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ALMANAC FOR GEODETIC ENGINEERS 2025

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RESEARCH & DEVELOPMENT AND TRAINING DIVISION

SPACE SCIENCE AND ASTRONOMY SECTION

ASTRONOMICAL PUBLICATION AND PLANETARIUM UNIT

PREFACE

The **ALMANAC FOR GEODETIC ENGINEERS** has been designed to provide the Geodetic Engineer the astronomical data he needs in the least space and without any unwanted matter. Tables are also supplied to facilitate calculations.

The main sources of data in this publication are the **ASTRONOMICAL ALMANAC and THE APPARENT PLACES OF FUNDAMENTAL STARS (FK5).**

Except where otherwise noted, Philippine Standard Time is used exclusively in this publication.

This publication is prepared annually by the Astronomical Publication and Planetarium Unit (APPU), Space Science and Astronomy Section (SSAS), Research & Development and Training Division (RDTD), PAGASA.

NATHANIEL T. SERVANDO, Ph.D.
Administrator, PAGASA

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NATHANIEL T. SERVANDO
Administrator, PAGASA

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Research & Development and Training Division (RDTD)

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INTRODUCTION

The following explanation is limited to a brief description of the contents of this volume and illustrations of how the tabulated values are to be extracted.

EPHEMERIS OF THE SUN

On pages 1 to 8 are tabulated the North Polar Distance of the Sun for 8:00 A.M. and 2:00 P.M.; the Equation of Time at 12:00 Noon; and the Sidereal Time at 0H Universal Time.

The tabulated 8:00 A.M. Hourly Variation represents strictly the change per hour in the North Polar Distance between 8:00 A.M. and 2:00 P.M.; Hourly Variation represents the change per hour after 2:00 P.M.

At any other time in the morning or afternoon, the corresponding North Polar Distance can easily be obtained by applying a correction equal to the product of the difference in time from 8:00 A.M. Alternatively, 2:00 P.M. by the corresponding hourly variation.

Example 1:

Required the North Polar Distance of the Sun on January 10, 2025 at 11:15 A.M. and 3:30 P.M.

The time may be expressed as 11. 25h and 3.50h respectively (Table VII-A).

Tabular value of NPD at 8:00 A.M.; Jan 10, p.1	------	111° 57' 01.8"
Corr. for HV of -22.54 = (3.25)(-22.54)	------	- 01' 13.3"
NPD of the Sun at 11:15 A.M., Jan 10	------	111° 55' 48.5'

or

Tabular value of NPD at 2:00 P.M.; Jan 10, p.1	------	111° 54' 46.6"
Corr, for HV of -22.54 = (-2.75)(-22.54)	------	+ 01' 01.9"
NPD of the Sun at 11:15 A.M., Jan 10	------	111° 54' 48.5"

Tabular value of NPD at 2:00 P.M., Jan 10, p.1	------	111° 54' 46.6"
Corr. for HV of -22.81 = (1.5)(-22.81)	------	- 00' 34.2"
NPD of the Sun at 3:30 P.M., Jan 10	------	111° 54' 12.4"

The equation of time, Apparent minus Mean, is the correction to be applied to Mean Solar Time in order to obtain Apparent Solar Time. In reality, the equation of time is a correction to be applied to either time to obtain the other.

Example 2:

Required the Standard Time of meridian passage of the Sun on January 10, 2025 at a place whose Longitude is 121° 45′ ($8^h\ 07^m$) East.

At the instant when the center of the Sun crosses the meridian of the observer, it is 12:00 local apparent noon.

		h	m	s
Local Apparent Time	--------	12	00	00.00
Subtract: Equation of Time, Jan 10, p.1	--------	-	-07	29.10
Local Mean Time	--------	12	07	29.10
Corr. to Standard Time for 121° 45′ East	--------	-	07	00.00
Standard Time of Meridian Passage, Jan 10	--------	12	00	29.10

or 12:00:29.10 PM

The tabulated Apparent Sidereal Time at 0h UT is the Greenwich Apparent Hour of Apparent Equinox. Like the Mean Solar Time, the Greenwich Sidereal Time is lesser than the local sidereal time at the same instant by the amount of east longitude; and therefore, the local sidereal time at 0H local mean time is obtained by directly subtracting from the tabular time at the previous instant of 0H UT the same correction as required to convert the mean solar interval measured by the longitude into an equivalent sidereal interval. This reduction may either be taken from Table I or by means of the hourly variation of +9.8565 seconds

Example 3:

Required the Local Sidereal Time for 9:15 P.M. on January 10, 2025 at a place whose longitude is 121° 45′ ($8^h\ 07^m$) East.

		h	m	s
Standard Time for 9:15 P.M. = $9^h\ 15^m + 12^h$	------	21	15	00.00
Corr. to Local Mean Time for 121° 45′ E , Table IV	------	-	-07	00.00
Local Mean Time	------	21	22	00.00
Tabulated Sidereal Time, 0H UT, Jan 10, p.1	------	07	19	05.00
Subtract: Corr. for longitude ($8^h\ 07^m$), Table I	------	-	01	20.00
Sidereal Time, 0h Local Mean Time	------	07	17	45.00
Add: Local Mean Time (above)	------	+	21	22	00.00
Add: Corr. for $21^h\ 22^m\ 00.^s0$, Table I	------	+	03	30.60
Local Sidereal Time, Jan 10	------	28	43	15.60

or $04^h\ 43^m\ 15.60^s$

Example 4:

On January 10, 2025 at approximately 9:00 P.M. at longitude 121° 45′ ($8^h\,07^m$) East, the observed local sidereal time was $4^h\,43^m\,15.6^s$. Required the Standard Time.

		h m s
Tabulated Sidereal Time, 0H UT, Jan 10, p.1	--------	07 19 05.00
Subtract: Corr. for longitude ($8^h\,07^m$), Table I	--------	- 01 20.00
Sidereal Time, 0H Local Mean Time	--------	07 17 45.00

		h m s
Observed Local Sidereal Time= $4^h43^m\,15.6^s + 24$	--------	28 43 15.60
Subtract: Sidereal Time, 0H LMT (above)	--------	- 07 17 45.00
Sidereal Time Interval since 0H, LMT	--------	21 25 30.60
Subtract: Corr. for $21^h\,25^m\,30.60^s$, Table II	--------	- 03 30.50
Local Mean Time (LMT)	--------	21 22 00.10
Reduction to Standard Time for 121° 45′ E	--------	- 07 00.00
Standard Time	--------	21 15 00.10

or 09:15:00.10 PM

APPARENT PLACES OF STARS

The apparent Right Ascension of 53 stars at monthly intervals during the year is tabulated on pages 9 to 10. The positions given are strictly for the instant of Upper Transit at the 120°E meridian at the first of each month. Using the same data at a different instant on the same date does not lead to a serious error. The Right Ascension for other dates of the month can be obtained by simple linear interpolation.

The Right Ascension of a star is also the sidereal time of its meridian passage. The civil time of meridian passage may, therefore, be found from the right ascension by the precept already given for the conversion of sidereal time.

The local hour angle of a star can be found by subtracting the star's right ascension from the local sidereal time.

The North Polar Distance of the same stars is given on pages 11 and 12. The same is given for the first of each month. The North Polar Distance for other dates can be obtained by simple linear interpolation.

POLARIS

On page 13 are the tabulated Apparent Right Ascension, Polar Distance. Local Mean Time of Upper Culmination at the 120°E Meridian, and the Mean Time interval between Upper Culmination and Elongation of Polaris at 10-day intervals. The Right Ascension and Polar Distance for other dates may be obtained by simple interpolation. To get the Local Mean Time of Upper Culmination on any other meridian, take from the table the local mean time of the nearest tabulated Upper Culmination, reduce it to the given date by means of the Variation per Day, and to the longitude of the given meridian by means of the Variation per Degree.

The time interval between Upper and Lower Culmination is 12 diminished by one-half the numerical value of the variation per day. The last column applies to all meridians.

Example 5:

Required the Standard Time of Upper Culmination, Lower Culmination, Eastern Elongation, Western Elongation of Polaris on January 15, 2025 at a place whose longitude is 121° 45′ (8^h 07^m) East, latitude 11° 15′ (11.25) North.

		h m s
Tabulated LMT of UC, 120° E, Jan. 11, p.13	-------	19 39 53.70
Corr. for 4 days = (-03 57.69) (4)	-------	- 15 50.76
Local Mean Time of UC, 120° E, Jan. 15	-------	19 24 02.94
Corr. for longitude = (1.75) (+0.660 per degree)	-------	+ 01.15
LMT of UC, 121° 45′ East, Jan. 15	-------	19 24 04.09
Corr.to Standard time for 121°45' E, Table IV		- 07 00.00
Standard Time for UC, 121°45' E, Jan. 15		19 17 04.09
	or	07:17:04.09 PM

On pages 14 to 17 are tabulated combined data for obtaining latitude from an observed latitude of Polaris and azimuth of the star for all hour angles and latitudes. There are six tabulated quantities: a_0, a_1, a_2, referring to the correction to latitude, and b_0, b_1, b_2, to the azimuth, thus

Latitude = corrected observed altitude +/- (a_0 + a_1 +a_2)
Azimuth = (b_0 + b_1 + b_2) (secant latitude)

a_0,b_o, are tabulated for every 3 minutes of local sidereal time and the remaining quantities for the midpoint 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 interpolation is not necessary.

The table is to be entered with LST of observation which gives the values of a_0, b_0 directly. Interpolation should be done mentally. In the same vertical column, the values of a_1, b_1 are found with the latitude, and those a_2, b_2 with the dates as argument. The errors due to the adoption for 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 be attempted.

The observed altitude must be corrected for refraction being used for determination of latitude. Azimuth of Polaris is reckoned positive to the east and negative to the west.

Example 6:

At a place whose longitude is 121°45' (8^h 07^m) East, approximate latitude 14° North, an observation was made on Polaris for the determination of latitude and azimuth. The observed altitude of Polaris was 14°39' 36" at 9:15 P.M., January 10, 2025. Required the latitude of the place and azimuth of Polaris.

LST for 9:15 P.M., Jan 10 (see example 3)	----		----	$04^h\ 43^m\ 15.60^s$
LST, $04^h\ 43^m\ 15.60^s$	----	$a_0 = -34.2$	----	$b_0 = -15.9$
Latitude 14	----	$a_1 = +0.0$	----	$b_1 = +0.1$
January	----	$a_2 = +0.2$	----	$b_2 = +0.0$
		$a_0 + a_1 + a_2 = -34.0$		$b_0 + b_1 + b_2 = -15.8$

Observed altitude	-------	14 39.6
Subtract: Refraction corr. (Table VI)	-------	- 03.5
Corrected observed altitude of Polaris	-------	14 36.1
Add: $a_0 + a_1 + a_2$	-------	- 34.0
Latitude of Observer	-------	14 02.1

Secant 14° 02.1' = 1.03°

Azimuth = $(b_0 + b_1 + b_2)(1.03)$ = -16.274 (West)

If greater accuracy is desired the Right Ascension and North Polar Distance of Polaris may be taken from page 13 and the observation reduced by direct calculation.

EPHEMERIS OF THE SUN, 2025

DATE	NORTH POLAR DISTANCE				EQUATION OF TIME AT 12NN	APP SIDE TIME AT 0H UT
	8 AM	HRLY VAR	2 PM	HRLY VAR		
	° ′ ″		° ′ ″		m s	h m s
JAN 1	112 59 53.8	-12.54	112 58 38.6	-12.83	-03 31.3	06 43 36
JAN 2	112 54 42.5	-13.69	112 53 20.3	-13.98	-03 59.4	06 47 32
JAN 3	112 49 03.7	-14.82	112 47 34.8	-15.10	-04 27.3	06 51 29
JAN 4	112 42 57.8	-15.96	112 41 22.1	-16.24	-04 54.7	06 55 26
JAN 5	112 36 24.8	-17.07	112 34 42.3	-17.35	-05 21.7	06 59 22
JAN 6	112 29 25.0	-18.19	112 27 35.9	-18.47	-05 48.2	07 03 19
JAN 7	112 21 58.5	-19.29	112 20 02.8	-19.56	-06 14.2	07 07 15
JAN 8	112 14 05.7	-20.39	112 12 03.4	-20.66	-06 39.7	07 11 12
JAN 9	112 05 46.7	-21.47	112 03 37.9	-21.74	-07 04.7	07 15 08
JAN 10	111 57 01.8	-22.54	111 54 46.6	-22.81	-07 29.1	07 19 05
JAN 11	111 47 51.3	-23.60	111 45 29.7	-23.86	-07 52.9	07 23 01
JAN 12	111 38 15.5	-24.65	111 35 47.6	-24.91	-08 16.1	07 26 58
JAN 13	111 28 14.6	-25.69	111 25 40.5	-25.94	-08 38.7	07 30 55
JAN 14	111 17 48.9	-26.71	111 15 08.6	-26.97	-09 00.7	07 34 51
JAN 15	111 06 58.7	-27.72	111 04 12.4	-27.98	-09 22.0	07 38 48
JAN 16	110 55 44.3	-28.73	110 52 51.9	-28.98	-09 42.6	07 42 44
JAN 17	110 44 05.9	-29.72	110 41 07.6	-29.96	-10 02.6	07 46 41
JAN 18	110 32 03.9	-30.69	110 28 59.7	-30.93	-10 21.9	07 50 37
JAN 19	110 19 38.6	-31.66	110 16 28.6	-31.90	-10 40.4	07 54 34
JAN 20	110 06 50.2	-32.61	110 03 34.5	-32.85	-10 58.2	07 58 31
JAN 21	109 53 39.1	-33.55	109 50 17.8	-33.78	-11 15.3	08 02 27
JAN 22	109 40 05.7	-34.47	109 36 38.9	-34.70	-11 31.7	08 06 24
JAN 23	109 26 10.3	-35.38	109 22 38.0	-35.60	-11 47.3	08 10 20
JAN 24	109 11 53.2	-36.27	109 08 15.6	-36.49	-12 02.1	08 14 17
JAN 25	108 57 14.9	-37.14	108 53 32.0	-37.36	-12 16.2	08 18 13
JAN 26	108 42 15.7	-38.01	108 38 27.6	-38.22	-12 29.5	08 22 10
JAN 27	108 26 55.9	-38.85	108 23 02.8	-39.06	-12 42.0	08 26 06
JAN 28	108 11 16.1	-39.68	108 07 18.0	-39.88	-12 53.7	08 30 03
JAN 29	107 55 16.6	-40.49	107 51 13.7	-40.69	-13 04.6	08 34 00
JAN 30	107 38 57.8	-41.28	107 34 50.1	-41.48	-13 14.7	08 37 56
JAN 31	107 22 20.1	-42.06	107 18 07.8	-42.24	-13 23.9	08 41 53
FEB 1	107 05 24.0	-42.81	107 01 07.1	-43.00	-13 32.4	08 45 49
FEB 2	106 48 09.9	-43.55	106 43 48.6	-43.73	-13 40.0	08 49 46
FEB 3	106 30 38.2	-44.28	106 26 12.5	-44.46	-13 46.7	08 53 42
FEB 4	106 12 49.2	-44.98	106 08 19.3	-45.15	-13 52.7	08 57 39
FEB 5	105 54 43.6	-45.67	105 50 09.6	-45.83	-13 57.8	09 01 35
FEB 6	105 36 21.6	-46.33	105 31 43.6	-46.49	-14 02.1	09 05 32
FEB 7	105 17 43.8	-46.99	105 13 01.9	-47.14	-14 05.5	09 09 29
FEB 8	104 58 50.5	-47.62	104 54 04.8	-47.77	-14 08.2	09 13 25
FEB 9	104 39 42.2	-48.24	104 34 52.8	-48.38	-14 10.0	09 17 22
FEB 10	104 20 19.2	-48.83	104 15 26.2	-48.98	-14 11.1	09 21 18
FEB 11	104 00 42.0	-49.42	103 55 45.5	-49.56	-14 11.3	09 25 15
FEB 12	103 40 51.0	-49.98	103 35 51.1	-50.11	-14 10.9	09 29 11
FEB 13	103 20 46.6	-50.54	103 15 43.4	-50.67	-14 09.6	09 33 08
FEB 14	103 00 29.0	-51.06	102 55 22.7	-51.19	-14 07.6	09 37 04
FEB 15	102 39 58.9	-51.58	102 34 49.4	-51.71	-14 04.9	09 41 01

EPHEMERIS OF THE SUN, 2025

DATE	NORTH POLAR DISTANCE 8 AM	HRLY VAR	NORTH POLAR DISTANCE 2 PM	HRLY VAR	EQUATION OF TIME AT 12NN	APP SIDE TIME AT 0H UT
	° ′ ″		° ′ ″		m s	h m s
FEB 16	102 19 16.4	-52.09	102 14 03.9	-52.21	-14 01.5	09 44 58
FEB 17	101 58 22.0	-52.57	101 53 06.6	-52.69	-13 57.3	09 48 54
FEB 18	101 37 16.1	-53.04	101 31 57.9	-53.15	-13 52.5	09 52 51
FEB 19	101 15 59.1	-53.49	101 10 38.1	-53.60	-13 47.0	09 56 47
FEB 20	100 54 31.4	-53.93	100 49 07.9	-54.03	-13 40.9	10 00 44
FEB 21	100 32 53.4	-54.35	100 27 27.3	-54.45	-13 34.1	10 04 40
FEB 22	100 11 05.4	-54.75	100 05 36.9	-54.84	-13 26.7	10 08 37
FEB 23	99 49 08.0	-55.13	99 43 37.2	-55.23	-13 18.8	10 12 33
FEB 24	99 27 01.5	-55.51	99 21 28.4	-55.59	-13 10.2	10 16 30
FEB 25	99 04 46.3	-55.85	98 59 11.2	-55.93	-13 01.0	10 20 27
FEB 26	98 42 23.0	-56.18	98 36 45.9	-56.26	-12 51.3	10 24 23
FEB 27	98 19 51.8	-56.50	98 14 12.8	-56.57	-12 41.0	10 28 20
FEB 28	97 57 13.2	-56.79	97 51 32.4	-56.86	-12 30.2	10 32 16
MAR 1	97 34 27.7	-57.08	97 28 45.2	-57.14	-12 18.8	10 36 13
MAR 2	97 11 35.6	-57.33	97 05 51.6	-57.39	-12 07.0	10 40 09
MAR 3	96 48 37.5	-57.58	96 42 52.0	-57.63	-11 54.6	10 44 06
MAR 4	96 25 33.7	-57.80	96 19 46.9	-57.85	-11 41.8	10 48 02
MAR 5	96 02 24.6	-58.01	95 56 36.5	-58.06	-11 28.5	10 51 59
MAR 6	95 39 10.6	-58.20	95 33 21.4	-58.25	-11 14.8	10 55 56
MAR 7	95 15 52.2	-58.38	95 10 01.9	-58.42	-11 00.6	10 59 52
MAR 8	94 52 29.7	-58.54	94 46 38.5	-58.57	-10 46.1	11 03 49
MAR 9	94 29 03.6	-58.68	94 23 11.5	-58.71	-10 31.1	11 07 45
MAR 10	94 05 34.2	-58.81	93 59 41.4	-58.83	-10 15.8	11 11 42
MAR 11	93 42 01.9	-58.92	93 36 08.4	-58.94	-10 00.1	11 15 38
MAR 12	93 18 27.0	-59.02	93 12 32.9	-59.04	-09 44.1	11 19 35
MAR 13	92 54 49.9	-59.10	92 48 55.3	-59.12	-09 27.8	11 23 31
MAR 14	92 31 10.9	-59.17	92 25 15.9	-59.18	-09 11.3	11 27 28
MAR 15	92 07 30.4	-59.23	92 01 35.1	-59.23	-08 54.5	11 31 25
MAR 16	91 43 48.7	-59.26	91 37 53.1	-59.27	-08 37.5	11 35 21
MAR 17	91 20 06.2	-59.29	91 14 10.4	-59.30	-08 20.2	11 39 18
MAR 18	90 56 23.1	-59.30	90 50 27.3	-59.30	-08 02.8	11 43 14
MAR 19	90 32 39.9	-59.31	90 26 44.1	-59.30	-07 45.2	11 47 11
MAR 20	90 08 56.8	-59.28	90 03 01.1	-59.27	-07 27.5	11 51 07
MAR 21	89 45 14.3	-59.26	89 39 18.8	-59.24	-07 09.7	11 55 04
MAR 22	89 21 32.6	-59.21	89 15 37.4	-59.19	-06 51.8	11 59 00
MAR 23	88 57 52.2	-59.15	88 51 57.3	-59.13	-06 33.8	12 02 57
MAR 24	88 34 13.4	-59.07	88 28 19.0	-59.05	-06 15.8	12 06 53
MAR 25	88 10 36.6	-58.97	88 04 42.8	-58.95	-05 57.7	12 10 50
MAR 26	87 47 02.2	-58.87	87 41 09.0	-58.84	-05 39.7	12 14 47
MAR 27	87 23 30.4	-58.74	87 17 37.9	-58.71	-05 21.6	12 18 43
MAR 28	87 00 01.8	-58.61	86 54 10.1	-58.57	-05 03.6	12 22 40
MAR 29	86 36 36.6	-58.45	86 30 45.9	-58.40	-04 45.6	12 26 36
MAR 30	86 13 15.4	-58.29	86 07 25.7	-58.24	-04 27.7	12 30 33
MAR 31	85 49 58.3	-58.09	85 44 09.7	-58.04	-04 09.8	12 34 29
APR 1	85 26 45.9	-57.89	85 20 58.5	-57.84	-03 52.0	12 38 26

EPHEMERIS OF THE SUN, 2025

DATE	NORTH POLAR DISTANCE				EQUATION OF TIME AT 12NN	APP SIDE TIME AT 0H UT
	8 AM	HRLY VAR	2 PM	HRLY VAR		
	° ′ ″		° ′ ″		m s	h m s
MAY 19	70 13 27.6	-32.00	70 10 15.6	-31.79	+03 32.5	15 47 41
MAY 20	70 00 47.2	-31.16	69 57 40.3	-30.94	+03 29.3	15 51 37
MAY 21	69 48 27.2	-30.30	69 45 25.4	-30.08	+03 25.5	15 55 34
MAY 22	69 36 27.8	-29.43	69 33 31.2	-29.21	+03 21.1	15 59 30
MAY 23	69 24 49.4	-28.55	69 21 58.1	-28.33	+03 16.2	16 03 27
MAY 24	69 13 32.2	-27.66	69 10 46.2	-27.43	+03 10.7	16 07 23
MAY 25	69 02 36.5	-26.76	68 59 55.9	-26.53	+03 04.8	16 11 20
MAY 26	68 52 02.4	-25.85	68 49 27.3	-25.62	+02 58.3	16 15 16
MAY 27	68 41 50.2	-24.93	68 39 20.6	-24.70	+02 51.4	16 19 13
MAY 28	68 32 00.2	-24.01	68 29 36.2	-23.77	+02 43.9	16 23 10
MAY 29	68 22 32.5	-23.07	68 20 14.1	-22.83	+02 36.1	16 27 06
MAY 30	68 13 27.4	-22.13	68 11 14.6	-21.89	+02 27.8	16 31 03
MAY 31	68 04 45.0	-21.17	68 02 38.0	-20.93	+02 19.0	16 34 59
JUN 1	67 56 25.6	-20.21	67 54 24.4	-19.96	+02 09.9	16 38 56
JUN 2	67 48 29.4	-19.24	67 46 34.0	-18.99	+02 00.5	16 42 52
JUN 3	67 40 56.5	-18.26	67 39 07.0	-18.01	+01 50.6	16 46 49
JUN 4	67 33 47.1	-17.28	67 32 03.4	-17.04	+01 40.4	16 50 46
JUN 5	67 27 01.2	-16.29	67 25 23.4	-16.05	+01 29.9	16 54 42
JUN 6	67 20 39.1	-15.30	67 19 07.3	-15.05	+01 19.1	16 58 39
JUN 7	67 14 40.9	-14.30	67 13 15.1	-14.05	+01 08.1	17 02 35
JUN 8	67 09 06.7	-13.30	67 07 46.9	-13.05	+00 56.7	17 06 32
JUN 9	67 03 56.5	-12.29	67 02 42.8	-12.04	+00 45.1	17 10 28
JUN 10	66 59 10.6	-11.29	66 58 02.9	-11.04	+00 33.2	17 14 25
JUN 11	66 54 48.8	-10.27	66 53 47.2	-10.01	+00 21.2	17 18 21
JUN 12	66 50 51.5	-09.26	66 49 55.9	-09.00	+00 08.9	17 22 18
JUN 13	66 47 18.5	-08.23	66 46 29.1	-07.98	-00 03.5	17 26 15
JUN 14	66 44 10.1	-07.21	66 43 26.8	-06.96	-00 16.1	17 30 11
JUN 15	66 41 26.2	-06.19	66 40 49.0	-05.93	-00 28.8	17 34 08
JUN 16	66 39 06.9	-05.16	66 38 36.0	-04.90	-00 41.7	17 38 04
JUN 17	66 37 12.4	-04.13	66 36 47.6	-03.87	-00 54.7	17 42 01
JUN 18	66 35 42.6	-03.10	66 35 24.0	-02.84	-01 07.7	17 45 57
JUN 19	66 34 37.6	-02.06	66 34 25.2	-01.80	-01 20.8	17 49 54
JUN 20	66 33 57.4	-01.03	66 33 51.2	-00.77	-01 33.9	17 53 50
JUN 21	66 33 42.1	+00.01	66 33 42.2	+00.27	-01 47.1	17 57 47
JUN 22	66 33 51.7	+01.05	66 33 58.0	+01.30	-02 00.2	18 01 44
JUN 23	66 34 26.1	+02.08	66 34 38.6	+02.34	-02 13.3	18 05 40
JUN 24	66 35 25.3	+03.11	66 35 44.0	+03.37	-02 26.3	18 09 37
JUN 25	66 36 49.3	+04.14	66 37 14.2	+04.40	-02 39.3	18 13 33
JUN 26	66 38 38.0	+05.18	66 39 09.0	+05.43	-02 52.1	18 17 30
JUN 27	66 40 51.4	+06.19	66 41 28.6	+06.45	-03 04.7	18 21 26
JUN 28	66 43 29.3	+07.23	66 44 12.7	+07.48	-03 17.2	18 25 23
JUN 29	66 46 31.9	+08.24	66 47 21.3	+08.49	-03 29.4	18 29 19
JUN 30	66 49 58.8	+09.26	66 50 54.3	+09.51	-03 41.5	18 33 16
JUL 1	66 53 50.1	+10.27	66 54 51.7	+10.52	-03 53.2	18 37 13
JUL 2	66 58 05.7	+11.28	66 59 13.4	+11.53	-04 04.7	18 41 09
JUL 3	67 02 45.4	+12.28	67 03 59.1	+12.53	-04 15.9	18 45 06

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DATE	NORTH POLAR DISTANCE				EQUATION OF TIME AT 12NN	APP SIDE TIME AT 0H UT
	8 AM	HRLY VAR	2 PM	HRLY VAR		
	° ′ ″		° ′ ″		m s	h m s
JUL 4	67 07 49.1	+13.28	67 09 08.8	+13.53	-04 26.7	18 49 02
JUL 5	67 13 16.7	+14.26	67 14 42.3	+14.51	-04 37.2	18 52 59
JUL 6	67 19 07.9	+15.25	67 20 39.4	+15.49	-04 47.4	18 56 55
JUL 7	67 25 22.7	+16.23	67 27 00.1	+16.48	-04 57.1	19 00 52
JUL 8	67 32 01.0	+17.20	67 33 44.2	+17.44	-05 06.5	19 04 48
JUL 9	67 39 02.4	+18.16	67 40 51.4	+18.40	-05 15.5	19 08 45
JUL 10	67 46 26.9	+19.12	67 48 21.6	+19.36	-05 24.0	19 12 42
JUL 11	67 54 14.3	+20.07	67 56 14.7	+20.30	-05 32.1	19 16 38
JUL 12	68 02 24.4	+21.01	68 04 30.4	+21.24	-05 39.8	19 20 35
JUL 13	68 10 57.0	+21.95	68 13 08.7	+22.18	-05 46.9	19 24 31
JUL 14	68 19 52.0	+22.87	68 22 09.2	+23.10	-05 53.7	19 28 28
JUL 15	68 29 09.2	+23.79	68 31 32.0	+24.02	-05 59.9	19 32 24
JUL 16	68 38 48.4	+24.70	68 41 16.6	+24.93	-06 05.7	19 36 21
JUL 17	68 48 49.4	+25.61	68 51 23.1	+25.84	-06 10.9	19 40 18
JUL 18	68 59 12.1	+26.50	69 01 51.1	+26.72	-06 15.7	19 44 14
JUL 19	69 09 56.1	+27.40	69 12 40.5	+27.61	-06 19.9	19 48 11
JUL 20	69 21 01.4	+28.26	69 23 51.0	+28.48	-06 23.6	19 52 07
JUL 21	69 32 27.5	+29.14	69 35 22.3	+29.35	-06 26.7	19 56 04
JUL 22	69 44 14.4	+29.99	69 47 14.3	+30.20	-06 29.3	20 00 00
JUL 23	69 56 21.6	+30.82	69 59 26.5	+31.03	-06 31.3	20 03 57
JUL 24	70 08 48.9	+31.67	70 11 58.9	+31.87	-06 32.8	20 07 53
JUL 25	70 21 36.2	+32.48	70 24 51.1	+32.68	-06 33.7	20 11 50
JUL 26	70 34 42.9	+33.29	70 38 02.7	+33.49	-06 33.9	20 15 47
JUL 27	70 48 09.0	+34.09	70 51 33.5	+34.28	-06 33.6	20 19 43
JUL 28	71 01 54.1	+34.87	71 05 23.3	+35.06	-06 32.7	20 23 40
JUL 29	71 15 57.9	+35.64	71 19 31.7	+35.83	-06 31.1	20 27 36
JUL 30	71 30 20.1	+36.41	71 33 58.5	+36.59	-06 28.9	20 31 33
JUL 31	71 45 00.5	+37.15	71 48 43.4	+37.33	-06 26.1	20 35 29
AUG 1	71 59 58.7	+37.89	72 03 46.0	+38.07	-06 22.6	20 39 26
AUG 2	72 15 14.5	+38.61	72 19 06.2	+38.79	-06 18.6	20 43 22
AUG 3	72 30 47.5	+39.32	72 34 43.4	+39.49	-06 13.9	20 47 19
AUG 4	72 46 37.4	+40.02	72 50 37.5	+40.19	-06 08.6	20 51 16
AUG 5	73 02 44.0	+40.70	73 06 48.2	+40.87	-06 02.6	20 55 12
AUG 6	73 19 06.9	+41.38	73 23 15.2	+41.54	-05 56.1	20 59 09
AUG 7	73 35 45.8	+42.03	73 39 58.0	+42.19	-05 49.0	21 03 05
AUG 8	73 52 40.4	+42.68	73 56 56.5	+42.84	-05 41.2	21 07 02
AUG 9	74 09 50.5	+43.32	74 14 10.4	+43.48	-05 32.9	21 10 58
AUG 10	74 27 15.8	+43.95	74 31 39.5	+44.10	-05 24.0	21 14 55
AUG 11	74 44 56.0	+44.56	74 49 23.3	+44.71	-05 14.5	21 18 51
AUG 12	75 02 50.8	+45.16	75 07 21.8	+45.31	-05 04.4	21 22 48
AUG 13	75 20 60.0	+45.75	75 25 34.5	+45.89	-04 53.8	21 26 45
AUG 14	75 39 23.2	+46.33	75 44 01.2	+46.48	-04 42.7	21 30 41
AUG 15	75 58 00.3	+46.90	76 02 41.7	+47.04	-04 31.1	21 34 38
AUG 16	76 16 50.9	+47.45	76 21 35.6	+47.59	-04 18.9	21 38 34
AUG 17	76 35 54.6	+48.00	76 40 42.6	+48.13	-04 06.3	21 42 31
AUG 18	76 55 11.3	+48.52	77 00 02.4	+48.65	-03 53.1	21 46 27

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DATE	NORTH POLAR DISTANCE				EQUATION OF TIME AT 12NN	APP SIDE TIME AT 0H UT
	8 AM	HRLY VAR	2 PM	HRLY VAR		
	° ′ ″		° ′ ″		m s	h m s
AUG 19	77 14 40.4	+49.04	77 19 34.6	+49.16	-03 39.5	21 50 24
AUG 20	77 34 21.8	+49.54	77 39 19.0	+49.66	-03 25.4	21 54 20
AUG 21	77 54 15.1	+50.03	77 59 15.3	+50.14	-03 10.8	21 58 17
AUG 22	78 14 19.9	+50.49	78 19 22.8	+50.61	-02 55.8	22 02 14
AUG 23	78 34 35.8	+50.95	78 39 41.5	+51.06	-02 40.3	22 06 10
AUG 24	78 55 02.6	+51.39	79 00 11.0	+51.50	-02 24.5	22 10 07
AUG 25	79 15 39.9	+51.83	79 20 50.8	+51.93	-02 08.1	22 14 03
AUG 26	79 36 27.4	+52.24	79 41 40.8	+52.34	-01 51.4	22 18 00
AUG 27	79 57 24.7	+52.64	80 02 40.5	+52.74	-01 34.3	22 21 56
AUG 28	80 18 31.5	+53.03	80 23 49.7	+53.12	-01 16.7	22 25 53
AUG 29	80 39 47.5	+53.40	80 45 07.9	+53.49	-00 58.8	22 29 49
AUG 30	81 01 12.3	+53.76	81 06 34.9	+53.85	-00 40.6	22 33 46
AUG 31	81 22 45.6	+54.10	81 28 10.2	+54.18	-00 22.0	22 37 43
SEP 1	81 44 27.0	+54.44	81 49 53.6	+54.52	-00 03.0	22 41 39
SEP 2	82 06 16.3	+54.75	82 11 44.8	+54.83	+00 16.2	22 45 36
SEP 3	82 28 13.0	+55.05	82 33 43.3	+55.13	+00 35.7	22 49 32
SEP 4	82 50 16.9	+55.35	82 55 49.0	+55.42	+00 55.6	22 53 29
SEP 5	83 12 27.7	+55.63	83 18 01.5	+55.69	+01 15.6	22 57 25
SEP 6	83 34 45.1	+55.88	83 40 20.4	+55.95	+01 35.9	23 01 22
SEP 7	83 57 08.6	+56.15	84 02 45.5	+56.20	+01 56.4	23 05 18
SEP 8	84 19 38.2	+56.38	84 25 16.5	+56.44	+02 17.1	23 09 15
SEP 9	84 42 13.4	+56.61	84 47 53.1	+56.66	+02 38.0	23 13 12
SEP 10	85 04 54.0	+56.83	85 10 35.0	+56.88	+02 59.0	23 17 08
SEP 11	85 27 39.8	+57.04	85 33 22.0	+57.08	+03 20.2	23 21 05
SEP 12	85 50 30.4	+57.23	85 56 13.8	+57.27	+03 41.4	23 25 01
SEP 13	86 13 25.5	+57.41	86 19 10.0	+57.45	+04 02.7	23 28 58
SEP 14	86 36 24.8	+57.58	86 42 10.3	+57.62	+04 24.1	23 32 54
SEP 15	86 59 28.0	+57.73	87 05 14.4	+57.76	+04 45.5	23 36 51
SEP 16	87 22 34.7	+57.87	87 28 21.9	+57.90	+05 06.9	23 40 47
SEP 17	87 45 44.6	+57.99	87 51 32.5	+58.02	+05 28.3	23 44 44
SEP 18	88 08 57.3	+58.10	88 14 45.9	+58.12	+05 49.7	23 48 41
SEP 19	88 32 12.5	+58.19	88 38 01.7	+58.21	+06 11.1	23 52 37
SEP 20	88 55 29.8	+58.27	89 01 19.4	+58.28	+06 32.4	23 56 34
SEP 21	89 18 48.8	+58.33	89 24 38.8	+58.34	+06 53.6	00 00 30
SEP 22	89 42 09.2	+58.39	89 47 59.5	+58.39	+07 14.7	00 04 27
SEP 23	90 05 30.7	+58.42	90 11 21.2	+58.42	+07 35.8	00 08 23
SEP 24	90 28 52.8	+58.43	90 34 43.4	+58.43	+07 56.7	00 12 20
SEP 25	90 52 15.2	+58.44	90 58 05.8	+58.44	+08 17.5	00 16 16
SEP 26	91 15 37.6	+58.43	91 21 28.2	+58.42	+08 38.1	00 20 13
SEP 27	91 38 59.6	+58.39	91 44 50.0	+58.38	+08 58.5	00 24 09
SEP 28	92 02 20.7	+58.36	92 08 10.9	+58.35	+09 18.7	00 28 06
SEP 29	92 25 40.8	+58.30	92 31 30.6	+58.28	+09 38.8	00 32 03
SEP 30	92 48 59.4	+58.23	92 54 48.8	+58.21	+09 58.5	00 35 59
OCT 1	93 12 16.1	+58.14	93 18 04.9	+58.11	+10 18.1	00 39 56
OCT 2	93 35 30.5	+58.05	93 41 18.8	+58.02	+10 37.3	00 43 52
OCT 3	93 58 42.5	+57.93	94 04 30.1	+57.89	+10 56.3	00 47 49

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DATE	NORTH POLAR DISTANCE				EQUATION OF TIME AT 12NN	APP SIDE TIME AT 0H UT
	8 AM	HRLY VAR	2 PM	HRLY VAR		
	° ′ ″		° ′ ″		m s	h m s
OCT 4	94 21 51.5	+57.79	94 27 38.2	+57.76	+11 14.9	00 51 45
OCT 5	94 44 57.2	+57.65	94 50 43.1	+57.61	+11 33.2	00 55 42
OCT 6	95 07 59.4	+57.49	95 13 44.4	+57.45	+11 51.2	00 59 38
OCT 7	95 30 57.7	+57.33	95 36 41.7	+57.28	+12 08.7	01 03 35
OCT 8	95 53 51.8	+57.14	95 59 34.6	+57.09	+12 25.9	01 07 32
OCT 9	96 16 41.3	+56.94	96 22 23.0	+56.89	+12 42.6	01 11 28
OCT 10	96 39 26.0	+56.73	96 45 06.4	+56.67	+12 58.8	01 15 25
OCT 11	97 02 05.5	+56.51	97 07 44.6	+56.45	+13 14.6	01 19 21
OCT 12	97 24 39.5	+56.27	97 30 17.1	+56.20	+13 29.8	01 23 18
OCT 13	97 47 07.5	+56.01	97 52 43.5	+55.94	+13 44.6	01 27 14
OCT 14	98 09 29.2	+55.74	98 15 03.7	+55.67	+13 58.7	01 31 11
OCT 15	98 31 44.3	+55.45	98 37 17.0	+55.37	+14 12.4	01 35 07
OCT 16	98 53 52.2	+55.14	98 59 23.0	+55.06	+14 25.4	01 39 04
OCT 17	99 15 52.6	+54.82	99 21 21.5	+54.73	+14 37.9	01 43 01
OCT 18	99 37 45.1	+54.48	99 43 12.0	+54.39	+14 49.7	01 46 57
OCT 19	99 59 29.3	+54.12	100 04 54.0	+54.03	+15 00.9	01 50 54
OCT 20	100 21 04.8	+53.75	100 26 27.3	+53.65	+15 11.5	01 54 50
OCT 21	100 42 31.2	+53.35	100 47 51.3	+53.25	+15 21.4	01 58 47
OCT 22	101 03 48.0	+52.95	101 09 05.7	+52.84	+15 30.7	02 02 43
OCT 23	101 24 54.9	+52.52	101 30 10.0	+52.41	+15 39.3	02 06 40
OCT 24	101 45 51.4	+52.09	101 51 03.9	+51.97	+15 47.2	02 10 36
OCT 25	102 06 37.2	+51.62	102 11 46.9	+51.50	+15 54.4	02 14 33
OCT 26	102 27 11.7	+51.15	102 32 18.6	+51.02	+16 00.9	02 18 30
OCT 27	102 47 34.7	+50.65	102 52 38.6	+50.52	+16 06.7	02 22 26
OCT 28	103 07 45.7	+50.14	103 12 46.5	+50.00	+16 11.7	02 26 23
OCT 29	103 27 44.2	+49.61	103 32 41.9	+49.47	+16 16.0	02 30 19
OCT 30	103 47 29.9	+49.07	103 52 24.3	+48.92	+16 19.6	02 34 16
OCT 31	104 07 02.4	+48.51	104 11 53.5	+48.36	+16 22.4	02 38 12
NOV 1	104 26 21.3	+47.93	104 31 08.9	+47.77	+16 24.4	02 42 09
NOV 2	104 45 26.1	+47.33	104 50 10.1	+47.18	+16 25.6	02 46 05
NOV 3	105 04 16.5	+46.72	105 08 56.8	+46.56	+16 26.0	02 50 02
NOV 4	105 22 52.1	+46.09	105 27 28.7	+45.93	+16 25.7	02 53 59
NOV 5	105 41 12.5	+45.45	105 45 45.2	+45.29	+16 24.5	02 57 55
NOV 6	105 59 17.4	+44.80	106 03 46.2	+44.63	+16 22.5	03 01 52
NOV 7	106 17 06.5	+44.13	106 21 31.3	+43.95	+16 19.7	03 05 48
NOV 8	106 34 39.3	+43.44	106 38 60.0	+43.26	+16 16.0	03 09 45
NOV 9	106 51 55.5	+42.73	106 56 11.9	+42.55	+16 11.4	03 13 41
NOV 10	107 08 54.6	+42.02	107 13 06.7	+41.83	+16 06.0	03 17 38
NOV 11	107 25 36.3	+41.28	107 29 44.0	+41.09	+15 59.7	03 21 34
NOV 12	107 42 00.1	+40.53	107 46 03.3	+40.33	+15 52.6	03 25 31
NOV 13	107 58 05.7	+39.75	108 02 04.2	+39.55	+15 44.6	03 29 28
NOV 14	108 13 52.5	+38.96	108 17 46.3	+38.76	+15 35.7	03 33 24
NOV 15	108 29 20.3	+38.16	108 33 09.2	+37.95	+15 26.0	03 37 21
NOV 16	108 44 28.6	+37.34	108 48 12.6	+37.12	+15 15.4	03 41 17
NOV 17	108 59 17.0	+36.49	109 02 55.9	+36.27	+15 03.9	03 45 14

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DATE	NORTH POLAR DISTANCE 8 AM	HRLY VAR	NORTH POLAR DISTANCE 2 PM	HRLY VAR	EQUATION OF TIME AT 12NN	APP SIDE TIME AT 0H UT
	° ′ ″		° ′ ″		m s	h m s
NOV 18	109 13 45.0	+35.64	109 17 18.8	+35.42	+14 51.6	03 49 10
NOV 19	109 27 52.4	+34.77	109 31 21.0	+34.55	+14 38.5	03 53 07
NOV 20	109 41 38.8	+33.88	109 45 02.1	+33.65	+14 24.5	03 57 03
NOV 21	109 55 03.7	+32.98	109 58 21.6	+32.74	+14 09.7	04 01 00
NOV 22	110 08 06.8	+32.06	110 11 19.1	+31.82	+13 54.1	04 04 57
NOV 23	110 20 47.7	+31.12	110 23 54.5	+30.89	+13 37.8	04 08 53
NOV 24	110 33 06.1	+30.18	110 36 07.2	+29.93	+13 20.6	04 12 50
NOV 25	110 45 01.6	+29.21	110 47 56.9	+28.96	+13 02.8	04 16 46
NOV 26	110 56 33.8	+28.24	110 59 23.2	+27.99	+12 44.1	04 20 43
NOV 27	111 07 42.5	+27.24	111 10 26.0	+26.99	+12 24.8	04 24 39
NOV 28	111 18 27.3	+26.24	111 21 04.7	+25.99	+12 04.7	04 28 36
NOV 29	111 28 47.9	+25.23	111 31 19.3	+24.97	+11 44.0	04 32 32
NOV 30	111 38 44.0	+24.19	111 41 09.1	+23.93	+11 22.6	04 36 29
DEC 1	111 48 15.2	+23.16	111 50 34.1	+22.89	+11 00.6	04 40 26
DEC 2	111 57 21.5	+22.10	111 59 34.1	+21.84	+10 38.0	04 44 22
DEC 3	112 06 02.4	+21.04	112 08 08.7	+20.78	+10 14.7	04 48 19
DEC 4	112 14 17.8	+19.97	112 16 17.6	+19.70	+09 50.9	04 52 15
DEC 5	112 22 07.4	+18.90	112 24 00.8	+18.62	+09 26.4	04 56 12
DEC 6	112 29 31.1	+17.80	112 31 17.9	+17.53	+09 01.5	05 00 08
DEC 7	112 36 28.5	+16.71	112 38 08.8	+16.43	+08 36.0	05 04 05
DEC 8	112 42 59.5	+15.61	112 44 33.1	+15.32	+08 10.0	05 08 02
DEC 9	112 49 03.9	+14.48	112 50 30.8	+14.20	+07 43.5	05 11 58
DEC 10	112 54 41.3	+13.36	112 56 01.5	+13.08	+07 16.6	05 15 55
DEC 11	112 59 51.7	+12.23	113 01 05.0	+11.94	+06 49.2	05 19 51
DEC 12	113 04 34.8	+11.08	113 05 41.3	+10.79	+06 21.4	05 23 48
DEC 13	113 08 50.4	+09.93	113 09 50.0	+09.64	+05 53.3	05 27 44
DEC 14	113 12 38.4	+08.78	113 13 31.1	+08.49	+05 24.8	05 31 41
DEC 15	113 15 58.7	+07.62	113 16 44.4	+07.33	+04 56.0	05 35 37
DEC 16	113 18 51.1	+06.46	113 19 29.9	+06.17	+04 27.0	05 39 34
DEC 17	113 21 15.6	+05.29	113 21 47.3	+05.00	+03 57.7	05 43 31
DEC 18	113 23 12.0	+04.11	113 23 36.7	+03.82	+03 28.2	05 47 27
DEC 19	113 24 40.2	+02.95	113 24 57.9	+02.65	+02 58.5	05 51 24
DEC 20	113 25 40.3	+01.77	113 25 50.9	+01.47	+02 28.8	05 55 20
DEC 21	113 26 12.1	+00.59	113 26 15.7	+00.30	+01 58.9	05 59 17
DEC 22	113 26 15.7	-00.59	113 26 12.2	-00.88	+01 29.0	06 03 13
DEC 23	113 25 51.0	-01.77	113 25 40.4	-02.06	+00 59.1	06 07 10
DEC 24	113 24 58.0	-02.94	113 24 40.4	-03.24	+00 29.2	06 11 06
DEC 25	113 23 36.8	-04.12	113 23 12.1	-04.42	-00 00.6	06 15 03
DEC 26	113 21 47.3	-05.29	113 21 15.5	-05.59	-00 30.3	06 19 00
DEC 27	113 19 29.7	-06.47	113 18 50.9	-06.76	-00 59.9	06 22 56
DEC 28	113 16 44.0	-07.63	113 15 58.2	-07.93	-01 29.3	06 26 53
DEC 29	113 13 30.3	-08.80	113 12 37.5	-09.09	-01 58.5	06 30 49
DEC 30	113 09 48.7	-09.96	113 08 48.9	-10.25	-02 27.5	06 34 46
DEC 31	113 05 39.3	-11.11	113 04 32.6	-11.40	-02 56.1	06 38 42

RIGHT ASCENSION OF STARS, 2025

NO	CONSTELLATION	RA	JAN1	FEB1	MAR1	APR1	MAY1	JUN1	JUL1	AUG1	SEP1	OCT1	NOV1	DEC1	JAN1	SPECIAL NAME	MAG
		h m	s	s	s	s	s	s	s	s	s	s	s	s	s		
1	A ANDROMEDAE	00 09	40.6	40.2	40.0	40.1	40.7	41.7	42.7	43.7	44.4	44.8	44.7	44.5	44.1	ALPHERATZ	2.2
2	B CASSIOPEIAE	00 10	30.4	29.5	28.9	29.0	29.8	31.2	32.8	34.3	35.3	35.7	35.5	34.9	34.0	CAPH	2.4
3	B CETI	00 44	50.8	50.5	50.2	50.2	50.6	51.4	52.4	53.4	54.1	54.6	54.6	54.4	54.1	DIPHDA	2.2
4	D CASSIOPEIAE	01 27	28.1	27.1	26.3	25.9	26.4	27.6	29.1	30.8	32.2	33.2	33.5	33.3	32.6	RUCHBAH	2.8
5	A ERIDANI	01 38	40.0	39.0	38.2	37.7	37.8	38.6	39.9	41.3	42.6	43.4	43.6	43.2	42.4	ACHERNAR	0.6
6	A ARIETIS	02 08	35.7	35.3	34.9	34.7	34.9	35.5	36.4	37.5	38.4	39.1	39.5	39.6	39.5	HAMAL	2.2
7	T ERIDANI	02 59	14.0	13.4	12.7	12.2	12.0	12.4	13.2	14.2	15.3	16.2	16.7	16.8	16.5	ACAMAR	3.4
8	A PERSEI	03 26	8.3	7.8	7.0	6.4	6.3	6.8	7.8	9.2	10.6	11.8	12.7	13.1	13.1	MIRFAK	1.9
9	A TAURI	04 37	22.7	22.5	22.1	21.6	21.4	21.6	22.1	23.0	24.0	24.9	25.7	26.3	26.5	ALDEBARAN	1.1
10	B ORIONIS	05 15	45.8	45.6	45.2	44.7	44.4	44.4	44.8	45.5	46.4	47.3	48.1	48.7	49.0	RIGEL	0.3
11	A AURIGAE	05 18	34.2	34.1	33.5	32.8	32.3	32.4	33.0	34.0	35.3	36.6	37.8	38.7	39.1	CAPELLA	0.2
12	G ORIONIS	05 26	29.7	29.7	29.3	28.8	28.5	28.5	28.9	29.6	30.5	31.4	32.3	32.9	33.3	BELLATRIX	1.7
13	E ORIONIS	05 37	30.3	30.3	29.9	29.4	29.1	29.1	29.4	30.0	30.9	31.8	32.7	33.3	33.7	ALNILAM	1.8
14	A ORIONIS	05 56	33.0	33.0	32.7	32.1	31.8	31.7	32.0	32.7	33.5	34.5	35.4	36.1	36.5	BETELGEUSE	1.0
15	A CARINAE	06 24	32.7	32.4	31.6	30.5	29.5	29.0	28.9	29.4	30.4	31.6	32.8	33.7	34.1	CANOPUS	- 0.9
16	A CAN MAJORIS	06 46	16.4	16.4	16.1	15.6	15.1	14.9	15.0	15.4	16.2	17.0	18.0	18.8	19.3	SIRIUS	-1.6
17	E CAN MAJORIS	06 59	38.0	38.1	37.8	37.1	36.6	36.2	36.2	36.6	37.3	38.2	39.2	40.1	40.7	ADHARA	1.6
18	A CAN MINORIS	07 40	37.9	38.2	38.1	37.7	37.2	37.0	37.0	37.4	38.0	38.8	39.8	40.7	41.4	PROCYON	0.5
19	B GEMINORUM	07 46	52.2	52.6	52.5	52.0	51.5	51.2	51.3	51.6	52.3	53.3	54.3	55.4	56.2	POLLUX	1.2
20	E CARINAE	08 22	63.4	63.6	63.2	62.2	61.0	59.9	59.2	59.1	59.7	60.8	62.3	63.7	64.8	AVIOR	1.7
21	L VELORUM	09 08	56.2	56.7	56.7	56.2	55.5	54.9	54.4	54.3	54.6	55.4	56.4	57.6	58.6	SUHAIL	2.1
22	B CARINAE	09 13	29.8	30.5	30.1	28.8	27.2	25.4	24.0	23.3	23.6	24.8	26.7	28.8	30.6	MIAPLACIDUS	1.8
23	A HYDRAE	09 28	49.9	50.5	50.7	50.5	50.1	49.7	49.5	49.5	49.8	50.4	51.3	52.2	53.2	ALPHARD	2.2
24	A LEONIS	10 09	43.0	43.8	44.1	44.0	43.7	43.4	43.1	43.1	43.3	43.7	44.5	45.5	46.5	REGULUS	1.3
25	A URSA MAJORIS	11 05	17.2	18.8	19.5	19.5	18.8	17.9	17.0	16.3	16.2	16.7	17.8	19.3	21.2	DUBHE	2.0
26	B LEONIS	11 50	20.5	21.4	22.0	22.2	22.1	21.9	21.6	21.3	21.2	21.4	21.9	22.8	23.8	DENEBOLA	2.2
27	A CRUCIS	12 27	59.5	61.3	62.3	62.9	62.8	62.1	61.1	60.1	59.3	59.2	59.9	61.4	63.3	ACRUX	1.6

RIGHT ASCENSION OF STARS, 2025

NO	CONSTELLATION	RA	JAN1	FEB1	MAR1	APR1	MAY1	JUN1	JUL1	AUG1	SEP1	OCT1	NOV1	DEC1	JAN1	SPECIAL NAME	MAG
		h m	s	s	s	s	s	s	s	s	s	s	s	s	s		
28	G CRUCIS	12 32	33.3	34.8	35.8	36.3	36.2	35.8	35.0	34.2	33.6	33.5	34.1	35.4	37.0	GACRUX	1.6
29	B CRUCIS	12 49	10.9	12.6	13.7	14.3	14.4	14.0	13.2	12.2	11.5	11.3	11.9	13.1	14.9	MIMOSA	1.5
30	E URSAE MAJORIS	12 55	8.0	9.5	10.6	11.1	11.1	10.6	9.8	9.0	8.3	8.1	8.5	9.4	10.8	ALIOTH	1.7
31	Z URSAE MAJORIS	13 24	56.0	57.5	58.6	59.3	59.4	59.0	58.3	57.4	56.7	56.3	56.5	57.3	58.6	MIZAR	2.4
32	A VIRGINIS	13 26	30.4	31.5	32.3	32.8	33.0	33.0	32.8	32.4	32.1	32.0	32.3	32.9	33.9	SPICA	1.2
33	T CENTAURI	14 08	8.8	10.0	11.0	11.7	12.2	12.3	12.0	11.6	11.1	10.8	11.0	11.6	12.7	MENKENT	2.3
34	A BOOTIS	14 16	47.7	48.8	49.6	50.3	50.6	50.6	50.4	50.0	49.6	49.4	49.4	49.9	50.7	ARCTURUS	0.2
35	A CENTAURI	14 41	16.8	18.6	20.2	21.4	22.2	22.3	21.8	20.9	19.9	19.2	19.1	19.9	21.5	RIGIL KENT	0.3
36	B URSAE MINORIS	14 50	38.3	40.8	43.2	45.1	45.8	45.2	43.7	41.5	39.1	37.2	36.2	36.5	38.1	KOCHAB	2.2
37	A CORONAE BOR	15 35	43.9	44.9	45.9	46.7	47.3	47.6	47.5	47.1	46.6	46.1	45.8	46.0	46.7	ALPHECCA	2.3
38	D SCORPII	16 01	47.7	48.7	49.7	50.6	51.4	51.9	52.0	51.8	51.3	50.9	50.7	50.9	51.6	DSCHUBBA	2.5
39	A SCORPII	16 30	55.3	56.3	57.3	58.3	59.1	59.7	59.9	59.7	59.3	58.8	58.5	58.7	59.3	ANTARES	1.2
40	A TRIANG AUST	16 51	16.2	18.2	20.5	22.8	24.8	26.2	26.5	25.9	24.6	23.2	22.1	22.1	23.3	ATRIA	1.9
41	L SCORPII	17 35	16.8	17.8	18.8	20.0	21.1	21.9	22.4	22.4	21.9	21.4	20.9	20.8	21.3	SHAULA	1.7
42	A OPHIUCHI	17 36	4.4	5.1	6.0	6.9	7.7	8.4	8.7	8.6	8.2	7.7	7.3	7.2	7.5	RASALHAGUE	2.1
43	G DRAGONIS	17 57	9.1	9.8	10.8	12.0	13.2	13.9	14.2	13.8	13.0	12.0	11.1	10.5	10.6	ELTANIN	2.4
44	E SAGITTARII	18 25	48.2	49.0	49.9	51.0	52.1	53.1	53.7	53.9	53.6	53.0	52.5	52.3	52.6	KAUS AUST	2.0
45	A LYRAE	18 37	45.3	45.8	46.6	47.6	48.7	49.5	49.9	49.9	49.4	48.7	48.0	47.5	47.5	VEGA	0.1
46	S SAGITTARII	18 56	47.4	48.0	48.8	49.8	50.8	51.8	52.5	52.7	52.5	52.0	51.5	51.3	51.5	NUNKI	2.1
47	A AQUILAE	19 51	58.8	59.1	59.7	0.5	1.4	2.4	3.0	3.3	3.3	2.9	2.4	2.0	2.0	ALTAIR	0.9
48,	A PAVONIS	20 27	34.8	35.2	36.0	37.3	38.9	40.5	41.8	42.5	42.6	42.0	41.1	40.3	40.0	PEACOCK	2.1
49	A CYGNI	20 42	15.0	15.0	15.5	16.3	17.5	18.6	19.5	19.9	19.8	19.3	18.5	17.8	17.3	DENEB	1.3
50	A PEGASI	21 45	23.8	23.8	24.0	24.6	25.4	26.4	27.3	27.9	28.2	28.1	27.7	27.3	27.1	ENIF	2.5
51	A GRUIS	22 09	47.1	47.0	47.3	47.9	49.0	50.3	51.6	52.6	53.0	52.9	52.4	51.7	51.2	AL NA'IR	2.2
52	A PISCIS AUST	22 58	1.2	1.1	1.1	1.5	2.3	3.3	4.4	5.3	5.8	5.9	5.7	5.3	4.9	FOMALHAUT	1.3
53	A PEGASI	23 05	59.8	59.6	59.6	59.9	60.6	61.6	62.5	63.3	63.8	64.0	63.8	63.4	63.1	MARKAB	2.6

NORTH POLAR DISTANCE OF STARS, 2025

NO	CONSTELLATION	NPD	JAN1	FEB1	MAR1	APR1	MAY1	JUN1	JUL1	AUG1	SEP1	OCT1	NOV1	DEC1	JAN1	SPECIAL NAME	MAG
		° ′	″	″	″	″	″	″	″	″	″	″	″	″	″		
1	A ANDROMEDAE	60 45	68.7	72.2	76.5	80.8	82.3	80.2	75.1	67.8	59.9	53.1	48.1	46.1	46.8	ALPHERATZ	2.2
2	B CASSIOPEIAE	30 42	27.4	31.1	37.7	45.9	51.6	53.0	49.9	42.5	32.4	22.0	12.7	6.9	5.5	CAPH	2.4
3	B CETI	107 50	65.4	65.9	64.2	60.0	53.7	46.0	39.2	34.3	32.5	33.6	37.1	41.0	43.7	DIPHDA	2.2
4	D CASSIOPEIAE	29 37	48.5	49.2	53.8	61.4	68.1	71.9	71.5	67.0	59.0	49.5	39.7	32.3	28.2	RUCHBAH	2.8
5	A ERIDANI	147 06	51.4	50.6	45.6	36.6	25.8	14.7	6.6	2.8	4.3	10.2	18.8	26.8	31.5	ACHERNAR	0.6
6	A ARIETIS	66 24	63.1	64.3	66.5	69.3	70.6	69.5	66.3	61.3	55.7	50.8	47.1	45.1	44.8	HAMAL	2.2
7	T ERIDANI	130 11	86.4	89.2	88.0	82.7	74.3	64.0	54.8	48.2	46.2	49.0	55.8	64.0	71.0	ACAMAR	3.4
8	A PERSEI	40 02	49.4	47.0	48.0	52.2	57.5	61.8	63.8	63.1	59.5	54.0	47.3	41.0	36.1	MIRFAK	1.9
9	A TAURI	73 26	23.6	24.1	24.7	25.5	25.8	24.9	22.8	20.0	17.4	15.7	15.0	15.5	16.4	ALDEBARAN	1.1
10	B ORIONIS	98 10	22.8	26.8	28.7	28.6	26.2	21.4	15.7	10.2	6.5	5.8	8.3	13.3	19.0	RIGEL	0.3
11	A AURIGAE	43 58	33.1	29.0	27.3	28.3	31.5	35.6	39.2	41.5	42.1	40.9	38.0	34.3	30.0	CAPELLA	0.2
12	G ORIONIS	83 37	39.5	41.6	42.6	42.9	42.0	39.6	36.4	32.9	30.3	29.5	30.7	33.5	36.7	BELLATRIX	1.7
13	E ORIONIS	91 10	69.8	73.0	74.7	74.9	73.4	69.9	65.5	61.0	57.9	57.2	59.2	63.2	68.0	ALNILAM	1.8
14	A ORIONIS	82 35	17.9	20.0	21.0	21.3	20.5	18.5	15.7	12.7	10.6	10.2	11.6	14.6	18.0	BETELGEUSE	1.0
15	A CARINAE	142 42	30.5	40.1	45.8	47.7	44.8	37.4	28.0	18.3	11.4	9.5	13.3	21.9	33.2	CANOPUS	- 0.9
16	A CAN MAJORIS	106 44	60.6	67.1	71.0	72.4	70.8	66.5	60.6	54.5	50.2	49.3	52.3	58.6	66.6	SIRIUS	-1.6
17	E CAN MAJORIS	119 00	19.6	27.9	33.1	35.4	34.0	28.9	21.7	14.0	8.2	6.3	9.1	16.1	25.6	ADHARA	1.6
18	A CAN MINORIS	84 50	21.6	25.1	26.7	27.2	26.6	25.0	22.7	20.5	19.4	20.1	22.9	27.3	32.4	PROCYON	0.5
19	B GEMINORUM	62 02	7.2	6.2	4.5	2.8	2.3	2.7	3.9	5.7	8.2	11.0	13.9	16.3	17.6	POLLUX	1.2
20	E CARINAE	149 35	12.6	24.3	33.7	40.6	42.8	40.0	33.3	24.0	15.2	9.8	9.5	15.2	25.8	AVIOR	1.7
21	L VELORUM	133 31	51.0	61.8	70.8	77.8	80.8	79.4	74.2	66.5	58.8	53.7	53.1	57.9	67.4	SUHAIL	2.1
22	B CARINAE	159 48	56.4	68.2	78.8	87.9	92.8	92.6	87.7	79.2	69.9	62.8	60.3	63.8	73.1	MIAPLACIDUS	1.8
23	A HYDRAE	98 45	59.7	66.5	71.0	73.7	74.2	72.7	69.8	66.1	63.3	62.5	64.8	70.0	77.4	ALPHARD	2.2
24	A LEONIS	78 09	22.5	26.3	27.5	26.9	25.5	23.9	22.7	22.2	23.3	26.0	30.7	36.4	42.2	REGULUS	1.3
25	A URSA MAJORIS	28 23	80.4	78.2	72.3	64.3	58.0	55.2	56.7	62.3	71.2	81.4	91.4	98.8	102.1	DUBHE	2.0
26	B LEONIS	75 34	10.4	15.1	16.6	15.4	13.0	10.4	8.6	8.2	9.7	13.3	18.9	25.7	32.6	DENEBOLA	2.2
27	A CRUCIS	153 13	57.7	65.2	74.6	85.6	95.0	101.7	103.9	101.4	95.1	87.3	80.3	77.2	79.6	ACRUX	1.6

NORTH POLAR DISTANCE OF STARS, 2025

NO	CONSTELLATION	NPD	JAN1	FEB1	MAR1	APR1	MAY1	JUN1	JUL1	AUG1	SEP1	OCT1	NOV1	DEC1	JAN1	SPECIAL NAME	MAG
		° ′	″	″	″	″	″	″	″	″	″	″	″	″	″		
28	G CRUCIS	147 14	54.9	62.5	71.6	82.0	90.8	97.0	98.9	96.4	90.4	83.1	76.8	74.3	77.0	GACRUX	1.6
29	B CRUCIS	149 49	14.4	21.3	30.1	40.5	49.7	56.5	59.1	57.2	51.6	44.3	37.5	34.1	35.9	MIMOSA	1.5
30	E URSAE MAJORIS	34 10	51.7	54.1	51.2	43.9	36.0	29.8	27.1	28.8	34.9	44.1	55.3	65.5	73.1	ALIOTH	1.7
31	Z URSAE MAJORIS	35 12	37.3	40.8	38.8	32.0	23.9	16.9	13.2	13.8	18.9	27.5	38.6	49.2	57.7	MIZAR	2.4
32	A VIRGINIS	101 17	28.5	35.0	39.9	43.2	44.7	44.9	43.8	41.9	40.1	39.2	40.1	43.3	48.9	SPICA	1.2
33	T CENTAURI	126 29	25.0	30.1	36.1	42.7	48.4	52.8	54.8	54.2	51.5	47.5	43.8	42.3	44.0	MENKENT	2.3
34	A BOOTIS	70 56	60.9	67.4	69.8	68.4	64.6	59.9	56.2	54.2	55.0	58.5	64.8	72.6	80.9	ARCTURUS	0.2
35	A CENTAURI	150 56	3.8	6.2	11.6	19.7	28.2	36.2	41.4	43.1	40.7	35.1	28.0	22.1	19.7	RIGIL KENT	0.3
36	B URSAE MINORIS	15 56	71.4	77.0	76.5	70.2	61.1	52.1	45.9	43.9	47.1	54.7	65.7	77.2	87.3	KOCHAB	2.2
37	A CORONAE BOR	63 22	20.2	27.6	30.5	28.8	23.7	17.1	11.2	7.2	6.5	9.4	15.6	23.9	32.9	ALPHECCA	2.3
38	D SCORPII	112 41	30.9	34.1	37.2	39.9	41.7	43.0	43.7	43.6	42.7	41.5	40.3	40.1	41.4	DSCHUBBA	2.5
39	A SCORPII	116 29	11.4	13.5	15.8	18.1	19.8	21.5	22.7	23.2	22.9	21.8	20.3	19.3	19.4	ANTARES	1.2
40	A TRIANG AUST	159 04	11.2	7.1	6.6	9.4	15.1	22.9	30.6	36.7	39.4	37.9	32.4	24.8	17.4	ATRIA	1.9
41	L SCORPII	127 07	16.4	15.3	15.2	15.8	17.1	19.4	22.0	24.5	25.9	25.8	24.0	21.2	18.4	SHAULA	1.7
42	A OPHIUCHI	77 27	34.2	40.9	44.6	44.8	41.5	36.1	30.4	25.4	22.5	22.3	25.0	29.8	36.2	RASALHAGUE	2.1
43	G DRAGONIS	38 30	59.6	69.8	75.6	76.2	71.1	62.2	52.4	43.6	38.1	37.1	41.1	49.0	59.3	ELTANIN	2.4
44	E SAGITTARII	124 22	22.3	20.5	19.3	18.3	17.8	18.4	20.0	22.1	24.0	24.8	24.2	22.2	19.5	KAUS AUST	2.0
45	A LYRAE	51 11	40.2	49.7	55.6	57.0	53.0	45.1	35.9	27.1	20.8	18.6	20.9	26.9	35.7	VEGA	0.1
46	S SAGITTARII	116 15	58.7	57.8	56.8	55.2	53.4	52.2	51.9	52.5	53.6	54.5	54.7	54.1	52.9	NUNKI	2.1
47	A AQUILAE	81 03	58.3	63.4	66.5	67.0	63.9	58.3	52.1	46.1	41.7	39.8	40.4	43.0	47.1	ALTAIR	0.9
48,	A PAVONIS	146 38	84.9	77.7	70.8	64.3	60.0	58.8	61.0	66.0	71.9	76.8	78.9	77.1	71.4	PEACOCK	2.1
49	A CYGNI	44 37	45.4	54.5	62.1	66.8	66.1	60.3	51.4	40.9	31.3	24.8	22.3	24.4	30.6	DENEB	1.3
50	A PEGASI	80 00	37.3	41.3	44.2	45.0	42.5	37.1	30.5	23.8	18.3	15.2	14.4	15.7	18.6	ENIF	2.5
51	A GRUIS	136 50	36.9	31.6	24.9	16.7	9.1	3.5	1.4	2.9	7.3	12.8	17.5	19.3	17.2	AL NA'IR	2.2
52	A PISCIS AUST	119 29	34.0	31.9	27.8	21.6	14.4	7.4	2.6	0.6	1.7	5.0	9.2	12.2	12.7	FOMALHAUT	1.3
53	A PEGASI	74 39	33.7	37.3	40.5	42.4	41.1	36.5	30.1	22.9	16.4	11.9	9.7	9.9	12.1	MARKAB	2.6

POLARIS, 2025
(120° EAST MERIDIAN)

DATE	R.A.	N.P.D.	UPPER CULMINATION	VAR. PER DAY	VAR. PER DEGREE
	h m s	° ′ ″	h m s	m s	W E
JAN 1	03 05 05	00 37 34	20 19 28.2	03 57.44	0.660
JAN 11	03 04 50	00 37 31	19 39 53.7	03 57.69	0.660
JAN 21	03 04 32	00 37 30	19 00 16.8	03 57.69	0.660
JAN 31	03 04 14	00 37 29	18 20 39.8	03 57.80	0.661
FEB 10	03 03 56	00 37 28	17 41 01.8	03 58.54	0.663
FEB 20	03 03 35	00 37 29	17 01 16.3	03 57.14	0.659
MAR 2	03 03 17	00 37 29	16 21 44.9	03 57.47	0.660
MAR 12	03 03 01	00 37 31	15 42 10.2	03 57.36	0.659
MAR 22	03 02 46	00 37 33	15 02 36.5	03 57.12	0.659
APR 1	03 02 34	00 37 36	14 23 05.3	03 56.71	0.658
APR 11	03 02 26	00 37 38	13 43 38.1	03 56.29	0.656
APR 21	03 02 22	00 37 41	13 04 15.1	03 55.98	0.656
MAY 1	03 02 21	00 37 44	12 24 55.3	03 55.74	0.655
MAY 11	03 02 23	00 37 47	11 45 37.9	03 55.25	0.653
MAY 21	03 02 30	00 37 50	11 06 25.3	03 54.84	0.652
MAY 31	03 02 40	00 37 53	10 27 16.9	03 54.73	0.652
JUN 10	03 02 52	00 37 55	09 48 09.6	03 54.47	0.651
JUN 20	03 03 07	00 37 57	09 09 04.8	03 54.07	0.650
JUN 30	03 03 25	00 37 59	08 30 04.1	03 53.95	0.650
JUL 10	03 03 45	00 38 00	07 51 04.6	03 53.94	0.650
JUL 20	03 04 04	00 38 00	07 12 05.1	03 53.79	0.649
JUL 30	03 04 26	00 38 00	06 33 07.1	03 53.66	0.649
AUG 9	03 04 48	00 38 00	05 54 10.5	03 53.71	0.649
AUG 19	03 05 10	00 37 59	05 15 13.3	03 53.87	0.650
AUG 29	03 05 30	00 37 58	04 36 14.5	03 53.88	0.650
SEP 8	03 05 51	00 37 55	03 57 15.7	03 53.89	0.650
SEP 18	03 06 11	00 37 53	03 18 16.8	03 54.23	0.651
SEP 28	03 06 28	00 37 51	02 39 14.4	03 54.48	0.651
OCT 8	03 06 42	00 37 48	02 00 09.5	03 54.55	0.652
OCT 18	03 06 56	00 37 44	01 21 04.0	03 54.85	0.652
OCT 28	03 07 06	00 37 41	00 41 55.5	03 55.24	0.653
NOV 7	03 07 13	00 37 37	00 02 43.0	03 55.62	0.655
NOV 17	03 07 16	00 37 33	23 19 31.1	03 55.82	0.655
NOV 27	03 07 17	00 37 30	22 40 12.8	03 56.19	0.656
DEC 7	03 07 14	00 37 26	22 00 50.9	03 56.70	0.658
DEC 17	03 07 06	00 37 23	21 21 23.8	03 56.99	0.658
DEC 27	03 06 55	00 37 20	20 41 53.8	03 57.08	0.659
DEC 31	03 06 50	00 37 19	20 26 05.5	03 56.87	0.658

POLARIS TABLE, 2025

	0^h		1^h		2^h		3^h		4^h		5^h	
LST	a_o	b_o	a_o	b_o	a_o	b_o	a_o	b_o	a_o	b_o	a_o	b_o
m	′	′	′	′	′	′	′	′	′	′	′	′
0	−26.0	+27.5	−32.2	+19.7	−36.2	+10.7	−37.7	+0.8	−36.6	−9.1	−33.0	−18.4
3	−26.3	+27.1	−32.4	+19.3	−36.3	+10.2	−37.7	+0.3	−36.5	−9.6	−32.7	−18.8
6	−26.7	+26.8	−32.7	+18.9	−36.4	+9.7	−37.7	−0.2	−36.3	−10.1	−32.5	−19.2
9	−27.0	+26.4	−32.9	+18.5	−36.6	+9.2	−37.7	−0.7	−36.2	−10.6	−32.2	−19.7
12	−27.4	+26.1	−33.2	+18.0	−36.7	+8.7	−37.7	−1.2	−36.1	−11.0	−32.0	−20.1
15	−27.7	+25.7	−33.4	+17.6	−36.8	+8.2	−37.7	−1.7	−35.9	−11.5	−31.7	−20.5
18	−28.0	+25.3	−33.6	+17.1	−36.9	+7.7	−37.6	−2.2	−35.8	−12.0	−31.4	−20.9
21	−28.4	+25.0	−33.9	+16.7	−37.0	+7.3	−37.6	−2.7	−35.6	−12.5	−31.2	−21.3
24	−28.7	+24.6	−34.1	+16.2	−37.1	+6.8	−37.6	−3.2	−35.4	−12.9	−30.9	−21.7
27	−29.0	+24.2	−34.3	+15.8	−37.2	+6.3	−37.5	−3.7	−35.3	−13.4	−30.6	−22.2
30	−29.3	+23.8	−34.5	+15.3	−37.3	+5.8	−37.5	−4.2	−35.1	−13.9	−30.3	−22.6
33	−29.6	+23.4	−34.7	+14.9	−37.3	+5.3	−37.4	−4.7	−34.9	−14.3	−30.0	−23.0
36	−29.9	+23.0	−34.9	+14.4	−37.4	+4.8	−37.3	−5.2	−34.7	−14.8	−29.7	−23.3
39	−30.2	+22.6	−35.1	+14.0	−37.5	+4.3	−37.3	−5.7	−34.5	−15.2	−29.4	−23.7
42	−30.5	+22.2	−35.2	+13.5	−37.5	+3.8	−37.2	−6.2	−34.3	−15.7	−29.1	−24.1
45	−30.8	+21.8	−35.4	+13.0	−37.6	+3.3	−37.1	−6.7	−34.1	−16.2	−28.8	−24.5
48	−31.1	+21.4	−35.6	+12.6	−37.6	+2.8	−37.0	−7.2	−33.9	−16.6	−28.4	−24.9
51	−31.4	+21.0	−35.7	+12.1	−37.6	+2.3	−36.9	−7.6	−33.7	−17.0	−28.1	−25.2
54	−31.7	+20.6	−35.9	+11.6	−37.7	+1.8	−36.8	−8.1	−33.4	−17.5	−27.8	−25.6
57	−31.9	+20.2	−36.0	+11.1	−37.7	+1.3	−36.7	−8.6	−33.2	−17.9	−27.4	−26.0
60	−32.2	+19.7	−36.2	+10.7	−37.7	+0.8	−36.6	−9.1	−33.0	−18.4	−27.1	−26.3
Lat.												
°												
00	−0.1	−0.2	0.0	−0.2	0.0	−0.1	0.0	+0.1	0.0	+0.2	−0.1	+0.2
10	−0.1	−0.2	0.0	−0.2	0.0	−0.1	0.0	0.0	0.0	+0.1	−0.1	+0.2
20	−0.1	−0.2	0.0	−0.1	0.0	−0.1	0.0	0.0	0.0	+0.1	−0.1	+0.2
30	0.0	−0.1	0.0	−0.1	0.0	0.0	0.0	0.0	0.0	+0.1	0.0	+0.1
Month												
Jan.	+0.1	−0.1	+0.2	−0.1	+0.2	−0.1	+0.2	0.0	+0.2	0.0	+0.2	+0.1
Feb.	+0.1	−0.3	+0.1	−0.2	+0.2	−0.2	+0.2	− 0.1	+0.3	−0.1	+0.3	0.0
Mar.	−0.1	−0.3	0.0	−0.3	+0.1	−0.3	+0.2	− 0.3	+0.3	−0.2	+0.3	−0.2
Apr.	−0.2	−0.3	−0.1	−0.4	0.0	−0.4	+0.1	− 0.4	+0.2	−0.3	+0.3	−0.3
May	−0.3	−0.2	−0.3	−0.3	−0.2	−0.4	−0.1	− 0.4	0.0	−0.4	+0.1	−0.4
Jun.	−0.4	−0.1	−0.3	−0.2	−0.3	−0.2	−0.2	− 0.3	−0.1	−0.4	0.0	−0.4
Jul.	−0.3	+0.1	−0.3	0.0	−0.3	−0.1	−0.3	− 0.2	−0.2	−0.2	−0.2	−0.3
Aug.	−0.2	+0.2	−0.2	+0.1	−0.3	+0.1	−0.3	0.0	−0.3	−0.1	−0.2	−0.1
Sep.	0.0	+0.3	−0.1	+0.3	−0.2	+0.2	−0.2	+0.2	−0.3	+0.1	−0.3	+0.1
Oct.	+0.2	+0.3	+0.1	+0.3	0.0	+0.3	−0.1	+0.3	−0.2	+0.3	−0.2	+0.2
Nov.	+0.4	+0.2	+0.3	+0.3	+0.2	+0.4	+0.1	+0.4	0.0	+0.4	−0.1	+0.4
Dec.	+0.5	+0.1	+0.4	+0.2	+0.4	+0.3	+0.3	+0.4	+0.2	+0.5	0.0	+0.5

LATITUDE OF OBSERVER IS THE SUM OF CORRECTED OBSERVED ALTITUDE OF POLARIS AND $(a_o + a_1 + a_2)$
AZIMUTH OF POLARIS IS THE PRODUCT OF $(b_0 + b_1 + b_2)$ BY SECANT OF LATITUDE

POLARIS TABLE, 2025

	6^h		7^h		8^h		9^h		10^h		11^h	
LST	a_o	b_o	a_o	b_o	a_o	b_o	a_o	b_o	a_o	b_o	a_o	b_o
m	′	′	′	′	′	′	′	′	′	′	′	′
0	−27.1	−26.3	−19.4	−32.5	−10.3	−36.3	−0.5	−37.7	+ 9.2	−36.5	+18.4	−32.8
3	−26.7	−26.7	−18.9	−32.7	−9.8	−36.5	−0.1	−37.7	+ 9.7	−36.4	+18.8	−32.6
6	−26.4	−27.0	−18.5	−33.0	−9.3	−36.6	+0.4	−37.7	+10.2	−36.2	+19.2	−32.3
9	−26.0	−27.4	−18.1	−33.2	−8.9	−36.7	+0.9	−37.7	+10.6	−36.1	+19.6	−32.1
12	−25.7	−27.7	−17.6	−33.4	−8.4	−36.8	+1.4	−37.7	+11.1	−36.0	+20.0	−31.8
15	−25.3	−28.1	−17.2	−33.7	−7.9	−36.9	+1.9	−37.6	+11.6	−35.8	+20.5	−31.6
18	−24.9	−28.4	−16.7	−33.9	−7.4	−37.0	+2.4	−37.6	+12.1	−35.6	+20.9	−31.3
21	−24.6	−28.7	−16.3	−34.1	−6.9	−37.1	+2.9	−37.6	+12.5	−35.5	+21.3	−31.0
24	−24.2	−29.0	−15.9	−34.3	−6.4	−37.2	+3.4	−37.5	+13.0	−35.3	+21.7	−30.7
27	−23.8	−29.4	−15.4	−34.5	−6.0	−37.3	+3.9	−37.5	+13.4	−35.1	+22.1	−30.4
30	−23.4	−29.7	−14.9	−34.7	−5.5	−37.3	+4.4	−37.4	+13.9	−35.0	+22.5	−30.1
33	−23.0	−30.0	−14.5	−34.9	−5.0	−37.4	+4.9	−37.4	+14.4	−34.8	+22.9	−29.9
36	−22.6	−30.3	−14.0	−35.1	−4.5	−37.5	+5.4	−37.3	+14.8	−34.6	+23.3	−29.6
39	−22.2	−30.6	−13.6	−35.3	−4.0	−37.5	+5.8	−37.2	+15.3	−34.4	+23.6	−29.2
42	−21.8	−30.8	−13.1	−35.4	−3.5	−37.6	+6.3	−37.1	+15.7	−34.2	+24.0	−28.9
45	−21.4	−31.1	−12.6	−35.6	−3.0	−37.6	+6.8	−37.0	+16.2	−34.0	+24.4	−28.6
48	−21.0	−31.4	−12.2	−35.8	−2.5	−37.6	+7.3	−36.9	+16.6	−33.7	+24.8	−28.3
51	−20.6	−31.7	−11.7	−35.9	−2.0	−37.7	+7.8	−36.8	+17.0	−33.5	+25.1	−28.0
54	−20.2	−31.9	−11.2	−36.1	−1.5	−37.7	+8.3	−36.7	+17.5	−33.3	+25.5	−27.6
57	−19.8	−32.2	−10.8	−36.2	−1.0	−37.7	+8.7	−36.6	+17.9	−33.1	+25.9	−27.3
60	−19.4	−32.5	−10.3	−36.3	−0.5	−37.7	+9.2	−36.5	+18.4	−32.8	+26.2	−27.0
Lat.												
°												
00	−0.2	+0.2	−0.2	+0.2	−0.2	+0.1	− 0.2	−0.1	−0.2	−0.2	−0.2	−0.2
10	−0.1	+0.2	−0.2	+0.2	−0.2	+0.1	− 0.2	0.0	−0.2	−0.1	−0.1	−0.2
20	−0.1	+0.2	−0.1	+0.1	−0.2	+0.1	− 0.2	0.0	−0.1	−0.1	−0.1	−0.2
30	−0.1	+0.1	−0.1	+0.1	−0.1	0.0	− 0.1	0.0	−0.1	−0.1	−0.1	−0.1
Month												
Jan.	+0.1	+0.1	+0.1	+0.2	+0.1	+0.2	0.0	+0.2	0.0	+0.2	−0.1	+0.2
Feb.	+0.3	+0.1	+0.2	+0.1	+0.2	+0.2	+0.1	+0.2	+0.1	+0.3	0.0	+0.3
Mar.	+0.3	−0.1	+0.3	0.0	+0.3	+0.1	+0.3	+0.2	+0.2	+0.3	+0.2	+0.3
Apr.	+0.3	−0.2	+0.4	−0.1	+0.4	0.0	+0.4	+0.1	+0.3	+0.2	+0.3	+0.3
May	+0.2	−0.3	+0.3	−0.3	+0.4	−0.2	+0.4	−0.1	+0.4	0.0	+0.4	+0.1
Jun.	+0.1	−0.4	+0.2	−0.3	+0.2	−0.3	+0.3	−0.2	+0.4	−0.1	+0.4	0.0
Jul.	−0.1	−0.3	0.0	−0.3	+0.1	−0.3	+0.2	−0.3	+0.2	−0.2	+0.3	−0.2
Aug.	−0.2	−0.2	−0.1	−0.2	−0.1	−0.3	0.0	−0.3	+0.1	−0.3	+0.1	−0.2
Sep.	−0.3	0.0	−0.3	−0.1	−0.2	−0.2	−0.2	−0.2	−0.1	−0.3	−0.1	−0.3
Oct.	−0.3	+0.2	−0.3	+0.1	−0.3	0.0	−0.3	−0.1	−0.3	−0.2	−0.2	−0.2
Nov.	−0.2	+0.4	−0.3	+0.3	−0.4	+0.2	−0.4	+0.1	−0.4	0.0	−0.4	−0.1
Dec.	−0.1	+0.5	−0.2	+0.4	−0.3	+0.4	−0.4	+0.3	−0.5	+0.2	−0.5	0.0

LATITUDE OF OBSERVER IS THE SUM OF CORRECTED OBSERVED ALTITUDE OF POLARIS AND $(a_o + a_1 + a_2)$
AZIMUTH OF POLARIS IS THE PRODUCT OF $(b_0 + b_1 + b_2)$ BY SECANT OF LATITUDE

POLARIS TABLE, 2025

	12h		13h		14h		15h		16h		17h	
LST	a_o	b_o	a_o	b_o	a_o	b_o	a_o	b_o	a_o	b_o	a_o	b_o
m	′	′	′	′	′	′	′	′	′	′	′	′
0	+ 26.2	− 27.0	+ 32.3	− 19.3	+ 36.2	−10.4	+ 37.7	− 0.8	+ 36.6	+8.9	+ 33.1	+ 18.0
3	+ 26.6	− 26.6	+ 32.6	− 18.9	+ 36.4	−9.9	+ 37.7	− 0.3	+ 36.5	+9.3	+ 32.9	+ 18.4
6	+ 26.9	− 26.3	+ 32.8	− 18.5	+ 36.5	−9.4	+ 37.7	+ 0.2	+ 36.4	+9.8	+ 32.6	+ 18.8
9	+ 27.3	− 25.9	+ 33.0	− 18.0	+ 36.6	−9.0	+ 37.7	+ 0.7	+ 36.2	+10.3	+ 32.4	+ 19.2
12	+ 27.6	− 25.6	+ 33.3	− 17.6	+ 36.7	−8.5	+ 37.7	+ 1.2	+ 36.1	+10.8	+ 32.1	+ 19.6
15	+ 27.9	− 25.2	+ 33.5	− 17.2	+ 36.8	−8.0	+ 37.7	+ 1.7	+ 36.0	+11.2	+ 31.9	+ 20.1
18	+ 28.3	− 24.8	+ 33.7	− 16.7	+ 36.9	−7.5	+ 37.6	+ 2.1	+ 35.8	+11.7	+ 31.6	+ 20.5
21	+ 28.6	− 24.5	+ 33.9	− 16.3	+ 37.0	−7.1	+ 37.6	+ 2.6	+ 35.7	+12.2	+ 31.3	+ 20.9
24	+ 28.9	− 24.1	+ 34.2	− 15.9	+ 37.1	−6.6	+ 37.6	+ 3.1	+ 35.5	+12.6	+ 31.0	+ 21.3
27	+ 29.2	− 23.7	+ 34.4	− 15.4	+ 37.2	−6.1	+ 37.5	+ 3.6	+ 35.3	+13.1	+ 30.8	+ 21.7
30	+ 29.5	− 23.3	+ 34.6	− 15.0	+ 37.3	−5.6	+ 37.5	+ 4.1	+ 35.2	+13.5	+ 30.5	+ 22.1
33	+ 29.8	− 22.9	+ 34.8	− 14.5	+ 37.3	−5.1	+ 37.4	+ 4.6	+ 35.0	+14.0	+ 30.2	+ 22.5
36	+ 30.1	− 22.6	+ 34.9	− 14.1	+ 37.4	−4.7	+ 37.4	+ 5.0	+ 34.8	+14.4	+ 29.9	+ 22.9
39	+ 30.4	− 22.2	+ 35.1	− 13.6	+ 37.5	−4.2	+ 37.3	+ 5.5	+ 34.6	+14.9	+ 29.6	+ 23.3
42	+ 30.7	− 21.8	+ 35.3	− 13.2	+ 37.5	−3.7	+ 37.2	+ 6.0	+ 34.4	+15.3	+ 29.3	+ 23.6
45	+ 31.0	− 21.4	+ 35.5	− 12.7	+ 37.6	−3.2	+ 37.1	+ 6.5	+ 34.2	+15.8	+ 29.0	+ 24.0
48	+ 31.3	− 21.0	+ 35.6	− 12.2	+ 37.6	−2.7	+ 37.0	+ 7.0	+ 34.0	+16.2	+ 28.6	+ 24.4
51	+ 31.5	− 20.6	+ 35.8	− 11.8	+ 37.6	−2.2	+ 36.9	+ 7.5	+ 33.8	+16.7	+ 28.3	+ 24.8
54	+ 31.8	− 20.1	+ 35.9	− 11.3	+ 37.7	−1.8	+ 36.8	+ 7.9	+ 33.6	+17.1	+ 28.0	+ 25.1
57	+ 32.1	− 19.7	+ 36.1	− 10.9	+ 37.7	−1.3	+ 36.7	+ 8.4	+ 33.3	+17.5	+ 27.7	+ 25.5
60	+ 32.3	− 19.3	+ 36.2	− 10.4	+ 37.7	−0.8	+ 36.6	+ 8.9	+ 33.1	+18.0	+ 27.3	+ 25.8
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
°												
00	−0.1	−0.2	0.0	−0.2	0.0	−0.1	0.0	+0.1	0.0	+0.2	−0.1	+0.2
10	−0.1	−0.2	0.0	−0.2	0.0	−0.1	0.0	0.0	0.0	+0.1	−0.1	+0.2
20	−0.1	−0.2	0.0	−0.1	0.0.	−0.1	0.0	0.0	0.0	+0.1	−0.1	+0.2
30	0.0	−0.1	0.0	−0.1	0.0	0.0	0.0	0.0	0.0	+0.1	0.0	+0.1
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.	−0.1	+0.1	−0.2	+0.1	−0.2	+0.1	−0.2	0.0	−0.2	0.0	−0.2	−0.1
Feb.	−0.1	+0.3	−0.1	+0.2	−0.2	+0.2	−0.2	+0.1	−0.3	+0.1	−0.3	0.0
Mar.	+0.1	+0.3	0.0	+0.3	−0.1	+0.3	−0.2	+0.3	−0.3	+0.2	−0.3	+0.2
Apr.	+0.2	+0.3	+0.1	+0.4	0.0	+0.4	−0.1	+0.4	−0.2	+0.3	−0.3	+0.3
May	+0.3	+0.2	+0.3	+0.3	+0.2	+0.4	+0.1	+0.4	0.0	+0.4	−0.1	+0.4
Jun.	+0.4	+0.1	+0.3	+0.2	+0.3	+0.2	+0.2	+0.3	+0.1	+0.4	0.0	+0.4
Jul.	+0.3	−0.1	+0.3	0.0	+0.3	+0.1	+0.3	+0.2	+0.2	+0.2	+0.2	+0.3
Aug.	+0.2	−0.2	+0.2	−0.1	+0.3	−0.1	+0.3	0.0	+0.3	+0.1	+0.2	+0.1
Sep.	0.0	−0.3	+0.1	−0.3	+0.2	−0.2	+0.2	− 0.2	+0.3	−0.1	+0.3	−0.1
Oct.	−0.2	−0.3	−0.1	−0.3	0.0	−0.3	+0.1	− 0.3	+0.2	−0.3	+0.2	−0.2
Nov.	−0.4	−0.2	−0.3	−0.3	−0.2	−0.4	−0.1	− 0.4	0.0	−0.4	+0.1	−0.4
Dec.	−0.5	−0.1	−0.4	−0.2	−0.4	−0.3	−0.3	− 0.4	−0.2	−0.5	0.0	−0.5

LATITUDE OF OBSERVER IS THE SUM OF CORRECTED OBSERVED ALTITUDE OF POLARIS AND $(a_o + a_1 + a_2)$
AZIMUTH OF POLARIS IS THE PRODUCT OF $(b_0 + b_1 + b_2)$ BY SECANT OF LATITUDE

POLARIS TABLE, 2025

LST	18^h		19^h		20^h		21^h		22^h		23^h	
	a_o	b_o	a_o	b_o	a_o	b_o	a_o	b_o	a_o	b_o	a_o	b_o
m	′	′	′	′	′	′	′	′	′	′	′	′
0	+27.3	+25.8	+19.7	+32.0	+10.7	+36.1	+1.0	+37.7	− 8.8	+36.7	−18.0	+33.2
3	+27.0	+26.2	+19.3	+32.3	+10.3	+36.2	+0.5	+37.7	− 9.2	+36.6	−18.4	+33.0
6	+26.6	+26.5	+18.9	+32.5	+9.8	+36.3	+0.1	+37.7	− 9.7	+36.5	−18.8	+32.8
9	+26.3	+26.9	+18.4	+32.8	+9.3	+36.5	−0.4	+37.7	−10.2	+36.4	−19.3	+32.5
12	+25.9	+27.2	+18.0	+33.0	+8.8	+36.6	−0.9	+37.7	−10.7	+36.2	−19.7	+32.3
15	+25.6	+27.6	+17.6	+33.3	+8.4	+36.7	−1.4	+37.7	−11.1	+36.1	−20.1	+32.0
18	+25.2	+27.9	+17.1	+33.5	+7.9	+36.8	−1.9	+37.7	−11.6	+35.9	−20.5	+31.7
21	+24.9	+28.2	+16.7	+33.7	+7.4	+36.9	−2.4	+37.6	−12.1	+35.8	−20.9	+31.5
24	+24.5	+28.6	+16.3	+33.9	+6.9	+37.0	−2.9	+37.6	−12.6	+35.6	−21.3	+31.2
27	+24.1	+28.9	+15.8	+34.1	+6.4	+37.1	−3.4	+37.6	−13.0	+35.5	−21.8	+30.9
30	+23.7	+29.2	+15.4	+34.3	+5.9	+37.2	−3.9	+37.5	−13.5	+35.3	−22.2	+30.6
33	+23.3	+29.5	+14.9	+34.5	+5.5	+37.3	−4.4	+37.5	−13.9	+35.1	−22.6	+30.3
36	+23.0	+29.8	+14.5	+34.7	+5.0	+37.3	−4.9	+37.4	−14.4	+34.9	−23.0	+30.0
39	+22.6	+30.1	+14.0	+34.9	+4.5	+37.4	−5.4	+37.4	−14.9	+34.7	−23.3	+29.7
42	+22.2	+30.4	+13.5	+35.1	+4.0	+37.5	−5.9	+37.3	−15.3	+34.5	−23.7	+29.4
45	+21.8	+30.7	+13.1	+35.3	+3.5	+37.5	−6.3	+37.2	−15.8	+34.3	−24.1	+29.1
48	+21.4	+31.0	+12.6	+35.4	+3.0	+37.6	−6.8	+37.1	−16.2	+34.1	−24.5	+28.8
51	+21.0	+31.2	+12.2	+35.6	+2.5	+37.6	−7.3	+37.0	−16.7	+33.9	−24.9	+28.5
54	+20.5	+31.5	+11.7	+35.8	+2.0	+37.6	−7.8	+36.9	−17.1	+33.7	−25.2	+28.1
57	+20.1	+31.8	+11.2	+35.9	+1.5	+37.7	−8.3	+36.8	−17.5	+33.5	−25.6	+27.8
60	+19.7	+32.0	+10.7	+36.1	+1.0	+37.7	−8.8	+36.7	−18.0	+33.2	−26.0	+27.5
Lat.												
°												
00	−0.2	+0.2	−0.2	+0.2	−0.2	+0.1	− 0.2	−0.1	−0.2	−0.2	−0.2	−0.2
10	−0.1	+0.2	−0.2	+0.2	−0.2	+0.1	− 0.2	0.0	−0.2	−0.1	−0.1	−0.2
20	−0.1	+0.2	−0.1	+0.1	−0.2	+0.1	− 0.2	0.0	−0.1	−0.1	−0.1	−0.2
30	−0.1	+0.1	−0.1	+0.1	−0.1	0.0	− 0.1	0.0	−0.1	−0.1	−0.1	−0.1
Month												
Jan.	−0.1	−0.1	−0.1	−0.2	−0.1	−0.2	0.0	− 0.2	0.0	−0.2	+0.1	−0.2
Feb.	−0.3	−0.1	−0.2	−0.1	−0.2	−0.2	− 0.1	− 0.2	−0.1	−0.3	0.0	−0.3
Mar.	−0.3	+0.1	−0.3	0.0	−0.3	−0.1	− 0.3	− 0.2	−0.2	−0.3	−0.2	−0.3
Apr.	−0.3	+0.2	−0.4	+0.1	−0.4	0.0	− 0.4	− 0.1	−0.3	−0.2	−0.3	−0.3
May	−0.2	+0.3	−0.3	+0.3	−0.4	+0.2	− 0.4	+0.1	−0.4	0.0	−0.4	−0.1
Jun.	−0.1	+0.4	−0.2	+0.3	−0.2	+0.3	− 0.3	+0.2	−0.4	+0.1	−0.4	0.0
Jul.	+0.1	+0.3	0.0	+0.3	−0.1	+0.3	− 0.2	+0.3	−0.2	+0.2	−0.3	+0.2
Aug.	+0.2	+0.2	+0.1	+0.2	+0.1	+0.3	0.0	+0.3	−0.1	+0.3	−0.1	+0.2
Sep.	+0.3	0.0	+0.3	+0.1	+0.2	+0.2	+0.2	+0.2	+0.1	+0.3	+0.1	+0.3
Oct.	+0.3	−0.2	+0.3	−0.1	+0.3	0.0	+0.3	+0.1	+0.3	+0.2	+0.2	+0.2
Nov.	+0.2	−0.4	+0.3	−0.3	+0.4	−0.2	+0.4	− 0.1	+0.4	0.0	+0.4	+0.1
Dec.	+0.1	−0.5	+0.2	−0.4	+0.3	−0.4	+0.4	− 0.3	+0.5	−0.2	+0.5	0.0

LATITUDE OF OBSERVER IS THE SUM OF CORRECTED OBSERVED ALTITUDE OF POLARIS AND $(a_o + a_1 + a_2)$
AZIMUTH OF POLARIS IS THE PRODUCT OF $(b_0 + b_1 + b_2)$ BY SECANT OF LATITUDE

TABLE I

Mean Solar into Sidereal Time
(to be added to a Mean Time Interval)

	0^h	1^h	2^h	3^h	4^h	5^h	6^h	7^h	8^h	9^h	10^h	11^h
m	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s
0	0 00.0	0 09.9	0 19.7	0 29.6	0 39.4	0 49.3	0 59.1	1 09.0	1 18.9	1 28.7	1 38.6	1 48.4
1	0 00.2	0 10.0	0 19.9	0 29.7	0 39.6	0 49.4	0 59.3	1 09.2	1 19.0	1 28.9	1 38.7	1 48.6
2	0 00.3	0 10.2	0 20.0	0 29.9	0 39.8	0 49.6	0 59.5	1 09.3	1 19.2	1 29.0	1 38.9	1 48.8
3	0 00.5	0 10.3	0 20.2	0 30.1	0 39.9	0 49.8	0 59.6	1 09.5	1 19.3	1 29.2	1 39.1	1 48.9
4	0 00.7	0 10.5	0 20.4	0 30.2	0 40.1	0 49.9	0 59.8	1 09.7	1 19.5	1 29.4	1 39.2	1 49.1
5	0 00.8	0 10.7	0 20.5	0 30.4	0 40.2	0 50.1	1 00.0	1 09.8	1 19.7	1 29.5	1 39.4	1 49.2
6	0 01.0	0 10.8	0 20.7	0 30.6	0 40.4	0 50.3	1 00.1	1 10.0	1 19.8	1 29.7	1 39.6	1 49.4
7	0 01.2	0 11.0	0 20.9	0 30.7	0 40.6	0 50.4	1 00.3	1 10.1	1 20.0	1 29.9	1 39.7	1 49.6
8	0 01.3	0 11.2	0 21.0	0 30.9	0 40.7	0 50.6	1 00.5	1 10.3	1 20.2	1 30.0	1 39.9	1 49.7
9	0 01.5	0 11.3	0 21.2	0 31.0	0 40.9	0 50.8	1 00.6	1 10.5	1 20.3	1 30.2	1 40.0	1 49.9
10	0 01.6	0 11.5	0 21.4	0 31.2	0 41.1	0 50.9	1 00.8	1 10.6	1 20.5	1 30.4	1 40.2	1 50.1
11	0 01.8	0 11.7	0 21.5	0 31.4	0 41.2	0 51.1	1 00.9	1 10.8	1 20.7	1 30.5	1 40.4	1 50.2
12	0 02.0	0 11.8	0 21.7	0 31.5	0 41.4	0 51.3	1 01.1	1 11.0	1 20.8	1 30.7	1 40.5	1 50.4
13	0 02.1	0 12.0	0 21.8	0 31.7	0 41.6	0 51.4	1 01.3	1 11.1	1 21.0	1 30.8	1 40.7	1 50.6
14	0 02.3	0 12.2	0 22.0	0 31.9	0 41.7	0 51.6	1 01.4	1 11.3	1 21.2	1 31.0	1 40.9	1 50.7
15	0 02.5	0 12.3	0 22.2	0 32.0	0 41.9	0 51.7	1 01.6	1 11.5	1 21.3	1 31.2	1 41.0	1 50.9
16	0 02.6	0 12.5	0 22.3	0 32.2	0 42.1	0 51.9	1 01.8	1 11.6	1 21.5	1 31.3	1 41.2	1 51.0
17	0 02.8	0 12.6	0 22.5	0 32.4	0 42.2	0 52.1	1 01.9	1 11.8	1 21.6	1 31.5	1 41.1	1 51.2
18	0 03.0	0 12.8	0 22.7	0 32.5	0 42.4	0 52.2	1 02.1	1 12.0	1 21.8	1 31.7	1 41.5	1 51.4
19	0 03.1	0 13.0	0 22.8	0 32.7	0 42.5	0 52.4	1 02.3	1 12.1	1 22.0	1 31.8	1 41.7	1 51.5
20	0 03.3	0 13.1	0 23.0	0 32.9	0 42.7	0 52.6	1 02.4	1 12.3	1 22.1	1 32.0	1 41.8	1 51.7
21	0 03.4	0 13.3	0 23.2	0 33.0	0 42.9	0 52.7	1 02.6	1 12.4	1 22.3	1 32.2	1 42.0	1 51.9
22	0 03.6	0 13.5	0 23.3	0 33.2	0 43.0	0 52.9	1 02.8	1 12.6	1 22.5	1 32.3	1 42.2	1 52.0
23	0 03.8	0 13.6	0 23.5	0 33.3	0 43.2	0 53.1	1 02.9	1 12.8	1 22.6	1 32.5	1 42.3	1 52.2
24	0 03.9	0 13.8	0 23.7	0 33.5	0 43.4	0 53.2	1 03.1	1 13.0	1 22.8	1 32.7	1 42.5	1 52.4
25	0 04.1	0 14.0	0 23.8	0 33.7	0 43.5	0 53.4	1 03.2	1 13.1	1 23.0	1 32.8	1 42.7	1 52.5
26	0 04.3	0 14.1	0 24.0	0 33.8	0 43.7	0 53.6	1 03.4	1 13.3	1 23.1	1 33.0	1 42.8	1 52.7
27	0 04.4	0 14.3	0 24.1	0 34.0	0 43.9	0 53.7	1 03.6	1 13.4	1 23.3	1 33.1	1 43.0	1 52.9
28	0 04.6	0 14.5	0 24.3	0 34.2	0 44.0	0 53.9	1 03.7	1 13.6	1 23.5	1 33.3	1 43.2	1 53.0
29	0 04.8	0 14.6	0 24.5	0 34.3	0 44.2	0 54.0	1 03.9	1 13.8	1 23.6	1 33.5	1 43.3	1 53.2
30	0 04.9	0 14.8	0 24.6	0 34.5	0 44.4	0 54.2	1 04.1	1 13.9	1 23.8	1 33.6	1 43.6	1 53.3
31	0 05.1	0 14.9	0 24.8	0 34.7	0 44.5	0 54.4	1 04.2	1 14.1	1 23.9	1 33.8	1 43.7	1 53.5
32	0 05.3	0 15.1	0 25.0	0 34.8	0 44.7	0 54.5	1 04.4	1 14.3	1 24.1	1 34.0	1 43.8	1 53.7
33	0 05.4	0 15.3	0 25.1	0 35.0	0 44.8	0 54.7	1 04.6	1 14.4	1 24.3	1 34.1	1 44.0	1 54.7
34	0 05.6	0 15.4	0 25.3	0 35.2	0 45.0	0 54.9	1 04.7	1 14.6	1 24.4	1 34.3	1 44.2	1 54.0
35	0 05.8	0 15.6	0 25.5	0 35.3	0 45.2	0 55.0	1 04.9	1 14.7	1 24.6	1 34.5	1 44.3	1 54.2
36	0 05.9	0 15.8	0 25.6	0 35.5	0 45.3	0 55.2	1 05.1	1 14.9	1 24.8	1 34.6	1 44.5	1 54.3
37	0 06.1	0 15.9	0 25.8	0 35.6	0 45.5	0 55.4	1 05.2	1 15.1	1 24.9	1 34.8	1 44.6	1 54.5
38	0 06.2	0 16.1	0 26.0	0 35.8	0 45.7	0 55.5	1 05.4	1 15.2	1 25.1	1 35.0	1 44.8	1 54.7
39	0 06.4	0 16.3	0 26.1	0 36.0	0 45.8	0 55.7	1 05.5	1 15.4	1 25.3	1 35.1	1 45.0	1 54.8
40	0 06.6	0 16.4	0 26.3	0 36.1	0 46.0	0 55.9	1 05.6	1 15.6	1 25.4	1 35.3	1 45.1	1 55.0
41	0 06.7	0 16.6	0 26.4	0 36.3	0 46.2	0 56.0	1 05.9	1 15.7	1 25.6	1 35.4	1 45.3	1 55.2
42	0 06.9	0 16.8	0 26.6	0 36.5	0 46.3	0 56.2	1 06.0	1 15.9	1 25.8	1 35.6	1 45.5	1 55.3
43	0 07.1	0 16.9	0 26.8	0 36.6	0 46.5	0 56.3	1 06.2	1 16.1	1 25.9	1 35.8	1 45.6	1 55.5
44	0 07.2	0 17.1	0 26.9	0 36.8	0 46.7	0 56.5	1 06.4	1 16.2	1 26.1	1 35.9	1 45.8	1 55.6
45	0 07.4	0 17.2	0 27.1	0 37.0	0 46.8	0 56.7	1 06.5	1 16.4	1 26.2	1 36.1	1 46.0	1 55.8
46	0 07.6	0 17.4	0 27.3	0 37.1	0 47.0	0 56.8	1 06.7	1 16.6	1 26.4	1 36.3	1 46.1	1 56.0
47	0 07.7	0 17.6	0 27.4	0 37.3	0 47.1	0 57.0	1 06.9	1 16.7	1 26.6	1 36.4	1 46.3	1 56.1
48	0 07.9	0 17.7	0 27.6	0 37.5	0 47.3	0 57.2	1 07.0	1 16.9	1 26.7	1 36.6	1 46.4	1 56.3
49	0 08.0	0 17.9	0 27.8	0 37.6	0 47.5	0 57.3	1 07.2	1 17.0	1 26.9	1 36.8	1 46.6	1 56.5
50	0 08.2	0 18.1	0 27.9	0 37.8	0 47.6	0 57.5	1 07.4	1 17.2	1 27.1	1 36.9	1 46.8	1 56.6
51	0 08.4	0 18.2	0 28.1	0 37.9	0 47.8	0 57.7	1 07.5	1 17.4	1 27.2	1 37.1	1 46.9	1 56.8
52	0 08.5	0 18.4	0 28.3	0 38.1	0 48.0	0 57.8	1 07.7	1 17.5	1 27.4	1 37.3	1 47.1	1 57.0
53	0 08.7	0 18.6	0 28.4	0 38.3	0 48.1	0 58.0	1 07.8	1 17.7	1 27.6	1 37.4	1 47.3	1 57.1
54	0 08.9	0 18.7	0 28.6	0 38.4	0 48.3	0 58.2	1 08.0	1 17.9	1 27.7	1 37.6	1 47.4	1 57.3
55	0 09.0	0 18.9	0 28.7	0 38.6	0 48.5	0 58.3	1 08.2	1 18.0	1 27.9	1 37.7	1 47.6	1 57.5
56	0 09.2	0 19.1	0 28.9	0 38.8	0 48.6	0 58.5	1 08.3	1 18.2	1 28.1	1 37.9	1 47.8	1 57.6
57	0 09.4	0 19.2	0 29.1	0 38.9	0 48.8	0 58.6	1 08.5	1 18.4	1 28.2	1 38.1	1 47.9	1 57.8
58	0 09.5	0 19.4	0 29.2	0 39.1	0 49.0	0 58.8	1 08.7	1 18.5	1 28.4	1 38.2	1 48.1	1 57.9
59	0 09.7	0 19.6	0 29.4	0 39.3	0 49.1	0 59.0	1 08.8	1 18.7	1 28.5	1 38.4	1 48.3	1 58.1

TABLE I

Mean Solar into Sidereal Time

(to be added to a Mean Time Interval)

	12^h	13^h	14^h	15^h	16^h	17^h	18^h	19^h	20^h	21^h	22^h	23^h
m	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s
0	1 58.3	2 08.1	2 18.0	2 27.8	2 37.7	2 47.6	2 57.4	3 07.3	3 17.1	3 27.0	3 36.8	3 46.7
1	1 58.4	2 08.3	2 18.2	2 28.0	2 37.9	2 47.7	2 57.6	3 07.4	3 17.3	3 27.2	3 37.0	3 46.9
2	1 58.6	2 08.5	2 18.3	2 28.2	2 38.0	2 47.9	2 57.7	3 07.6	3 17.5	3 27.3	3 37.2	3 47.0
3	1 58.8	2 08.6	2 18.5	2 28.3	2 38.2	2 48.1	2 57.9	3 07.8	3 17.6	3 27.5	3 37.3	3 47.2
4	1 58.9	2 08.8	2 18.6	2 28.5	2 38.4	2 48.2	2 58.1	3 07.9	3 17.8	3 27.6	3 37.5	3 47.4
5	1 59.1	2 09.0	2 18.8	2 28.7	2 33.5	2 48.4	2 58.2	3 08.1	3 18.0	3 27.8	3 37.7	3 47.5
6	1 59.3	2 09.1	2 19.0	2 28.8	2 38.7	2 48.5	2 58.5	3 08.3	3 18.1	3 28.0	3 37.8	3 47.7
7	1 59.4	2 09.3	2 19.1	2 29.0	2 38.9	2 48.7	2 58.6	3 08.4	3 18.3	3 28.1	3 38.0	3 47.8
8	1 59.6	2 09.4	2 19.3	2 29.2	2 39.0	2 48.9	2 58.7	3 08.6	3 18.4	3 28.3	3 38.2	3 48.0
9	1 59.8	2 09.6	2 19.5	2 29.3	2 39.2	2 49.0	2 58.9	3 08.8	3 18.6	3 28.5	3 38.3	3 48.2
10	1 59.9	2 09.8	2 19.6	2 29.5	2 39.3	2 49.2	2 59.1	3 08.9	3 18.8	3 28.6	3 38.5	3 48.3
11	2 00.1	2 09.9	2 19.8	2 29.7	2 39.5	2 49.5	2 59.2	3 09.1	3 18.9	3 28.8	3 38.6	3 48.5
12	2 00.2	2 0.10	2 20.0	2 29.8	2 39.7	2 49.5	2 59.4	3 09.2	3 19.1	3 29.0	3 38.8	3 48.7
13	2 00.4	2 10.3	2 20.1	2 30.0	2 39.8	2 49.7	2 59.6	3 09.4	3 19.3	3 29.1	3 39.0	3 48.8
14	2 00.6	2 10.4	2 20.3	2 30.1	2 40.0	2 49.9	2 59.7	3 09.6	3 19.4	3 29.3	3 39.1	3 49.0
15	2 00.7	2 10.6	2 20.5	2 30.3	2 40.2	2 50.0	2 59.9	3 09.7	3 19.6	3 29.4	3 39.3	3 49.2
16	2 00.9	2 10.8	2 20.6	2 30.5	2 40.3	2 50.2	3 00.0	3 09.9	3 19.8	3 29.6	3 39.5	3 49.3
17	2 01.1	2 10.9	2 20.8	2 30.6	2 40.5	2 50.4	3 00.2	3 10.1	3 19.9	3 29.8	3 39.6	3 49.5
18	2 01.2	2 11.1	2 20.9	2 30.8	2 40.7	2 50.5	3 00.4	3 10.2	3 20.1	3 29.9	3 39.8	3 49.7
19	2 01.4	2 11.3	2 21.1	2 31.0	2 40.8	2 50.7	3 00.5	3 10.4	3 20.3	3 30.1	3 40.0	3 49.8
20	2 01.6	2 11.4	2 21.3	2 31.1	2 41.0	2 50.8	3 00.7	3 10.6	3 20.4	3 30.3	3 40.1	3 50.0
21	2 01.7	2 11.6	2 21.4	2 31.3	2 41.2	2 51.0	3 00.9	3 10.7	3 20.6	3 30.4	3 40.3	3 50.1
22	2 01.9	2 11.7	2 21.6	2 31.5	2 41.3	2 51.2	3 01.3	3 10.9	3 20.7	3 30.6	3 40.5	3 50.3
23	2 02.1	2 11.9	2 21.8	2 31.6	2 41.5	2 51.3	3 01.2	3 11.1	3 20.9	3 30.8	3 40.6	3 50.5
24	2 02.2	2 12.1	2 21.9	2 31.8	2 41.6	2 51.5	3 01.4	3 11.2	3 21.1	3 30.9	3 40.8	3 50.6
25	2 02.4	2 12.2	2 22.1	2 32.0	2 41.8	2 51.7	3 01.5	3 11.4	3 21.2	3 31.1	3 40.9	3 50.8
26	2 02.5	2 12.4	2 22.3	2 32.1	2 42.0	2 51.8	3 01.7	3 11.5	3 21.4	3 31.3	3 41.1	3 51.0
27	2 02.7	2 12.6	2 22.4	2 32.3	2 42.1	2 52.0	3 01.9	3 11.7	3 21.6	3 31.4	3 41.3	3 51.1
28	2 02.9	2 12.7	2 22.6	2 32.4	2 42.3	2 52.2	3 02.0	3 11.9	3 21.7	3 31.6	3 41.4	3 51.3
29	2 03.0	2 12.9	2 22.8	2 32.6	2 42.5	2 52.3	3 02.2	3 12.0	3 21.9	3 31.8	3 41.6	3 51.5
30	2 03.2	2 13.1	2 22.9	2 32.8	2 42.6	2 52.5	3 02.3	3 12.2	3 22.1	3 31.9	3 41.8	3 51.6
31	2 03.4	2 13.2	2 23.1	2 32.9	2 42.8	2 52.7	3 02.5	3 12.4	3 22.2	3 32.1	3 41.9	3 51.8
32	2 03.5	2 13.4	2 23.2	2 33.1	2 43.0	2 52.8	3 02.7	3 12.5	3 22.4	3 32.2	3 42.1	3 52.0
33	2 03.7	2 13.6	2 23.4	2 33.3	2 43.1	2 53.0	3 02.8	3 12.7	3 22.6	3 32.4	3 42.3	3 52.1
34	2 03.9	2 13.7	2 23.6	2 33.4	2 43.3	2 53.1	3 03.0	3 12.9	3 22.7	3 32.6	3 42.4	3 52.3
35	2 04.0	2 13.9	2 23.7	2 33.6	2 43.5	2 53.3	3 03.2	3 13.0	3 22.9	3 32.7	3 42.6	3 52.4
36	2 04.2	2 14.0	2 23.9	2 33.8	2 43.6	2 53.3	3 03.3	3 13.2	3 23.0	3 32.9	3 42.8	3 52.6
37	2 04.4	2 14.2	2 24.1	2 33.9	2 43.8	2 53.6	3 03.5	3 13.4	3 23.2	3 33.1	3 42.9	3 52.8
38	2 04.5	2 14.4	2 24.2	2 34.1	2 43.9	2 53.8	3 03.7	3 13.5	3 23.4	3 33.2	3 43.1	3 52.9
39	2 04.7	2 14.5	2 24.4	2 34.3	2 44.1	2 54.0	3 03.8	3 13.7	3 23.5	3 33.4	3 43.2	3 53.1
40	2 04.8	2 14.7	2 24.6	2 34.4	2 44.3	2 54.1	3 04.0	3 13.8	3 23.7	3 33.6	3 43.3	3 53.3
41	2 05.0	2 14.9	2 24.7	2 34.6	2 44.4	2 54.3	3 04.2	3 14.0	3 23.9	3 33.7	3 43.6	3 53.4
42	2 05.2	2 15.0	2 24.9	2 34.7	2 44.6	2 54.5	3 04.3	3 14.2	3 24.0	3 33.9	3 43.7	3 53.6
43	2 05.3	2 15.2	2 25.1	2 34.9	2 44.8	2 54.6	3 04.5	3 14.3	3 24.2	3 34.0	3 43.9	3 53.8
44	2 05.5	2 15.4	2 25.2	2 35.1	2 44.9	2 54.8	3 04.6	3 14.5	3 24.4	3 34.2	3 44.1	3 53.9
45	2 05.7	2 15.5	2 25.4	2 35.2	2 45.1	2 55.0	3 04.8	3 14.7	3 24.5	3 34.4	3 44.2	3 54.1
46	2 05.8	2 15.7	2 25.5	2 35.4	2 45.3	2 55.1	3 05.0	3 14.8	3 24.7	3 34.5	3 44.4	3 54.3
47	2 06.0	2 15.9	2 25.7	2 35.6	2 45.4	2 55.3	3 05.1	3 15.0	3 24.8	3 34.7	3 44.6	3 54.4
48	2 06.2	2 16.0	2 25.9	2 35.7	2 45.6	2 55.4	3 05.3	3 15.2	3 25.0	3 34.9	3 44.7	3 54.6
49	2 06.3	2 16.2	2 26.0	2 35.9	2 45.8	2 55.6	3 05.5	3 15.3	3 25.2	3 35.0	3 44.9	3 54.7
50	2 06.5	2 16.3	2 26.2	2 36.1	2 45.9	2 55.8	3 05.6	3 15.5	3 25.3	3 35.2	3 45.1	3 54.9
51	2 06.7	2 16.5	2 26.4	2 36.2	2 46.1	2 55.9	3 05.8	3 15.7	3 25.5	3 35.4	3 45.2	3 55.1
52	2 06.8	2 16.7	2 26.5	2 36.4	2 46.2	2 56.1	3 06.0	3 15.8	3 25.7	3 35.5	3 45.4	3 55.2
53	2 07.0	2 16.8	2 26.7	2 36.6	2 46.4	2 56.3	3 06.1	3 16.0	3 25.8	3 35.7	3 45.5	3 55.4
54	2 07.1	2 17.0	2 26.9	2 36.7	2 46.6	2 56.4	3 06.3	3 16.1	3 26.0	3 35.9	3 45.7	3 55.6
55	2 07.3	2 17.2	2 27.0	2 36.9	2 46.7	2 56.6	3 06.5	3 16.3	3 26.2	3 36.0	3 45.9	3 55.7
56	2 07.5	2 17.3	2 27.2	2 37.0	2 47.9	2 56.8	3 06.6	3 16.5	3 26.3	3 36.2	3 46.0	3 55.9
57	2 07.6	2 17.5	2 27.4	2 37.2	2 47.1	2 57.9	3 06.8	3 16.6	3 26.5	3 36.4	3 46.2	3 56.1
58	2 07.8	2 17.7	2 27.5	2 37.4	2 47.2	2 57.1	3 06.9	3 16.8	3 26.7	3 36.5	3 46.4	3 56.2
59	2 08.0	2 17.8	2 27.7	2 37.5	2 47.4	2 57.3	3 07.1	3 17.0	3 26.8	3 36.7	3 46.5	3 56.4

TABLE II

Sidereal into Mean Solar Time

(to be subtracted from a Sidereal Time Interval)

m	0^h	1^h	2^h	3^h	4^h	5^h	6^h	7^h	8^h	9^h	10^h	11^h
	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s
0	0 00.0	0 09.8	0 19.7	0 29.5	0 39.3	0 49.1	0 59.0	1 08.8	1 18.6	1 28.5	1 38.3	1 48.1
1	0 00.2	0 10.0	0 19.8	0 29.7	0 39.5	0 49.3	0 59.1	1 09.0	1 18.8	1 28.6	1 38.5	1 48.3
2	0 00.3	0 10.2	0 20.0	0 29.8	0 39.6	0 49.5	0 59.3	1 09.1	1 19.0	1 28.8	1 38.6	1 48.5
3	0 00.5	0 10.3	0 20.2	0 30.0	0 39.8	0 49.6	0 59.5	1 09.3	1 19.1	1 29.0	1 38.8	1 48.6
4	0 00.7	0 10.5	0 20.3	0 30.1	0 40.0	0 49.8	0 59.6	1 09.5	1 19.3	1 29.1	1 39.0	1 48.8
5	0 00.8	0 10.6	0 20.5	0 30.3	0 40.1	0 50.0	0 59.8	1 09.6	1 19.5	1 29.3	1 39.1	1 48.9
6	0 01.0	0 10.8	0 20.6	0 30.5	0 40.3	0 50.2	1 00.0	1 09.8	1 19.6	1 29.4	1 39.3	1 49.1
7	0 01.1	0 11.0	0 20.8	0 30.6	0 40.5	0 50.3	1 00.1	1 10.0	1 19.8	1 29.6	1 39.4	1 49.3
8	0 01.3	0 11.1	0 21.0	0 30.8	0 40.6	0 50.5	1 00.3	1 10.1	1 19.9	1 29.8	1 39.6	1 49.4
9	0 01.5	0 11.3	0 21.1	0 31.0	0 40.8	0 50.6	1 00.5	1 10.3	1 20.1	1 29.9	1 39.8	1 49.6
10	0 01.6	0 11.5	0 21.3	0 31.1	0 41.0	0 50.8	1 00.6	1 10.4	1 20.3	1 30.1	1 39.9	1 49.8
11	0 01.8	0 11.6	0 21.5	0 31.3	0 41.1	0 51.0	1 00.8	1 10.6	1 20.4	1 30.3	1 40.1	1 49.9
12	0 02.0	0 11.8	0 21.6	0 31.5	0 41.3	0 51.1	1 00.9	1 10.8	1 20.6	1 30.4	1 40.3	1 50.1
13	0 02.1	0 12.0	0 21.8	0 31.6	0 41.4	0 51.3	1 01.1	1 10.9	1 20.8	1 30.6	1 40.4	1 50.3
14	0 02.3	0 12.1	0 22.0	0 31.8	0 41.6	0 51.4	1 01.3	1 11.1	1 20.9	1 30.8	1 40.6	1 50.4
15	0 02.5	0 12.3	0 22.1	0 31.9	0 41.8	0 51.6	1 01.4	1 11.3	1 21.1	1 30.9	1 40.8	1 50.6
16	0 02.6	0 12.5	0 22.3	0 32.1	0 41.9	0 51.8	1 01.6	1 11.4	1 21.3	1 31.1	1 40.9	1 50.7
17	0 02.8	0 12.6	0 22.4	0 32.3	0 42.1	0 51.9	1 01.8	1 11.6	1 21.4	1 31.3	1 41.1	1 50.9
18	0 02.9	0 12.8	0 22.6	0 32.4	0 42.3	0 52.1	1 01.9	1 11.8	1 21.6	1 31.4	1 41.2	1 51.1
19	0 03.1	0 12.9	0 22.8	0 32.6	0 42.4	0 52.3	1 02.1	1 11.9	1 21.7	1 31.6	1 41.4	1 51.2
20	0 03.3	0 13.1	0 22.9	0 32.8	0 42.6	0 52.4	1 02.3	1 12.1	1 21.9	1 31.7	1 41.6	1 51.4
21	0 03.4	0 13.3	0 23.1	0 32.9	0 42.8	0 52.6	1 02.4	1 12.2	1 22.1	1 31.9	1 41.7	1 51.6
22	0 03.6	0 13.4	0 23.3	0 33.1	0 42.9	0 52.8	1 02.6	1 12.4	1 22.2	1 32.1	1 41.9	1 51.7
23	0 03.8	0 13.6	0 23.4	0 33.3	0 43.1	0 52.9	1 02.7	1 12.6	1 22.4	1 32.2	1 42.1	1 51.9
24	0 03.9	0 13.8	0 23.6	0 33.4	0 43.2	0 53.1	1 02.9	1 12.7	1 22.6	1 32.4	1 42.2	1 52.1
25	0 04.1	0 13.9	0 23.6	0 33.6	0 43.4	0 53.2	1 03.1	1 12.9	1 22.7	1 32.6	1 42.4	1 52.2
26	0 04.3	0 14.1	0 23.9	0 33.7	0 43.6	0 53.4	1 03.2	1 13.1	1 22.9	1 32.7	1 42.6	1 52.4
27	0 04.4	0 14.3	0 24.1	0 33.9	0 43.7	0 53.6	1 03.4	1 13.2	1 23.1	1 32.9	1 42.7	1 52.5
28	0 04.6	0 14.4	0 24.2	0 34.1	0 43.9	0 53.7	1 03.6	1 13.4	1 23.2	1 33.1	1 42.9	1 52.7
29	0 04.8	0 14.6	0 24.4	0 34.2	0 44.1	0 53.9	1 03.7	1 13.6	1 23.4	1 33.2	1 43.0	1 52.9
30	0 04.9	0 14.7	0 24.6	0 34.4	0 44.2	0 54.1	1 03.9	1 13.7	1 23.6	1 33.4	1 43.2	1 53.0
31	0 05.1	0 14.9	0 24.7	0 34.6	0 44.4	0 54.2	1 04.1	1 13.9	1 23.7	1 33.5	1 43.4	1 53.2
32	0 05.2	0 15.1	0 24.9	0 34.7	0 44.6	0 54.4	1 04.2	1 14.0	1 23.9	1 33.7	1 43.5	1 53.4
33	0 05.4	0 15.2	0 25.1	0 34.9	0 44.7	0 54.6	1 04.4	1 14.2	1 24.0	1 33.9	1 43.7	1 53.5
34	0 05.6	0 15.4	0 25.2	0 35.1	0 44.9	0 54.7	1 04.5	1 14.4	1 24.2	1 34.0	1 43.9	1 53.7
35	0 05.7	0 15.6	0 25.4	0 35.2	0 45.1	0 54.9	1 04.7	1 14.5	1 24.4	1 34.2	1 44.0	1 53.9
36	0 05.9	0 15.7	0 25.6	0 35.4	0 45.2	0 55.0	1 04.9	1 14.7	1 24.5	1 34.4	1 44.2	1 54.0
37	0 06.1	0 15.9	0 25.7	0 35.6	0 45.4	0 55.2	1 05.0	1 14.9	1 24.7	1 34.5	1 44.4	1 54.2
38	0 06.2	0 16.1	0 25.9	0 35.7	0 45.5	0 55.4	1 05.2	1 15.0	1 24.9	1 34.7	1 44.5	1 54.4
39	0 06.4	0 16.2	0 26.0	0 35.9	0 45.7	0 55.5	1 05.4	1 15.2	1 25.0	1 34.9	1 44.7	1 54.5
40	0 06.6	0 16.4	0 26.2	0 36.0	0 45.9	0 55.7	1 05.5	1 15.4	1 25.2	1 35.0	1 44.8	1 54.7
41	0 06.7	0 16.5	0 26.4	0 36.2	0 46.0	0 55.9	1 05.7	1 15.5	1 25.4	1 35.2	1 45.0	1 54.8
42	0 06.9	0 16.7	0 26.5	0 36.4	0 46.2	0 56.0	1 05.9	1 15.7	1 25.5	1 35.3	1 45.2	1 55.0
43	0 07.0	0 16.9	0 26.7	0 36.5	0 46.4	0 56.2	1 06.0	1 15.9	1 25.7	1 35.5	1 45.3	1 55.2
44	0 07.2	0 17.0	0 26.9	0 36.7	0 56.5	0 56.4	1 06.2	1 16.0	1 25.8	1 35.7	1 45.5	1 55.3
45	0 07.4	0 17.2	0 27.0	0 36.9	0 46.7	0 56.5	1 06.4	1 16.2	1 26.0	1 35.8	1 45.7	1 55.5
46	0 07.5	0 17.4	0 27.2	0 37.0	0 46.9	0 56.7	1 06.5	1 16.3	1 26.2	1 36.0	1 45.8	1 55.7
47	0 07.7	0 17.5	0 27.4	0 37.2	0 47.0	0 56.8	1 06.7	1 16.5	1 26.3	1 36.2	1 46.0	1 55.8
48	0 07.9	0 17.7	0 27.5	0 37.4	0 47.2	0 57.0	1 06.8	1 16.7	1 26.5	1 36.3	1 46.2	1 56.0
49	0 08.0	0 17.9	0 27.7	0 37.5	0 47.3	0 57.2	1 07.0	1 16.8	1 26.7	1 36.5	1 46.3	1 56.2
50	0 08.2	0 18.0	0 27.8	0 37.7	0 47.5	0 57.3	1 07.2	1 17.0	1 26.8	1 36.7	1 46.5	1 56.3
51	0 08.4	0 18.2	0 28.0	0 37.8	0 47.7	0 57.5	1 07.3	1 17.2	1 27.0	1 36.8	1 46.7	1 56.5
52	0 08.5	0 18.3	0 28.2	0 38.0	0 47.8	0 57.7	1 07.5	1 17.3	1 27.2	1 37.0	1 46.8	1 56.6
53	0 08.7	0 18.5	0 28.3	0 38.2	0 48.0	0 57.8	1 07.7	1 17.5	1 27.3	1 37.1	1 47.0	1 56.8
54	0 08.8	0 18.6	0 28.5	0 38.3	0 48.2	0 58.0	1 07.8	1 17.7	1 27.5	1 37.3	1 47.1	1 57.0
55	0 09.0	0 18.8	0 28.7	0 38.5	0 48.3	0 58.2	1 08.0	1 17.8	1 27.6	1 37.5	1 47.3	1 57.1
56	0 09.2	0 19.0	0 28.8	0 38.7	0 48.5	0 58.3	1 08.2	1 18.0	1 27.8	1 37.6	1 47.5	1 57.3
57	0 09.3	0 19.2	0 29.0	0 38.8	0 48.6	9 58.5	1 08.3	1 18.1	1 28.0	1 37.8	1 47.6	1 57.5
58	0 09.5	0 19.3	0 29.2	0 39.0	0 48.8	0 58.6	1 08.5	1 18.3	1 28.1	1 38.0	1 47.8	1 57.6
59	0 09.7	0 19.5	0 29.3	0 39.2	0 49.0	0 58.8	1 08.6	1 18.5	1 28.3	1 38.1	1 48.0	1 57.8

TABLE II

Sidereal into Mean Solar Time

(to be subtracted from Sidereal Time Interval)

m	12^h	13^h	14^h	15^h	16^h	17^h	18^h	19^h	20^h	21^h	22^h	23^h
	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s
0	1 58.0	2 07.8	2 17.6	2 27.4	2 37.3	2 47.1	2 56.9	3 06.8	3 16.6	3 26.4	3 36.2	3 46.1
1	1 58.1	2 07.9	2 17.8	2 27.6	2 37.4	2 47.3	2 57.1	3 06.9	3 16.8	3 26.6	3 36.4	3 46.2
2	1 58.3	2 08.1	2 17.9	2 27.8	2 37.6	2 47.4	2 57.3	3 07.1	3 16.9	3 26.7	3 36.6	3 46.4
3	1 58.4	2 08.3	2 18.1	2 27.9	2 37.8	2 47.6	2 57.4	3 07.3	3 17.1	3 26.9	3 36.7	3 46.6
4	1 58.6	2 08.4	2 18.3	2 28.1	2 37.9	2 47.8	2 57.6	3 07.4	3 17.2	3 27.1	3 36.9	3 46.8
5	1 58.8	2 08.6	2 18.4	2 28.3	2 38.1	2 47.9	2 57.8	3 07.6	3 17.4	3 27.2	3 37.1	3 46.9
6	1 58.9	2 08.8	2 18.6	2 28.4	2 38.3	2 48.0	2 57.9	3 07.7	3 17.6	3 27.4	3 37.2	3 47.1
7	1 59.1	2 08.9	2 18.8	2 28.6	2 38.4	2 48.2	2 58.1	3 07.9	3 17.7	3 27.6	3 37.4	3 47.2
8	1 59.3	2 09.1	2 18.9	2 28.8	2 38.6	2 48.4	2 58.2	3 08.1	3 17.9	3 27.7	3 37.6	3 47.4
9	1 59.4	2 09.3	2 19.1	2 28.9	2 38.7	2 48.6	2 58.4	3 08.2	3 18.1	3 27.9	3 37.7	3 47.6
10	1 59.6	2 09.4	2 19.3	2 29.1	2 38.9	2 48.7	2 58.6	3 08.4	3 18.2	3 28.1	3 37.9	3 47.7
11	1 59.8	2 09.6	2 19.4	2 29.2	2 39.1	2 48.9	2 58.8	3 08.6	3 18.4	3 28.2	3 38.1	3 47.9
12	1 59.9	2 09.9	2 19.6	2 29.4	2 39.2	2 49.1	3 58.9	3 08.7	3 18.6	3 28.4	3 38.2	3 48.0
13	2 00.1	2 09.9	2 19.7	2 29.6	2 39.4	2 49.2	2 59.1	3 08.9	3 18.7	3 28.6	3 38.4	3 48.2
14	2 00.2	2 10.1	2 19.9	2 29.7	2 39.6	2 49.4	2 59.2	3 09.1	3 18.9	3 28.7	3 38.5	3 48.4
15	2 00.4	2 10.2	2 20.1	2 29.9	2 39.7	2 49.6	2 59.4	3 09.2	3 19.0	3 28.9	3 38.7	3 48.5
16	2 00.6	2 10.4	2 20.2	2 30.1	2 39.9	2 49.7	2 59.6	3 09.4	3 19.2	3 29.0	3 38.9	3 48.7
17	2 00.7	2 10.6	2 20.4	2 30.2	2 40.1	2 49.9	2 59.7	3 09.5	3 19.4	3 29.2	3 39.0	3 48.9
18	2 00.9	2 10.7	2 20.6	2 30.4	2 40.2	2 50.1	2 59.9	3 09.7	3 19.5	3 29.4	3 39.2	3 49.0
19	2 01.1	2 10.9	2 20.7	2 30.6	3 40.4	2 50.2	3 00.0	3 09.9	3 19.7	3 29.5	3 39.4	3 49.2
20	2 01.2	2 11.1	2 20.9	2 30.7	2 40.5	2 50.4	3 00.2	3 10.0	3 19.9	3 29.7	3 39.5	3 49.4
21	2 01.4	2 11.2	2 21.1	2 30.9	2 40.7	2 50.5	3 00.4	3 10.2	3 20.0	3 29.9	3 39.7	3 49.5
22	2 01.6	2 11.4	2 21.2	2 31.0	2 40.9	2 50.7	3 00.5	3 10.4	3 20.2	3 30.0	3 39.9	3 49.7
23	2 01.7	2 11.6	2 21.4	2 31.2	2 41.0	2 50.9	3 00.7	3 10.5	3 20.4	3 30.2	3 40.0	3 49.8
24	2 01.9	2 11.7	2 21.5	2 31.4	2 41.2	2 51.0	3 00.9	3 10.7	3 20.5	3 30.4	3 40.2	3 50.0
25	2 02.0	2 11.9	2 21.7	2 31.5	2 41.4	2 51.2	3 01.0	3 10.9	3 20.7	3 30.5	3 40.3	3 50.2
26	2 02.2	2 12.0	2 21.9	2 31.7	2 41.5	2 51.4	3 01.2	3 11.0	3 20.9	3 30.7	3 40.5	3 50.3
27	2 02.4	2 12.2	2 22.0	2 31.9	2 41.7	2 51.5	3 01.4	3 11.2	3 21.0	3 30.8	3 40.7	3 50.5
28	2 02.5	2 12.4	2 22.2	2 32.0	2 41.9	2 51.7	3 01.5	3 11.3	3 21.2	3 31.0	3 40.8	3 50.7
29	2 02.7	2 12.5	2 22.4	2 32.2	2 42.0	2 51.9	3 01.7	3 11.5	3 21.3	3 31.2	3 41.0	3 50.8
30	2 02.9	2 12.7	2 22.5	2 32.4	2 42.2	2 52.0	3 01.8	3 11.7	3 21.5	3 31.3	3 41.2	3 51.0
31	2 03.0	2 12.9	2 22.7	2 32.5	2 42.4	2 52.2	3 02.0	3 11.8	3 21.7	3 31.5	3 41.3	3 51.2
32	2 03.2	2 13.0	2 22.9	2 32.7	2 42.5	2 52.3	3 02.2	3 12.0	3 21.8	3 31.7	3 41.5	3 51.3
33	2 03.4	2 13.2	2 23.0	2 32.8	2 42.7	2 52.5	3 02.3	3 12.2	3 22.0	3 31.8	3 41.7	3 51.5
34	2 03.5	2 13.4	2 23.2	2 33.0	2 42.8	2 52.7	3 02.5	3 12.3	3 22.2	3 32.0	3 41.8	3 51.6
35	2 03.7	2 13.5	2 23.3	2 33.2	2 43.0	2 52.8	3 02.6	3 12.5	3 22.3	3 32.2	3 42.0	3 51.8
36	2 03.9	2 13.7	2 23.5	2 33.3	2 43.2	2 53.0	3 02.8	3 12.7	3 22.5	3 32.3	3 42.1	3 52.0
37	2 04.0	2 13.8	2 23.7	2 33.5	2 43.3	2 53.2	3 03.0	3 12.8	3 22.7	3 32.5	3 42.3	3 52.1
38	2 04.2	2 14.0	2 23.8	2 33.7	2 43.5	2 53.3	3 03.2	3 13.0	3 22.8	3 32.6	3 42.5	3 52.3
39	2 04.3	2 14.2	2 24.0	2 33.8	2 43.7	2 53.5	3 03.3	3 13.2	3 23.0	3 32.8	3 42.6	3 52.5
40	2 04.5	2 14.3	2 24.2	2 34.0	2 43.8	2 53.7	3 03.5	3 13.3	3 23.1	3 33.0	3 42.8	3 52.6
41	2 04.7	2 14.5	2 24.3	2 34.2	2 44.0	2 53.8	3 03.6	3 13.5	3 23.3	3 33.1	3 43.0	3 52.8
42	2 04.8	2 14.7	2 24.5	2 34.3	2 44.2	2 54.0	3 03.8	3 13.6	3 23.5	3 33.3	3 43.1	3 53.0
43	2 05.0	2 14.8	2 24.7	2 34.5	2 44.3	2 54.1	3 04.0	3 13.8	3 23.6	3 33.5	3 43.3	3 53.1
44	2 05.2	2 15.0	2 24.8	2 34.7	2 44.5	2 54.3	3 04.1	3 14.0	3 23.8	3 33.6	3 43.5	3 53.3
45	2 05.3	2 15.2	2 25.0	2 34.8	2 44.6	2 54.5	3 04.3	3 14.1	3 24.0	3 33.8	3 43.6	3 53.5
46	2 05.5	2 15.3	2 25.2	2 35.0	2 44.8	2 54.6	3 04.5	3 14.3	3 24.1	3 34.0	3 43.8	3 53.6
47	2 05.7	2 15.5	2 25.3	2 35.1	2 45.0	2 54.8	3 04.6	3 14.5	3 24.3	3 34.1	3 44.0	3 53.8
48	2 05.8	2 15.6	2 25.5	2 35.3	2 45.1	2 55.0	3 04.8	3 14.6	3 24.5	3 34.3	3 44.1	3 53.9
49	2 06.0	2 15.8	2 25.6	2 35.5	2 45.3	2 55.1	3 05.0	3 14.8	3 24.6	3 34.4	3 44.3	3 54.1
50	2 06.1	2 16.0	2 25.8	2 35.6	2 45.5	2 55.3	3 05.1	3 15.0	3 24.8	3 34.6	3 44.4	3 54.3
51	2 06.3	2 16.1	2 26.0	2 35.8	2 45.6	2 55.5	3 05.3	3 15.1	3 24.9	3 34.8	3 44.6	3 54.4
52	2 06.5	2 16.3	2 26.1	2 36.0	3 45.8	2 55.6	3 05.5	3 15.3	3 25.1	3 34.9	3 44.8	3 54.6
53	2 06.6	2 16.5	2 26.3	2 36.1	2 46.0	2 55.8	3 05.6	3 15.4	3 25.3	3 35.1	3 44.9	3 54.8
54	2 06.8	2 16.6	2 26.5	2 36.3	2 46.1	2 55.9	3 05.8	3 15.6	3 25.4	3 35.3	3 45.1	3 54.9
55	2 07.0	2 16.8	2 26.6	2 36.5	2 46.3	2 56.1	3 05.9	3 15.8	3 25.6	3 35.4	3 45.3	3 55.1
56	2 07.1	2 17.0	2 26.8	2 36.6	2 46.4	2 56.3	3 06.1	3 15.9	3 25.8	3 35.6	3 45.4	3 55.3
57	2 07.3	2 17.1	2 27.0	2 36.8	2 46.6	2 56.4	3 06.3	3 16.1	3 25.9	3 35.8	3 45.6	3 55.4
58	2 07.5	2 17.3	2 27.1	2 36.9	2 46.8	2 56.6	3 06.4	3 16.3	3 26.1	3 35.9	3 45.8	3 55.6
59	2 07.6	2 17.4	2 27.3	2 37.1	2 46.9	2 56.8	3 06.6	3 16.4	3 26.3	3 36.1	3 45.9	3 55.7

TABLE III - PROVINCIAL CAPITALS AND CITIES

Place	Latitude	Reduction To Standard Time
	°	m
Angeles City	15.1	- 02
Bacolod City	10.7	- 12
Bago City	10.5	- 11
Baguio City	16.4	- 02
Bais City	09.6	- 12
Balanga, Bataan	14.7	- 02
Bangued, Abra	17.6	- 02
Basco, Batanes	20.4	- 08
Basilan City	06.7	- 08
Batangas City	13.8	- 04
Batu Batu, Tawi-Tawi	05.2	00
Bayombong, Nueva Viscaya	16.5	- 05
Boac, Marinduque	13.4	- 07
Bontoc, Mt. Province	17.1	- 04
Borongan, Eastern Samar	11.6	- 22
Butuan City	08.9	- 22
Cabanatuan City	15.5	- 04
Cabarroguis, Quirino	16.6	- 08
Cadiz City	11.0	- 13
Cagayan de Oro City	08.5	- 19
Calapan, Oriental Mindoro	13.4	- 05
Calbayog City	12.1	- 18
Caloocan City	14.6	- 04
Canlaon City	10.4	- 12
Catarman, Northern Samar	12.5	- 19
Catbalogan, Samar (Western)	11.8	- 20
Cavite City	14.5	- 04
Cebu City	10.3	- 16
Cotabato City	07.2	- 17
Daet, Camarines Norte	14.1	- 12
Dagupan City	16.0	- 01
Danao City	10.5	- 16
Dapitan City	08.7	- 14
Davao City	07.3	- 22
Digos, Davao Del Sur	06.7	- 22
Dipolog City	08.6	- 13
Dumaguete City	09.3	- 13
General Santos City	06.1	- 20
Gingoog City	08.8	- 20
Iba, Zambales	15.3	00

TABLE III - PROVINCIAL CAPITALS AND CITIES

Place	Latitude	Reduction To Standard Time
	°	m
Ilagan, Isabela	17.1	- 08
Iligan City	08.2	- 17
Iloilo City	10.7	- 10
Iriga City	13.4	- 14
Isabela, Basilan	06.7	- 08
Isulan, Sultan Kudarat	07.0	- 18
Jolo, Sulu	06.1	- 04
Kalibo, Aklan	11.7	- 09
Kidapawan, North Cotabato	07.0	- 20
Koronadal, South Cotabato	06.2	- 20
La Carlota City	10.4	- 12
Lagawe (Burnay), Ifugao	16.8	- 04
Laoag City	18.2	- 02
Lapu-lapu City	10.3	- 16
La Trinidad, Benguet	16.5	- 02
Legaspi City	13.1	- 15
Lingayen, Pangasinan	16.0	- 01
Lipa City	13.9	- 05
Lucena City	13.9	- 06
Maasin, Southern Leyte	10.1	- 19
Maganoy, Maguindanao	06.8	- 18
Malaybalay, Bukidnon	08.2	- 20
Malolos, Bulacan	14.8	- 03
Mambajao, Camiguin	09.2	- 19
Mamburao, Occidental Mindoro	13.2	- 02
Mandaue City	10.3	- 16
Manila City	14.6	- 04
Marawi City	08.0	- 17
Masbate, Masbate	12.4	- 14
Mati, Davao Oriental	07.0	- 25
Naga City	13.6	- 13
Olongapo City	14.8	- 01
Ormoc City	11.0	- 18
Oroquieta City	08.5	- 15
Ozamis City	08.2	- 15
Pagadian City	07.8	- 14
Pagalungan, Cotabato	08.0	- 17
Palayan City	15.6	- 06
Pasay City	14.6	- 04
Pasig, Rizal	14.6	- 04

TABLE III - PROVINCIAL CAPITALS AND CITIES

Place	Latitude	Reduction To Standard Time
	°	m
Pili, Camarines Sur	13.6	- 13
Prosperidad, Agusan del Sur	08.6	- 24
Puerto Princesa, Palawan	09.7	+05
Quezon City	14.6	- 04
Romblon, Romblon	12.6	- 09
Roxas City	11.6	- 11
San Carlos City (Negros Occ.)	10.5	- 14
San Carlos City (Pangasinan)	15.9	- 01
San Fernando, La Union	16.6	- 01
San Fernando, Pampanga	15.0	- 03
San Jose City (Nueva Ecija)	15.8	- 04
San Jose, Antique	10.7	- 08
San Pablo City	14.1	- 05
Santa Cruz, Laguna	14.3	- 06
Silay City	10.8	- 12
Siquijor, Siquijor	09.2	- 14
Sorsogon, Sorsogon	13.0	- 16
Surigao, Surigao del Norte	09.8	- 22
Tacloban City	11.2	- 20
Tabuk, Kalinga Apayao	17.4	- 05
Tagaytay City	14.1	- 04
Tagbilaran City	09.6	- 15
Tagum, Davao del Norte	07.4	- 23
Tandag, Surigao del Sur	09.1	- 25
Tangub City	08.0	- 15
Tarlac, Tarlac	15.5	- 02
Trece Martirez City	14.3	- 03
Tuguegarao, Cagayan	17.6	- 07
Vigan, Ilocos Sur	17.6	- 02
Virac, Catanduanes	13.6	- 17
Zamboanga City	06.9	- 08

TABLE IV

Correction to Local Mean Time to Obtain Standard Time

	115°E	116°E	117°E	118°E	119°E	120°E	121°h	122°E	123°E	124°E	125°E	126°E
m	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s
00	+20 00	+16 00	+12 00	+08 00	+04 00	00 00	-04 00	-08 00	-12 00	-16 00	-20 00	-24 00
01	+19 56	+15 56	+11 56	+07 56	+03 56	-00 04	-04 04	-08 04	-12 04	-16 04	-20 04	-24 04
02	+19 52	+15 52	+11 52	+07 52	+03 52	-00 08	-04 08	-08 08	-12 08	-16 08	-20 08	-24 08
03	+19 48	+15 48	+11 48	+07 48	+03 48	-00 12	-04 12	-08 12	-12 12	-16 12	-20 12	-24 12
04	+19 44	+15 44	+11 44	+07 44	+03 44	-00 16	-04 16	-08 16	-12 16	-16 16	-20 16	-24 16
05	+19 40	+15 40	+11 40	+07 40	+03 40	-00 20	-04 20	-08 20	-12 20	-16 20	-20 20	-24 20
06	+19 36	+15 36	+11 36	+07 36	+03 36	-00 24	-04 24	-08 24	-12 24	-16 24	-20 24	-24 24
07	+19 32	+15 32	+11 32	+07 32	+03 32	-00 28	-04 28	-08 28	-12 28	-16 28	-20 28	-24 28
08	+19 28	+15 28	+11 28	+07 28	+03 28	-00 32	-04 32	-08 32	-12 32	-16 32	-20 32	-24 32
09	+19 24	+15 24	+11 24	+07 24	+03 24	-00 36	-04 36	-08 36	-12 36	-16 36	-20 36	-24 36
10	+19 20	+15 20	+11 20	+07 20	+03 20	-00 40	-04 40	-08 40	-12 40	-16 40	-20 40	-24 40
11	+19 16	+15 16	+11 16	+07 16	+03 16	-00 44	-04 44	-08 44	-12 44	-16 44	-20 44	-24 44
12	+19 12	+15 12	+11 12	+07 12	+03 12	-00 48	-04 48	-08 48	-12 48	-16 48	-20 48	-24 48
13	+19 08	+15 08	+11 08	+07 08	+03 08	-00 52	-04 52	-08 52	-12 52	-16 52	-20 52	-24 52
14	+19 04	+15 04	+11 04	+07 04	+03 04	-00 56	-04 56	-08 56	-12 56	-16 56	-20 56	-24 56
15	+19 00	+15 00	+11 00	+07 00	+03 00	-01 00	-05 00	-09 00	-13 00	-17 00	-21 00	-25 00
16	+18 56	+14 56	+10 56	+06 56	+02 56	-01 04	-05 04	-09 04	-13 04	-17 04	-21 04	-25 04
17	+18 52	+14 52	+10 52	+06 52	+02 52	-01 08	-05 08	-09 08	-13 08	-17 08	-21 08	-25 08
18	+18 48	+14 48	+10 48	+06 48	+02 48	-01 12	-05 12	-09 12	-13 12	-17 12	-21 12	-25 12
19	+18 44	+14 44	+10 44	+06 44	+02 44	-01 16	-05 16	-09 16	-13 16	-17 16	-21 16	-25 16
20	+18 40	+14 40	+10 40	+06 40	+02 40	-01 20	-05 20	-09 20	-13 20	-17 20	-21 20	-25 20
21	+18 36	+14 36	+10 36	+06 36	+02 36	-01 24	-05 24	-09 24	-13 24	-17 24	-21 24	-25 24
22	+18 32	+14 32	+10 32	+06 32	+02 32	-01 28	-05 28	-09 28	-13 28	-17 28	-21 28	-25 28
23	+18 28	+14 28	+10 28	+06 28	+02 28	-01 32	-05 32	-09 32	-13 32	-17 32	-21 32	-25 32
24	+18 24	+14 24	+10 24	+06 24	+02 24	-01 36	-05 36	-09 36	-13 36	-17 36	-21 36	-25 36
25	+18 20	+14 20	+10 20	+06 20	+02 20	-01 40	-05 40	-09 40	-13 40	-17 40	-21 40	-25 40
26	+18 16	+14 16	+10 16	+06 16	+02 16	-01 44	-05 44	-09 44	-13 44	-17 44	-21 44	-25 44
27	+18 12	+14 12	+10 12	+06 12	+02 12	-01 48	-05 48	-09 48	-13 48	-17 48	-21 48	-25 48
28	+18 08	+14 08	+10 08	+06 08	+02 08	-01 52	-05 52	-09 52	-13 52	-17 52	-21 52	-25 52
29	+18 04	+14 04	+10 04	+06 04	+02 04	-01 56	-05 56	-09 56	-13 56	-17 56	-21 56	-25 56
30	+18 00	+14 00	+10 00	+06 00	+02 00	-02 00	-06 00	-10 00	-14 00	-18 00	-22 00	-26 00
31	+17 56	+13 56	+09 56	+05 56	+01 56	-02 04	-06 04	-10 04	-14 04	-18 04	-22 04	-26 04
32	+17 52	+13 52	+09 52	+05 52	+01 52	-02 08	-06 08	-10 08	-14 08	-18 08	-22 08	-26 08
33	+17 48	+13 48	+09 48	+05 48	+01 48	-02 12	-06 12	-10 12	-14 12	-18 12	-22 12	-26 12
34	+17 44	+13 44	+09 44	+05 44	+01 44	-02 16	-06 16	-10 16	-14 16	-18 16	-22 16	-26 16
35	+17 40	+13 40	+09 40	+05 40	+01 40	-02 20	-06 20	-10 20	-14 20	-18 20	-22 20	-26 20
36	+17 36	+13 36	+09 36	+05 36	+01 36	-02 24	-06 24	-10 24	-14 24	-18 24	-22 24	-26 24
37	+17 32	+13 32	+09 32	+05 32	+01 32	-02 28	-06 28	-10 28	-14 28	-18 28	-22 28	-26 28
38	+17 28	+13 28	+09 28	+05 28	+01 28	-02 32	-06 32	-10 32	-14 32	-18 32	-22 32	-26 32
39	+17 24	+13 24	+09 24	+05 24	+01 24	-02 36	-06 36	-10 36	-14 36	-18 36	-22 36	-26 36
40	+17 20	+13 20	+09 20	+05 20	+01 20	-02 40	-06 40	-10 40	-14 40	-18 40	-22 40	-26 40
41	+17 16	+13 16	+09 16	+05 16	+01 16	-02 44	-06 44	-10 44	-14 44	-18 44	-22 44	-26 44
42	+17 12	+13 12	+09 12	+05 12	+01 12	-02 48	-06 48	-10 48	-14 48	-18 48	-22 48	-26 48
43	+17 08	+13 08	+09 08	+05 08	+01 08	-02 52	-06 52	-10 52	-14 52	-18 52	-22 52	-26 52
44	+17 04	+13 04	+09 04	+05 04	+01 04	-02 56	-06 56	-10 56	-14 56	-18 56	-22 56	-26 56
45	+17 00	+13 00	+09 00	+05 00	+01 00	-03 00	-07 00	-11 00	-15 00	-19 00	-23 00	-27 00
46	+16 56	+12 56	+08 56	+04 56	+00 56	-03 04	-07 04	-11 04	-15 04	-19 04	-23 04	-27 04
47	+16 52	+12 52	+08 52	+04 52	+00 52	-03 08	-07 08	-11 08	-15 08	-19 08	-23 08	-27 08
48	+16 48	+12 48	+08 48	+04 48	+00 48	-03 12	-07 12	-11 12	-15 12	-19 12	-23 12	-27 12
49	+16 44	+12 44	+08 44	+04 44	+00 44	-03 16	-07 16	-11 16	-15 16	-19 16	-23 16	-27 16
50	+16 40	+12 40	+08 40	+04 40	+00 40	-03 20	-07 20	-11 20	-15 20	-19 20	-23 20	-27 20
51	+16 36	+12 36	+08 36	+04 36	+00 36	-03 24	-07 24	-11 24	-15 24	-19 24	-23 24	-27 24
52	+16 32	+12 32	+08 32	+04 32	+00 32	-03 28	-07 28	-11 28	-15 28	-19 28	-23 28	-27 28
53	+16 28	+12 28	+08 28	+04 28	+00 28	-03 32	-07 32	-11 32	-15 32	-19 32	-23 32	-27 32
54	+16 24	+12 24	+08 24	+04 24	+00 24	-03 36	-07 36	-11 36	-15 36	-19 36	-23 36	-27 36
55	+16 20	+12 20	+08 20	+04 20	+00 20	-03 40	-07 40	-11 40	-15 40	-19 40	-23 40	-27 40
56	+16 16	+12 16	+08 16	+04 16	+00 16	-03 44	-07 44	-11 44	-15 44	-19 44	-23 44	-27 44
57	+16 12	+12 12	+08 12	+04 12	+00 12	-03 48	-07 48	-11 48	-15 48	-19 48	-23 48	-27 48
58	+16 08	+12 08	+08 08	+04 08	+00 08	-03 52	-07 52	-11 52	-15 52	-19 52	-23 52	-27 52
59	+16 04	+12 04	+08 04	+04 04	+00 04	-03 56	-07 56	-11 56	-15 56	-19 56	-23 56	-27 56

TABLE V

Correction of the Sun's Apparent Altitude for Refraction and Parallax

(Barometer 30 inches, Thermometer 80° Fahrenheit)

Apparent Altitude	Mean Refraction and Parallax	Apparent Altitude	Mean Refraction and Parallax	Apparent Altitude	Mean Refraction and Parallax	Apparent Altitude	Mean Refraction and Parallax
° ′	′ ″	° ′	′ ″	° ′	′ ″	° ′	′ ″
5 00	09 06	10 20	04 43	17 00	02 50	37 30	01 05
05	00	25	41	10	48	38 00	04
10	08 52	30	39	20	47	30	03
15	46	35	36	30	45	39 00	02
20	38	40	34	40	43	20	01
25	32	45	32	50	42	40	00
30	25	50	30	18 00	41	40 00	00 59
35	19	55	28	10	39	30	58
40	12	11 00	26	20	37	41 00	57
45	07	05	24	30	35	30	56
50	00	10	22	40	34	42 00	55
55	07 54	15	21	50	32	20	54
6 00	49	20	19	19 00	31	40	53
05	43	25	17	20	29	43 00	52
10	38	30	15	40	26	30	51
15	33	35	13	20 00	23	44 00	50
20	27	40	11	20	20	45 00	49
25	22	45	09	40	17	30	48
30	17	50	07	21 00	15	46 00	47
35	13	55	05	20	12	47 00	46
40	08	12 00	04	40	10	48 00	45
45	02	05	03	22 00	08	49 00	43
50	06 58	10	01	20	06	50 00	41
55	54	15	03 59	40	04	51 00	39
7 00	49	20	57	23 00	01	52 00	38
05	44	25	56	20	01 59	53 00	37
10	40	30	54	40	57	54 00	35
15	36	35	52	24 00	55	55 00	34
20	32	40	51	20	53	56 00	32
25	27	45	49	40	51	57 00	31
30	24	50	47	25 00	49	58 00	30
35	20	55	46	20	48	59 00	29
40	16	13 00	44	40	46	60 00	28
45	13	05	43	26 00	45	61 00	27
50	09	10	41	20	43	62 00	26
55	05	15	40	40	42	63 00	25
8 00	01	20	38	27 00	40	64 00	23
05	05 59	25	37	20	38	65 00	22
10	55	30	36	40	37	66 00	21
15	51	35	35	28 00	35	67 00	20
20	48	40	33	30	33	68 00	19
25	45	45	32	29 00	31	69 00	18
30	42	50	30	30	29	70 00	17
35	39	55	29	30 00	28	71 00	16
40	36	14 00	28	30	26	72 00	15
45	33	10	26	31 00	24	73 00	15
50	30	20	23	30	22	74 00	14
55	27	30	21	32 00	20	75 00	13
9 00	24	40	18	20	19	76 00	12
10	19	50	16	40	18	77 00	11
15	16	15 00	13	33 00	17	78 00	10
20	13	10	11	20	16	79 00	09
25	10	20	09	40	15	80 00	08
30	07	30	08	34 00	14	81 00	07
35	04	40	06	20	13	82 00	06
40	02	50	04	40	12	83 00	06
45	00	16 00	02	35 00	11	84 00	05
50	04 57	10	00	30	10	85 00	04
55	53	20	02 58	36 00	09	86 00	03
10 00	52	30	56	20	08	87 00	02
05	50	40	54	40	07	88 00	02
10	48	50	52	37 00	06	89 00	01
10 15	04 46	17 00	02 50	37 30	01 05	90 00	00 00

This table was prepared especially for the Philippine Islands by the Bureau of Lands as a substitute to the table prepared by Nathaniel Bowditch for Barometer 30 inches. Thermometer 80° Fahrenheit

TABLE VI

Mean Refraction

(Barometer 30 inches, Thermometer 75° Fahrenheit)

Apparent Altitude	Mean Refraction	Apparent Altitude	Mean Refraction	Apparent Altitude	Mean Refraction	Apparent Altitude	Mean Refraction	Apparent Altitude	Mean Refraction
° ′	′ ″	° ′	′ ″	° ′	′ ″	° ′	′ ″	° ′	′ ″
5 00	9 24.4	9 55	5 06.6	15 40	3 15.6	25 30	1 55.5	42 40	1 00.0
05	16.8	10 00	04.2	50	13.5	40	54.7	43 00	0 59.3
10	09.4	05	01.9	16 00	11.5	50	53.8	20	58.6
15	02.2	10	4 59.5	10	09.5	26 00	53.0	40	58.0
20	8 55.1	15	57.1	20	07.5	10	52.2	44 00	57.3
25	48.3	20	54.8	30	05.5	20	51.3	20	56.6
30	41.6	25	52.6	40	03.6	30	50.6	40	56.0
35	35.1	30	50.4	50	01.8	40	49.7	45 00	55.3
40	28.6	35	48.2	17 00	2 59.9	50	49.0	20	54.7
45	22.2	40	46.0	10	58.1	27 00	48.2	40	54.1
50	16.1	45	43.9	20	56.4	10	47.4	46 00	53.4
55	10.1	50	41.8	30	54.7	20	46.7	20	52.8
6 00	04.1	55	39.7	40	53.0	30	45.9	40	52.2
05	7 58.4	11 00	37.6	50	51.2	40	45.2	47 00	51.6
10	52.7	05	35.6	18 00	49.6	50	44.5	20	51.0
15	47.1	10	33.6	10	47.9	28 00	43.7	40	50.4
20	41.6	15	31.7	20	46.3	20	42.3	48 00	49.9
25	36.3	20	29.8	30	44.7	40	40.9	49 00	48.1
30	31.2	25	27.9	40	43.1	29 00	39.6	50 00	46.5
35	26.3	30	26.0	50	41.6	20	38.2	51 00	44.8
40	21.3	35	24.1	19 00	40.1	40	36.9	52 00	43.2
45	16.5	40	22.2	10	38.6	30 00	35.6	53 00	41.7
50	11.8	45	20.4	20	37.1	20	34.3	54 00	40.2
55	07.2	50	18.6	30	35.7	40	33.1	55 00	38.8
7 00	02.6	55	16.9	40	34.2	31 00	31.9	56 00	37.3
05	6 58.2	12 00	15.1	50	32.9	20	30.7	57 00	35.9
10	53.9	05	13.4	20 00	31.5	40	29.5	58 00	34.6
15	49.6	10	11.7	10	30.2	32 00	28.4	59 00	33.2
20	45.4	15	10.1	20	28.8	20	27.2	60 00	31.9
25	41.3	20	08.4	30	27.4	40	26.2	61 00	30.7
30	37.2	25	06.8	40	26.2	33 00	25.0	62 00	29.4
35	33.4	30	05.2	50	24.9	20	24.0	63 00	28.2
40	29.5	35	03.5	21 00	23.7	40	22.9	64 00	27.0
45	25.7	40	01.9	10	22.4	34 00	21.9	65 00	25.8
50	22.0	45	00.4	20	21.2	20	20.8	66 00	24.6
55	18.2	50	3 58.9	30	20.0	40	19.9	67 00	23.5
8 00	14.6	55	57.4	40	18.8	35 00	18.9	68 00	22.4
05	11.1	13 00	55.8	50	17.7	20	17.9	69 00	21.3
10	07.6	05	54.3	22 00	16.5	40	17.0	70 00	20.1
15	04.2	10	52.9	10	15.4	36 00	16.1	71 00	19.1
20	00.9	15	51.5	20	14.2	20	15.1	72 00	18.0
25	5 57.5	20	50.0	30	13.1	40	14.3	73 00	16.9
30	54.3	25	48.6	40	12.1	37 00	13.3	74 00	15.9
35	51.1	30	47.2	50	10.9	20	12.5	75 00	14.8
40	47.9	35	45.8	23 00	09.9	40	11.6	76 00	13.8
45	44.9	40	44.4	10	08.9	38 00	10.8	77 00	12.8
50	41.9	45	43.0	20	07.8	20	09.9	78 00	11.8
55	38.9	50	41.7	30	06.9	40	09.1	79 00	10.7
9 00	36.0	55	40.4	40	05.8	39 00	08.3	80 00	09.8
05	33.1	14 00	39.0	50	04.8	20	07.4	81 00	08.7
10	30.3	10	36.5	24 00	03.9	40	06.7	82 00	07.8
15	27.4	20	34.0	10	02.9	40 00	05.9	83 00	06.8
20	24.7	30	31.5	20	01.9	20	05.2	84 00	05.8
25	22.0	40	29.0	30	00.9	40	04.4	85 00	04.8
30	19.3	50	26.7	40	00.0	41 00	03.6	86 00	03.9
35	16.8	15 00	24.4	50	1 59.1	20	02.9	87 00	02.9
40	14.1	10	22.1	25 00	58.3	40	02.1	88 00	01.9
45	11.6	20	19.9	10	57.3	42 00	01.5	89 00	01.0
50	09.1	15 30	3 17.7	25 20	1 56.4	42 20	1 00.7	90 00	0 00.0

This table was prepared especially for the Philippines by the Bureau of Lands as a substitute to the table prepared by Nathaniel Bowditch for Barometer 30 inches. Thermometer 50° Fahrenheit.

TABLE VII-A

Conversion of Minutes and Seconds into Decimals of an Hour or of a Degree

Minutes	Decimals of an Hour or a Degree	Minutes	Decimals of an Hour or a Degree	Seconds	Decimals of an Hour or a Degree	Seconds	Decimals of an Hour or a Degree
1	0.0167	31	0.5167	1	0.0003	31	0.0086
2	0.0333	32	0.5333	2	0.0006	32	0.0089
3	0.0500	33	0.5500	3	0.0008	33	0.0092
4	0.0667	34	0.5667	4	0.0011	34	0.0094
5	0.0833	35	0.5833	5	0.0014	35	0.0097
6	0.1000	36	0.6000	6	0.0017	36	0.0100
7	0.1167	37	0.6167	7	0.0019	37	0.0103
8	0.1333	38	0.6333	8	0.0022	38	0.0106
9	0.1500	39	0.6500	9	0.0025	39	0.0108
10	0.1667	40	0.6667	10	0.0028	40	0.0111
11	0.1833	41	0.6833	11	0.0031	41	0.0114
12	0.2000	42	0.7000	12	0.0033	42	0.0117
13	0.2167	43	0.7167	13	0.0036	43	0.0119
14	0.2333	44	0.7333	14	0.0039	44	0.0122
15	0.2500	45	0.7500	15	0.0042	45	0.0125
16	0.2667	46	0.7667	16	0.0044	46	0.0128
17	0.2833	47	0.7833	17	0.0047	47	0.0131
18	0.3000	48	0.8000	18	0.0050	48	0.0133
19	0.3167	49	0.8167	19	0.0053	49	0.0136
20	0.3333	50	0.8333	20	0.0056	50	0.0139
21	0.3500	51	0.8500	21	0.0058	51	0.0142
22	0.3667	52	0.8667	22	0.0061	52	0.0144
23	0.3833	53	0.8833	23	0.0064	53	0.0147
24	0.4000	54	0.9000	24	0.0067	54	0.0150
25	0.4167	55	0.9167	25	0.0069	55	0.0153
26	0.4333	56	0.9333	26	0.0072	56	0.0156
27	0.4500	57	0.9500	27	0.0075	57	0.0158
28	0.4667	58	0.9667	28	0.0078	58	0.0161
29	0.4833	59	0.9833	29	0.0081	59	0.0164
30	0.5000	60	1.0000	30	0.0083	60	0.0167

TABLE VII-B

Conversion of Decimals of a Degree or of an Hour into Minutes and Seconds

Hour or degree	Minutes and Seconds	Hour or degree	Minutes and Seconds	Hour or degree	Minutes and Seconds	Hour or degree	Minutes and Seconds
0.0001	0 00.36	0.0010	0 03.60	0.0100	0 36	0.1000	6 00
0.0002	0 00.72	0.0020	0 07.20	0.0200	1 12	0.2000	12 00
0.0003	0 01.08	0.0030	0 10.80	0.0300	1 48	0.3000	18 00
0.0004	0 01.44	0.0040	0 14.40	0.0400	2 24	0.4000	24 00
0.0005	0 01.80	0.0050	0 18.00	0.0500	3 00	0.5000	30 00
0.0006	0 02.16	0.0060	0 21.60	0.0600	3 33	0.6000	36 00
0.0007	0 02.52	0.0070	0 25.20	0.0700	4 12	0.7000	42 00
0.0008	0 02.88	0.0080	0 28.80	0.0800	4 48	0.8000	48 00
0.0009	0 03.24	0.0090	0 32.40	0.0900	5 24	0.9000	54 00

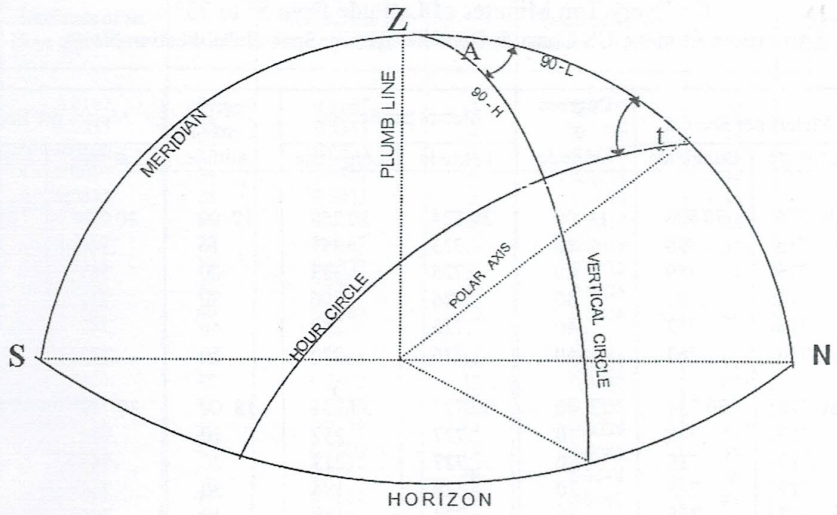
These tables were extracted from the B.L. Bulletin No. 21, North Polar Distances of the Sun for the Year 1933.

TABLE VIII

Length in Meters of One Second of Latitude and Longitude
for Every Ten Minutes of Latitude from 5° to 23°
(An extract from the US Coast & Geodetic Survey Special Publication No.5)

Degrees of Latitude	Meters per Second		Degrees of Latitude	Meters per Second		Degrees of Latitude	Meters per Second	
	Latitude	Longitude		Latitude	Longitude		Latitude	Longitude
° '			° '			° '		
5 00	30.715	30.806	11 00	30.724	30.358	17 00	30.740	29.580
10	.716	.798	10	.725	.341	10	.740	.554
20	.716	.789	20	.725	.323	20	.741	.527
30	.716	.781	30	.726	.306	30	.741	.500
40	.716	.772	40	.726	.288	40	.742	.473
50	.716	.763	50	.726	.270	50	.742	.446
6 00	30.716	30.754	12 00	30.727	30.251	18 00	30.743	29.418
10	.717	.745	10	.727	.232	10	.743	.391
20	.717	.735	20	.727	.213	20	.744	.363
30	.717	.725	30	.728	.194	30	.744	.334
40	.717	.715	40	.728	.175	40	.745	.306
50	.718	.704	50	.728	.155	50	.746	.277
7 00	30.718	30.693	13 00	30.729	30.135	19 00	30.746	29.248
10	.718	.682	10	.729	.115	10	.747	.219
20	.718	.671	20	.730	.094	20	.747	.190
30	.718	.660	30	.730	.074	30	.748	.160
40	.719	.648	40	.731	.053	40	.748	.130
50	.719	.636	50	.731	.031	50	.749	.100
8 00	30.719	30.623	14 00	30.731	30.010	20 00	30.750	29.069
10	.719	.611	10	.732	29.988	10	.750	.038
20	.720	.598	20	.732	.966	20	.751	.007
30	.720	.585	30	.733	.944	30	.751	28.976
40	.720	.572	40	.733	.921	40	.752	.945
50	.720	.558	50	.734	.899	50	.753	.913
9 00	30.721	30.544	15 00	30.734	29.876	21 00	30.753	28.881
10	.721	.530	10	.734	.852	10	.754	.849
20	.721	.516	20	.735	.829	20	.754	.817
30	.722	.501	30	.735	.805	30	.755	.784
40	.722	.486	40	.736	.781	40	.756	.751
50	.722	.471	50	.736	.757	50	.756	.718
10 00	30.723	30.456	16 00	30.737	29.732	22 00	30.757	28.684
10	.723	.440	10	.737	.707	10	.757	.650
20	.723	.424	20	.738	.682	20	.758	.616
30	.723	.408	30	.738	.657	30	.759	.584
40	.724	.392	40	.739	.632	40	.760	.547
50	.724	.375	50	.739	.606	50	.761	.513

ASTRONOMICAL FORMULAE USED IN SURVEYING WORKS



A. Azimuth of a body at any Altitude

$$Cot\ \frac{1}{2}\ A = \sqrt{Sec\ S\ Sec\ (S-P)\ Sin\ (S-H)\ Sin\ (S-L)}$$

NOTE: A is the Azimuth at P.M. and 360 - azimuth at A.M.

$$Cos\ A = \frac{Cos\ P - Sin\ H\ \ Sin\ L}{Cos\ H\ \ Cos\ L}$$

If $Cos\ A$ is positive, $180 - A$ is azimuth at P.M. and
$180 + A$ is the azimuth at A.M.

If $Cos\ A$ is negative, A is the azimuth at P.M. and
$360 - A$ is azimuth at A.M

B. Azimuth of Polaris at Elongation

$$Sin\ A = \frac{Sin\ P}{Cos\ L}$$

Where: $180 + A$ is the azimuth at Eastern Elongation; and
$180 - A$ is the azimuth at Western Elongation

NOTE: South point is the origin of Azimuth coordinate