

and on coming down the page, at the side, you will notice that the given hour angle lies between 3h 12m and 3h 20m. The declination is given for every degree, and so also, is the latitude.

The "standard" will then be taken out for hour angle 3h 12m, declination 16°, and latitude 40°.

In actual problems, the explanatory figures shown, are omitted, only the actual azimuth values and differences are put down.

H.A.	Dec.	Lat.
h m		
16° (3 12 131.2°	3.12 (16° 131.2°	3.12 (40° 131.2°
40° (3 20 129.6	40° (17° 131.8	16° (41° 131.4

diff. for 8m = -1.6	diff. for 1° = +0.6	diff. for 1° = +0.2
× $\frac{2}{3}$	× $\frac{1}{3}$	× 0.7

diff. for 3m = -0.6	diff. for 20' = +0.2	diff. for 42' = +0.14

sum of differences = -0.6° + 0.2° + 0.14°		
= -0.26°		
131.2°		

diff. = -0.26		

Azimuth N. 130.94° W. = 229.06° T.		

In working the differences, take the odd minutes of arc either as a vulgar fraction or as a decimal fraction, whichever is the easier, e.g., 20' = $\frac{1}{3}$, 42' = 0.7. Do not work to unnecessary accuracy, the first decimal place is sufficient. In the example the azimuth would be given as 229° T.

Using the ABC Tables.

If the altitude-azimuth tables are not available, or if the latitude or the declinations are outside the limits of the tables available, use the ABC tables. Also, it is usual to use these tables when finding the azimuth in position line problems.

Example.—The previous example worked with ABC tables (*Norie*)
Data:—L.H.A. = 48° 45'; lat. = 40° 42' N.; dec. = 16° 20' S.

$$\begin{aligned}
 A &= 0.76 + 0.7(0.02) - \frac{3}{4}(0.03) \\
 &= 0.76 + 0.014 - 0.022 \\
 &= 0.76 - 0.008 \\
 &= 0.752 \text{ S.}
 \end{aligned}$$

$$\begin{aligned}
 B &= 0.39 + \frac{1}{3}(0.02) - \frac{3}{4}(0.01) \\
 &= 0.39 + 0.007 - 0.007 \\
 &= 0.390 \text{ S.}
 \end{aligned}$$

A = 0.752 S. (name—opposite to lat.)
B = 0.390 S. (, , —same as dec.)

C = 1.142 S.

Azimuth for value of C

$$\begin{aligned}
 &= 48.8^\circ + 0.7(0.4) \\
 &= 48.8^\circ + 0.28^\circ \\
 &= 49.1^\circ
 \end{aligned}$$

True azimuth = S. 49.1° W.
= 229.1° T.

Notes.—Usually, the full interpolation shown here is not necessary, but, if practised, will make the necessary interpolation easier. When using *Burton's Tables* the method is exactly the same except that (1) + and - signs are used instead of N. and S., (2) the factors A and B are given to 3 decimal places, (3) the azimuth is given for every full degree. This may make interpolation a little more awkward, but this can be overcome by using the interpolation table at the end of the ABC tables, and by following the concise instructions given there.

Example.

6th October 1952, in D.R. position lat. 45° 22' N., long. 125° 00' E., where the variation was 24° E., the Sun bore 229° C. at 16h 10m 00s L.M.T. Find the Sun's true azimuth, and thence the deviation of the compass.

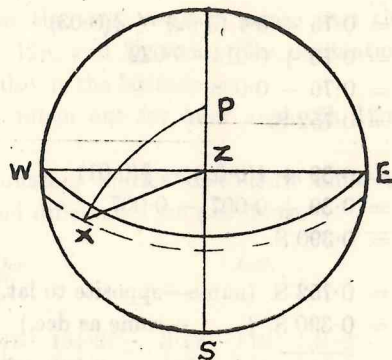
A		
Lat.	Hour	Angle
	48°	49°
40°	0.76	0.73
41°	0.78	

B		
Dec.	Hour	Angle
	48°	49°
16°	0.39	0.38
17°	0.41	

C		
	1.14	1.16
Lat.	Azimuth	
40°	48.9°	48.4°
41°	49.3°	

L.M.T. 16h 10m 00s
 long. E. 8 20 40

 G.M.T. 07 49 20 (6th)



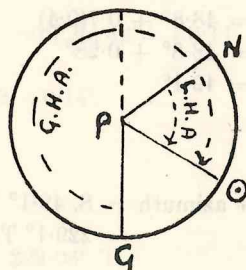
d.p. 287° 57.7' d.p. 5° 07.2'S.
 incr. + 12 20.0 "d" 0.8

G.H.A. 300 17.7 Dec. 5 08.0 S.
 long. E. 125 00.0

425 17.7
 subtract 360

L.H.A. 65 17.7

= 4h 21m 11s



112.5°	112.5°	112.5°		112.5°
110.9	113.2	112.7	diff.	-0.9°
-1.6	+0.7	+0.2	True az. =	N.111.6° W.
× $\frac{5}{8}$	× 0.1	× $\frac{1}{8}$	Brg. =	248.4° T.
-1.0	+0.07	+0.06	" =	229.0° C.
			Error =	19.4° E.
			Var. =	24.0° E.
			Dev. =	4.6° W.

EXERCISE 16A

SUN TIME AZIMUTHS

1. 17th September 1952, in D.R. position lat. 42° 50' N., long. 46° 10' W. at 11h 40m 19s G.M.T., the Sun bore 149° C. Find the true azimuth and the deviation, the variation being 24.5° W.

2. 16th January 1952, in E.P. 48° 20' S., 96° 30' W., at 20h 40m 30s G.M.T., the Sun bore 286° C. Find the deviation, the variation being 23° E.

3. 16th December 1952, in D.R. pos. 46° 15' N., 168° 35' W., the observed azimuth of the Sun was 122° C. at 20h 32m 10s G.M.T. Find the Sun's true azimuth and the deviation, the variation being 23.5° E.

4. 28th October 1952, in D.R. position, lat. 38° 10' S., long. 124° 10' E., a.m. at ship, when the chronometer showed 11h 55m 10s, the observed azimuth of the Sun was 067° C. Find the deviation, the variation being 7° E.

5. 20th September 1952, at 15h 20m 00s L.M.T., the Sun bore 262.5° C. to an observer in D.R. position lat. 19° 20' N., long. 149° 50' E., where the variation was 11° E. Find the deviation.

STAR TIME AZIMUTHS

Example.

28th September 1952, at 09h 14m 09s G.M.T., in D.R. position 37° 36' N., 47° 50' W., the observed bearing of *Mirfak 9* was 274° C. Find the true azimuth and the deviation, the variation being 23.5° W.

G.M.T. 09h 14m 09s (28)

d.p. γ 142° 04.9' *Dec. 17° 53.6' N.
 incr. 3° 32.8' *S.H.A. 309° 45.6'

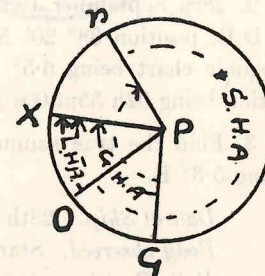
G.H.A. 145° 37.7'
 *S.H.A. 309° 45.6'

sum 455° 23.3'
 subtract 360°

*G.H.A. 95° 23.3'
 long. W. 47° 50.0'

*L.H.A. 47° 33.3'

3h 10m 13.2 S.



From altitude-azimuth tables.

103.6°	103.6°	103.6°	103.6°
102.0°	102.4°	104.6°	-1.7°
<hr/>			
-1.6	-1.2	+1.0	N. 101.9° W.
<hr/>			
-1.2°	-1.1°	+0.6°	

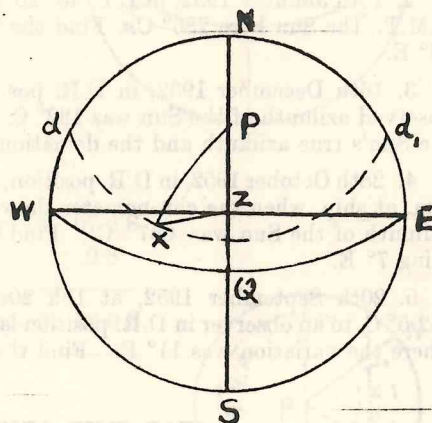
Azimuth = 258.1° T.

„ = 274.0° C.

Error = 15.9° W.

Var. = 23.5° W.

Dev. = 7.6° E.



EXERCISE 16B

STAR TIME AZIMUTHS

1. 20th December 1952, in D.R. position lat. $46^{\circ} 40' N.$, long. $168^{\circ} 20' W.$, at 04h 09m 04s A.T.S., the observed azimuth of γ Corvi (Gienah) 29 was $129^{\circ} C.$, the magnetic variation in the locality being $25^{\circ} E.$ Find the deviation.

2. 28th September 1952, *Alpheratz* 1 bore $280^{\circ} C.$ to an observer in D.R. position $38^{\circ} 20' N., 05^{\circ} 40' E.$, the variation taken from an Isogonic chart being $6.5^{\circ} E.$ Find the deviation, the time of observation being 02h 35m 00s A.T.S.

3. Find the true azimuth and thence the deviation, the variation being $5.3^{\circ} E.$

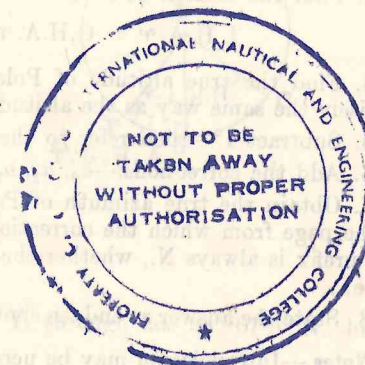
Date at Ship. 28th September 1952, *Time.* 22h 28m 00s L.M.T.

Body observed. Star Menkar 8. *Azimuth.* $153^{\circ} C.$

D.R. Position. $41^{\circ} 15' N., 145^{\circ} 26' E.$

4. 16th January 1952, in lat. $46^{\circ} 20' N.$, long. $07^{\circ} 52' W.$, where the variation was $11.5^{\circ} W.$, *Procyon* 20 bore $268.5^{\circ} C.$ at 02h 45m 11s Zone Time. Find the deviation for the direction of the ship's head.

5. 14th December 1952, at about 2230 at ship, when the time by the chronometer was 05h 25m 40s, *Pollux* 21 bore $085.5^{\circ} C.$ to an observer in E.P. lat. $32^{\circ} 24' S.$, long. $80^{\circ} 15' E.$, where the variation was $20^{\circ} W.$ Find the deviation of the compass.



EXERCISE 17

LATITUDE BY POLARIS

Steps in the problem.

1. From the time given, find the G.M.T.

L.M.T. given.		A.T.S. given.	
L.M.T.	=	A.T.S.	=
long. W. + } =		long. W. + } =	
E. - } =		E. - } =	
G.M.T.	=	A.T.G.	=
		Eq. Time	= (sign as in <i>N.A.</i>)
		G.M.T.	=

2. Find the G.H.A. of Aries.
3. Find the L.H.A. of Aries.

$$\text{L.H.A. } \gamma = \text{G.H.A. } \gamma \begin{matrix} + \text{E.} \\ - \text{W.} \end{matrix} \text{ long.}$$

4. Find the true altitude of Polaris—the altitude is corrected in precisely the same way as the altitude of any other star.
5. Subtract 1° —then refer to the Pole Star Tables.
6. Add the corrections:— a_0, a_1, a_2 , to obtain the latitude.
7. Obtain the true azimuth of Polaris from the tables at the foot of the page from which the corrections a_0, a_1, a_2 , have been obtained. The prefix is always N., whether the suffix is E. or W. is given in the table.
8. State the answer at end, as shown in the example.

Notes.—Interpolation may be necessary for a_0 . It is not necessary as a rule for a_1 and a_2 . Be careful to take a_1 and a_2 from the appropriate part of the table.

See page 267, *Principles for Second Mates*, for figure drawing.

Example.

23rd September 1952, in D.R. position $37^\circ 58' \text{ N.}, 52^\circ 30' \text{ E.}$, at -05h 48m 00s L.M.T., an observation of Polaris gave sextant altitude $38^\circ 40.4'$, I.E. $2.2'$ off the arc, height of eye 38 feet. Find the latitude and the direction of the position line.

LATITUDE BY POLARIS

L.M.T. = 05h 48m 00s (23rd)
long. — 3 30 00

G.M.T. = 02 18 00 (23rd)

Aries d.p. $31^\circ 51.9'$
incr. 4 30.7

G.H.A. γ 36 22.6
long. + 52 30.0

L.H.A. γ 88 52.6

sext. alt. $38^\circ 40.4'$
index error + 2.2

obs. alt. 38 42.6
dip — 6.1

main corr. — 1.2

True alt. 38 35.3
minus 1

a_0 37 35.3

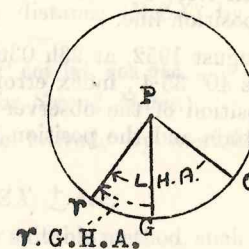
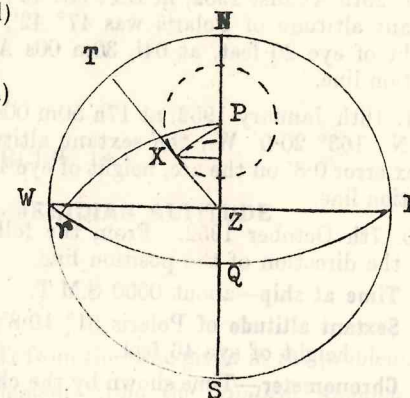
a_1 0.5

a_2 0.2

latitude 38 07.8 N.

True az. N. 1.1° W.

P.L. trends 088.9° T. — 268.9° T. through lat. $38^\circ 07.8' \text{ N.}$, long. $52^\circ 30' \text{ E.}$



EXERCISE 17

1. 16th January 1952, at 22h 32m 18s G.M.T. in D.R. position $49^\circ 10' \text{ N.}, 36^\circ 20.4' \text{ W.}$; the sextant altitude of Polaris was $50^\circ 09.4'$, index error $1.6'$ off the arc, height of eye 42 feet. Find the latitude and the direction of the position line.

2. 28th September 1952, in D.R. lat. $35^\circ 25' \text{ N.}$, long. $36^\circ 25' \text{ W.}$, at 18h 00m 00s A.T.S., the sextant altitude of Polaris was $35^\circ 15.8'$, index error $0.8'$ on the arc, height of eye 38 feet. Find the latitude and position line.

3. 29th August 1952, in E.P. lat. $46^{\circ} 35' N.$, long. $158^{\circ} 40' W.$, the sextant altitude of Polaris was $47^{\circ} 42'$, index error $1.4'$ off the arc, height of eye 20 feet, at 04h 30m 00s A.T.S. Find the latitude and position line.

4. 16th January 1952, at 17h 50m 00s L.M.T., in D.R. position $22^{\circ} 50' N.$, $163^{\circ} 20.0' W.$, the sextant altitude of Polaris was $23^{\circ} 40.4'$, index error $0.8'$ on the arc, height of eye 44 feet. Find the latitude and position line.

5. 7th October 1952. From the following data find the latitude and the direction of the position line.

Time at ship—about 0550 S.M.T.

Sextant altitude of Polaris $51^{\circ} 10.8'$, index error $1.2'$ off the arc, height of eye 46 feet.

Chronometer—Time shown by the chronometer 07h 04m 17s, error 2m 8s slow.

D.R. Position lat. $51^{\circ} 00' N.$, long. $162^{\circ} 10.8' E.$

6. 14th September 1952, in D.R. position lat. $32^{\circ} 05' N.$, long. $31^{\circ} 20' E.$, at 03h 24m 40s G.M.T., the sextant altitude of Polaris was $32^{\circ} 44.2'$, index error $1.6'$ off the arc, height of eye 44 feet. Find the latitude and position line.

7. 29th August 1952, at 23h 03m 46s G.M.T., the sextant altitude of Polaris was $40^{\circ} 35.4'$, index error $0.6'$ on the arc, height of eye 34 feet, D.R. position of the observer lat. $40^{\circ} 52' N.$, long. $57^{\circ} 02' W.$ Find the latitude and the position line.

EXERCISE 18

LATITUDE BY EX-MERIDIAN ALTITUDE

By the Sun.

Steps in the problem.

1. Ascertain the correct G.M.T. from the time given in the problem.
2. Take out the necessary elements from the *Nautical Almanac*, viz.: \odot G.H.A., and \odot Declination.

3. Obtain the \odot L.H.A. (See Time Formulae, pages 157 to 168, *Principles for Second Mates*.)

1. Correct the sextant altitude and obtain the zenith distance.

5. Calculate the meridian zenith distance (M.ZX) by using the formula.

$$\text{hav M.ZX} = \text{hav ZX} - \text{hav } P \cos \text{lat.} \cos \text{dec.}$$

(See pages 96 to 98, *Principles for Second Mates*.)

6. Obtain the latitude as in the latitude by meridian altitude problem.

$$\text{Latitude} = \text{M.ZX} \pm \text{dec.}$$

7. Obtain the true azimuth by any suitable method, such as (1) ABC tables, (2) altitude-azimuth tables, (3) the calculation of angle Z in the PZX triangle, by using the formula:

$$\text{hav } Z = \frac{\text{hav } PX - \text{hav } (PZ \sim ZX)}{\sin PZ \sin ZX}$$

(See pages 93, 94, *Principles for Second Mates*.)

8. Obtain the direction of the position line.

9. State the answer at the end.

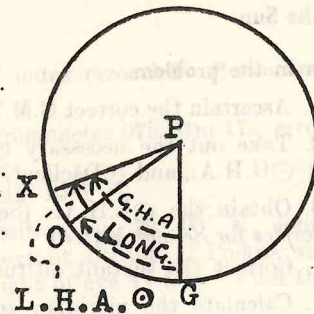
Notes.—

1. The latitude obtained is not the actual latitude, but with the longitude used in determining the L.H.A., gives the position of a point through which the position line can be drawn.
2. If the latest editions of Nautical Tables are used, the L.H.A. can be used even though it exceeds 180° , since the Haversine Table is indexed up to 360° , for this purpose.

Example.

From the following particulars of an observation of the Sun's lower limb near the meridian, find the direction of the position line, and the latitude in which it crosses the meridian of the D.R. longitude. Date at ship 16th September 1952; D.R. position 44° 20' S., 52° 35' W., sextant altitude 41° 57·6', index error 2·2' off the arc, height of eye 40 feet, chronometer time 16h 10m 10s.

G.M.T.	16h 10m 10s (16th)	
d.p.☉	61° 19·0'	2° 29·9'N.
incr.	2° 32·5'	d — 0·2'
☉G.H.A.	63° 51·5'	Dec. 2° 29·7'N.
long. W.	52° 35·0'	lat. 44° 20·0' S.
☉L.H.A.	11° 16·5'	

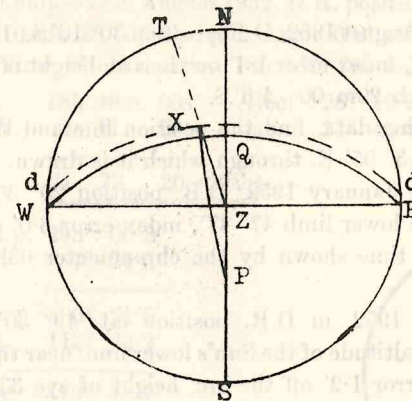


Sext. alt.	41° 57·6'	hav M.ZX = hav ZX - hav P cos lat. cos dec.
index error +	2·2'	l. hav 11° 16·5' = 7·98453
		l. cos 44° 20' = 9·85448
obs. alt.	41° 59·8'	l. cos 2° 29·7' = 9·99959
dip	— 6·3'	
		l. hav 0 = 7·83860
	41° 53·5'	
main corr. +	14·9'	n.hav 47° 51·6' = 0·16453
		n.hav 0 = 0·00690
True alt.	42° 08·4'	
	90°	n.hav M.ZX = 0·15763
zen. dist.	47° 51·6'	

Mer. zen. dist.	— 46° 47·1' S.	A = 4·964 N.
Dec.	— 2° 29·7' N.	B = 0·226 S.
Latitude	— 44° 17·4' S.	C = 4·738 N.
		T. az. = N. 16·4° W. = 343·6° T.

P.L. trends 073·6° T. — 253·6° T. through lat. 44° 17·4' S., long. 52° 35' W.

For the steps in the figure drawing see page 265, *Principles for Second Mates.*



Description of figure.

The figure represents a stereographic projection of the celestial sphere on the plane of the rational horizon.

NESW represents the observer's rational horizon.

P—his elevated pole.

Z—his zenith.

NZS—his meridian.

WZE—his prime vertical.

WQE—the equinoctial.

dXd—the Sun's parallel of declination.

X—the Sun.

TX—the Sun's true altitude.

ZX—the Sun's zenith distance.

P—the Sun's hour angle.

PX—its polar distance.

QZ—the observer's latitude.

PZ—his co-lat.

angle *PZX*—the Sun's azimuth.

Note.—A description of the figure is included here, as an example should it be desired to give one at any time. This description is very similar to that required for any other figure.

Sext. alt.	28° 03·8'	hav M.ZX = hav ZX - hav P cos lat. cos dec.
index err.	+ 0·8'	
obs. alt.	28° 04·6'	l. hav 13° 23·7' = 8·13359
dip	- 6·3'	l. cos 34° 40·0' = 9·91512
		l. cos 26° 19·9' = 9·95242
main corr.	27° 58·3'	
	- 1·8'	l. hav 0 = 8·00113
True alt.	27° 56·5'	n. hav 62° 03·5' = 0·26571
	90°	n. hav 0 = 0·01002
zen. dist.	62° 03·5'	n. hav M.ZX = 0·25569

		A	2·93 S.
		B	2·14 S.
M. zen dist	60° 45·0' N.		
dec.	26° 19·9' S.	C	5·07 S.
latitude	34° 25·1' N.		Azimuth S. 13·4° W. = 193·4° T.

P.L. trends 103·4° T. - 283·4° T. through lat. 34° 25·1' N., long. 10° 20' W.

EXERCISE 18B

✓ 1. From the following particulars of an observation of *Denebola* 28 near the meridian, find the direction of the position line and the latitude of the point where it crosses the meridian of longitude 136° 02' W.

Date at ship 20th December 1952, D.R. position 47° 10' N. 136° 02' W., sextant altitude 57° 24', index error 0·8' on the arc, height of eye 36 feet. Time at ship, about 0520. The chronometer showed 02h 28m 10s.

2. 29th August 1952, in D.R. latitude 36° 10' N., long. 40° 15' W., an ex-meridian observation of *Antares* 42 gave sextant altitude 26° 39·6', index error 0·4' off the arc, height of eye 40 feet, A.T.S. of observation 18h 40m 00s. Find the latitude and position line.

3. 28th September 1952, the sextant altitude of *Kaus Australis* 48 near the meridian was 29° 59·2', index error nil, height of eye 35 feet, D.R. position 25° 44' N., 144° 25' E., G.M.T. of observation 08h 28m 20s. Find the direction of the position line and the latitude in which it crosses the D.R. longitude.

4. 17th December 1952, in D.R. position 30° 10' S., 137° 50' W., an observation of *Alphard* 25 near the meridian, gave the following sextant altitude 67° 08·2', index error 0·8' on the arc, height of eye

51 feet, time by the chronometer 13h 27m 10s, error 1m 10s fast of G.M.T. Required, the direction of the position line and the latitude of the point where it crosses the meridian of 137° 50' W.

5. From the following particulars of an ex-meridian altitude observation of *Capella* 12, find the direction of the position line and the latitude of the point where it crosses the meridian of 120° 25' W.

Date at ship—18th September 1952, E.P. lat. 18° 40' S., long. 120° 25' W. Sextant altitude 25° 31', index error 1·4' on the arc, height of eye 58 feet, G.M.T. 13h 55m 40s.

EXERCISE 19

**THE LONGITUDE METHOD OF OBTAINING A POSITION LINE,
AND THE POSITION OF A POINT THROUGH WHICH IT CAN
BE DRAWN**

BY OBSERVATION OF THE SUN

General Notes.

1. Before commencing the problems, read Chapter VIII, pages 207 to 224, *Principles for Second Mates*.
2. In the M.O.T. Examination, either the Longitude Method or the Marc St. Hilaire Method can be used.
3. The lay-out shown is not a standard, but it is convenient and clear, two essentials in any work.

Steps in the problem.

1. Ascertain the correct G.M.T. from the chronometer time.
2. From the *Nautical Almanac*, take out the G.H.A. and the declination of the Sun.
3. Correct the sextant altitude of the Sun.
4. Subtract the true altitude from 90° to obtain the true zenith distance of the Sun.
5. Calculate the hour angle of the Sun—if it is East of the meridian, subtract the E.H.A. from 360° to obtain the \odot L.H.A. (See Example 7, page 95, *Principles for Second Mates*.)

Formula:—

hav $P = [\text{hav } ZX - \text{hav } (\text{lat.} \sim \text{dec.})] \text{ sec lat. sec dec.}$
 if lat. and dec. have the same names, use lat. \sim dec.
 „ lat. and dec. „ different „ „ lat. + dec.

6. Obtain the longitude from the G.H.A. and L.H.A.
 Longitude East — G.H.A. least.
 „ West — G.H.A. best.

7. Calculate the Sun's true azimuth from the altitude azimuth tables, ABC tables, or by formula:—

$$\text{hav } Z = \frac{\text{hav } PX - \text{hav } (PZ \sim ZX)}{\sin PZ \sin ZX}$$

(For an example of the use of the formula, see page 93, *Principles for Second Mates*.)

8. Obtain the direction of the position line, which is at right angles to the true azimuth. (See page 224, *Principles for Second Mates*.)

9. State the answer at the end:—

P.L. trends _____ through _____

Lat. (D.R.) _____ long. _____

Example.

From the following data, find the direction of the position line, and the position of a point through which it passes.

Date at ship—6th October 1952, D.R. position $41^\circ 15' \text{ N.}$, $175^\circ 00' \text{ W.}$, time at ship—about 0900, sextant altitude Sun's lower limb $27^\circ 56.2'$, index error $0.4'$ off the arc, height of eye 52 feet. Chronometer showed 08h 30m 15s.

Approx. time ship 09h 00m 00s (6th)
 long. W. + 11 00 00

Approx. time Green. 20 00 00 (6th)

G.M.T. 20h 30m 15s (6th)

d.p. $123^\circ 00.0'$ d.p. $5^\circ 19.7' \text{ S.}$ lat. $41^\circ 15.0' \text{ N.}$
 incr. + $7^\circ 33.8'$ "d" + $0.5'$ dec. $5^\circ 20.2' \text{ S.}$

\odot G.H.A. $130^\circ 33.8'$ dec. $5^\circ 20.2' \text{ S.}$ L+D $46^\circ 35.2'$

Formula:—

sext. alt. $27^\circ 56.2'$ hav $P = [\text{hav } ZX - \text{hav } (L \sim D)] \text{ sec lat. sec dec.}$
 index error + $0.4'$

obs. alt. $27^\circ 56.6'$ n. hav $61^\circ 56.1' = 0.26476$

dip — $7.2'$ n. hav $46^\circ 35.2' = 0.15637$

$27^\circ 49.4'$ n. hav 0 = 0.10839

main corr. + $14.5'$

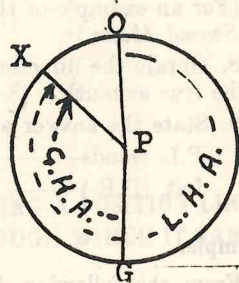
l. hav 0 = 9.03497

true alt. $28^\circ 03.9'$ l. sec $41^\circ 15.0' = 10.12387$

90° l. sec $5^\circ 20.2' = 10.00188$

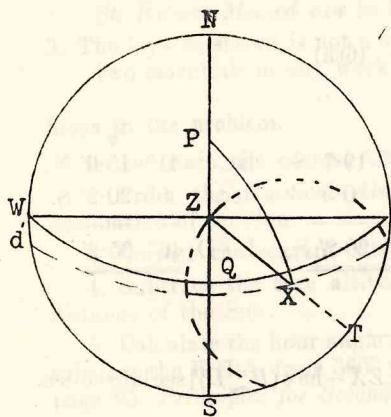
T. ZX $61^\circ 56.1'$ l. hav $P = \underline{\underline{9.16072}}$

☉E.H.A. = 44° 43·8'	A = 0·890 S.
360°	B = 0·129 S.
☉L.H.A. = 315° 16·2'	C = 1·019 S.
☉G.H.A. = 130° 33·8'	Az = S.52·6° E.
long. = 175° 17·6' W.	= 127·4° T.



P.L. trends 037·4° T.—217·4° T. through lat. 41° 15' N., long 175° 17·6' W.

Note.—The longitude is West, so that ☉L.H.A. is subtracted from the ☉G.H.A.; 360° is added if necessary.



The figure for the M.H.S. problem is precisely the same. For notes on drawing this figure, see page 266, *Principles for Second Mates*.

THE MARC ST. HILAIRE METHOD OF OBTAINING THE POSITION THROUGH WHICH TO DRAW THE POSITION LINE

By Observation of the Sun

Steps in the problem.

1. Ascertain the correct G.M.T. from the chronometer time.
2. From the *Nautical Almanac*, take out the ☉G.H.A. and the ☉dec. for the G.M.T.

3. Apply the longitude to the ☉G.H.A. to obtain the ☉L.H.A.—if it exceeds 180°, subtract from 360° to obtain the E.H.A. (This step is unnecessary where the latest editions of *Nautical Tables* are used, as explained in the notes on the latitude by ex-meridian altitude problem).

Read Chapter VIII., *Principles for Second Mates*.

4. Correct the sextant altitude of the Sun.

5. Subtract the true altitude from 90° to obtain the true zenith distance (T.ZX).

6. Calculate the zenith distance of the Sun, *i.e.*, side ZX in the PZX triangle, using the formula:—

$$\text{hav } ZX = \text{hav } P \cos \text{ lat. } \cos \text{ dec. } + \text{hav } (\text{lat. } \pm \text{ dec.})$$

if lat. and dec. have the same names, use lat. ~ dec.

„ lat. and dec. „, different „ „, lat. + dec.

See page 89, example No. 4, *Principles for Second Mates*.

7. Obtain the intercept.

$$\text{Intercept} = T.ZX \sim C.ZX$$

8. Name the intercept.

Towards, if the T.ZX is less than the C.ZX

Away, if the T.ZX is greater than the C.ZX

See page 218, *Principles for Second Mates*.

9. Calculate the Sun's true azimuth by means of the altitude azimuth tables, ABC tables, or by means of the formula:—

$$\text{hav } Z = \frac{\text{hav } PX - \text{hav } (PZ \sim ZX)}{\sin PZ \sin ZX}$$

10. Obtain the direction of the position line, which is at right angles to the Sun's true bearing.

See page 224, *Principles for Second Mates*.

11. Use the traverse table to obtain the position of the intercept terminal point, through which the position line is drawn. Use the azimuth as course, if the intercept is towards (reverse the names of the azimuth if the intercept is away) and, with the intercept as distance, take out the d. lat. and the departure. Apply the d. lat. to the D.R. lat. With the mean latitude change the departure into d. long., which is then applied to the D.R. longitude. This gives the position of the intercept terminal point.

Read pages 216 to 218, *Principles for Second Mates*.

12. State the answer at the end:—

P.L. trends _____ through

lat. _____ long. _____

Example.

The previous example worked as a M.S.H.

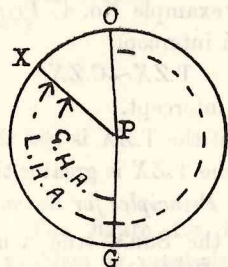
Approx. time ship 09h 00m 00s (6th)

long. W. 11 00 00

Appx. time Green. 20 00 00 (6th)

G.M.T. 20h 30m 15s (6th)

d.p.	123° 00·0'	d.p.	5° 19·7'S.	lat.	41° 15·0' N.
incr.	+ 7° 33·8'	"d"	+ 0·5'	dec.	5° 20·2' S.
⊙G.H.A.	130° 33·8'	dec.	5° 20·2'S.	lat.+dec.	<u>46° 35·2'</u>
long. W.	175° 00·0'				
⊙L.H.A.	315° 33·8'				
	<u>360°</u>				
⊙E.H.A.	<u>44° 26·2'</u>				



Formula:—

$$\text{hav } ZX = \text{hav } P \cos \text{lat.} \cos \text{dec.} + \text{hav } (\text{lat } \pm \text{dec.})$$

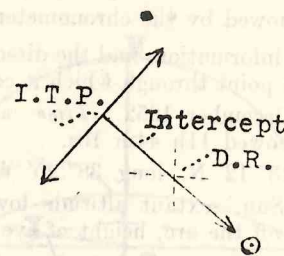
sext. alt.	27° 56·2'	l. hav	44° 26·2'	=	9·15530
index error +	0·4'	l. cos	41° 15·0'	=	9·87613
		l. cos	5° 20·2'	=	9·99812
obs. alt.	27° 56·6'	l. hav	0	=	9·02955
dip	— 7·2'	n. hav	0	=	0·10705
		n. hav	46° 35·2'	=	0·15637
main corr. +	27° 49·4'	n. hav	C. ZX	=	<u>0·26342</u>
	14·5'				
True alt.	28° 03·9'	A	= 0·890 S.	Az.	= S. 52·6° E.
	90°	B	= 0·129 S.		= 127·4° T.
T.ZX	61° 56·1'	C	= <u>1·019 S.</u>		
C.ZX	61° 45·1'				
intercept	<u>11·0' Away</u>				

Course N.52·6°W. dist. 11·0, d. lat.=6·9' N., dep. = 8·7' W.

D.R. lat. 41° 15·0' N. long. 175° 00·0' W.

d. lat. 6·8' N. d. long. 11·7' W.

I.T.P. lat. 41° 21·8' N. long. 175° 11·7' W.



P.L. trends 037·4° T.—217·4° T. through lat. 41° 21·8' N., long. 175° 11·7' W.

EXAMPLE 19A

Sun position line problems.

1. 29th August 1952, in D.R. position 29° 30' S., 138° 20' W. at about 0830 at ship, when the chronometer showed 05h 48m 20s, an observation of the Sun's lower limb gave sextant altitude 27° 22·2', index error 1·6' on the arc, height of eye 40 feet. Find the direction of the position line, and the position of a point through which it can be drawn.

2. 28th October 1952, approximate time at ship 0850, in D.R. position 35° 53·5' S., 138° 58' E., the chronometer showed 11h 51m 43s, sextant altitude of the Sun's L.L. 48° 09', index error 2·0' on the arc, height of eye 50 feet. From this data find the direction of the position line, and the position of a point through which it can be drawn.

3. From the following data find the position line and the position of a point through which it can be drawn.

Date at ship.—15th January 1952, D.R. position 32° 15' S., 48° 16' W.

Chronometer.—The time showed by the chronometer 18h 31m 24s.

Body observed.—The Sun's upper limb, sextant altitude 46° 53·4', index error 0·4' on the arc, height of eye 36 feet.

4. From the following data, find the position line and the position of a point through which it can be drawn.

Date at ship.—22nd September 1952, at about 4 p.m.

Estimated position.—Lat. Equator long. 160° 55' W.

Body Observed.—The Sun, sextant altitude upper limb 32° 42·8', index error 0·6' off the arc, height of eye 41 feet.

Chronometer.—Time showed by the chronometer 02h 26m 15s.

5. From the following information, find the direction of the position line, and the position of a point through which it can be drawn.

Date at ship.—18th December 1952. *Time*—about 0900 at ship, when the chronometer showed 11h 44m 10s.

D.R. position.—Lat. 43° 12' N., long. 38° 25' W.

Body observed.—The Sun, sextant altitude lower limb 13° 12·0', index error 1·6' off the arc, height of eye 38 feet.

6. 19th October 1952, in D.R. position lat. 44° 05' N., long. 27° 41' W. at 09h 41m 02s G.M.T., the sextant altitude of the Sun's lower limb was 14° 33·4', index error 1·4' on the arc, height of eye 30 feet. Find the direction of the position line and the position of a point through which it can be drawn.

Longitude method of obtaining the direction of the position line and the position of a point through which it can be drawn.

By observation of a star

Steps in the problem.

There is no difference between the steps in this problem, and that of the Sun, except in finding the *G.H.A., and, the student should be familiar with this from the time azimuth problem. As a recapitulation, the form of finding the *G.H.A. is shown.

d.p. φ
incr.

G.H.A. φ

*S.H.A.

*G.H.A. (subtract from 360° if necessary)

Example.

From the following information find the direction of the position line, and the position of a point through which it can be drawn.

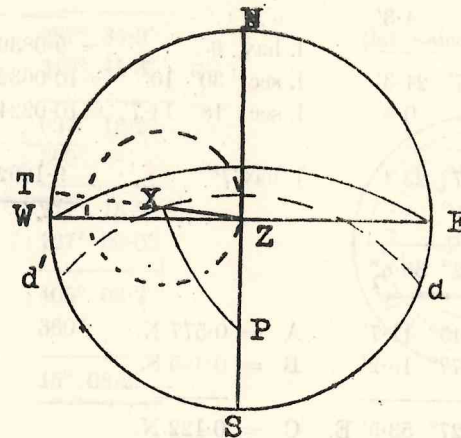
Date at ship.—17th December 1952. *Time at ship.*—Evening.

D.R. position.—Lat. 30° 10' S., long. 127° 50' E.

Body observed.—Diphda, west of the meridian.

Sextant altitude.—47° 29·0', index error 0·4' on the arc, height of eye 19 feet.

Chronometer.—Time by chronometer—13h 26m 00s.

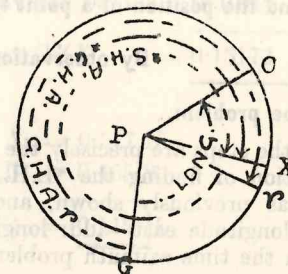


G.M.T. 13h 26m 00s (17th)

φ d.p.	281° 05·8'	*S.H.A.	349° 41·3'
incr.	+ 6° 31·1'	*dec.	18° 14·7' S.
	_____	lat.	30° 10·0' S.
G.H.A. φ	287° 36·9'		
*S.H.A.	349° 41·3'	(L~D)	11° 55·3'

	637° 18·2'		
subtract	360°		

*G.H.A.	277° 18·2'		

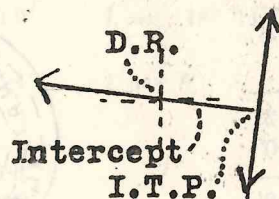


$Az = N. 84.5^\circ W. = 275.5^\circ T.$

Course S. $84.5^\circ E.$ dist. 2.8; d. lat. $0.3' S.$ dep. $2.7 E.$
 D.R. pos. lat. = $30^\circ 10.0' S.$ long. = $127^\circ 50.0' E.$
 d. lat. = $0.3' S.$ d. long. = $3.2' E.$

I.T.P. lat. = $30^\circ 10.3' S.$ long. = $127^\circ 53.2' E.$

P.L. trends $005.5^\circ T.$ — $185.5^\circ T.$ through lat. $30^\circ 10.3' S.$, long. $127^\circ 53.2' E.$



EXERCISE 19B

1. From the following information find the direction of the position line, and the position of a point through which it can be drawn.

Date at ship.—28th September 1952. *Time*—08h 26m 35s G.M.T.

D.R. position.— $24^\circ 50' N.$, $145^\circ 10' E.$

Body observed.—*Antares* 42, west of the meridian.

Sextant altitude.— $30^\circ 21.6'$, index error $0.8'$ on the arc, height of eye 40 feet.

2: From the following data find the direction of the position line, and the position of a point through which it can be drawn.

Date at ship.—6th October 1952.

Chronometer.—Time shown by the chronometer, 20h 59m 41s.

Body observed.—*Alhena*, west of the meridian. D.R. position $43^\circ 05' N.$, $177^\circ 16' W.$

Sextant altitude.— $36^\circ 55.2'$, index error $0.2'$ off the arc, height of eye 44 feet.

3. 28th September 1952, in E.P. $17^\circ 53.6' N.$, $47^\circ 30' W.$, when the chronometer showed 08h 59m 16s, error 14m 53s slow, the sextant altitude of *Mirfak* 9, west of the meridian, at morning twilight, was $40^\circ 17' 30''$, index error $0' 30''$ on the arc, height of eye 62 feet. Find the direction of the position line and the position of a point through which it can be drawn.

4. 18th December 1952, chosen position $42^\circ 40' N.$, $172^\circ 10' W.$, sextant altitude *Denebola* 28, east of the meridian, was $43^\circ 02' 10''$, index error $1' 20''$ on the arc, height of eye 58 feet, chronometer time 14h 27m 53s. Find the direction of the position line and the latitude and longitude of the point through which it can be drawn.

5. 14th September 1952, in D.R. position $32^\circ 10' N.$, $31^\circ 40' E.$, the sextant altitude of *Arcturus* 37, was $35^\circ 19.0'$, index error $1.4'$ on the arc, height of eye 42 feet, the star being west of the meridian.

Time at ship.—Evening twilight.

Chronometer time.—16h 15m 35s, error 2m 30s fast.

Find the direction of the position line, and the position of a point through which it can be drawn.

6. 29th August 1952, find the direction of the position line and the position of a point through which it can be drawn.

G.M.T. of observation 23h 04m 32s, D.R. position lat. $40^\circ 59\frac{1}{2}' N.$, long. $56^\circ 57' W.$, sextant altitude of *Arcturus* 37, west of the meridian, was $39^\circ 48' 50''$, index error $0' 40''$ off the arc, height of eye 30 feet.

EXERCISE 20

PROJECTION OF POSITION LINES

General Notes.

Read Chapter VIII, *Principles for Second Mates*, for general ideas on the theory of position lines.

In working problems, remember that every position line must be drawn through some specified position, depending on the form of observation used, and the method of obtaining the position line, thus:—

Latitude by Meridian Altitude.

P.L. trends 090° T.— 270° T. through position

Latitude (by observation). Longitude (by D.R.)

Latitude by ex-Meridian Altitude.

P.L. trends (at right angles to the bearing) through position

Latitude (by observation). Longitude (by D.R.)

Longitude Method.

P.L. trends (at right angles to the bearing) through position

Latitude (by D.R.). Longitude (by observation)

M.S.H. or Intercept Method.

P.L. trends (at right angles to the bearing) through position

Latitude and longitude of the intercept terminal point

Latitude by Polaris.

P.L. trends (at right angles to the bearing) through position

Latitude (by observation). Longitude (by D.R.)

In dealing with the following problems, plot everything. Indicate the single position lines by a single arrow at each end of the P.L. and the transferred P.L. by double arrows at each end (as shown in the examples).

Use the same scale throughout for d. lat., dep., and distance.

To take off a position, it then means that the d. lat., and dep. from a known position must be measured, and the departure changed into difference of longitude.

To plot a position, the difference of latitude, and the difference of longitude from a known position must be obtained. Change the d. long. into dep., and plot the position by measuring the d. lat. and dep., from the known position.

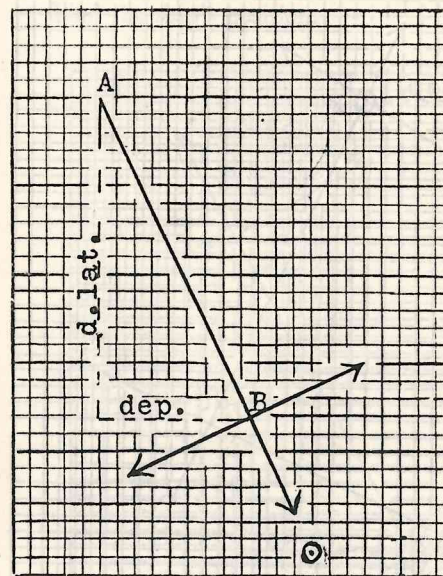
A scale of longitude and a scale of distance and d. lat. can be constructed and used, but this is not necessary unless a question definitely states that this must be done.

Note that **any two position lines can be crossed** (except those from two latitudes) to obtain a ship's position, and, this includes position lines from observation of shore objects.

In cases where the body observed for an ex-Meridian Observation is very close to the meridian, it is often assumed that the P.L. trends 090° T.— 270° T., and a similar assumption is often made in the case of observations of *Polaris*.

Example 1. To find the position of the Intercept Terminal Point.

On a vessel in Chosen Position Lat. $50^\circ 16' N.$, long. $32^\circ 20' W.$, an observation of the Sun gave T.ZX $34^\circ 58' 0''$, C.ZX $35^\circ 06' 0''$, bearing 155° T. Plot the position line using a scale of $\frac{1}{4}$ in. to $1'$ of arc.



T.ZX $34^\circ 58' 0''$

C.ZX $35^\circ 06' 0''$

Intercept $8' 0''$ towards

Description of plot.

A represents the chosen position.

AB—the intercept.

B—the intercept terminal point.

By measurement.—d. lat. = $7' 2'' S.$, dep. = $3' 4'' W.$

A lat. $50^\circ 16' 0'' N.$ long. $32^\circ 20' 0'' W.$

d. lat. $7' 2'' S.$ d. long. $5' 3'' E.$

B lat. $50^\circ 08' 8'' N.$ long. $32^\circ 14' 7'' W.$

P.L. trends 065° T.— 245° T. through lat. $50^\circ 08' 8'' N.$, long. $32^\circ 14' 7'' W.$

Notes:—

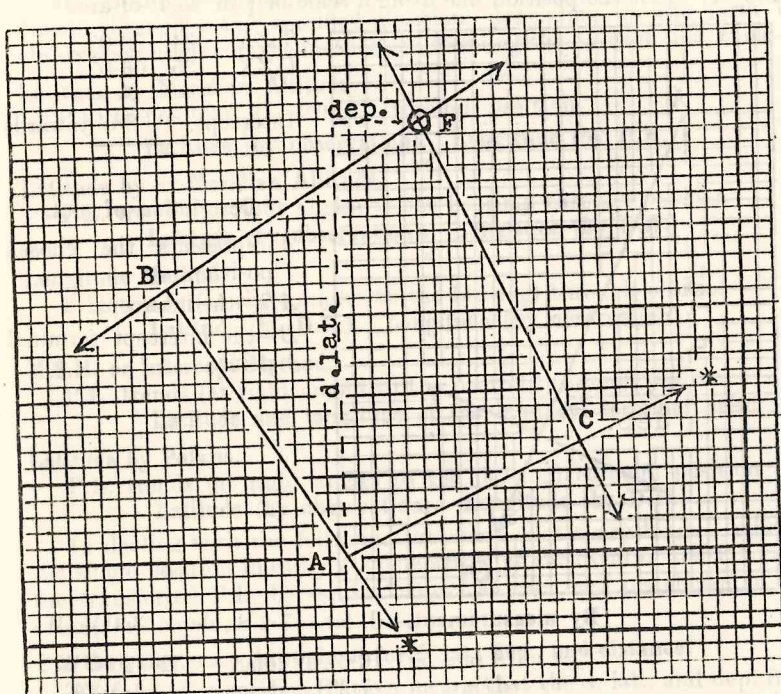
1. Chosen position is a position used in determining an intercept.
2. Where, in practice, the position of the I.T.P. is required, it is found by using the traverse table. The bearing is taken as course, the intercept as distance, and the corresponding d. lat. and dep. are

taken out. The d. lat. is applied to the lat. of the chosen position, and the mean latitude is used to convert the dep. into d. long. The d. lat. and d. long. are named the same as the course if the intercept is towards, the names being reversed if the intercept is away.

Example 2.—Simultaneous observations by Marc St. Hilaire method.

Using D.R. position lat. $47^{\circ} 56' N.$, long. $27^{\circ} 50' W.$, simultaneous observations of two stars gave:—

- (1) bearing $148^{\circ} T.$, intercept $5'$ away.
 - (2) bearing $065^{\circ} T.$, intercept $4'$ towards.
- Find the ship's position.



Scale 4 sm. sq. = 1' of arc.

By measurement from A to F.

d. lat. = $7.7' N.$ dep. = $1.4 M. W.$
 A lat. $47^{\circ} 56.0' N.$ long. $27^{\circ} 50.0' W.$
 d. lat. $7.7' N.$ d. long. $2.2' E.$

B lat. $48^{\circ} 03.7' N.$ long. $27^{\circ} 47.8' W.$

Description of plot.

A—the D.R. position.
 B—the intercept terminal point for P.L. $058^{\circ} T.$ — $238^{\circ} T.$
 C—the I.T.P. for P.L. $150^{\circ} T.$ — $335^{\circ} T.$

Position by observation.

F—Position by observation.

Lat. $48^{\circ} 03.7' N.$, long. $27^{\circ} 47.8' W.$

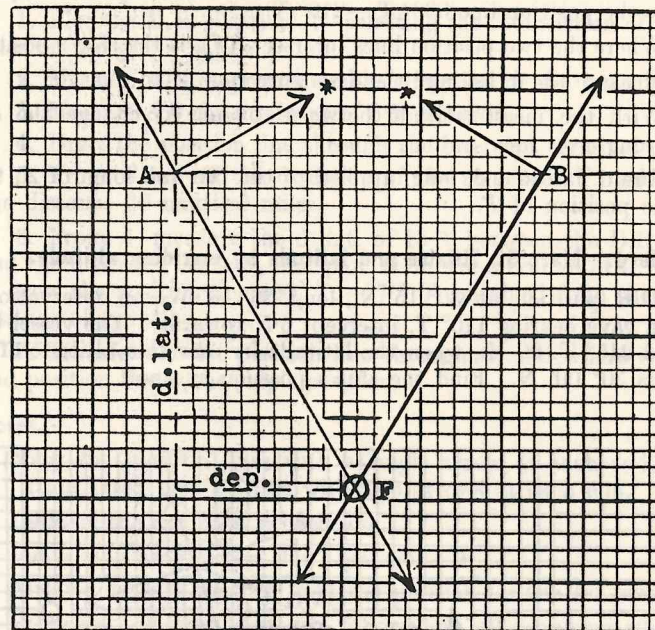
Note.—The departure of $1.4 M.$ is changed into d. long. by using mean latitude $48^{\circ} 00'$.

Example 3.—Simultaneous observations—longitude method.

By using D.R. latitude $25^{\circ} 20' N.$, simultaneous observations of two stars gave:—

- (1) Longitude $36^{\circ} 15' W.$, Bearing $060^{\circ} T.$
- (2) Longitude $35^{\circ} 50' W.$, Bearing $300^{\circ} T.$

Find the ship's position.



Scale 1 sm. sq. = 1' of arc

Description of plot

Long. A $36^{\circ} 15' W.$	in lat. $25^{\circ} 20'$	A—represents the position
„ B $35^{\circ} 50' W.$	d. long. $25' E.$	for the P.L. $150^{\circ} T.$ — $330^{\circ} T.$
d. long. $25' E.$	= dep. $22.5 M. E.$	B—the position for P.L. $030^{\circ} T.$ — $210^{\circ} T.$

By measurement from *A* to *F*.

d. lat. = 19.3'S. dep. = 11.1M.E.
 Pos. *A* Lat. 25° 20.0'N. long. 36° 15.0'W.
 d. Lat. 19.3'S. d. long. 12.3'E.
 Pos. *F* Lat. 25° 00.7'N. long. 36° 02.7'W.

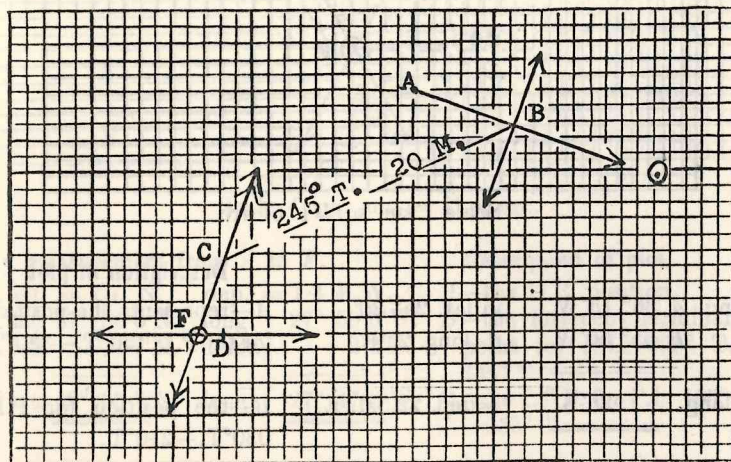
F—the ship's position

Steps in the problem.

1. Plot *A*, the D.R. latitude and longitude by observation, the position for the position line 150° T.—330° T.
2. With the departure corresponding to the difference in longitude between the positions for the position lines, plot position *B*, and through it, draw the position line 030° T.—210° T.
3. Where the two position lines intersect, (*F*), is the ship's position.
4. Measure the d. lat. and the departure from *A* to *F*.
5. With the mean latitude between *A* and *F*, change the dep. into d. long.
6. The d. lat. and d. long. applied to the lat. and long. of *A*, then give the position of *F*.

Example 4.—Marc St. Hilaire and latitude by meridian altitude.

In D.R. position lat. 30° 15' N., long. 26° 40' W., an observation of the Sun gave bearing 110° T. intercept 6.5' towards. The vessel then steamed 245° T. 20 M., when the latitude by meridian altitude of the Sun was 30° 00' N. Find the ship's position at noon.



By measurement from *A* to *F*.

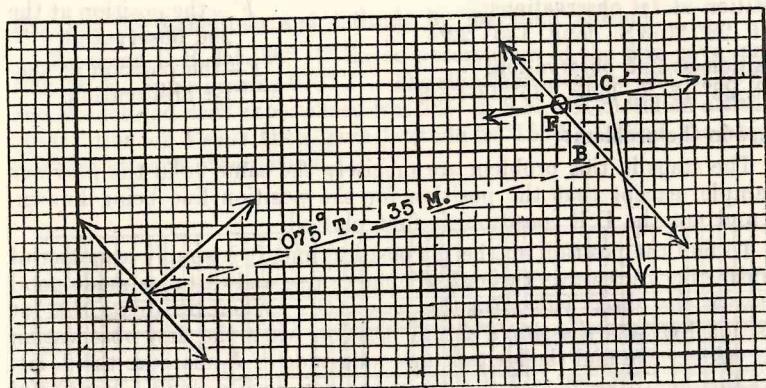
dep. 13.4 M.W. 1 small square = 1' of arc
A, lat. = 30° 15.0'N. long. = 26° 40.0'W. **Description of figure.**
 d. long. = 15.5'W. *A*—the D.R. position.
F, lat. = 30° 00.0'N. long. = 26° 55.5'W. *AB*—the intercept.
B—the intercept terminal point.
Position at noon:—
 lat. 30° 00' N., long. 26° 55.5' W. *BC*—the run
C—the position for the transferred P.L.
D—the position for the 2nd position line
F—the position by observation.

Steps in the problem.

1. Plot the D.R. position *A*—selecting the intersection of two main lines on the graph paper.
2. Measure with a protractor the direction of the bearing 110° T.
3. Measure *AB* the intercept of 6.5' towards.
4. Draw the position line through the intercept terminal point—*B*.
5. From *B* lay off the direction of the run, 245° T., and measure the distance 20 nautical miles.
6. From *A*, measure the d. lat. of 15.0' between the D.R. latitude and the observed latitude, and plot *D* on the meridian of *C*. Through *D* draw the position line 090° T. —270° T. obtained from the meridian altitude observation.
7. Transfer the 1st position line through *C*, and where it cuts the 2nd position line is the ship's position.

Notes.—

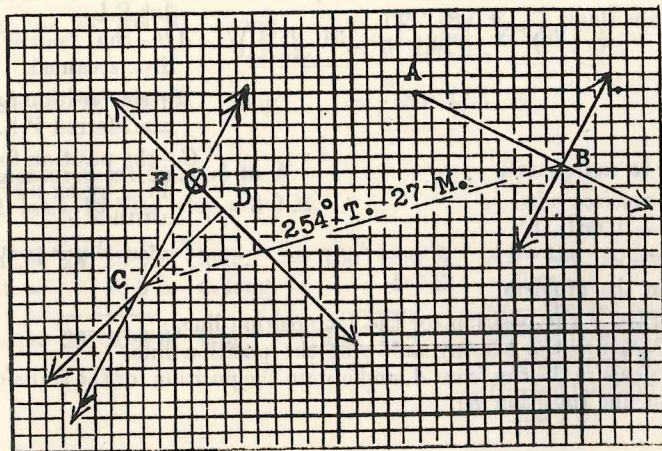
1. Mark the position lines with a single arrow at each end, and the transferred position line with two arrows at each end.
2. Indicate the run by a pecked line.
3. Put a ring around the ship's position—*F*.
4. Always measure the run from the position for the 1st position line.
5. Precisely the same steps are followed in all problems where there is a run between the observations.
6. If a set and drift is experienced, lay it off at the end of the course and distance steamed.
7. In dealing with these problems, always—from the position for the 1st position line, lay off exactly what the ship has done between the two observations, and through the point so obtained, transfer the 1st position line. Where the transferred position line cuts the 2nd position line is the ship's position at the 2nd observation.



4. Plot *C* the position for the position line by the ex-meridian altitude observation. Note that the position line must be drawn through the latitude by observation and the D.R. longitude, in this case the longitude of *B*. Therefore, to plot *C*, measure along the meridian of *B*, and from the parallel of *A*, the d. lat. between the D.R. lat. and the lat. by ex-meridian altitude. If some longitude, other than that of *B*, is used in the ex-meridian observation, then change the d. long. between this longitude and the longitude of the first plotted position into departure. Then measure the d. lat. and dep. from the first plotted position in order to plot the position of the point through which the position line by ex-meridian observation is to be drawn.

Example 7.—Two position lines by Marc St. Hilaire, with a run between.

Using selected position lat. $23^{\circ} 40' S.$, long. $98^{\circ} 50' E.$, an observation of a star gave bearing $117^{\circ} T.$ intercept $10'$ towards. The



ship then ran $254^{\circ} T.$ $27 M.$, when a second observation gave bearing $226^{\circ} T.$ intercept $6.8'$ away. Find the ship's position.

By measurement from *A* to *F*.

Scale

d. lat. = $5.5' S.$, dep. = $13.8 M.W.$ 1 sm. sq. = $1'$ of arc.
A, lat. = $23^{\circ} 40.0' S.$ long. = $98^{\circ} 50.0' E.$
d. lat. = $5.5' S.$ d. long. = $15.1' W.$
F, lat. = $23^{\circ} 45.5' S.$ long. = $98^{\circ} 34.9' E.$

Ship's position:—Lat. $23^{\circ} 45.5' S.$, long. $98^{\circ} 34.9' E.$

Description of figure:—

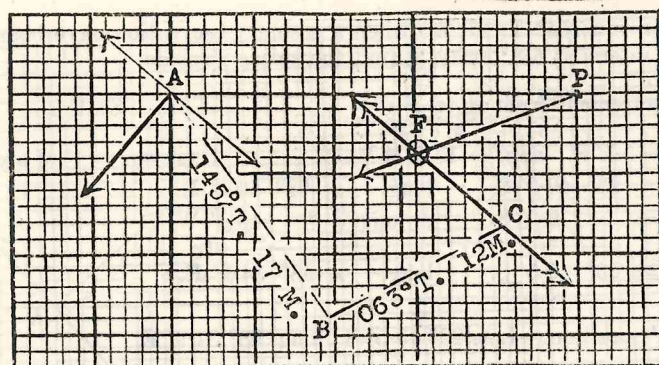
- A*—the 1st D.R. position.
- AB*—the intercept at the 1st observation.
- B*—the intercept terminal point, and position for the 1st position line.
- BC*—the run between the observations.
- C*—the position for the transferred position line.
- CD*—the 2nd intercept.
- D*—the intercept terminal point and position for the 2nd position line.
- F*—the position by observation.

Steps in the problem.

1. Plot position *A*, the selected position.
2. Lay off the bearing, and measure the intercept.
3. Plot the position line through the intercept terminal point.
4. Measure the run from the position for the 1st position line.
5. *C* is the position used for the 2nd observation (unless some chosen or selected position is stated). Plot the 2nd position line.
6. Transfer the 1st position line through the end of the run, and where it cuts the 2nd position line, is the ship's position.

Example 8.—Position line from observation of a celestial body combined with the position line from observation of a shore object.

An observation of a celestial body gave bearing $220^{\circ} T.$ and long. $115^{\circ} 02' E.$, by using D.R. lat. $32^{\circ} 00' S.$ Later, a point of land (lat. $32^{\circ} 00' S.$, long. $115^{\circ} 31' E.$) bore $070^{\circ} T.$ Between the observations the vessel steamed $145^{\circ} T.$ for 17 nautical miles, and then $063^{\circ} T.$ for 12 nautical miles. Find the vessel's position.



By measurement from *A* to *F*:—

Scale

d. lat. = 3·7' S., dep. = 15 M.E. $\frac{1}{10}$ in. = 1' of arc.
A, lat. = 32° 00·0'S. long. = 115° 02·0'E. D.R. long. = 115° 02'E.
A, lat. = 3·7'S. d. long. = 17·7'E. *P*, long. = 115° 31'E.

F, lat. = 32° 03·7'S. long. = 115° 19·7'E. d. long. = 29'E.

dep. = 25 M. using
 mean lat. 32° S.

Ship's position:—Lat. 32° 03·7' S., long. 115° 19·7' E.

Description of figure:—

A—the position for the 1st position line.

AB and *BC*—the courses and distances steamed.

P—the position of the land.

F—the ship's position.

Steps in the problem.

1. Plot the 1st position line and the courses and distances steamed.
2. To plot *P*, the position of the point of land, change into dep. the d. long. between the longitude of the point of land and the longitude of *A*. With the d. lat. and dep. measured from *A*, plot the position of *P*.
3. Through *P* draw the bearing.
4. Transfer the 1st position line through the end of the run, and so find the position *F*.
5. Measure the d. lat. and dep. from *A* to *F*.
6. Apply the d. lat. to the latitude of *A*, and with the mean latitude, change the dep. into d. long., which, applied to the longitude of *A*, will give the longitude of *F*.

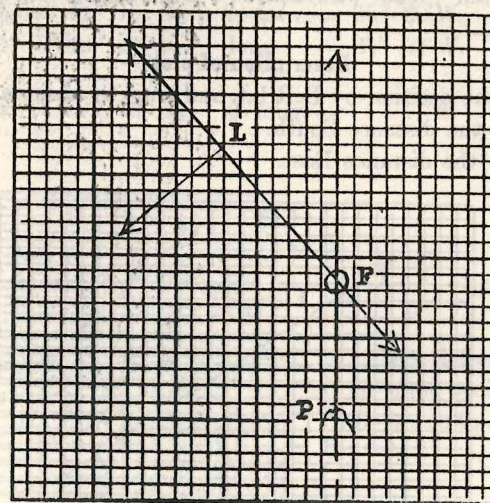
Note.—The position lines from any two observations can be combined.

Miscellaneous examples.

These examples can be solved either graphically, or by calculation. Many of the previous examples can be solved by calculation (including use of the traverse table). These methods were not shown for two reasons; firstly, it is most essential to be thoroughly familiar with the graphical methods; secondly, the graphical methods being known, the solving of the problems by calculation or by use of the traverse table becomes obvious.

Example 9.

In fog, a vessel anchors in D.R. position 48° 58' N., 02° 25' W. During a clearance in the fog, a light-house in lat. 48° 41·1' N., long. 02° 19·2' W., was observed bearing 180° T. Later, the fog cleared and an observation of the Sun gave longitude 02° 30' W., and bearing of the Sun 230° T. How much in error was the D.R. latitude?



Scale

1 sm. sq. = 1' of arc.

Description of plot:—

P—the position of the lighthouse.

L—the position for the P.L. by longitude observation.

F—the ship's position.

Pos. for P.L. lat. = 48° 58·0' N. long. = 02° 30·0' W.
 Light-house lat. = 48° 41·1' N. long. = 02° 19·2' W.
 d. lat. = 16·9' N. d. long. = 10·8' W.

With mean lat. 48° 50', d. long. 10·8', dep. = 7·1 M. W.

By measurement:—

d. lat. between L and $F = 8.5'$.

Error in D.R. latitude = $8.5'$ N.

Problem solved by calculation:—

An approximate figure, similar to the exact one shown, must be drawn. The d. long., and the dep. must be obtained as shown, then, in Traverse table:—

with course S. 40° E. and dep. 7.1 , the d. lat. = 8.5 .

Error in D. R. latitude = $8.5'$ N.

Example 10.

On a vessel at anchor, an observation of the Sun, during the afternoon, gave longitude $05^\circ 05'$ W. by using lat. $50^\circ 04'$ N. Vertical sextant angle observations taken later, put the ship 4 M. South and 6 M. East of this position. What was the Sun's true bearing?

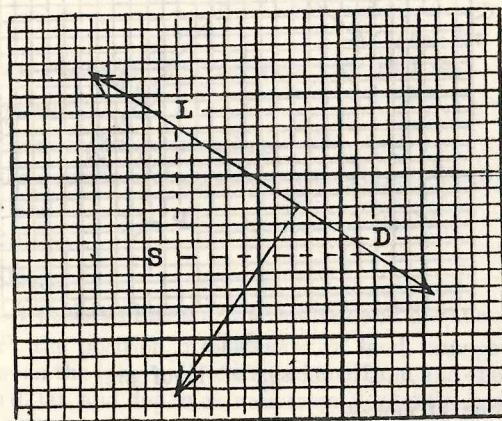
By plotting:—

Description of plot:—

L —the position by D.R. lat. and long. by observation.

LS —the distance South.

SD —the distance East.



Scale

2 sm. sq. = 1 M.

The position line *must* pass through position L , and it *must* also pass through D , since that was the ship's actual position. Therefore a line at right angles to the line joining L and D will give the Sun's true bearing.

Sun's bearing = 214° T.

By calculation:—

From a figure similar to LSD , in the plot,

$$\tan L = \frac{6}{4} = 1.5$$

$$L = 56^\circ 19' \quad \therefore \text{direction of } LD = \text{S. } 56^\circ 19' \text{ E.}$$

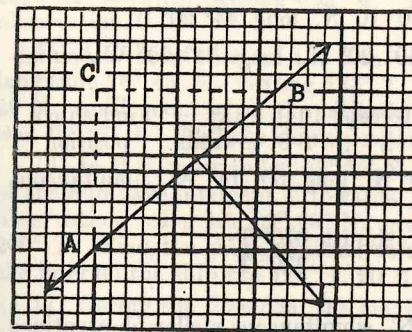
Hence Sun's bearing = $213^\circ 41'$ T.

Example 11.

A morning observation of the Sun worked with lat. $42^\circ 10'$ N. gave long. $35^\circ 20'$ W. and when worked with lat. $42^\circ 20'$ N. gave long. $35^\circ 03'$ W. What was the Sun's bearing?

By plotting:—

1st obs., lat. = $42^\circ 10'$ N.	long. = $35^\circ 20'$ W.	M.L. $42^\circ 15'$
2nd obs., lat. = $42^\circ 20'$ N.	long. = $35^\circ 03'$ W.	d. long. $17'$
		dep. = 11 M.
d. lat. = $10'$ N.	d. long. = $17'$ E.	



Scale

1 sm. sq. = $1'$ of arc

Description of plot:—

A —first position for P.L.

B —second position for P.L.

The position line must have passed through A and through B . Therefore by joining these two points, the position line is obtained, and the Sun's bearing will be at right angles to this direction.

Sun's bearing = 138° T.

By calculation:—

From an approximate figure similar to the plot, and using the traverse table:—

AC (d. lat.) 10 , and CB (dep.) 11 , give angle equal to 48° .

\therefore P.L. trends 048° T. -228° T., so that Sun's bearing = 138° T.

EXERCISE 20

PROJECTION OF POSITION LINES

1. Given chosen position lat. $40^{\circ} 20' N.$, long. $18^{\circ} 30' W.$, $O.ZX = 38^{\circ} 10' 0'$, $C.ZX = 38^{\circ} 20' 0'$, azimuth = $120^{\circ} T.$ Plot the position line, using scale of 1 cm. to 1 nautical mile, and state the position of the intercept terminal point.

2. D.R. position lat. $20^{\circ} 20' S.$, long. $27^{\circ} 30' W.$, true altitude = $55^{\circ} 28'$, $C.ZX = 34^{\circ} 26'$, azimuth $235^{\circ} T.$ Plot the position line, using a scale of $\frac{1}{2}$ -in. to 1 M. State the position of the intercept terminal point.

3. In D.R. position lat. $40^{\circ} 00' N.$, long. $30^{\circ} 00' W.$, an observation of the Sun gave true altitude $45^{\circ} 02'$. The calculated zenith distance was $45^{\circ} 04'$, and the azimuth was $140^{\circ} T.$ Plot the position line using a scale of $\frac{1}{2}$ in. to 1' of arc, and state the position of the intercept terminal point.

4. From the following simultaneous observations, find the ship's position.

Sun — bearing $130^{\circ} T.$ intercept 6' towards

Venus — " $210^{\circ} T.$ " 8' away

The selected position was lat. $50^{\circ} 10' N.$, long. $44^{\circ} 20' W.$

5. In estimated position lat. $40^{\circ} 20' N.$, long. $34^{\circ} 20' W.$, simultaneous observations gave:—

Sirius — bearing $136^{\circ} T.$ intercept 10' away } Find ship's

Venus — " $286^{\circ} T.$ " 8' towards } position

6. In D.R. position lat. $48^{\circ} 10' N.$, long. $50^{\circ} 14' W.$, simultaneous observations of two stars gave:—

1. longitude $50^{\circ} 08' W.$ azimuth $070^{\circ} T.$

2. " $50^{\circ} 20' W.$ " $330^{\circ} T.$

Find the ship's position.

7. By using D.R. lat. $25^{\circ} 20' N.$, simultaneous stellar observations gave:—

1. longitude $36^{\circ} 15' W.$ bearing $060^{\circ} T.$

2. " $35^{\circ} 50' W.$ " $300^{\circ} T.$

Find the ship's position.

8. From a vessel steering $035^{\circ} T.$ a point of land bore $330^{\circ} T.$ After the vessel had steamed 30 nautical miles, the point bore $250^{\circ} T.$ Find the distance off the point at the second observation.

9. In D.R. position lat. $23^{\circ} 40' N.$, long. $52^{\circ} 30' W.$, a stellar observation gave intercept $4'$ towards, and bearing $040^{\circ} T.$ The vessel steamed $090^{\circ} T.$ at 12 knots through a current setting $000^{\circ} T.$ at 2.5 knots. 2 hours later, another observation gave the intercept $5'$ towards and bearing $120^{\circ} T.$ Find the ship's position at the 2nd observation.

10. By using D.R. lat. $34^{\circ} 11' N.$ the longitude by observation was $42^{\circ} 25' W.$, bearing of the Sun being $121^{\circ} T.$, and log reading 40. The vessel steered $042^{\circ} T.$ until noon, when the latitude by meridian altitude of the Sun was $34^{\circ} 11' N.$, and the log read 72. Find the position at noon.

11. An observation of the Sun gave longitude $36^{\circ} 58' W.$ and bearing $130^{\circ} T.$, by using D.R. lat. $29^{\circ} 32' S.$ The ship then steamed $300^{\circ} T.$ for 27 M. in a current setting $090^{\circ} T.$ 5 M., when the latitude by meridian altitude of the Sun was $29^{\circ} 06' S.$ Find the ship's position at noon.

12. In D.R. lat. $34^{\circ} 20' N.$ an observation of a star gave longitude $47^{\circ} 58' W.$, and bearing of the star as $222^{\circ} T.$ At the same time an observation of another star gave longitude $47^{\circ} 46' W.$, and bearing $142^{\circ} T.$ Find the ship's position.

13. By observation in D.R. position lat. $53^{\circ} 47' S.$, long. $178^{\circ} 37' W.$, the bearing of the Sun was $076^{\circ} T.$ intercept $11'$ away. The ship then ran $284^{\circ} T.$ for 47 M. through a current setting $256^{\circ} T.$ for 7 M., when a second observation of the Sun gave bearing $284^{\circ} T.$, intercept $5'$ towards. Find the ship's position at the second observation.

14. By using selected position lat. $16^{\circ} 41' S.$, long. $163^{\circ} 29' E.$, an observation of the Sun gave intercept $18'$ away, bearing $055^{\circ} T.$ The ship then steamed $208^{\circ} T.$ 33 M., when a second observation gave intercept $12'$ towards, bearing $332^{\circ} T.$ Find the ship's position at each observation.

15. An observation of the Sun worked with lat. $42^{\circ} 17' S.$ gave longitude $76^{\circ} 43' E.$, bearing $123^{\circ} T.$ The ship then steamed $237^{\circ} T.$ 29 M., until noon, when the latitude by meridian altitude of the Sun was $42^{\circ} 27' S.$ Find the ship's position at noon.

16. In D.R. position lat. $39^{\circ} 39' N.$, long. $130^{\circ} 47' E.$, an observation of the Sun gave intercept $4'$ towards, bearing $160^{\circ} T.$ Later, a second observation, using lat. $39^{\circ} 09' N.$ gave longitude $130^{\circ} 47' E.$, bearing $200^{\circ} T.$ Find the ship's position at the second observation, if during the interval the ship ran $196^{\circ} T.$ 20 M. and $186^{\circ} T.$ 18 M.

17. During the forenoon, the longitude was worked out on a vessel at anchor. Fog then set in. Later the fog cleared, and vertical angle observations put the ship 6 M. north and 5 M. east of the observed position. What was the true bearing of the Sun at sights?

18. An a.m. sight of the Sun when worked with lat. $51^{\circ} 55' N.$ gave longitude $20^{\circ} 04' W.$, and when worked with lat. $52^{\circ} 05' N.$ gave longitude $19^{\circ} 54\cdot5' W.$ What was the true bearing of the Sun?

19. An observation worked with D.R. lat. $48^{\circ} 20' N.$ gave long. $35^{\circ} 17' W.$, and bearing $127^{\circ} C.$ The vessel then steamed for 4 hours at 11 knots and a current set $090^{\circ} T.$ at 3 knots. The course steered was $154^{\circ} C.$, dev. $5^{\circ} E.$, var. $12^{\circ} W.$, wind N.E., and leeway 5° . A second observation then gave a star's bearing $252^{\circ} C.$, intercept $10'$ towards. Find the ship's position.

EXERCISE 21

TIDES

Read Chapter IX., *Principles for Second Mates.*

Steps in the problem:—

The steps in the problem will vary slightly according to the method employed, viz.:—(1) finding the correction to mean tide level by using the traverse table, (2) finding the correction to high water, or to low water, by the tables in the front of the tide tables, (3) finding the height of tide by means of a scale drawing. So far as the examination work is concerned, any one of the methods may be used—the first is shown here. The answer obtained must be within 0.5 feet of a correct result.

1. If the time given is other than zone time, then bring it to the zone time for the port. In the tide tables for European waters, G.M.T. is the zone time used throughout.

2. Pick out the times and heights of high water and low water.

The two "tides" must follow one another, and they must lie one on each side of the given time.

Note that the 24 hour notation is used for the times. This should make the picking out of the required times, easier.

Examples:—

Time 07h 52m (15)
H.W.=11h 06m L.W.=04h 48m

Extract from tables

H.W.		L.W.		
Time	Ht.	Time	Ht.	
H M	Ft.	H M	Ft.	15
11 06	12.6	04 48	5.0	
23 24	12.4	17 15	4.5	
—	—	05 52	2.2	16
12 05	12.5	18 11	3.6	

Time 13h 50m (15)
H.W.=11h 06m L.W.=17h 15m

Time 20h 30m (15)
H.W.=17h 15m L.W.=23h 24m

Time 03h 10m (16)
H.W.=23h 24m (15) L.W.=05h 52m

3. Find the interval from high water or low water, whichever is the nearer to the given time.

4. Find the duration of the tide, i.e., the time of rise or fall.

5. Find the height of M.T.L. above datum. To do this, add the heights of high water and low water, and divide by 2, if both heights are above datum.

If the low water is below datum (this is indicated by an asterisk against the height) subtract the low water height from the high water height and divide by 2.

This is the same as finding the mean latitude, when, (1) the latitudes have the same names, (2) the latitudes have different names.

6. Find the half-range ($\frac{1}{2}R$).—The range is the difference between the heights of high water and low water, and, the M.T.L. being midway between the two, then,

$$\frac{1}{2} \text{ range} = \text{high water height} - \text{M.T.L.}$$

Example:—

Given:—Height of high water = 15.6 ft. and height of low water = 4.8 ft.

To find (1) the height of mean tide level, (2) the half-range.

High water height = 15.6 ft.

Low water height = 4.8 ,,

$$\begin{array}{r} \text{---} \\ 2)20.4 \\ \text{---} \end{array}$$

M.T.L. = 10.2 ,,

$\frac{1}{2}$ Range = 5.4 ,,

7. Calculate the angle from high water, or from low water, whichever the interval is taken from.

$$\theta = \frac{\text{Interval} \times 180^\circ}{\text{Duration}}$$

8. Find the correction to M.T.L.—Enter the traverse table with θ as course, and the half-range as distance, then

the d. lat. = the correction.

If the interval has not been taken from the nearer "tide", θ will exceed 90° —in this event take θ from 180° and proceed as already explained.

9. Apply the correction to the height of M.T.L.

θ from high water—correction is added to M.T.L.

θ from low water—correction is subtracted from M.T.L.

The result is the height of tide above datum.

10. State the required answer at the end of the problem.

Example 1.

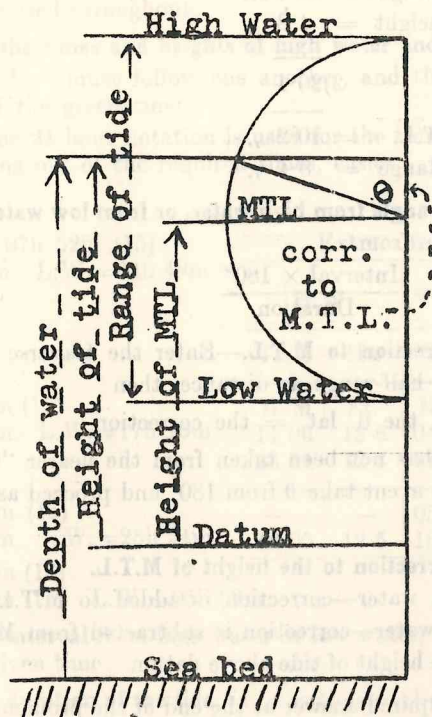
Find the height of tide off Swansea at 09h 10m 00s G.M.T. on 8th January 1949.

	h	m	ft.		h	m	ft.
H.W. time	11	46	ht. 21·7	L.W. time	05	25	ht. 8·1
Zone time	09	10		H.W. time	11	46	ht. 21·7
<hr/>				<hr/>			
Interval =	2	36		Duration	6	21	2)29·8
from H.W.	<hr/>			M.T.L.	<hr/>		14·9
				$\frac{1}{2}$ Range =	<hr/>		6·8

$$\theta = \frac{\text{Int.} \times 180^\circ}{\text{Duration}}$$

$$= \frac{156 \times 180^\circ}{381}$$

$$= 73\cdot7^\circ \text{ from H.W.}$$



With course $73\frac{1}{2}^\circ$, and dist. 6·8, d. lat. = 1·9
i.e., correction = 1·9 ft.

Ht. of M.T.L. = 14·9 ft. above datum
 Correction = 1·9 „

Ht. of tide = 16·8 ft. above datum

Height of tide off Swansea = 16·8 ft. above datum.

Notes.

1. If the correction to apply to the leadline is required, the problem is precisely the same as the example. The correction to apply to the leadline before comparing with the depth on the chart is simply the height of the tide above datum at the time of taking the cast. The correction is therefore to be subtracted from the leadline depth, if the height of tide is above datum, but added if the height of tide is below datum.

If in the example, the correction to apply to the leadline had been asked for, the answer to the question would have been:—
 “Correction to apply to the leadline = 16·8 ft. to subtract.”

2. If the actual depth at any time is asked for:—proceed to find the height of tide, then, if it is above datum, add to the given depth, but if the height of tide is below datum, then subtract it from the height of tide.

Had the actual depth, where the chart showed 3 fathoms, been asked for in the Example, it would have been found thus:—

Depth on chart = 18·0 ft. below datum
 Height of tide = 16·8 ft. above datum

Actual depth = 34·8 ft.

3. If the height of a light-house above sea-level is required:—

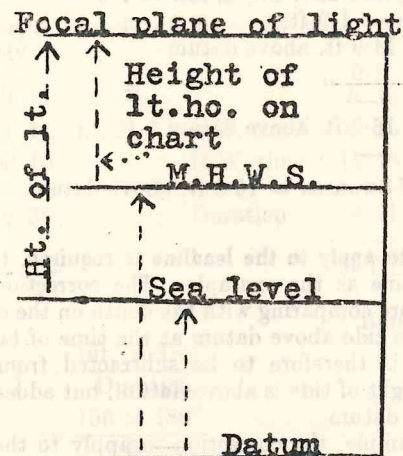
Again proceed to find the height of tide. Remember that the height of a light-house (actually the height of the focal plane of the light) is given above mean high water springs (M.H.W.S.), the height of which is given above datum.

Thus, suppose the example had said, “Find the height above sea-level of a light-house 60 ft. high (M.H.W.S. = 42 ft.)

Ht. of lt.-ho. = 60·0 ft. above M.H.W.S.
 „ „ M.H.W.S. = 42·0 „ „ datum

 „ „ lt.-ho. = 102·0 „ „ „
 „ „ tide = 16·8 „ „ „

 „ „ lt.-ho. = 85·2 „ „ sea level



Note. In the back of the tidetables for European waters is a section which gives the heights of M.H.W.S., M.H.W.N., M.L.W.S., and M.L.W.N. with the differences for Secondary Ports. These four quantities are given in black type for the Standard Ports.

4. If the time is asked for:—

The problem, again, is almost identically the same as in the first example, except that the angle from high water or low water must first be obtained by using the height of tide, M.T.L., and the half-range.

Then from the equation:—

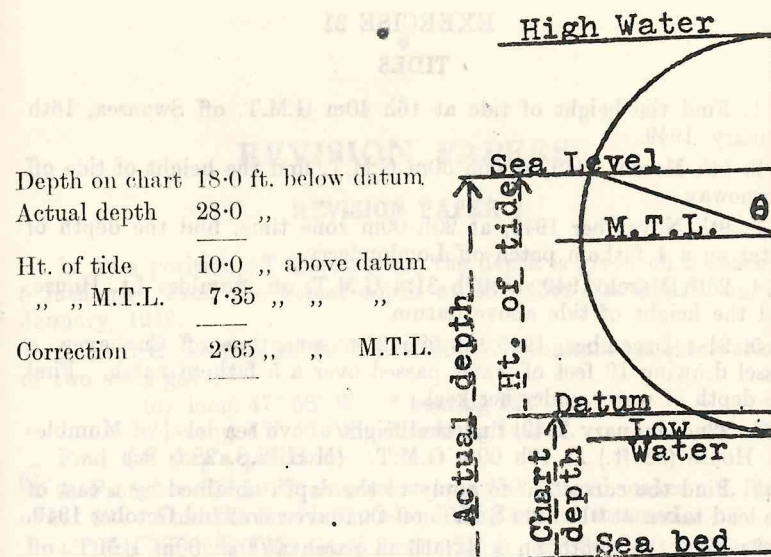
$$\frac{\text{Interval}}{\text{Duration}} = \frac{0^\circ}{180^\circ}$$

Find the interval from high water or low water, *i.e.*, from which ever 0 has been measured.

Example 2.

Off Stornoway, what is the earliest time on the morning of 16th March, 1949, when there will be a depth of 28 feet on a patch marked 3 fathoms on a chart?

	h	m	ft.		h	m	ft.
H.W. time	07	44	ht. 15.6	L.W. time	01	43	ht. *0.9
L.W. ,,	01	43	,, *0.9				
Duration =	6	01	2)14.7				
				M.T.L. =	7.35	½ R =	8.25 ft.



Depth on chart	18.0 ft. below datum
Actual depth	28.0 ,,
Ht. of tide	10.0 ,, above datum
,, ,, M.T.L.	7.35 ,, ,,
Correction	2.65 ,, ,, M.T.L.

From the traverse table, with:—
dist. 8.25, and d. lat. 2.65 0 = 71° from H.W.

$$\begin{aligned} \text{Interval} &= \frac{0^\circ \times \text{Duration}}{180^\circ} \\ &= 143 \text{ mins.} \\ &= 2\text{h } 23\text{m from H.W.} \end{aligned}$$

Time of H.W.	= 07h 43m
Int. before	= 2 23
Time	= 05 21

Earliest time at which there will be the required depth is 05h 21m 16th March (Zone Time)

Notes.

- In these problems be careful to note whether a rising tide or a falling tide is to be dealt with.
If the earliest time is required—use a rising tide.
If the latest time is required—use a falling tide.
Thus, if in the example, the latest time on the morning of 16th March had been required, the "tides" used would have been:
H.W. time 07h 44m, L.W. time 14h 17m.
- If the local mean time is required, change the d. long. between the longitudes of the place and the standard meridian into time, and apply, in the usual way, to the zone time found.

EXERCISE 21

TIDES

- ✓1. Find the height of tide at 16h 40m G.M.T. off Swansea, 16th January, 1949.
- ✓2. 5th March, 1949, at 05h 50m G.M.T. find the height of tide off Stornoway.
- ✓3. 9th November 1949, at 20h 00m zone time, find the depth of water on a 4 fathom patch off Londonderry.
- ✓4. 25th March 1949, at 07h 31m G.M.T. off Mumbles Lt. House, find the height of tide above datum.
- ✱ 5. 21st December, 1949, at 08h 20m zone time off Cuxhaven, a vessel drawing 19 feet of water passed over a 5 fathom patch. Find the depth of water under her keel.
- ✱ 6. 22nd January 1949, find the height above sea level of Mumbles Lt. House (58 ft.) at 19h 00m G.M.T. (M.H.W.S. 28.5 ft.)
7. Find the correction to apply to the depth obtained by a cast of the lead taken at 01h 40m S.M.T. off Cuxhaven on 22nd October 1949.
8. Find the depth on a 4 fathom patch at 02h 00m L.M.T. off Stornoway, 6th March 1949.
9. At what time will the tide have risen to 8 feet above datum on the evening of 5th March 1949, off Stornoway?
10. Off Stornoway 15th March 1949, find the correction to apply to the lead at 18h 25m G.M.T. Find the actual depth of water if the chart showed 4 fathoms.
- ✱ 11. Find the earliest time on the morning of 19th February 1949, when a vessel off Swansea can, with a draught of 26 feet, cross a 3 fathom patch with a clearance of 3 feet.
12. 24th September 1949, find the depth of water under the keel of a vessel drawing 14 feet, and crossing a 2 fathom patch off Londonderry at 1840 Zone time.
13. 16th February 1949 off Queenstown, find the time when the actual depth on a 4 fathom patch, during the evening, is 34 feet.
14. Off Londonderry, on the night of 27th October 1949, find the earliest time when the actual depth is 15 feet on a patch marked 2 fathoms on the chart.
15. Off Stornoway, 16th March 1949, what is the earliest time at which a vessel drawing 28 feet and aground, on a 3 fathom bank, will float?

REVISION PAPERS

REVISION PAPER 1

1. At a position off Queenstown, the depth is given on a chart as 5 fathoms. Find the actual depth at 03h 45m 00s G.M.T. on 1st January, 1949.

2. In D.R. position $34^{\circ} 20' N.$, $47^{\circ} 50' W.$, simultaneous observations of two stars gave:—

(a) long. $47^{\circ} 58' W.$ * bearing $222^{\circ} T.$

(b) long. $47^{\circ} 46' W.$ * bearing $142^{\circ} T.$

Find the ship's position.

③ 3. From lat. $37^{\circ} 10' S.$ a vessel steams $210^{\circ} T.$ and makes a d. long. of $11^{\circ} 30'.$ Find the final latitude and the distance steamed.

4. 16th January 1952, in E.P. $38^{\circ} 25' S.$, $25^{\circ} 20' W.$, the sextant altitude of *Antares* 42, on the meridian, was $78^{\circ} 00'$ bearing $000^{\circ} T.$, index error $4.6'$ on the arc, height of eye 22 feet. Find the latitude and the position line.

5. 18th January 1952, the sextant altitude of *Mirfak* 9, on the meridian below the pole, was $13^{\circ} 13.6'$, index error $0.8'$ on the arc, height of eye 46 feet. Find the latitude and the position line.

6. 29th August 1952, in D.R. position $25^{\circ} 20' N.$, $162^{\circ} 12' W.$, at 18h 23m L.M.T., the Sun set bearing $271^{\circ} C.$ Find the true amplitude, and the deviation, the variation being $12^{\circ} E.$

7. 20th December 1952, at 08h 19m 00s A.T.S., the Sun bore $130^{\circ} C.$ to an observer in $37^{\circ} 20' N.$, $12^{\circ} 15' W.$ where the variation was $5^{\circ} W.$ Find the true azimuth and the deviation.

8. 14th December 1952, at 03h 20m 00s S.M.T., an observation of the star *Bellatrix* 13 gave a bearing of $292^{\circ} C.$ The observer's D.R. position was $39^{\circ} 21' S.$, $100^{\circ} 13' W.$ Find the star's true azimuth, and the deviation, the variation being $20^{\circ} E.$

9. 29th August 1952, at 18h 50m 00s L.M.T., in lat. $42^{\circ} 03' N.$, long. $17^{\circ} 30' W.$ an observation of *Polaris* gave sextant altitude $41^{\circ} 26.0'$, index error $2.6'$ off the arc, height of eye 23 feet. Find the latitude and the position line.

10. 16th January 1952, in D.R. lat. $48^{\circ} 55' S.$, long. $98^{\circ} 40' W.$ an observation of the Sun's lower limb was taken. The sextant altitude was $61^{\circ} 25'$, index error $1.6'$ on the arc, height of eye 40 feet. The time shown by the chronometer was 06h 14m 26s. Find the latitude of the point in long. $98^{\circ} 40' W.$, through which to draw the position line, and find also, the direction of the position line.

11. 17th September 1952, in D.R. position $37^{\circ} 45.5' S.$, $137^{\circ} 38' E.$, at about 0830 a.m., an observation of the Sun's lower limb gave sextant altitude $28^{\circ} 28'$, index error $2.0'$ off the arc, height of eye 36 feet. The time by the chronometer was 11h 17m 40s, its error on G.M.T. being 5m 57s slow. Find the direction of the position line and the position of a point through which it can be drawn.

12. From the following data find the direction of the position line and the position of a point through which it can be drawn.

Date:—16th January 1952. D.R. pos. lat. $41^{\circ} 35' S.$, long. $154^{\circ} 52.5' W.$

Sextant altitude of *Menkent* 36 , $58^{\circ} 26.8'$, index error on the arc $2.4'$, height of eye 38 feet. G.M.T. of observation 19h 23m 20s.

13. From the following data, find the direction of the position line and the latitude of the point in long. $30^{\circ} 20' W.$ through which it is drawn. D.R. position $45^{\circ} 16' N.$, $30^{\circ} 20' W.$

Sextant altitude of β *Ophiuchi* $48^{\circ} 21'$, index error $2.2'$ on the arc, height of eye 25 feet. A.T.S. of observation 18h 36m 02s 18th September 1952.

14. 17th January 1952, in long. $32^{\circ} 50' E.$, the correct H.A.T.S. was 3h 11m 10s, when the time shown by a chronometer was 01h 36m 20s. Find the chronometer error.

15. 20th September 1952, the sextant altitude of the Sun's upper limb when on the meridian was $67^{\circ} 18.4'$. Index error $1.6'$ on the arc, height of eye 42 feet. Find the latitude and the position line, the observer's D.R. position being $22^{\circ} 12' S.$, $152^{\circ} 10' E.$

16. From a vessel in D.R. position $49^{\circ} 20' N.$, $02^{\circ} 23' W.$, a station in $50^{\circ} 20' N$ $00^{\circ} 17' E.$ bore 076° by W/T D.F. Find the bearing to plot on a mercator chart.

17. From the following log extract, find the E.P. at 1200 hours 29th April, and the D.R. position at 1200 hours 28th April.

28th April, 1200 hrs.,	s/c $130^{\circ} C.$,	dev. $3^{\circ} E.$,	var. $15^{\circ} W.$,	speed 12 kts
1600 ..	$130^{\circ} C.$	.. $3^{\circ} E.$,	.. $15^{\circ} W.$,	.. 12 ..
2000 ..	a/c $127^{\circ} C.$,	.. $3^{\circ} E.$,	.. $14^{\circ} W.$,	.. 12 ..
29th April, 0000 ..	$127^{\circ} C.$,	.. $3^{\circ} E.$,	.. $14^{\circ} W.$,	.. 12 ..
0400 ..	$127^{\circ} C.$,	.. $3^{\circ} E.$,	.. $14^{\circ} W.$,	.. 12 ..
0800 ..	a/c $120^{\circ} C.$,	.. $4^{\circ} E.$,	.. $14^{\circ} W.$,	.. 12 ..

At 0530 hours 29th April, stellar observations gave position lat. $41^{\circ} 10' N.$, long. $179^{\circ} 40' E.$ A current was estimated to set $035^{\circ} T.$ at 2 knots throughout.

18. A vessel steams due East from *A* in long. $60^{\circ} 00' W.$ to *B* in long. $20^{\circ} 00' W.$ If the distance steamed is 1956 nautical miles, find the latitude of *A* and of *B*.

REVISION PAPER 2

1. 18th September 1952, in D.R. position $17^{\circ} 50' N.$, $35^{\circ} 17' W.$, the sextant altitude of *Eltanin* 47 , on the meridian was $56^{\circ} 24.4'$,

index error $1.4'$ on the arc, height of eye 42 feet. Find the latitude and position line.

2. 14th December 1952, the sextant altitude of *Rigel Kent* 38 , on the meridian below the pole was $15^{\circ} 52.4'$, index error $1.2'$ off the arc, height of eye 41 feet. Find the latitude and position line.

3. 17th January 1952 in D.R. position $26^{\circ} 39' N.$, $172^{\circ} 15' W.$, the sextant altitude of the lower limb of the Sun, when on the meridian, was $42^{\circ} 08.2'$, index error $2.4'$ off the arc, height of eye 38 feet. Find the latitude and the position line.

4. 16th January 1952, the Sun when rising bore $144^{\circ} C.$ to an observer in D.R. position $39^{\circ} 30' S.$, $32^{\circ} 10' E.$ If the variation was $30^{\circ} W.$ find the deviation.

5. 15th September 1952, in E.P. lat. $40^{\circ} 36' N.$, $162^{\circ} 20' W.$ at 07h 31m 20s L.M.T. the Sun bore $087^{\circ} C.$ Find the true azimuth and the deviation, the variation being $20^{\circ} E.$ in the locality.

6. 16th December 1952, at 16h 55m 00s A.T.S. to an observer in D.R. position $47^{\circ} 18' N.$, $156^{\circ} 20' W.$, the sextant altitude of Polaris was $48^{\circ} 15.4'$, index error $2.4'$ off the arc, height of eye 52 feet. Find the latitude and the position line.

7. 15th January 1952, from the following data find the latitude of the point in long. $44^{\circ} 15' W.$ through which the position line is drawn. Time of observation—04h 23m 55s. D.R. position $32^{\circ} 10' S.$, $44^{\circ} 15' W.$ Sextant altitude of *Acrux* 30 near the meridian was $59^{\circ} 26.8'$, index error $1.4'$ on the arc, height of eye 38 feet.

8. 14th December 1952, in E.P. lat. $15^{\circ} 20' N.$, long. $165^{\circ} 30' W.$ at 11h 39m 20s A.T.S. an observation of the Sun's upper limb gave sextant altitude $51^{\circ} 22.2'$, index error $1.6'$ off the arc, height of eye 44 feet. Find the direction of the position line and the latitude of the point in long. $165^{\circ} 30' W.$ through which it is drawn.

9. 17th September 1952. From the following data find the direction of the position line, and the position of a point through which it can be drawn.

D.R. position lat. $43^{\circ} 17' N.$, long. $46^{\circ} 00' W.$, time shown by chronometer 11h 51m 33s, error 11m 14s fast, time at ship about 0930 hours, sextant altitude of the Sun's lower limb $29^{\circ} 41.2'$, index error $2.2'$ on the arc, height of eye 50 feet.

10. 17th January 1952. From the following data find the direction of the position line, and the position of a point through which it can be drawn.

Time of observation 21h 02m 48s G.M.T., E.P. lat. $40^{\circ} 20' N.$, long. $30^{\circ} 42' W.$, approximate time at ship—1900 hours, sextant altitude of *Capella* 12 , $62^{\circ} 26.8'$ East of the meridian, index error nil, height of eye 30 feet.

11. A position by observation was lat. $33^{\circ} 16.5' S.$, long. $113^{\circ} 53' E.$ From this position the vessel steamed $145^{\circ} T.$, 80 M., when a point of

land ($34^{\circ} 22' S.$, $115^{\circ} 08' 02'' E.$) bore $090^{\circ} T.$ 15 M. When observations were taken, the chronometer was estimated to be 13m 00s fast of G.M.T. Find the actual error.

12. Two ships *A* and *B* are in lat. $42^{\circ} 00' N.$, long. $179^{\circ} 25.4' W.$, and lat. $42^{\circ} 00' N.$, long. $179^{\circ} 25.4' E.$, respectively. A current sets both $040^{\circ} T.$ 40 M. Find their new positions.

13. Find by mercator sailing the true course and distance from *A*, lat. $30^{\circ} 28' S.$, long. $113^{\circ} 40' E.$, to *B*, lat. $34^{\circ} 35' S.$, long. $18^{\circ} 40' E.$

14. Off Greenock at 22h 40m 00s G.M.T. on 14th February 1949, find the depth of water under the keel of a vessel drawing 28 feet, when crossing a 5 fathom patch.

15. In D.R. position lat. $39^{\circ} 39' N.$, long. $130^{\circ} 47' E.$ an observation of the Sun gave azimuth $160^{\circ} T.$, intercept $4.0'$ towards. The ship then ran $196^{\circ} T.$ 20 M., and $186^{\circ} T.$ 18 M., when a second observation gave azimuth $200^{\circ} T.$ and long. $130^{\circ} 47' E.$ by using D.R. lat. $39^{\circ} 09' N.$ Find the ship's position.

16. At noon, a vessel *A* is in lat. $40^{\circ} 00' N.$, long. $35^{\circ} 20' W.$, and a vessel *B* bears $345^{\circ} T.$ 12 nautical miles from *A*. *A* steams $260^{\circ} T.$ at 11 knots and *B* $290^{\circ} T.$ at 10 knots. At 4 p.m. *B* sends out a distress call. Find the course and distance *A* must steam to reach *B*. (Use the traverse table only.)

17. 5th October 1952, at 22h 10m 00s L.M.T., the azimuth of *Hamal* 6 was $034.5^{\circ} C.$ to an observer in lat. $35^{\circ} 10' S.$, long. $140^{\circ} 10' W.$ Find the deviation of the compass, the magnetic variation being $12.5^{\circ} E.$

REVISION PAPER 3

1. A vessel left *A*, lat. $35^{\circ} 00' N.$, long. $170^{\circ} 00' E.$, and arrived at *B*, lat. $45^{\circ} 00' N.$, long. $160^{\circ} 00' W.$ Required the course and distance. If the vessel made good 10 knots all the way, and left *A* at 12h 00m 00s A.T.S. 21st December, at what date and time (A.T.S.) did she arrive at *B*?

2. At 11h 20m 00s G.M.T. 16th February 1949, off Kingstown, find the depth of water on a $2\frac{1}{2}$ fathom patch.

3. 29th August 1952 at noon A.T.S., a point of land in long. $45^{\circ} 02' W.$ bore $000^{\circ} T.$ distant 20 nautical miles from a vessel, when a chronometer on board indicated 03h 04m 10s. Find the error of the chronometer on G.M.T.

4. 16th December 1952, in D.R. position lat. $46^{\circ} 10' N.$, long. $168^{\circ} 40' W.$, an observation of the Sun's upper limb near the meridian, gave sextant altitude $20^{\circ} 26.8'$, index error $1.8'$ on the arc, height of eye 43 feet. Time shown by the chronometer was 10h 46m 42s. The chronometer was 2m 10s fast on 20th November at 12h 00m 00s G.M.T., and gained 2 secs. daily. Find the latitude and position line.

5. 17th January 1952, in D.R. position $50^{\circ} 10' N.$, $141^{\circ} 10' W.$ the observed altitude of *Polaris* at 07h 40m 00s L.M.T. was $49^{\circ} 30'$, height of eye 21 feet. Find the latitude and position line.

6. 16th January 1952, at 17h 00m 00s A.T.S. in lat. $35^{\circ} 20' N.$, long. $40^{\circ} 20' W.$, the observed amplitude of the Sun was $W. 25^{\circ} S.$ Find the true amplitude and the deviation, the variation being $4^{\circ} W.$

7. 17th September 1952, the sextant altitude of *Schedar* 3, on the meridian below the pole, was $23^{\circ} 18.2'$, index error $0.6'$ off the arc, height of eye 38 feet. Find the latitude.

8. 30th August 1952, at morning twilight, in E.P. lat. $20^{\circ} 30' S.$, long. $152^{\circ} 15' E.$ the sextant altitude of *Capella* 12, near the meridian, was $23^{\circ} 50'$, index error $2.2'$ on the arc, height of eye 34 feet. Time by the chronometer 08h 11m 00s. Find the latitude of the point in long. $152^{\circ} 15' E.$ through which to draw the position line.

9. 16th January 1952, at 17h 34m 00s G.M.T., the Sun bore $251^{\circ} C.$ to an observer in D.R. lat. $50^{\circ} 10' N.$, long. $35^{\circ} 50' W.$, where the variation was $25^{\circ} W.$ Find the true azimuth and the deviation.

10. 6th October 1952, in long. $25^{\circ} 04' W.$, *Rigel* 11, when on the meridian bore $000^{\circ} T.$, sextant altitude $51^{\circ} 33.6'$, index error $2.2'$ on the arc, height of eye 30 feet. Find the latitude and the position line.

11. 28th September 1952, in long. $172^{\circ} 00' W.$, the sextant altitude of the Sun's upper limb, when on the meridian, was $53^{\circ} 10' 10''$, index error $1' 10''$ on the arc, height of eye 38 feet, bearing $000^{\circ} T.$ Find the latitude and the position line.

12. A vessel makes a d. lat. of $7^{\circ} 19'$ and an M.D. lat. of 618.2 . Between what parallels did she steam?

13. In D.R. position lat. $53^{\circ} 47' S.$, long. $178^{\circ} 37' W.$, the Sun bore $076^{\circ} T.$, intercept $11'$ away. The ship then ran $284^{\circ} T.$ for 47 nautical miles through a current setting $256^{\circ} T.$ for 7 nautical miles, when a second observation gave the Sun's bearing $284^{\circ} T.$ intercept $5'$ towards. Find the ship's position at the second observation.

14. 15th September 1952, in D.R. position lat. $32^{\circ} 10' N.$, long. $31^{\circ} 20' E.$, at about 0150 hours at ship, when the chronometer showed 11h 43m 10s, the star *Enif* 54 was observed bearing $256^{\circ} C.$ If the variation was $1^{\circ} E.$, find the true azimuth and thence the deviation.

15. 28th October 1952, from the following data find the direction of the position line, and the position of a point through which it can be drawn.

D.R. position lat. $42^{\circ} 40' N.$, long. $172^{\circ} 10' W.$, sextant altitude of *Denebola* 28, $40^{\circ} 50' 10''$, index error $1' 10''$ on the arc, height of eye 57 feet, chronometer time 17h 38m 10s.

REVISION PAPER 4

✓ PRACTICAL NAVIGATION.

1. 14th September 1952, in D.R. position lat. $31^{\circ} 54' N.$, long. $31^{\circ} 29' E.$, the observed altitude of the Sun's lower limb was $46^{\circ} 43' 20''$, height of eye 40 feet. The chronometer time was 07h 28m 27s, error

2m 42s slow on G.M.T. Find the direction of the position line and the latitude and longitude of a point through which it can be drawn.

2. 16th January 1952, in E.P. lat. $23^{\circ} 12' 6''$ N., long. $162^{\circ} 20' 4''$ W. at 06h 27m 00s L.M.T., the Sun rose bearing 123° C. Find the true amplitude and if the variation was 6.5° E., find the deviation.

3. 16th January 1952, in D.R. position lat. $28^{\circ} 37' 2''$ N., long. $14^{\circ} 56'$ W., an observation of Polaris gave sextant altitude $27^{\circ} 53' 0''$, index error $0.4'$ off the arc, height of eye 40 feet. The chronometer time was 07h 39m 44s. Find the latitude and the direction of the position line.

4. A vessel steamed on a course so that the d. lat., which was $4^{\circ} 10'$, was three-fourths the M.D. lat. Find the parallels between which she steamed.

5. In D.R. lat. $34^{\circ} 20'$ N., long. $47^{\circ} 53'$ W., an observation of a star, bearing 222° T., gave a longitude of $47^{\circ} 58'$ W. At the same time an observation of another star gave longitude $47^{\circ} 46'$ W. and bearing 142° T. Find the ship's position.

PRINCIPLES.

Section A.

1. A vessel is steering 300° T. at 24 knots in lat. 57° N. At what rate will she change her longitude?

2. What will be the R.A. of the true Sun when Aries is on the meridian of 120° W., on 29th August 1952?

3. On a vessel at anchor, the longitude was worked out from an observation of the Sun, and then fog set in. Later, the fog cleared, and a fix was obtained by vertical sextant angles. This fix put her 6 nautical miles North and 5 nautical miles East of the position by observation. What was the bearing of the Sun at sights?

Section B

4. When is the initial course between two places the same as the final course? When is it of a different name, and when is it of the same name?

5. Chronometer *A* was 4m 20s fast of G.M.T. Chronometer *B* was 5m 24s slow of *A*. An observation for longitude, using chronometer *B*, when the Sun was on the prime vertical, gave longitude $30^{\circ} 07'$ W. If the error of *B* was forgotten when working the sight, what would be the correct longitude?

6. Why do the Sidereal Day, the Lunar Day, and the Solar Day differ in length of time?

7. What is (a) the magnetic meridian, (b) the magnetic equator? If the compass needle is deflected to the right of the magnetic meridian, what would be the deviation?

REVISION PAPER 5

PRACTICAL NAVIGATION.

1. From the following data find the direction of the position line, and the position of a point through which it can be drawn. Date at ship, 23rd December 1952, time at ship, about 0810 hrs., D.R. position lat. $29^{\circ} 10'$ S., long. $98^{\circ} 40'$ E., sextant altitude Sun's lower limb $40^{\circ} 16' 8''$, index error $1.4'$ on the arc, height of eye 50 feet. Chronometer time 01h 35m 15s, error on G.M.T. 8m 32s slow.

2. 20th December 1952, *Fomalhaut* 56 was observed on the meridian bearing 180° T. The sextant altitude was $65^{\circ} 18' 4''$, index error $0.8'$ off the arc, height of eye 46 feet. Find the latitude and the position line.

3. 27th October 1952, in D.R. position $36^{\circ} 18'$ S., $131^{\circ} 40'$ E., where the magnetic variation was 1° E., the Sun bore 283.3° C. at 15h 40m A.T.S. Find the Sun's true bearing and the deviation.

4. 30th August 1952, in D.R. position lat. $45^{\circ} 18'$ N., long. $36^{\circ} 20'$ W. an observation of *Antares* 42 was taken.

Time at ship, evening twilight, time shown by the chronometer 09h 09m 20s, observed altitude $17^{\circ} 34' 4''$, height of eye 48 feet. Find the direction of the position line and the latitude of the point where it crosses the meridian of $36^{\circ} 20'$ W.

5. At 1.00 p.m. a ship sights a light-vessel bearing 000° T. distant 12 M. The ship is steering 071° C., dev. 3° E., variation 10° W., speed 10 knots, and a current is setting 270° T. at 3 knots. Find the bearing and distance of the light-vessel at 1.15 p.m. and at 2.00 p.m. (Use the traverse table only.)

PRINCIPLES

Section A

1. From lat. $40^{\circ} 10'$ N., long. $36^{\circ} 25'$ W., to lat. $43^{\circ} 36'$ N., long. $32^{\circ} 56'$ W. the course steered was 046° C. Find the deviation, the variation being 15° W.

2. Using D.R. position lat. $38^{\circ} 50'$ N., long. $27^{\circ} 28'$ W., the Sun's azimuth was 142° T., intercept $12.0'$ towards. What would be the value of the intercept if a selected position lat. $38^{\circ} 53'$ N., long. $27^{\circ} 20'$ W. had been used?

3. To an observer in North latitude a star is circumpolar. If when the star is on the meridian above the pole the minimum altitude necessary for it to be circumpolar is $73^{\circ} 24'$, find the star's declination. Illustrate and explain by a figure.

Section B

4. Explain what is meant by Venus being (a) a morning star, (b) an evening star.

5. Explain how a chronometer is wound, and if it is stopped, how it is started. Why is the chronometer wound at the same time each day?

6. Define:—(1) Sensible horizon, (2) celestial poles, (3) prime meridian, (4) ecliptic.

7. What is meant by the terms conjunction and opposition, when applied to the Sun and the Moon?

REVISION PAPER 6

PRACTICAL NAVIGATION.

1. From the following data of an observation of *Antares* 42 out of the meridian, find the direction of the position line, and the position of a point through which it can be drawn.

Date at ship, 17th September 1952. Time at ship, late evening, chronometer time 13h 55m 39s, error on G.M.T. 5m 57s fast, sextant altitude $31^{\circ} 57' 8''$, index error $1' 6''$ on the arc, height of eye 43 feet, D.R. position lat. $17^{\circ} 22' S.$, long. $105^{\circ} 34' 5'' E.$

2. 5th October 1952, in D.R. position $50^{\circ} 15' 4'' N.$, $168^{\circ} 20' 5'' W.$, the Sun set bearing $239^{\circ} C.$ If the variation in the locality was $17' 3'' E.$, find the true amplitude and thence the deviation.

3. 28th September 1952, in D.R. position lat. $38^{\circ} 50' N.$, long. $40^{\circ} 00' W.$, the observed altitude of *Nunki* 50 was $24^{\circ} 53' 30''$, height of eye 40 feet, G.M.T. 20h 40m 00s. Find the direction of the position line, and the latitude of the point where it crosses the meridian of $40^{\circ} 00' W.$

4. In D.R. position $48^{\circ} 20' N.$, $35^{\circ} 10' W.$, an observation of a star gave longitude $35^{\circ} 17' W.$, star's bearing $127^{\circ} C.$ The vessel continued her course of $154^{\circ} C.$, deviation $5^{\circ} E.$, variation $12^{\circ} W.$, speed 11 knots, wind N.E., leeway 5° , current $090^{\circ} T.$ 3 knots. After 4 hours, a second observation gave bearing $252^{\circ} C.$, intercept $15'$ towards.

Plot on squared paper and find the ship's position at the end of the run.

5. 27th September 1952, at 17h 50m 00s L.M.T., in D.R. position lat. $21^{\circ} 23' 6'' N.$, long. $155^{\circ} 49' 6'' W.$ the observed altitude of *Polaris* was $21^{\circ} 15' 20''$, height of eye 48 feet. Find the latitude and position line.

PRINCIPLES

Section A

1. The Sun was on the meridian of Greenwich at 18h 40m 00s, and a star at 23h 00m 00s by a sidereal clock, which was neither gaining nor losing. The R.A. of the star was 5h 20m 00s. Find the R.A. of the Sun when on the meridian of Greenwich, and the error of the clock.

2. A star was found to bear $180^{\circ} T.$ twice in the same night, its altitudes being 73° and 23° . Find the star's declination, and the latitude.

3. Draw a figure of the celestial sphere showing the poles of the celestial sphere, the Ecliptic, the Equinoctial, and the First Point of Aries. Show the position of a star of declination $32^{\circ} N.$, and R.A. 7h 30m.

Section B

4. What are the phases of the Moon?

5. How does refraction affect the true altitude of a star? What is its value in the observer's zenith and why?

6. Explain, briefly, the solar system.

7. What is deviation and variation? Given that the combined effect of variation and deviation is 10° to the right, the compass course, is 010° , what is the true course? Illustrate with a figure.

REVISION PAPER 7

PRACTICAL NAVIGATION.

1. From the following data, find the direction of the position line and the position of a point through which it can be drawn. Date at ship, 16th January 1952, D.R. position $25^{\circ} 38' S.$, $10^{\circ} 40' E.$, time at ship, about 7h 50m a.m., chronometer time 07h 13m 09s, error 2m 25s fast, sextant altitude Sun's lower limb $31^{\circ} 34' 8''$, index error $0' 8''$ on the arc, height of eye 35 feet.

2. A vessel in D.R. position lat. $54^{\circ} 08' N.$, long. $05^{\circ} 34' W.$ is at anchor in fog. A break appeared and an observation of the Sun gave longitude $05^{\circ} 24' W.$, Sun's bearing $127^{\circ} T.$ Some time later the fog lifted again, and a light-house in lat. $54^{\circ} 13' 3'' N.$, long. $05^{\circ} 39' 5'' W.$ bore $000^{\circ} T.$ How much in error was the D.R. lat.?

3. 29th August 1952, in D.R. position lat. $16^{\circ} 10' 7'' N.$, long. $57^{\circ} 21' W.$, the sextant altitude of the Sun's lower limb was $82^{\circ} 45' 10''$, index error $0' 20''$ off the arc, height of eye 44 feet, the Sun being on the observer's meridian. Find the latitude and position line.

4. 29th August 1952, in E.P. lat. $15^{\circ} 26' N.$, long. $57^{\circ} 20' W.$ at 12h 50m 10s G.M.T., the Sun bore $105^{\circ} C.$ Find the true azimuth, and the deviation, the variation being $15' 5'' W.$

5. 13th December 1952, in D.R. position lat. $38^{\circ} 48' N.$, long. $179^{\circ} 36' 6'' W.$ at about 12h 50m at ship, when the chronometer showed 00h 49m 15s, the sextant altitude of the Sun's upper limb was $27^{\circ} 10' 30''$, index error $1' 30''$ on the arc, height of eye 46 feet. Find the direction of the position line and the latitude of a point through which it can be drawn:—In long. $179^{\circ} 36' 6'' W.$

PRINCIPLES

Section A

1. The Sun's declination is 0° , the latitude of the observer is the Equator, and the Sun's true altitude is $65^\circ 10' 4''$, before reaching the meridian. Find the Sun's L.H.A.

2. Arcturus (Declination $19^\circ 25\frac{1}{2}'$ N.) bore North of an observer when on the meridian of an observer in North latitude. The true altitude of the star when at its maximum azimuth was $24^\circ 29'$. Find the observer's latitude.

3. An a.m. sight of the Sun when worked with lat. $51^\circ 55'$ N. gave long. $20^\circ 04'$ W. and when worked with lat. $52^\circ 05'$ N. gave long. $19^\circ 54\frac{1}{2}'$ W. What was the true bearing of the Sun?

Section B

4. Define, (a) geographical mile, (b) nautical mile, (c) statute mile.

5. Describe the corrections applied to an altitude of the Moon.

6. State the position of the following stars in relation to their constellations:—*Sirius*, *Vega*, *Altair* and *Procyon*.

7. Why do mariners ignore height of eye when taking a vertical sextant angle observation of a shore object?

ANSWERS

POSITION ON THE EARTH

Exercise 1A

- | | | |
|-----------------------|----------------------|----------------------|
| 1. 425' N. 709' W. | 2. 910' N. 635' E. | 3. 930' S. 741' W. |
| 4. 2026' N. 522' E. | 5. 741' N. 1278' W. | 6. 1005' S. 300' E. |
| 7. 995' N. 3712' W. | 8. 2910' N. 4425' E. | 9. 1508' N. 8226' W. |
| 10. 2983' N. 3516' E. | | |

Exercise 1B

- | | |
|-------------------------------------------------|------------------------------------------------|
| 1. $2^\circ 46'$ W. | 2. $12^\circ 24'$ N. $165^\circ 34'$ W. |
| 3. $43^\circ 37'$ N. $17^\circ 46'$ E. | 4. $42^\circ 08' 2''$ N. $34^\circ 14' 4''$ W. |
| 5. $17^\circ 45' 1''$ S. $170^\circ 59' 5''$ E. | |

PARALLEL SAILING

Exercise 2A

- | | |
|--------------------------------------------|--------------------------------------------------------|
| 1. lat. $41^\circ 23\frac{1}{2}'$ N. or S. | 2. lat. $72^\circ 32'$ N. or S. |
| 3. d. long. $9^\circ 22'$ E. or W. | 4. dist. 348.5 M. |
| 5. lat. $56^\circ 26\frac{3}{4}'$ N. | 6. lat. $31^\circ 42'$ N. long. $23^\circ 07' 9''$ W. |
| 7. lat. $50^\circ 20'$ N. or S. | 8. angle at pole $6^\circ 15' 1''$ |
| 9. lat. $48^\circ 11' 5''$ N. | 10. lat. $39^\circ 00'$ N. long. $50^\circ 19' 6''$ W. |

Exercise 2B

- | | |
|--------------------------------------------------------|--------------------------------------------------------|
| 1. angle at pole $11^\circ 08' 9''$ | 2. dist. 44.06 M. |
| 3. lat. A. $51^\circ 19'$ N. lat. B. $28^\circ 57'$ N. | 4. rate 574.5 knots. |
| 5. d. long. $6^\circ 02' 2''$ | 6. dist. 594.9 M. |
| 7. clocks advanced 20m 23s | 8. lats. $53^\circ 08' N.$, $25^\circ 50' S.$ d. lat. |
| 9. lat. $44^\circ 25'$ N. or S. | 78° 58' |
| 10. speed 9.77 knots | 11. d. lat. $29^\circ 49' 20''$, dist. 1789.3 M. |
| 12. set 090° T. drift 32.3 M. | |

PLANE SAILING

Exercise 3

- | | |
|----------------------------------|------------------------------------------------|
| 1. d. lat. 725.2' S. dep. 1795.1 | 2. d. lat. 391.0' N. dep. 190.7 |
| 3. d. lat. 279.3' S. dep. 195.6 | 4. course N. $35^\circ 04' 5''$ W. dist. 353.6 |
| 5. d. lat. 1584' S. dist. 1910.7 | |

MERCATOR SAILING

Exercise 4

- (a) 848.9, (b) 1862.0, (c) 2244.1, (d) 3962.8
- d. lat. 1909' S., D.M.P. 1927.1, d. long. 1128' W., course S. $30^\circ 20' 6''$ W., dist. 2212 M.
- d. lat. 1805' S., D.M.P. 2019.6, d. long. 506' W., course S. $14^\circ 8'$ W., dist. 1861.4 M.
- d. lat. 2943' S., D.M.P. 3171.7, d. long. 5635' E., course S. $60^\circ 37' 6''$ E., dist. 6000 M.

5. d. lat. 375' S., D.M.P. 416.6, d. long. 240.5' W., lat. 23° 15' N., long. 158° 19.5' E.
6. d. lat. 1296.3' S., D.M.P. 1295.2, d. long. 396' E., lat. 11° 24.3' N., dist. 1355.5 M.
7. (1) d. lat. 565.6' S., D.M.P. 581.8, d. long. 581.8' W.
(2) d. lat. 565.6' S., D.M.P. 617.3, d. long. 617.3' E.,
lat. 28° 51.2' S., long. 00° 25.5' W.
8. d. lat. 781.8' N., D.M.P. 973.3, d. long. 2135.9' E., lat. 32° 15.9' N.,
long. 159° 04.1' W.
9. d. lat. 1780' S., D.M.P. 1814.6, d. long. 1978' E., course S. 47° 28' E.,
dist. 2633 M.
10. d. lat. 343' S., D.M.P. 413.1, d. long. 1095' E., course S. 69° 19.8' E.,
dist. 971.7 M.

CORRECTION OF COURSES

Exercise 5A

- | | | | | |
|----------|----------|----------|----------|-----------|
| 1. 15°E. | 2. 19°E. | 3. 33°W. | 4. 30°W. | 5. 26°E. |
| 6. 15°W. | 7. 17°W. | 8. Nil. | 9. 55°W. | 10. 38°E. |

Exercise 5B

- | | | | | |
|----------|----------|----------|---------|----------|
| 1. 24°E. | 2. 9°E. | 3. 3°E. | 4. 4°W. | 5. 2°W. |
| 6. 5°E. | 7. 10°E. | 8. 16°E. | 9. 6°E. | 10. 5°W. |

Exercise 5C

- | | | | | |
|-----------|----------|-----------|----------|-----------|
| 1. 2°W. | 2. 6°E. | 3. 4°E. | 4. 1°W. | 5. 7°W. |
| 6. 8°W. | 7. 5°E. | 8. 3°W. | 9. 2°E. | 10. 12°W. |
| 11. 15°W. | 12. 7°E. | 13. 25°W. | 14. 4°W. | 15. 5°W. |

Exercise 5D

- | | | | | |
|---------|---------|---------|---------|----------|
| 1. 207° | 2. 351° | 3. 345° | 4. 283° | 5. 022° |
| 6. 318° | 7. 106° | 8. 204° | 9. 096° | 10. 195° |

Exercise 5E

- | | | | | |
|---------|---------|---------|---------|----------|
| 1. 203° | 2. 021° | 3. 187° | 4. 199° | 5. 359° |
| 6. 087° | 7. 118° | 8. 178° | 9. 319° | 10. 198° |

Exercise 5F

- | | | | | |
|---------|---------|---------|---------|----------|
| 1. 049° | 2. 121° | 3. 259° | 4. 322° | 5. 105° |
| 6. 107° | 7. 013° | 8. 178° | 9. 240° | 10. 250° |

Exercise 5G

- | | | | |
|----------------|----------------|----------------|----------------|
| 1. 6°E., 20°W. | 2. 217°, 5°E. | 3. 284°, 262° | 4. 5°W., 15°E. |
| 5. 245°, 230° | 6. 172°, 12°E. | 7. 346°, 348° | 8. 280°, 275° |
| 9. 3°E., 25°W. | 10. 201°, 175° | 11. Nil, 42°E. | 12. 2°W., Nil |

TRAVERSE TABLE

Exercise 6A

- | | | | | | |
|-------------|-------|-------------|-------|--------------|--------|
| 1. 215.7 | 100.6 | 2. 327.9 | 57.8 | 3. 386.9 | 324.6 |
| 4. 73.2 | 201.1 | 5. 103.5 | 142.4 | 6. 80.8 | 191.26 |
| 7. 456.0 | 241.6 | 8. 37° | 348.2 | 9. N.24°E. | 490.0 |
| 10. S.33°W. | 421.0 | 11. N.18°E. | 46.9 | 12. S.36½°W. | 388.5 |
| 13. N.50°W. | 480.0 | 14. S.24°E. | 936.0 | 15. 1230 | 995.1 |

Departure into d. long.

Exercise 6B

- | | | | | |
|-----------|----------|----------|-----------|-----------|
| 1. 552 | 2. 319.6 | 3. 333.7 | 4. 250.7 | 5. 391 |
| 6. 1395.0 | 7. 478.5 | 8. 406.7 | 9. 470.75 | 10. 408.9 |

D. long. into departure

Exercise 6C

- | | | | | |
|----------|----------|----------|----------|-----------|
| 1. 199.5 | 2. 233.6 | 3. 32.49 | 4. 34.08 | 5. 450.6 |
| 6. 36.26 | 7. 416.8 | 8. 59.98 | 9. 204.6 | 10. 314.2 |

Course and distance

Exercise 6D

- | | d. lat. | d. long. | M. lat. | dep. | Course | Dist. |
|-----|----------|----------|---------|-------|--------------------------------------|-------|
| 1. | 590.0'S. | 590.0'W. | 45½°N. | 409.9 | S. 35°W. | 720 |
| 2. | 160.0'N. | 230.0'W. | 36½°N. | 184.9 | N.49°W. | 245 |
| 3. | 148.0'N. | 189.0'E. | 24°S. | 172.7 | N.49°E. | 227.5 |
| 4. | 17.0'N. | 260.0'W. | 38°N. | 204.9 | N.85°W. | 206 |
| 5. | 70.0'S. | 330.0'E. | 9½°N. | 325.9 | S. 77.8°E. | 333.3 |
| 6. | 15.0'N. | 31.0'E. | 50½°N. | 19.79 | Set N.52½°E.
Drift 24.9M. | |
| 7. | 82.9'S. | 73.0'W. | 40°N. | 55.9 | Lat. 39° 17.1'N.
Long. 5° 17.0'W. | |
| 8. | 107.5'N. | 726.0'E. | 48°N. | 485.8 | N.77½°E. | 498 |
| 9. | 170.0'S. | 242.0'W. | 21.1°S. | 225.7 | S. 53°W. | 282.7 |
| 10. | 249.8'N. | 157.5'W. | 20.7°N. | 147.3 | N.30½°W. | 289.5 |

TRAVERSE SAILINGS

Exercise 7A

1. 124° T. 114 M.
2. 068° T. 18.6 M.
3. 190° T. 29.5 M.
4. 025½° T. 35.8 M.
5. 291° T. 35 M.
6. 241° T. 33 M. lat. 44° 24' N., long. 35° 50.5' W.
7. lat. 55° 23.3' N., long. 08° 01.5' W.
8. lat. 39° 19.7' N., long. 42° 29.1' W.
9. 168° T. 5.9 M.
10. 270° T. 45.9 M. lat. 50° 19.7' N., long. 19° 46.9' W.

Exercise 7B

1. d. lat. 39.9'N. dep. 18.9 Course N.25½°W. Dist. 44.2 M.
2. " 40.3'S. " 204.3 " S.79°E. " 208 M.
3. " 10.5'S. " 92.7 " S.83½°E. " 93 M.
4. " 49.3'S. " 38.3 " S.38°E. " 62½ M.
5. " 60.1'S. " 41.0 Lat. 50° 14.9' N., long. 32° 12.3' W.
6. " 63.9'S. " 64.9 Lat. 15° 06.1' N., long. 26° 22.4' W.
7. " 51.4'S. " 44.1 Lat. 51° 20.6' N., long. 07° 23.7' W.
8. " 139.0'S. " 22.3 Lat. 47° 54.0' N., long. 04° 13.0' W.
9. " 163.4'S. " 83.8 Lat. 40° 09.6' N., long. 11° 06.8' W.
10. " 76.6'S. " 44.5 Lat. 50° 06.7' N., long. 10° 46.7' W.
11. D.R. Lat. 60° 14.6' N., long. 10° 33.7' W.
d. lat. 8.4' N., dep. 24.7 M. Set N.56½°E. Drift 15.0 M.
12. E.P. Lat. 50° 22.6' S., long. 177° 55.0' W., d. lat. 2.4' N., dep. 66.6 M.
course N. 74½° E., dist. 69.0 M., d. lat. 18.4' N., dep. 67.7 M.

13. Pos. at 3 a.m., lat. 46° 53-9' N., long. 08° 52-5' E., d. lat. 6-1' S., dep. 5-1.
E.P. Lat. 47° 50-8' N., long. 7° 50' E., d. lat. 50-8' N., dep. 47-3,
course N. 46° W., dist. 196 M., d. lat. 136' N., dep. 141 M.
14. at 0000 hrs., D.R. pos. lat. 50° 14-3' N., long. 11° 41-2' W., due to current:—
d. lat. 8-3' S., d. long. 6-2' E., dep. 3-9, set S. 25° E., drift 9 M.
From point of land:—d. lat. 42-6' S., dep. 324-1, d. long. 506-1' W.,
E.P. at Noon:—Lat. 49° 49-4' N., long. 15° 36-1' W.
For course and dist.:—d. lat. 38-2' S., dep. 303-6, course S. 83° W.,
dist. 306 M.
15. at 11 p.m. D.R. pos. lat. 55° 40-5' N., long. 166° 48-8' E., d. lat. 115-5' S.,
dep. 117-6.
Due to current:—d. lat. 8-0' N., d. long. 29-2' E., dep. 16-43, set
N. 63° E., drift 18-5 M.
From point of land:—d. lat. 240-0' S., dep. 305-6, d. long. 541-1' E.
E.P. at Noon:—Lat. 53° 36-0' N., long. 172° 16-1' E.
For course and dist.:—d. lat. 244-5' S. dep. 319-7.
Course S. 52½° E., dist. 399-3 M.
16. for E.P.:—d. lat. 89-1' S., dep. 31-6, d. long. 50-2' W.
E.P. Lat. 50° 03-9' N., long. 131° 52-2' W.
for course & dist.:—d. lat. 80-2' S., dep. 39-6.
Course S. 26° W., dist. 89-2 M.

FOUR POINT BEARING WITH LEEWAY AND CURRENT

Exercise 8

- | | | |
|-----------------------------|---------------|---------------------|
| 1. Course made good N.36°E. | dist. 13-9 M. | Beam dist. 10-13 M. |
| 2. " " " N.53°E. | " 9-2 M. | " " 6-5 M. |
| 3. " " " S.72°E. | " 27-6 M. | " " 20-7 M. |
| 4. " " " S.80°W. | " 19-5 M. | " " 14-2 M. |
| 5. " " " N.21°W. | " 26-2 M. | " " 26-2 M. |

W/T BEARINGS

Exercise 9

1. corr. 28-3' bearing 218-0° T.
2. corr. 34' bearing 066-6° T.
3. corr. 18-7' bearing 047-3° T.
4. corr. 49-6' bearing 235-8° T.
5. corr. 28-8' bearing 265-5° T.

MISCELLANEOUS SAILINGS

Exercise 10

1. Speed 10 knots.
2. Mid. lat. = 34° 24-5', corr. = +21-6', d. lat. = 198-6', parallels are 33°
06-8' and 36° 25-4'.
3. Set 139° T. Drift 7-5 M.
4. 498-4 M.
5. 37-6 M.
6. S. 39° 44-6' W., 1164 M.
7. N. 18° 26' W.
8. 51° 07' W.

9. Time 9h 38m 56s.
10. A arrives the earlier. Dist. by A = 1491-4 M.
Dist. by B = 1651-7 M. Dist. shorter by 160-3 M.
11. Lat. = 60° N. or S.
12. d. lat. = 1352-3'; D.M.P. 1526-9, d. long. 413-4'.
Final lat. 15° 55' S., long. 169° 42-0' E.
13. d. lat. = 921' N., D.M.P. = 1071-1, d. long. = 323' W., course N. 16°
46-1' W., dist. 961-9 M.
14. course = 068° T.
15. d. lat. 246-3', Mid. lat. 41° 22', corr. -8-7', mean lat. 41° 13-3', parallels
39° 10-2', 43° 16-4' N. or S.
16. course = N. 10° 00-6' W., dist. = 60-9 M., speed = 15-225 knots.
17. 4-8 M.
18. 6½ points.
19. 60-6 M., 3 hours.
20. Feb. 20th. 50 days.
21. D.M.P. 635-9, 1367-4, 797-2; lat. 42° 25-6' N., long. 38° 51-0' W.
22. D.M.P. = 427-39; final lat. = 7° 9-2' S.
d. lat. = 429-2'; dist. = 858-4 M.
23. D.M.P. = 1195-1; Final lat. = 51° 22-5' S.; dist. = 984-4 M.
24. d. lat. 642-8' N. D.M.P. 904-2.
Lat. 39° 17-2' S., long. 87° 47-5' E.
25. 137½ M.
26. 35° 49' N. or 35° 18' S.
27. 20° 22' N.
28. 33-1' per hour.
29. 60° 20' N. or S.

TIME FORMULAE

Exercise 11

- | | |
|------------------------|---------------------|
| 1. G.M.T. 04h 32m 25s | R.A.T.S. 184° 34-7' |
| 2. " 04 21 57-5 | " 191° 49-4' |
| 3. " " " " | R.A.M.S. 294° 47-4' |
| 4. " 20 48 01 | " 157° 59-75' |
| 5. " " " " | " 293° 45-9' |
| 6. " 14 37 45 | R.A.T.S. 268° 33-7' |
| 7. R.A. 06h 03m 10s | |
| 8. " 05h 30m 14s | |
| 9. R.A.T.S. 192° 19-0' | G.M.T. 17h 18m 46s |

CORRECTION OF THE SUN'S ALTITUDE

Exercise 12A

	Dip	Ref.	Par.	True Alt.
1.	5-2'	0-75'	0-1'	52° 39-2'
2.	6-2'	1-4'	0-1'	33° 20-2'
3.	5-9'	0-3'	Nil	71° 33-2'
4.	4-9'	1-8'	0-1'	27° 24-2'
5.	5-3'	0-5'	0-1'	62° 46-9'
6.	4-8'	0-7'	0-1'	55° 33-1'

7.	6-0'	0-1'	nil	68° 55-6'
8.	5-7'	0-1'	Nil	81° 56-1'
9.	Nil	0-8'	0-1'	48° 33-2'
10.	Nil	0-7'	0-1'	51° 40-6'

CORRECTION OF THE MOON'S ALTITUDE

Exercise 12B

	Dip	S. Dia.	Ref.	Par.	True Alt.
1.	4-8'	15-58'	0-49'	25-1'	63° 49-64'
2.	6-35'	15-24'	1-41'	45-68'	35° 05-76'
3.	5-71'	16-35'	0-60'	31-43'	58° 23-97'
4.	5-39'	15-02'	0-20'	11-80'	77° 43-99'
5.	6-04'	15-90'	2-40'	53-87'	22° 36-73'
6.	5-37'	16-47'	1-20'	46-60'	39° 20-7'
7.	7-07'	15-09'	0-78'	34-4'	51° 26-86'
8.	6-57'	16-8'	1-32'	43-7'	36° 39-44'

Note.—There is no necessity to work these answers to the second place of decimals; it is done here simply as a check on accuracy of work.

CORRECTION OF ALTITUDES OF STARS AND PLANETS

Exercise 12C

	Dip	Ref.	True Alt.
1.	5-96'	0-9'	47° 21-74'
2.	4-8'	1-5'	32° 17-3'
3.	6-04'	2-47'	21° 05-49'
4.	6-93'	0-9'	47° 06-57'
5.	5-2'	1-28'	37° 02-12'
6.	6-65'	4-34'	12° 08-01'
7.	4-9'	0-71'	53° 13-99'
8.	5-88'	2-23'	23° 08-1'
9.	7-33'	0-76'	51° 47-51'
10.	5-54'	3-66'	14° 26-2'

LATITUDE BY MERIDIAN ALTITUDE OF A STAR.

Exercise 13A

	Dip	Main corr.	True Alt.	Dec. . .	Latitude
1.	6-9'	0-5'	63° 12-6'	49° 41-7'N.	22° 54-3'N.
2.	5-9'	0-6'	57° 05-5'	18° 14-7'S.	14° 39-8'N.
3.	7-0'	2-0'	25° 42-8'	62° 49-8'S.	01° 27-4'N.
4.	6-9'	1-0'	45° 07-5'	4° 35-2'N.	49° 27-7'N.
5.	6-2'	1-5'	32° 00-5'	45° 57-1'N.	12° 02-4'S.

LATITUDE BY STAR BELOW THE POLE

Exercise 13B

	Dip	Main corr.	True Alt.	Dec.	Latitude
1.	6-5'	1-5'	33° 16-6'	62° 00-0'N.	61° 16-6'N.
2.	6-5'	4-1'	12° 57-0'	38° 44-3'N.	64° 12-7'N.

3.	6-6'	2-0'	26° 10-6'	62° 49-8'S.	53° 20-8'S.
4.	6-7'	2-3'	23° 08-0'	68° 56-9'S.	44° 11-1'S.
5.	6-4'	1-5'	32° 59-3'	74° 21-1'N.	48° 38-2'N.

COMPUTING THE ALTITUDE OF A STAR ON THE MERIDIAN

Exercise 13C

1.	5-3'	0-3'	74° 20-2'	51° 29-8'N.	74° 25-4'
2.	6-3'	0-5'	62° 20-2'	62° 49-8'S.	62° 25-8'
3.	6-6'	1-5'	32° 25-3'	18° 14-7'S.	32° 32-8'
4.	7-3'	0-6'	52° 36-3'	49° 41-7'N.	52° 46-0'
5.	7-5'	0-8'	49° 17-9'	45° 57-1'N.	49° 24-0'

LATITUDE BY MERIDIAN ALTITUDE OF THE SUN

Exercise 13D

	Dip	Main corr.	True Alt.	Dec.	Latitude	G.M.T.
1.	6-6'	15-8'	66° 18-4'	23° 24-8'S.	00° 16-8'N.	22h 46m 20s ✓
2.	4-8'	14-9'	41° 38-9'	9° 14-9'N.	39° 06-2'S.	14 42 20 ✓
3.	6-1'	16-6'	61° 00-9'	21° 01-9'S.	50° 01-0'S.	18 36 40 ✓
4.	6-7'	14-7'	31° 32-0'	23° 12-3'S.	35° 15-7'N.	00 53 00 ✓
5.	6-5'	14-7'	32° 20-2'	20° 58-1'S.	36° 41-7'N.	02 45 17 ✓

CHRONOMETER ERRORS

Exercise 14

- C is 11m 25s slow of B.
- C is 11m 28s slow of A.
- B is 8m 31s slow of A.
- 1 sec. gaining.
- B is 12m 51s fast of A.
- sea rate 4.3 secs. gaining.
sea rate gaining 1.6s on port rate.
- 1st No. of days 59; 2nd No. of days 20-9; Accumulated error 41-8s; G.M.T. 08h 49m 52-2s (26th).
- 1st No. of days 58; 2nd No. of days 62-3; Accumulated error 4m 13-1s; G.M.T. 15h 11m 46-9s (1st.).
- Error 39m 43s fast.
- Error 9m 24s fast.
- Error 2m 11s slow.
- A—error on G.M.T. 28m 18-3s fast; daily rate 5-67s losing
B— " " " " 19m 44s fast; " " " " 2-9s gaining
B— " " " " 8m 34s slow
- No. of days 114 and 239-4; Acc. error 3m 59-4s gain; G.M.T. 12h 11m 11-6s (6th).
- B was 4m 5s fast of A.
- 2-5 secs. gaining.
- No. of days 47 and 89-35; Acc. error 4m 28s gain; G.M.T. 20h 24m 58s (13th).
- 0-54 secs. losing.
- B—1m 4s slow of G.M.T.; Long. 30° 23' W.

AMPLITUDES

Exercise 15

	G.M.T.				Dec.	True Amplitude	Error	Deviation
	d	h	m	s				
1.	6	16	03	43	5° 15.9'S.	E. 5° 38.2'S.	17° 08.2'E.	6° 08.2'E.
2.	23	02	24	01	Nil	East	5° 00'E.	Nil
3.	29	17	32	00	9° 12.3'N.	W.12° 06.8'N.	19° 23.2'W.	6° 36.8'E.
4.	20	09	20	00	23° 26.3'S.	E. 30° 05.5'S.	17.9°W.	3.1°E.
5.	17	03	22	00	20° 57.8'S.	W.33° 10'S.	21.2°W.	45.2°W.
6.	29	08	10	40	9° 20.6'N.	E. 12° 39.2'N.	24.6°W.	0.2°E.

AZIMUTHS—SUN

Exercise 16A

	G.M.T.				Dec.	Az.	Error	Dev.	L.H.A.
	d	h	m	s					
1.	17	11	40	19	2° 10.9'N.	118.3°T.	30.7°W.	6.2°W.	310° 18.0'
2.	16	20	40	30	21° 01.0'S.	306.5°T.	20.5°E.	2.5°W.	31° 12.6'
3.	16	20	32	10	23° 20.8'S.	143.3°T.	21.3°E.	2.2°W.	320° 29.0'
4.	27	23	55	10	13° 00.2'S.	076.6°T.	9.6°E.	2.6°E.	306° 59.5'
5.	20	05	20	40	1° 07.2'N.	256.6°T.	5.9°W.	16.9°W.	51° 37.8'

AZIMUTHS—STAR

Exercise 16B

	G.M.T.				Dec.	Az.	Error	Dev.	L.H.A.
	d	h	m	s					
1.	20	15	20	10		147.0°T.	18.0°E.	7.0°W.	327° 30.6'
2.	28	02	03	14		266.6°T.	13.4°W.	19.9°W.	41° 44.7'
3.	28	12	46	16		107.3°T.	46.2°W.	51.5°W.	299° 16.7'
4.	16	03	45	11		241.2°T.	27.3°W.	15.8°W.	48° 45.8'
5.	14	17	25	40	28° 08.5'N.	044.5°T.	41.0°W.	21.0°W.	309° 22.2'

LATITUDE BY POLARIS

Exercise 17

	L.H.A.	True Alt.	a ⁰	a ¹	a ²	Lat.	P.L.
1.	57° 02.7'	50° 03.7'	9.1	0.6	0.6	49° 14.0'N.	089.4°—269.4°
2.	275° 10.4'	35° 07.5'	81.1	0.4	1.0	35° 30.0'N.	091° —271°
3.	45° 28.0'	47° 38.1'	4.4	0.6	0.1	46° 43.2'N.	089.6°—269.6°
4.	23° 04.4'	23° 30.8'	1.8	0.6	0.6	22° 33.8'N.	090.1°—270.1°
5.	104° 09.9'	51° 04.5'	46.1	0.6	0.2	50° 51.4'N.	088.6°—268.6°
6.	75° 33.1'	32° 37.7'	20.8	0.4	0.2	31° 59.1'N.	090.8°—270.8°
7.	266° 59.9'	40° 27.9'	88.3	0.5	1.6	40° 57.7'N.	091.0°—271.0°

LATITUDE BY EX-MERIDIAN ALTITUDE OF THE SUN

Exercise 18A

- G.M.T. 20h 42m 05s (29th), Dec. 9° 09.5' N., L.H.A. 350° 00', true alt. 49° 30.3', M.ZX 39° 20.2', lat. 30° 10.7'S., Az. 015.4° T., P.L. 105.4° T.—285.4° T.
- G.M.T. 04h 08m 10s (16th), Dec. 21° 08.6' S., L.H.A. 352° 45.8', True alt. 47° 53.3', M.ZX 41° 30.8', lat. 20° 22.2' N., Az. 169.9° T., P.L. 079.9° T.—259.5° T.
- G.M.T. 13h 20m 28s (15th), Dec. 2° 55.7' N., L.H.A. 346° 00', true alt. 42° 10.8', M.ZX 46° 18.8', lat. 49° 14.5' N., Az. 161° T., P.L. 071° T.—251° T.
- G.M.T. 13h 14m 40s (23rd) Dec. 00° 10.5' S., L.H.A. 351° 55.3' true alt. 46° 57.8', M.ZX 42° 25.2', lat. 42° 14.7' N., Az. 168.4° T., P.L. 078.4° T.—258.4° T.
- G.M.T. 23h 04m 00s (16th) Dec. 23° 21.1' S. L.H.A. 346° 30.6' true alt., 24° 11.9' M.ZX. 64° 35.7' lat. 41° 14.6' N. Az. 166.4° T. P.L. 076.4° T.—256.4° T.

LATITUDE BY EX-MERIDIAN ALTITUDE OF A STAR

Exercise 18B

- G.M.T. 14h 28m 10s (20th) Dec. 14° 50.0' N., G.H.A. ♀ 306° 09.4', *L.H.A. 353° 27.3', true alt. 57° 16.6', M.ZX 32° 16.0' N., lat. 47° 06.0' N., Az. 167.4° T., P.L. 077.4° T.—257.4° T.
- G.M.T. 21h 21m 44s (29th), Dec. 26° 19.9' S., G.H.A. ♀ 298° 27.2', *L.H.A. 11° 34', true alt. 26° 31.8', M.ZX 62° 31.4' N., lat. 36° 11.5' N., Az. 191.6° T., P.L. 101.6° T.—281.6° T.
- G.M.T. 08h 28m 20s (28th) Dec. 34° 24.7' S., G.H.A. ♀ 134° 08.6', *L.H.A. 3° 17.8', true alt. 29° 51.6', M.ZX 60° 03.6' lat. 25° 38.9' N., Az. 182° T., P.L. 092° T.—272° T.
- G.M.T. 13h 26m 00s (17th), Dec. 8° 27.2' S., G.H.A. ♀ 287° 36.9', *L.H.A. 8° 27.4', true alt. 66° 59.9', M.ZX 21° 35.8' S., lat. 30° 03.0' S., Az. 201.1° T., P.L. 111.1° T.—291.1° T.
- G.M.T. 13h 55m 40s (18th), Dec. 45° 57.1' N., G.H.A. ♀ 206° 20.6', *L.H.A. 7° 37.5', true alt. 25° 20.0', M.ZX 64° 17.7' S., lat. 18° 20.6' S., Az. 354.2° T., P.L. 084.2° T.—264.2° T.

POSITION LINE BY LONGITUDE METHOD

Exercise 19A

By the Sun

- G.M.T. 17h 48m 20s (29th), Dec. 9° 12.1' N., G.H.A. 86° 53.2', zen. dist. 62° 31.5', L.H.A. 308° 57.2', long. 137° 56.0' W., Az. 059.6° T., P.L. 149.6° T.—329.6° T.
- G.M.T. 23h 51m 43s (27th) Dec. 13° 01.6' S. G.H.A. 181° 57.8' zen. dist. 41° 44.6', L.H.A. 321° 04.0', long. 139° 06.2' E., Az. 066.3° T., P.L. 156.3° T.—336.3° T.
- G.M.T. 18h 31m 24s (15th), Dec. 21° 13.0' S., G.H.A. 95° 31.6', zen. dist. 43° 30.0', L.H.A. 47° 32.1', long. 47° 59.5' W., Az. 272.5° T., P.L. 002.5° T.—182.5° T.
- G.M.T. 02h 26m 15s (23rd), Dec. Nil., G.H.A. 218° 26.7', zen. dist. 57° 40.3', L.H.A. 57° 40.3', long. 160° 46.4' W., Az. 270° T., P.L. 000° T.—180° T.
- G.M.T. 11h 44m 10s (18th), Dec. 23° 24' S., G.H.A. 356° 52.0', zen. dist. 76° 40.3', L.H.A. 318° 40.4', long. 38° 11.6' W., Az. 141.4° T., P.L. 051.4° T.—231.4° T.

6. G.M.T. 09h 41m 02s (19th), Dec. 10° 01-6' S., G.H.A. 329° 00-5', zen. dist. 75° 20-9', L.H.A. 301° 55-8', long. 27° 04-7' W., Az. 120-3° T., P.L. 030-3° T.—210-3° T.

Exercise 19B**By a Star**

- G.M.T. 08h 26m 35s (28th), Dec. 26° 19-9' S., G.H.A. γ 133° 42-2', zen. dist. 59° 47-2', *L.H.A. 32° 02-2', long. 144° 57-6' E., Az. 213-6° T., P.L. 123-6° T.—303-6° T.
- G.M.T. 20h 59m 41s (6th), Dec. 16° 26-6' N., G.H.A. γ 330° 22-8', zen. dist. 53° 12-5', *L.H.A. 54° 37-8', long. 177° 00-4' W., Az. 257-2° T., P.L. 167-2° T.—347-2° T.
- G.M.T. 09h 14m 09s (28th), dec. 49° 41-7' N., G.H.A. γ 145° 37-7' W, zen. dist. 49° 51-9', *L.H.A. 48° 12-3', long. 47° 11-0' W., Az. 320-8° T., P.L. 050-8° T.—330-8° T.
- G.M.T. 14h 27m 53s (18th), dec. 14° 50' N., G.H.A. γ 304° 06-8', zen. dist. 47° 07-7', *L.H.A. 315° 29-1', long. 171° 57-6' W., Az. 112-5° T., P.L. 032-5° T.—202-5° T.
- G.M.T. 16h 13m 05s (14th), dec. 19° 25-7' N., G.H.A. γ 236° 51-0', zen. dist. 50° 50-1', *L.H.A. 55° 17-6', long. 31° 49-1' E., Az. 269-4° T., P.L. 179-4° T.—359-4° T.
- G.M.T. 23h 04m 32s (29th), dec. 19° 25-8' N., G.H.A. γ 324° 13-4', zen. dist. 50° 17-2', *L.H.A. 53° 46', long. 57° 04-5' W., Az. 261-4° T., P.L. 171-4° T.—351-4° T.

POSITION LINE BY M.S.H. METHOD.**Exercise 19A****By the Sun**

- G.M.T. 17h 48m 20s (29th), dec. 9° 12-1' N., G.H.A. 86° 53-2', L.H.A. 308° 33-2', T.ZX 62° 31-4', C.ZX 62° 49-5', int. 18-1' towards, Az. 059-6° T., P.L. 149-6° T.—329-6° T., I.T.P. 29° 20-8' S., 138° 02-1' W.
- G.M.T. 23h 51m 43s (27th), dec. 13° 01-6' S., G.H.A. 181° 57-8', L.H.A. 320° 55-8', T.ZX 41° 44-6', C.ZX 41° 51-0', int. 6-4' towards, Az. 066-3° T., P.L. 156-3° T.—336-3° T., I.T.P. 35° 50-8' S., 139° 05-2' E.
- G.M.T. 18h 31m 24s (15th), dec. 21° 13-0' S., G.H.A. 95° 31-6', L.H.A. 47° 15-6', T.ZX 43° 30-0', C.ZX 43° 16-0', int. 14-0' away, Az. 272-5° T., P.L. 002-5° T.—182-5° T., I.T.P. 32° 15-7' S., 47° 59-5' W.
- G.M.T. 02h 26m 15s (23rd), dec. nil, G.H.A. 218° 26-7', L.H.A. 57° 31-7', T.ZX 57° 40-3', C.ZX 57° 31-7', int. 8-6' away, Az. 270° T., P.L. 000° T.—270° T., I.T.P. 00° 00', 160° 46-4' W.
- G.M.T. 11h 44m 10s (18th), dec. 23° 24' S., G.H.A. 356° 52-0', L.H.A. 318° 27-0', T.ZX 76° 40-3', C.ZX 76° 46-5', int. 6-2' towards, Az. 141-4° T., P.L. 051-4° T.—231-4° T., I.T.P. 43° 07-2' N., 38° 19-7' W.
- G.M.T. 09h 41m 02s (19th), dec. 10° 01-6' S., G.H.A. 329° 00-5', L.H.A. 301° 19-5', T.ZX 75° 20-9', C.ZX 75° 43-4', int. 22-5' towards, Az. 120-3° T., P.L. 030-3° T.—210-3° T., I.T.P. 43° 53-8' N., 27° 13-0' W.

Exercise 19B**By a Star**

- G.M.T. 08h 26m 35s (28th), Dec. 26° 19-9' S., G.H.A. γ 247° 04-6', *L.H.A. 32° 14-6', T.ZX 59° 47-2', C.ZX 59° 53-4', int. 6-2' towards, Az. 213-6° T., P.L. 123-6° T.—303-6° T., I.T.P. 24° 44-0' N., 145° 06-5' E.
- G.M.T. 20h 59m 41s (6th), dec. 16° 26-6' N., G.H.A. γ 330° 22-8', *L.H.A. 54° 21-8', T.ZX 53° 12-5', C.ZX 53° 01-4', int. 11-1' away, Az. 257-2° T., P.L. 167-2° T.—347-2° T., I.T.P. 43° 07-5' N., 177° 01-2' W.

- G.M.T. 09h 14m 09s (28th), dec. 49° 41-7' N., G.H.A. γ 145° 37-7', *L.H.A. 47° 53-3', T.ZX 49° 51-9', C.ZX 49° 40-7', int. 11-2' away, az. 320-8° T., P.L. 050-8° T.—230-8° T., I.T.P. 17° 44-9' N., 47° 22-6' W.
- G.M.T. 14h 27m 53s (18th), dec. 14° 50' N., G.H.A. γ 304° 06-8', *L.H.A. 315° 16-7', T.ZX 47° 07-7', C.ZX 47° 16-0', int. 8-3' towards, Az. 112-5° T., P.L. 022-5° T.—202-5° T., I.T.P. 42° 36-8' N., 171° 59-6' W.
- G.M.T. 16h 13m 05s (14th), dec. 19° 25-7' N., G.H.A. γ 236° 51-0', *L.H.A. 55° 08-5', T.ZX 50° 50-1', C.ZX 50° 42-0', int. 8-1' away, Az. 269-4° T., P.L. 179-4° T.—359-4° T., I.T.P. 32° 10' N., 31° 49-2' E.
- G.M.T. 23h 04m 32s (29th), dec. 19° 25-8' N., G.H.A. γ 324° 13-4', *L.H.A. 53° 53-8', T.ZX 50° 17-2', C.ZX 50° 22-8', int. 5-6' towards, Az. 261-4° T., P.L. 171-4° T.—351-4° T., I.T.P. 40° 58-7' N., 57° 04-2' W.

PROJECTION OF POSITION LINES**Exercise 20**

- 40° 15' N., 18° 19' W.
- 20° 16-6' S., 27° 24-6' W.
- 39° 55-4' N., 29° 55' W.
- 50° 13' N., 44° 03-7' W.
- 40° 28-2' N., 34° 27-8' W.
- 48° 18-4' N., 50° 12-7' W.
- 25° 00-5' N., 36° 02-5' W.
- 28 M.
- 23° 44-8' N., 51° 56-6' W.
- 34° 11' N., 42° 16' W.
- 29° 06' S., 37° 06' W.
- 34° 15-8' N., 47° 52-3' W.
- 53° 29' S., 179° 35' E.
- (1) 16° 41-5' S., 163° 06' E.
(2) 17° 11' S., 162° 51' E.
- 42° 27' S., 76° 16' E.
- 39° 04' N., 131° 02' E.
- 131° 45½' T.
- 120½° T.
- d. lat. 49-4' S., dep. 26-6 M., d. long. 39-8' E., lat. 47° 30-6' N., long., 34° 37-2' W.

TIDES**Exercise 21**

- Interval 2h 56m duration 6h 17m $\theta=84^\circ$ from H.W., M.T.L. 14-4 ft. height of tide 15-9 feet.
- Interval 3h 48m, duration 5h 52m, $\theta=116\frac{1}{2}^\circ$ from H.W., M.T.L. 7-3 feet, height of tide 5 feet.
- Interval 2h 4m, duration 5h 54m $\theta=63^\circ$ from H.W., M.T.L. 4-5 ft., height of tide 5-6 ft., depth on patch 29-6 ft.
- Interval 3h 51m, duration 6h 15m, $\theta=69-2^\circ$ from L.W., M.T.L. 14-3 ft., height of tide 11-4 ft.
- Interval 4h 49m, duration 5h 37m, $\theta=26^\circ$ from L.W., M.T.L. 5-3 ft., height of tide 0-8 ft., clearance 11-8 ft.
- Interval 5h 17m, duration 6h 29m, $\theta=33^\circ$ from L.W., M.T.L. 14-4 ft., height of tide 7-8 ft., height of light 78-7 ft.

7. Interval 1h 7m, duration 6h 46m, $\theta=29.7^\circ$ from H.W., M.T.L. 5.35 ft., corr. 9.5 ft. to subtract.
8. Interval 4h 32m, duration 6h 25m, $\theta=52^\circ$ from L.W., M.T.L. 7.15 ft., height of tide 4.8 ft., depth 28.8 ft.
9. Interval 2h 19m, duration 5h 49m, $\theta=72^\circ$ from H.W., M.T.L. 6.7 ft., time 19h 35m G.M.T.
10. Interval 1h 6m, duration 5h 56m, $\theta=33.3^\circ$ from H.W., M.T.L. 6.55 ft., height of tide 13.35 ft., depth 4 fathoms.
11. Height of tide 11 ft., duration 6h 21m, M.T.L. 14.2 ft., $\theta=73^\circ$ from L.W., interval 2h 34m from L.W., time 06h 42m zone time.
12. Interval 2h 42m, duration 6h 12m, M.T.L. 4.5 ft., $\theta=78.4^\circ$ from H.W., height of tide 5.4 ft., actual depth 17.4 ft., clearance 3.4 ft.
13. Duration 5h 48m, M.T.L. 5.5 ft., height of tide 10 ft., $\theta=46.1^\circ$ from H.W., interval 1h 28m, time 18h 29m zone time.
14. Duration 6h 17m, M.T.L. 4 ft., height of tide 3 ft., $\theta=45^\circ$ from L.W., interval 1h 34m, time 19h 44m zone time.
15. Duration 6h 1m, M.T.L. 7.35 ft., height of tide 10 ft., $\theta=69^\circ$ from H.W., interval 2h 18m, time 05h 26m zone time.

Revision Paper 1.

1. Interval 2h 53m, M.T.L. 6.25 ft., $\theta=88.5^\circ$ from H.W., height of tide 6.4 ft., depth 36.4 ft.
2. Lat. $34^\circ 15.8' N.$, long. $47^\circ 52.3' W.$
3. D.M.P. 1195.1, lat. $51^\circ 14.5' S.$, dist. 986.7 M.
4. Tr. alt. $77^\circ 50.6'$, lat. $38^\circ 29.1' S.$
5. True alt. $13^\circ 02.1'$, lat. $53^\circ 20.2' N.$
6. True amp. W. $10^\circ 00' N.$, dev. $3^\circ W.$
7. Az. $129.7^\circ T.$, dev. $4.7^\circ E.$
8. L.H.A. $52^\circ 21.4'$, Az. $300.8^\circ T.$, dev. $11.2^\circ W.$
9. L.H.A. $\gamma 260^\circ 27.8'$, true alt. $41^\circ 22.8'$, lat. $41^\circ 57.9' N.$, P.L. $091^\circ T.-271^\circ T.$
10. L.H.A. $352^\circ 31.8'$, true alt. $61^\circ 32.8'$, dec. $21^\circ 02.1' S.$, M.ZX $27^\circ 49.3'$ lat. $48^\circ 51.4' S.$, P.L. $104.9^\circ T.-284.9^\circ T.$
11. G.M.T. 23h 23m 37s (16th), dec. $2^\circ 22.8' N.$, G.H.A. $172^\circ 14.9'$, ZX $61^\circ 21.8'$, L.H.A. $309^\circ 42.5'$, long. $137^\circ 27.6' E.$, P.L. $151.2^\circ T.-331.2^\circ T.$
by **M.S.H.**: L.H.A. $309^\circ 52.9'$, int. 7' away, C.ZX $61^\circ 14.8'$, I.T.P. lat. $37^\circ 48.9' S.$, long. $137^\circ 28.1' E.$
12. G.H.A. $195^\circ 03.1'$, ZX $31^\circ 42.3'$, *L.H.A. $40^\circ 29.4'$, long. $154^\circ 33.7' W.$, P.L. $178.1^\circ T.-358.1^\circ T.$
by **M.S.H.**: *L.H.A. $40^\circ 10.6'$, int. $14.3'$ away, C.ZX $31^\circ 28'$ I.T.P. lat. $41^\circ 34.5' S.$, long. $154^\circ 33.7' W.$
13. G.M.T. 20h 31m 20s, L.H.A. $9^\circ 54.7'$, true alt. $48^\circ 12.9'$, M.ZX $40^\circ 52.5'$, lat. $45^\circ 27.7' N.$, P.L. $104.5^\circ T.-284.5^\circ T.$
14. \odot G.H.A. $14^\circ 57.5'$, G.M.T. 13h 09m 45s, error 26m 35s fast.
15. G.M.T. 01h 44m 20s, dec. $1^\circ 10.7' N.$, true alt. $66^\circ 54'$, lat. $21^\circ 55.3' S.$, P.L. $090^\circ T.-270^\circ T.$
16. Corr. $61.1'$, bearing $077^\circ T.$
17. for D.R. pos. d. lat. $66.4' S.$, dep. 207.4, d. long. $4^\circ 37.9'$
" E.P. " $19.0' S.$, " 79.6 " $1^\circ 45.5'$
D.R. pos. lat. $42^\circ 16.4' N.$, long. $175^\circ 02.1' E.$
E.P. lat. $40^\circ 51.0' N.$, long. $178^\circ 34.5' W.$
18. d. long. $2400'$, lat. $35^\circ 24.7' N.$ or S.

Revision Paper 2

1. True alt. $56^\circ 15.9'$, lat. $17^\circ 45.7' N.$
2. True alt. $15^\circ 43.8'$, lat. $45^\circ 05.3' S.$
3. G.M.T. 23h 39m 00s, true alt. $42^\circ 19.7'$, dec. $20^\circ 48.0' S.$, lat. $26^\circ 52.3' N.$
4. G.M.T. 02h 41m 00s, dec. $21^\circ 09.2' S.$, true amp. E. $27^\circ 53.3' S.$, dev. $3^\circ 53.3' E.$
5. L.H.A. $65^\circ 55.9'$, dec. $2^\circ 50.9' N.$, az. $103.9^\circ T.$, dev. $3.1^\circ W.$
6. G.M.T. 03h 16m 22s (17th) L.H.A. $\gamma 338^\circ 27.4'$, true alt. $48^\circ 09.7'$, lat. $47^\circ 32.8' N.$, P.L. $091^\circ T.-271^\circ T.$
7. G.M.T. 07h 30m 03s, L.H.A. $355^\circ 59.3'$, true alt. $59^\circ 18.7'$, M.ZX $30^\circ 35.0'$, lat. $32^\circ 14.8' S.$, P.L. $086.3^\circ T.-266.3^\circ T.$
8. G.M.T. 22h 36m 18s, *L.H.A. $354^\circ 50'$, true alt. $51^\circ 00.4'$, M.ZX $38^\circ 39.9'$ lat. $15^\circ 24.5' N.$, P.L. $082.4^\circ T.-262.4^\circ T.$
9. G.M.T. 11h 40m 19s, G.H.A. $356^\circ 28.0'$, dec. $2^\circ 10.9' N.$, true alt. $29^\circ 46.3'$, L.H.A. $310^\circ 18.0'$ long. $46^\circ 10' W.$, P.L. $028.4^\circ T.-208.4^\circ T.$
by **M.S.H.**: L.H.A. $310^\circ 28'$, int. $6.6'$ away, C.ZX $60^\circ 07.1'$, I.T.P. lat. $43^\circ 20.2' N.$, long. $46^\circ 08' W.$
10. G.M.T. 21h 02m 48s, G.H.A. $353^\circ 38.3'$, true alt. $62^\circ 20.8'$, L.H.A. $322^\circ 31.3'$, long. $31^\circ 07.0' W.$, P.L. $155.6^\circ T.-335.6^\circ T.$
by **M.S.H.**: L.H.A. $322^\circ 56.3'$, int. $18.0'$ away, C.ZX $27^\circ 21.2'$, I.T.P. lat. $40^\circ 12.5' N.$, long. $31^\circ 03.6' W.$
11. Error in longitude $1' 44''$, chron. error 13m 07s fast.
12. d. lat. $30.64' N.$, dep. 25.71, d. long. $34.73'$, lat. $42^\circ 30.6' N.$, long. $178^\circ 50.7' W.$, lat. $42^\circ 30.6' N.$, long. $179^\circ 59.9' W.$
13. d. lat. $247' S.$, D.M.P. 291.7, d. long. $5700' W.$, course S. $87^\circ 04.2' W.$, dist. 4834 M.
14. Interval 3h 13m, M.T.L. 4.85 ft., height of tide 5.7 ft., clearance 7.7 ft.
15. Lat. $39^\circ 04' N.$, long. $131^\circ 02' E.$
16. A's pos. lat. $39^\circ 52.4' N.$, long. $36^\circ 16.6' W.$, B's pos. lat. $40^\circ 25.3'$, long. $36^\circ 13.3' W.$, course N. $4\frac{1}{2}^\circ E.$, dist. 33 M.
17. G.M.T. 07h 30m 40s (6th), *L.H.A. $316^\circ 16.2'$, az. $042^\circ T.$, dev. $5^\circ W.$

Revision Paper 3

1. d. lat. $600' N.$, D.M.P. 782.5, d. long. $1800' E.$, course N. $66^\circ 30.3' E.$, dist. 1504 M. A.T.S. 20h 24m 57s (26th).
2. Interval 2h 11m duration 6h 44m M.T.L. 6.6 ft. $\frac{1}{2}$ range 6.5 ft., 0 58.1' from H.W., corr. -3.1 ft., depth 23.5 ft.
3. Error 3m 13s fast.
4. G.M.T. 22h 43m 39s (16th) dec. $23^\circ 21.0' S.$, L.H.A. $353^\circ 15.7'$, true alt. $29^\circ 59.9'$, M.ZX $69^\circ 44.0'$, lat. $46^\circ 23.0' N.$, P.L. $083.4^\circ T.-263.4^\circ T.$
5. G.M.T. 17h 04m 40s (17th), L.H.A. $231^\circ 04.3'$, true alt. $48^\circ 24.7'$, lat. $50^\circ 17.3' N.$, P.L. $090.5^\circ T.-270.5^\circ T.$
6. G.M.T. 19h 50m 00s (16th), dec. $21^\circ 01.4' S.$, true amp. W. $26^\circ 05.3' S.$, error $1^\circ 05.3' W.$, dev. $2^\circ 54.7' E.$
7. True alt. $23^\circ 10.5'$, P. dist. $33^\circ 43.2'$, lat. $56^\circ 53.7' N.$
8. G.M.T. 20h 11m 00s (29th), G.H.A. $\gamma 280^\circ 43.3'$, *L.H.A. $354^\circ 40.2'$, true alt. $23^\circ 39.8'$, M.ZX $66^\circ 09.6'$, lat. $20^\circ 12.5' S.$, P.L. $096^\circ T.-276^\circ T.$
9. L.H.A. $47^\circ 30.5'$, dec. $21^\circ 02.4' S.$, true az. $224.0^\circ T.$, error $27.0' W.$, dev. $2.0' W.$
10. True alt. $51^\circ 25.1'$, lat. $46^\circ 49.9' S.$, P.L. $090^\circ T.-270^\circ T.$
11. G.M.T. 23h 19m 00s (28th), dec. $2^\circ 17.3' S.$, true alt. $52^\circ 46.4'$, lat. $39^\circ 30.9' S.$, P.L. $090^\circ T.-270^\circ T.$

12. Mid lat. $44^{\circ} 45' 4''$, corr. $+5' 0''$, parallels $41^{\circ} 10' 9''$ and $48^{\circ} 29' 9''$ N. or S.
13. Lat. $53^{\circ} 29' S.$, long. $179^{\circ} 35' E.$
14. G.M.T. 23h 43m 10s (14th), G.H.A. φ $349^{\circ} 40' 7''$, *L.H.A. $55^{\circ} 32' 3''$, az. $259' 1'' T.$, dev. $2' 1'' E.$
15. G.M.T. 17h 38m 10s (28th), dec. $14^{\circ} 50' 2'' N.$, *S.H.A. $183^{\circ} 20' 3''$, G.H.A. φ $301^{\circ} 32' 8''$, true alt. $40^{\circ} 40' 6''$, L.H.A. $312^{\circ} 17' 2''$, long. $172^{\circ} 35' 9'' W.$, P.L. $019' 2'' T$ — $199' 2'' T$.
by **M.S.H.**: *L.H.A. $312^{\circ} 43' 1''$, T.ZX $49^{\circ} 19' 4''$, C.ZX $49^{\circ} 01' 5''$, intercept $17' 9''$ away, I.T.P. $42^{\circ} 45' 8'' N.$, $172^{\circ} 33' 1'' W.$

Revision Paper 4

PRACTICAL NAVIGATION

1. G.M.T. 07h 31m 09s (14th), G.H.A. $293^{\circ} 53' 7''$, dec. $3^{\circ} 24' 3'' N.$, T.ZX $43^{\circ} 08' 0''$, L.H.A. $325^{\circ} 29' 7''$, long. $31^{\circ} 36' 0'' E.$, P.L. $034' 3'' T$ — $214' 3'' T$.
by **M.S.H.**: L.H.A. $325^{\circ} 22' 7''$, C.ZX $43^{\circ} 13' 0''$. Intercept $5' 0''$ towards, I.T.P. $21^{\circ} 51' 4'' S.$, $31^{\circ} 34' 0'' E.$
2. G.M.T. 17h 16m 22s (16th), dec. $21^{\circ} 02' 6'' S.$, true amp. E. $23^{\circ} S.$, dev. $16' 5'' W.$
3. G.M.T. 07h 39m 44s (16th), L.H.A. φ , $214^{\circ} 41' 9''$ true alt. $27^{\circ} 45' 3''$, lat. $28^{\circ} 42' 0'' N.$, P.L. $090^{\circ} T$ — $270^{\circ} T$.
4. Mid. lat. $41^{\circ} 24'$ corr. $12' 9''$, + parallels $39^{\circ} 31' 9''$ and $43^{\circ} 41' 9'' N.$ or S.
5. lat. $34^{\circ} 15' 8'' N.$, long. $47^{\circ} 52' 3'' W.$

PRINCIPLES

1. D. lat. $12' N.$ dep. $20' 8''$ mean lat. $57^{\circ} 06'$ rate 38.93 minutes per hour.
2. G.H.A. φ $120^{\circ} 00'$, G.H.A. \odot $322^{\circ} 14' 7''$ R.A.T.S. $157^{\circ} 45' 3''$.
3. Bearing $128' 8'' T$.
5. B's error on G.M.T. 1m 04s slow, long. $37^{\circ} 23' W.$

Revision Paper 5

PRACTICAL NAVIGATION

1. G.M.T. 01h 43m 47s (23rd), dec. $23^{\circ} 26' 5'' S.$, G.H.A. $206^{\circ} 12' 1''$, T.ZX $49^{\circ} 36' 5''$, L.H.A. $304^{\circ} 31' 8''$, long. $98^{\circ} 19' 7'' E.$, P.L. $007' 1'' T$ — $187' 1'' T$.
by **M.S.H.**: L.H.A. $304^{\circ} 52' 1''$, C.ZX $49^{\circ} 18' 5''$, intercept $18' 0''$ away, I.T.P. $29^{\circ} 08' 0'' S.$, $98^{\circ} 21' 7'' E.$
2. True alt. $65^{\circ} 12' 1''$, dec. $29^{\circ} 52' 4'' S.$, lat. $5^{\circ} 04' 5'' S.$
3. G.M.T. 06h 37m 16s (27th), dec. $12^{\circ} 47' 2'' S.$, L.H.A. $55^{\circ} 00'$, true az. $280' 8'' T.$, dev. $3' 5'' W.$
4. G.M.T. 21h 09m 20s (30th), dec. $26^{\circ} 19' 9'' S.$, L.H.A. $13^{\circ} 21' 8''$, true alt. $17^{\circ} 24' 5''$, M.ZX $71^{\circ} 33' 8''$, lat. $45^{\circ} 13' 9'' N.$, P.L. $102' 2'' T$ — $282' 2'' T$.
5. N. $8^{\circ} W.$, 11.0 M., N. $38^{\circ} W.$, 9.7 M.

PRINCIPLES

1. Course $037^{\circ} T.$, dev. $6^{\circ} E.$
2. Intercept $10' 1''$ towards.
3. Lat. $36^{\circ} 42' N.$, dec. $53^{\circ} 18' N.$

Revision Paper 6

PRACTICAL NAVIGATION

1. G.M.T. 13h 49m 42s (17th), dec. $26^{\circ} 19' 9'' S.$, G.H.A. $317^{\circ} 14' 1''$, T.ZX $58^{\circ} 11' 9''$, L.H.A. $62^{\circ} 32' 0''$, long. $105^{\circ} 17' 9'' E.$, P.L. $159' 3'' T$ — $339' 3'' T$.
by **M.S.H.**: L.H.A. $62^{\circ} 48' 6''$, C.ZX $58^{\circ} 26' 9''$, intercept $15'$ towards, I.T.P. $17^{\circ} 27' 3'' S.$, $105^{\circ} 19' 8'' E.$

2. G.M.T. 04h 42m 28s (6th), dec. $5^{\circ} 05' 0'' S.$, true amp. W. $7^{\circ} 58' S.$, dev. $5' 7'' E.$
3. G.M.T. 20h 40m 00s (28th), dec. $26^{\circ} 21' 6'' S.$, L.H.A. $354^{\circ} 28' 3''$, true alt. $24^{\circ} 45' 1''$, M.ZX $65^{\circ} 02' 7''$, lat. $38^{\circ} 41' 1'' N.$, P.L. $084' 5'' T$ — $264' 5'' T$.
4. Lat. $47^{\circ} 25' 6'' N.$, long. $34^{\circ} 43' 1'' W.$
5. G.M.T. 04h 13m 18s (28th), L.H.A. φ $274^{\circ} 22' 9''$, true alt. $20^{\circ} 05' 9''$, lat. $21^{\circ} 29' 0'' N.$, P.L. $091^{\circ} T$ — $271^{\circ} T$.

PRINCIPLES

1. Sun's R.A. 01h 00m 00s, error 6h 20m 00s slow.
2. Lat. $48^{\circ} S.$, Dec. $65^{\circ} S.$

Revision Paper 7

PRACTICAL NAVIGATION

1. G.M.T. 07h 10m 44s (16th), dec. $21^{\circ} 07' 2'' S.$, G.H.A. $285^{\circ} 18' 7''$, T.ZX $58^{\circ} 17' 2''$, L.H.A. $296^{\circ} 05' 2''$, long. $10^{\circ} 46' 5'' E.$, P.L. $189' 8'' T$ — $009' 8'' T$.
by **M.S.H.**: L.H.A. $295^{\circ} 58' 7''$, C.ZX $58^{\circ} 22' 6''$, intercept $5' 4''$ towards, I.T.P. $25^{\circ} 38' 9'' S.$, $10^{\circ} 45' 9'' E.$
2. $12' 0'' N.$
3. G.M.T. 15h 50m 24s, dec. $9^{\circ} 13' 8'' N.$, lat. $16^{\circ} 19' 1'' N.$
4. G.M.T. 12h 05m 10s (29th), dec. $9^{\circ} 16' 4'' N.$, L.H.A. $314^{\circ} 59' 7''$, true az. $092' 5'' T.$, dev. $3' 0'' E.$
5. G.M.T. 00h 49m 15s (14th), dec. $23^{\circ} 12' 3'' S.$, L.H.A. $14^{\circ} 04' 3''$, ZX $63^{\circ} 15' 5''$, M.ZX $61^{\circ} 52' 2'' N.$, lat. $38^{\circ} 39' 9'' N.$, P.L. $104' 5'' T$ — $284' 5'' T$.

PRINCIPLES

1. $335^{\circ} 10' 4''$.
2. Lat. $7^{\circ} 55\frac{1}{4}' N.$

STARS, 1952 January—June

R.A.	Name and No.	S.H.A.					Declination							
		JAN.	FEB.	MAR.	APR.	MAY	JUNE	JAN.	FEB.	MAR.	APR.	MAY	JUNE	
00 38	z Cassiopeiae 3	350	33.7	33.8	33.9	33.8	33.2	N. 56	16.8	16.7	16.6	16.5	16.4	16.4
00 41	β Ceti 4	349	42.2	42.2	42.3	42.2	41.9	S. 18	15.0	15.0	15.0	14.9	14.8	14.7
01 36	z Eridani 5	336	00.7	01.0	01.2	01.2	01.1	S. 57	29.0	28.9	28.8	28.7	28.5	28.3
02 04	z Arietis 6	328	52.9	53.0	53.1	53.1	53.0	N. 23	14.4	14.4	14.3	14.3	14.3	14.3
03 00	z Ceti 3	315	03.2	03.3	03.4	03.5	03.4	N. 3	54.8	54.2	54.2	54.2	54.3	54.4
03 21	z Persei 9	309	46.4	46.5	46.7	46.8	46.8	N. 48	41.9	41.0	41.8	41.7	41.7	41.6
04 33	z Tauri 10	291	42.1	42.2	42.3	42.4	42.4	N. 16	25.0	25.0	25.0	25.0	25.0	25.0
05 12	β Orionis 11	281	56.1	56.2	56.3	56.4	56.4	S. 8	15.3	15.3	15.4	15.3	15.3	15.2
05 13	z Aurigae 12	281	42.3	42.4	42.6	42.7	42.8	N. 45	57.3	57.4	57.4	57.3	57.3	57.2
05 23	γ Orionis 13	279	21.2	21.3	21.4	21.5	21.5	N. 6	18.6	18.5	18.5	18.5	18.6	18.6
05 23	β Tauri 14	279	10.7	10.7	10.9	11.0	11.0	N. 28	34.3	34.3	34.3	34.3	34.3	34.3
05 53	z Orionis 16	271	50.9	51.0	51.1	51.2	51.3	N. 7	24.1	24.1	24.0	24.0	24.1	24.1
06 23	z Carinae* 17	264	16.1	16.3	16.5	16.8	17.0	S. 52	40.1	40.3	40.3	40.3	40.2	40.1
06 35	γ Geminorum 261	15.4	15.4	15.5	15.6	15.7	15.7	N. 16	26.6	26.6	26.6	26.6	26.6	26.6
06 43	z Canis Majoris 18	259	14.0	14.1	14.2	14.3	14.4	S. 16	38.9	39.0	39.0	39.0	39.0	38.9
07 37	z Canis Minoris 20	245	47.7	47.6	47.7	47.8	47.9	N. 5	21.0	20.9	20.9	20.9	20.9	21.0
07 42	β Geminorum 21	244	23.7	23.6	23.7	23.9	24.0	N. 28	08.7	08.7	08.7	08.7	0.87	08.7
09 25	z Hydrae 25	218	41.1	41.0	41.0	41.1	41.2	S. 8	27.0	27.1	27.1	27.2	27.2	27.1
10 06	z Leonis 26	208	32.3	32.1	32.1	32.2	32.3	N. 12	12.1	12.0	12.0	12.0	12.1	12.1
11 01	z Ursae Majoris 27	194	47.4	47.1	47.0	47.1	47.3	N. 62	00.3	00.4	00.5	00.7	00.7	00.7
11 47	β Leonis 28	183	20.5	20.3	20.2	20.2	20.3	N. 14	50.2	50.2	50.2	50.2	50.3	50.3
12 13	γ Corvi 29	176	39.8	39.5	39.4	39.4	39.5	S. 17	16.6	16.7	16.8	16.8	16.9	16.9
12 24	z Crucis 30	174	01.1	00.7	00.5	00.5	00.6	S. 62	49.8	50.0	50.3	50.4	50.5	50.5
13 23	z Virginis 33	159	19.9	19.7	19.5	19.4	19.4	S. 10	54.8	54.9	55.0	55.0	55.0	55.0
14 04	β Centauri 36	149	02.2	01.9	01.7	01.6	01.5	S. 36	08.1	08.2	08.3	08.4	08.5	08.5
14 13	z Bootis 37	146	37.8	37.6	37.4	37.2	37.2	N. 19	25.6	25.5	25.5	25.6	25.7	25.7
14 36	z Centauri 38	140	55.2	54.8	54.4	54.2	54.1	S. 60	38.2	38.3	38.4	38.5	38.7	38.8
14 51	β Ursae Majoris 40	137	17.8	17.1	16.5	16.2	16.2	N. 74	20.6	20.6	20.7	20.8	20.9	21.1
16 26	z Scorpil 42	113	23.2	22.9	22.7	02.4	22.3	S. 26	19.7	19.8	19.8	19.9	19.9	19.9
16 44	z Triang. Aust. 43	109	07.0	06.4	05.9	05.3	04.9	S. 68	56.5	56.5	56.5	56.6	56.7	56.8
17 33	z Ophiuchi 46	96	49.6	49.4	49.2	48.9	48.7	N. 12	35.4	35.3	35.3	35.3	35.4	35.5
17 41	β Ophiuchi 94	43.6	43.4	43.2	43.0	42.8	42.7	N. 4	34.9	34.9	34.8	34.9	34.9	35.0
17 55	γ Draconis 47	91	08.1	07.8	07.6	07.3	07.0	N. 51	29.4	29.2	29.2	29.2	29.3	29.5
18 21	z Sagittarii 48	84	45.4	45.1	44.9	44.6	44.4	S. 34	24.7	24.6	24.6	24.6	24.6	24.6
18 35	z Lyrae 49	81	10.7	10.5	10.2	10.0	09.7	N. 38	44.1	43.9	43.9	43.9	44.0	44.1
18 52	z Sagittarii 50	76	55.8	55.6	55.4	55.1	54.9	S. 26	21.6	21.6	21.6	21.6	21.5	21.5
22 55	z Piscis Aust 56	16	15.0	15.0	14.9	14.8	14.6	S. 29	52.8	52.7	52.6	52.5	52.4	52.3

STARS, 1952 July—December

Mag.	Name and No.	S.H.A.						Declination							
		JULY	AUG.	SEPV.	OCT.	NOV.	DEC.	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.		
2.5	Schedar 3	350	32.9	32.5	32.3	32.3	32.3	32.4	N. 56	16.5	16.6	16.8	17.0	17.1	17.2
2.2	Diphda 4	349	49.6	41.4	41.2	41.2	41.2	41.3	S. 18	14.6	14.5	14.5	14.5	14.6	14.7
0.6	Achernar 5	335	60.5	60.1	59.9	59.7	59.8	59.9	S. 57	28.2	28.2	28.3	28.4	28.5	28.6
2.2	Hamal 6	325	52.5	52.3	52.1	51.9	51.9	51.9	N. 23	14.4	14.5	14.6	14.6	14.7	14.7
2.8	Menkar 8	315	08.0	02.8	02.6	02.4	02.3	02.3	N. 3	54.4	54.5	54.6	54.6	54.6	54.5
1.9	Mirfak 9	309	46.3	45.9	4.56	45.3	45.2	45.1	N. 49	41.6	41.6	41.7	41.8	41.9	42.0
1.1	Aldebaran 10	291	42.2	41.9	41.7	41.5	41.3	41.2	N. 16	25.1	25.1	24.1	25.2	25.2	25.1
0.3	Rigel 11	281	56.3	56.1	55.9	55.6	55.5	55.4	S. 8	15.1	15.0	15.0	15.0	15.1	15.2
0.2	Capella 12	281	42.5	42.2	41.9	41.6	41.3	41.1	N. 45	57.2	57.1	57.1	57.2	57.2	57.3
1.7	Bellatrix 13	279	21.3	21.2	20.9	20.7	20.5	20.4	N. 6	18.7	18.7	18.7	18.7	18.7	18.6
1.8	El Nath 14	271	10.8	10.6	10.3	10.0	09.8	09.7	N. 28	34.2	34.3	34.3	34.3	34.3	34.3
Var.	Betelgeuse 16	271	51.1	50.9	50.7	50.5	50.3	50.1	N. 7	24.1	24.2	24.2	24.2	24.2	24.1
-0.9	Canopus 17	264	17.0	16.8	16.5	16.2	16.0	15.8	S. 52	39.9	39.8	39.7	39.8	39.8	40.0
-1.9	Athena 18	261	15.6	15.4	15.2	15.0	14.7	14.5	N. 16	26.6	26.6	26.6	26.6	26.6	26.5
-1.6	Sirius 18	259	14.4	14.2	14.0	13.8	13.6	13.4	S. 16	38.8	38.7	38.7	38.7	38.8	38.9
C.5	Procyon 20	245	47.9	47.8	47.6	47.4	47.1	46.9	N. 5	21.0	21.0	21.0	21.0	20.9	20.9
1.2	Pollux 21	244	23.9	23.8	23.6	23.3	23.1	22.8	N. 28	08.7	08.6	08.6	08.6	08.5	08.5
2.2	Alphard 25	218	41.3	41.3	41.2	41.0	40.8	40.5	S. 8	27.1	27.0	27.0	27.0	27.1	27.2
1.3	Regulus 26	208	32.4	32.4	32.3	32.1	31.9	31.6	N. 12	12.1	12.1	12.1	12.0	11.9	11.8
2.0	Dubhe 27	194	47.8	47.9	47.8	47.7	47.3	46.9	N. 62	00.7	00.6	00.4	00.2	00.1	00.0
2.2	Denebola 28	183	26.4	26.4	26.4	26.3	26.1	25.9	N. 14	50.3	50.3	50.3	50.2	50.1	50.0
2.8	Gienah 29	176	39.6	39.6	39.6	39.6	39.4	39.1	S. 17	16.8	16.8	16.7	16.7	16.7	16.8
1.1	Acrux 30	174	01.0	01.3	01.4	01.3	01.0	00.6	S. 62	50.5	50.5	50.3	50.2	50.1	50.1
1.2	Spica 33	159	19.5	19.6	19.7	19.6	19.5	19.3	N. 10	55.0	54.9	54.9	54.9	54.9	55.0
2.3	Minckent 36	149	01.6	01.7	01.8	01.8	01.7	01.5	S. 36	08.5	08.5	08.4	08.4	08.3	08.3
0.2	Arcturus 37	146	37.3	37.4	37.5	37.6	37.5	37.3	N. 19	25.8	25.8	25.7	25.7	25.5	25.4
0.1	Rigel Kent 38	140	54.3	54.6	54.8	54.9	54.8	54.5	S. 60	38.8	38.8	38.8	38.6	38.5	38.5
2.2	Kochab 40	137	17.0	17.6	18.1	18.5	18.6	18.4	N. 74	21.2	21.1	21.1	20.9	20.7	20.5
1.2	Antares 42	113	22.2	22.2	22.4	22.5	22.5	22.4	S. 26	19.9	19.9	19.9	19.8	19.8	19.8
1.9	Atria 43	109	04.7	05.0	05.4	05.7	05.8	05.7	S. 68	56.9	57.0	57.0	56.9	56.8	56.7
2.1	Rasalhague 46	96	48.6	48.7	48.8	48.9	49.0	49.0	N. 12	35.6	35.6	35.6	35.6	35.6	35.5
2.9	β Ophiuchi 94	42.6	42.7	42.8	42.9	43.0	43.0	N. 4	35.1	35.1	35.2	35.1	35.1	35.5	
2.4	Eltanin 47	91	06.9	07.0	07.3	07.5	07.7	07.8	N. 51	29.6	29.8	29.8	29.8	29.7	29.5
2.0	Kaus Australis 48	84	44.1	44.1	44.2	44.3	44.4	44.4	S. 34	24.7	24.7	24.7	24.7	24.7	24.6
0.1	Vega 49	81	09.5	09.6	09.8	09.9	10.1	10.2	N. 38	44.3	44.4	44.5	44.5	44.4	44.3
2.1	Nunki 50	76	5												

CALENDAR 1952

Day of Month	JAN.		FEB.		MAR.		APR.		MAY		JUNE		JULY		AUG.		SEPT.		OCT.		NOV.		DEC.	
	Week	Year	Week	Year	Week	Year	Week	Year	Week	Year	Week	Year	Week	Year	Week	Year	Week	Year	Week	Year	Week	Year	Week	Year
1	Tu	1	Fr	32	S	61	Tu	92	Th	122	S	153	Tu	183	Fr	214	M	245	W	275	S	306	M	336
2	W	2	S	33	Th	62	W	93	Fr	123	M	154	W	184	S	215	Tu	246	Th	276	Fr	307	Tu	337
3	Th	3	M	34	Th	63	M	94	Th	124	Tu	155	Th	185	S	216	W	247	F	277	M	308	W	338
4	Fr	4	Th	35	Fr	64	F	95	S	125	W	156	F	186	M	217	Th	248	S	278	Tu	309	Th	339
5	S	5	M	36	S	65	Tu	96	M	126	Th	157	S	187	Tu	218	F	249	W	279	W	310	F	340
6	S	6	W	37	Th	66	S	97	Tu	127	F	158	S	188	W	219	S	250	M	280	Th	311	S	341
7	M	7	Th	38	F	67	M	98	W	128	S	159	M	189	Th	220	S	251	Tu	281	F	312	S	342
8	Tu	8	Fr	39	S	68	Tu	99	Th	129	S	160	Tu	190	F	221	M	252	W	282	S	313	M	343
9	W	9	S	40	S	69	W	100	F	130	M	161	W	191	S	222	Tu	253	Th	283	S	314	Tu	344
10	Th	10	M	41	M	70	Th	101	S	131	Tu	162	Th	192	S	223	W	254	F	284	M	315	W	345
11	Fr	11	M	42	Tu	71	F	102	S	132	W	163	F	193	M	224	Th	255	S	285	Tu	316	Th	346
12	S	12	Tu	43	W	72	S	103	M	133	Th	164	S	194	Tu	225	F	256	S	286	W	317	F	347
13	S	13	W	44	Th	73	S	104	F	134	Th	165	S	195	W	226	M	257	Th	287	Th	318	S	348
14	M	14	Th	45	F	74	M	105	W	135	S	166	M	196	Th	227	S	258	Tu	288	F	319	S	349
15	Tu	15	F	46	S	75	Tu	106	Th	136	S	167	Tu	197	F	228	M	259	W	289	S	320	M	350
16	W	16	S	47	S	76	W	107	F	137	M	168	W	198	S	229	Tu	260	Th	290	S	321	Tu	351
17	Th	17	Th	48	M	77	Th	108	S	138	Tu	169	Th	199	S	230	W	261	F	291	M	322	W	352
18	Fr	18	M	49	W	78	F	109	S	139	W	170	F	200	M	231	Th	262	S	292	Tu	323	Th	353
19	S	19	Tu	50	Th	79	S	110	M	140	Th	171	S	201	Tu	232	F	263	S	293	W	324	F	354
20	S	20	W	51	Th	80	S	111	Tu	141	F	172	S	202	W	233	S	264	M	294	Th	325	S	355
21	M	21	Th	52	F	81	M	112	W	142	S	173	M	203	Th	234	S	265	Tu	295	F	326	S	356
22	Tu	22	F	53	S	82	Tu	113	Th	143	S	174	Tu	204	F	235	M	266	W	296	S	327	M	357
23	W	23	S	54	S	83	W	114	F	144	M	175	W	205	S	236	Tu	267	Th	297	S	328	Th	358
24	Th	24	S	55	M	84	Th	115	S	145	Tu	176	Th	206	S	237	W	268	F	298	M	329	W	359
25	F	25	M	56	Tu	85	F	116	S	146	W	177	F	207	M	238	Th	269	S	299	Tu	330	Th	360
26	S	26	Tu	57	W	86	S	117	M	147	Th	178	S	208	Tu	239	F	270	S	300	W	331	F	361
27	S	27	W	58	Th	87	S	118	Tu	148	F	179	S	209	W	240	S	271	M	301	Th	332	S	362
28	M	28	Th	59	F	88	M	119	W	149	S	180	M	210	Th	241	S	272	Tu	302	F	333	S	363
29	Tu	29	F	60	S	89	Tu	120	Th	150	S	181	Tu	211	F	242	M	273	W	303	S	334	M	364
30	W	30	S	61	S	90	W	121	F	151	M	182	W	212	S	243	Tu	274	Th	304	S	335	Tu	365
31	Th	31			M	91			S	152			Th	213	S	244			F	305			W	366

ECLIPSES

There will be four eclipses, two of the Sun and two of the Moon.

I. A Partial Eclipse of the Moon, February 11. The eclipse begins at 00h 03m and ends at 01h 15m. At maximum eclipse 0.09 of the Moon's diameter will be obscured. It is visible from Asia, the Indian Ocean, except the eastern part, Europe, Africa, the Arctic Regions, the Atlantic Ocean, North America, except the western and north-western parts, and South America, except the southern part.

II. A Total Eclipse of the Sun, February 25. See map on page 8. The maximum duration of the total phase is 3m 10s.

III. A Partial Eclipse of the Moon, August 5. The eclipse begins at 18h 33m and ends at 21h 01m. At maximum eclipse 0.54 of the Moon's diameter will be obscured. It is visible from the western part of the Pacific Ocean, Australia, the Antarctic regions, Asia, except the north-eastern part, the Indian Ocean, Europe, Africa, the Atlantic Ocean, except the north-western part, and the eastern parts of South America.

IV. An Annular Eclipse of the Sun, August 20. See map on page 9. The maximum duration of the annular phase is 6m 41s.



TABLE FOR INTERPOLATING SUNRISE

TABLE I—FOR LATITUDE

Tabular Interval	Difference between consecutive tabular latitudes																
	Sunrise, Sunset and Twilight																
	10°			5°			2°			10m 20m 30m			40m 50m 60m			1h 10m 1h 20m 1h 30m	
0 30	0 15	0 06	m	m	m	m	m	m	m	m	m	h	m	h	m	h	m
1 00	0 30	0 12	0	1	1	2	2	2	0	02	0	03	0	03	0	05	0
1 30	0 45	0 18	1	2	3	4	4	4	0	05	0	05	0	05	0	07	0
2 00	1 00	0 24	1	3	4	5	6	7	0	07	0	08	0	08	0	10	0
2 30	1 15	0 30	2	4	6	7	8	9	0	10	0	10	0	10	0	12	0
3 00	1 30	0 36	2	5	7	9	10	11	0	12	0	13	0	13	0	15	0
3 30	1 45	0 42	3	6	8	11	12	14	0	15	0	16	0	16	0	18	0
4 00	2 00	0 48	3	7	10	13	14	16	0	18	0	19	0	20	0	21	0
4 30	2 15	0 54	4	8	11	14	17	19	0	21	0	23	0	23	0	24	0
5 00	2 30	1 00	4	9	13	16	19	21	0	24	0	26	0	27	0	27	0
5 30	2 45	1 06	5	10	14	18	21	24	0	27	0	29	0	30	0	29	0
6 00	3 00	1 12	5	11	16	20	24	27	0	30	0	32	0	34	0	34	0
6 30	3 15	1 18	6	12	17	22	27	30	0	34	0	36	0	38	0	37	0
7 00	3 30	1 24	6	13	19	24	29	34	0	37	0	40	0	42	0	41	0
7 30	3 45	1 30	7	14	20	26	32	37	0	41	0	44	0	46	0	44	0
8 00	4 00	1 36	7	15	22	28	35	40	0	44	0	49	0	51	0	48	0
8 30	4 15	1 42	8	16	24	30	38	44	0	48	0	53	0	57	0	53	0
9 00	4 30	1 48	8	17	25	33	41	48	0	53	0	58	1	03	0	58	1
9 30	4 45	1 54	9	18	27	35	44	52	0	58	1	04	1	09	0	58	1
10 00	5 00	2 00	9	19	28	38	47	56	0	1	04	1	11	1	18	1	11
			10	20	30	40	50	60	0	1	10	1	20	1	30	1	20

Table I is for the interpolation of the L.M.T. of sunrise, twilight, etc., for latitude. It is necessary, when using this table, to take out the required phenomenon for the latitude less than the true latitude. This table is entered with the nearest value of the difference between the times for the tabular latitude and the next higher one, and, in the appropriate column, with the difference between true latitude and tabular latitude; the correction so obtained is applied to the time for the tabular latitude; the sign of the correction can be seen by inspection. It is to be noted that the interpolation is not linear, so that when using this table it is essential to work from the tabular latitude numerically less than the one required.

SCOTLAND, WEST COAST—GREENOCK

Lat. 55° 57' N., 4° 46' W.

TIME ZONE: Greenwich

		February							
D. of M.	D. of W.	HIGH WATER		LOW WATER		HIGH WATER		LOW WATER	
		Time	Ht.	Time	Ht.	Time	Ht.	Time	Ht.
14	M			0107	9.9	0622	0.7		
				1303	11.4	1837	*0.4		
15	T			0153	10.1	0703	0.4		
				1348	11.9	1920	*0.5		

WALES—SWANSEA (MUMBLES LIGHTHOUSE)

Lat. 51° 34' N., Long. 3° 58' W.

TIME ZONE: Greenwich

		January		February		March	
8	S	1146	21.7	0525	8.1		
				1759	8.3		
16	S	0709	28.8	0051	1.1		
		1936	28.4	1319	0.4		
19	S			1029	25.3	0408	3.1
				2243	23.8	1623	4.5
22	S	1143	23.6	0520	5.9		
				1748	6.5		
23	S	0017	22.3	0619	7.3		
		1254	22.6	1859	7.7		
25	F					0340	22.5
						1612	22.8
						0955	6.1
						2213	5.5

IRELAND—EAST COAST—KINGSTOWN

Lat. 53° 18' N., Long. 6° 08' W.

TIME ZONE: Greenwich

		February					
16	W			0116	11.9	0647	0.1
				1331	13.1	1919	*0.1

IRELAND—NORTH COAST—LONDONDERRY

Lat. 54° 59' N., Long. 7° 19' W.

TIME ZONE: Greenwich

		September		October		November	
9	W					0981	7.4
						2204	6.9
24	S	0905	8.6	0314	0.0		
		2122	9.2	1510	*0.2		
27	T			1138	6.9	0540	2.3
						1810	2.6
28	F			0027	5.4	0640	2.9
				1251	6.4	1948	3.1

IRELAND—SOUTH COAST—QUEENSTOWN

Lat. 51° 50' N., Long. 8° 18' W.

TIME ZONE: Greenwich

		January		February					
D. of M.	D. of W.	HIGH WATER		LOW WATER		HIGH WATER		LOW WATER	
		Time	Ht.	Time	Ht.	Time	Ht.	Time	Ht.
1	S	0638	11.9	0045	0.6				
		1857	11.1	1304	0.7				
16	W					0739	12.1	0141	*1.2
						1957	12.6	1409	*1.0

GERMANY—CUXHAVEN ✓

Lat. 53° 52' N., Long. 8° 43' E.

TIME ZONE: Greenwich

		October		December			
21	F	1122	10.9	0558	1.0		
		2358	10.1	1823	0.1		
22	S			0644	6.6		
21	W					0039	10.9
						1909	10.3
22	T					0732	0.3
						1949	0.4
						0126	11.0
						1357	10.0
						0821	0.3
						2037	0.7

HEBRIDES—STORNOWAY

Lat. 58° 12' N., Long. 6° 28' W.

TIME ZONE: Greenwich

		March					
5	S			0938	12.1	0346	2.4
				✓ 2154	11.0	1605	2.4
6	S			1615	11.1	0419	3.3
				2231	10.2	1640	3.2
15	T			0705	15.5	0101	*0.3
				1931	14.7	1385	*1.6
16	W			0744	15.6	0143	*0.9
				2010	14.6	1417	*1.7

Moon's Upper Meridian Passage, 1952

L.M.T. OF TRANSIT OF THE MOON'S CENTRE OVER THE GREENWICH MERIDIAN

Equation of Time, 1952

TABULATED IN THE SENSE MEAN MINUS APPARENT TIME

Date	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1	15 58	16 56	17 43	18 00	18 42	18 44	18 44	20 07	21 59	22 26	23 38	23 55
2	16 45	17 43	18 07	18 33	19 23	19 23	19 23	20 07	21 59	22 26	23 38	23 55
3	17 30	18 32	18 52	19 21	19 26	19 26	19 26	20 07	21 59	22 26	23 38	23 55
4	18 15	19 23	19 00	20 07	20 07	20 53	21 23	23 18	...	00 07	01 29	02 02
5	19 01	20 14	19 51	20 50	20 48	21 44	22 27	...	00 40	00 59	02 25	02 52
6	19 48	21 06	20 40	21 32	21 31	22 41	23 32	00 17	01 31	01 52	03 20	03 39
7	20 36	21 50	21 27	22 13	22 16	23 43	24 32	00 21	01 50	02 48	04 12	04 23
8	21 27	22 45	22 12	22 55	23 05	...	00 37	02 04	03 15	03 43	05 01	05 04
9	22 19	23 31	22 55	23 38	23 59	00 48	01 38	02 54	04 06	04 58	06 29	06 24
10	23 10	...	23 36	...	...	01 53	02 34	03 43	05 00	05 31	06 29	06 24
11	...	00 15	...	00 25	00 58	02 54	03 26	04 32	05 54	06 21	07 09	07 04
12	00 00	00 57	00 17	01 15	02 00	03 51	04 15	05 23	06 47	07 08	07 49	07 47
13	00 48	01 38	00 59	02 10	03 03	04 43	05 02	06 14	07 38	07 52	08 30	08 33
14	01 34	02 19	01 43	03 08	04 05	05 32	05 49	07 08	08 27	08 33	09 11	09 23
15	02 16	03 00	02 30	04 10	05 03	06 19	06 38	08 01	09 12	09 14	09 56	10 19
16	02 58	03 44	03 20	05 12	05 57	07 05	07 27	08 53	09 55	09 54	10 44	11 19
17	03 38	04 32	04 15	06 11	06 47	08 40	08 52	10 36	11 37	11 37	12 31	12 31
18	04 19	05 23	05 14	07 07	07 34	09 53	10 30	11 16	11 18	11 43	12 34	13 24
19	05 01	06 20	06 15	08 00	08 20	10 53	11 05	11 15	11 56	12 03	13 34	14 23
20	05 47	07 22	07 17	08 49	09 07	10 23	10 56	11 57	12 38	12 52	14 36	15 19
21	06 36	08 25	08 17	09 37	09 54	11 16	11 46	12 37	13 21	13 46	15 35	16 11
22	07 32	09 29	09 13	10 24	10 44	12 09	12 32	13 17	14 06	14 43	16 31	17 00
23	08 33	10 29	10 06	11 12	11 36	13 00	13 44	14 37	15 50	16 42	18 24	18 48
24	09 38	11 26	10 56	12 01	12 29	13 49	14 38	15 50	17 02	17 50	19 34	20 03
25	10 45	12 19	11 45	12 52	13 23	14 35	15 22	16 48	17 40	18 28	19 02	19 24
26	11 49	13 09	12 33	13 45	14 16	15 18	15 17	16 08	17 48	18 35	19 50	20 15
27	12 49	14 12	13 22	14 39	15 06	15 59	16 39	17 00	18 48	19 27	20 38	21 38
28	13 44	15 14	14 12	15 33	16 04	16 39	17 42	18 00	19 46	20 17	21 28	22 03
29	14 34	16 04	15 04	16 24	17 00	17 49	18 45	19 58	20 42	21 06	22 21	22 59
30	15 22	17 02	16 04	17 24	18 00	18 00	18 33	19 58	21 35	21 55	23 16	23 53
31	16 09	18 02	17 06	18 28	19 02	19 08	19 59	21 00	22 46	22 52	...	...

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
00	+ 3 00	+13 30	+12 31	+ 4 03	- 2 53	- 2 22	+ 3 38	+ 6 15	+ 0 05	-10 12	-16 22	-11 04
01	3 15	13 34	12 26	3 54	2 57	2 17	3 44	6 13	- 0 04	-10 22	-16 23	-11 03
02	3 29	13 39	12 20	3 45	3 01	2 13	3 49	6 11	0 14	-10 31	-16 23	-11 02
03	3 43	13 43	12 13	3 36	3 04	2 08	3 55	6 09	0 33	-10 41	-16 24	-11 01
04	3 57	13 46	12 07	3 27	3 07	2 03	4 00	6 07	0 33	-10 50	-16 24	-11 00
05	4 11	13 50	12 01	3 18	3 11	1 58	4 06	6 04	0 43	-11 00	-16 24	-11 00
06	+ 4 25	+13 53	+11 54	+ 3 09	- 3 14	- 1 53	+ 4 11	+ 6 02	- 0 53	-11 09	-16 24	- 9 55
07	4 39	13 57	11 48	3 01	3 17	1 48	4 17	5 59	- 1 03	-11 18	-16 23	- 9 43
08	4 53	14 00	11 41	2 52	3 19	1 43	4 22	5 56	- 1 12	-11 27	-16 23	- 9 31
09	5 06	14 02	11 34	2 43	3 22	1 38	4 27	5 53	- 1 22	-11 36	-16 22	- 9 18
10	5 20	14 05	11 27	2 35	3 24	1 33	4 32	5 50	- 1 33	-11 45	-16 21	- 9 06
11	5 33	14 07	11 20	2 26	3 27	1 27	4 37	5 47	- 1 42	-11 54	-16 20	- 8 53
12	+ 5 47	+14 10	+11 13	+ 2 17	- 3 29	- 1 22	+ 4 42	+ 5 43	- 1 53	-12 03	-16 18	- 8 40
13	6 00	14 11	11 06	2 09	3 31	1 16	4 47	5 40	- 2 03	-12 11	-16 17	- 8 27
14	6 13	14 13	10 59	2 00	3 33	1 11	4 52	5 36	- 2 13	-12 20	-16 15	- 8 14
15	6 26	14 15	10 51	1 52	3 35	1 05	4 56	5 32	- 2 24	-12 28	-16 13	- 8 01
16	6 39	14 16	10 44	1 43	3 37	0 59	5 01	5 28	- 2 34	-12 37	-16 10	- 7 48
17	6 51	14 17	10 36	1 35	3 38	0 54	5 05	5 24	- 2 44	-12 45	-16 08	- 7 34
18	+ 7 04	+14 18	+10 28	+ 1 27	- 3 39	- 0 48	+ 5 10	+ 5 19	- 2 55	-12 53	-16 05	- 7 21
19	7 16	14 19	10 21	1 19	3 41	0 42	5 14	5 15	- 3 05	-13 01	-16 02	- 7 07
20	7 28	14 20	10 13	1 11	3 42	0 36	5 18	5 10	- 3 16	-13 09	-15 59	- 6 53
21	7 41	14 20	10 05	1 03	3 43	0 30	5 22	5 05	- 3 26	-13 16	-15 56	- 6 40
22	7 52	14 20	9 57	0 55	3 44	0 24	5 26	5 01	- 3 37	-13 24	-15 52	- 6 26
23	8 04	14 20	9 49	0 47	3 44	0 18	5 30	4 56	- 3 47	-13 31	-15 48	- 6 12
24	+ 8 16	+14 20	+ 9 41	+ 0 39	- 3 45	- 0 11	+ 5 33	+ 4 50	- 3 58	-13 39	-15 44	- 5 57
25	8 27	14 19	9 32	0 31	3 45	- 0 05	5 37	4 45	- 4 08	-13 46	-15 40	- 5 43
26	8 39	14 19	9 24	0 24	3 45	+ 0 01	5 40	4 40	- 4 19	-13 53	-15 36	- 5 29
27	8 50	14 18	9 16	0 16	3 45	0 07	5 44	4 34	- 4 30	-14 00	-15 31	- 5 15
28	9 01	14 17	9 07	0 09	3 45	0 14	5 47	4 28	- 4 40	-14 07	-15 26	- 5 00
29	9 12	14 16	8 59	+ 0 01	3 45	0 20	5 50	4 23	- 4 51	-14 13	-15 21	- 4 46
30	+ 9 23	+14 15	+ 8 50	- 0 06	- 3 45	+ 0 26	+ 5 53	+ 4 17	- 5 01	-14 20	-15 16	- 4 31
31	9 33	14 13	8 41	0 13	3 44	0 33	5 56	4 11	- 5 12	-14 26	-15 10	- 4 16
00	9 44	14 11	8 33	0 20	3 43	0 39	5 58	4 04	- 5 23	-14 32	-15 04	- 4 02
01	9 54	14 10	8 24	0 27	3 43	0 46	6 01	3 58	- 5 33	-14 38	-14 58	- 3 47
02	10 04	14 08	8 15	0 34	3 42	0 52	6 04	3 52	- 5 44	-14 44	-14 52	- 3 32
03	10 14	14 05	8 07	0 41	3 41	0 59	6 06	3 45	- 5 55	-14 50	-14 46	- 3 17
04	+10 24	+14 03	+ 7 58	- 0 48	- 3 39	+ 1 05	+ 6 08	+ 3 38	- 6 05	-14 56	-14 39	- 3 02
05	10 33	14 01	7 49	0 54	3 38	1 12	6 10	3 32	- 6 16	-15 01	-14 32	- 2 48
06	10 42	13 58	7 40	1 01	3 36	1 19	6 12	3 25	- 6 26	-15 06	-14 26	- 2 33
07	10 52	13 55	7 31	1 07	3 35	1 25	6 14	3 18	- 6 37	-15 11	-14 18	- 2 18
08	11 01	13 52	7 22	1 13	3 33	1 32	6 16	3 10	- 6 47	-15 16	-14 11	- 2 03
09	11 09	13 49	7 13	1 19	3 31	1 38	6 17	3 03	- 6 58	-15 21	-14 03	- 1 48
10	+11 18	+13 45	+ 7 04	- 1 25	- 3 29	+ 1 45	+ 6 19	+ 2 56	- 7 09	-15 26	-13 56	- 1 33
11	11 27	13 42	6 55	1 31	3 27	1 51	6 20	2 48	- 7 19	-15 30	-13 47	- 1 18
12	11 35	13 38	6 46	1 37	3 24	1 58	6 21	2 40	- 7 30	-15 35	-13 40	- 1 03
13	11 43	13 34	6 37	1 43	3 22	2 04	6 22	2 33	- 7 40	-15 39	-13 31	- 0 48
14	11 51	13 30	6 28	1 48	3 19	2 11	6 23	2 25	- 7 50	-15 43	-13 23	- 0 33
15	11 58	13 26	6 19	1 54	3 17	2 17	6 23	2 17	- 8 01	-15 47	-13 14	- 0 18
16	+12 06	+13 22	+ 6 10	- 1 59	- 3 14	+ 2 24	+ 6 24	+ 2 09	- 8 11	-15 50	-13 05	- 0 03
17	12 13	13 18	6 01	2 04	3 11	2 30	6 24	2 01	- 8 21	-15 54	-12 56	+ 0 12
18	12 20	13 13	5 52	2 09	3 08	2 37	6 24	1 52	- 8 32	-15 57	-12 47	+ 0 27
19	12 27	13 08	5 43	2 14	3 04	2 43	6 24	1 44	- 8 42	-16 00	-12 37	+ 0 42
20												

Conversion of Arc to Time

0°-59°		60°-119°		120°-179°		180°-239°		240°-299°		300°-359°		0' 0	0' 25	0' 5	0' 75	
h	m	h	m	h	m	h	m	h	m	h	m	m	m	m	m	
0	0 00	60	4 00	120	8 00	180	12 00	240	16 00	300	20 00	0	0 00	0 01	0 02	0 03
1	0 04	61	4 04	121	8 04	181	12 04	241	16 04	301	20 04	1	0 04	0 05	0 06	0 07
2	0 08	62	4 08	122	8 08	182	12 08	242	16 08	302	20 08	2	0 08	0 09	0 10	0 11
3	0 12	63	4 12	123	8 12	183	12 12	243	16 12	303	20 12	3	0 12	0 13	0 14	0 15
4	0 16	64	4 16	124	8 16	184	12 16	244	16 16	304	20 16	4	0 16	0 17	0 18	0 19
5	0 20	65	4 20	125	8 20	185	12 20	245	16 20	305	20 20	5	0 20	0 21	0 22	0 23
6	0 24	66	4 24	126	8 24	186	12 24	246	16 24	306	20 24	6	0 24	0 25	0 26	0 27
7	0 28	67	4 28	127	8 28	187	12 28	247	16 28	307	20 28	7	0 28	0 29	0 30	0 31
8	0 32	68	4 32	128	8 32	188	12 32	248	16 32	308	20 32	8	0 32	0 33	0 34	0 35
9	0 36	69	4 36	129	8 36	189	12 36	249	16 36	309	20 36	9	0 36	0 37	0 38	0 39
10	0 40	70	4 40	130	8 40	190	12 40	250	16 40	310	20 40	10	0 40	0 41	0 42	0 43
11	0 44	71	4 44	131	8 44	191	12 44	251	16 44	311	20 44	11	0 44	0 45	0 46	0 47
12	0 48	72	4 48	132	8 48	192	12 48	252	16 48	312	20 48	12	0 48	0 49	0 50	0 51
13	0 52	73	4 52	133	8 52	193	12 52	253	16 52	313	20 52	13	0 52	0 53	0 54	0 55
14	0 56	74	4 56	134	8 56	194	12 56	254	16 56	314	20 56	14	0 56	0 57	0 58	0 59
15	1 00	75	5 00	135	9 00	195	13 00	255	17 00	315	21 00	15	1 00	1 01	1 02	1 03
16	1 04	76	5 04	136	9 04	196	13 04	256	17 04	316	21 04	16	1 04	1 05	1 06	1 07
17	1 08	77	5 08	137	9 08	197	13 08	257	17 08	317	21 08	17	1 08	1 09	1 10	1 11
18	1 12	78	5 12	138	9 12	198	13 12	258	17 12	318	21 12	18	1 12	1 13	1 14	1 15
19	1 16	79	5 16	139	9 16	199	13 16	259	17 16	319	21 16	19	1 16	1 17	1 18	1 19
20	1 20	80	5 20	140	9 20	200	13 20	260	17 20	320	21 20	20	1 20	1 21	1 22	1 23
21	1 24	81	5 24	141	9 24	201	13 24	261	17 24	321	21 24	21	1 24	1 25	1 26	1 27
22	1 28	82	5 28	142	9 28	202	13 28	262	17 28	322	21 28	22	1 28	1 29	1 30	1 31
23	1 32	83	5 32	143	9 32	203	13 32	263	17 32	323	21 32	23	1 32	1 33	1 34	1 35
24	1 36	84	5 36	144	9 36	204	13 36	264	17 36	324	21 36	24	1 36	1 37	1 38	1 39
25	1 40	85	5 40	145	9 40	205	13 40	265	17 40	325	21 40	25	1 40	1 41	1 42	1 43
26	1 44	86	5 44	146	9 44	206	13 44	266	17 44	326	21 44	26	1 44	1 45	1 46	1 47
27	1 48	87	5 48	147	9 48	207	13 48	267	17 48	327	21 48	27	1 48	1 49	1 50	1 51
28	1 52	88	5 52	148	9 52	208	13 52	268	17 52	328	21 52	28	1 52	1 53	1 54	1 55
29	1 56	89	5 56	149	9 56	209	13 56	269	17 56	329	21 56	29	1 56	1 57	1 58	1 59
30	2 00	90	6 00	150	10 00	210	14 00	270	18 00	330	22 00	30	2 00	2 01	2 02	2 03
31	2 04	91	6 04	151	10 04	211	14 04	271	18 04	331	22 04	31	2 04	2 05	2 06	2 07
32	2 08	92	6 08	152	10 08	212	14 08	272	18 08	332	22 08	32	2 08	2 09	2 10	2 11
33	2 12	93	6 12	153	10 12	213	14 12	273	18 12	333	22 12	33	2 12	2 13	2 14	2 15
34	2 16	94	6 16	154	10 16	214	14 16	274	18 16	334	22 16	34	2 16	2 17	2 18	2 19
35	2 20	95	6 20	155	10 20	215	14 20	275	18 20	335	22 20	35	2 20	2 21	2 22	2 23
36	2 24	96	6 24	156	10 24	216	14 24	276	18 24	336	22 24	36	2 24	2 25	2 26	2 27
37	2 28	97	6 28	157	10 28	217	14 28	277	18 28	337	22 28	37	2 28	2 29	2 30	2 31
38	2 32	98	6 32	158	10 32	218	14 32	278	18 32	338	22 32	38	2 32	2 33	2 34	2 35
39	2 36	99	6 36	159	10 36	219	14 36	279	18 36	339	22 36	39	2 36	2 37	2 38	2 39
40	2 40	100	6 40	160	10 40	220	14 40	280	18 40	340	22 40	40	2 40	2 41	2 42	2 43
41	2 44	101	6 44	161	10 44	221	14 44	281	18 44	341	22 44	41	2 44	2 45	2 46	2 47
42	2 48	102	6 48	162	10 48	222	14 48	282	18 48	342	22 48	42	2 48	2 49	2 50	2 51
43	2 52	103	6 52	163	10 52	223	14 52	283	18 52	343	22 52	43	2 52	2 53	2 54	2 55
44	2 56	104	6 56	164	10 56	224	14 56	284	18 56	344	22 56	44	2 56	2 57	2 58	2 59
45	3 00	105	7 00	165	11 00	225	15 00	285	19 00	345	23 00	45	3 00	3 01	3 02	3 03
46	3 04	106	7 04	166	11 04	226	15 04	286	19 04	346	23 04	46	3 04	3 05	3 06	3 07
47	3 08	107	7 08	167	11 08	227	15 08	287	19 08	347	23 08	47	3 08	3 09	3 10	3 11
48	3 12	108	7 12	168	11 12	228	15 12	288	19 12	348	23 12	48	3 12	3 13	3 14	3 15
49	3 16	109	7 16	169	11 16	229	15 16	289	19 16	349	23 16	49	3 16	3 17	3 18	3 19
50	3 20	110	7 20	170	11 20	230	15 20	290	19 20	350	23 20	50	3 20	3 21	3 22	3 23
51	3 24	111	7 24	171	11 24	231	15 24	291	19 24	351	23 24	51	3 24	3 25	3 26	3 27
52	3 28	112	7 28	172	11 28	232	15 28	292	19 28	352	23 28	52	3 28	3 29	3 30	3 31
53	3 32	113	7 32	173	11 32	233	15 32	293	19 32	353	23 32	53	3 32	3 33	3 34	3 35
54	3 36	114	7 36	174	11 36	234	15 36	294	19 36	354	23 36	54	3 36	3 37	3 38	3 39
55	3 40	115	7 40	175	11 40	235	15 40	295	19 40	355	23 40	55	3 40	3 41	3 42	3 43
56	3 44	116	7 44	176	11 44	236	15 44	296	19 44	356	23 44	56	3 44	3 45	3 46	3 47
57	3 48	117	7 48	177	11 48	237	15 48	297	19 48	357	23 48	57	3 48	3 49	3 50	3 51
58	3 52	118	7 52	178	11 52	238	15 52	298	19 52	358	23 52	58	3 52	3 53	3 54	3 55
59	3 56	119	7 56	179	11 56	239	15 56	299	19 56	359	23 56	59	3 56	3 57	3 58	3 59

The above table is for converting expressions in arc to their equivalent in time; its main use in this Almanac is for the conversion of longitude for application to L.M.T. (added if west, subtracted if east) to give G.M.T. or vice versa, particularly in the case of sunrise, sunset, etc. It may also be used for the conversion of L.H.A. into time for entering tables whose hour angle argument is in time.

Altitude Correction Tables—Sun, Stars, Planets

OCT.-JAN.-MAR. SUN			APR.-SEPT.		
App. Alt.	Lower Limb	Upper Limb	App. Alt.	Lower Limb	Upper Limb
9 34	+10.8	-21.5	9 39	+10.6	-21.2
9 45			9 51		
9 56	10.9	21.4	10 03	10.7	21.1
10 08	11.0	21.3	10 15	10.8	21.0
10 21	11.1	21.2	10 27	10.9	20.9
10 34	11.2	21.1	10 40	11.0	20.8
10 47	11.3	21.0	10 54	11.1	20.7
11 01	11.4	20.9	11 08	11.2	20.6
11 15	11.5	20.8	11 23	11.3	20.5
11 30	11.6	20.7	11 38	11.4	20.4
11 46	11.7	20.6	11 54	11.5	20.3
12 02	11.8	20.5	12 10	11.6	20.2
12 19	11.9	20.4	12 28	11.7	20.1
12 37	12.0	20.3	12 46	11.8	20.0
12 55	12.1	20.2	13 05	11.9	19.9
13 14	12.2	20.1	13 24	12.0	19.8
13 35	12.3	20.0	13 45	12.1	19.7
13 56	12.4	19.9	14 07	12.2	19.6
14 18	12.5	19.8	14 30	12.3	19.5
14 42	12.6	19.7	14 54	12.4	19.4
15 06	12.7	19.6	15 19	12.5	19.3
15 32	12.8	19.5	15 46	12.6	19.2
15 59	12.9	19.4	16 14	12.7	19.1
16 28	13.0	19.3	16 44	12.8	19.0
16 59	13.1	19.2	17 15	12.9	18.9
17 32	13.2	19.1	17 48	13.0	18.8
18 06	13.3	19.0	18 24	13.1	18.7
18 42	13.4	18.9	19 01	13.2	18.6
19 21	13.5	18.8	19 42	13.3	18.5
20 03	13.6	18.7	20 25	13.4	18.4
20 48	13.7	18.6	21 11	13.5	18.3
21 35	13.8	18.5	22 00	13.6	18.2
22 26	13.9	18.4	22 54	13.7	18.1
23 22	14.0	18.3	23 51	13.8	18.0
24 21	14.1	18.2	24 53	13.9	17.9
25 26	14.2	18.1	26 00	14.0	17.8
26 36	14.3	18.0	27 13	14.1	17.7
27 52	14.4	17.9	28 33	14.2	17.6
29 15	14.5	17.8	30 00	14.3	17.5
30 46	14.6	17.7	31 35	14.4	17.4
32 26	14.7	17.6	33 20	14.5	17.3
34 17	14.8	17.5	35 17	14.6	17.2
36 20	14.9	17.4			

Pole Star Tables, 1952

FOR DETERMINING LATITUDE FROM OBSERVED ALTITUDE

L.H.A. ARIES	a_0	Lat. a_1	Month a_2	L.H.A. ARIES	a_0	Lat. a_1	Month a_2	L.H.A. ARIES	a_0	Lat. a_1	Month a_2	L.H.A. ARIES	a_0	Lat. a_1	Month a_2
0	008.2			45	004.3			90	032.8			135	116.5		
1	007.8	00.5	J. 0.5	46	004.6	00.5	J. 0.6	91	033.7	00.1	J. 0.7	136	117.4	00.1	J. 0.7
2	007.3	100.5	F. 0.5	47	004.9	100.5	F. 0.6	92	034.6	100.2	F. 0.8	137	118.3	100.2	F. 0.8
3	006.9	200.6	M. 0.4	48	005.3	200.5	M. 0.5	93	035.5	200.3	M. 0.9	138	119.3	200.3	M. 0.9
4	006.5	300.6	A. 0.2	49	005.6	300.5	A. 0.5	94	036.4	300.3	A. 0.9	139	120.2	300.4	A. 0.9
5	006.1	400.6	M. 0.1	50	006.0	400.6	M. 0.4	95	037.3	400.5	M. 0.8	140	121.1	400.5	M. 0.8
6	005.7	450.6	J. 0.1	51	006.4	450.6	J. 0.2	96	038.3	450.5	J. 0.6	141	122.0	450.5	J. 0.6
7	005.3	500.6		52	006.8	500.6		97	039.2	500.6		142	123.0	500.6	
8	005.0	550.6	J. 0.1	53	007.2	550.6	J. 0.1	98	040.2	550.7	J. 0.4	143	123.9	550.7	J. 0.4
9	004.6	600.6	A. 0.2	54	007.7	600.6	A. 0.2	99	041.1	600.8	A. 0.3	144	124.7	600.8	A. 0.3
			S. 0.4				S. 0.2				S. 0.2				S. 0.2
10	004.3	620.6		55	008.2	620.7		100	042.1	620.9		145	125.6	620.9	
11	004.0	640.6	O. 0.6	56	008.6	640.7	O. 0.3	101	043.0	641.0	O. 0.2	146	126.5	641.0	O. 0.2
12	003.7	660.7	N. 0.8	57	009.1	660.7	N. 0.5	102	044.0	661.0	N. 0.3	147	127.4	661.0	N. 0.3
13	003.5	680.7	D. 0.9	58	009.6	680.7	D. 0.7	103	045.0	681.1	D. 0.4	148	128.2	681.1	D. 0.4
14	003.2			59	010.1			104	045.9			149	129.1		
15	003.0			60	010.7			105	046.9			150	129.9		
16	002.8	00.6	J. 0.6	61	011.2	00.4	J. 0.6	106	047.9	00.0	J. 0.7	151	130.7	00.3	J. 0.7
17	002.6	100.6	F. 0.5	62	011.8	100.4	F. 0.7	107	048.9	100.1	F. 0.8	152	131.5	100.3	F. 0.8
18	002.4	200.6	M. 0.4	63	012.4	200.4	M. 0.7	108	049.9	200.2	M. 0.9	153	132.4	200.4	M. 0.9
19	002.3	300.6	A. 0.3	64	013.0	300.5	A. 0.6	109	050.8	300.3	A. 0.9	154	133.2	300.4	A. 0.9
			M. 0.2				M. 0.5				M. 0.9				M. 0.9
20	002.1	400.6	J. 0.1	65	013.6	400.5	J. 0.3	110	051.8	400.4	M. 0.9	155	133.9	400.5	M. 0.9
21	002.0	450.6		66	014.2	450.6		111	052.8	450.5	J. 0.7	156	134.7	450.5	J. 0.7
22	001.9	500.6		67	014.8	500.6		112	053.8	500.6		157	135.5	500.6	
23	001.8	550.6	J. 0.1	68	015.5	550.6	J. 0.2	113	054.8	550.7	J. 0.6	158	136.2	550.7	J. 0.6
24	001.7	600.6	A. 0.1	69	016.2	600.7	A. 0.2	114	055.8	600.9	A. 0.4	159	137.0	600.8	A. 0.4
			S. 0.3				S. 0.2				S. 0.3				S. 0.3
25	001.7	620.6		70	016.8	620.7		115	056.8	620.9		160	137.7	620.8	
26	001.6	640.6	O. 0.5	71	017.5	640.8	O. 0.3	116	057.8	641.0	O. 0.3	161	138.4	640.8	O. 0.3
27	001.6	660.6	N. 0.7	72	018.2	660.8	N. 0.4	117	058.8	661.1	N. 0.2	162	139.1	660.9	N. 0.2
28	001.6	680.6	D. 0.8	73	019.0	680.9	D. 0.6	118	059.8	681.2	D. 0.3	163	139.8	681.0	D. 0.3
29	001.6			74	019.7			119	100.8			164	140.5		
30	001.7			75	020.4			120	101.8			165	141.2		
31	001.7	00.6	J. 0.6	76	021.2	00.2	J. 0.6	121	102.8	00.1	J. 0.7	166	141.8	00.4	J. 0.7
32	001.8	100.6	F. 0.6	77	021.9	100.3	F. 0.7	122	103.8	100.1	F. 0.8	167	142.5	100.4	F. 0.8
33	001.9	200.6	M. 0.5	78	022.7	200.3	M. 0.8	123	104.8	200.2	M. 0.9	168	143.1	200.5	M. 0.9
34	002.0	300.6	A. 0.4	79	023.5	300.4	A. 0.7	124	105.8	300.3	A. 1.0	169	143.7	300.5	A. 1.0
			M. 0.2				M. 0.6				M. 1.0				M. 1.0
35	002.1	400.6	J. 0.1	80	024.3	400.5	J. 0.5	125	106.8	400.4	M. 0.9	170	144.4	400.5	M. 0.9
36	002.2	450.6		81	025.1	450.5		126	107.7	450.5	J. 0.9	171	145.0	450.6	J. 0.9
37	002.4	500.6		82	025.9	500.6		127	108.7	500.6		172	145.5	500.6	
38	002.6	550.6	J. 0.1	83	026.7	550.7	J. 0.3	128	109.7	550.7	J. 0.7	173	146.1	550.6	J. 0.7
39	002.8	600.6	A. 0.1	84	027.6	600.8	A. 0.2	129	110.7	600.9	A. 0.5	174	146.6	600.7	A. 0.5
			S. 0.2				S. 0.2				S. 0.4				S. 0.4
40	003.0	620.6		85	028.4	620.8		130	111.7	620.9		175	147.2	620.7	
41	003.2	640.6	O. 0.4	86	029.3	640.9	O. 0.2	131	112.6	641.0	O. 0.3	176	147.7	640.9	O. 0.3
42	003.4	660.6	N. 0.6	87	030.1	660.9	N. 0.3	132	113.6	661.1	N. 0.2	177	148.2	660.8	N. 0.2
43	003.7	680.6	D. 0.8	88	031.0	681.0	D. 0.5	133	114.6	681.2	D. 0.3	178	148.7	680.8	D. 0.3
44	004.0			89	031.9			134	115.5			179	149.2		
45	004.3			90	032.8			135	116.5			180	149.6		

Pole Star Tables, 1952

FOR DETERMINING LATITUDE FROM OBSERVED ALTITUDE

L.H.A. ARIES	a_0	Lat. a_1	Month a_2	L.H.A. ARIES	a_0	Lat. a_1	Month a_2	L.H.A. ARIES	a_0	Lat. a_1	Month a_2	L.H.A. ARIES	a_0	Lat. a_1	Month a_2
180	149.6			225	153.4			270	125.7			315	042.2		
181	150.1	00.5	J. 0.7	226	153.1	00.5	J. 0.6	271	124.8	00.1	J. 0.5	316	041.2	00.1	J. 0.5
182	150.5	100.5	F. 0.7	227	152.8	100.5	F. 0.6	272	123.9	100.2	F. 0.4	317	040.3	100.2	F. 0.4
183	150.9	200.6	M. 0.8	228	152.5	200.5	M. 0.6	273	123.0	200.3	M. 0.3	318	039.3	200.3	M. 0.3
184	151.3	300.6	A. 1.0	229	152.1	300.5	A. 0.7	274	122.1	300.3	A. 0.4	319	038.4	300.4	A. 0.4
			M. 1.1				M. 0.8				M. 0.4				M. 0.4
185	151.7	400.6	J. 1.1	230	151.7	400.6	J. 1.0	275	121.2	400.5	M. 0.4	320	037.4	400.5	M. 0.4
186	152.1	450.6		231	151.4	450.6		276	120.3	450.5	J. 0.6	321	036.5	450.5	J. 0.6
187	152.4	500.6		232	151.0	500.6		277	119.4	500.6		322	035.6	500.6	
188	152.8	550.6	J. 1.1	233	150.5	550.6	J. 1.1	278	118.4	550.7	J. 0.8	323	034.7	550.7	J. 0.8
189	153.1	600.6	A. 1.0	234	150.1	600.6	A. 1.1	279	117.5	600.8	A. 0.9	324	033.8	600.8	A. 0.9
			S. 0.8				S. 1.0				S. 1.0				S. 1.0
190	153.4	620.6		235	149.7	620.7		280	116.6	620.9		325	032.9	620.9	
191	153.7	640.6	O. 0.6	236	149.2	640.7	O. 0.9	281	115.6	641.0	O. 1.0	326	032.0	641.0	O. 1.0
192	153.9	660.7	N. 0.4	237	148.7	660.7	N. 0.4	282	114.7	661.0	N. 0.9	327	031.1	661.0	N. 0.9
193	154.2	680.7	D. 0.3	238	148.2	680.7	D. 0.3	283	113.7	681.1	D. 0.8	328	030.2	681.1	D. 0.8
194	154.4			239	147.7			284	112.7			329	029.4		
195	154.7			240	147.2			285	111.8			330	028.5		
196	154.9	00.6	J. 0.6	241	146.7	00.4	J. 0.6	286	110.8	00.0	J. 0.5	331	027.7	00.3	J. 0.5
197	155.1	100.6	F. 0.7	242	146.1	100.4	F. 0.5	287	109.8	100.1	F. 0.4	332	026.8	100.3	F. 0.4
198	155.2	200.6	M. 0.8	243	145.6	200.4	M. 0.5	288	108.8	200.2	M. 0.3	333	026.0	200.4	M. 0.3
199	155.4	300.6	A. 0.9	244	145.0	300.5	A. 0.6	289	107.9	300.3	A. 0.3	334	025.2	300.4	A. 0.3
			M. 1.0				M. 0.7				M. 0.3				M. 0.3
200	155.5	400.6	J. 1.1	245	144.4	400.5	J. 1.1	290	106.9	400.4	M. 0.3	335	024.4	400.5	M. 0.3
201	155.6	450.6		246	143.8	450.6		291	105.9	450.5	J. 0.4	336	023.6	450.5	J. 0.4
202	155.7	500.6		247	143.2	500.6		292	104.9	500.6		337	022.8	500.6	
203	155.8	550.6	J. 1.1	248	142.6	550.6	J. 1.1	293	103.9	550.7	J. 0.6	338	022.0	550.7	J. 0.6
204	155.9	600.6	A. 1.1	249	141.9	600.6	A. 1.1	294	102.9	600.8	A. 0.8	339	021.2	600.8	A. 0.8
			S. 0.9				S. 1.0				S. 0.9				S. 0.9
205	155.9	620.6		250	141.3	620.7		295	101.9	620.9		340	020.5	620.8	
206	156.0	640.6	O. 0.7	251	140.6	640.8	O. 0.9	296	100.9	641.0	O. 1.0	341	019.8	640.8	O. 1.0
207	156.0	660.6	N. 0.5	252	139.9	660									

1952 January 14, Monday

Lat.	Sun-set	Twilight	G. M. T.	S.D. SUN 16°3		ARIES		VENUS -3.6		MARS +1.1	
	h m	h m		G.H.A.	Dec.	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	
N.72	S.B.H.	14 51	00	177 50.2	S.21 31.6	112 24.8	220 07.0	S.20 29.8	266 33.6	S. 8 43.5	
N.70	14 32	15 17	01	192 49.9	21 31.1	127 27.3	235 06.3	20 30.3	281 34.9	8 44.3	
68	14 17	15 37	02	207 49.7	21 30.7	142 29.8	250 05.5	20 30.7	296 36.2	8 44.7	
66	14 47	15 53	03	222 49.5	21 30.3	157 32.2	265 04.8	20 31.2	311 37.5	8 45.1	
64	15 09	16 07	04	237 49.2	21 29.9	172 34.7	280 04.1	20 31.7	326 38.8	8 45.6	
N.60	15 26	16 19	05	252 49.0	S.21 29.4	187 37.1	295 03.4	S.20 32.1	341 40.2	S. 8 46.0	
58	15 41	16 29	06	267 48.8	21 29.0	202 39.6	310 02.7	20 32.6	356 41.5	8 46.4	
56	15 53	16 38	07	282 48.5	21 28.6	217 42.1	325 02.0	20 33.0	371 42.8	8 46.8	
54	16 05	16 46	08	297 48.3	21 28.2	232 44.5	340 01.2	20 33.5	386 44.2	8 47.2	
52	16 14	16 53	09	312 48.1	21 27.7	247 47.0	355 00.5	20 33.9	401 45.5	8 47.7	
N.50	16 23	16 59	10	327 47.8	S.21 27.3	262 49.5	9 59.8	S.20 34.4	56 46.8	S. 8 48.1	
45	16 42	17 14	11	342 47.6	21 26.9	277 51.9	24 59.1	20 34.8	71 48.1	8 48.5	
40	16 57	17 26	12	357 47.4	21 26.5	292 54.4	39 58.4	20 35.3	86 49.5	8 48.9	
35	17 10	17 37	13	372 47.1	21 26.0	307 56.9	54 57.6	20 35.7	101 50.8	8 49.3	
30	17 21	17 46	14	387 46.9	21 25.6	322 59.3	69 56.9	20 36.2	116 52.1	8 49.8	
N.20	17 40	18 03	15	402 46.7	S.21 25.2	338 01.8	84 56.2	S.20 36.6	131 53.4	S. 8 50.2	
N.10	17 57	18 19	16	417 46.4	21 24.7	353 04.3	99 55.5	20 37.1	146 54.8	8 50.6	
0	18 12	18 34	17	432 46.2	21 24.3	368 06.7	114 54.8	20 37.5	161 56.1	8 51.0	
S.10	18 28	18 51	18	447 46.0	21 23.9	383 09.2	129 54.0	20 38.0	176 57.4	8 51.4	
20	18 46	19 10	19	462 45.8	21 23.4	398 11.6	144 53.3	20 38.4	191 58.8	8 51.9	
S.30	19 06	19 32	20	477 45.5	S.21 23.0	413 14.1	159 52.6	S.20 38.9	207 00.1	S. 8 52.3	
35	19 17	19 47	21	492 45.3	21 22.6	428 16.6	174 51.9	20 39.3	222 01.4	8 52.7	
40	19 31	20 04	22	507 45.1	21 22.1	443 19.0	189 51.2	20 39.7	237 02.7	8 53.1	
45	19 47	20 24	23	522 44.8	21 21.7	458 21.5	204 50.4	20 40.2	252 04.1	8 53.5	
50	20 07	20 50		T=12 ^h 09 ^m d=0.4		T=16 ^h 28 ^m v=-0.7 d=0.5		v=1.3 d=0.4			
S.55	20 34	21 28									

Lat.	Moon-rise	Moon-set	G. M. T.	Age 16 ^d .5 MOON S.D. 14.7				JUPITER -1.9		SATURN +0.9	
	h m	h m		G.H.A.	v	Dec.	d	G.H.A.	Dec.	G.H.A.	Dec.
N.72	16.0 12	12.2 -5	00	337 17.3	14.3	N.18 45.4	10.8	105 00.7	N. 1 50.3	277 45.9	S. 3 35.6
N.70	16.7 10	11.5 -3	01	351 50.6	14.3	18 34.6	10.9	120 02.8	1 50.4	292 48.4	3 35.6
68	17.5 9	10.6 -1	02	6 23.9	14.4	18 23.7	11.0	135 05.0	1 50.6	307 50.8	3 35.6
66	17.8 8	10.3 -1	03	20 57.3	14.4	18 12.7	11.1	150 07.1	1 50.7	322 53.2	3 35.6
64	18.0 8	10.1 0	04	35 30.7	14.5	18 01.6	11.1	165 09.3	1 50.9	337 55.6	3 35.6
N.60	18.2 7	09.9 0	05	50 04.2	14.6	N.17 50.5	11.2	180 11.4	N. 1 51.0	352 58.0	S. 3 35.6
58	18.3 7	09.7 0	06	64 37.8	14.6	17 39.3	11.3	195 13.6	1 51.1	8 00.4	3 35.7
56	18.5 7	09.6 +1	07	79 11.4	14.6	17 28.0	11.3	210 15.7	1 51.3	23 02.9	3 35.7
54	18.6 6	09.4 +1	08	93 45.0	14.7	17 16.7	11.4	225 17.9	1 51.4	38 05.3	3 35.7
52	18.7 6	09.3 1	09	108 18.7	14.8	17 05.3	11.5	240 20.0	1 51.6	53 07.7	3 35.7
N.50	18.8 6	09.2 1	10	122 52.5	14.8	N.16 53.8	11.6	255 22.2	N. 1 51.7	68 10.1	S. 3 35.7
45	19.0 5	09.0 2	11	137 26.3	14.8	16 42.2	11.6	270 24.3	1 51.9	83 12.5	3 35.7
40	19.2 5	08.8 2	12	152 00.1	14.9	16 30.6	11.7	285 26.5	1 52.0	98 14.9	3 35.7
35	19.4 5	08.6 2	13	166 34.0	15.0	16 18.9	11.7	300 28.6	1 52.2	113 17.4	3 35.7
30	19.5 4	08.4 2	14	181 08.0	15.0	16 07.2	11.9	315 30.8	1 52.3	128 19.8	3 35.7
N.20	19.7 4	08.2 3	15	195 42.0	15.1	N.15 55.3	11.8	330 32.9	N. 1 52.5	143 22.2	S. 3 35.7
N.10	19.9 4	07.9 3	16	210 16.1	15.1	15 43.5	12.0	345 35.1	1 52.6	158 24.6	3 35.7
0	20.0 3	07.7 3	17	224 50.2	15.1	15 31.5	12.0	0 37.2	1 52.8	173 27.0	3 35.7
S.10	20.3 3	07.5 4	18	239 24.3	15.2	15 19.5	12.1	15 39.4	1 52.9	188 29.4	3 35.7
20	20.5 3	07.3 4	19	253 58.5	15.3	15 07.4	12.1	30 41.5	1 53.0	203 31.9	3 35.7
S.30	20.7 2	07.0 4	20	268 32.8	15.3	N.14 55.3	12.3	45 43.7	N. 1 53.2	218 34.3	S. 3 35.7
35	20.8 2	06.9 5	21	283 07.1	15.3	14 43.0	12.2	60 45.8	1 53.3	233 36.7	3 35.8
40	21.0 2	06.7 5	22	297 41.4	15.4	14 30.8	12.3	75 48.0	1 53.5	248 39.1	3 35.8
45	21.1 2	06.5 5	23	312 15.8	15.4	14 18.5	12.4	90 50.1	1 53.6	263 41.5	3 35.8
50	21.3 1	06.2 6		H.P. 4 ^h , 54 ^m .1; 12 ^h , 54 ^m .2; 20 ^h , 54 ^m .2		v=2.1 d=0.1		v=2.4 d=0.0			
S.55	21.6 1	05.9 6									

1952 January 15, Tuesday

G. M. T.	S.D. SUN 16°3		ARIES		VENUS -3.6		MARS +1.1		Lat.	Twilight	Sun-rise
	G.H.A.	Dec.	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	N.72		h m	h m
00	177 44.6	S.21 21.2	113 24.0	219 49.7	S.20 40.6	267 05.4	S. 8 53.9	N.70	09 21	S.B.H.	
01	192 44.4	21 20.8	128 26.4	234 49.0	20 41.1	282 06.7	8 54.4	68	08 55	10 37	
02	207 44.2	21 20.4	143 28.9	249 48.3	20 41.5	297 08.1	8 54.8	66	08 36	09 56	
03	222 43.9	21 19.9	158 31.4	264 47.5	20 41.9	312 09.4	8 55.2	64	08 20	09 27	
04	237 43.7	21 19.5	173 33.8	279 46.8	20 42.4	327 10.7	8 55.6	62	08 07	09 06	
05	252 43.5	S.21 19.0	188 36.3	294 46.1	S.20 42.8	342 12.1	S. 8 56.0	N.60	07 55	08 50	
06	267 43.3	21 18.6	203 38.7	309 45.4	20 43.2	357 13.4	8 56.4	58	07 45	08 35	
07	282 43.0	21 18.2	218 41.2	324 44.6	20 43.7	372 14.7	8 56.9	56	07 37	08 23	
08	297 42.8	21 17.7	233 43.7	339 43.9	20 44.1	387 16.0	8 57.3	54	07 30	08 12	
09	312 42.6	21 17.3	248 46.1	354 43.2	20 44.5	402 17.4	8 57.7	52	07 23	08 03	
10	327 42.3	S.21 16.8	263 48.6	9 42.4	S.20 45.0	57 18.7	S. 8 58.1	N.50	07 17	07 54	
11	342 42.1	21 16.4	278 51.1	24 41.7	20 45.4	72 20.0	8 58.5	45	07 02	07 36	
12	357 41.9	21 15.9	293 53.5	39 41.0	20 45.8	87 21.4	8 58.9	40	06 49	07 21	
13	372 41.7	21 15.5	308 56.0	54 40.3	20 46.3	102 22.7	8 59.4	35	06 39	07 08	
14	387 41.4	21 15.0	323 58.5	69 39.5	20 46.7	117 24.0	8 59.8	30	06 30	06 58	
15	402 41.2	S.21 14.6	339 00.9	84 38.8	S.20 47.1	132 25.4	S. 9 00.2	N.20	06 14	06 38	
16	417 41.0	21 14.1	354 03.4	99 38.1	20 47.5	147 26.7	9 00.6	N.10	05 58	06 21	
17	432 40.8	21 13.7	9 05.9	114 37.3	20 47.9	162 28.0	9 01.0	0	05 43	06 05	
18	447 40.6	21 13.2	24 08.3	129 36.6	20 48.4	177 29.4	9 01.4	S.10	05 27	05 50	
19	462 40.3	21 12.8	39 10.8	144 35.9	20 48.8	192 30.7	9 01.8	20	05 08	05 33	
20	477 40.1	S.21 12.3	54 13.2	159 35.1	S.20 49.2	207 32.0	S. 9 02.3	S.30	04 46	05 13	
21	492 39.9	21 11.9	69 15.7	174 34.4	20 49.6	222 33.4	9 02.7	35	04 32	05 01	
22	507 39.7	21 11.4	84 18.2	189 33.7	20 50.1	237 34.7	9 03.1	40	04 16	04 48	
23	522 39.4	21 11.0	99 20.6	204 32.9	20 50.5	252 36.0	9 03.5	45	03 56	04 32	
	T=12 ^h 09 ^m d=0.4		T=16 ^h 24 ^m v=-0.7 d=0.4		v=1.3 d=0.4				50	03 30	04 12
									S.55	02 55	03 46

G. M. T.	Age 17 ^d .5 MOON S.D. 14.8				JUPITER -1.9		SATURN +0.9		Lat.	Moon-rise	Moon-set
	G.H.A.	v	Dec.	d	G.H.A.	Dec.	G.H.A.	Dec.		N.72	h m	h m
00	326 50.2	15.5	N.14 06.1	12.5	105 52.2	N. 1 53.8	278 44.0	S. 3 35.8	N.70	18.8 10	10.8 -3
01	341 24.7	15.5	13 53.6	12.5	120 54.4	1 53.9	293 46.4	3 35.8	68	19.0 9	10.6 -2
02	355 59.2	15.5	13 41.1	12.5	135 56.5	1 54.1	308 48.8	3 35.8	66	19.2 8	10.4 -1
03											

1952 January 16, Wednesday

Lat.	Sun-set		Twilight		G.M.T.	S.D. SUN 16°3		ARIES		VENUS -3.6		MARS +1.1	
	h	m	h	m		G.H.A.	Dec.	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	
N.72	14	23	14	23									
N.70	13	44	15	23	00	177 39.2	S.21 10.5	114 23.1	219 32.2	S.20 50.9	267 37.4	S. 9 03.9	
68	14	25	15	42	01	192 39.0	21 10.1	129 25.6	234 31.5	20 51.3	282 38.7	9 04.3	
66	14	53	15	58	02	207 38.8	21 09.6	144 28.0	249 30.7	20 51.7	297 40.1	9 04.7	
64	15	14	15	48	03	222 38.6	21 09.1	159 30.5	264 30.0	20 52.1	312 41.4	9 05.1	
62	15	15	16	11	04	237 38.3	21 08.7	174 33.0	279 29.3	20 52.5	327 42.7	9 05.6	
N.60	15	30	16	22	05	252 38.1	S.21 08.2	189 35.4	294 28.5	S.20 53.0	342 44.1	S. 9 06.0	
58	15	45	16	32	06	267 37.9	21 07.8	204 37.9	309 27.8	20 53.4	357 45.4	9 06.4	
56	15	57	16	41	07	282 37.7	21 07.3	219 40.3	324 27.0	20 53.8	12 46.7	9 06.8	
54	16	08	16	49	08	297 37.5	21 06.9	234 42.8	339 26.3	20 54.2	27 48.1	9 07.2	
52	16	17	16	56	09	312 37.2	21 06.4	249 45.3	354 25.6	20 54.6	42 49.4	9 07.6	
N.50	16	26	17	02	10	327 37.0	S.21 05.9	264 47.7	9 24.8	S.20 55.0	57 50.8	S. 9 08.0	
45	16	44	17	16	11	342 36.8	21 05.5	279 50.2	24 24.1	20 55.4	72 52.1	9 08.4	
40	16	59	17	28	12	357 36.6	21 05.0	294 52.7	39 23.4	20 55.8	87 53.4	9 08.8	
35	17	11	17	38	13	12 36.4	21 04.5	309 55.1	54 22.6	20 56.2	102 54.8	9 09.3	
30	17	22	17	48	14	27 36.1	21 04.1	324 57.6	69 21.9	20 56.6	117 56.1	9 09.7	
N.20	17	41	18	04	15	42 35.9	S.21 03.6	340 00.1	84 21.1	S.20 57.0	132 57.4	S. 9 10.1	
N.10	17	58	18	20	16	57 35.7	21 03.1	355 02.5	99 20.4	20 57.4	147 58.8	9 10.5	
0	18	13	18	35	17	72 35.5	21 02.7	10 05.0	114 19.6	20 57.8	163 00.1	9 10.9	
S.10	18	29	18	52	18	87 35.3	21 02.2	25 07.5	129 18.9	20 58.2	178 01.5	9 11.3	
20	18	46	19	10	19	102 35.1	21 01.7	40 09.9	144 18.2	20 58.6	193 02.8	9 11.7	
S.30	19	05	19	32	20	117 34.8	S.21 01.3	55 12.4	159 17.4	S.20 59.0	208 04.1	S. 9 12.1	
35	19	17	19	45	21	132 34.6	21 00.8	70 14.8	174 16.7	20 59.4	223 05.5	9 12.5	
40	19	30	20	02	22	147 34.4	21 00.3	85 17.3	189 15.9	20 59.8	238 06.8	9 12.9	
45	19	46	20	22	23	162 34.2	20 59.9	100 19.8	204 15.2	21 00.2	253 08.2	9 13.4	
S.50	20	05	20	48									
S.55	20	31	21	24									

Lat.	Moon-rise		Moon-set		G.M.T.	Age 18°5 MOON S.D. 14°9				JUPITER -1.9		SATURN +0.9	
	h	l	h	l		G.H.A.	v	Dec.	d	G.H.A.	Dec.	G.H.A.	Dec.
N.72	20	6	10	5									
N.70	20	7	10	4	00	316 47.3	16.2	N. 8 53.3	13.6	106 43.7	N. 1 57.4	279 42.1	S. 3 35.9
68	20	8	10	2	01	331 22.5	16.3	8 39.7	13.6	121 45.8	1 57.5	294 44.5	3 35.9
66	20	9	10	1	02	345 57.8	16.2	8 26.1	13.7	136 47.9	1 57.7	309 46.9	3 35.9
64	20	9	10	0	03	0 33.0	16.3	8 12.4	13.7	151 50.1	1 57.8	324 49.3	3 35.9
62	21	0	10	0	04	15 08.3	16.4	7 58.7	13.7	166 52.2	1 58.0	339 51.8	3 35.9
N.60	21	0	09	9	05	29 43.7	16.3	N. 7 45.0	13.8	181 54.4	N. 1 58.1	354 54.2	S. 3 35.9
58	21	0	09	8	06	44 19.0	16.3	7 31.2	13.8	196 56.5	1 58.3	9 56.6	3 35.9
56	21	1	09	8	07	58 54.3	16.4	7 17.4	13.9	211 58.6	1 58.4	24 59.0	3 35.9
54	21	1	09	7	08	73 29.7	16.4	7 03.5	13.9	227 00.8	1 58.6	40 01.5	3 35.9
52	21	1	09	7	09	88 05.1	16.3	6 49.6	13.9	242 02.9	1 58.7	55 03.9	3 35.9
N.50	21	1	09	7	10	102 40.4	16.4	N. 6 35.7	13.9	257 05.0	N. 1 58.9	70 06.3	S. 3 35.9
45	21	2	09	6	11	117 15.8	16.4	6 21.8	14.0	272 07.2	1 59.0	85 08.7	3 35.9
40	21	2	09	5	12	131 51.2	16.5	6 07.8	14.0	287 09.3	1 59.2	100 11.2	3 35.9
35	21	3	09	4	13	146 26.7	16.4	5 53.8	14.1	302 11.5	1 59.3	115 13.6	3 35.9
30	21	3	09	4	14	161 02.1	16.4	5 39.7	14.0	317 13.6	1 59.5	130 16.0	3 35.9
N.20	21	4	09	3	15	175 37.5	16.4	N. 5 25.7	14.1	332 15.7	N. 1 59.6	145 18.4	S. 3 35.9
N.10	21	4	09	2	16	190 12.9	16.5	5 11.6	14.1	347 17.9	1 59.8	160 20.9	3 35.9
0	21	5	09	1	17	204 48.4	16.4	4 57.5	14.2	2 20.0	1 59.9	175 23.3	3 35.9
S.10	21	5	09	0	18	219 23.8	16.5	4 43.3	14.2	17 22.1	2 00.1	190 25.7	3 35.9
20	21	6	08	9	19	233 59.3	16.4	4 29.1	14.2	32 24.3	2 00.2	205 28.1	3 36.0
S.30	21	6	08	8	20	248 34.7	16.5	N. 4 14.9	14.2	47 26.4	N. 2 00.4	220 30.6	S. 3 36.0
35	21	7	08	8	21	263 10.2	16.4	4 00.7	14.2	62 28.5	2 00.5	235 33.0	3 36.0
40	21	7	08	7	22	277 45.6	16.5	3 46.5	14.3	77 30.7	2 00.7	250 35.4	3 36.0
45	21	7	08	6	23	292 21.1	16.4	3 32.2	14.3	92 32.8	2 00.8	265 37.8	3 36.0
S.50	21	8	08	5									
S.55	21	8	08	4									

1952 January 17, Thursday

Lat.	Sun-set		Twilight		G.M.T.	S.D. SUN 16°3		ARIES		VENUS -3.6		MARS +1.0	
	h	m	h	m		G.H.A.	Dec.	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	
N.72	09	47	09	47									
N.70	09	15	09	15	00	177 34.0	S.20 59.4	115 22.2	219 14.4	S.21 00.6	268 09.5	S. 9 13.8	
68	09	31	09	31	01	192 33.8	20 58.9	130 24.7	234 13.7	21 01.0	283 10.9	9 14.2	
66	08	52	09	14	02	207 33.6	20 58.4	145 27.2	249 13.0	21 01.4	298 12.2	9 14.6	
64	08	17	09	23	03	222 33.3	20 58.0	160 29.6	264 12.2	21 01.8	313 13.5	9 15.0	
62	08	04	09	02	04	237 33.1	20 57.5	175 32.1	279 11.5	21 02.2	328 14.9	9 15.4	
N.60	07	53	08	46	05	252 32.9	S.20 57.0	190 34.6	294 10.7	S.21 02.5	343 16.2	S. 9 15.8	
58	07	43	08	36	06	267 32.7	20 56.5	205 37.0	309 10.0	21 02.9	358 17.6	9 16.2	
56	07	35	08	27	07	282 32.5	20 56.1	220 39.5	324 09.2	21 03.3	13 18.9	9 16.6	
54	07	28	08	20	08	297 32.3	20 55.6	235 42.0	339 08.5	21 03.7	28 20.3	9 17.0	
52	07	21	08	13	09	312 32.1	20 55.1	250 44.4	354 07.7	21 04.1	43 21.6	9 17.4	
N.50	07	15	07	15	10	327 31.9	S.20 54.6	265 46.9	9 07.0	S.21 04.5	58 22.9	S. 9 17.8	
45	07	01	07	01	11	342 31.6	20 54.1	280 49.3	24 06.2	21 04.9	73 24.3	9 18.3	
40	06	49	07	20	12	357 31.4	20 53.7	295 51.8	39 05.5	21 05.2	88 25.6	9 18.7	
35	06	39	07	11	13	12 31.2	20 53.2	310 54.3	54 04.7	21 05.6	103 27.0	9 19.1	
30	06	30	07	08	14	27 31.0	20 52.7	325 56.7	69 04.0	21 06.0	118 28.3	9 19.5	
N.20	06	14	06	14	15	42 30.8	S.20 52.2	340 59.2	84 03.2	S.21 06.4	133 29.7	S. 9 19.9	
N.10	05	58	06	22	16	57 30.6	20 51.7	356 01.7	99 02.5	21 06.8	148 31.0	9 20.3	
0	05	44	06	15	17	72 30.4	20 51.3	11 04.1	114 01.7	21 07.1	163 32.4	9 20.7	
S.10	05	28	06	08	18	87 30.2	20 50.8	26 06.6	129 01.0	21 07.5	178 33.7	9 21.1	
20	05	20	06	01	19	102 30.0	20 50.3	41 09.1	144 00.2	21 07.9	193 35.0	9 21.5	
S.30	04	48	05	15	20	117 29.7	S.20 49.8	56 11.5	158 59.5	S.21 08.3	208 36.4	S. 9 21.9	
35	04	35	05	08	21	132 29.5	20 49.3	71 14.0	173 58.7	21 08.6	223 37.7	9 22.3	
40	04	19	05	02	22	147 29.3	20 48.8	86 16.5	188 58.0	21 09.0	238 39.1	9 22.7	
45	04	11											

1952 August 28, Thursday

G. M. T.	S.D. SUN 15'9		ARIES	VENUS -3.3		MARS +0.3		Lat.	Twilight		Sun-rise	
	G.H.A. Dec.		G.H.A.	G.H.A. Dec.		G.H.A. Dec.			N.72	h m		h m
	G.H.A. Dec.		G.H.A.	G.H.A. Dec.		G.H.A. Dec.			N.72	02 01		03 42
00	179	40.6 N. 9 49.1	336 09.4	162 49.2 N. 4 17.7	98 39.9 S.22 08.8	N.70	02 37	03 59				
01	194	40.7 9 48.3	351 11.8	177 48.8 4 16.5	113 40.8 22 09.1	68	03 02	04 12				
02	209	40.9 9 47.4	6 14.3	192 48.5 4 15.2	128 41.7 22 09.4	66	03 21	04 22				
03	224	41.1 9 46.5	21 16.8	207 48.1 4 13.9	143 42.5 22 09.8	64	03 36	04 31				
04	239	41.3 9 45.6	36 19.2	222 47.8 4 12.7	158 43.4 22 10.1	62	03 49	04 39				
05	254	41.5 N. 9 44.7	51 21.7	237 47.4 N. 4 11.4	173 44.3 S.22 10.4	N.60	03 59	04 45				
06	269	41.6 9 43.8	66 24.2	252 47.1 4 10.1	188 45.2 22 10.7	58	04 08	04 51				
07	284	41.8 9 43.0	81 26.6	267 46.7 4 08.9	203 46.1 22 11.1	56	04 16	04 56				
08	299	42.0 9 42.1	96 29.1	282 46.4 4 07.6	218 47.0 22 11.4	54	04 23	05 01				
09	314	42.2 9 41.2	111 31.6	297 46.0 4 06.4	233 47.9 22 11.7	52	04 29	05 05				
10	329	42.4 N. 9 40.3	126 34.0	312 45.7 N. 4 05.1	248 48.7 S.22 12.0	N.50	04 35	05 09				
11	344	42.6 9 39.4	141 36.5	327 45.3 4 03.8	263 49.6 22 12.3	45	04 46	05 17				
12	359	42.8 9 38.5	156 39.0	342 45.0 4 02.6	278 50.5 22 12.7	40	04 55	05 23				
13	14	42.9 9 37.7	171 41.4	357 44.6 4 01.3	293 51.4 22 13.0	35	05 03	05 29				
14	29	43.1 9 36.8	186 43.9	12 44.3 4 00.0	308 52.3 22 13.3	30	05 10	05 34				
15	44	43.3 N. 9 35.9	201 46.3	27 43.9 N. 3 58.8	323 53.2 S.22 13.6	N.20	05 20	05 43				
16	59	43.5 9 35.0	216 48.8	42 43.5 3 57.5	338 54.0 22 14.0	N.10	05 29	05 51				
17	74	43.7 9 34.1	231 51.3	57 43.2 3 56.3	353 54.9 22 14.3	0	05 37	05 58				
18	89	43.9 9 33.2	246 53.7	72 42.8 3 55.0	8 55.8 22 14.6	S.10	05 44	06 05				
19	104	44.0 9 32.3	261 56.2	87 42.5 3 53.7	23 57.7 22 14.9	20	05 51	06 12				
20	119	44.2 N. 9 31.5	276 58.7	102 42.1 N. 3 52.5	38 57.6 S.22 15.2	S.30	05 57	06 21				
21	134	44.4 9 30.6	292 01.1	117 41.8 3 51.2	53 58.4 22 15.6	35	05 59	06 25				
22	149	44.6 9 29.7	307 03.6	132 41.4 3 49.9	68 59.3 22 15.9	40	06 03	06 30				
23	164	44.8 9 28.8	322 06.1	147 41.1 3 48.7	84 00.2 22 16.2	45	06 06	06 36				
		T=12 ^h 01 ^m d=0.9	T=01 ^h 35 ^m v=-0.4 d=1.3	v=0.9 d=0.3		50	06 10	06 43				
						S.55	06 15	05 52				

G. M. T.	Age 7 ^d .4		MOON S.D. 15'6		JUPITER -2.1	SATURN +1.1	Lat.	Moon-rise		Moon-set	
	G.H.A. v Dec. d		G.H.A. Dec.		G.H.A. Dec.			N.72	h M.B.H.		h M.B.H.
	G.H.A. v Dec. d		G.H.A. Dec.		G.H.A. Dec.			N.72	h M.B.H.		h M.B.H.
00	101	16.5 7.9 S.24 55.0 7.2	287 32.2 N.16 45.6	143 29.8 S. 2 56.8	N.70	M.B.H.	M.B.H.				
01	115	43.4 7.8 25 02.2 7.0	302 34.5 16 45.6	158 32.1 2 56.9	68	M.B.H.	M.B.H.				
02	130	10.2 7.7 25 09.2 6.9	317 36.9 16 45.6	173 34.3 2 57.0	66	M.B.H.	M.B.H.				
03	144	36.9 7.6 25 16.1 6.8	332 39.3 16 45.6	188 36.5 2 57.1	64	M.B.H.	M.B.H.				
04	159	03.5 7.4 25 22.9 6.6	347 41.6 16 45.7	203 38.7 2 57.2	62	16.6 19	19.1 0				
05	173	29.9 7.4 S.25 29.5 6.5	2 44.0 N.16 45.7	218 41.0 S. 2 57.3	N.60	15.9 8	19.9 2				
06	187	56.3 7.2 25 36.0 6.3	17 46.3 16 45.7	233 43.2 2 57.4	58	15.4 7	20.4 3				
07	202	22.5 7.2 25 42.3 6.2	32 48.7 16 45.7	248 45.4 2 57.5	56	15.0 7	20.7 3				
08	216	48.7 7.0 25 48.5 6.1	47 51.1 16 45.7	263 47.6 2 57.6	54	14.7 6	21.1 3				
09	231	14.7 6.9 25 54.6 5.9	62 53.4 16 45.8	278 49.8 2 57.7	52	14.4 6	21.3 4				
10	245	40.6 6.9 S.26 00.5 5.8	77 55.8 N.16 45.8	293 52.1 S. 2 57.9	N.50	14.2 6	21.6 4				
11	260	06.5 6.7 26 06.3 5.6	92 58.1 16 45.8	308 54.3 2 58.0	45	13.8 6	22.0 4				
12	274	32.2 6.6 26 11.9 5.4	108 00.5 16 45.8	323 56.5 2 58.1	40	13.4 6	22.4 4				
13	288	57.8 6.5 26 17.3 5.4	123 02.9 16 45.8	338 58.7 2 58.2	35	13.1 5	22.7 4				
14	303	23.3 6.4 26 22.7 5.1	138 05.2 16 45.9	354 01.0 2 58.3	30	12.8 5	23.0 4				
15	317	48.7 6.4 S.26 27.8 5.0	153 07.6 N.16 45.9	9 03.2 S. 2 58.4	N.20	12.4 5	23.4 5				
16	332	14.1 6.2 26 32.8 4.9	168 09.9 16 45.9	24 05.4 2 58.5	N.10	12.0 5	23.8 5				
17	346	39.3 6.1 26 37.7 4.7	183 12.3 16 45.9	39 07.6 2 58.6	0	11.7 5	(23.2) 5				
18	1	04.4 6.1 26 42.4 4.5	198 14.7 16 45.9	54 09.9 2 58.7	S.10	11.3 4	(23.5) 5				
19	15	29.5 5.9 26 46.9 4.4	213 17.0 16 45.9	69 12.1 2 58.8	20	11.0 4	(23.9) 5				
20	29	54.4 5.8 S.26 51.3 4.2	228 19.4 N.16 46.0	84 14.3 S. 2 58.9	S.30	10.6 4	00.3 5				
21	44	19.2 5.8 26 55.5 4.1	243 21.8 16 46.0	99 16.5 2 59.0	35	10.3 4	00.5 5				
22	58	44.0 5.7 26 59.6 3.9	258 24.1 16 46.0	114 18.7 2 59.1	40	10.0 4	00.8 5				
23	73	08.7 5.5 27 03.5 3.7	273 26.5 16 46.0	129 21.0 2 59.2	45	09.7 3	01.1 5				
		H.P. 4 ^h , 57'4; 12 ^h , 57'7; 20 ^h , 58'0	v=2.4 d=0.0	v=2.2 d=0.1		50	09.2 3	01.5 5			
						S.55	08.7 3	02.1 5			

1952 August 29, Friday

Lat.	Sun-set	Twilight	G. M. T.	S.D. SUN 15'9		ARIES	VENUS -3.3		MARS +0.3	
				G.H.A. Dec.		G.H.A.	G.H.A. Dec.		G.H.A. Dec.	
				G.H.A. Dec.		G.H.A.	G.H.A. Dec.		G.H.A. Dec.	
N.72	20 16	22 01	h	G.H.A.	Dec.	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.
N.70	20 00	21 24	00	179 45.0 N. 9 27.9	337 08.5	162 40.7 N. 3 47.4	99 01.1 S.22 16.5			
68	19 47	21 00	01	194 45.2 9 27.0	352 11.0	177 40.4 3 46.1	114 01.9 22 16.8			
66	19 37	20 41	02	209 45.3 9 26.1	7 13.5	192 40.0 3 44.9	129 02.8 22 17.2			
64	19 28	20 26	03	224 45.5 9 25.2	22 15.9	207 39.7 3 43.6	144 03.7 22 17.5			
62	19 21	20 13	04	239 45.7 9 24.3	37 18.4	222 39.3 3 42.3	159 04.6 22 17.8			
N.60	19 15	20 02	05	254 45.9 N. 9 23.5	52 20.8	237 39.0 N. 3 41.1	174 05.4 S.22 18.1			
58	19 09	19 53	06	269 46.1 9 22.6	67 23.3	252 38.7 3 39.8	189 06.3 22 18.4			
56	19 04	19 45	07	284 46.3 9 21.7	82 25.8	267 38.3 3 38.5	204 07.2 22 18.8			
54	19 00	19 38	08	299 46.5 9 20.8	97 28.2	282 38.0 3 37.3	219 08.1 22 19.1			
52	18 56	19 33	09	314 46.6 9 19.9	112 30.7	297 37.6 3 36.0	234 08.9 22 19.4			
N.50	18 52	19 27	10	329 46.8 N. 9 19.0	127 33.2	312 37.3 N. 3 34.7	249 09.8 S.22 19.7			
45	18 44	19 15	11	344 47.0 9 18.1	142 35.6	327 36.9 3 33.5	264 10.7 22 20.0			
40	18 37	19 06	12	359 47.2 9 17.2	157 38.1	342 36.6 3 32.2	279 11.6 22 20.4			
35	18 32	18 58	13	14 47.4 9 16.3	172 40.6	357 36.2 3 30.9	294 12.4 22 20.7			
30	18 27	18 51	14	29 47.6 9 15.5	187 43.0	12 35.9 3 29.7	309 13.3 22 21.0			
N.20	18 18	18 41	15	44 47.8 N. 9 14.6	202 45.5	27 35.5 N. 3 28.4	324 14.2 S.22 21.3			
N.10	18 11	18 32	16	59 48.0 9 13.7	217 48.0	42 35.2 3 27.1	339 15.0 22 21.6			
0	18 04	18 25	17	74 48.2 9 12.8	232 50.4	57 34.8 3 25.9	354 15.9 22 21.9			
S.10	17 58	18 19	18	89 48.3 9 11.9	247 52.9	72 34.5 3 24.6	9 16.8 22 22.3			
20	17 51	18 13	19	104 48.5 9 11.0	262 55.3	87 34.1 3 23.3	24 17.6 22 22.6			
S.30	17 43	18 07	20	119 48.7 N. 9 10.1	277 57.8	102 33.8 N. 3 22.1	39 18.5 S.22 22.9			
35	17 39	18 04	21	134 48.9 9 09.2	293 00.3	117 33.4 3 20.8	54 19.4 22 23.2			
40	17 34	18 01	22	149 49.1 9 08.3	308 02.7	132 33.1 3 19.5	69 20.2 22 23.5			
45	17 28	17 57	23	164 49.3 9 07.4	323 05.2	147 32.8 3 18.3	84 21.1 22 23.8			
50	17 21	17 52								
S.55	17 12	17 48								
				T=12 ^h 01 ^m d=0.9	T=01 ^h 31 ^m v=-0.3 d=1.3	v=0.9 d=0.3				

Lat.	Moon-rise	Moon-set	G. M. T.	Age 8 ^d .4		MOON S.D. 15'8		JUPITER -2.1	SATURN +1.1
				G.H.A. v Dec. d		G.H.A. Dec.		G.H.A. Dec.	
				G.H.A. v Dec. d		G.H.A. Dec.		G.H.A. Dec.	
N.72	h M.B.H.	h M.B.H.	h	G.H.A.	v Dec. d	G.H.A.	Dec.	G.H.A.	Dec.
N.70	M.B.H.	M.B.H.	00	87 33.2 5.5 S.27 07.2 3.6	288 28.8 N.16 46.0	144 23.2 S. 2 59.4			
68	M.B.H.	M.B.H.	01	101 57.7 5.4 27 10.8 3.4	303 31.2 16 46.1	159 25.4 2 59.5			
66	M.B.H.	M.B.H.	02	116 22.1 5.3 27 14.2 3.2	318 33.6 16 46.1	174 27.6 2 59.6			
64	M.B.H.	M.B.H.	03	130 46.4 5.3 27 17.4 3.1	333 35.9 16 46.1	189 29.9 2 59.7			
62	18.6 6	19.3 5	04	145 10.7 5.1 27 20.5 2.9	348 38.3 16 46.1	204 32.1 2 59.8			
N.60	17.3 5	20.5 5	05	159 34.8 5.1 S.27 23.4 2.7	3 40.7 N.16 46.1	219 34.3 S. 2 59.9			
58	16.7 5	21.1 5	06	173 58.9 5.0 27 26.1 2.5	18 43.0 16 46.2	234 36.5 3 00.0			
56	16.3 5	21.6 5	07	188 22.9 4.9 27 28.6 2.4	33 45.4 16 46.2	249 38.7 3 00.1			
54	15.9 5	21.9 5	08	202 46.8 4.9 27 31.0 2.2	48 47.8 16 46.2	264 41.0 3 00.2			
52	15.6 5	22.2 5	09	217 10.7 4.7 27 33.2 2.0	63 50.1 16 46.2	279 43.2 3 00.3			
N.50	15.4 5	22.5 5	10	231 34.4 4.7 S.27 35.2 1.9	78 52.5 N.16 46.2	294 45.4 S. 3 00.4			
45	14.9 5	22.9 5	11	245 58.1 4.7 27 37.1 1.7	93 54.9 16 46.2	309 47.6 3 00.5			
40	14.5 5	23.3 5	12	260 21.8 4.5 27 38.8 1.5	108 57.2 16 46.3	324 49.9 3 00.6			
35	14.2 5	23.7 5	13	274 45.3 4.6 27 40.3 1.3	123 59.6 16 46.3	339 52.1 3 00.7			
30	13.9 5	23.9 5	14	289 08.9 4.4 27 41.6 1.1	139 02.0 16 46.3	354 54.3 3 00.9			
N.20	13.4 5	24.4 5	15	303 32.3 4.3 S.27 42.7 0.9	154 04.3 N.16 46.3	9 56.5 S. 3 01.0			
N.10	13.0 5	24.8 5	16	317 55.7 4.3 27 43.6 0.8	169 06.7 16 46.3	24 58.7 3 01.1			
0	12.7 5	00.2 5	17	332 19.0 4.3 27 44.4 0.6	184 09.1 16 46.3	40 01.0 3 01.2			
S.10	12.3 5	00.5 5	18	346 42.3 4.2 27 45.0 0.4	199 11.5 16 46.4	55 03.2 3 01.3			

1952 August 30, Saturday

G.M.T.	S.D. SUN 15'9		ARIES		VENUS -3:3		MARS +0:3		Lat.	Twilight	Sun-rise
	G.H.A.	Dec.	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.				
00	179 49.5 N.	9 06.5	338 07.7	162 32.4 N.	3 17.0	99 22.0	S.22 24.2	N.70	02 49	03 52	
01	194 49.7	9 05.6	353 10.1	177 32.1	3 15.7	114 22.8	22 24.5	68	03 11	04 08	
02	209 49.9	9 04.7	8 12.6	192 31.7	3 14.4	129 23.7	22 24.8	66	03 29	04 19	
03	224 50.1	9 03.9	23 15.1	207 31.4	3 13.2	144 24.6	22 25.1	64	03 43	04 29	
04	239 50.2	9 03.0	38 17.5	222 31.0	3 11.9	159 25.4	22 25.4	62	03 54	04 44	
05	254 50.4 N.	9 02.1	53 20.0	237 30.7 N.	3 10.6	174 26.3	S.22 25.7	N.60	04 04	04 50	
06	269 50.6	9 01.2	68 22.4	252 30.3	3 09.4	189 27.1	22 26.1	58	04 13	04 55	
07	284 50.8	9 00.3	83 24.9	267 30.0	3 08.1	204 28.0	22 26.4	56	04 20	05 00	
08	299 51.0	8 59.4	98 27.4	282 29.6	3 06.8	219 28.9	22 26.7	54	04 27	05 04	
09	314 51.2	8 58.5	113 29.8	297 29.3	3 05.5	234 29.7	22 27.0	52	04 32	05 08	
10	329 51.4 N.	8 57.6	128 32.3	312 29.0 N.	3 04.3	249 30.6	S.22 27.3	N.50	04 38	05 12	
11	344 51.6	8 56.7	143 34.8	327 28.6	3 03.0	264 31.5	22 27.6	45	04 48	05 19	
12	359 51.8	8 55.8	158 37.2	342 28.3	3 01.7	279 32.3	22 27.9	40	04 57	05 25	
13	14 52.0	8 54.9	173 39.7	357 27.9	3 00.5	294 33.2	22 28.3	35	05 04	05 31	
14	29 52.2	8 54.0	188 42.2	12 27.6	2 59.2	309 34.0	22 28.6	30	05 11	05 36	
15	44 52.3 N.	8 53.1	203 44.6	27 27.2 N.	2 57.9	324 34.9	S.22 28.9	N.20	05 21	05 44	
16	59 52.5	8 52.2	218 47.1	42 26.9	2 56.6	339 35.7	22 29.2	N.10	05 29	05 51	
17	74 52.7	8 51.3	233 49.6	57 26.5	2 55.4	354 36.6	22 29.5	0	05 36	05 57	
18	89 52.9	8 50.4	248 52.0	72 26.2	2 54.1	9 37.5	22 29.8	S.10	05 42	06 03	
19	104 53.1	8 49.5	263 54.5	87 25.9	2 52.8	24 38.3	22 30.1	20	05 49	06 10	
20	119 53.3 N.	8 48.6	278 56.9	102 25.5 N.	2 51.5	39 39.2	S.22 30.5	S.30	05 54	06 18	
21	134 53.5	8 47.7	293 59.4	117 25.2	2 50.3	54 40.0	22 30.8	35	05 56	06 22	
22	149 53.7	8 46.8	309 01.9	132 24.8	2 49.0	69 40.9	22 31.1	40	05 59	06 26	
23	164 53.9	8 45.9	324 04.3	147 24.5	2 47.7	84 41.7	22 31.4	45	06 02	06 32	
	T=12 ^h 01 ^m	d=0.9	T=01 ^h 27 ^m	v=-0.3	d=1.3	v=0.9	d=0.3	50	06 05	06 38	
								S.55	06 10	06 47	

G.M.T.	Age 9 ^d .4 ○ MOON S.D. 16'.1				JUPITER -2:1		SATURN +1:1		Lat.	Moon-rise	Moon-set
	G.H.A.	v	Dec.	d	G.H.A.	Dec.	G.H.A.	Dec.			
00	73 00.8	3.9	S.27 44.6	0.7	289 25.7 N.	16 46.5	145 16.5	S. 3 01.9	N.70	M.B.H.	M.B.H.
01	87 23.7	3.9	27 43.9	0.9	304 28.1	16 46.5	160 18.7	3 02.0	68	M.B.H.	M.B.H.
02	101 46.6	3.8	27 43.0	1.1	319 30.4	16 46.5	175 21.0	3 02.1	66	M.B.H.	M.B.H.
03	116 09.4	3.9	27 41.9	1.3	334 32.8	16 46.5	190 23.2	3 02.2	64	M.B.H.	M.B.H.
04	130 32.3	3.7	27 40.6	1.4	349 35.2	16 46.5	205 25.4	3 02.4	62	18.9 0	21.1 10
05	144 55.0	3.8	S.27 39.2	1.7	4 37.6 N.	16 46.5	220 27.6	S. 3 02.5	N.60	18.1 3	21.9 8
06	159 17.8	3.7	27 37.5	1.8	19 39.9	16 46.6	235 29.8	3 02.6	58	17.6 3	22.4 7
07	173 40.5	3.7	27 35.7	2.1	34 42.3	16 46.6	250 32.1	3 02.7	56	17.2 3	22.8 7
08	188 03.2	3.7	27 33.6	2.2	49 44.7	16 46.6	265 34.3	3 02.8	54	16.8 4	23.1 7
09	202 25.9	3.7	27 31.4	2.4	64 47.1	16 46.6	280 36.5	3 02.9	52	16.6 4	23.4 7
10	216 48.6	3.6	S.27 29.0	2.7	79 49.4 N.	16 46.6	295 38.7	S. 3 03.0	N.50	16.3 4	23.6 6
11	231 11.2	3.7	27 26.3	2.8	94 51.8	16 46.6	310 40.9	3 03.1	45	15.9 4	(22.9) 5
12	245 33.9	3.6	27 23.5	3.0	109 54.2	16 46.7	325 43.2	3 03.2	40	15.5 4	(23.3) 5
13	259 56.5	3.6	27 20.5	3.2	124 56.6	16 46.7	340 45.4	3 03.3	35	15.2 5	(23.7) 5
14	274 19.1	3.6	27 17.3	3.4	139 58.9	16 46.7	355 47.6	3 03.4	30	14.9 5	(23.9) 5
15	288 41.7	3.6	S.27 13.9	3.5	155 01.3 N.	16 46.7	10 49.8	S. 3 03.5	N.20	14.5 5	00.4 5
16	303 04.3	3.6	27 10.4	3.8	170 03.7	16 46.7	25 52.0	3 03.6	N.10	14.1 5	00.8 5
17	317 26.9	3.6	27 06.6	4.0	185 06.1	16 46.7	40 54.3	3 03.8	0	13.7 5	01.2 5
18	331 49.5	3.5	27 02.6	4.1	200 08.5	16 46.7	55 56.5	3 03.9	S.10	13.3 5	01.5 5
19	346 12.0	3.6	26 58.5	4.4	215 10.8	16 46.8	70 58.7	3 04.0	20	13.0 5	01.9 5
20	0 34.6	3.6	S.26 54.1	4.5	230 13.2 N.	16 46.8	86 00.9	S. 3 04.1	S.30	12.5 5	02.4 5
21	14 57.2	3.6	26 49.6	4.7	245 15.6	16 46.8	101 03.1	3 04.2	35	12.2 5	02.7 5
22	29 19.8	3.7	26 44.9	5.0	260 18.0	16 46.8	116 05.4	3 04.3	40	11.9 5	03.0 5
23	43 42.5	3.6	26 39.9	5.1	275 20.4	16 46.8	131 07.6	3 04.4	45	11.5 6	03.4 5
	H.P. 4 ^h , 59'.1 ; 12 ^h , 59'.3 ; 20 ^h , 59'.6				v=2.4	d=0.0	v=2.2	d=0.1	50	11.1 6	03.8 5
									S.55	10.4 6	04.5 5

1952 September 14, Sunday

G.M.T.	S.D. SUN 15'9		ARIES		VENUS 3:3		MARS +0:5		Lat.	Sun-set	Twilight
	G.H.A.	Dec.	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.				
00	181 04.8 N.	3 31.5	352 54.7	160 31.4 S.	4 24.7	104 03.7	S.24 03.5	N.70	18 43	19 51	
01	196 05.1	3 30.6	7 57.2	175 31.0	4 25.9	119 04.5	24 03.7	68	18 39	19 40	
02	211 05.3	3 29.6	22 59.7	190 30.7	4 27.2	134 05.2	24 04.0	66	18 35	19 31	
03	226 05.5	3 28.7	38 02.1	205 30.3	4 28.5	149 05.9	24 04.2	64	18 32	19 23	
04	241 05.7	3 27.7	53 04.6	220 30.0	4 29.8	164 06.6	24 04.4	62	18 29	19 16	
05	256 06.0 N.	3 26.7	68 07.1	235 29.7 S.	4 31.1	179 07.3	S.24 04.7	N.60	18 26	19 11	
06	271 06.2	3 25.8	83 09.5	250 29.3	4 32.3	194 08.0	24 04.9	58	18 24	19 06	
07	286 06.4	3 24.8	98 12.0	265 29.0	4 33.6	209 08.7	24 05.1	56	18 22	19 02	
08	301 06.6	3 23.9	113 14.5	280 28.6	4 34.9	224 09.4	24 05.3	54	18 21	18 58	
09	316 06.8	3 22.9	128 16.9	295 28.3	4 36.2	239 10.1	24 05.6	52	18 19	18 55	
10	331 07.1 N.	3 21.9	143 19.4	310 27.9 S.	4 37.4	254 10.8	S.24 05.8	N.50	18 18	18 51	
11	346 07.3	3 21.0	158 21.8	325 27.6	4 38.7	269 11.5	24 06.0	45	18 14	18 45	
12	1 07.5	3 20.0	173 24.3	340 27.2	4 40.0	284 12.2	24 06.3	40	18 12	18 41	
13	16 07.7	3 19.1	188 26.8	355 26.9	4 41.3	299 12.9	24 06.5	35	18 09	18 36	
14	31 07.9	3 18.1	203 29.2	10 26.5	4 42.5	314 13.6	24 06.7	30	18 07	18 32	
15	46 08.2 N.	3 17.1	218 31.7	25 26.2 S.	4 43.8	329 14.3	S.24 06.9	N.20	18 04	18 27	
16	61 08.4	3 16.2	233 34.2	40 25.9	4 45.1	344 15.0	24 07.2	N.10	18 01	18 23	
17	76 08.6	3 15.2	248 36.6	55 25.5	4 46.4	359 15.7	24 07.4	0	17 59	18 20	
18	91 08.8	3 14.3	263 39.1	70 25.2	4 47.6	14 16.4	24 07.6	S.10	17 57	18 18	
19	106 09.0	3 13.3	278 41.6	85 24.8	4 48.9	29 17.1	24 07.8	20	17 55	18 17	
20	121 09.3 N.	3 12.3	293 44.0	100 24.5 S.	4 50.2	44 17.8	S.24 08.1	S.30	17 52	18 15	
21	136 09.5	3 11.4	308 46.5	115 24.1	4 51.4	59 18.5	24 08.3	35	17 51	18 16	
22	151 09.7	3 10.4	323 49.0	130 23.8	4 52.7	74 19.2	24 08.5	40	17 49	18 15	
23	166 09.9	3 09.5	338 51.4	145 23.4	4 54.0	89 19.8	24 08.7	45	17 47	18 16	
	T=11 ^h 56 ^m	d=1.0	T=00 ^h 28 ^m	v=-0.3	d=1.3	v=0.7	d=0.2	50	17 45	18 16	
								S.55	17 42	18 17	

G.M.T.	Age 24 ^h .4 ● MOON S.D. 14'.8				JUPITER -2:2		SATURN +1:1		Lat.	Moon-rise	Moon-set
	G.H.A.	v	Dec.	d	G.H.A.	Dec.	G.H.A.	Dec.			
00	237 19.6	12.0	N.23 52.1	7.5	304 02.2 N.	16 46.7	158 31.8	S. 3 42.0	N.72	M.A.H.	M.A.H.
01	251 50.6	12.2	23 44.6	7.6	319 04.7	16 46.6	173 34.0	3 42.1	N.70	M.A.H.	M.A.H.
02	266 21.8	12.2	23 37.0	7.7	334 07.2	16 46.6	188 36.1	3 42.2	68	22.3 11	19.6 -4
03	280 53.0	12.3	23 29.3	7.8	349 09.7	16 46.6	203 38.3	3 42.3	66	23.1 9	18.8 -2
04	295 24.3	12.4	23 21.5	7.9	4 12.2	16 46.6	218 40.5	3 42.4	64	23.6 9	18.3 -1
05	309 55.7	12.4	N.23 13.6	8.0	19 14.7 N.	16 46.6	233 42.7	S. 3 42.5	N.60	24.3 7	17.6 0
06	324 27.1	12.5	23 05.6	8.1	34 17.2	16 46.6	248 44.9	3 42.6	58	24.5 7	17.3 +1
07	338 58.6	12.6	22 57.5	8.2	49 19.7	16 46.5	263 47.1	3 42.8	56	24.7 7	17.1 -1
08	353 30.2	12.6	22 49.3	8.3	64 22.2	16 46.5	278 49.3	3 42.9	54	24.9 6	16.9 1
09	8 01.8	12.7	22 41.0	8.4	79 24.7	16 46.5	293 51.5	3 43.0	52	25.1 6	16.7 2
10	22 33.5	12.8	N.22 32.6	8.5	94 27.2 N.	16 46.5	308 53.7	S. 3 43.1	N.50	00.1 6	16.6 2
11	37 05.3	12.8	22 24.1	8.6	109 29.7	16 46.5	323 55.9	3 43.2	45	00.5 5	16.2 2
12	51 37.1	12.9	22 15.5	8.6	124 32.2	16 46.5	338 58.1	3 43.3	40	00.	

1952 September 15, Monday

G. M. T.	S.D. SUN 15°9		ARIES		VENUS -3.3		MARS +0.5		Lat.	Twilight		Sun-rise	
	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.		N.72	h m	h m	h m
00	181 10.2 N.	3 08.5	353 53.9	160 23.1 S.	4 55.3	104 20.5 S.	24 08.9	N.70	04.08	05 13	05 13	05 13	
01	196 10.4	3 07.5	8 56.3	175 22.7	4 56.5	119 21.2	24 09.2	68	04.19	05 17	05 17	05 17	
02	211 10.6	3 06.6	23 58.8	190 22.4	4 57.8	134 21.9	24 09.4	66	04.27	05 20	05 20	05 20	
03	226 10.8	3 05.6	39 01.3	205 22.0	4 59.1	149 22.6	24 09.6	64	04.34	05 23	05 23	05 23	
04	241 11.0	3 04.6	54 03.7	220 21.7	5 00.4	164 23.3	24 09.8	62	04.41	05 26	05 26	05 26	
05	256 11.3 N.	3 03.7	69 06.2	235 21.3 S.	5 01.6	179 24.0 S.	24 10.1	N.60	04.46	05 28	05 28	05 28	
06	271 11.5	3 02.7	84 08.7	250 21.0	5 02.9	194 24.7	24 10.3	58	04.50	05 30	05 30	05 30	
07	286 11.7	3 01.8	99 11.1	265 20.6	5 04.2	209 25.4	24 10.5	56	04.54	05 32	05 32	05 32	
08	301 11.9	3 00.8	114 13.6	280 20.3	5 05.4	224 26.1	24 10.7	54	04.58	05 33	05 33	05 33	
09	316 12.1	2 59.8	129 16.1	295 19.9	5 06.7	239 26.8	24 10.9	52	05 01	05 34	05 34	05 34	
10	331 12.4 N.	2 58.9	144 18.5	310 19.6 S.	5 08.0	254 27.5 S.	24 11.2	N.50	05 04	05 36	05 36	05 36	
11	346 12.6	2 57.9	159 21.0	325 19.2	5 09.3	269 28.2	24 11.4	45	05 10	05 38	05 38	05 38	
12	1 12.8	2 56.9	174 23.4	340 18.9	5 10.5	284 28.9	24 11.6	40	05 13	05 40	05 40	05 40	
13	16 13.0	2 56.0	189 25.9	355 18.6	5 11.8	299 29.5	24 11.8	35	05 17	05 42	05 42	05 42	
14	31 13.3	2 55.0	204 28.4	10 18.2	5 13.1	314 30.2	24 12.0	30	05 21	05 44	05 44	05 44	
15	46 13.5 N.	2 54.0	219 30.8	25 17.9 S.	5 14.3	329 30.9 S.	24 12.3	N.20	05 25	05 47	05 47	05 47	
16	61 13.7	2 53.1	234 33.3	40 17.5	5 15.6	344 31.6	24 12.5	N.10	05 29	05 50	05 50	05 50	
17	76 13.9	2 52.1	249 35.8	55 17.2	5 16.9	359 32.3	24 12.7	0	05 32	05 52	05 52	05 52	
18	91 14.1	2 51.2	264 38.2	70 16.8	5 18.2	374 33.0	24 12.9	S.10	05 34	05 53	05 53	05 53	
19	106 14.4	2 50.2	279 40.7	85 16.5	5 19.4	389 33.7	24 13.1	20	05 34	05 55	05 55	05 55	
20	121 14.6 N.	2 49.2	294 43.2	100 16.1 S.	5 20.7	44 34.4 S.	24 13.4	S.30	05 35	05 58	05 58	05 58	
21	136 14.8	2 48.3	309 45.6	115 15.7	5 22.0	59 35.0	24 13.6	35	05 35	06 00	06 00	06 00	
22	151 15.0	2 47.3	324 48.1	130 15.4	5 23.2	74 35.7	24 13.8	40	05 34	06 01	06 01	06 01	
23	166 15.2	2 46.3	339 50.6	145 15.0	5 24.5	89 36.4	24 14.0	45	05 33	06 02	06 02	06 02	
	T=11h 55m d=1.0		T=00h 24m v=-0.3 d=1.3		v=0.7 d=0.2		S.55		05 30	06 04	06 06	06 06	

1952 September 16, Tuesday

G. M. T.	S.D. SUN 15°9		ARIES		VENUS -3.3		MARS +0.5		Lat.	Twilight		G. M. T.	S.D. SUN 15°9		ARIES		VENUS -3.3		MARS +0.5	
	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.		N.72	h m		h m	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
00	181 10.2 N.	2 45.4	354 53.0	160 14.7 S.	5 25.8	104 37.1 S.	24 14.2	N.70	18 39	19 54	00	181 10.2 N.	2 45.4	354 53.0	160 14.7 S.	5 25.8	104 37.1 S.	24 14.2	N.70	18 39
01	196 10.4	2 44.4	9 55.5	175 14.3	5 27.0	119 37.8	24 14.4	68	18 30	19 31	01	196 10.4	2 44.4	9 55.5	175 14.3	5 27.0	119 37.8	24 14.4	68	18 30
02	211 10.6	2 43.4	24 57.9	190 14.0	5 28.3	134 38.5	24 14.6	66	18 27	19 22	02	211 10.6	2 43.4	24 57.9	190 14.0	5 28.3	134 38.5	24 14.6	66	18 27
03	226 10.8	2 42.5	40 00.4	205 13.6	5 29.6	149 39.2	24 14.9	64	18 24	19 15	03	226 10.8	2 42.5	40 00.4	205 13.6	5 29.6	149 39.2	24 14.9	64	18 24
04	241 11.0	2 41.5	55 02.9	220 13.3	5 30.8	164 39.8	24 15.1	62	18 22	19 09	04	241 11.0	2 41.5	55 02.9	220 13.3	5 30.8	164 39.8	24 15.1	62	18 22
05	256 11.3 N.	2 40.5	70 05.3	235 12.9 S.	5 32.1	179 40.5 S.	24 15.3	N.60	18 20	19 05	05	256 11.3 N.	2 40.5	70 05.3	235 12.9 S.	5 32.1	179 40.5 S.	24 15.3	N.60	18 20
06	271 11.5	2 39.6	85 07.8	250 12.6	5 33.4	194 41.2	24 15.5	58	18 19	19 00	06	271 11.5	2 39.6	85 07.8	250 12.6	5 33.4	194 41.2	24 15.5	58	18 19
07	286 11.7	2 38.6	100 10.3	265 12.2	5 34.7	209 41.9	24 15.7	56	18 17	18 57	07	286 11.7	2 38.6	100 10.3	265 12.2	5 34.7	209 41.9	24 15.7	56	18 17
08	301 11.9	2 37.6	115 12.7	280 11.9	5 35.9	224 42.6	24 15.9	54	18 16	18 53	08	301 11.9	2 37.6	115 12.7	280 11.9	5 35.9	224 42.6	24 15.9	54	18 16
09	316 12.1	2 36.7	130 15.2	295 11.5	5 37.2	239 43.2	24 16.1	52	18 14	18 50	09	316 12.1	2 36.7	130 15.2	295 11.5	5 37.2	239 43.2	24 16.1	52	18 14
10	331 12.4 N.	2 35.7	145 17.7	310 11.2 S.	5 38.5	254 43.9 S.	24 16.4	N.50	18 13	18 47	10	331 12.4 N.	2 35.7	145 17.7	310 11.2 S.	5 38.5	254 43.9 S.	24 16.4	N.50	18 13
11	346 12.6	2 34.8	160 20.1	325 10.8	5 39.7	269 44.6	24 16.6	45	18 11	18 41	11	346 12.6	2 34.8	160 20.1	325 10.8	5 39.7	269 44.6	24 16.6	45	18 11
12	1 12.8	2 33.8	175 22.6	340 10.5	5 41.0	284 45.3	24 16.8	40	18 08	18 37	12	1 12.8	2 33.8	175 22.6	340 10.5	5 41.0	284 45.3	24 16.8	40	18 08
13	16 13.0	2 32.8	190 25.0	355 10.1	5 42.3	299 46.0	24 17.0	35	18 06	18 33	13	16 13.0	2 32.8	190 25.0	355 10.1	5 42.3	299 46.0	24 17.0	35	18 06
14	31 13.3	2 31.9	205 27.5	10 09.8	5 43.5	314 46.7	24 17.2	30	18 05	18 30	14	31 13.3	2 31.9	205 27.5	10 09.8	5 43.5	314 46.7	24 17.2	30	18 05
15	46 13.5 N.	2 30.9	220 30.0	25 09.4 S.	5 44.8	329 47.3 S.	24 17.4	N.20	18 02	18 25	15	46 13.5 N.	2 30.9	220 30.0	25 09.4 S.	5 44.8	329 47.3 S.	24 17.4	N.20	18 02
16	61 13.7	2 29.9	235 32.4	40 09.0	5 46.1	344 48.0	24 17.6	N.10	18 00	18 22	16	61 13.7	2 29.9	235 32.4	40 09.0	5 46.1	344 48.0	24 17.6	N.10	18 00
17	76 13.9	2 29.0	250 34.9	55 08.7	5 47.3	359 48.7	24 17.8	0	17 58	18 19	17	76 13.9	2 29.0	250 34.9	55 08.7	5 47.3	359 48.7	24 17.8	0	17 58
18	91 14.1	2 28.0	265 37.4	70 08.3	5 48.6	374 49.4	24 18.1	S.10	17 57	18 18	18	91 14.1	2 28.0	265 37.4	70 08.3	5 48.6	374 49.4	24 18.1	S.10	17 57
19	106 14.4	2 27.0	280 39.8	85 08.0	5 49.9	389 50.0	24 18.3	20	17 55	18 17	19	106 14.4	2 27.0	280 39.8	85 08.0	5 49.9	389 50.0	24 18.3	20	17 55
20	121 14.6 N.	2 26.1	295 42.3	100 07.6 S.	5 51.1	44 50.7 S.	24 18.5	S.30	17 54	18 17	20	121 14.6 N.	2 26.1	295 42.3	100 07.6 S.	5 51.1	44 50.7 S.	24 18.5	S.30	17 54
21	136 14.8	2 25.1	310 44.8	115 07.3	5 52.4	59 51.4	24 18.7	35	17 53	18 18	21	136 14.8	2 25.1	310 44.8	115 07.3	5 52.4	59 51.4	24 18.7	35	17 53
22	151 15.0	2 24.1	325 47.2	130 06.9	5 53.6	74 52.1	24 18.9	40	17 51	18 19	22	151 15.0	2 24.1	325 47.2	130 06.9	5 53.6	74 52.1	24 18.9	40	17 51
23	166 15.2	2 23.2	340 49.7	145 06.6	5 54.9	89 52.8	24 19.1	45	17 50	18 19	23	166 15.2	2 23.2	340 49.7	145 06.6	5 54.9	89 52.8	24 19.1	45	17 50
	T=11h 55m d=1.0		T=00h 20m v=-0.4 d=1.3		v=0.7 d=0.2		S.55		17 46	18 21		T=11h 55m d=1.0		T=00h 20m v=-0.4 d=1.3		v=0.7 d=0.2		S.55		17 46

G. M. T.	MOON				JUPITER -2.2		SATURN +1.1		Lat.	Moon-rise		Moon-set			
	Age 25 ^d .4	G.H.A.	v	Dec. d	G.H.A.	Dec.	G.H.A.	Dec.		N.72	h l		h l		
00	226 04.5	13.7	N.20	25.5	9.8	305 02.2	N.16	46.2	159 24.5	S. 3	44.7	N.70	24.2 10	19.3 -3	
01	240 37.2	13.8	20	15.7	9.8	320 04.7	16 46.2	174 26.7	3 44.8	68	(22.3) 11	18 8 -3	68	(23.1) 9	18.4 -2
02	255 10.0	13.8	20	05.9	9.9	335 07.2	16 46.2	189 28.9	3 44.9	66	(23.6) 9	18.1 -1	66	(23.6) 9	18.1 -1
03	269 42.8	13.9	19	56.0	10.0	350 09.7	16 46.2	204 31.1	3 45.0	64	(23.6) 9	17.8 -0	64	(23.6) 9	17.8 -0
04	284 15.7	14.0	19	46.0	10.0	5 12.2	16 46.2	219 33.3	3 45.2	62	00.0 8	17.8 0	62	00.0 8	17.8 0
05	298 48.7	14.0	N.19	36.0	10.2	20 14.8	N.16	46.2	234 35.5	S. 3	45.3	N.60	00.3 7	17.6 0	
06	313 21.7	14.1	19	25.8	10.2	35 17.3	16 46.1	249 37.7	3 45.4	58	00.5 7	17.4 0	58	00.5 7	17.4 0
07	327 54.8	14.1	19	15.6	10.3	50 19.8	16 46.1	264 39.9	3 45.5	56	00.7 7	17.3 +1	56	00.7 7	17.3 +1
08	342 27.9	14.2	19	05.3	10.4	65 22.3	16 46.1	279 42.1	3 45.6	54	00.9 6	17.1 1	54	00.9 6	17.1 1
09	357 01.1	14.3	18	54.9	10.4	80 24.8	16 46.1	294 44.3	3 45.7	52	01.1 6	17.0 1	52	01.1 6	17.0 1
10	11 34.4	14.3	N.18	44.5	10.6	95 27.3	N.16	46.1	309 46.5	S. 3	45.8	N.50	01.2 6	16.9 1	
11	26 07.7	14.4	18	33.9	10.6	110 29.8	16 46.0	324 48.7	3 46.0	45	01.5 5	16.6 2	45	01.5 5	16.6 2
12	40 41.1	14.4</													

1952 September 17, Wednesday

G. M. T.	S.D.	SUN 15'9	ARIES	VENUS -3.3	MARS +0.5	Lat.	Twilight	Sunrise
	G.H.A.	Dec.	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	N.72
00	181 20.8	N. 2 22.2	355 52.2	160 06.2	S. 5 56.2	104 53.4	S.24 19.3	N.70
01	196 21.0	2 21.2	10 54.6	175 05.8	5 57.4	119 54.1	24 19.5	68
02	211 21.2	2 20.3	25 57.1	190 05.5	5 58.7	134 54.8	24 19.7	66
03	226 21.4	2 19.3	40 59.5	205 05.1	6 00.0	149 55.5	24 19.9	64
04	241 21.7	2 18.3	56 02.0	220 04.8	6 01.2	164 56.1	24 20.1	62
05	256 21.9	N. 2 17.4	71 04.5	235 04.4	S. 6 02.5	179 56.8	S.24 20.3	N.60
06	271 22.1	2 16.4	86 06.9	250 04.1	6 03.8	194 57.5	24 20.6	58
07	286 22.3	2 15.4	101 09.4	265 03.7	6 05.0	209 58.2	24 20.8	56
08	301 22.5	2 14.5	116 11.9	280 03.4	6 06.3	224 58.8	24 21.0	54
09	316 22.8	2 13.5	131 14.3	295 03.0	6 07.5	239 59.5	24 21.2	52
10	331 23.0	N. 2 12.5	146 16.8	310 02.6	S. 6 08.8	255 00.2	S.24 21.4	N.50
11	346 23.2	2 11.6	161 19.3	325 02.3	6 10.1	270 00.8	24 21.6	45
12	1 23.4	2 10.6	176 21.7	340 01.9	6 11.3	285 01.5	24 21.8	40
13	16 23.7	2 09.6	191 24.2	355 01.6	6 12.6	300 02.2	24 22.0	35
14	31 23.9	2 08.6	206 26.7	10 01.2	6 13.9	315 02.9	24 22.2	30
15	46 24.1	N. 2 07.7	221 29.1	25 00.9	S. 6 15.1	330 03.5	S.24 22.4	N.20
16	61 24.3	2 06.7	236 31.6	40 00.5	6 16.4	345 04.2	24 22.6	N.10
17	76 24.5	2 05.7	251 34.0	55 00.1	6 17.6	0 04.9	24 22.8	0
18	91 24.8	2 04.8	266 36.5	69 59.8	6 18.9	15 05.5	24 23.0	S.10
19	106 25.0	2 03.8	281 39.0	84 59.4	6 20.2	30 06.2	24 23.2	20
20	121 25.2	N. 2 02.8	296 41.4	99 59.1	S. 6 21.4	45 06.9	S.24 23.4	S.30
21	136 25.4	2 01.9	311 43.9	114 58.7	6 22.7	60 07.5	24 23.6	35
22	151 25.6	2 00.9	326 46.4	129 58.3	6 23.9	75 08.2	24 23.8	40
23	166 25.9	1 59.9	341 48.8	144 58.0	6 25.2	90 08.9	24 24.0	45
	T=11h 54m	d=1.0	T=00h 16m	v=-0.4	d=1.3	v=0.7	d=0.2	50
								S.55

G. M. T.	Age	MOON	S.D.	JUPITER -2.2	SATURN +1.0	Lat.	Moonrise	Moonset
	27d.4		14.7	G.H.A.	Dec.	G.H.A.	Dec.	N.72
00	205 17.1	16.1	N.11	18.9	12.8	307 02.9	N.16 45.3	161 09.9
01	219 52.2	16.2	11 06.1	12.9		322 05.5	16 45.3	176 12.1
02	234 27.4	16.2	10 53.2	12.9		337 08.0	16 45.2	191 14.3
03	249 02.6	16.2	10 40.3	12.9		352 10.5	16 45.2	206 16.5
04	263 37.8	16.2	10 27.4	13.0		7 13.0	16 45.2	221 18.7
05	278 13.0	16.3	N.10	14.4	13.0	22 15.6	N.16 45.2	236 20.9
06	292 48.3	16.3	10 01.4	13.0		37 18.1	16 45.2	251 23.1
07	307 23.6	16.3	9 48.4	13.1		52 20.6	16 45.1	266 25.3
08	321 58.9	16.3	9 35.3	13.1		67 23.1	16 45.1	281 27.5
09	336 34.2	16.4	9 22.2	13.2		82 25.7	16 45.1	296 29.7
10	351 09.6	16.4	N. 9	09.0	13.2	97 28.2	N.16 45.1	311 31.9
11	5 45.0	16.4	8 55.8	13.3		112 30.7	16 45.0	326 34.1
12	20 20.4	16.5	8 42.5	13.2		127 33.2	16 45.0	341 36.2
13	34 55.9	16.4	8 29.3	13.3		142 35.8	16 45.0	356 38.4
14	49 31.3	16.5	8 16.0	13.4		157 38.3	16 45.0	11 40.6
15	64 06.8	16.5	N. 8	02.6	13.4	172 40.8	N.16 45.0	26 42.8
16	78 42.3	16.5	7 49.2	13.4		187 43.4	16 44.9	41 45.0
17	93 17.8	16.6	7 35.8	13.4		202 45.9	16 44.9	56 47.2
18	107 53.4	16.6	7 22.4	13.5		217 48.4	16 44.9	71 49.4
19	122 29.0	16.5	7 08.9	13.5		232 50.9	16 44.9	86 51.6
20	137 04.5	16.6	N. 6	55.4	13.6	247 53.5	N.16 44.8	101 53.8
21	151 40.1	16.6	6 41.8	13.5		262 56.0	16 44.8	116 56.0
22	166 15.7	16.7	6 28.3	13.6		277 58.5	16 44.8	131 58.2
23	180 51.4	16.6	6 14.7	13.7		293 01.1	16 44.8	147 00.4
	H.P. 4h, 54.1; 12h, 54.2; 20h, 54.3					v=2.5	d=0.0	v=2.2
								d=0.1

1952 September 18, Thursday

G. M. T.	Sun-set	Twilight	G. M. T.	S.D.	SUN 15'9	ARIES	VENUS -3.3	MARS +0.5
	N.72	h m	h m		G.H.A.	Dec.	G.H.A.	G.H.A.
00	181 26.1	N. 1 59.0	356 51.3	159 57.6	S. 6 26.5	105 09.5	S.24 24.2	N.70
01	196 26.3	1 58.0	11 53.8	174 57.3	6 27.7	120 10.2	24 24.4	68
02	211 26.5	1 57.0	26 56.2	189 56.9	6 29.0	135 10.9	24 24.6	66
03	226 26.8	1 56.1	41 58.7	204 56.5	6 30.2	150 11.5	24 24.8	64
04	241 27.0	1 55.1	57 01.2	219 56.2	6 31.5	165 12.2	24 25.0	62
05	256 27.2	N. 1 54.1	72 03.6	234 55.8	S. 6 32.8	180 12.9	S.24 25.2	N.60
06	271 27.4	1 53.2	87 06.1	249 55.5	6 34.0	195 13.5	24 25.4	58
07	286 27.6	1 52.2	102 08.5	264 55.1	6 35.3	210 14.2	24 25.6	56
08	301 27.9	1 51.2	117 11.0	279 54.7	6 36.5	225 14.9	24 25.8	54
09	316 28.1	1 50.2	132 13.5	294 54.4	6 37.8	240 15.5	24 26.0	52
10	331 28.3	N. 1 49.3	147 15.9	309 54.0	S. 6 39.0	255 16.2	S.24 26.2	N.50
11	346 28.5	1 48.3	162 18.4	324 53.6	6 40.3	270 16.8	24 26.4	45
12	1 28.7	1 47.3	177 20.9	339 53.3	6 41.6	285 17.5	24 26.6	40
13	16 29.0	1 46.4	192 23.3	354 52.9	6 42.8	300 18.2	24 26.8	35
14	31 29.2	1 45.4	207 25.8	9 52.6	6 44.1	315 18.8	24 27.0	30
15	46 29.4	N. 1 44.4	222 28.3	24 52.2	S. 6 45.3	330 19.5	S.24 27.2	N.20
16	61 29.6	1 43.5	237 30.7	39 51.8	6 46.6	345 20.1	24 27.4	N.10
17	76 29.9	1 42.5	252 33.2	54 51.5	6 47.8	0 20.8	24 27.6	0
18	91 30.1	1 41.5	267 35.6	69 51.1	6 49.1	15 21.5	24 27.8	S.10
19	106 30.3	1 40.5	282 38.1	84 50.7	6 50.3	30 22.1	24 28.0	20
20	121 30.5	N. 1 39.6	297 40.6	99 50.4	S. 6 51.6	45 22.8	S.24 28.2	S.30
21	136 30.7	1 38.6	312 43.0	114 50.0	6 52.9	60 23.4	24 28.4	35
22	151 31.0	1 37.6	327 45.5	129 49.6	6 54.1	75 24.1	24 28.6	40
23	166 31.2	1 36.7	342 48.0	144 49.3	6 55.4	90 24.8	24 28.8	45
	T=11h 54m	d=1.0	T=00h 13m	v=-0.4	d=1.3	v=0.7	d=0.2	50
								S.55

G. M. T.	Age	MOON	S.D.	JUPITER -2.3	SATURN +1.0	Lat.	Moonrise	Moonset
	28d.4		14.8	G.H.A.	Dec.	G.H.A.	Dec.	N.72
00	205 17.1	16.1	N.11	18.9	12.8	307 02.9	N.16 44.7	162 02.6
01	219 52.2	16.2	11 06.1	12.9		322 05.5	16 44.7	177 04.8
02	234 27.4	16.2	10 53.2	12.9		337 08.0	16 44.7	192 07.0
03	249 02.6	16.2	10 40.3	12.9		352 10.5	16 44.7	207 09.1
04	263 37.8	16.2	10 27.4	13.0		7 13.0	16 44.6	222 11.3
05	278 13.0	16.3	N.10	14.4	13.0	22 15.6	N.16 44.6	237 13.5
06	292 48.3	16.3	10 01.4	13.0		37 18.1	16 44.6	252 15.7
07	307 23.6	16.3	9 48.4	13.1		52 20.6	16 44.6	267 17.9
08	321 58.9	16.3	9 35.3	13.1		67 23.1	16 44.5	282 20.1
09	336 34.2	16.4	9 22.2	13.2		82 25.7	16 44.5	297 22.3
10	351 09.6	16.4	N. 9	09.0	13.2	97 28.2	N.16 44.5	312 24.5
11	5 45.0	16.4	8 55.8	13.3		112 30.7	16 44.5	327 26.7
12	20 20.4	16.5	8 42.5	13.2		127 33.2	16 44.4	342 28.9
13	34 55.9	16.4	8 29.3	13.3		142 35.8	16 44.4	357 31.1
14	49 31.3	16.5	8 16.0	13.4		157 38.3	16 44.4	12 33.3
15	64 06.8	16.5	N. 8	02.6	13.4	172 40.8	N.16 44.4	27 35.5
16	78 42.3	16.5	7 49.2	13.4		187 43.4	16 44.3	42 37.7
17	93 17.8	16.6	7 35.8	13.4		202 45.9	16 44.3	57 39.9
18	107 53.4	16.6	7 22.4	13.5		217 48.4	16 44.3	72 42.0
19	122 29.0	16.5	7 08.9	13.5		232 50.9	16 44.3	87 44.2
20	137 04.5	16.6	N. 6	55.4	13.6	247 53.5	N.16 44.2	102 46.4
21	151 40.1	16.6	6 41.8	13.5		262 56.0	16 44.2	117 48.6
22	166 15.7	16.7	6 28.3	13.6		277 58.5	16 44.2	132 50.8
23	180 51.4	16.6	6 14.7	13.7		293 01.1	16 44.2	147 53.0
	H.P. 4h, 54.3; 12h, 54.4; 20h, 54.5					v=2.5	d=0.0	v=2.2
								d=0.1

THE MOON IS TOO CLOSE TO THE SUN FOR OBSERVATION

1952 September 19, Friday

G.M.T.	S.D.	SUN 15'9	ARIES	VENUS -3.3	MARS +0.5	Lat.	Twilight	Sun-rise			
	G.H.A.	Dec.	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	N.72			
00	181	31.4 N.	1 35.7	357 50.4	159 48.9 S.	6 56.6	105 25.4	S.24 29.0	N.70	04 26	05 25
01	196	31.6	1 34.7	12 52.9	174 48.5	6 57.9	120 26.1	24 29.2	68	04 34	05 29
02	211	31.8	1 33.8	27 55.4	189 48.2	6 59.1	135 26.7	24 29.3	66	04 41	05 33
03	226	32.1	1 32.8	42 57.8	204 47.8	7 00.4	150 27.4	24 29.5	64	04 46	05 35
04	241	32.3	1 31.8	58 00.3	219 47.4	7 01.6	165 28.0	24 29.7	62	04 51	05 36
05	256	32.5 N.	1 30.8	73 02.8	234 47.1 S.	7 02.9	180 28.7	S.24 29.9	N.60	04 56	05 37
06	271	32.7	1 29.9	88 05.2	249 46.7	7 04.1	195 29.3	24 30.1	58	05 00	05 38
07	286	32.9	1 28.9	103 07.7	264 46.3	7 05.4	210 30.0	24 30.3	56	05 02	05 39
08	301	33.2	1 27.9	118 10.1	279 46.0	7 06.6	225 30.7	24 30.5	54	05 05	05 40
09	316	33.4	1 27.0	133 12.6	294 45.6	7 07.9	240 31.3	24 30.7	52	05 08	05 41
10	331	33.6 N.	1 26.0	148 15.1	309 45.2 S.	7 09.1	255 32.0	S.24 30.9	N.50	05 10	05 42
11	346	33.8	1 25.0	163 17.5	324 44.9	7 10.4	270 32.6	24 31.1	45	05 14	05 43
12	1 34.1	1 24.1	178 20.0	339 44.5	7 11.6	285 33.3	24 31.3	40	05 17	05 44	
13	16 34.3	1 23.1	193 22.5	354 44.1	7 12.9	300 33.9	24 31.4	35	05 20	05 45	
14	31 34.5	1 22.1	208 24.9	9 43.8	7 14.1	315 34.6	24 31.6	30	05 23	05 46	
15	46 34.7 N.	1 21.1	223 27.4	24 43.4 S.	7 15.4	330 35.2	S.24 31.8	N.20	05 27	05 48	
16	61 34.9	1 20.2	238 29.9	39 43.0	7 16.7	345 35.9	24 32.0	N.10	05 29	05 49	
17	76 35.2	1 19.2	253 32.3	54 42.7	7 17.9	0 36.5	24 32.2	0	05 30	05 51	
18	91 35.4	1 18.2	268 34.8	69 42.3	7 19.1	15 37.2	24 32.4	S.10	05 30	05 51	
19	106 35.6	1 17.3	283 37.3	84 41.9	7 20.4	30 37.8	24 32.6	20	05 30	05 52	
20	121 35.8 N.	1 16.3	298 39.7	99 41.5 S.	7 21.6	45 38.5	S.24 32.8	S.30	05 29	05 53	
21	136 36.0	1 15.3	313 42.2	114 41.2	7 22.9	60 39.1	24 33.0	35	05 28	05 53	
22	151 36.3	1 14.3	328 44.6	129 40.8	7 24.1	75 39.8	24 33.1	40	05 27	05 54	
23	166 36.5	1 13.4	343 47.1	144 40.4	7 25.4	90 40.4	24 33.3	45	05 25	05 54	
								50	05 22	05 54	
								S.55	05 19	05 55	

G.M.T.	Age	MOON	S.D.	JUPITER -2.3	SATURN +1.0	Lat.	Moon-rise	Moon-set		
	29 ^d .4	MOON	14'9	G.H.A.	Dec.	G.H.A.	Dec.	N.72		
00				309 04.5	N.16 44.1	162 55.2	S. 3 55.7	N.70	06.0 10	17.3 -2
01				324 07.0	16 44.1	177 57.4	3 55.8	68	05.9 8	17.5 -1
02				339 09.5	16 44.1	192 59.6	3 56.0	66	05.9 8	17.5 -1
03				354 12.1	16 44.1	208 01.8	3 56.1	64	05.9 7	17.6 -1
04				9 14.6	16 44.0	223 04.0	3 56.2	62	05.9 7	17.6 0
05				24 17.2	N.16 44.0	238 06.2	S. 3 56.3	N.60	05.9 7	17.7 0
06				39 19.7	16 44.0	253 08.4	3 56.4	58	05.9 6	17.7 0
07				54 22.2	16 44.0	268 10.6	3 56.5	56	05.9 6	17.7 0
08				69 24.8	16 43.9	283 12.7	3 56.7	54	05.9 6	17.7 +1
09				84 27.3	16 43.9	298 14.9	3 56.8	52	05.9 6	17.8 1
10				99 29.9	N.16 43.9	313 17.1	S. 3 56.9	N.50	05.9 6	17.8 1
11				114 32.4	16 43.8	328 19.3	3 57.0	45	05.8 5	17.8 1
12				129 35.0	16 43.8	343 21.5	3 57.1	40	05.8 5	17.9 2
13				144 37.5	16 43.8	358 23.7	3 57.2	35	05.8 5	17.9 2
14				159 40.1	16 43.8	13 25.9	3 57.4	30	05.8 4	17.9 2
15				174 42.6	N.16 43.7	28 28.1	S. 3 57.5	N.20	05.8 4	18.0 2
16				189 45.1	16 43.7	43 30.3	3 57.6	N.10	05.8 4	18.1 3
17				204 47.7	16 43.7	58 32.5	3 57.7	0	05.8 3	18.1 3
18				219 50.2	16 43.7	73 34.7	3 57.8	S.10	05.8 3	18.1 4
19				234 52.8	16 43.6	88 36.9	3 57.9	20	05.8 3	18.2 4
20				249 55.3	N.16 43.6	103 39.1	S. 3 58.0	S.30	05.7 2	18.2 5
21				264 57.9	16 43.6	118 41.2	3 58.2	35	05.7 2	18.3 5
22				280 00.4	16 43.5	133 43.4	3 58.3	40	05.7 2	18.3 5
23				295 03.0	16 43.5	148 45.6	3 58.4	45	05.7 1	18.4 5
								50	05.7 1	18.4 6
								S.55	05.7 0	18.5 6

H.P. 4^h, 54^m.6; 12^h, 54^m.7; 20^h, 54^m.8

v=2.5 d=0.0

v=2.2 d=0.1

1952 September 20, Saturday

G.M.T.	S.D.	SUN 16'0	ARIES	VENUS -3.3	MARS +0.5	Lat.	Sun-set	Twilight			
	G.H.A.	Dec.	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	N.72			
00	181	36.7 N.	1 12.4	358 49.6	159 40.1 S.	7 26.6	105 41.1	S.24 33.5	N.70	18 15	19 21
01	196	36.9	1 11.4	13 52.0	174 39.7	7 27.9	120 41.7	24 33.7	68	18 13	19 13
02	211	37.1	1 10.5	28 54.5	189 39.3	7 29.1	135 42.4	24 33.9	66	18 12	19 06
03	226	37.4	1 09.5	43 57.0	204 39.0	7 30.4	150 43.0	24 34.1	64	18 10	19 01
04	241	37.6	1 08.5	58 59.4	219 38.6	7 31.6	165 43.7	24 34.3	62	18 09	18 55
05	256	37.8 N.	1 07.5	74 01.9	234 38.2 S.	7 32.9	180 44.3	S.24 34.4	N.60	18 08	18 52
06	271	38.0	1 06.6	89 04.4	249 37.8	7 34.1	195 45.0	24 34.6	58	18 07	18 49
07	286	38.2	1 05.6	104 06.8	264 37.5	7 35.4	210 45.6	24 34.8	56	18 06	18 46
08	301	38.5	1 04.6	119 09.3	279 37.1	7 36.6	225 46.3	24 35.0	54	18 06	18 43
09	316	38.7	1 03.7	134 11.7	294 36.7	7 37.9	240 46.9	24 35.2	52	18 05	18 40
10	331	38.9 N.	1 02.7	149 14.2	309 36.3 S.	7 39.1	255 47.5	S.24 35.4	N.50	18 05	18 38
11	346	39.1	1 01.7	164 16.7	324 36.0	7 40.4	270 48.2	24 35.5	45	18 03	18 34
12	1 39.3	1 00.7	179 19.1	339 35.6	7 41.6	285 48.8	24 35.7	40	18 02	18 31	
13	16 39.6	0 59.8	194 21.6	354 35.2	7 42.8	300 49.5	24 35.9	35	18 01	18 27	
14	31 39.8	0 58.8	209 24.1	9 34.8	7 44.1	315 50.1	24 36.1	30	18 00	18 24	
15	46 40.0 N.	0 57.8	224 26.5	24 34.5 S.	7 45.3	330 50.8	S.24 36.3	N.20	17 58	18 21	
16	61 40.2	0 56.8	239 29.0	39 34.1	7 46.6	345 51.4	24 36.4	N.10	17 57	18 19	
17	76 40.4	0 55.9	254 31.5	54 33.7	7 47.8	0 52.0	24 36.6	0	17 57	18 18	
18	91 40.7	0 54.9	269 33.9	69 33.3	7 49.1	15 52.7	24 36.8	S.10	17 56	18 17	
19	106 40.9	0 53.9	284 36.4	84 33.0	7 50.3	30 53.3	24 37.0	20	17 55	18 18	
20	121 41.1 N.	0 53.0	299 38.9	99 32.6 S.	7 51.5	45 54.0	S.24 37.2	S.30	17 55	18 18	
21	136 41.3	0 52.0	314 41.3	114 32.2	7 52.8	60 54.6	24 37.3	35	17 55	18 20	
22	151 41.5	0 51.0	329 43.8	129 31.8	7 54.0	75 55.2	24 37.5	40	17 54	18 21	
23	166 41.8	0 50.0	344 46.2	144 31.5	7 55.3	90 55.9	24 37.7	45	17 54	18 23	
								50	17 54	18 25	
								S.55	17 53	18 28	

G.M.T.	Age	MOON	S.D.	JUPITER -2.3	SATURN +1.0	Lat.	Moon-rise	Moon-set		
	0 ^d .7	MOON	15'0	G.H.A.	Dec.	G.H.A.	Dec.	N.72		
00				310 05.5	N.16 43.5	163 47.8	S. 3 58.5	N.70	08.0 11	16.8 -3
01				325 08.1	16 43.5	178 50.0	3 58.6	68	07.7 9	17.2 -2
02				340 10.6	16 43.4	193 52.2	3 58.7	66	07.5 8	17.3 -1
03				355 13.2	16 43.4	208 54.4	3 58.9	64	07.4 8	17.4 -1
04				10 15.7	16 43.4	223 56.6	3 59.0	62	07.4 7	17.6 0
05				25 18.3	N.16 43.3	238 58.8	S. 3 59.1	N.60	07.3 7	17.7 0
06				40 20.8	16 43.3	254 01.0	3 59.2	58	07.2 7	17.7 0
07				55 23.4	16 43.3	269 03.2	3 59.3	56	07.2 6	17.8 0
08				70 25.9	16 43.3	284 05.4	3 59.4	54	07.1 6	17.9 +1
09				85 28.5	16 43.2	299 07.6	3 59.6	52	07.1 6	17.9 1
10				100 31.0	N.16 43.2	314 09.7	S. 3 59.7	N.50	07.0 6	18.0 1
11				115 33.6	16 43.2	329 11.9	3 59.8	45	06.9 5	18.1 2
12				130 36.1	16 43.1	344 14.1	3 59.9	40	06.8 5	18.2 2
13				145 38.7	16 43.1	359 16.3	4 00.0	35	06.8 5	18.3 2
14				160 41.2	16 43.1	14 18.5	4 00.1	30	06.7 5	18.4 2
15				34 36.1	15.4 S.	8 38.4	13.7	N.20	06.6 4	18.5 3
16				49 40.5	15.4	8 52.1	13.7	N.10	06.5 4	18.7 3
17				63 44.9	15.3	9 05.8	13.6	0	06.5 3	18.8 3
18				78 19.2	15.3	9 19.4	13.6	S.10	06.4 3	18.9 4
19				92 53.5	15.3	9 33.0	13.6	20	06.3 3	19.0 4
20				107 27.8	15.2 S.	9 46.6	13.6	S.30	06.2 2	19.2 5
21				122 02.0	15.1	10 00.2	13.5	35	06.1 2	19.3 5
22				136 36.1	15.1	10 13.7	13.5	40	06.1 2	19.3 5
23										

1952 September 23, Tuesday

G. M. T.	S.D.	SUN 16°0	ARIES	VENUS -3.3	MARS +0.5	Lat.	Twilight	Sun-rise		
	G.H.A.	Dec.	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	N.72	^h ₀₄ ^m ₃₅	^h ₀₅ ^m ₄₃
00	181	52.5 N. 0 02.3	1 47.0	159 12.7 S. 8 55.7	106 26.8 S.24 46.0	N.70	04 43	05 45		
01	196	52.7 0 01.4	16 49.5	174 12.3 8 57.0	121 27.4 24 46.2	68	04 49	05 44		
02	211	52.9 N. 0 00.4	31 51.9	189 11.9 8 58.2	136 28.0 24 46.4	66	04 54	05 46		
03	226	53.1 S. 0 00.6	46 54.4	204 11.5 8 59.4	151 28.7 24 46.5	64	04 58	05 46		
04	241	53.4 0 01.6	61 56.8	219 11.1 9 00.6	166 29.3 24 46.7	62	05 02	05 47		
05	256	53.6 S. 0 02.5	76 59.3	234 10.7 S. 9 01.9	181 29.9 S.24 46.8	N.60	05 05	05 47		
06	271	53.8 0 03.5	92 01.8	249 10.3 9 03.1	196 30.5 24 47.0	58	05 08	05 47		
07	286	54.0 0 04.5	107 04.2	264 09.9 9 04.3	211 31.1 24 47.2	56	05 10	05 47		
08	301	54.2 0 05.5	122 06.7	279 09.5 9 05.5	226 31.8 24 47.3	54	05 13	05 47		
09	316	54.5 0 06.4	137 09.2	294 09.1 9 06.7	241 32.4 24 47.5	52	05 14	05 47		
10	331	54.7 S. 0 07.4	152 11.6	309 08.8 S. 9 08.0	256 33.0 S.24 47.6	N.50	05 15	05 48		
11	346	54.9 0 08.4	167 14.1	324 08.4 9 09.2	271 33.6 24 47.8	45	05 19	05 48		
12	1 55.1	0 09.4	182 16.6	339 08.0 9 10.4	286 34.2 24 48.0	40	05 21	05 48		
13	16 55.3	0 10.3	197 19.0	354 07.6 9 11.6	301 34.9 24 48.1	35	05 23	05 48		
14	31 55.5	0 11.3	212 21.5	9 07.2 9 12.9	316 35.5 24 48.3	30	05 25	05 49		
15	46 55.8	S. 0 12.3	227 23.9	24 06.8 S. 9 14.1	331 36.1 S.24 48.4	N.20	05 28	05 49		
16	61 56.0	0 13.3	242 26.4	39 06.4 9 15.3	346 36.7 24 48.6	N.10	05 28	05 49		
17	76 56.2	0 14.2	257 28.9	54 06.0 9 16.5	1 37.3 24 48.7	0	05 29	05 49		
18	91 56.4	0 15.2	272 31.3	69 05.6 9 17.7	16 37.9 24 48.9	S.10	05 28	05 49		
19	106 56.6	0 16.2	287 33.8	84 05.2 9 19.0	31 38.6 24 49.1	20	05 27	05 49		
20	121 56.8	S. 0 17.1	302 36.3	99 04.8 S. 9 20.2	46 39.2 S.24 49.2	S.30	05 24	05 48		
21	136 57.1	0 18.1	317 38.7	114 04.4 9 21.4	61 39.8 24 49.4	35	05 22	05 48		
22	151 57.3	0 19.1	332 41.2	129 04.0 9 22.6	76 40.4 24 49.5	40	05 20	05 47		
23	166 57.5	0 20.1	347 43.7	144 03.6 9 23.8	91 41.0 24 49.7	45	05 17	05 46		
						50	05 13	05 46		
						S.55	05 09	05 45		

G. M. T.	Age	MOON	S.D.	JUPITER -2.3	SATURN +1.0	Lat.	Moon-rise	Moon-set
	3 ^d .7		15°3				^h ₀₄ ^m ₃₅	^h ₀₅ ^m ₄₃
00	143	31.5 11.1	S.20 24.8 10.4	313 09.9 N.16 41.2	166 25.5 S. 4 06.9	N.70	M.B.H.	M.B.H.
01	158	01.6 11.1	20 35.2 10.3	328 12.5 16 41.2	181 27.7 4 07.0	68	M.B.H.	M.B.H.
02	172	31.7 10.9	20 35.2 10.3	343 15.1 16 41.1	196 29.9 4 07.1	66	13.6 12	16.1 -3
03	187	01.6 10.9	20 55.8 10.1	358 17.7 16 41.1	211 32.1 4 07.2	64	12.8 10	16.9 -1
04	201	31.5 10.7	21 05.9 10.0	13 20.2 16 41.1	226 34.3 4 07.3	62	12.3 9	17.4 0
05	216	01.2 10.7	S.21 15.9 9.9	28 22.8 N.16 41.0	241 36.5 S. 4 07.4	N.60	11.9 8	17.8 +1
06	230	30.9 10.6	21 25.8 9.8	43 25.4 16 41.0	256 38.7 4 07.6	58	11.6 7	18.1 1
07	245	00.5 10.4	21 35.6 9.7	58 28.0 16 41.0	271.40.8 4 07.7	56	11.3 7	18.4 2
08	259	29.9 10.4	21 45.3 9.6	73 30.5 16 40.9	286 43.0 4 07.8	54	11.1 7	18.6 2
09	273	59.3 10.2	21 54.9 9.5	88 33.1 16 40.9	301 45.2 4 07.9	52	10.9 6	18.8 2
10	288	28.5 10.2	S.22 04.4 9.4	103 35.7 N.16 40.9	316 47.4 S. 4 08.0	N.50	10.7 6	19.0 2
11	302	57.7 10.1	22 13.8 9.3	118 38.3 16 40.8	331 49.6 4 08.1	45	10.4 6	19.4 3
12	317	26.8 10.0	22 23.1 9.2	133 40.8 16 40.8	346 51.8 4 08.3	40	10.1 5	19.7 3
13	331	55.8 9.8	22 32.3 9.1	148 43.4 16 40.8	1 54.0 4 08.4	35	09.9 5	19.9 3
14	346	24.6 9.8	22 41.4 9.0	163 46.0 16 40.7	16 56.2 4 08.5	30	09.7 5	20.1 3
15	0 53.4 9.7	S.22 50.4 8.8	178 48.6 N.16 40.7	31 58.4 S. 4 08.6	N.20	09.3 5	20.5 4	
16	15 22.1 9.6	22 59.2 8.8	193 51.2 16 40.6	47 00.5 4 08.7	N.10	09.0 4	20.8 4	
17	29 50.7 9.4	23 08.0 8.6	208 53.7 16 40.6	62 02.7 4 08.8	0	08.7 4	21.1 4	
18	44 19.1 9.4	23 16.6 8.5	223 56.3 16 40.6	77 04.9 4 09.0	S.10	08.4 4	21.4 5	
19	58 47.5 9.3	23 25.1 8.4	238 58.9 16 40.5	92 07.1 4 09.1	20	08.1 3	21.8 5	
20	73 15.8 9.2	S.23 33.5 8.3	254 01.5 N.16 40.5	107 09.3 S. 4 09.2	S.30	07.8 3	22.2 5	
21	87 44.0 9.1	23 41.8 8.1	269 04.1 16 40.5	122 11.5 4 09.3	35	07.6 3	22.4 5	
22	102 12.1 9.0	23 49.9 8.1	284 06.6 16 40.4	137 13.7 4 09.4	40	07.4 3	22.6 6	
23	116 40.1 8.8	23 58.0 7.9	299 09.2 16 40.4	152 15.9 4 09.5	45	07.1 2	23.0 6	
					50	06.8 2	23.3 6	
					S.55	06.4 1	23.9 7	

H.P. 4^h, 56'3; 12^h, 56'5; 20^h, 56'7 v 2.6 d 0.0 v 2.2 d -0.1

1952 September 27, Saturday

G. M. T.	S.D.	SUN 16°0	ARIES	VENUS -3.3	MARS +0.6	Lat.	Twilight	Sun-rise		
	G.H.A.	Dec.	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	N.72	^h ₀₄ ^m ₅₄	^h ₀₆ ^m ₀₁
00	182	13.1 S. 1 31.2	5 43.5	158 33.8 S.10 51.8	107 25.0 S.25 00.0	N.70	04 59	06 00		
01	197	13.4 1 32.2	20 46.0	173 33.3 10 53.0	122 25.5 25 00.1	68	05 03	05 59		
02	212	13.6 1 33.2	35 48.5	188 32.9 10 54.2	137 26.1 25 00.2	66	05 07	05 58		
03	227	13.8 1 34.1	50 50.9	203 32.5 10 55.3	152 26.7 25 00.4	64	05 10	05 57		
04	242	14.0 1 35.1	65 53.4	218 32.1 10 56.5	167 27.3 25 00.5	62	05 13	05 57		
05	257	14.2 S. 1 36.1	80 55.9	233 31.7 S.10 57.7	182 27.9 S.25 00.6	N.60	05 14	05 56		
06	272	14.4 1 37.1	95 58.3	248 31.2 10 58.9	197 28.5 25 00.7	58	05 16	05 56		
07	287	14.6 1 38.0	111 00.8	263 30.8 11 00.1	212 29.1 25 00.9	56	05 18	05 55		
08	302	14.8 1 39.0	126 03.3	278 30.4 11 01.3	227 29.7 25 01.0	54	05 19	05 55		
09	317	15.1 1 40.0	141 05.7	293 30.0 11 02.5	242 30.3 25 01.1	52	05 20	05 54		
10	332	15.3 S. 1 41.0	156 08.2	308 29.5 S.11 03.7	257 30.8 S.25 01.2	N.50	05 21	05 54		
11	347	15.5 1 41.9	171 10.6	323 29.1 11 04.8	272 31.4 25 01.4	45	05 23	05 53		
12	2 15.7	1 42.9	186 13.1	338 28.7 11 06.0	287 32.0 25 01.5	40	05 24	05 52		
13	17 15.9	1 43.9	201 15.6	353 28.3 11 07.2	302 32.6 25 01.6	35	05 26	05 51		
14	32 16.1	1 44.9	216 18.0	8 27.8 11 08.4	317 33.2 25 01.7	30	05 27	05 51		
15	47 16.3	S. 1 45.8	231 20.5	23 27.4 S.11 09.6	332 33.8 S.25 01.9	N.20	05 28	05 50		
16	62 16.5	1 46.8	246 23.0	38 27.0 11 10.8	347 34.4 25 02.0	N.10	05 27	05 49		
17	77 16.7	1 47.8	261 25.4	53 26.6 11 11.9	2 34.9 25 02.1	0	05 27	05 48		
18	92 16.9	1 48.8	276 27.9	68 26.1 11 13.1	17 35.5 25 02.2	S.10	05 26	05 47		
19	107 17.2	1 49.7	291 30.4	83 25.7 11 14.3	32 36.1 25 02.4	20	05 23	05 45		
20	122 17.4	S. 1 50.7	306 32.8	98 25.3 S.11 15.5	47 36.7 S.25 02.5	S.30	05 19	05 43		
21	137 17.6	1 51.7	321 35.3	113 24.8 11 16.7	62 37.3 25 02.6	35	05 16	05 42		
22	152 17.8	1 52.7	336 37.7	128 24.4 11 17.9	77 37.9 25 02.7	40	05 13	05 41		
23	167 18.0	1 53.6	351 40.2	143 24.0 11 19.0	92 38.5 25 02.8	45	05 09	05 40		
						50	05 04	05 38		
						S.55	04 59	05 36		

G. M. T.	Age	MOON	S.D.	JUPITER -2.3	SATURN	Lat.	Moon-rise	Moon-set
	7 ^d .7		16°0				^h ₀₄ ^m ₅₄	^h ₀₆ ^m ₀₁
00	89	20.9 4.9	S.26 58.7 3.8	317 18.6 N.16 37.5		N.70	M.B.H.	M.B.H.
01	103	44.8 4.8	26 54.9 4.0	332 21.2 16 37.5		68	M.B.H.	M.B.H.
02	118	08.6 4.9	26 50.9 4.2	347 23.8 16 37.4		66	M.B.H.	M.B.H.
03	132	32.5 4.8	26 46.7 4.3	2 26.4 16 37.4		64	18.0 -3	19.8 12
04	146	56.3 4.9	26 42.4 4.6	17 29.0 16 37.3		62	17.0 0	20.7 10
05	161	20.2 4.9	S.26 37.8 4.7	32 31.6 N.16 37.3		N.60	16.5 +1	21.3 9
06	175	44.1 4.9	26 33.1 4.9	47 34.2 16 37.2		58	16.0 2	21.7 8
07	190	08.0 5.0	26 28.2 5.1	62 36.8 16 37.2		56	15.7 2	22.0 7
08	204	32.0 4.9	26 23.1 5.2	77 39.4 16 37.1		54	15.4 3	22.3 7
09	218	55.9 5.0	26 17.9 5.4	92 42.1 16 37.1		52	15.2 3	22.5 7
10	233	19.9 5.0	S.26 12.5 5.6	107 44.7 N.16 37.1		N.50	15.0 3	22.7 7
11	247	43.9 5.1	26 06.9 5.8	122 47.3 16 37.0		45	14.6 4	23.1 6
12	262	08.0 5.0	26 01.1 6.0	137 49.9 16 37.0		40	14.2 4	23.4 6
13	276	32.0 5.1	25 55.1 6.1	152 52.5 16 36.9		35	13.9 4	23.7 6
14	290	56.1 5.2	25 49.0 6.3	167 55.1 16 36.9		30	13.7 4	24.0 6
15	305	20.3 5.1	S.25 42.7 6.4	182 57.7 N.16 36.8		N.20	13.3 4	(23.3) 5
16	319	44.4 5.2	25 36.3 6.7	198 00.3 16 36.8		N.10	12.9 5	(23.7) 5
17	334	08.6 5.3	25 29.6 6.8	213 02.9 16 36.8		0	12.5 5	00.0 5
18	348	32.9 5.2	25 22.8 7.0	228 05.5 16 36.7		S.10	12.2 5	00.4 5
19	2 57.1 5.4	25 15.8 7.1	243 08.2 16 36.7		20	11.8 5	00.8 5	
20	17 21.5 5.3	S.25 08.7 7.4	258 10.8 N.16 36.6		S.30	11.4 6	01.2 5	
21	31 45.8 5.4	25 01.3 7.4	273 13.4 16 36.6		35	11.2 6	01.5 4	
22	46 10.2 5.4	24 53.9 7.7	288 16.0 16 36.5		40	10.9 6		

Table with columns: Lat., Sun-set, Twi-light, M. T., S.D., SUN 16°0, ARIES, VENUS -3.3, MARS +0.6. Includes data for various latitudes from N.70 to S.55.

Table with columns: G. M. T., S.D., SUN 16°0, ARIES, VENUS -3.3, MARS +0.6, Lat., Twi-light, Sun-rise. Includes data for various latitudes from N.70 to S.55.

Table with columns: Lat., Moon-rise, Moon-set, G. M. T., Age 8d.7, MOON, S.D. 16°1, JUPITER -2.3, SATURN. Includes data for various latitudes from N.72 to S.55.

Table with columns: G. M. T., Age 15d.7, MOON, S.D. 16°1, JUPITER -2.4, SATURN, Lat., Moon-rise, Moon-set. Includes data for various latitudes from N.72 to S.55.

SATURN IS TOO CLOSE TO THE SUN FOR OBSERVATION

SATURN IS TOO CLOSE TO THE SUN FOR OBSERVATION

1952 October 6, Monday

Lat.	Sun-set	Twilight	G. M. T.	S.D. SUN 16°0	ARIES	VENUS -3.3	MARS +0.6			
	h m	h m		G.H.A. Dec.	G.H.A.	G.H.A. Dec.	G.H.A. Dec.			
N.72	16 56	18 07								
N.70	17 02	18 05	00	182 56.4 S. 5 00.5	14 35.8	156 53.8 S.14 57.5	109 25.8 S.25 18.9			
68	17 07	18 05	01	197 56.6 5 01.5	29 38.2	171 53.2 14 58.6	124 26.3 25 18.9			
66	17 11	18 04	02	212 56.8 5 02.4	44 40.7	186 52.7 14 59.6	139 26.9 25 19.0			
64	17 14	18 03	03	227 56.9 5 03.4	59 43.2	201 52.2 15 00.7	154 27.4 25 19.0			
62	17 17	18 03	04	242 57.1 5 04.4	74 45.6	216 51.7 15 01.8	169 27.9 25 19.1			
N.60	17 20	18 03	05	257 57.3 S. 5 05.3	89 48.1	231 51.2 S.15 02.9	184 28.5 S.25 19.1			
58	17 22	18 03	06	272 57.5 5 06.3	104 50.6	246 50.7 15 03.9	199 29.0 25 19.2			
56	17 24	18 03	07	287 57.7 5 07.2	119 53.0	261 50.2 15 05.0	214 29.5 25 19.2			
54	17 26	18 02	08	302 57.9 5 08.2	134 55.5	276 49.7 15 06.1	229 30.0 25 19.2			
52	17 28	18 02	09	317 58.0 5 09.2	149 58.0	291 49.1 15 07.2	244 30.6 25 19.3			
N.50	17 29	18 03	10	332 58.2 S. 5 10.1	165 00.4	306 48.6 S.15 08.2	259 31.1 S.25 19.3			
45	17 33	18 03	11	347 58.4 5 11.1	180 02.9	321 48.1 15 09.3	274 31.6 25 19.4			
40	17 36	18 03	12	2 58.6 5 12.0	195 05.4	336 47.6 15 10.4	289 32.2 25 19.4			
35	17 38	18 04	13	17 58.8 5 13.0	210 07.8	351 47.1 15 11.4	304 32.7 25 19.4			
30	17 40	18 05	14	32 59.0 5 14.0	225 10.3	6 46.6 15 12.5	319 33.2 25 19.5			
N.20	17 44	18 07	15	47 59.1 S. 5 14.9	240 12.7	21 46.1 S.15 13.6	334 33.7 S.25 19.5			
N.10	17 48	18 09	16	62 59.3 5 15.9	255 15.2	36 45.5 15 14.6	349 34.3 25 19.6			
0	17 51	18 12	17	77 59.5 5 16.8	270 17.7	51 45.0 15 15.7	4 34.8 25 19.6			
S.10	17 55	18 17	18	92 59.7 5 17.8	285 20.1	66 44.5 15 16.8	19 35.3 25 19.6			
20	17 58	18 21	19	107 59.9 5 18.7	300 22.6	81 44.0 15 17.8	34 35.9 25 19.7			
S.30	18 03	18 28	20	123 00.0 S. 5 19.7	315 25.1	96 43.5 S.15 18.9	49 36.4 S.25 19.7			
35	18 06	18 32	21	138 00.2 5 20.7	330 27.5	111 43.0 15 20.0	64 36.9 25 19.8			
40	18 09	18 37	22	153 00.4 5 21.6	345 30.0	126 42.4 15 21.0	79 37.4 25 19.8			
45	18 12	18 42	23	168 00.6 5 22.6	0 32.5	141 41.9 15 22.1	94 38.0 25 19.8			
50	18 16	18 49								
S.55	18 21	18 58								
				T=11 ^h 48 ^m	d=1.0	T=22 ^h 58 ^m	v=-0.5 d=1.1	v=0.5 d=0.0		

Lat.	Moon-rise	Moon-set	G. M. T.	Age 16 ^h .7	MOON	S.D. 15 ^h .9	JUPITER -2.4	SATURN
	h m	h m			G.H.A. v Dec. d	G.H.A. Dec.	G.H.A. Dec.	
N.72								
N.70			00	332 55.2 8.3	N.21 25.4 10.4	326 49.0 N.16 26.4		
68			01	347 22.5 8.3	21 35.8 10.3	341 51.6 16 26.3		
66	15.0 -4	13.4 14	02	1 49.8 8.2	21 46.1 10.1	356 54.3 16 26.3		
64	16.1 -1	12.4 11	03	16 17.0 8.2	21 56.2 10.0	11 57.0 16 26.2		
62	16.7 0	11.8 9	04	30 44.2 8.1	22 06.2 9.9	26 59.7 16 26.1		
N.60	17.1 +1	11.4 8	05	45 11.3 8.2	N.22 16.1 9.7	42 02.3 N.16 26.1		
58	17.4 1	11.1 8	06	59 38.5 8.0	22 25.8 9.5	57 05.0 16 26.0		SATURN IS
56	17.7 2	10.8 7	07	74 05.5 8.1	22 35.3 9.5	72 07.7 16 26.0		TOO CLOSE
54	17.9 2	10.6 7	08	88 32.6 8.0	22 44.8 9.3	87 10.4 16 25.9		TO THE SUN
52	18.1 2	10.4 7	09	102 59.6 8.0	22 54.1 9.1	102 13.1 16 25.8		FOR
N.50	18.3 3	10.2 7	10	117 26.6 7.9	N.23 03.2 9.0	117 15.7 N.16 25.8		OBSERVATION
45	18.7 3	09.8 6	11	131 53.5 7.9	23 12.2 8.9	132 18.4 16 25.7		
40	19.0 3	09.5 6	12	146 20.4 7.9	23 21.1 8.7	147 21.1 16 25.7		
35	19.3 4	09.3 6	13	160 47.3 7.8	23 29.8 8.5	162 23.8 16 25.6		
30	19.5 4	09.1 5	14	175 14.1 7.8	23 38.3 8.4	177 26.4 16 25.5		
N.20	19.9 4	08.7 5	15	189 40.9 7.8	N.23 46.7 8.3	192 29.1 N.16 25.5		
N.10	20.2 4	08.4 5	16	204 07.7 7.8	23 55.0 8.1	207 31.8 16 25.4		
0	20.6 4	08.1 4	17	218 34.5 7.7	24 03.1 8.0	222 34.5 16 25.3		
S.10	20.9 5	07.8 4	18	233 01.2 7.7	24 11.1 7.8	237 37.2 16 25.3		
20	21.2 5	07.5 4	19	247 27.9 7.7	24 18.9 7.7	252 39.8 16 25.2		
S.30	21.6 5	07.1 4	20	261 54.6 7.7	N.24 26.6 7.5	267 42.5 N.16 25.2		
35	21.9 5	06.9 3	21	276 21.3 7.6	24 34.1 7.4	282 45.2 16 25.1		
40	22.1 6	06.7 3	22	290 47.9 7.6	24 41.5 7.2	297 47.9 16 25.0		
45	22.5 6	06.4 3	23	305 14.5 7.6	24 48.7 7.1	312 50.6 16 25.0		
50	22.9 6	06.0 2						
S.55	23.4 7	05.6 2						
				H.P. 4 ^h , 58 ^h .1 ; 12 ^h , 57 ^h .8 ; 20 ^h , 57 ^h .5		v=2.7 d=0.1		

1952 October 19, Sunday

G. M. T.	S.D. SUN 16°1	ARIES	VENUS -3.4	MARS +0.7	Lat.	Twilight	Sun-rise	
	G.H.A. Dec.	G.H.A.	G.H.A. Dec.	G.H.A. Dec.	N.72	h m	h m	
00	183 44.0 S. 9 52.8	27 24.6	153 50.4 S.19 59.0	112 01.5 S.25 13.0	N.70	06 26	07 31	
01	198 44.1 9 53.7	42 27.0	168 49.8 19 59.8	127 01.9 25 12.9	68	06 21	07 20	
02	213 44.2 9 54.7	57 29.5	183 49.1 20 00.7	142 02.4 25 12.8	66	06 16	07 10	
03	228 44.3 9 55.6	72 32.0	198 48.4 20 01.5	157 02.9 25 12.7	64	06 12	07 02	
04	243 44.4 9 56.5	87 34.4	213 47.7 20 02.3	172 03.4 25 12.6	62	06 09	06 55	
05	258 44.5 S. 9 57.4	102 36.9	228 47.1 S.20 03.2	187 03.8 S.25 12.5	N.60	06 07	06 49	
06	273 44.7 9 58.3	117 39.4	243 46.4 20 04.0	202 04.3 25 12.4	58	06 04	06 44	
07	288 44.8 9 59.2	132 41.8	258 45.7 20 04.8	217 04.8 25 12.4	56	06 02	06 40	
08	303 44.9 10 00.1	147 44.3	273 45.1 20 05.7	232 05.2 25 12.3	54	06 00	06 36	
09	318 45.0 10 01.0	162 46.8	288 44.4 20 06.5	247 05.7 25 12.2	52	05 58	06 32	
10	333 45.1 S.10 01.9	177 49.2	303 43.7 S.20 07.3	262 06.2 S.25 12.1	N.50	05 56	06 28	
11	348 45.2 10 02.8	192 51.7	318 43.0 20 08.2	277 06.7 25 12.0	45	05 51	06 21	
12	3 45.3 10 03.7	207 54.2	333 42.4 20 09.0	292 07.1 25 11.9	40	05 47	06 14	
13	18 45.4 10 04.6	222 56.6	348 41.7 20 09.8	307 07.6 25 11.8	35	05 43	06 09	
14	33 45.6 10 05.5	237 59.1	3 41.0 20 10.7	322 08.1 25 11.7	30	05 40	06 04	
15	48 45.7 S.10 06.4	253 01.5	18 40.3 S.20 11.5	337 08.5 S.25 11.6	N.20	05 34	05 56	
16	63 45.8 10 07.3	268 04.0	33 39.7 20 12.3	352 09.0 25 11.5	N.10	05 27	05 49	
17	78 45.9 10 08.2	283 06.5	48 39.0 20 13.1	7 09.5 25 11.5	0	05 21	05 42	
18	93 46.0 10 09.1	298 08.9	63 38.3 20 14.0	22 09.9 25 11.4	S.10	05 13	05 35	
19	108 46.1 10 10.0	313 11.4	78 37.6 20 14.8	37 10.4 25 11.3	20	05 04	05 27	
20	123 46.2 S.10 10.9	328 13.9	93 36.9 S.20 15.6	52 10.9 S.25 11.2	S.30	04 53	05 18	
21	138 46.3 10 11.8	343 16.3	108 36.3 20 16.4	67 11.4 25 11.1	35	04 46	05 13	
22	153 46.4 10 12.7	358 18.8	123 35.6 20 17.2	82 11.8 25 11.0	40	04 37	05 07	
23	168 46.5 10 13.6	13 21.3	138 34.9 20 18.1	97 12.3 25 10.9	45	04 28	04 59	
	T=11 ^h 45 ^m	d=0.9	T=22 ^h 07 ^m	v=-0.7 d=0.8	v=0.5 d=0.1	S.55	04 16	04 50
							04 00	04 40

G. M. T.	Age 0 ^h .1	MOON	S.D. 15 ^h .2	JUPITER -2.4	SATURN	Lat.	Moon-rise	Moon-set
		G.H.A. Dec.		G.H.A. Dec.		N.72	h m	h m
00		340 56.4 N.16 04.3				N.70	09.6 11	14.1 -4
01		355 59.1 16 04.2				68	09.1 12	14.7 -4
02		11 01.9 16 04.1				66	08.7 10	15.1 -2
03		26 04.6 16 04.0				64	08.4 9	15.4 -1
04		41 07.4 16 04.0				62	08.1 8	15.7 0
05		56 10.1 N.16 03.9				N.60	07.9 8	15.9 0
06		71 12.9 16 03.8				58	07.8 7	16.1 +1
07		86 15.6 16 03.7			SATURN IS	56	07.6 7	16.3 1
08		101 18.4 16 03.6			TOO CLOSE	54	07.5 7	16.4 1
09		116 21.1 16 03.6			TOO CLOSE	52	07.3 6	16.6 1
10		131 23.9 N.16 03.5			TO THE SUN	N.50	07.2 6	16.7 2
11		146 26.7 16 03.4			FOR	45	07.0 6	16.9 2
12		161 29.4 16 03.3			OBSERVATION	40	06.8 5	17.1 2
13		176 32.2 16 03.2				35	06.6 5	17.3 3
14		191 34.9 16 03.1				30	06.5 5	17.5 3
15		206 37.7 N.16 03.1				N.20	06.3 4	17.8 3
16		221 40.4 16 03.0				N.10	06.1 4	18.0 4
17		236 43.2 16 02.9				0	05.9 4	18.2 4
18		251 45.9 16 02.8				S.10	05.7 3	18.5 4
19		266 48.7 16 02.7				20	05.5 3	18.7 5
20		281 51.5 N.16 02.7				S.30	05.2 3	19.0 5
21		296 54.2 16 02.6				35	05.1 2	19.2 5
22		311 57.0 16 02.5				40	04.9 2	19.3 6
23		326 59.7 16 02.4				45	04.8 2	19.6 6
						50	04.5 1	19.8 6
						S.55	04.3 1	20.2 7
				H.P. 4 ^h , 56 ^h .0 ; 12 ^h , 56 ^h .2 ; 20 ^h , 56 ^h .4		v=2.8 d=0.1		

1952 October 27, Monday

G. M. T.	S.D. SUN 16° I		ARIES		VENUS -3.4		MARS +0.8		Lat.	Twilight	Sun-rise
	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.			
00	184 00.7	S.12 41.5	35 17.7	151 32.7	S.22 22.5	113 30.0	S.24 48.4	N.70	06 57	08 07	
01	199 00.8	12 42.4	50 20.2	166 31.9	22 23.1	128 30.5	24 48.3	68	06 48	07 52	
02	214 00.9	12 43.2	65 22.6	181 31.1	22 23.8	143 30.9	24 48.1	66	06 41	07 38	
03	229 00.9	12 44.1	80 25.1	196 30.4	22 24.4	158 31.4	24 47.9	64	06 35	07 27	
04	244 01.0	12 44.9	95 27.6	211 29.6	22 25.1	173 31.8	24 47.8	62	06 30	07 18	
05	259 01.0	S.12 45.8	110 30.0	226 28.8	S.22 25.7	188 32.3	S.24 47.6	N.60	06 26	07 09	
06	274 01.1	12 46.6	125 32.5	241 28.1	22 26.3	203 32.8	24 47.4	58	06 22	07 03	
07	289 01.1	12 47.5	140 34.9	256 27.3	22 27.0	218 33.2	24 47.3	56	06 18	06 57	
08	304 01.2	12 48.3	155 37.4	271 26.5	22 27.6	233 33.7	24 47.1	54	06 14	06 51	
09	319 01.3	12 49.1	170 39.9	286 25.8	22 28.3	248 34.1	24 46.9	52	06 11	06 46	
10	334 01.3	S.12 50.0	185 42.3	301 25.0	S.22 28.9	263 34.6	S.24 46.7	N.50	06 08	06 41	
11	349 01.4	12 50.8	200 44.8	316 24.2	22 29.6	278 35.0	24 46.6	45	06 01	06 31	
12	4 01.4	12 51.7	215 47.3	331 23.5	22 30.2	293 35.5	24 46.4	40	05 55	06 23	
13	19 01.5	12 52.5	230 49.7	346 22.7	22 30.8	308 35.9	24 46.2	35	05 50	06 16	
14	34 01.5	12 53.4	245 52.2	1 21.9	22 31.5	323 36.4	24 46.0	30	05 45	06 10	
15	49 01.6	S.12 54.2	260 54.7	16 21.1	S.22 32.1	338 36.8	S.24 45.8	N.20	05 37	05 59	
16	64 01.6	12 55.1	275 57.1	31 20.4	22 32.7	353 37.3	24 45.7	N.10	05 28	05 50	
17	79 01.7	12 55.9	290 59.6	46 19.6	22 33.4	8 37.7	24 45.5	0	05 19	05 41	
18	94 01.7	12 56.7	306 02.0	61 18.8	22 34.0	23 38.2	24 45.3	S.10	05 10	05 31	
19	109 01.8	12 57.6	321 04.5	76 18.1	22 34.6	38 38.6	24 45.1	20	04 59	05 22	
20	124 01.9	S.12 58.4	336 07.0	91 17.3	S.22 35.2	53 39.1	S.24 45.0	S.30	04 45	05 10	
21	139 01.9	12 59.3	351 09.4	106 16.5	22 35.9	68 39.5	24 44.8	35	04 37	05 03	
22	154 02.0	13 00.1	6 11.9	121 15.7	22 36.5	83 40.0	24 44.6	40	04 27	04 55	
23	169 02.0	13 00.9	21 14.4	136 15.0	22 37.1	98 40.4	24 44.4	45	04 15	04 46	
	T=11 ^h 44 ^m d=0.8		T=21 ^h 35 ^m v=-0.8 d=0.6		v=0.5 d=0.2		S.50		04 00	04 35	
							S.55		03 41	04 21	

G. M. T.	Age 8 ^d .1 MOON S.D. 16° 2				JUPITER -2.4		SATURN		Lat.	Moon-rise	Moon-set
	G.H.A.	v	Dec.	d	G.H.A.	Dec.	G.H.A.	Dec.			
00	78 20.0	9.1	S.16 51.7	13.3	349 48.3	N.15 47.9		N.72	16.4 -3	23.0 12	
01	92 48.1	9.2	16 38.4	13.4	4 51.1	15 47.9		N.70	16.0 -2	23.3 13	
02	107 16.3	9.2	16 25.0	13.5	19 53.8	15 47.8		68	15.7 -2	23.6 11	
03	121 44.5	9.3	16 11.5	13.7	34 56.6	15 47.7		66	15.5 -1	23.8 10	
04	136 12.8	9.4	15 57.8	13.7	49 59.4	15 47.6		64	15.3 -1	(22.0) 10	
05	150 41.2	9.4	S.15 44.1	13.7	65 02.2	N.15 47.5		62	15.1 0	(22.3) 9	
06	165 09.6	9.5	15 30.4	13.9	80 05.0	15 47.4		N.60	14.9 0	(22.5) 9	
07	179 38.1	9.6	15 16.5	14.0	95 07.8	15 47.3		58	14.8 0	(22.7) 8	
08	194 06.7	9.6	15 02.5	14.1	110 10.6	15 47.2		56	14.7 +1	(22.9) 8	
09	208 35.3	9.7	14 48.4	14.1	125 13.3	15 47.1		54	14.6 1	(23.0) 8	
10	223 04.0	9.7	S.14 34.3	14.3	140 16.1	N.15 47.1		52	14.5 1	(23.2) 7	
11	237 32.7	9.8	14 20.0	14.3	155 18.9	15 47.0		N.50	14.4 2	(23.3) 7	
12	252 01.5	9.9	14 05.7	14.4	170 21.7	15 46.9		45	14.2 2	(23.6) 7	
13	266 30.4	9.9	13 51.3	14.5	185 24.5	15 46.8		40	14.1 2	(23.8) 6	
14	280 59.3	10.0	13 36.8	14.6	200 27.3	15 46.7		35	13.9 3	(23.9) 6	
15	295 28.3	10.0	S.13 22.2	14.6	215 30.1	N.15 46.6		30	13.8 3	00.1 5	
16	309 57.3	10.1	13 07.6	14.7	230 32.9	15 46.5		N.20	13.6 3	00.3 5	
17	324 26.4	10.1	12 52.9	14.8	245 35.6	15 46.4		N.10	13.4 4	00.6 5	
18	338 55.5	10.2	12 38.1	14.9	260 38.4	15 46.3		0	13.2 4	00.8 4	
19	353 24.7	10.3	12 23.1	14.9	275 41.2	15 46.3		S.10	13.1 5	01.0 4	
20	7 54.0	10.3	S.12 08.3	15.0	290 44.0	N.15 46.2		20	12.9 5	01.2 3	
21	22 23.3	10.3	11 53.3	15.1	305 46.8	15 46.1		S.30	12.7 6	01.5 3	
22	36 52.6	10.4	11 38.2	15.2	320 49.6	15 46.0		35	12.6 6	01.6 3	
23	51 22.0	10.5	11 23.0	15.2	335 52.4	15 45.9		40	12.4 6	01.8 3	
	H.P. 4 ^h , 59' 4 ; 12 ^h , 59' 5 ; 20 ^h , 59' 5				v=2.8 d=0.1				45	12.3 7	02.0 2
									50	12.1 7	02.2 2
									S.55	11.8 8	02.5 1

1952 October 28, Tuesday

G. M. T.	S.D. SUN 16° I		ARIES		VENUS -3.4		MARS +0.8		Lat.	Sun-set	Twilight
	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.			
00	184 02.1	S.13 01.8	36 16.8	151 14.2	S.22 37.7	113 40.9	S.24 44.2	N.72	14 57	16 20	
01	199 02.1	13 02.6	51 19.3	166 13.4	22 38.4	128 41.4	24 44.1	N.70	15 18	16 31	
02	214 02.2	13 03.5	66 21.8	181 12.6	22 39.0	143 41.8	24 43.9	68	15 35	16 39	
03	229 02.2	13 04.3	81 24.2	196 11.9	22 39.6	158 42.3	24 43.7	66	15 48	16 46	
04	244 02.3	13 05.1	96 26.7	211 11.1	22 40.2	173 42.7	24 43.5	64	15 59	16 52	
05	259 02.3	S.13 06.0	111 29.2	226 10.3	S.22 40.9	188 43.2	S.24 43.3	62	16 08	16 57	
06	274 02.4	13 06.8	126 31.6	241 09.5	22 41.5	203 43.6	24 43.1	N.60	16 17	17 02	
07	289 02.4	13 07.7	141 34.1	256 08.8	22 42.1	218 44.1	24 43.0	58	16 24	17 06	
08	304 02.5	13 08.5	156 36.5	271 08.0	22 42.7	233 44.5	24 42.8	56	16 30	17 10	
09	319 02.5	13 09.3	171 39.0	286 07.2	22 43.3	248 45.0	24 42.6	54	16 36	17 14	
10	334 02.6	S.13 10.2	186 41.5	301 06.4	S.22 43.9	263 45.4	S.24 42.4	52	16 41	17 17	
11	349 02.6	13 11.0	201 43.9	316 05.6	22 44.5	278 45.9	24 42.2	N.50	16 45	17 20	
12	4 02.6	13 11.8	216 46.4	331 04.9	22 45.2	293 46.3	24 42.0	45	16 55	17 26	
13	19 02.7	13 12.7	231 48.9	346 04.1	22 45.8	308 46.8	24 41.9	40	17 03	17 32	
14	34 02.7	13 13.5	246 51.3	1 03.3	22 46.4	323 47.2	24 41.7	35	17 10	17 37	
15	49 02.8	S.13 14.3	261 53.8	16 02.5	S.22 47.0	338 47.7	S.24 41.5	30	17 17	17 42	
16	64 02.8	13 15.2	276 56.3	31 01.7	22 47.6	353 48.1	24 41.3	N.20	17 28	17 51	
17	79 02.9	13 16.0	291 58.7	46 00.9	22 48.2	8 48.6	24 41.1	N.10	17 38	18 00	
18	94 02.9	13 16.8	307 01.2	61 00.2	22 48.8	23 49.0	24 40.9	0	17 47	18 09	
19	109 03.0	13 17.7	322 03.7	75 59.4	22 49.4	38 49.5	24 40.7	S.10	17 57	18 19	
20	124 03.0	S.13 18.5	337 06.1	90 58.6	S.22 50.0	53 49.9	S.24 40.5	20	18 07	18 30	
21	139 03.1	13 19.3	352 08.6	105 57.8	22 50.6	68 50.4	24 40.3	S.30	18 19	18 44	
22	154 03.1	13 20.2	7 11.0	120 57.0	22 51.2	83 50.8	24 40.2	35	18 26	18 52	
23	169 03.1	13 21.0	22 13.5	135 56.2	22 51.8	98 51.3	24 40.0	40	18 34	19 02	
	T=11 ^h 44 ^m d=0.8		T=21 ^h 31 ^m v=-0.8 d=0.6		v=0.5 d=0.2		S.50		18 43	19 14	
							S.55		18 54	19 28	
									19 08	19 48	

G. M. T.	Age 9 ^d .1 MOON S.D. 16° 2				JUPITER -2.4		SATURN		Lat.	Moon-rise	Moon-set
	G.H.A.	v	Dec.	d	G.H.A.	Dec.	G.H.A.	Dec.			
00	65 51.5	10.5	S.11 07.8	15.3	350 55.2	N.15 45.8		N.72	15.7 -3	25.5 12	
01	80 21.0	10.5	10 52.5	15.3	5 57.9	15 45.7		N.70	15.5 -2	25.6 11	
02	94 50.5	10.6	10 37.2	15.4	21 00.7	15 45.6		68	15.3 -2	25.7 10	
03	109 20.1	10.7	10 21.8	15.5	36 03.5	15 45.5		66	15.2 -1	25.8 10	
04	123 49.8	10.6	10 06.3	15.5	51 06.3	15 45.4		64	15.1 -1	00.0 10	
05	138 19.4	10.8	S. 9 50.8	15.5	66 09.1	N.15 45.4		62	15.0 0	00.1 9	
06	152 49.2	10.7	9 35.3	15.7	81 11.9	15 45.3		N.60	15.0 0	00.3 9	
07	167 18.9	10.8	9 19.6	15.7	96 14.7	15 45.2		58	14.9 0	00.4 8	
08	181 48.7	10.9	9 03.9	15.7	111 17.5	15 45.1		56	14.8 +1	00.5 8	
09	196 18.6	10.9	8 48.2	15.8	126 20.2	15 45.0		54	14.8 1	00.6 8	
10	210 48.5	10.9	S. 8 32.4	15.8	141 23.0	N.15 44.9		52	14.7 1	00.6 7	
11	225 18.4	11.0	8 16.6	15.9	156 25.8	15 44.8		N.50	14.7 1	00.7 7	
12	239 48.4	11.0	8 00.7	15.9	171 28.6	15 44.7		45	14.6 2	00.9 6	
13	254 18.4	11.0	7 44.8	16.0	186 31.4	15 44.6		40	14.5 2	01.0 6	
14	268 48.4	11.0	7 28.8	16.0	201 34.2	15 44.5		35	14.4 2	01.1 6	
15	283 18.4	11.1	S. 7 12.8	16.0	216 37.0	N.15 44.5		30	14.4 3	01.2 5	
16	297 48.5	11.2	6 56.8	16.1	231 39.8	15 44.4		N.20	14.3 3		

1952 December 14, Sunday

G. M. T.	S.D. SUN 16°3		ARIES		VENUS -3.6		MARS +1.1		Lat.	Twilight	Sun-rise
	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.			
00	181 22.1	S.23 12.1	82 36.4		135 54.0	S.21 25.6	122 46.9	S.16 57.7	N.70	09 46	S.B.H.
01	196 21.8	23 12.3	97 38.8		150 53.4	21 24.8	137 47.4	16 57.1	68	09 12	S.B.H.
02	211 21.5	23 12.5	112 41.3		165 52.7	21 24.1	152 48.0	16 56.4	66	08 47	10 26
03	226 21.2	23 12.6	127 43.8		180 52.1	21 23.4	167 48.5	16 55.8	64	08 28	09 45
04	241 20.9	23 12.8	142 46.2		195 51.5	21 22.6	182 49.1	16 55.2	62	08 12	09 17
05	256 20.6	S.23 12.9	157 48.7		210 50.9	S.21 21.9	197 49.7	S.16 54.6	N.60	07 58	08 56
06	271 20.3	23 13.1	172 51.2		225 50.3	21 21.1	212 50.2	16 54.0	58	07 47	08 39
07	286 20.0	23 13.2	187 53.6		240 49.7	21 20.4	227 50.8	16 53.4	56	07 37	08 24
08	301 19.7	23 13.4	202 56.1		255 49.0	21 19.7	242 51.3	16 52.7	54	07 28	08 12
09	316 19.4	23 13.5	217 58.6		270 48.4	21 18.9	257 51.9	16 52.1	52	07 20	08 01
10	331 19.1	S.23 13.7	233 01.0		285 47.8	S.21 18.2	272 52.5	S.16 51.5	N.50	07 12	07 51
11	346 18.8	23 13.8	248 03.5		300 47.2	21 17.4	287 53.0	16 50.9	45	06 57	07 31
12	1 18.5	23 13.9	263 05.9		315 46.6	21 16.7	302 53.6	16 50.3	40	06 43	07 14
13	16 18.2	23 14.1	278 08.4		330 46.0	21 15.9	317 54.1	16 49.6	35	06 32	07 00
14	31 17.9	23 14.2	293 10.9		345 45.4	21 15.2	332 54.7	16 49.0	30	06 21	06 48
15	46 17.6	S.23 14.4	308 13.3		0 44.8	S.21 14.5	347 55.3	S.16 48.4	N.20	06 03	06 27
16	61 17.3	23 14.5	323 15.8		15 44.2	21 13.7	2 55.8	16 47.8	N.10	05 46	06 08
17	76 17.0	23 14.7	338 18.3		30 43.5	21 13.0	17 56.4	16 47.2	0	05 29	05 51
18	91 16.7	23 14.8	353 20.7		45 42.9	21 12.2	32 57.0	16 46.5	S.10	05 11	05 34
19	106 16.4	23 14.9	8 23.2		60 42.3	21 11.5	47 57.5	16 45.9	20	04 50	05 15
20	121 16.1	S.23 15.1	23 25.7		75 41.7	S.21 10.7	62 58.1	S.16 45.3	S.30	04 26	04 53
21	136 15.8	23 15.2	38 28.1		90 41.1	21 10.0	77 58.6	16 44.7	35	04 11	04 40
22	151 15.5	23 15.4	53 30.6		105 40.5	21 09.2	92 59.2	16 44.1	40	03 53	04 25
23	166 15.2	23 15.5	68 33.1		120 39.9	21 08.4	107 59.8	16 43.4	45	03 31	04 08
									50	03 02	03 45
									S.55	02 18	03 15

G. M. T.	Age 26 ^h .5 MOON S.D. 15°5				JUPITER -2.3		SATURN +0.9		Lat.	Moon-rise	Moon-set
	G.H.A.	v	Dec.	d	G.H.A.	Dec.	G.H.A.	Dec.			
00	224 04.0	10.2	S.20 30.1	10.3	42 50.1	N.14 14.5	238 38.2	S. 7 27.4	N.70	M.B.H.	M.B.H.
01	238 33.2	10.0	20 40.4	10.1	57 52.8	14 14.4	253 40.4	7 27.5	68	M.B.H.	M.B.H.
02	253 02.2	9.9	20 50.5	10.1	72 55.4	14 14.4	268 42.7	7 27.5	66	07.6 11	10.9 -2
03	267 31.1	9.7	21 00.6	10.0	87 58.1	14 14.3	283 45.0	7 27.6	64	07.0 11	11.6 -2
04	281 59.8	9.7	21 10.6	9.9	103 00.7	14 14.3	298 47.2	7 27.7	62	06.5 9	12.0 0
05	296 28.5	9.5	S.21 20.5	9.7	118 03.4	N.14 14.2	313 49.5	S. 7 27.7	N.60	06.2 8	12.4 +1
06	310 57.0	9.5	21 30.2	9.7	133 06.0	14 14.2	328 51.7	7 27.8	58	05.9 7	12.7 1
07	325 25.5	9.3	21 39.9	9.6	148 08.7	14 14.1	343 54.0	7 27.9	56	05.6 7	12.9 2
08	339 53.8	9.2	21 49.5	9.4	163 11.3	14 14.1	358 56.3	7 27.9	54	05.4 7	13.2 2
09	354 22.0	9.0	21 58.9	9.4	178 14.0	14 14.0	373 58.5	7 28.0	52	05.3 7	13.4 2
10	8 50.0	9.0	S.22 08.3	9.2	193 16.6	N.14 14.0	29 00.8	S. 7 28.1	N.50	05.1 6	13.5 2
11	23 18.0	8.8	22 17.5	9.0	208 19.3	14 14.0	44 03.1	7 28.2	45	04.8 6	13.9 3
12	37 45.8	8.7	22 26.7	9.0	223 21.9	14 13.9	59 05.3	7 28.2	40	04.5 6	14.2 3
13	52 13.5	8.6	22 35.7	8.9	238 24.6	14 13.9	74 07.6	7 28.3	35	04.3 5	14.4 3
14	66 41.1	8.5	22 44.6	8.8	253 27.2	14 13.8	89 09.9	7 28.4	30	04.1 5	14.6 3
15	81 08.6	8.3	S.22 53.4	8.7	268 29.9	N.14 13.8	104 12.1	S. 7 28.4	N.20	03.7 5	15.0 4
16	95 35.9	8.3	23 02.1	8.5	283 32.5	14 13.7	119 14.4	7 28.5	N.10	03.4 4	15.3 4
17	110 03.2	8.1	23 10.6	8.5	298 35.1	14 13.7	134 16.7	7 28.6	0	03.2 4	15.6 4
18	124 30.3	8.0	23 19.1	8.3	313 37.8	14 13.6	149 18.9	7 28.6	S.10	02.9 4	15.9 5
19	138 57.3	7.9	23 27.4	8.2	328 40.4	14 13.6	164 21.2	7 28.7	20	02.6 4	16.2 5
20	153 24.2	7.8	S.23 35.6	8.0	343 43.1	N.14 13.6	179 23.5	S. 7 28.8	S.30	02.3 3	16.6 5
21	167 51.0	7.6	23 43.6	8.0	358 45.7	14 13.5	194 25.7	7 28.8	35	02.1 3	16.8 5
22	182 17.6	7.5	23 51.6	7.8	13 48.4	14 13.5	209 28.0	7 28.9	40	01.9 3	17.0 6
23	196 44.1	7.5	23 59.4	7.7	28 51.0	14 13.4	224 30.3	7 29.0	45	01.6 2	17.3 6
									50	01.3 2	17.7 6
									S.55	00.9 1	18.2 7

H.P. 4^h, 57°1; 12^h, 57°4; 20^h, 57°6 v=2.6 d=0.0 v=2.3 d=0.1

1952 December 15, Monday

G. M. T.	S.D. SUN 16°3		ARIES		VENUS -3.6		MARS +1.1		Lat.	Sun-set	Twilight
	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.			
00	181 14.9	S.23 15.6	83 35.5		135 39.3	S.21 07.7	123 00.3	S.16 42.8	N.70	14 03	00
01	196 14.6	23 15.8	98 38.0		150 38.7	21 06.9	138 00.9	16 42.2	68	14 37	01
02	211 14.3	23 15.9	113 40.4		165 38.1	21 06.2	153 01.4	16 41.6	66	13 23	02
03	226 14.0	23 16.0	128 42.9		180 37.5	21 05.4	168 02.0	16 40.9	64	14 04	03
04	241 13.7	23 16.2	143 45.4		195 36.9	21 04.6	183 02.6	16 40.3	62	14 32	04
05	256 13.4	S.23 16.3	158 47.8		210 36.3	S.21 03.9	198 03.1	S.16 39.7	N.60	14 53	05
06	271 13.1	23 16.4	173 50.3		225 35.7	21 03.1	213 03.7	16 39.1	58	15 10	06
07	286 12.8	23 16.5	188 52.8		240 35.1	21 02.4	228 04.3	16 38.4	56	15 25	07
08	301 12.5	23 16.7	203 55.2		255 34.5	21 01.6	243 04.8	16 37.8	54	15 38	08
09	316 12.2	23 16.8	218 57.7		270 33.9	21 00.8	258 05.4	16 37.2	52	15 49	09
10	331 11.9	S.23 16.9	234 00.2		285 33.3	S.21 00.1	273 06.0	16 36.6	N.50	15 59	10
11	346 11.6	23 17.1	249 02.6		300 32.7	20 59.3	288 06.5	16 35.9	45	16 19	11
12	1 11.3	23 17.2	264 05.1		315 32.1	20 58.5	303 07.1	16 35.3	40	16 36	12
13	16 10.9	23 17.3	279 07.6		330 31.5	20 57.8	318 07.7	15 34.7	35	16 50	13
14	31 10.6	23 17.4	294 10.0		345 30.9	20 57.0	333 08.2	16 34.1	30	17 02	14
15	46 10.3	S.23 17.6	309 12.5		0 30.3	S.20 56.2	348 08.8	S.16 33.4	N.20	17 23	15
16	61 10.0	23 17.7	324 14.9		15 29.8	20 55.5	3 09.4	16 32.8	N.10	17 42	16
17	76 09.7	23 17.8	339 17.4		30 29.2	20 54.7	18 09.9	16 32.2	0	17 59	17
18	91 09.4	23 17.9	354 19.9		45 28.6	20 53.9	33 10.5	16 31.6	S.10	18 16	18
19	106 09.1	23 18.0	9 22.3		60 28.0	20 53.1	48 11.1	16 30.9	20	18 35	19
20	121 08.8	S.23 18.2	24 24.8		75 27.4	S.20 52.4	63 11.6	S.16 30.3	S.30	18 57	20
21	136 08.5	23 18.3	39 27.3		90 26.8	20 51.6	78 12.2	16 29.7	35	19 10	21
22	151 08.2	23 18.4	54 29.7		105 26.2	20 50.8	93 12.8	16 29.0	40	19 25	22
23	166 07.9	23 18.5	69 32.2		120 25.6	20 50.0	108 13.3	16 28.4	45	19 43	23
									50	20 05	20 49
									S.55	20 35	21 32

G. M. T.	Age 27 ^h .5 MOON S.D. 15°7				JUPITER -2.3		SATURN +0.9		Lat.	Moon-rise	Moon-set
	G.H.A.	v	Dec.	d	G.H.A.	Dec.	G.H.A.	Dec.			
00	211 10.6	7.3	S.24 07.1	7.5	43 53.7	N.14 13.4	239 32.5	S. 7 29.0	N.70	M.B.H.	M.B.H.
01	225 36.9	7.1	24 14.6	7.4	58 56.3	14 13.3	254 34.8	7 29.1	68	M.B.H.	M.B.H.
02	240 03.0	7.1	24 22.0	7.3	73 59.0	14 13.3	269 37.1	7 29.2	66	M.B.H.	M.B.H.
03	254 29.1	7.0	24 29.3	7.1	89 01.6	14 13.2	284 39.3	7 29.2	64	09.3 11	11.1 -2
04	268 55.1	6.8	24 36.4	7.0	104 04.2	14 13.2	299 41.6	7 29.3	62	08.4 9	12.1 +1
05	283 20.9	6.8	S.24 43.4	6.9	119 06.9	N.14 13.2	314 43.9	S. 7 29.4	N.60	07.8 8	12.6 2
06	297 46.7	6.6	24 50.3	6.7	134 09.5	14 13.1	329 46.1	7 29.4	58	07.4 7	13.0 2
07	312 12.3	6.5	24 57.0	6.5	149 12.2	14 13.1	344 48.4	7 29.5	56	07.1 7	13.4 3
08	326 37.8	6.4	25 03.5	6.5	164 14.8	14 13.0	359 50.7	7 29.6	54	06.8 7	13.7 3
09	341 03.2	6.3	25 10.0	6.2	179 17.5	14 13.0	374 52.9	7 29.6	52	06.6 6	13.9 3
10	355 28.5	6.2	S.25 16.2	6.2	194 20.1	N.14 12.9	29 55.2	S. 7 29.7	N.50	06.4 6	14.1 3
11	9 53.7	6.1	25 22.4	6.0	209 22.7	14 12.9	44 57.5	7			

1952 December 16, Tuesday

G.M.T.	S.D.	SUN 16'3	ARIES	VENUS -3.7	MARS +1.1	Lat.	Twilight	Sunrise			
	G.H.A.	Dec.	G.H.A.	G.H.A.	Dec.	N.72	h m	h m			
							10 49	S.B.H.			
00	181	07.6	S.23 18.6	84 34.7	135 25.0	S.20 49.2	123 13.9	S.16 27.8	N.70	09 49	S.B.H.
01	196	07.3	23 18.7	99 37.1	150 24.5	20 48.5	138 14.5	16 27.2	68	09 15	S.B.H.
02	211	07.0	23 18.8	114 39.6	165 23.9	20 47.7	153 15.0	16 26.5	66	08 49	10 30
03	226	06.7	23 19.0	129 42.1	180 23.3	20 46.9	168 15.6	16 25.9	64	08 30	09 48
04	241	06.4	23 19.1	144 44.5	195 22.7	20 46.1	183 16.2	16 25.3	62	08 14	09 20
05	256	06.1	S.23 19.2	159 47.0	210 22.1	S.20 45.3	198 16.7	S.16 24.6	N.60	08 00	08 58
06	271	05.8	23 19.3	174 49.4	225 21.5	20 44.5	213 17.3	16 24.0	58	07 49	08 41
07	286	05.5	23 19.4	189 51.9	240 21.0	20 43.8	228 17.9	16 23.4	56	07 39	08 26
08	301	05.2	23 19.5	204 54.4	255 20.4	20 43.0	243 18.4	16 22.7	54	07 30	08 13
09	316	04.9	23 19.6	219 56.8	270 19.8	20 42.2	258 19.0	16 22.1	52	07 22	08 03
10	331	04.6	S.23 19.7	234 59.3	285 19.2	S.20 41.4	273 19.6	S.16 21.5	N.50	07 14	07 53
11	346	04.3	23 19.8	250 01.8	300 18.6	20 40.6	288 20.1	16 20.8	45	06 58	07 32
12	1	04.0	23 19.9	265 04.2	315 18.1	20 39.8	303 20.7	16 20.2	40	06 45	07 15
13	16	03.6	23 20.1	280 06.7	330 17.5	20 39.0	318 21.3	16 19.6	35	06 33	07 01
14	31	03.3	23 20.2	295 09.2	345 16.9	20 38.2	333 21.8	16 18.9	30	06 22	06 49
15	46	03.0	S.23 20.3	310 11.6	0 16.3	S.20 37.4	348 22.4	S.16 18.3	N.20	06 03	06 28
16	61	02.7	23 20.4	325 14.1	15 15.8	20 36.6	3 23.0	16 17.7	N.10	05 46	06 07
17	76	02.4	23 20.5	340 16.6	30 15.2	20 35.8	18 23.6	16 17.0	0	05 29	05 52
18	91	02.1	23 20.6	355 19.0	45 14.6	20 35.1	33 24.1	16 16.4	S.10	05 11	05 34
19	106	01.8	23 20.7	10 21.5	60 14.0	20 34.3	48 24.7	16 15.8	20	04 50	05 15
20	121	01.5	S.23 20.8	25 23.9	75 13.5	S.20 33.5	63 25.3	S.16 15.1	S.30	04 25	04 53
21	136	01.2	23 20.9	40 26.4	90 12.9	20 32.7	78 25.8	16 14.5	35	04 10	04 40
22	151	00.9	23 21.0	55 28.9	105 12.3	20 31.9	93 26.4	16 13.9	40	03 52	04 25
23	166	00.6	23 21.1	70 31.3	120 11.7	20 31.1	108 27.0	16 13.2	45	03 30	04 07
		T=11 ^h 56 ^m	d=0.1	T=18 ^h 19 ^m	v=-0.6	d=0.8	v=0.6	d=0.6	50	03 01	03 45
									S.55	02 17	03 15

G.M.T.	Age	MOON	S.D.	JUPITER -2.3	SATURN +0.9	Lat.	Moon-rise	Moon-set				
	28 ^d .5		15 ^d .9	G.H.A.	Dec.	N.72	h M.B.H.	h M.B.H.				
00	197	12.1	4.9	S.26 27.8	3.9	44 57.0	N.14 12.3	240 27.0	S. 7 30.6	N.70	M.B.H.	M.B.H.
01	211	36.0	4.7	26 31.7	3.7	59 59.7	14 12.3	255 29.2	7 30.7	68	M.B.H.	M.B.H.
02	225	59.7	4.7	26 35.4	3.6	75 02.3	14 12.3	270 31.5	7 30.8	66	M.B.H.	M.B.H.
03	240	23.4	4.6	26 39.0	3.3	90 04.9	14 12.2	285 33.8	7 30.8	64	M.B.H.	M.B.H.
04	254	47.0	4.5	26 42.3	3.2	105 07.6	14 12.2	300 36.0	7 30.9	62	10.2 7	12.3 3
05						120 10.2	N.14 12.1	315 38.3	S. 7 31.0	N.60	09.4 6	13.2 4
06						135 12.8	14 12.1	330 40.6	7 31.0	58	08.9 6	13.7 4
07						150 15.5	14 12.1	345 42.9	7 31.1	56	08.5 6	14.1 4
08						165 18.1	14 12.0	0 45.1	7 31.2	54	08.2 6	14.4 4
09						180 20.7	14 12.0	15 47.4	7 31.2	52	07.9 6	14.7 5
10						195 23.4	N.14 11.9	30 49.7	S. 7 31.3	N.50	07.7 6	14.9 5
11						210 26.0	14 11.9	45 51.9	7 31.4	45	07.2 5	15.4 5
12						225 28.6	14 11.8	60 54.2	7 31.4	40	06.8 5	15.8 5
13						240 31.3	14 11.8	75 56.5	7 31.5	35	06.5 5	16.1 5
14						255 33.9	14 11.8	90 58.8	7 31.5	30	06.2 5	16.4 5
15						270 36.5	N.14 11.7	106 01.0	S. 7 31.6	N.20	05.8 5	16.8 5
16						285 39.2	14 11.7	121 03.3	7 31.7	N.10	05.4 5	17.2 5
17						300 41.8	14 11.6	136 05.6	7 31.7	0	05.1 5	17.6 5
18						315 44.4	14 11.6	151 07.8	7 31.8	S.10	04.7 5	17.9 5
19						330 47.1	14 11.6	166 10.1	7 31.9	20	04.3 5	18.3 5
20						345 49.7	N.14 11.5	181 12.4	S. 7 31.9	S.30	03.9 5	18.7 5
21						0 52.3	14 11.5	196 14.7	7 32.0	35	03.6 5	19.0 5
22						15 55.0	14 11.5	211 16.9	7 32.1	40	03.3 4	19.3 5
23						30 57.6	14 11.4	226 19.2	7 32.1	45	03.0 4	19.7 5
										50	02.5 4	20.2 5
										S.55	01.9 4	20.8 5

H.P. 4^h, 58^m.7; 12^h, 58^m.9; 20^h, 59^m.1

1952 December 17, Wednesday

G.M.T.	S.D.	SUN 16'3	ARIES	VENUS -3.7	MARS +1.1	Lat.	Sunset	Twilight			
	G.H.A.	Dec.	G.H.A.	G.H.A.	Dec.	N.72	h m	h m			
							13 02	13 02			
00	181	00.3	S.23 21.2	85 33.8	135 11.2	S.20 30.3	123 27.5	S.16 12.6	N.70	14 02	S.B.H.
01	196	00.0	23 21.3	100 36.3	150 10.6	20 29.5	138 28.1	16 12.0	68	14 36	S.B.H.
02	211	00.0	23 21.4	115 38.7	165 10.0	20 28.6	153 28.7	16 11.3	66	13 22	15 02
03	226	00.0	23 21.5	130 41.2	180 09.5	20 27.8	168 29.3	16 10.7	64	14 04	15 21
04	241	00.0	23 21.5	145 43.7	195 08.9	20 27.0	183 29.8	16 10.0	62	14 32	15 37
05	256	00.0	S.23 21.6	160 46.1	210 08.3	S.20 26.2	198 30.4	S.16 09.4	N.60	14 53	15 50
06	271	00.0	23 21.7	175 48.6	225 07.8	20 25.4	213 31.0	16 08.8	58	15 11	16 02
07	286	00.0	23 21.8	190 51.0	240 07.2	20 24.6	228 31.5	16 08.1	56	15 25	16 12
08	301	00.0	23 21.9	205 53.5	255 06.6	20 23.8	243 32.1	16 07.5	54	15 38	16 21
09	316	00.0	23 22.0	220 56.0	270 06.1	20 23.0	258 32.7	16 06.9	52	15 49	16 29
10	331	00.0	S.23 22.1	235 58.4	285 05.5	S.20 22.2	273 33.3	S.16 06.2	N.50	15 59	16 37
11	346	00.0	23 22.2	251 00.9	300 05.0	20 21.4	288 33.8	16 05.6	45	16 20	16 53
12	1	00.0	23 22.3	266 03.4	315 04.4	20 20.6	303 34.4	16 04.9	40	16 36	17 07
13	16	00.0	23 22.3	281 05.8	330 03.8	20 19.7	318 35.0	16 04.3	35	16 50	17 18
14	31	00.0	23 22.4	296 08.3	345 03.3	20 18.9	333 35.6	16 03.7	30	17 03	17 29
15	46	00.0	S.23 22.5	311 10.8	0 02.7	S.20 18.1	348 36.1	S.16 03.0	N.20	17 24	17 48
16	61	00.0	23 22.6	326 13.2	15 02.2	20 17.3	3 36.7	16 02.4	N.10	17 42	18 05
17	76	00.0	23 22.7	341 15.7	30 01.6	20 16.5	18 37.3	16 01.7	0	18 00	18 22
18	91	00.0	23 22.8	356 18.2	45 01.1	20 15.7	33 37.9	16 01.1	S.10	18 17	18 40
19	106	00.0	23 22.8	11 20.6	60 00.5	20 14.8	48 38.4	16 00.5	20	18 36	19 01
20	121	00.0	S.23 22.9	26 23.1	74 59.9	S.20 14.0	63 39.0	S.15 59.8	S.30	18 58	19 26
21	136	00.0	23 23.0	41 25.5	89 59.4	20 13.2	78 39.6	15 59.2	35	19 11	19 41
22	151	00.0	23 23.1	56 28.0	104 58.8	20 12.4	93 40.2	15 58.5	40	19 26	19 59
23	166	00.0	23 23.2	71 30.5	119 58.3	20 11.6	108 40.7	15 57.9	45	19 44	20 21
		T=11 ^h 56 ^m	d=0.1	T=18 ^h 15 ^m	v=-0.6	d=0.8	v=0.6	d=0.6	50	20 07	20 51
									S.55	20 37	21 34

G.M.T.	Age	MOON	S.D.	JUPITER -2.3	SATURN +0.9	Lat.	Moon-rise	Moon-set				
	29 ^d .5		16 ^d .1	G.H.A.	Dec.	N.72	h M.B.H.	h M.B.H.				
00	197	12.1	4.9	S.26 27.8	3.9	44 57.0	N.14 12.3	240 27.0	S. 7 30.6	N.70	M.B.H.	M.B.H.
01	211	36.0	4.7	26 31.7	3.7	59 59.7	14 12.3	255 29.2	7 30.7	68	M.B.H.	M.B.H.
02	225	59.7	4.7	26 35.4	3.6	75 02.3	14 12.3	270 31.5	7 30.8	66	M.B.H.	M.B.H.
03	240	23.4	4.6	26 39.0	3.3	90 04.9	14 12.2	285 33.8	7 30.8	64	M.B.H.	M.B.H.
04	254	47.0	4.5	26 42.3	3.2	105 07.6	14 12.2	300 36.0	7 30.9	62	10.2 7	12.3 3
05						120 10.2	N.14 12.1	315 38.3	S. 7 31.0	N.60	09.4 6	13.2 4
06						135 12.8	14 12.1	330 40.6	7 31.0	58	08.9 6	13.7 4
07						150 15.5	14 12.1	345 42.9	7 31.1	56	08.5 6	14.1 4
08						165 18.1	14 12.0	0 45.1	7 31.2	54	08.2 6	14.4 4
09						180 20.7	14 12.0	15 47.4	7 31.2	52	07.9 6	14.7 5
10						195 23.4	N.14 11.9	30 49.7	S. 7 31.3	N.50	07.7 6	14.9 5
11						210 26.0	14 11.9	45 51.9	7 31.4	45	07.2 5	15.4 5
12						225 28.6	14 11.8	60 54.2	7 31.4	40	06.8 5	15.8 5
13						240 31.3	14 11.8	75 56.5	7 31.5	35	06.5 5	16.1 5

1952 December 18, Thursday

G. M. T.	S.D.	SUN 16'3	ARIES	VENUS -3.7	MARS +1.1	Lat.	Twilight	Sun-rise			
		G.H.A. Dec.	G.H.A.	G.H.A. Dec.	G.H.A. Dec.	N.72	h m	h S.B.H. ^m			
00	180	52.9	S.23 23.2	86 32.9	134 57.7	S.20 10.7	123 41.3	S.15 57.2	N.70	09 52	S.B.H.
01	195	52.6	23 23.3	101 35.4	149 57.2	20 09.9	138 41.9	15 56.6	68	09 17	S.B.H.
02	210	52.3	23 23.4	116 37.9	164 56.6	20 09.1	153 42.5	15 55.0	66	08 51	10 32
03	225	52.0	23 23.5	131 40.3	179 56.1	20 08.3	168 43.0	15 53.3	64	08 32	09 50
04	240	51.7	23 23.5	146 42.8	194 55.5	20 07.4	183 43.6	15 54.7	62	08 16	09 22
05	255	51.3	S.23 23.6	161 45.3	209 55.0	S.20 06.6	198 44.2	S.15 54.0	N.60	08 02	09 00
06	270	51.0	23 23.7	176 47.7	224 54.4	20 05.8	213 44.8	15 53.4	58	07 50	08 43
07	285	50.7	23 23.7	191 50.2	239 53.9	20 04.9	228 45.3	15 52.7	56	07 40	08 28
08	300	50.4	23 23.8	206 52.7	254 53.3	20 04.1	243 45.9	15 52.1	54	07 31	08 15
09	315	50.1	23 23.9	221 55.1	269 52.8	20 03.3	258 46.5	15 51.5	52	07 23	08 04
10	330	49.8	S.23 24.0	236 57.6	284 52.3	S.20 02.4	273 47.1	S.15 50.8	N.50	07 15	07 54
11	345	49.5	23 24.0	252 00.0	299 51.7	20 01.6	288 47.7	15 50.2	45	06 59	07 33
12	0	49.2	23 24.1	267 02.5	314 51.2	20 00.8	303 48.2	15 49.5	40	06 46	07 17
13	15	48.9	23 24.2	282 05.0	329 50.6	19 59.9	318 48.8	15 48.9	35	06 34	07 02
14	30	48.6	23 24.2	297 07.4	344 50.1	19 59.1	333 49.4	15 48.2	30	06 23	06 50
15	45	48.3	S.23 24.3	312 09.9	359 49.5	S.19 58.3	348 50.0	S.15 47.6	N.20	06 04	06 29
16	60	47.9	23 24.3	327 12.4	374 49.0	19 57.4	3 50.5	15 46.9	N.10	05 47	06 10
17	75	47.6	23 24.4	342 14.8	389 48.5	19 56.6	18 51.1	15 46.3	0	05 30	05 53
18	90	47.3	23 24.5	357 17.3	404 47.9	19 55.7	33 51.7	15 45.6	S.10	05 13	05 35
19	105	47.0	23 24.5	372 19.8	419 47.4	19 54.9	48 52.3	15 45.0	20	04 52	05 16
20	120	46.7	S.23 24.6	387 22.2	434 46.8	S.19 54.1	63 52.9	S.15 44.3	S.30	04 27	04 55
21	135	46.4	23 24.7	402 24.7	449 46.3	19 53.2	78 53.4	15 43.7	35	04 12	04 41
22	150	46.1	23 24.7	417 27.1	464 45.8	19 52.4	93 54.0	15 43.0	40	03 54	04 26
23	165	45.8	23 24.8	432 29.6	479 45.2	19 51.5	108 54.6	15 42.4	45	03 30	04 08
									50	03 01	03 46
									S.55	02 17	03 16

G. M. T.	Age	MOON	S.D.	JUPITER -2.3	SATURN +0.9	Lat.	Moon-rise	Moon-set				
	0 ^h .9	●	16'3	G.H.A. Dec.	G.H.A. Dec.	N.72	h M.B.H.	h M.B.H.				
00	167	23.8	3.6	S.26 08.3	5.0	47 03.2	N.14 10.5	242 16.1	S. 7 33.7	N.70	M.B.H.	M.B.H.
01	181	46.4	3.6	26 03.3	5.2	62 05.8	14 10.4	257 18.3	7 33.8	68	M.B.H.	M.B.H.
02	196	09.0	3.7	25 58.1	5.4	77 08.4	14 10.4	272 20.6	7 33.9	66	M.B.H.	M.B.H.
03	210	31.7	3.7	25 52.7	5.6	92 11.1	14 10.4	287 22.9	7 33.9	64	12.2 -1	14.7 12
04	224	54.4	3.8	25 47.1	5.8	107 13.7	14 10.3	302 25.2	7 34.0	62	11.4 +1	15.5 10
05	239	17.2	3.8	S.25 41.3	5.9	122 16.3	N.14 10.3	317 27.4	S. 7 34.0	N.60	10.9 2	16.0 9
06	253	40.0	3.9	25 35.4	6.1	137 18.9	14 10.2	332 29.7	7 34.1	58	10.5 2	16.4 8
07	268	02.9	3.9	25 29.3	6.3	152 21.5	14 10.2	347 32.0	7 34.2	56	10.2 3	16.7 8
08	282	25.8	4.0	25 23.0	6.5	167 24.2	14 10.2	2 34.3	7 34.2	54	10.0 3	16.9 7
09	296	48.8	4.1	25 16.5	6.6	182 26.8	14 10.1	17 36.5	7 34.3	52	09.7 3	17.2 7
10	311	11.9	4.2	S.25 09.9	6.9	197 29.4	N.14 10.1	32 38.8	S. 7 34.4	N.50	09.5 3	17.4 7
11	325	34.9	4.2	25 03.0	7.0	212 32.0	14 10.1	47 41.1	7 34.4	45	09.1 4	17.8 6
12	339	58.1	4.2	24 56.0	7.2	227 34.6	14 10.0	62 43.4	7 34.5	40	08.8 4	18.1 6
13	354	21.3	4.3	24 48.8	7.3	242 37.2	14 10.0	77 45.7	7 34.5	35	08.5 4	18.4 6
14	8	44.6	4.3	24 41.5	7.5	257 39.9	14 10.0	92 47.9	7 34.6	30	08.2 4	18.6 6
15	23	07.9	4.4	S.24 34.0	7.7	272 42.5	N.14 09.9	107 50.2	S. 7 34.7	N.20	07.8 5	19.0 5
16	37	31.3	4.5	24 26.3	7.9	287 45.1	14 09.9	122 52.5	7 34.7	N.10	07.5 5	19.3 5
17	51	54.8	4.6	24 18.4	8.1	302 47.7	14 09.9	137 54.8	7 34.8	0	07.1 5	19.6 5
18	66	18.4	4.6	24 10.3	8.2	317 50.3	14 09.8	152 57.0	7 34.9	S.10	06.8 5	19.9 5
19	80	42.0	4.7	24 02.1	8.3	332 52.9	14 09.8	167 59.3	7 34.9	20	06.4 5	20.3 4
20	95	05.7	4.8	S.23 53.8	8.6	347 55.6	N.14 09.7	183 01.6	S. 7 35.0	S.30	06.0 6	20.6 4
21	109	29.5	4.8	23 45.2	8.6	2 58.2	14 09.7	198 03.9	7 35.0	35	05.8 6	20.9 4
22	123	53.3	4.9	23 36.6	8.9	18 00.8	14 09.7	213 06.1	7 35.1	40	05.6 6	21.1 4
23	138	17.2	5.0	23 27.7	9.0	33 03.4	14 09.6	228 08.4	7 35.2	45	05.1 6	21.4 3
										50	04.7 6	21.8 3
										S.55	04.1 7	22.3 2

H.P. 4^h, 59'7; 12^h, 59'8; 20^h, 59'9 v=2.6 d=0.0 v=2.3 d=0.1

1952 December 20, Saturday

G. M. T.	S.D.	SUN 16'3	ARIES	VENUS -3.7	MARS +1.1	Lat.	Twilight	Sun-rise			
		G.H.A. Dec.	G.H.A.	G.H.A. Dec.	G.H.A. Dec.	N.72	h m	h S.B.H. ^m			
00	180	38.0	S.23 26.0	88 31.2	134 32.1	S.19 30.1	124 09.1	S.15 26.1	N.70	09 54	S.B.H.
01	195	37.7	23 26.0	103 33.7	149 31.6	19 29.3	139 09.7	15 25.4	68	09 18	S.B.H.
02	210	37.4	23 26.0	118 36.1	164 31.1	19 28.4	154 10.3	15 24.8	66	08 53	10 34
03	225	37.1	23 26.1	133 38.6	179 30.6	19 27.5	169 10.9	15 24.1	64	08 33	09 52
04	240	36.8	23 26.1	148 41.1	194 30.0	19 26.6	184 11.5	15 23.5	62	08 17	09 23
05	255	36.4	S.23 26.1	163 43.5	209 29.5	S.19 25.8	199 12.1	S.15 22.8	N.60	08 03	09 02
06	270	36.1	23 26.2	178 46.0	224 29.0	19 24.9	214 12.6	15 22.2	58	07 51	08 44
07	285	35.8	23 26.2	193 48.5	239 28.5	19 24.0	229 13.2	15 21.5	56	07 41	08 29
08	300	35.5	23 26.2	208 50.9	254 28.0	19 23.2	244 13.8	15 20.8	54	07 32	08 16
09	315	35.2	23 26.3	223 53.4	269 27.5	19 22.3	259 14.4	15 20.2	52	07 24	08 05
10	330	34.9	S.23 26.3	238 55.9	284 27.0	S.19 21.4	274 15.0	S.15 19.5	N.50	07 16	07 55
11	345	34.6	23 26.3	253 58.3	299 26.5	19 20.5	289 15.6	15 18.9	45	07 00	07 35
12	0	34.3	23 26.4	269 00.8	314 26.0	19 19.7	304 16.2	15 18.2	40	06 47	07 18
13	15	34.0	23 26.4	284 03.3	329 25.5	19 18.8	319 16.7	15 17.6	35	06 35	07 04
14	30	33.6	23 26.4	299 05.7	344 24.9	19 17.9	334 17.3	15 16.9	30	06 24	06 51
15	45	33.3	S.23 26.4	314 08.2	359 24.4	S.19 17.0	349 17.9	S.15 16.2	N.20	06 05	06 30
16	60	33.0	23 26.5	329 10.6	374 23.9	19 16.1	4 18.5	15 15.6	N.10	05 48	06 11
17	75	32.7	23 26.5	344 13.1	389 23.4	19 15.3	19 19.1	15 14.9	0	05 31	05 54
18	90	32.4	23 26.5	359 15.6	404 22.9	19 14.4	34 19.7	15 14.3	S.10	05 13	05 36
19	105	32.1	23 26.5	14 18.0	419 22.4	19 13.5	49 20.3	15 13.6	20	04 52	05 17
20	120	31.8	S.23 26.6	29 20.5	434 21.9	S.19 12.6	64 20.8	S.15 12.9	S.30	04 27	04 55
21	135	31.5	23 26.6	44 23.0	449 21.4	19 11.7	79 21.4	15 12.3	35	04 12	04 42
22	150	31.2	23 26.6	59 25.4	464 20.9	19 10.8	94 22.0	15 11.6	40	03 54	04 27
23	165	30.9	23 26.6	74 27.9	479 20.4	19 10.0	109 22.6	15 11.0	45	03 30	04 09
									50	03 02	03 46
									S.55	02 17	03 16

G. M. T.	Age	MOON	S.D.	JUPITER -2.3	SATURN +0.9	Lat.	Moon-rise	Moon-set				
	2 ^h .9	●	16'4	G.H.A. Dec.	G.H.A. Dec.	N.72	h M.B.H.	h M.B.H.				
00	138	43.5	7.3	S.18 58.7	12.5	49 08.6	N.14 08.8	244 05.4	S. 7 36.7	N.70	12.8 -3	18.2 12
01	153	09.8	7.3	18 46.2	12.6	64 11.2	14 08.8	259 07.7	7 36.8	68	12.3 -3	18.7 13
02	167	36.1	7.5	18 33.6	12.6	79 13.8	14 08.8	274 10.0	7 36.8	66	12.0 -2	19.0 11
03	182	02.6	7.5	18 21.0	12.8	94 16.4	14 08.7	289 12.3	7 36.9	64	11.7 -1	19.3 10
04	196	29.1	7.6	18 08.2	13.0	109 19.0	14 08.7	304 14.6	7 37.0	62	11.4 0	19.5 9
05	210	55.7	7.7	S.17 55.2	13.0	124 21.6	N.14 08.7	319 16.8	S. 7 37.0	N.60	11.2 0	19.7 9
06	225	22.4	7.8	17 42.2	13.1	139 24.2	14 08.6	334 19.1	7 37.1	58	11.1 +1	19.8 8
07	239	49.2	8.0	17 29.1	13.2	154 26.8	14 08.6	349 21.4	7 37.1	56	10.9 1	19.9 8
08	254	16.2	7.9	17 15.9	13.3	169 29.5	14 08.6	4 23.7	7 37.2	54	10.8 1	20.1 8
09	268	43.1	8.1	17 02.6	13.5	184 32.1	14 08.5	19 26.0	7 37.3	52	1	

1952 December 21, Sunday

Lat.	Sun-set	Twilight	G. M. T.	S.D. SUN 16'3		ARIES	VENUS -3.7		MARS +1.1	
	^h _m S.B.H.	^h _m 12 58		G.H.A.	Dec.	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.
N.72	14 01	00	180 30.5	S.23 26.6	89 30.4	134 19.9	S.19 09.1	124 23.2	S.15 10.3	
N.70	14 01	01	180 30.5	S.23 26.6	89 30.4	134 19.9	S.19 09.1	124 23.2	S.15 10.3	
68	14 37	01	195 30.2	23 26.6	104 32.8	149 19.4	19 08.2	139 23.8	15 09.6	
66	13 21	02	210 29.9	23 26.7	119 35.3	164 18.9	19 07.3	154 24.4	15 09.6	
64	14 04	03	225 29.6	23 26.7	134 37.8	179 18.4	19 06.4	169 25.0	15 08.3	
62	14 32	04	240 29.3	23 26.7	149 40.2	194 17.9	19 05.5	184 25.6	15 07.7	
N.60	14 54	05	255 29.0	S.23 26.7	164 42.7	209 17.5	S.19 04.6	199 26.1	S.15 07.0	
58	15 11	06	270 28.7	23 26.7	179 45.1	224 17.0	19 03.7	214 26.7	15 06.3	
56	15 26	07	285 28.4	23 26.7	194 47.6	239 16.5	19 02.8	229 27.3	15 05.7	
54	15 39	08	300 28.0	23 26.7	209 50.1	254 16.0	19 01.9	244 27.9	15 05.0	
52	15 50	09	315 27.7	23 26.8	224 52.5	269 15.5	19 01.1	259 28.5	15 04.4	
N.50	16 00	10	330 27.4	S.23 26.8	239 55.0	284 15.0	S.19 00.2	274 29.1	S.15 03.7	
45	16 21	11	345 27.1	23 26.8	254 57.5	299 14.5	18 59.3	289 29.7	15 03.0	
40	16 38	12	0 26.8	23 26.8	269 59.9	314 14.0	18 58.4	304 30.3	15 02.4	
35	16 52	13	15 26.5	23 26.8	285 02.4	329 13.5	18 57.5	319 30.9	15 01.7	
30	17 04	14	30 26.2	23 26.8	300 04.9	344 13.0	18 56.6	334 31.5	15 01.0	
N.20	17 25	15	45 25.9	S.23 26.8	315 07.3	359 12.6	S.18 55.7	349 32.0	S.15 00.4	
N.10	17 44	16	60 25.6	23 26.8	330 09.8	14 12.1	18 54.8	4 32.6	14 59.7	
0	18 01	17	75 25.2	23 26.8	345 12.2	29 11.6	18 53.9	19 33.2	14 59.0	
S.10	18 19	18	90 24.9	23 26.8	0 14.7	44 11.1	18 53.0	34 33.8	14 58.4	
20	18 38	19	105 24.6	23 26.8	15 17.2	59 10.6	18 52.1	49 34.4	14 57.7	
S.30	19 00	20	120 24.3	S.23 26.8	30 19.6	74 10.1	S.18 51.2	64 35.0	S.14 57.0	
35	19 13	21	135 24.0	23 26.8	45 22.1	89 09.6	18 50.3	79 35.6	14 56.4	
40	19 28	22	150 23.7	23 26.8	60 24.6	104 09.2	18 49.3	94 36.2	14 55.7	
45	19 46	23	165 23.4	23 26.8	75 27.0	119 08.7	18 48.4	109 36.8	14 55.0	
50	20 09									
S.55	20 40									

Lat.	Moon-rise	Moon-set	G. M. T.	Age 3 ^d .9	MOON S.D. 16'3				JUPITER -2.3		SATURN +0.9	
	^h _m 12 58	^h _m 12 58			G.H.A.	v	Dec.	d	G.H.A.	Dec.	G.H.A.	Dec.
N.72	12:4 -4	20:5 13										
N.70	12:1 -3	20:7 12	00	125 38.9	9.4	S.13 31.7	14.7	50 11.0	N.14 08.1	245 00.2	S. 7 38.1	
68	11:9 -2	20:9 11	01	140 07.3	9.5	13 17.0	14.7	65 13.6	14 08.1	260 02.5	7 38.2	
66	11:7 -1	21:1 10	02	154 35.8	9.5	13 02.3	14.9	80 16.2	14 08.0	275 04.8	7 38.3	
64	11:6 -1	21:2 9	03	169 04.3	9.7	12 47.4	14.9	95 18.8	14 08.0	290 07.1	7 38.3	
62	11:4 0	21:3 9	04	183 33.0	9.7	12 32.5	14.9	110 21.4	14 08.0	305 09.4	7 38.4	
N.60	11:3 0	21:4 8	05	198 01.7	9.8	S.12 17.6	15.1	125 24.0	N.14 08.0	320 11.6	S. 7 38.4	
58	11:2 0	21:5 8	06	212 30.5	9.9	12 02.5	15.1	140 26.6	14 07.9	335 13.9	7 38.5	
56	11:1 +1	21:5 8	07	226 59.4	9.9	11 47.4	15.1	155 29.2	14 07.9	350 16.2	7 38.6	
54	11:0 -1	21:6 7	08	241 28.3	10.0	11 32.3	15.2	170 31.8	14 07.9	5 18.5	7 38.6	
52	11:0 1	21:6 7	09	255 57.3	10.2	11 17.1	15.3	185 34.4	14 07.8	20 20.8	7 38.7	
N.50	10:9 2	21:7 7	10	270 26.5	10.1	S.11 01.8	15.3	200 37.0	N.14 07.8	35 23.1	S. 7 38.7	
45	10:7 2	21:8 6	11	284 55.6	10.3	10 46.5	15.4	215 39.6	14 07.8	50 25.4	7 38.8	
40	10:6 2	21:9 6	12	299 24.9	10.3	10 31.1	15.4	230 42.2	14 07.8	65 27.6	7 38.8	
35	10:5 3	22:0 6	13	313 54.2	10.4	10 15.7	15.5	245 44.8	14 07.7	80 29.9	7 38.9	
30	10:4 3	22:1 5	14	328 23.6	10.4	10 00.2	15.5	260 47.4	14 07.7	95 32.2	7 39.0	
N.20	10:3 3	22:2 5	15	342 53.0	10.5	S. 9 44.7	15.5	275 50.0	N.14 07.7	110 34.5	S. 7 39.0	
N.10	10:1 4	22:3 5	16	357 22.5	10.6	9 29.2	15.6	290 52.5	14 07.7	125 36.8	7 39.1	
0	10:0 4	22:4 4	17	11 52.1	10.7	9 13.6	15.7	305 55.1	14 07.6	140 39.1	7 39.1	
S.10	09:8 4	22:5 4	18	26 21.8	10.7	8 57.9	15.7	320 57.7	14 07.6	155 41.4	7 39.2	
20	09:7 5	22:6 3	19	40 51.5	10.8	8 42.2	15.7	336 00.3	14 07.6	170 43.7	7 39.3	
S.30	09:5 5	22:7 3	20	55 21.3	10.8	S. 8 26.5	15.8	351 02.9	N.14 07.5	185 45.9	S. 7 39.3	
35	09:4 6	22:7 2	21	69 51.1	10.9	8 10.7	15.8	6 05.5	14 07.5	200 48.2	7 39.4	
40	09:3 6	22:8 2	22	84 21.0	11.0	7 54.9	15.8	21 08.1	14 07.5	215 50.5	7 39.4	
45	09:2 7	22:9 2	23	98 51.0	11.0	7 39.1	15.9	36 10.7	14 07.5	230 52.8	7 39.5	
50	09:0 7	23:0 1										
S.55	08:8 8	23:1 1										

Sun-set	Twilight	G. M. T.	S.D. SUN 16'3	ARIES	VENUS -3.7	MARS +1.1
^h _m S.B.H.	^h _m 12 59		G.H.A.	Dec.	G.H.A.	Dec.
180 15.6	S.23 26.5	91 28.6	133 56.9	S.18 25.5	124 51.6	S.14 38.3
195 15.3	23 26.5	106 31.1	148 56.4	18 24.6	139 52.2	14 37.6
210 14.9	23 26.5	121 33.6	163 56.0	18 23.7	154 52.8	14 37.0
225 14.6	23 26.5	136 36.0	178 55.5	18 22.7	169 53.4	14 36.3
240 14.3	23 26.4	151 38.5	193 55.1	18 21.8	184 54.0	14 35.6
255 14.0	S.23 26.4	166 41.0	208 54.6	S.18 20.9	199 54.6	S.14 34.9
270 13.7	23 26.4	181 43.4	223 54.1	18 19.0	214 55.2	14 34.3
285 13.4	23 26.4	196 45.9	238 53.7	18 19.0	229 55.8	14 33.6
300 13.1	23 26.3	211 48.4	253 53.2	18 18.1	244 56.4	14 32.9
315 12.8	23 26.3	226 50.8	268 52.8	18 17.1	259 57.0	14 32.2
330 12.4	S.23 26.3	241 53.3	283 52.3	S.18 16.2	274 57.6	S.14 31.6
345 12.1	23 26.2	256 55.7	298 51.9	18 15.3	289 58.2	14 30.9
0 11.8	23 26.2	271 58.2	313 51.4	18 14.3	304 58.8	14 30.2
15 11.5	23 26.2	287 00.7	328 51.0	18 13.4	319 59.4	14 29.5
30 11.2	23 26.1	302 03.1	343 50.5	18 12.5	335 00.0	14 28.9
45 10.9	S.23 26.1	317 05.6	358 50.1	S.18 11.5	350 00.6	S.14 28.2
60 10.6	23 26.1	332 08.1	13 49.6	18 10.6	5 01.2	14 27.5
75 10.3	23 26.0	347 10.5	28 49.2	18 09.7	20 01.8	14 26.8
90 09.9	23 26.0	2 13.0	43 48.7	18 08.7	35 02.4	14 26.2
105 09.6	23 26.0	17 15.5	58 48.3	18 07.8	50 03.0	14 25.5
120 09.3	S.23 25.9	32 17.9	73 47.8	S.18 06.8	65 03.6	S.14 24.8
135 09.0	23 25.9	47 20.4	88 47.4	18 05.9	80 04.2	14 24.1
150 08.7	23 25.9	62 22.9	103 46.9	18 04.9	95 04.8	14 23.4
165 08.4	23 25.8	77 25.3	118 46.5	18 04.0	110 05.4	14 22.8

Moon-rise	Moon-set	G. M. T.	Age 5 ^d .9	MOON S.D. 16'1				JUPITER -2.3		SATURN +0.9	
^h _m 12 59	^h _m 12 59			G.H.A.	v	Dec.	d	G.H.A.	Dec.	G.H.A.	Dec.
101 35.3	12.0	S. 0 56.9	16.2	52 15.3	N.14 06.8	246 50.0	S. 7 40.9				
116 06.3	12.1	0 40.7	16.2	67 17.9	14 06.8	261 52.3	7 41.0				
130 37.4	12.1	0 24.5	16.1	82 20.5	14 06.8	276 54.6	7 41.0				
145 08.5	12.1	S. 0 08.4	16.2	97 23.0	14 06.8	291 56.9	7 41.1				
159 39.6	12.1	N. 0 07.8	16.1	112 25.6	14 06.7	306 59.2	7 41.2				
174 10.7	12.1	N. 0 23.9	16.1	127 28.2	N.14 06.7	322 01.5	S. 7 41.2				
188 41.8	12.2	0 40.0	16.1	142 30.8	14 06.7	337 03.8	7 41.3				
203 13.0	12.1	0 56.1	16.1	157 33.3	14 06.7	352 06.1	7 41.3				
217 44.1	12.2	1 12.2	16.1	172 35.9	14 06.6	7 08.4	7 41.4				
232 15.3	12.2	1 28.3	16.1	187 38.5	14 06.6	22 10.7	7 41.4				
246 46.5	12.2	N. 1 44.4	16.0	202 41.1	N.14 06.6	37 13.0	S. 7 41.5				
261 17.7	12.3	2 00.4	16.0	217 43.7	14 06.6	52 15.3	7 41.5				
275 49.0	12.2	2 16.4	16.0	232 46.2	14 06.6	67 17.5	7 41.6				
290 20.2	12.2	2 32.4	16.0	247 48.8	14 06.5	82 19.8	7 41.7				
304 51.4	12.3	2 48.4	16.0	262 51.4	14 06.5	97 22.1	7 41.7				
319 22.7	12.2	N. 3 04.4	15.9	277 54.0	N.14 06.5	112 24.4	S. 7 41.8				
333 53.9	12.3	3 20.3	15.9	292 56.5	14 06.5	127 26.7	7 41.8				
348 25.2	12.2	3 36.2	15.8	307 59.1	14 06.4	142 29.0	7 41.9				
2 56.4	12.3	3 52.0	15.9	323 01.7	14 06.4	157 31.3	7 41.9				
17 27.7	12.3	4 07.9	15.8	338 04.3	14 06.4	172 33.6	7 42.0				
31 59.0	12.2	N. 4 23.7	15.8	353 06.8	N.14 06.4	187 35.9	S. 7 42.0				
46 30.2	12.3	4 39.5	15.7	8 09.4	14 06.4	202 38.2	7 42.1				
61 01.5	12.2	4 55.2	15.7	23 12.0	14 06.3	217 40.5	7 42.2				
75 32.7	12.3	5 10.9	15.7	38 14.6	14 06.3	232 42.8	7 42.2				

H.P. 4^h, 59'2; 12^h, 59'0; 20^h, 58'9 v=2.6 d=0.0 v=2.3 d=0.1

INTERPOLATION TABLES

Interpolation Tables

Interpolation Tables

0
1
2
3

m 0	Increment to G.H.A.			v or d Corr ⁿ
	SUN	ARIES	MOON	
00	0 00.0	0 00.0	0 00.0	0.0 0.0
01	0 00.3	0 00.3	0 00.2	0.3 0.0
02	0 00.5	0 00.5	0 00.5	0.6 0.0
03	0 00.8	0 00.8	0 00.7	0.9 0.0
04	0 01.0	0 01.0	0 01.0	1.2 0.0
05	0 01.3	0 01.3	0 01.2	1.5 0.0
06	0 01.5	0 01.5	0 01.4	1.8 0.0
07	0 01.8	0 01.8	0 01.7	2.1 0.0
08	0 02.0	0 02.0	0 01.9	2.4 0.0
09	0 02.3	0 02.3	0 02.1	2.7 0.0
10	0 02.5	0 02.5	0 02.4	3.0 0.0
11	0 02.8	0 02.8	0 02.6	3.3 0.0
12	0 03.0	0 03.0	0 02.9	3.6 0.0
13	0 03.3	0 03.3	0 03.1	3.9 0.0
14	0 03.5	0 03.5	0 03.3	4.2 0.0
15	0 03.8	0 03.8	0 03.6	4.5 0.0
16	0 04.0	0 04.0	0 03.8	4.8 0.0
17	0 04.3	0 04.3	0 04.1	5.1 0.0
18	0 04.5	0 04.5	0 04.3	5.4 0.0
19	0 04.8	0 04.8	0 04.5	5.7 0.0
20	0 05.0	0 05.0	0 04.8	6.0 0.1
21	0 05.3	0 05.3	0 05.0	6.3 0.1
22	0 05.5	0 05.5	0 05.2	6.6 0.1
23	0 05.8	0 05.8	0 05.5	6.9 0.1
24	0 06.0	0 06.0	0 05.7	7.2 0.1
25	0 06.3	0 06.3	0 06.0	7.5 0.1
26	0 06.5	0 06.5	0 06.2	7.8 0.1
27	0 06.8	0 06.8	0 06.4	8.1 0.1
28	0 07.0	0 07.0	0 06.7	8.4 0.1
29	0 07.3	0 07.3	0 06.9	8.7 0.1
30	0 07.5	0 07.5	0 07.2	9.0 0.1
31	0 07.8	0 07.8	0 07.4	9.3 0.1
32	0 08.0	0 08.0	0 07.6	9.6 0.1
33	0 08.3	0 08.3	0 07.9	9.9 0.1
34	0 08.5	0 08.5	0 08.1	10.2 0.1
35	0 08.8	0 08.8	0 08.4	10.5 0.1
36	0 09.0	0 09.0	0 08.6	10.8 0.1
37	0 09.3	0 09.3	0 08.8	11.1 0.1
38	0 09.5	0 09.5	0 09.1	11.4 0.1
39	0 09.8	0 09.8	0 09.3	11.7 0.1
40	0 10.0	0 10.0	0 09.5	12.0 0.1
41	0 10.3	0 10.3	0 09.8	12.3 0.1
42	0 10.5	0 10.5	0 10.0	12.6 0.1
43	0 10.8	0 10.8	0 10.3	12.9 0.1
44	0 11.0	0 11.0	0 10.5	13.2 0.1
45	0 11.3	0 11.3	0 10.7	13.5 0.1
46	0 11.5	0 11.5	0 11.0	13.8 0.1
47	0 11.8	0 11.8	0 11.2	14.1 0.1
48	0 12.0	0 12.0	0 11.5	14.4 0.1
49	0 12.3	0 12.3	0 11.7	14.7 0.1
50	0 12.5	0 12.5	0 11.9	15.0 0.1
51	0 12.8	0 12.8	0 12.2	15.3 0.1
52	0 13.0	0 13.0	0 12.4	15.6 0.1
53	0 13.3	0 13.3	0 12.6	15.9 0.1
54	0 13.5	0 13.5	0 12.9	16.2 0.1
55	0 13.8	0 13.8	0 13.1	16.5 0.1
56	0 14.0	0 14.0	0 13.4	16.8 0.1
57	0 14.3	0 14.3	0 13.6	17.1 0.1
58	0 14.5	0 14.5	0 13.8	17.4 0.1
59	0 14.8	0 14.8	0 14.1	17.7 0.1
60	0 15.0	0 15.0	0 14.3	18.0 0.2

m 1	Increment to G.H.A.			v or d Corr ⁿ
	SUN	ARIES	MOON	
00	0 15.0	0 15.0	0 14.3	0.0 0.0
01	0 15.3	0 15.3	0 14.6	0.3 0.0
02	0 15.5	0 15.5	0 14.8	0.6 0.0
03	0 15.8	0 15.8	0 15.0	0.9 0.0
04	0 16.0	0 16.0	0 15.3	1.2 0.0
05	0 16.3	0 16.3	0 15.5	1.5 0.0
06	0 16.5	0 16.5	0 15.7	1.8 0.0
07	0 16.8	0 16.8	0 16.0	2.1 0.0
08	0 17.0	0 17.0	0 16.2	2.4 0.1
09	0 17.3	0 17.3	0 16.5	2.7 0.1
10	0 17.5	0 17.5	0 16.7	3.0 0.1
11	0 17.8	0 17.8	0 16.9	3.3 0.1
12	0 18.0	0 18.0	0 17.2	3.6 0.1
13	0 18.3	0 18.3	0 17.4	3.9 0.1
14	0 18.5	0 18.6	0 17.7	4.2 0.1
15	0 18.8	0 18.8	0 17.9	4.5 0.1
16	0 19.0	0 19.1	0 18.1	4.8 0.1
17	0 19.3	0 19.3	0 18.4	5.1 0.1
18	0 19.5	0 19.6	0 18.6	5.4 0.1
19	0 19.8	0 19.8	0 18.9	5.7 0.1
20	0 20.0	0 20.1	0 19.1	6.0 0.2
21	0 20.3	0 20.3	0 19.3	6.3 0.2
22	0 20.5	0 20.6	0 19.6	6.6 0.2
23	0 20.8	0 20.8	0 19.8	6.9 0.2
24	0 21.0	0 21.1	0 20.0	7.2 0.2
25	0 21.3	0 21.3	0 20.3	7.5 0.2
26	0 21.5	0 21.6	0 20.5	7.8 0.2
27	0 21.8	0 21.8	0 20.8	8.1 0.2
28	0 22.0	0 22.1	0 21.0	8.4 0.2
29	0 22.3	0 22.3	0 21.2	8.7 0.2
30	0 22.5	0 22.6	0 21.5	9.0 0.2
31	0 22.8	0 22.8	0 21.7	9.3 0.2
32	0 23.0	0 23.1	0 22.0	9.6 0.2
33	0 23.3	0 23.3	0 22.2	9.9 0.2
34	0 23.5	0 23.6	0 22.4	10.2 0.3
35	0 23.8	0 23.8	0 22.7	10.5 0.3
36	0 24.0	0 24.1	0 22.9	10.8 0.3
37	0 24.3	0 24.3	0 23.1	11.1 0.3
38	0 24.5	0 24.6	0 23.4	11.4 0.3
39	0 24.8	0 24.8	0 23.6	11.7 0.3
40	0 25.0	0 25.1	0 23.9	12.0 0.3
41	0 25.3	0 25.3	0 24.1	12.3 0.3
42	0 25.5	0 25.6	0 24.3	12.6 0.3
43	0 25.8	0 25.8	0 24.6	12.9 0.3
44	0 26.0	0 26.1	0 24.8	13.2 0.3
45	0 26.3	0 26.3	0 25.1	13.5 0.3
46	0 26.5	0 26.6	0 25.3	13.8 0.3
47	0 26.8	0 26.8	0 25.5	14.1 0.4
48	0 27.0	0 27.1	0 25.8	14.4 0.4
49	0 27.3	0 27.3	0 26.0	14.7 0.4
50	0 27.5	0 27.6	0 26.2	15.0 0.4
51	0 27.8	0 27.8	0 26.5	15.3 0.4
52	0 28.0	0 28.1	0 26.7	15.6 0.4
53	0 28.3	0 28.3	0 27.0	15.9 0.4
54	0 28.5	0 28.6	0 27.2	16.2 0.4
55	0 28.8	0 28.8	0 27.4	16.5 0.4
56	0 29.0	0 29.1	0 27.7	16.8 0.4
57	0 29.3	0 29.3	0 27.9	17.1 0.4
58	0 29.5	0 29.6	0 28.2	17.4 0.4
59	0 29.8	0 29.8	0 28.4	17.7 0.4
60	0 30.0	0 30.1	0 28.6	18.0 0.5

m 2	Increment to G.H.A.			v or d Corr ⁿ
	SUN	ARIES	MOON	
00	0 30.0	0 30.1	0 28.6	0.0 0.0
01	0 30.3	0 30.3	0 28.9	0.3 0.0
02	0 30.5	0 30.6	0 29.1	0.6 0.0
03	0 30.8	0 30.8	0 29.3	0.9 0.0
04	0 31.0	0 31.1	0 29.6	1.2 0.1
05	0 31.3	0 31.3	0 29.8	1.5 0.1
06	0 31.5	0 31.6	0 30.1	1.8 0.1
07	0 31.8	0 31.8	0 30.3	2.1 0.1
08	0 32.0	0 32.1	0 30.5	2.4 0.1
09	0 32.3	0 32.3	0 30.8	2.7 0.1
10	0 32.5	0 32.6	0 31.0	3.0 0.1
11	0 32.8	0 32.8	0 31.3	3.3 0.1
12	0 33.0	0 33.1	0 31.5	3.6 0.2
13	0 33.3	0 33.3	0 31.7	3.9 0.2
14	0 33.5	0 33.6	0 32.0	4.2 0.2
15	0 33.8	0 33.8	0 32.2	4.5 0.2
16	0 34.0	0 34.1	0 32.5	4.8 0.2
17	0 34.3	0 34.3	0 32.7	5.1 0.2
18	0 34.5	0 34.6	0 32.9	5.4 0.2
19	0 34.8	0 34.8	0 33.2	5.7 0.2
20	0 35.0	0 35.1	0 33.4	6.0 0.3
21	0 35.3	0 35.3	0 33.6	6.3 0.3
22	0 35.5	0 35.6	0 33.9	6.6 0.3
23	0 35.8	0 35.8	0 34.1	6.9 0.3
24	0 36.0	0 36.1	0 34.4	7.2 0.3
25	0 36.3	0 36.3	0 34.6	7.5 0.3
26	0 36.5	0 36.6	0 34.8	7.8 0.3
27	0 36.8	0 36.9	0 35.1	8.1 0.3
28	0 37.0	0 37.1	0 35.3	8.4 0.4
29	0 37.3	0 37.4	0 35.6	8.7 0.4
30	0 37.5	0 37.6	0 35.8	9.0 0.4
31	0 37.8	0 37.9	0 36.0	9.3 0.4
32	0 38.0	0 38.1	0 36.3	9.6 0.4
33	0 38.3	0 38.4	0 36.5	9.9 0.4
34	0 38.5	0 38.6	0 36.7	10.2 0.4
35	0 38.8	0 38.9	0 37.0	10.5 0.4
36	0 39.0	0 39.1	0 37.2	10.8 0.5
37	0 39.3	0 39.4	0 37.5	11.1 0.5
38	0 39.5	0 39.6	0 37.7	11.4 0.5
39	0 39.8	0 39.9	0 37.9	11.7 0.5
40	0 40.0	0 40.1	0 38.2	12.0 0.5
41	0 40.3	0 40.4	0 38.4	12.3 0.5
42	0 40.5	0 40.6	0 38.7	12.6 0.5
43	0 40.8	0 40.9	0 38.9	12.9 0.5
44	0 41.0	0 41.1	0 39.1	13.2 0.6
45	0 41.3	0 41.4	0 39.4	13.5 0.6
46	0 41.5	0 41.6	0 39.6	13.8 0.6
47	0 41.8	0 41.9	0 39.8	14.1 0.6
48	0 42.0	0 42.1	0 40.1	14.4 0.6
49	0 42.3	0 42.4	0 40.3	14.7 0.6
50	0 42.5	0 42.6	0 40.6	15.0 0.6
51	0 42.8	0 42.9	0 40.8	15.3 0.6
52	0 43.0	0 43.1	0 41.0	15.6 0.7
53	0 43.3	0 43.4	0 41.3	15.9 0.7
54	0 43.5	0 43.6	0 41.5	16.2 0.7
55	0 43.8	0 43.9	0 41.8	16.5 0.7
56	0 44.0	0 44.1	0 42.0	16.8 0.7
57	0 44.3	0 44.4	0 42.2	17.1 0.7
58	0 44.5	0 44.6	0 42.5	17.4 0.7
59	0 44.8	0 44.9	0 42.7	17.7 0.7
60	0 45.0	0 45.1	0 43.0	18.0 0.8

m 3	Increment to G.H.A.			v or d Corr ⁿ
	SUN	ARIES	MOON	
00	0 45.0	0 45.1	0 43.0	0.0 0.0
01	0 45.3	0 45.4	0 43.2	0.3 0.0
02	0 45.5	0 45.6	0 43.4	0.6 0.0
03	0 45.8	0 45.9	0 43.7	0.9 0.1
04	0 46.0	0 46.1	0 43.9	1.2 0.1
05	0 46.3	0 46.4	0 44.1	1.5 0.1
06	0 46.5	0 46.6	0 44.4	1.8 0.1
07	0 46.8	0 46.9	0 44.6	2.1 0.1
08	0 47.0	0 47.1	0 44.9	2.4 0.1
09	0 47.3	0 47.4	0 45.1	2.7 0.2
10	0 47.5	0 47.6	0 45.3	3.0 0.2
11	0 47.8	0 47.9	0 45.6	3.3 0.2
12	0 48.0	0 48.1	0 45.8	3.6 0.2
13	0 48.3	0 48.4	0 46.1	3.9 0.2
14	0 48.5	0 48.6	0 46.3	4.2 0.2
15	0 48.8	0 48.9	0 46.5	4.5 0.3
16	0 49.0	0 49.1	0 46.8	4.8 0.3
17	0 49.3	0 49.4	0 47.0	5.1 0.3
18	0 49.5	0 49.6	0 47.2	5.4 0.3
19	0 49.8	0 49.9	0 47.5	5.7 0.3
20	0 50.0	0 50.1	0 47.7	6

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m 4	Increment to G.H.A.			v or d Corr ⁿ
	SUN	ARIES	MOON	
00	I 00.0	I 00.2	0 57.3	0.0 0.0
01	I 00.3	I 00.4	0 57.5	0.3 0.0
02	I 00.5	I 00.7	0 57.7	0.6 0.0
03	I 00.8	I 00.9	0 58.0	0.9 0.1
04	I 01.0	I 01.2	0 58.2	1.2 0.1
05	I 01.3	I 01.4	0 58.5	1.5 0.1
06	I 01.5	I 01.7	0 58.7	1.8 0.1
07	I 01.8	I 01.9	0 58.9	2.1 0.2
08	I 02.0	I 02.2	0 59.2	2.4 0.2
09	I 02.3	I 02.4	0 59.4	2.7 0.2
10	I 02.5	I 02.7	0 59.7	3.0 0.2
11	I 02.8	I 02.9	0 59.9	3.3 0.2
12	I 03.0	I 03.2	I 00.1	3.6 0.3
13	I 03.3	I 03.4	I 00.4	3.9 0.3
14	I 03.5	I 03.7	I 00.6	4.2 0.3
15	I 03.8	I 03.9	I 00.8	4.5 0.3
16	I 04.0	I 04.2	I 01.1	4.8 0.4
17	I 04.3	I 04.4	I 01.3	5.1 0.4
18	I 04.5	I 04.7	I 01.6	5.4 0.4
19	I 04.8	I 04.9	I 01.8	5.7 0.4
20	I 05.0	I 05.2	I 02.0	6.0 0.5
21	I 05.3	I 05.4	I 02.3	6.3 0.5
22	I 05.5	I 05.7	I 02.5	6.6 0.5
23	I 05.8	I 05.9	I 02.8	6.9 0.5
24	I 06.0	I 06.2	I 03.0	7.2 0.5
25	I 06.3	I 06.4	I 03.2	7.5 0.6
26	I 06.5	I 06.7	I 03.5	7.8 0.6
27	I 06.8	I 06.9	I 03.7	8.1 0.6
28	I 07.0	I 07.2	I 03.9	8.4 0.6
29	I 07.3	I 07.4	I 04.2	8.7 0.7
30	I 07.5	I 07.7	I 04.4	9.0 0.7
31	I 07.8	I 07.9	I 04.7	9.3 0.7
32	I 08.0	I 08.2	I 04.9	9.6 0.7
33	I 08.3	I 08.4	I 05.1	9.9 0.7
34	I 08.5	I 08.7	I 05.4	10.2 0.8
35	I 08.8	I 08.9	I 05.6	10.5 0.8
36	I 09.0	I 09.2	I 05.9	10.8 0.8
37	I 09.3	I 09.4	I 06.1	11.1 0.8
38	I 09.5	I 09.7	I 06.3	11.4 0.9
39	I 09.8	I 09.9	I 06.6	11.7 0.9
40	I 10.0	I 10.2	I 06.8	12.0 0.9
41	I 10.3	I 10.4	I 07.0	12.3 0.9
42	I 10.5	I 10.7	I 07.3	12.6 0.9
43	I 10.8	I 10.9	I 07.5	12.9 1.0
44	I 11.0	I 11.2	I 07.8	13.2 1.0
45	I 11.3	I 11.4	I 08.0	13.5 1.0
46	I 11.5	I 11.7	I 08.2	13.8 1.0
47	I 11.8	I 11.9	I 08.5	14.1 1.1
48	I 12.0	I 12.2	I 08.7	14.4 1.1
49	I 12.3	I 12.4	I 09.0	14.7 1.1
50	I 12.5	I 12.7	I 09.2	15.0 1.1
51	I 12.8	I 12.9	I 09.4	15.3 1.1
52	I 13.0	I 13.2	I 09.7	15.6 1.2
53	I 13.3	I 13.5	I 09.9	15.9 1.2
54	I 13.5	I 13.7	I 10.2	16.2 1.2
55	I 13.8	I 14.0	I 10.4	16.5 1.2
56	I 14.0	I 14.2	I 10.6	16.8 1.3
57	I 14.3	I 14.5	I 10.9	17.1 1.3
58	I 14.5	I 14.7	I 11.1	17.4 1.3
59	I 14.8	I 15.0	I 11.3	17.7 1.3
60	I 15.0	I 15.2	I 11.6	18.0 1.4

m 5	Increment to G.H.A.			v or d Corr ⁿ
	SUN	ARIES	MOON	
00	I 15.0	I 15.2	I 11.6	0.0 0.0
01	I 15.3	I 15.5	I 11.8	0.3 0.0
02	I 15.5	I 15.7	I 12.1	0.6 0.1
03	I 15.8	I 16.0	I 12.3	0.9 0.1
04	I 16.0	I 16.2	I 12.5	1.2 0.1
05	I 16.3	I 16.5	I 12.8	1.5 0.1
06	I 16.5	I 16.7	I 13.0	1.8 0.2
07	I 16.8	I 17.0	I 13.3	2.1 0.2
08	I 17.0	I 17.2	I 13.5	2.4 0.2
09	I 17.3	I 17.5	I 13.7	2.7 0.2
10	I 17.5	I 17.7	I 14.0	3.0 0.3
11	I 17.8	I 18.0	I 14.2	3.3 0.3
12	I 18.0	I 18.2	I 14.4	3.6 0.3
13	I 18.3	I 18.5	I 14.7	3.9 0.4
14	I 18.5	I 18.7	I 14.9	4.2 0.4
15	I 18.8	I 19.0	I 15.2	4.5 0.4
16	I 19.0	I 19.2	I 15.4	4.8 0.4
17	I 19.3	I 19.5	I 15.6	5.1 0.5
18	I 19.5	I 19.7	I 15.9	5.4 0.5
19	I 19.8	I 20.0	I 16.1	5.7 0.5
20	I 20.0	I 20.2	I 16.4	6.0 0.6
21	I 20.3	I 20.5	I 16.6	6.3 0.6
22	I 20.5	I 20.7	I 16.8	6.6 0.6
23	I 20.8	I 21.0	I 17.1	6.9 0.6
24	I 21.0	I 21.2	I 17.3	7.2 0.7
25	I 21.3	I 21.5	I 17.5	7.5 0.7
26	I 21.5	I 21.7	I 17.8	7.8 0.7
27	I 21.8	I 22.0	I 18.0	8.1 0.7
28	I 22.0	I 22.2	I 18.3	8.4 0.8
29	I 22.3	I 22.5	I 18.5	8.7 0.8
30	I 22.5	I 22.7	I 18.7	9.0 0.8
31	I 22.8	I 23.0	I 19.0	9.3 0.9
32	I 23.0	I 23.2	I 19.2	9.6 0.9
33	I 23.3	I 23.5	I 19.5	9.9 0.9
34	I 23.5	I 23.7	I 19.7	10.2 0.9
35	I 23.8	I 24.0	I 19.9	10.5 1.0
36	I 24.0	I 24.2	I 20.2	10.8 1.0
37	I 24.3	I 24.5	I 20.4	11.1 1.0
38	I 24.5	I 24.7	I 20.7	11.4 1.0
39	I 24.8	I 25.0	I 20.9	11.7 1.1
40	I 25.0	I 25.2	I 21.1	12.0 1.1
41	I 25.3	I 25.5	I 21.4	12.3 1.1
42	I 25.5	I 25.7	I 21.6	12.6 1.2
43	I 25.8	I 26.0	I 21.8	12.9 1.2
44	I 26.0	I 26.2	I 22.1	13.2 1.2
45	I 26.3	I 26.5	I 22.3	13.5 1.2
46	I 26.5	I 26.7	I 22.6	13.8 1.3
47	I 26.8	I 27.0	I 22.8	14.1 1.3
48	I 27.0	I 27.2	I 23.0	14.4 1.3
49	I 27.3	I 27.5	I 23.3	14.7 1.3
50	I 27.5	I 27.7	I 23.5	15.0 1.4
51	I 27.8	I 28.0	I 23.8	15.3 1.4
52	I 28.0	I 28.2	I 24.0	15.6 1.4
53	I 28.3	I 28.5	I 24.2	15.9 1.5
54	I 28.5	I 28.7	I 24.5	16.2 1.5
55	I 28.8	I 29.0	I 24.7	16.5 1.5
56	I 29.0	I 29.2	I 24.9	16.8 1.5
57	I 29.3	I 29.5	I 25.2	17.1 1.6
58	I 29.5	I 29.7	I 25.4	17.4 1.6
59	I 29.8	I 30.0	I 25.7	17.7 1.6
60	I 30.0	I 30.2	I 25.9	18.0 1.7

m 6	Increment to G.H.A.			v or d Corr ⁿ
	SUN	ARIES	MOON	
00	I 30.0	I 30.2	I 25.9	0.0 0.0
01	I 30.3	I 30.5	I 26.1	0.3 0.0
02	I 30.5	I 30.7	I 26.4	0.6 0.1
03	I 30.8	I 31.0	I 26.6	0.9 0.1
04	I 31.0	I 31.2	I 26.9	1.2 0.1
05	I 31.3	I 31.5	I 27.1	1.5 0.2
06	I 31.5	I 31.8	I 27.3	1.8 0.2
07	I 31.8	I 32.0	I 27.6	2.1 0.2
08	I 32.0	I 32.3	I 27.8	2.4 0.3
09	I 32.3	I 32.5	I 28.0	2.7 0.3
10	I 32.5	I 32.8	I 28.3	3.0 0.3
11	I 32.8	I 33.0	I 28.5	3.3 0.4
12	I 33.0	I 33.3	I 28.8	3.6 0.4
13	I 33.3	I 33.5	I 29.0	3.9 0.4
14	I 33.5	I 33.8	I 29.2	4.2 0.5
15	I 33.8	I 34.0	I 29.5	4.5 0.5
16	I 34.0	I 34.3	I 29.7	4.8 0.5
17	I 34.3	I 34.5	I 30.0	5.1 0.6
18	I 34.5	I 34.8	I 30.2	5.4 0.6
19	I 34.8	I 35.0	I 30.4	5.7 0.6
20	I 35.0	I 35.3	I 30.7	6.0 0.7
21	I 35.3	I 35.5	I 30.9	6.3 0.7
22	I 35.5	I 35.8	I 31.1	6.6 0.7
23	I 35.8	I 36.0	I 31.4	6.9 0.7
24	I 36.0	I 36.3	I 31.6	7.2 0.8
25	I 36.3	I 36.5	I 31.9	7.5 0.8
26	I 36.5	I 36.8	I 32.1	7.8 0.8
27	I 36.8	I 37.0	I 32.3	8.1 0.9
28	I 37.0	I 37.3	I 32.6	8.4 0.9
29	I 37.3	I 37.5	I 32.8	8.7 0.9
30	I 37.5	I 37.8	I 33.1	9.0 1.0
31	I 37.8	I 38.0	I 33.3	9.3 1.0
32	I 38.0	I 38.3	I 33.5	9.6 1.0
33	I 38.3	I 38.5	I 33.8	9.9 1.1
34	I 38.5	I 38.8	I 34.0	10.2 1.1
35	I 38.8	I 39.0	I 34.3	10.5 1.1
36	I 39.0	I 39.3	I 34.5	10.8 1.2
37	I 39.3	I 39.5	I 34.7	11.1 1.2
38	I 39.5	I 39.8	I 35.0	11.4 1.2
39	I 39.8	I 40.0	I 35.2	11.7 1.3
40	I 40.0	I 40.3	I 35.4	12.0 1.3
41	I 40.3	I 40.5	I 35.7	12.3 1.3
42	I 40.5	I 40.8	I 35.9	12.6 1.4
43	I 40.8	I 41.0	I 36.2	12.9 1.4
44	I 41.0	I 41.3	I 36.4	13.2 1.4
45	I 41.3	I 41.5	I 36.6	13.5 1.5
46	I 41.5	I 41.8	I 36.9	13.8 1.5
47	I 41.8	I 42.0	I 37.1	14.1 1.5
48	I 42.0	I 42.3	I 37.4	14.4 1.6
49	I 42.3	I 42.5	I 37.6	14.7 1.6
50	I 42.5	I 42.8	I 37.8	15.0 1.6
51	I 42.8	I 43.0	I 38.1	15.3 1.7
52	I 43.0	I 43.3	I 38.3	15.6 1.7
53	I 43.3	I 43.5	I 38.5	15.9 1.7
54	I 43.5	I 43.8	I 38.8	16.2 1.8
55	I 43.8	I 44.0	I 39.0	16.5 1.8
56	I 44.0	I 44.3	I 39.3	16.8 1.8
57	I 44.3	I 44.5	I 39.5	17.1 1.9
58	I 44.5	I 44.8	I 39.7	17.4 1.9
59	I 44.8	I 45.0	I 40.0	17.7 1.9
60	I 45.0	I 45.3	I 40.2	18.0 2.0

m 7	Increment to G.H.A.			v or d Corr ⁿ
	SUN	ARIES	MOON	
00	I 45.0	I 45.3	I 40.2	0.0 0.0
01	I 45.3	I 45.5	I 40.5	0.3 0.0
02	I 45.5	I 45.8	I 40.7	0.6 0.1
03	I 45.8	I 46.0	I 40.9	0.9 0.1
04	I 46.0	I 46.3	I 41.2	1.2 0.2
05	I 46.3	I 46.5	I 41.4	1.5 0.2
06	I 46.5	I 46.8	I 41.6	1.8 0.2
07	I 46.8	I 47.0	I 41.9	2.1 0.3
08	I 47.0	I 47.3	I 42.1	2.4 0.3
09	I 47.3	I 47.5	I 42.4	2.7 0.3
10	I 47.5	I 47.8	I 42.6	3.0 0.4
11	I 47.8	I 48.0	I 42.8	3.3 0.4
12	I 48.0	I 48.3	I 43.1	3.6 0.5
13	I 48.3	I 48.5	I 43.3	3.9 0.5
14	I 48.5	I 48.8	I 43.6	4.2 0.5
15	I 48.8	I 49.0	I 43.8	4.5 0.6
16	I 49.0	I 49.3	I 44.0	4.8 0.6
17	I 49.3	I 49.5	I 44.3	5.1 0.6
18	I 49.5	I 49.8	I 44.5	5.4 0.7
19	I 49.8	I 50.1	I 44.8	5.7 0.7
20	I 50.0	I 50.3	I 45.0	6.0 0.8
21	I 50.3	I 50.6	I 45.2	6.3 0.8
22	I 50.5	I 50.8	I 45.5	6.6 0.8
23	I 50.8	I 51.1	I 45.7	6.9 0.9
24	I 51.0	I 51.3	I 45.9	7.2 0.9
25	I 51.3	I 51.6	I 46.2	7.5 0.9
26	I 51.5	I 51.8	I 46.4	7.8 1.0
27	I 51.8	I 52.1	I 46.7	8.1 1.0
28	I 52.0	I 52.3	I 46.9	8.4 1.1
29	I 52.			

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11

m 8	Increment to G.H.A.			v or Corr ⁿ d
	SUN	ARIES	MOON	
00	2 00.0	2 00.3	1 54.5	0.0 0.0
01	2 00.3	2 00.6	1 54.8	0.3 0.0
02	2 00.5	2 00.8	1 55.0	0.6 0.1
03	2 00.8	2 01.1	1 55.2	0.9 0.1
04	2 01.0	2 01.3	1 55.5	1.2 0.2
05	2 01.3	2 01.6	1 55.7	1.5 0.2
06	2 01.5	2 01.8	1 56.0	1.8 0.3
07	2 01.8	2 02.1	1 56.2	2.1 0.3
08	2 02.0	2 02.3	1 56.4	2.4 0.3
09	2 02.3	2 02.6	1 56.7	2.7 0.4
10	2 02.5	2 02.8	1 56.9	3.0 0.4
11	2 02.8	2 03.1	1 57.2	3.3 0.5
12	2 03.0	2 03.3	1 57.4	3.6 0.5
13	2 03.3	2 03.6	1 57.6	3.9 0.6
14	2 03.5	2 03.8	1 57.9	4.2 0.6
15	2 03.8	2 04.1	1 58.1	4.5 0.6
16	2 04.0	2 04.3	1 58.4	4.8 0.7
17	2 04.3	2 04.6	1 58.6	5.1 0.7
18	2 04.5	2 04.8	1 58.8	5.4 0.8
19	2 04.8	2 05.1	1 59.1	5.7 0.8
20	2 05.0	2 05.3	1 59.3	6.0 0.9
21	2 05.3	2 05.6	1 59.5	6.3 0.9
22	2 05.5	2 05.8	1 59.8	6.6 0.9
23	2 05.8	2 06.1	1 60.0	6.9 1.0
24	2 06.0	2 06.3	2 00.3	7.2 1.0
25	2 06.3	2 06.6	2 00.5	7.5 1.1
26	2 06.5	2 06.8	2 00.7	7.8 1.1
27	2 06.8	2 07.1	2 01.0	8.1 1.1
28	2 07.0	2 07.3	2 01.2	8.4 1.2
29	2 07.3	2 07.6	2 01.5	8.7 1.2
30	2 07.5	2 07.8	2 01.7	9.0 1.3
31	2 07.8	2 08.1	2 01.9	9.3 1.3
32	2 08.0	2 08.4	2 02.2	9.6 1.4
33	2 08.3	2 08.6	2 02.4	9.9 1.4
34	2 08.5	2 08.9	2 02.6	10.2 1.4
35	2 08.8	2 09.1	2 02.9	10.5 1.5
36	2 09.0	2 09.4	2 03.1	10.8 1.5
37	2 09.3	2 09.6	2 03.4	11.1 1.6
38	2 09.5	2 09.9	2 03.6	11.4 1.6
39	2 09.8	2 10.1	2 03.8	11.7 1.7
40	2 10.0	2 10.4	2 04.1	12.0 1.7
41	2 10.3	2 10.6	2 04.3	12.3 1.7
42	2 10.5	2 10.9	2 04.6	12.6 1.8
43	2 10.8	2 11.1	2 04.8	12.9 1.8
44	2 11.0	2 11.4	2 05.0	13.2 1.9
45	2 11.3	2 11.6	2 05.3	13.5 1.9
46	2 11.5	2 11.9	2 05.5	13.8 2.0
47	2 11.8	2 12.1	2 05.7	14.1 2.0
48	2 12.0	2 12.4	2 06.0	14.4 2.0
49	2 12.3	2 12.6	2 06.2	14.7 2.1
50	2 12.5	2 12.9	2 06.5	15.0 2.1
51	2 12.8	2 13.1	2 06.7	15.3 2.2
52	2 13.0	2 13.4	2 06.9	15.6 2.2
53	2 13.3	2 13.6	2 07.2	15.9 2.3
54	2 13.5	2 13.9	2 07.4	16.2 2.3
55	2 13.8	2 14.1	2 07.7	16.5 2.3
56	2 14.0	2 14.4	2 07.9	16.8 2.4
57	2 14.3	2 14.6	2 08.1	17.1 2.4
58	2 14.5	2 14.9	2 08.4	17.4 2.5
59	2 14.8	2 15.1	2 08.6	17.7 2.5
60	2 15.0	2 15.4	2 08.9	18.0 2.6

m 9	Increment to G.H.A.			v or Corr ⁿ d
	SUN	ARIES	MOON	
00	2 15.0	2 15.4	2 08.9	0.0 0.0
01	2 15.3	2 15.6	2 09.1	0.3 0.0
02	2 15.5	2 15.9	2 09.3	0.6 0.1
03	2 15.8	2 16.1	2 09.6	0.9 0.1
04	2 16.0	2 16.4	2 09.8	1.2 0.2
05	2 16.3	2 16.6	2 10.0	1.5 0.2
06	2 16.5	2 16.9	2 10.3	1.8 0.3
07	2 16.8	2 17.1	2 10.5	2.1 0.3
08	2 17.0	2 17.4	2 10.8	2.4 0.4
09	2 17.3	2 17.6	2 11.0	2.7 0.4
10	2 17.5	2 17.9	2 11.2	3.0 0.5
11	2 17.8	2 18.1	2 11.5	3.3 0.5
12	2 18.0	2 18.4	2 11.7	3.6 0.6
13	2 18.3	2 18.6	2 12.0	3.9 0.6
14	2 18.5	2 18.9	2 12.2	4.2 0.7
15	2 18.8	2 19.1	2 12.4	4.5 0.7
16	2 19.0	2 19.4	2 12.7	4.8 0.8
17	2 19.3	2 19.6	2 12.9	5.1 0.8
18	2 19.5	2 19.9	2 13.1	5.4 0.9
19	2 19.8	2 20.1	2 13.4	5.7 0.9
20	2 20.0	2 20.4	2 13.6	6.0 1.0
21	2 20.3	2 20.6	2 13.9	6.3 1.0
22	2 20.5	2 20.9	2 14.1	6.6 1.0
23	2 20.8	2 21.1	2 14.3	6.9 1.1
24	2 21.0	2 21.4	2 14.6	7.2 1.1
25	2 21.3	2 21.6	2 14.8	7.5 1.2
26	2 21.5	2 21.9	2 15.1	7.8 1.2
27	2 21.8	2 22.1	2 15.3	8.1 1.3
28	2 22.0	2 22.4	2 15.5	8.4 1.3
29	2 22.3	2 22.6	2 15.8	8.7 1.4
30	2 22.5	2 22.9	2 16.0	9.0 1.4
31	2 22.8	2 23.1	2 16.2	9.3 1.5
32	2 23.0	2 23.4	2 16.5	9.6 1.5
33	2 23.3	2 23.6	2 16.7	9.9 1.6
34	2 23.5	2 23.9	2 17.0	10.2 1.6
35	2 23.8	2 24.1	2 17.2	10.5 1.7
36	2 24.0	2 24.4	2 17.4	10.8 1.7
37	2 24.3	2 24.6	2 17.7	11.1 1.8
38	2 24.5	2 24.9	2 17.9	11.4 1.8
39	2 24.8	2 25.1	2 18.2	11.7 1.9
40	2 25.0	2 25.4	2 18.4	12.0 1.9
41	2 25.3	2 25.6	2 18.6	12.3 1.9
42	2 25.5	2 25.9	2 18.9	12.6 2.0
43	2 25.8	2 26.1	2 19.1	12.9 2.0
44	2 26.0	2 26.4	2 19.3	13.2 2.1
45	2 26.3	2 26.7	2 19.6	13.5 2.1
46	2 26.5	2 26.9	2 19.8	13.8 2.2
47	2 26.8	2 27.2	2 20.1	14.1 2.2
48	2 27.0	2 27.4	2 20.3	14.4 2.3
49	2 27.3	2 27.7	2 20.5	14.7 2.3
50	2 27.5	2 27.9	2 20.8	15.0 2.4
51	2 27.8	2 28.2	2 21.0	15.3 2.4
52	2 28.0	2 28.4	2 21.3	15.6 2.5
53	2 28.3	2 28.7	2 21.5	15.9 2.5
54	2 28.5	2 28.9	2 21.7	16.2 2.6
55	2 28.8	2 29.2	2 22.0	16.5 2.6
56	2 29.0	2 29.4	2 22.2	16.8 2.7
57	2 29.3	2 29.7	2 22.5	17.1 2.7
58	2 29.5	2 29.9	2 22.7	17.4 2.8
59	2 29.8	2 30.2	2 22.9	17.7 2.8
60	2 30.0	2 30.4	2 23.2	18.0 2.9

m 10	Increment to G.H.A.			v or Corr ⁿ d
	SUN	ARIES	MOON	
00	2 30.0	2 30.4	2 23.2	0.0 0.0
01	2 30.3	2 30.7	2 23.4	0.3 0.1
02	2 30.5	2 30.9	2 23.6	0.6 0.1
03	2 30.8	2 31.2	2 23.9	0.9 0.2
04	2 31.0	2 31.4	2 24.1	1.2 0.2
05	2 31.3	2 31.7	2 24.4	1.5 0.3
06	2 31.5	2 31.9	2 24.6	1.8 0.3
07	2 31.8	2 32.2	2 24.8	2.1 0.4
08	2 32.0	2 32.4	2 25.1	2.4 0.4
09	2 32.3	2 32.7	2 25.3	2.7 0.5
10	2 32.5	2 32.9	2 25.6	3.0 0.5
11	2 32.8	2 33.2	2 25.8	3.3 0.6
12	2 33.0	2 33.4	2 26.0	3.6 0.6
13	2 33.3	2 33.7	2 26.3	3.9 0.7
14	2 33.5	2 33.9	2 26.5	4.2 0.7
15	2 33.8	2 34.2	2 26.7	4.5 0.8
16	2 34.0	2 34.4	2 27.0	4.8 0.8
17	2 34.3	2 34.7	2 27.2	5.1 0.9
18	2 34.5	2 34.9	2 27.5	5.4 0.9
19	2 34.8	2 35.2	2 27.7	5.7 1.0
20	2 35.0	2 35.4	2 27.9	6.0 1.1
21	2 35.3	2 35.7	2 28.2	6.3 1.1
22	2 35.5	2 35.9	2 28.4	6.6 1.2
23	2 35.8	2 36.2	2 28.7	6.9 1.2
24	2 36.0	2 36.4	2 28.9	7.2 1.3
25	2 36.3	2 36.7	2 29.1	7.5 1.3
26	2 36.5	2 36.9	2 29.4	7.8 1.4
27	2 36.8	2 37.2	2 29.6	8.1 1.4
28	2 37.0	2 37.4	2 29.8	8.4 1.5
29	2 37.3	2 37.7	2 30.1	8.7 1.5
30	2 37.5	2 37.9	2 30.3	9.0 1.6
31	2 37.8	2 38.2	2 30.6	9.3 1.6
32	2 38.0	2 38.4	2 30.8	9.6 1.7
33	2 38.3	2 38.7	2 31.0	9.9 1.7
34	2 38.5	2 38.9	2 31.3	10.2 1.8
35	2 38.8	2 39.2	2 31.5	10.5 1.8
36	2 39.0	2 39.4	2 31.8	10.8 1.9
37	2 39.3	2 39.7	2 32.0	11.1 1.9
38	2 39.5	2 39.9	2 32.2	11.4 2.0
39	2 39.8	2 40.2	2 32.5	11.7 2.0
40	2 40.0	2 40.4	2 32.7	12.0 2.1
41	2 40.3	2 40.7	2 32.9	12.3 2.2
42	2 40.5	2 40.9	2 33.2	12.6 2.2
43	2 40.8	2 41.2	2 33.4	12.9 2.3
44	2 41.0	2 41.4	2 33.7	13.2 2.3
45	2 41.3	2 41.7	2 33.9	13.5 2.4
46	2 41.5	2 41.9	2 34.1	13.8 2.4
47	2 41.8	2 42.2	2 34.4	14.1 2.5
48	2 42.0	2 42.4	2 34.6	14.4 2.5
49	2 42.3	2 42.7	2 34.9	14.7 2.6
50	2 42.5	2 42.9	2 35.1	15.0 2.6
51	2 42.8	2 43.2	2 35.3	15.3 2.7
52	2 43.0	2 43.4	2 35.6	15.6 2.7
53	2 43.3	2 43.7	2 35.8	15.9 2.8
54	2 43.5	2 43.9	2 36.1	16.2 2.8
55	2 43.8	2 44.2	2 36.3	16.5 2.9
56	2 44.0	2 44.4	2 36.5	16.8 2.9
57	2 44.3	2 44.7	2 36.8	17.1 3.0
58	2 44.5	2 45.0	2 37.0	17.4 3.0
59	2 44.8	2 45.2	2 37.2	17.7 3.1
60	2 45.0	2 45.5	2 37.5	18.0 3.2

m 11	Increment to G.H.A.			v or Corr ⁿ d
	SUN	ARIES	MOON	
00	2 45.0	2 45.5	2 37.5	0.0 0.0
01	2 45.3	2 45.7	2 37.7	0.3 0.1
02	2 45.5	2 46.0	2 38.0	0.6 0.1
03	2 45.8	2 46.2	2 38.2	0.9 0.2
04	2 46.0	2 46.5	2 38.4	1.2 0.2
05	2 46.3	2 46.7	2 38.7	1.5 0.3
06	2 46.5	2 47.0	2 38.9	1.8 0.3
07	2 46.8	2 47.2	2 39.2	2.1 0.4
08	2 47.0	2 47.5	2 39.4	2.4 0.4
09	2 47.3	2 47.7	2 39.6	2.7 0.5
10	2 47.5	2 48.0	2 39.9	3.0 0.6
11	2 47.8	2 48.2	2 40.1	3.3 0.6
12	2 48.0	2 48.5	2 40.3	3.6 0.7
13	2 48.3	2 48.7	2 40.6	3.9 0.7
14	2 48.5	2 49.0	2 40.8	4.2 0.8
15	2 48.8	2 49.2	2 41.1	4.5 0.9
16	2 49.0	2 49.5	2 41.3	4.8 0.9
17	2 49.3	2 49.7	2 41.5	5.1 1.0</

I2
I3
I4
I5

I2
I3
I4
I5

m I2	Increment to G.H.A.			v or Corr ⁿ d
	SUN	ARIES	MOON	
00	3 00.0	3 00.5	2 51.8	0.0 0.0
01	3 00.3	3 00.7	2 52.0	0.3 0.1
02	3 00.5	3 01.0	2 52.3	0.6 0.1
03	3 00.8	3 01.2	2 52.5	0.9 0.2
04	3 01.0	3 01.5	2 52.8	1.2 0.3
05	3 01.3	3 01.7	2 53.0	1.5 0.3
06	3 01.5	3 02.0	2 53.2	1.8 0.4
07	3 01.8	3 02.2	2 53.5	2.1 0.4
08	3 02.0	3 02.5	2 53.7	2.4 0.5
09	3 02.3	3 02.7	2 53.9	2.7 0.6
10	3 02.5	3 03.0	2 54.2	3.0 0.6
11	3 02.8	3 03.3	2 54.4	3.3 0.7
12	3 03.0	3 03.5	2 54.7	3.6 0.8
13	3 03.3	3 03.8	2 54.9	3.9 0.8
14	3 03.5	3 04.0	2 55.1	4.2 0.9
15	3 03.8	3 04.3	2 55.4	4.5 0.9
16	3 04.0	3 04.5	2 55.6	4.8 1.0
17	3 04.3	3 04.8	2 55.9	5.1 1.1
18	3 04.5	3 05.0	2 56.1	5.4 1.1
19	3 04.8	3 05.3	2 56.3	5.7 1.2
20	3 05.0	3 05.5	2 56.6	6.0 1.3
21	3 05.3	3 05.8	2 56.8	6.3 1.3
22	3 05.5	3 06.0	2 57.0	6.6 1.4
23	3 05.8	3 06.3	2 57.3	6.9 1.4
24	3 06.0	3 06.5	2 57.5	7.2 1.5
25	3 06.3	3 06.8	2 57.8	7.5 1.6
26	3 06.5	3 07.0	2 58.0	7.8 1.6
27	3 06.8	3 07.3	2 58.2	8.1 1.7
28	3 07.0	3 07.5	2 58.5	8.4 1.8
29	3 07.3	3 07.8	2 58.7	8.7 1.8
30	3 07.5	3 08.0	2 59.0	9.0 1.9
31	3 07.8	3 08.3	2 59.2	9.3 1.9
32	3 08.0	3 08.5	2 59.4	9.6 2.0
33	3 08.3	3 08.8	2 59.7	9.9 2.1
34	3 08.5	3 09.0	2 59.9	10.2 2.1
35	3 08.8	3 09.3	3 00.2	10.5 2.2
36	3 09.0	3 09.5	3 00.4	10.8 2.3
37	3 09.3	3 09.8	3 00.6	11.1 2.3
38	3 09.5	3 10.0	3 00.9	11.4 2.4
39	3 09.8	3 10.3	3 01.1	11.7 2.4
40	3 10.0	3 10.5	3 01.3	12.0 2.5
41	3 10.3	3 10.8	3 01.6	12.3 2.6
42	3 10.5	3 11.0	3 01.8	12.6 2.6
43	3 10.8	3 11.3	3 02.1	12.9 2.7
44	3 11.0	3 11.5	3 02.3	13.2 2.8
45	3 11.3	3 11.8	3 02.5	13.5 2.8
46	3 11.5	3 12.0	3 02.8	13.8 2.9
47	3 11.8	3 12.3	3 03.0	14.1 2.9
48	3 12.0	3 12.5	3 03.3	14.4 3.0
49	3 12.3	3 12.8	3 03.5	14.7 3.1
50	3 12.5	3 13.0	3 03.7	15.0 3.1
51	3 12.8	3 13.3	3 04.0	15.3 3.2
52	3 13.0	3 13.5	3 04.2	15.6 3.3
53	3 13.3	3 13.8	3 04.4	15.9 3.3
54	3 13.5	3 14.0	3 04.7	16.2 3.4
55	3 13.8	3 14.3	3 04.9	16.5 3.4
56	3 14.0	3 14.5	3 05.2	16.8 3.5
57	3 14.3	3 14.8	3 05.4	17.1 3.6
58	3 14.5	3 15.0	3 05.6	17.4 3.6
59	3 14.8	3 15.3	3 05.9	17.7 3.7
60	3 15.0	3 15.5	3 06.1	18.0 3.8

m I3	Increment to G.H.A.			v or Corr ⁿ d
	SUN	ARIES	MOON	
00	3 15.0	3 15.5	3 06.1	0.0 0.0
01	3 15.3	3 15.8	3 06.4	0.3 0.1
02	3 15.5	3 16.0	3 06.6	0.6 0.1
03	3 15.8	3 16.3	3 06.8	0.9 0.2
04	3 16.0	3 16.5	3 07.1	1.2 0.3
05	3 16.3	3 16.8	3 07.3	1.5 0.3
06	3 16.5	3 17.0	3 07.5	1.8 0.4
07	3 16.8	3 17.3	3 07.8	2.1 0.5
08	3 17.0	3 17.5	3 08.0	2.4 0.5
09	3 17.3	3 17.8	3 08.3	2.7 0.6
10	3 17.5	3 18.0	3 08.5	3.0 0.7
11	3 17.8	3 18.3	3 08.7	3.3 0.7
12	3 18.0	3 18.5	3 09.0	3.6 0.8
13	3 18.3	3 18.8	3 09.2	3.9 0.9
14	3 18.5	3 19.0	3 09.5	4.2 0.9
15	3 18.8	3 19.3	3 09.7	4.5 1.0
16	3 19.0	3 19.5	3 09.9	4.8 1.1
17	3 19.3	3 19.8	3 10.2	5.1 1.1
18	3 19.5	3 20.0	3 10.4	5.4 1.2
19	3 19.8	3 20.3	3 10.7	5.7 1.3
20	3 20.0	3 20.5	3 10.9	6.0 1.4
21	3 20.3	3 20.8	3 11.1	6.3 1.4
22	3 20.5	3 21.0	3 11.4	6.6 1.5
23	3 20.8	3 21.3	3 11.6	6.9 1.6
24	3 21.0	3 21.6	3 11.8	7.2 1.6
25	3 21.3	3 21.8	3 12.1	7.5 1.7
26	3 21.5	3 22.1	3 12.3	7.8 1.8
27	3 21.8	3 22.3	3 12.6	8.1 1.8
28	3 22.0	3 22.6	3 12.8	8.4 1.9
29	3 22.3	3 22.8	3 13.0	8.7 2.0
30	3 22.5	3 23.1	3 13.3	9.0 2.0
31	3 22.8	3 23.3	3 13.5	9.3 2.1
32	3 23.0	3 23.6	3 13.8	9.6 2.2
33	3 23.3	3 23.8	3 14.0	9.9 2.2
34	3 23.5	3 24.1	3 14.2	10.2 2.3
35	3 23.8	3 24.3	3 14.5	10.5 2.4
36	3 24.0	3 24.6	3 14.7	10.8 2.4
37	3 24.3	3 24.8	3 14.9	11.1 2.5
38	3 24.5	3 25.1	3 15.2	11.4 2.6
39	3 24.8	3 25.3	3 15.4	11.7 2.6
40	3 25.0	3 25.6	3 15.7	12.0 2.7
41	3 25.3	3 25.8	3 15.9	12.3 2.8
42	3 25.5	3 26.1	3 16.1	12.6 2.8
43	3 25.8	3 26.3	3 16.4	12.9 2.9
44	3 26.0	3 26.6	3 16.6	13.2 3.0
45	3 26.3	3 26.8	3 16.9	13.5 3.0
46	3 26.5	3 27.1	3 17.1	13.8 3.1
47	3 26.8	3 27.3	3 17.3	14.1 3.2
48	3 27.0	3 27.6	3 17.6	14.4 3.2
49	3 27.3	3 27.8	3 17.8	14.7 3.3
50	3 27.5	3 28.1	3 18.0	15.0 3.4
51	3 27.8	3 28.3	3 18.3	15.3 3.4
52	3 28.0	3 28.6	3 18.5	15.6 3.5
53	3 28.3	3 28.8	3 18.8	15.9 3.6
54	3 28.5	3 29.1	3 19.0	16.2 3.6
55	3 28.8	3 29.3	3 19.2	16.5 3.7
56	3 29.0	3 29.6	3 19.5	16.8 3.8
57	3 29.3	3 29.8	3 19.7	17.1 3.8
58	3 29.5	3 30.1	3 20.0	17.4 3.9
59	3 29.8	3 30.3	3 20.2	17.7 4.0
60	3 30.0	3 30.6	3 20.4	18.0 4.1

m I4	Increment to G.H.A.			v or Corr ⁿ d
	SUN	ARIES	MOON	
00	3 30.0	3 30.6	3 20.4	0.0 0.0
01	3 30.3	3 30.8	3 20.7	0.3 0.1
02	3 30.5	3 31.1	3 20.9	0.6 0.1
03	3 30.8	3 31.3	3 21.1	0.9 0.2
04	3 31.0	3 31.6	3 21.4	1.2 0.3
05	3 31.3	3 31.8	3 21.6	1.5 0.4
06	3 31.5	3 32.1	3 21.9	1.8 0.4
07	3 31.8	3 32.3	3 22.1	2.1 0.5
08	3 32.0	3 32.6	3 22.3	2.4 0.6
09	3 32.3	3 32.8	3 22.6	2.7 0.7
10	3 32.5	3 33.1	3 22.8	3.0 0.7
11	3 32.8	3 33.3	3 23.1	3.3 0.8
12	3 33.0	3 33.6	3 23.3	3.6 0.9
13	3 33.3	3 33.8	3 23.5	3.9 0.9
14	3 33.5	3 34.1	3 23.8	4.2 1.0
15	3 33.8	3 34.3	3 24.0	4.5 1.1
16	3 34.0	3 34.6	3 24.3	4.8 1.2
17	3 34.3	3 34.8	3 24.5	5.1 1.2
18	3 34.5	3 35.1	3 24.7	5.4 1.3
19	3 34.8	3 35.3	3 25.0	5.7 1.4
20	3 35.0	3 35.6	3 25.2	6.0 1.5
21	3 35.3	3 35.8	3 25.4	6.3 1.5
22	3 35.5	3 36.1	3 25.7	6.6 1.6
23	3 35.8	3 36.3	3 25.9	6.9 1.7
24	3 36.0	3 36.6	3 26.2	7.2 1.7
25	3 36.3	3 36.8	3 26.4	7.5 1.8
26	3 36.5	3 37.1	3 26.6	7.8 1.9
27	3 36.8	3 37.3	3 26.9	8.1 2.0
28	3 37.0	3 37.6	3 27.1	8.4 2.0
29	3 37.3	3 37.8	3 27.4	8.7 2.1
30	3 37.5	3 38.1	3 27.6	9.0 2.2
31	3 37.8	3 38.3	3 27.8	9.3 2.2
32	3 38.0	3 38.6	3 28.1	9.6 2.3
33	3 38.3	3 38.8	3 28.3	9.9 2.4
34	3 38.5	3 39.1	3 28.5	10.2 2.5
35	3 38.8	3 39.3	3 28.8	10.5 2.5
36	3 39.0	3 39.6	3 29.0	10.8 2.6
37	3 39.3	3 39.9	3 29.3	11.1 2.7
38	3 39.5	3 40.1	3 29.5	11.4 2.8
39	3 39.8	3 40.4	3 29.7	11.7 2.8
40	3 40.0	3 40.6	3 30.0	12.0 2.9
41	3 40.3	3 40.9	3 30.2	12.3 3.0
42	3 40.5	3 41.1	3 30.5	12.6 3.0
43	3 40.8	3 41.4	3 30.7	12.9 3.1
44	3 41.0	3 41.6	3 30.9	13.2 3.2
45	3 41.3	3 41.9	3 31.2	13.5 3.3
46	3 41.5	3 42.1	3 31.4	13.8 3.3
47	3 41.8	3 42.4	3 31.6	14.1 3.4
48	3 42.0	3 42.6	3 31.9	14.4 3.5
49	3 42.3	3 42.9	3 32.1	14.7 3.6
50	3 42.5	3 43.1	3 32.4	15.0 3.6
51	3 42.8	3 43.4	3 32.6	15.3 3.7
52	3 43.0	3 43.6	3 32.8	15.6 3.8
53	3 43.3	3 43.9	3 33.1	15.9 3.8
54	3 43.5	3 44.1	3 33.3	16.2 3.9
55	3 43.8	3 44.4	3 33.6	16.5 4.0
56	3 44.0	3 44.6	3 33.8	16.8 4.1
57	3 44.3	3 44.9	3 34.0	17.1 4.1
58	3 44.5	3 45.1	3 34.3	17.4 4.2
59	3 44.8	3 45.4	3 34.5	17.7 4.3
60	3 45.0	3 45.6	3 34.8	18.0 4.4

m I5	Increment to G.H.A.			v or Corr ⁿ d
	SUN	ARIES	MOON	
00	3 45.0	3 45.6	3 34.8	0.0 0.0
01	3 45.3	3 45.9	3 35.0	0.3 0.1
02	3 45.5	3 46.1	3 35.2	0.6 0.2
03	3 45.8	3 46.4	3 35.5	0.9 0.2
04	3 46.0	3 46.6	3 35.7	1.2 0.3
05	3 46.3	3 46.9	3 35.9	1.5 0.4
06	3 46.5	3 47.1	3 36.2	1.8 0.5
07	3 46.8	3 47.4	3 36.4	2.1 0.5
08	3 47.0	3 47.6	3 36.7	2.4 0.6
09	3 47.3	3 47.9	3 36.9	2.7 0.7
10	3 47.5	3 48.1	3 37.1	3.0 0.8
11	3 47.8	3 48.4	3 37.4	3.3 0.9
12	3 48.0	3 48.6	3 37.6	3.6 0.9
13	3 48.3	3 48.9	3 37.9	3.9 1.0
14	3 48.5	3 49.1	3 38.1	4.2 1.1
15	3 48.8	3 49.4	3 38.3	4.5 1.2
16	3 49.0	3 49.6	3 38.6	4.8 1.2

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m 16	Increment to G.H.A.			v or Corr ⁿ d	
	SUN	ARIES	MOON		
00	4 00.0	4 00.7	3 49.1	0.0	0.0
01	4 00.3	4 00.9	3 49.3	0.3	0.1
02	4 00.5	4 01.2	3 49.5	0.6	0.2
03	4 00.8	4 01.4	3 49.8	0.9	0.2
04	4 01.0	4 01.7	3 50.0	1.2	0.3
05	4 01.3	4 01.9	3 50.3	1.5	0.4
06	4 01.5	4 02.2	3 50.5	1.8	0.5
07	4 01.8	4 02.4	3 50.7	2.1	0.6
08	4 02.0	4 02.7	3 51.0	2.4	0.7
09	4 02.3	4 02.9	3 51.2	2.7	0.7
10	4 02.5	4 03.2	3 51.5	3.0	0.8
11	4 02.8	4 03.4	3 51.7	3.3	0.9
12	4 03.0	4 03.7	3 51.9	3.6	1.0
13	4 03.3	4 03.9	3 52.2	3.9	1.1
14	4 03.5	4 04.2	3 52.4	4.2	1.2
15	4 03.8	4 04.4	3 52.6	4.5	1.2
16	4 04.0	4 04.7	3 52.9	4.8	1.3
17	4 04.3	4 04.9	3 53.1	5.1	1.4
18	4 04.5	4 05.2	3 53.4	5.4	1.5
19	4 04.8	4 05.4	3 53.6	5.7	1.6
20	4 05.0	4 05.7	3 53.8	6.0	1.7
21	4 05.3	4 05.9	3 54.1	6.3	1.7
22	4 05.5	4 06.2	3 54.3	6.6	1.8
23	4 05.8	4 06.4	3 54.6	6.9	1.9
24	4 06.0	4 06.7	3 54.8	7.2	2.0
25	4 06.3	4 06.9	3 55.0	7.5	2.1
26	4 06.5	4 07.2	3 55.3	7.8	2.1
27	4 06.8	4 07.4	3 55.5	8.1	2.2
28	4 07.0	4 07.7	3 55.7	8.4	2.3
29	4 07.3	4 07.9	3 56.0	8.7	2.4
30	4 07.5	4 08.2	3 56.2	9.0	2.5
31	4 07.8	4 08.4	3 56.5	9.3	2.6
32	4 08.0	4 08.7	3 56.7	9.6	2.6
33	4 08.3	4 08.9	3 56.9	9.9	2.7
34	4 08.5	4 09.2	3 57.2	10.2	2.8
35	4 08.8	4 09.4	3 57.4	10.5	2.9
36	4 09.0	4 09.7	3 57.7	10.8	3.0
37	4 09.3	4 09.9	3 57.9	11.1	3.1
38	4 09.5	4 10.2	3 58.1	11.4	3.1
39	4 09.8	4 10.4	3 58.4	11.7	3.2
40	4 10.0	4 10.7	3 58.6	12.0	3.3
41	4 10.3	4 10.9	3 58.8	12.3	3.4
42	4 10.5	4 11.2	3 59.1	12.6	3.5
43	4 10.8	4 11.4	3 59.3	12.9	3.5
44	4 11.0	4 11.7	3 59.6	13.2	3.6
45	4 11.3	4 11.9	3 59.8	13.5	3.7
46	4 11.5	4 12.2	4 00.0	13.8	3.8
47	4 11.8	4 12.4	4 00.3	14.1	3.9
48	4 12.0	4 12.7	4 00.5	14.4	4.0
49	4 12.3	4 12.9	4 00.8	14.7	4.0
50	4 12.5	4 13.2	4 01.0	15.0	4.1
51	4 12.8	4 13.4	4 01.2	15.3	4.2
52	4 13.0	4 13.7	4 01.5	15.6	4.3
53	4 13.3	4 13.9	4 01.7	15.9	4.4
54	4 13.5	4 14.2	4 02.0	16.2	4.5
55	4 13.8	4 14.4	4 02.2	16.5	4.5
56	4 14.0	4 14.7	4 02.4	16.8	4.6
57	4 14.3	4 14.9	4 02.7	17.1	4.7
58	4 14.5	4 15.2	4 02.9	17.4	4.8
59	4 14.8	4 15.4	4 03.1	17.7	4.9
60	4 15.0	4 15.7	4 03.4	18.0	5.0

m 17	Increment to G.H.A.			v or Corr ⁿ d	
	SUN	ARIES	MOON		
00	4 15.0	4 15.7	4 03.4	0.0	0.0
01	4 15.3	4 15.9	4 03.6	0.3	0.1
02	4 15.5	4 16.2	4 03.9	0.6	0.2
03	4 15.8	4 16.5	4 04.1	0.9	0.2
04	4 16.0	4 16.7	4 04.3	1.2	0.4
05	4 16.3	4 17.0	4 04.6	1.5	0.4
06	4 16.5	4 17.2	4 04.8	1.8	0.5
07	4 16.8	4 17.5	4 05.1	2.1	0.6
08	4 17.0	4 17.7	4 05.3	2.4	0.7
09	4 17.3	4 18.0	4 05.5	2.7	0.8
10	4 17.5	4 18.2	4 05.8	3.0	0.9
11	4 17.8	4 18.5	4 06.0	3.3	1.0
12	4 18.0	4 18.7	4 06.2	3.6	1.1
13	4 18.3	4 19.0	4 06.5	3.9	1.1
14	4 18.5	4 19.2	4 06.7	4.2	1.2
15	4 18.8	4 19.5	4 07.0	4.5	1.3
16	4 19.0	4 19.7	4 07.2	4.8	1.4
17	4 19.3	4 20.0	4 07.4	5.1	1.5
18	4 19.5	4 20.2	4 07.7	5.4	1.6
19	4 19.8	4 20.5	4 07.9	5.7	1.7
20	4 20.0	4 20.7	4 08.2	6.0	1.8
21	4 20.3	4 21.0	4 08.4	6.3	1.8
22	4 20.5	4 21.2	4 08.6	6.6	1.9
23	4 20.8	4 21.5	4 08.9	6.9	2.0
24	4 21.0	4 21.7	4 09.1	7.2	2.1
25	4 21.3	4 22.0	4 09.3	7.5	2.2
26	4 21.5	4 22.2	4 09.6	7.8	2.3
27	4 21.8	4 22.5	4 09.8	8.1	2.4
28	4 22.0	4 22.7	4 10.1	8.4	2.5
29	4 22.3	4 23.0	4 10.3	8.7	2.5
30	4 22.5	4 23.2	4 10.5	9.0	2.6
31	4 22.8	4 23.5	4 10.8	9.3	2.7
32	4 23.0	4 23.7	4 11.0	9.6	2.8
33	4 23.3	4 24.0	4 11.3	9.9	2.9
34	4 23.5	4 24.2	4 11.5	10.2	3.0
35	4 23.8	4 24.5	4 11.7	10.5	3.1
36	4 24.0	4 24.7	4 12.0	10.8	3.2
37	4 24.3	4 25.0	4 12.2	11.1	3.2
38	4 24.5	4 25.2	4 12.5	11.4	3.3
39	4 24.8	4 25.5	4 12.7	11.7	3.4
40	4 25.0	4 25.7	4 12.9	12.0	3.5
41	4 25.3	4 26.0	4 13.2	12.3	3.6
42	4 25.5	4 26.2	4 13.4	12.6	3.7
43	4 25.8	4 26.5	4 13.6	12.9	3.8
44	4 26.0	4 26.7	4 13.9	13.2	3.9
45	4 26.3	4 27.0	4 14.1	13.5	3.9
46	4 26.5	4 27.2	4 14.4	13.8	4.0
47	4 26.8	4 27.5	4 14.6	14.1	4.1
48	4 27.0	4 27.7	4 14.8	14.4	4.2
49	4 27.3	4 28.0	4 15.1	14.7	4.3
50	4 27.5	4 28.2	4 15.3	15.0	4.4
51	4 27.8	4 28.5	4 15.6	15.3	4.5
52	4 28.0	4 28.7	4 15.8	15.6	4.6
53	4 28.3	4 29.0	4 16.0	15.9	4.6
54	4 28.5	4 29.2	4 16.3	16.2	4.7
55	4 28.8	4 29.5	4 16.5	16.5	4.8
56	4 29.0	4 29.7	4 16.7	16.8	4.9
57	4 29.3	4 30.0	4 17.0	17.1	5.0
58	4 29.5	4 30.2	4 17.2	17.4	5.1
59	4 29.8	4 30.5	4 17.5	17.7	5.2
60	4 30.0	4 30.7	4 17.7	18.0	5.3

m 18	Increment to G.H.A.			v or Corr ⁿ d	
	SUN	ARIES	MOON		
00	4 30.0	4 30.7	4 17.7	0.0	0.0
01	4 30.3	4 31.0	4 17.9	0.3	0.1
02	4 30.5	4 31.2	4 18.2	0.6	0.2
03	4 30.8	4 31.5	4 18.4	0.9	0.3
04	4 31.0	4 31.7	4 18.7	1.2	0.4
05	4 31.3	4 32.0	4 18.9	1.5	0.5
06	4 31.5	4 32.2	4 19.1	1.8	0.6
07	4 31.8	4 32.5	4 19.4	2.1	0.6
08	4 32.0	4 32.7	4 19.6	2.4	0.7
09	4 32.3	4 33.0	4 19.8	2.7	0.8
10	4 32.5	4 33.2	4 20.1	3.0	0.9
11	4 32.8	4 33.5	4 20.3	3.3	1.0
12	4 33.0	4 33.7	4 20.6	3.6	1.1
13	4 33.3	4 34.0	4 20.8	3.9	1.2
14	4 33.5	4 34.2	4 21.0	4.2	1.3
15	4 33.8	4 34.5	4 21.3	4.5	1.4
16	4 34.0	4 34.8	4 21.5	4.8	1.5
17	4 34.3	4 35.0	4 21.8	5.1	1.6
18	4 34.5	4 35.3	4 22.0	5.4	1.7
19	4 34.8	4 35.5	4 22.2	5.7	1.8
20	4 35.0	4 35.8	4 22.5	6.0	1.9
21	4 35.3	4 36.0	4 22.7	6.3	1.9
22	4 35.5	4 36.3	4 22.9	6.6	2.0
23	4 35.8	4 36.5	4 23.2	6.9	2.1
24	4 36.0	4 36.8	4 23.4	7.2	2.2
25	4 36.3	4 37.0	4 23.7	7.5	2.3
26	4 36.5	4 37.3	4 23.9	7.8	2.4
27	4 36.8	4 37.5	4 24.1	8.1	2.5
28	4 37.0	4 37.8	4 24.4	8.4	2.6
29	4 37.3	4 38.0	4 24.6	8.7	2.7
30	4 37.5	4 38.3	4 24.9	9.0	2.8
31	4 37.8	4 38.5	4 25.1	9.3	2.9
32	4 38.0	4 38.8	4 25.3	9.6	3.0
33	4 38.3	4 39.0	4 25.6	9.9	3.1
34	4 38.5	4 39.3	4 25.8	10.2	3.1
35	4 38.8	4 39.5	4 26.1	10.5	3.2
36	4 39.0	4 39.8	4 26.3	10.8	3.3
37	4 39.3	4 40.0	4 26.5	11.1	3.4
38	4 39.5	4 40.3	4 26.8	11.4	3.5
39	4 39.8	4 40.5	4 27.0	11.7	3.6
40	4 40.0	4 40.8	4 27.2	12.0	3.7
41	4 40.3	4 41.0	4 27.5	12.3	3.8
42	4 40.5	4 41.3	4 27.7	12.6	3.9
43	4 40.8	4 41.5	4 28.0	12.9	4.0
44	4 41.0	4 41.8	4 28.2	13.2	4.1
45	4 41.3	4 42.0	4 28.4	13.5	4.2
46	4 41.5	4 42.3	4 28.7	13.8	4.3
47	4 41.8	4 42.5	4 28.9	14.1	4.3
48	4 42.0	4 42.8	4 29.2	14.4	4.4
49	4 42.3	4 43.0	4 29.4	14.7	4.5
50	4 42.5	4 43.3	4 29.6	15.0	4.6
51	4 42.8	4 43.5	4 29.9	15.3	4.7
52	4 43.0	4 43.8	4 30.1	15.6	4.8
53	4 43.3	4 44.0	4 30.3	15.9	4.9
54	4 43.5	4 44.3	4 30.6	16.2	5.0
55	4 43.8	4 44.5	4 30.8	16.5	5.1
56	4 44.0	4 44.8	4 31.1	16.8	5.2
57	4 44.3	4 45.0	4 31.3	17.1	5.3
58	4 44.5	4 45.3	4 31.5	17.4	5.4
59	4 44.8	4 45.5	4 31.8	17.7	5.5
60	4 45.0	4 45.8	4 32.0	18.0	5.6

m 19	Increment to G.H.A.			v or Corr ⁿ d	
	SUN	ARIES	MOON		
00	4 45.0	4 45.8	4 32.0	0.0	0.0
01	4 45.3	4 46.0	4 32.3	0.3	0.1
02	4 45.5	4 46.3	4 32.5	0.6	0.2
03	4 45.8	4 46.5	4 32.7	0.9	0.3
04	4 4				

m 20	Increment to G.H.A.			v or Corr ⁿ d	
	SUN	ARIES	MOON		
00	5 00.0	5 00.8	4 46.3	0.0	0.0
01	5 00.3	5 01.1	4 46.6	0.3	0.1
02	5 00.5	5 01.3	4 46.8	0.6	0.2
03	5 00.8	5 01.6	4 47.0	0.9	0.3
04	5 01.0	5 01.8	4 47.3	1.2	0.4
05	5 01.3	5 02.1	4 47.5	1.5	0.5
06	5 01.5	5 02.3	4 47.8	1.8	0.6
07	5 01.8	5 02.6	4 48.0	2.1	0.7
08	5 02.0	5 02.8	4 48.2	2.4	0.8
09	5 02.3	5 03.1	4 48.5	2.7	0.9
10	5 02.5	5 03.3	4 48.7	3.0	1.0
11	5 02.8	5 03.6	4 49.0	3.3	1.1
12	5 03.0	5 03.8	4 49.2	3.6	1.2
13	5 03.3	5 04.1	4 49.4	3.9	1.3
14	5 03.5	5 04.3	4 49.7	4.2	1.4
15	5 03.8	5 04.6	4 49.9	4.5	1.5
16	5 04.0	5 04.8	4 50.2	4.8	1.6
17	5 04.3	5 05.1	4 50.4	5.1	1.7
18	5 04.5	5 05.3	4 50.6	5.4	1.8
19	5 04.8	5 05.6	4 50.9	5.7	1.9
20	5 05.0	5 05.8	4 51.1	6.0	2.1
21	5 05.3	5 06.1	4 51.3	6.3	2.2
22	5 05.5	5 06.3	4 51.6	6.6	2.3
23	5 05.8	5 06.6	4 51.8	6.9	2.4
24	5 06.0	5 06.8	4 52.1	7.2	2.5
25	5 06.3	5 07.1	4 52.3	7.5	2.6
26	5 06.5	5 07.3	4 52.5	7.8	2.7
27	5 06.8	5 07.6	4 52.8	8.1	2.8
28	5 07.0	5 07.8	4 53.0	8.4	2.9
29	5 07.3	5 08.1	4 53.3	8.7	3.0
30	5 07.5	5 08.3	4 53.5	9.0	3.1
31	5 07.8	5 08.6	4 53.7	9.3	3.2
32	5 08.0	5 08.8	4 54.0	9.6	3.3
33	5 08.3	5 09.1	4 54.2	9.9	3.4
34	5 08.5	5 09.3	4 54.4	10.2	3.5
35	5 08.8	5 09.6	4 54.7	10.5	3.6
36	5 09.0	5 09.8	4 54.9	10.8	3.7
37	5 09.3	5 10.1	4 55.2	11.1	3.8
38	5 09.5	5 10.3	4 55.4	11.4	3.9
39	5 09.8	5 10.6	4 55.6	11.7	4.0
40	5 10.0	5 10.8	4 55.9	12.0	4.1
41	5 10.3	5 11.1	4 56.1	12.3	4.2
42	5 10.5	5 11.4	4 56.4	12.6	4.3
43	5 10.8	5 11.6	4 56.6	12.9	4.4
44	5 11.0	5 11.9	4 56.8	13.2	4.5
45	5 11.3	5 12.1	4 57.1	13.5	4.6
46	5 11.5	5 12.4	4 57.3	13.8	4.7
47	5 11.8	5 12.6	4 57.5	14.1	4.8
48	5 12.0	5 12.9	4 57.8	14.4	4.9
49	5 12.3	5 13.1	4 58.0	14.7	5.0
50	5 12.5	5 13.4	4 58.3	15.0	5.1
51	5 12.8	5 13.6	4 58.5	15.3	5.2
52	5 13.0	5 13.9	4 58.7	15.6	5.3
53	5 13.3	5 14.1	4 59.0	15.9	5.4
54	5 13.5	5 14.4	4 59.2	16.2	5.5
55	5 13.8	5 14.6	4 59.5	16.5	5.6
56	5 14.0	5 14.9	4 59.7	16.8	5.7
57	5 14.3	5 15.1	4 59.9	17.1	5.8
58	5 14.5	5 15.4	5 00.2	17.4	5.9
59	5 14.8	5 15.6	5 00.4	17.7	6.0
60	5 15.0	5 15.9	5 00.7	18.0	6.2

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m 21	Increment to G.H.A.			v or Corr ⁿ d	
	SUN	ARIES	MOON		
00	5 15.0	5 15.9	5 00.7	0.0	0.0
01	5 15.3	5 16.1	5 00.9	0.3	0.1
02	5 15.5	5 16.4	5 01.1	0.6	0.2
03	5 15.8	5 16.6	5 01.4	0.9	0.3
04	5 16.0	5 16.9	5 01.6	1.2	0.4
05	5 16.3	5 17.1	5 01.8	1.5	0.5
06	5 16.5	5 17.4	5 02.1	1.8	0.6
07	5 16.8	5 17.6	5 02.3	2.1	0.8
08	5 17.0	5 17.9	5 02.6	2.4	0.9
09	5 17.3	5 18.1	5 02.8	2.7	1.0
10	5 17.5	5 18.4	5 03.0	3.0	1.1
11	5 17.8	5 18.6	5 03.3	3.3	1.2
12	5 18.0	5 18.9	5 03.5	3.6	1.3
13	5 18.3	5 19.1	5 03.8	3.9	1.4
14	5 18.5	5 19.4	5 04.0	4.2	1.5
15	5 18.8	5 19.6	5 04.2	4.5	1.6
16	5 19.0	5 19.9	5 04.5	4.8	1.7
17	5 19.3	5 20.1	5 04.7	5.1	1.8
18	5 19.5	5 20.4	5 04.9	5.4	1.9
19	5 19.8	5 20.6	5 05.2	5.7	2.0
20	5 20.0	5 20.9	5 05.4	6.0	2.2
21	5 20.3	5 21.1	5 05.7	6.3	2.3
22	5 20.5	5 21.4	5 05.9	6.6	2.4
23	5 20.8	5 21.6	5 06.1	6.9	2.5
24	5 21.0	5 21.9	5 06.4	7.2	2.6
25	5 21.3	5 22.1	5 06.6	7.5	2.7
26	5 21.5	5 22.4	5 06.9	7.8	2.8
27	5 21.8	5 22.6	5 07.1	8.1	2.9
28	5 22.0	5 22.9	5 07.3	8.4	3.0
29	5 22.3	5 23.1	5 07.6	8.7	3.1
30	5 22.5	5 23.4	5 07.8	9.0	3.2
31	5 22.8	5 23.6	5 08.0	9.3	3.3
32	5 23.0	5 23.9	5 08.3	9.6	3.4
33	5 23.3	5 24.1	5 08.5	9.9	3.5
34	5 23.5	5 24.4	5 08.8	10.2	3.7
35	5 23.8	5 24.6	5 09.0	10.5	3.8
36	5 24.0	5 24.9	5 09.2	10.8	3.9
37	5 24.3	5 25.1	5 09.5	11.1	4.0
38	5 24.5	5 25.4	5 09.7	11.4	4.1
39	5 24.8	5 25.6	5 10.0	11.7	4.2
40	5 25.0	5 25.9	5 10.2	12.0	4.3
41	5 25.3	5 26.1	5 10.4	12.3	4.4
42	5 25.5	5 26.4	5 10.7	12.6	4.5
43	5 25.8	5 26.6	5 10.9	12.9	4.6
44	5 26.0	5 26.9	5 11.1	13.2	4.7
45	5 26.3	5 27.1	5 11.4	13.5	4.8
46	5 26.5	5 27.4	5 11.6	13.8	4.9
47	5 26.8	5 27.6	5 11.9	14.1	5.1
48	5 27.0	5 27.9	5 12.1	14.4	5.2
49	5 27.3	5 28.1	5 12.3	14.7	5.3
50	5 27.5	5 28.4	5 12.6	15.0	5.4
51	5 27.8	5 28.6	5 12.8	15.3	5.5
52	5 28.0	5 28.9	5 13.1	15.6	5.6
53	5 28.3	5 29.1	5 13.3	15.9	5.7
54	5 28.5	5 29.4	5 13.5	16.2	5.8
55	5 28.8	5 29.7	5 13.8	16.5	5.9
56	5 29.0	5 29.9	5 14.0	16.8	6.0
57	5 29.3	5 30.2	5 14.3	17.1	6.1
58	5 29.5	5 30.4	5 14.5	17.4	6.2
59	5 29.8	5 30.7	5 14.7	17.7	6.3
60	5 30.0	5 30.9	5 15.0	18.0	6.5

m 22	Increment to G.H.A.			v or Corr ⁿ d	
	SUN	ARIES	MOON		
00	5 30.0	5 30.9	5 15.0	0.0	0.0
01	5 30.3	5 31.2	5 15.2	0.3	0.1
02	5 30.5	5 31.4	5 15.4	0.6	0.2
03	5 30.8	5 31.7	5 15.7	0.9	0.3
04	5 31.0	5 31.9	5 15.9	1.2	0.5
05	5 31.3	5 32.2	5 16.2	1.5	0.6
06	5 31.5	5 32.4	5 16.4	1.8	0.7
07	5 31.8	5 32.7	5 16.6	2.1	0.8
08	5 32.0	5 32.9	5 16.9	2.4	0.9
09	5 32.3	5 33.2	5 17.1	2.7	1.0
10	5 32.5	5 33.4	5 17.4	3.0	1.1
11	5 32.8	5 33.7	5 17.6	3.3	1.2
12	5 33.0	5 33.9	5 17.8	3.6	1.4
13	5 33.3	5 34.2	5 18.1	3.9	1.5
14	5 33.5	5 34.4	5 18.3	4.2	1.6
15	5 33.8	5 34.7	5 18.5	4.5	1.7
16	5 34.0	5 34.9	5 18.8	4.8	1.8
17	5 34.3	5 35.2	5 19.0	5.1	1.9
18	5 34.5	5 35.4	5 19.3	5.4	2.0
19	5 34.8	5 35.7	5 19.5	5.7	2.1
20	5 35.0	5 35.9	5 19.7	6.0	2.3
21	5 35.3	5 36.2	5 20.0	6.3	2.4
22	5 35.5	5 36.4	5 20.2	6.6	2.5
23	5 35.8	5 36.7	5 20.5	6.9	2.6
24	5 36.0	5 36.9	5 20.7	7.2	2.7
25	5 36.3	5 37.2	5 20.9	7.5	2.8
26	5 36.5	5 37.4	5 21.2	7.8	2.9
27	5 36.8	5 37.7	5 21.4	8.1	3.0
28	5 37.0	5 37.9	5 21.6	8.4	3.2
29	5 37.3	5 38.2	5 21.9	8.7	3.3
30	5 37.5	5 38.4	5 22.1	9.0	3.4
31	5 37.8	5 38.7	5 22.4	9.3	3.5
32	5 38.0	5 38.9	5 22.6	9.6	3.6
33	5 38.3	5 39.2	5 22.8	9.9	3.7
34	5 38.5	5 39.4	5 23.1	10.2	3.8
35	5 38.8	5 39.7	5 23.3	10.5	3.9
36	5 39.0	5 39.9	5 23.6	10.8	4.1
37	5 39.3	5 40.2	5 23.8	11.1	4.2
38	5 39.5	5 40.4	5 24.0	11.4	4.3
39	5 39.8	5 40.7	5 24.3	11.7	4.4
40	5 40.0	5 40.9	5 24.5	12.0	4.5
41	5 40.3	5 41.2	5 24.7	12.3	4.6
42	5 40.5	5 41.4	5 25.0	12.6	4.7
43	5 40.8	5 41.7	5 25.2	12.9	4.8
44	5 41.0	5 41.9	5 25.5	13.2	5.0
45	5 41.3	5 42.2	5 25.7	13.5	5.1
46	5 41.5	5 42.4	5 25.9	13.8	5.2
47	5 41.8	5 42.7	5 26.2	14.1	5.3
48	5 42.0	5 42.9	5 26.4	14.4	5.4
49	5 42.3	5 43.2	5 26.7	14.7	5.5
50	5 42.5	5 43.4	5 26.9	15.0	5.6
51	5 42.8	5 43.7	5 27.1	15.3	5.7
52	5 43.0	5 43.9	5 27.4	15.6	5.9
53	5 43.3	5 44.2	5 27.6	15.9	6.0
54	5 43.5	5 44.4	5 27.9	16.2	6.1
55	5 43.8	5 44.7	5 28.1	16.5	6.2
56	5 44.0	5 44.9	5 28.3	16.8	6.3
57	5 44.3	5 45.2	5 28.6	17.1	6.4
58	5 44.5	5 45.4	5 28.8	17.4	6.5
59	5 44.8	5 45.7	5 29.0	17.7	6.6
60	5 45.0	5 45.9	5 29.3	18.0	6.8

m 23	Increment to G.H.A.			v or Corr ⁿ d	
	SUN	ARIES	MOON		
00	5 45.0	5 45.9	5 29.3	0.0	0.0
01	5 45.3	5 46.2	5 29.5	0.3	0.1
02	5 45.5	5 46.4	5 29.8	0.6	0.2
03	5 45.8	5 46.7	5 30.0	0.9	0.4
04	5 4				

m	Increment to G.H.A.			v or d	Corr ⁿ
	SUN	ARIES	MOON		
24					
00	6 00.0	6 01.0	5 43.6	0.0	0.0
01	6 00.3	6 01.2	5 43.8	0.3	0.1
02	6 00.5	6 01.5	5 44.1	0.6	0.2
03	6 00.8	6 01.7	5 44.3	0.9	0.4
04	6 01.0	6 02.0	5 44.6	1.2	0.5
05	6 01.3	6 02.2	5 44.8	1.5	0.6
06	6 01.5	6 02.5	5 45.0	1.8	0.7
07	6 01.8	6 02.7	5 45.3	2.1	0.9
08	6 02.0	6 03.0	5 45.5	2.4	1.0
09	6 02.3	6 03.2	5 45.7	2.7	1.1
10	6 02.5	6 03.5	5 46.0	3.0	1.2
11	6 02.8	6 03.7	5 46.2	3.3	1.3
12	6 03.0	6 04.0	5 46.5	3.6	1.5
13	6 03.3	6 04.2	5 46.7	3.9	1.6
14	6 03.5	6 04.5	5 46.9	4.2	1.7
15	6 03.8	6 04.7	5 47.2	4.5	1.8
16	6 04.0	6 05.0	5 47.4	4.8	2.0
17	6 04.3	6 05.2	5 47.7	5.1	2.1
18	6 04.5	6 05.5	5 47.9	5.4	2.2
19	6 04.8	6 05.7	5 48.1	5.7	2.3
20	6 05.0	6 06.0	5 48.4	6.0	2.5
21	6 05.3	6 06.3	5 48.6	6.3	2.6
22	6 05.5	6 06.5	5 48.8	6.6	2.7
23	6 05.8	6 06.8	5 49.1	6.9	2.8
24	6 06.0	6 07.0	5 49.3	7.2	2.9
25	6 06.3	6 07.3	5 49.6	7.5	3.1
26	6 06.5	6 07.5	5 49.8	7.8	3.2
27	6 06.8	6 07.8	5 50.0	8.1	3.3
28	6 07.0	6 08.0	5 50.3	8.4	3.4
29	6 07.3	6 08.3	5 50.5	8.7	3.6
30	6 07.5	6 08.5	5 50.8	9.0	3.7
31	6 07.8	6 08.8	5 51.0	9.3	3.8
32	6 08.0	6 09.0	5 51.2	9.6	3.9
33	6 08.3	6 09.3	5 51.5	9.9	4.0
34	6 08.5	6 09.5	5 51.7	10.2	4.2
35	6 08.8	6 09.8	5 52.0	10.5	4.3
36	6 09.0	6 10.0	5 52.2	10.8	4.4
37	6 09.3	6 10.3	5 52.4	11.1	4.5
38	6 09.5	6 10.5	5 52.7	11.4	4.7
39	6 09.8	6 10.8	5 52.9	11.7	4.8
40	6 10.0	6 11.0	5 53.1	12.0	4.9
41	6 10.3	6 11.3	5 53.4	12.3	5.0
42	6 10.5	6 11.5	5 53.6	12.6	5.1
43	6 10.8	6 11.8	5 53.9	12.9	5.3
44	6 11.0	6 12.0	5 54.1	13.2	5.4
45	6 11.3	6 12.3	5 54.3	13.5	5.5
46	6 11.5	6 12.5	5 54.6	13.8	5.6
47	6 11.8	6 12.8	5 54.8	14.1	5.8
48	6 12.0	6 13.0	5 55.1	14.4	5.9
49	6 12.3	6 13.3	5 55.3	14.7	6.0
50	6 12.5	6 13.5	5 55.5	15.0	6.1
51	6 12.8	6 13.8	5 55.8	15.3	6.2
52	6 13.0	6 14.0	5 56.0	15.6	6.4
53	6 13.3	6 14.3	5 56.2	15.9	6.5
54	6 13.5	6 14.5	5 56.5	16.2	6.6
55	6 13.8	6 14.8	5 56.7	16.5	6.7
56	6 14.0	6 15.0	5 57.0	16.8	6.9
57	6 14.3	6 15.3	5 57.2	17.1	7.0
58	6 14.5	6 15.5	5 57.4	17.4	7.1
59	6 14.8	6 15.8	5 57.7	17.7	7.2
60	6 15.0	6 16.0	5 57.9	18.0	7.4

24
25
26
27

m	Increment to G.H.A.			v or d	Corr ⁿ
	SUN	ARIES	MOON		
25					
00	6 15.0	6 16.0	5 57.9	0.0	0.0
01	6 15.3	6 16.3	5 58.2	0.3	0.1
02	6 15.5	6 16.5	5 58.4	0.6	0.3
03	6 15.8	6 16.8	5 58.6	0.9	0.4
04	6 16.0	6 17.0	5 58.9	1.2	0.5
05	6 16.3	6 17.3	5 59.1	1.5	0.6
06	6 16.5	6 17.5	5 59.3	1.8	0.8
07	6 16.8	6 17.8	5 59.6	2.1	0.9
08	6 17.0	6 18.0	5 59.8	2.4	1.0
09	6 17.3	6 18.3	6 00.1	2.7	1.1
10	6 17.5	6 18.5	6 00.3	3.0	1.3
11	6 17.8	6 18.8	6 00.5	3.3	1.4
12	6 18.0	6 19.0	6 00.8	3.6	1.5
13	6 18.3	6 19.3	6 01.0	3.9	1.7
14	6 18.5	6 19.5	6 01.3	4.2	1.8
15	6 18.8	6 19.8	6 01.5	4.5	1.9
16	6 19.0	6 20.0	6 01.7	4.8	2.0
17	6 19.3	6 20.3	6 02.0	5.1	2.2
18	6 19.5	6 20.5	6 02.2	5.4	2.3
19	6 19.8	6 20.8	6 02.5	5.7	2.4
20	6 20.0	6 21.0	6 02.7	6.0	2.6
21	6 20.3	6 21.3	6 02.9	6.3	2.7
22	6 20.5	6 21.5	6 03.2	6.6	2.8
23	6 20.8	6 21.8	6 03.4	6.9	2.9
24	6 21.0	6 22.0	6 03.6	7.2	3.1
25	6 21.3	6 22.3	6 03.9	7.5	3.2
26	6 21.5	6 22.5	6 04.1	7.8	3.3
27	6 21.8	6 22.8	6 04.4	8.1	3.4
28	6 22.0	6 23.0	6 04.6	8.4	3.6
29	6 22.3	6 23.3	6 04.8	8.7	3.7
30	6 22.5	6 23.5	6 05.1	9.0	3.8
31	6 22.8	6 23.8	6 05.3	9.3	4.0
32	6 23.0	6 24.0	6 05.6	9.6	4.1
33	6 23.3	6 24.3	6 05.8	9.9	4.2
34	6 23.5	6 24.5	6 06.0	10.2	4.3
35	6 23.8	6 24.8	6 06.3	10.5	4.5
36	6 24.0	6 25.1	6 06.5	10.8	4.6
37	6 24.3	6 25.3	6 06.7	11.1	4.7
38	6 24.5	6 25.6	6 07.0	11.4	4.8
39	6 24.8	6 25.8	6 07.2	11.7	5.0
40	6 25.0	6 26.1	6 07.5	12.0	5.1
41	6 25.3	6 26.3	6 07.7	12.3	5.2
42	6 25.5	6 26.6	6 07.9	12.6	5.4
43	6 25.8	6 26.8	6 08.2	12.9	5.5
44	6 26.0	6 27.1	6 08.4	13.2	5.6
45	6 26.3	6 27.3	6 08.7	13.5	5.7
46	6 26.5	6 27.6	6 08.9	13.8	5.9
47	6 26.8	6 27.8	6 09.1	14.1	6.0
48	6 27.0	6 28.1	6 09.4	14.4	6.1
49	6 27.3	6 28.3	6 09.6	14.7	6.2
50	6 27.5	6 28.6	6 09.8	15.0	6.4
51	6 27.8	6 28.8	6 10.1	15.3	6.5
52	6 28.0	6 29.1	6 10.3	15.6	6.6
53	6 28.3	6 29.3	6 10.6	15.9	6.8
54	6 28.5	6 29.6	6 10.8	16.2	6.9
55	6 28.8	6 29.8	6 11.0	16.5	7.0
56	6 29.0	6 30.1	6 11.3	16.8	7.1
57	6 29.3	6 30.3	6 11.5	17.1	7.3
58	6 29.5	6 30.6	6 11.8	17.4	7.4
59	6 29.8	6 30.8	6 12.0	17.7	7.5
60	6 30.0	6 31.1	6 12.2	18.0	7.7

m	Increment to G.H.A.			v or d	Corr ⁿ
	SUN	ARIES	MOON		
26					
00	6 30.0	6 31.1	6 12.2	0.0	0.0
01	6 30.3	6 31.3	6 12.5	0.3	0.1
02	6 30.5	6 31.6	6 12.7	0.6	0.3
03	6 30.8	6 31.8	6 12.9	0.9	0.4
04	6 31.0	6 32.1	6 13.2	1.2	0.5
05	6 31.3	6 32.3	6 13.4	1.5	0.7
06	6 31.5	6 32.6	6 13.7	1.8	0.8
07	6 31.8	6 32.8	6 13.9	2.1	0.9
08	6 32.0	6 33.1	6 14.1	2.4	1.1
09	6 32.3	6 33.3	6 14.4	2.7	1.2
10	6 32.5	6 33.6	6 14.6	3.0	1.3
11	6 32.8	6 33.8	6 14.9	3.3	1.5
12	6 33.0	6 34.1	6 15.1	3.6	1.6
13	6 33.3	6 34.3	6 15.3	3.9	1.7
14	6 33.5	6 34.6	6 15.6	4.2	1.9
15	6 33.8	6 34.8	6 15.8	4.5	2.0
16	6 34.0	6 35.1	6 16.1	4.8	2.1
17	6 34.3	6 35.3	6 16.3	5.1	2.3
18	6 34.5	6 35.6	6 16.5	5.4	2.4
19	6 34.8	6 35.8	6 16.8	5.7	2.5
20	6 35.0	6 36.1	6 17.0	6.0	2.7
21	6 35.3	6 36.3	6 17.2	6.3	2.8
22	6 35.5	6 36.6	6 17.5	6.6	2.9
23	6 35.8	6 36.8	6 17.7	6.9	3.0
24	6 36.0	6 37.1	6 18.0	7.2	3.2
25	6 36.3	6 37.3	6 18.2	7.5	3.3
26	6 36.5	6 37.6	6 18.4	7.8	3.4
27	6 36.8	6 37.8	6 18.7	8.1	3.6
28	6 37.0	6 38.1	6 18.9	8.4	3.7
29	6 37.3	6 38.3	6 19.2	8.7	3.8
30	6 37.5	6 38.6	6 19.4	9.0	4.0
31	6 37.8	6 38.8	6 19.6	9.3	4.1
32	6 38.0	6 39.1	6 19.9	9.6	4.2
33	6 38.3	6 39.3	6 20.1	9.9	4.4
34	6 38.5	6 39.6	6 20.3	10.2	4.5
35	6 38.8	6 39.8	6 20.6	10.5	4.6
36	6 39.0	6 40.1	6 20.8	10.8	4.8
37	6 39.3	6 40.3	6 21.1	11.1	4.9
38	6 39.5	6 40.6	6 21.3	11.4	5.0
39	6 39.8	6 40.8	6 21.5	11.7	5.2
40	6 40.0	6 41.1	6 21.8	12.0	5.3
41	6 40.3	6 41.3	6 22.0	12.3	5.4
42	6 40.5	6 41.6	6 22.3	12.6	5.6
43	6 40.8	6 41.8	6 22.5	12.9	5.7
44	6 41.0	6 42.1	6 22.7	13.2	5.8
45	6 41.3	6 42.3	6 23.0	13.5	6.0
46	6 41.5	6 42.6	6 23.2	13.8	6.1
47	6 41.8	6 42.8	6 23.4	14.1	6.2
48	6 42.0	6 43.1	6 23.7	14.4	6.4
49	6 42.3	6 43.4	6 23.9	14.7	6.5
50	6 42.5	6 43.6	6 24.2	15.0	6.6
51	6 42.8	6 43.9	6 24.4	15.3	6.8
52	6 43.0	6 44.1	6 24.6	15.6	6.9
53	6 43.3	6 44.4	6 24.9	15.9	7.0
54	6 43.5	6 44.6	6 25.1	16.2	7.2
55	6 43.8	6 44.9	6 25.4	16.5	7.3
56	6 44.0	6 45.1	6 25.6	16.8	7.4
57	6 44.3	6 45.4	6 25.8	17.1	7.6
58	6 44.5	6 45.6	6 26.1	17.4	7.7
59	6 44.8	6 45.9	6 26.3	17.7	7.8
60	6 45.0	6 46.1	6 26.6	18.0	8.0

m	Increment to G.H.A.			v or d	Corr ⁿ
	SUN	ARIES	MOON		
27					
00	6 45.0	6 46.1	6 26.6	0.0	0.0
01	6 45.3	6 46.4	6 26.8	0.3	0.1
02	6 45.5	6 46.6			

m 28	Increment to G.H.A.			v or Corr ⁿ d
	SUN	ARIES	MOON	
00	7 00.0	7 01.1	6 40.9	0.0 0.0
01	7 00.3	7 01.4	6 41.1	0.3 0.1
02	7 00.5	7 01.7	6 41.3	0.6 0.3
03	7 00.8	7 01.9	6 41.6	0.9 0.4
04	7 01.0	7 02.2	6 41.8	1.2 0.6
05	7 01.3	7 02.4	6 42.1	1.5 0.7
06	7 01.5	7 02.7	6 42.3	1.8 0.9
07	7 01.8	7 02.9	6 42.5	2.1 1.0
08	7 02.0	7 03.2	6 42.8	2.4 1.1
09	7 02.3	7 03.4	6 43.0	2.7 1.3
10	7 02.5	7 03.7	6 43.3	3.0 1.4
11	7 02.8	7 03.9	6 43.5	3.3 1.6
12	7 03.0	7 04.2	6 43.7	3.6 1.7
13	7 03.3	7 04.4	6 44.0	3.9 1.9
14	7 03.5	7 04.7	6 44.2	4.2 2.0
15	7 03.8	7 04.9	6 44.4	4.5 2.1
16	7 04.0	7 05.2	6 44.7	4.8 2.3
17	7 04.3	7 05.4	6 44.9	5.1 2.4
18	7 04.5	7 05.7	6 45.2	5.4 2.6
19	7 04.8	7 05.9	6 45.4	5.7 2.7
20	7 05.0	7 06.2	6 45.6	6.0 2.9
21	7 05.3	7 06.4	6 45.9	6.3 3.0
22	7 05.5	7 06.7	6 46.1	6.6 3.1
23	7 05.8	7 06.9	6 46.4	6.9 3.3
24	7 06.0	7 07.2	6 46.6	7.2 3.4
25	7 06.3	7 07.4	6 46.8	7.5 3.6
26	7 06.5	7 07.7	6 47.1	7.8 3.7
27	7 06.8	7 07.9	6 47.3	8.1 3.8
28	7 07.0	7 08.2	6 47.5	8.4 4.0
29	7 07.3	7 08.4	6 47.8	8.7 4.1
30	7 07.5	7 08.7	6 48.0	9.0 4.3
31	7 07.8	7 08.9	6 48.3	9.3 4.4
32	7 08.0	7 09.2	6 48.5	9.6 4.6
33	7 08.3	7 09.4	6 48.7	9.9 4.7
34	7 08.5	7 09.7	6 49.0	10.2 4.8
35	7 08.8	7 09.9	6 49.2	10.5 5.0
36	7 09.0	7 10.2	6 49.5	10.8 5.1
37	7 09.3	7 10.4	6 49.7	11.1 5.3
38	7 09.5	7 10.7	6 49.9	11.4 5.4
39	7 09.8	7 10.9	6 50.2	11.7 5.6
40	7 10.0	7 11.2	6 50.4	12.0 5.7
41	7 10.3	7 11.4	6 50.6	12.3 5.8
42	7 10.5	7 11.7	6 50.9	12.6 6.0
43	7 10.8	7 11.9	6 51.1	12.9 6.1
44	7 11.0	7 12.2	6 51.4	13.2 6.3
45	7 11.3	7 12.4	6 51.6	13.5 6.4
46	7 11.5	7 12.7	6 51.8	13.8 6.6
47	7 11.8	7 12.9	6 52.1	14.1 6.7
48	7 12.0	7 13.2	6 52.3	14.4 6.8
49	7 12.3	7 13.4	6 52.6	14.7 7.0
50	7 12.5	7 13.7	6 52.8	15.0 7.1
51	7 12.8	7 13.9	6 53.0	15.3 7.3
52	7 13.0	7 14.2	6 53.3	15.6 7.4
53	7 13.3	7 14.4	6 53.5	15.9 7.6
54	7 13.5	7 14.7	6 53.8	16.2 7.7
55	7 13.8	7 14.9	6 54.0	16.5 7.8
56	7 14.0	7 15.2	6 54.2	16.8 8.0
57	7 14.3	7 15.4	6 54.5	17.1 8.1
58	7 14.5	7 15.7	6 54.7	17.4 8.3
59	7 14.8	7 15.9	6 54.9	17.7 8.4
60	7 15.0	7 16.2	6 55.2	18.0 8.6

28
29
30
31

m 29	Increment to G.H.A.			v or Corr ⁿ d
	SUN	ARIES	MOON	
00	7 15.0	7 16.2	6 55.2	0.0 0.0
01	7 15.3	7 16.4	6 55.4	0.3 0.1
02	7 15.5	7 16.7	6 55.7	0.6 0.3
03	7 15.8	7 16.9	6 55.9	0.9 0.4
04	7 16.0	7 17.2	6 56.1	1.2 0.6
05	7 16.3	7 17.4	6 56.4	1.5 0.7
06	7 16.5	7 17.7	6 56.6	1.8 0.9
07	7 16.8	7 17.9	6 56.9	2.1 1.0
08	7 17.0	7 18.2	6 57.1	2.4 1.2
09	7 17.3	7 18.4	6 57.3	2.7 1.3
10	7 17.5	7 18.7	6 57.6	3.0 1.5
11	7 17.8	7 18.9	6 57.8	3.3 1.6
12	7 18.0	7 19.2	6 58.0	3.6 1.8
13	7 18.3	7 19.4	6 58.3	3.9 1.9
14	7 18.5	7 19.7	6 58.5	4.2 2.1
15	7 18.8	7 20.0	6 58.8	4.5 2.2
16	7 19.0	7 20.2	6 59.0	4.8 2.4
17	7 19.3	7 20.5	6 59.2	5.1 2.5
18	7 19.5	7 20.7	6 59.5	5.4 2.7
19	7 19.8	7 21.0	6 59.7	5.7 2.8
20	7 20.0	7 21.2	7 00.0	6.0 3.0
21	7 20.3	7 21.5	7 00.2	6.3 3.1
22	7 20.5	7 21.7	7 00.4	6.6 3.2
23	7 20.8	7 22.0	7 00.7	6.9 3.4
24	7 21.0	7 22.2	7 00.9	7.2 3.5
25	7 21.3	7 22.5	7 01.1	7.5 3.7
26	7 21.5	7 22.7	7 01.4	7.8 3.8
27	7 21.8	7 23.0	7 01.6	8.1 4.0
28	7 22.0	7 23.2	7 01.9	8.4 4.1
29	7 22.3	7 23.5	7 02.1	8.7 4.3
30	7 22.5	7 23.7	7 02.3	9.0 4.4
31	7 22.8	7 24.0	7 02.6	9.3 4.6
32	7 23.0	7 24.2	7 02.8	9.6 4.7
33	7 23.3	7 24.5	7 03.1	9.9 4.9
34	7 23.5	7 24.7	7 03.3	10.2 5.0
35	7 23.8	7 25.0	7 03.5	10.5 5.2
36	7 24.0	7 25.2	7 03.8	10.8 5.3
37	7 24.3	7 25.5	7 04.0	11.1 5.5
38	7 24.5	7 25.7	7 04.3	11.4 5.6
39	7 24.8	7 26.0	7 04.5	11.7 5.8
40	7 25.0	7 26.2	7 04.7	12.0 5.9
41	7 25.3	7 26.5	7 05.0	12.3 6.0
42	7 25.5	7 26.7	7 05.2	12.6 6.2
43	7 25.8	7 27.0	7 05.4	12.9 6.3
44	7 26.0	7 27.2	7 05.7	13.2 6.5
45	7 26.3	7 27.5	7 05.9	13.5 6.6
46	7 26.5	7 27.7	7 06.2	13.8 6.8
47	7 26.8	7 28.0	7 06.4	14.1 6.9
48	7 27.0	7 28.2	7 06.6	14.4 7.1
49	7 27.3	7 28.5	7 06.9	14.7 7.2
50	7 27.5	7 28.7	7 07.1	15.0 7.4
51	7 27.8	7 29.0	7 07.4	15.3 7.5
52	7 28.0	7 29.2	7 07.6	15.6 7.7
53	7 28.3	7 29.5	7 07.8	15.9 7.8
54	7 28.5	7 29.7	7 08.1	16.2 8.0
55	7 28.8	7 30.0	7 08.3	16.5 8.1
56	7 29.0	7 30.2	7 08.5	16.8 8.3
57	7 29.3	7 30.5	7 08.8	17.1 8.4
58	7 29.5	7 30.7	7 09.0	17.4 8.6
59	7 29.8	7 31.0	7 09.3	17.7 8.7
60	7 30.0	7 31.2	7 09.5	18.0 8.9

m 30	Increment to G.H.A.			v or Corr ⁿ d
	SUN	ARIES	MOON	
00	7 30.0	7 31.2	7 09.5	0.0 0.0
01	7 30.3	7 31.5	7 09.7	0.3 0.2
02	7 30.5	7 31.7	7 10.0	0.6 0.3
03	7 30.8	7 32.0	7 10.2	0.9 0.5
04	7 31.0	7 32.2	7 10.5	1.2 0.6
05	7 31.3	7 32.5	7 10.7	1.5 0.8
06	7 31.5	7 32.7	7 10.9	1.8 0.9
07	7 31.8	7 33.0	7 11.2	2.1 1.1
08	7 32.0	7 33.2	7 11.4	2.4 1.2
09	7 32.3	7 33.5	7 11.6	2.7 1.4
10	7 32.5	7 33.7	7 11.9	3.0 1.5
11	7 32.8	7 34.0	7 12.1	3.3 1.7
12	7 33.0	7 34.2	7 12.4	3.6 1.8
13	7 33.3	7 34.5	7 12.6	3.9 2.0
14	7 33.5	7 34.7	7 12.8	4.2 2.1
15	7 33.8	7 35.0	7 13.1	4.5 2.3
16	7 34.0	7 35.2	7 13.3	4.8 2.4
17	7 34.3	7 35.5	7 13.6	5.1 2.6
18	7 34.5	7 35.7	7 13.8	5.4 2.7
19	7 34.8	7 36.0	7 14.0	5.7 2.9
20	7 35.0	7 36.2	7 14.3	6.0 3.1
21	7 35.3	7 36.5	7 14.5	6.3 3.2
22	7 35.5	7 36.7	7 14.7	6.6 3.4
23	7 35.8	7 37.0	7 15.0	6.9 3.5
24	7 36.0	7 37.2	7 15.2	7.2 3.7
25	7 36.3	7 37.5	7 15.5	7.5 3.8
26	7 36.5	7 37.7	7 15.7	7.8 4.0
27	7 36.8	7 38.0	7 15.9	8.1 4.1
28	7 37.0	7 38.3	7 16.2	8.4 4.3
29	7 37.3	7 38.5	7 16.4	8.7 4.4
30	7 37.5	7 38.8	7 16.7	9.0 4.6
31	7 37.8	7 39.0	7 16.9	9.3 4.7
32	7 38.0	7 39.3	7 17.1	9.6 4.9
33	7 38.3	7 39.5	7 17.4	9.9 5.0
34	7 38.5	7 39.8	7 17.6	10.2 5.2
35	7 38.8	7 40.0	7 17.9	10.5 5.3
36	7 39.0	7 40.3	7 18.1	10.8 5.5
37	7 39.3	7 40.5	7 18.3	11.1 5.6
38	7 39.5	7 40.8	7 18.6	11.4 5.8
39	7 39.8	7 41.0	7 18.8	11.7 5.9
40	7 40.0	7 41.3	7 19.0	12.0 6.1
41	7 40.3	7 41.5	7 19.3	12.3 6.3
42	7 40.5	7 41.8	7 19.5	12.6 6.4
43	7 40.8	7 42.0	7 19.8	12.9 6.6
44	7 41.0	7 42.3	7 20.0	13.2 6.7
45	7 41.3	7 42.5	7 20.2	13.5 6.9
46	7 41.5	7 42.8	7 20.5	13.8 7.0
47	7 41.8	7 43.0	7 20.7	14.1 7.2
48	7 42.0	7 43.3	7 21.0	14.4 7.3
49	7 42.3	7 43.5	7 21.2	14.7 7.5
50	7 42.5	7 43.8	7 21.4	15.0 7.6
51	7 42.8	7 44.0	7 21.7	15.3 7.8
52	7 43.0	7 44.3	7 21.9	15.6 7.9
53	7 43.3	7 44.5	7 22.1	15.9 8.1
54	7 43.5	7 44.8	7 22.4	16.2 8.2
55	7 43.8	7 45.0	7 22.6	16.5 8.4
56	7 44.0	7 45.3	7 22.9	16.8 8.5
57	7 44.3	7 45.5	7 23.1	17.1 8.7
58	7 44.5	7 45.8	7 23.3	17.4 8.8
59	7 44.8	7 46.0	7 23.6	17.7 9.0
60	7 45.0	7 46.3	7 23.8	18.0 9.2

m 31	Increment to G.H.A.			v or Corr ⁿ d
	SUN	ARIES	MOON	
00	7 45.0	7 46.3	7 23.8	0.0 0.0
01	7 45.3	7 46.5	7 24.1	0.3 0.2
02	7 45.5	7 46.8	7 24.3	0.6 0.3
03	7 45.8	7 47.0	7 24.5	0.9 0.5
04	7 46.0	7 47.3	7 24.8	1.2 0.6
05	7 46.3	7 47.5	7 25.0	1.5 0.8
06	7 46.5	7 47.8	7 25.2	1.8 0.9
07	7 46.8	7 48.0	7 25.5	2.1 1.1
08	7 47.0	7 48.3	7 25.7	2.4 1.3
09	7 47.3	7 48.5	7 26.0	2.7 1.4
10	7 47.5	7 48.8	7 26.2	3.0 1.6
11	7 47.8	7 49.0	7 26.4	3.3 1.7
12	7 48.0	7 49.3	7 26.7	3.6 1.9
13	7 48.3	7 49.5	7 26.9	3.9 2.0
14	7 48.5	7 49.8	7 27.2	4.2 2.2
15	7 48.8	7 50.0	7 27.4	4.5 2.4
16	7 49.0	7 50.3	7 27.6	4.8 2.5
17	7 49.3	7 50.5	7 27.9	5.1 2.7
1				

m	Increment to G.H.A.			v or Corr ⁿ d
	SUN	ARIES	MOON	
00	8 00.0	8 01.3	7 38.1	0.0 0.0
01	8 00.3	8 01.6	7 38.4	0.3 0.2
02	8 00.5	8 01.8	7 38.6	0.6 0.3
03	8 00.8	8 02.1	7 38.8	0.9 0.5
04	8 01.0	8 02.3	7 39.1	1.2 0.7
05	8 01.3	8 02.6	7 39.3	1.5 0.8
06	8 01.5	8 02.8	7 39.6	1.8 1.0
07	8 01.8	8 03.1	7 39.8	2.1 1.1
08	8 02.0	8 03.3	7 40.0	2.4 1.3
09	8 02.3	8 03.6	7 40.3	2.7 1.5
10	8 02.5	8 03.8	7 40.5	3.0 1.6
11	8 02.8	8 04.1	7 40.8	3.3 1.8
12	8 03.0	8 04.3	7 41.0	3.6 2.0
13	8 03.3	8 04.6	7 41.2	3.9 2.1
14	8 03.5	8 04.8	7 41.5	4.2 2.3
15	8 03.8	8 05.1	7 41.7	4.5 2.4
16	8 04.0	8 05.3	7 42.0	4.8 2.6
17	8 04.3	8 05.6	7 42.2	5.1 2.8
18	8 04.5	8 05.8	7 42.4	5.4 2.9
19	8 04.8	8 06.1	7 42.7	5.7 3.1
20	8 05.0	8 06.3	7 42.9	6.0 3.3
21	8 05.3	8 06.6	7 43.1	6.3 3.4
22	8 05.5	8 06.8	7 43.4	6.6 3.6
23	8 05.8	8 07.1	7 43.6	6.9 3.7
24	8 06.0	8 07.3	7 43.9	7.2 3.9
25	8 06.3	8 07.6	7 44.1	7.5 4.1
26	8 06.5	8 07.8	7 44.3	7.8 4.2
27	8 06.8	8 08.1	7 44.6	8.1 4.4
28	8 07.0	8 08.3	7 44.8	8.4 4.6
29	8 07.3	8 08.6	7 45.1	8.7 4.7
30	8 07.5	8 08.8	7 45.3	9.0 4.9
31	8 07.8	8 09.1	7 45.5	9.3 5.0
32	8 08.0	8 09.3	7 45.8	9.6 5.2
33	8 08.3	8 09.6	7 46.0	9.9 5.4
34	8 08.5	8 09.8	7 46.2	10.2 5.5
35	8 08.8	8 10.1	7 46.5	10.5 5.7
36	8 09.0	8 10.3	7 46.7	10.8 5.9
37	8 09.3	8 10.6	7 47.0	11.1 6.0
38	8 09.5	8 10.8	7 47.2	11.4 6.2
39	8 09.8	8 11.1	7 47.4	11.7 6.3
40	8 10.0	8 11.3	7 47.7	12.0 6.5
41	8 10.3	8 11.6	7 47.9	12.3 6.7
42	8 10.5	8 11.8	7 48.2	12.6 6.8
43	8 10.8	8 12.1	7 48.4	12.9 7.0
44	8 11.0	8 12.3	7 48.6	13.2 7.2
45	8 11.3	8 12.6	7 48.9	13.5 7.3
46	8 11.5	8 12.8	7 49.1	13.8 7.5
47	8 11.8	8 13.1	7 49.3	14.1 7.6
48	8 12.0	8 13.3	7 49.6	14.4 7.8
49	8 12.3	8 13.6	7 49.8	14.7 8.0
50	8 12.5	8 13.8	7 50.1	15.0 8.1
51	8 12.8	8 14.1	7 50.3	15.3 8.3
52	8 13.0	8 14.3	7 50.5	15.6 8.5
53	8 13.3	8 14.6	7 50.8	15.9 8.6
54	8 13.5	8 14.9	7 51.0	16.2 8.8
55	8 13.8	8 15.1	7 51.3	16.5 8.9
56	8 14.0	8 15.4	7 51.5	16.8 9.1
57	8 14.3	8 15.6	7 51.7	17.1 9.3
58	8 14.5	8 15.9	7 52.0	17.4 9.4
59	8 14.8	8 16.1	7 52.2	17.7 9.6
60	8 15.0	8 16.4	7 52.5	18.0 9.8

m	Increment to G.H.A.			v or Corr ⁿ d
	SUN	ARIES	MOON	
00	8 15.0	8 16.4	7 52.5	0.0 0.0
01	8 15.3	8 16.6	7 52.7	0.3 0.2
02	8 15.5	8 16.9	7 52.9	0.6 0.3
03	8 15.8	8 17.1	7 53.2	0.9 0.5
04	8 16.0	8 17.4	7 53.4	1.2 0.7
05	8 16.3	8 17.6	7 53.6	1.5 0.8
06	8 16.5	8 17.9	7 53.9	1.8 1.0
07	8 16.8	8 18.1	7 54.1	2.1 1.2
08	8 17.0	8 18.4	7 54.4	2.4 1.3
09	8 17.3	8 18.6	7 54.6	2.7 1.5
10	8 17.5	8 18.9	7 54.8	3.0 1.7
11	8 17.8	8 19.1	7 55.1	3.3 1.8
12	8 18.0	8 19.4	7 55.3	3.6 2.0
13	8 18.3	8 19.6	7 55.6	3.9 2.2
14	8 18.5	8 19.9	7 55.8	4.2 2.3
15	8 18.8	8 20.1	7 56.0	4.5 2.5
16	8 19.0	8 20.4	7 56.3	4.8 2.7
17	8 19.3	8 20.6	7 56.5	5.1 2.8
18	8 19.5	8 20.9	7 56.7	5.4 3.0
19	8 19.8	8 21.1	7 57.0	5.7 3.2
20	8 20.0	8 21.4	7 57.2	6.0 3.4
21	8 20.3	8 21.6	7 57.5	6.3 3.5
22	8 20.5	8 21.9	7 57.7	6.6 3.7
23	8 20.8	8 22.1	7 57.9	6.9 3.9
24	8 21.0	8 22.4	7 58.2	7.2 4.0
25	8 21.3	8 22.6	7 58.4	7.5 4.2
26	8 21.5	8 22.9	7 58.7	7.8 4.4
27	8 21.8	8 23.1	7 58.9	8.1 4.5
28	8 22.0	8 23.4	7 59.1	8.4 4.7
29	8 22.3	8 23.6	7 59.4	8.7 4.9
30	8 22.5	8 23.9	7 59.6	9.0 5.0
31	8 22.8	8 24.1	7 59.8	9.3 5.2
32	8 23.0	8 24.4	8 00.1	9.6 5.4
33	8 23.3	8 24.6	8 00.3	9.9 5.5
34	8 23.5	8 24.9	8 00.6	10.2 5.7
35	8 23.8	8 25.1	8 00.8	10.5 5.9
36	8 24.0	8 25.4	8 01.0	10.8 6.0
37	8 24.3	8 25.6	8 01.3	11.1 6.2
38	8 24.5	8 25.9	8 01.5	11.4 6.4
39	8 24.8	8 26.1	8 01.8	11.7 6.5
40	8 25.0	8 26.4	8 02.0	12.0 6.7
41	8 25.3	8 26.6	8 02.2	12.3 6.9
42	8 25.5	8 26.9	8 02.5	12.6 7.0
43	8 25.8	8 27.1	8 02.7	12.9 7.2
44	8 26.0	8 27.4	8 02.9	13.2 7.4
45	8 26.3	8 27.6	8 03.2	13.5 7.5
46	8 26.5	8 27.9	8 03.4	13.8 7.7
47	8 26.8	8 28.1	8 03.7	14.1 7.9
48	8 27.0	8 28.4	8 03.9	14.4 8.0
49	8 27.3	8 28.6	8 04.1	14.7 8.2
50	8 27.5	8 28.9	8 04.4	15.0 8.4
51	8 27.8	8 29.1	8 04.6	15.3 8.5
52	8 28.0	8 29.4	8 04.9	15.6 8.7
53	8 28.3	8 29.6	8 05.1	15.9 8.9
54	8 28.5	8 29.9	8 05.3	16.2 9.0
55	8 28.8	8 30.1	8 05.6	16.5 9.2
56	8 29.0	8 30.4	8 05.8	16.8 9.4
57	8 29.3	8 30.6	8 06.1	17.1 9.5
58	8 29.5	8 30.9	8 06.3	17.4 9.7
59	8 29.8	8 31.1	8 06.5	17.7 9.9
60	8 30.0	8 31.4	8 06.8	18.0 10.1

m	Increment to G.H.A.			v or Corr ⁿ d
	SUN	ARIES	MOON	
00	8 30.0	8 31.4	8 06.8	0.0 0.0
01	8 30.3	8 31.6	8 07.0	0.3 0.2
02	8 30.5	8 31.9	8 07.2	0.6 0.3
03	8 30.8	8 32.1	8 07.5	0.9 0.5
04	8 31.0	8 32.4	8 07.7	1.2 0.7
05	8 31.3	8 32.6	8 08.0	1.5 0.9
06	8 31.5	8 32.9	8 08.2	1.8 1.0
07	8 31.8	8 33.2	8 08.4	2.1 1.2
08	8 32.0	8 33.4	8 08.7	2.4 1.4
09	8 32.3	8 33.7	8 08.9	2.7 1.6
10	8 32.5	8 33.9	8 09.2	3.0 1.7
11	8 32.8	8 34.2	8 09.4	3.3 1.9
12	8 33.0	8 34.4	8 09.6	3.6 2.1
13	8 33.3	8 34.7	8 09.9	3.9 2.2
14	8 33.5	8 34.9	8 10.1	4.2 2.4
15	8 33.8	8 35.2	8 10.3	4.5 2.6
16	8 34.0	8 35.4	8 10.6	4.8 2.8
17	8 34.3	8 35.7	8 10.8	5.1 2.9
18	8 34.5	8 35.9	8 11.1	5.4 3.1
19	8 34.8	8 36.2	8 11.3	5.7 3.3
20	8 35.0	8 36.4	8 11.5	6.0 3.5
21	8 35.3	8 36.7	8 11.8	6.3 3.6
22	8 35.5	8 36.9	8 12.0	6.6 3.8
23	8 35.8	8 37.2	8 12.3	6.9 4.0
24	8 36.0	8 37.4	8 12.5	7.2 4.1
25	8 36.3	8 37.7	8 12.7	7.5 4.3
26	8 36.5	8 37.9	8 13.0	7.8 4.5
27	8 36.8	8 38.2	8 13.2	8.1 4.7
28	8 37.0	8 38.4	8 13.4	8.4 4.8
29	8 37.3	8 38.7	8 13.7	8.7 5.0
30	8 37.5	8 38.9	8 13.9	9.0 5.2
31	8 37.8	8 39.2	8 14.2	9.3 5.3
32	8 38.0	8 39.4	8 14.4	9.6 5.5
33	8 38.3	8 39.7	8 14.6	9.9 5.7
34	8 38.5	8 39.9	8 14.9	10.2 5.9
35	8 38.8	8 40.2	8 15.1	10.5 6.0
36	8 39.0	8 40.4	8 15.4	10.8 6.2
37	8 39.3	8 40.7	8 15.6	11.1 6.4
38	8 39.5	8 40.9	8 15.8	11.4 6.6
39	8 39.8	8 41.2	8 16.1	11.7 6.7
40	8 40.0	8 41.4	8 16.3	12.0 6.9
41	8 40.3	8 41.7	8 16.5	12.3 7.1
42	8 40.5	8 41.9	8 16.8	12.6 7.2
43	8 40.8	8 42.2	8 17.0	12.9 7.4
44	8 41.0	8 42.4	8 17.3	13.2 7.6
45	8 41.3	8 42.7	8 17.5	13.5 7.8
46	8 41.5	8 42.9	8 17.7	13.8 7.9
47	8 41.8	8 43.2	8 18.0	14.1 8.1
48	8 42.0	8 43.4	8 18.2	14.4 8.3
49	8 42.3	8 43.7	8 18.5	14.7 8.5
50	8 42.5	8 43.9	8 18.7	15.0 8.6
51	8 42.8	8 44.2	8 18.9	15.3 8.8
52	8 43.0	8 44.4	8 19.2	15.6 9.0
53	8 43.3	8 44.7	8 19.4	15.9 9.1
54	8 43.5	8 44.9	8 19.7	16.2 9.3
55	8 43.8	8 45.2	8 19.9	16.5 9.5
56	8 44.0	8 45.4	8 20.1	16.8 9.7
57	8 44.3	8 45.7	8 20.4	17.1 9.8
58	8 44.5	8 45.9	8 20.6	17.4 10.0
59	8 44.8	8 46.2	8 20.8	17.7 10.2
60	8 45.0	8 46.4	8 21.1	18.0 10.4

m	Increment to G.H.A.			v or Corr ⁿ d
	SUN	ARIES	MOON	
00	8 45.0	8 46.4	8 21.1	0.0 0.0
01	8 45.3	8 46.7	8 21.3	0.3 0.2
02	8 45.5	8 46.9	8 21.6	0.6 0.4
03	8 45.8	8 47.2	8 21.8	0.9 0.5
04	8 46.0	8 47.4	8 22.0	1.2 0.7
05	8 46.3	8 47.7	8 22.3	1.5 0.9
06	8 46.5	8 47.9	8 22.5	1.8 1.1
07	8 46.8	8 48.2	8 22.8	2.1 1.2
08	8 47.0	8 48.4	8 23.0	2.4 1.4
09	8 47.3	8 48.7	8 23.2	2.7 1.6
10	8 47.5	8 48.9	8 23.5	3.0 1.8
11	8 47.8	8 49.2	8 23.7	3.3 2.0
12	8 48.0	8 49.4	8 23.9	3.6 2.1
13	8 48.3	8 49.7	8 24.2	3.9 2.3
14	8 48.5	8 49.9	8 24.4	4.2 2.5
15	8 48.8	8 50.2	8 24.7	4.5 2.7
16	8 49.0	8 50.4	8 24.9	4.8 2.8
17	8 49.3	8 50.7	8 25.1	5.1 3.0
18	8 49.5	8 50.9	8 25.4	5.4 3.

m 36	Increment to G.H.A.			v or Corr ⁿ d	
	SUN	ARIES	MOON		
00	9 00.0	9 01.5	8 35.4	0.0	0.0
01	9 00.3	9 01.7	8 35.6	0.3	0.2
02	9 00.5	9 02.0	8 35.9	0.6	0.4
03	9 00.8	9 02.2	8 36.1	0.9	0.5
04	9 01.0	9 02.5	8 36.4	1.2	0.7
05	9 01.3	9 02.7	8 36.6	1.5	0.9
06	9 01.5	9 03.0	8 36.8	1.8	1.1
07	9 01.8	9 03.2	8 37.1	2.1	1.3
08	9 02.0	9 03.5	8 37.3	2.4	1.5
09	9 02.3	9 03.7	8 37.5	2.7	1.6
10	9 02.5	9 04.0	8 37.8	3.0	1.8
11	9 02.8	9 04.2	8 38.0	3.3	2.0
12	9 03.0	9 04.5	8 38.3	3.6	2.2
13	9 03.3	9 04.7	8 38.5	3.9	2.4
14	9 03.5	9 05.0	8 38.7	4.2	2.6
15	9 03.8	9 05.2	8 39.0	4.5	2.7
16	9 04.0	9 05.5	8 39.2	4.8	2.9
17	9 04.3	9 05.7	8 39.5	5.1	3.1
18	9 04.5	9 06.0	8 39.7	5.4	3.3
19	9 04.8	9 06.2	8 39.9	5.7	3.5
20	9 05.0	9 06.5	8 40.2	6.0	3.7
21	9 05.3	9 06.7	8 40.4	6.3	3.8
22	9 05.5	9 07.0	8 40.6	6.6	4.0
23	9 05.8	9 07.2	8 40.9	6.9	4.2
24	9 06.0	9 07.5	8 41.1	7.2	4.4
25	9 06.3	9 07.7	8 41.4	7.5	4.6
26	9 06.5	9 08.0	8 41.6	7.8	4.7
27	9 06.8	9 08.2	8 41.8	8.1	4.9
28	9 07.0	9 08.5	8 42.1	8.4	5.1
29	9 07.3	9 08.7	8 42.3	8.7	5.3
30	9 07.5	9 09.0	8 42.6	9.0	5.5
31	9 07.8	9 09.2	8 42.8	9.3	5.7
32	9 08.0	9 09.5	8 43.0	9.6	5.8
33	9 08.3	9 09.8	8 43.3	9.9	6.0
34	9 08.5	9 10.0	8 43.5	10.2	6.2
35	9 08.8	9 10.3	8 43.8	10.5	6.4
36	9 09.0	9 10.5	8 44.0	10.8	6.6
37	9 09.3	9 10.8	8 44.2	11.1	6.8
38	9 09.5	9 11.0	8 44.5	11.4	6.9
39	9 09.8	9 11.3	8 44.7	11.7	7.1
40	9 10.0	9 11.5	8 44.9	12.0	7.3
41	9 10.3	9 11.8	8 45.2	12.3	7.5
42	9 10.5	9 12.0	8 45.4	12.6	7.7
43	9 10.8	9 12.3	8 45.7	12.9	7.8
44	9 11.0	9 12.5	8 45.9	13.2	8.0
45	9 11.3	9 12.8	8 46.1	13.5	8.2
46	9 11.5	9 13.0	8 46.4	13.8	8.4
47	9 11.8	9 13.3	8 46.6	14.1	8.6
48	9 12.0	9 13.5	8 46.9	14.4	8.8
49	9 12.3	9 13.8	8 47.1	14.7	8.9
50	9 12.5	9 14.0	8 47.3	15.0	9.1
51	9 12.8	9 14.3	8 47.6	15.3	9.3
52	9 13.0	9 14.5	8 47.8	15.6	9.5
53	9 13.3	9 14.8	8 48.0	15.9	9.7
54	9 13.5	9 15.0	8 48.3	16.2	9.9
55	9 13.8	9 15.3	8 48.5	16.5	10.0
56	9 14.0	9 15.5	8 48.8	16.8	10.2
57	9 14.3	9 15.8	8 49.0	17.1	10.4
58	9 14.5	9 16.0	8 49.2	17.4	10.6
59	9 14.8	9 16.3	8 49.5	17.7	10.8
60	9 15.0	9 16.5	8 49.7	18.0	11.0

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m 37	Increment to G.H.A.			v or Corr ⁿ d	
	SUN	ARIES	MOON		
00	9 15.0	9 16.5	8 49.7	0.0	0.0
01	9 15.3	9 16.8	8 50.0	0.3	0.2
02	9 15.5	9 17.0	8 50.2	0.6	0.4
03	9 15.8	9 17.3	8 50.4	0.9	0.6
04	9 16.0	9 17.5	8 50.7	1.2	0.8
05	9 16.3	9 17.8	8 50.9	1.5	0.9
06	9 16.5	9 18.0	8 51.1	1.8	1.1
07	9 16.8	9 18.3	8 51.4	2.1	1.3
08	9 17.0	9 18.5	8 51.6	2.4	1.5
09	9 17.3	9 18.8	8 51.9	2.7	1.7
10	9 17.5	9 19.0	8 52.1	3.0	1.9
11	9 17.8	9 19.3	8 52.3	3.3	2.1
12	9 18.0	9 19.5	8 52.6	3.6	2.3
13	9 18.3	9 19.8	8 52.8	3.9	2.4
14	9 18.5	9 20.0	8 53.1	4.2	2.6
15	9 18.8	9 20.3	8 53.3	4.5	2.8
16	9 19.0	9 20.5	8 53.5	4.8	3.0
17	9 19.3	9 20.8	8 53.8	5.1	3.2
18	9 19.5	9 21.0	8 54.0	5.4	3.4
19	9 19.8	9 21.3	8 54.3	5.7	3.6
20	9 20.0	9 21.5	8 54.5	6.0	3.8
21	9 20.3	9 21.8	8 54.7	6.3	3.9
22	9 20.5	9 22.0	8 55.0	6.6	4.1
23	9 20.8	9 22.3	8 55.2	6.9	4.3
24	9 21.0	9 22.5	8 55.4	7.2	4.5
25	9 21.3	9 22.8	8 55.7	7.5	4.7
26	9 21.5	9 23.0	8 55.9	7.8	4.9
27	9 21.8	9 23.3	8 56.2	8.1	5.1
28	9 22.0	9 23.5	8 56.4	8.4	5.3
29	9 22.3	9 23.8	8 56.6	8.7	5.5
30	9 22.5	9 24.0	8 56.9	9.0	5.6
31	9 22.8	9 24.3	8 57.1	9.3	5.8
32	9 23.0	9 24.5	8 57.4	9.6	6.0
33	9 23.3	9 24.8	8 57.6	9.9	6.2
34	9 23.5	9 25.0	8 57.8	10.2	6.4
35	9 23.8	9 25.3	8 58.1	10.5	6.6
36	9 24.0	9 25.5	8 58.3	10.8	6.8
37	9 24.3	9 25.8	8 58.5	11.1	6.9
38	9 24.5	9 26.0	8 58.8	11.4	7.1
39	9 24.8	9 26.3	8 59.0	11.7	7.3
40	9 25.0	9 26.5	8 59.3	12.0	7.5
41	9 25.3	9 26.8	8 59.5	12.3	7.7
42	9 25.5	9 27.0	8 59.7	12.6	7.9
43	9 25.8	9 27.3	9 00.0	12.9	8.1
44	9 26.0	9 27.5	9 00.2	13.2	8.3
45	9 26.3	9 27.8	9 00.5	13.5	8.4
46	9 26.5	9 28.1	9 00.7	13.8	8.6
47	9 26.8	9 28.3	9 00.9	14.1	8.8
48	9 27.0	9 28.6	9 01.2	14.4	9.0
49	9 27.3	9 28.8	9 01.4	14.7	9.2
50	9 27.5	9 29.1	9 01.6	15.0	9.4
51	9 27.8	9 29.3	9 01.9	15.3	9.6
52	9 28.0	9 29.6	9 02.1	15.6	9.8
53	9 28.3	9 29.8	9 02.4	15.9	9.9
54	9 28.5	9 30.1	9 02.6	16.2	10.1
55	9 28.8	9 30.3	9 02.8	16.5	10.3
56	9 29.0	9 30.6	9 03.1	16.8	10.5
57	9 29.3	9 30.8	9 03.3	17.1	10.7
58	9 29.5	9 31.1	9 03.6	17.4	10.9
59	9 29.8	9 31.3	9 03.8	17.7	11.1
60	9 30.0	9 31.6	9 04.0	18.0	11.3

m 38	Increment to G.H.A.			v or Corr ⁿ d	
	SUN	ARIES	MOON		
00	9 30.0	9 31.6	9 04.0	0.0	0.0
01	9 30.3	9 31.8	9 04.3	0.3	0.2
02	9 30.5	9 32.1	9 04.5	0.6	0.4
03	9 30.8	9 32.3	9 04.7	0.9	0.6
04	9 31.0	9 32.6	9 05.0	1.2	0.8
05	9 31.3	9 32.8	9 05.2	1.5	1.0
06	9 31.5	9 33.1	9 05.5	1.8	1.2
07	9 31.8	9 33.3	9 05.7	2.1	1.3
08	9 32.0	9 33.6	9 05.9	2.4	1.5
09	9 32.3	9 33.8	9 06.2	2.7	1.7
10	9 32.5	9 34.1	9 06.4	3.0	1.9
11	9 32.8	9 34.3	9 06.7	3.3	2.1
12	9 33.0	9 34.6	9 06.9	3.6	2.3
13	9 33.3	9 34.8	9 07.1	3.9	2.5
14	9 33.5	9 35.1	9 07.4	4.2	2.7
15	9 33.8	9 35.3	9 07.6	4.5	2.9
16	9 34.0	9 35.6	9 07.9	4.8	3.1
17	9 34.3	9 35.8	9 08.1	5.1	3.3
18	9 34.5	9 36.1	9 08.3	5.4	3.5
19	9 34.8	9 36.3	9 08.6	5.7	3.7
20	9 35.0	9 36.6	9 08.8	6.0	3.9
21	9 35.3	9 36.8	9 09.0	6.3	4.0
22	9 35.5	9 37.1	9 09.3	6.6	4.2
23	9 35.8	9 37.3	9 09.5	6.9	4.4
24	9 36.0	9 37.6	9 09.8	7.2	4.6
25	9 36.3	9 37.8	9 10.0	7.5	4.8
26	9 36.5	9 38.1	9 10.2	7.8	5.0
27	9 36.8	9 38.3	9 10.5	8.1	5.2
28	9 37.0	9 38.6	9 10.7	8.4	5.4
29	9 37.3	9 38.8	9 11.0	8.7	5.6
30	9 37.5	9 39.1	9 11.2	9.0	5.8
31	9 37.8	9 39.3	9 11.4	9.3	6.0
32	9 38.0	9 39.6	9 11.7	9.6	6.2
33	9 38.3	9 39.8	9 11.9	9.9	6.4
34	9 38.5	9 40.1	9 12.1	10.2	6.5
35	9 38.8	9 40.3	9 12.4	10.5	6.7
36	9 39.0	9 40.6	9 12.6	10.8	6.9
37	9 39.3	9 40.8	9 12.9	11.1	7.1
38	9 39.5	9 41.1	9 13.1	11.4	7.3
39	9 39.8	9 41.3	9 13.3	11.7	7.5
40	9 40.0	9 41.6	9 13.6	12.0	7.7
41	9 40.3	9 41.8	9 13.8	12.3	7.9
42	9 40.5	9 42.1	9 14.1	12.6	8.1
43	9 40.8	9 42.3	9 14.3	12.9	8.3
44	9 41.0	9 42.6	9 14.5	13.2	8.5
45	9 41.3	9 42.8	9 14.8	13.5	8.7
46	9 41.5	9 43.1	9 15.0	13.8	8.9
47	9 41.8	9 43.3	9 15.2	14.1	9.0
48	9 42.0	9 43.6	9 15.5	14.4	9.2
49	9 42.3	9 43.8	9 15.7	14.7	9.4
50	9 42.5	9 44.1	9 16.0	15.0	9.6
51	9 42.8	9 44.3	9 16.2	15.3	9.8
52	9 43.0	9 44.6	9 16.4	15.6	10.0
53	9 43.3	9 44.8	9 16.7	15.9	10.2
54	9 43.5	9 45.1	9 16.9	16.2	10.4
55	9 43.8	9 45.3	9 17.2	16.5	10.6
56	9 44.0	9 45.6	9 17.4	16.8	10.8
57	9 44.3	9 45.8	9 17.6	17.1	11.0
58	9 44.5	9 46.1	9 17.9	17.4	11.2
59	9 44.8	9 46.4	9 18.1	17.7	11.4
60	9 45.0	9 46.6	9 18.4	18.0	11.6

m 39	Increment to G.H.A.			v or Corr ⁿ d	
	SUN	ARIES	MOON		
00	9 45.0	9 46.6	9 18.4	0.0	0.0
01	9 45.3	9 46.9	9 18.6	0.3	0.2
02	9 45.5	9 47.2	9 18.8	0.6	0.4
03	9 45.8	9 47.4	9 19.1	0.9	0

m	Increment to G.H.A.			v or Corr ⁿ d
	SUN	ARIES	MOON	
00	10 00.0	10 01.6	9 32.7	0.0 0.0
01	10 00.3	10 01.9	9 32.9	0.3 0.2
02	10 00.5	10 02.1	9 33.1	0.6 0.4
03	10 00.8	10 02.4	9 33.4	0.9 0.6
04	10 01.0	10 02.6	9 33.6	1.2 0.8
05	10 01.3	10 02.9	9 33.9	1.5 1.0
06	10 01.5	10 03.1	9 34.1	1.8 1.2
07	10 01.8	10 03.4	9 34.3	2.1 1.4
08	10 02.0	10 03.6	9 34.6	2.4 1.6
09	10 02.3	10 03.9	9 34.8	2.7 1.8
10	10 02.5	10 04.1	9 35.1	3.0 2.0
11	10 02.8	10 04.4	9 35.3	3.3 2.2
12	10 03.0	10 04.7	9 35.5	3.6 2.4
13	10 03.3	10 04.9	9 35.8	3.9 2.6
14	10 03.5	10 05.2	9 36.0	4.2 2.8
15	10 03.8	10 05.4	9 36.2	4.5 3.0
16	10 04.0	10 05.7	9 36.5	4.8 3.2
17	10 04.3	10 05.9	9 36.7	5.1 3.4
18	10 04.5	10 06.2	9 37.0	5.4 3.6
19	10 04.8	10 06.4	9 37.2	5.7 3.8
20	10 05.0	10 06.7	9 37.4	6.0 4.1
21	10 05.3	10 06.9	9 37.7	6.3 4.3
22	10 05.5	10 07.2	9 37.9	6.6 4.5
23	10 05.8	10 07.4	9 38.2	6.9 4.7
24	10 06.0	10 07.7	9 38.4	7.2 4.9
25	10 06.3	10 07.9	9 38.6	7.5 5.1
26	10 06.5	10 08.2	9 38.9	7.8 5.3
27	10 06.8	10 08.4	9 39.1	8.1 5.5
28	10 07.0	10 08.7	9 39.3	8.4 5.7
29	10 07.3	10 08.9	9 39.6	8.7 5.9
30	10 07.5	10 09.2	9 39.8	9.0 6.1
31	10 07.8	10 09.4	9 40.1	9.3 6.3
32	10 08.0	10 09.7	9 40.3	9.6 6.5
33	10 08.3	10 09.9	9 40.5	9.9 6.7
34	10 08.5	10 10.2	9 40.8	10.2 6.9
35	10 08.8	10 10.4	9 41.0	10.5 7.1
36	10 09.0	10 10.7	9 41.3	10.8 7.3
37	10 09.3	10 10.9	9 41.5	11.1 7.5
38	10 09.5	10 11.2	9 41.7	11.4 7.7
39	10 09.8	10 11.4	9 42.0	11.7 7.9
40	10 10.0	10 11.7	9 42.2	12.0 8.1
41	10 10.3	10 11.9	9 42.4	12.3 8.3
42	10 10.5	10 12.2	9 42.7	12.6 8.5
43	10 10.8	10 12.4	9 42.9	12.9 8.7
44	10 11.0	10 12.7	9 43.2	13.2 8.9
45	10 11.3	10 12.9	9 43.4	13.5 9.1
46	10 11.5	10 13.2	9 43.6	13.8 9.3
47	10 11.8	10 13.4	9 43.9	14.1 9.5
48	10 12.0	10 13.7	9 44.1	14.4 9.7
49	10 12.3	10 13.9	9 44.4	14.7 9.9
50	10 12.5	10 14.2	9 44.6	15.0 10.1
51	10 12.8	10 14.4	9 44.8	15.3 10.3
52	10 13.0	10 14.7	9 45.1	15.6 10.5
53	10 13.3	10 14.9	9 45.3	15.9 10.7
54	10 13.5	10 15.2	9 45.6	16.2 10.9
55	10 13.8	10 15.4	9 45.8	16.5 11.1
56	10 14.0	10 15.7	9 46.0	16.8 11.3
57	10 14.3	10 15.9	9 46.3	17.1 11.5
58	10 14.5	10 16.2	9 46.5	17.4 11.7
59	10 14.8	10 16.4	9 46.7	17.7 11.9
60	10 15.0	10 16.7	9 47.0	18.0 12.2

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m	Increment to G.H.A.			v or Corr ⁿ d
	SUN	ARIES	MOON	
00	10 15.0	10 16.7	9 47.0	0.0 0.0
01	10 15.3	10 16.9	9 47.2	0.3 0.2
02	10 15.5	10 17.2	9 47.5	0.6 0.4
03	10 15.8	10 17.4	9 47.7	0.9 0.6
04	10 16.0	10 17.7	9 47.9	1.2 0.8
05	10 16.3	10 17.9	9 48.2	1.5 1.0
06	10 16.5	10 18.2	9 48.4	1.8 1.2
07	10 16.8	10 18.4	9 48.7	2.1 1.5
08	10 17.0	10 18.7	9 48.9	2.4 1.7
09	10 17.3	10 18.9	9 49.1	2.7 1.9
10	10 17.5	10 19.2	9 49.4	3.0 2.1
11	10 17.8	10 19.4	9 49.6	3.3 2.3
12	10 18.0	10 19.7	9 49.8	3.6 2.5
13	10 18.3	10 19.9	9 50.1	3.9 2.7
14	10 18.5	10 20.2	9 50.3	4.2 2.9
15	10 18.8	10 20.4	9 50.6	4.5 3.1
16	10 19.0	10 20.7	9 50.8	4.8 3.3
17	10 19.3	10 20.9	9 51.0	5.1 3.5
18	10 19.5	10 21.2	9 51.3	5.4 3.7
19	10 19.8	10 21.4	9 51.5	5.7 3.9
20	10 20.0	10 21.7	9 51.8	6.0 4.2
21	10 20.3	10 21.9	9 52.0	6.3 4.4
22	10 20.5	10 22.2	9 52.2	6.6 4.6
23	10 20.8	10 22.4	9 52.5	6.9 4.8
24	10 21.0	10 22.7	9 52.7	7.2 5.0
25	10 21.3	10 23.0	9 52.9	7.5 5.2
26	10 21.5	10 23.2	9 53.2	7.8 5.4
27	10 21.8	10 23.5	9 53.4	8.1 5.6
28	10 22.0	10 23.7	9 53.7	8.4 5.8
29	10 22.3	10 24.0	9 53.9	8.7 6.0
30	10 22.5	10 24.2	9 54.1	9.0 6.2
31	10 22.8	10 24.5	9 54.4	9.3 6.4
32	10 23.0	10 24.7	9 54.6	9.6 6.6
33	10 23.3	10 25.0	9 54.9	9.9 6.8
34	10 23.5	10 25.2	9 55.1	10.2 7.1
35	10 23.8	10 25.5	9 55.3	10.5 7.3
36	10 24.0	10 25.7	9 55.6	10.8 7.5
37	10 24.3	10 26.0	9 55.8	11.1 7.7
38	10 24.5	10 26.2	9 56.1	11.4 7.9
39	10 24.8	10 26.5	9 56.3	11.7 8.1
40	10 25.0	10 26.7	9 56.5	12.0 8.3
41	10 25.3	10 27.0	9 56.8	12.3 8.5
42	10 25.5	10 27.2	9 57.0	12.6 8.7
43	10 25.8	10 27.5	9 57.2	12.9 8.9
44	10 26.0	10 27.7	9 57.5	13.2 9.1
45	10 26.3	10 28.0	9 57.7	13.5 9.3
46	10 26.5	10 28.2	9 58.0	13.8 9.5
47	10 26.8	10 28.5	9 58.2	14.1 9.8
48	10 27.0	10 28.7	9 58.4	14.4 10.0
49	10 27.3	10 29.0	9 58.7	14.7 10.2
50	10 27.5	10 29.2	9 58.9	15.0 10.4
51	10 27.8	10 29.5	9 59.2	15.3 10.6
52	10 28.0	10 29.7	9 59.4	15.6 10.8
53	10 28.3	10 30.0	9 59.6	15.9 11.0
54	10 28.5	10 30.2	9 59.9	16.2 11.2
55	10 28.8	10 30.5	10 00.1	16.5 11.4
56	10 29.0	10 30.7	10 00.3	16.8 11.6
57	10 29.3	10 31.0	10 00.6	17.1 11.8
58	10 29.5	10 31.2	10 00.8	17.4 12.0
59	10 29.8	10 31.5	10 01.1	17.7 12.2
60	10 30.0	10 31.7	10 01.3	18.0 12.5

m	Increment to G.H.A.			v or Corr ⁿ d
	SUN	ARIES	MOON	
00	10 30.0	10 31.7	10 01.3	0.0 0.0
01	10 30.3	10 32.0	10 01.5	0.3 0.2
02	10 30.5	10 32.2	10 01.8	0.6 0.4
03	10 30.8	10 32.5	10 02.0	0.9 0.6
04	10 31.0	10 32.7	10 02.3	1.2 0.9
05	10 31.3	10 33.0	10 02.5	1.5 1.1
06	10 31.5	10 33.2	10 02.7	1.8 1.3
07	10 31.8	10 33.5	10 03.0	2.1 1.5
08	10 32.0	10 33.7	10 03.2	2.4 1.7
09	10 32.3	10 34.0	10 03.4	2.7 1.9
10	10 32.5	10 34.2	10 03.7	3.0 2.1
11	10 32.8	10 34.5	10 03.9	3.3 2.3
12	10 33.0	10 34.7	10 04.2	3.6 2.6
13	10 33.3	10 35.0	10 04.4	3.9 2.8
14	10 33.5	10 35.2	10 04.6	4.2 3.0
15	10 33.8	10 35.5	10 04.9	4.5 3.2
16	10 34.0	10 35.7	10 05.1	4.8 3.4
17	10 34.3	10 36.0	10 05.4	5.1 3.6
18	10 34.5	10 36.2	10 05.6	5.4 3.8
19	10 34.8	10 36.5	10 05.8	5.7 4.0
20	10 35.0	10 36.7	10 06.1	6.0 4.3
21	10 35.3	10 37.0	10 06.3	6.3 4.5
22	10 35.5	10 37.2	10 06.5	6.6 4.7
23	10 35.8	10 37.5	10 06.8	6.9 4.9
24	10 36.0	10 37.7	10 07.0	7.2 5.1
25	10 36.3	10 38.0	10 07.3	7.5 5.3
26	10 36.5	10 38.2	10 07.5	7.8 5.5
27	10 36.8	10 38.5	10 07.7	8.1 5.7
28	10 37.0	10 38.7	10 08.0	8.4 6.0
29	10 37.3	10 39.0	10 08.2	8.7 6.2
30	10 37.5	10 39.2	10 08.5	9.0 6.4
31	10 37.8	10 39.5	10 08.7	9.3 6.6
32	10 38.0	10 39.7	10 08.9	9.6 6.8
33	10 38.3	10 40.0	10 09.2	9.9 7.0
34	10 38.5	10 40.2	10 09.4	10.2 7.2
35	10 38.8	10 40.5	10 09.7	10.5 7.4
36	10 39.0	10 40.7	10 09.9	10.8 7.7
37	10 39.3	10 41.0	10 10.1	11.1 7.9
38	10 39.5	10 41.3	10 10.4	11.4 8.1
39	10 39.8	10 41.5	10 10.6	11.7 8.3
40	10 40.0	10 41.8	10 10.8	12.0 8.5
41	10 40.3	10 42.0	10 11.1	12.3 8.7
42	10 40.5	10 42.3	10 11.3	12.6 8.9
43	10 40.8	10 42.5	10 11.6	12.9 9.1
44	10 41.0	10 42.8	10 11.8	13.2 9.4
45	10 41.3	10 43.0	10 12.0	13.5 9.6
46	10 41.5	10 43.3	10 12.3	13.8 9.8
47	10 41.8	10 43.5	10 12.5	14.1 10.0
48	10 42.0	10 43.8	10 12.8	14.4 10.2
49	10 42.3	10 44.0	10 13.0	14.7 10.4
50	10 42.5	10 44.3	10 13.2	15.0 10.6
51	10 42.8	10 44.5	10 13.5	15.3 10.8
52	10 43.0	10 44.8	10 13.7	15.6 11.1
53	10 43.3	10 45.0	10 13.9	15.9 11.3
54	10 43.5	10 45.3	10 14.2	16.2 11.5
55	10 43.8	10 45.5	10 14.4	16.5 11.7
56	10 44.0	10 45.8	10 14.7	16.8 11.9
57	10 44.3	10 46.0	10 14.9	17.1 12.1
58	10 44.5	10 46.3	10 15.1	17.4 12.3
59	10 44.8	10 46.5	10 15.4	17.7 12.5
60	10 45.0	10 46.8	10 15.6	18.0 12.8

m	Increment to G.H.A.			v or Corr ⁿ d
	SUN	ARIES	MOON	
00	10 45.0	10 46.8	10 15.6	0.0 0.0
01	10 45.3	10 47.0	10 15.9	0.3 0.2
02	10 45.5	10 47.3	10 16.1	0.6 0.4
03	10 45.8	10 47.5	10 16.3	0.9 0.7
04	10 46.0	10 47.8	10 16.6	1.2 0.9
05	10 46.3	10 48.0	10 16.8	1.5 1.1
06	10 46.5	10 48.3	10 17.0	1.8 1.3
07	10 46.8	10 48.5	10 17.3	2.1 1.5
08	10 47.0	10 48.8	10 17.5	2.4 1.7
09	10 47.3			

m	Increment to G.H.A.			v or d	Corr ⁿ
	SUN	ARIES	MOON		
44					
00	11 00.0	11 01.8	10 29.9	0.0	0.0
01	11 00.3	11 02.1	10 30.2	0.3	0.2
02	11 00.5	11 02.3	10 30.4	0.6	0.4
03	11 00.8	11 02.6	10 30.6	0.9	0.7
04	11 01.0	11 02.8	10 30.9	1.2	0.9
05	11 01.3	11 03.1	10 31.1	1.5	1.1
06	11 01.5	11 03.3	10 31.4	1.8	1.3
07	11 01.8	11 03.6	10 31.6	2.1	1.6
08	11 02.0	11 03.8	10 31.8	2.4	1.8
09	11 02.3	11 04.1	10 32.1	2.7	2.0
10	11 02.5	11 04.3	10 32.3	3.0	2.2
11	11 02.8	11 04.6	10 32.6	3.3	2.4
12	11 03.0	11 04.8	10 32.8	3.6	2.7
13	11 03.3	11 05.1	10 33.0	3.9	2.9
14	11 03.5	11 05.3	10 33.3	4.2	3.1
15	11 03.8	11 05.6	10 33.5	4.5	3.3
16	11 04.0	11 05.8	10 33.8	4.8	3.6
17	11 04.3	11 06.1	10 34.0	5.1	3.8
18	11 04.5	11 06.3	10 34.2	5.4	4.0
19	11 04.8	11 06.6	10 34.5	5.7	4.2
20	11 05.0	11 06.8	10 34.7	6.0	4.5
21	11 05.3	11 07.1	10 34.9	6.3	4.7
22	11 05.5	11 07.3	10 35.2	6.6	4.9
23	11 05.8	11 07.6	10 35.4	6.9	5.1
24	11 06.0	11 07.8	10 35.7	7.2	5.3
25	11 06.3	11 08.1	10 35.9	7.5	5.6
26	11 06.5	11 08.3	10 36.1	7.8	5.8
27	11 06.8	11 08.6	10 36.4	8.1	6.0
28	11 07.0	11 08.8	10 36.6	8.4	6.2
29	11 07.3	11 09.1	10 36.9	8.7	6.5
30	11 07.5	11 09.3	10 37.1	9.0	6.7
31	11 07.8	11 09.6	10 37.3	9.3	6.9
32	11 08.0	11 09.9	10 37.6	9.6	7.1
33	11 08.3	11 10.1	10 37.8	9.9	7.3
34	11 08.5	11 10.3	10 38.0	10.2	7.6
35	11 08.8	11 10.6	10 38.3	10.5	7.8
36	11 09.0	11 10.8	10 38.5	10.8	8.0
37	11 09.3	11 11.1	10 38.8	11.1	8.2
38	11 09.5	11 11.3	10 39.0	11.4	8.5
39	11 09.8	11 11.6	10 39.2	11.7	8.7
40	11 10.0	11 11.8	10 39.5	12.0	8.9
41	11 10.3	11 12.1	10 39.7	12.3	9.1
42	11 10.5	11 12.3	10 40.0	12.6	9.3
43	11 10.8	11 12.6	10 40.2	12.9	9.6
44	11 11.0	11 12.8	10 40.4	13.2	9.8
45	11 11.3	11 13.1	10 40.7	13.5	10.0
46	11 11.5	11 13.3	10 40.9	13.8	10.2
47	11 11.8	11 13.6	10 41.1	14.1	10.5
48	11 12.0	11 13.8	10 41.4	14.4	10.7
49	11 12.3	11 14.1	10 41.6	14.7	10.9
50	11 12.5	11 14.3	10 41.9	15.0	11.1
51	11 12.8	11 14.6	10 42.1	15.3	11.3
52	11 13.0	11 14.8	10 42.3	15.6	11.6
53	11 13.3	11 15.1	10 42.6	15.9	11.8
54	11 13.5	11 15.3	10 42.8	16.2	12.0
55	11 13.8	11 15.6	10 43.1	16.5	12.2
56	11 14.0	11 15.8	10 43.3	16.8	12.5
57	11 14.3	11 16.1	10 43.5	17.1	12.7
58	11 14.5	11 16.3	10 43.8	17.4	12.9
59	11 14.8	11 16.6	10 44.0	17.7	13.1
60	11 15.0	11 16.8	10 44.3	18.0	13.4

m	Increment to G.H.A.			v or d	Corr ⁿ
	SUN	ARIES	MOON		
45					
00	11 15.0	11 16.8	10 44.3	0.0	0.0
01	11 15.3	11 17.1	10 44.5	0.3	0.2
02	11 15.5	11 17.3	10 44.7	0.6	0.5
03	11 15.8	11 17.6	10 45.0	0.9	0.7
04	11 16.0	11 17.9	10 45.2	1.2	0.9
05	11 16.3	11 18.1	10 45.4	1.5	1.1
06	11 16.5	11 18.4	10 45.7	1.8	1.4
07	11 16.8	11 18.6	10 45.9	2.1	1.6
08	11 17.0	11 18.9	10 46.2	2.4	1.8
09	11 17.3	11 19.1	10 46.4	2.7	2.0
10	11 17.5	11 19.4	10 46.6	3.0	2.3
11	11 17.8	11 19.6	10 46.9	3.3	2.5
12	11 18.0	11 19.9	10 47.1	3.6	2.7
13	11 18.3	11 20.1	10 47.4	3.9	3.0
14	11 18.5	11 20.4	10 47.6	4.2	3.2
15	11 18.8	11 20.6	10 47.8	4.5	3.4
16	11 19.0	11 20.9	10 48.1	4.8	3.6
17	11 19.3	11 21.1	10 48.3	5.1	3.9
18	11 19.5	11 21.4	10 48.5	5.4	4.1
19	11 19.8	11 21.6	10 48.8	5.7	4.3
20	11 20.0	11 21.9	10 49.0	6.0	4.6
21	11 20.3	11 22.1	10 49.3	6.3	4.8
22	11 20.5	11 22.4	10 49.5	6.6	5.0
23	11 20.8	11 22.6	10 49.7	6.9	5.2
24	11 21.0	11 22.9	10 50.0	7.2	5.5
25	11 21.3	11 23.1	10 50.2	7.5	5.7
26	11 21.5	11 23.4	10 50.5	7.8	5.9
27	11 21.8	11 23.6	10 50.7	8.1	6.1
28	11 22.0	11 23.9	10 50.9	8.4	6.4
29	11 22.3	11 24.1	10 51.2	8.7	6.6
30	11 22.5	11 24.4	10 51.4	9.0	6.8
31	11 22.8	11 24.6	10 51.6	9.3	7.1
32	11 23.0	11 24.9	10 51.9	9.6	7.3
33	11 23.3	11 25.1	10 52.1	9.9	7.5
34	11 23.5	11 25.4	10 52.4	10.2	7.7
35	11 23.8	11 25.6	10 52.6	10.5	8.0
36	11 24.0	11 25.9	10 52.8	10.8	8.2
37	11 24.3	11 26.1	10 53.1	11.1	8.4
38	11 24.5	11 26.4	10 53.3	11.4	8.6
39	11 24.8	11 26.6	10 53.6	11.7	8.9
40	11 25.0	11 26.9	10 53.8	12.0	9.1
41	11 25.3	11 27.1	10 54.0	12.3	9.3
42	11 25.5	11 27.4	10 54.3	12.6	9.6
43	11 25.8	11 27.6	10 54.5	12.9	9.8
44	11 26.0	11 27.9	10 54.7	13.2	10.0
45	11 26.3	11 28.1	10 55.0	13.5	10.2
46	11 26.5	11 28.4	10 55.2	13.8	10.5
47	11 26.8	11 28.6	10 55.5	14.1	10.7
48	11 27.0	11 28.9	10 55.7	14.4	10.9
49	11 27.3	11 29.1	10 55.9	14.7	11.1
50	11 27.5	11 29.4	10 56.2	15.0	11.4
51	11 27.8	11 29.6	10 56.4	15.3	11.6
52	11 28.0	11 29.9	10 56.7	15.6	11.8
53	11 28.3	11 30.1	10 56.9	15.9	12.1
54	11 28.5	11 30.4	10 57.1	16.2	12.3
55	11 28.8	11 30.6	10 57.4	16.5	12.5
56	11 29.0	11 30.9	10 57.6	16.8	12.7
57	11 29.3	11 31.1	10 57.9	17.1	13.0
58	11 29.5	11 31.4	10 58.1	17.4	13.2
59	11 29.8	11 31.6	10 58.3	17.7	13.4
60	11 30.0	11 31.9	10 58.6	18.0	13.7

m	Increment to G.H.A.			v or d	Corr ⁿ
	SUN	ARIES	MOON		
46					
00	11 30.0	11 31.9	10 58.6	0.0	0.0
01	11 30.3	11 32.1	10 58.8	0.3	0.2
02	11 30.5	11 32.4	10 59.0	0.6	0.5
03	11 30.8	11 32.6	10 59.3	0.9	0.7
04	11 31.0	11 32.9	10 59.5	1.2	0.9
05	11 31.3	11 33.1	10 59.8	1.5	1.2
06	11 31.5	11 33.4	11 00.0	1.8	1.4
07	11 31.8	11 33.6	11 00.2	2.1	1.6
08	11 32.0	11 33.9	11 00.5	2.4	1.9
09	11 32.3	11 34.1	11 00.7	2.7	2.1
10	11 32.5	11 34.4	11 01.0	3.0	2.3
11	11 32.8	11 34.6	11 01.2	3.3	2.6
12	11 33.0	11 34.9	11 01.4	3.6	2.8
13	11 33.3	11 35.1	11 01.7	3.9	3.0
14	11 33.5	11 35.4	11 01.9	4.2	3.3
15	11 33.8	11 35.6	11 02.1	4.5	3.5
16	11 34.0	11 35.9	11 02.4	4.8	3.7
17	11 34.3	11 36.2	11 02.6	5.1	4.0
18	11 34.5	11 36.4	11 02.9	5.4	4.2
19	11 34.8	11 36.7	11 03.1	5.7	4.4
20	11 35.0	11 36.9	11 03.3	6.0	4.7
21	11 35.3	11 37.2	11 03.6	6.3	4.9
22	11 35.5	11 37.4	11 03.8	6.6	5.1
23	11 35.8	11 37.7	11 04.1	6.9	5.3
24	11 36.0	11 37.9	11 04.3	7.2	5.6
25	11 36.3	11 38.2	11 04.5	7.5	5.8
26	11 36.5	11 38.4	11 04.8	7.8	6.0
27	11 36.8	11 38.7	11 05.0	8.1	6.3
28	11 37.0	11 38.9	11 05.2	8.4	6.5
29	11 37.3	11 39.2	11 05.5	8.7	6.7
30	11 37.5	11 39.4	11 05.7	9.0	7.0
31	11 37.8	11 39.7	11 06.0	9.3	7.2
32	11 38.0	11 39.9	11 06.2	9.6	7.4
33	11 38.3	11 40.2	11 06.4	9.9	7.7
34	11 38.5	11 40.4	11 06.7	10.2	7.9
35	11 38.8	11 40.7	11 06.9	10.5	8.1
36	11 39.0	11 40.9	11 07.2	10.8	8.4
37	11 39.3	11 41.2	11 07.4	11.1	8.6
38	11 39.5	11 41.4	11 07.6	11.4	8.8
39	11 39.8	11 41.7	11 07.9	11.7	9.1
40	11 40.0	11 41.9	11 08.1	12.0	9.3
41	11 40.3	11 42.2	11 08.3	12.3	9.5
42	11 40.5	11 42.4	11 08.6	12.6	9.8
43	11 40.8	11 42.7	11 08.8	12.9	10.0
44	11 41.0	11 42.9	11 09.1	13.2	10.2
45	11 41.3	11 43.2	11 09.3	13.5	10.5
46	11 41.5	11 43.4	11 09.5	13.8	10.7
47	11 41.8	11 43.7	11 09.8	14.1	10.9
48	11 42.0	11 43.9	11 10.0	14.4	11.2
49	11 42.3	11 44.2	11 10.3	14.7	11.4
50	11 42.5	11 44.4	11 10.5	15.0	11.6
51	11 42.8	11 44.7	11 10.7	15.3	11.9
52	11 43.0	11 44.9	11 11.0	15.6	12.1
53	11 43.3	11 45.2	11 11.2	15.9	12.3
54	11 43.5	11 45.4	11 11.5	16.2	12.6
55	11 43.8	11 45.7	11 11.7	16.5	12.8
56	11 44.0	11 45.9	11 11.9	16.8	13.0
57	11 44.3	11 46.2	11 1		

m 48	Increment to G.H.A.			v or Corr ⁿ d	
	SUN	ARIES	MOON		
00	12 00.0	12 02.0	11 27.2	0.0	0.0
01	12 00.3	12 02.2	11 27.4	0.3	0.2
02	12 00.5	12 02.5	11 27.7	0.6	0.5
03	12 00.8	12 02.7	11 27.9	0.9	0.7
04	12 01.0	12 03.0	11 28.2	1.2	1.0
05	12 01.3	12 03.2	11 28.4	1.5	1.2
06	12 01.5	12 03.5	11 28.6	1.8	1.5
07	12 01.8	12 03.7	11 28.9	2.1	1.7
08	12 02.0	12 04.0	11 29.1	2.4	1.9
09	12 02.3	12 04.2	11 29.3	2.7	2.2
10	12 02.5	12 04.5	11 29.6	3.0	2.4
11	12 02.8	12 04.7	11 29.8	3.3	2.7
12	12 03.0	12 05.0	11 30.1	3.6	2.9
13	12 03.3	12 05.2	11 30.3	3.9	3.2
14	12 03.5	12 05.5	11 30.5	4.2	3.4
15	12 03.8	12 05.7	11 30.8	4.5	3.6
16	12 04.0	12 06.0	11 31.0	4.8	3.9
17	12 04.3	12 06.2	11 31.3	5.1	4.1
18	12 04.5	12 06.5	11 31.5	5.4	4.4
19	12 04.8	12 06.7	11 31.7	5.7	4.6
20	12 05.0	12 07.0	11 32.0	6.0	4.9
21	12 05.3	12 07.2	11 32.2	6.3	5.1
22	12 05.5	12 07.5	11 32.4	6.6	5.3
23	12 05.8	12 07.7	11 32.7	6.9	5.6
24	12 06.0	12 08.0	11 32.9	7.2	5.8
25	12 06.3	12 08.2	11 33.2	7.5	6.1
26	12 06.5	12 08.5	11 33.4	7.8	6.3
27	12 06.8	12 08.7	11 33.6	8.1	6.5
28	12 07.0	12 09.0	11 33.9	8.4	6.8
29	12 07.3	12 09.2	11 34.1	8.7	7.0
30	12 07.5	12 09.5	11 34.4	9.0	7.3
31	12 07.8	12 09.7	11 34.6	9.3	7.5
32	12 08.0	12 10.0	11 34.8	9.6	7.8
33	12 08.3	12 10.2	11 35.1	9.9	8.0
34	12 08.5	12 10.5	11 35.3	10.2	8.2
35	12 08.8	12 10.7	11 35.6	10.5	8.5
36	12 09.0	12 11.0	11 35.8	10.8	8.7
37	12 09.3	12 11.2	11 36.0	11.1	9.0
38	12 09.5	12 11.5	11 36.3	11.4	9.2
39	12 09.8	12 11.7	11 36.5	11.7	9.5
40	12 10.0	12 12.0	11 36.7	12.0	9.7
41	12 10.3	12 12.2	11 37.0	12.3	9.9
42	12 10.5	12 12.5	11 37.2	12.6	10.2
43	12 10.8	12 12.8	11 37.5	12.9	10.4
44	12 11.0	12 13.0	11 37.7	13.2	10.7
45	12 11.3	12 13.3	11 37.9	13.5	10.9
46	12 11.5	12 13.5	11 38.2	13.8	11.2
47	12 11.8	12 13.8	11 38.4	14.1	11.4
48	12 12.0	12 14.0	11 38.7	14.4	11.6
49	12 12.3	12 14.3	11 38.9	14.7	11.9
50	12 12.5	12 14.5	11 39.1	15.0	12.1
51	12 12.8	12 14.8	11 39.4	15.3	12.4
52	12 13.0	12 15.0	11 39.6	15.6	12.6
53	12 13.3	12 15.3	11 39.8	15.9	12.9
54	12 13.5	12 15.5	11 40.1	16.2	13.1
55	12 13.8	12 15.8	11 40.3	16.5	13.3
56	12 14.0	12 16.0	11 40.6	16.8	13.6
57	12 14.3	12 16.3	11 40.8	17.1	13.8
58	12 14.5	12 16.5	11 41.0	17.4	14.1
59	12 14.8	12 16.8	11 41.3	17.7	14.3
60	12 15.0	12 17.0	11 41.5	18.0	14.6

m 49	Increment to G.H.A.			v or Corr ⁿ d	
	SUN	ARIES	MOON		
00	12 15.0	12 17.0	11 41.5	0.0	0.0
01	12 15.3	12 17.3	11 41.8	0.3	0.2
02	12 15.5	12 17.5	11 42.0	0.6	0.5
03	12 15.8	12 17.8	11 42.2	0.9	0.7
04	12 16.0	12 18.0	11 42.5	1.2	1.0
05	12 16.3	12 18.3	11 42.7	1.5	1.2
06	12 16.5	12 18.5	11 42.9	1.8	1.5
07	12 16.8	12 18.8	11 43.2	2.1	1.7
08	12 17.0	12 19.0	11 43.4	2.4	2.0
09	12 17.3	12 19.3	11 43.7	2.7	2.2
10	12 17.5	12 19.5	11 43.9	3.0	2.5
11	12 17.8	12 19.8	11 44.1	3.3	2.7
12	12 18.0	12 20.0	11 44.4	3.6	3.0
13	12 18.3	12 20.3	11 44.6	3.9	3.2
14	12 18.5	12 20.5	11 44.9	4.2	3.5
15	12 18.8	12 20.8	11 45.1	4.5	3.7
16	12 19.0	12 21.0	11 45.3	4.8	4.0
17	12 19.3	12 21.3	11 45.6	5.1	4.2
18	12 19.5	12 21.5	11 45.8	5.4	4.5
19	12 19.8	12 21.8	11 46.1	5.7	4.7
20	12 20.0	12 22.0	11 46.3	6.0	5.0
21	12 20.3	12 22.3	11 46.5	6.3	5.2
22	12 20.5	12 22.5	11 46.8	6.6	5.4
23	12 20.8	12 22.8	11 47.0	6.9	5.7
24	12 21.0	12 23.0	11 47.2	7.2	5.9
25	12 21.3	12 23.3	11 47.5	7.5	6.2
26	12 21.5	12 23.5	11 47.7	7.8	6.4
27	12 21.8	12 23.8	11 48.0	8.1	6.7
28	12 22.0	12 24.0	11 48.2	8.4	6.9
29	12 22.3	12 24.3	11 48.4	8.7	7.2
30	12 22.5	12 24.5	11 48.7	9.0	7.4
31	12 22.8	12 24.8	11 48.9	9.3	7.7
32	12 23.0	12 25.0	11 49.2	9.6	7.9
33	12 23.3	12 25.3	11 49.4	9.9	8.2
34	12 23.5	12 25.5	11 49.6	10.2	8.4
35	12 23.8	12 25.8	11 49.9	10.5	8.7
36	12 24.0	12 26.0	11 50.1	10.8	8.9
37	12 24.3	12 26.3	11 50.3	11.1	9.2
38	12 24.5	12 26.5	11 50.6	11.4	9.4
39	12 24.8	12 26.8	11 50.8	11.7	9.7
40	12 25.0	12 27.0	11 51.1	12.0	9.9
41	12 25.3	12 27.3	11 51.3	12.3	10.1
42	12 25.5	12 27.5	11 51.5	12.6	10.4
43	12 25.8	12 27.8	11 51.8	12.9	10.6
44	12 26.0	12 28.0	11 52.0	13.2	10.9
45	12 26.3	12 28.3	11 52.3	13.5	11.1
46	12 26.5	12 28.5	11 52.5	13.8	11.4
47	12 26.8	12 28.8	11 52.7	14.1	11.6
48	12 27.0	12 29.0	11 53.0	14.4	11.9
49	12 27.3	12 29.3	11 53.2	14.7	12.1
50	12 27.5	12 29.5	11 53.4	15.0	12.4
51	12 27.8	12 29.8	11 53.7	15.3	12.6
52	12 28.0	12 30.0	11 53.9	15.6	12.9
53	12 28.3	12 30.3	11 54.2	15.9	13.1
54	12 28.5	12 30.5	11 54.4	16.2	13.4
55	12 28.8	12 30.8	11 54.6	16.5	13.6
56	12 29.0	12 31.1	11 54.9	16.8	13.9
57	12 29.3	12 31.3	11 55.1	17.1	14.1
58	12 29.5	12 31.6	11 55.4	17.4	14.4
59	12 29.8	12 31.8	11 55.6	17.7	14.6
60	12 30.0	12 32.1	11 55.8	18.0	14.9

m 50	Increment to G.H.A.			v or Corr ⁿ d	
	SUN	ARIES	MOON		
00	12 30.0	12 32.1	11 55.8	0.0	0.0
01	12 30.3	12 32.3	11 56.1	0.3	0.3
02	12 30.5	12 32.6	11 56.3	0.6	0.5
03	12 30.8	12 32.8	11 56.5	0.9	0.8
04	12 31.0	12 33.1	11 56.8	1.2	1.0
05	12 31.3	12 33.3	11 57.0	1.5	1.3
06	12 31.5	12 33.6	11 57.3	1.8	1.5
07	12 31.8	12 33.8	11 57.5	2.1	1.8
08	12 32.0	12 34.1	11 57.7	2.4	2.0
09	12 32.3	12 34.3	11 58.0	2.7	2.3
10	12 32.5	12 34.6	11 58.2	3.0	2.5
11	12 32.8	12 34.8	11 58.5	3.3	2.8
12	12 33.0	12 35.1	11 58.7	3.6	3.0
13	12 33.3	12 35.3	11 58.9	3.9	3.3
14	12 33.5	12 35.6	11 59.2	4.2	3.5
15	12 33.8	12 35.8	11 59.4	4.5	3.8
16	12 34.0	12 36.1	11 59.7	4.8	4.0
17	12 34.3	12 36.3	11 59.9	5.1	4.3
18	12 34.5	12 36.6	12 00.1	5.4	4.5
19	12 34.8	12 36.8	12 00.4	5.7	4.8
20	12 35.0	12 37.1	12 00.6	6.0	5.1
21	12 35.3	12 37.3	12 00.8	6.3	5.3
22	12 35.5	12 37.6	12 01.1	6.6	5.6
23	12 35.8	12 37.8	12 01.3	6.9	5.8
24	12 36.0	12 38.1	12 01.6	7.2	6.1
25	12 36.3	12 38.3	12 01.8	7.5	6.3
26	12 36.5	12 38.6	12 02.0	7.8	6.6
27	12 36.8	12 38.8	12 02.3	8.1	6.8
28	12 37.0	12 39.1	12 02.5	8.4	7.1
29	12 37.3	12 39.3	12 02.8	8.7	7.3
30	12 37.5	12 39.6	12 03.0	9.0	7.6
31	12 37.8	12 39.8	12 03.2	9.3	7.8
32	12 38.0	12 40.1	12 03.5	9.6	8.1
33	12 38.3	12 40.3	12 03.7	9.9	8.3
34	12 38.5	12 40.6	12 03.9	10.2	8.6
35	12 38.8	12 40.8	12 04.2	10.5	8.8
36	12 39.0	12 41.1	12 04.4	10.8	9.1
37	12 39.3	12 41.3	12 04.7	11.1	9.3
38	12 39.5	12 41.6	12 04.9	11.4	9.6
39	12 39.8	12 41.8	12 05.1	11.7	9.8
40	12 40.0	12 42.1	12 05.4	12.0	10.1
41	12 40.3	12 42.3	12 05.6	12.3	10.4
42	12 40.5	12 42.6	12 05.9	12.6	10.6
43	12 40.8	12 42.8	12 06.1	12.9	10.9
44	12 41.0	12 43.1	12 06.3	13.2	11.1
45	12 41.3	12 43.3	12 06.6	13.5	11.4
46	12 41.5	12 43.6	12 06.8	13.8	11.6
47	12 41.8	12 43.8	12 07.0	14.1	11.9
48	12 42.0	12 44.1	12 07.3	14.4	12.1
49	12 42.3	12 44.3	12 07.5	14.7	12.4
50	12 42.5	12 44.6	12 07.8	15.0	12.6
51	12 42.8	12 44.8	12 08.0	15.3	12.9
52	12 43.0	12 45.1	12 08.2	15.6	13.1
53	12 43.3	12 45.3	12 08.5	15.9	13.4
54	12 43.5	12 45.6	12 08.7	16.2	13.6
55	12 43.8	12 45.8	12 09.0	16.5	13.9
56	12 44.0	12 46.1	12 09.2	16.8	14.1
57	12 44.3	12 46.3	12 09.4	17.1	14.4
58	12 44.5	12 46.6	12 09.7</		

m 52	Increment to G.H.A.			v or d	Corr ⁿ
	SUN	ARIES	MOON		
00	13 00.0	13 02.1	12 24.5	0.0	0.0
01	13 00.3	13 02.4	12 24.7	0.3	0.3
02	13 00.5	13 02.6	12 24.9	0.6	0.5
03	13 00.8	13 02.9	12 25.2	0.9	0.8
04	13 01.0	13 03.1	12 25.4	1.2	1.1
05	13 01.3	13 03.4	12 25.7	1.5	1.3
06	13 01.5	13 03.6	12 25.9	1.8	1.6
07	13 01.8	13 03.9	12 26.1	2.1	1.8
08	13 02.0	13 04.1	12 26.4	2.4	2.1
09	13 02.3	13 04.4	12 26.6	2.7	2.4
10	13 02.5	13 04.6	12 26.9	3.0	2.6
11	13 02.8	13 04.9	12 27.1	3.3	2.9
12	13 03.0	13 05.1	12 27.3	3.6	3.2
13	13 03.3	13 05.4	12 27.6	3.9	3.4
14	13 03.5	13 05.6	12 27.8	4.2	3.7
15	13 03.8	13 05.9	12 28.0	4.5	3.9
16	13 04.0	13 06.1	12 28.3	4.8	4.2
17	13 04.3	13 06.4	12 28.5	5.1	4.5
18	13 04.5	13 06.6	12 28.8	5.4	4.7
19	13 04.8	13 06.9	12 29.0	5.7	5.0
20	13 05.0	13 07.1	12 29.2	6.0	5.3
21	13 05.3	13 07.4	12 29.5	6.3	5.5
22	13 05.5	13 07.7	12 29.7	6.6	5.8
23	13 05.8	13 07.9	12 30.0	6.9	6.0
24	13 06.0	13 08.2	12 30.2	7.2	6.3
25	13 06.3	13 08.4	12 30.4	7.5	6.6
26	13 06.5	13 08.7	12 30.7	7.8	6.8
27	13 06.8	13 08.9	12 30.9	8.1	7.1
28	13 07.0	13 09.2	12 31.1	8.4	7.4
29	13 07.3	13 09.4	12 31.4	8.7	7.6
30	13 07.5	13 09.7	12 31.6	9.0	7.9
31	13 07.8	13 09.9	12 31.9	9.3	8.1
32	13 08.0	13 10.2	12 32.1	9.6	8.4
33	13 08.3	13 10.4	12 32.3	9.9	8.7
34	13 08.5	13 10.7	12 32.6	10.2	8.9
35	13 08.8	13 10.9	12 32.8	10.5	9.2
36	13 09.0	13 11.2	12 33.1	10.8	9.5
37	13 09.3	13 11.4	12 33.3	11.1	9.7
38	13 09.5	13 11.7	12 33.5	11.4	10.0
39	13 09.8	13 11.9	12 33.8	11.7	10.2
40	13 10.0	13 12.2	12 34.0	12.0	10.5
41	13 10.3	13 12.4	12 34.2	12.3	10.8
42	13 10.5	13 12.7	12 34.5	12.6	11.0
43	13 10.8	13 12.9	12 34.7	12.9	11.3
44	13 11.0	13 13.2	12 35.0	13.2	11.6
45	13 11.3	13 13.4	12 35.2	13.5	11.8
46	13 11.5	13 13.7	12 35.4	13.8	12.1
47	13 11.8	13 13.9	12 35.7	14.1	12.3
48	13 12.0	13 14.2	12 35.9	14.4	12.6
49	13 12.3	13 14.4	12 36.2	14.7	12.9
50	13 12.5	13 14.7	12 36.4	15.0	13.1
51	13 12.8	13 14.9	12 36.6	15.3	13.4
52	13 13.0	13 15.2	12 36.9	15.6	13.7
53	13 13.3	13 15.4	12 37.1	15.9	13.9
54	13 13.5	13 15.7	12 37.4	16.2	14.2
55	13 13.8	13 15.9	12 37.6	16.5	14.4
56	13 14.0	13 16.2	12 37.8	16.8	14.7
57	13 14.3	13 16.4	12 38.1	17.1	15.0
58	13 14.5	13 16.7	12 38.3	17.4	15.2
59	13 14.8	13 16.9	12 38.5	17.7	15.5
60	13 15.0	13 17.2	12 38.8	18.0	15.8

m 53	Increment to G.H.A.			v or d	Corr ⁿ
	SUN	ARIES	MOON		
00	13 15.0	13 17.2	12 38.8	0.0	0.0
01	13 15.3	13 17.4	12 39.0	0.3	0.3
02	13 15.5	13 17.7	12 39.3	0.6	0.5
03	13 15.8	13 17.9	12 39.5	0.9	0.8
04	13 16.0	13 18.2	12 39.7	1.2	1.1
05	13 16.3	13 18.4	12 40.0	1.5	1.3
06	13 16.5	13 18.7	12 40.2	1.8	1.6
07	13 16.8	13 18.9	12 40.5	2.1	1.9
08	13 17.0	13 19.2	12 40.7	2.4	2.1
09	13 17.3	13 19.4	12 40.9	2.7	2.4
10	13 17.5	13 19.7	12 41.2	3.0	2.7
11	13 17.8	13 19.9	12 41.4	3.3	2.9
12	13 18.0	13 20.2	12 41.6	3.6	3.2
13	13 18.3	13 20.4	12 41.9	3.9	3.5
14	13 18.5	13 20.7	12 42.1	4.2	3.7
15	13 18.8	13 20.9	12 42.4	4.5	4.0
16	13 19.0	13 21.2	12 42.6	4.8	4.3
17	13 19.3	13 21.4	12 42.8	5.1	4.5
18	13 19.5	13 21.7	12 43.1	5.4	4.8
19	13 19.8	13 21.9	12 43.3	5.7	5.1
20	13 20.0	13 22.2	12 43.6	6.0	5.4
21	13 20.3	13 22.4	12 43.8	6.3	5.6
22	13 20.5	13 22.7	12 44.0	6.6	5.9
23	13 20.8	13 22.9	12 44.3	6.9	6.2
24	13 21.0	13 23.2	12 44.5	7.2	6.4
25	13 21.3	13 23.4	12 44.7	7.5	6.7
26	13 21.5	13 23.7	12 45.0	7.8	7.0
27	13 21.8	13 23.9	12 45.2	8.1	7.2
28	13 22.0	13 24.2	12 45.5	8.4	7.5
29	13 22.3	13 24.4	12 45.7	8.7	7.8
30	13 22.5	13 24.7	12 45.9	9.0	8.0
31	13 22.8	13 24.9	12 46.2	9.3	8.3
32	13 23.0	13 25.2	12 46.4	9.6	8.6
33	13 23.3	13 25.4	12 46.7	9.9	8.8
34	13 23.5	13 25.7	12 46.9	10.2	9.1
35	13 23.8	13 26.0	12 47.1	10.5	9.4
36	13 24.0	13 26.2	12 47.4	10.8	9.6
37	13 24.3	13 26.5	12 47.6	11.1	9.9
38	13 24.5	13 26.7	12 47.9	11.4	10.2
39	13 24.8	13 27.0	12 48.1	11.7	10.4
40	13 25.0	13 27.2	12 48.3	12.0	10.7
41	13 25.3	13 27.5	12 48.6	12.3	11.0
42	13 25.5	13 27.7	12 48.8	12.6	11.2
43	13 25.8	13 28.0	12 49.0	12.9	11.5
44	13 26.0	13 28.2	12 49.3	13.2	11.8
45	13 26.3	13 28.5	12 49.5	13.5	12.0
46	13 26.5	13 28.7	12 49.8	13.8	12.3
47	13 26.8	13 29.0	12 50.0	14.1	12.6
48	13 27.0	13 29.2	12 50.2	14.4	12.8
49	13 27.3	13 29.5	12 50.5	14.7	13.1
50	13 27.5	13 29.7	12 50.7	15.0	13.4
51	13 27.8	13 30.0	12 51.0	15.3	13.6
52	13 28.0	13 30.2	12 51.2	15.6	13.9
53	13 28.3	13 30.5	12 51.4	15.9	14.2
54	13 28.5	13 30.7	12 51.7	16.2	14.4
55	13 28.8	13 31.0	12 51.9	16.5	14.7
56	13 29.0	13 31.2	12 52.1	16.8	15.0
57	13 29.3	13 31.5	12 52.4	17.1	15.2
58	13 29.5	13 31.7	12 52.6	17.4	15.5
59	13 29.8	13 32.0	12 52.9	17.7	15.8
60	13 30.0	13 32.2	12 53.1	18.0	16.1

m 54	Increment to G.H.A.			v or d	Corr ⁿ
	SUN	ARIES	MOON		
00	13 30.0	13 32.2	12 53.1	0.0	0.0
01	13 30.3	13 32.5	12 53.3	0.3	0.3
02	13 30.5	13 32.7	12 53.6	0.6	0.5
03	13 30.8	13 33.0	12 53.8	0.9	0.8
04	13 31.0	13 33.2	12 54.1	1.2	1.1
05	13 31.3	13 33.5	12 54.3	1.5	1.4
06	13 31.5	13 33.7	12 54.5	1.8	1.6
07	13 31.8	13 34.0	12 54.8	2.1	1.9
08	13 32.0	13 34.2	12 55.0	2.4	2.2
09	13 32.3	13 34.5	12 55.2	2.7	2.5
10	13 32.5	13 34.7	12 55.5	3.0	2.7
11	13 32.8	13 35.0	12 55.7	3.3	3.0
12	13 33.0	13 35.2	12 56.0	3.6	3.3
13	13 33.3	13 35.5	12 56.2	3.9	3.5
14	13 33.5	13 35.7	12 56.4	4.2	3.8
15	13 33.8	13 36.0	12 56.7	4.5	4.1
16	13 34.0	13 36.2	12 56.9	4.8	4.4
17	13 34.3	13 36.5	12 57.2	5.1	4.6
18	13 34.5	13 36.7	12 57.4	5.4	4.9
19	13 34.8	13 37.0	12 57.6	5.7	5.2
20	13 35.0	13 37.2	12 57.9	6.0	5.5
21	13 35.3	13 37.5	12 58.1	6.3	5.7
22	13 35.5	13 37.7	12 58.3	6.6	6.0
23	13 35.8	13 38.0	12 58.6	6.9	6.3
24	13 36.0	13 38.2	12 58.8	7.2	6.5
25	13 36.3	13 38.5	12 59.1	7.5	6.8
26	13 36.5	13 38.7	12 59.3	7.8	7.1
27	13 36.8	13 39.0	12 59.5	8.1	7.4
28	13 37.0	13 39.2	12 59.8	8.4	7.6
29	13 37.3	13 39.5	13 00.0	8.7	7.9
30	13 37.5	13 39.7	13 00.3	9.0	8.2
31	13 37.8	13 40.0	13 00.5	9.3	8.4
32	13 38.0	13 40.2	13 00.7	9.6	8.7
33	13 38.3	13 40.5	13 01.0	9.9	9.0
34	13 38.5	13 40.7	13 01.2	10.2	9.3
35	13 38.8	13 41.0	13 01.5	10.5	9.5
36	13 39.0	13 41.2	13 01.7	10.8	9.8
37	13 39.3	13 41.5	13 01.9	11.1	10.1
38	13 39.5	13 41.7	13 02.2	11.4	10.4
39	13 39.8	13 42.0	13 02.4	11.7	10.6
40	13 40.0	13 42.2	13 02.6	12.0	10.9
41	13 40.3	13 42.5	13 02.9	12.3	11.2
42	13 40.5	13 42.7	13 03.1	12.6	11.4
43	13 40.8	13 43.0	13 03.4	12.9	11.7
44	13 41.0	13 43.2	13 03.6	13.2	12.0
45	13 41.3	13 43.5	13 03.8	13.5	12.3
46	13 41.5	13 43.7	13 04.1	13.8	12.5
47	13 41.8	13 44.0	13 04.3	14.1	12.8
48	13 42.0	13 44.3	13 04.6	14.4	13.1
49	13 42.3	13 44.5	13 04.8	14.7	13.4
50	13 42.5	13 44.8	13 05.0	15.0	13.6
51	13 42.8	13 45.0	13 05.3	15.3	13.9
52	13 43.0	13 45.3	13 05.5	15.6	14.2
53	13 43.3	13 45.5	13 05.7	15.9	14.4
54	13 43.5	13 45.8	13 06.0	16.2	14.7
55	13 43.8	13 46.0	13 06.2	16.5	15.0
56	13 44.0	13 46.3	13 06.5	16.8	15.3
57	13 44.3	13 46.5	13 06.7	17.1	15.5
58	13 44.5	13 46.8	13 06		

m 56	Increment to G.H.A.			v or Corr ⁿ d	
	SUN	ARIES	MOON		
00	14 00.0	14 02.3	13 21.7	0.0	0.0
01	14 00.3	14 02.6	13 22.0	0.3	0.3
02	14 00.5	14 02.8	13 22.2	0.6	0.6
03	14 00.8	14 03.1	13 22.4	0.9	0.8
04	14 01.0	14 03.3	13 22.7	1.2	1.1
05	14 01.3	14 03.6	13 22.9	1.5	1.4
06	14 01.5	14 03.8	13 23.2	1.8	1.7
07	14 01.8	14 04.1	13 23.4	2.1	2.0
08	14 02.0	14 04.3	13 23.6	2.4	2.3
09	14 02.3	14 04.6	13 23.9	2.7	2.5
10	14 02.5	14 04.8	13 24.1	3.0	2.8
11	14 02.8	14 05.1	13 24.4	3.3	3.1
12	14 03.0	14 05.3	13 24.6	3.6	3.4
13	14 03.3	14 05.6	13 24.8	3.9	3.7
14	14 03.5	14 05.8	13 25.1	4.2	4.0
15	14 03.8	14 06.1	13 25.3	4.5	4.2
16	14 04.0	14 06.3	13 25.6	4.8	4.5
17	14 04.3	14 06.6	13 25.8	5.1	4.8
18	14 04.5	14 06.8	13 26.0	5.4	5.1
19	14 04.8	14 07.1	13 26.3	5.7	5.4
20	14 05.0	14 07.3	13 26.5	6.0	5.7
21	14 05.3	14 07.6	13 26.7	6.3	5.9
22	14 05.5	14 07.8	13 27.0	6.6	6.2
23	14 05.8	14 08.1	13 27.2	6.9	6.5
24	14 06.0	14 08.3	13 27.5	7.2	6.8
25	14 06.3	14 08.6	13 27.7	7.5	7.1
26	14 06.5	14 08.8	13 27.9	7.8	7.3
27	14 06.8	14 09.1	13 28.2	8.1	7.6
28	14 07.0	14 09.3	13 28.4	8.4	7.9
29	14 07.3	14 09.6	13 28.7	8.7	8.2
30	14 07.5	14 09.8	13 28.9	9.0	8.5
31	14 07.8	14 10.1	13 29.1	9.3	8.8
32	14 08.0	14 10.3	13 29.4	9.6	9.0
33	14 08.3	14 10.6	13 29.6	9.9	9.3
34	14 08.5	14 10.8	13 29.8	10.2	9.6
35	14 08.8	14 11.1	13 30.1	10.5	9.9
36	14 09.0	14 11.3	13 30.3	10.8	10.2
37	14 09.3	14 11.6	13 30.6	11.1	10.5
38	14 09.5	14 11.8	13 30.8	11.4	10.7
39	14 09.8	14 12.1	13 31.0	11.7	11.0
40	14 10.0	14 12.3	13 31.3	12.0	11.3
41	14 10.3	14 12.6	13 31.5	12.3	11.6
42	14 10.5	14 12.8	13 31.8	12.6	11.9
43	14 10.8	14 13.1	13 32.0	12.9	12.1
44	14 11.0	14 13.3	13 32.2	13.2	12.4
45	14 11.3	14 13.6	13 32.5	13.5	12.7
46	14 11.5	14 13.8	13 32.7	13.8	13.0
47	14 11.8	14 14.1	13 32.9	14.1	13.3
48	14 12.0	14 14.3	13 33.2	14.4	13.6
49	14 12.3	14 14.6	13 33.4	14.7	13.8
50	14 12.5	14 14.8	13 33.7	15.0	14.1
51	14 12.8	14 15.1	13 33.9	15.3	14.4
52	14 13.0	14 15.3	13 34.1	15.6	14.7
53	14 13.3	14 15.6	13 34.4	15.9	15.0
54	14 13.5	14 15.8	13 34.6	16.2	15.3
55	14 13.8	14 16.1	13 34.9	16.5	15.5
56	14 14.0	14 16.3	13 35.1	16.8	15.8
57	14 14.3	14 16.6	13 35.3	17.1	16.1
58	14 14.5	14 16.8	13 35.6	17.4	16.4
59	14 14.8	14 17.1	13 35.8	17.7	16.7
60	14 15.0	14 17.3	13 36.1	18.0	17.0

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m 57	Increment to G.H.A.			v or Corr ⁿ d	
	SUN	ARIES	MOON		
00	14 15.0	14 17.3	13 36.1	0.0	0.0
01	14 15.3	14 17.6	13 36.3	0.3	0.3
02	14 15.5	14 17.8	13 36.5	0.6	0.6
03	14 15.8	14 18.1	13 36.8	0.9	0.9
04	14 16.0	14 18.3	13 37.0	1.2	1.2
05	14 16.3	14 18.6	13 37.2	1.5	1.4
06	14 16.5	14 18.8	13 37.5	1.8	1.7
07	14 16.8	14 19.1	13 37.7	2.1	2.0
08	14 17.0	14 19.3	13 38.0	2.4	2.3
09	14 17.3	14 19.6	13 38.2	2.7	2.6
10	14 17.5	14 19.8	13 38.4	3.0	2.9
11	14 17.8	14 20.1	13 38.7	3.3	3.2
12	14 18.0	14 20.3	13 38.9	3.6	3.5
13	14 18.3	14 20.6	13 39.2	3.9	3.7
14	14 18.5	14 20.9	13 39.4	4.2	4.0
15	14 18.8	14 21.1	13 39.6	4.5	4.3
16	14 19.0	14 21.4	13 39.9	4.8	4.6
17	14 19.3	14 21.6	13 40.1	5.1	4.9
18	14 19.5	14 21.9	13 40.3	5.4	5.2
19	14 19.8	14 22.1	13 40.6	5.7	5.5
20	14 20.0	14 22.4	13 40.8	6.0	5.8
21	14 20.3	14 22.6	13 41.1	6.3	6.0
22	14 20.5	14 22.9	13 41.3	6.6	6.3
23	14 20.8	14 23.1	13 41.5	6.9	6.6
24	14 21.0	14 23.4	13 41.8	7.2	6.9
25	14 21.3	14 23.6	13 42.0	7.5	7.2
26	14 21.5	14 23.9	13 42.3	7.8	7.5
27	14 21.8	14 24.1	13 42.5	8.1	7.8
28	14 22.0	14 24.4	13 42.7	8.4	8.1
29	14 22.3	14 24.6	13 43.0	8.7	8.3
30	14 22.5	14 24.9	13 43.2	9.0	8.6
31	14 22.8	14 25.1	13 43.4	9.3	8.9
32	14 23.0	14 25.4	13 43.7	9.6	9.2
33	14 23.3	14 25.6	13 43.9	9.9	9.5
34	14 23.5	14 25.9	13 44.2	10.2	9.8
35	14 23.8	14 26.1	13 44.4	10.5	10.1
36	14 24.0	14 26.4	13 44.6	10.8	10.4
37	14 24.3	14 26.6	13 44.9	11.1	10.6
38	14 24.5	14 26.9	13 45.1	11.4	10.9
39	14 24.8	14 27.1	13 45.4	11.7	11.2
40	14 25.0	14 27.4	13 45.6	12.0	11.5
41	14 25.3	14 27.6	13 45.8	12.3	11.8
42	14 25.5	14 27.9	13 46.1	12.6	12.1
43	14 25.8	14 28.1	13 46.3	12.9	12.4
44	14 26.0	14 28.4	13 46.5	13.2	12.7
45	14 26.3	14 28.6	13 46.8	13.5	12.9
46	14 26.5	14 28.9	13 47.0	13.8	13.2
47	14 26.8	14 29.1	13 47.3	14.1	13.5
48	14 27.0	14 29.4	13 47.5	14.4	13.8
49	14 27.3	14 29.6	13 47.7	14.7	14.1
50	14 27.5	14 29.9	13 48.0	15.0	14.4
51	14 27.8	14 30.1	13 48.2	15.3	14.7
52	14 28.0	14 30.4	13 48.5	15.6	15.0
53	14 28.3	14 30.6	13 48.7	15.9	15.2
54	14 28.5	14 30.9	13 48.9	16.2	15.5
55	14 28.8	14 31.1	13 49.2	16.5	15.8
56	14 29.0	14 31.4	13 49.4	16.8	16.1
57	14 29.3	14 31.6	13 49.7	17.1	16.4
58	14 29.5	14 31.9	13 49.9	17.4	16.7
59	14 29.8	14 32.1	13 50.1	17.7	17.0
60	14 30.0	14 32.4	13 50.4	18.0	17.3

m 58	Increment to G.H.A.			v or Corr ⁿ d	
	SUN	ARIES	MOON		
00	14 30.0	14 32.4	13 50.4	0.0	0.0
01	14 30.3	14 32.6	13 50.6	0.3	0.3
02	14 30.5	14 32.9	13 50.8	0.6	0.6
03	14 30.8	14 33.1	13 51.1	0.9	0.9
04	14 31.0	14 33.4	13 51.3	1.2	1.2
05	14 31.3	14 33.6	13 51.6	1.5	1.5
06	14 31.5	14 33.9	13 51.8	1.8	1.8
07	14 31.8	14 34.1	13 52.0	2.1	2.0
08	14 32.0	14 34.4	13 52.3	2.4	2.3
09	14 32.3	14 34.6	13 52.5	2.7	2.6
10	14 32.5	14 34.9	13 52.8	3.0	2.9
11	14 32.8	14 35.1	13 53.0	3.3	3.2
12	14 33.0	14 35.4	13 53.2	3.6	3.5
13	14 33.3	14 35.6	13 53.5	3.9	3.8
14	14 33.5	14 35.9	13 53.7	4.2	4.1
15	14 33.8	14 36.1	13 53.9	4.5	4.4
16	14 34.0	14 36.4	13 54.2	4.8	4.7
17	14 34.3	14 36.6	13 54.4	5.1	5.0
18	14 34.5	14 36.9	13 54.7	5.4	5.3
19	14 34.8	14 37.1	13 54.9	5.7	5.6
20	14 35.0	14 37.4	13 55.1	6.0	5.9
21	14 35.3	14 37.6	13 55.4	6.3	6.1
22	14 35.5	14 37.9	13 55.6	6.6	6.4
23	14 35.8	14 38.1	13 55.9	6.9	6.7
24	14 36.0	14 38.4	13 56.1	7.2	7.0
25	14 36.3	14 38.6	13 56.3	7.5	7.3
26	14 36.5	14 38.9	13 56.6	7.8	7.6
27	14 36.8	14 39.2	13 56.8	8.1	7.9
28	14 37.0	14 39.4	13 57.0	8.4	8.2
29	14 37.3	14 39.7	13 57.3	8.7	8.5
30	14 37.5	14 39.9	13 57.5	9.0	8.8
31	14 37.8	14 40.2	13 57.8	9.3	9.1
32	14 38.0	14 40.4	13 58.0	9.6	9.4
33	14 38.3	14 40.7	13 58.2	9.9	9.7
34	14 38.5	14 40.9	13 58.5	10.2	9.9
35	14 38.8	14 41.2	13 58.7	10.5	10.2
36	14 39.0	14 41.4	13 59.0	10.8	10.5
37	14 39.3	14 41.7	13 59.2	11.1	10.8
38	14 39.5	14 41.9	13 59.4	11.4	11.1
39	14 39.8	14 42.2	13 59.7	11.7	11.4
40	14 40.0	14 42.4	13 59.9	12.0	11.7
41	14 40.3	14 42.7	14 00.1	12.3	12.0
42	14 40.5	14 42.9	14 00.4	12.6	12.3
43	14 40.8	14 43.2	14 00.6	12.9	12.6
44	14 41.0	14 43.4	14 00.9	13.2	12.9
45	14 41.3	14 43.7	14 01.1	13.5	13.2
46	14 41.5	14 43.9	14 01.3	13.8	13.5
47	14 41.8	14 44.2	14 01.6	14.1	13.7
48	14 42.0	14 44.4	14 01.8	14.4	14.0
49	14 42.3	14 44.7	14 02.1	14.7	14.3
50	14 42.5	14 44.9	14 02.3	15.0	14.6
51	14 42.8	14 45.2	14 02.5	15.3	14.9
52	14 43.0	14 45.4	14 02.8	15.6	15.2
53	14 43.3	14 45.7	14 03.0	15.9	15.5
54	14 43.5	14 45.9	14 03.3	16.2	15.8
55	14 43.8	14 46.2	14 03.5	16.5	16.1
56	14 44.0	14 46.4	14 03.7	16.8	16.4
57	14 44				