		34	14·6		18	19·6	37		53	34·7	7
23	**0**	20	03	41·3	N20	04·3	30	11	53	31·1	4	**31**	**0**	20	35	13·7	N18	15·9	37	11	53	35·4	8
Sun.	**6**		04	40·5		20	01·3	31		53	30·7	4	**Mon.**	**6**		36	12·9		18	12·2	37		53	36·2	8
	12		05	39·6		19	58·2	31		53	30·3	4		**12**		37	12·0		18	08·5	37		53	37·0	8
	18		06	38·7		19	55·1	32		53	29·9	4		**18**		38	11·2		18	04·8	37		53	37·8	9
24	**0**	20	07	37·9	N19	51·9	31	11	53	29·5	3	**32**	**0**	20	39	10·3	N18	01·0	38	11	53	38·7	9
Mon.	**6**		08	37·0		19	48·8	32		53	29·2	2	**Tues.**	**6**		40	09·4		17	57·2	38		53	39·6	10
	12		09	36·2		19	45·6	32		53	29·0	3		**12**		41	08·6		17	53·4	38		53	40·6	10
	18		10	35·3		19	42·4	32		53	28·7	2		**18**		42	07·7		17	49·6	38		53	41·6	11
	24	20	11	34·4	N19	39·2		11	53	28·5				**24**	20	43	06·8	N17	45·8		11	53	42·7	

Sun's SD 15′·7

SUNSET

Date	South Latitude									North Latitude								
	60°	55°	50°	45°	40°	30°	20°	10°	0°	10°	20°	30°	40°	45°	50°	55°	60°
July	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
1	15·1	15·7	16·1	16·5	16·8	17·2	17·5	17·8	18·1	18·4	18·7	19·1	19·5	19·8	20·2	20·7	21·4
6	15·2	15·8	16·2	16·5	16·8	17·2	17·6	17·9	18·1	18·4	18·7	19·1	19·5	19·8	20·2	20·6	21·3
11	15·3	15·9	16·3	16·6	16·9	17·3	17·6	17·9	18·2	18·4	18·7	19·1	19·5	19·8	20·1	20·6	21·2
16	15·4	16·0	16·4	16·7	16·9	17·3	17·6	17·9	18·2	18·4	18·7	19·0	19·5	19·7	20·0	20·5	21·1
21	15·6	16·1	16·5	16·7	17·0	17·4	17·7	17·9	18·2	18·4	18·7	19·0	19·4	19·6	20·0	20·4	20·9
26	15·8	16·2	16·6	16·8	17·1	17·4	17·7	17·9	18·2	18·4	18·7	19·0	19·3	19·6	19·8	20·2	20·7
31	15·9	16·4	16·7	16·9	17·1	17·5	17·7	17·9	18·2	18·4	18·6	18·9	19·2	19·5	19·7	20·1	20·5

Moon's Phases: New Moon $23^{d}\ 09^{h}\ 46^{m}$ First Quarter $30^{d}\ 15^{h}\ 23^{m}$

UT1		*R*			Dec			*E*			UT1		*R*			Dec			*E*		
d	h	h	m	s	°	′		h	m	s	d	h	h	m	s	°	′		h	m	s
1	**0**	20	39	10·3	N 18	01·0	38	11	53	38·7	**9**	**0**	21	10	42·7	N 15	51·3	43	11	54	27·5
Tues.	**6**		40	09·4	17	57·2	38		53	39·6	**Wed.**	**6**		11	41·9	15	47·0	44		54	29·6
	12		41	08·6	17	53·4	38		53	40·6		**12**		12	41·0	15	42·6	43		54	31·8
	18		42	07·7	17	49·6	38		53	41·6		**18**		13	40·2	15	38·3	44		54	34·0
2	**0**	20	43	06·8	N 17	45·8	39	11	53	42·7	**10**	**0**	21	14	39·3	N 15	33·9	44	11	54	36·2
Wed.	**6**		44	06·0	17	41·9	39		53	43·7	**Thur.**	**6**		15	38·4	15	29·5	44		54	38·5
	12		45	05·1	17	38·0	39		53	44·9		**12**		16	37·6	15	25·1	44		54	40·8
	18		46	04·3	17	34·1	39		53	46·0		**18**		17	36·7	15	20·7	44		54	43·2
3	**0**	20	47	03·4	N 17	30·2	39	11	53	47·2	**11**	**0**	21	18	35·8	N 15	16·3	45	11	54	45·6
Thur.	**6**		48	02·5	17	26·3	39		53	48·5	**Fri.**	**6**		19	35·0	15	11·8	45		54	48·0
	12		49	01·7	17	22·4	40		53	49·8		**12**		20	34·1	15	07·3	44		54	50·5
	18		50	00·8	17	18·4	40		53	51·1		**18**		21	33·3	15	02·9	45		54	52·9
4	**0**	20	51	00·0	N 17	14·4	40	11	53	52·4	**12**	**0**	21	22	32·4	N 14	58·4	46	11	54	55·5
Fri.	**6**		51	59·1	17	10·4	40		53	53·8	**Sat.**	**6**		23	31·5	14	53·8	45		54	58·0
	12		52	58·2	17	06·4	40		53	55·3		**12**		24	30·7	14	49·3	45		55	00·6
	18		53	57·4	17	02·4	41		53	56·7		**18**		25	29·8	14	44·8	46		55	03·2
5	**0**	20	54	56·5	N 16	58·3	40	11	53	58·2	**13**	**0**	21	26	28·9	N 14	40·2	46	11	55	05·9
Sat.	**6**		55	55·7	16	54·3	41		53	59·8	**Sun.**	**6**		27	28·1	14	35·6	45		55	08·6
	12		56	54·8	16	50·2	41		54	01·4		**12**		28	27·2	14	31·1	46		55	11·3
	18		57	53·9	16	46·1	41		54	03·0		**18**		29	26·4	14	26·5	47		55	14·1
6	**0**	20	58	53·1	N 16	42·0	41	11	54	04·6	**14**	**0**	21	30	25·5	N 14	21·8	46	11	55	16·9
Sun.	**6**	20	59	52·2	16	37·9	42		54	06·3	**Mon.**	**6**		31	24·6	14	17·2	46		55	19·7
	12	21	00	51·4	16	33·7	42		54	08·1		**12**		32	23·8	14	12·6	47		55	22·5
	18		01	50·5	16	29·5	42		54	09·9		**18**		33	22·9	14	07·9	47		55	25·4
7	**0**	21	02	49·6	N 16	25·4	42	11	54	11·7	**15**	**0**	21	34	22·0	N 14	03·2	46	11	55	28·4
Mon.	**6**		03	48·8	16	21·2	43		54	13·5	**Tues.**	**6**		35	21·2	13	58·6	47		55	31·3
	12		04	47·9	16	16·9	42		54	15·4		**12**		36	20·3	13	53·9	48		55	34·3
	18		05	47·1	16	12·7	42		54	17·3		**18**		37	19·5	13	49·1	47		55	37·3
8	**0**	21	06	46·2	N 16	08·5	43	11	54	19·3	**16**	**0**	21	38	18·6	N 13	44·4	47	11	55	40·4
Tues.	**6**		07	45·3	16	04·2	43		54	21·3	**Wed.**	**6**		39	17·7	13	39·7	48		55	43·4
	12		08	44·5	15	59·9	43		54	23·3		**12**		40	16·9	13	34·9	47		55	46·5
	18		09	43·6	15	55·6	43		54	25·4		**18**		41	16·0	13	30·2	48		55	49·7
	24	21	10	42·7	N 15	51·3		11	54	27·5		**24**	21	42	15·2	N 13	25·4		11	55	52·9

Sun's SD 15′·8

SUNRISE

Date	South Latitude									North Latitude							
	60°	55°	50°	45°	40°	30°	20°	10°	0°	10°	20°	30°	40°	45°	50°	55°	60°
Aug.	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
1	8·2	7·8	7·5	7·3	7·1	6·8	6·5	6·3	6·0	5·8	5·6	5·3	5·0	4·8	4·5	4·1	3·7
6	8·0	7·7	7·4	7·2	7·0	6·7	6·5	6·2	6·0	5·8	5·6	5·4	5·1	4·9	4·6	4·3	3·9
11	7·8	7·5	7·3	7·1	6·9	6·6	6·4	6·2	6·0	5·8	5·6	5·4	5·1	5·0	4·7	4·5	4·1
16	7·6	7·3	7·1	6·9	6·8	6·5	6·3	6·2	6·0	5·8	5·7	5·5	5·2	5·0	4·9	4·6	4·3
21	7·4	7·1	6·9	6·8	6·7	6·5	6·3	6·1	6·0	5·9	5·7	5·5	5·3	5·1	5·0	4·8	4·5
26	7·1	6·9	6·8	6·6	6·5	6·4	6·2	6·1	6·0	5·9	5·7	5·6	5·4	5·2	5·1	4·9	4·7
31	6·9	6·7	6·6	6·5	6·4	6·3	6·2	6·0	5·9	5·8	5·7	5·6	5·4	5·3	5·2	5·1	4·9

Moon's Phases: Full Moon $7^{d}\ 18^{h}\ 11^{m}$ Last Quarter $15^{d}\ 01^{h}\ 15^{m}$

UT1		*R*			Dec			*E*		
d	h	h	m	s	°	′		h	m	s
17	**0**	21	42	15·2	N 13	25·4	48	11	55	52·9
Thur.	**6**		43	14·3	13	20·6	48		55	56·1
	12		44	13·4	13	15·8	49		55	59·3
	18		45	12·6	13	10·9	48		56	02·6
18	**0**	21	46	11·7	N 13	06·1	48	11	56	05·8
Fri.	**6**		47	10·9	13	01·3	49		56	09·2
	12		48	10·0	12	56·4	49		56	12·5
	18		49	09·1	12	51·5	49		56	15·9
19	**0**	21	50	08·3	N 12	46·6	49	11	56	19·3
Sat.	**6**		51	07·4	12	41·7	49		56	22·8
	12		52	06·6	12	36·8	49		56	26·2
	18		53	05·7	12	31·9	49		56	29·7
20	**0**	21	54	04·8	N 12	27·0	50	11	56	33·3
Sun.	**6**		55	04·0	12	22·0	49		56	36·8
	12		56	03·1	12	17·1	50		56	40·4
	18		57	02·3	12	12·1	50		56	44·0
21	**0**	21	58	01·4	N 12	07·1	50	11	56	47·7
Mon.	**6**		59	00·5	12	02·1	50		56	51·4
	12	21	59	59·7	11	57·1	50		56	55·1
	18	22	00	58·8	11	52·1	51		56	58·8
22	**0**	22	01	58·0	N 11	47·0	50	11	57	02·6
Tues.	**6**		02	57·1	11	42·0	51		57	06·4
	12		03	56·2	11	36·9	50		57	10·2
	18		04	55·4	11	31·9	51		57	14·0
23	**0**	22	05	54·5	N 11	26·8	51	11	57	17·9
Wed.	**6**		06	53·6	11	21·7	51		57	21·8
	12		07	52·8	11	16·6	51		57	25·7
	18		08	51·9	11	11·5	51		57	29·7
24	**0**	22	09	51·0	N 11	06·4	52	11	57	33·7
Thur.	**6**		10	50·2	11	01·2	51		57	37·7
	12		11	49·3	10	56·1	52		57	41·7
	18		12	48·5	10	50·9	51		57	45·8
	24	22	13	47·6	N 10	45·8		11	57	49·9

UT1		*R*			Dec			*E*		
d	h	h	m	s	°	′		h	m	s
25	**0**	22	13	47·6	N 10	45·8	52	11	57	49·9
Fri.	**6**		14	46·7	10	40·6	52		57	54·0
	12		15	45·9	10	35·4	52		57	58·2
	18		16	45·0	10	30·2	52		58	02·3
26	**0**	22	17	44·1	N 10	25·0	52	11	58	06·5
Sat.	**6**		18	43·3	10	19·8	53		58	10·7
	12		19	42·4	10	14·5	52		58	15·0
	18		20	41·6	10	09·3	52		58	19·3
27	**0**	22	21	40·7	N 10	04·1	53	11	58	23·6
Sun.	**6**		22	39·8	9	58·8	53		58	27·9
	12		23	39·0	9	53·5	53		58	32·2
	18		24	38·1	9	48·2	52		58	36·6
28	**0**	22	25	37·2	N 9	43·0	53	11	58	41·0
Mon.	**6**		26	36·4	9	37·7	53		58	45·4
	12		27	35·5	9	32·4	54		58	49·9
	18		28	34·7	9	27·0	53		58	54·3
29	**0**	22	29	33·8	N 9	21·7	53	11	58	58·8
Tues.	**6**		30	32·9	9	16·4	54		59	03·3
	12		31	32·1	9	11·0	53		59	07·9
	18		32	31·2	9	05·7	54		59	12·4
30	**0**	22	33	30·4	N 9	00·3	54	11	59	17·0
Wed.	**6**		34	29·5	8	54·9	53		59	21·6
	12		35	28·6	8	49·6	54		59	26·2
	18		36	27·8	8	44·2	54		59	30·9
31	**0**	22	37	26·9	N 8	38·8	54	11	59	35·5
Thur.	**6**		38	26·0	8	33·4	55		59	40·2
	12		39	25·2	8	27·9	54		59	44·9
	18		40	24·3	8	22·5	54		59	49·6
32	**0**	22	41	23·5	N 8	17·1	54	11	59	54·4
Fri.	**6**		42	22·6	8	11·7	55	11	59	59·2
	12		43	21·7	8	06·2	55	12	00	03·9
	18		44	20·9	8	00·7	54		00	08·7
	24	22	45	20·0	N 7	55·3		12	00	13·6

Sun's SD 15′·8

SUNSET

Date	South Latitude									North Latitude								
	60°	55°	50°	45°	40°	30°	20°	10°	0°	10°	20°	30°	40°	45°	50°	55°	60°
Aug.	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
1	16·0	16·4	16·7	16·9	17·1	17·5	17·7	17·9	18·2	18·4	18·6	18·9	19·2	19·4	19·7	20·0	20·5
6	16·2	16·5	16·8	17·0	17·2	17·5	17·7	18·0	18·2	18·4	18·6	18·8	19·1	19·3	19·6	19·9	20·3
11	16·4	16·7	16·9	17·1	17·3	17·6	17·8	18·0	18·1	18·3	18·5	18·7	19·0	19·2	19·4	19·7	20·1
16	16·6	16·8	17·1	17·2	17·4	17·6	17·8	18·0	18·1	18·3	18·5	18·7	18·9	19·1	19·3	19·5	19·8
21	16·7	17·0	17·2	17·3	17·4	17·7	17·8	18·0	18·1	18·2	18·4	18·6	18·8	18·9	19·1	19·3	19·6
26	16·9	17·1	17·3	17·4	17·5	17·7	17·8	18·0	18·1	18·2	18·3	18·5	18·7	18·8	18·9	19·1	19·3
31	17·1	17·3	17·4	17·5	17·6	17·7	17·9	18·0	18·1	18·2	18·3	18·4	18·5	18·6	18·8	18·9	19·1

Moon's Phases: New Moon 21^{d} 18^{h} 30^{m} First Quarter 29^{d} 08^{h} 13^{m}

UT1		*R*			Dec		*E*			UT1		*R*			Dec		*E*		
d	h	h	m	s	°	′	h	m	s	d	h	h	m	s	°	′	h	m	s
1	**0**	22	41	23·5	N 8	17·1 54	11	59	54·4 48	**9**	**0**	23	12	55·9	N 5	19·4 57	12	02	34·9 52
Fri.	**6**		42	22·6	8	11·7 55	11	59	59·2 47	**Sat.**	**6**		13	55·0	5	13·7 56		02	40·1 52
	12		43	21·7	8	06·2 55	12	00	03·9 48		**12**		14	54·1	5	08·1 57		02	45·3 53
	18		44	20·9	8	00·7 54		00	08·7 49		**18**		15	53·3	5	02·4 57		02	50·6 52
2	**0**	22	45	20·0	N 7	55·3 55	12	00	13·6 48	**10**	**0**	23	16	52·4	N 4	56·7 57	12	02	55·8 53
Sat.	**6**		46	19·2	7	49·8 55		00	18·4 49	**Sun.**	**6**		17	51·6	4	51·0 57		03	01·1 52
	12		47	18·3	7	44·3 55		00	23·3 48		**12**		18	50·7	4	45·3 57		03	06·3 53
	18		48	17·4	7	38·8 55		00	28·1 49		**18**		19	49·8	4	39·6 57		03	11·6 53
3	**0**	22	49	16·6	N 7	33·3 55	12	00	33·0 49	**11**	**0**	23	20	49·0	N 4	33·9 57	12	03	16·9 53
Sun.	**6**		50	15·7	7	27·8 55		00	37·9 50	**Mon.**	**6**		21	48·1	4	28·2 57		03	22·2 53
	12		51	14·9	7	22·3 55		00	42·9 49		**12**		22	47·3	4	22·5 57		03	27·5 53
	18		52	14·0	7	16·8 55		00	47·8 50		**18**		23	46·4	4	16·8 57		03	32·8 53
4	**0**	22	53	13·1	N 7	11·3 55	12	00	52·8 50	**12**	**0**	23	24	45·5	N 4	11·1 57	12	03	38·1 53
Mon.	**6**		54	12·3	7	05·8 56		00	57·8 49	**Tues.**	**6**		25	44·7	4	05·4 57		03	43·4 53
	12		55	11·4	7	00·2 55		01	02·7 51		**12**		26	43·8	3	59·7 58		03	48·7 53
	18		56	10·5	6	54·7 56		01	07·8 50		**18**		27	42·9	3	53·9 57		03	54·0 53
5	**0**	22	57	09·7	N 6	49·1 55	12	01	12·8 50	**13**	**0**	23	28	42·1	N 3	48·2 58	12	03	59·3 53
Tues.	**6**		58	08·8	6	43·6 56		01	17·8 51	**Wed.**	**6**		29	41·2	3	42·4 57		04	04·6 53
	12	22	59	08·0	6	38·0 56		01	22·9 50		**12**		30	40·4	3	36·7 57		04	09·9 54
	18	23	00	07·1	6	32·4 56		01	27·9 51		**18**		31	39·5	3	31·0 58		04	15·3 53
6	**0**	23	01	06·2	N 6	26·8 55	12	01	33·0 51	**14**	**0**	23	32	38·6	N 3	25·2 58	12	04	20·6 53
Wed.	**6**		02	05·4	6	21·3 56		01	38·1 51	**Thur.**	**6**		33	37·8	3	19·4 57		04	25·9 54
	12		03	04·5	6	15·7 56		01	43·2 51		**12**		34	36·9	3	13·7 58		04	31·3 53
	18		04	03·6	6	10·1 57		01	48·3 52		**18**		35	36·1	3	07·9 57		04	36·6 53
7	**0**	23	05	02·8	N 6	04·4 56	12	01	53·5 51	**15**	**0**	23	36	35·2	N 3	02·2 58	12	04	41·9 54
Thur.	**6**		06	01·9	5	58·8 56		01	58·6 51	**Fri.**	**6**		37	34·3	2	56·4 58		04	47·3 53
	12		07	01·1	5	53·2 56		02	03·7 52		**12**		38	33·5	2	50·6 58		04	52·6 53
	18		08	00·2	5	47·6 56		02	08·9 52		**18**		39	32·6	2	44·8 58		04	57·9 54
8	**0**	23	08	59·3	N 5	42·0 57	12	02	14·1 52	**16**	**0**	23	40	31·8	N 2	39·0 57	12	05	03·3 53
Fri.	**6**		09	58·5	5	36·3 56		02	19·3 52	**Sat.**	**6**		41	30·9	2	33·3 58		05	08·6 54
	12		10	57·6	5	30·7 57		02	24·5 52		**12**		42	30·0	2	27·5 58		05	14·0 53
	18		11	56·7	5	25·0 56		02	29·7 52		**18**		43	29·2	2	21·7 58		05	19·3 53
	24	23	12	55·9	N 5	19·4	12	02	34·9		**24**	23	44	28·3	N 2	15·9	12	05	24·6

Sun's SD 15′·9

SUNRISE

Date	South Latitude									North Latitude								
	60°	55°	50°	45°	40°	30°	20°	10°	0°	10°	20°	30°	40°	45°	50°	55°	60°
Sept.	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
1	6·8	6·7	6·6	6·5	6·4	6·3	6·1	6·0	5·9	5·8	5·7	5·6	5·5	5·4	5·3	5·1	4·9
6	6·6	6·5	6·4	6·3	6·3	6·2	6·1	6·0	5·9	5·8	5·8	5·7	5·5	5·5	5·4	5·3	5·1
11	6·3	6·3	6·2	6·2	6·1	6·1	6·0	5·9	5·9	5·8	5·8	5·7	5·6	5·6	5·5	5·4	5·3
16	6·1	6·1	6·0	6·0	6·0	5·9	5·9	5·9	5·9	5·8	5·8	5·8	5·7	5·7	5·6	5·6	5·5
21	5·8	5·8	5·8	5·8	5·8	5·8	5·8	5·8	5·8	5·8	5·8	5·8	5·8	5·8	5·7	5·7	5·7
26	5·6	5·6	5·7	5·7	5·7	5·7	5·8	5·8	5·8	5·8	5·8	5·8	5·9	5·9	5·9	5·9	5·9
31	5·3	5·4	5·5	5·5	5·6	5·6	5·7	5·7	5·8	5·8	5·8	5·9	5·9	6·0	6·0	6·0	6·1

Moon's Phases: Full Moon $6^{d}\ 07^{h}\ 03^{m}$ Last Quarter $13^{d}\ 06^{h}\ 25^{m}$

UT1		*R*			Dec			*E*			UT1		*R*			Dec			*E*		
d	h	h	m	s	°	′		h	m	s	d	h	h	m	s	°	′		h	m	s
17	**0**	23	44	28·3	N	2	15·9 58	12	05	24·6 54	**25**	**0**	0	16	00·7	S	0	50·6 58	12	08	13·6 52
Sun.	**6**		45	27·5		2	10·1 58		05	30·0 53	**Mon.**	**6**		16	59·8		0	56·4 59		08	18·8 52
	12		46	26·6		2	04·3 58		05	35·3 54		**12**		17	59·0		1	02·3 58		08	24·0 51
	18		47	25·7		1	58·5 58		05	40·7 53		**18**		18	58·1		1	08·1 59		08	29·1 52
18	**0**	23	48	24·9	N	1	52·7 58	12	05	46·0 53	**26**	**0**	0	19	57·3	S	1	14·0 58	12	08	34·3 51
Mon.	**6**		49	24·0		1	46·9 58		05	51·3 54	**Tues.**	**6**		20	56·4		1	19·8 58		08	39·4 51
	12		50	23·1		1	41·1 59		05	56·7 53		**12**		21	55·5		1	25·6 59		08	44·5 51
	18		51	22·3		1	35·2 58		06	02·0 53		**18**		22	54·7		1	31·5 58		08	49·6 51
19	**0**	23	52	21·4	N	1	29·4 58	12	06	07·3 53	**27**	**0**	0	23	53·8	S	1	37·3 59	12	08	54·7 51
Tues.	**6**		53	20·6		1	23·6 58		06	12·6 53	**Wed.**	**6**		24	53·0		1	43·2 58		08	59·8 51
	12		54	19·7		1	17·8 58		06	17·9 54		**12**		25	52·1		1	49·0 58		09	04·9 51
	18		55	18·8		1	12·0 59		06	23·3 53		**18**		26	51·2		1	54·8 59		09	10·0 50
20	**0**	23	56	18·0	N	1	06·1 58	12	06	28·6 53	**28**	**0**	0	27	50·4	S	2	00·7 58	12	09	15·0 50
Wed.	**6**		57	17·1		1	00·3 58		06	33·9 53	**Thur.**	**6**		28	49·5		2	06·5 58		09	20·0 51
	12		58	16·2		0	54·5 58		06	39·2 53		**12**		29	48·6		2	12·3 59		09	25·1 50
	18	23	59	15·4		0	48·7 59		06	44·5 53		**18**		30	47·8		2	18·2 58		09	30·1 50
21	**0**	0	00	14·5	N	0	42·8 58	12	06	49·8 53	**29**	**0**	0	31	46·9	S	2	24·0 58	12	09	35·1 49
Thur.	**6**		01	13·6		0	37·0 58		06	55·1 52	**Fri.**	**6**		32	46·1		2	29·8 59		09	40·0 50
	12		02	12·8		0	31·2 59		07	00·3 53		**12**		33	45·2		2	35·7 58		09	45·0 50
	18		03	11·9		0	25·3 58		07	05·6 53		**18**		34	44·3		2	41·5 58		09	50·0 49
22	**0**	0	04	11·1	N	0	19·5 58	12	07	10·9 53	**30**	**0**	0	35	43·5	S	2	47·3 58	12	09	54·9 49
Fri.	**6**		05	10·2		0	13·7 59		07	16·2 52	**Sat.**	**6**		36	42·6		2	53·1 59		09	59·8 49
	12		06	09·3		0	07·8 58		07	21·4 53		**12**		37	41·8		2	59·0 58		10	04·7 49
	18		07	08·5	N	0	02·0 59		07	26·7 52		**18**		38	40·9		3	04·8 58		10	09·6 49
23	**0**	0	08	07·6	S	0	03·9 58	12	07	31·9 53	**31**	**0**	0	39	40·0	S	3	10·6 58	12	10	14·5 48
Sat.	**6**		09	06·7		0	09·7 58		07	37·2 52	**Sun.**	**6**		40	39·2		3	16·4 58		10	19·3 49
	12		10	05·9		0	15·5 59		07	42·4 52		**12**		41	38·3		3	22·2 58		10	24·2 48
	18		11	05·0		0	21·4 58		07	47·6 52		**18**		42	37·4		3	28·0 58		10	29·0 48
24	**0**	0	12	04·2	S	0	27·2 59	12	07	52·8 53		**24**	0	43	36·6	S	3	33·8	12	10	33·8
Sun.	**6**		13	03·3		0	33·1 58		07	58·1 52											
	12		14	02·4		0	38·9 58		08	03·3 51											
	18		15	01·6		0	44·7 59		08	08·4 52											
	24	0	16	00·7	S	0	50·6	12	08	13·6											

Sun's SD 15′·9

SUNSET

Date	South Latitude									North Latitude								
	60°	55°	50°	45°	40°	30°	20°	10°	0°	10°	20°	30°	40°	45°	50°	55°	60°
Sept.	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
1	17·2	17·3	17·4	17·5	17·6	17·8	17·9	18·0	18·1	18·1	18·3	18·4	18·5	18·6	18·7	18·9	19·1
6	17·4	17·5	17·6	17·6	17·7	17·8	17·9	18·0	18·0	18·1	18·2	18·3	18·4	18·5	18·6	18·7	18·8
11	17·6	17·6	17·7	17·7	17·8	17·8	17·9	17·9	18·0	18·0	18·1	18·2	18·3	18·3	18·4	18·4	18·5
16	17·7	17·8	17·8	17·8	17·9	17·9	17·9	17·9	18·0	18·0	18·0	18·1	18·1	18·1	18·2	18·2	18·3
21	17·9	17·9	17·9	17·9	17·9	17·9	17·9	17·9	17·9	17·9	18·0	18·0	18·0	18·0	18·0	18·0	18·0
26	18·1	18·1	18·1	18·0	18·0	18·0	17·9	17·9	17·9	17·9	17·9	17·9	17·8	17·8	17·8	17·8	17·8
31	18·3	18·3	18·2	18·1	18·1	18·0	18·0	17·9	17·9	17·8	17·8	17·8	17·7	17·7	17·6	17·6	17·5

Moon's Phases: New Moon $20^{d}\ 05^{h}\ 30^{m}$ First Quarter $28^{d}\ 02^{h}\ 54^{m}$

UT1		*R*			Dec			*E*		
d	h	h	m	s	°	′		h	m	s
1	**0**	0	39	40·0	S	3	10·6 58	12	10	14·5 48
Sun.	**6**		40	39·2		3	16·4 58		10	19·3 49
	12		41	38·3		3	22·2 58		10	24·2 48
	18		42	37·4		3	28·0 58		10	29·0 48
2	**0**	0	43	36·6	S	3	33·8 58	12	10	33·8 48
Mon.	**6**		44	35·7		3	39·6 59		10	38·6 47
	12		45	34·9		3	45·5 58		10	43·3 48
	18		46	34·0		3	51·3 57		10	48·1 47
3	**0**	0	47	33·1	S	3	57·0 58	12	10	52·8 47
Tues.	**6**		48	32·3		4	02·8 58		10	57·5 47
	12		49	31·4		4	08·6 58		11	02·2 47
	18		50	30·5		4	14·4 58		11	06·9 46
4	**0**	0	51	29·7	S	4	20·2 58	12	11	11·5 46
Wed.	**6**		52	28·8		4	26·0 58		11	16·1 46
	12		53	28·0		4	31·8 57		11	20·7 46
	18		54	27·1		4	37·5 58		11	25·3 46
5	**0**	0	55	26·2	S	4	43·3 58	12	11	29·9 45
Thur.	**6**		56	25·4		4	49·1 57		11	34·4 45
	12		57	24·5		4	54·8 58		11	38·9 45
	18		58	23·6		5	00·6 57		11	43·4 45
6	**0**	0	59	22·8	S	5	06·3 58	12	11	47·9 44
Fri.	**6**	1	00	21·9		5	12·1 57		11	52·3 44
	12		01	21·1		5	17·8 58		11	56·7 44
	18		02	20·2		5	23·6 57		12	01·1 44
7	**0**	1	03	19·3	S	5	29·3 58	12	12	05·5 43
Sat.	**6**		04	18·5		5	35·1 57		12	09·8 43
	12		05	17·6		5	40·8 57		12	14·1 43
	18		06	16·7		5	46·5 57		12	18·4 43
8	**0**	1	07	15·9	S	5	52·2 58	12	12	22·7 42
Sun.	**6**		08	15·0		5	58·0 57		12	26·9 42
	12		09	14·2		6	03·7 57		12	31·1 42
	18		10	13·3		6	09·4 57		12	35·3 41
	24	1	11	12·4	S	6	15·1	12	12	39·4

UT1		*R*			Dec			*E*		
d	h	h	m	s	°	′		h	m	s
9	**0**	1	11	12·4	S	6	15·1 57	12	12	39·4 41
Mon.	**6**		12	11·6		6	20·8 57		12	43·5 41
	12		13	10·7		6	26·5 56		12	47·6 41
	18		14	09·8		6	32·1 57		12	51·7 40
10	**0**	1	15	09·0	S	6	37·8 57	12	12	55·7 40
Tues.	**6**		16	08·1		6	43·5 57		12	59·7 40
	12		17	07·3		6	49·2 56		13	03·7 39
	18		18	06·4		6	54·8 57		13	07·6 39
11	**0**	1	19	05·5	S	7	00·5 56	12	13	11·5 39
Wed.	**6**		20	04·7		7	06·1 57		13	15·4 39
	12		21	03·8		7	11·8 56		13	19·3 38
	18		22	03·0		7	17·4 57		13	23·1 37
12	**0**	1	23	02·1	S	7	23·1 56	12	13	26·8 38
Thur.	**6**		24	01·2		7	28·7 56		13	30·6 37
	12		25	00·4		7	34·3 56		13	34·3 37
	18		25	59·5		7	39·9 56		13	38·0 36
13	**0**	1	26	58·7	S	7	45·5 56	12	13	41·6 36
Fri.	**6**		27	57·8		7	51·1 56		13	45·2 36
	12		28	56·9		7	56·7 56		13	48·8 36
	18		29	56·1		8	02·3 56		13	52·4 35
14	**0**	1	30	55·2	S	8	07·9 56	12	13	55·9 34
Sat.	**6**		31	54·4		8	13·5 56		13	59·3 35
	12		32	53·5		8	19·1 55		14	02·8 34
	18		33	52·6		8	24·6 56		14	06·2 34
15	**0**	1	34	51·8	S	8	30·2 55	12	14	09·6 33
Sun.	**6**		35	50·9		8	35·7 56		14	12·9 33
	12		36	50·0		8	41·3 55		14	16·2 32
	18		37	49·2		8	46·8 55		14	19·4 33
16	**0**	1	38	48·3	S	8	52·3 55	12	14	22·7 32
Mon.	**6**		39	47·5		8	57·8 55		14	25·9 31
	12		40	46·6		9	03·3 55		14	29·0 31
	18		41	45·7		9	08·8 55		14	32·1 31
	24	1	42	44·9	S	9	14·3	12	14	35·2

Sun's SD 16′0

SUNRISE

Date	South Latitude									North Latitude							
	60°	55°	50°	45°	40°	30°	20°	10°	0°	10°	20°	30°	40°	45°	50°	55°	60°
Oct.	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
1	5·3	5·4	5·5	5·5	5·6	5·6	5·7	5·7	5·8	5·8	5·8	5·9	5·9	6·0	6·0	6·0	6·1
6	5·1	5·2	5·3	5·4	5·4	5·5	5·6	5·7	5·7	5·8	5·9	5·9	6·0	6·1	6·1	6·2	6·3
11	4·8	5·0	5·1	5·2	5·3	5·4	5·5	5·6	5·7	5·8	5·9	6·0	6·1	6·2	6·3	6·4	6·5
16	4·6	4·8	4·9	5·1	5·2	5·3	5·5	5·6	5·7	5·8	5·9	6·0	6·2	6·3	6·4	6·5	6·7
21	4·3	4·6	4·8	4·9	5·1	5·3	5·4	5·6	5·7	5·8	5·9	6·1	6·3	6·4	6·5	6·7	6·9
26	4·1	4·4	4·6	4·8	4·9	5·2	5·4	5·5	5·7	5·8	6·0	6·2	6·4	6·5	6·7	6·9	7·1
31	3·9	4·2	4·5	4·7	4·8	5·1	5·3	5·5	5·7	5·8	6·0	6·2	6·5	6·6	6·8	7·0	7·3

Moon's Phases: Full Moon $5^{d}\ 18^{h}\ 40^{m}$ Last Quarter $12^{d}\ 12^{h}\ 25^{m}$

UT1		*R*			Dec			*E*		
d	h	h	m	s	°	′		h	m	s
17	**0**	1	42	44·9	S 9	14·3	55	12	14	35·2 30
Tues.	**6**		43	44·0	9	19·8	55		14	38·2 30
	12		44	43·1	9	25·3	55		14	41·2 30
	18		45	42·3	9	30·8	54		14	44·2 29
18	**0**	1	46	41·4	S 9	36·2	55	12	14	47·1 29
Wed.	**6**		47	40·6	9	41·7	54		14	50·0 28
	12		48	39·7	9	47·1	54		14	52·8 29
	18		49	38·8	9	52·5	55		14	55·7 27
19	**0**	1	50	38·0	S 9	58·0	54	12	14	58·4 27
Thur.	**6**		51	37·1	10	03·4	54		15	01·1 27
	12		52	36·2	10	08·8	54		15	03·8 27
	18		53	35·4	10	14·2	54		15	06·5 26
20	**0**	1	54	34·5	S 10	19·6	53	12	15	09·1 26
Fri.	**6**		55	33·7	10	24·9	54		15	11·7 25
	12		56	32·8	10	30·3	54		15	14·2 25
	18		57	31·9	10	35·7	53		15	16·7 24
21	**0**	1	58	31·1	S 10	41·0	53	12	15	19·1 24
Sat.	**6**	1	59	30·2	10	46·3	54		15	21·5 24
	12	2	00	29·3	10	51·7	53		15	23·9 23
	18		01	28·5	10	57·0	53		15	26·2 23
22	**0**	2	02	27·6	S 11	02·3	53	12	15	28·5 22
Sun.	**6**		03	26·8	11	07·6	53		15	30·7 22
	12		04	25·9	11	12·9	53		15	32·9 22
	18		05	25·0	11	18·2	52		15	35·1 21
23	**0**	2	06	24·2	S 11	23·4	53	12	15	37·2 21
Mon.	**6**		07	23·3	11	28·7	52		15	39·3 20
	12		08	22·4	11	33·9	52		15	41·3 20
	18		09	21·6	11	39·1	53		15	43·3 20
24	**0**	2	10	20·7	S 11	44·4	52	12	15	45·3 19
Tues.	**6**		11	19·9	11	49·6	52		15	47·2 18
	12		12	19·0	11	54·8	52		15	49·0 18
	18		13	18·1	12	00·0	51		15	50·8 18
	24	2	14	17·3	S 12	05·1		12	15	52·6

UT1		*R*			Dec			*E*		
d	h	h	m	s	°	′		h	m	s
25	**0**	2	14	17·3	S 12	05·1	52	12	15	52·6 17
Wed.	**6**		15	16·4	12	10·3	52		15	54·3 17
	12		16	15·6	12	15·5	51		15	56·0 17
	18		17	14·7	12	20·6	51		15	57·7 15
26	**0**	2	18	13·8	S 12	25·7	51	12	15	59·2 16
Thur.	**6**		19	13·0	12	30·8	52		16	00·8 15
	12		20	12·1	12	36·0	50		16	02·3 15
	18		21	11·3	12	41·0	51		16	03·8 14
27	**0**	2	22	10·4	S 12	46·1	51	12	16	05·2 13
Fri.	**6**		23	09·5	12	51·2	51		16	06·5 14
	12		24	08·7	12	56·3	50		16	07·9 12
	18		25	07·8	13	01·3	50		16	09·1 13
28	**0**	2	26	07·0	S 13	06·3	50	12	16	10·4 12
Sat.	**6**		27	06·1	13	11·3	50		16	11·6 11
	12		28	05·2	13	16·3	50		16	12·7 11
	18		29	04·4	13	21·3	50		16	13·8 10
29	**0**	2	30	03·5	S 13	26·3	50	12	16	14·8 10
Sun.	**6**		31	02·6	13	31·3	49		16	15·8 10
	12		32	01·8	13	36·2	50		16	16·8 9
	18		33	00·9	13	41·2	49		16	17·7 9
30	**0**	2	34	00·1	S 13	46·1	49	12	16	18·6 8
Mon.	**6**		34	59·2	13	51·0	49		16	19·4 7
	12		35	58·3	13	55·9	49		16	20·1 8
	18		36	57·5	14	00·8	49		16	20·9 6
31	**0**	2	37	56·6	S 14	05·7	48	12	16	21·5 6
Tues.	**6**		38	55·7	14	10·5	48		16	22·1 6
	12		39	54·9	14	15·3	49		16	22·7 5
	18		40	54·0	14	20·2	48		16	23·2 5
32	**0**	2	41	53·2	S 14	25·0	48	12	16	23·7 4
Wed.	**6**		42	52·3	14	29·8	48		16	24·1 4
	12		43	51·4	14	34·6	47		16	24·5 3
	18		44	50·6	14	39·3	48		16	24·8 3
	24	2	45	49·7	S 14	44·1		12	16	25·1

Sun's SD 16′·1

SUNSET

Date	South Latitude									North Latitude							
	60°	55°	50°	45°	40°	30°	20°	10°	0°	10°	20°	30°	40°	45°	50°	55°	60°
Oct.	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
1	18·3	18·3	18·2	18·1	18·1	18·0	18·0	17·9	17·9	17·8	17·8	17·8	17·7	17·7	17·6	17·6	17·5
6	18·5	18·4	18·3	18·2	18·2	18·1	18·0	17·9	17·9	17·8	17·7	17·7	17·6	17·5	17·5	17·4	17·3
11	18·7	18·6	18·5	18·3	18·3	18·1	18·0	17·9	17·8	17·7	17·7	17·6	17·4	17·4	17·3	17·2	17·0
16	19·0	18·7	18·6	18·5	18·3	18·2	18·0	17·9	17·8	17·7	17·6	17·5	17·3	17·2	17·1	17·0	16·8
21	19·2	18·9	18·7	18·6	18·4	18·2	18·1	17·9	17·8	17·7	17·5	17·4	17·2	17·1	16·9	16·8	16·6
26	19·4	19·1	18·9	18·7	18·5	18·3	18·1	17·9	17·8	17·6	17·5	17·3	17·1	16·9	16·8	16·6	16·3
31	19·6	19·3	19·0	18·8	18·6	18·4	18·1	18·0	17·8	17·6	17·4	17·2	17·0	16·8	16·6	16·4	16·1

Moon's Phases: New Moon $19^{d}\ 19^{h}\ 12^{m}$ First Quarter $27^{d}\ 22^{h}\ 22^{m}$

UT1		*R*			Dec			*E*			UT1		*R*			Dec			*E*		
d	h	h	m	s	°	′		h	m	s	d	h	h	m	s	°	′		h	m	s
1	**0**	2	41	53·2	S 14	25·0	48	12	16	23·7	**9**	**0**	3	13	25·6	S 16	50·7	43	12	16	12·0	13
Wed.	**6**		42	52·3		14	29·8	48		16	24·1	4	**Thur.**	**6**		14	24·7		16	55·0	42		16	10·7	13
	12		43	51·4		14	34·6	47		16	24·5	3		**12**		15	23·9		16	59·2	43		16	09·4	13
	18		44	50·6		14	39·3	48		16	24·8	3		**18**		16	23·0		17	03·5	42		16	08·1	14
2	**0**	2	45	49·7	S 14	44·1	47	12	16	25·1	**10**	**0**	3	17	22·2	S 17	07·7	42	12	16	06·7	15
Thur.	**6**		46	48·8		14	48·8	47		16	25·3	2	**Fri.**	**6**		18	21·3		17	11·9	42		16	05·2	15
	12		47	48·0		14	53·5	47		16	25·5	2		**12**		19	20·4		17	16·1	42		16	03·7	16
	18		48	47·1		14	58·2	47		16	25·6	1		**18**		20	19·6		17	20·3	41		16	02·1	16
3	**0**	2	49	46·3	S 15	02·9	47	12	16	25·7	**11**	**0**	3	21	18·7	S 17	24·4	41	12	16	00·5	16
Fri.	**6**		50	45·4		15	07·6	47		16	25·7	0	**Sat.**	**6**		22	17·9		17	28·5	42		15	58·9	18
	12		51	44·5		15	12·3	46		16	25·7	1		**12**		23	17·0		17	32·7	41		15	57·1	18
	18		52	43·7		15	16·9	46		16	25·6	1		**18**		24	16·1		17	36·8	40		15	55·3	18
4	**0**	2	53	42·8	S 15	21·5	47	12	16	25·5	**12**	**0**	3	25	15·3	S 17	40·8	41	12	15	53·5	19
Sat.	**6**		54	41·9		15	26·2	46		16	25·3	2	**Sun.**	**6**		26	14·4		17	44·9	40		15	51·6	19
	12		55	41·1		15	30·8	45		16	25·1	3		**12**		27	13·6		17	48·9	40		15	49·7	20
	18		56	40·2		15	35·3	46		16	24·8	3		**18**		28	12·7		17	52·9	40		15	47·7	21
5	**0**	2	57	39·4	S 15	39·9	46	12	16	24·5	**13**	**0**	3	29	11·8	S 17	56·9	40	12	15	45·6	21
Sun.	**6**		58	38·5		15	44·5	45		16	24·1	4	**Mon.**	**6**		30	11·0		18	00·9	40		15	43·5	21
	12	2	59	37·6		15	49·0	45		16	23·7	4		**12**		31	10·1		18	04·9	39		15	41·4	23
	18	3	00	36·8		15	53·5	45		16	23·2	5		**18**		32	09·2		18	08·8	39		15	39·1	22
6	**0**	3	01	35·9	S 15	58·0	45	12	16	22·6	**14**	**0**	3	33	08·4	S 18	12·7	39	12	15	36·9	23
Mon.	**6**		02	35·1		16	02·5	45		16	22·0	6	**Tues.**	**6**		34	07·5		18	16·6	39		15	34·6	24
	12		03	34·2		16	07·0	44		16	21·4	7		**12**		35	06·7		18	20·5	39		15	32·2	25
	18		04	33·3		16	11·4	44		16	20·7	8		**18**		36	05·8		18	24·4	38		15	29·7	24
7	**0**	3	05	32·5	S 16	15·8	45	12	16	19·9	**15**	**0**	3	37	04·9	S 18	28·2	38	12	15	27·3	26
Tues.	**6**		06	31·6		16	20·3	44		16	19·1	8	**Wed.**	**6**		38	04·1		18	32·0	38		15	24·7	26
	12		07	30·8		16	24·7	43		16	18·3	10		**12**		39	03·2		18	35·8	38		15	22·1	26
	18		08	29·9		16	29·0	44		16	17·3	9		**18**		40	02·3		18	39·6	38		15	19·5	27
8	**0**	3	09	29·0	S 16	33·4	44	12	16	16·4	**16**	**0**	3	41	01·5	S 18	43·4	37	12	15	16·8	28
Wed.	**6**		10	28·2		16	37·8	43		16	15·3	10	**Thur.**	**6**		42	00·6		18	47·1	37		15	14·0	28
	12		11	27·3		16	42·1	43		16	14·3	12		**12**		42	59·8		18	50·8	37		15	11·2	28
	18		12	26·5		16	46·4	43		16	13·1	11		**18**		43	58·9		18	54·5	37		15	08·4	29
	24	3	13	25·6	S 16	50·7		12	16	12·0		**24**	3	44	58·0	S 18	58·2		12	15	05·5	

Sun's SD 16′·1

SUNRISE

Date	South Latitude									North Latitude							
	60°	55°	50°	45°	40°	30°	20°	10°	0°	10°	20°	30°	40°	45°	50°	55°	60°
Nov.	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
1	3·8	4·2	4·4	4·6	4·8	5·1	5·3	5·5	5·7	5·8	6·0	6·2	6·5	6·6	6·8	7·1	7·4
6	3·6	4·0	4·3	4·5	4·7	5·0	5·3	5·5	5·7	5·9	6·1	6·3	6·6	6·8	7·0	7·2	7·6
11	3·4	3·8	4·2	4·4	4·6	5·0	5·2	5·5	5·7	5·9	6·1	6·4	6·7	6·9	7·1	7·4	7·8
16	3·2	3·7	4·1	4·3	4·6	4·9	5·2	5·5	5·7	5·9	6·2	6·4	6·8	7·0	7·2	7·6	8·0
21	3·0	3·6	4·0	4·3	4·5	4·9	5·2	5·5	5·7	5·9	6·2	6·5	6·9	7·1	7·4	7·7	8·2
26	2·9	3·5	3·9	4·2	4·5	4·9	5·2	5·5	5·7	6·0	6·3	6·6	7·0	7·2	7·5	7·9	8·4
31	2·7	3·4	3·8	4·2	4·4	4·9	5·2	5·5	5·8	6·0	6·3	6·6	7·0	7·3	7·6	8·0	8·6

Moon's Phases: Full Moon $4^{d}\ 05^{h}\ 23^{m}$ Last Quarter $10^{d}\ 20^{h}\ 36^{m}$

UT1		*R*			Dec			*E*		
d	h	h	m	s	°	′		h	m	s
17	**0**	3	44	58·0	S 18	58·2	37	12	15	05·5 30
Fri.	**6**		45	57·2		19	01·9 36		15	02·5 30
	12		46	56·3		19	05·5 36		14	59·5 31
	18		47	55·4		19	09·1 36		14	56·4 31
18	**0**	3	48	54·6	S 19	12·7	36	12	14	53·3 32
Sat.	**6**		49	53·7		19	16·3 35		14	50·1 32
	12		50	52·9		19	19·8 35		14	46·9 33
	18		51	52·0		19	23·3 35		14	43·6 33
19	**0**	3	52	51·1	S 19	26·8	35	12	14	40·3 34
Sun.	**6**		53	50·3		19	30·3 35		14	36·9 34
	12		54	49·4		19	33·8 34		14	33·5 35
	18		55	48·6		19	37·2 34		14	30·0 35
20	**0**	3	56	47·7	S 19	40·6	34	12	14	26·5 36
Mon.	**6**		57	46·8		19	44·0 34		14	22·9 36
	12		58	46·0		19	47·4 33		14	19·3 37
	18	3	59	45·1		19	50·7 34		14	15·6 37
21	**0**	4	00	44·3	S 19	54·1	33	12	14	11·9 38
Tues.	**6**		01	43·4		19	57·4 32		14	08·1 38
	12		02	42·5		20	00·6 33		14	04·3 39
	18		03	41·7		20	03·9 32		14	00·4 39
22	**0**	4	04	40·8	S 20	07·1	33	12	13	56·5 40
Wed.	**6**		05	40·0		20	10·4 31		13	52·5 40
	12		06	39·1		20	13·5 32		13	48·5 41
	18		07	38·2		20	16·7 31		13	44·4 41
23	**0**	4	08	37·4	S 20	19·8	32	12	13	40·3 42
Thur.	**6**		09	36·5		20	23·0 31		13	36·1 42
	12		10	35·7		20	26·1 30		13	31·9 43
	18		11	34·8		20	29·1 31		13	27·6 43
24	**0**	4	12	33·9	S 20	32·2	30	12	13	23·3 43
Fri.	**6**		13	33·1		20	35·2 30		13	19·0 44
	12		14	32·2		20	38·2 30		13	14·6 45
	18		15	31·4		20	41·2 29		13	10·1 45
	24	4	16	30·5	S 20	44·1		12	13	05·6 45

UT1		*R*			Dec			*E*		
d	h	h	m	s	°	′		h	m	s
25	**0**	4	16	30·5	S 20	44·1	30	12	13	05·6 45
Sat.	**6**		17	29·6		20	47·1 29		13	01·1 46
	12		18	28·8		20	50·0 28		12	56·5 47
	18		19	27·9		20	52·8 29		12	51·8 47
26	**0**	4	20	27·1	S 20	55·7	28	12	12	47·1 47
Sun.	**6**		21	26·2		20	58·5 28		12	42·4 47
	12		22	25·3		21	01·3 28		12	37·7 49
	18		23	24·5		21	04·1 28		12	32·8 48
27	**0**	4	24	23·6	S 21	06·9	27	12	12	28·0 49
Mon.	**6**		25	22·7		21	09·6 27		12	23·1 50
	12		26	21·9		21	12·3 27		12	18·1 50
	18		27	21·0		21	15·0 26		12	13·1 50
28	**0**	4	28	20·2	S 21	17·6	27	12	12	08·1 51
Tues.	**6**		29	19·3		21	20·3 26		12	03·0 51
	12		30	18·4		21	22·9 25		11	57·9 52
	18		31	17·6		21	25·4 26		11	52·7 52
29	**0**	4	32	16·7	S 21	28·0	25	12	11	47·5 52
Wed.	**6**		33	15·8		21	30·5 25		11	42·3 53
	12		34	15·0		21	33·0 25		11	37·0 53
	18		35	14·1		21	35·5 25		11	31·7 54
30	**0**	4	36	13·3	S 21	38·0	24	12	11	26·3 54
Thur.	**6**		37	12·4		21	40·4 24		11	20·9 55
	12		38	11·5		21	42·8 24		11	15·4 54
	18		39	10·7		21	45·2 23		11	10·0 56
31	**0**	4	40	09·8	S 21	47·5	23	12	11	04·4 55
Fri.	**6**		41	09·0		21	49·8 23		10	58·9 57
	12		42	08·1		21	52·1 23		10	53·2 56
	18		43	07·2		21	54·4 22		10	47·6 57
	24	4	44	06·4	S 21	56·6		12	10	41·9

Sun's SD 16′·2

SUNSET

Date	South Latitude									North Latitude							
	60°	55°	50°	45°	40°	30°	20°	10°	0°	10°	20°	30°	40°	45°	50°	55°	60°
Nov.	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
1	19·7	19·3	19·0	18·8	18·6	18·4	18·2	18·0	17·8	17·6	17·4	17·2	17·0	16·8	16·6	16·4	16·1
6	19·9	19·5	19·2	18·9	18·7	18·4	18·2	18·0	17·8	17·6	17·4	17·2	16·9	16·7	16·5	16·2	15·9
11	20·1	19·6	19·3	19·1	18·8	18·5	18·2	18·0	17·8	17·6	17·4	17·1	16·8	16·6	16·4	16·1	15·7
16	20·3	19·8	19·5	19·2	18·9	18·6	18·3	18·0	17·8	17·6	17·3	17·1	16·7	16·5	16·2	15·9	15·5
21	20·5	20·0	19·6	19·3	19·0	18·6	18·3	18·1	17·8	17·6	17·3	17·0	16·7	16·4	16·1	15·8	15·3
26	20·7	20·1	19·7	19·4	19·1	18·7	18·4	18·1	17·9	17·6	17·3	17·0	16·6	16·4	16·1	15·7	15·2
31	20·9	20·3	19·8	19·5	19·2	18·8	18·4	18·2	17·9	17·6	17·3	17·0	16·6	16·3	16·0	15·6	15·0

Moon's Phases: New Moon $18^{d}\ 11^{h}\ 42^{m}$ First Quarter $26^{d}\ 17^{h}\ 03^{m}$

UT1		*R*			Dec			*E*			UT1		*R*			Dec			*E*		
d	h	h	m	s	°	′		h	m	s	d	h	h	m	s	°	′		h	m	s
1	**0**	4	40	09·8	S 21	47·5	23	12	11	04·4	55	**9**	**0**	5	11	42·3	S 22	48·5	15	12	07	48·1	67
Fri.	**6**		41	09·0		21	49·8	23		10	58·9	57	**Sat.**	**6**		12	41·4		22	50·0	14		07	41·4	67
	12		42	08·1		21	52·1	23		10	53·2	56		**12**		13	40·6		22	51·4	14		07	34·7	67
	18		43	07·2		21	54·4	22		10	47·6	57		**18**		14	39·7		22	52·8	14		07	28·0	68
2	**0**	4	44	06·4	S 21	56·6	23	12	10	41·9	57	**10**	**0**	5	15	38·9	S 22	54·2	13	12	07	21·2	68
Sat.	**6**		45	05·5		21	58·9	21		10	36·2	58	**Sun.**	**6**		16	38·0		22	55·5	13		07	14·4	68
	12		46	04·6		22	01·0	22		10	30·4	58		**12**		17	37·1		22	56·8	13		07	07·6	69
	18		47	03·8		22	03·2	22		10	24·6	58		**18**		18	36·3		22	58·1	13		07	00·7	68
3	**0**	4	48	02·9	S 22	05·4	21	12	10	18·8	59	**11**	**0**	5	19	35·4	S 22	59·4	12	12	06	53·9	69
Sun.	**6**		49	02·1		22	07·5	20		10	12·9	59	**Mon.**	**6**		20	34·5		23	00·6	12		06	47·0	70
	12		50	01·2		22	09·5	21		10	07·0	60		**12**		21	33·7		23	01·8	12		06	40·0	69
	18		51	00·4		22	11·6	20		10	01·0	60		**18**		22	32·8		23	03·0	11		06	33·1	70
4	**0**	4	51	59·5	S 22	13·6	20	12	09	55·0	60	**12**	**0**	5	23	32·0	S 23	04·1	11	12	06	26·1	70
Mon.	**6**		52	58·6		22	15·6	20		09	49·0	60	**Tues.**	**6**		24	31·1		23	05·2	11		06	19·1	70
	12		53	57·8		22	17·6	20		09	43·0	61		**12**		25	30·2		23	06·3	11		06	12·1	70
	18		54	56·9		22	19·6	19		09	36·9	62		**18**		26	29·4		23	07·4	10		06	05·1	71
5	**0**	4	55	56·1	S 22	21·5	19	12	09	30·7	61	**13**	**0**	5	27	28·5	S 23	08·4	10	12	05	58·0	71
Tues.	**6**		56	55·2		22	23·4	18		09	24·6	62	**Wed.**	**6**		28	27·7		23	09·4	10		05	50·9	71
	12		57	54·3		22	25·2	19		09	18·4	63		**12**		29	26·8		23	10·4	9		05	43·8	71
	18		58	53·5		22	27·1	18		09	12·1	62		**18**		30	25·9		23	11·3	9		05	36·7	71
6	**0**	4	59	52·6	S 22	28·9	18	12	09	05·9	63	**14**	**0**	5	31	25·1	S 23	12·2	9	12	05	29·6	72
Wed.	**6**	5	00	51·8		22	30·7	18		08	59·6	64	**Thur.**	**6**		32	24·2		23	13·1	9		05	22·4	72
	12		01	50·9		22	32·5	17		08	53·2	64		**12**		33	23·3		23	14·0	8		05	15·2	72
	18		02	50·0		22	34·2	17		08	46·8	64		**18**		34	22·5		23	14·8	8		05	08·0	72
7	**0**	5	03	49·2	S 22	35·9	17	12	08	40·4	64	**15**	**0**	5	35	21·6	S 23	15·6	7	12	05	00·8	72
Thur.	**6**		04	48·3		22	37·6	16		08	34·0	65	**Fri.**	**6**		36	20·8		23	16·3	8		04	53·6	73
	12		05	47·5		22	39·2	16		08	27·5	65		**12**		37	19·9		23	17·1	7		04	46·3	73
	18		06	46·6		22	40·8	16		08	21·0	65		**18**		38	19·0		23	17·8	7		04	39·0	72
8	**0**	5	07	45·7	S 22	42·4	16	12	08	14·5	65	**16**	**0**	5	39	18·2	S 23	18·5	6	12	04	31·8	73
Fri.	**6**		08	44·9		22	44·0	15		08	08·0	66	**Sat.**	**6**		40	17·3		23	19·1	7		04	24·5	73
	12		09	44·0		22	45·5	15		08	01·4	67		**12**		41	16·5		23	19·8	5		04	17·2	74
	18		10	43·2		22	47·0	15		07	54·7	66		**18**		42	15·6		23	20·3	6		04	09·8	73
	24	5	11	42·3	S 22	48·5		12	07	48·1				**24**	5	43	14·7	S 23	20·9		12	04	02·5	

Sun's SD 16′·2

SUNRISE

Date	South Latitude									North Latitude							
	60°	55°	50°	45°	40°	30°	20°	10°	0°	10°	20°	30°	40°	45°	50°	55°	60°
Dec.	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
1	2·7	3·4	3·8	4·2	4·4	4·9	5·2	5·5	5·8	6·0	6·3	6·6	7·0	7·3	7·6	8·0	8·6
6	2·6	3·3	3·8	4·1	4·4	4·9	5·2	5·5	5·8	6·1	6·4	6·7	7·1	7·4	7·7	8·1	8·7
11	2·5	3·3	3·8	4·1	4·4	4·9	5·2	5·5	5·8	6·1	6·4	6·8	7·2	7·5	7·8	8·2	8·9
16	2·5	3·3	3·8	4·1	4·4	4·9	5·3	5·6	5·9	6·2	6·5	6·8	7·3	7·5	7·9	8·3	9·0
21	2·5	3·3	3·8	4·2	4·5	4·9	5·3	5·6	5·9	6·2	6·5	6·9	7·3	7·6	7·9	8·4	9·0
26	2·6	3·3	3·8	4·2	4·5	5·0	5·3	5·7	5·9	6·2	6·5	6·9	7·3	7·6	8·0	8·4	9·1
31	2·7	3·4	3·9	4·3	4·6	5·0	5·4	5·7	6·0	6·3	6·6	6·9	7·4	7·6	8·0	8·4	9·0

Moon's Phases: Full Moon $3^{d}\ 15^{h}\ 47^{m}$ Last Quarter $10^{d}\ 07^{h}\ 51^{m}$

UT1		R			Dec			E			UT1		R			Dec			E		
d	h	h	m	s	°	′		h	m	s	d	h	h	m	s	°	′		h	m	s
17	**0**	5	43	14·7	S 23	20·9	6	12	04	02·5	74	**25**	**0**	6	14	47·2	S 23	23·5	4	12	00	04·3	74
Sun.	**6**		44	13·9		23	21·5	5		03	55·1	73	**Mon.**	**6**		15	46·4		23	23·1	4	11	59	56·9	75
	12		45	13·0		23	22·0	4		03	47·8	74		**12**		16	45·5		23	22·7	5		59	49·4	74
	18		46	12·2		23	22·4	5		03	40·4	74		**18**		17	44·6		23	22·2	5		59	42·0	74
18	**0**	5	47	11·3	S 23	22·9	4	12	03	33·0	74	**26**	**0**	6	18	43·8	S 23	21·7	5	11	59	34·6	74
Mon.	**6**		48	10·4		23	23·3	4		03	25·6	74	**Tues.**	**6**		19	42·9		23	21·2	6		59	27·2	74
	12		49	09·6		23	23·7	4		03	18·2	74		**12**		20	42·0		23	20·6	5		59	19·8	74
	18		50	08·7		23	24·1	3		03	10·8	74		**18**		21	41·2		23	20·1	6		59	12·4	74
19	**0**	5	51	07·9	S 23	24·4	3	12	03	03·4	74	**27**	**0**	6	22	40·3	S 23	19·5	7	11	59	05·0	74
Tues.	**6**		52	07·0		23	24·7	3		02	56·0	75	**Wed.**	**6**		23	39·5		23	18·8	7		58	57·6	73
	12		53	06·1		23	25·0	2		02	48·5	74		**12**		24	38·6		23	18·1	6		58	50·3	74
	18		54	05·3		23	25·2	2		02	41·1	75		**18**		25	37·7		23	17·5	8		58	42·9	73
20	**0**	5	55	04·4	S 23	25·4	2	12	02	33·6	74	**28**	**0**	6	26	36·9	S 23	16·7	7	11	58	35·6	74
Wed.	**6**		56	03·6		23	25·6	2		02	26·2	75	**Thur.**	**6**		27	36·0		23	16·0	8		58	28·2	73
	12		57	02·7		23	25·8	1		02	18·7	74		**12**		28	35·1		23	15·2	8		58	20·9	73
	18		58	01·8		23	25·9	1		02	11·3	75		**18**		29	34·3		23	14·4	9		58	13·6	72
21	**0**	5	59	01·0	S 23	26·0	0	12	02	03·8	75	**29**	**0**	6	30	33·4	S 23	13·5	8	11	58	06·4	73
Thur.	**6**	6	00	00·1		23	26·0	1		01	56·3	74	**Fri.**	**6**		31	32·6		23	12·7	9		57	59·1	73
	12		00	59·3		23	26·1	0		01	48·9	75		**12**		32	31·7		23	11·8	10		57	51·8	72
	18		01	58·4		23	26·1	0		01	41·4	75		**18**		33	30·8		23	10·8	9		57	44·6	72
22	**0**	6	02	57·5	S 23	26·1	1	12	01	33·9	75	**30**	**0**	6	34	30·0	S 23	09·9	10	11	57	37·4	72
Fri.	**6**		03	56·7		23	26·0	1		01	26·4	75	**Sat.**	**6**		35	29·1		23	08·9	10		57	30·2	72
	12		04	55·8		23	25·9	1		01	18·9	74		**12**		36	28·3		23	07·9	11		57	23·0	72
	18		05	55·0		23	25·8	1		01	11·5	75		**18**		37	27·4		23	06·8	11		57	15·8	72
23	**0**	6	06	54·1	S 23	25·7	2	12	01	04·0	75	**31**	**0**	6	38	26·5	S 23	05·7	11	11	57	08·6	71
Sat.	**6**		07	53·2		23	25·5	2		00	56·5	75	**Sun.**	**6**		39	25·7		23	04·6	11		57	01·5	71
	12		08	52·4		23	25·3	2		00	49·0	74		**12**		40	24·8		23	03·5	12		56	54·4	71
	18		09	51·5		23	25·1	3		00	41·6	75		**18**		41	24·0		23	02·3	12		56	47·3	71
24	**0**	6	10	50·7	S 23	24·8	3	12	00	34·1	74	**32**	**0**	6	42	23·1	S 23	01·1	12	11	56	40·2	71
Sun.	**6**		11	49·8		23	24·5	3		00	26·7	75	**Mon.**	**6**		43	22·2		22	59·9	12		56	33·1	70
	12		12	48·9		23	24·2	3		00	19·2	75		**12**		44	21·4		22	58·7	13		56	26·1	70
	18		13	48·1		23	23·9	4		00	11·7	74		**18**		45	20·5		22	57·4	13		56	19·1	70
	24	6	14	47·2	S 23	23·5		12	00	04·3			**24**	6	46	19·7	S 22	56·1		11	56	12·1	

Sun's SD 16′·3

SUNSET

Date	South Latitude									North Latitude							
	60°	55°	50°	45°	40°	30°	20°	10°	0°	10°	20°	30°	40°	45°	50°	55°	60°
Dec.	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
1	20·9	20·3	19·8	19·5	19·2	18·8	18·4	18·2	17·9	17·6	17·3	17·0	16·6	16·3	16·0	15·6	15·0
6	21·1	20·4	19·9	19·6	19·3	18·9	18·5	18·2	17·9	17·6	17·3	17·0	16·6	16·3	16·0	15·6	15·0
11	21·2	20·5	20·0	19·7	19·4	18·9	18·6	18·2	18·0	17·7	17·4	17·0	16·6	16·3	16·0	15·5	14·9
16	21·3	20·6	20·1	19·7	19·4	19·0	18·6	18·3	18·0	17·7	17·4	17·0	16·6	16·3	16·0	15·5	14·9
21	21·4	20·7	20·2	19·8	19·5	19·0	18·6	18·3	18·0	17·7	17·4	17·1	16·6	16·4	16·0	15·6	14·9
26	21·4	20·7	20·2	19·8	19·5	19·0	18·7	18·4	18·1	17·8	17·5	17·1	16·7	16·4	16·1	15·6	15·0
31	21·4	20·7	20·2	19·8	19·5	19·1	18·7	18·4	18·1	17·8	17·5	17·2	16·7	16·5	16·1	15·7	15·1

Moon's Phases: New Moon 18^{d} 06^{h} 30^{m} First Quarter 26^{d} 09^{h} 20^{m}

No.	Mag.	RA	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
		h m	s	s	s	s	s	s	s	s	s	s	s	s	s
1	2·1	**0 09**	15·9	15·5	15·2	15·3	15·8	16·6	17·6	18·6	19·2	19·5	19·4	19·1	18·7
2	2·4	**0 10**	06·0	05·0	04·4	04·4	05·1	06·4	07·9	09·3	10·3	10·6	10·4	09·7	08·7
3	3·9	**0 10**	14·9	14·3	14·0	14·0	14·5	15·5	16·7	17·8	18·7	19·0	18·9	18·3	17·7
4	2·9	**0 14**	06·4	06·0	05·8	05·9	06·3	07·1	08·0	08·9	09·6	09·8	09·8	09·5	09·2
5	3·7	**0 20**	17·0	16·7	16·5	16·5	16·9	17·7	18·6	19·5	20·1	20·4	20·4	20·1	19·8
6	4·3	**0 20**	54·9	53·8	53·1	53·0	53·7	55·0	56·8	58·5	59·9	60·4	60·1	59·2	57·9
7	2·9	**0 26**	34·1	31·6	30·1	29·8	30·8	33·1	36·2	39·3	41·7	42·7	42·1	40·1	37·4
8	3·9	**0 27**	01·1	00·5	00·2	00·1	00·6	01·4	02·6	03·7	04·6	05·0	04·9	04·4	03·8
9	2·4	**0 27**	06·3	05·7	05·4	05·3	05·8	06·6	07·8	08·9	09·7	10·1	10·0	09·6	09·0
10	4·2	**0 33**	59·5	58·2	57·4	57·2	57·9	59·2	60·9	62·5	63·7	64·2	64·1	63·4	62·3
11	3·7	**0 37**	56·1	55·2	54·6	54·4	55·0	56·1	57·4	58·7	59·7	60·2	60·1	59·7	58·9
12	3·5	**0 40**	14·4	13·9	13·6	13·5	13·9	14·7	15·7	16·7	17·5	17·9	17·9	17·7	17·2
13	2·3	**0 41**	29·5	28·5	27·8	27·6	28·2	29·3	30·7	32·1	33·2	33·7	33·7	33·2	32·4
14	2·2	**0 44**	26·0	25·6	25·3	25·2	25·6	26·3	27·2	28·1	28·9	29·3	29·3	29·1	28·7
15	4·3	**0 48**	14·5	14·1	13·7	13·7	14·0	14·8	15·7	16·7	17·4	17·8	17·9	17·7	17·3
16	3·6	**0 50**	09·3	08·3	07·5	07·3	07·9	09·0	10·5	11·9	13·1	13·7	13·7	13·2	12·4
17	4·4	**0 50**	45·7	45·1	44·6	44·5	44·9	45·7	46·8	47·9	48·8	49·3	49·3	49·1	48·6
18	1—4†	**0 57**	45·7	44·6	43·7	43·4	44·0	45·1	46·7	48·2	49·5	50·2	50·2	49·7	48·8
19	3·9	**0 57**	42·4	41·8	41·3	41·2	41·6	42·4	43·5	44·5	45·4	45·9	46·0	45·7	45·3
20	4·4	**0 59**	24·9	24·4	24·0	23·9	24·2	24·9	25·8	26·8	27·7	28·1	28·2	27·9	27·5
21	4·4	**1 03**	49·5	49·1	48·8	48·7	49·0	49·6	50·5	51·4	52·2	52·6	52·7	52·6	52·3
22	3·3	**1 06**	49·6	48·9	48·4	48·2	48·4	49·2	50·3	51·5	52·5	53·1	53·1	52·8	52·1
23	3·6	**1 09**	26·4	26·0	25·7	25·6	25·8	26·5	27·3	28·3	29·0	29·5	29·6	29·5	29·1
24	2·4	**1 10**	41·6	41·0	40·6	40·4	40·7	41·5	42·5	43·6	44·4	45·0	45·1	44·9	44·5
25	3·8	**1 24**	52·2	51·8	51·5	51·3	51·5	52·1	53·0	53·9	54·7	55·2	55·3	55·2	54·9
26	2·8	**1 26**	57·6	56·5	55·6	55·2	55·5	56·6	58·1	59·6	61·0	61·9	62·1	61·8	61·0
27	3·4	**1 29**	05·7	05·0	04·4	04·1	04·3	05·0	06·0	07·1	08·1	08·7	08·9	08·6	08·1
28	3·7	**1 32**	23·8	23·4	23·0	22·8	23·0	23·7	24·5	25·5	26·3	26·8	27·0	27·0	26·7
29	4·0	**1 31**	57·0	56·2	55·6	55·2	55·3	56·0	57·1	58·3	59·4	60·1	60·3	60·0	59·3
30	4·2	**1 37**	48·6	48·0	47·4	47·1	47·4	48·1	49·2	50·3	51·3	52·0	52·2	52·1	51·7
31	3·8	**1 39**	03·4	02·7	02·0	01·6	01·9	02·7	03·8	05·1	06·2	06·9	07·2	07·1	06·6
32 d	0·6	**1 38**	20·2	19·2	18·4	17·9	18·0	18·7	19·9	21·3	22·6	23·5	23·6	23·2	22·4
33	4·2	**1 44**	45·0	44·2	43·4	43·1	43·3	44·1	45·3	46·6	47·8	48·5	48·9	48·7	48·3
34	3·6	**1 44**	51·4	50·9	50·5	50·3	50·4	51·0	51·8	52·7	53·5	54·1	54·3	54·2	53·9
35	3·9	**1 52**	18·0	17·6	17·2	16·9	17·0	17·6	18·4	19·3	20·1	20·7	21·0	20·9	20·7
36	3·6	**1 54**	03·7	03·2	02·7	02·4	02·6	03·2	04·2	05·2	06·1	06·7	07·0	07·0	06·7
37	3·4	**1 55**	39·8	38·5	37·4	36·7	36·9	37·9	39·5	41·2	42·9	44·0	44·5	44·3	43·5
38	4·4	**1 54**	19·3	18·6	17·9	17·5	17·5	18·1	19·1	20·3	21·4	22·1	22·4	22·1	21·6
39	2·7	**1 55**	35·2	34·8	34·3	34·1	34·2	34·8	35·7	36·6	37·5	38·1	38·4	38·4	38·2
40	3·7	**1 56**	36·9	36·0	35·3	34·8	34·8	35·4	36·5	37·7	38·9	39·7	40·0	39·7	39·1
41	3·0	**1 59**	18·1	16·9	15·8	15·1	15·1	15·7	17·0	18·5	20·0	21·0	21·4	21·0	20·0
42	4·2	**2 00**	48·3	47·9	47·4	47·1	47·2	47·7	48·5	49·5	50·3	51·0	51·2	51·2	50·9
43	3·9	**2 02**	55·8	55·4	55·0	54·7	54·9	55·4	56·2	57·1	57·9	58·5	58·8	58·8	58·6
44	4·1	**2 04**	58·0	56·0	54·2	53·1	53·2	54·5	56·7	59·1	61·5	63·1	63·9	63·6	62·4
45	2·3	**2 04**	57·7	57·1	56·4	56·1	56·2	56·8	57·9	59·0	60·1	60·9	61·3	61·3	60·9
46	2·2	**2 08**	08·5	08·1	07·6	07·3	07·4	08·0	08·8	09·8	10·7	11·3	11·7	11·7	11·5
47	3·1	**2 10**	34·2	33·7	33·1	32·8	32·9	33·5	34·4	35·5	36·5	37·2	37·6	37·6	37·4
48	3·8	**2 17**	07·0	06·2	05·3	04·8	04·7	05·2	06·1	07·4	08·6	09·5	09·8	09·7	09·1
49	4·1	**2 18**	20·4	19·9	19·3	19·0	19·1	19·6	20·5	21·6	22·6	23·3	23·7	23·8	23·6
50	2—10*	**2 20**	12·6	12·2	11·7	11·4	11·5	12·0	12·7	13·6	14·5	15·1	15·5	15·5	15·3

The figures given refer to the beginning of the month, and should be interpolated to the actual date by means of the table on page 73.

No.		Name	Dec	Jan.	F.	M.	Apr.	M.	J.	July	A.	S.	Oct.	N.	D.	Jan.
			° ′	″	″	″	″	″	″	″	″	″	″	″	″	″
1	α	Andromedae	**N 29 10**	69	65	60	56	54	56	60	67	75	81	86	88	87
2	β	Cassiopeiae	**N 59 14**	51	47	39	31	25	23	26	33	42	53	61	67	68
3	ϵ	Phoenicis	**S 45 38**	92	90	84	76	67	58	52	51	53	59	67	72	74
4	γ	Pegasi	**N 15 16**	42	39	36	33	34	37	43	49	55	59	61	61	60
5	ι	Ceti	**S 8 43**	55	57	57	54	50	44	38	33	30	30	32	35	37
6	ζ	Tucanae	**S 64 46**	53	49	41	31	20	11	05	05	09	17	26	32	34
7	β	Hydri	**S 77 09**	56	51	42	31	20	11	06	06	12	21	30	36	37
8	κ	Phoenicis	**S 43 34**	87	86	81	73	64	55	48	46	48	54	61	67	69
9	α	Phoenicis	**S 42 12**	68	66	62	54	45	36	30	27	29	34	41	47	50
10	κ	Cassiopeiae	**N 63 01**	45	43	36	27	21	17	19	25	34	45	54	61	63
11	ζ	Cassiopeiae	**N 53 59**	37	34	27	20	14	12	14	20	29	39	47	53	55
12	δ	Andromedae	**N 30 57**	19	16	11	07	04	05	09	16	23	30	35	37	37
13	α	Cassiopeiae	**N 56 37**	61	59	52	45	38	36	38	44	53	62	71	77	79
14	β	Ceti	**S 17 53**	49	50	48	45	39	31	25	20	18	20	24	28	31
15	ζ	Andromedae	**N 24 21**	37	34	30	26	25	27	31	37	44	50	53	55	54
16	η	Cassiopeiae	**N 57 54**	30	28	21	14	07	04	06	11	20	30	39	45	47
17	ν	Andromedae	**N 41 10**	24	22	16	10	06	05	08	14	22	30	37	41	42
18†	γ	Cassiopeiae	**N 60 48**	43	41	35	27	20	17	18	23	31	41	51	58	61
19	μ	Andromedae	**N 38 35**	35	33	28	22	18	18	21	27	34	42	48	52	53
20	α	Sculptoris	**S 29 15**	73	74	71	66	58	50	42	38	38	41	46	52	56
21	ϵ	Piscium	**N 7 58**	49	47	45	44	46	50	55	61	66	69	69	69	67
22	β	Phoenicis	**S 46 37**	60	60	55	47	37	28	20	17	18	24	32	39	43
23	η	Ceti	**S 10 05**	43	45	45	43	38	31	25	20	17	17	19	23	26
24	β	Andromedae	**N 35 42**	43	40	36	31	27	27	30	35	43	50	56	59	60
25	θ	Ceti	**S 8 05**	55	57	57	55	51	45	39	33	30	30	32	35	38
26	δ	Cassiopeiae	**N 60 19**	34	33	28	21	13	09	09	14	21	31	40	47	51
27	γ	Phoenicis	**S 43 13**	74	75	71	64	54	45	37	33	33	38	45	53	57
28	η	Piscium	**N 15 25**	57	54	52	50	50	53	57	63	68	72	74	75	74
29	δ	Phoenicis	**S 48 58**	87	87	83	75	65	55	47	43	44	49	58	65	70
30	υ	Andromedae	**N 41 29**	30	28	24	19	14	12	14	19	25	33	40	44	46
31	51	Andromedae	**N 48 42**	57	56	52	46	40	37	38	42	49	58	65	71	74
32	*Achernar* (α Eri)		**S 57 08**	87	87	82	73	62	52	44	40	42	48	57	65	70
33	ϕ	Persei	**N 50 46**	33	33	28	22	16	13	13	17	24	33	41	47	50
34	τ	Ceti	**S 15 50**	68	69	69	66	60	53	46	40	37	38	42	46	50
35	ζ	Ceti	**S 10 14**	77	79	79	77	73	66	60	54	51	51	53	57	61
36	α	Trianguli	**N 29 39**	41	40	37	33	30	30	33	38	43	49	54	57	58
37	ϵ	Cassiopeiae	**N 63 44**	81	81	77	70	62	57	56	59	66	75	84	92	97
38	ψ	Phoenicis	**S 46 12**	94	94	91	84	74	64	56	51	51	56	64	72	77
39	β	Arietis	**N 20 53**	25	23	20	18	17	18	22	27	32	37	40	41	41
40	χ	Eridani	**S 51 31**	52	53	49	42	31	21	12	08	08	13	22	30	35
41	α	Hydri	**S 61 28**	100	100	96	87	76	65	57	53	54	60	69	78	83
42	υ	Ceti	**S 20 59**	61	63	62	58	52	44	37	31	29	30	35	40	45
43	α	Piscium	**N 2 50**	35	33	32	32	34	39	44	50	54	56	56	54	52
44	50	Cassiopeiae	**N 72 29**	80	81	77	70	62	55	53	55	61	70	80	90	96
45	γ	Andromedae	**N 42 24**	43	42	39	34	29	27	27	31	37	44	51	56	59
46	α	Arietis	**N 23 32**	31	29	27	24	22	23	26	31	36	41	45	46	47
47	β	Trianguli	**N 35 03**	64	63	60	55	52	51	52	56	62	68	74	78	80
48	ϕ	Eridani	**S 51 25**	85	87	84	77	67	56	47	42	42	46	55	63	69
49	γ	Trianguli	**N 33 55**	32	31	28	24	21	20	21	25	31	37	42	46	48
50*	ο	Ceti	**S 2 53**	74	76	77	76	73	68	62	56	53	51	53	56	59

† **18:** mag. 2·1 (2015)

* **50:** At maximum (mag. 2–5) in February.

No.	Mag.	RA	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
		h m	s	s	s	s	s	s	s	s	s	s	s	s	s
51	4·3	**2 21**	63·7	62·0	60·4	59·3	58·9	59·5	60·9	62·8	64·7	66·1	66·6	66·2	64·9
52	4·4	**2 27**	36·6	35·9	35·1	34·5	34·4	34·8	35·7	36·9	38·0	38·9	39·3	39·2	38·7
53	4·3	**2 29**	04·2	03·8	03·4	03·1	03·1	03·6	04·3	05·2	06·1	06·8	07·1	07·2	07·1
54	4·0	**2 40**	21·7	21·3	20·8	20·5	20·5	20·9	21·6	22·5	23·4	24·0	24·4	24·6	24·4
55	4·3	**2 39**	52·0	50·4	48·8	47·5	47·0	47·5	48·7	50·6	52·5	53·9	54·6	54·3	53·1
56	4·1	**2 41**	20·5	19·9	19·2	18·7	18·6	18·9	19·7	20·8	21·8	22·6	23·1	23·1	22·7
57	3·6	**2 44**	11·3	11·0	10·5	10·1	10·1	10·5	11·3	12·2	13·0	13·7	14·1	14·3	14·1
58	4·2	**2 45**	23·3	22·6	21·8	21·3	21·2	21·8	22·9	24·1	25·4	26·4	27·0	27·2	26·9
59	4·4	**2 44**	56·2	55·8	55·3	54·9	54·9	55·3	56·0	56·9	57·8	58·4	58·9	59·0	58·8
60	4·4	**2 45**	52·2	51·9	51·4	51·0	51·0	51·4	52·2	53·1	54·0	54·7	55·1	55·3	55·1
61	3·7	**2 50**	60·0	59·5	59·0	58·6	58·5	59·0	59·8	60·8	61·8	62·5	63·0	63·2	63·1
62	3·9	**2 51**	58·4	57·6	56·6	55·9	55·8	56·4	57·6	59·0	60·5	61·6	62·4	62·6	62·3
63	4·1	**2 55**	29·7	29·0	28·1	27·4	27·3	27·9	29·0	30·3	31·7	32·8	33·5	33·7	33·5
64	4·0	**2 57**	15·9	15·5	15·0	14·6	14·6	14·9	15·6	16·5	17·4	18·1	18·5	18·7	18·5
65	3·4	**2 58**	54·7	54·1	53·4	52·8	52·6	52·9	53·7	54·7	55·8	56·6	57·1	57·2	56·9
66	2·8	**3 03**	10·7	10·3	09·8	09·4	09·4	09·7	10·4	11·3	12·2	12·9	13·4	13·5	13·5
67	4·2	**3 03**	08·9	08·4	07·9	07·4	07·3	07·6	08·3	09·2	10·1	10·8	11·3	11·4	11·3
68	3·1	**3 06**	03·7	03·0	02·1	01·4	01·2	01·7	02·8	04·1	05·6	06·7	07·5	07·8	07·5
69	3·7	**3 06**	17·2	16·7	16·1	15·6	15·5	15·9	16·8	17·8	19·0	19·9	20·5	20·8	20·6
70	2—3	**3 09**	17·9	17·3	16·7	16·1	16·0	16·4	17·3	18·4	19·6	20·5	21·2	21·4	21·3
71	4·2	**3 10**	19·4	18·8	18·0	17·4	17·2	17·7	18·7	20·0	21·3	22·4	23·1	23·4	23·3
72	3·9	**3 12**	48·4	47·9	47·3	46·8	46·6	46·9	47·6	48·5	49·4	50·2	50·7	50·9	50·7
73	3·9	**3 20**	16·9	16·5	15·9	15·4	15·2	15·5	16·1	17·0	17·9	18·7	19·2	19·4	19·3
74	4·3	**3 20**	37·0	36·3	35·6	34·9	34·7	34·9	35·6	36·7	37·8	38·7	39·3	39·5	39·2
75	1·9	**3 25**	34·0	33·4	32·6	31·9	31·7	32·1	33·0	34·3	35·6	36·7	37·6	37·9	37·8
76	3·8	**3 25**	44·4	44·0	43·5	43·1	43·0	43·3	43·9	44·8	45·7	46·5	47·0	47·3	47·3
77	3·7	**3 28**	06·2	05·8	05·3	04·9	04·8	05·1	05·7	06·6	07·5	08·3	08·8	09·1	09·1
78	4·4	**3 30**	29·5	28·6	27·5	26·6	26·2	26·7	27·8	29·3	31·0	32·4	33·4	33·9	33·7
79	4·3	**3 31**	49·5	49·1	48·6	48·2	48·1	48·3	49·0	49·9	50·8	51·6	52·1	52·4	52·4
80	3·8	**3 33**	44·5	44·1	43·6	43·2	43·0	43·2	43·8	44·7	45·6	46·3	46·9	47·1	47·0
81	4·3	**3 34**	32·9	32·5	32·0	31·4	31·2	31·4	32·0	32·9	33·8	34·6	35·2	35·4	35·3
82	4·4	**3 37**	45·1	44·8	44·3	43·8	43·7	43·9	44·5	45·4	46·2	47·0	47·6	47·9	47·9
83	3·1	**3 44**	09·9	09·3	08·5	07·8	07·6	07·9	08·7	09·9	11·2	12·4	13·2	13·7	13·7
84	3·7	**3 44**	04·4	04·1	03·6	03·1	02·9	03·1	03·7	04·5	05·4	06·2	06·8	07·0	07·0
85	3·9	**3 45**	24·3	23·9	23·3	22·8	22·6	22·8	23·5	24·5	25·6	26·5	27·2	27·6	27·6
86	3·8	**3 45**	54·1	53·8	53·2	52·7	52·5	52·8	53·5	54·4	55·4	56·2	56·9	57·2	57·3
87	3·9	**3 46**	22·5	22·0	21·3	20·6	20·4	20·7	21·5	22·6	23·8	24·8	25·6	26·0	26·1
88	3·8	**3 44**	26·6	25·3	23·8	22·5	21·6	21·6	22·3	23·7	25·4	27·0	27·9	28·1	27·5
89	4·3	**3 47**	35·4	35·0	34·5	33·9	33·7	33·8	34·4	35·2	36·2	37·0	37·6	37·8	37·8
90	3·0	**3 48**	30·7	30·4	29·8	29·3	29·1	29·4	30·1	31·0	31·9	32·8	33·5	33·8	33·9
91	3·2	**3 46**	62·3	60·1	57·6	55·4	53·9	53·6	54·6	56·6	59·1	61·4	62·9	63·0	61·8
92	3·8	**3 50**	11·4	11·1	10·5	10·0	09·8	10·1	10·7	11·6	12·6	13·5	14·2	14·5	14·6
93	4·2	**3 50**	06·2	05·7	05·0	04·3	04·0	04·1	04·7	05·6	06·6	07·5	08·1	08·4	08·3
94	2·9	**3 55**	13·2	12·9	12·3	11·7	11·5	11·7	12·4	13·4	14·4	15·4	16·1	16·5	16·6
95	3·0	**3 58**	61·1	60·7	60·0	59·4	59·1	59·4	60·1	61·1	62·3	63·3	64·1	64·6	64·7
96	3·2	**3 58**	50·1	49·7	49·2	48·7	48·5	48·6	49·1	49·9	50·8	51·6	52·3	52·6	52·6
97	4·0	**4 00**	05·4	05·0	04·4	03·8	03·5	03·8	04·5	05·5	06·5	07·5	08·3	08·8	08·9
98	4·4	**3 58**	62·7	61·6	60·2	59·0	58·2	58·1	58·7	59·9	61·5	62·9	63·8	64·1	63·6
99	3·9	**4 01**	38·2	37·9	37·4	36·9	36·7	36·9	37·5	38·3	39·2	40·1	40·7	41·1	41·2
100	3·9	**4 04**	04·5	04·2	03·7	03·2	03·0	03·2	03·7	04·5	05·4	06·2	06·9	07·2	07·3

The figures given refer to the beginning of the month, and should be interpolated to the actual date by means of the table on page 73.

No.		Name	Dec	Jan.	F.	M.	Apr.	M.	J.	July	A.	S.	Oct.	N.	D.	Jan.
			° ′	″	″	″	″	″	″	″	″	″	″	″	″	″
51	δ	Hydri	**S 68 34**	82	83	78	70	59	48	39	34	35	41	50	60	66
52	κ	Eridani	**S 47 37**	63	65	63	56	47	36	27	22	21	25	33	41	48
53	ξ^2	Ceti	**N 8 31**	61	59	58	57	58	61	66	71	76	78	79	78	77
54	δ	Ceti	**N 0 23**	54	52	51	52	54	59	64	70	74	75	75	72	69
55	ϵ	Hydri	**S 68 11**	65	66	63	55	45	33	24	19	19	24	33	43	50
56	ι	Eridani	**S 39 46**	80	83	81	76	67	58	48	42	41	44	51	59	65
57	γ	Ceti	**N 3 18**	15	14	12	12	14	18	23	29	33	35	34	32	30
58	θ	Persei	**N 49 17**	62	63	60	55	50	46	45	47	52	58	65	72	76
59	π	Ceti	**S 13 47**	28	31	31	29	24	17	10	04	01	01	04	09	14
60	μ	Ceti	**N 10 10**	60	58	57	56	57	59	64	69	73	76	77	76	74
61	41	Arietis	**N 27 19**	45	45	43	40	38	37	39	43	47	52	56	58	59
62	η	Persei	**N 55 57**	59	61	58	53	47	42	39	41	45	52	60	68	73
63	τ	Persei	**N 52 49**	56	57	55	50	44	40	38	39	44	50	58	65	70
64	η	Eridani	**S 8 49**	65	68	68	67	63	57	50	45	41	41	43	47	51
65*	θ	Eridani	**S 40 13**	94	97	96	91	83	73	64	57	55	58	65	73	80
66	α	Ceti	**N 4 09**	11	09	08	08	10	13	18	23	27	29	29	27	25
67	τ^3	Eridani	**S 23 33**	47	51	50	47	41	33	25	19	16	17	21	28	34
68	γ	Persei	**N 53 34**	22	24	23	18	12	07	05	06	10	16	24	31	36
69	ρ	Persei	**N 38 54**	19	20	18	14	10	08	07	10	14	19	25	29	32
70	*Algol* (β Persei)		**N 41 01**	13	14	12	09	04	01	01	03	07	12	18	23	26
71	ι	Persei	**N 49 40**	40	42	40	35	30	26	24	25	29	35	42	48	53
72	α	Fornacis	**S 28 55**	35	39	38	35	28	19	11	04	01	02	08	15	21
73	16	Eridani	**S 21 41**	64	68	68	66	60	52	44	38	34	35	39	46	51
74	BS 1008 (Eridani)		**S 43 00**	41	45	44	39	31	21	11	04	01	04	11	20	27
75	α	Persei	**N 49 55**	15	18	16	12	07	02	00	01	04	10	16	23	28
76	o	Tauri	**N 9 05**	08	06	05	04	05	08	12	16	20	23	23	22	20
77	ξ	Tauri	**N 9 47**	20	18	17	16	17	19	23	28	32	34	35	34	32
78	BS 1035 (Cam)		**N 59 59**	56	60	59	55	48	42	38	38	41	47	54	62	69
79	5	Tauri	**N 12 59**	31	30	29	28	28	30	33	37	41	44	45	44	43
80	ϵ	Eridani	**S 9 23**	79	82	83	81	78	72	65	59	56	55	58	62	67
81	τ^5	Eridani	**S 21 34**	52	56	56	54	49	41	33	26	23	23	28	34	40
82	10	Tauri	**N 0 27**	06	04	03	03	05	09	14	19	23	25	24	21	18
83	δ	Persei	**N 47 50**	26	28	28	24	19	15	13	13	16	21	27	32	37
84	δ	Eridani	**S 9 42**	38	41	42	40	37	31	24	18	14	14	16	21	25
85	o	Persei	**N 32 20**	24	25	24	22	19	17	17	19	23	27	30	33	36
86	17	Tauri	**N 24 09**	51	52	50	49	47	47	48	51	55	58	60	62	63
87	ν	Persei	**N 42 37**	51	53	52	49	45	41	40	40	43	48	53	58	62
88	β	Reticuli	**S 64 44**	96	100	100	95	85	74	64	57	54	57	65	75	84
89	τ^6	Eridani	**S 23 11**	77	81	82	80	75	67	59	52	48	49	53	60	67
90	η	Tauri	**N 24 09**	19	19	18	16	14	14	16	18	22	25	27	29	30
91	γ	Hydri	**S 74 10**	95	99	98	93	83	72	62	55	52	56	64	74	83
92	27	Tauri	**N 24 06**	10	10	09	08	06	06	07	10	13	17	19	20	21
93	BS 1195 (Eridani)		**S 36 08**	77	82	82	79	72	63	53	46	42	44	50	58	66
94	ζ	Persei	**N 31 55**	55	56	55	53	50	49	49	50	53	57	60	63	66
95	ϵ	Persei	**N 40 03**	27	29	29	26	22	19	18	18	21	25	29	34	37
96	γ	Eridani	**S 13 27**	54	57	59	57	53	47	40	34	30	30	33	38	43
97	ξ	Persei	**N 35 50**	16	18	17	15	12	09	08	10	12	16	20	24	27
98	δ	Reticuli	**S 61 20**	91	96	96	91	83	72	62	54	50	53	61	71	80
99	λ	Tauri	**N 12 32**	06	05	04	03	03	05	08	12	16	18	18	18	17
100	ν	Tauri	**N 6 01**	58	56	55	55	56	59	63	67	71	73	72	70	68

* No., mag., dist. and p.a. of companion star: **65**, 4·4, 8″, 91°

No.	Mag.	RA	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
		h m	s	s	s	s	s	s	s	s	s	s	s	s	s
101	4·3	**4 07**	53·0	52·5	51·6	50·8	50·5	50·7	51·5	52·7	54·0	55·3	56·3	56·8	56·9
102	4·0	**4 09**	55·5	55·1	54·3	53·5	53·2	53·4	54·2	55·3	56·6	57·8	58·7	59·3	59·4
103	4·1	**4 12**	42·5	42·2	41·7	41·2	41·0	41·1	41·6	42·4	43·2	44·1	44·7	45·1	45·2
104	4·3	**4 16**	10·6	10·1	09·3	08·6	08·2	08·4	09·1	10·2	11·5	12·8	13·8	14·4	14·5
105	3·8	**4 14**	35·0	34·4	33·6	32·9	32·4	32·4	32·9	33·7	34·8	35·8	36·6	36·9	36·8
106	3·4	**4 14**	40·7	39·6	38·2	36·8	35·9	35·7	36·2	37·4	39·0	40·5	41·5	41·9	41·5
107	4·3	**4 16**	28·3	28·1	27·6	27·1	26·8	27·0	27·5	28·3	29·2	30·0	30·7	31·1	31·2
108	4·4	**4 16**	29·7	29·0	28·0	27·0	26·4	26·3	26·8	27·8	29·0	30·1	31·0	31·4	31·2
109	3·6	**4 18**	33·2	32·8	32·1	31·4	31·0	31·0	31·5	32·3	33·3	34·2	34·9	35·3	35·3
110	3·9	**4 20**	46·6	46·3	45·8	45·3	45·1	45·2	45·8	46·6	47·5	48·4	49·1	49·5	49·7
111	3·9	**4 23**	55·9	55·6	55·1	54·6	54·3	54·5	55·0	55·8	56·8	57·7	58·4	58·8	59·0
112	4·1	**4 24**	41·5	41·1	40·4	39·7	39·3	39·3	39·8	40·6	41·5	42·5	43·2	43·6	43·6
113	3·6	**4 29**	37·6	37·3	36·8	36·3	36·0	36·1	36·7	37·5	38·4	39·3	40·0	40·5	40·7
114	3·6	**4 29**	38·9	38·7	38·2	37·7	37·4	37·5	38·0	38·8	39·8	40·6	41·4	41·8	42·0
115	3·5	**4 34**	23·5	22·8	21·7	20·6	19·8	19·6	20·0	21·0	22·3	23·5	24·5	24·9	24·8
116 d	1·1	**4 36**	54·7	54·5	54·0	53·5	53·2	53·3	53·8	54·6	55·5	56·4	57·1	57·6	57·8
117	3·9	**4 36**	13·7	13·3	12·7	12·0	11·6	11·6	12·0	12·7	13·7	14·6	15·3	15·8	15·8
118	4·1	**4 37**	11·0	10·7	10·2	09·7	09·4	09·5	09·9	10·7	11·5	12·4	13·1	13·5	13·7
119	4·0	**4 38**	58·4	58·1	57·6	57·1	56·7	56·8	57·2	57·9	58·8	59·6	60·3	60·8	60·9
120	4·3	**4 43**	17·0	16·8	16·3	15·7	15·4	15·5	16·0	16·8	17·7	18·7	19·4	20·0	20·2
121	4·2	**4 46**	22·1	21·8	21·3	20·8	20·5	20·5	21·0	21·7	22·5	23·4	24·1	24·6	24·7
122	3·3	**4 50**	46·7	46·5	46·0	45·5	45·2	45·3	45·7	46·4	47·3	48·2	48·9	49·4	49·6
123	3·8	**4 52**	07·6	07·4	07·0	06·4	06·1	06·1	06·6	07·3	08·2	09·0	09·8	10·3	10·5
124	4·4	**4 55**	47·8	47·2	45·8	44·4	43·5	43·4	44·3	45·8	47·8	49·9	51·6	52·8	53·1
125	3·9	**4 55**	09·2	09·0	08·5	08·0	07·6	07·7	08·1	08·8	09·6	10·5	11·2	11·7	12·0
126	2·9	**4 58**	07·3	07·1	06·5	05·9	05·5	05·6	06·1	06·9	07·9	09·0	09·9	10·5	10·8
127	3·4	**5 03**	12·9	12·6	12·0	11·2	10·7	10·8	11·3	12·2	13·4	14·6	15·6	16·4	16·7
128	3·9	**5 03**	41·4	41·2	40·6	39·9	39·4	39·4	40·0	40·9	42·0	43·1	44·1	44·9	45·2
129	4·2	**5 04**	58·4	57·9	56·9	55·8	55·0	54·9	55·6	56·9	58·5	60·2	61·7	62·7	63·1
130	3·3	**5 06**	11·9	11·6	11·1	10·5	10·0	09·9	10·3	10·9	11·8	12·7	13·5	14·0	14·2
131	3·3	**5 07**	43·9	43·7	43·0	42·3	41·9	41·9	42·4	43·3	44·4	45·5	46·5	47·3	47·6
132	2·9	**5 08**	42·1	41·9	41·4	40·9	40·5	40·5	40·9	41·5	42·4	43·2	44·0	44·5	44·7
133	4·3	**5 09**	58·6	58·4	57·9	57·3	56·9	56·9	57·3	57·9	58·7	59·6	60·4	60·9	61·1
134	3·3	**5 13**	42·7	42·5	42·0	41·4	41·0	40·9	41·3	41·9	42·7	43·6	44·4	44·9	45·2
135 d	0·3	**5 15**	22·3	22·1	21·6	21·1	20·7	20·6	21·0	21·6	22·4	23·3	24·0	24·6	24·9
136 d	0·2	**5 17**	58·3	58·1	57·4	56·6	56·1	56·0	56·5	57·5	58·7	59·9	61·0	61·8	62·2
137	3·7	**5 18**	26·9	26·7	26·3	25·7	25·3	25·3	25·6	26·2	27·1	27·9	28·7	29·2	29·5
138	4·3	**5 20**	22·5	22·4	21·9	21·3	20·9	20·8	21·1	21·7	22·5	23·4	24·2	24·8	25·0
139	3·4	**5 25**	20·9	20·7	20·3	19·7	19·3	19·3	19·6	20·2	21·1	21·9	22·7	23·3	23·6
140	1·7	**5 26**	03·5	03·4	03·0	02·4	02·1	02·0	02·4	03·0	03·8	04·7	05·5	06·1	06·4
141	1·8	**5 27**	23·1	23·0	22·5	21·9	21·5	21·5	21·8	22·6	23·5	24·5	25·4	26·2	26·5
142	3·0	**5 28**	59·5	59·3	58·8	58·2	57·7	57·6	57·9	58·5	59·3	60·2	61·0	61·6	61·8
143	3·9	**5 31**	50·3	50·0	49·4	48·7	48·1	47·8	48·0	48·7	49·5	50·5	51·4	52·0	52·2
144	2·5	**5 32**	53·5	53·4	52·9	52·4	52·0	51·9	52·2	52·8	53·6	54·5	55·3	55·9	56·2
145	2·7	**5 33**	29·9	29·7	29·2	28·6	28·2	28·0	28·3	28·9	29·7	30·6	31·4	32·0	32·3
146	3·8	**5 33**	49·2	48·4	47·1	45·6	44·3	43·7	43·7	44·5	45·8	47·4	48·8	49·6	49·7
147	3·7	**5 36**	05·4	05·4	04·9	04·4	04·0	03·9	04·2	04·9	05·7	06·6	07·4	08·1	08·4
148	2·9	**5 36**	16·9	16·8	16·3	15·8	15·3	15·3	15·5	16·1	16·9	17·8	18·6	19·2	19·5
149	1·7	**5 37**	05·6	05·5	05·0	04·5	04·1	04·0	04·3	04·9	05·7	06·5	07·3	08·0	08·3
150	3·0	**5 38**	40·7	40·6	40·2	39·6	39·2	39·1	39·5	40·1	41·0	41·9	42·8	43·5	43·9

The figures given refer to the beginning of the month, and should be interpolated to the actual date by means of the table on page 73.

No.		Name	Dec	Jan.	F.	M.	Apr.	M.	J.	July	A.	S.	Oct.	N.	D.	Jan.
			° ′	″	″	″	″	″	″	″	″	″	″	″	″	″
101	λ	Persei	**N 50 23**	44	48	48	45	40	35	32	31	33	37	43	49	54
102	48	Persei	**N 47 45**	22	25	25	22	18	13	11	10	12	16	21	26	31
103	o^1	Eridani	**S 6 47**	52	55	56	56	53	48	41	36	32	31	33	37	42
104	μ	Persei	**N 48 26**	62	65	66	63	59	54	51	50	52	56	61	66	71
105	α	Horologii	**S 42 14**	90	96	97	94	87	78	68	60	56	57	63	72	81
106	α	Reticuli	**S 62 25**	74	80	81	77	69	58	48	39	36	38	45	55	65
107	μ	Tauri	**N 8 55**	53	51	50	50	50	53	56	60	64	66	65	64	62
108	γ	Doradus	**S 51 26**	59	65	66	63	55	45	35	26	23	24	31	40	50
109	υ^4	Eridani	**S 33 45**	45	50	52	49	43	35	25	18	13	14	19	27	36
110	γ	Tauri	**N 15 39**	55	54	54	53	53	54	56	59	62	65	65	65	64
111	δ	Tauri	**N 17 34**	45	44	43	43	42	43	45	48	51	53	54	54	53
112	43	Eridani	**S 33 58**	58	64	66	63	57	49	40	32	27	28	33	41	49
113	ϵ	Tauri	**N 19 12**	53	53	53	52	51	51	53	56	58	61	62	62	62
114	θ^2	Tauri	**N 15 54**	18	18	17	16	16	17	19	22	25	27	28	28	27
115	α	Doradus	**S 55 00**	56	63	64	61	54	44	34	25	20	22	28	38	48
116	*Aldebaran* (α Tau)		**N 16 32**	24	23	23	22	22	23	25	27	30	32	33	32	32
117	υ^2	Eridani	**S 30 31**	58	64	66	64	59	51	42	34	30	30	34	42	50
118	ν	Eridani	**S 3 19**	19	22	24	23	21	17	12	06	03	02	03	07	11
119	53	Eridani	**S 14 16**	32	37	38	37	34	28	21	15	11	10	13	19	25
120	τ	Tauri	**N 22 59**	10	11	10	10	08	08	09	11	13	15	17	17	18
121	μ	Eridani	**S 3 13**	40	43	45	45	42	38	33	28	24	23	25	29	33
122	π^3	Orionis	**N 6 59**	13	11	10	10	11	13	17	21	24	25	25	23	20
123	π^4	Orionis	**N 5 37**	49	46	45	45	46	49	53	57	60	61	61	58	55
124	α	Camelopardalis	**N 66 21**	67	74	76	75	69	62	56	52	51	53	59	66	74
125	π^5	Orionis	**N 2 27**	52	49	48	48	49	53	57	61	65	66	65	62	58
126	ι	Aurigae	**N 33 11**	23	25	26	25	23	21	20	20	21	23	25	27	30
127	ϵ	Aurigae	**N 43 50**	44	47	49	47	44	41	38	36	36	38	41	45	50
128	ζ	Aurigae	**N 41 05**	51	54	56	55	52	48	46	45	45	47	50	54	57
129	β	Camelopardalis	**N 60 27**	51	57	59	58	53	47	42	38	37	39	43	50	57
130	ϵ	Leporis	**S 22 20**	71	77	79	78	74	68	60	53	48	47	51	58	65
131	η	Aurigae	**N 41 15**	16	19	20	19	16	13	10	09	09	11	14	17	21
132	β	Eridani	**S 5 03**	68	71	73	73	71	66	61	56	52	51	53	57	62
133	λ	Eridani	**S 8 43**	72	76	78	78	75	71	65	59	55	54	56	61	67
134	μ	Leporis	**S 16 11**	24	29	31	31	28	22	15	08	04	03	06	12	19
135	*Rigel* (β Ori)		**S 8 10**	71	75	77	77	75	70	64	58	54	53	56	61	66
136	*Capella* (α Aur)		**N 46 00**	43	47	49	48	45	41	38	35	35	36	39	43	48
137	τ	Orionis	**S 6 49**	50	54	55	55	53	49	43	37	34	33	35	39	45
138	λ	Leporis	**S 13 09**	50	54	57	56	54	48	42	35	31	30	33	39	45
139	η	Orionis	**S 2 22**	69	72	74	74	72	68	64	59	55	54	56	60	64
140	*Bellatrix* (γ Ori)		**N 6 21**	40	38	36	36	37	40	43	47	49	51	50	47	44
141	β	Tauri	**N 28 37**	05	07	08	07	06	05	04	04	05	06	07	08	09
142	β	Leporis	**S 20 44**	62	68	70	70	67	61	53	46	41	40	44	50	58
143	ϵ	Columbae	**S 35 27**	46	53	57	57	52	45	36	27	21	21	25	33	42
144	δ	Orionis	**S 0 17**	27	30	31	31	30	26	22	17	14	13	15	19	23
145	α	Leporis	**S 17 48**	53	58	61	61	58	52	45	38	34	33	36	42	49
146	β	Doradus	**S 62 28**	59	68	72	71	66	57	46	37	31	30	35	44	55
147*	λ	Orionis	**N 9 56**	29	28	27	27	28	29	32	35	37	38	37	35	33
148	ι	Orionis	**S 5 53**	71	75	77	77	75	71	66	60	57	56	58	62	67
149	ϵ	Orionis	**S 1 11**	43	46	48	48	47	43	38	34	30	30	31	35	40
150	ζ	Tauri	**N 21 08**	57	57	57	57	56	56	57	58	60	60	61	60	60

* No., mag., dist. and p.a. of companion star: **147**, 5·6, 4″, 44°

No.	Mag.	RA	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
		h m	s	s	s	s	s	s	s	s	s	s	s	s	s
151	3·8	**5 39**	37·0	36·9	36·4	35·9	35·5	35·4	35·7	36·2	37·0	37·9	38·7	39·3	39·7
152	2·7	**5 40**	17·2	17·0	16·4	15·6	15·0	14·8	15·0	15·6	16·4	17·4	18·3	18·9	19·2
153	2·0	**5 41**	38·0	37·9	37·5	36·9	36·5	36·4	36·7	37·3	38·1	38·9	39·7	40·4	40·7
154	3·8	**5 45**	11·5	11·3	10·8	10·2	09·6	09·5	09·7	10·2	11·1	11·9	12·8	13·4	13·7
155	3·7	**5 47**	44·6	44·5	44·1	43·5	43·0	42·9	43·1	43·6	44·4	45·3	46·1	46·7	47·1
156	2·2	**5 48**	34·8	34·7	34·3	33·7	33·2	33·1	33·4	33·9	34·7	35·6	36·4	37·0	37·4
157	3·9	**5 47**	43·2	42·8	41·9	40·9	40·0	39·5	39·6	40·2	41·3	42·4	43·5	44·3	44·5
158	4·4	**5 50**	10·5	10·0	09·0	07·8	06·7	06·2	06·2	06·8	07·9	09·3	10·5	11·3	11·5
159	4·2	**5 52**	41·4	41·3	40·8	40·1	39·6	39·4	39·8	40·5	41·5	42·7	43·7	44·6	45·1
160	3·2	**5 51**	35·0	34·8	34·1	33·4	32·8	32·5	32·6	33·2	34·0	35·0	35·9	36·6	36·9
161	3·9	**5 52**	04·3	04·2	03·7	03·1	02·6	02·4	02·6	03·1	03·9	04·8	05·6	06·3	06·6
162 d	0—1	**5 56**	06·5	06·5	06·1	05·5	05·1	05·0	05·2	05·8	06·6	07·5	08·3	09·0	09·4
163	3·8	**5 57**	11·8	11·7	11·3	10·7	10·2	10·1	10·3	10·8	11·6	12·4	13·3	13·9	14·3
164	4·4	**5 58**	09·8	09·6	09·0	08·3	07·6	07·3	07·4	08·0	08·8	09·8	10·7	11·4	11·7
165	3·9	**6 00**	57·4	57·3	56·6	55·6	54·8	54·6	54·9	55·8	57·1	58·6	60·0	61·1	61·8
166	2·1	**6 00**	47·9	47·9	47·3	46·6	45·9	45·8	46·1	46·8	47·9	49·2	50·3	51·3	51·9
167	2·7	**6 00**	54·0	54·0	53·5	52·8	52·3	52·2	52·5	53·2	54·1	55·2	56·3	57·2	57·7
168	4·0	**5 59**	41·7	41·4	40·7	39·9	39·1	38·7	38·8	39·4	40·3	41·3	42·3	43·0	43·3
169	4·3	**6 05**	10·3	10·3	09·9	09·3	08·9	08·7	09·0	09·6	10·4	11·4	12·3	13·1	13·6
170	4·4	**6 08**	33·6	33·6	33·2	32·6	32·2	32·0	32·3	32·8	33·6	34·5	35·4	36·2	36·6
171	3—4	**6 15**	55·2	55·3	54·9	54·3	53·8	53·7	53·9	54·5	55·3	56·3	57·2	58·0	58·5
172	4·4	**6 16**	28·7	28·8	28·4	27·8	27·3	27·1	27·3	27·9	28·8	29·8	30·8	31·6	32·2
173	4·4	**6 21**	09·2	09·2	08·5	07·4	06·4	06·0	06·3	07·2	08·6	10·2	11·8	13·1	14·0
174	3·1	**6 20**	59·3	59·2	58·7	58·0	57·4	57·1	57·2	57·6	58·4	59·3	60·2	61·0	61·4
175	4·0	**6 22**	45·6	45·4	44·9	44·2	43·5	43·2	43·3	43·7	44·5	45·4	46·4	47·1	47·5
176	3·2	**6 23**	60·3	60·4	60·0	59·5	59·0	58·8	59·0	59·5	60·4	61·3	62·2	63·0	63·6
177	2·0	**6 23**	28·1	28·0	27·6	27·0	26·5	26·3	26·4	26·8	27·5	28·4	29·3	30·0	30·4
178	4·5	**6 24**	41·1	41·2	40·8	40·3	39·8	39·6	39·8	40·3	41·0	41·9	42·7	43·5	44·0
179 d	−0·9	**6 24**	22·0	21·7	20·8	19·8	18·8	18·1	18·1	18·5	19·5	20·6	21·8	22·8	23·1
180	4·1	**6 29**	59·3	59·4	59·1	58·5	58·0	57·8	58·0	58·5	59·3	60·2	61·2	62·0	62·5
181	1·9	**6 38**	42·5	42·6	42·3	41·8	41·3	41·1	41·2	41·7	42·5	43·3	44·3	45·1	45·6
182	3·2	**6 38**	18·7	18·5	17·9	17·1	16·3	15·8	15·7	16·1	16·9	17·9	19·0	19·8	20·3
183	3·2	**6 44**	59·6	59·8	59·4	58·9	58·3	58·1	58·3	58·8	59·5	60·5	61·5	62·3	62·9
184	3·4	**6 46**	15·5	15·7	15·4	14·8	14·3	14·1	14·3	14·7	15·4	16·3	17·2	18·0	18·6
185 d	−1·6	**6 45**	55·0	55·0	54·6	54·1	53·5	53·2	53·3	53·7	54·4	55·2	56·1	56·9	57·3
186	3·3	**6 48**	25·0	24·6	23·6	22·2	20·8	19·8	19·4	19·8	20·8	22·2	23·8	25·0	25·5
187	3·8	**6 50**	30·0	30·0	29·6	28·9	28·2	27·8	27·8	28·1	28·8	29·7	30·7	31·5	32·0
188	2·8	**6 50**	23·6	23·5	22·8	21·8	20·8	20·2	20·0	20·3	21·2	22·3	23·5	24·4	24·9
189	3·6	**6 53**	55·5	55·7	55·4	54·8	54·2	53·9	54·0	54·5	55·4	56·4	57·4	58·4	59·1
190	4·2	**6 54**	59·9	60·0	59·6	59·1	58·6	58·3	58·3	58·7	59·4	60·2	61·1	61·8	62·4
191	1·6	**6 59**	19·0	19·1	18·6	18·0	17·4	17·0	17·0	17·3	18·0	18·8	19·8	20·6	21·1
192	3·7	**7 02**	25·1	25·2	24·8	24·2	23·5	23·2	23·1	23·5	24·1	25·0	25·9	26·7	27·3
193	3·1	**7 03**	45·3	45·4	45·1	44·5	43·9	43·5	43·5	43·8	44·5	45·3	46·2	47·0	47·6
194	3·9	**7 05**	07·9	08·1	07·8	07·3	06·8	06·5	06·6	07·0	07·7	08·6	09·6	10·5	11·1
195	4·1	**7 04**	32·8	32·9	32·6	32·0	31·5	31·2	31·2	31·5	32·1	33·0	33·8	34·6	35·2
196	2·0	**7 09**	06·3	06·4	06·0	05·4	04·8	04·4	04·3	04·7	05·3	06·1	07·1	07·9	08·4
197	3·9	**7 08**	40·6	40·1	38·7	36·7	34·6	33·0	32·2	32·4	33·6	35·5	37·6	39·3	40·0
198	4·1	**7 12**	44·9	45·1	44·8	44·3	43·8	43·6	43·6	43·9	44·6	45·4	46·2	47·1	47·7
199	4·5	**7 13**	04·7	04·7	04·1	03·3	02·4	01·7	01·5	01·8	02·5	03·5	04·6	05·6	06·2
200	3·8	**7 15**	31·4	31·5	31·1	30·5	29·9	29·5	29·4	29·7	30·3	31·2	32·1	32·9	33·5

The figures given refer to the beginning of the month, and should be interpolated to the actual date by means of the table on page 73.

No.		Name	Dec	Jan.	F.	M.	Apr.	M.	J.	July	A.	S.	Oct.	N.	D.	Jan.
			° ′	″	″	″	″	″	″	″	″	″	″	″	″	″
151	σ	Orionis	**S 2 35**	40	44	46	46	44	40	35	31	27	26	28	32	37
152	α	Columbae	**S 34 03**	71	78	82	82	78	70	62	53	47	46	50	58	67
153	ζ^1	Orionis	**S 1 56**	16	20	21	21	20	16	12	07	03	03	04	08	13
154	γ	Leporis	**S 22 26**	50	57	60	60	57	51	43	36	31	30	33	40	48
155	ζ	Leporis	**S 14 48**	72	77	80	80	78	72	66	59	55	54	57	62	69
156	κ	Orionis	**S 9 39**	64	69	71	72	69	65	59	53	49	48	51	56	62
157	β	Pictoris	**S 51 03**	53	62	66	66	62	54	43	34	27	26	31	40	50
158	γ	Pictoris	**S 56 09**	60	69	73	74	69	61	50	41	34	33	37	46	57
159	ν	Aurigae	**N 39 08**	59	62	64	64	62	60	57	55	54	54	56	58	61
160	β	Columbae	**S 35 45**	59	66	71	71	67	60	51	42	36	35	39	47	56
161	δ	Leporis	**S 20 52**	55	62	65	65	62	57	49	42	37	36	39	46	54
162		*Betelgeuse* (α Ori)	**N 7 24**	22	20	19	19	20	22	25	28	30	31	30	27	24
163	η	Leporis	**S 14 09**	68	73	76	76	74	69	63	56	52	51	53	59	66
164	γ	Columbae	**S 35 16**	69	76	81	81	78	71	62	53	47	46	49	57	67
165	δ	Aurigae	**N 54 16**	55	61	64	65	62	57	52	48	45	45	47	51	56
166	β	Aurigae	**N 44 56**	43	47	50	50	48	45	41	38	36	36	38	40	44
167	θ	Aurigae	**N 37 12**	35	38	40	41	39	37	35	33	32	32	33	34	37
168	η	Columbae	**S 42 48**	66	75	79	80	76	69	59	50	44	42	46	54	64
169	1	Geminorum	**N 23 15**	30	31	32	32	31	31	31	32	32	32	32	32	31
170	ν	Orionis	**N 14 45**	44	44	43	43	44	45	46	48	50	50	49	47	45
171	η	Geminorum	**N 22 29**	52	52	53	53	53	53	53	54	54	54	54	53	52
172	κ	Aurigae	**N 29 29**	16	18	19	19	19	18	17	16	15	15	15	15	16
173	2	Lyncis	**N 58 59**	61	68	73	74	72	67	61	55	51	50	51	55	61
174	ζ	Canis Majoris	**S 30 04**	29	37	42	43	40	34	26	18	12	10	13	20	29
175	δ	Columbae	**S 33 26**	56	64	69	70	67	61	53	44	38	36	39	47	56
176	μ	Geminorum	**N 22 30**	03	03	04	04	04	04	04	05	05	05	04	03	02
177	β	Canis Majoris	**S 17 57**	66	72	76	77	75	70	63	56	51	50	53	59	66
178	ϵ	Monocerotis	**N 4 34**	48	46	44	44	45	48	51	54	57	57	56	52	48
179		*Canopus* (α Car)	**S 52 42**	30	40	46	47	44	37	27	17	10	08	11	20	30
180	ν	Geminorum	**N 20 11**	50	50	51	51	51	51	52	53	53	53	52	50	49
181	γ	Geminorum	**N 16 22**	50	49	49	50	50	51	52	53	54	54	52	50	48
182	ν	Puppis	**S 43 12**	51	60	66	68	66	59	50	41	34	31	34	42	52
183	ϵ	Geminorum	**N 25 06**	36	37	38	39	39	39	39	38	38	37	36	35	34
184	ξ	Geminorum	**N 12 52**	23	22	22	22	23	24	25	27	28	28	26	24	21
185		*Sirius* (α CMa)	**S 16 44**	36	42	46	47	45	41	35	29	24	23	25	31	39
186	α	Pictoris	**S 61 57**	44	55	62	64	62	56	46	36	28	24	27	35	46
187	κ	Canis Majoris	**S 32 31**	53	62	67	69	67	62	54	45	39	36	39	46	55
188	τ	Puppis	**S 50 37**	76	86	92	95	93	87	77	68	60	57	59	67	78
189	θ	Geminorum	**N 33 56**	11	13	16	17	17	16	14	12	10	08	07	07	08
190	θ	Canis Majoris	**S 12 03**	49	55	58	59	58	54	48	43	38	37	39	45	51
191	ϵ	Canis Majoris	**S 28 59**	54	63	68	70	68	63	56	48	42	39	42	48	57
192	σ	Canis Majoris	**S 27 57**	45	53	58	60	59	53	46	38	32	30	32	39	48
193	o^2	Canis Majoris	**S 23 51**	41	49	54	55	54	49	42	35	29	27	30	36	44
194	ζ	Geminorum	**N 20 32**	28	28	29	30	30	30	31	31	31	30	28	26	25
195	γ	Canis Majoris	**S 15 39**	43	49	53	55	53	49	43	37	32	31	33	39	46
196	δ	Canis Majoris	**S 26 25**	24	32	37	39	38	33	26	19	13	10	12	19	28
197*	γ^2	Volantis	**S 70 31**	40	51	59	63	62	56	47	37	28	24	26	33	44
198	δ	Monocerotis	**S 0 31**	29	33	35	35	34	32	28	24	22	21	23	28	33
199	I	Puppis	**S 46 47**	24	35	42	45	44	38	29	20	12	09	11	18	28
200	ω	Canis Majoris	**S 26 48**	19	27	32	34	33	29	22	14	08	05	08	14	23

* No., mag., dist. and p.a. of companion star: **197**, 5·8, 14″, 296°

No.	Mag.	RA	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
		h m	s	s	s	s	s	s	s	s	s	s	s	s	s
201	2·7	**7 17**	46·2	46·3	45·8	45·1	44·4	43·9	43·8	44·0	44·7	45·5	46·6	47·5	48·1
202	3·6	**7 19**	05·1	05·3	05·0	04·5	04·0	03·8	03·8	04·2	04·8	05·7	06·6	07·5	08·1
203	4·0	**7 16**	53·2	52·9	51·7	50·0	48·2	46·7	46·0	46·1	47·2	48·8	50·7	52·3	53·1
204	3·5	**7 21**	09·1	09·4	09·1	08·6	08·1	07·8	07·9	08·2	08·9	09·8	10·7	11·7	12·4
205	2·4	**7 24**	47·4	47·6	47·2	46·6	46·0	45·5	45·4	45·7	46·3	47·1	48·1	48·9	49·5
206	3·9	**7 26**	47·8	48·0	47·8	47·3	46·7	46·4	46·4	46·8	47·5	48·4	49·4	50·4	51·1
207	3·1	**7 28**	05·2	05·5	05·3	04·8	04·3	04·0	04·0	04·3	04·9	05·7	06·6	07·5	08·1
208	4·2	**7 30**	13·1	13·4	13·2	12·7	12·1	11·7	11·8	12·1	12·9	13·8	14·8	15·8	16·6
209	3·3	**7 29**	48·0	48·1	47·6	46·9	46·1	45·4	45·2	45·4	46·0	47·0	48·1	49·0	49·7
210	1·6	**7 35**	41·7	42·0	41·8	41·3	40·7	40·3	40·3	40·7	41·4	42·3	43·3	44·4	45·1
211	4·2	**7 36**	59·0	59·3	59·1	58·6	58·0	57·7	57·7	58·0	58·7	59·6	60·5	61·5	62·3
212 d	0·5	**7 40**	12·4	12·6	12·4	11·9	11·4	11·1	11·1	11·4	12·0	12·7	13·6	14·5	15·2
213	4·1	**7 42**	04·6	04·8	04·6	04·1	03·6	03·3	03·2	03·4	04·0	04·7	05·6	06·5	07·1
214	3·9	**7 41**	41·5	41·3	39·9	37·8	35·5	33·5	32·3	32·2	33·2	35·1	37·5	39·5	40·6
215	3·7	**7 45**	29·2	29·5	29·3	28·9	28·3	28·0	28·0	28·3	28·9	29·7	30·7	31·7	32·4
216 d	1·2	**7 46**	22·1	22·4	22·3	21·7	21·2	20·8	20·8	21·1	21·8	22·6	23·6	24·6	25·4
217	3·7	**7 45**	53·3	53·4	53·1	52·4	51·7	51·1	50·9	51·1	51·6	52·5	53·5	54·5	55·1
218	3·5	**7 50**	01·8	02·0	01·8	01·3	00·7	00·2	00·1	00·3	00·8	01·6	02·5	03·4	04·1
219	3·8	**7 52**	49·8	50·0	49·7	49·0	48·2	47·6	47·3	47·5	48·0	48·8	49·9	50·9	51·6
220	3·6	**7 57**	15·0	15·1	14·6	13·7	12·7	11·9	11·4	11·4	12·0	13·0	14·3	15·5	16·3
221	2·3	**8 04**	12·6	12·8	12·5	11·9	11·1	10·5	10·2	10·3	10·8	11·6	12·6	13·7	14·4
222	2·9	**8 08**	17·3	17·6	17·4	16·9	16·3	15·9	15·7	15·8	16·3	17·0	17·9	18·8	19·6
223	1·9	**8 10**	05·4	05·6	05·3	04·5	03·6	02·9	02·5	02·5	03·0	03·9	05·0	06·2	07·0
224	3·8	**8 17**	27·0	27·3	27·3	26·9	26·4	26·0	25·9	26·1	26·6	27·3	28·2	29·1	29·9
225	4·4	**8 19**	13·0	13·3	13·1	12·5	11·8	11·3	11·0	11·0	11·4	12·2	13·2	14·2	15·0
226	4·4	**8 23**	60·4	61·0	60·9	60·3	59·7	59·1	59·0	59·2	59·8	60·7	61·9	63·1	64·1
227	4·3	**8 20**	13·8	13·9	12·5	09·8	06·6	03·6	01·5	00·7	01·6	03·9	06·9	09·9	11·8
228	1·7	**8 22**	54·6	54·8	54·3	53·3	52·1	51·0	50·3	50·1	50·6	51·7	53·1	54·5	55·5
229	3·9	**8 26**	31·4	31·8	31·7	31·4	30·9	30·5	30·4	30·5	30·9	31·6	32·4	33·3	34·1
230	3·6	**8 25**	58·8	59·1	58·4	57·1	55·5	54·0	53·0	52·7	53·3	54·5	56·3	58·0	59·2
231	3·5	**8 31**	41·0	41·8	41·6	40·8	39·7	38·8	38·4	38·6	39·4	40·7	42·3	44·1	45·5
232	4·2	**8 38**	34·0	34·5	34·5	34·1	33·6	33·3	33·1	33·2	33·6	34·3	35·1	36·1	36·9
233	4·1	**8 38**	16·3	16·6	16·4	15·8	15·1	14·4	14·0	13·9	14·3	15·0	16·1	17·2	18·1
234	3·7	**8 40**	49·1	49·4	49·2	48·4	47·4	46·5	45·9	45·8	46·2	47·0	48·2	49·5	50·5
235	4·1	**8 41**	13·3	13·7	13·5	12·8	12·0	11·3	10·8	10·7	11·1	11·9	12·9	14·1	15·0
236	3·7	**8 44**	17·9	18·3	18·2	17·7	17·1	16·5	16·2	16·2	16·5	17·2	18·2	19·2	20·0
237	4·2	**8 45**	39·6	40·1	40·1	39·7	39·3	38·9	38·7	38·9	39·2	39·9	40·8	41·8	42·7
238	2·0	**8 45**	12·8	13·2	12·9	12·1	11·1	10·1	09·5	09·3	09·7	10·5	11·8	13·1	14·2
239	4·2	**8 47**	44·0	44·5	44·5	44·2	43·6	43·2	43·0	43·1	43·6	44·3	45·3	46·3	47·3
240	3·5	**8 47**	41·1	41·6	41·6	41·2	40·8	40·4	40·2	40·3	40·7	41·4	42·2	43·1	44·0
241	4·2	**8 51**	16·4	16·9	16·8	16·4	15·8	15·3	15·0	15·0	15·3	16·0	16·8	17·8	18·7
242	3·3	**8 56**	18·2	18·7	18·7	18·4	17·9	17·5	17·3	17·4	17·8	18·4	19·2	20·1	21·0
243	4·0	**8 55**	28·8	29·2	28·9	28·0	26·8	25·6	24·7	24·4	24·7	25·7	27·1	28·6	29·8
244	4·3	**8 59**	25·6	26·1	26·1	25·8	25·3	25·0	24·8	24·8	25·2	25·8	26·7	27·6	28·5
245	3·1	**9 00**	22·5	23·2	23·3	22·8	22·0	21·4	21·1	21·1	21·6	22·5	23·7	25·0	26·2
246	4·1	**9 01**	45·0	45·7	45·7	45·3	44·6	44·1	43·8	43·9	44·3	45·1	46·2	47·4	48·5
247	4·4	**9 00**	45·1	45·6	45·5	45·0	44·3	43·6	43·2	43·0	43·3	44·0	45·0	46·1	47·0
248	3·7	**9 04**	47·3	48·1	48·1	47·7	47·0	46·3	46·0	46·0	46·5	47·4	48·5	49·8	51·1
249	4·2	**9 02**	46·3	46·9	46·5	45·4	43·9	42·4	41·2	40·7	40·9	42·0	43·7	45·5	47·0
250	3·7	**9 04**	46·3	46·8	46·7	46·1	45·3	44·6	44·0	43·9	44·1	44·8	45·9	47·1	48·1

The figures given refer to the beginning of the month, and should be interpolated to the actual date by means of the table on page 73.

No.		Name	Dec	Jan.	F.	M.	Apr.	M.	J.	July	A.	S.	Oct.	N.	D.	Jan.
			° ′	″	″	″	″	″	″	″	″	″	″	″	″	″
201	π	Puppis	**S 37 07**	50	60	66	69	68	63	55	46	39	36	38	45	55
202	λ	Geminorum	**N 16 30**	20	19	19	20	21	22	23	23	24	23	21	18	16
203	δ	Volantis	**S 67 59**	23	34	42	46	45	40	31	20	12	07	09	16	27
204	δ	Geminorum	**N 21 56**	48	49	50	51	51	52	52	51	51	49	47	45	44
205	η	Canis Majoris	**S 29 20**	20	29	35	37	36	32	25	17	11	08	10	16	25
206	ι	Geminorum	**N 27 45**	36	37	39	40	41	41	40	38	37	35	33	31	30
207	β	Canis Minoris	**N 8 14**	64	62	61	61	62	64	66	68	69	69	67	63	59
208	ρ	Geminorum	**N 31 44**	47	49	51	53	54	53	52	50	47	45	43	41	42
209	σ	Puppis	**S 43 20**	17	27	34	38	37	32	24	15	07	03	05	12	22
210*		*Castor* (α Gem)	**N 31 50**	47	49	51	53	54	53	52	50	47	45	42	41	41
211	υ	Geminorum	**N 26 51**	13	14	16	17	18	18	17	16	14	12	10	08	07
212		*Procyon* (α CMi)	**N 5 10**	40	36	35	35	36	37	40	42	44	44	41	37	33
213	α	Monocerotis	**S 9 35**	38	44	48	49	48	45	41	36	32	30	32	38	44
214	ζ	Volantis	**S 72 38**	50	61	70	75	76	72	63	53	44	39	39	46	56
215	κ	Geminorum	**N 24 21**	10	11	12	14	15	15	15	14	12	10	08	05	04
216		*Pollux* (β Gem)	**N 27 58**	51	52	54	56	57	57	56	54	52	50	47	45	44
217	c	Puppis	**S 38 00**	42	52	59	63	63	59	51	43	35	32	33	39	49
218	ξ	Puppis	**S 24 54**	17	26	31	34	34	30	24	17	11	08	10	16	24
219		BS 3080 (Puppis)	**S 40 37**	17	27	34	38	39	34	27	18	11	07	08	14	24
220	χ	Carinae	**S 53 01**	44	55	64	69	70	66	58	48	40	35	35	41	52
221	ζ	Puppis	**S 40 03**	09	19	27	31	32	28	21	12	04	00	01	07	17
222	ρ	Puppis	**S 24 21**	19	28	34	37	37	34	28	21	15	12	13	19	27
223	γ^2	Velorum	**S 47 23**	15	26	35	40	41	37	30	21	12	07	08	14	24
224	β	Cancri	**N 9 07**	47	44	43	43	44	46	48	49	50	49	46	42	38
225		BS 3270 (Puppis)	**S 36 42**	47	57	65	69	70	67	60	52	45	41	41	47	56
226	31	Lyncis	**N 43 07**	43	46	51	55	57	56	53	49	44	39	35	33	33
227	θ	Chamaeleontis	**S 77 32**	17	28	38	45	47	45	38	29	19	13	11	16	25
228	ϵ	Carinae	**S 59 33**	51	62	72	78	80	77	70	61	51	45	45	50	60
229		BS 3314 (Hydrae)	**S 3 57**	53	58	61	62	62	60	56	52	49	49	51	56	62
230	β	Volantis	**S 66 11**	35	47	57	64	66	63	56	47	37	31	30	35	45
231	o	Ursae Majoris	**N 60 39**	20	26	33	39	41	39	34	27	19	13	08	07	10
232	δ	Hydrae	**N 5 38**	29	25	24	24	25	26	29	31	32	31	28	24	19
233		BS 3426 (Velorum)	**S 43 02**	56	67	75	81	83	80	74	65	57	52	52	57	66
234	o	Velorum	**S 52 58**	55	66	76	82	85	82	76	67	58	52	51	56	65
235		BS 3445 (Velorum)	**S 46 42**	34	45	54	60	62	59	53	44	36	30	30	35	44
236	α	Pyxidis	**S 33 14**	54	64	72	76	78	75	70	62	55	51	51	56	65
237	δ	Cancri	**N 18 05**	17	16	16	18	19	20	21	21	20	17	14	10	06
238	δ	Velorum	**S 54 46**	15	26	36	43	45	43	37	28	19	12	11	16	26
239	ι	Cancri	**N 28 41**	36	37	39	42	44	45	44	42	39	35	31	27	25
240	ϵ	Hydrae	**N 6 21**	12	09	07	07	08	10	12	14	15	14	11	07	02
241	γ	Pyxidis	**S 27 46**	26	35	42	46	47	45	40	33	26	23	23	28	37
242	ζ	Hydrae	**N 5 52**	40	37	35	35	36	38	40	42	43	42	39	34	29
243		BS 3571 (Carinae)	**S 60 42**	31	42	52	60	63	62	56	47	37	30	28	33	42
244	α	Cancri	**N 11 47**	19	16	16	16	18	19	21	22	22	20	17	12	08
245	ι	Ursae Majoris	**N 47 58**	12	16	21	26	29	29	26	21	14	08	03	00	00
246		BS 3579 (Lyncis)	**N 41 42**	37	40	44	49	51	52	50	45	40	34	29	26	25
247		BS 3591 (Velorum)	**S 41 19**	11	21	30	36	38	36	31	23	15	09	09	13	22
248	κ	Ursae Majoris	**N 47 04**	63	66	72	77	80	80	77	72	66	59	54	51	51
249	α	Volantis	**S 66 27**	45	56	67	75	79	78	72	63	54	46	44	47	56
250		BS 3614 (Velorum)	**S 47 09**	54	65	74	80	83	82	76	68	59	53	52	56	65

* **210**: position refers to the A component.

No.	Mag.	RA	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
		h m	s	s	s	s	s	s	s	s	s	s	s	s	s
251	2·2	**9 08**	39·0	39·5	39·4	38·9	38·2	37·5	37·0	36·8	37·1	37·7	38·7	39·9	40·9
252	3·6	**9 11**	27·6	28·1	27·9	27·1	26·1	24·9	24·1	23·7	23·9	24·8	26·1	27·6	28·8
253	1·8	**9 13**	27·0	27·7	27·3	26·1	24·4	22·6	21·1	20·4	20·6	21·7	23·6	25·7	27·4
254	3·8	**9 15**	15·5	16·0	16·1	15·8	15·4	15·0	14·8	14·8	15·1	15·7	16·5	17·4	18·3
255	2·2	**9 17**	35·3	35·9	35·8	35·0	33·9	32·8	31·9	31·5	31·7	32·5	33·8	35·4	36·6
256	3·8	**9 19**	54·3	55·0	55·1	54·8	54·2	53·7	53·4	53·4	53·8	54·5	55·5	56·6	57·7
257	3·3	**9 22**	05·6	06·3	06·4	06·1	05·6	05·1	04·8	04·8	05·2	05·8	06·8	07·9	08·9
258	2·6	**9 22**	40·7	41·3	41·2	40·6	39·6	38·7	37·9	37·6	37·7	38·5	39·7	41·0	42·2
259	2·2	**9 28**	26·1	26·6	26·7	26·5	26·0	25·6	25·4	25·3	25·6	26·1	26·9	27·8	28·7
260	3·7	**9 32**	51·7	52·9	53·1	52·5	51·4	50·3	49·6	49·4	49·8	50·9	52·5	54·3	56·1
261	3·6	**9 31**	23·7	24·3	24·3	23·9	23·3	22·7	22·2	22·0	22·1	22·7	23·7	24·8	25·8
262	3·0	**9 31**	46·7	47·4	47·3	46·7	45·7	44·7	43·8	43·4	43·5	44·3	45·5	46·9	48·2
263	3·3	**9 33**	59·6	60·5	60·6	60·2	59·5	58·7	58·3	58·2	58·5	59·3	60·5	61·9	63·2
264	4·1	**9 40**	44·0	44·6	44·7	44·5	44·1	43·7	43·5	43·4	43·6	44·1	44·9	45·8	46·7
265	3·8	**9 42**	03·8	04·5	04·6	04·4	04·0	03·6	03·4	03·3	03·6	04·1	04·8	05·8	06·7
266	3·1	**9 46**	49·1	49·8	50·0	49·8	49·4	49·0	48·7	48·6	48·9	49·4	50·2	51·2	52·2
267	4—5	**9 45**	45·6	46·4	46·4	45·7	44·6	43·4	42·3	41·7	41·7	42·4	43·8	45·4	46·9
268	3·1	**9 47**	34·7	35·6	35·5	34·8	33·5	32·1	30·9	30·2	30·2	31·0	32·4	34·2	35·8
269	3·9	**9 52**	11·4	12·6	12·9	12·4	11·6	10·6	09·9	09·7	10·0	10·8	12·1	13·7	15·3
270	4·1	**9 53**	43·9	44·7	44·9	44·7	44·3	43·8	43·5	43·4	43·6	44·2	45·0	46·0	47·0
271	3·7	**9 57**	29·6	30·4	30·5	30·1	29·3	28·3	27·5	27·1	27·1	27·7	28·7	30·1	31·4
272	3·6	**10 08**	15·7	16·4	16·7	16·5	16·2	15·8	15·5	15·4	15·5	16·0	16·7	17·7	18·7
273 d	1·3	**10 09**	16·8	17·6	17·8	17·7	17·3	16·9	16·6	16·5	16·7	17·1	17·8	18·7	19·7
274	3·8	**10 11**	25·6	26·3	26·5	26·3	26·0	25·6	25·3	25·1	25·2	25·6	26·3	27·2	28·2
275	3·6	**10 14**	12·1	13·3	13·4	12·7	11·3	09·6	07·9	06·8	06·5	07·3	08·9	11·0	13·0
276	4·1	**10 15**	28·3	29·1	29·3	29·1	28·5	27·9	27·3	27·0	27·0	27·4	28·3	29·4	30·5
277	3·6	**10 17**	38·2	38·9	39·2	39·1	38·7	38·3	38·0	37·9	38·0	38·4	39·2	40·1	41·2
278	3·5	**10 18**	07·0	07·9	08·3	08·1	07·6	07·0	06·6	06·4	06·5	07·0	07·9	09·1	10·3
279	3·4	**10 17**	41·6	42·5	42·7	42·3	41·4	40·2	39·2	38·4	38·3	38·8	40·0	41·6	43·2
280	2·6	**10 20**	54·6	55·4	55·7	55·6	55·2	54·8	54·5	54·4	54·5	54·9	55·6	56·6	57·6
281	3·2	**10 23**	20·2	21·1	21·5	21·4	20·9	20·3	19·9	19·6	19·8	20·2	21·1	22·2	23·5
282	4·1	**10 24**	48·3	49·8	50·1	49·2	47·5	45·3	43·2	41·7	41·2	41·9	43·9	46·5	48·9
283	4·1	**10 26**	55·4	56·1	56·4	56·2	55·9	55·5	55·1	54·9	55·0	55·4	56·0	57·0	57·9
284	4·4	**10 27**	56·7	57·5	57·7	57·6	57·2	56·7	56·2	56·0	56·0	56·3	57·1	58·1	59·1
285	4·4	**10 28**	51·7	52·6	53·0	52·9	52·4	51·9	51·5	51·3	51·4	51·8	52·6	53·7	54·9
286	4·1	**10 28**	32·4	33·4	33·7	33·3	32·5	31·5	30·6	29·9	29·7	30·2	31·2	32·7	34·2
287	3·6	**10 32**	40·2	41·3	41·6	41·2	40·3	39·2	38·1	37·3	37·1	37·6	38·7	40·3	41·9
288	3·8	**10 33**	42·5	43·3	43·6	43·5	43·2	42·9	42·5	42·4	42·4	42·8	43·5	44·4	45·4
289	4·1	**10 35**	45·7	47·9	48·3	47·3	45·0	41·9	38·8	36·5	35·5	36·3	38·8	42·3	45·7
290	4·4	**10 39**	60·9	61·9	62·2	62·0	61·3	60·5	59·6	59·0	58·8	59·2	60·1	61·5	62·9
291	3·0	**10 43**	36·5	37·7	38·1	37·7	36·8	35·6	34·4	33·4	33·1	33·5	34·7	36·4	38·1
292	2·8	**10 47**	31·6	32·5	32·9	32·7	32·2	31·5	30·8	30·2	30·1	30·4	31·2	32·5	33·8
293	3·3	**10 50**	28·3	29·1	29·4	29·4	29·1	28·7	28·4	28·1	28·1	28·4	29·0	29·9	30·9
294	3·9	**10 54**	15·4	16·3	16·8	16·7	16·4	15·9	15·5	15·3	15·3	15·6	16·3	17·3	18·4
295	3·9	**10 54**	13·2	14·3	14·7	14·5	13·9	12·9	11·9	11·2	10·9	11·2	12·2	13·7	15·2
296	4·2	**11 00**	36·6	37·4	37·8	37·8	37·5	37·2	36·8	36·5	36·5	36·7	37·3	38·2	39·2
297	2·4	**11 02**	51·0	52·4	53·0	53·0	52·4	51·6	50·8	50·3	50·2	50·6	51·5	52·8	54·4
298	1·9	**11 04**	45·3	46·9	47·6	47·5	46·8	45·8	44·9	44·2	44·0	44·4	45·5	47·0	48·8
299	4·0	**11 09**	20·9	22·1	22·7	22·5	22·0	21·1	20·1	19·3	18·9	19·1	20·0	21·5	23·1
300	3·1	**11 10**	36·5	37·6	38·1	38·2	37·8	37·2	36·7	36·3	36·2	36·5	37·2	38·3	39·6

The figures given refer to the beginning of the month, and should be interpolated to the actual date by means of the table on page 73.

No.		Name	Dec	Jan.	F.	M.	Apr.	M.	J.	July	A.	S.	Oct.	N.	D.	Jan.
			° ′	″	″	″	″	″	″	″	″	″	″	″	″	″
251	λ	Velorum	**S 43 30**	03	14	23	29	32	30	25	17	08	03	02	06	15
252	*a*	Carinae	**S 59 02**	07	18	28	36	40	39	33	25	16	09	06	10	19
253	β	Carinae	**S 69 47**	07	18	29	37	42	42	36	28	18	10	07	10	19
254	θ	Hydrae	**N 2 14**	24	20	17	17	17	19	22	24	26	25	22	17	12
255	ι	Carinae	**S 59 20**	42	53	64	72	76	75	70	61	52	45	42	46	54
256	38	Lyncis	**N 36 43**	34	35	39	43	46	47	46	43	38	32	27	23	21
257	α	Lyncis	**N 34 18**	58	59	63	67	70	71	70	67	62	57	52	48	46
258	κ	Velorum	**S 55 04**	55	66	76	84	88	87	82	74	65	58	55	59	67
259	α	Hydrae	**S 8 44**	02	08	12	15	15	13	10	06	02	01	03	08	15
260	23	Ursae Majoris	**N 62 58**	54	59	67	74	78	78	74	67	59	50	43	40	41
261	ψ	Velorum	**S 40 32**	26	36	45	52	55	54	49	42	34	28	27	31	39
262	*N*	Velorum	**S 57 06**	27	38	49	57	62	61	56	48	39	32	29	32	41
263	θ	Ursae Majoris	**N 51 35**	40	44	50	56	60	60	58	52	45	37	31	27	26
264	ι	Hydrae	**S 1 13**	19	24	27	28	28	26	23	21	19	19	21	26	32
265	*o*	Leonis	**N 9 48**	44	41	40	40	42	43	45	46	46	44	41	36	30
266	ϵ	Leonis	**N 23 41**	33	31	33	35	38	40	40	39	37	33	28	22	18
267	*l*	Carinae	**S 62 35**	02	13	24	33	38	39	34	27	17	09	06	08	16
268	υ	Carinae	**S 65 08**	54	65	76	85	90	91	87	79	70	62	58	60	68
269	υ	Ursae Majoris	**N 58 56**	72	76	83	90	94	95	92	86	78	69	62	57	57
270	μ	Leonis	**N 25 55**	24	23	24	27	30	32	32	31	28	24	18	13	09
271	ϕ	Velorum	**S 54 38**	47	58	68	77	82	83	79	71	62	55	52	54	62
272	η	Leonis	**N 16 40**	37	34	34	36	38	40	41	41	40	37	32	27	22
273	*Regulus* (α Leo)		**N 11 52**	54	50	50	50	52	54	56	57	56	54	50	44	39
274	λ	Hydrae	**S 12 26**	19	26	31	34	35	34	31	27	23	22	23	27	34
275	ω	Carinae	**S 70 07**	07	18	29	39	46	48	46	39	29	20	15	16	23
276	BS 4023 (Velorum)		**S 42 12**	15	25	34	42	46	47	43	37	29	23	20	23	30
277	ζ	Leonis	**N 23 19**	46	44	45	48	51	53	54	53	50	46	41	35	30
278	λ	Ursae Majoris	**N 42 49**	30	31	35	41	46	48	47	43	37	30	23	17	14
279	BS 4050 (Carinae)		**S 61 24**	50	61	72	81	88	90	87	80	71	62	58	59	66
280 *	γ^1	Leonis	**N 19 44**	69	67	67	69	72	74	75	75	73	69	64	58	53
281	μ	Ursae Majoris	**N 41 24**	34	35	40	45	50	52	51	48	42	35	28	22	19
282	*I*	Carinae	**S 74 06**	51	61	72	83	90	93	91	84	75	66	60	60	66
283	μ	Hydrae	**S 16 55**	22	30	36	40	41	41	38	33	29	26	27	31	38
284	α	Antliae	**S 31 09**	10	19	28	34	37	37	34	28	22	17	16	19	26
285	β	Leonis Minoris	**N 36 36**	57	58	61	66	70	73	72	70	65	58	51	45	41
286	BS 4114 (Carinae)		**S 58 49**	22	33	43	53	59	61	59	52	43	35	31	31	38
287	BS 4140 (Carinae)		**S 61 46**	09	19	30	40	47	49	47	40	31	23	18	19	25
288	ρ	Leonis	**N 9 12**	62	58	56	57	58	60	62	63	63	61	57	52	46
289	γ	Chamaeleontis	**S 78 41**	29	39	50	61	69	73	71	65	56	47	41	40	45
290	BS 4180 (Velorum)		**S 55 41**	18	28	39	48	54	57	54	48	40	32	27	28	34
291	θ	Carinae	**S 64 28**	46	56	67	77	85	88	86	80	71	62	57	57	62
292	μ	Velorum	**S 49 30**	25	34	45	53	59	61	59	53	45	38	34	35	41
293	*v*	Hydrae	**S 16 16**	55	62	68	72	74	74	71	67	63	60	61	65	71
294	46	Leonis Minoris	**N 34 06**	70	69	72	77	81	84	85	83	78	72	65	58	53
295	*u*	Carinae	**S 58 56**	22	32	43	52	59	62	61	55	46	38	33	33	39
296	α	Crateris	**S 18 23**	18	25	32	36	38	38	35	31	27	24	24	28	34
297	β	Ursae Majoris	**N 56 16**	71	73	79	86	93	96	95	91	83	74	65	57	54
298	*Dubhe* (α UMa)		**N 61 38**	75	78	84	92	99	02	101	96	88	78	68	61	58
299	BS 4337 (Carinae)		**S 59 03**	46	55	66	76	83	87	86	80	72	64	58	58	63
300	ψ	Ursae Majoris	**N 44 23**	68	68	72	78	84	87	88	85	79	71	62	55	50

* No., mag., dist. and p.a. of companion star: **280**, 3·8, 5″, 126°

No.	Mag.	RA h m	Jan. s	Feb. s	Mar. s	Apr. s	May s	June s	July s	Aug. s	Sept. s	Oct. s	Nov. s	Dec. s	Jan. s
301	2·6	**11 15**	00·5	01·4	01·8	01·9	01·7	01·3	00·9	00·7	00·6	00·9	01·4	02·3	03·4
302	3·4	**11 15**	07·8	08·6	09·1	09·1	08·9	08·6	08·2	08·0	07·9	08·1	08·7	09·6	10·6
303	3·9	**11 19**	04·8	05·8	06·3	06·3	06·1	05·6	05·2	04·9	04·8	05·1	05·7	06·6	07·7
304	3·7	**11 19**	23·3	24·3	24·8	24·9	24·6	24·2	23·8	23·4	23·4	23·6	24·2	25·2	26·3
305	3·8	**11 20**	11·8	12·6	13·0	13·1	12·9	12·5	12·2	11·9	11·8	12·0	12·5	13·4	14·4
306	4·1	**11 22**	00·7	01·6	02·0	02·1	01·9	01·6	01·3	01·0	00·9	01·1	01·7	02·5	03·5
307	4·3	**11 21**	48·5	49·7	50·2	50·2	49·8	49·0	48·2	47·5	47·1	47·3	48·1	49·4	50·8
308	4·1	**11 25**	44·2	45·1	45·5	45·6	45·4	45·1	44·7	44·4	44·3	44·4	45·0	45·9	46·9
309	4·1	**11 32**	22·7	24·8	25·9	26·0	25·2	23·8	22·4	21·3	20·7	21·0	22·1	23·9	26·1
310	3·7	**11 33**	50·9	51·8	52·3	52·4	52·2	51·8	51·3	50·9	50·7	50·9	51·4	52·4	53·5
311	3·3	**11 36**	36·0	37·5	38·2	38·3	37·8	36·8	35·7	34·6	34·0	34·1	35·0	36·5	38·3
312	3·8	**11 46**	27·0	28·6	29·5	29·7	29·1	28·0	26·7	25·4	24·6	24·6	25·5	27·2	29·3
313	4·2	**11 46**	43·8	44·7	45·2	45·3	45·2	44·9	44·6	44·3	44·2	44·3	44·8	45·6	46·6
314	3·8	**11 46**	55·9	57·1	57·8	58·0	57·7	57·1	56·5	56·0	55·7	55·9	56·5	57·5	58·8
315	4·2	**11 47**	22·0	23·4	24·2	24·4	23·9	23·1	22·1	21·1	20·5	20·5	21·3	22·7	24·4
316	2·2	**11 49**	55·3	56·2	56·7	56·9	56·7	56·4	56·1	55·8	55·6	55·7	56·2	57·0	58·0
317	3·8	**11 51**	34·7	35·6	36·1	36·3	36·2	35·9	35·6	35·3	35·1	35·3	35·7	36·5	37·5
318	2·5	**11 54**	42·3	43·7	44·5	44·7	44·4	43·7	43·0	42·3	42·0	42·1	42·7	43·8	45·2
319	4·2	**12 06**	04·2	05·1	05·7	05·9	05·8	05·5	05·2	04·9	04·7	04·7	05·2	05·9	06·9
320	2·9	**12 09**	15·3	16·6	17·3	17·6	17·4	16·9	16·2	15·5	15·0	15·0	15·5	16·6	18·0
321	3·2	**12 11**	00·1	01·1	01·7	01·9	01·8	01·5	01·2	00·8	00·5	00·6	01·0	01·8	02·8
322	3·1	**12 16**	04·3	05·7	06·6	06·9	06·7	06·1	05·2	04·3	03·6	03·5	04·1	05·3	07·0
323	3·4	**12 16**	14·5	16·1	17·0	17·3	17·1	16·4	15·5	14·8	14·2	14·2	14·7	15·8	17·3
324	2·8	**12 16**	40·9	41·8	42·4	42·6	42·6	42·4	42·0	41·6	41·4	41·4	41·8	42·6	43·6
325	4·4	**12 19**	26·1	29·7	31·9	32·6	31·7	29·5	26·4	23·3	21·0	20·3	21·6	24·7	28·7
326	4·0	**12 20**	46·3	47·2	47·8	48·1	48·0	47·8	47·5	47·2	46·9	46·9	47·3	48·1	49·0
327	3·6	**12 22**	18·1	19·6	20·6	21·0	20·8	20·1	19·2	18·2	17·4	17·3	17·8	19·1	20·8
328 d	1·6	**12 27**	34·2	35·9	37·0	37·4	37·2	36·5	35·4	34·3	33·5	33·2	33·8	35·2	37·0
329	4·2	**12 28**	58·3	59·6	60·4	60·8	60·7	60·3	59·6	58·9	58·4	58·3	58·7	59·8	61·1
330	3·1	**12 30**	44·6	45·5	46·2	46·4	46·4	46·2	45·9	45·5	45·2	45·2	45·6	46·3	47·3
331	1·6	**12 32**	07·7	09·1	10·1	10·5	10·4	09·8	09·0	08·1	07·5	07·3	07·8	08·9	10·5
332	4·0	**12 33**	31·7	34·0	35·5	36·2	35·9	34·8	33·1	31·3	29·9	29·4	30·2	32·1	34·6
333	3·9	**12 34**	10·1	12·3	13·8	14·4	14·0	12·8	11·3	09·9	08·8	08·5	09·0	10·5	12·6
334	4·3	**12 34**	31·9	33·1	33·9	34·2	34·1	33·7	33·2	32·7	32·3	32·2	32·6	33·4	34·5
335	2·8	**12 35**	16·9	17·8	18·5	18·8	18·8	18·6	18·2	17·8	17·5	17·5	17·8	18·6	19·6
336	2·9	**12 38**	14·0	16·1	17·5	18·1	17·9	17·0	15·6	14·1	12·9	12·5	13·1	14·7	17·0
337	2·4	**12 42**	27·9	29·2	30·1	30·5	30·5	30·1	29·5	28·8	28·3	28·1	28·5	29·5	30·8
338	2·9	**12 42**	30·9	31·8	32·5	32·8	32·8	32·6	32·3	32·0	31·7	31·7	32·0	32·6	33·6
339	3·3	**12 47**	21·3	23·3	24·7	25·3	25·3	24·5	23·2	21·8	20·6	20·1	20·7	22·2	24·3
340	1·5	**12 48**	44·0	45·5	46·6	47·1	47·1	46·6	45·8	44·8	44·0	43·7	44·1	45·3	46·9
341	4·3	**12 54**	23·0	24·1	24·9	25·3	25·4	25·2	24·7	24·2	23·7	23·5	23·9	24·7	25·9
342	1·7	**12 54**	44·9	46·5	47·5	48·0	48·0	47·4	46·6	45·8	45·1	44·9	45·2	46·1	47·5
343	3·7	**12 56**	27·1	28·0	28·7	29·1	29·1	29·0	28·7	28·3	28·0	27·9	28·2	28·8	29·8
344	2·9	**12 56**	48·2	49·4	50·2	50·6	50·6	50·4	49·9	49·3	48·9	48·8	49·0	49·7	50·8
345	3·6	**13 03**	28·7	31·1	32·8	33·7	33·8	32·9	31·5	29·7	28·2	27·5	28·0	29·7	32·1
346	2·9	**13 03**	00·7	01·7	02·4	02·8	02·8	02·7	02·4	02·0	01·7	01·6	01·8	02·4	03·4
347	4·4	**13 07**	54·6	56·0	56·9	57·5	57·6	57·3	56·8	56·0	55·4	55·1	55·4	56·3	57·7
348	4·5	**13 10**	49·3	50·3	51·0	51·4	51·5	51·4	51·1	50·8	50·4	50·3	50·5	51·2	52·1
349	4·3	**13 12**	39·0	40·1	40·8	41·3	41·3	41·1	40·8	40·3	39·9	39·7	39·9	40·6	41·5
350	3·3	**13 19**	50·5	51·5	52·3	52·7	52·9	52·8	52·5	52·1	51·7	51·5	51·7	52·4	53·4

The figures given refer to the beginning of the month, and should be interpolated to the actual date by means of the table on page 73.

No.		Name	Dec	Jan.	F.	M.	Apr.	M.	J.	July	A.	S.	Oct.	N.	D.	Jan.
			° ′	″	″	″	″	″	″	″	″	″	″	″	″	″
301	δ	Leonis	**N 20 25**	42	39	39	41	45	47	49	49	47	43	37	30	24
302	θ	Leonis	**N 15 19**	65	62	61	62	65	68	69	70	69	65	60	54	48
303	ξ	Ursae Majoris	**N 31 25**	49	47	49	53	58	61	63	61	57	51	44	37	31
304	ν	Ursae Majoris	**N 32 59**	54	52	54	59	64	67	69	67	63	57	49	42	37
305	δ	Crateris	**S 14 52**	10	17	23	27	29	28	26	22	19	17	17	21	27
306	σ	Leonis	**N 5 55**	67	62	60	60	61	63	65	67	67	65	62	56	50
307	π	Centauri	**S 54 34**	47	56	67	76	83	87	86	81	73	65	60	60	65
308	γ	Crateris	**S 17 46**	33	41	47	51	53	53	51	48	44	41	41	44	51
309	λ	Draconis	**N 69 13**	56	58	65	74	81	85	85	80	71	60	50	42	38
310	ξ	Hydrae	**S 31 56**	56	64	72	79	83	85	83	79	73	68	66	67	73
311	λ	Centauri	**S 63 06**	31	40	51	61	69	74	74	70	62	54	47	45	49
312	λ	Muscae	**S 66 49**	03	11	22	32	41	47	47	43	36	27	20	17	21
313	ν	Virginis	**N 6 25**	61	56	53	53	55	57	59	61	61	59	55	50	43
314	χ	Ursae Majoris	**N 47 40**	52	52	56	62	69	74	75	72	66	58	48	40	35
315		BS 4522 (Centauri)	**S 61 16**	03	12	22	32	41	46	46	42	34	26	20	18	21
316		*Denebola* (β Leo)	**N 14 28**	33	28	27	29	32	34	37	37	36	33	28	21	15
317	β	Virginis	**N 1 39**	68	62	59	58	59	61	63	65	66	65	62	57	50
318	γ	Ursae Majoris	**N 53 35**	46	46	50	58	65	70	71	68	61	52	42	33	28
319	o	Virginis	**N 8 38**	18	12	10	10	12	15	17	19	19	16	12	06	00
320	δ	Centauri	**S 50 48**	43	51	60	69	77	82	82	78	72	65	59	58	61
321	ϵ	Corvi	**S 22 42**	42	49	55	61	64	65	64	61	57	53	52	54	60
322	δ	Crucis	**S 58 50**	16	23	33	43	52	57	58	55	49	41	34	31	34
323	δ	Ursae Majoris	**N 56 55**	63	62	67	74	82	88	89	87	80	71	60	51	45
324	γ	Corvi	**S 17 38**	02	09	15	19	22	22	21	18	15	12	12	14	20
325	β	Chamaeleontis	**S 79 24**	00	06	16	27	38	46	48	46	39	30	22	17	18
326	η	Virginis	**S 0 45**	38	44	48	49	49	47	45	43	42	42	45	50	56
327	ϵ	Crucis	**S 60 29**	21	28	38	48	57	62	64	61	55	46	39	36	39
328*	α	Crucis	**S 63 11**	14	21	30	40	50	56	58	55	49	41	33	30	32
329	σ	Centauri	**S 50 19**	10	17	26	35	43	47	48	46	40	32	27	25	28
330	δ	Corvi	**S 16 36**	27	34	40	44	46	47	45	43	40	37	37	40	45
331	γ	Crucis	**S 57 12**	09	16	25	35	44	49	51	48	42	34	28	25	27
332	γ	Muscae	**S 72 13**	13	19	29	39	50	57	60	58	51	43	34	30	31
333	κ	Draconis	**N 69 41**	25	25	30	38	47	53	55	52	45	34	23	13	07
334	β	Canum Venat.	**N 41 15**	44	41	44	49	56	62	64	64	59	52	43	33	26
335	β	Corvi	**S 23 29**	15	22	29	34	37	39	38	35	31	28	26	28	33
336	α	Muscae	**S 69 13**	21	28	37	47	57	65	68	66	59	51	43	38	39
337	γ	Centauri	**S 49 02**	52	58	67	76	83	88	90	87	82	75	69	67	70
338*	γ	Virginis	**S 1 32**	30	36	40	42	41	40	38	36	34	35	37	42	48
339	β	Muscae	**S 68 11**	40	46	55	65	75	83	86	84	78	70	62	57	58
340	β	Crucis	**S 59 46**	31	38	46	56	65	72	74	72	66	59	51	48	49
341		BS 4889 (Centauri)	**S 40 15**	59	65	73	81	87	91	92	89	85	79	75	73	76
342	ϵ	Ursae Majoris	**N 55 51**	51	49	52	59	68	74	77	76	70	61	51	40	33
343	δ	Virginis	**N 3 18**	22	16	13	12	13	15	18	20	20	19	16	10	04
344	α	Canum Venat.	**N 38 13**	28	24	25	30	37	43	46	46	42	36	27	17	10
345	δ	Muscae	**S 71 38**	00	05	14	24	35	43	47	46	40	32	24	18	18
346	ϵ	Virginis	**N 10 51**	65	59	57	58	60	64	66	68	68	65	61	54	47
347	ξ^2	Centauri	**S 49 59**	29	35	43	51	59	65	67	65	60	54	48	45	46
348	θ	Virginis	**S 5 37**	39	46	50	52	52	51	50	47	46	46	47	51	57
349	β	Comae Ber.	**N 27 47**	27	22	22	26	31	36	40	41	39	34	26	18	10
350	γ	Hydrae	**S 23 15**	26	32	38	43	47	49	48	46	43	40	39	40	44

* No., mag., dist. and p.a. of companion star: **328**, 2·1, 4″, 114° **338**, 3·7, 3″, 1°

No.	Mag.	RA	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
		h m	s	s	s	s	s	s	s	s	s	s	s	s	s
351	2·9	**13 21**	33·1	34·3	35·1	35·6	35·8	35·7	35·3	34·8	34·3	34·0	34·2	35·0	36·1
352	2·4	**13 24**	34·8	36·3	37·5	38·1	38·2	37·7	37·0	36·1	35·4	35·0	35·1	35·8	37·1
353 d	1·2	**13 26**	04·8	05·8	06·6	07·0	07·2	07·1	06·9	06·5	06·1	05·9	06·1	06·7	07·6
354	4·0	**13 32**	01·7	02·9	03·8	04·4	04·6	04·5	04·1	03·6	03·0	02·8	02·9	03·6	04·8
355	3·4	**13 35**	32·9	33·9	34·6	35·1	35·3	35·2	35·0	34·6	34·2	34·0	34·2	34·7	35·6
356	2·6	**13 40**	58·1	59·6	60·7	61·5	61·8	61·6	61·1	60·3	59·5	59·1	59·2	60·0	61·4
357	4·4	**13 46**	38·9	40·0	40·9	41·5	41·7	41·7	41·4	40·9	40·4	40·1	40·2	40·9	41·9
358	1·9	**13 48**	10·9	12·3	13·4	14·0	14·2	14·0	13·4	12·6	11·9	11·5	11·5	12·1	13·2
359	3·5	**13 50**	31·3	32·5	33·5	34·1	34·4	34·4	34·0	33·5	32·9	32·5	32·6	33·3	34·4
360	3·3	**13 50**	38·3	39·5	40·5	41·1	41·5	41·4	41·0	40·5	39·9	39·5	39·6	40·3	41·4
361	2·8	**13 55**	28·6	29·6	30·4	31·0	31·2	31·2	30·9	30·5	30·0	29·8	29·8	30·3	31·2
362	3·1	**13 56**	35·9	37·2	38·3	39·0	39·4	39·3	38·9	38·3	37·6	37·2	37·3	37·9	39·2
363	4·3	**14 02**	29·9	30·8	31·6	32·2	32·4	32·5	32·2	31·9	31·5	31·2	31·3	31·7	32·6
364 d	0·9	**14 05**	01·6	03·3	04·7	05·7	06·2	06·1	05·5	04·5	03·5	02·8	02·8	03·7	05·2
365	3·6	**14 04**	48·5	50·4	51·9	52·9	53·2	52·8	51·8	50·5	49·3	48·4	48·2	48·8	50·2
366	3·5	**14 07**	19·8	20·9	21·8	22·4	22·7	22·8	22·5	22·1	21·6	21·3	21·4	21·9	22·9
367	2·3	**14 07**	40·6	41·7	42·7	43·3	43·7	43·7	43·4	42·9	42·4	42·0	42·1	42·6	43·7
368	4·3	**14 13**	47·4	48·4	49·2	49·8	50·1	50·2	50·0	49·6	49·2	48·9	48·9	49·4	50·2
369 d	0·2	**14 16**	25·1	26·1	26·9	27·5	27·8	27·8	27·5	27·1	26·6	26·3	26·3	26·7	27·5
370	4·2	**14 16**	53·5	54·5	55·3	55·9	56·2	56·3	56·1	55·7	55·3	55·0	55·0	55·5	56·3
371	4·3	**14 17**	00·1	01·3	02·4	03·1	03·4	03·3	02·8	02·2	01·4	00·9	00·8	01·2	02·2
372	4·4	**14 21**	30·6	32·2	33·5	34·5	35·1	35·1	34·6	33·8	32·9	32·3	32·2	32·9	34·3
373	4·2	**14 21**	35·0	36·1	37·1	37·8	38·3	38·4	38·1	37·6	37·0	36·6	36·6	37·1	38·2
374	4·1	**14 25**	44·6	45·9	47·1	48·0	48·3	48·2	47·6	46·8	46·0	45·3	45·1	45·5	46·5
375	4·4	**14 27**	26·1	29·0	31·6	33·5	34·0	33·3	31·4	29·0	26·5	24·6	23·8	24·4	26·4
376	3·8	**14 32**	32·3	33·4	34·3	35·0	35·3	35·3	35·1	34·6	34·0	33·6	33·5	33·9	34·7
377	3·0	**14 32**	44·2	45·3	46·3	47·0	47·3	47·3	47·0	46·4	45·8	45·3	45·2	45·5	46·4
378	2·6	**14 36**	34·6	35·8	36·9	37·7	38·2	38·4	38·1	37·6	37·0	36·5	36·4	36·9	37·9
379 d	0·1	**14 40**	45·3	47·0	48·5	49·6	50·3	50·3	49·8	48·8	47·7	46·8	46·6	47·3	48·7
380	3·9	**14 41**	56·4	57·4	58·3	58·9	59·3	59·4	59·2	58·8	58·4	58·0	57·9	58·2	59·0
381	2·9	**14 43**	03·0	04·3	05·5	06·4	07·0	07·1	06·9	06·3	05·6	05·0	04·9	05·4	06·5
382	3·4	**14 43**	52·6	54·6	56·4	57·7	58·6	58·7	58·2	57·1	55·8	54·8	54·5	55·2	56·8
383	3·9	**14 43**	56·4	57·4	58·2	58·8	59·3	59·4	59·3	58·9	58·5	58·1	58·1	58·4	59·2
384	4·1	**14 44**	41·1	42·2	43·2	44·0	44·5	44·7	44·5	44·0	43·5	43·0	42·9	43·4	44·3
385	2·7	**14 45**	42·3	43·3	44·2	44·9	45·3	45·4	45·1	44·7	44·1	43·7	43·6	43·9	44·7
386	3·8	**14 50**	00·3	04·4	08·2	11·2	13·0	13·1	11·6	08·9	05·8	03·3	02·4	03·7	06·8
387	3·8	**14 47**	05·4	06·4	07·2	07·8	08·3	08·4	08·3	07·9	07·5	07·1	07·0	07·4	08·1
388	2·9	**14 51**	48·2	49·2	50·1	50·7	51·2	51·4	51·3	50·9	50·4	50·1	50·0	50·3	51·2
389	2·2	**14 50**	36·0	38·6	41·1	42·9	43·7	43·2	41·7	39·5	37·2	35·3	34·3	34·6	36·2
390	2·8	**14 59**	37·9	39·2	40·3	41·2	41·8	42·0	41·9	41·4	40·7	40·1	40·0	40·4	41·4
391	3·3	**15 00**	15·2	16·4	17·5	18·4	19·0	19·3	19·1	18·6	18·0	17·4	17·3	17·7	18·7
392	3·6	**15 02**	33·5	34·6	35·6	36·4	36·9	36·9	36·6	36·1	35·4	34·8	34·5	34·8	35·5
393	3·4	**15 05**	03·0	04·0	04·9	05·7	06·2	06·4	06·3	06·0	05·5	05·0	04·9	05·2	06·1
394	4·1	**15 13**	06·1	07·4	08·6	09·7	10·4	10·7	10·5	10·0	09·2	08·5	08·3	08·7	09·7
395	3·5	**15 13**	29·5	30·9	32·2	33·3	34·1	34·4	34·2	33·6	32·7	32·0	31·7	32·2	33·2
396	3·5	**15 16**	09·7	10·7	11·7	12·4	12·9	13·1	12·9	12·4	11·8	11·2	11·0	11·2	11·9
397	4·2	**15 18**	49·8	51·4	52·9	54·2	55·1	55·5	55·3	54·5	53·5	52·6	52·2	52·7	53·9
398	2·7	**15 17**	54·2	55·1	56·0	56·7	57·2	57·5	57·4	57·1	56·6	56·2	56·1	56·3	57·0
399	3·1	**15 20**	29·0	31·2	33·3	35·1	36·4	36·8	36·4	35·2	33·7	32·4	31·7	32·3	33·9
400	3·4	**15 22**	28·2	29·4	30·5	31·4	32·1	32·4	32·4	31·9	31·3	30·7	30·5	30·8	31·7

The figures given refer to the beginning of the month, and should be interpolated to the actual date by means of the table on page 73.

No.		Name	Dec	Jan.	F.	M.	Apr.	M.	J.	July	A.	S.	Oct.	N.	D.	Jan.
			° ′	″	″	″	″	″	″	″	″	″	″	″	″	″
351	ι	Centauri	**S 36 47**	49	55	62	68	74	78	79	77	73	69	65	63	66
352*	ζ	Ursae Majoris	**N 54 49**	61	58	60	67	76	83	87	87	82	73	63	52	44
353	*Spica* (α Vir)		**S 11 14**	50	56	61	64	65	65	64	62	60	59	59	62	67
354	*d*	Centauri	**S 39 29**	23	28	35	42	48	53	54	53	49	44	40	38	40
355	ζ	Virginis	**S 0 40**	51	57	61	62	61	60	57	55	54	55	57	62	68
356	ϵ	Centauri	**S 53 32**	46	51	58	67	75	81	85	84	80	74	67	63	63
357	ι	Centauri	**S 33 07**	29	34	40	46	51	55	56	55	52	47	44	43	46
358	η	Ursae Majoris	**N 49 13**	34	30	31	37	45	52	57	58	55	47	37	27	18
359	ν	Centauri	**S 41 46**	00	05	11	18	25	30	32	31	27	22	18	15	16
360	μ	Centauri	**S 42 33**	09	14	21	28	34	39	42	41	37	32	27	25	26
361	η	Bootis	**N 18 18**	46	40	38	40	44	49	52	54	54	50	45	37	29
362	ζ	Centauri	**S 47 21**	57	61	68	75	83	88	91	91	88	82	76	73	73
363	τ	Virginis	**N 1 27**	51	45	42	41	42	44	47	49	50	49	46	41	35
364	β	Centauri	**S 60 26**	52	55	62	70	79	87	92	92	89	83	75	70	68
365	α	Draconis	**N 64 17**	31	26	28	35	44	53	58	59	54	46	35	24	15
366	π	Hydrae	**S 26 45**	34	40	45	50	54	56	57	56	53	50	48	48	51
367	θ	Centauri	**S 36 26**	53	58	64	70	75	79	81	81	78	74	70	68	70
368	κ	Virginis	**S 10 20**	58	64	68	71	72	72	70	69	67	66	66	69	74
369	*Arcturus* (α Boo)		**N 19 05**	40	34	31	33	37	42	46	48	47	44	38	30	22
370	ι	Virginis	**S 6 04**	43	49	53	55	55	54	53	51	49	49	51	54	60
371	λ	Bootis	**N 46 00**	32	26	26	31	39	47	52	54	52	45	36	25	16
372	υ	Centauri	**S 56 27**	28	31	37	44	53	60	64	65	63	57	50	45	43
373	ψ	Centauri	**S 37 57**	28	32	38	44	49	54	56	56	53	49	45	42	43
374	θ	Bootis	**N 51 45**	74	68	68	73	82	90	96	98	95	89	79	68	58
375	5	Ursae Minoris	**N 75 36**	63	58	60	67	76	85	91	92	88	80	68	57	48
376	ρ	Bootis	**N 30 17**	48	42	40	43	49	56	61	64	63	58	51	42	33
377	γ	Bootis	**N 38 13**	60	53	52	56	63	70	76	79	77	72	64	54	45
378	η	Centauri	**S 42 13**	35	38	43	50	56	61	64	64	62	58	53	50	50
379*	α	Centauri	**S 60 53**	52	54	60	67	76	83	89	90	88	82	75	69	66
380	ζ	Bootis	**N 13 39**	25	18	16	16	20	24	28	31	31	29	24	17	10
381	α	Lupi	**S 47 27**	16	19	25	31	38	44	48	49	46	42	36	32	31
382	α	Circini	**S 65 02**	29	30	36	43	52	61	67	69	67	62	54	47	44
383	μ	Virginis	**S 5 43**	44	50	54	56	56	54	53	51	49	49	51	54	59
384	BS 5485 (Centauri)		**S 35 14**	28	32	37	42	47	51	53	53	51	48	44	42	43
385	ϵ	Bootis	**N 26 59**	73	67	65	67	72	79	84	87	87	83	76	67	59
386	α	Apodis	**S 79 06**	29	29	33	41	51	61	69	72	71	65	57	48	43
387	109	Virginis	**N 1 49**	26	20	16	15	17	19	22	24	25	25	22	17	11
388	α^2	Librae	**S 16 06**	30	35	39	42	44	44	44	43	41	40	39	41	44
389	β	Ursae Minoris	**N 74 04**	61	55	56	62	71	80	87	89	86	79	68	56	46
390	β	Lupi	**S 43 11**	46	49	53	59	65	70	74	75	73	69	64	61	60
391	κ	Centauri	**S 42 09**	58	61	65	71	77	82	85	86	84	81	76	73	72
392	β	Bootis	**N 40 19**	24	17	15	18	25	33	40	43	43	38	30	20	10
393	σ	Librae	**S 25 20**	38	42	46	50	53	55	56	56	54	52	50	49	51
394	κ^1	Lupi	**S 48 47**	45	46	50	56	63	69	73	75	74	70	65	60	58
395	ζ	Lupi	**S 52 09**	25	26	31	36	43	50	55	57	56	52	46	41	38
396	δ	Bootis	**N 33 14**	67	59	57	59	66	73	79	83	83	79	72	63	53
397	β	Circini	**S 58 51**	26	27	31	37	44	52	58	61	60	56	49	43	39
398	β	Librae	**S 9 26**	31	36	40	42	42	41	40	38	37	36	37	40	44
399	γ	Trianguli Aust.	**S 68 44**	03	03	06	13	21	30	37	41	41	36	29	21	16
400	δ	Lupi	**S 40 42**	10	13	17	21	27	31	35	36	35	32	28	24	23

* No., mag., dist. and p.a. of companion star: **352**, 4·0, 14″, 153° **379**, 1·7, 4″, 321°

No.	Mag.	RA h m	Jan. s	Feb. s	Mar. s	Apr. s	May s	June s	July s	Aug. s	Sept. s	Oct. s	Nov. s	Dec. s	Jan. s
401	3·6	**15 22**	52·0	53·2	54·2	55·1	55·7	56·0	56·0	55·6	55·0	54·4	54·2	54·5	55·4
402	3·1	**15 20**	38·8	40·9	43·1	45·0	45·9	45·8	44·6	42·9	40·8	38·9	37·8	37·8	38·9
403	3·7	**15 23**	49·1	50·4	51·5	52·5	53·2	53·6	53·5	53·0	52·3	51·7	51·4	51·8	52·7
404	4·5	**15 25**	06·2	07·3	08·3	09·1	09·6	09·8	09·6	09·1	08·4	07·8	07·5	07·6	08·3
405	3·5	**15 25**	16·0	17·4	18·8	20·0	20·7	20·8	20·2	19·3	18·1	17·0	16·4	16·5	17·3
406	3·7	**15 28**	30·2	31·2	32·1	32·9	33·4	33·6	33·5	33·0	32·4	31·9	31·6	31·8	32·4
407	4·2	**15 33**	35·3	36·2	37·2	38·0	38·5	38·8	38·6	38·2	37·6	37·0	36·7	36·8	37·5
408	2·9	**15 36**	15·2	16·4	17·5	18·4	19·2	19·6	19·5	19·1	18·5	17·9	17·6	17·9	18·7
409	3·8	**15 35**	35·5	36·4	37·3	38·0	38·5	38·8	38·8	38·4	37·9	37·5	37·3	37·4	38·1
410	2·3	**15 35**	22·9	23·8	24·8	25·5	26·1	26·3	26·2	25·8	25·2	24·7	24·4	24·6	25·2
411	4·0	**15 36**	27·4	28·4	29·3	30·0	30·6	30·9	30·9	30·6	30·2	29·7	29·5	29·7	30·4
412	4·1	**15 38**	15·3	17·3	19·3	21·0	22·3	22·9	22·6	21·7	20·3	19·0	18·4	18·7	20·1
413	3·8	**15 38**	02·2	03·2	04·2	05·0	05·7	06·0	06·0	05·7	05·2	04·6	04·4	04·7	05·4
414	3·8	**15 39**	40·8	41·9	42·8	43·7	44·4	44·7	44·7	44·4	43·8	43·3	43·1	43·3	44·1
415	3·9	**15 43**	25·8	26·7	27·7	28·4	29·0	29·3	29·2	28·8	28·2	27·7	27·4	27·5	28·1
416	2·7	**15 45**	04·9	05·8	06·7	07·4	08·0	08·3	08·3	08·0	07·5	07·0	06·8	07·0	07·6
417	4·3	**15 43**	23·0	25·8	29·1	31·8	33·4	33·3	31·7	29·1	25·8	22·8	20·8	20·3	21·5
418	3·7	**15 46**	56·9	57·8	58·6	59·4	60·0	60·3	60·2	59·9	59·4	58·9	58·6	58·8	59·4
419	4·3	**15 49**	28·8	29·7	30·6	31·3	31·9	32·2	32·2	31·8	31·3	30·8	30·5	30·6	31·2
420	3·6	**15 50**	29·1	30·0	30·9	31·6	32·2	32·5	32·5	32·3	31·8	31·3	31·1	31·3	31·9
421	4·1	**15 52**	01·1	02·1	03·2	04·1	04·8	05·2	05·2	04·9	04·3	03·8	03·5	03·7	04·4
422	3·7	**15 51**	38·4	39·3	40·2	40·9	41·5	41·8	41·8	41·6	41·1	40·6	40·4	40·5	41·1
423	3·0	**15 56**	36·9	38·6	40·4	42·1	43·3	44·0	43·9	43·1	41·9	40·8	40·1	40·3	41·5
424	3·9	**15 57**	12·8	13·7	14·6	15·3	15·9	16·3	16·2	15·9	15·4	14·9	14·6	14·7	15·3
425	4·2	**15 58**	15·8	16·7	17·7	18·5	19·1	19·4	19·3	19·0	18·4	17·8	17·5	17·5	18·1
426	3·0	**15 59**	51·5	52·5	53·4	54·3	55·0	55·4	55·5	55·2	54·7	54·1	53·9	54·0	54·7
427	3·6	**16 01**	13·5	14·6	15·7	16·7	17·5	18·0	18·0	17·7	17·1	16·5	16·1	16·3	17·1
428	2·5	**16 01**	19·0	19·9	20·9	21·7	22·4	22·8	22·9	22·6	22·1	21·6	21·3	21·5	22·1
429	4·1	**16 02**	09·9	11·2	12·6	13·8	14·7	14·9	14·5	13·7	12·5	11·3	10·5	10·4	11·0
430	2·9	**16 06**	24·2	25·1	26·0	26·9	27·5	28·0	28·0	27·8	27·3	26·8	26·5	26·6	27·3
431	4·3	**16 07**	41·1	42·2	43·2	44·2	45·0	45·5	45·6	45·3	44·7	44·1	43·7	43·9	44·6
432	4·3	**16 09**	16·3	17·3	18·4	19·4	20·1	20·4	20·2	19·7	18·9	18·1	17·5	17·5	18·0
433	3·0	**16 15**	12·8	13·6	14·5	15·3	15·9	16·3	16·4	16·2	15·7	15·2	14·9	15·0	15·6
434	4·0	**16 16**	57·1	58·9	60·7	62·4	63·8	64·6	64·6	63·9	62·8	61·5	60·8	60·9	62·0
435	3·3	**16 19**	11·8	12·7	13·5	14·3	15·0	15·4	15·5	15·3	14·8	14·3	14·0	14·1	14·6
436	4·1	**16 21**	05·0	06·3	07·6	08·8	09·8	10·5	10·6	10·2	09·4	08·6	08·1	08·2	09·0
437	3·9	**16 20**	13·0	14·0	15·1	16·1	16·9	17·2	17·1	16·6	15·7	14·9	14·3	14·2	14·7
438	3·1	**16 22**	11·8	12·7	13·7	14·6	15·3	15·8	16·0	15·7	15·2	14·7	14·3	14·4	15·1
439	3·8	**16 22**	38·6	39·4	40·3	41·1	41·8	42·2	42·2	41·9	41·4	40·8	40·5	40·5	41·0
440	2·9	**16 24**	10·5	11·8	13·3	14·7	15·7	16·1	15·7	14·8	13·5	12·2	11·2	10·8	11·3
441 d	1·2	**16 30**	25·5	26·4	27·4	28·3	29·0	29·6	29·7	29·5	29·0	28·4	28·1	28·2	28·7
442	2·8	**16 30**	55·4	56·2	57·1	57·9	58·6	59·0	59·1	58·8	58·3	57·7	57·3	57·2	57·7
443	3·9	**16 36**	00·2	03·7	07·7	11·6	14·8	16·6	16·7	15·0	12·1	09·1	06·9	06·6	08·4
444	3·8	**16 31**	44·7	45·6	46·4	47·2	47·9	48·3	48·4	48·2	47·8	47·3	46·9	47·0	47·5
445	4·3	**16 32**	28·0	29·0	30·0	31·0	31·8	32·4	32·6	32·3	31·8	31·2	30·8	30·8	31·5
446	4·2	**16 34**	37·0	37·9	39·0	40·0	40·8	41·2	41·1	40·7	39·9	39·1	38·5	38·4	38·8
447	2·9	**16 36**	54·9	55·8	56·8	57·7	58·5	59·0	59·2	59·0	58·5	57·9	57·6	57·6	58·2
448	2·7	**16 38**	04·2	05·0	05·9	06·7	07·4	07·9	08·1	07·9	07·4	06·9	06·6	06·6	07·1
449	3·0	**16 41**	53·8	54·6	55·6	56·4	57·2	57·6	57·6	57·3	56·7	56·0	55·5	55·4	55·9
450	3·6	**16 43**	26·8	27·6	28·6	29·6	30·4	30·8	30·8	30·4	29·7	29·0	28·4	28·2	28·7

The figures given refer to the beginning of the month, and should be interpolated to the actual date by means of the table on page 73.

No.		Name	Dec	Jan.	F.	M.	Apr.	M.	J.	July	A.	S.	Oct.	N.	D.	Jan.
			° ′	″	″	″	″	″	″	″	″	″	″	″	″	″
401	ϕ^1	Lupi	**S 36 19**	02	04	08	13	17	21	24	25	24	21	18	15	15
402	γ	Ursae Minoris	**N 71 46**	18	11	11	16	24	34	41	45	44	37	27	16	05
403	ϵ	Lupi	**S 44 44**	40	41	45	50	56	62	66	67	66	63	58	54	53
404	μ	Bootis	**N 37 18**	64	57	54	57	64	71	78	82	82	79	71	61	52
405	ι	Draconis	**N 58 54**	20	12	11	15	24	33	41	45	44	39	29	18	07
406	β	Coronae Bor.	**N 29 02**	53	45	43	45	50	57	63	67	68	65	58	50	40
407	θ	Coronae Bor.	**N 31 17**	69	62	59	61	67	74	80	85	85	82	75	67	57
408	γ	Lupi	**S 41 13**	04	05	09	13	18	23	27	28	28	25	21	17	16
409 *	δ	Serpentis	**N 10 28**	64	57	54	54	57	61	65	69	70	68	65	59	52
410	α	Coronae Bor.	**N 26 39**	31	24	21	22	28	34	40	44	45	42	36	28	19
411	γ	Librae	**S 14 50**	31	36	39	42	42	43	42	41	40	39	39	40	43
412	ϵ	Trianguli Aust.	**S 66 21**	59	58	61	66	74	83	90	94	94	90	83	76	71
413	υ	Librae	**S 28 11**	10	13	17	20	23	26	27	27	27	25	22	21	22
414	τ	Librae	**S 29 49**	42	45	48	52	55	58	59	60	59	57	55	53	54
415	γ	Coronae Bor.	**N 26 14**	35	28	24	26	31	38	44	48	49	47	41	33	24
416	α	Serpentis	**N 6 22**	29	23	20	19	22	26	29	32	34	33	30	24	18
417	ζ	Ursae Minoris	**N 77 44**	24	17	16	20	29	38	46	50	50	44	35	23	13
418	β	Serpentis	**N 15 22**	15	08	04	05	08	14	19	22	23	22	18	11	03
419	κ	Serpentis	**N 18 05**	27	20	17	18	22	27	33	36	38	36	31	24	16
420	μ	Serpentis	**S 3 28**	44	49	52	54	53	51	48	46	45	45	47	50	55
421	χ	Lupi	**S 33 40**	24	26	29	33	36	39	42	43	42	40	38	35	35
422	ϵ	Serpentis	**N 4 25**	46	40	37	36	38	42	45	48	49	49	46	41	35
423	β	Trianguli Aust.	**S 63 28**	33	31	33	38	45	53	60	65	65	62	56	49	44
424	γ	Serpentis	**N 15 36**	30	23	19	20	23	28	33	37	38	37	32	26	18
425	ϵ	Coronae Bor.	**N 26 49**	48	41	37	39	44	51	57	61	63	61	55	47	38
426	π	Scorpii	**S 26 09**	29	31	34	37	40	42	43	43	42	41	39	38	39
427	η	Lupi	**S 38 26**	22	23	26	29	33	38	41	43	42	40	37	34	32
428	δ	Scorpii	**S 22 39**	55	58	62	64	66	67	68	68	67	66	65	64	66
429	θ	Draconis	**N 58 30**	70	62	59	62	70	80	88	94	95	91	82	71	60
430	β	Scorpii	**S 19 50**	50	54	57	59	61	61	61	61	60	59	58	59	61
431	θ	Lupi	**S 36 50**	34	35	38	41	45	49	52	53	53	51	48	45	44
432	ϕ	Herculis	**N 44 53**	27	19	15	18	24	33	41	47	48	45	38	28	17
433	δ	Ophiuchi	**S 3 44**	04	09	13	14	13	10	08	06	05	05	06	09	14
434	δ	Trianguli Aust.	**S 63 43**	18	16	17	21	28	35	43	48	49	46	41	34	28
435	ϵ	Ophiuchi	**S 4 43**	49	54	57	58	57	55	53	51	50	50	51	54	58
436	γ^2	Normae	**S 50 11**	27	26	27	31	36	42	47	50	51	49	45	40	36
437	τ	Herculis	**N 46 16**	25	16	12	14	21	30	38	44	46	43	36	26	16
438	σ	Scorpii	**S 25 37**	43	45	48	50	52	54	55	55	55	54	52	52	52
439	γ	Herculis	**N 19 06**	55	48	44	45	49	55	61	65	67	66	61	55	47
440	η	Draconis	**N 61 28**	32	23	20	23	30	40	49	55	57	53	46	35	24
441		*Antares* (α Sco)	**S 26 27**	53	55	57	60	62	63	64	65	65	64	62	61	62
442	β	Herculis	**N 21 27**	17	09	06	06	10	17	23	28	30	28	24	17	09
443	γ	Apodis	**S 78 55**	35	31	30	34	41	50	59	66	69	67	60	52	44
444	λ	Ophiuchi	**N 1 56**	60	54	51	50	52	56	59	62	63	63	61	57	52
445	N	Scorpii	**S 34 44**	09	10	12	15	18	21	23	25	25	24	22	19	18
446	σ	Herculis	**N 42 23**	71	62	58	60	66	75	83	89	92	89	83	74	63
447	τ	Scorpii	**S 28 14**	46	48	50	52	54	56	58	59	59	58	56	55	54
448	ζ	Ophiuchi	**S 10 35**	51	55	58	59	59	58	56	55	54	53	54	56	59
449	ζ	Herculis	**N 31 34**	24	16	12	13	18	26	33	39	41	40	35	27	17
450	η	Herculis	**N 38 53**	29	20	16	17	23	31	39	45	48	46	40	31	21

* No., mag., dist. and p.a. of companion star: **409**, 5·2, 4″, 172°

No.	Mag.	RA	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
		h m	s	s	s	s	s	s	s	s	s	s	s	s	s
451	1·9	**16 50**	24·9	26·8	29·0	31·2	33·1	34·3	34·6	33·9	32·5	30·9	29·7	29·5	30·5
452	3·7	**16 51**	12·9	14·3	15·9	17·4	18·8	19·7	19·9	19·5	18·6	17·5	16·8	16·7	17·5
453	4·4	**16 44**	07·8	10·9	15·5	20·0	23·3	24·2	22·7	19·0	14·0	08·8	04·5	02·3	02·7
454	2·4	**16 51**	14·1	15·1	16·1	17·1	18·0	18·6	18·8	18·6	18·1	17·5	17·0	17·0	17·6
455	3·1	**16 52**	59·5	60·5	61·6	62·6	63·6	64·2	64·5	64·3	63·7	63·0	62·6	62·6	63·1
456	3·6	**16 53**	27·4	28·4	29·5	30·5	31·5	32·1	32·4	32·2	31·6	30·9	30·5	30·5	31·0
457	3·7	**16 55**	44·9	45·9	47·0	48·2	49·2	49·8	50·1	49·9	49·3	48·6	48·1	48·0	48·6
458	4·3	**16 54**	47·1	47·9	48·7	49·5	50·2	50·7	50·9	50·7	50·2	49·7	49·3	49·2	49·7
459	3·4	**16 58**	26·7	27·5	28·3	29·1	29·9	30·4	30·5	30·4	29·9	29·4	28·9	28·9	29·3
460	3·1	**16 59**	59·3	60·5	62·0	63·4	64·7	65·6	65·9	65·6	64·8	63·8	63·1	63·0	63·7
461	4·1	**17 00**	54·1	55·3	56·7	58·0	59·2	60·1	60·4	60·1	59·4	58·4	57·8	57·7	58·3
462	3·9	**17 00**	54·6	55·3	56·2	57·1	57·9	58·4	58·5	58·2	57·7	57·0	56·4	56·3	56·6
463	3·2	**17 08**	46·9	48·0	49·6	51·3	52·7	53·3	53·2	52·3	50·8	49·1	47·7	46·9	47·1
464	2·6	**17 11**	19·5	20·3	21·2	22·0	22·8	23·4	23·7	23·6	23·2	22·6	22·2	22·2	22·6
465	3·4	**17 13**	20·2	21·2	22·3	23·5	24·5	25·3	25·6	25·4	24·9	24·1	23·6	23·5	24·0
466	3·5	**17 15**	23·7	24·4	25·2	26·0	26·8	27·3	27·5	27·4	26·9	26·4	25·9	25·8	26·1
467	3·2	**17 15**	42·0	42·7	43·6	44·5	45·3	45·8	46·0	45·8	45·3	44·6	44·1	43·9	44·3
468	3·4	**17 15**	36·4	37·2	38·1	39·0	39·9	40·4	40·6	40·3	39·6	38·9	38·3	38·0	38·3
469	3·4	**17 23**	01·4	02·2	03·1	04·0	04·9	05·6	05·9	05·8	05·4	04·8	04·4	04·3	04·7
470	2·8	**17 26**	40·1	41·3	42·7	44·1	45·5	46·5	46·9	46·7	46·0	45·0	44·2	44·0	44·6
471	3·5	**17 26**	46·8	48·0	49·4	50·9	52·3	53·3	53·8	53·5	52·8	51·8	51·0	50·7	51·3
472	4·3	**17 27**	22·7	23·5	24·4	25·3	26·2	26·9	27·2	27·1	26·7	26·1	25·6	25·6	26·0
473	4·4	**17 27**	19·8	20·5	21·3	22·1	22·9	23·5	23·7	23·7	23·3	22·7	22·3	22·1	22·5
474	4·4	**17 28**	24·5	25·3	26·3	27·2	28·2	28·9	29·2	29·1	28·7	28·1	27·6	27·5	27·9
475	3·8	**17 32**	34·9	36·2	37·8	39·4	41·0	42·2	42·7	42·4	41·6	40·4	39·5	39·2	39·7
476	2·8	**17 31**	53·1	54·0	55·0	56·1	57·1	57·9	58·2	58·2	57·7	57·0	56·5	56·3	56·8
477	4·5	**17 31**	23·7	24·4	25·2	26·1	26·9	27·5	27·7	27·6	27·1	26·4	25·9	25·6	25·9
478	3·0	**17 30**	46·6	47·4	48·5	49·7	50·8	51·4	51·5	51·1	50·2	49·1	48·2	47·7	47·8
479	3·0	**17 33**	06·9	07·9	09·1	10·4	11·7	12·6	13·0	12·9	12·3	11·4	10·7	10·5	11·0
480	1·7	**17 34**	43·7	44·6	45·6	46·6	47·6	48·4	48·8	48·7	48·3	47·6	47·1	46·9	47·3
481	2·1	**17 35**	41·7	42·4	43·2	44·0	44·8	45·4	45·6	45·5	45·1	44·5	44·1	43·9	44·2
482	2·0	**17 38**	30·1	31·1	32·2	33·3	34·4	35·3	35·7	35·6	35·1	34·4	33·7	33·6	34·0
483	3·6	**17 38**	31·8	32·5	33·4	34·3	35·1	35·8	36·1	36·1	35·7	35·1	34·7	34·6	34·9
484	3·8	**17 39**	54·5	55·2	56·2	57·3	58·3	58·9	59·1	58·8	58·0	57·1	56·3	55·9	56·0
485	2·5	**17 43**	37·7	38·5	39·5	40·6	41·7	42·5	42·9	42·9	42·4	41·7	41·1	41·0	41·4
486	2·9	**17 44**	17·0	17·7	18·5	19·3	20·1	20·7	21·0	21·0	20·6	20·0	19·6	19·4	19·7
487	3·6	**17 47**	20·4	21·8	23·5	25·4	27·2	28·6	29·2	29·0	28·1	26·8	25·6	25·1	25·6
488	3·5	**17 47**	05·7	06·3	07·1	08·0	08·8	09·5	09·7	09·6	09·1	08·4	07·8	07·6	07·8
489	3·1	**17 48**	44·2	45·0	46·1	47·2	48·2	49·1	49·5	49·5	49·0	48·4	47·7	47·5	47·9
490	3·7	**17 48**	43·0	43·6	44·4	45·2	46·0	46·7	47·0	47·0	46·6	46·0	45·6	45·4	45·7
491	3·2	**17 50**	58·7	59·5	60·5	61·6	62·6	63·5	63·9	63·9	63·4	62·8	62·2	62·0	62·4
492	3·9	**17 53**	46·8	47·5	48·6	49·9	51·2	51·9	52·1	51·7	50·7	49·5	48·4	47·7	47·7
493	4·0	**17 56**	48·2	48·8	49·7	50·6	51·6	52·2	52·5	52·3	51·8	51·0	50·3	49·9	50·0
494	2·4	**17 56**	57·7	58·4	59·4	60·6	61·7	62·4	62·6	62·3	61·5	60·5	59·5	58·9	59·0
495	3·8	**17 58**	23·7	24·3	25·1	26·0	26·9	27·5	27·8	27·7	27·2	26·5	25·9	25·6	25·8
496	3·5	**17 59**	55·9	56·6	57·4	58·2	59·1	59·8	60·1	60·2	59·8	59·3	58·8	58·6	58·9
497	3·9	**18 01**	28·1	28·7	29·4	30·2	31·1	31·7	32·1	32·1	31·7	31·2	30·7	30·5	30·8
498	3·1	**18 06**	51·9	52·6	53·5	54·5	55·5	56·3	56·8	56·8	56·4	55·8	55·3	55·1	55·4
499	3·9	**18 07**	54·5	55·4	56·6	57·8	59·2	60·2	60·8	60·8	60·3	59·4	58·7	58·3	58·7
500	3·7	**18 08**	07·6	08·2	08·9	09·7	10·6	11·2	11·6	11·6	11·2	10·7	10·2	09·9	10·1

The figures given refer to the beginning of the month, and should be interpolated to the actual date by means of the table on page 73.

No.		Name	Dec	Jan.	F.	M.	Apr.	M.	J.	July	A.	S.	Oct.	N.	D.	Jan.
			° ′	″	″	″	″	″	″	″	″	″	″	″	″	″
451	α	Trianguli Aust.	**S 69 03**	06	02	01	04	10	17	25	31	34	33	28	20	13
452	η	Arae	**S 59 03**	54	51	51	54	59	65	72	77	79	78	74	67	62
453	ϵ	Ursae Minoris	**N 82 00**	25	16	12	14	21	31	40	46	48	45	38	28	17
454	ϵ	Scorpii	**S 34 19**	08	08	10	12	14	17	19	21	22	21	19	17	15
455	μ^1	Scorpii	**S 38 04**	16	16	17	19	22	25	28	31	31	31	28	25	23
456	μ^2	Scorpii	**S 38 02**	28	28	29	31	34	37	40	42	43	42	40	37	35
457	ζ^2	Scorpii	**S 42 23**	05	04	05	07	10	14	18	21	23	22	19	15	12
458	ι	Ophiuchi	**N 10 08**	25	19	15	15	18	22	27	31	33	33	30	25	18
459	κ	Ophiuchi	**N 9 20**	66	59	56	55	58	63	68	72	74	73	71	66	59
460	ζ	Arae	**S 56 00**	39	36	35	38	42	48	54	59	61	60	56	50	45
461	ϵ^1	Arae	**S 53 10**	50	47	47	49	53	59	64	69	71	70	66	61	56
462	ϵ	Herculis	**N 30 53**	72	64	59	60	65	72	80	86	89	88	83	75	66
463	ζ	Draconis	**N 65 41**	40	30	25	26	32	42	51	59	63	61	55	45	34
464	η	Ophiuchi	**S 15 44**	30	33	35	36	36	35	34	34	33	33	33	34	36
465	η	Scorpii	**S 43 15**	22	21	21	22	25	29	33	36	38	38	35	31	28
466*	α	Herculis	**N 14 22**	26	19	15	14	18	23	29	34	36	36	33	28	21
467	δ	Herculis	**N 24 49**	18	10	05	05	09	16	23	29	32	32	28	21	12
468	π	Herculis	**N 36 47**	31	22	17	17	22	30	39	46	49	49	44	36	26
469	θ	Ophiuchi	**S 25 00**	43	44	46	47	47	48	49	49	50	50	49	48	48
470	β	Arae	**S 55 32**	25	21	20	21	24	29	35	40	43	43	40	35	29
471	γ	Arae	**S 56 23**	17	13	11	13	16	21	27	32	36	36	32	27	21
472	44	Ophiuchi	**S 24 11**	12	13	14	15	15	16	16	17	17	17	16	16	16
473	σ	Ophiuchi	**N 4 07**	44	38	35	34	37	41	45	49	51	51	49	45	40
474	45	Ophiuchi	**S 29 52**	40	40	41	42	43	44	46	47	48	48	47	45	44
475	δ	Arae	**S 60 41**	32	27	25	26	30	35	42	48	52	52	48	42	36
476	υ	Scorpii	**S 37 18**	16	15	15	16	18	20	23	25	27	27	25	23	20
477	λ	Herculis	**N 26 05**	61	53	48	48	52	59	67	73	76	76	73	66	57
478	β	Draconis	**N 52 17**	26	15	10	10	15	24	34	42	46	46	41	32	22
479	α	Arae	**S 49 52**	63	60	59	60	63	67	72	76	79	79	77	72	67
480	λ	Scorpii	**S 37 06**	41	40	40	41	42	44	47	50	51	52	50	47	45
481	α	Ophiuchi	**N 12 32**	62	56	52	51	54	60	65	70	73	73	70	65	59
482	θ	Scorpii	**S 43 00**	13	11	10	11	13	16	20	23	26	26	24	20	17
483	ξ	Serpentis	**S 15 24**	19	22	23	24	23	22	21	20	20	20	20	21	23
484	ι	Herculis	**N 45 59**	57	47	42	42	47	55	65	72	77	77	73	65	54
485	κ	Scorpii	**S 39 02**	02	01	00	01	02	04	08	10	13	13	11	08	05
486	β	Ophiuchi	**N 4 33**	49	43	40	39	42	46	50	54	57	57	55	51	46
487	η	Pavonis	**S 64 43**	34	29	26	26	29	35	42	49	53	54	51	44	37
488	μ	Herculis	**N 27 42**	48	39	34	34	38	45	53	59	63	63	60	53	44
489	ι^1	Scorpii	**S 40 07**	44	42	41	42	43	45	49	52	54	54	53	50	47
490	γ	Ophiuchi	**N 2 42**	15	10	07	06	09	13	17	20	22	23	21	17	13
491	G	Scorpii	**S 37 02**	39	38	37	37	38	40	43	46	48	48	47	44	42
492	ξ	Draconis	**N 56 52**	19	08	02	01	06	15	25	34	39	40	36	27	17
493	θ	Herculis	**N 37 14**	63	53	48	47	51	59	68	76	80	81	78	70	61
494	γ	Draconis	**N 51 29**	20	10	04	03	08	16	26	35	40	41	37	29	18
495	ξ	Herculis	**N 29 14**	55	47	41	41	45	52	60	67	71	72	69	62	54
496	ν	Ophiuchi	**S 9 46**	20	23	25	25	24	21	19	17	16	16	17	19	21
497	67	Ophiuchi	**N 2 55**	63	57	54	54	56	60	65	68	71	71	69	66	61
498	γ	Sagittarii	**S 30 25**	11	11	10	10	10	11	12	14	15	16	15	14	13
499	θ	Arae	**S 50 05**	09	05	02	02	03	06	11	16	20	21	19	15	10
500	72	Ophiuchi	**N 9 33**	70	64	60	59	62	67	73	78	80	81	79	75	69

* No., mag., dist. and p.a. of companion star: **466**, 5·4, 5″, 102°

No.	Mag.	RA h m	Jan. s	Feb. s	Mar. s	Apr. s	May s	June s	July s	Aug. s	Sept. s	Oct. s	Nov. s	Dec. s	Jan. s
501	3·8	**18 08**	10·5	11·1	11·8	12·7	13·6	14·3	14·6	14·5	14·1	13·4	12·8	12·5	12·6
502	4·0	**18 14**	44·8	45·5	46·3	47·2	48·1	48·9	49·4	49·4	49·1	48·6	48·0	47·8	48·1
503	3·2	**18 18**	44·3	45·1	46·0	47·0	48·1	49·0	49·5	49·6	49·2	48·6	48·0	47·7	48·0
504	4·3	**18 20**	25·5	26·1	26·9	27·8	28·7	29·5	29·8	29·7	29·2	28·5	27·8	27·4	27·4
505	2·8	**18 22**	02·8	03·4	04·3	05·3	06·3	07·1	07·6	07·7	07·4	06·8	06·2	06·0	06·2
506	3·4	**18 22**	09·6	10·1	10·9	11·7	12·6	13·3	13·7	13·8	13·4	12·9	12·4	12·2	12·4
507	4·2	**18 24**	43·7	44·8	46·3	47·9	49·7	51·1	51·9	52·0	51·3	50·1	49·0	48·4	48·7
508	3·7	**18 20**	40·6	41·4	43·2	45·4	47·6	49·0	49·3	48·4	46·5	44·2	41·8	40·1	39·6
509	1·9	**18 25**	15·7	16·4	17·3	18·3	19·4	20·3	20·8	20·9	20·6	20·0	19·4	19·1	19·3
510	3·9	**18 24**	23·6	24·1	24·8	25·7	26·6	27·3	27·7	27·6	27·3	26·7	26·1	25·8	25·9
511	3·8	**18 28**	11·3	12·1	13·1	14·3	15·6	16·6	17·2	17·3	16·9	16·2	15·4	15·1	15·3
512	2·9	**18 28**	59·1	59·7	60·5	61·5	62·4	63·3	63·8	63·9	63·6	63·0	62·5	62·2	62·4
513	4·1	**18 36**	06·1	06·6	07·3	08·2	09·1	09·8	10·3	10·4	10·1	09·6	09·1	08·9	09·0
514d	0·1	**18 37**	28·9	29·4	30·2	31·1	32·1	32·9	33·3	33·3	32·8	32·0	31·2	30·7	30·7
515	4·1	**18 44**	55·1	56·4	58·4	60·9	63·4	65·5	66·8	66·9	66·0	64·3	62·5	61·4	61·4
516	3·3	**18 46**	40·9	41·5	42·3	43·2	44·2	45·1	45·7	45·8	45·6	45·0	44·5	44·2	44·3
517	4·3	**18 46**	21·9	22·3	23·0	23·8	24·7	25·5	25·9	26·0	25·7	25·1	24·5	24·1	24·2
518	4·5	**18 48**	02·8	03·2	03·9	04·7	05·6	06·4	06·9	07·0	06·8	06·3	05·8	05·5	05·6
519	4·4	**18 47**	44·6	45·0	45·7	46·5	47·4	48·2	48·6	48·7	48·4	47·8	47·2	46·9	46·9
520	3·8	**18 50**	40·6	41·0	41·7	42·6	43·6	44·4	44·8	44·9	44·5	43·8	43·1	42·6	42·6
521	4·4	**18 53**	43·2	44·1	45·5	47·2	49·0	50·6	51·5	51·8	51·2	50·1	48·9	48·2	48·3
522	2·1	**18 56**	17·0	17·5	18·3	19·2	20·2	21·1	21·7	21·9	21·6	21·1	20·5	20·2	20·4
523	4·2	**18 55**	49·1	49·5	50·3	51·3	52·4	53·2	53·7	53·7	53·2	52·4	51·5	50·9	50·7
524	3·6	**18 58**	42·6	43·1	43·8	44·7	45·6	46·5	47·1	47·3	47·1	46·6	46·0	45·7	45·8
525	3·3	**18 59**	33·0	33·3	34·0	34·9	35·9	36·7	37·2	37·2	36·8	36·2	35·5	35·0	35·0
526	4·2	**19 00**	21·9	22·3	23·0	23·8	24·7	25·4	25·9	26·0	25·8	25·2	24·7	24·3	24·3
527	2·7	**19 03**	39·3	39·9	40·6	41·6	42·6	43·5	44·2	44·4	44·1	43·6	43·0	42·7	42·8
528	3·9	**19 05**	40·0	40·5	41·2	42·1	43·0	43·9	44·5	44·7	44·5	44·0	43·5	43·2	43·3
529	3·0	**19 06**	09·8	10·1	10·8	11·6	12·5	13·3	13·8	13·9	13·6	13·1	12·6	12·2	12·2
530	3·5	**19 07**	07·2	07·7	08·3	09·1	10·0	10·8	11·4	11·5	11·3	10·9	10·3	10·0	10·1
531	3·4	**19 07**	57·9	58·4	59·1	60·0	61·0	62·0	62·6	62·8	62·6	62·1	61·5	61·2	61·2
532	4·1	**19 10**	35·2	35·7	36·5	37·5	38·7	39·7	40·4	40·7	40·4	39·9	39·2	38·8	38·9
533	3·0	**19 10**	44·4	44·9	45·6	46·4	47·4	48·3	48·9	49·1	48·9	48·4	47·9	47·5	47·6
534	3·2	**19 12**	30·1	30·4	31·5	33·2	35·1	36·5	37·2	36·9	35·8	34·1	32·3	30·8	30·1
535	4·5	**19 16**	55·7	56·0	56·6	57·5	58·6	59·4	60·0	60·1	59·7	59·0	58·2	57·7	57·5
536	4·0	**19 17**	27·5	27·8	28·6	29·7	31·0	32·0	32·6	32·6	32·0	31·0	29·9	29·1	28·7
537	3·9	**19 22**	37·5	37·9	38·6	39·4	40·3	41·2	41·8	42·1	41·9	41·5	40·9	40·6	40·6
538	4·3	**19 23**	48·7	49·3	50·1	51·2	52·4	53·6	54·4	54·7	54·5	53·8	53·1	52·6	52·6
539	4·1	**19 25**	01·1	01·6	02·5	03·5	04·6	05·7	06·5	06·8	06·6	06·0	05·3	04·9	04·9
540	3·4	**19 26**	19·6	19·9	20·5	21·3	22·2	23·0	23·6	23·8	23·6	23·2	22·6	22·3	22·3
541	3·9	**19 30**	06·0	06·2	06·9	08·0	09·2	10·3	10·9	11·0	10·4	09·5	08·5	07·6	07·3
542	3·2	**19 31**	22·7	23·0	23·6	24·4	25·3	26·2	26·8	26·9	26·7	26·1	25·5	25·0	24·8
543	4·4	**19 41**	47·1	47·4	47·9	48·7	49·6	50·4	51·0	51·2	51·1	50·6	50·0	49·6	49·5
544	3·0	**19 45**	28·5	28·7	29·3	30·2	31·3	32·3	33·0	33·2	32·8	32·1	31·2	30·4	30·1
545	2·8	**19 47**	02·4	02·7	03·2	03·9	04·8	05·7	06·3	06·6	06·4	06·0	05·4	05·0	04·9
546	3·8	**19 48**	07·1	07·3	07·9	08·6	09·5	10·4	11·0	11·2	11·1	10·6	10·0	09·6	09·5
547	4·0	**19 48**	03·3	03·3	04·2	06·0	08·1	09·8	10·8	10·8	09·8	08·0	05·9	04·1	03·0
548d	0·9	**19 51**	35·1	35·4	35·9	36·6	37·5	38·4	39·0	39·3	39·1	38·7	38·2	37·8	37·7
549	4·0	**19 53**	18·6	18·9	19·4	20·1	21·0	21·9	22·5	22·8	22·7	22·3	21·8	21·4	21·3
550	4·2	**19 56**	23·3	23·6	24·3	25·3	26·5	27·7	28·5	29·0	28·9	28·3	27·6	27·1	27·0

The figures given refer to the beginning of the month, and should be interpolated to the actual date by means of the table on page 73.

No.		Name	Dec	Jan.	F.	M.	Apr.	M.	J.	July	A.	S.	Oct.	N.	D.	Jan.
			° ′	″	″	″	″	″	″	″	″	″	″	″	″	″
501	*o*	Herculis	**N 28 45**	63	55	49	48	52	59	67	74	79	80	77	71	62
502	μ	Sagittarii	**S 21 03**	02	03	04	04	03	02	01	02	02	02	03	03	03
503	η	Sagittarii	**S 36 45**	09	07	06	05	06	07	09	12	14	15	14	12	10
504	κ	Lyrae	**N 36 04**	30	20	14	13	17	25	33	41	47	48	45	39	30
505	δ	Sagittarii	**S 29 48**	61	61	60	60	59	59	60	62	63	64	64	63	62
506	η	Serpentis	**S 2 53**	28	32	35	35	33	29	26	23	21	21	22	25	29
507	ξ	Pavonis	**S 61 28**	53	47	43	42	43	47	54	60	65	67	65	60	53
508	χ	Draconis	**N 72 44**	30	19	12	11	15	23	33	43	49	51	48	40	30
509	ϵ	Sagittarii	**S 34 22**	22	20	19	18	18	19	21	23	25	26	26	24	22
510	109	Herculis	**N 21 46**	50	42	37	36	39	46	53	59	64	65	62	57	50
511	α	Telescopii	**S 45 57**	18	14	12	11	11	13	17	21	25	26	25	22	18
512	λ	Sagittarii	**S 25 24**	31	31	31	31	30	29	29	30	31	32	32	32	31
513	α	Scuti	**S 8 13**	44	47	49	49	47	44	41	39	38	38	39	41	43
514	*Vega* (α Lyrae)		**N 38 47**	69	59	53	51	55	62	71	80	86	88	86	79	70
515	ζ	Pavonis	**S 71 24**	32	24	18	16	17	21	28	36	43	46	44	38	30
516	ϕ	Sagittarii	**S 26 58**	12	11	11	09	08	07	08	09	10	11	12	11	10
517	110	Herculis	**N 20 33**	56	49	44	42	46	52	59	65	70	72	70	65	58
518	β	Scuti	**S 4 43**	35	39	41	41	39	35	32	29	27	27	28	30	33
519	111	Herculis	**N 18 12**	13	06	01	00	03	09	16	22	26	28	26	22	15
520	β	Lyrae	**N 33 22**	68	59	52	50	54	61	69	78	84	86	84	78	70
521	λ	Pavonis	**S 62 09**	51	45	40	37	37	40	46	52	58	61	60	56	49
522	σ	Sagittarii	**S 26 16**	21	20	19	18	17	16	15	16	18	19	19	19	18
523	*R*	Lyrae	**N 43 57**	78	67	60	58	61	69	78	87	94	97	95	89	80
524	ξ^2	Sagittarii	**S 21 04**	52	53	53	52	50	48	47	47	48	49	49	50	50
525	γ	Lyrae	**N 32 42**	58	49	42	40	43	50	59	67	73	76	74	69	61
526	ϵ	Aquilae	**N 15 05**	40	33	29	28	31	36	43	49	53	55	53	49	43
527	ζ	Sagittarii	**S 29 51**	10	09	07	06	04	03	04	05	07	09	09	08	07
528	*o*	Sagittarii	**S 21 42**	49	49	49	48	46	44	43	43	44	45	46	46	46
529	ζ	Aquilae	**N 13 53**	31	24	20	19	22	27	33	39	44	45	44	40	34
530	λ	Aquilae	**S 4 51**	15	18	20	20	17	14	10	07	05	05	06	08	11
531	τ	Sagittarii	**S 27 38**	34	33	31	30	28	27	27	28	30	31	32	31	30
532	α	Coronae Aust.	**S 37 52**	30	27	25	22	21	21	23	25	29	31	31	30	27
533	π	Sagittarii	**S 20 59**	37	38	37	36	34	32	31	31	31	32	33	34	34
534	δ	Draconis	**N 67 41**	40	28	20	17	19	26	36	47	55	59	59	53	44
535	θ	Lyrae	**N 38 09**	62	53	46	43	46	53	62	71	78	81	80	75	67
536	κ	Cygni	**N 53 23**	71	60	52	49	52	59	69	79	87	91	90	85	76
537	ρ	Sagittarii	**S 17 48**	45	46	46	44	42	39	38	37	37	38	39	40	40
538	β^1	Sagittarii	**S 44 25**	28	24	20	17	15	15	18	22	26	29	29	27	23
539	α	Sagittarii	**S 40 34**	53	49	46	43	41	41	43	46	50	53	53	52	48
540	δ	Aquilae	**N 3 08**	66	61	58	58	61	65	70	75	78	79	77	75	71
541	ι	Cygni	**N 51 45**	70	59	51	48	50	57	67	77	85	89	89	84	75
542	β	Cygni	**N 27 59**	55	47	41	38	41	47	55	63	70	73	72	68	60
543	β	Sagittae	**N 17 30**	67	60	55	53	56	62	69	75	80	83	82	79	73
544	δ	Cygni	**N 45 10**	33	23	15	12	13	20	29	39	47	52	52	48	40
545	γ	Aquilae	**N 10 39**	27	22	18	17	19	25	31	37	41	43	42	39	34
546	δ	Sagittae	**N 18 34**	46	39	34	32	34	40	47	54	60	62	62	58	52
547	ϵ	Draconis	**N 70 18**	53	42	33	28	29	35	45	55	65	70	72	68	59
548	*Altair* (α Aql)		**N 8 54**	58	53	49	48	51	56	62	68	72	73	73	70	65
549	η	Aquilae	**N 1 03**	07	03	00	00	03	08	13	17	20	21	20	17	14
550	ι	Sagittarii	**S 41 49**	19	15	11	07	04	03	04	07	11	15	16	15	12

No.	Mag.	RA h	m	Jan. s	Feb. s	Mar. s	Apr. s	May s	June s	July s	Aug. s	Sept. s	Oct. s	Nov. s	Dec. s	Jan. s
551	3·9	**19**	**56**	07·2	07·5	08·0	08·7	09·6	10·5	11·1	11·4	11·3	10·9	10·3	09·9	09·9
552	4·0	**19**	**56**	55·0	55·1	55·7	56·5	57·5	58·4	59·1	59·3	59·1	58·5	57·8	57·2	57·0
553	3·7	**19**	**59**	29·2	29·4	29·9	30·6	31·5	32·4	33·0	33·3	33·2	32·7	32·2	31·7	31·5
554	4·1	**20**	**02**	25·5	26·1	27·7	29·9	32·6	35·3	37·2	38·1	37·6	36·1	34·2	32·5	31·8
555	4·4	**20**	**00**	48·0	48·4	49·0	49·9	51·0	52·1	52·9	53·3	53·2	52·8	52·1	51·7	51·6
556	3·6	**20**	**10**	18·1	18·5	19·7	21·3	23·4	25·4	26·9	27·6	27·4	26·4	25·0	23·9	23·4
557	4·4	**20**	**08**	13·0	12·4	13·6	16·1	19·3	22·0	23·7	23·7	22·2	19·5	16·1	13·0	10·8
558	3·4	**20**	**12**	09·2	09·4	09·9	10·6	11·5	12·4	13·0	13·4	13·4	13·0	12·5	12·1	12·0
559	4·3	**20**	**13**	45·5	45·5	46·1	47·1	48·5	49·8	50·6	50·9	50·5	49·6	48·4	47·3	46·7
560	3·9	**20**	**14**	08·3	08·3	08·9	09·7	10·9	12·0	12·7	13·0	12·7	12·0	11·2	10·4	09·9
561	3·8	**20**	**18**	58·0	58·2	58·7	59·4	60·3	61·2	62·0	62·4	62·3	62·0	61·5	61·1	61·0
562	3·2	**20**	**21**	56·1	56·3	56·8	57·5	58·4	59·3	60·1	60·5	60·5	60·1	59·6	59·2	59·1
563	2·3	**20**	**22**	48·7	48·8	49·2	50·0	51·1	52·1	52·8	53·2	53·0	52·4	51·7	51·0	50·6
564	2·1	**20**	**26**	55·5	55·8	56·6	57·8	59·3	60·8	62·0	62·7	62·7	62·0	61·1	60·2	59·8
565	4·1	**20**	**30**	03·9	04·0	04·4	05·1	06·1	07·0	07·8	08·1	08·0	07·6	06·9	06·4	06·1
566	4·3	**20**	**29**	49·7	49·5	50·1	51·3	52·8	54·3	55·4	55·7	55·3	54·2	52·8	51·4	50·5
567	4·0	**20**	**34**	00·0	00·1	00·5	01·1	02·0	02·9	03·6	04·0	04·0	03·7	03·1	02·7	02·5
568	3·2	**20**	**38**	42·6	42·8	43·4	44·4	45·6	46·9	48·0	48·6	48·6	48·2	47·4	46·7	46·5
569	3·7	**20**	**38**	19·3	19·4	19·8	20·4	21·3	22·2	22·9	23·3	23·3	23·0	22·4	22·0	21·8
570	3·9	**20**	**40**	24·2	24·3	24·7	25·3	26·2	27·1	27·8	28·2	28·2	27·9	27·4	26·9	26·7
571 d	1·3	**20**	**41**	59·2	59·1	59·5	60·3	61·4	62·5	63·3	63·7	63·6	63·0	62·2	61·4	60·9
572	3·6	**20**	**46**	23·7	23·9	24·7	26·2	28·1	30·1	31·8	32·8	32·8	32·0	30·6	29·3	28·7
573	4·3	**20**	**47**	04·0	04·2	04·6	05·3	06·2	07·3	08·1	08·6	08·7	08·4	07·9	07·4	07·2
574	3·6	**20**	**45**	36·1	35·8	36·2	37·3	38·8	40·3	41·4	41·8	41·5	40·6	39·2	37·9	37·0
575	2·6	**20**	**46**	52·5	52·5	52·9	53·6	54·6	55·6	56·4	56·8	56·7	56·3	55·6	55·0	54·7
576	3·8	**20**	**48**	34·0	34·1	34·5	35·2	36·0	37·0	37·8	38·2	38·3	38·0	37·5	37·1	36·9
577	4·2	**20**	**52**	48·0	48·1	48·6	49·3	50·2	51·2	52·1	52·7	52·8	52·5	51·9	51·4	51·2
578	3·7	**20**	**56**	04·1	04·2	04·9	06·0	07·5	09·1	10·5	11·3	11·4	10·8	09·9	08·9	08·4
579	4·0	**20**	**57**	47·1	47·0	47·3	48·0	49·0	50·1	51·0	51·4	51·4	50·9	50·2	49·5	49·0
580	3·9	**21**	**05**	31·6	31·5	31·8	32·5	33·5	34·7	35·6	36·0	36·0	35·5	34·8	34·0	33·5
581	4·2	**21**	**06**	52·3	52·4	52·7	53·4	54·2	55·2	56·1	56·6	56·7	56·5	56·0	55·6	55·3
582	3·4	**21**	**13**	38·3	38·3	38·6	39·2	40·1	41·0	41·9	42·4	42·4	42·1	41·5	41·0	40·6
583	3·8	**21**	**15**	27·0	26·9	27·2	27·8	28·8	29·8	30·7	31·2	31·3	30·9	30·2	29·5	29·1
584	4·1	**21**	**16**	39·0	39·0	39·3	39·8	40·7	41·6	42·4	42·9	43·0	42·8	42·4	41·9	41·7
585	4·3	**21**	**18**	03·8	03·6	03·9	04·5	05·5	06·6	07·5	08·0	08·0	07·7	07·0	06·3	05·8
586	4·4	**21**	**18**	35·8	35·7	35·9	36·5	37·5	38·5	39·4	39·9	40·0	39·6	39·0	38·4	38·0
587	2·6	**21**	**18**	57·5	57·0	57·2	58·2	59·7	61·2	62·5	63·1	63·0	62·2	61·0	59·6	58·6
588	4·3	**21**	**23**	09·8	09·8	10·1	10·7	11·6	12·5	13·4	14·0	14·2	14·0	13·5	13·0	12·8
589	4·3	**21**	**22**	51·1	51·1	51·3	51·9	52·7	53·7	54·5	55·0	55·1	54·9	54·4	53·9	53·6
590	4·3	**21**	**27**	45·6	45·4	46·0	47·2	48·9	50·8	52·6	53·8	54·1	53·5	52·3	51·0	50·1
591	3·9	**21**	**27**	36·3	36·4	36·7	37·2	38·1	39·1	40·0	40·6	40·8	40·6	40·2	39·7	39·4
592	3·3	**21**	**28**	50·6	49·7	49·9	51·0	53·0	55·1	56·8	57·6	57·5	56·4	54·6	52·7	51·0
593	3·1	**21**	**32**	25·7	25·7	25·9	26·5	27·3	28·2	29·1	29·6	29·8	29·6	29·2	28·8	28·5
594	4·2	**21**	**34**	36·1	35·8	36·0	36·6	37·7	38·8	39·8	40·4	40·5	40·1	39·4	38·6	38·0
595	3·8	**21**	**41**	00·2	00·2	00·5	01·0	01·8	02·8	03·7	04·3	04·6	04·4	04·0	03·5	03·2
596	3·7	**21**	**43**	11·0	10·3	11·0	12·9	15·9	19·4	22·6	24·7	25·3	24·3	22·0	19·3	17·3
597	4·4	**21**	**44**	00·5	00·0	00·1	00·8	02·1	03·5	04·8	05·5	05·6	05·1	04·1	02·9	02·0
598	2·5	**21**	**44**	60·0	59·9	60·1	60·6	61·4	62·3	63·2	63·8	64·0	63·8	63·4	62·9	62·6
599	4·3	**21**	**45**	55·4	55·3	55·6	56·2	57·1	58·2	59·2	59·9	60·2	60·0	59·5	59·0	58·6
600	4·5	**21**	**45**	55·1	54·5	54·6	55·4	56·7	58·3	59·6	60·4	60·5	59·9	58·8	57·6	56·5

The figures given refer to the beginning of the month, and should be interpolated to the actual date by means of the table on page 73.

No.		Name	Dec	Jan.	F.	M.	Apr.	M.	J.	July	A.	S.	Oct.	N.	D.	Jan.
			° ′	″	″	″	″	″	″	″	″	″	″	″	″	″
551	β	Aquilae	**N 6 26**	67	62	59	58	61	66	71	77	80	82	81	78	74
552	η	Cygni	**N 35 07**	55	47	39	36	38	44	53	62	69	74	74	70	63
553	γ	Sagittae	**N 19 32**	29	22	17	15	17	23	30	37	43	46	46	42	37
554	ϵ	Pavonis	**S 72 51**	49	40	32	26	23	25	30	37	45	51	52	49	41
555	θ^1	Sagittarii	**S 35 13**	43	40	37	33	30	29	29	31	34	37	39	38	36
556	δ	Pavonis	**S 66 07**	74	66	58	52	49	50	54	61	69	74	76	73	67
557	κ	Cephei	**N 77 45**	57	46	37	31	31	36	45	56	66	73	75	72	65
558	θ	Aquilae	**S 0 45**	67	71	73	73	70	65	60	56	53	53	54	56	59
559	33	Cygni	**N 56 37**	25	15	06	01	01	07	17	27	37	43	45	41	34
560	o^1	Cygni	**N 46 47**	48	38	30	26	27	33	42	52	61	66	67	64	57
561	α^2	Capricorni	**S 12 29**	25	26	26	25	22	18	14	12	11	12	13	15	16
562	β	Capricorni	**S 14 43**	33	34	34	32	29	25	22	20	19	20	22	23	24
563	γ	Cygni	**N 40 18**	53	44	36	32	33	39	48	57	66	71	72	69	62
564	α	Pavonis	**S 56 40**	48	41	34	28	24	23	26	31	37	43	45	44	39
565	41	Cygni	**N 30 25**	43	35	29	25	27	32	40	49	56	61	62	59	53
566	θ	Cephei	**N 63 02**	79	69	60	54	54	59	68	78	89	96	99	96	89
567	ϵ	Delphini	**N 11 21**	49	44	40	39	41	46	52	59	63	66	66	63	59
568	α	Indi	**S 47 13**	55	49	44	38	34	32	32	36	41	46	49	48	45
569	β	Delphini	**N 14 39**	25	19	15	13	15	20	27	34	39	42	42	40	35
570	α	Delphini	**N 15 58**	29	23	18	16	18	24	31	37	43	46	46	44	39
571		*Deneb* (α Cygni)	**N 45 20**	42	33	24	20	20	25	34	44	53	59	61	59	53
572	β	Pavonis	**S 66 08**	32	23	15	08	03	02	05	11	19	25	28	27	21
573	ψ	Capricorni	**S 25 12**	33	31	29	25	21	18	15	15	17	19	21	22	22
574	η	Cephei	**N 61 54**	33	23	13	07	07	11	20	31	42	49	53	51	44
575	ϵ	Cygni	**N 34 01**	75	67	60	56	57	62	70	79	87	93	94	92	86
576	ϵ	Aquarii	**S 9 25**	56	57	57	56	53	48	44	41	40	40	41	43	45
577	ω	Capricorni	**S 26 51**	18	16	13	10	05	02	00	00	01	04	06	07	07
578	β	Indi	**S 58 22**	85	78	71	64	59	57	58	63	70	76	80	79	74
579	ν	Cygni	**N 41 13**	71	62	54	50	50	55	63	73	82	88	90	88	82
580	ξ	Cygni	**N 43 59**	59	50	42	36	36	41	49	59	68	75	78	76	71
581	θ	Capricorni	**S 17 09**	53	53	51	49	45	40	37	35	35	36	38	40	41
582	ζ	Cygni	**N 30 17**	60	52	46	42	42	47	55	63	71	77	79	77	72
583	τ	Cygni	**N 38 06**	77	69	62	57	57	62	70	79	88	94	97	96	90
584	α	Equulei	**N 5 19**	12	08	05	05	07	12	18	24	28	30	29	27	24
585	σ	Cygni	**N 39 27**	71	63	55	50	50	54	62	72	81	87	90	89	84
586	υ	Cygni	**N 34 57**	79	71	64	59	59	64	72	81	89	95	98	97	91
587	α	Cephei	**N 62 39**	44	35	25	18	16	20	28	38	49	58	62	62	57
588	ι	Capricorni	**S 16 45**	42	42	41	38	34	29	26	23	23	25	27	29	30
589	1	Pegasi	**N 19 52**	48	42	37	34	35	40	47	55	61	65	67	65	61
590	γ	Pavonis	**S 65 16**	87	79	70	62	55	52	54	59	66	73	78	78	73
591	ζ	Capricorni	**S 22 19**	76	75	73	69	64	60	56	55	56	58	61	63	63
592	β	Cephei	**N 70 37**	84	75	65	58	55	58	65	75	87	96	102	102	98
593	β	Aquarii	**S 5 29**	44	46	46	45	42	37	32	28	25	25	26	28	30
594	ρ	Cygni	**N 45 39**	76	67	59	53	52	56	64	73	83	91	95	94	89
595	γ	Capricorni	**S 16 34**	68	68	67	64	59	54	50	48	47	49	51	53	54
596	ν	Octantis	**S 77 18**	59	50	40	31	24	21	23	29	37	46	51	51	46
597	μ	Cephei	**N 58 51**	46	37	27	20	18	21	28	38	49	58	63	64	60
598	ϵ	Pegasi	**N 9 57**	17	13	09	08	10	15	21	28	33	36	36	34	31
599	ι	Piscis Aust.	**S 32 56**	57	55	50	45	39	34	32	32	35	39	42	44	44
600	ν	Cephei	**N 61 11**	74	66	56	49	46	49	56	66	77	86	92	93	88

No.	Mag.	RA h m	Jan. s	Feb. s	Mar. s	Apr. s	May s	June s	July s	Aug. s	Sept. s	Oct. s	Nov. s	Dec. s	Jan. s
601	3·0	**21 47**	57·1	57·0	57·3	57·8	58·6	59·5	60·4	61·1	61·3	61·2	60·8	60·3	60·1
602	4·3	**21 47**	24·3	23·9	24·0	24·6	25·7	26·9	28·0	28·7	28·8	28·4	27·7	26·8	26·2
603	3·2	**21 54**	55·2	55·1	55·3	55·9	56·8	57·9	59·0	59·8	60·1	60·0	59·4	58·9	58·5
604	3·2	**22 06**	38·1	38·0	38·2	38·6	39·3	40·3	41·1	41·8	42·1	42·0	41·6	41·2	40·9
605	4·3	**22 07**	19·8	19·7	19·8	20·3	21·1	22·0	22·9	23·6	23·9	23·8	23·5	23·0	22·7
606	4·0	**22 07**	47·2	47·0	47·1	47·5	48·3	49·3	50·2	50·9	51·1	51·0	50·6	50·0	49·7
607	2·2	**22 09**	15·5	15·3	15·5	16·1	17·1	18·4	19·6	20·5	21·0	20·8	20·2	19·5	19·0
608	4·4	**22 10**	43·7	43·4	43·5	43·9	44·8	45·8	46·7	47·4	47·7	47·5	47·0	46·5	46·0
609	3·7	**22 11**	02·3	02·2	02·3	02·7	03·4	04·3	05·2	05·9	06·2	06·1	05·7	05·3	05·0
610	3·6	**22 11**	25·8	25·2	25·2	25·8	27·0	28·4	29·7	30·6	30·8	30·5	29·6	28·5	27·6
611	4·3	**22 17**	42·5	42·4	42·5	42·9	43·6	44·6	45·5	46·1	46·5	46·4	46·1	45·7	45·4
612	2·9	**22 19**	36·1	35·7	35·8	36·5	37·8	39·4	41·0	42·2	42·8	42·6	41·8	40·7	39·9
613	4·0	**22 22**	30·8	30·7	30·8	31·2	31·9	32·8	33·7	34·4	34·7	34·7	34·3	33·9	33·6
614	3·7	**22 29**	41·3	41·1	41·2	41·6	42·3	43·2	44·1	44·8	45·1	45·1	44·8	44·4	44·0
615	4·0	**22 30**	14·7	14·5	14·6	15·1	16·0	17·1	18·3	19·2	19·7	19·7	19·2	18·6	18·0
616	4·0	**22 29**	47·6	46·9	46·7	47·2	48·4	49·8	51·2	52·1	52·5	52·2	51·4	50·4	49·4
617	4·4	**22 32**	26·4	26·2	26·3	26·7	27·5	28·6	29·6	30·4	30·9	30·8	30·5	29·9	29·5
618	3·8	**22 31**	59·0	58·4	58·4	58·8	59·8	61·0	62·2	63·0	63·4	63·2	62·6	61·8	61·1
619	4·1	**22 36**	12·7	12·5	12·6	12·9	13·6	14·5	15·4	16·1	16·5	16·5	16·2	15·8	15·4
620	4·2	**22 41**	34·1	33·9	33·9	34·3	35·0	36·0	37·0	37·8	38·3	38·3	38·0	37·5	37·1
621	3·6	**22 42**	17·7	17·5	17·5	17·8	18·5	19·4	20·3	21·0	21·4	21·4	21·1	20·7	20·3
622	2·2	**22 43**	38·5	38·2	38·2	38·6	39·5	40·7	42·0	43·0	43·5	43·5	43·1	42·4	41·8
623	3·1	**22 43**	47·3	47·0	46·9	47·3	48·0	49·0	50·0	50·7	51·1	51·1	50·7	50·2	49·8
624	4·3	**22 47**	33·4	31·0	30·6	32·1	35·3	39·8	44·4	48·2	50·2	49·7	47·0	43·1	39·3
625	4·1	**22 47**	20·3	20·0	20·0	20·3	21·0	21·9	22·9	23·6	24·0	24·0	23·7	23·3	22·8
626	3·7	**22 49**	32·2	31·8	31·8	32·3	33·2	34·5	35·8	36·9	37·5	37·5	37·0	36·3	35·6
627	4·2	**22 50**	28·2	28·0	28·0	28·4	29·0	29·9	30·9	31·6	32·1	32·1	31·8	31·4	31·1
628	3·7	**22 50**	16·9	15·8	15·4	15·9	17·2	19·0	20·7	22·0	22·5	22·3	21·3	20·0	18·6
629	3·7	**22 50**	48·7	48·4	48·4	48·7	49·4	50·4	51·3	52·1	52·5	52·5	52·2	51·7	51·3
630	3·8	**22 53**	28·9	28·7	28·8	29·1	29·7	30·6	31·5	32·3	32·7	32·8	32·5	32·1	31·8
631	3·5	**22 55**	31·8	31·6	31·6	31·9	32·6	33·5	34·4	35·2	35·7	35·7	35·5	35·1	34·7
632 d	1·3	**22 58**	33·8	33·5	33·5	33·8	34·5	35·5	36·6	37·4	37·9	38·0	37·7	37·2	36·8
633	4·2	**23 01**	50·4	49·9	49·8	50·2	51·1	52·4	53·8	54·9	55·6	55·7	55·2	54·4	53·7
634	3·6	**23 02**	41·8	41·4	41·2	41·5	42·3	43·4	44·5	45·3	45·8	45·8	45·4	44·8	44·2
635	2·6	**23 04**	35·4	35·0	34·9	35·2	35·9	36·8	37·8	38·6	39·1	39·1	38·8	38·4	37·9
636	2·6	**23 05**	35·7	35·5	35·4	35·7	36·3	37·2	38·1	38·9	39·4	39·4	39·2	38·8	38·4
637	3·8	**23 10**	19·9	19·6	19·6	19·8	20·5	21·4	22·3	23·2	23·7	23·8	23·6	23·1	22·8
638	4·1	**23 11**	17·1	16·8	16·7	17·0	17·7	18·9	20·1	21·1	21·8	21·9	21·5	20·9	20·3
639	4·4	**23 15**	11·2	11·0	10·9	11·1	11·7	12·6	13·5	14·3	14·8	14·9	14·7	14·3	14·0
640	3·8	**23 18**	02·0	01·7	01·7	01·9	02·5	03·4	04·3	05·1	05·6	05·7	05·5	05·1	04·8
641	4·1	**23 18**	22·4	21·7	21·5	21·9	22·8	24·2	25·7	27·0	27·9	28·0	27·5	26·6	25·7
642	4·2	**23 23**	50·6	50·3	50·2	50·4	51·0	51·9	52·9	53·7	54·3	54·4	54·2	53·8	53·4
643	4·4	**23 28**	49·1	48·9	48·7	48·9	49·5	50·3	51·3	52·1	52·6	52·7	52·6	52·2	51·9
644	4·5	**23 33**	51·4	51·0	50·8	51·0	51·6	52·6	53·7	54·7	55·4	55·6	55·3	54·8	54·3
645	4·0	**23 38**	23·8	23·2	22·9	23·1	23·8	24·9	26·0	27·1	27·7	27·9	27·6	27·0	26·4
646	4·3	**23 38**	58·2	57·7	57·4	57·5	58·2	59·2	60·4	61·4	62·0	62·2	61·9	61·4	60·8
647	3·4	**23 40**	04·5	01·8	00·3	00·5	02·3	05·2	08·4	11·1	12·6	12·8	11·5	09·1	06·3
648	4·3	**23 40**	48·9	48·6	48·4	48·6	49·1	50·0	50·9	51·7	52·3	52·4	52·3	52·0	51·6
649	4·3	**23 41**	14·8	14·2	13·9	14·0	14·7	15·8	16·9	17·9	18·6	18·8	18·5	18·0	17·4
650	4·0	**0 00**	10·6	10·2	10·1	10·2	10·6	11·4	12·4	13·2	13·8	14·0	14·0	13·7	13·3

The figures given refer to the beginning of the month, and should be interpolated to the actual date by means of the table on page 73.

No.		Name	Dec	Jan.	F.	M.	Apr.	M.	J.	July	A.	S.	Oct.	N.	D.	Jan.
			° ′	″	″	″	″	″	″	″	″	″	″	″	″	″
601	δ	Capricorni	**S 16 02**	61	61	60	57	52	47	43	40	40	41	44	46	47
602	π^2	Cygni	**N 49 23**	33	25	16	10	08	11	18	28	39	47	51	52	47
603	γ	Gruis	**S 37 16**	71	68	63	57	50	45	43	43	47	51	56	58	57
604	α	Aquarii	**S 0 13**	72	74	76	75	72	67	61	56	53	52	52	54	57
605	ι	Aquarii	**S 13 46**	75	76	75	72	67	62	57	54	53	54	56	59	60
606	ι	Pegasi	**N 25 25**	51	45	39	36	36	40	47	55	62	68	70	70	66
607	α	Gruis	**S 46 52**	52	47	40	33	26	21	19	20	25	31	36	39	37
608	π	Pegasi	**N 33 15**	54	47	40	35	35	38	45	54	62	69	73	72	69
609	θ	Pegasi	**N 6 16**	58	54	52	51	53	58	64	70	75	77	77	76	73
610	ζ	Cephei	**N 58 16**	83	75	66	58	55	57	64	73	84	94	100	102	98
611	θ	Aquarii	**S 7 41**	55	57	57	55	51	46	41	36	34	34	36	38	40
612	α	Tucanae	**S 60 10**	41	35	26	17	09	04	03	06	12	20	26	28	26
613	γ	Aquarii	**S 1 17**	65	67	68	68	64	59	53	48	45	44	45	47	49
614	ζ	Aquarii	**N 0 03**	63	60	59	59	62	67	73	78	82	83	83	81	79
615	δ^1	Gruis	**S 43 24**	42	38	32	24	17	11	08	08	12	18	24	26	26
616	δ	Cephei	**N 58 29**	85	77	68	60	57	58	64	74	84	94	101	103	101
617	β	Piscis Aust.	**S 32 15**	40	38	33	28	21	15	11	10	12	16	21	24	24
618	α	Lacertae	**N 50 22**	27	20	11	04	01	03	09	19	29	38	44	46	43
619	η	Aquarii	**S 0 01**	47	49	51	50	47	42	36	31	27	26	26	28	30
620	ϵ	Piscis Aust.	**S 26 56**	85	84	81	75	69	63	58	57	58	61	65	68	69
621	ζ	Pegasi	**N 10 55**	16	13	09	08	10	14	20	27	32	36	37	35	33
622	β	Gruis	**S 46 47**	57	52	46	38	30	23	20	21	26	32	38	41	40
623	η	Pegasi	**N 30 18**	46	41	35	30	29	32	39	47	55	61	65	66	63
624	β	Octantis	**S 81 17**	49	40	30	19	10	04	04	08	16	26	33	35	32
625	λ	Pegasi	**N 23 39**	26	21	16	12	12	16	22	30	37	43	46	45	43
626	ϵ	Gruis	**S 51 13**	52	48	40	32	23	17	14	15	20	27	33	37	36
627	τ	Aquarii	**S 13 29**	75	75	74	71	66	61	55	52	50	51	54	56	58
628	ι	Cephei	**N 66 17**	41	34	25	16	11	11	17	26	37	47	55	59	57
629	μ	Pegasi	**N 24 41**	37	32	26	23	22	26	32	40	47	53	56	56	53
630	λ	Aquarii	**S 7 29**	24	25	25	23	19	13	08	03	01	01	02	05	07
631	δ	Aquarii	**S 15 43**	55	55	54	50	45	39	34	30	29	31	34	36	38
632		*Fomalhaut* (α PsA)	**S 29 31**	65	64	60	54	47	41	36	34	36	40	44	48	49
633	ζ	Gruis	**S 52 39**	62	57	50	41	32	25	22	23	28	35	42	45	45
634	o	Andromedae	**N 42 24**	75	69	62	56	53	54	60	69	78	87	92	94	92
635	β	Pegasi	**N 28 10**	38	33	28	23	22	25	31	39	47	54	57	58	56
636	α	Pegasi	**N 15 17**	52	48	45	43	43	47	53	60	66	71	73	72	70
637	88	Aquarii	**S 21 04**	56	56	54	49	43	37	32	29	29	31	34	38	39
638	ι	Gruis	**S 45 08**	91	88	81	73	65	58	54	54	57	63	70	74	74
639	ϕ	Aquarii	**S 5 57**	30	32	32	30	26	21	15	10	07	07	08	11	13
640	γ	Piscium	**N 3 22**	30	28	26	26	28	33	39	45	49	51	51	50	48
641	γ	Tucanae	**S 58 08**	51	46	38	28	19	11	08	09	14	22	29	34	33
642	98	Aquarii	**S 20 00**	37	37	34	30	24	18	12	09	08	10	14	17	19
643	θ	Piscium	**N 6 28**	21	18	15	15	17	21	27	33	38	41	42	40	38
644	β	Sculptoris	**S 37 43**	42	39	35	28	19	12	07	05	07	12	18	23	24
645	λ	Andromedae	**N 46 32**	73	68	61	54	50	50	55	63	72	81	88	91	90
646	ι	Andromedae	**N 43 21**	55	50	43	37	33	34	39	46	56	64	71	74	73
647	γ	Cephei	**N 77 43**	55	51	42	33	26	23	26	33	44	55	65	72	73
648	ι	Piscium	**N 5 43**	05	03	01	00	02	07	13	19	23	26	26	25	23
649	κ	Andromedae	**N 44 25**	53	48	41	34	30	31	35	43	52	61	68	71	70
650	ω	Piscium	**N 6 57**	25	22	20	20	22	26	32	38	43	45	46	45	43

No.	Mag.	RA	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
		h m	s	s	s	s	s	s	s	s	s	s	s	s	s
651	5·4	**0 48**	58·0	55·6	53·9	53·3	54·2	56·3	58·9	61·6	63·6	64·6	64·5	63·3	61·3
652	5·2	**2 07**	15·6	13·1	10·7	09·3	09·3	10·9	13·5	16·6	19·5	21·6	22·5	22·1	20·6
653	5·5	**3 22**	38·1	35·7	32·8	30·5	29·6	30·5	32·8	36·1	39·8	42·9	45·1	45·8	44·9
654	5·2	**4 12**	66·0	63·3	59·6	56·0	54·0	54·2	56·6	60·5	65·3	69·9	73·5	75·3	75·0
655	5·1	**5 03**	42·9	40·9	37·2	33·3	30·5	29·8	31·5	35·1	40·0	45·1	49·5	52·4	53·0
656	5·2	**5 25**	29·6	28·3	25·5	22·2	19·7	18·9	20·0	22·8	26·8	31·0	34·9	37·6	38·5
657	4·7	**7 02**	35·6	35·8	34·3	31·8	29·3	27·7	27·5	28·8	31·3	34·7	38·3	41·4	43·4
658	5·3	**8 07**	27·2	28·4	27·4	24·8	21·6	19·0	17·7	18·2	20·5	24·0	28·3	32·4	35·7
659	4·6	**9 39**	25·4	28·5	29·0	27·0	23·5	19·8	17·0	15·8	16·6	19·3	23·6	28·6	33·2
660	5·0	**10 36**	29·4	31·9	32·9	32·3	30·5	28·4	26·4	25·2	25·0	26·0	28·2	31·1	34·2
661	5·1	**12 12**	56·2	59·6	61·7	62·3	61·2	59·1	56·5	54·1	52·6	52·2	53·4	55·8	59·1
662	5·3	**12 49**	18·1	24·3	28·8	30·6	29·2	25·5	20·4	15·4	11·5	09·8	10·6	14·1	19·6
663	5·0	**14 08**	43·6	47·0	49·9	51·8	52·2	51·1	48·8	46·0	43·2	41·3	40·6	41·5	43·9
375	4·4	**14 27**	26·1	29·0	31·6	33·5	34·0	33·3	31·4	29·0	26·5	24·6	23·8	24·4	26·4
389	2·2	**14 50**	36·0	38·6	41·1	42·9	43·7	43·2	41·7	39·5	37·2	35·3	34·3	34·6	36·2
417	4·3	**15 43**	23·0	25·8	29·1	31·8	33·4	33·3	31·7	29·1	25·8	22·8	20·8	20·3	21·5
664	5·0	**16 16**	56·2	58·4	61·1	63·7	65·3	65·7	64·7	62·6	59·8	57·1	55·0	54·2	54·9
453	4·4	**16 44**	07·8	10·9	15·5	20·0	23·3	24·2	22·7	19·0	14·0	08·8	04·5	02·3	02·7
665	5·0	**17 48**	35·7	37·1	39·6	42·5	45·1	46·5	46·4	44·8	42·1	38·9	35·9	33·8	33·4
666	5·1	**19 08**	26·6	26·9	28·7	31·4	34·2	36·4	37·2	36·6	34·5	31·6	28·5	25·9	24·5
557	4·4	**20 08**	13·0	12·4	13·6	16·1	19·3	22·0	23·7	23·7	22·2	19·5	16·1	13·0	10·8
667	5·2	**20 31**	12·7	12·0	12·8	14·7	17·3	19·7	21·3	21·7	20·8	18·8	16·1	13·5	11·6
668	4·8	**22 47**	21·8	17·3	15·5	16·9	21·0	26·4	31·6	35·2	36·5	35·1	31·4	26·1	20·5
669	4·5	**23 08**	26·5	24·4	23·5	24·0	25·9	28·5	31·1	33·2	34·2	33·9	32·5	30·3	27·8
647	3·4	**23 40**	04·5	01·8	00·3	00·5	02·3	05·2	08·4	11·1	12·6	12·8	11·5	09·1	06·3
670	4·7	**0 02**	22·9	20·6	19·4	19·3	20·6	23·1	26·2	29·2	31·3	31·9	31·0	28·8	26·1
7	2·9	**0 26**	34·1	31·6	30·1	29·8	30·8	33·1	36·2	39·3	41·7	42·7	42·1	40·1	37·4
671	4·7	**2 50**	24·4	21·9	19·5	17·5	16·6	16·9	18·5	21·0	23·6	25·7	26·7	26·2	24·5
91	3·2	**3 46**	62·3	60·1	57·6	55·4	53·9	53·6	54·6	56·6	59·1	61·4	62·9	63·0	61·8
672	5·1	**6 09**	49·6	48·3	46·0	43·3	40·7	39·0	38·5	39·3	41·2	43·7	46·2	47·8	48·0
673	4·1	**8 17**	71·0	71·1	69·6	67·1	64·1	61·2	59·2	58·5	59·4	61·6	64·6	67·4	69·2
227	4·3	**8 20**	13·8	13·9	12·5	09·8	06·6	03·6	01·5	00·7	01·6	03·9	06·9	09·9	11·8
674	5·2	**9 33**	29·8	31·3	30·6	28·0	24·2	19·9	16·2	13·9	13·7	15·8	19·5	23·9	27·4
289	4·1	**10 35**	45·7	47·9	48·3	47·3	45·0	41·9	38·8	36·5	35·5	36·3	38·8	42·3	45·7
675	4·6	**10 45**	62·8	65·6	66·3	65·2	62·5	58·9	55·1	52·1	50·7	51·5	54·3	58·5	62·6
676	4·9	**12 00**	33·2	36·3	38·0	38·3	37·3	35·1	32·3	29·5	27·6	27·2	28·7	31·7	35·3
677	5·0	**12 05**	43·4	46·2	47·9	48·2	47·4	45·6	43·1	40·8	39·1	38·7	40·0	42·6	45·8
325	4·4	**12 19**	26·1	29·7	31·9	32·6	31·7	29·5	26·4	23·3	21·0	20·3	21·6	24·7	28·7
678	5·0	**13 26**	30·1	33·0	35·3	36·6	36·9	36·1	34·4	32·2	30·3	29·2	29·4	31·2	34·0
679	4·9	**14 20**	26·6	31·5	35·8	38·9	40·5	40·0	37·6	34·1	30·3	27·6	27·0	29·0	33·1
680	4·3	**14 29**	47·7	54·6	60·7	65·3	67·7	67·2	64·0	58·9	53·4	49·3	48·1	50·6	56·1
386	3·8	**14 50**	00·3	04·4	08·2	11·2	13·0	13·1	11·6	08·9	05·8	03·3	02·4	03·7	06·8
681	5·0	**14 59**	49·8	53·3	56·4	59·0	60·6	60·9	59·9	57·7	55·2	53·1	52·3	53·2	55·8
682	4·8	**16 22**	50·6	54·2	58·1	61·8	64·9	66·5	66·3	64·6	61·7	58·7	56·7	56·6	58·6
443	3·9	**16 36**	00·2	03·7	07·7	11·6	14·8	16·6	16·7	15·0	12·1	09·1	06·9	06·6	08·4
683	4·2	**16 45**	26·7	29·7	33·3	36·8	39·7	41·5	41·7	40·3	37·9	35·1	33·1	32·7	34·3
684	5·2	**21 06**	35·5	35·3	36·5	38·8	41·9	45·4	48·3	50·0	50·2	48·8	46·4	43·8	42·2
596	3·7	**21 43**	11·0	10·3	11·0	12·9	15·9	19·4	22·6	24·7	25·3	24·3	22·0	19·3	17·3
685	5·1	**22 21**	41·9	40·2	40·3	42·1	45·5	49·7	54·0	57·2	58·5	57·7	55·0	51·4	48·3
624	4·3	**22 47**	33·4	31·0	30·6	32·1	35·3	39·8	44·4	48·2	50·2	49·7	47·0	43·1	39·3

The figures given refer to the beginning of the month, and should be interpolated to the actual date by means of the table on page 73.

No.		Name	Dec	Jan.	F.	M.	Apr.	M.	J.	July	A.	S.	Oct.	N.	D.	Jan.
			° ′	″	″	″	″	″	″	″	″	″	″	″	″	″
651	23	Cassiopeiae	**N 74 56**	39	38	31	22	14	10	10	15	23	34	45	53	57
652	49	Cassiopeiae	**N 76 11**	55	57	53	46	37	30	27	29	35	44	55	65	71
653	BS 0961	(Cephei)	**N 77 47**	47	52	52	46	38	30	25	23	26	32	41	51	60
654	BS 1230	(Cephei)	**N 80 44**	33	40	42	38	31	22	15	11	11	16	23	33	43
655	BS 1523	(Cephei)	**N 81 12**	63	71	75	73	67	59	51	45	43	45	51	59	69
656	BS 1686	(Cam)	**N 79 14**	45	53	58	57	52	44	36	29	26	27	32	40	49
657	BS 2527	(Cam)	**N 76 56**	58	67	74	77	75	70	62	53	46	43	43	47	54
658	BS 3082	(Cam)	**N 79 25**	33	42	51	56	57	53	45	36	27	21	18	19	25
659	BS 3751	(Draconis)	**N 81 14**	39	46	56	64	68	67	62	53	43	33	26	23	25
660	BS 4126	(Draconis)	**N 75 36**	70	75	83	92	98	00	97	90	80	69	60	54	54
661	BS 4646	(Cam)	**N 77 30**	61	63	69	78	87	92	93	88	79	68	57	48	43
662 *	BS 4893	(Cam)	**N 83 18**	58	58	64	73	82	88	90	86	78	67	55	46	40
663	4	Ursae Minoris	**N 77 27**	51	48	50	58	67	76	81	81	76	67	56	44	35
375	5	Ursae Minoris	**N 75 36**	63	58	60	67	76	85	91	92	88	80	68	57	48
389	β	Ursae Minoris	**N 74 04**	61	55	56	62	71	80	87	89	86	79	68	56	46
417	ζ	Ursae Minoris	**N 77 44**	24	17	16	20	29	38	46	50	50	44	35	23	13
664	η	Ursae Minoris	**N 75 42**	53	45	42	46	53	63	72	77	78	75	66	55	44
453	ϵ	Ursae Minoris	**N 82 00**	25	16	12	14	21	31	40	46	48	45	38	28	17
665	35	Draconis	**N 76 57**	39	29	23	22	28	36	46	55	60	60	56	48	37
666	59	Draconis	**N 76 35**	27	16	08	04	06	14	23	34	42	46	45	40	31
557	κ	Cephei	**N 77 45**	57	46	37	31	31	36	45	56	66	73	75	72	65
667	73	Draconis	**N 75 00**	60	50	40	34	33	38	46	57	68	75	79	77	70
668	BS 8702	(Cephei)	**N 83 14**	57	51	41	32	26	25	29	38	49	60	69	74	73
669	π	Cephei	**N 75 28**	64	58	49	40	34	33	36	45	56	67	76	81	81
647	γ	Cephei	**N 77 43**	55	51	42	33	26	23	26	33	44	55	65	72	73
670	θ	Octantis	**S 76 57**	102	96	87	76	65	57	53	54	61	70	79	84	84
7	β	Hydri	**S 77 09**	56	51	42	31	20	11	06	06	12	21	30	36	37
671	ν	Hydri	**S 74 59**	76	78	74	67	56	45	35	30	30	36	45	55	61
91	γ	Hydri	**S 74 10**	95	99	98	93	83	72	62	55	52	56	64	74	83
672	α	Mensae	**S 74 45**	41	51	56	57	54	46	36	26	19	17	21	29	40
673	α	Chamaeleontis	**S 76 58**	20	32	41	48	51	48	41	32	22	16	14	19	29
227	θ	Chamaeleontis	**S 77 32**	17	28	38	45	47	45	38	29	19	13	11	16	25
674	ζ	Chamaeleontis	**S 81 00**	51	62	73	82	88	90	86	78	68	60	55	57	64
289	γ	Chamaeleontis	**S 78 41**	29	39	50	61	69	73	71	65	56	47	41	40	45
675	δ^2	Chamaeleontis	**S 80 37**	30	40	51	62	70	75	74	68	59	50	43	42	46
676	ϵ	Chamaeleontis	**S 78 18**	37	44	55	66	76	83	85	82	75	66	57	53	55
677	κ	Chamaeleontis	**S 76 36**	26	33	43	54	65	71	74	71	64	54	46	42	44
325	β	Chamaeleontis	**S 79 24**	00	06	16	27	38	46	48	46	39	30	22	17	18
678	ι^1	Muscae	**S 74 58**	10	15	22	32	43	52	57	57	53	45	36	29	28
679	η	Apodis	**S 81 04**	43	44	50	59	69	79	87	89	87	80	71	63	59
680	δ	Octantis	**S 83 44**	11	11	17	25	36	46	54	57	55	49	39	31	26
386	α	Apodis	**S 79 06**	29	29	33	41	51	61	69	72	71	65	57	48	43
681	R	Apodis	**S 76 43**	24	23	27	35	45	54	62	66	65	59	51	43	38
682 *	δ^1	Apodis	**S 78 43**	47	43	43	47	54	64	73	79	82	79	72	64	56
443	γ	Apodis	**S 78 55**	35	31	30	34	41	50	59	66	69	67	60	52	44
683	β	Apodis	**S 77 32**	41	36	35	38	45	53	62	69	73	71	65	57	49
684	α	Octantis	**S 76 56**	93	84	74	66	60	59	63	69	78	86	90	88	82
596	ν	Octantis	**S 77 18**	59	50	40	31	24	21	23	29	37	46	51	51	46
685	ϵ	Octantis	**S 80 20**	90	82	71	61	52	48	48	54	62	71	78	79	75
624	β	Octantis	**S 81 17**	49	40	30	19	10	04	04	08	16	26	33	35	32

* No., mag., dist. and p.a. of companion star: **662**, 5·8, 21″, 326° **682**, 5·2, 104″, 10°

Name		BS 0285 (Cephei)		α Ursae Min. (*Polaris*)		BS 2609 (Cephei)		δ Ursae Min.		BS 8546 (Cephei)		
Mag.		4·5		2·1		5·3		4·4		5·4		
Date		RA	Dec	RA	Dec	RA	Dec	RA	Dec	RA	Dec	GST
0^h UT1		1^h	N 86°	2^h	N 89°	7^h	N 86°	17^h	N 86°	22^h	N 86°	
		m s	′ ″	m s	′ ″	m s	′ ″	m s	′ ″	m s	′ ″	h m
Jan.	**1**	11 35	21 05	54 29	20 19	48 08	58 29	26 28	34 30	11 27	11 51	06 43
	11	11 32	21 06	54 14	20 21	48 09	58 32	26 29	34 26	11 25	11 49	07 23
	21	11 28	21 06	53 56	20 22	48 10	58 36	26 30	34 23	11 22	11 47	08 02
	31	11 25	21 05	53 37	20 23	48 10	58 39	26 33	34 20	11 20	11 44	08 42
Feb.	**10**	11 22	21 04	53 19	20 23	48 09	58 42	26 36	34 18	11 19	11 41	09 21
	20	11 19	21 02	53 00	20 23	48 07	58 45	26 39	34 17	11 19	11 38	10 00
Mar.	**2**	11 17	21 00	52 41	20 22	48 05	58 48	26 42	34 15	11 19	11 34	10 40
	12	11 15	20 57	52 26	20 20	48 02	58 50	26 46	34 15	11 19	11 31	11 19
	22	11 14	20 54	52 12	20 18	47 59	58 51	26 50	34 15	11 21	11 28	11 59
Apr.	**1**	11 13	20 51	52 01	20 15	47 55	58 53	26 53	34 16	11 23	11 26	12 38
	11	11 13	20 48	51 53	20 12	47 51	58 53	26 56	34 17	11 25	11 23	13 18
	21	11 14	20 45	51 49	20 09	47 47	58 53	26 59	34 19	11 28	11 22	13 57
May	**1**	11 15	20 42	51 49	20 06	47 43	58 52	27 02	34 22	11 31	11 21	14 36
	11	11 17	20 39	51 51	20 03	47 40	58 51	27 04	34 25	11 34	11 20	15 16
	21	11 19	20 37	51 57	20 00	47 37	58 49	27 05	34 27	11 37	11 20	15 55
	31	11 22	20 36	52 07	19 58	47 34	58 47	27 05	34 31	11 40	11 21	16 35
June	**10**	11 25	20 34	52 18	19 55	47 32	58 45	27 05	34 34	11 43	11 22	17 14
	20	11 28	20 34	52 32	19 53	47 31	58 42	27 05	34 37	11 46	11 24	17 54
	30	11 32	20 34	52 48	19 52	47 30	58 39	27 03	34 40	11 48	11 26	18 33
July	**10**	11 35	20 34	53 07	19 51	47 30	58 36	27 01	34 43	11 50	11 29	19 12
	20	11 39	20 35	53 25	19 51	47 31	58 32	26 59	34 45	11 52	11 32	19 52
	30	11 42	20 37	53 44	19 51	47 32	58 29	26 56	34 47	11 53	11 35	20 31
Aug.	**9**	11 45	20 39	54 04	19 51	47 34	58 26	26 52	34 49	11 54	11 39	21 11
	19	11 48	20 42	54 24	19 52	47 37	58 23	26 49	34 50	11 54	11 42	21 50
	29	11 50	20 44	54 43	19 54	47 40	58 21	26 45	34 51	11 53	11 46	22 30
Sept.	**8**	11 52	20 48	55 00	19 56	47 44	58 18	26 41	34 51	11 53	11 49	23 09
	18	11 54	20 51	55 18	19 58	47 48	58 16	26 36	34 51	11 51	11 53	23 48
	28	11 55	20 55	55 33	20 01	47 52	58 14	26 32	34 51	11 50	11 56	00 28
Oct.	**8**	11 56	20 58	55 45	20 04	47 56	58 13	26 28	34 50	11 47	11 59	01 07
	18	11 56	21 02	55 56	20 08	48 01	58 12	26 24	34 48	11 45	12 02	01 47
	28	11 56	21 06	56 04	20 11	48 06	58 12	26 21	34 46	11 42	12 05	02 26
Nov.	**7**	11 55	21 10	56 09	20 15	48 11	58 12	26 18	34 44	11 39	12 07	03 06
	17	11 54	21 13	56 10	20 19	48 16	58 13	26 15	34 41	11 35	12 08	03 45
	27	11 52	21 16	56 08	20 22	48 20	58 14	26 13	34 38	11 32	12 09	04 24
Dec.	**7**	11 50	21 19	56 04	20 26	48 24	58 16	26 11	34 34	11 29	12 09	05 04
	17	11 47	21 21	55 55	20 29	48 27	58 18	26 11	34 31	11 25	12 09	05 43
	27	11 44	21 23	55 43	20 32	48 30	58 21	26 11	34 27	11 22	12 07	06 23
	37	11 40	21 24	55 30	20 34	48 33	58 24	26 11	34 24	11 19	12 06	07 02

Name	ζ Octantis		ι Octantis		χ Octantis		σ Octantis		τ Octantis		
Mag.	5·4		5·4		5·2		5·5		5·6		
Date	RA	Dec	RA	Dec	RA	Dec	RA	Dec	RA	Dec	GST
0^h UT1	8^h	S 85°	12^h	S 85°	19^h	S 87°	21^h	S 88°	23^h	S 87°	
	m s	′ ″	m s	′ ″	m s	′ ″	m s	′ ″	m s	′ ″	h m
Jan. 1	54 16	43 36	57 02	12 29	03 40	34 50	21 28	53 16	29 42	23 39	06 43
11	54 17	43 40	57 05	12 30	03 41	34 47	21 24	53 13	29 37	23 37	07 23
21	54 17	43 43	57 07	12 32	03 43	34 44	21 21	53 09	29 34	23 35	08 02
31	54 17	43 47	57 10	12 34	03 47	34 41	21 21	53 06	29 31	23 32	08 42
Feb. 10	54 17	43 51	57 12	12 36	03 51	34 38	21 23	53 02	29 29	23 29	09 21
20	54 15	43 54	57 14	12 39	03 55	34 35	21 26	52 58	29 27	23 25	10 00
Mar. 2	54 14	43 57	57 16	12 43	04 00	34 33	21 31	52 55	29 26	23 21	10 40
12	54 12	44 01	57 17	12 46	04 06	34 32	21 38	52 52	29 26	23 17	11 19
22	54 09	44 03	57 18	12 50	04 12	34 30	21 46	52 48	29 27	23 14	11 59
Apr. 1	54 07	44 06	57 18	12 54	04 17	34 30	21 55	52 46	29 28	23 10	12 38
11	54 04	44 08	57 18	12 57	04 24	34 29	22 06	52 44	29 30	23 06	13 18
21	54 01	44 09	57 18	13 01	04 30	34 30	22 17	52 42	29 33	23 03	13 57
May 1	53 58	44 10	57 18	13 05	04 35	34 30	22 28	52 40	29 36	23 00	14 36
11	53 55	44 10	57 17	13 08	04 41	34 32	22 40	52 39	29 40	22 57	15 16
21	53 51	44 10	57 15	13 11	04 46	34 33	22 52	52 39	29 44	22 55	15 55
31	53 48	44 10	57 14	13 13	04 50	34 35	23 04	52 39	29 48	22 53	16 35
June 10	53 46	44 08	57 12	13 15	04 54	34 38	23 15	52 40	29 53	22 52	17 14
20	53 43	44 07	57 10	13 17	04 57	34 40	23 25	52 41	29 58	22 52	17 54
30	53 41	44 05	57 07	13 18	04 59	34 43	23 35	52 42	30 03	22 51	18 33
July 10	53 39	44 02	57 05	13 19	05 00	34 46	23 43	52 44	30 07	22 52	19 12
20	53 38	43 59	57 03	13 19	05 01	34 49	23 50	52 47	30 11	22 53	19 52
30	53 37	43 56	57 00	13 18	05 00	34 52	23 55	52 50	30 16	22 55	20 31
Aug. 9	53 37	43 53	56 58	13 17	04 59	34 55	23 58	52 53	30 19	22 57	21 11
19	53 37	43 50	56 56	13 15	04 56	34 58	23 59	52 56	30 22	22 59	21 50
29	53 38	43 47	56 54	13 13	04 53	35 00	23 58	52 59	30 24	23 02	22 30
Sept. 8	53 39	43 44	56 53	13 10	04 49	35 02	23 55	53 02	30 25	23 05	23 09
18	53 40	43 41	56 52	13 08	04 45	35 04	23 51	53 05	30 26	23 08	23 48
28	53 43	43 39	56 51	13 04	04 40	35 05	23 43	53 07	30 25	23 11	00 28
Oct. 8	53 45	43 37	56 51	13 01	04 35	35 05	23 35	53 09	30 24	23 14	01 07
18	53 48	43 36	56 51	12 58	04 30	35 05	23 26	53 11	30 22	23 17	01 47
28	53 51	43 36	56 52	12 55	04 26	35 04	23 16	53 12	30 19	23 19	02 26
Nov. 7	53 54	43 36	56 53	12 53	04 21	35 02	23 04	53 12	30 15	23 22	03 06
17	53 56	43 37	56 55	12 50	04 17	35 00	22 54	53 12	30 11	23 23	03 45
27	53 59	43 38	56 57	12 49	04 14	34 58	22 44	53 11	30 07	23 24	04 24
Dec. 7	54 02	43 40	57 00	12 47	04 12	34 55	22 34	53 09	30 02	23 24	05 04
17	54 04	43 43	57 03	12 47	04 11	34 52	22 25	53 07	29 57	23 24	05 43
27	54 05	43 45	57 05	12 47	04 11	34 49	22 18	53 05	29 53	23 23	06 23
37	54 06	43 49	57 08	12 48	04 12	34 45	22 13	53 02	29 49	23 21	07 02

POLARIS TABLE, 2017

LST	0^h		1^h		2^h		3^h		4^h		5^h	
	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0
m	′	′	′	′	′	′	′	′	′	′	′	′
0	−28·7	+27·7	−34·9	+19·2	−38·7	+ 9·4	−39·8	− 1·1	−38·1	−11·5	−33·9	−21·0
3	29·1	27·3	35·2	18·8	38·8	8·9	39·8	1·6	38·0	12·0	33·6	21·5
6	29·5	26·9	35·4	18·3	38·9	8·4	39·7	2·1	37·8	12·5	33·3	21·9
9	29·8	26·5	35·6	17·8	39·0	7·9	39·7	2·6	37·7	13·0	33·0	22·4
12	30·2	26·1	35·9	17·3	39·1	7·3	39·7	3·2	37·5	13·5	32·7	22·8
15	−30·5	+25·7	−36·1	+16·9	−39·2	+ 6·8	−39·6	− 3·7	−37·3	−14·0	−32·4	−23·2
18	30·8	25·3	36·3	16·4	39·3	6·3	39·6	4·2	37·1	14·4	32·1	23·7
21	31·2	24·9	36·5	15·9	39·4	5·8	39·5	4·7	36·9	14·9	31·8	24·1
24	31·5	24·5	36·7	15·4	39·5	5·3	39·5	5·3	36·7	15·4	31·5	24·5
27	31·8	24·1	36·9	14·9	39·5	4·7	39·4	5·8	36·5	15·9	31·1	24·9
30	−32·1	+23·7	−37·1	+14·4	−39·6	+ 4·2	−39·3	− 6·3	−36·3	−16·4	−30·8	−25·3
33	32·4	23·2	37·3	14·0	39·6	3·7	39·2	6·8	36·1	16·9	30·5	25·7
36	32·7	22·8	37·5	13·5	39·7	3·2	39·1	7·4	35·9	17·4	30·1	26·1
39	33·0	22·4	37·7	13·0	39·7	2·6	39·0	7·9	35·6	17·8	29·8	26·5
42	33·3	21·9	37·8	12·5	39·7	2·1	38·9	8·4	35·4	18·3	29·5	26·9
45	−33·6	+21·5	−38·0	+12·0	−39·8	+ 1·6	−38·8	− 8·9	−35·2	−18·8	−29·1	−27·3
48	33·9	21·0	38·1	11·5	39·8	1·1	38·7	9·4	34·9	19·2	28·7	27·7
51	34·1	20·6	38·3	10·9	39·8	+ 0·5	38·6	9·9	34·7	19·7	28·4	28·0
54	34·4	20·1	38·4	10·4	39·8	0·0	38·4	10·4	34·4	20·1	28·0	28·4
57	34·7	19·7	38·6	9·9	39·8	− 0·5	38·3	10·9	34·1	20·6	27·6	28·8
60	−34·9	+19·2	−38·7	+ 9·4	−39·8	− 1·1	−38·1	−11·5	−33·9	−21·0	−27·2	−29·1
Lat.	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1
°												
0	−·1	−·3	·0	−·2	·0	−·1	·0	+·1	·0	+·2	−·1	+·3
10	−·1	−·2	·0	−·2	·0	·0	·0	+·1	·0	+·2	−·1	+·2
20	−·1	−·2	·0	−·1	·0	·0	·0	+·1	·0	+·1	−·1	+·2
30	·0	−·1	·0	−·1	·0	·0	·0	·0	·0	+·1	−·1	+·1
40	·0	−·1	·0	−·1	·0	·0	·0	·0	·0	+·1	·0	+·1
45	·0	·0	·0	·0	·0	·0	·0	·0	·0	·0	·0	·0
50	·0	·0	·0	·0	·0	·0	·0	·0	·0	·0	·0	·0
55	·0	+·1	·0	·0	·0	·0	·0	·0	·0	·0	·0	−·1
60	·0	+·1	·0	+·1	·0	·0	·0	·0	·0	−·1	·0	−·1
62	+·1	+·2	·0	+·1	·0	·0	·0	·0	·0	−·1	+·1	−·2
64	+·1	+·2	·0	+·1	·0	·0	·0	−·1	·0	−·1	+·1	−·2
66	+·1	+·2	·0	+·2	·0	+·1	·0	−·1	·0	−·2	+·1	−·2
Month	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2
Jan.	+·1	−·1	+·1	·0	+·1	·0	+·1	·0	+·1	+·1	+·1	+·1
Feb.	+·1	−·2	+·1	−·2	+·2	−·2	+·2	−·1	+·2	−·1	+·2	·0
Mar.	−·1	−·3	·0	−·3	+·1	−·3	+·2	−·3	+·2	−·2	+·3	−·2
Apr.	−·2	−·3	−·2	−·3	−·1	−·4	·0	−·4	+·1	−·3	+·2	−·3
May	−·3	−·2	−·3	−·3	−·2	−·3	−·1	−·4	·0	−·4	+·1	−·4
June	−·4	·0	−·4	−·1	−·3	−·2	−·2	−·3	−·2	−·4	−·1	−·4
July	−·3	+·1	−·4	·0	−·4	−·1	−·3	−·2	−·3	−·2	−·2	−·3
Aug.	−·2	+·2	−·3	+·2	−·3	+·1	−·3	·0	−·3	−·1	−·3	−·2
Sept.	−·1	+·3	−·1	+·3	−·2	+·2	−·3	+·2	−·3	+·1	−·3	·0
Oct.	+·1	+·3	·0	+·3	·0	+·3	−·1	+·3	−·2	+·3	−·3	+·2
Nov.	+·3	+·2	+·2	+·3	+·1	+·4	·0	+·4	−·1	+·4	−·2	+·3
Dec.	+·4	+·1	+·4	+·2	+·3	+·3	+·2	+·4	+·1	+·4	·0	+·4

Latitude = Corrected observed altitude of *Polaris* + a_0 + a_1 + a_2

Azimuth of *Polaris* = (b_0 + b_1 + b_2) / cos (latitude)

LST	6^h		7^h		8^h		9^h		10^h		11^h	
	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0
m	′	′	′	′	′	′	′	′	′	′	′	′
0	−27·2	−29·1	−18·8	−35·2	− 9·0	−38·8	+ 1·3	−39·8	+11·6	−38·0	+21·0	−33·7
3	26·9	29·5	18·3	35·5	8·5	38·9	1·8	39·7	12·1	37·9	21·4	33·4
6	26·5	29·9	17·8	35·7	8·0	39·0	2·4	39·7	12·6	37·7	21·9	33·1
9	26·1	30·2	17·4	35·9	7·5	39·1	2·9	39·7	13·0	37·5	22·3	32·8
12	25·7	30·5	16·9	36·1	7·0	39·2	3·4	39·6	13·5	37·3	22·7	32·5
15	−25·3	−30·9	−16·4	−36·4	− 6·5	−39·3	+ 3·9	−39·6	+14·0	−37·2	+23·2	−32·2
18	24·9	31·2	16·0	36·6	6·0	39·4	4·4	39·5	14·5	37·0	23·6	31·9
21	24·5	31·5	15·5	36·8	5·4	39·5	5·0	39·5	15·0	36·8	24·0	31·6
24	24·1	31·8	15·0	37·0	4·9	39·5	5·5	39·4	15·5	36·6	24·4	31·3
27	23·6	32·2	14·5	37·2	4·4	39·6	6·0	39·3	15·9	36·4	24·8	31·0
30	−23·2	−32·5	−14·0	−37·3	− 3·9	−39·6	+ 6·5	−39·2	+16·4	−36·2	+25·2	−30·7
33	22·8	32·8	13·5	37·5	3·4	39·7	7·0	39·1	16·9	35·9	25·6	30·3
36	22·4	33·1	13·0	37·7	2·8	39·7	7·5	39·0	17·4	35·7	26·0	30·0
39	21·9	33·3	12·5	37·9	2·3	39·8	8·0	38·9	17·8	35·5	26·4	29·6
42	21·5	33·6	12·0	38·0	1·8	39·8	8·5	38·8	18·3	35·2	26·8	29·3
45	−21·0	−33·9	−11·5	−38·2	− 1·3	−39·8	+ 9·0	−38·7	+18·7	−35·0	+27·2	−29·0
48	20·6	34·2	11·0	38·3	0·8	39·8	9·6	38·6	19·2	34·7	27·5	28·6
51	20·1	34·4	10·5	38·4	− 0·2	39·8	10·1	38·4	19·7	34·5	27·9	28·2
54	19·7	34·7	10·0	38·6	+ 0·3	39·8	10·6	38·3	20·1	34·2	28·3	27·9
57	19·2	35·0	9·5	38·7	0·8	39·8	11·1	38·2	20·6	34·0	28·6	27·5
60	−18·8	−35·2	− 9·0	−38·8	+ 1·3	−39·8	+11·6	−38·0	+21·0	−33·7	+29·0	−27·1
Lat.	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1
°												
0	−·2	+·3	−·2	+·2	−·3	+·1	−·3	−·1	−·2	−·2	−·2	−·3
10	−·2	+·2	−·2	+·2	−·2	·0	−·2	−·1	−·2	−·2	−·1	−·2
20	−·1	+·2	−·2	+·1	−·2	·0	−·2	−·1	−·2	−·1	−·1	−·2
30	−·1	+·1	−·1	+·1	−·1	·0	−·1	·0	−·1	−·1	−·1	−·1
40	−·1	+·1	−·1	+·1	−·1	·0	−·1	·0	−·1	−·1	·0	−·1
45	·0	·0	·0	·0	·0	·0	·0	·0	·0	·0	·0	·0
50	·0	·0	·0	·0	·0	·0	·0	·0	·0	·0	·0	·0
55	·0	−·1	·0	·0	+·1	·0	+·1	·0	·0	·0	·0	+·1
60	+·1	−·1	+·1	−·1	+·1	·0	+·1	·0	+·1	+·1	+·1	+·1
62	+·1	−·2	+·1	−·1	+·2	·0	+·2	·0	+·1	+·1	+·1	+·2
64	+·1	−·2	+·2	−·1	+·2	·0	+·2	+·1	+·2	+·1	+·1	+·2
66	+·2	−·2	+·2	−·2	+·2	−·1	+·2	+·1	+·2	+·2	+·1	+·2
Month	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2
Jan.	+·1	+·1	·0	+·1	·0	+·1	·0	+·1	−·1	+·1	−·1	+·1
Feb.	+·2	+·1	+·2	+·1	+·2	+·2	+·1	+·2	+·1	+·2	·0	+·2
Mar.	+·3	−·1	+·3	·0	+·3	+·1	+·3	+·2	+·2	+·2	+·2	+·3
Apr.	+·3	−·2	+·3	−·2	+·4	−·1	+·4	·0	+·3	+·1	+·3	+·2
May	+·2	−·3	+·3	−·3	+·3	−·2	+·4	−·1	+·4	·0	+·4	+·1
June	·0	−·4	+·1	−·4	+·2	−·3	+·3	−·2	+·4	−·2	+·4	−·1
July	−·1	−·3	·0	−·4	+·1	−·4	+·2	−·3	+·2	−·3	+·3	−·2
Aug.	−·2	−·2	−·2	−·3	−·1	−·3	·0	−·3	+·1	−·3	+·2	−·3
Sept.	−·3	−·1	−·3	−·1	−·2	−·2	−·2	−·3	−·1	−·3	·0	−·3
Oct.	−·3	+·1	−·3	·0	−·3	·0	−·3	−·1	−·3	−·2	−·2	−·3
Nov.	−·2	+·3	−·3	+·2	−·4	+·1	−·4	·0	−·4	−·1	−·3	−·2
Dec.	−·1	+·4	−·2	+·4	−·3	+·3	−·4	+·2	−·4	+·1	−·4	·0

Latitude = Corrected observed altitude of *Polaris* + $a_0 + a_1 + a_2$
Azimuth of *Polaris* = $(b_0 + b_1 + b_2)$ / cos (latitude)

POLARIS TABLE, 2017

LST	12^h		13^h		14^h		15^h		16^h		17^h	
	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0
m	′	′	′	′	′	′	′	′	′	′	′	′
0	+29·0	−27·1	+35·0	−18·8	+38·7	−9·2	+39·8	+1·0	+38·2	+11·2	+34·0	+20·6
3	29·4	26·7	35·3	18·3	38·8	8·7	39·8	1·5	38·0	11·6	33·7	21·0
6	29·7	26·4	35·5	17·8	38·9	8·2	39·7	2·1	37·9	12·1	33·5	21·4
9	30·0	26·0	35·8	17·4	39·0	7·7	39·7	2·6	37·7	12·6	33·2	21·9
12	30·4	25·6	36·0	16·9	39·1	7·2	39·7	3·1	37·5	13·1	32·9	22·3
15	+30·7	−25·2	+36·2	−16·5	+39·2	−6·6	+39·6	+3·6	+37·4	+13·6	+32·6	+22·7
18	31·0	24·8	36·4	16·0	39·3	6·1	39·6	4·1	37·2	14·1	32·3	23·1
21	31·4	24·4	36·6	15·5	39·4	5·6	39·5	4·6	37·0	14·6	32·0	23·6
24	31·7	24·0	36·8	15·0	39·5	5·1	39·5	5·1	36·8	15·0	31·7	24·0
27	32·0	23·5	37·0	14·6	39·5	4·6	39·4	5·6	36·6	15·5	31·4	24·4
30	+32·3	−23·1	+37·2	−14·1	+39·6	−4·1	+39·3	+6·1	+36·4	+16·0	+31·0	+24·8
33	32·6	22·7	37·4	13·6	39·6	3·6	39·2	6·7	36·2	16·5	30·7	25·2
36	32·9	22·3	37·5	13·1	39·7	3·1	39·1	7·2	36·0	16·9	30·4	25·6
39	33·2	21·9	37·7	12·6	39·7	2·6	39·0	7·7	35·7	17·4	30·0	26·0
42	33·5	21·4	37·9	12·1	39·7	2·1	38·9	8·2	35·5	17·8	29·7	26·4
45	+33·7	−21·0	+38·0	−11·6	+39·8	−1·5	+38·8	+8·7	+35·3	+18·3	+29·4	+26·7
48	34·0	20·5	38·2	11·2	39·8	1·0	38·7	9·2	35·0	18·8	29·0	27·1
51	34·3	20·1	38·3	10·7	39·8	0·5	38·6	9·7	34·8	19·2	28·6	27·5
54	34·5	19·7	38·5	10·2	39·8	0·0	38·5	10·2	34·5	19·7	28·3	27·9
57	34·8	19·2	38·6	9·7	39·8	+0·5	38·3	10·7	34·3	20·1	27·9	28·2
60	+35·0	−18·8	+38·7	−9·2	+39·8	+1·0	+38·2	+11·2	+34·0	+20·6	+27·5	+28·6
Lat.	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1
°												
0	−·1	−·3	·0	−·2	·0	−·1	·0	+·1	·0	+·2	−·1	+·3
10	−·1	−·2	·0	−·2	·0	·0	·0	+·1	·0	+·2	−·1	+·2
20	−·1	−·2	·0	−·1	·0	·0	·0	+·1	·0	+·1	−·1	+·2
30	·0	−·1	·0	−·1	·0	·0	·0	·0	·0	+·1	−·1	+·1
40	·0	−·1	·0	−·1	·0	·0	·0	·0	·0	+·1	·0	+·1
45	·0	·0	·0	·0	·0	·0	·0	·0	·0	·0	·0	·0
50	·0	·0	·0	·0	·0	·0	·0	·0	·0	·0	·0	·0
55	·0	+·1	·0	·0	·0	·0	·0	·0	·0	·0	·0	−·1
60	·0	+·1	·0	+·1	·0	·0	·0	·0	·0	−·1	·0	−·1
62	+·1	+·2	·0	+·1	·0	·0	·0	·0	·0	−·1	+·1	−·2
64	+·1	+·2	·0	+·1	·0	·0	·0	−·1	·0	−·1	+·1	−·2
66	+·1	+·2	·0	+·2	·0	+·1	·0	−·1	·0	−·2	+·1	−·2
Month	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2
Jan.	−·1	+·1	−·1	·0	−·1	·0	−·1	·0	−·1	−·1	−·1	−·1
Feb.	−·1	+·2	−·1	+·2	−·2	+·2	−·2	+·1	−·2	+·1	−·2	·0
Mar.	+·1	+·3	·0	+·3	−·1	+·3	−·2	+·3	−·2	+·2	−·3	+·2
Apr.	+·2	+·3	+·2	+·3	+·1	+·4	·0	+·4	−·1	+·3	−·2	+·3
May	+·3	+·2	+·3	+·3	+·2	+·3	+·1	+·4	·0	+·4	−·1	+·4
June	+·4	·0	+·4	+·1	+·3	+·2	+·2	+·3	+·2	+·4	+·1	+·4
July	+·3	−·1	+·4	·0	+·4	+·1	+·3	+·2	+·3	+·2	+·2	+·3
Aug.	+·2	−·2	+·3	−·2	+·3	−·1	+·3	·0	+·3	+·1	+·3	+·2
Sept.	+·1	−·3	+·1	−·3	+·2	−·2	+·3	−·2	+·3	−·1	+·3	·0
Oct.	−·1	−·3	·0	−·3	·0	−·3	+·1	−·3	+·2	−·3	+·3	−·2
Nov.	−·3	−·2	−·2	−·3	−·1	−·4	·0	−·4	+·1	−·4	+·2	−·3
Dec.	−·4	−·1	−·4	−·2	−·3	−·3	−·2	−·4	−·1	−·4	·0	−·4

Latitude = Corrected observed altitude of *Polaris* + $a_0 + a_1 + a_2$

Azimuth of *Polaris* = $(b_0 + b_1 + b_2)$ / cos (latitude)

LST	18^h		19^h		20^h		21^h		22^h		23^h	
	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0
m	′	′	′	′	′	′	′	′	′	′	′	′
0	+ 27·5	+ 28·6	+ 19·2	+ 34·7	+ 9·5	+ 38·6	− 0·8	+ 39·8	− 11·1	+ 38·3	− 20·6	+ 34·2
3	27·2	29·0	18·7	35·0	9·0	38·7	1·3	39·8	11·6	38·2	21·0	33·9
6	26·8	29·3	18·3	35·2	8·5	38·8	1·8	39·8	12·1	38·0	21·5	33·6
9	26·4	29·7	17·8	35·5	8·0	38·9	2·3	39·8	12·6	37·9	21·9	33·3
12	26·0	30·0	17·4	35·7	7·5	39·0	2·9	39·7	13·0	37·7	22·4	33·1
15	+ 25·6	+ 30·3	+ 16·9	+ 35·9	+ 7·0	+ 39·1	− 3·4	+ 39·7	− 13·5	+ 37·5	− 22·8	+ 32·8
18	25·2	30·7	16·4	36·2	6·5	39·2	3·9	39·6	14·0	37·3	23·2	32·5
21	24·8	31·0	15·9	36·4	6·0	39·3	4·4	39·6	14·5	37·2	23·6	32·2
24	24·4	31·3	15·5	36·6	5·5	39·4	4·9	39·5	15·0	37·0	24·1	31·8
27	24·0	31·6	15·0	36·8	4·9	39·5	5·4	39·5	15·5	36·8	24·5	31·5
30	+ 23·6	+ 31·9	+ 14·5	+ 37·0	+ 4·4	+ 39·5	− 6·0	+ 39·4	− 16·0	+ 36·6	− 24·9	+ 31·2
33	23·2	32·2	14·0	37·2	3·9	39·6	6·5	39·3	16·4	36·4	25·3	30·9
36	22·7	32·5	13·5	37·3	3·4	39·6	7·0	39·2	16·9	36·1	25·7	30·5
39	22·3	32·8	13·0	37·5	2·9	39·7	7·5	39·1	17·4	35·9	26·1	30·2
42	21·9	33·1	12·5	37·7	2·4	39·7	8·0	39·0	17·9	35·7	26·5	29·8
45	+ 21·4	+ 33·4	+ 12·0	+ 37·9	+ 1·8	+ 39·7	− 8·5	+ 38·9	− 18·3	+ 35·4	− 26·9	+ 29·5
48	21·0	33·7	11·6	38·0	1·3	39·8	9·0	38·8	18·8	35·2	27·3	29·1
51	20·5	34·0	11·1	38·2	0·8	39·8	9·5	38·7	19·2	35·0	27·6	28·8
54	20·1	34·2	10·6	38·3	+ 0·3	39·8	10·0	38·6	19·7	34·7	28·0	28·4
57	19·7	34·5	10·1	38·4	− 0·2	39·8	10·6	38·4	20·1	34·4	28·4	28·0
60	+ 19·2	+ 34·7	+ 9·5	+ 38·6	− 0·8	+ 39·8	− 11·1	+ 38·3	− 20·6	+ 34·2	− 28·7	+ 27·7
Lat. °	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1
0	−·2	+·3	−·2	+·2	−·3	+·1	−·3	−·1	−·2	−·2	−·2	−·3
10	−·2	+·2	−·2	+·2	−·2	·0	−·2	−·1	−·2	−·2	−·1	−·2
20	−·1	+·2	−·2	+·1	−·2	·0	−·2	−·1	−·2	−·1	−·1	−·2
30	−·1	+·1	−·1	+·1	−·1	·0	−·1	·0	−·1	−·1	−·1	−·1
40	−·1	+·1	−·1	+·1	−·1	·0	−·1	·0	−·1	−·1	·0	−·1
45	·0	·0	·0	·0	·0	·0	·0	·0	·0	·0	·0	·0
50	·0	·0	·0	·0	·0	·0	·0	·0	·0	·0	·0	·0
55	·0	−·1	·0	·0	+·1	·0	+·1	·0	·0	·0	·0	+·1
60	+·1	−·1	+·1	−·1	+·1	·0	+·1	·0	+·1	+·1	+·1	+·1
62	+·1	−·2	+·1	−·1	+·2	·0	+·2	·0	+·1	+·1	+·1	+·2
64	+·1	−·2	+·2	−·1	+·2	·0	+·2	+·1	+·2	+·1	+·1	+·2
66	+·2	−·2	+·2	−·2	+·2	−·1	+·2	+·1	+·2	+·2	+·1	+·2
Month	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2
Jan.	−·1	−·1	·0	−·1	·0	−·1	·0	−·1	+·1	−·1	+·1	−·1
Feb.	−·2	−·1	−·2	−·1	−·2	−·2	−·1	−·2	−·1	−·2	·0	−·2
Mar.	−·3	+·1	−·3	·0	−·3	−·1	−·3	−·2	−·2	−·2	−·2	−·3
Apr.	−·3	+·2	−·3	+·2	−·4	+·1	−·4	·0	−·3	−·1	−·3	−·2
May	−·2	+·3	−·3	+·3	−·3	+·2	−·4	+·1	−·4	·0	−·4	−·1
June	·0	+·4	−·1	+·4	−·2	+·3	−·3	+·2	−·4	+·2	−·4	+·1
July	+·1	+·3	·0	+·4	−·1	+·4	−·2	+·3	−·2	+·3	−·3	+·2
Aug.	+·2	+·2	+·2	+·3	+·1	+·3	·0	+·3	−·1	+·3	−·2	+·3
Sept.	+·3	+·1	+·3	+·1	+·2	+·2	+·2	+·3	+·1	+·3	·0	+·3
Oct.	+·3	−·1	+·3	·0	+·3	·0	+·3	+·1	+·3	+·2	+·2	+·3
Nov.	+·2	−·3	+·3	−·2	+·4	−·1	+·4	·0	+·4	+·1	+·3	+·2
Dec.	+·1	−·4	+·2	−·4	+·3	−·3	+·4	−·2	+·4	−·1	+·4	·0

Latitude = Corrected observed altitude of *Polaris* + a_0 + a_1 + a_2
Azimuth of *Polaris* = (b_0 + b_1 + b_2) / cos (latitude)

LIST OF RADIO TIME SIGNALS

Call sign Station	Frequency (kHz)	Power (kW)	Notes on signals (All times are in UTC)
MSF Anthorn England	60	15	Continuous except for maintenance, search NPL web site www.npl.co.uk for MSF Outages. Second markers 100 ms; minute markers 500 ms; both markers interruption of carrier. Seconds 1-16 carry information for the current minute about DUT1, and the remaining seconds convey the time and date code.
DCF77 Mainflingen Germany	77·5	30	Continuous. M-Minute markers. Markers interruption of carrier; no interruption at 59^{s}.
RWM Moscow Russia	4 996 9 996 14 996	5 5 8	Continuous except between 05^{h}–13^{h} on some Wednesdays. Second markers 40 ms and 100 ms, minute markers 500 ms. Call sign in morse 09^{m}–10^{m} and 39^{m}–40^{m}. DUT1 coded (Russian system) between 10^{m}–20^{m} and 40^{m}–50^{m}.
JJY Otakadoya-yama Hagane-yama Japan	 40 60	 10 10	Continuous. Minute marker pulse $0^{s}.2$. Call sign in morse at 15^{m} and 45^{m} hourly.
WWVH * Kauai, Kekaha Hawaii U.S.A.	2 500 5 000 10 000 15 000	5 10 10 10	Continuous. Second markers 5 ms of 1·2 kHz tone, minute markers 800 ms of 1·2 kHz tone; hour markers 800 ms of 1·5 kHz tone; no audio tone between 00^{m}–01^{m}, 08^{m}–11^{m}, 14^{m}–20^{m}, 30^{m}–31^{m}. Voice station identification at 29^{m} & 59^{m}.
WWV * Fort Collins Colorado U.S.A.	2 500 5 000 10 000 15 000 20 000	2·5 10 10 10 2·5	Continuous. Second markers 5 ms of 1 kHz tone, minute markers 800 ms of 1 kHz tone, hour markers 800 ms of 1·5 kHz tone; no audio tone between 29^{m}–30^{m}, 43^{m}–52^{m}, 59^{m}–60^{m}. Voice station identification at 00^{m} and 30^{m}.
WWVB * Fort Collins Colorado U.S.A.	60	70	Continuous. One pulse/second special binary time code. Gives minutes, hours, days, DUT1, year, DST. Identified by unique time code and a 45° carrier phase shift between 10^{m} and 15^{m} hourly.
CHU * Ottawa Canada	3 330 7 850 14 670	3 10 3	Continuous. Second markers 300 ms, minute markers 500 ms, hour markers 1^{s}; silence at 29^{s}. Bilingual station identification and time announcement of UTC between 51^{s}–59^{s}.
LOL Buenos Aires Argentina	10 000	2	Mon.-Fri. 11^{h}–12^{h} local time. Second and minute markers 5 ms with either 1 kHz or 440 Hz tone. Voice announcement of time (UTC−3^{h}).

* See note opposite.

NOTES ON RADIO TIME SIGNALS

The list of radio time signals is restricted to the principal signals that are likely to be used by land surveyors. The details of the transmissions are believed to be correct at March 2016, but the signals are liable to changes at short notice. An extended list of radio time signals is given in *The Admiralty List of Radio Signals*, Volume 2; this is published by the UK Hydrographic Office (www.ukho.gov.uk) and is obtainable from the Agents for the sale of Admiralty Charts. Details of amendments to the signals are given in Section VI of the Weekly Edition of *Admiralty Notices to Mariners* (published as for the Admiralty List). The weekly notices are available at http://www.ukho.gov.uk/ProductsandServices/MartimeSafety/Pages/NMPublic.aspx.

The signals in the list are all based on the system of coordinated universal time (UTC) that was introduced in 1972 January 1. This system is derived from the international atomic time scale (TAI), and differs from it only by an integral number of seconds, but step adjustments of 1 second are made from time to time in order that UTC shall not differ from UT1, which corresponds to mean solar time on the meridian of Greenwich, by more than 0·9 seconds. Any such step adjustments are normally made at the last UTC second of December 31 and June 30, but may be made at the end of any other month if this is necessary in order to maintain compatibility with UT1. The signals indicated (*) are coded by emphasising some seconds markers to give DUT1, the predicted value of UT1 − UTC rounded to a precision of 0·1 seconds. If the seconds markers from 1^s to n^s are emphasised, the difference is $+n \times 0{\cdot}1$ seconds; if the seconds markers from 9^s to $(8 + m)^s$ are emphasised, the difference is $-m \times 0{\cdot}1$ seconds (n and m are always less than or equal to 8). The appropriate seconds markers may be emphasised by lengthening, doubling, splitting or tone modulation of the normal seconds markers. In reducing observations it is possible either to apply corrections to all the times to reduce them to UT1 (e.g. by incorporating them with the corrections to the chronometer) or to apply corrections to the deduced positions. The correction in longitude in seconds of arc, measured positively to the east, is equal to *minus* fifteen times the difference UT1 − UTC in seconds of time. Provisional values in seconds (s) of the differences UT1 − UTC and TAI − UTC, are given in the weekly *International Earth Rotation Service (IERS) Bulletin A*, obtainable from National Earth Orientation Service, US Naval Observatory, Washington DC 20392 − 5100, United States of America. The Internet address is http://www.usno.navy.mil/USNO/earth-orientation.

In all cases the commencement of each minute and second marker indicates the timing reference point. In the case of JJY a lengthened additional marker gives previous notice that the next second is the minute marker.

Warning: The "6-pips" time-signals broadcast in the World Service of the BBC are not intended for precise use. Digital radio broadcasts are subject to delays between 1^s to 4^s. Analogue radio broadcasts are accurate to the second. In direct transmissions from the UK the start of the long final pip will normally be received within $0^s{\cdot}1$ of UTC, but signals from relay stations abroad may be subject to additional delays of $0^s{\cdot}25$.

MEAN REFRACTION, r_o

Alt.	r_o	Alt.	r_o	Alt.	r_o	Alt.	r_o	Alt.	r_o	Alt.	r_o	Alt.	r_o
° ′	″	° ′	″	° ′	″	° ′	″	° ′	″	° ′	″	° ′	″
10 00	319	11 43	273	14 06	227	17 35	181	23 07	135	32 40	90	51 58	45
10 01	318	11 46	272	14 10	226	17 41	180	23 16	134	32 58	89	52 35	44
10 03	317	11 48	271	14 14	225	17 47	179	23 25	133	33 15	88	53 12	43
10 05	316	11 51	270	14 18	224	17 52	178	23 35	132	33 33	87	53 50	42
10 07	315	11 54	269	14 21	223	17 58	177	23 45	131	33 52	86	54 29	41
10 09	314	11 56	268	14 25	222	18 04	176	23 55	130	34 10	85	55 09	40
10 11	313	11 59	267	14 29	221	18 10	175	24 04	129	34 29	84	55 49	39
10 13	312	12 02	266	14 33	220	18 16	174	24 15	128	34 49	83	56 30	38
10 15	311	12 05	265	14 37	219	18 22	173	24 25	127	35 08	82	57 11	37
10 17	310	12 07	264	14 41	218	18 28	172	24 35	126	35 28	81	57 53	36
10 19	309	12 10	263	14 45	217	18 34	171	24 45	125	35 48	80	58 36	35
10 21	308	12 13	262	14 49	216	18 40	170	24 56	124	36 09	79	59 20	34
10 23	307	12 16	261	14 53	215	18 47	169	25 07	123	36 30	78	60 04	33
10 25	306	12 19	260	14 57	214	18 53	168	25 18	122	36 51	77	60 48	32
10 27	305	12 22	259	15 01	213	18 59	167	25 29	121	37 12	76	61 34	31
10 29	304	12 25	258	15 05	212	19 06	166	25 40	120	37 34	75	62 20	30
10 32	303	12 27	257	15 10	211	19 12	165	25 51	119	37 56	74	63 07	29
10 34	302	12 30	256	15 14	210	19 19	164	26 03	118	38 19	73	63 54	28
10 36	301	12 33	255	15 18	209	19 26	163	26 14	117	38 42	72	64 42	27
10 38	300	12 36	254	15 22	208	19 32	162	26 26	116	39 06	71	65 31	26
10 40	299	12 39	253	15 27	207	19 39	161	26 38	115	39 29	70	66 20	25
10 43	298	12 42	252	15 31	206	19 46	160	26 50	114	39 54	69	67 10	24
10 45	297	12 45	251	15 36	205	19 53	159	27 03	113	40 18	68	68 00	23
10 47	296	12 49	250	15 40	204	20 00	158	27 15	112	40 43	67	68 51	22
10 49	295	12 52	249	15 45	203	20 07	157	27 28	111	41 09	66	69 43	21
10 52	294	12 55	248	15 49	202	20 14	156	27 40	110	41 35	65	70 35	20
10 54	293	12 58	247	15 54	201	20 22	155	27 53	109	42 01	64	71 28	19
10 56	292	13 01	246	15 58	200	20 29	154	28 07	108	42 28	63	72 22	18
10 58	291	13 04	245	16 03	199	20 36	153	28 20	107	42 55	62	73 15	17
11 01	290	13 08	244	16 08	198	20 44	152	28 34	106	43 23	61	74 10	16
11 03	289	13 11	243	16 13	197	20 52	151	28 47	105	43 51	60	75 05	15
11 06	288	13 14	242	16 17	196	20 59	150	29 01	104	44 20	59	76 00	14
11 08	287	13 17	241	16 22	195	21 07	149	29 15	103	44 49	58	76 56	13
11 10	286	13 21	240	16 27	194	21 15	148	29 30	102	45 19	57	77 52	12
11 13	285	13 24	239	16 32	193	21 23	147	29 44	101	45 49	56	78 49	11
11 15	284	13 27	238	16 37	192	21 31	146	29 59	100	46 20	55	79 46	10
11 18	283	13 31	237	16 42	191	21 39	145	30 14	99	46 51	54	80 43	9
11 20	282	13 34	236	16 47	190	21 48	144	30 29	98	47 23	53	81 41	8
11 23	281	13 38	235	16 52	189	21 56	143	30 45	97	47 55	52	82 39	7
11 25	280	13 41	234	16 58	188	22 04	142	31 01	96	48 28	51	83 37	6
11 28	279	13 45	233	17 03	187	22 13	141	31 17	95	49 01	50	84 36	5
11 30	278	13 48	232	17 08	186	22 22	140	31 33	94	49 35	49	85 34	4
11 33	277	13 52	231	17 13	185	22 30	139	31 49	93	50 10	48	86 33	3
11 35	276	13 55	230	17 19	184	22 39	138	32 06	92	50 45	47	87 32	2
11 38	275	13 59	229	17 24	183	22 48	137	32 23	91	51 21	46	88 31	1
11 40	274	14 03	228	17 30	182	22 57	136	32 40	90	51 58	45	89 30	0
11 43	273	14 06	227	17 35	181	23 07	135	32 58		52 35		90 00	
11 46		14 10		17 41		23 16							

In critical cases ascend.

Refraction = $r_o \times f$, where r_o is the mean refraction and f is the correcting factor on pages 63, 64.

CORRECTING FACTOR, *f*, FOR PRESSURE AND TEMPERATURE

1080	1070	1060	1050	mb
°C	°C	°C	°C	
		+58	+55	*f*
	+57	54	51	0·90
+57	53	50	47	0·91
53	50	47	44	0·92
49	46	43	40	0·93
46	43	40	37	0·94
43	40	37	34	0·95
39	36	34	31	0·96
36	33	30	28	0·97
33	30	27	25	0·98
30	27	24	22	0·99
27	24	21	19	1·00
24	21	19	16	1·01
21	18	16	13	1·02
18	16	13	10	1·03
16	13	10	8	1·04
13	10	8	5	1·05
10	8	5	+ 2	1·06
8	5	+ 3	0	1·07
5	+ 3	0	− 3	1·08
+ 3	0	− 2	5	1·09
0	− 2	5	7	1·10
− 2	5	7	10	1·11
5	7	10	12	1·12
7	9	12	14	1·13
9	12	14	17	1·14
12	14	16	19	1·15
−14	−16	−19	−21	1·16

960	950	940	930	mb
450	550	650	700	m
°C	°C	°C	°C	
+48	+45	+41	+38	*f*
44	41	37	34	0·84
40	37	34	31	0·85
37	34	30	27	0·86
33	30	27	24	0·87
30	27	24	20	0·88
26	23	20	17	0·89
23	20	17	14	0·90
20	17	14	11	0·91
17	14	11	8	0·92
14	11	8	5	0·93
11	8	5	+ 2	0·94
8	5	+ 2	− 1	0·95
5	+ 2	− 1	4	0·96
+ 2	− 1	4	6	0·97
− 1	3	6	9	0·98
3	6	9	12	0·99
6	9	12	14	1·00
9	11	14	17	1·01
11	14	17	19	1·02
14	16	19	22	1·03
16	19	21	24	1·04
19	21	24	−26	1·05
21	24	−26		1·06
−23	−26			1·07

1040	1030	1020	1010	mb
°C	°C	°C	°C	
		+56	+53	*f*
+59	+56	52	49	0·87
55	52	49	46	0·88
51	48	45	42	0·89
48	45	42	38	0·90
44	41	38	35	0·91
41	38	35	32	0·92
37	34	31	29	0·93
34	31	28	25	0·94
31	28	25	22	0·95
28	25	22	19	0·96
25	22	19	16	0·97
22	19	16	13	0·98
19	16	13	11	0·99
16	13	10	8	1·00
13	10	8	5	1·01
10	8	5	+ 2	1·02
8	5	+ 2	0	1·03
5	+ 2	0	− 3	1·04
+ 2	0	− 3	5	1·05
0	− 3	5	8	1·06
− 3	5	8	10	1·07
5	8	10	13	1·08
8	10	13	15	1·09
10	12	15	17	1·10
12	15	17	20	1·11
15	17	19	22	1·12
−17	−19	−22	−24	1·13

920	910	900	890	mb
800	900	1000	1100	m
°C	°C	°C	°C	
+46	+43	+39	+36	*f*
42	39	35	32	0·81
38	35	32	28	0·82
35	31	28	25	0·83
31	28	24	21	0·84
27	24	21	18	0·85
24	21	18	14	0·86
21	17	14	11	0·87
17	14	11	8	0·88
14	11	8	5	0·89
11	8	5	+ 2	0·90
8	5	+ 2	− 1	0·91
5	+ 2	− 1	4	0·92
+ 2	− 1	4	7	0·93
− 1	4	7	10	0·94
4	7	9	12	0·95
6	9	12	15	0·96
9	12	15	18	0·97
12	15	17	20	0·98
14	17	20	23	0·99
17	20	23	25	1·00
20	22	25	28	1·01
22	25	27	−30	1·02
24	27	−30		1·03
−27	−29			1·04

1000	990	980	970	mb
°C	°C	°C	°C	
+54	+50	+47	+44	*f*
50	46	43	40	0·86
46	43	40	36	0·87
42	39	36	33	0·88
39	36	33	29	0·89
35	32	29	26	0·90
32	29	26	23	0·91
29	26	23	20	0·92
26	23	20	17	0·93
22	19	17	14	0·94
19	16	14	11	0·95
16	13	11	8	0·96
13	11	8	5	0·97
11	8	5	+ 2	0·98
8	5	+ 2	− 1	0·99
5	+ 2	− 1	3	1·00
+ 2	0	3	6	1·01
0	− 3	6	8	1·02
− 3	6	8	11	1·03
6	8	11	13	1·04
8	11	13	16	1·05
10	13	16	18	1·06
13	16	18	21	1·07
15	18	20	23	1·08
18	20	23	−25	1·09
20	22	−25		1·10
22	−25			1·11
−24				1·12

880	870	860	850	mb
1150	1250	1350	1450	m
°C	°C	°C	°C	
		+49	+46	*f*
	+49	45	42	0·75
+48	45	41	37	0·76
44	41	37	33	0·77
40	37	33	30	0·78
36	33	29	26	0·79
32	29	25	22	0·80
29	25	22	19	0·81
25	22	18	15	0·82
21	18	15	12	0·83
18	15	11	8	0·84
15	11	8	5	0·85
11	8	5	+ 2	0·86
8	5	+ 2	− 1	0·87
5	+ 2	− 1	4	0·88
+ 2	− 1	4	7	0·89
− 1	4	7	10	0·90
4	7	10	13	0·91
7	10	13	16	0·92
10	13	16	19	0·93
13	15	18	21	0·94
15	18	21	24	0·95
18	21	24	26	0·96
20	23	26	−29	0·97
−23	−26	−29		0·98

CORRECTING FACTOR, *f*, FOR PRESSURE AND TEMPERATURE

840	830	820	810	mb	800	790	780	770	mb	760	750	740	730	mb
1550	1650	1750	1850	m	1950	2050	2150	2250	m	2350	2450	2550	2700	m
°C	°C	°C	°C	*f*	°C	°C	°C	°C	*f*	°C	°C	°C	°C	*f*
	+52	+48	+44	0·72			+51	+47	0·68				+56	0·63
+51	47	43	40	0·73		+50	46	42	0·69			+55	50	0·64
46	43	39	35	0·74	+49	45	41	38	0·70		+54	49	45	0·65
42	38	35	31	0·75	45	41	37	33	0·71	+53	49	45	41	0·66
38	34	31	27	0·76	40	36	33	29	0·72	48	44	40	36	0·67
34	30	27	23	0·77	36	32	29	25	0·73	43	39	35	31	0·68
30	26	23	20	0·78	32	28	24	21	0·74	38	34	31	27	0·69
26	23	19	16	0·79	28	24	20	17	0·75	34	30	26	23	0·70
22	19	16	12	0·80	24	20	17	13	0·76	30	26	22	18	0·71
19	15	12	9	0·81	20	16	13	9	0·77	25	22	18	14	0·72
15	12	9	5	0·82	16	13	9	6	0·78	21	18	14	10	0·73
12	8	5	+ 2	0·83	12	9	6	+ 2	0·79	17	14	10	7	0·74
8	5	+ 2	− 1	0·84	9	6	+ 2	− 1	0·80	13	10	6	+ 3	0·75
5	+ 2	− 1	4	0·85	5	+ 2	− 1	4	0·81	10	6	+ 3	− 1	0·76
+ 2	− 1	4	8	0·86	+ 2	− 1	4	8	0·82	6	+ 3	− 1	4	0·77
− 1	4	7	11	0·87	− 1	4	8	11	0·83	+ 2	− 1	4	8	0·78
4	7	10	14	0·88	4	8	11	14	0·84	− 1	4	8	11	0·79
7	10	13	16	0·89	8	11	14	17	0·85	4	8	11	14	0·80
10	13	16	19	0·90	11	14	17	20	0·86	8	11	14	17	0·81
13	16	19	22	0·91	14	17	20	23	0·87	11	14	17	21	0·82
16	19	22	25	0·92	17	20	23	26	0·88	14	17	20	24	0·83
19	22	25	28	0·93	19	23	26	29	0·89	17	20	23	27	0·84
21	24	27	−30	0·94	22	25	28	−31	0·90	20	23	26	−29	0·85
24	27	−30		0·95	25	28	−31		0·91	23	26	−29		0·86
27	−30			0·96	28	−31			0·92	26	−29			0·87
−29					−30					−29				

720	710	700	690	mb	680	670	660	650	mb	640	630	620	610	mb
2800	2900	3000	3150	m	3250	3350	3450	3600	m	3700	3850	3950	4100	m
°C	°C	°C	°C	*f*	°C	°C	°C	°C	*f*	°C	°C	°C	°C	*f*
		+54	+49	0·61			+53	+49	0·58				+54	0·54
	+53	48	44	0·62		+52	47	43	0·59			+53	48	0·55
+51	47	43	39	0·63	+51	46	42	38	0·60		+51	47	42	0·56
46	42	38	34	0·64	45	41	37	33	0·61	+50	46	41	37	0·57
41	37	33	29	0·65	40	36	32	28	0·62	44	40	36	31	0·58
37	33	29	25	0·66	35	31	27	23	0·63	39	35	30	26	0·59
32	28	24	20	0·67	30	26	22	18	0·64	34	29	25	21	0·60
27	24	20	16	0·68	25	22	18	14	0·65	29	25	20	16	0·61
23	19	16	12	0·69	21	17	13	10	0·66	24	20	16	12	0·62
19	15	12	8	0·70	17	13	9	5	0·67	19	15	11	7	0·63
15	11	8	+ 4	0·71	12	9	5	+ 1	0·68	14	11	7	+ 3	0·64
11	7	+ 4	0	0·72	8	5	+ 1	− 3	0·69	10	6	+ 2	− 1	0·65
7	+ 3	0	− 4	0·73	+ 4	+ 1	− 3	7	0·70	6	+ 2	− 2	5	0·66
+ 3	0	− 4	7	0·74	0	− 3	7	10	0·71	+ 2	− 2	6	9	0·67
0	− 4	7	11	0·75	− 3	7	10	14	0·72	− 2	6	10	13	0·68
− 4	7	11	14	0·76	7	11	14	17	0·73	6	10	13	17	0·69
8	11	14	18	0·77	11	14	18	21	0·74	10	14	17	21	0·70
11	14	18	21	0·78	14	18	21	24	0·75	14	17	21	24	0·71
14	18	21	24	0·79	18	21	24	28	0·76	17	21	24	28	0·72
17	21	24	27	0·80	21	24	28	−31	0·77	21	24	28	−31	0·73
21	24	27	−30	0·81	24	27	−31		0·78	24	28	−31		0·74
24	27	−30		0·82	27	−31			0·79	28	−31			0·75
−27	−30				−30					−31				

In critical cases ascend.

° ′		° ′		° ′		° ′		° ′		° ′	
0 00·0	1·000	12 48·2	1·027	18 10·3	1·054	22 07·5	1·081	25 20·6	1·108	28 05·2	1·135
3 08·1	·003	13 31·1	·030	18 39·7	·057	22 30·8	·084	25 40·1	·111	28 22·2	·138
5 25·5	·006	14 11·7	·033	19 08·2	·060	22 53·5	·087	25 59·3	·114	28 38·9	·141
6 59·7	·009	14 50·3	·036	19 35·9	·063	23 15·8	·090	26 18·2	·117	28 55·3	·144
8 16·0	·012	15 27·1	·039	20 02·8	·066	23 37·6	·093	26 36·7	·120	29 11·5	·147
9 21·7	·015	16 02·3	·042	20 29·0	·069	23 59·0	·096	26 55·0	·123	29 27·5	·150
10 20·2	·018	16 36·1	·045	20 54·5	·072	24 20·0	·099	27 12·9	·126	29 43·3	·153
11 13·4	·021	17 08·6	·048	21 19·5	·075	24 40·6	·102	27 30·6	·129	29 58·9	·156
12 02·5	1·024	17 40·0	1·051	21 43·8	1·078	25 00·8	1·105	27 48·1	1·132	30 14·3	1·159
12 48·2		18 10·3		22 07·5		25 20·6		28 05·2		30 29·5	

In critical cases ascend.

	00′	05′	10′	15′	20′	25′	30′	35′	40′	45′	50′	55′
°												
30	1·155	1·156	1·157	1·158	1·159	1·160	1·161	1·162	1·163	1·164	1·165	1·166
31	·167	·168	·169	·170	·171	·172	·173	·174	·175	·176	·177	·178
32	·179	·180	·181	·182	·184	·185	·186	·187	·188	·189	·190	·191
33	·192	·193	·195	·196	·197	·198	·199	·200	·202	·203	·204	·205
34	·206	·207	·209	·210	·211	·212	·213	·215	·216	·217	·218	·220
35	1·221	1·222	1·223	1·225	1·226	1·227	1·228	1·230	1·231	1·232	1·233	1·235
36	·236	·237	·239	·240	·241	·243	·244	·245	·247	·248	·249	·251
37	·252	·254	·255	·256	·258	·259	·260	·262	·263	·265	·266	·268
38	·269	·270	·272	·273	·275	·276	·278	·279	·281	·282	·284	·285
39	·287	·288	·290	·291	·293	·294	·296	·298	·299	·301	·302	·304
40	1·305	1·307	1·309	1·310	1·312	1·313	1·315	1·317	1·318	1·320	1·322	1·323
41	·325	·327	·328	·330	·332	·333	·335	·337	·339	·340	·342	·344
42	·346	·347	·349	·351	·353	·355	·356	·358	·360	·362	·364	·365
43	·367	·369	·371	·373	·375	·377	·379	·381	·382	·384	·386	·388
44	·390	·392	·394	·396	·398	·400	·402	·404	·406	·408	·410	·412
45	1·414	1·416	1·418	1·420	1·423	1·425	1·427	1·429	1·431	1·433	1·435	1·437
46	·440	·442	·444	·446	·448	·451	·453	·455	·457	·459	·462	·464
47	·466	·469	·471	·473	·476	·478	·480	·483	·485	·487	·490	·492
48	·494	·497	·499	·502	·504	·507	·509	·512	·514	·517	·519	·522
49	·524	·527	·529	·532	·535	·537	·540	·542	·545	·548	·550	·553
50	1·556	1·558	1·561	1·564	1·567	1·569	1·572	1·575	1·578	1·581	1·583	1·586
51	·589	·592	·595	·598	·601	·603	·606	·609	·612	·615	·618	·621
52	·624	·627	·630	·633	·636	·640	·643	·646	·649	·652	·655	·658
53	·662	·665	·668	·671	·675	·678	·681	·684	·688	·691	·695	·698
54	·701	·705	·708	·712	·715	·719	·722	·726	·729	·733	·736	·740
55	1·743	1·747	1·751	1·754	1·758	1·762	1·766	1·769	1·773	1·777	1·781	1·784
56	·788	·792	·796	·800	·804	·808	·812	·816	·820	·824	·828	·832
57	·836	·840	·844	·849	·853	·857	·861	·865	·870	·874	·878	·883
58	·887	·891	·896	·900	·905	·909	·914	·918	·923	·928	·932	·937
59	1·942	1·946	1·951	1·956	1·961	1·965	1·970	1·975	1·980	1·985	1·990	1·995
60	2·000	2·005	2·010	2·015	2·020	2·026	2·031	2·036	2·041	2·047	2·052	2·057
61	·063	·068	·074	·079	·085	·090	·096	·101	·107	·113	·118	·124
62	·130	·136	·142	·148	·154	·160	·166	·172	·178	·184	·190	·196
63	·203	·209	·215	·222	·228	·235	·241	·248	·254	·261	·268	·274
64	·281	·288	·295	·302	·309	·316	·323	·330	·337	·344	·352	·359
65	2·366	2·374	2·381	2·389	2·396	2·404	2·411	2·419	2·427	2·435	2·443	2·451
66	·459	·467	·475	·483	·491	·499	·508	·516	·525	·533	·542	·551
67	·559	·568	·577	·586	·595	·604	·613	·622	·632	·641	·650	·660
68	·669	·679	·689	·699	·709	·718	·729	·739	·749	·759	·769	·780
69	·790	·801	·812	·823	·833	·844	·855	2·867	2·878	2·889	2·901	2·912
70	2·924	2·936	2·947	2·959	2·971	2·983	2·996	3·008	3·021	3·033	3·046	3·059

TABLE FOR CONVERSION

OF MINUTES AND SECONDS TO DECIMALS OF A DEGREE

	0′	1′	2′	3′	4′	5′
″	°	°	°	°	°	°
0	0·0000	0·0167	0·0333	0·0500	0·0667	0·0833
1	003	169	336	503	669	836
2	006	172	339	506	672	839
3	008	175	342	508	675	842
4	011	178	344	511	678	844
5	0·0014	0·0181	0·0347	0·0514	0·0681	0·0847
6	017	183	350	517	683	850
7	019	186	353	519	686	853
8	022	189	356	522	689	856
9	025	192	358	525	692	858
10	0·0028	0·0194	0·0361	0·0528	0·0694	0·0861
11	031	197	364	531	697	864
12	033	200	367	533	700	867
13	036	203	369	536	703	869
14	039	206	372	539	706	872
15	0·0042	0·0208	0·0375	0·0542	0·0708	0·0875
16	044	211	378	544	711	878
17	047	214	381	547	714	881
18	050	217	383	550	717	883
19	053	219	386	553	719	886
20	0·0056	0·0222	0·0389	0·0556	0·0722	0·0889
21	058	225	392	558	725	892
22	061	228	394	561	728	894
23	064	231	397	564	731	897
24	067	233	400	567	733	900
25	0·0069	0·0236	0·0403	0·0569	0·0736	0·0903
26	072	239	406	572	739	906
27	075	242	408	575	742	908
28	078	244	411	578	744	911
29	081	247	414	581	747	914
30	0·0083	0·0250	0·0417	0·0583	0·0750	0·0917
31	086	253	419	586	753	919
32	089	256	422	589	756	922
33	092	258	425	592	758	925
34	094	261	428	594	761	928
35	0·0097	0·0264	0·0431	0·0597	0·0764	0·0931
36	100	267	433	600	767	933
37	103	269	436	603	769	936
38	106	272	439	606	772	939
39	108	275	442	608	775	942
40	0·0111	0·0278	0·0444	0·0611	0·0778	0·0944
41	114	281	447	614	781	947
42	117	283	450	617	783	950
43	119	286	453	619	786	953
44	122	289	456	622	789	956
45	0·0125	0·0292	0·0458	0·0625	0·0792	0·0958
46	128	294	461	628	794	961
47	131	297	464	631	797	964
48	133	300	467	633	800	967
49	136	303	469	636	803	969
50	0·0139	0·0306	0·0472	0·0639	0·0806	0·0972
51	142	308	475	642	808	975
52	144	311	478	644	811	978
53	147	314	481	647	814	981
54	150	317	483	650	817	983
55	0·0153	0·0319	0·0486	0·0653	0·0819	0·0986
56	156	322	489	656	822	989
57	158	325	492	658	825	992
58	161	328	494	661	828	994
59	0·0164	0·0331	0·0497	0·0664	0·0831	0·0997

′	°
0	0·0
6	·1
12	·2
18	·3
24	·4
30	·5
36	·6
42	·7
48	·8
54	0·9

In units of the fourth decimal of a degree.

″	
0·0	
	0
·1	
	1
·5	
	2
0·8	
	3
1·0	

In critical cases ascend.

TABLE FOR CONVERSION

OF HOURS, MINUTES AND SECONDS TO DECIMALS OF A DAY

	0h	1h	2h	3h	4h	5h	SECONDS	
m	d	d	d	d	d	d	s	d
0	0·00000	0·04167	0·08333	0·12500	0·16667	0·20833	0	0·00000
1	·00069	·04236	·08403	·12569	·16736	·20903	1	·00001
2	·00139	·04306	·08472	·12639	·16806	·20972	2	·00002
3	·00208	·04375	·08542	·12708	·16875	·21042	3	·00003
4	·00278	·04444	·08611	·12778	·16944	·21111	4	·00005
5	0·00347	0·04514	0·08681	0·12847	0·17014	0·21181	5	0·00006
6	·00417	·04583	·08750	·12917	·17083	·21250	6	·00007
7	·00486	·04653	·08819	·12986	·17153	·21319	7	·00008
8	·00556	·04722	·08889	·13056	·17222	·21389	8	·00009
9	·00625	·04792	·08958	·13125	·17292	·21458	9	·00010
10	0·00694	0·04861	0·09028	0·13194	0·17361	0·21528	10	0·00012
11	·00764	·04931	·09097	·13264	·17431	·21597	11	·00013
12	·00833	·05000	·09167	·13333	·17500	·21667	12	·00014
13	·00903	·05069	·09236	·13403	·17569	·21736	13	·00015
14	·00972	·05139	·09306	·13472	·17639	·21806	14	·00016
15	0·01042	0·05208	0·09375	0·13542	0·17708	0·21875	15	0·00017
16	·01111	·05278	·09444	·13611	·17778	·21944	16	·00019
17	·01181	·05347	·09514	·13681	·17847	·22014	17	·00020
18	·01250	·05417	·09583	·13750	·17917	·22083	18	·00021
19	·01319	·05486	·09653	·13819	·17986	·22153	19	·00022
20	0·01389	0·05556	0·09722	0·13889	0·18056	0·22222	20	0·00023
21	·01458	·05625	·09792	·13958	·18125	·22292	21	·00024
22	·01528	·05694	·09861	·14028	·18194	·22361	22	·00025
23	·01597	·05764	·09931	·14097	·18264	·22431	23	·00027
24	·01667	·05833	·10000	·14167	·18333	·22500	24	·00028
25	0·01736	0·05903	0·10069	0·14236	0·18403	0·22569	25	0·00029
26	·01806	·05972	·10139	·14306	·18472	·22639	26	·00030
27	·01875	·06042	·10208	·14375	·18542	·22708	27	·00031
28	·01944	·06111	·10278	·14444	·18611	·22778	28	·00032
29	·02014	·06181	·10347	·14514	·18681	·22847	29	·00034
30	0·02083	0·06250	0·10417	0·14583	0·18750	0·22917	30	0·00035
31	·02153	·06319	·10486	·14653	·18819	·22986	31	·00036
32	·02222	·06389	·10556	·14722	·18889	·23056	32	·00037
33	·02292	·06458	·10625	·14792	·18958	·23125	33	·00038
34	·02361	·06528	·10694	·14861	·19028	·23194	34	·00039
35	0·02431	0·06597	0·10764	0·14931	0·19097	0·23264	35	0·00041
36	·02500	·06667	·10833	·15000	·19167	·23333	36	·00042
37	·02569	·06736	·10903	·15069	·19236	·23403	37	·00043
38	·02639	·06806	·10972	·15139	·19306	·23472	38	·00044
39	·02708	·06875	·11042	·15208	·19375	·23542	39	·00045
40	0·02778	0·06944	0·11111	0·15278	0·19444	0·23611	40	0·00046
41	·02847	·07014	·11181	·15347	·19514	·23681	41	·00047
42	·02917	·07083	·11250	·15417	·19583	·23750	42	·00049
43	·02986	·07153	·11319	·15486	·19653	·23819	43	·00050
44	·03056	·07222	·11389	·15556	·19722	·23889	44	·00051
45	0·03125	0·07292	0·11458	0·15625	0·19792	0·23958	45	0·00052
46	·03194	·07361	·11528	·15694	·19861	·24028	46	·00053
47	·03264	·07431	·11597	·15764	·19931	·24097	47	·00054
48	·03333	·07500	·11667	·15833	·20000	·24167	48	·00056
49	·03403	·07569	·11736	·15903	·20069	·24236	49	·00057
50	0·03472	0·07639	0·11806	0·15972	0·20139	0·24306	50	0·00058
51	·03542	·07708	·11875	·16042	·20208	·24375	51	·00059
52	·03611	·07778	·11944	·16111	·20278	·24444	52	·00060
53	·03681	·07847	·12014	·16181	·20347	·24514	53	·00061
54	·03750	·07917	·12083	·16250	·20417	·24583	54	·00062
55	0·03819	0·07986	0·12153	0·16319	0·20486	0·24653	55	0·00064
56	·03889	·08056	·12222	·16389	·20556	·24722	56	·00065
57	·03958	·08125	·12292	·16458	·20625	·24792	57	·00066
58	·04028	·08194	·12361	·16528	·20694	·24861	58	·00067
59	0·04097	0·08264	0·12431	0·16597	0·20764	0·24931	59	0·00068

For larger intervals of time, note that $6^h = 0^d{\cdot}25$; $12^h = 0^d{\cdot}50$; $18^h = 0^d{\cdot}75$.

CORRECTING FACTOR $m = 2 \sin^2 \frac{1}{2}(\text{H.A.}) \operatorname{cosec} 1''$

H.A.	m	H.A.	m	H.A.	m	H.A.	m	H.A.	m	H.A.	m
m s	″	m s	″	m s	″	m s	″	h m	″	h m	″
0 00	0	5 01·2	50	7 07·1	100	8 43·5	150	10 00	196	15 00	442
0 30	1	5 04·2	51	7 09·2	101	8 45·3	151	05	200	05	447
0 52	2	5 07·2	52	7 11·4	102	8 47·0	152	10	203	10	451
1 07	3	5 10·2	53	7 13·5	103	8 48·8	153	15	206	15	456
1 20	4	5 13·1	54	7 15·6	104	8 50·5	154	20	210	20	461
1 30	5	5 16·1	55	7 17·7	105	8 52·2	155	25	213	25	466
1 40	6	5 18·9	56	7 19·8	106	8 53·9	156	10 30	216	15 30	472
1 49	7	5 21·8	57	7 21·9	107	8 55·6	157	35	220	35	477
1 57	8	5 24·6	58	7 23·9	108	8 57·4	158	40	223	40	482
2 04	9	5 27·5	59	7 26·0	109	8 59·1	159	45	227	45	487
2 11	10	5 30·2	60	7 28·0	110	9 00·8	160	50	230	50	492
2 18	11	5 33·0	61	7 30·1	111	9 02·5	161	55	234	55	497
2 25	12	5 35·8	62	7 32·1	112	9 04·1	162	11 00	238	16 00	502
2 31	13	5 38·5	63	7 34·1	113	9 05·8	163	05	241	05	508
2 37	14	5 41·2	64	7 36·1	114	9 07·5	164	10	245	10	513
2 43	15	5 43·8	65	7 38·2	115	9 09·2	165	15	248	15	518
2 48	16	5 46·5	66	7 40·2	116	9 10·8	166	20	252	20	524
2 53	17	5 49·1	67	7 42·1	117	9 12·5	167	25	256	25	529
2 59	18	5 51·8	68	7 44·1	118	9 14·2	168	11 30	260	16 30	534
3 04	19	5 54·4	69	7 46·1	119	9 15·8	169	35	263	35	540
3 09	20	5 56·9	70	7 48·1	120	9 17·5	170	40	267	40	545
3 13	21	5 59·5	71	7 50·0	121	9 19·1	171	45	271	45	551
3 18	22	6 02·0	72	7 52·0	122	9 20·7	172	50	275	50	556
3 22	23	6 04·6	73	7 53·9	123	9 22·4	173	55	279	55	562
3 27	24	6 07·1	74	7 55·8	124	9 24·0	174	12 00	283	17 00	567
3 31	25	6 09·5	75	7 57·8	125	9 25·6	175	05	287	05	573
3 35	26	6 12·0	76	7 59·7	126	9 27·2	176	10	291	10	578
3 40	27	6 14·5	77	8 01·6	127	9 28·9	177	15	295	15	584
3 44	28	6 16·9	78	8 03·5	128	9 30·5	178	20	299	20	590
3 48	29	6 19·3	79	8 05·4	129	9 32·1	179	25	303	25	595
3 52	30	6 21·7	80	8 07·3	130	9 33·7	180	12 30	307	17 30	601
3 56	31	6 24·1	81	8 09·1	131	9 35·3	181	35	311	35	607
4 00	32	6 26·5	82	8 11·0	132	9 36·9	182	40	315	40	613
4 04	33	6 28·9	83	8 12·9	133	9 38·4	183	45	319	45	618
4 07	34	6 31·2	84	8 14·7	134	9 40·0	184	50	323	50	624
4 11	35	6 33·6	85	8 16·6	135	9 41·6	185	55	328	55	630
4 15	36	6 35·9	86	8 18·4	136	9 43·2	186	13 00	332	18 00	636
4 18	37	6 38·2	87	8 20·2	137	9 44·8	187	05	336	05	642
4 22	38	6 40·5	88	8 22·1	138	9 46·3	188	10	340	10	648
4 25	39	6 42·8	89	8 23·9	139	9 47·9	189	15	345	15	654
4 29	40	6 45·1	90	8 25·7	140	9 49·4	190	20	349	20	660
4 32	41	6 47·3	91	8 27·5	141	9 51·0	191	25	353	25	666
4 35	42	6 49·6	92	8 29·3	142	9 52·5	192	13 30	358	18 30	672
4 39	43	6 51·8	93	8 31·1	143	9 54·1	193	35	362	35	678
4 42	44	6 54·0	94	8 32·9	144	9 55·6	194	40	367	40	684
4 45	45	6 56·2	95	8 34·7	145	9 57·2	195	45	371	45	690
4 48	46	6 58·4	96	8 36·5	146	9 58·7	196	50	376	50	696
4 51	47	7 00·6	97	8 38·2	147	10 00·2	197	55	380	55	702
4 55	48	7 02·8	98	8 40·0	148	10 01·8	198	14 00	385	19 00	708
4 58	49	7 04·9	99	8 41·8	149	10 03·3	199	05	389	05	715
5 01		7 07·1		8 43·5		10 04·8		10	394	10	721
								15	399	15	727
								20	403	20	733
								25	408	25	740
								14 30	413	19 30	746
								35	417	35	753
								40	422	40	759
								45	427	45	765
								50	432	50	772
								55	437	55	778
								15 00	442	20 00	785

In critical cases ascend.

For further explanation see page xii.

	0h	1h	2h	3h	4h	5h		s0	s2	s4	s6	s8
m	° ′	° ′	° ′	° ′	° ′	° ′	s	′ ″	′ ″	′ ″	′ ″	′ ″
0	0 00	15 00	30 00	45 00	60 00	75 00	0	0 00	0 03	0 06	0 09	0 12
1	0 15	15 15	30 15	45 15	60 15	75 15	1	0 15	0 18	0 21	0 24	0 27
2	0 30	15 30	30 30	45 30	60 30	75 30	2	0 30	0 33	0 36	0 39	0 42
3	0 45	15 45	30 45	45 45	60 45	75 45	3	0 45	0 48	0 51	0 54	0 57
4	1 00	16 00	31 00	46 00	61 00	76 00	4	1 00	1 03	1 06	1 09	1 12
5	1 15	16 15	31 15	46 15	61 15	76 15	5	1 15	1 18	1 21	1 24	1 27
6	1 30	16 30	31 30	46 30	61 30	76 30	6	1 30	1 33	1 36	1 39	1 42
7	1 45	16 45	31 45	46 45	61 45	76 45	7	1 45	1 48	1 51	1 54	1 57
8	2 00	17 00	32 00	47 00	62 00	77 00	8	2 00	2 03	2 06	2 09	2 12
9	2 15	17 15	32 15	47 15	62 15	77 15	9	2 15	2 18	2 21	2 24	2 27
10	2 30	17 30	32 30	47 30	62 30	77 30	10	2 30	2 33	2 36	2 39	2 42
11	2 45	17 45	32 45	47 45	62 45	77 45	11	2 45	2 48	2 51	2 54	2 57
12	3 00	18 00	33 00	48 00	63 00	78 00	12	3 00	3 03	3 06	3 09	3 12
13	3 15	18 15	33 15	48 15	63 15	78 15	13	3 15	3 18	3 21	3 24	3 27
14	3 30	18 30	33 30	48 30	63 30	78 30	14	3 30	3 33	3 36	3 39	3 42
15	3 45	18 45	33 45	48 45	63 45	78 45	15	3 45	3 48	3 51	3 54	3 57
16	4 00	19 00	34 00	49 00	64 00	79 00	16	4 00	4 03	4 06	4 09	4 12
17	4 15	19 15	34 15	49 15	64 15	79 15	17	4 15	4 18	4 21	4 24	4 27
18	4 30	19 30	34 30	49 30	64 30	79 30	18	4 30	4 33	4 36	4 39	4 42
19	4 45	19 45	34 45	49 45	64 45	79 45	19	4 45	4 48	4 51	4 54	4 57
20	5 00	20 00	35 00	50 00	65 00	80 00	20	5 00	5 03	5 06	5 09	5 12
21	5 15	20 15	35 15	50 15	65 15	80 15	21	5 15	5 18	5 21	5 24	5 27
22	5 30	20 30	35 30	50 30	65 30	80 30	22	5 30	5 33	5 36	5 39	5 42
23	5 45	20 45	35 45	50 45	65 45	80 45	23	5 45	5 48	5 51	5 54	5 57
24	6 00	21 00	36 00	51 00	66 00	81 00	24	6 00	6 03	6 06	6 09	6 12
25	6 15	21 15	36 15	51 15	66 15	81 15	25	6 15	6 18	6 21	6 24	6 27
26	6 30	21 30	36 30	51 30	66 30	81 30	26	6 30	6 33	6 36	6 39	6 42
27	6 45	21 45	36 45	51 45	66 45	81 45	27	6 45	6 48	6 51	6 54	6 57
28	7 00	22 00	37 00	52 00	67 00	82 00	28	7 00	7 03	7 06	7 09	7 12
29	7 15	22 15	37 15	52 15	67 15	82 15	29	7 15	7 18	7 21	7 24	7 27
30	7 30	22 30	37 30	52 30	67 30	82 30	30	7 30	7 33	7 36	7 39	7 42
31	7 45	22 45	37 45	52 45	67 45	82 45	31	7 45	7 48	7 51	7 54	7 57
32	8 00	23 00	38 00	53 00	68 00	83 00	32	8 00	8 03	8 06	8 09	8 12
33	8 15	23 15	38 15	53 15	68 15	83 15	33	8 15	8 18	8 21	8 24	8 27
34	8 30	23 30	38 30	53 30	68 30	83 30	34	8 30	8 33	8 36	8 39	8 42
35	8 45	23 45	38 45	53 45	68 45	83 45	35	8 45	8 48	8 51	8 54	8 57
36	9 00	24 00	39 00	54 00	69 00	84 00	36	9 00	9 03	9 06	9 09	9 12
37	9 15	24 15	39 15	54 15	69 15	84 15	37	9 15	9 18	9 21	9 24	9 27
38	9 30	24 30	39 30	54 30	69 30	84 30	38	9 30	9 33	9 36	9 39	9 42
39	9 45	24 45	39 45	54 45	69 45	84 45	39	9 45	9 48	9 51	9 54	9 57
40	10 00	25 00	40 00	55 00	70 00	85 00	40	10 00	10 03	10 06	10 09	10 12
41	10 15	25 15	40 15	55 15	70 15	85 15	41	10 15	10 18	10 21	10 24	10 27
42	10 30	25 30	40 30	55 30	70 30	85 30	42	10 30	10 33	10 36	10 39	10 42
43	10 45	25 45	40 45	55 45	70 45	85 45	43	10 45	10 48	10 51	10 54	10 57
44	11 00	26 00	41 00	56 00	71 00	86 00	44	11 00	11 03	11 06	11 09	11 12
45	11 15	26 15	41 15	56 15	71 15	86 15	45	11 15	11 18	11 21	11 24	11 27
46	11 30	26 30	41 30	56 30	71 30	86 30	46	11 30	11 33	11 36	11 39	11 42
47	11 45	26 45	41 45	56 45	71 45	86 45	47	11 45	11 48	11 51	11 54	11 57
48	12 00	27 00	42 00	57 00	72 00	87 00	48	12 00	12 03	12 06	12 09	12 12
49	12 15	27 15	42 15	57 15	72 15	87 15	49	12 15	12 18	12 21	12 24	12 27
50	12 30	27 30	42 30	57 30	72 30	87 30	50	12 30	12 33	12 36	12 39	12 42
51	12 45	27 45	42 45	57 45	72 45	87 45	51	12 45	12 48	12 51	12 54	12 57
52	13 00	28 00	43 00	58 00	73 00	88 00	52	13 00	13 03	13 06	13 09	13 12
53	13 15	28 15	43 15	58 15	73 15	88 15	53	13 15	13 18	13 21	13 24	13 27
54	13 30	28 30	43 30	58 30	73 30	88 30	54	13 30	13 33	13 36	13 39	13 42
55	13 45	28 45	43 45	58 45	73 45	88 45	55	13 45	13 48	13 51	13 54	13 57
56	14 00	29 00	44 00	59 00	74 00	89 00	56	14 00	14 03	14 06	14 09	14 12
57	14 15	29 15	44 15	59 15	74 15	89 15	57	14 15	14 18	14 21	14 24	14 27
58	14 30	29 30	44 30	59 30	74 30	89 30	58	14 30	14 33	14 36	14 39	14 42
59	14 45	29 45	44 45	59 45	74 45	89 45	59	14 45	14 48	14 51	14 54	14 57

The left-hand portion of the table gives the arc equivalent of each minute of time less than 6^h; for larger intervals note that $6^h = 90°$; $12^h = 180°$; $18^h = 270°$. The right-hand portion gives the equivalent of seconds, and fifths of seconds, of time.

MUTUAL CONVERSION OF INTERVALS OF SOLAR AND SIDEREAL TIME

solar 0^h	ΔR	sidereal 0^h	solar 0^h	ΔR	sidereal 0^h	solar 1^h	ΔR	sidereal 1^h	solar 1^h	ΔR	sidereal 1^h
m s	s	m s	m s	s	m s	m s	s	m s	m s	s	m s
00 00·0	0·0	00 00·0	30 07·9	5·0	30 12·8	00 34·1	10·0	00 44·1	30 23·8	14·9	30 38·6
00 18·2	0·1	00 18·3	30 44·4	5·1	30 49·5	01 10·6	10·1	01 20·7	31 00·3	15·0	31 15·3
00 54·7	0·2	00 54·9	31 20·9	5·2	31 26·1	01 47·2	10·2	01 57·3	31 36·8	15·1	31 51·9
01 31·3	0·3	01 31·5	31 57·5	5·3	32 02·7	02 23·7	10·3	02 33·9	32 13·4	15·2	32 28·5
02 07·8	0·4	02 08·1	32 34·0	5·4	32 39·3	03 00·2	10·4	03 10·6	32 49·9	15·3	33 05·1
02 44·3	0·5	02 44·8	33 10·5	5·5	33 16·0	03 36·7	10·5	03 47·2	33 26·4	15·4	33 41·8
03 20·8	0·6	03 21·4	33 47·0	5·6	33 52·6	04 13·3	10·6	04 23·8	34 02·9	15·5	34 18·4
03 57·4	0·7	03 58·0	34 23·6	5·7	34 29·2	04 49·8	10·7	05 00·4	34 39·5	15·6	34 55·0
04 33·9	0·8	04 34·6	35 00·1	5·8	35 05·8	05 26·3	10·8	05 37·1	35 16·0	15·7	35 31·6
05 10·4	0·9	05 11·3	35 36·6	5·9	35 42·5	06 02·8	10·9	06 13·7	35 52·5	15·8	36 08·3
05 46·9	1·0	05 47·9	36 13·1	6·0	36 19·1	06 39·4	11·0	06 50·3	36 29·0	15·9	36 44·9
06 23·5	1·1	06 24·5	36 49·7	6·1	36 55·7	07 15·9	11·1	07 26·9	37 05·6	16·0	37 21·5
07 00·0	1·2	07 01·1	37 26·2	6·2	37 32·3	07 52·4	11·2	08 03·6	37 42·1	16·1	37 58·1
07 36·5	1·3	07 37·8	38 02·7	6·3	38 09·0	08 28·9	11·3	08 40·2	38 18·6	16·2	38 34·8
08 13·0	1·4	08 14·4	38 39·2	6·4	38 45·6	09 05·4	11·4	09 16·8	38 55·1	16·3	39 11·4
08 49·6	1·5	08 51·0	39 15·8	6·5	39 22·2	09 42·0	11·5	09 53·4	39 31·7	16·4	39 48·0
09 26·1	1·6	09 27·6	39 52·3	6·6	39 58·8	10 18·5	11·6	10 30·0	40 08·2	16·5	40 24·6
10 02·6	1·7	10 04·2	40 28·8	6·7	40 35·5	10 55·0	11·7	11 06·7	40 44·7	16·6	41 01·3
10 39·1	1·8	10 40·9	41 05·3	6·8	41 12·1	11 31·5	11·8	11 43·3	41 21·2	16·7	41 37·9
11 15·6	1·9	11 17·5	41 41·9	6·9	41 48·7	12 08·1	11·9	12 19·9	41 57·8	16·8	42 14·5
11 52·2	2·0	11 54·1	42 18·4	7·0	42 25·3	12 44·6	12·0	12 56·5	42 34·3	16·9	42 51·1
12 28·7	2·1	12 30·7	42 54·9	7·1	43 02·0	13 21·1	12·1	13 33·2	43 10·8	17·0	43 27·8
13 05·2	2·2	13 07·4	43 31·4	7·2	43 38·6	13 57·6	12·2	14 09·8	43 47·3	17·1	44 04·4
13 41·7	2·3	13 44·0	44 08·0	7·3	44 15·2	14 34·2	12·3	14 46·4	44 23·9	17·2	44 41·0
14 18·3	2·4	14 20·6	44 44·5	7·4	44 51·8	15 10·7	12·4	15 23·0	45 00·4	17·3	45 17·6
14 54·8	2·5	14 57·2	45 21·0	7·5	45 28·5	15 47·2	12·5	15 59·7	45 36·9	17·4	45 54·3
15 31·3	2·6	15 33·9	45 57·5	7·6	46 05·1	16 23·7	12·6	16 36·3	46 13·4	17·5	46 30·9
16 07·8	2·7	16 10·5	46 34·1	7·7	46 41·7	17 00·3	12·7	17 12·9	46 50·0	17·6	47 07·5
16 44·4	2·8	16 47·1	47 10·6	7·8	47 18·3	17 36·8	12·8	17 49·5	47 26·5	17·7	47 44·1
17 20·9	2·9	17 23·7	47 47·1	7·9	47 55·0	18 13·3	12·9	18 26·2	48 03·0	17·8	48 20·7
17 57·4	3·0	18 00·4	48 23·6	8·0	48 31·6	18 49·8	13·0	19 02·8	48 39·5	17·9	48 57·4
18 33·9	3·1	18 37·0	49 00·1	8·1	49 08·2	19 26·4	13·1	19 39·4	49 16·0	18·0	49 34·0
19 10·5	3·2	19 13·6	49 36·7	8·2	49 44·8	20 02·9	13·2	20 16·0	49 52·6	18·1	50 10·6
19 47·0	3·3	19 50·2	50 13·2	8·3	50 21·4	20 39·4	13·3	20 52·7	50 29·1	18·2	50 47·2
20 23·5	3·4	20 26·9	50 49·7	8·4	50 58·1	21 15·9	13·4	21 29·3	51 05·6	18·3	51 23·9
21 00·0	3·5	21 03·5	51 26·2	8·5	51 34·7	21 52·5	13·5	22 05·9	51 42·1	18·4	52 00·5
21 36·6	3·6	21 40·1	52 02·8	8·6	52 11·3	22 29·0	13·6	22 42·5	52 18·7	18·5	52 37·1
22 13·1	3·7	22 16·7	52 39·3	8·7	52 47·9	23 05·5	13·7	23 19·2	52 55·2	18·6	53 13·7
22 49·6	3·8	22 53·4	53 15·8	8·8	53 24·6	23 42·0	13·8	23 55·8	53 31·7	18·7	53 50·4
23 26·1	3·9	23 30·0	53 52·3	8·9	54 01·2	24 18·6	13·9	24 32·4	54 08·2	18·8	54 27·0
24 02·7	4·0	24 06·6	54 28·9	9·0	54 37·8	24 55·1	14·0	25 09·0	54 44·8	18·9	55 03·6
24 39·2	4·1	24 43·2	55 05·4	9·1	55 14·4	25 31·6	14·1	25 45·7	55 21·3	19·0	55 40·2
25 15·7	4·2	25 19·9	55 41·9	9·2	55 51·1	26 08·1	14·2	26 22·3	55 57·8	19·1	56 16·9
25 52·2	4·3	25 56·5	56 18·4	9·3	56 27·7	26 44·7	14·3	26 58·9	56 34·3	19·2	56 53·5
26 28·8	4·4	26 33·1	56 55·0	9·4	57 04·3	27 21·2	14·4	27 35·5	57 10·9	19·3	57 30·1
27 05·3	4·5	27 09·7	57 31·5	9·5	57 40·9	27 57·7	14·5	28 12·1	57 47·4	19·4	58 06·7
27 41·8	4·6	27 46·4	58 08·0	9·6	58 17·6	28 34·2	14·6	28 48·8	58 23·9	19·5	58 43·4
28 18·3	4·7	28 23·0	58 44·5	9·7	58 54·2	29 10·7	14·7	29 25·4	59 00·4	19·6	59 20·0
28 54·9	4·8	28 59·6	59 21·1	9·8	59 30·8	29 47·3	14·8	30 02·0	59 37·0	19·7	59 56·6
29 31·4	4·9	29 36·2	59 57·6	9·9	60 07·4	30 23·8		30 38·6	60 13·5		60 33·2
30 07·9		30 12·8	60 34·1		60 44·1						

In critical cases ascend.

Add ΔR to solar time interval (left-hand argument) to obtain sidereal time interval.
Subtract ΔR from sidereal time interval (right-hand argument) to obtain solar time interval.

MUTUAL CONVERSION OF INTERVALS OF SOLAR AND SIDEREAL TIME

solar 2^h	ΔR	sidereal 2^h
m s	s	m s
00 13·5	19·8	00 33·2
00 50·0	19·9	01 09·9
01 26·5	20·0	01 46·5
02 03·1	20·1	02 23·1
02 39·6	20·2	02 59·7
03 16·1	20·3	03 36·4
03 52·6	20·4	04 13·0
04 29·2	20·5	04 49·6
05 05·7	20·6	05 26·2
05 42·2	20·7	06 02·9
06 18·7	20·8	06 39·5
06 55·2	20·9	07 16·1
07 31·8	21·0	07 52·7
08 08·3	21·1	08 29·3
08 44·8	21·2	09 06·0
09 21·3	21·3	09 42·6
09 57·9	21·4	10 19·2
10 34·4	21·5	10 55·8
11 10·9	21·6	11 32·5
11 47·4	21·7	12 09·1
12 24·0	21·8	12 45·7
13 00·5	21·9	13 22·3
13 37·0	22·0	13 59·0
14 13·5	22·1	14 35·6
14 50·1	22·2	15 12·2
15 26·6	22·3	15 48·8
16 03·1	22·4	16 25·5
16 39·6	22·5	17 02·1
17 16·2	22·6	17 38·7
17 52·7	22·7	18 15·3
18 29·2	22·8	18 52·0
19 05·7	22·9	19 28·6
19 42·3	23·0	20 05·2
20 18·8	23·1	20 41·8
20 55·3	23·2	21 18·5
21 31·8	23·3	21 55·1
22 08·4	23·4	22 31·7
22 44·9	23·5	23 08·3
23 21·4	23·6	23 45·0
23 57·9	23·7	24 21·6
24 34·5	23·8	24 58·2
25 11·0	23·9	25 34·8
25 47·5	24·0	26 11·5
26 24·0	24·1	26 48·1
27 00·5	24·2	27 24·7
27 37·1	24·3	28 01·3
28 13·6	24·4	28 37·9
28 50·1	24·5	29 14·6
29 26·6	24·6	29 51·2
30 03·2		30 27·8

solar 2^h	ΔR	sidereal 2^h
m s	s	m s
30 03·2	24·7	30 27·8
30 39·7	24·8	31 04·4
31 16·2	24·9	31 41·1
31 52·7	25·0	32 17·7
32 29·3	25·1	32 54·3
33 05·8	25·2	33 30·9
33 42·3	25·3	34 07·6
34 18·8	25·4	34 44·2
34 55·4	25·5	35 20·8
35 31·9	25·6	35 57·4
36 08·4	25·7	36 34·1
36 44·9	25·8	37 10·7
37 21·5	25·9	37 47·3
37 58·0	26·0	38 23·9
38 34·5	26·1	39 00·6
39 11·0	26·2	39 37·2
39 47·6	26·3	40 13·8
40 24·1	26·4	40 50·4
41 00·6	26·5	41 27·1
41 37·1	26·6	42 03·7
42 13·7	26·7	42 40·3
42 50·2	26·8	43 16·9
43 26·7	26·9	43 53·6
44 03·2	27·0	44 30·2
44 39·8	27·1	45 06·8
45 16·3	27·2	45 43·4
45 52·8	27·3	46 20·0
46 29·3	27·4	46 56·7
47 05·8	27·5	47 33·3
47 42·4	27·6	48 09·9
48 18·9	27·7	48 46·5
48 55·4	27·8	49 23·2
49 31·9	27·9	49 59·8
50 08·5	28·0	50 36·4
50 45·0	28·1	51 13·0
51 21·5	28·2	51 49·7
51 58·0	28·3	52 26·3
52 34·6	28·4	53 02·9
53 11·1	28·5	53 39·5
53 47·6	28·6	54 16·2
54 24·1	28·7	54 52·8
55 00·7	28·8	55 29·4
55 37·2	28·9	56 06·0
56 13·7	29·0	56 42·7
56 50·2	29·1	57 19·3
57 26·8	29·2	57 55·9
58 03·3	29·3	58 32·5
58 39·8	29·4	59 09·2
59 16·3	29·5	59 45·8
59 52·9	29·6	60 22·4
60 29·4		60 59·0

solar 3^h	ΔR	sidereal 3^h
m s	s	m s
00 29·4	29·7	00 59·0
01 05·9	29·8	01 35·7
01 42·4	29·9	02 12·3
02 19·0	30·0	02 48·9
02 55·5	30·1	03 25·5
03 32·0	30·2	04 02·2
04 08·5	30·3	04 38·8
04 45·1	30·4	05 15·4
05 21·6	30·5	05 52·0
05 58·1	30·6	06 28·6
06 34·6	30·7	07 05·3
07 11·1	30·8	07 41·9
07 47·7	30·9	08 18·5
08 24·2	31·0	08 55·1
09 00·7	31·1	09 31·8
09 37·2	31·2	10 08·4
10 13·8	31·3	10 45·0
10 50·3	31·4	11 21·6
11 26·8	31·5	11 58·3
12 03·3	31·6	12 34·9
12 39·9	31·7	13 11·5
13 16·4	31·8	13 48·1
13 52·9	31·9	14 24·8
14 29·4	32·0	15 01·4
15 06·0	32·1	15 38·0
15 42·5	32·2	16 14·6
16 19·0	32·3	16 51·3
16 55·5	32·4	17 27·9
17 32·1	32·5	18 04·5
18 08·6	32·6	18 41·1
18 45·1	32·7	19 17·8
19 21·6	32·8	19 54·4
19 58·2	32·9	20 31·0
20 34·7	33·0	21 07·6
21 11·2	33·1	21 44·3
21 47·7	33·2	22 20·9
22 24·3	33·3	22 57·5
23 00·8	33·4	23 34·1
23 37·3	33·5	24 10·8
24 13·8	33·6	24 47·4
24 50·3	33·7	25 24·0
25 26·9	33·8	26 00·6
26 03·4	33·9	26 37·2
26 39·9	34·0	27 13·9
27 16·4	34·1	27 50·5
27 53·0	34·2	28 27·1
28 29·5	34·3	29 03·7
29 06·0	34·4	29 40·4
29 42·5	34·5	30 17·0
30 19·1		30 53·6

solar 3^h	ΔR	sidereal 3^h
m s	s	m s
30 19·1	34·6	30 53·6
30 55·6	34·7	31 30·2
31 32·1	34·8	32 06·9
32 08·6	34·9	32 43·5
32 45·2	35·0	33 20·1
33 21·7	35·1	33 56·7
33 58·2	35·2	34 33·4
34 34·7	35·3	35 10·0
35 11·3	35·4	35 46·6
35 47·8	35·5	36 23·2
36 24·3	35·6	36 59·9
37 00·8	35·7	37 36·5
37 37·4	35·8	38 13·1
38 13·9	35·9	38 49·7
38 50·4	36·0	39 26·4
39 26·9	36·1	40 03·0
40 03·5	36·2	40 39·6
40 40·0	36·3	41 16·2
41 16·5	36·4	41 52·9
41 53·0	36·5	42 29·5
42 29·6	36·6	43 06·1
43 06·1	36·7	43 42·7
43 42·6	36·8	44 19·4
44 19·1	36·9	44 56·0
44 55·6	37·0	45 32·6
45 32·2	37·1	46 09·2
46 08·7	37·2	46 45·8
46 45·2	37·3	47 22·5
47 21·7	37·4	47 59·1
47 58·3	37·5	48 35·7
48 34·8	37·6	49 12·3
49 11·3	37·7	49 49·0
49 47·8	37·8	50 25·6
50 24·4	37·9	51 02·2
51 00·9	38·0	51 38·8
51 37·4	38·1	52 15·5
52 13·9	38·2	52 52·1
52 50·5	38·3	53 28·7
53 27·0	38·4	54 05·3
54 03·5	38·5	54 42·0
54 40·0	38·6	55 18·6
55 16·6	38·7	55 55·2
55 53·1	38·8	56 31·8
56 29·6	38·9	57 08·5
57 06·1	39·0	57 45·1
57 42·7	39·1	58 21·7
58 19·2	39·2	58 58·3
58 55·7	39·3	59 35·0
59 32·2	39·4	60 11·6
60 08·8		60 48·2

In critical cases ascend.

Add ΔR to solar time interval (left-hand argument) to obtain sidereal time interval.
Subtract ΔR from sidereal time interval (right-hand argument) to obtain solar time interval.

MUTUAL CONVERSION OF INTERVALS OF SOLAR AND SIDEREAL TIME

solar 4^h	ΔR	sidereal 4^h	solar 4^h	ΔR	sidereal 4^h	solar 5^h	ΔR	sidereal 5^h	solar 5^h	ΔR	sidereal 5^h
m s	s	m s	m s	s	m s	m s	s	m s	m s	s	m s
00 08·8	39·5	00 48·2	**30 35·0**	44·5	31 19·4	**00 24·7**	49·4	01 14·0	**30 14·3**	54·3	31 08·6
00 45·3	39·6	01 24·8	**31 11·5**	44·6	31 56·0	**01 01·2**	49·5	01 50·6	**30 50·9**	54·4	31 45·2
01 21·8	39·7	02 01·5	**31 48·0**	44·7	32 32·7	**01 37·7**	49·6	02 27·3	**31 27·4**	54·5	32 21·8
01 58·3	39·8	02 38·1	**32 24·5**	44·8	33 09·3	**02 14·2**	49·7	03 03·9	**32 03·9**	54·6	32 58·5
02 34·9	39·9	03 14·7	**33 01·1**	44·9	33 45·9	**02 50·7**	49·8	03 40·5	**32 40·4**	54·7	33 35·1
03 11·4	40·0	03 51·3	**33 37·6**	45·0	34 22·5	**03 27·3**	49·9	04 17·1	**33 17·0**	54·8	34 11·7
03 47·9	40·1	04 28·0	**34 14·1**	45·1	34 59·2	**04 03·8**	50·0	04 53·7	**33 53·5**	54·9	34 48·3
04 24·4	40·2	05 04·6	**34 50·6**	45·2	35 35·8	**04 40·3**	50·1	05 30·4	**34 30·0**	55·0	35 25·0
05 00·9	40·3	05 41·2	**35 27·2**	45·3	36 12·4	**05 16·8**	50·2	06 07·0	**35 06·5**	55·1	36 01·6
05 37·5	40·4	06 17·8	**36 03·7**	45·4	36 49·0	**05 53·4**	50·3	06 43·6	**35 43·1**	55·2	36 38·2
06 14·0	40·5	06 54·4	**36 40·2**	45·5	37 25·7	**06 29·9**	50·4	07 20·2	**36 19·6**	55·3	37 14·8
06 50·5	40·6	07 31·1	**37 16·7**	45·6	38 02·3	**07 06·4**	50·5	07 56·9	**36 56·1**	55·4	37 51·5
07 27·0	40·7	08 07·7	**37 53·3**	45·7	38 38·9	**07 42·9**	50·6	08 33·5	**37 32·6**	55·5	38 28·1
08 03·6	40·8	08 44·3	**38 29·8**	45·8	39 15·5	**08 19·5**	50·7	09 10·1	**38 09·2**	55·6	39 04·7
08 40·1	40·9	09 20·9	**39 06·3**	45·9	39 52·2	**08 56·0**	50·8	09 46·7	**38 45·7**	55·7	39 41·3
09 16·6	41·0	09 57·6	**39 42·8**	46·0	40 28·8	**09 32·5**	50·9	10 23·4	**39 22·2**	55·8	40 18·0
09 53·1	41·1	10 34·2	**40 19·4**	46·1	41 05·4	**10 09·0**	51·0	11 00·0	**39 58·7**	55·9	40 54·6
10 29·7	41·2	11 10·8	**40 55·9**	46·2	41 42·0	**10 45·6**	51·1	11 36·6	**40 35·3**	56·0	41 31·2
11 06·2	41·3	11 47·4	**41 32·4**	46·3	42 18·7	**11 22·1**	51·2	12 13·2	**41 11·8**	56·1	42 07·8
11 42·7	41·4	12 24·1	**42 08·9**	46·4	42 55·3	**11 58·6**	51·3	12 49·9	**41 48·3**	56·2	42 44·4
12 19·2	41·5	13 00·7	**42 45·4**	46·5	43 31·9	**12 35·1**	51·4	13 26·5	**42 24·8**	56·3	43 21·1
12 55·8	41·6	13 37·3	**43 22·0**	46·6	44 08·5	**13 11·7**	51·5	14 03·1	**43 01·3**	56·4	43 57·7
13 32·3	41·7	14 13·9	**43 58·5**	46·7	44 45·1	**13 48·2**	51·6	14 39·7	**43 37·9**	56·5	44 34·3
14 08·8	41·8	14 50·6	**44 35·0**	46·8	45 21·8	**14 24·7**	51·7	15 16·4	**44 14·4**	56·6	45 10·9
14 45·3	41·9	15 27·2	**45 11·5**	46·9	45 58·4	**15 01·2**	51·8	15 53·0	**44 50·9**	56·7	45 47·6
15 21·9	42·0	16 03·8	**45 48·1**	47·0	46 35·0	**15 37·8**	51·9	16 29·6	**45 27·4**	56·8	46 24·2
15 58·4	42·1	16 40·4	**46 24·6**	47·1	47 11·6	**16 14·3**	52·0	17 06·2	**46 04·0**	56·9	47 00·8
16 34·9	42·2	17 17·1	**47 01·1**	47·2	47 48·3	**16 50·8**	52·1	17 42·9	**46 40·5**	57·0	47 37·4
17 11·4	42·3	17 53·7	**47 37·6**	47·3	48 24·9	**17 27·3**	52·2	18 19·5	**47 17·0**	57·1	48 14·1
17 48·0	42·4	18 30·3	**48 14·2**	47·4	49 01·5	**18 03·9**	52·3	18 56·1	**47 53·5**	57·2	48 50·7
18 24·5	42·5	19 06·9	**48 50·7**	47·5	49 38·1	**18 40·4**	52·4	19 32·7	**48 30·1**	57·3	49 27·3
19 01·0	42·6	19 43·6	**49 27·2**	47·6	50 14·8	**19 16·9**	52·5	20 09·4	**49 06·6**	57·4	50 03·9
19 37·5	42·7	20 20·2	**50 03·7**	47·7	50 51·4	**19 53·4**	52·6	20 46·0	**49 43·1**	57·5	50 40·6
20 14·1	42·8	20 56·8	**50 40·3**	47·8	51 28·0	**20 30·0**	52·7	21 22·6	**50 19·6**	57·6	51 17·2
20 50·6	42·9	21 33·4	**51 16·8**	47·9	52 04·6	**21 06·5**	52·8	21 59·2	**50 56·2**	57·7	51 53·8
21 27·1	43·0	22 10·1	**51 53·3**	48·0	52 41·3	**21 43·0**	52·9	22 35·9	**51 32·7**	57·8	52 30·4
22 03·6	43·1	22 46·7	**52 29·8**	48·1	53 17·9	**22 19·5**	53·0	23 12·5	**52 09·2**	57·9	53 07·1
22 40·2	43·2	23 23·3	**53 06·4**	48·2	53 54·5	**22 56·0**	53·1	23 49·1	**52 45·7**	58·0	53 43·7
23 16·7	43·3	23 59·9	**53 42·9**	48·3	54 31·1	**23 32·6**	53·2	24 25·7	**53 22·3**	58·1	54 20·3
23 53·2	43·4	24 36·5	**54 19·4**	48·4	55 07·8	**24 09·1**	53·3	25 02·3	**53 58·8**	58·2	54 56·9
24 29·7	43·5	25 13·2	**54 55·9**	48·5	55 44·4	**24 45·6**	53·4	25 39·0	**54 35·3**	58·3	55 33·6
25 06·2	43·6	25 49·8	**55 32·5**	48·6	56 21·0	**25 22·1**	53·5	26 15·6	**55 11·8**	58·4	56 10·2
25 42·8	43·7	26 26·4	**56 09·0**	48·7	56 57·6	**25 58·7**	53·6	26 52·2	**55 48·4**	58·5	56 46·8
26 19·3	43·8	27 03·0	**56 45·5**	48·8	57 34·3	**26 35·2**	53·7	27 28·8	**56 24·9**	58·6	57 23·4
26 55·8	43·9	27 39·7	**57 22·0**	48·9	58 10·9	**27 11·7**	53·8	28 05·5	**57 01·4**	58·7	58 00·1
27 32·3	44·0	28 16·3	**57 58·6**	49·0	58 47·5	**27 48·2**	53·9	28 42·1	**57 37·9**	58·8	58 36·7
28 08·9	44·1	28 52·9	**58 35·1**	49·1	59 24·1	**28 24·8**	54·0	29 18·7	**58 14·5**	58·9	59 13·3
28 45·4	44·2	29 29·5	**59 11·6**	49·2	60 00·8	**29 01·3**	54·1	29 55·3	**58 51·0**	59·0	59 49·9
29 21·9	44·3	30 06·2	**59 48·1**	49·3	60 37·4	**29 37·8**	54·2	30 32·0	**59 27·5**	59·1	60 26·6
29 58·4	44·4	30 42·8	**60 24·7**		61 14·0	**30 14·3**		31 08·6	**60 04·0**		61 03·2
30 35·0		31 19·4									

In critical cases ascend.

Add ΔR to solar time interval (left-hand argument) to obtain sidereal time interval.
Subtract ΔR from sidereal time interval (right-hand argument) to obtain solar time interval.

INTERPOLATION TABLE FOR SUN

Time diff.	Tabular six-hourly difference																							
	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72
h m																								
0 10	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2
20	0	0	1	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4
30	0	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6
40	0	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5	6	6	6	7	7	7	8	8
50	0	1	1	2	2	3	3	3	4	4	5	5	5	6	6	7	7	8	8	8	9	9	10	10
1 00	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	10	10	11	11	12	12
10	1	1	2	2	3	4	4	5	5	6	6	7	8	8	9	9	10	11	11	12	12	13	13	14
20	1	1	2	3	3	4	5	5	6	7	7	8	9	9	10	11	11	12	13	13	14	15	15	16
30	1	2	2	3	4	5	5	6	7	8	8	9	10	11	11	12	13	14	14	15	16	17	17	18
40	1	2	3	3	4	5	6	7	8	8	9	10	11	12	13	13	14	15	16	17	18	18	19	20
50	1	2	3	4	5	6	6	7	8	9	10	11	12	13	14	15	16	17	17	18	19	20	21	22
2 00	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
10	1	2	3	4	5	7	8	9	10	11	12	13	14	15	16	17	18	20	21	22	23	24	25	26
20	1	2	4	5	6	7	8	9	11	12	13	14	15	16	18	19	20	21	22	23	25	26	27	28
30	1	3	4	5	6	8	9	10	11	13	14	15	16	18	19	20	21	23	24	25	26	28	29	30
40	1	3	4	5	7	8	9	11	12	13	15	16	17	19	20	21	23	24	25	27	28	29	31	32
50	1	3	4	6	7	9	10	11	13	14	16	17	18	20	21	23	24	26	27	28	30	31	33	34
3 00	2	3	5	6	8	9	11	12	14	15	17	18	20	21	23	24	26	27	29	30	32	33	35	36
10	2	3	5	6	8	10	11	13	14	16	17	19	21	22	24	25	27	29	30	32	33	35	36	38
20	2	3	5	7	8	10	12	13	15	17	18	20	22	23	25	27	28	30	32	33	35	37	38	40
30	2	4	5	7	9	11	12	14	16	18	19	21	23	25	26	28	30	32	33	35	37	39	40	42
40	2	4	6	7	9	11	13	15	17	18	20	22	24	26	28	29	31	33	35	37	39	40	42	44
50	2	4	6	8	10	12	13	15	17	19	21	23	25	27	29	31	33	35	36	38	40	42	44	46
4 00	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48
10	2	4	6	8	10	13	15	17	19	21	23	25	27	29	31	33	35	38	40	42	44	46	48	50
20	2	4	7	9	11	13	15	17	20	22	24	26	28	30	33	35	37	39	41	43	46	48	50	52
30	2	5	7	9	11	14	16	18	20	23	25	27	29	32	34	36	38	41	43	45	47	50	52	54
40	2	5	7	9	12	14	16	19	21	23	26	28	30	33	35	37	40	42	44	47	49	51	54	56
50	2	5	7	10	12	15	17	19	22	24	27	29	31	34	36	39	41	44	46	48	51	53	56	58
5 00	3	5	8	10	13	15	18	20	23	25	28	30	33	35	38	40	43	45	48	50	53	55	58	60
10	3	5	8	10	13	16	18	21	23	26	28	31	34	36	39	41	44	47	49	52	54	57	59	62
20	3	5	8	11	13	16	19	21	24	27	29	32	35	37	40	43	45	48	51	53	56	59	61	64
30	3	6	8	11	14	17	19	22	25	28	30	33	36	39	41	44	47	50	52	55	58	61	63	66
40	3	6	9	11	14	17	20	23	26	28	31	34	37	40	43	45	48	51	54	57	60	62	65	68
50	3	6	9	12	15	18	20	23	26	29	32	35	38	41	44	47	50	53	55	58	61	64	67	70
6 00	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72

INTERPOLATION TABLE FOR STARS

Day of month	Monthly difference																							
	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	26	28	30
2	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	2	2	2	2
4	0	0	0	1	1	1	1	1	1	1	1	2	2	2	2	3	3	3	3	4	4
6	0	0	1	1	1	1	1	2	2	2	2	2	3	3	4	4	4	5	5	6	6
8	0	1	1	1	1	2	2	2	2	3	3	3	4	4	5	5	6	6	7	7	8
10	0	1	1	1	2	2	2	3	3	3	4	4	5	5	6	7	7	8	9	9	10
12	0	1	1	2	2	2	3	3	4	4	4	5	6	6	7	8	9	10	10	11	12
14	0	1	1	2	2	3	3	4	4	5	5	6	7	7	8	9	10	11	12	13	14
16	1	1	2	2	3	3	4	4	5	5	6	6	7	9	10	11	12	13	14	15	16
18	1	1	2	2	3	4	4	5	5	6	7	7	8	10	11	12	13	14	16	17	18
20	1	1	2	3	3	4	5	5	6	7	7	8	9	11	12	13	15	16	17	19	20
22	1	1	2	3	4	4	5	6	7	7	8	9	10	12	13	15	16	18	19	21	22
24	1	2	2	3	4	5	6	6	7	8	9	10	11	13	14	16	18	19	21	22	24
26	1	2	3	3	4	5	6	7	8	9	10	10	12	14	16	17	19	21	23	24	26
28	1	2	3	4	5	6	7	7	8	9	10	11	13	15	17	19	21	22	24	26	28
30	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	26	28	30

As an alternative to the main tabulations of *R* and Sun on pages 2–25, monthly sets of polynomial coefficients are given on the opposite page. The coefficients have been included to enable users who possess small programmable electronic calculators to evaluate *R* and Sun directly without recourse to interpolation tables.

Formulae for the evaluation of the polynomials are given beneath the tabulations. The polynomial series for Dec and *E* may be evaluated efficiently by using the second expression in which the interpolating factor x is used as a constant multiplier and the formation of the separate powers of x is avoided; the algorithm may be written as

$$b_{n+1} = b_n x + a_{4-n}, \quad \text{for } n = 1 \text{ to } 4$$

where $b_1 = a_4$ and b_5 = required value. Particular care must be taken to ensure that the coefficients are entered with the correct signs; check sums are provided for checking that the coefficients have been entered correctly.

Example for 2017 January $19^d\ 13^h\ 23^m\ 49^s.3$ UT1.

$x = 19.558\ 2095/32 = 0.611\ 1940$

$R = +6^h.656\ 709 + 2^h.102\ 723\, x = 7^h.941\ 881 = 7^h\ 56^m\ 31^s$

Dec				*E*			
b_1	− 0·109 35	b_2	− 0·316 4641	b_1	− 0·009 171	b_2	+ 0·036 0017
b_3	+ 3·757 2690	b_4	+ 4·678 3905	b_3	+ 0·069 4400	b_4	− 0·213 5757
b_5	− 20·217 8956	= S 20° 13′ 04″		b_5	+ 11·820 0598	= $11^h\ 49^m\ 12^s$	

$SD = +0^\circ.271\ 18 - 0^\circ.000\ 56\, x = 0^\circ.270\ 838 = 16'\ 15''$

Parallax. If the full accuracy of the polynomial coefficients is to be used then it is necessary to correct the observed altitude of the Sun for parallax by adding $8''.8 \cos(\text{altitude})$.

Accuracy of the Polynomial Method. Estimates of the standard error and the maximum error that can arise using the polynomials are given below.

	R	Dec	*E*	SD
Standard error	$0^s.010$	$0''.13$	$0^s.032$	$0''.14$
Maximum error	$0^s.022$	$0''.38$	$0^s.090$	$0''.35$

The error distribution is approximately Gaussian over a long period of time, but errors on a given day for a particular quantity are likely to be systematic. If the values from the polynomials are rounded before use to $1''$ for Dec and SD and $0^s.1$ for *R* and *E*, then additional rounding errors are introduced, and the maximum possible errors are increased to $0''.8$ for Dec, $0''.8$ for SD, and $0^s.07$ for *R* and $0^s.14$ for *E*.

Conversion of GST to UT1. For planning purposes it may be useful to find the approximate values of UT1 corresponding to given values of GST on a particular day d. The series for *R* may be used. First calculate GST at 0^h UT1 on the day concerned from $a_0 + (d/32)a_1$.

Then

$$\text{UT1} = (\text{GST} - \text{GST at } 0^h \text{ UT1}) \times 0.997\ 2696$$

since a mean value of the rate of increase of GST with UT1 may be used.

For example, suppose we wish to find the UT1 corresponding to $00^h\ 24^m\ 08^s$ GST on 2017 January 19.

$$\text{GST at } 0^h \text{ UT1 on 2017 January 19} = 7^h.905\ 201$$

(or the value $7^h\ 54^m\ 18^s.7$ may be taken directly from the main tabulation on page 3). Hence

$$\text{UT1} = (24^h.402\ 222 - 7^h.905\ 201) \times 0.997\ 2696 = 16^h.451\ 978 = 16^h\ 27^m\ 07^s$$

where 24^h has been added to GST to make the term in parentheses positive.

		R		R		R		R
		h		h		h		h
a_0	**Jan.**	+ 6·656709	**Apr.**	+12·570554	**July**	+18·550142	**Oct.**	+ 0·595409
a_1		+ 2·102723		+ 2·102693		+ 2·102720		+ 2·102691
a_0	**Feb.**	+ 8·693722	**May**	+14·541828	**Aug.**	+20·587153	**Nov.**	+ 2·632389
a_1		+ 2·102696		+ 2·102715		+ 2·102700		+ 2·102715
a_0	**Mar.**	+10·533581	**June**	+16·578834	**Sept.**	+22·624143	**Dec.**	+ 4·603685
a_1		+ 2·102682		+ 2·102727		+ 2·102685		+ 2·102733

		Dec	E	Dec	E	Dec	E
		°	h	°	h	°	h
a_0	**Jan.**	−23·07730	+ 11·950596	**May** + 14·76255	+ 12·045799	**Sept.** + 8·64615	+ 11·993198
a_1		+ 2·38197	− 0·256017	+ 9·81920	+ 0·068214	−11·52541	+ 0·166247
a_2		+ 3·95069	+ 0·047436	− 2·09738	− 0·067290	− 1·15845	+ 0·048346
a_3		− 0·24963	+ 0·041607	− 0·47478	− 0·024448	+ 0·43672	− 0·034955
a_4		− 0·10935	− 0·009171	+ 0·03727	+ 0·014574	+ 0·03698	+ 0·003232
Check sum		−17·10362	+ 11·774451	+ 22·04686	+ 12·036849	− 3·56401	+ 12·176068
a_0	**Feb.**	−17·38545	+ 11·776862	**June** + 21·90774	+ 12·039344	**Oct.** − 2·78868	+ 12·165246
a_1		+ 8·93882	− 0·080993	+ 4·55409	− 0·078028	−12·42359	+ 0·175317
a_2		+ 2·61043	+ 0·125586	− 3·25907	− 0·053602	+ 0·25634	− 0·034766
a_3		− 0·60358	− 0·015176	− 0·27913	+ 0·017239	+ 0·49270	− 0·040830
a_4		− 0·00801	− 0·002396	+ 0·11001	+ 0·008306	+ 0·04694	+ 0·008293
Check sum		− 6·44779	+ 11·803883	+ 23·03364	+ 11·933259	−14·41629	+ 12·273260
a_0	**Mar.**	− 7·97449	+ 11·790581	**July** + 23·16777	+ 11·939715	**Nov.** −14·09427	+ 12·272635
a_1		+ 12·10342	+ 0·096633	− 1·92988	− 0·106055	−10·36607	+ 0·023239
a_2		+ 0·95715	+ 0·082746	− 3·46601	+ 0·039607	+ 1·90226	− 0·111175
a_3		− 0·56300	− 0·038792	+ 0·16247	+ 0·023716	+ 0·64731	− 0·022368
a_4		+ 0·00669	+ 0·002966	+ 0·08222	− 0·002891	− 0·03316	+ 0·015990
Check sum		+ 4·52977	+ 11·934134	+ 18·01657	+ 11·894092	−21·94393	+ 12·178321
a_0	**Apr.**	+ 4·14294	+ 11·929206	**Aug.** + 18·26558	+ 11·893168	**Dec.** −21·63277	+ 12·190618
a_1		+ 12·39912	+ 0·158117	− 7·89077	+ 0·026460	− 5·20001	− 0·190621
a_2		− 0·68361	− 0·004466	− 2·53391	+ 0·092517	+ 3·50014	− 0·099265
a_3		− 0·48263	− 0·042360	+ 0·41207	− 0·012865	+ 0·48230	+ 0·036188
a_4		− 0·00787	+ 0·009299	+ 0·03194	− 0·000831	− 0·16872	+ 0·007606
Check sum		+ 15·36795	+ 12·049796	+ 8·28491	+ 11·998449	−23·01906	+ 11·944526

SUN'S SEMI-DIAMETER (SD)

		°		°		°		°
a_0	**Jan.**	+0·27118	**Apr.**	+0·26684	**July**	+0·26213	**Oct.**	+0·26618
a_1		−0·00056		−0·00235		+0·00042		+0·00240
a_0	**Feb.**	+0·27063	**May**	+0·26459	**Aug.**	+0·26254	**Nov.**	+0·26855
a_1		−0·00174		−0·00177		+0·00152		+0·00187
a_0	**Mar.**	+0·26913	**June**	+0·26286	**Sept.**	+0·26404	**Dec.**	+0·27037
a_1		−0·00234		−0·00074		+0·00226		+0·00081

The interpolating factor $x = d/32$, where d is the sum of the day of the month and the decimal of the day in UT1.

R and SD are computed from $a_0 + a_1 x$ where a_0, a_1 are given in the table.

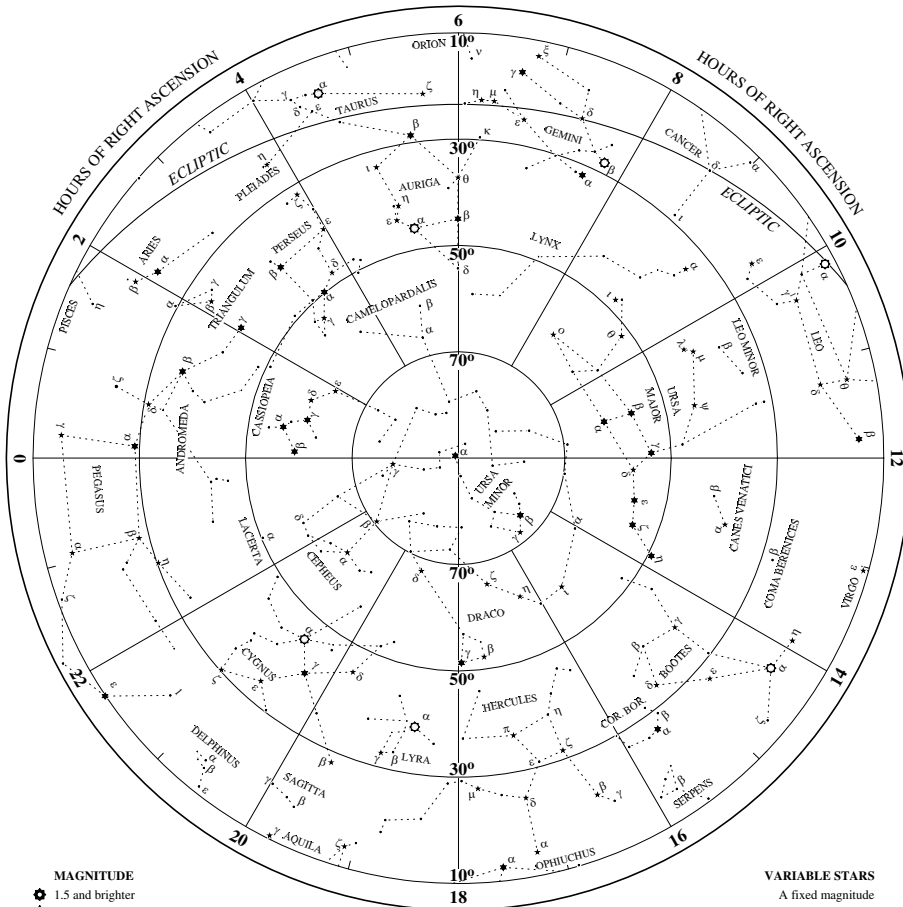
Dec and E are computed from the polynomial:

$$a_0 + a_1 x + a_2 x^2 + a_3 x^3 + a_4 x^4 \equiv (((a_4 x + a_3)x + a_2)x + a_1)x + a_0$$

The coefficients for each month are valid for $0 \le x \le 1$. To obtain full accuracy x should be calculated to seven decimal places.

STAR CHARTS

NORTHERN STARS



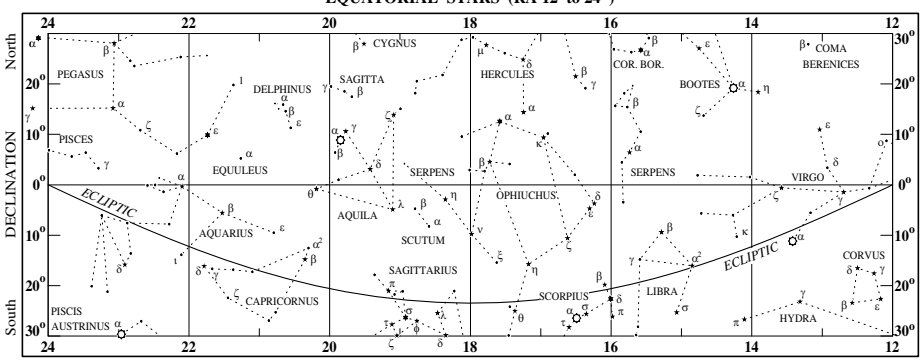
MAGNITUDE

- 1.5 and brighter
- 2.5 and brighter to 1.5
- 3.5 and brighter to 2.5
- Fainter than 3.5
- Untabulated stars

VARIABLE STARS

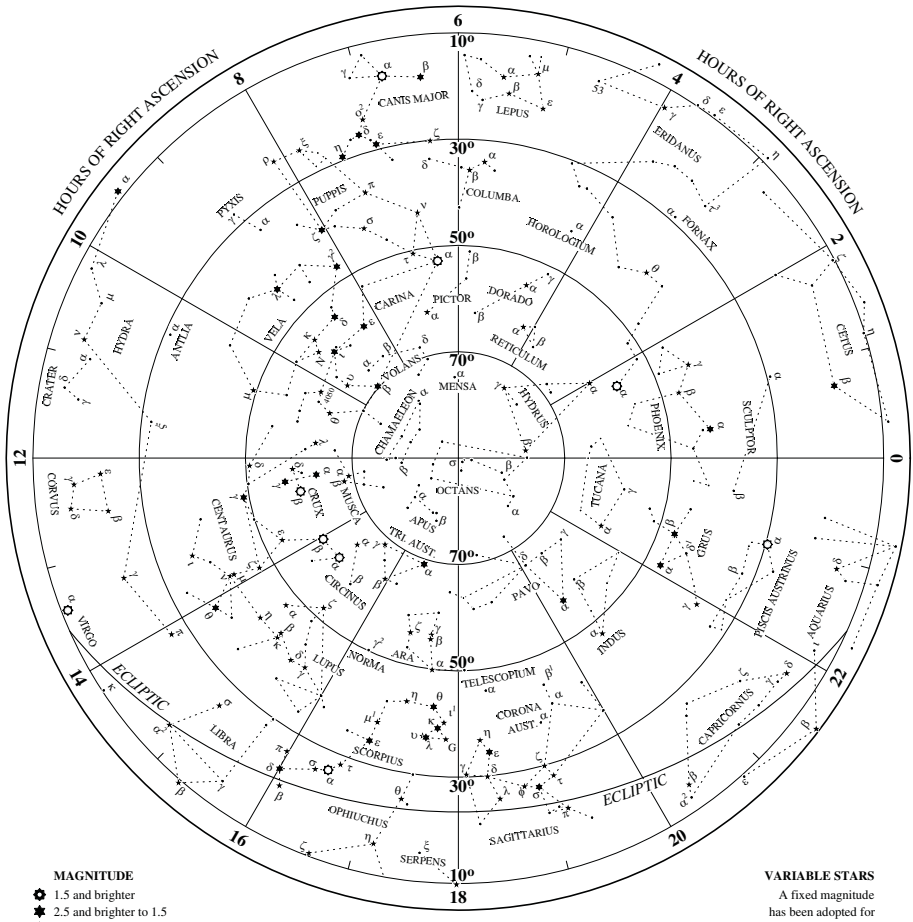
A fixed magnitude has been adopted for each variable star.

EQUATORIAL STARS (RA 12^h to 24^h)



HOURS OF RIGHT ASCENSION

SOUTHERN STARS



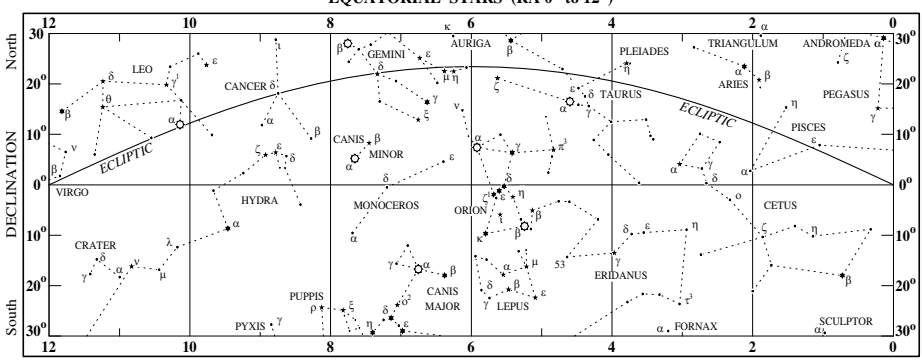
MAGNITUDE

- 1.5 and brighter
- 2.5 and brighter to 1.5
- 3.5 and brighter to 2.5
- Fainter than 3.5
- Untabulated stars

VARIABLE STARS

A fixed magnitude has been adopted for each variable star.

EQUATORIAL STARS (RA 0^h to 12^h)



This index gives the number by which each star is distinguished in the list of apparent places on pages 26-53.

The five northern circumpolar stars are indicated by NP, the five southern by SP. Apparent places of these ten stars (for every ten days) are tabulated on pages 54-55.

The numbers of some of the brighter stars that are known by their proper names are as follows:

Proper Name	Number	Proper Name	Number	Proper Name	Number
Achernar	32	*Canopus*	179	*Pollux*	216
Aldebaran	116	*Capella*	136	*Procyon*	212
Algol	70	*Castor*	210	*Regulus*	273
Altair	548	*Deneb*	571	*Rigel*	135
Antares	441	*Denebola*	316	*Sirius*	185
Arcturus	369	*Dubhe*	298	*Spica*	353
Bellatrix	140	*Fomalhaut*	632	*Vega*	514
Betelgeuse	162	*Polaris*	NP		

Name	No.
Andromedae	
α	1
β	24
γ	45
δ	12
ζ	15
ι	646
κ	649
λ	645
μ	19
ν	17
o	634
υ	30
51	31
Antliae	
α	284
Apodis	
α	386
β	683
γ	443
δ^1	682
η	679
R	681
Aquarii	
α	604
β	593
γ	613
δ	631
ϵ	576
ζ	614
η	619
Aquarii	
θ	611
ι	605
λ	630
τ	627
φ	639
88	637
98	642
Aquilae	
α	548
β	551
γ	545
δ	540
ϵ	526
ζ	529
η	549
θ	558
λ	530
Arae	
α	479
β	470
γ	471
δ	475
ϵ^1	461
ζ	460
η	452
θ	499
Arietis	
α	46
β	39
41	61
Aurigae	
α	136
β	166
δ	165
ϵ	127
ζ	128
η	131
θ	167
ι	126
κ	172
ν	159
Bootis	
α	369
β	392
γ	377
δ	396
ϵ	385
ζ	380
η	361
θ	374
λ	371
μ	404
ρ	376
Camelopardalis	
α	124
β	129
BS 1035	78
BS 1686	656
BS 2527	657
BS 3082	658
BS 4646	661
BS 4893	662
Cancri	
α	244
β	224
δ	237
ι	239
Canis Majoris	
α	185
β	177
γ	195
δ	196
ϵ	191
ζ	174
η	205
θ	190
κ	187
o^2	193
σ	192
ω	200
Canis Minoris	
α	212
β	207
Canum Venat.	
α	344
β	334
Capricorni	
α^2	561
β	562
γ	595
δ	601
ζ	591
θ	581
Capricorni	
ι	588
ψ	573
ω	577
Carinae	
α	179
β	253
ϵ	228
θ	291
ι	255
υ	268
χ	220
ω	275
I	282
a	252
l	267
u	295
BS 3571	243
BS 4050	279
BS 4114	286
BS 4140	287
BS 4337	299
Cassiopeiae	
α	13
β	2
γ	18
δ	26
ϵ	37
ζ	11
η	16
κ	10
23	651
49	652
Cassiopeiae	
50	44
Centauri	
α	379
β	364
γ	337
δ	320
ϵ	356
ζ	362
η	378
θ	367
ι	351
κ	391
λ	311
μ	360
ν	359
ξ^2	347
π	307
σ	329
ψ	373
d	354
v	372
I	357
BS 4522	315
BS 4889	341
BS 5485	384
Cephei	
α	587
β	592
γ	647
δ	616
ζ	610
η	574

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