**ANNEXURE 1**

**EXAMINATION NOTES AND DEVIATION CARD**

1. **All** relevant working must be shown.

2. **All** work done on the chart must be done lightly, using a 2B pencil.

3. Corrections applicable to courses and bearings must be calculated correct to the nearest 1° and plotted to a similar accuracy.

**DEVIATION CARD**

| Comp. Head | Dev. | | Comp. Head | Dev. |
|---|---|---|---|---|
| 000 | 4˚ E | | 180 | 3˚ E |
| 010 | 5˚ E | | 190 | 4˚ E |
| 020 | 4˚ E | | 200 | 5˚ E |
| 030 | 3˚ E | | 210 | 4˚ E |
| 040 | 2˚ E | | 220 | 3˚ E |
| 050 | 1˚ E | | 230 | 2˚ E |
| 060 | 1˚ W | | 240 | 1˚ E |
| 070 | 2˚ W | | 250 | 0˚ |
| 080 | 3˚ W | | 260 | 1˚ W |
| 090 | 4˚ W | | 270 | 2˚ W |
| 100 | 5˚ W | | 280 | 3˚ W |
| 110 | 4˚ W | | 290 | 4˚ W |
| 120 | 3˚ W | | 300 | 5˚ W |
| 130 | 2˚ W | | 310 | 4˚ W |
| 140 | 1˚ W | | 320 | 3˚ W |
| 150 | 0˚ | | 330 | 2˚ W |
| 160 | 1˚ E | | 340 | 1˚ W |
| 170 | 2˚ E | | 350 | 2˚ E |

IEB Copyright © 2011 

## ANNEXURE 2

PREDICTED HOURLY HEIGHTS IN METRES

**KNYSNA**

DECEMBER 2007

| | | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S | 1 | 0.84 | 0.68 | 0.61 | 0.64 | 0.75 | 0.89 | 1.07 | 1.25 | 1.38 | 1.43 | 1.40 | 1.30 | 1.16 | 1.00 | 0.87 | 0.81 | 0.80 | 0.85 | 0.94 | 1.06 | 1.18 | 1.25 | 1.24 | 1.17 |
| $ | 2 | 1.04 | 0.89 | 0.76 | 0.70 | 0.72 | 0.78 | 0.89 | 1.04 | 1.20 | 1.33 | 1.40 | 1.40 | 1.34 | 1.21 | 1.05 | 0.92 | 0.84 | 0.80 | 0.81 | 0.89 | 1.00 | 1.12 | 1.20 | 1.23 |
| M | 3 | 1.19 | 1.09 | 0.95 | 0.83 | 0.76 | 0.74 | 0.77 | 0.87 | 1.01 | 1.18 | 1.32 | 1.42 | 1.45 | 1.39 | 1.25 | 1.08 | 0.92 | 0.80 | 0.74 | 0.75 | 0.83 | 0.96 | 1.10 | 1.22 |
| TD | 4 | 1.28 | 1.26 | 1.15 | 1.00 | 0.86 | 0.75 | 0.70 | 0.73 | 0.84 | 1.01 | 1.21 | 1.38 | 1.49 | 1.52 | 1.43 | 1.25 | 1.04 | 0.85 | 0.71 | 0.65 | 0.68 | 0.80 | 0.97 | 1.15 |
| W | 5 | 1.29 | 1.37 | 1.33 | 1.20 | 1.01 | 0.83 | 0.69 | 0.64 | 0.69 | 0.84 | 1.06 | 1.29 | 1.48 | 1.59 | 1.58 | 1.44 | 1.21 | 0.96 | 0.74 | 0.59 | 0.56 | 0.64 | 0.81 | 1.03 |
| TD | 6 | 1.24 | 1.41 | 1.46 | 1.39 | 1.20 | 0.97 | 0.75 | 0.61 | 0.58 | 0.68 | 0.89 | 1.15 | 1.40 | 1.59 | 1.67 | 1.60 | 1.39 | 1.11 | 0.82 | 0.59 | 0.48 | 0.50 | 0.65 | 0.88 |
| FV | 7 | 1.14 | 1.38 | 1.52 | 1.54 | 1.39 | 1.15 | 0.87 | 0.64 | 0.52 | 0.55 | 0.72 | 0.99 | 1.28 | 1.53 | 1.69 | 1.71 | 1.56 | 1.29 | 0.96 | 0.66 | 0.46 | 0.40 | 0.50 | 0.72 |
| S | 8 | 1.00 | 1.29 | 1.51 | 1.62 | 1.56 | 1.34 | 1.03 | 0.73 | 0.52 | 0.46 | 0.57 | 0.81 | 1.12 | 1.42 | 1.65 | 1.76 | 1.69 | 1.47 | 1.13 | 0.78 | 0.50 | 0.36 | 0.38 | 0.56 |
| $ | 9 | 0.84 | 1.15 | 1.44 | 1.63 | 1.66 | 1.51 | 1.22 | 0.88 | 0.59 | 0.44 | 0.46 | 0.65 | 0.94 | 1.26 | 1.55 | 1.74 | 1.77 | 1.62 | 1.32 | 0.95 | 0.61 | 0.38 | 0.31 | 0.42 |
| M | 10 | 0.67 | 0.99 | 1.31 | 1.57 | 1.70 | 1.64 | 1.40 | 1.06 | 0.73 | 0.49 | 0.41 | 0.51 | 0.76 | 1.08 | 1.40 | 1.65 | 1.78 | 1.72 | 1.49 | 1.14 | 0.77 | 0.47 | 0.31 | 0.33 |
| TD | 11 | 0.52 | 0.82 | 1.15 | 1.46 | 1.66 | 1.71 | 1.56 | 1.26 | 0.91 | 0.60 | 0.43 | 0.43 | 0.61 | 0.89 | 1.21 | 1.51 | 1.71 | 1.76 | 1.62 | 1.32 | 0.95 | 0.61 | 0.37 | 0.30 |
| W | 12 | 0.41 | 0.66 | 0.98 | 1.30 | 1.57 | 1.70 | 1.66 | 1.43 | 1.10 | 0.77 | 0.52 | 0.43 | 0.51 | 0.73 | 1.02 | 1.33 | 1.58 | 1.72 | 1.69 | 1.48 | 1.15 | 0.79 | 0.49 | 0.33 |
| TD | 13 | 0.35 | 0.52 | 0.80 | 1.12 | 1.42 | 1.62 | 1.68 | 1.56 | 1.30 | 0.98 | 0.69 | 0.50 | 0.47 | 0.61 | 0.85 | 1.13 | 1.41 | 1.61 | 1.68 | 1.58 | 1.32 | 0.99 | 0.67 | 0.43 |
| FV | 14 | 0.35 | 0.44 | 0.65 | 0.94 | 1.23 | 1.48 | 1.63 | 1.63 | 1.46 | 1.19 | 0.90 | 0.66 | 0.53 | 0.55 | 0.71 | 0.95 | 1.20 | 1.44 | 1.59 | 1.60 | 1.45 | 1.18 | 0.87 | 0.60 |
| S | 15 | 0.43 | 0.42 | 0.55 | 0.77 | 1.04 | 1.30 | 1.50 | 1.60 | 1.56 | 1.38 | 1.13 | 0.88 | 0.68 | 0.59 | 0.63 | 0.79 | 1.00 | 1.22 | 1.42 | 1.52 | 1.50 | 1.34 | 1.09 | 0.82 |
| $ | 16 | 0.60 | 0.48 | 0.50 | 0.65 | 0.86 | 1.09 | 1.31 | 1.49 | 1.56 | 1.51 | 1.35 | 1.13 | 0.90 | 0.72 | 0.65 | 0.69 | 0.82 | 1.00 | 1.19 | 1.36 | 1.44 | 1.41 | 1.26 | 1.05 |
| M | 17 | 0.83 | 0.64 | 0.56 | 0.59 | 0.71 | 0.89 | 1.09 | 1.30 | 1.47 | 1.54 | 1.51 | 1.38 | 1.18 | 0.96 | 0.77 | 0.68 | 0.70 | 0.79 | 0.94 | 1.11 | 1.28 | 1.37 | 1.35 | 1.25 |
| TD | 18 | 1.08 | 0.88 | 0.72 | 0.63 | 0.64 | 0.72 | 0.87 | 1.06 | 1.27 | 1.45 | 1.56 | 1.55 | 1.45 | 1.25 | 1.01 | 0.81 | 0.68 | 0.66 | 0.72 | 0.85 | 1.03 | 1.20 | 1.32 | 1.35 |
| W | 19 | 1.29 | 1.15 | 0.97 | 0.78 | 0.67 | 0.64 | 0.68 | 0.81 | 1.01 | 1.25 | 1.47 | 1.61 | 1.64 | 1.54 | 1.33 | 1.05 | 0.81 | 0.64 | 0.57 | 0.61 | 0.74 | 0.95 | 1.16 | 1.33 |
| TD | 20 | 1.41 | 1.39 | 1.25 | 1.04 | 0.83 | 0.66 | 0.58 | 0.60 | 0.73 | 0.97 | 1.25 | 1.51 | 1.69 | 1.74 | 1.63 | 1.38 | 1.06 | 0.77 | 0.56 | 0.46 | 0.49 | 0.66 | 0.91 | 1.17 |
| FV | 21 | 1.39 | 1.51 | 1.50 | 1.35 | 1.10 | 0.83 | 0.61 | 0.50 | 0.51 | 0.67 | 0.95 | 1.28 | 1.58 | 1.78 | 1.83 | 1.69 | 1.40 | 1.03 | 0.69 | 0.45 | 0.34 | 0.40 | 0.61 | 0.91 |
| S | 22 | 1.22 | 1.48 | 1.63 | 1.61 | 1.42 | 1.11 | 0.79 | 0.53 | 0.40 | 0.43 | 0.64 | 0.96 | 1.32 | 1.64 | 1.86 | 1.89 | 1.72 | 1.37 | 0.96 | 0.59 | 0.33 | 0.25 | 0.35 | 0.62 |
| $ | 23 | 0.96 | 1.32 | 1.60 | 1.75 | 1.69 | 1.44 | 1.08 | 0.72 | 0.45 | 0.33 | 0.40 | 0.64 | 0.99 | 1.37 | 1.70 | 1.91 | 1.91 | 1.68 | 1.29 | 0.85 | 0.48 | 0.24 | 0.20 | 0.36 |
| M | 24 | 0.67 | 1.05 | 1.43 | 1.72 | 1.83 | 1.72 | 1.41 | 1.01 | 0.64 | 0.38 | 0.29 | 0.40 | 0.68 | 1.04 | 1.43 | 1.75 | 1.93 | 1.87 | 1.60 | 1.17 | 0.73 | 0.37 | 0.18 | 0.21 |
| TD | 25 | 0.43 | 0.77 | 1.17 | 1.54 | 1.80 | 1.86 | 1.69 | 1.34 | 0.93 | 0.57 | 0.34 | 0.31 | 0.46 | 0.75 | 1.11 | 1.48 | 1.77 | 1.89 | 1.78 | 1.46 | 1.02 | 0.60 | 0.30 | 0.18 |
| W | 26 | 0.27 | 0.54 | 0.90 | 1.29 | 1.64 | 1.84 | 1.83 | 1.60 | 1.24 | 0.84 | 0.53 | 0.36 | 0.38 | 0.56 | 0.85 | 1.19 | 1.52 | 1.76 | 1.81 | 1.63 | 1.28 | 0.87 | 0.50 | 0.27 |
| TD | 27 | 0.24 | 0.39 | 0.68 | 1.04 | 1.40 | 1.69 | 1.82 | 1.74 | 1.48 | 1.13 | 0.78 | 0.53 | 0.43 | 0.49 | 0.69 | 0.96 | 1.26 | 1.54 | 1.70 | 1.67 | 1.45 | 1.11 | 0.74 | 0.45 |
| FV | 28 | 0.30 | 0.35 | 0.54 | 0.84 | 1.16 | 1.47 | 1.69 | 1.74 | 1.61 | 1.35 | 1.04 | 0.75 | 0.57 | 0.53 | 0.62 | 0.81 | 1.06 | 1.31 | 1.51 | 1.59 | 1.50 | 1.27 | 0.96 | 0.66 |
| S | 29 | 0.45 | 0.39 | 0.49 | 0.70 | 0.97 | 1.25 | 1.49 | 1.63 | 1.63 | 1.48 | 1.24 | 0.98 | 0.77 | 0.65 | 0.65 | 0.75 | 0.92 | 1.12 | 1.31 | 1.45 | 1.46 | 1.34 | 1.12 | 0.86 |
| $ | 30 | 0.64 | 0.52 | 0.52 | 0.65 | 0.84 | 1.07 | 1.29 | 1.47 | 1.55 | 1.51 | 1.37 | 1.18 | 0.97 | 0.81 | 0.73 | 0.75 | 0.85 | 0.98 | 1.13 | 1.27 | 1.35 | 1.33 | 1.21 | 1.03 |
| M | 31 | 0.84 | 0.69 | 0.62 | 0.65 | 0.77 | 0.93 | 1.11 | 1.28 | 1.41 | 1.46 | 1.42 | 1.31 | 1.16 | 0.99 | 0.87 | 0.81 | 0.82 | 0.89 | 0.99 | 1.10 | 1.20 | 1.25 | 1.23 | 1.15 |

IEB Copyright © 2011

## ANNEXURE 3

# ALTITUDE CORRECTION TABLES 10° – 90° – SUN, STARS, PLANETS

**SUN**

| OCT.—MAR. App. Alt. | Lower Limb | Upper Limb | APR.—SEPT. App. Alt. | Lower Limb | Upper Limb |
|---|---|---|---|---|---|
| ° ′ | ′ | ′ | ° ′ | ′ | ′ |
| 9 34 | +10·8 | −21·5 | 9 39 | +10·6 | −21·2 |
| 9 45 | +10·9 | −21·4 | 9 51 | +10·7 | −21·1 |
| 9 56 | +11·0 | −21·3 | 10 03 | +10·8 | −21·0 |
| 10 08 | +11·1 | −21·2 | 10 15 | +10·9 | −20·9 |
| 10 21 | +11·2 | −21·1 | 10 27 | +11·0 | −20·8 |
| 10 34 | +11·3 | −21·0 | 10 40 | +11·1 | −20·7 |
| 10 47 | +11·4 | −20·9 | 10 54 | +11·2 | −20·6 |
| 11 01 | +11·5 | −20·8 | 11 08 | +11·3 | −20·5 |
| 11 15 | +11·6 | −20·7 | 11 23 | +11·4 | −20·4 |
| 11 30 | +11·7 | −20·6 | 11 38 | +11·5 | −20·3 |
| 11 46 | +11·8 | −20·5 | 11 54 | +11·6 | −20·2 |
| 12 02 | +11·9 | −20·4 | 12 10 | +11·7 | −20·1 |
| 12 19 | +12·0 | −20·3 | 12 28 | +11·8 | −20·0 |
| 12 37 | +12·1 | −20·2 | 12 46 | +11·9 | −19·9 |
| 12 55 | +12·2 | −20·1 | 13 05 | +12·0 | −19·8 |
| 13 14 | +12·3 | −20·0 | 13 24 | +12·1 | −19·7 |
| 13 35 | +12·4 | −19·9 | 13 45 | +12·2 | −19·6 |
| 13 56 | +12·5 | −19·8 | 14 07 | +12·3 | −19·5 |
| 14 18 | +12·6 | −19·7 | 14 30 | +12·4 | −19·4 |
| 14 42 | +12·7 | −19·6 | 14 54 | +12·5 | −19·3 |
| 15 06 | +12·8 | −19·5 | 15 19 | +12·6 | −19·2 |
| 15 32 | +12·9 | −19·4 | 15 46 | +12·7 | −19·1 |
| 15 59 | +13·0 | −19·3 | 16 14 | +12·8 | −19·0 |
| 16 28 | +13·1 | −19·2 | 16 44 | +12·9 | −18·9 |
| 16 59 | +13·2 | −19·1 | 17 15 | +13·0 | −18·8 |
| 17 32 | +13·3 | −19·0 | 17 48 | +13·1 | −18·7 |
| 18 06 | +13·4 | −18·9 | 18 24 | +13·2 | −18·6 |
| 18 42 | +13·5 | −18·8 | 19 01 | +13·3 | −18·5 |
| 19 21 | +13·6 | −18·7 | 19 42 | +13·4 | −18·4 |
| 20 03 | +13·7 | −18·6 | 20 25 | +13·5 | −18·3 |
| 20 48 | +13·8 | −18·5 | 21 11 | +13·6 | −18·2 |
| 21 35 | +13·9 | −18·4 | 22 00 | +13·7 | −18·1 |
| 22 26 | +14·0 | −18·3 | 22 54 | +13·8 | −18·0 |
| 23 22 | +14·1 | −18·2 | 23 51 | +13·9 | −17·9 |
| 24 21 | +14·2 | −18·1 | 24 53 | +14·0 | −17·8 |
| 25 26 | +14·3 | −18·0 | 26 00 | +14·1 | −17·7 |
| 26 36 | +14·4 | −17·9 | 27 13 | +14·2 | −17·6 |
| 27 52 | +14·5 | −17·8 | 28 33 | +14·3 | −17·5 |
| 29 15 | +14·6 | −17·7 | 30 00 | +14·4 | −17·4 |
| 30 46 | +14·7 | −17·6 | 31 35 | +14·5 | −17·3 |
| 32 26 | +14·8 | −17·5 | 33 20 | +14·6 | −17·2 |
| 34 17 | +14·9 | −17·4 | 35 17 | +14·7 | −17·1 |
| 36 20 | +15·0 | −17·3 | 37 26 | +14·8 | −17·0 |
| 38 36 | +15·1 | −17·2 | 39 50 | +14·9 | −16·9 |
| 41 08 | +15·2 | −17·1 | 42 31 | +15·0 | −16·8 |
| 43 59 | +15·3 | −17·0 | 45 31 | +15·1 | −16·7 |
| 47 10 | +15·4 | −16·9 | 48 55 | +15·2 | −16·6 |
| 50 46 | +15·5 | −16·8 | 52 44 | +15·3 | −16·5 |
| 54 49 | +15·6 | −16·7 | 57 02 | +15·4 | −16·4 |
| 59 23 | +15·7 | −16·6 | 61 51 | +15·5 | −16·3 |
| 64 30 | +15·8 | −16·5 | 67 17 | +15·6 | −16·2 |
| 70 12 | +15·9 | −16·4 | 73 16 | +15·7 | −16·1 |
| 76 26 | +16·0 | −16·3 | 79 43 | +15·8 | −16·0 |
| 83 05 | +16·1 | −16·2 | 86 32 | +15·9 | −15·9 |
| 90 00 | | | 90 00 | | |

**STARS AND PLANETS**

| App. Alt. | Corrⁿ |
|---|---|
| ° ′ | ′ |
| 9 56 | −5·3 |
| 10 08 | −5·2 |
| 10 20 | −5·1 |
| 10 33 | −5·0 |
| 10 46 | −4·9 |
| 11 00 | −4·8 |
| 11 14 | −4·7 |
| 11 29 | −4·6 |
| 11 45 | −4·5 |
| 12 01 | −4·4 |
| 12 18 | −4·3 |
| 12 35 | −4·2 |
| 12 54 | −4·1 |
| 13 13 | −4·0 |
| 13 33 | −3·9 |
| 13 54 | −3·8 |
| 14 16 | −3·7 |
| 14 40 | −3·6 |
| 15 04 | −3·5 |
| 15 30 | −3·4 |
| 15 57 | −3·3 |
| 16 26 | −3·2 |
| 16 56 | −3·1 |
| 17 28 | −3·0 |
| 18 02 | −2·9 |
| 18 38 | −2·8 |
| 19 17 | −2·7 |
| 19 58 | −2·6 |
| 20 42 | −2·5 |
| 21 28 | −2·4 |
| 22 19 | −2·3 |
| 23 13 | −2·2 |
| 24 11 | −2·1 |
| 25 14 | −2·0 |
| 26 22 | −1·9 |
| 27 36 | −1·8 |
| 28 56 | −1·7 |
| 30 24 | −1·6 |
| 32 00 | −1·5 |
| 33 45 | −1·4 |
| 35 40 | −1·3 |
| 37 48 | −1·2 |
| 40 08 | −1·1 |
| 42 44 | −1·0 |
| 45 36 | −0·9 |
| 48 47 | −0·8 |
| 52 18 | −0·7 |
| 56 11 | −0·6 |
| 60 28 | −0·5 |
| 65 08 | −0·4 |
| 70 11 | −0·3 |
| 75 34 | −0·2 |
| 81 13 | −0·1 |
| 87 03 | 0·0 |
| 90 00 | |

| App. Alt. | Additional Corrⁿ |
|---|---|
| | **1987** |
| | **VENUS** |
| | Jan. 1-Jan. 4 |
| ° | ′ |
| 0 | + 0·3 |
| 34 | + 0·2 |
| 60 | + 0·1 |
| | Jan. 5-Feb. 25 |
| ° | ′ |
| 0 | + 0·2 |
| 41 | + 0·1 |
| 76 | |
| | Feb. 26-Dec. 31 |
| ° | ′ |
| 0 | |
| 60 | + 0·1 |
| | **MARS** |
| | Jan. 1-Dec. 31 |
| ° | ′ |
| 0 | |
| 60 | + 0·1 |

**DIP**

| Ht. of Eye | Corrⁿ | Ht. of Eye | Ht. of Eye | Corrⁿ |
|---|---|---|---|---|
| m | | ft. | m | |
| 2·4 | −2·8 | 8·0 | 1·0 | − 1·8 |
| 2·6 | −2·9 | 8·6 | 1·5 | − 2·2 |
| 2·8 | −3·0 | 9·2 | 2·0 | − 2·5 |
| 3·0 | −3·1 | 9·8 | 2·5 | − 2·8 |
| 3·2 | −3·2 | 10·5 | 3·0 | − 3·0 |
| 3·4 | −3·3 | 11·2 | See table ← | |
| 3·6 | −3·4 | 11·9 | | |
| 3·8 | −3·5 | 12·6 | m | ′ |
| 4·0 | −3·6 | 13·3 | 20 | − 7·9 |
| 4·3 | −3·7 | 14·1 | 22 | − 8·3 |
| 4·5 | −3·8 | 14·9 | 24 | − 8·6 |
| 4·7 | −3·9 | 15·7 | 26 | − 9·0 |
| 5·0 | −4·0 | 16·5 | 28 | − 9·3 |
| 5·2 | −4·1 | 17·4 | | |
| 5·5 | −4·2 | 18·3 | 30 | − 9·6 |
| 5·8 | −4·3 | 19·1 | 32 | −10·0 |
| 6·1 | −4·4 | 20·1 | 34 | −10·3 |
| 6·3 | −4·5 | 21·0 | 36 | −10·6 |
| 6·6 | −4·6 | 22·0 | 38 | −10·8 |
| 6·9 | −4·7 | 22·9 | | |
| 7·2 | −4·8 | 23·9 | 40 | −11·1 |
| 7·5 | −4·9 | 24·9 | 42 | −11·4 |
| 7·9 | −5·0 | 26·0 | 44 | −11·7 |
| 8·2 | −5·1 | 27·1 | 46 | −11·9 |
| 8·5 | −5·2 | 28·1 | 48 | −12·2 |
| 8·8 | −5·3 | 29·2 | ft. | ′ |
| 9·2 | −5·4 | 30·4 | 2 | − 1·4 |
| 9·5 | −5·5 | 31·5 | 4 | − 1·9 |
| 9·9 | −5·6 | 32·7 | 6 | − 2·4 |
| 10·3 | −5·7 | 33·9 | 8 | − 2·7 |
| 10·6 | −5·8 | 35·1 | 10 | − 3·1 |
| 11·0 | −5·9 | 36·3 | See table ← | |
| 11·4 | −6·0 | 37·6 | | |
| 11·8 | −6·1 | 38·9 | ft. | ′ |
| 12·2 | −6·2 | 40·1 | 70 | − 8·1 |
| 12·6 | −6·3 | 41·5 | 75 | − 8·4 |
| 13·0 | −6·4 | 42·8 | 80 | − 8·7 |
| 13·4 | −6·5 | 44·2 | 85 | − 8·9 |
| 13·8 | −6·6 | 45·5 | 90 | − 9·2 |
| 14·2 | −6·7 | 46·9 | 95 | − 9·5 |
| 14·7 | −6·8 | 48·4 | | |
| 15·1 | −6·9 | 49·8 | 100 | − 9·7 |
| 15·5 | −7·0 | 51·3 | 105 | − 9·9 |
| 16·0 | −7·1 | 52·8 | 110 | −10·2 |
| 16·5 | −7·2 | 54·3 | 115 | −10·4 |
| 16·9 | −7·3 | 55·8 | 120 | −10·6 |
| 17·4 | −7·4 | 57·4 | 125 | −10·8 |
| 17·9 | −7·5 | 58·9 | | |
| 18·4 | −7·6 | 60·5 | 130 | −11·1 |
| 18·8 | −7·7 | 62·1 | 135 | −11·3 |
| 19·3 | −7·8 | 63·8 | 140 | −11·5 |
| 19·8 | −7·9 | 65·4 | 145 | −11·7 |
| 20·4 | −8·0 | 67·1 | 150 | −11·9 |
| 20·9 | −8·1 | 68·8 | 155 | −12·1 |
| 21·4 | | 70·5 | | |

App. Alt. = Apparent altitude = Sextant altitude corrected for index error and dip.

IEB Copyright © 2011 

## ANNEXURE 4

### CONVERSION OF ARC TO TIME

| 0°–59° | | 60°–119° | | 120°–179° | | 180°–239° | | 240°–299° | | 300°–359° | | | 0′·00 | 0′·25 | 0′·50 | 0′·75 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ° | h m | ° | h m | ° | h m | ° | h m | ° | h m | ° | h m | ′ | m s | m s | m s | m s |
| 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.

IEB Copyright © 2011

## ANNEXURE 5 NAUTICAL ALMANAC



| G.M.T. (UT) | SUN G.H.A. | SUN Dec. | MOON G.H.A. | MOON v | MOON Dec. | MOON d | MOON H.P. |
|---|---|---|---|---|---|---|---|
| d h | ° ′ | ° ′ | ° ′ | ′ | ° ′ | ′ | ′ |
| 17 00 | 178 56.4 | N13 39.8 | 266 55.5 | 10.7 | N24 39.6 | 8.0 | 55.4 |
| 01 | 193 56.6 | 39.0 | 281 25.2 | 10.5 | 24 47.6 | 7.7 | 55.4 |
| 02 | 208 56.7 | 38.2 | 295 54.7 | 10.6 | 24 55.3 | 7.7 | 55.4 |
| 03 | 223 56.8 | .. 37.4 | 310 24.3 | 10.5 | 25 03.0 | 7.5 | 55.3 |
| 04 | 238 57.0 | 36.6 | 324 53.8 | 10.5 | 25 10.5 | 7.5 | 55.3 |
| 05 | 253 57.1 | 35.9 | 339 23.3 | 10.4 | 25 18.0 | 7.2 | 55.3 |
| 06 | 268 57.2 | N13 35.1 | 353 52.7 | 10.4 | N25 25.2 | 7.2 | 55.3 |
| 07 | 283 57.3 | 34.3 | 8 22.1 | 10.4 | 25 32.4 | 7.0 | 55.2 |
| 08 | 298 57.5 | 33.5 | 22 51.5 | 10.3 | 25 39.4 | 6.9 | 55.2 |
| M 09 | 313 57.6 | .. 32.7 | 37 20.8 | 10.3 | 25 46.3 | 6.8 | 55.2 |
| O 10 | 328 57.7 | 31.9 | 51 50.1 | 10.3 | 25 53.1 | 6.6 | 55.2 |
| N 11 | 343 57.9 | 31.1 | 66 19.4 | 10.2 | 25 59.7 | 6.5 | 55.1 |
| D 12 | 358 58.0 | N13 30.3 | 80 48.6 | 10.2 | N26 06.2 | 6.3 | 55.1 |
| A 13 | 13 58.1 | 29.5 | 95 17.8 | 10.2 | 26 12.5 | 6.3 | 55.1 |
| Y 14 | 28 58.3 | 28.7 | 109 47.0 | 10.1 | 26 18.8 | 6.1 | 55.1 |
| 15 | 43 58.4 | .. 27.9 | 124 16.1 | 10.1 | 26 24.9 | 5.9 | 55.0 |
| 16 | 58 58.5 | 27.1 | 138 45.2 | 10.1 | 26 30.8 | 5.9 | 55.0 |
| 17 | 73 58.7 | 26.3 | 153 14.3 | 10.0 | 26 36.7 | 5.6 | 55.0 |
| 18 | 88 58.8 | N13 25.5 | 167 43.3 | 10.0 | N26 42.3 | 5.6 | 55.0 |
| 19 | 103 58.9 | 24.7 | 182 12.3 | 10.0 | 26 47.9 | 5.4 | 54.9 |
| 20 | 118 59.1 | 23.9 | 196 41.3 | 9.9 | 26 53.3 | 5.3 | 54.9 |
| 21 | 133 59.2 | .. 23.1 | 211 10.2 | 10.0 | 26 58.6 | 5.2 | 54.9 |
| 22 | 148 59.3 | 22.3 | 225 39.2 | 9.8 | 27 03.8 | 5.0 | 54.9 |
| 23 | 163 59.5 | 21.5 | 240 08.0 | 9.9 | 27 08.8 | 4.9 | 54.9 |
| 18 00 | 178 59.6 | N13 20.7 | 254 36.9 | 9.9 | N27 13.7 | 4.7 | 54.8 |
| 01 | 193 59.7 | 19.9 | 269 05.8 | 9.8 | 27 18.4 | 4.6 | 54.8 |
| 02 | 208 59.9 | 19.1 | 283 34.6 | 9.8 | 27 23.0 | 4.5 | 54.8 |
| 03 | 224 00.0 | .. 18.3 | 298 03.4 | 9.8 | 27 27.5 | 4.3 | 54.8 |
| 04 | 239 00.1 | 17.5 | 312 32.2 | 9.7 | 27 31.8 | 4.2 | 54.8 |
| 05 | 254 00.3 | 16.7 | 327 00.9 | 9.8 | 27 36.0 | 4.0 | 54.7 |
| 06 | 269 00.4 | N13 15.9 | 341 29.7 | 9.7 | N27 40.0 | 3.9 | 54.7 |
| 07 | 284 00.5 | 15.1 | 355 58.4 | 9.7 | 27 43.9 | 3.8 | 54.7 |
| T 08 | 299 00.7 | 14.3 | 10 27.1 | 9.7 | 27 47.7 | 3.7 | 54.7 |
| U 09 | 314 00.8 | .. 13.5 | 24 55.8 | 9.6 | 27 51.4 | 3.4 | 54.7 |
| E 10 | 329 01.0 | 12.7 | 39 24.4 | 9.7 | 27 54.8 | 3.4 | 54.6 |
| S 11 | 344 01.1 | 11.9 | 53 53.1 | 9.6 | 27 58.2 | 3.2 | 54.6 |
| D 12 | 359 01.2 | N13 11.1 | 68 21.7 | 9.6 | N28 01.4 | 3.1 | 54.6 |
| A 13 | 14 01.4 | 10.3 | 82 50.3 | 9.7 | 28 04.5 | 2.9 | 54.6 |
| Y 14 | 29 01.5 | 09.5 | 97 19.0 | 9.6 | 28 07.4 | 2.8 | 54.6 |
| 15 | 44 01.6 | .. 08.7 | 111 47.6 | 9.5 | 28 10.2 | 2.7 | 54.6 |
| 16 | 59 01.8 | 07.9 | 126 16.1 | 9.6 | 28 12.9 | 2.5 | 54.5 |
| 17 | 74 01.9 | 07.0 | 140 44.7 | 9.6 | 28 15.4 | 2.4 | 54.5 |
| 18 | 89 02.0 | N13 06.2 | 155 13.3 | 9.6 | N28 17.8 | 2.2 | 54.5 |
| 19 | 104 02.2 | 05.4 | 169 41.9 | 9.5 | 28 20.0 | 2.1 | 54.5 |
| 20 | 119 02.3 | 04.6 | 184 10.4 | 9.6 | 28 22.1 | 1.9 | 54.5 |
| 21 | 134 02.5 | .. 03.8 | 198 39.0 | 9.5 | 28 24.0 | 1.8 | 54.5 |
| 22 | 149 02.6 | 03.0 | 213 07.5 | 9.6 | 28 25.8 | 1.7 | 54.4 |
| 23 | 164 02.7 | 02.2 | 227 36.1 | 9.5 | 28 27.5 | 1.5 | 54.4 |
| 19 00 | 179 02.9 | N13 01.4 | 242 04.6 | 9.6 | N28 29.0 | 1.4 | 54.4 |
| 01 | 194 03.0 | 13 00.6 | 256 33.2 | 9.5 | 28 30.4 | 1.3 | 54.4 |
| 02 | 209 03.2 | 12 59.8 | 271 01.7 | 9.6 | 28 31.7 | 1.1 | 54.4 |
| 03 | 224 03.3 | .. 59.0 | 285 30.3 | 9.5 | 28 32.8 | 0.9 | 54.4 |
| 04 | 239 03.4 | 58.1 | 299 58.8 | 9.6 | 28 33.7 | 0.8 | 54.4 |
| 05 | 254 03.6 | 57.3 | 314 27.4 | 9.5 | 28 34.5 | 0.7 | 54.3 |
| 06 | 269 03.7 | N12 56.5 | 328 55.9 | 9.6 | N28 35.2 | 0.6 | 54.3 |
| W 07 | 284 03.9 | 55.7 | 343 24.5 | 9.6 | 28 35.8 | 0.4 | 54.3 |
| E 08 | 299 04.0 | 54.9 | 357 53.1 | 9.6 | 28 36.2 | 0.2 | 54.3 |
| D 09 | 314 04.1 | .. 54.1 | 12 21.7 | 9.6 | 28 36.4 | 0.1 | 54.3 |
| N 10 | 329 04.3 | 53.3 | 26 50.3 | 9.6 | 28 36.5 | 0.0 | 54.3 |
| E 11 | 344 04.4 | 52.5 | 41 18.9 | 9.6 | 28 36.5 | 0.1 | 54.3 |
| S 12 | 359 04.6 | N12 51.6 | 55 47.5 | 9.6 | N28 36.4 | 0.4 | 54.3 |
| D 13 | 14 04.7 | 50.8 | 70 16.1 | 9.7 | 28 36.0 | 0.4 | 54.2 |
| A 14 | 29 04.9 | 50.0 | 84 44.8 | 9.7 | 28 35.6 | 0.6 | 54.2 |
| Y 15 | 44 05.0 | .. 49.2 | 99 13.5 | 9.6 | 28 35.0 | 0.7 | 54.2 |
| 16 | 59 05.1 | 48.4 | 113 42.1 | 9.7 | 28 34.3 | 0.9 | 54.2 |
| 17 | 74 05.3 | 47.6 | 128 10.8 | 9.8 | 28 33.4 | 1.0 | 54.2 |
| 18 | 89 05.4 | N12 46.8 | 142 39.6 | 9.7 | N28 32.4 | 1.1 | 54.2 |
| 19 | 104 05.6 | 45.9 | 157 08.3 | 9.8 | 28 31.3 | 1.3 | 54.2 |
| 20 | 119 05.7 | 45.1 | 171 37.1 | 9.8 | 28 30.0 | 1.4 | 54.2 |
| 21 | 134 05.9 | .. 44.3 | 186 05.9 | 9.8 | 28 28.6 | 1.5 | 54.2 |
| 22 | 149 06.0 | 43.5 | 200 34.7 | 9.8 | 28 27.1 | 1.7 | 54.2 |
| 23 | 164 06.1 | 42.7 | 215 03.5 | 9.9 | 28 25.4 | 1.9 | 54.2 |
| | S.D. 15.8 | d 0.8 | S.D. | 15.0 | | 14.9 | 14.8 |

| Lat. | Twilight Naut. | Twilight Civil | Sunrise | Moonrise 17 | Moonrise 18 | Moonrise 19 | Moonrise 20 |
|---|---|---|---|---|---|---|---|
| ° | h m | h m | h m | h m | h m | h m | h m |
| N 72 | //// | //// | 02 40 | □ | □ | □ | □ |
| N 70 | //// | 01 05 | 03 08 | □ | □ | □ | □ |
| 68 | //// | 02 01 | 03 29 | □ | □ | □ | □ |
| 66 | //// | 02 33 | 03 46 | □ | □ | □ | □ |
| 64 | 00 57 | 02 56 | 03 59 | □ | □ | □ | □ |
| 62 | 01 47 | 03 15 | 04 10 | 20 06 | □ | □ | 22 34 |
| 60 | 02 17 | 03 30 | 04 20 | 20 50 | 21 10 | 22 01 | 23 23 |
| N 58 | 02 38 | 03 42 | 04 28 | 21 19 | 21 49 | 22 40 | 23 54 |
| 56 | 02 56 | 03 53 | 04 35 | 21 41 | 22 16 | 23 08 | 24 17 |
| 54 | 03 10 | 04 02 | 04 42 | 22 00 | 22 37 | 23 29 | 24 36 |
| 52 | 03 22 | 04 10 | 04 48 | 22 15 | 22 55 | 23 47 | 24 51 |
| 50 | 03 32 | 04 17 | 04 53 | 22 29 | 23 10 | 24 02 | 00 02 |
| 45 | 03 54 | 04 33 | 05 04 | 22 57 | 23 40 | 24 33 | 00 33 |
| N 40 | 04 10 | 04 45 | 05 14 | 23 19 | 24 04 | 00 04 | 00 57 |
| 35 | 04 23 | 04 55 | 05 22 | 23 37 | 24 24 | 00 24 | 01 16 |
| 30 | 04 34 | 05 04 | 05 29 | 23 53 | 24 41 | 00 41 | 01 33 |
| 20 | 04 51 | 05 18 | 05 41 | 24 19 | 00 19 | 01 09 | 02 01 |
| N 10 | 05 04 | 05 29 | 05 51 | 24 43 | 00 43 | 01 33 | 02 25 |
| 0 | 05 15 | 05 39 | 06 01 | 00 13 | 01 04 | 01 56 | 02 48 |
| S 10 | 05 24 | 05 49 | 06 10 | 00 33 | 01 26 | 02 19 | 03 11 |
| 20 | 05 31 | 05 57 | 06 20 | 00 53 | 01 49 | 02 44 | 03 35 |
| 30 | 05 39 | 06 07 | 06 31 | 01 17 | 02 16 | 03 12 | 04 03 |
| 35 | 05 42 | 06 12 | 06 38 | 01 32 | 02 33 | 03 29 | 04 20 |
| 40 | 05 45 | 06 17 | 06 45 | 01 48 | 02 51 | 03 49 | 04 39 |
| 45 | 05 49 | 06 23 | 06 53 | 02 08 | 03 14 | 04 13 | 05 03 |
| S 50 | 05 52 | 06 30 | 07 04 | 02 33 | 03 44 | 04 44 | 05 33 |
| 52 | 05 54 | 06 33 | 07 08 | 02 46 | 03 58 | 05 00 | 05 48 |
| 54 | 05 55 | 06 37 | 07 13 | 03 00 | 04 15 | 05 18 | 06 05 |
| 56 | 05 57 | 06 40 | 07 19 | 03 16 | 04 35 | 05 40 | 06 26 |
| 58 | 05 58 | 06 44 | 07 26 | 03 35 | 05 01 | 06 09 | 06 53 |
| S 60 | 06 00 | 06 49 | 07 33 | 04 00 | 05 36 | 06 52 | 07 30 |

| Lat. | Sunset | Twilight Civil | Twilight Naut. | Moonset 17 | Moonset 18 | Moonset 19 | Moonset 20 |
|---|---|---|---|---|---|---|---|
| ° | h m | h m | h m | h m | h m | h m | h m |
| N 72 | 21 22 | //// | //// | □ | □ | □ | □ |
| N 70 | 20 56 | 22 51 | //// | □ | □ | □ | □ |
| 68 | 20 35 | 22 01 | //// | □ | □ | □ | □ |
| 66 | 20 20 | 21 31 | //// | □ | □ | □ | □ |
| 64 | 20 07 | 21 08 | 23 00 | □ | □ | □ | □ |
| 62 | 19 56 | 20 51 | 22 16 | 17 28 | □ | □ | 20 24 |
| 60 | 19 46 | 20 36 | 21 48 | 16 45 | 18 13 | 19 10 | 19 35 |
| N 58 | 19 38 | 20 24 | 21 27 | 16 16 | 17 34 | 18 31 | 19 04 |
| 56 | 19 31 | 20 14 | 21 10 | 15 54 | 17 07 | 18 03 | 18 40 |
| 54 | 19 25 | 20 04 | 20 56 | 15 36 | 16 46 | 17 42 | 18 21 |
| 52 | 19 19 | 19 56 | 20 44 | 15 21 | 16 29 | 17 24 | 18 05 |
| 50 | 19 14 | 19 49 | 20 34 | 15 08 | 16 14 | 17 08 | 17 51 |
| 45 | 19 03 | 19 34 | 20 13 | 14 40 | 15 43 | 16 38 | 17 22 |
| N 40 | 18 53 | 19 22 | 19 57 | 14 19 | 15 20 | 16 14 | 17 00 |
| 35 | 18 46 | 19 12 | 19 44 | 14 01 | 15 00 | 15 54 | 16 41 |
| 30 | 18 39 | 19 04 | 19 33 | 13 46 | 14 44 | 15 37 | 16 25 |
| 20 | 18 27 | 18 50 | 19 17 | 13 20 | 14 16 | 15 09 | 15 58 |
| N 10 | 18 17 | 18 38 | 19 04 | 12 58 | 13 52 | 14 44 | 15 35 |
| 0 | 18 07 | 18 29 | 18 53 | 12 38 | 13 29 | 14 21 | 15 13 |
| S 10 | 17 58 | 18 19 | 18 44 | 12 17 | 13 07 | 13 58 | 14 51 |
| 20 | 17 48 | 18 11 | 18 37 | 11 55 | 12 43 | 13 34 | 14 27 |
| 30 | 17 37 | 18 01 | 18 30 | 11 30 | 12 15 | 13 05 | 14 00 |
| 35 | 17 31 | 17 57 | 18 26 | 11 15 | 11 58 | 12 48 | 13 43 |
| 40 | 17 23 | 17 51 | 18 23 | 10 57 | 11 39 | 12 28 | 13 24 |
| 45 | 17 15 | 17 45 | 18 20 | 10 37 | 11 16 | 12 04 | 13 01 |
| S 50 | 17 05 | 17 38 | 18 16 | 10 11 | 10 46 | 11 33 | 12 31 |
| 52 | 17 00 | 17 35 | 18 15 | 09 58 | 10 31 | 11 17 | 12 16 |
| 54 | 16 55 | 17 32 | 18 14 | 09 44 | 10 14 | 10 59 | 11 59 |
| 56 | 16 50 | 17 29 | 18 12 | 09 27 | 09 54 | 10 37 | 11 38 |
| 58 | 16 43 | 17 25 | 18 11 | 09 07 | 09 28 | 10 08 | 11 12 |
| S 60 | 16 36 | 17 20 | 18 09 | 08 42 | 08 53 | 09 25 | 10 35 |

| Day | SUN Eqn. of Time 00 h | SUN Eqn. of Time 12 h | SUN Mer. Pass. | MOON Mer. Pass. Upper | MOON Mer. Pass. Lower | MOON Age | MOON Phase |
|---|---|---|---|---|---|---|---|
| | m s | m s | h m | h m | h m | d | |
| 17 | 04 15 | 04 08 | 12 04 | 06 25 | 18 51 | 23 | |
| 18 | 04 02 | 03 55 | 12 04 | 07 17 | 19 43 | 24 | |
| 19 | 03 49 | 03 42 | 12 04 | 08 09 | 20 35 | 25 | |

IEB Copyright © 2011 

## ANNEXURE 6

### 50m INCREMENTS AND CORRECTIONS 51m

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

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



IEB Copyright © 2011

## 52m INCREMENTS AND CORRECTIONS 53m

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

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



IEB Copyright © 2011