NOON

## WHY

- Traditionally the NOON Sight is Very Important to Navigators as his Day Starts at NOON
- The NOON Sight gave the Navigator the Distance Run in the Past 24 Hours
- You will be learning how to obtain your Latitude from a NOON Sight Observation


## WHAT

How to determine when it is "Noon"?

- How to Find Latitude by Observing the SUN at "Noon"


## HOW

- You FIRST determine WHEN NOON occurs for You
Do a series of Sights at Your NOON
- Reduce your Sight to your Ho
- Find the SUN's Declination at the Time of NOON Sight
- Calculate the ZENITH DISTANCE
- Combine Declination and Zenith Distance to obtain Your Latitude


## New Terms

Meridian Passage
Zenith
Zenith Distance

## Meridian Passage

- The moment in Time that the Subject Body is located on a Specific Meridian (Yours)
- All bodies have a Time of being on a given Meridian
- Celestially known as Noon with the Sun
- Usually referenced to the Sun being on the Observer's Meridian
- This is known as Local Apparent Noon


## Zenith

- Indicates a Point Directly Overhead
- If an Observer is at a Body's GP, the Body is in the Observer's Zenith (directly overhead)


## Zenith Distance

Mathematically, the complement of the Observed Altitude

Zenith Distance $=90^{\circ}-\mathrm{Ho}$

Zenith Distance is the side of the Navigation Triangle that is between the Observer and the GP of the Body

## When is it NOON?

NO - it is NOT when you get hungry
NO - it is NOT 12:00:00 though it could be

NOON is the Time that the SUN crosses your Meridian

- Your Longitude and the GHA of the SUN are the same value


## The Noon Diagram



## How is the Time of Noon Determined?

- The Time of Meridian Passage is noted in the Nautical Almanac for each day.
This Time is the Local Time at the CENTER of each Time Zone
The Navigator MUST determine how far from the Center of his Time Zone he is located
- This angular difference is converted (Table in Almanac) to Time, which is then Added (if West of the Center) or Subtracted (if East of the Center) from/to the Meridian Passage Time as found in the Almanac
The Time thus found is the Local Time of NOON


## Example

- 11 March 2011 You are located at a DR position of $21-25$ ' N 068-50' W

What Time is LAN?

Go To the Bottom of the Right Daily Page of Nautical Almanac for 11 March 2011 (in handouts)

2011 MARCH 11, 12, 13 (FRI., SAT., SUN.)


| A 17 | 12 | 30.1 |  | 30.1 | 210 | 4.15 | 1.7 |  | 4.0 | 6.1 | 2r.u | 36 | 1026 | 17 vo | 17 7 | cu 31 | 6.74 |  |  | , |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Y 14 | 27 | 36.9 |  | 55.1 | 291 | 09.0 | 7.9 | 23 | 20.3 | 2.9 | 57.1 | 54 | 1833 | 1909 | 1952 | 2039 | 2129 |  | 31 | 2346 |
| Y 15 | 42 | 37.1 | . | 54.1 | 305 | 35.9 | 7.9 | 23 | 17.4 | 3.0 | 57.1 | 56 | 1835 | 1913 | 1958 | 2025 | 2114 |  | 18 | 2334 |
| 16 | 57 | 37.2 |  | 53.2 | 320 | 02.8 | 7.9 | 23 | 14.4 | 3.2 | 57.2 | 58 | 1837 | 1917 | 2005 | $20 \quad 09$ | $20 \quad 57$ | 22 | 02 | 2321 |
| 17 | 72 | 37.4 |  | 52.2 | 334 | 29.7 | 7.8 | 23 | 11.2 | 3.3 | 57.2 | S 60 | 1839 | 1921 | 2013 | 1950 | 2036 | 21 | 43 | 2305 |
| 18 | 87 | 37.6 | S 2 | 251.2 | 348 | 56.5 | 7.8 | N23 | 07.9 | 3.4 | 57.2 |  |  | SUN |  |  |  |  |  |  |
| 19 | 102 | 37.7 |  | 50.2 | 3 | 23.3 | 7.8 | 23 | 04.5 | 3.6 | 57.3 |  | Eqn | Tim | Mer | Mer | ass. |  |  |  |
| 20 | 117 | 37.9 |  | 49.2 | 17 | 50.1 | 7.8 | 23 | 00.9 | 3.7 | 57.3 | Day | Eqn. | Time | Mer. | Mer, | Pass. | Age |  | ase |
| 21 | 132 | 38.1 | . | 48.2 | 32 | 16.9 | 7.8 | 22 | 57.2 | 3.8 | 57.3 |  | $00^{\prime \prime}$ | $12^{\prime \prime}$ | Pass. | pper | Lower |  |  |  |
| 22 | 147 | 38.2 |  | 47.2 | 46 | 43.7 | 7.8 | 22 | 53.4 | 4.0 | 57.4 | d | m s | m s | h m | h m | h m | d | \% |  |
| 23 | 162 | 38.4 |  | 46.3 | 61 | 10.5 | 7.7 | N22 | 49.4 | 4.1 | 57.4 | 11 | $10 \quad 14$ | 1006 | 1210 | 658 | 0433 | 07 | 35 |  |
|  | SD | 16.1 | $d$ | d 1.0 | SD |  | 15.1 |  | 15.3 |  | 15.5 | 13 | 0942 | 0934 | 1210 | 1751 1846 | $\begin{array}{ll}05 & 25 \\ 06 & 18\end{array}$ | 08 | 45 55 |  |

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## LAN Calculation

Meridian Passage from the nautical Almanac is 12:10 on 11 March 2011

Your DR Longitude is 68 deg - 50 min West of Greenwich

- Now go to the Conversion of Arc to Time table in the Nautical Almanac


## CONVERSION OF ARC TO TIME

| $0^{\circ}-59^{\circ}$ |  | $60^{\circ}-119^{\circ}$ |  | $120^{\circ}-179{ }^{\circ}$ |  | $180^{\circ}-239^{\circ}$ |  | $240^{\circ}-299^{\circ}$ |  | $300^{\circ}-359^{\circ}$ |  |  | 0.00 | 0. 25 | 0. 50 | 0'75 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | h m | - | h m | - | h m | - | h m | $\bigcirc$ | h m | - | h m | , | m s | m s | m s | m |
| 0 | 000 | 60 | 400 | 120 | 800 | 180 | 1200 | 240 | 1600 | 300 | 2000 | 0 | 000 | 0 OI | 002 | 003 |
| 1 | 004 | 61 | 404 | 12I | 804 | 181 | 1204 | 241 | 1604 | 301 | 2004 | 1 | 004 | 005 | 006 | 007 |
| 2 | 008 | 62 | 408 | 122 | 808 | 182 | 1208 | 242 | 1608 | 302 | 2008 | 2 | 008 | $0 \quad 09$ | 010 | 0 II |
| 3 | 012 | 63 | 412 | 123 | 812 | 183 | 1212 | 243 | $16 \quad 12$ | 303 | $20 \quad 12$ | 3 | 012 | 013 | 0 | 015 |
| 4 | - 16 | 64 | 416 | 124 | 816 | 184 | $12 \quad 16$ | 244 | $16 \quad 16$ | 304 | 2016 | 4 | 0 16 | 017 | 018 | $0 \quad 19$ |
| 5 | 020 | 65 | 420 | 125 | 820 | 185 | 1220 | 245 | 1620 | 305 | 2020 | 5 | 020 | 021 | 022 | 023 |
| 6 | - 24 | 66 | 424 | 126 | 824 | 186 | $12 \quad 24$ | 246 | 1624 | 306 | 2024 | 6 | O 24 | 025 | 026 | 027 |
| 7 | 028 | 67 | 4 28 | 127 | 8.28 | 187 | 1228 | 247 | 1628 | 307 | 2028 | 7 | - 28 | - 29 | - 30 | 031 |
| 8 | - 32 | 68 | 432 | 128 | 832 | 188 | $12 \quad 32$ | 248 | 1632 | 308 | 2032 | 8 | - 32 | - 33 | - 34 | - 35 |
| 9 | - 36 |  |  | 129 | 836 | 189 | 1236 | 249 | 1636 | 309 | 2036 | 9 | - 36 | 037 | - 38 | - 39 |
| 48 | $\overline{3} 12$ | 108 | $7 \quad 12$ | 168 | 1112 | 228 | $15 \quad 12$ | 288 | 1912 | 348 | 2312 | 48 | 312 | $\begin{array}{ll}3 & 13\end{array}$ | 314 | 315 |
| 49 | $\begin{array}{lll}3 & 16\end{array}$ | 109 | $7 \quad 16$ | 169 | 1116 | 229 | $15 \quad 16$ | 289 | 1916 | 349 | 2316 | 49 | 316 | $\begin{array}{lll}3 & 17\end{array}$ | 318 | 319 |
| 50 | 320 | 110 | 720 | 170 | 1120 | 230 | 1520 | 290 | 1920 | 350 | 2320 | 50 | 320 | 321 | 322 | 323 |
| 51 | 324 | III | 724 | 171 | 1124 | 231 | $15 \quad 24$ | 291 | 1924 | 351 | 2324 |  |  | 325 | 326 | 327 |
| 52 | 328 | 112 | 728 | 172 | II 28 | 232 | $15 \quad 28$ | 292 | 1928 | 352 | 2328 | 52 | 328 | 329 | 330 | $3 \mathrm{3I}$ |
| 53 | 332 | 113 | 732 | 173 | II 32 | 233 | 1532 | 293 | 1932 | 353 | 2332 | 53 | 332 | 333 | 334 | 335 |
| 54 | $3{ }^{36}$ | 114 | 736 | 174 | II 36 | 234 | 1536 | 294 | 1936 | 354 | $23 \quad 36$ | 54 | 336 | 337 | $33^{8}$ | 339 |
| 55 | 340 | 115 | 740 | 175 | II 40 | 235 | 1540 | 295 | 1940 | 355 | 2340 | 55 | 340 | 341 | 342 | 343 |
| 56 | 344 | 116 | 744 | 176 | II 44 | 236 | 1544 | 296 | 1944 | 356 | 2344 | 56 | 344 | 345 | 346 | 347 |
| 57 | 348 | 117 | 748 | 177 | II 48 | 237 | 15.48 | 297 | 1948 | 357 | 2348 | 57 | 348 | 349 | 350 | 351 |
| 58 | 352 | 118 | 752 | 178 | 1152 | 238 | 1552 | 298 | 1952 | 358 | 2352 | $5^{8}$ | 352 | 353 | 354 | 355 |
| 59 | 356 | 119 | 756 | 179 | II 56 | 239 | 1556 | 299 | 1956 | 359 | 2356 | 59 | 356 | 357 | 358 | 359 |

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 LMT (added if west, subtracted if east) to give UT or vice versa, particularly in the case of sunrise, sunset, etc.

## LAN Calculation



## The NOON Sight -1 Before and During

The Navigator prepares to start shooting the SUN approximately 15 20 minutes before LAN (approx. 1125-1130 in our Example)
Sights are taken as every minute until 3 minutes before LAN (1142), then taken at as quickly as possible until 2 minutes before LAN

## The NOON Sight - 2 During and After

During that 4 minutes when the Navigator is shooting the SUN the Navigator should notice that the SUN has stopped rising, then hangs in place, then starts to fall.

- Sights are then taken for about 5 minutes or more after LAN to ensure that the Sun is indeed falling


## Graphing Multiple Sights Before and After Noon

 F1:L6.L5

## Determination of Latitude

- Correct the Sextant Altitude (Hs) to your Observed Altitude (Ho) in the usual manner
- Subtract the Ho from $90^{\circ}$ - this is your Zenith Distance
- Find the Declination of the SUN for the Time of your Sight (in GMT) in the Nautical Almanac


## EXAMPLE DATA

- 11 March 2011 You are located at $21^{\circ} 25^{\prime} \mathrm{N} 068^{\circ} 50^{\prime} \mathrm{W}$
- We obtained an altitude of $64^{\circ} 55.4^{\prime}$ for the Sun's Lower Limb at 11:45:20 LMT. Our height of eye is 115' above sea level. Our Sextant IC is $0^{\prime}$.
- Go To Table A2 of the Nautical Almanac for the necessary Correction values (in handouts)

A2 ALTITUDE CORRECTION TABLES $10^{\circ}-90^{\circ}-$ SUN, STARS, PLANETS

| OCT--MAR. SUN APR.-SEPT. |  | STARS AND PLANETS |  | DIP |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| App. Lower Upper <br> Alt. Limb Limb | App. Lower Upper <br> Alt. Limb Limb | $\begin{aligned} & \text { App } \\ & \text { Alt. } \end{aligned}$ | App. Additional Alt. Corr ${ }^{\text {n }}$ | $\underset{\text { Eye }}{\text { Hyt. of } \text { Corrn }^{\text {Ht. of }} \text { Eye }}$ | $\begin{aligned} & \text { Ht. of Corr } \\ & \text { Eye } \end{aligned}$ |
|  |  |  | 2011 | $\mathrm{m} \quad \mathrm{ft}$. |  |
| $933+10 \cdot 8-21^{\prime} \cdot 5$ | $939+10 \cdot 6-21^{\prime} \cdot 2$ | $955-{ }^{\prime} \cdot$ | venus | $\begin{array}{lll}2.4 & \\ 2.8 & 8.0\end{array}$ | ${ }_{1} \cdot 0-1.8$ |
| $945+10 \cdot 8-21 \cdot 5$ | ${ }^{950}+10 \cdot 6-21.29$ | 10 $07-5.3$ | Jan. I-Feb i8 | $\begin{array}{lll}2.6 & -2.8 & 8.6\end{array}$ | ${ }^{1} 5.5-2.2$ |
| $956+10 \cdot 9-2$ | 1002+10.7-21.1 | Io $20-5 \cdot 2$ | Jan. I-Feb. 18 | 2.8 - | $2.0-2.5$ |
| $1008+11 \cdot 1-21 \cdot 2$ | 10 $144+10.9-20.9$ | 10 $32-5.0$ | - +0.2 | $3.0-3 \cdot 1$ | $2.5-2.8$ |
| $1020+11 \cdot 1 \cdot 21 \cdot 2$ | $1027+10.9-20.9$ | Io $46-5.0$ | ${ }_{41}{ }^{\text {I }}+0.2$ | $\begin{array}{llll}3.2 & -3.1 \\ & 10 \\ 3.2\end{array}$ | $3.0-3.0$ |
| $1033+11 \cdot 3-21.0$ | I0 $40+$ +11.1-20.7 | Io $59-4.8$ |  | $3 \cdot 4-3 \cdot 3$ |  |
| $1046+$ I1.4-20.9 | I0 $53+111 \cdot 2-20 \cdot 6$ | II $144-4.7$ | Feb. 19-Dec. 31 | 3.6 -3.4 11.9 <br> 3.8   <br> 15   | See |
| II $000+11.5-20 \cdot 8$ | II $07+$ +11.3-20.5 | II $29-4.6$ |  | $\begin{array}{llll}3.8 & -3.5 & 12.6\end{array}$ |  |
| II 15 | II $22+11.4-20 \cdot 4$ | II $44-4.5$ | ${ }_{60}^{0}+0 \cdot 1$ | $\begin{array}{llll}4.0 & -3.6 & 13.3\end{array}$ | ${ }^{\mathrm{m}} \mathrm{O}-7 \cdot 9$ |
| II $30+11 \cdot 7-20.6$ | II 37 i $53+11 \cdot 5-20 \cdot 3$ | $1200-4.4$ |  | $\begin{array}{llll}4.3 & -3.7 & 14.1\end{array}$ | 22-8.3 |
| $1145+11 \cdot 8-20 \cdot 5$ | II $53+11 \cdot 6-20 \cdot 2$ | $\begin{array}{llll}12 & 17 \\ 12 & -4.3\end{array}$ | MARS | $\begin{array}{llll}4.5 & -3.8 & 14.9\end{array}$ | 24-8.6 |
| 1201 | ${ }_{12}^{12} 10+11 \cdot 7-20 \cdot 1$ | $1235-4.2$ | Jan. 1-Dec. 31 | 4.7 -3.9 15.7 <br> 5.0   <br> 6.5   | $26-9.0$ |
|  | ${ }_{12} 2727+11.8-20.0$ | $\begin{array}{ll}12 & 53 \\ \text { I3 } & \text {-4.1 }\end{array}$ |  | $\begin{array}{llll}5.0 & -4.0 & 16.5\end{array}$ | $28-9.3$ |
| $1236+12 \cdot 1-20 \cdot 2$ | $1245+11.9-19.9$ | $1312-4.0$ | $0^{\circ}+0.1$ | $\begin{array}{llll}5.2 & -4.1 & 17.4\end{array}$ | $28-93$ |
| $1254+12 \cdot 2-20 \cdot 2$ | $1304+12.0-19.8$ | 13 32 I3 53 |  | $\begin{array}{ccc}5 \cdot 5 & -4.1 & 18 \cdot 3 \\ 5 \cdot 8 & -4 \cdot 2 & \end{array}$ | $30-9.6$ |
| $1314+12 \cdot 3-20.0$ | $1324+12 \cdot 1-19.7$ | 13 53-3.8 |  | $5 \cdot 8$ $6 \cdot 4 \cdot 3$ | $32-10.0$ |
| $1334+12 \cdot 4-19.9$ | $1344+12 \cdot 2-19 \cdot 6$ | $1416-3.7$ |  | $6 \cdot 1$ $-4 \cdot 4$ $20 \cdot 1$ <br> $6 \cdot 3$   | $34-10 \cdot 3$ |
| $1355+12 \cdot 5-19.8$ | $1406+12.3-19.5$ | $1439-3.6$ |  | ${ }^{6 \cdot 3}-4.5{ }^{-4.0}$ | 34-10.6 |
|  | $1429+12 \cdot 4-19 \cdot 4$ 1453 | $\begin{array}{llllllllllll}15 & 03 \\ 15 & 29 & -3.5\end{array}$ |  | $\begin{array}{llll}6 \cdot 6 & -4.6 & 22 \\ 6.9 & \end{array}$ | 38-10.8 |
| 1441 $1505+12.7-19.6$ | $1453+12 \cdot 5-19 \cdot 3$ 1518 | 15 15 15 56 ${ }^{-}$ |  | $\begin{array}{llll}6.9 & -4.7 & 22 \cdot 9 \\ 7.2 & -4.9\end{array}$ |  |
| $1531+12.8-19.5$ | $1545+12 \cdot 6-19.2$ | 16 25-3.3 |  | $\begin{array}{lll}7.5 & -4.8 & 24.9\end{array}$ | $40-11 \cdot 1$ |
| $1559+12 \cdot 9-19.4$ | $1613+12 \cdot 7-19.1$ | $1655-3 \cdot 2$ |  | $\begin{array}{llll}7.9 & -4.9 & 24.9\end{array}$ | $42-11 \cdot 4$ |
| $1627+13.0-19.3$ | $1643+12 \cdot 8-19.0$ | 1717 27 |  | $\begin{array}{llll}8 \cdot 2 & -5 \cdot 0 & 27 \cdot 1\end{array}$ | 44 - 11.7 |
| $1658+13 \cdot 1-19 \cdot 2$ | $1714+12.9-18.9$ | 18 or ${ }^{-3.0}$ |  | 8.5 ${ }^{8}$ | $46-11.9$ |
| $1730+13.2-19.1$ | $1747+13.0-18.8$ | $183^{-2.9}$ |  | $\begin{array}{llll}8 \cdot 8 & -5 \cdot 2 & 28 \cdot 2\end{array}$ | $48-12 \cdot 2$ |
| $1805+13.3-19.0$ | $1823+13 \cdot 1-18 \cdot 7$ | 19 16 ${ }^{-2.8}$ |  | $\begin{array}{ll}-5.3 & 30.4\end{array}$ |  |
| 184 I $+13.4-18.9$ $+13.5-18.8$ | $1900+13.2-18.6$ $+13.3-18.5$ | I9 $5^{6}{ }_{-2.6}^{-2.7}$ |  | -5.4 <br> -5.5 <br> 1.5 | $2-1.4$ $4-\mathrm{I} .9$ |
| $\begin{aligned} & 1920+13.5-18.8 \\ &+13.6-18.7\end{aligned}$ | $1941 \begin{aligned} & \text { +13.3-18.5 } \\ & +13.4-18.4\end{aligned}$ | $2040-2.6$ |  | -5.5 <br> -5.6 | $4-1.9$ $6-2.4$ |
| $2002+13.18-18.7$ | $2024+13.4-18.4$ $21.15-18.3$ | 21 27 <br> -2.5  <br> 2.4  |  | $\begin{array}{llll}10.3 & -5.6 & 33.9 \\ 106 & -5.7 & 3.9\end{array}$ | 6- $2 \cdot 4$ $8-2.7$ |
| $2046+13.8-18.5$ | ${ }^{21} 10+13 \cdot 6-18 \cdot 2$ | $2217-2 \cdot 3$ |  |  | $10-3 \cdot 1$ |
| 2134 $2225+13 \cdot 9-18 \cdot 4$ | ${ }_{21}^{21} 59+13 \cdot 7-18 \cdot 1$ | $\begin{aligned} & 23 \\ & 24 \\ & 24\end{aligned} 11-2 \cdot 2$ |  | I1.   <br> II. 4 -5.9 36.3 <br> 1.6   | See table |
| 2225 220 | $2252+13.8-18.0$ 23 29 | 24 25 I 2 |  | $\begin{array}{ccc}11.4 & -6.0 & 37.6 \\ \text { II.8 } & -6.1 & 38.9\end{array}$ | , |
| $2420{ }^{+14.1-18 \cdot 2}$ | 2451+13.9-17.9 |  |  | 6.1 |  |
| $2524+14.2-18.1$ $+14.3-18.0$ |  | $2734^{-1.9}$ |  | 6.2 41.5 | $70-8 \cdot 1$ |
| $\begin{aligned} & 2634+14.3-18.0 \\ & +14.4-17.9 \end{aligned}$ | 2711 <br> $+14.14-17.7$ <br> 18.6 |  |  | $\begin{array}{llll}13.0 & -6.4 & 42 \cdot 8\end{array}$ | $75-8.4$ |
| $\begin{aligned} & 2750+14.4-17.9 \\ & 27 \\ & +14.5-17.8 \end{aligned}$ |  | $3022-1.7$ |  | $13.4 \begin{array}{llll}-6.4 & 44 \cdot 2\end{array}$ | $80-8 \cdot 7$ |
| $\begin{array}{r} +14.5-17.8 \\ 2913 . \\ +14.6-17.7 \end{array}$ | $2958+14.3-17 \cdot 5$ |  |  | $\begin{array}{llll}13.8 & -6.5 & 45.5\end{array}$ | $85-8.9$ |
| $3044+14.7-17.6$ | $3133+14.4-17.4$ | 33 43-1.5 |  | $\begin{array}{llll}14 \cdot 2 & -6.6 & 46 \cdot 9\end{array}$ | $90-9.2$ |
| $3224+14.8-17.6$ | $3{ }^{3} 18+14.5-17.3$ | $3538{ }^{-1 \cdot 4}$ |  | $\begin{array}{llll}14.7 & -6.7 & 48.4\end{array}$ | 95-9.5 |
| $3415+14.8-17.5$ | $3515+14.6-17.2$ | $3745{ }^{-1 \cdot 3}$ |  | ${ }^{15} 511-6.989 .8$ |  |
| $3617+14.9-17.4$ $+15.0-17.3$ | 3724 ${ }^{3}+14.7-17.1$ | $4006{ }_{-1 \cdot 1}^{-1 \cdot 2}$ |  | $15.5 \begin{array}{ll}-6.9 & 51.3\end{array}$ | $100-9 \cdot 7$ |
| $3834+15 \cdot 15 \cdot 17 \cdot 3$ | 3948 +14.8-17.0 | ${ }^{42} 42-1.1$ |  | 6.0-7. <br> 7.15 | $105-9 \cdot 9$ |
| $\begin{array}{r} 4106+15 \cdot 1-17 \cdot 2 \\ 415 \cdot 12-17.1 \end{array}$ | $4228+14.9-16 \cdot 9$ $+15.0-16.8$ | $4534 \begin{aligned} & \text { - } 1.0 \\ & -0.9\end{aligned}$ |  | 16.5-7.1 <br> -7.2 5 |  |
| $\begin{aligned} & 4356+15 \cdot 2-17 \cdot 1 \\ & +15 \cdot 3-17 \cdot 0 \end{aligned}$ | ${ }^{45} 29+15.0-16.8$ | $4845{ }^{-0.9}$ |  | $16.9 \begin{array}{ll}-7.2 \\ -7.3 & 55.8\end{array}$ | $115-10.4$ |
| $\begin{aligned} & 4707+15.3-17.0 \\ & 50+15 \cdot 4-16.9 \end{aligned}$ | $4852+15.16 .7$ $52+15 \cdot 2-16.6$ | $5^{52} 16{ }_{-}^{-0.8}$ |  |  | 120-10.0 |
| $\begin{array}{r} 5043+15.4-16.9 \\ 50.15 .5-16.8 \end{array}$ | $5^{52} 41 \begin{aligned} & \text { +15.2-16.6 } \\ & +15.3-16.5\end{aligned}$ | ${ }_{56}{ }^{0} 99^{-0.7}$ |  | $\begin{array}{llll}17.9 & -7.4 & 58.9\end{array}$ | $125-10.8$ |
| $\begin{array}{r} 5446+15 \cdot 5-16 \cdot 8 \\ +15 \cdot 6-16.7 \end{array}$ | ${ }^{56} 59+15 \cdot 3-16.5$ | $60 \quad 26-0.6$ |  | $\begin{array}{llll}18.4 & -7.5 & 60.5\end{array}$ |  |
| $5921+15.6-16.7$ $+15.7-16.6$ | $6^{61} 50+15 \cdot 4-16 \cdot 4$ | $6506-0.5$ |  | $62 \cdot \mathrm{I}$ | I30-11•1 |
| $6428+15.7-16.6$ $+15.8-16.5$ | $6715+15 \cdot 5-16 \cdot 3$ | $70 \quad 09^{-0.4}$ |  | $\begin{array}{llll}19.3 & -7.7 & 63.8\end{array}$ | $135-11 \cdot 3$ |
| $7010+15.8-16.5$ $+15.9-16.4$ | $7314+15 \cdot 6-16 \cdot 2$ $+15 \cdot 7-16 \cdot 1$ | 75 $32-0.3$ <br> 15  |  | $65 \cdot 4$ | $140-11 \cdot 5$ |
| $7624+159-16 \cdot 4$ <br> $8.160-16.3$ | $7942+15.7-16.1$ $86.15 .8-16.0$ | 81.12 |  | $67 \cdot 1$ | $145-117$ |
| $8305+16 \cdot 1-16 \cdot 2$ | $8631+15$. |  |  | $20.9{ }_{-8.1}^{-8.0} 68.8$ | $150-11.9$ |
| 9000 | $9000+159-159$ | 9000 |  | $70 \cdot 5$ | $155-12 \cdot 1$ |

App. Alt. $=$ Apparent altitude $=$ Sextant altitude corrected for index error and dip.
CHAPMAN SCHOOL OF SEAMANSHIP

## Table A2 Information Page


for index error and dip.

Insert the Height of Eye correction and Compute Ha Then go back to Table A2 with the Ha to get the Alt Corr.


## Now go back to Table A2 with the Ha to get the Alt Corr.

| OCT.-MAR. SUN | N PR.-SEPT. | STARS AND PLANETS |  | DIP |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| App. Lower Upper Alt. Limb Limb | Ap Lower Upper <br> Al <br> Limb Limb | $\begin{aligned} & \text { App } \text { Corr }^{\text {n }} \\ & \text { Alt. } \end{aligned}$ | App. Additional <br> Alt. Corr ${ }^{\text {n }}$ | $\underset{\text { Eye }}{\text { Ht. of }} \text { Corrn }^{\text {E Ht. ofe }}$ | $\begin{array}{\|l} \text { Ht. of } \text { Cyerr }^{\mathrm{n}} \\ \hline \end{array}$ |
|  |  |  | 2011 | m , ft. |  |
| $933+10 \cdot 8-21.5$ | ${ }^{9} 39{ }^{\prime}+10^{\prime} \cdot 6-21^{\prime} \cdot 2$ | ${ }^{9} 55-{ }^{\prime}$ | VENUS | $\begin{array}{lll}2.4 & 1 & 8.8 \\ & 8.6\end{array}$ |  |
| ${ }^{9} 45+10 \cdot 9-21 \cdot 4$ | ${ }^{950} 50+10 \cdot 7-21 \cdot 1$ | $\begin{array}{ll}10 & 07 \\ \text { IO } & -5.3 \\ \text { IO } & -5.2\end{array}$ | Jan. I-Feb. 18 | $\begin{array}{lll}2.6 & -2.8 & 8.6 \\ 2.8 & -2.9 & 9.2\end{array}$ | $1.5-2.2$ $2.0-2.5$ |
| ${ }_{\text {IO }} 956{ }^{56}+11 \cdot 0-21 \cdot 3$ | $1002+10.8-21.0$ | IO $20-5 \cdot 1$ IO $32-510$ | Jan. 1-Feb. 18 | 2.8 3.0 | $2.0-2.5$ |
| Io $20+1{ }^{\text {a }}$ I $-21 \cdot 2$ | $1027+10.9-20.9$ | Io $46-5 \cdot 0$ | ${ }_{41}+0 \cdot 2$ | $\begin{array}{llll}3.0 & -3.1 & 9.8 \\ 3.2 & -5\end{array}$ | $2.5-2.8$ $3.0-3.0$ |
| 10 $33+11 \cdot 2-21 \cdot 1$ | 10 $40 \begin{aligned} & \text { + } 11 \cdot 0-20.8 \\ & +11.1-20.7 ~\end{aligned}$ | Io $59-4.9$ | $7^{46}+0 \cdot 1$ | $\begin{array}{llll}3.4 & -3.2 & 11.2\end{array}$ |  |
| 10 $46+11 \cdot 3-21.0$ | 10 53 $+11 \cdot 1-20 \cdot 7$ 11 $12-20.6$ | II 14 | Feb. 19-Dec. 31 | 3.6 -3.3 11.9 <br> 3.6   <br> .3 .4 1.9  | $\stackrel{\text { See table }}{ }$ |
| $\begin{aligned} & \text { II } \\ & \text { II } \\ & 115\end{aligned} 15+11.5-20.8$ | II 07 II 22 2 | $\begin{array}{llll}\text { II } & 29 \\ \text { II } & 44 & -4 \cdot 6\end{array}$ |  | $\begin{array}{lll}3.8 & -3.5 & 12.6 \\ 4.0 & 13.3\end{array}$ |  |
| II $30+11.6-20.7$ | $1137+11.4-20 \cdot 4$ | 11 44 <br> 12 00 <br> - 4.5 <br> 12  | $60^{\circ}+0.1$ | $\begin{array}{llll}4.8 & 3.6 & 13.3 \\ 4.3 & 14.1\end{array}$ | 20-7.9 |
| II $45+$ +11.7-20.6 | II $53+11 \cdot 5-20 \cdot 3$ $+11.6-20.2$ | 12 12 <br> 12 17 | MAR | $\begin{array}{lll}4.5 & -3.7 & 14.1 \\ 4.3 & \text { 14.9 }\end{array}$ | 22-8.3 |
|  | $1210+11.6-20.2$ $+11.7-20.1$ | $1235-4.3$ | Jan. I-Dec. 31 | $\begin{array}{llll}4.7 & -3.8 & 15.7\end{array}$ | $24-8.6$ $26-0.0$ |
| 1218 12 12 +12 $+12 \cdot 0-20.3$ | $1227+11.7-20.1$ $+11.8-20.0$ | $1253-4.1$ | , | $\begin{array}{ccc}5.0 & -3.9 & 16.5 \\ -4.0 & \end{array}$ | $26-9.0$ $28-9.3$ |
| $1236+12 \cdot 0-20 \cdot 3$ | $1245+11.8-20 \cdot 0$ | 13 I2-4.0 | $0^{\circ}+0 \cdot 1$ | $\begin{array}{ccc}5.2 & -4.1 & 17.4\end{array}$ | $28-9.3$ |
| $1254+12 \cdot 1-20 \cdot 2$ | $1304+11.9-19.9$ $+12.0-19.8$ |  | $60+0 \cdot 1$ | $\begin{array}{cccc}5.5 & -4.1 & 18.3 \\ 5.8 & -4.2 & 10.1\end{array}$ | $30-9.6$ |
| $1314+12 \cdot 3-20.0$ | $1324+12 \cdot 1-19 \cdot 7$ | 13 53--3.8 |  | $5 \cdot 8$ -4.3 19.1 <br> 6.1   | $32-10.0$ |
| $1334+12 \cdot 4-19.9$ | $1344+12 \cdot 2-19 \cdot 6$ |  |  | $\begin{array}{llll}6 \cdot 1 & -4 \cdot 4 & 20 \cdot 1 \\ 6 \cdot 3 & -4 .\end{array}$ | $34-10 \cdot 3$ |
| $1355+12 \cdot 5-19.8$ | $1406+12 \cdot 3-19.5$ | $\begin{array}{lllllll}14 & 39 & -3.6\end{array}$ |  | $6 \cdot 3-4.5{ }^{21 \cdot 0}$ | $\begin{aligned} & 36 \\ & 36\end{aligned}-10.6$ |
| $1417+12.6-19.7$ | $1429+12 \cdot 4-19 \cdot 4$ | $\begin{array}{lllll}15 & 03 & -3.5\end{array}$ |  | $\begin{array}{lllll}6 \cdot 6 & -4.6 & 22.0\end{array}$ | 38-10.8 |
| 1441 | $1453+12 \cdot 5-19 \cdot 3$ | $\begin{array}{ll}15 & 29\end{array}$ |  | $\begin{array}{llll}6.9 & -4.6 & 22.9\end{array}$ | $38-10.8$ |
| $1505+12 \cdot 8-19 \cdot 5$ | $1518+12 \cdot 6-19 \cdot 2$ | 15 56 <br> 16 -3.4 <br> 16  |  | $\begin{array}{llll}7.2 & -4.8 & 23.9\end{array}$ | $40-11 \cdot 1$ |
| 1531 $1559+12.9-19.4$ | $1545+12 \cdot 7-19 \cdot 1$ | $\begin{array}{ll}16 & 25-3.2 \\ 16 & 55\end{array}$ |  | $\begin{array}{llll}7.5 & -4.9 & 24.9 \\ 7.9 & -4.9 & 26.0\end{array}$ | $42-11 \cdot 4$ |
| $1559+13.0-19.3$ | $1613+12 \cdot 8-19.0$ | $\begin{array}{ll}16 & 55-3 \cdot 1 \\ 17 & 27\end{array}$ |  | $\begin{array}{llll}7 \cdot 9 & -4.8 & 26 \cdot 0 \\ 8 \cdot 2 & -5.0 & 27.1\end{array}$ |  |
|  | $1643+12.8-190$ $1714+12.9-18$ | $\begin{array}{lll}17 & 27-3.0 \\ 18 & \text { O1 }\end{array}$ |  |  | 46 <br> 46 |
| $1658+13 \cdot 2-19 \cdot 1$ | $1714+13.0-18.8$ 1747 | 18 17 <br> 18 $37-2.9$ <br>   |  | $\begin{array}{lll}8.5 & -5.2 & 28 \cdot 1 \\ 8.8 & -5.3 & 29.2\end{array}$ | $48-12 \cdot 2$ |
| $1805+13.3-19.0$ | $1823+13.1-18.7$ | $1916{ }^{1}$ |  | $\begin{array}{llll}8 \cdot 2 & -5 \cdot 3 & 30 \cdot 4\end{array}$ | ft. |
|  | $1900{ }^{19}+13.2-18.6$ | I9 $5^{6}{ }_{-2.6}^{-2.7}$ |  | $\begin{array}{llll} \\ 9.5 & -5.4 & 31.5 \\ -5.5 & 31.5\end{array}$ | $2-1.4$ |
| $1920+13.5-18.8$ | $1941+13.3-18.5$ | $2040{ }^{-2.6}$ |  | $\begin{array}{lllll} \\ 9.9 & -5.5 & 32.7\end{array}$ | 4-1.9 |
| $2002+13.6-18.7$ | $2024+13.4-18.4$ | $2127-2.5$ |  | $\begin{array}{llll} \\ \text { 10.3 } & -5 \cdot 6 & 33.9\end{array}$ | 6-2.4 |
| $2046+13.7-18.6$ | $2110+13.5-18.3$ | $2217{ }^{-2.4}$ |  | $10 \cdot 6$ $-5 \cdot 7$ $35 \cdot 1$ <br> $5 \cdot 8$ $35 \cdot 1$  | $8-2.7$ |
| $2134+13.8-18.5$ | $2159+13 \cdot 6-18 \cdot 2$ | $\begin{array}{ll}23 & \mathrm{II}^{-2.3} \\ -2.2\end{array}$ |  | - $-5 \cdot 8 \quad 36 \cdot 3$ | 10-3.1 |
| $22.25+13.9-18 \cdot 4$ $+14.0-18 \cdot 3$ | 22 $52+13.7-18.1$ +13.8-18.0 | 24 24 $9^{-2 \cdot 2}$ |  | 11.4 -5.9 $37 \cdot 6$ <br> 6.0 376  | See table |
| $2320+14.0-18 \cdot 3$ $+14.1-18 \cdot 2$ | 2349 $+13.8-18.0$ $+13.9-17.9$ | $\begin{array}{ll}25 & \text { I2 } \\ \text { - } \\ -2.1\end{array}$ |  | $\begin{array}{ll}-6.0 & 38.9\end{array}$ |  |
| $2420+14 \cdot 1 \cdot 18 \cdot 2$ | $2451+13.9-17.9$ <br> 2558 <br> $14.0-17.8$ | $26 \quad 20-2.0$ |  | 6.2 $40 \cdot 1$ | ft. |
| $2524+14.2-18.1$ 2634 2 | 2558+14.0-17.8 | $2734-1.9$ <br> 2854 <br> 54 |  | ${ }^{6} 3^{41.5}$ | $70-8 \cdot 1$ |
| $2634+14.4-17.9$ | 2711 +14.17. 28 | 28 $54-1.8$ |  | 13.0 -6.3 42.8 <br>    <br> 13.4 -6.4 44.2 | $75-8.4$ |
| $2750+14.4-17.9$ 29 2 | $2831+14.2-17.6$ <br> $28+14.3-17.5$ | $\begin{array}{ll}30 & 22-1.7 \\ 31 & -1.6\end{array}$ |  | 13.4 -6.4 4.2 <br>    | $80-8.7$ |
| $\begin{aligned} & 2913+14.5-17.8 \\ & +14.6-17.7 \end{aligned}$ | $2958+14.3-17.5$ $+14.4-17.4$ | $3158-1.6$ <br> 15 <br> 15 |  |  | $85-8.9$ |
| $3044+14.7-17 \cdot 6$ | $3133+14.4-17.4$ | 33 43-1.5 |  | $\begin{array}{llll}14.2 & -6.6 & 46.9\end{array}$ | $90-9.2$ |
| $3224+14.8-17 \cdot 6$ |  | $\begin{array}{lll}35 & 38-1.4 \\ \\ 37 & \text {-1.3 }\end{array}$ |  | $\begin{array}{llll}14.7 & -6.7 & 48.4\end{array}$ | 95-9.5 |
| $3415+14.8-17.5$ <br> $14.9-17.4$ | $3515+14.6-17.2$ | 3745-1.3 |  | $\begin{array}{llll}15 \cdot 1 & -6.8 & 49.8 \\ -6.9 & 4.8\end{array}$ |  |
| $\begin{aligned} & 3617+14 \cdot 9-17 \cdot 4 \\ & 3+15 \cdot 0-17 \cdot 3 \end{aligned}$ | $\begin{aligned} & 3724+147-17 \cdot 1 \\ & 37+14.8-170^{\circ} \end{aligned}$ | ${ }^{40} 06{ }^{-1 \cdot 2}$ |  | ${ }_{15} 5.5-7.0815$ | $100-9.7$ |
| $\begin{aligned} & 3834+15.0-17 \cdot 3 \\ & +15 \cdot 1-17.2 \end{aligned}$ | $\begin{aligned} & 3948+14.8-17.0 \\ & +14.9-16.9 \end{aligned}$ | $4242^{-1.1}$ |  | ${ }_{16 \cdot 0}^{16} \begin{aligned} & \text { l }\end{aligned}$ | $105-9.9$ |
| $\begin{aligned} & 4106+15 \cdot 1-17 \cdot 2 \\ & +15 \cdot 2-17 \cdot 1 \end{aligned}$ | $\begin{aligned} & 4228+149-16 \cdot 9 \\ & 42+150-16 \cdot 8 \end{aligned}$ | 4534-1.0 <br> 0.9 |  | $16 \cdot 5{ }_{-7 \cdot 2} 54 \cdot 3$ | $110-10.2$ |
| 4356+15.2-17.1 | $4529+150-16.8$ $+15.1-16.7$ | $484^{45}{ }^{-0.9}$ |  | $16.9 \begin{array}{ll}-7.2 & 55.8 \\ -7.3 & 58\end{array}$ | $115-10 \cdot 4$ |
| $4707+15 \cdot 4-17.9$ | $4852+15.16-16.7$ | $5_{52} 16{ }_{-0.7}^{-0.7}$ |  | $17 \cdot 4 \begin{array}{ll}-7 \cdot 3 & 57 \cdot 4\end{array}$ | $120-10 \cdot 6$ |
| $5043+15 \cdot 5-16.8$ | $524 \mathrm{I}+15 \cdot 16.5$ 659 | ${ }_{56}^{56} 09-0.6$ |  | $\begin{array}{lll}17.9 & -7.4 & 58.9 \\ 18.4 & -7.5 & 60.5\end{array}$ | $125-10.8$ |
|  | \% $590+15 \cdot 4-16 \cdot 4$ | ${ }_{60} 26-0.5$ |  | $18.4 \begin{array}{ll}-7.5 & 60.5\end{array}$ |  |
|  |  | 65 $06-0.4$ |  | $18 \cdot 8-7.7{ }^{18}$ | $130-11 \cdot 1$ |
| $6428+15.8-16.5$ $7010+15.0-16.4$ | ${ }^{7} 15+15 \cdot 6-16 \cdot 2$ | $7009+0.3$ |  | $\begin{array}{lllll}19.3 & -7.8 & 63.8\end{array}$ | I35-11.3 |
|  | 314 942 42 + | $75 \quad 32-0.2$ |  |  | $140-11 \cdot 5$ |
| $8305{ }^{8}+16 \cdot 0-16 \cdot 3$ | $842{ }^{\text {a }}+15.8-16.0$ $3^{1}+15.9-15.9$ | 81 12 -0.1 <br> 87 03 -0.1 <br>   0.0 |  | $\begin{array}{lll}20.4 & -8.0 & 67 \cdot 1 \\ 20.9 & -8.1 & 68.8\end{array}$ | 145 <br> 150 <br> 150 <br> 111.9 <br> 15 |
| 9000 | 9000 | 9000 |  | $\begin{array}{lll}21.4 & 70 \cdot 5\end{array}$ | 155-12.I |

App. Alt. $=$ Apparent altitude $=$ Sextant altitude corrected for index error and dip.
CHAPMAN SCHOOL OF SEAMANSHIP

## For the SUN's Lower Limb in March with an Ha of $64^{\circ} 45^{\prime}$, we find that the Alt Corr. is $+15.8^{\prime}$

| 4356 | 4529 |
| :---: | :---: |
| $4707+15.4-16$ | 4852 |
| $5043+\mathrm{I} 5 \cdot 5-\mathrm{I} 6$. | 524 I |
| 5446 | 5659 |
| $5921+15616.6$ | 6150 |
| $6428+15 \cdot 8-16 \cdot 5$ | 67 I5 |
| 70 IO | 73 I4 |



## Find Declination for your Sight Time

2011 MARCH 11, 12, 13 (FRI., SAT., SUN.)

| UT | SUN |  | MOON |  |  |  |  |  | Lat. |  | Twilight |  | Sunrise | Moonrise |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | Naut. | Civil | 11 | 12 | 13 | 14 |  |  |  |
|  | GHA | Dec |  |  |  |  |  |  | GHA | $v$ | D | ec |  |  |  | $72^{\circ}$ | $\begin{array}{rr} \text { h } & \text { m } \\ 04 & 13 \end{array}$ | $\begin{array}{rr} \text { h } & \mathrm{m} \\ 05 & 35 \end{array}$ | $\begin{array}{ll} \text { h } & \mathrm{m} \\ 06 & 41 \end{array}$ | $\stackrel{\text { h m }}{\square}$ | $\stackrel{\text { h m }}{\square}$ | $\stackrel{\text { h m }}{ }$ | $\stackrel{\mathrm{h}}{ }{ }^{\text {m }}$ |
| 1100 | 17726.6 | S 356.1 | 11404.0 | 10.8 | N22 | 05.3 | 4.8 | 55.2 |  | 70 | 0425 | 0538 | 0638 | $\square$ | $\square$ | $\square$ | $\square$ |
| ${ }^{11} 01$ | 19226.8 | 55.1 | 12833.8 | 10.7 | 22 | 10.1 | 4.7 | 55.2 |  | 68 | 0434 | 0540 | 0635 | $\square$ | $\square$ | $\square$ | $\square$ |
| 02 | 20726.9 | 54.1 | 14303.5 | 10.6 | 22 | 14.8 | 4.6 | 55.2 |  | 66 | 0442 | 0542 | 0633 | 0604 | 0612 | 0711 | 0859 |
| 03 | 22227.1 | 53.1 | 15733.1 | 10.6 | 22 | 19.4 | 4.6 | 55.2 |  | 64 | 0448 | 0543 | 0631 | 0645 | 0714 | 0812 | 0938 |
| 04 | 23727.3 | 52.2 | 17202.7 | 10.6 | 22 | 24.0 | 4.4 | 55.3 |  | 62 | 0453 | 0545 | 0629 | 0713 | 0749 | 0846 | 1005 |
| 05 | 25227.4 | 51.2 | 18632.3 | 10.4 | 22 | 28.4 | 4.3 | 55.3 |  | 60 | 0457 | 0546 | 0627 | 0735 | 0814 | 0911 | 1026 |
| 06 | 26727.6 | S 350.2 | 20101.7 | 10.5 | N22 | 32.7 | 4.1 | 55.3 | N | 58 | 0501 | 0547 | 0626 | 0753 | 0834 | 0930 | 1043 |
| 07 | 28227.7 | 49.2 | 21531.2 | 10.3 | 22 | 36.8 | 4.1 | 55.3 |  | 56 | 0504 | 0547 | 0624 | 0808 | 0850 | 0947 | 1057 |
| 08 | 29727.9 | 48.2 | 23000.5 | 10.3 | 22 | 40.9 | 4.0 | 55.4 |  | 54 | 0507 | 0548 | 0623 | 0821 | 0904 | 1001 | 1110 |
| F 09 | 31228.1 | 47.2 | 24429.8 | 10.2 | 22 | 44.9 | 3.8 | 55.4 |  | 52 | 0509 | 0549 | 0622 | 0832 | 0917 | 1013 | 1121 |
| R 10 | 32728.2 | 46.3 | 25859.0 | 10.2 | 22 | 48.7 | 3.8 | 55.4 |  | 50 | 0512 | 0549 | 0621 | 0842 | 0928 | 1024 | 1130 |
| \| 11 | 34228.4 | 45.3 | 27328.2 | 10.1 | 22 | 52.5 | 3.6 | 55.4 |  | 45 | 0516 | 0550 | 0619 | 0904 | 0950 | 1046 | 1151 |
| D 12 | 35728 | S 3 - 4.3 | 28757.3 | 10.0 | N22 | 56.1 | 3.5 | 55.5 | N | 40 | 0519 | 0550 | 0617 | 0921 | 1009 | 1104 | 1207 |
| A 13 | 1228. | 13.3 | 30226.3 | 10.0 | 22 | 59.6 | 3.4 | 55.5 |  | 35 | 0521 | 0550 | 0615 | 0935 | 1024 | 1119 | 1221 |
| Y 14 | 2728.9 | 42.3 | 31655.3 | 9.9 | 23 | 03.0 | 3.3 | 55.5 |  | 30 | 0522 | 0550 | 0614 | 0948 | 1037 | 1133 | 1233 |
| Y 15 | 42290 |  | 33124.2 | 9.9 | 23 | 06.3 | 3.2 | 55.5 |  | 20 | 0524 | 0549 | 0611 | 1010 | 1100 | 1155 | 1254 |
| 16 | 5729.2 | 40.4 | 34553.1 | 9.8 | 23 | 09.5 | 3.0 | 55.6 | N | 10 | 0524 | 0548 | 0609 | 1028 | 1120 | 1215 | 1311 |
| 17 | 7229.4 |  | 021.9 | 9.8 | 23 | 12.5 | 3.0 | 55.6 |  | 0 | 0522 | 0546 | 0607 | 1046 | 1138 | 1233 | 1328 |
| 18 | 8729.5 | S 338.4 | 1450.7 | 9.7 | N23 | 15.5 | 2.8 | 55.6 |  | 10 | 0519 | 0543 | 0604 | 1104 | 1157 | 1251 | 1345 |
| 19 | 10229.7 | 37.4 | 2919.4 | 9.6 | 23 | 18.3 | 2.7 | 55.7 |  | 20 | 0514 | 0539 | 0601 | 1123 | 1217 | 1310 | 1402 |
| 20 | 11729.9 | 36.4 | 4348.0 | 9.6 | 23 | 21.0 | 2.6 | 55.7 |  | 30 | 0506 | 0534 | 0558 | 1145 | 1240 | 1333 | 1423 |
| 21 | 13230.0 | 35.5 | 5816.6 | 9.5 | 23 | 23.6 | 2.4 | 55.7 |  | 35 | 0501 | 0531 | 0556 | 1158 | 1253 | 1346 | 1435 |
| 22 | 14730.2 | 34.5 | 7245.1 | 9.5 | 23 | 26.0 | 2.4 | 55.7 |  | 40 | 0455 | 0527 | 0554 | 1212 | 1309 | 1401 | 1448 |
| 23 | 16230.4 | 33.5 | 8713.6 | 9.4 | 23 | 28.4 | 2.2 | 55.8 |  | 45 | 0447 | 0522 | 0551 | 1230 | 1327 | $14 \quad 19$ | 1504 |

## Find 'd' factor

| U 10 | 32736.2 |  | 259.1 | 23321.2 | 8.0 | 23 | 30.4 | 2.3 | 56.9 | 40 | 1825 | 1852 | 1924 | 2142 | 2234 | 23 | 33 |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| N 11 | 34236.4 |  | 58.1 | 24748.2 | 7.9 | 23 | 28.1 | 2.5 | 57.0 | 45 | 1827 | 1857 | 1932 | 2124 | 2215 |  |  |  |  |
| D 12 | 35736.5 | S 2 | 257.1 | 26215.1 | 8.0 | N23 | 25.6 | 2.6 | 57.0 | S 50 | 1830 | 1903 | 1942 | 2102 | 2152 | 22 | 54 | 24 |  |
| A 13 | 1236.7 |  | 56.1 | 27642.1 | 7.9 | 23 | 23.0 | 2.7 | 57.0 | 52 | 1832 | 1906 | 1947 | 2051 | 2141 | 22 | 43 | 23 |  |
| Y 14 | 2736.9 |  | 55.1 | 29109.0 | 7.9 | 23 | 20.3 | 2.9 | 57.1 | 54 | 1833 | 1909 | 1952 | 2039 | 2129 | 22 | 31 |  |  |
| 15 | 4237.1 | . | 54.1 | 30535.9 | 7.9 | 23 | 17.4 | 3.0 | 57.1 | 56 | 1835 | 1913 | 1958 | $20 \quad 25$ | 2114 | 22 | 18 | 23 |  |
| 16 | 5737.2 |  | 53.2 | 32002.8 | 7.9 | 23 | 14.4 | 3.2 | 57.2 | 58 | 1837 | 1917 | 2005 | $20 \quad 09$ | 2057 | 22 | 02 | 23 | 21 |
| 17 | 7237.4 |  | 52.2 | 33429.7 | 7.8 | 23 | 11.2 | 3.3 | 57.2 | S 60 | 1839 | 1921 | 2013 | 1950 | 2036 | 21 | 43 | 23 |  |
| 18 | 8737.6 | S 2 | 251.2 | 34856.5 | 7.8 | N23 | 07.9 | 3.4 | 57.2 | Day | SUN |  |  | MOON |  |  |  |  |  |
| 19 | 10237.7 |  | 50.2 | 323.3 | 7.8 | 23 | 04.5 | 3.6 | 57.3 |  | Eqn. of Time |  | Mer. | Mer. Pass. |  | Age | Phase |  |  |
| 20 | 11737.9 |  | 49.2 | 1750.1 | 7.8 | 23 | 00.9 | 3.7 | 57.3 |  |  |  |  |  |  |  |  |  |  |
| 21 | 13238.1 | - | 48.2 | 3216.9 | 7.8 | 22 | 57.2 | 3.8 | 57.3 |  | $00^{h}$ | $12^{\text {h }}$ | Pass. | Upper | Lower |  |  |  |  |
| 22 | 14738.2 |  | 47.2 | 4643.7 | 7.8 | 22 | 53.4 | 4.0 | 57.4 | d | m s | m s | h m | h m | h m | d | \% |  |  |
| 23 | 16238.4 |  | 46.3 | 6110.5 | 7.7 | N22 | 49.4 | 4.1 | 57.4 | 11 | $10 \quad 14$ | 1006 | 1210 | 1658 | 0433 | 07 | 35 |  |  |
|  |  |  |  |  |  |  |  |  |  |  | 0958 | 0950 | 1210 | 1751 | 0525 | 08 | 45 |  |  |
|  | SD 16.1 |  | d 1.0 | SD | 15.1 |  | 15.3 |  | 15.5 | 13 | 0942 | 0934 | 1210 | 1846 | 0618 | 09 | 55 |  |  |

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The 'd' Factor is the amount of change in Declination in an hour - in our example it is 1.0' per hour

Find the ' d '
Correction
in the
Increments and
Corrections pages for the
minutes of
GMT for
your sight

| 4 |  |  |  | INCREMENTS AND CORRECTIONS |  |  |  |  |  |  |  |  |  |  | $45^{\text {m }}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 44 | $\begin{array}{\|c\|c\|c\|c\|c\|} \text { SULANN } \end{array}$ | ARIES | MOON | $\begin{aligned} & \stackrel{i}{o r} \begin{array}{c} 0 \\ d \end{array} \text { Corrn } \end{aligned}$ | $\begin{aligned} & \begin{array}{l} v \\ o r \\ d \end{array} \text { Corrn } \end{aligned}$ | $\begin{aligned} & v \\ & \text { or Corrn } \\ & d \end{aligned}$ | 45 | $\left\lvert\, \begin{gathered} \text { SUN } \\ \text { PLANETS } \end{gathered}\right.$ | ARIES | MOON |  | Corrn |  | Corrn | $\begin{aligned} & v \\ & \text { or Corrn } \\ & d \end{aligned}$ |
|  |  |  |  | , , |  |  |  |  |  |  |  |  |  | , |  |
| 00 | 1100.0 | 1101.8 | 1029.9 | 0.00 .0 | 6.04 .5 | 12.08 .9 | 00 | 1115.0 | 1116.8 | 1044.3 | 0.0 | 0.0 | $6 \cdot 0$ | 4.6 | 12.0 9.1 |
| 01 | $1100 \cdot 3$ | $1102 \cdot 1$ | $1030 \cdot 2$ | $\begin{array}{ll}0.1 & 0.1\end{array}$ | ${ }^{6} 14.5$ | $12.1 \quad 9.0$ | 01 | $1115 \cdot 3$ | $1117 \cdot 1$ | 1044.5 | 0.1 | 0.1 | $6 \cdot 1$ | 4.6 | $\begin{array}{lll}12.1 & 9.2\end{array}$ |
| 02 | $1100 \cdot 5$ | $1102 \cdot 3$ | $1030 \cdot 4$ | $\begin{array}{ll}0.2 & 0.1\end{array}$ | 6.24 .6 | 12.29 .0 | 02 | $1115 \cdot 5$ | 1117.3 | 1044.7 | 0.2 | 0.2 | 6.2 | 4.7 | $\begin{array}{ll}12 \cdot 2 & 9.3\end{array}$ |
| 03 | $1100 \cdot 8$ | $1102 \cdot 6$ | $1030 \cdot 6$ | $\begin{array}{ll}0.3 & 0.2\end{array}$ | 6.347 | $\begin{array}{lll}12 \cdot 3 & 9.1\end{array}$ | 03 | $1115 \cdot 8$ | $1117 \cdot 6$ | $1045 \cdot 0$ | 0.3 | 0.2 | 6.3 | 4.8 | $\begin{array}{lll}12.3 & 9.3\end{array}$ |
| 04 | 1101.0 | $1102 \cdot 8$ | $1030 \cdot 9$ | $\begin{array}{ll}0.4 & 0.3\end{array}$ | 6.44 | $\begin{array}{lll}12 \cdot 4 & 9.2\end{array}$ | 04 | 11160 | 1117.9 | $1045 \cdot 2$ | $0 \cdot 4$ | 0.3 | $6 \cdot 4$ | 4.9 | $\begin{array}{ll}12.4 & 9.4\end{array}$ |
| 05 | $1101 \cdot 3$ | $1103 \cdot 1$ | $1031 \cdot 1$ | 0.4 | $\begin{array}{ll}6.5 & 4.8\end{array}$ | $12.5 \quad 9.3$ | 05 | $1116 \cdot 3$ | $1118 \cdot 1$ | $1045 \cdot 4$ | 0.5 | 0.4 | 6.5 | 4.9 | $2 \cdot 5$ |
| 06 | 1101.5 | $1103 \cdot 3$ | 1031.4 | $\begin{array}{ll}0.6 & 0.4\end{array}$ | 6.64 .9 | $12.6 \quad 9.3$ | 06 | $1116 \cdot 5$ | 1118.4 | $1045 \cdot 7$ | 0.6 | 0.5 | 6.6 | 5.0 | 12.69 .6 |
| 07 | 1101.8 | $1103 \cdot 6$ | 1031.6 | $\begin{array}{ll}0.7 & 0.5\end{array}$ | $\begin{array}{lll}6.7 & 5.0\end{array}$ | $\begin{array}{ll}12.7 & 9.4\end{array}$ | 07 | 1116.8 | 1118.6 | 1045.9 | 0.7 | 0.5 | 6.7 | $5 \cdot 1$ | $\begin{array}{ll}12.7 & 9.6\end{array}$ |
| 08 | 1102.0 | 1103.8 | 1031.8 | $\begin{array}{ll}0.8 & 0.6\end{array}$ | $6.8 \quad 5.0$ | $12.8 \quad 9.5$ | 08 | 1117.0 | 1118.9 | $1046 \cdot 2$ | 0.8 | 0.6 | $6 \cdot 8$ | 5.2 | $\begin{array}{ll}12 \cdot 8 & 9.7\end{array}$ |
| 09 | $1102 \cdot 3$ | 1104.1 | $1032 \cdot 1$ | $\begin{array}{ll}0.9 & 0.7\end{array}$ | 6.95 .1 | $12.9 \quad 9.6$ | 09 | 1117.3 | 1119.1 |  |  |  |  | $5 \cdot 2$ | 12.989 |
| 10 | 1102.5 | 1104.3 | 10 | $\begin{array}{ll}1.0 & 0.7\end{array}$ | $\begin{array}{lll}7.0 & 5.2\end{array}$ | 7 | 10 | 1117.5 | 1119.4 | 104 |  | 0.8 |  | $5 \cdot 3$ | 13.09 .9 |
| 11 | $1102 \cdot 8$ | 1104.6 | $1032 \cdot 6$ | $\begin{array}{ll}1 \cdot 1 & 0.8\end{array}$ | $7.15 \cdot 3$ | $13 \cdot 1 \quad 9.7$ | 11 | 1117.8 | 1119.6 | 104 |  |  |  | $5 \cdot 4$ | $\begin{array}{ll}13 \cdot 1 & 9.9\end{array}$ |
| 12 | 1103.0 | $1104 \cdot 8$ | $1032 \cdot 8$ | $\begin{array}{ll}1.2 & 0.9\end{array}$ | 7.25 .3 | 13.29 .8 | 12 | 1118.0 | 1119.9 | 1047.1 | 1.2 | 0.9 | 7.2 | 5.5 | 13.210 .0 |
| 13 | $1103 \cdot 3$ | $1105 \cdot 1$ | 1033.0 | 1.31 .0 | 7.35 | $13.3 \quad 9.9$ | 13 | 1118.3 | $1120 \cdot 1$ | $1047 \cdot 4$ | 1.3 | 1.0 | 7.3 | 5.5 | $13.310 \cdot 1$ |
| 14 | 1103 | $1105 \cdot 3$ | 1033.3 | 1.0 | $\begin{array}{lll}7.4 & 5.5\end{array}$ | 13.49 .9 | 14 | 1118.5 | 1120.4 | 1047.6 | 1.4 | $1 \cdot 1$ | 7.4 | $5 \cdot 6$ | $13.410 \cdot 2$ |
| 15 | 1103.8 | 11056 | 1033.5 | $1 \cdot 1$ | $7.5 \quad 5.6$ | $13.510 \cdot 0$ | 15 | 1118.8 | $1120 \cdot 6$ | 1047.8 | 1.5 |  | 7.5 |  | $13.510 \cdot 2$ |
| 16 | $1104 \cdot 0$ | $1105 \cdot 8$ | $1033 \cdot 8$ | $\begin{array}{ll}1.6 & 1.2\end{array}$ | 7.656 | $13 \cdot 610 \cdot 1$ | 16 | 11190 | 1120.9 | 1048.1 | 1.6 | 1.2 | 7.6 | 5.8 | 13.610 .3 |
| 17 | 1104.3 | $1106 \cdot 1$ | 1034.0 | $\begin{array}{ll}1.7 & 1.3\end{array}$ | 7.75 | $13.710 \cdot 2$ | 17 | 1119.3 | 11 21-1 | 1048.3 | 1.7 | 1.3 | 7.7 | 5.8 | $13.710 \cdot 4$ |
| 18 | 1104.5 | $1106 \cdot 3$ | 1034.2 | $\begin{array}{ll}1.8 & 1.3\end{array}$ | $\begin{array}{ll}7.8 & 5.8\end{array}$ | 13.810 .2 | 18 | 1119.5 | 1121.4 | 1048.5 | 1.8 | 1.4 | 7.8 | 5.9 | $13.810 \cdot 5$ |
| 19 | $1104 \cdot 8$ | 1106.6 | 1034.5 | $\begin{array}{ll}1.9 & 1.4\end{array}$ | 7.959 | $13.910 \cdot 3$ | 19 | 1119.8 | 1121.6 | 1048.8 | 1.9 | 1.4 | 7.9 | 6.0 | 13.910 .5 |
| 20 | 110 | $1106 \cdot 8$ | 10 | 2.01 .5 | 8.05 .9 | $14 \cdot 010 \cdot 4$ | 20 | 1120.0 | 1121.9 | 1049.0 | $2 \cdot 0$ | 1.5 | 8.0 | $6 \cdot 1$ | $14 \cdot 010 \cdot 6$ |
| 21 | $1105 \cdot 3$ | $1107 \cdot 1$ | $1034 \cdot 9$ | 2.11 .6 | 8.16 | 14.1 $10 \cdot 5$ | 21 | 1120.3 | $1122 \cdot 1$ | $1049 \cdot 3$ | $2 \cdot 1$ | 1.6 | $8 \cdot 1$ | $6 \cdot 1$ | $\begin{array}{llll}14 \cdot 1 & 10 \cdot 7\end{array}$ |
| 22 | $1105 \cdot 5$ | 1107.3 | $1035 \cdot 2$ | $\begin{array}{ll}2.2 & 1.6\end{array}$ | $\begin{array}{lll}8.2 & 6.1\end{array}$ | $14.210 \cdot 5$ | 22 | 1120.5 | 1122.4 | 1049.5 | 2.2 | 1.7 | $8 \cdot 2$ | 6.2 | $14 \cdot 210.8$ |
| 23 | $1105 \cdot 8$ | 1107.6 | $1035 \cdot 4$ | $\begin{array}{ll}2.3 & 1.7\end{array}$ | $8.3 \quad 6.2$ | $14.310 \cdot 6$ | 23 | 1120.8 | 1122.6 | 10 49-7 | $2 \cdot 3$ | 1.7 | 8.3 | 6.3 | $14.310 \cdot 8$ |
| 24 | 11060 | 1107.8 | $1035 \cdot 7$ | $\begin{array}{ll}2.4 & 1.8\end{array}$ | 8.46 .2 | $14.4 \quad 10 \cdot 7$ | 24 | 1121.0 | 1122.9 | 1050.0 | 2.4 | 1.8 | 8.4 | $6 \cdot 4$ |  |
| 25 | 1106.3 | 1108.1 | $1035 \cdot 9$ | 1.9 | 6.3 | 14.510 .8 | 25 | 112 | 1123.1 | 10 |  | 1.9 |  | $6 \cdot 4$ | 11.0 |
| 26 | $1106 \cdot 5$ | 1108.3 | $1036 \cdot 1$ | 2.61 .9 | $8.6 \quad 6.4$ | $14.610 \cdot 8$ | 26 | 1121.5 | 1123.4 | 1050.5 | 2.6 | 2.0 | $8 \cdot 6$ | 6.5 | $14 \cdot 611 \cdot 1$ |
| 27 | 1106.8 | 1108.6 | $1036 \cdot 4$ | $\begin{array}{ll}2.7 & 2.0\end{array}$ | 8.76 .5 | 14.710 .9 | 27 | 1121.8 | $1123 \cdot 6$ | $1050 \cdot 7$ | 2.7 | 2.0 | 8.7 | $6 \cdot 6$ | $14 \cdot 7 \quad 11 \cdot 1$ |
| 28 | 11 | 1108.8 | $1036 \cdot 6$ | $2 \cdot 1$ | $8.8 \quad 6.5$ | 14.811 .0 | 28 | 1122.0 | 1123.9 | $1050 \cdot 9$ | 2.8 |  | 8.8 |  | 14.8 11.2 |
| 29 | 11 | 1109.1 | 1036.9 | 2.92 .2 | 8.96 .6 | $14.911 \cdot 1$ | 29 | $1122 \cdot 3$ | 1124.1 | 1051.2 | $2 \cdot 9$ | $2 \cdot 2$ | $8 \cdot 9$ | 6.7 | 14.911 .3 |
| 30 | 1107.5 | 1109.3 | 1037.1 | $\begin{array}{lll}3.0 & 2.2\end{array}$ | 9.06 .7 | $15 \cdot 011 \cdot 1$ | 30 | 1122.5 | $1124 \cdot 4$ | $1051 \cdot 4$ | 3.0 | $2 \cdot 3$ | 9.0 | 6.8 | 15.0 $11 \cdot 4$ |
| 31 | 11078 | 1109.6 | 1037.3 | $\begin{array}{ll}3.1 & 2.3\end{array}$ | 9.16 .7 | $15 \cdot 111 \cdot 2$ | 31 | 1122.8 | 1124.6 | $1051 \cdot 6$ | $3 \cdot 1$ | 2.4 | $9 \cdot 1$ | 6.9 | $15 \cdot 111 \cdot 5$ |
| 32 | 1108.0 | 1109.8 | 1037.6 | $\begin{array}{ll}3.2 & 2.4\end{array}$ | 9. 26.8 | 15.211 .3 | 32 | 1123.0 | 1124.9 | $1051 \cdot 9$ | $3 \cdot 2$ | 2.4 | 9.2 | 7.0 | 15.2 11.5 |
| 33 | $1108 \cdot 3$ | $1110 \cdot 1$ | 1037.8 | $\begin{array}{ll}3.3 & 2.4\end{array}$ | 9.36 .9 | $15 \cdot 3 \quad 11 \cdot 3$ | 33 | 1123.3 | $1125 \cdot 1$ | $1052 \cdot 1$ | $3 \cdot 3$ | 2.5 | 9.3 | 7.1 | $15 \cdot 3 \quad 11.6$ |
| 34 | 1108.5 | $1110 \cdot 3$ | 1038.0 | $\begin{array}{lll}3.4 & 2.5\end{array}$ | $9.4 \quad 7.0$ | $15 \cdot 411.4$ | 34 | 1123.5 | $1125 \cdot 4$ | 1052.4 | $3 \cdot 4$ | 2.6 | $9 \cdot 4$ | 7.1 | $15 \cdot 4 \quad 11.7$ |
| 35 | 11 | $1110 \cdot 6$ | 10 | $\begin{array}{lll}3.5 & 2.6\end{array}$ | $9.5 \quad 7.0$ | $15 \cdot 511.5$ | 35 | 1123.8 | $1125 \cdot 6$ | $1052 \cdot 6$ | 3.5 | 2.7 | 9.5 | 7.2 | 15.5 $11 \cdot 8$ |
| 36 | 1109.0 | 1110.8 | 1038.5 | $\begin{array}{ll}3.6 & 2.7\end{array}$ | $9.6 \quad 7.1$ | 15.611 .6 | 36 | 1124.0 | $1125 \cdot 9$ | $1052 \cdot 8$ | 3.6 |  | 9.6 | 7.3 | $\begin{array}{llllllll}15 & 11.8\end{array}$ |
| 37 | 1109.3 | 111111 | 1038.8 | $\begin{array}{ll}3.7 & 2.7\end{array}$ | 9.7  <br> 9 7 | 15.711 .6 | 37 | 1124.3 | $1126 \cdot 1$ | 10 53.1 | $3 \cdot 7$ | 2.8 | 9.7 | 7.4 | $15.711 \cdot 9$ |
| 38 | 1109.5 | 1111.3 | $1039 \cdot 0$ | $\begin{array}{ll}3.8 & 2.8\end{array}$ | $9.8 \quad 7.3$ | 15.811 .7 | 38 | 1124.5 | $1126 \cdot 4$ | 1053.3 | 3.8 | $2 \cdot 9$ | 9.8 | 7.4 | 15-8 12.0 |
| 39 | 1109.8 | 1111.6 | $1039 \cdot 2$ | $3.9 \quad 2.9$ | 9.97 .3 | $15 \cdot 9 \quad 11.8$ | 39 | 1124.8 | $1126 \cdot 6$ | 1053.6 | $3 \cdot 9$ | 3.0 | 9.9 | 7.5 | $15 \cdot 912 \cdot 1$ |
| 40 | 11100 | 1111.8 | $1039 \cdot 5$ | 3.0 | $10.0 \quad 7.4$ | 16.011 .9 | 40 | 1125.0 | $1126 \cdot 9$ | 1053.8 | 4.0 |  | 10.0 | 7.6 | $16.012 \cdot 1$ |
| 41 | $1110 \cdot 3$ | $1112 \cdot 1$ | 1039.7 | $4.1 \quad 3.0$ | $10 \cdot 1 \quad 7.5$ | 16.111 .9 | 41 | $1125 \cdot 3$ | $1127 \cdot 1$ | 1054.0 | 4.1 | $3 \cdot 1$ | 10 | 7.7 | 16.1 $12 \cdot 2$ |
| 42 | $1110 \cdot 5$ | 1112.3 | $1040 \cdot 0$ | $4.2 \begin{array}{ll}4.1\end{array}$ | $10.2 \quad 76$ | $16 \cdot 212 \cdot 0$ | 42 | 1125.5 | $1127 \cdot 4$ | $1054 \cdot 3$ | $4 \cdot 2$ | $3 \cdot 2$ | $10 \cdot 2$ | 7.7 | 16-2 $12 \cdot 3$ |
| 43 | 1110.8 | 1112.6 | $1040 \cdot 2$ | $4.3 \quad 3.2$ | $10.3 \quad 7.6$ | $16 \cdot 312 \cdot 1$ | 43 | 1125.8 | $1127 \cdot 6$ | 1054.5 | 4.3 | $3 \cdot 3$ | 10 | 7.8 | 16.3 $12 \cdot 4$ |
| 44 | 11 | $1112 \cdot 8$ | 10 | $\begin{array}{lll}4.4 & 3.3\end{array}$ | $10.4 \quad 7.7$ | 16.412 .2 | 44 | 1126.0 | $1127 \cdot 9$ | 1054.7 | $4 \cdot 4$ | $3 \cdot 3$ | $10 \cdot 4$ | 7.9 | $16 \cdot 4 \quad 12 \cdot 4$ |
| 45 | 1111.3 | $1113 \cdot 1$ | 1040.7 | $\begin{array}{llll}4.5 & 3.3\end{array}$ | $10.5 \quad 7.8$ | $16.512 \cdot 2$ | 45 | $1126 \cdot 3$ | 1128.1 | 1055.0 | 4.5 | 3.4 | 10. | 8.0 | $16.512 \cdot 5$ |
| 46 | 1111.5 | $1113 \cdot 3$ | $1040 \cdot 9$ | 4.63 .4 | $10.6 \quad 7.9$ | $16 \cdot 612 \cdot 3$ | 46 | 1126.5 | 1128.4 | $1055 \cdot 2$ | 4.6 | 3.5 | 10 | 8.0 | 16.612.6 |
| 47 | 1111.8 | $1113 \cdot 6$ | 1041.1 | $4.7 \quad 3.5$ | $10.7 \quad 7.9$ | $16.712 \cdot 4$ | 47 | 1126.8 | 11286 | 1055.5 | 4.7 | 3.6 |  | $8 \cdot 1$ | 16.7 $12 \cdot 7$ |
| 48 | 1112.0 | $1113 \cdot 8$ | 1041.4 | $4.8 \quad 3.6$ | $10.8 \quad 8.0$ | 16.812 .5 | 48 | 1127.0 | 1128.9 | 1055.7 | 4.8 | $3 \cdot 6$ | $10 \cdot 8$ | $8 \cdot 2$ | 16-8 $12 \cdot 7$ |
| 49 | 1112.3 | 1114.1 | 1041.6 | $4.9 \quad 3.6$ |  | 16.9 | 49 | 1127.3 | 11 | 10 | 4.9 | $3 \cdot 7$ | $10 \cdot 9$ | $8 \cdot 3$ | $16 \cdot 912 \cdot 8$ |
| 50 | 1112.5 | 1114.3 | 1041.9 | $\begin{array}{lll}5.0 & 3.7\end{array}$ | $\begin{array}{ll}11.0 & 8.2\end{array}$ | 17.0 12.6 | 50 | 1127.5 | 1129.4 | 1056.2 | 5.0 | 3.8 | 11. | $8 \cdot 3$ | $17.012 \cdot 9$ |
| 51 | 1112.8 | 1114.6 | $1042 \cdot 1$ | $\begin{array}{lll}5.1 & 3.8\end{array}$ | $\begin{array}{ll}11.1 & 8.2\end{array}$ | $\begin{array}{ll}17 \cdot 1 & 12.7\end{array}$ | 51 | 1127.8 | 1129.6 | 1056.4 | 5.1 | $3 \cdot 9$ | 11 | 4 | $17 \cdot 0$ |
| 52 | 1113.0 | 1114.8 | $1042 \cdot 3$ | 5.23 .9 | $\begin{array}{ll}11.2 & 8.3\end{array}$ | 17.212 .8 | 52 | 1128.0 | 1129.9 | 1056.7 | $5 \cdot 2$ | $3 \cdot 9$ | 11.2 | 8.5 | $\begin{array}{ll}17.2 & 13.0\end{array}$ |
| 53 | 1113.3 | $1115 \cdot 1$ | $1042 \cdot 6$ | $5.3 \quad 3.9$ | 11.38 | 17.312 .8 | 53 | 1128.3 | $1130 \cdot 1$ | $1056 \cdot 9$ | $5 \cdot 3$ | 4.0 | 11 | 8.6 | 17.3 $13 \cdot 1$ |
| 54 | 1113.5 | $1115 \cdot 3$ | $1042 \cdot 8$ | $5.4 \quad 4.0$ | 11.48 | $17.412 \cdot 9$ | 54 | 1128.5 | $1130 \cdot 4$ | 1057 | $5 \cdot 4$ |  | 11.4 | 8.6 | 172 |
| 55 | 1113.8 | 1115.6 | $1043 \cdot 1$ | $5.5 \quad 4.1$ | $11.5 \quad 8.5$ | $17.5 \quad 13.0$ | 55 | 1128.8 | $1130 \cdot 6$ | 1057.4 | 5.5 |  | 11.5 | 8.7 | $17 \cdot 513 \cdot 3$ |
| 57 | 1114.0 | $1115 \cdot 8$ | 1043.3 | $5 \cdot 6 \quad 4.2$ | $\begin{array}{lll}11.6 & 8.6\end{array}$ | $\begin{array}{llll}17 \cdot 6 & 13 \cdot 1\end{array}$ | 56 | 1129.0 | $1130 \cdot 9$ | 1057.6 | $5 \cdot 6$ | 4.2 | 11.6 | 8.8 | $\begin{array}{lllllllllll}17.6 & 13 \cdot 3\end{array}$ |
| 57 | 1114.3 | $1116 \cdot 1$ | $1043 \cdot 5$ | $\begin{array}{ll}5.7 & 4.2\end{array}$ | 11.78 | 17.713 .1 | 57 | 1129.3 | 1131.1 | 1057.9 | $5 \cdot 7$ | 4.3 | 11.7 | $8 \cdot 9$ | 177.713.4 |
| 58 | 1114.5 | 1116.3 | $1043 \cdot 8$ | $\begin{array}{ll}5.8 & 4.3\end{array}$ | $11.8 \quad 8.8$ | $\begin{array}{ll}17.8 & 13.2\end{array}$ | 58 | 1129.5 | $1131 \cdot 4$ | 1058.1 | 5.8 | $4 \cdot 4$ |  | 8.9 | $\begin{array}{lll}17.8 & 13.5\end{array}$ |
| 59 | 1114.8 | $1116 \cdot 6$ | 1044.0 | 59 | 11.988 | 17.913 .3 | 59 | 1129.8 | $1131 \cdot 6$ | 1058.3 | $5 \cdot 9$ |  | 11.9 | $9 \cdot 0$ | $17.913 \cdot 6$ |
| 60 | 11150 | 1116.8 | 1044 | 6.04 .5 | 12.08 | 18.013 .4 | 60 | $1130 \cdot 0$ | 1131 | 1058 | 6.0 | 4.6 | 12.0 | 9.1 | 18.013 .7 |


| Corr* | ${ }_{6}^{5}$ Corm $d$ |  | or Corrn |  | 45 | SUN | ARIES | MOON |  | orr* |  | Cerr* | $\stackrel{8}{6}$ | Cerrn |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| , | ' | , | , | , | 5 | ${ }^{6}$, | - | - | ' | ' | ${ }^{\prime}$ | , | , |  |
| 0.0 | 6.0 | 4.5 | 12.0 | 8.9 | 00 | 11150 | 1116.8 | $1044 \cdot 3$ | 0 | 00 | 65 | 46 | 12.0 | 9.1 |
| 0.1 | $6 \cdot 1$ | 4.5 | 12/1 | $9 \cdot 0$ | 01 | $1115 \cdot 3$ | 11171 | 1044.5 | 0.1 | 0.1 | $6 \cdot 1$ | 4.6 | 12-1 | 9.2 |
| 0.1 | $6 \cdot 2$ | 4.6 | 12'2 | 9.0 | 02 | $1115 \cdot 5$ | 1117.3 | 1044.7 | $0 \cdot 2$ | $0-2$ | $6 \cdot 2$ | 4.7 | 12-2 | 9.3 |
| 0.2 | $6 \cdot 3$ | 4.7 | 12.3 | 9.1 | 03 | $1115 \cdot 8$ | 11176 | 1045.0 | $0 \cdot 3$ | $0-2$ | $6 \cdot 3$ | 48 | $12 \cdot$ | 9.3 |
| 0.3 | 6.4 | 4.7 | 12.4 | 9.2 | 04 | 1116.0 | 1117.9 | $1045 \cdot 2$ | 04 | 0.3 | 64 | 49 | 12.4 | 9.4 |
| 0.4 | 6.5 | 4.8 | 12.5 | 9.3 | 05 | 1116.3 | 1118.1 | $1045 \cdot 4$ | Os | 04 | 65 | 49 | $12 \cdot 5$ | 9.5 |
| 0.4 | 6.6 | 4.9 | 12.6 | 9.3 | 06 | 1116.5 | 11184 | $1045 \cdot 7$ | 06 | 05 | 66 | 50 | 12.6 | 96 |
| 0.5 | 6.7 | 5.0 | 12.7 | 9.4 | 07 | $1116 \cdot 8$ | 11186 | 10 45.9 | $0 \cdot 7$ | 0.5 | 6.7 | 5.1 | $12 \cdot 7$ | 9.6 |
| 06 | 68 | $5 \cdot 0$ | 12.8 | 9.5 | 08 | $\begin{array}{lll}11 & 17 \% \\ 11 & 17\end{array}$ | 1118.9 | 10 46.2 | 08 | 06 | 6* | $5 \cdot 2$ | 12.8 | 9.7 |
| 0.7 | 69 | 51 | $12 \cdot 9$ | 96 | 09 | $1117 \cdot 3$ | $1119 \cdot 1$ | $1046 \cdot 4$ | 09 | 0.7 | 6-9 | 52 | 129 | 9.8 |
| 0.7 | 90 | 5.2 | 13.0 | 9.6 | 10 | 1117.5 | 1119.4 | $1046 \cdot 6$ | 1.9 | 08 | 70 | 5.3 | 130 | 99 |
| 0.8 | \%-1 | 5.3 | 13.1 | 9.7 | 11 | $1117 \cdot 8$ | 11196 | $1046 \cdot 9$ | 1 |  | 71 | 54 | 132 | 99 |
| $0 \cdot 9$ | $7 \cdot$ | 5.3 | 13.2 | 9.8 | 12 | $1118 \cdot 0$ | 11199 | 10 47.1 | $1 \cdot 2$ | 09 | 72 | 5.5 | 132 | 100 |
| 10 | T.3 | 5.4 | 13.3 | 9.9 | 13 | 1118.9 | 11 | 10 | 1.3 | 10 | 7-3 | 5. | 13.3 | 10 |

Find the 'd' Correction in the Increments and Corrections pages for the minutes of GMT for your sight in this case for a 'd' of 1.0 ' the Correction is 0.8 ' for 45 minutes of GMT


Place the values of the Zenith Distance and Declination in the appropriate boxes at the bottom of the Form to

Calculate your Latitude at the time of the Sight.


COMPLETED
Noon Sight Form
for
this example


| Step 1 Determine the Zenith Distance |  |  | 89 - | $60.0{ }^{\prime}$ |
| :---: | :---: | :---: | :---: | :---: |
| 2-1 | Record Ho from Step 1, above, and then subtract it from $90^{\circ}$ to get the zenith distance. | Ho | 65 | 0.8 |
| 2-2 | Zenith Distance | Z | 24 | 59.2 |


| Step 3 |  | Use the Almanac to Find Sun's Declination |  |  | GMT date $=$ |  | 11-Mar-11 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3-1 |  | the date and GM e the Sun reache | he sight peak height) | GMT | hr) = | 16 | $\mathrm{GMT}(\mathrm{min})=$ | 45 |
| 3-2 | Turn <br> of the the ho | the daily page of ight, and find the of the sight (lin | Imanac for the date declination (dec) for and record it here | Dec (hr) |  |  | $\mid l l l_{\mathbf{N}} \mathrm{S}^{\text {S }} 3{ }^{\circ}$ | 40.4 |
| 3-3 | Recor colum d-valu is larger | the d -value from in the Almanac. and the d-corr , or - if it is sma | otom of the dec the signs of the dec for the next hour | d-value |  | - 1.0 | d-corr $=\stackrel{+}{+} 0.8$ |  |
|  | Turn the ba and fi | the Increments of the Almanac the minutes tab | orrections pages at <br> to 12 , in the notes) <br> thr GMT minutes | Declination $=$ |  |  | $\begin{array}{\|lll\|} \hline \mathbf{N} & & 0 \\ & \text { S } 3 & \\ \mathbf{S} & & \\ \hline \end{array}$ | 39.6 |
|  | (line 3 <br> line in <br> the d - | 1). On the righthe table, find the alue of line 3-3 | side of the double corresponding to |  | Apply the d-corr to the dec (hr) and record it above |  |  |  |
| Step 4 Find Latitude <br> from Zenith Distance and Declination <br> Record DR Latitide to use as a guide, and then take the sum or difference of zenith distance and declination to find your true Latitude at LAN |  |  |  | Declination or Zenith Distance |  |  | 24 o | 59.2 |
|  |  |  |  | Zenith Distance or <br> Declination |  |  | $3 \quad 0$ | 39.6 |
|  |  |  |  | Latitude = |  | N | 21 | 19.6 |

## Summary

You have Learned How to Determine the time of LAN

- You have Seen How to Determine your Latitude from your NOON Sight

