## ANNEXURE 1 – EXAMINATION NOTES AND DEVIATION CARD

1.    **All** relevant working must be shown on the Answer Sheet.

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 ½° and plotted to a similar accuracy.

### DEVIATION CARD

| Sip's Head (Compass) | Deviation | Sip's Head (Compass) | Deviation |
|---|---|---|---|
| 000 | 2° W | 180 | 0° |
| 010 | 4° W | 190 | 3° E |
| 020 | 5° W | 200 | 5° E |
| 030 | 7° W | 210 | 7° E |
| 040 | 9° W | 220 | 9° E |
| 050 | 11° W | 230 | 11° E |
| 060 | 12° W | 240 | 12° E |
| 070 | 13° W | 250 | 13° E |
| 080 | 14° W | 260 | 14° E |
| 090 | 13° W | 270 | 13° E |
| 100 | 12° W | 280 | 12° E |
| 110 | 11° W | 290 | 11° E |
| 120 | 10° W | 300 | 10° E |
| 130 | 9° W | 310 | 9° E |
| 140 | 8° W | 320 | 7° E |
| 150 | 7° W | 330 | 5° E |
| 160 | 5° W | 340 | 3° E |
| 170 | 3° W | 350 | 1° E |

## ANNEXURE 2 – SOUTH AFRICAN TIDE TABLES 2007, PAGE 45

### DURBAN
#### 2007

TIME ZONE - 2                                                                 TIME ZONE - 2

#### JANUARY

| DAY | TIME | M | DAY | TIME | M |
|---|---|---|---|---|---|
| 1 M | 02 07 | 1.60 | 16 T | 02 04 | 1.51 |
|  | 08 07 | 0.54 |  | 08 00 | 0.65 |
|  | 14 25 | 1.79 |  | 14 11 | 1.69 |
|  | 20 42 | 0.43 |  | 20 33 | 0.53 |
| 2 T | 02 57 | 1.72 | 17 W | 02 44 | 1.66 |
|  | 08 56 | 0.45 |  | 08 42 | 0.53 |
|  | 15 10 | 1.85 |  | 14 52 | 1.82 |
|  | 21 25 | 0.34 |  | 21 11 | 0.40 |
| 3 W | 03 40 | 1.82 | 18 T | 03 22 | 1.80 |
|  | 09 39 | 0.39 |  | 09 21 | 0.41 |
|  | 15 51 | 1.89 |  | 15 31 | 1.92 |
|  | 22 03 | 0.27 |  | 21 47 | 0.29 |
| 4 T | 04 18 | 1.88 | 19 F | 03 59 | 1.93 |
|  | 10 17 | 0.36 |  | 09 59 | 0.32 |
|  | 16 29 | 1.90 |  | 16 09 | 2.00 |
|  | 22 38 | 0.24 |  | 22 22 | 0.20 |
| 5 F | 04 54 | 1.91 | 20 S | 04 36 | 2.02 |
|  | 10 52 | 0.36 |  | 10 38 | 0.27 |
|  | 17 02 | 1.88 |  | 16 47 | 2.04 |
|  | 23 10 | 0.24 |  | 22 58 | 0.15 |
| 6 S | 05 26 | 1.90 | 21 $ | 05 14 | 2.07 |
|  | 11 26 | 0.40 |  | 11 17 | 0.26 |
|  | 17 34 | 1.84 |  | 17 25 | 2.02 |
|  | 23 42 | 0.27 |  | 23 34 | 0.15 |
| 7 $ | 05 58 | 1.86 | 22 M | 05 52 | 2.07 |
|  | 11 57 | 0.45 |  | 11 56 | 0.30 |
|  | 18 03 | 1.78 |  | 18 03 | 1.97 |
| 8 M | 00 12 | 0.33 | 23 T | 00 09 | 0.19 |
|  | 06 28 | 1.80 |  | 06 31 | 2.02 |
|  | 12 29 | 0.53 |  | 12 35 | 0.38 |
|  | 18 32 | 1.70 |  | 18 40 | 1.86 |
| 9 T | 00 42 | 0.41 | 24 W | 00 46 | 0.28 |
|  | 06 59 | 1.73 |  | 07 11 | 1.92 |
|  | 13 03 | 0.62 |  | 13 17 | 0.50 |
|  | 19 03 | 1.61 |  | 19 20 | 1.73 |
| 10 W | 01 14 | 0.51 | 25 T | 01 24 | 0.42 |
|  | 07 35 | 1.64 |  | 07 55 | 1.78 |
|  | 13 41 | 0.72 |  | 14 03 | 0.64 |
|  | 19 38 | 1.50 |  | 20 04 | 1.57 |
| 11 T | 01 50 | 0.63 | 26 F | 02 09 | 0.58 |
|  | 08 18 | 1.54 |  | 08 50 | 1.62 |
|  | 14 30 | 0.82 |  | 15 03 | 0.78 |
|  | 20 25 | 1.38 |  | 21 05 | 1.41 |
| 12 F | 02 38 | 0.76 | 27 S | 03 11 | 0.76 |
|  | 09 19 | 1.45 |  | 10 15 | 1.49 |
|  | 15 43 | 0.89 |  | 16 40 | 0.87 |
|  | 21 39 | 1.29 |  | 23 00 | 1.31 |
| 13 S | 03 57 | 0.86 | 28 $ | 05 14 | 0.86 |
|  | 10 51 | 1.41 |  | 12 11 | 1.47 |
|  | 17 31 | 0.89 |  | 18 44 | 0.82 |
|  | 23 42 | 1.27 |  |  |  |
| 14 $ | 05 51 | 0.86 | 29 M | 01 07 | 1.39 |
|  | 12 22 | 1.46 |  | 07 14 | 0.79 |
|  | 18 58 | 0.80 |  | 13 34 | 1.56 |
|  |  |  |  | 19 58 | 0.67 |
| 15 M | 01 11 | 1.37 | 30 T | 02 14 | 1.55 |
|  | 07 09 | 0.78 |  | 08 17 | 0.65 |
|  | 13 24 | 1.57 |  | 14 29 | 1.68 |
|  | 19 52 | 0.67 |  | 20 45 | 0.52 |
|  |  |  | 31 W | 02 59 | 1.71 |
|  |  |  |  | 09 00 | 0.52 |
|  |  |  |  | 15 11 | 1.79 |
|  |  |  |  | 21 22 | 0.39 |

#### FEBRUARY

| DAY | TIME | M | DAY | TIME | M |
|---|---|---|---|---|---|
| 1 T | 03 36 | 1.84 | 16 F | 03 08 | 1.87 |
|  | 09 36 | 0.42 |  | 09 11 | 0.39 |
|  | 15 46 | 1.88 |  | 15 19 | 1.96 |
|  | 21 54 | 0.29 |  | 21 32 | 0.26 |
| 2 F | 04 08 | 1.93 | 17 S | 03 44 | 2.04 |
|  | 10 08 | 0.35 |  | 09 48 | 0.25 |
|  | 16 18 | 1.93 |  | 15 56 | 2.07 |
|  | 22 24 | 0.23 |  | 22 07 | 0.14 |
| 3 S | 04 38 | 1.98 | 18 $ | 04 20 | 2.16 |
|  | 10 38 | 0.32 |  | 10 25 | 0.17 |
|  | 16 46 | 1.95 |  | 16 33 | 2.13 |
|  | 22 52 | 0.20 |  | 22 41 | 0.06 |
| 4 $ | 05 05 | 2.00 | 19 M | 04 56 | 2.22 |
|  | 11 06 | 0.32 |  | 11 01 | 0.15 |
|  | 17 13 | 1.94 |  | 17 09 | 2.13 |
|  | 23 19 | 0.21 |  | 23 15 | 0.05 |
| 5 M | 05 31 | 1.98 | 20 T | 05 32 | 2.21 |
|  | 11 33 | 0.35 |  | 11 38 | 0.18 |
|  | 17 38 | 1.90 |  | 17 44 | 2.06 |
|  | 23 45 | 0.25 |  | 23 48 | 0.11 |
| 6 T | 05 57 | 1.94 | 21 W | 06 08 | 2.13 |
|  | 12 01 | 0.41 |  | 12 14 | 0.28 |
|  | 18 03 | 1.84 |  | 18 19 | 1.95 |
| 7 W | 00 11 | 0.32 | 22 T | 00 22 | 0.22 |
|  | 06 23 | 1.87 |  | 06 44 | 1.99 |
|  | 12 28 | 0.49 |  | 12 50 | 0.42 |
|  | 18 29 | 1.75 |  | 18 55 | 1.79 |
| 8 T | 00 37 | 0.42 | 23 F | 00 57 | 0.40 |
|  | 06 51 | 1.77 |  | 07 22 | 1.80 |
|  | 12 57 | 0.59 |  | 13 29 | 0.59 |
|  | 18 57 | 1.64 |  | 19 33 | 1.61 |
| 9 F | 01 05 | 0.54 | 24 S | 01 36 | 0.60 |
|  | 07 22 | 1.66 |  | 08 07 | 1.58 |
|  | 13 30 | 0.70 |  | 14 17 | 0.77 |
|  | 19 29 | 1.51 |  | 20 24 | 1.41 |
| 10 S | 01 37 | 0.69 | 25 $ | 02 30 | 0.82 |
|  | 08 01 | 1.53 |  | 09 24 | 1.39 |
|  | 14 13 | 0.83 |  | 15 45 | 0.93 |
|  | 20 12 | 1.37 |  | 22 38 | 1.27 |
| 11 $ | 02 23 | 0.84 | 26 M | 05 18 | 0.97 |
|  | 09 05 | 1.40 |  | 12 11 | 1.34 |
|  | 15 30 | 0.94 |  | 18 47 | 0.89 |
|  | 21 43 | 1.25 |  |  |  |
| 12 M | 04 12 | 0.96 | 27 T | 01 16 | 1.38 |
|  | 11 14 | 1.36 |  | 07 30 | 0.84 |
|  | 18 12 | 0.93 |  | 13 38 | 1.48 |
|  |  |  |  | 19 57 | 0.72 |
| 13 T | 00 40 | 1.30 | 28 W | 02 12 | 1.57 |
|  | 06 44 | 0.89 |  | 08 19 | 0.67 |
|  | 13 01 | 1.47 |  | 14 25 | 1.63 |
|  | 19 35 | 0.78 |  | 20 36 | 0.55 |
| 14 M | 01 49 | 1.48 |  |  |  |
|  | 07 48 | 0.73 |  |  |  |
|  | 13 58 | 1.63 |  |  |  |
|  | 20 21 | 0.60 |  |  |  |
| 15 T | 02 31 | 1.67 |  |  |  |
|  | 08 32 | 0.55 |  |  |  |
|  | 14 41 | 1.80 |  |  |  |
|  | 20 58 | 0.42 |  |  |  |

#### MARCH

| DAY | TIME | M | DAY | TIME | M |
|---|---|---|---|---|---|
| 1 T | 02 49 | 1.74 | 16 F | 02 07 | 1.71 |
|  | 08 53 | 0.53 |  | 08 13 | 0.53 |
|  | 15 00 | 1.77 |  | 14 21 | 1.79 |
|  | 21 07 | 0.41 |  | 20 33 | 0.42 |
| 2 F | 03 19 | 1.87 | 17 S | 02 45 | 1.93 |
|  | 09 22 | 0.41 |  | 08 51 | 0.34 |
|  | 15 30 | 1.87 |  | 14 59 | 1.96 |
|  | 21 35 | 0.30 |  | 21 08 | 0.24 |
| 3 S | 03 47 | 1.97 | 18 $ | 03 20 | 2.12 |
|  | 09 49 | 0.33 |  | 09 28 | 0.19 |
|  | 15 57 | 1.95 |  | 15 36 | 2.08 |
|  | 22 01 | 0.22 |  | 21 43 | 0.09 |
| 4 $ | 04 12 | 2.03 | 19 M | 03 56 | 2.24 |
|  | 10 15 | 0.28 |  | 10 04 | 0.09 |
|  | 16 23 | 1.98 |  | 16 12 | 2.14 |
|  | 22 27 | 0.18 |  | 22 17 | 0.02 |
| 5 M | 04 37 | 2.05 | 20 T | 04 32 | 2.28 |
|  | 10 41 | 0.26 |  | 10 40 | 0.07 |
|  | 16 47 | 1.98 |  | 16 48 | 2.14 |
|  | 22 51 | 0.18 |  | 22 51 | 0.02 |
| 6 T | 05 01 | 2.04 | 21 W | 05 08 | 2.25 |
|  | 11 06 | 0.28 |  | 11 16 | 0.12 |
|  | 17 11 | 1.96 |  | 17 23 | 2.07 |
|  | 23 16 | 0.21 |  | 23 26 | 0.10 |
| 7 W | 05 25 | 2.00 | 22 T | 05 43 | 2.13 |
|  | 11 31 | 0.32 |  | 11 51 | 0.23 |
|  | 17 35 | 1.90 |  | 17 59 | 1.95 |
|  | 23 40 | 0.28 |  |  |  |
| 8 T | 05 49 | 1.94 | 23 F | 00 00 | 0.24 |
|  | 11 56 | 0.39 |  | 06 19 | 1.95 |
|  | 17 59 | 1.83 |  | 12 26 | 0.38 |
|  |  |  |  | 18 35 | 1.79 |
| 9 F | 00 05 | 0.37 | 24 S | 00 36 | 0.44 |
|  | 06 14 | 1.84 |  | 06 56 | 1.74 |
|  | 12 22 | 0.48 |  | 13 03 | 0.56 |
|  | 18 26 | 1.72 |  | 19 14 | 1.60 |
| 10 S | 00 31 | 0.49 | 25 $ | 01 16 | 0.66 |
|  | 06 42 | 1.72 |  | 07 39 | 1.51 |
|  | 12 51 | 0.60 |  | 13 48 | 0.75 |
|  | 18 54 | 1.60 |  | 20 07 | 1.41 |
| 11 $ | 00 59 | 0.64 | 26 M | 02 14 | 0.87 |
|  | 07 15 | 1.58 |  | 08 55 | 1.31 |
|  | 13 26 | 0.74 |  | 15 12 | 0.92 |
|  | 19 30 | 1.45 |  | 22 35 | 1.28 |
| 12 M | 01 38 | 0.80 | 27 T | 05 35 | 0.97 |
|  | 08 04 | 1.43 |  | 11 58 | 1.28 |
|  | 14 20 | 0.89 |  | 18 21 | 0.90 |
|  | 20 36 | 1.30 |  |  |  |
| 13 T | 02 59 | 0.96 | 28 W | 00 56 | 1.40 |
|  | 10 01 | 1.32 |  | 07 17 | 0.83 |
|  | 16 55 | 0.97 |  | 13 20 | 1.42 |
|  | 23 59 | 1.29 |  | 19 30 | 0.74 |
| 14 W | 06 18 | 0.93 | 29 T | 01 48 | 1.57 |
|  | 12 35 | 1.41 |  | 07 59 | 0.67 |
|  | 19 07 | 0.82 |  | 14 03 | 1.58 |
|  |  |  |  | 20 09 | 0.58 |
| 15 T | 01 23 | 1.49 | 30 F | 02 22 | 1.72 |
|  | 07 29 | 0.74 |  | 08 29 | 0.54 |
|  | 13 38 | 1.60 |  | 14 35 | 1.71 |
|  | 19 56 | 0.62 |  | 20 39 | 0.45 |
|  |  |  | 31 S | 02 51 | 1.85 |
|  |  |  |  | 08 56 | 0.42 |
|  |  |  |  | 15 04 | 1.82 |
|  |  |  |  | 21 06 | 0.34 |

## ANNEXURE 3 – ALTITUDE CORRECTION TABLES

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

| OCT.—MAR. SUN APR.—SEPT. | | | | | | STARS AND PLANETS | | DIP | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| App. Alt. | Lower Limb | Upper Limb | App. Alt. | Lower Limb | Upper Limb | App. Alt. | Corrn | App. Alt. Additional Corrn | Ht. of Eye / Corrn | Ht. of Eye | Ht. of Eye Corrn |
| ° ′ | ′ | ′ | ° ′ | ′ | ′ | ° ′ | ′ | | m | ft. | m |
| 9 34 | +10·8 | −21·5 | 9 39 | +10·6 | −21·2 | 9 56 | −5·3 | **1987** | 2·4 −2·8 | 8·0 | 1·0 — 1·8 |
| 9 45 | +10·9 | −21·4 | 9 51 | +10·7 | −21·1 | 10 08 | −5·2 | **VENUS** | 2·6 −2·9 | 8·6 | 1·5 — 2·2 |
| 9 56 | +11·0 | −21·3 | 10 03 | +10·8 | −21·0 | 10 20 | −5·1 | Jan. 1-Jan. 4 | 2·8 −3·0 | 9·2 | 2·0 — 2·5 |
| 10 08 | +11·1 | −21·2 | 10 15 | +10·9 | −20·9 | 10 33 | −5·0 | ° ′ | 3·0 −3·1 | 9·8 | 2·5 — 2·8 |
| 10 21 | +11·2 | −21·1 | 10 27 | +11·0 | −20·8 | 10 46 | −4·9 | 34 + 0·3 | 3·2 −3·2 | 10·5 | 3·0 — 3·0 |
| 10 34 | +11·3 | −21·0 | 10 40 | +11·1 | −20·7 | 11 00 | −4·8 | 60 + 0·2 | 3·4 −3·3 | 11·2 | See table ← |
| 10 47 | +11·4 | −20·9 | 10 54 | +11·2 | −20·6 | 11 14 | −4·7 | 80 + 0·1 | 3·6 −3·4 | 11·9 | |
| 11 01 | +11·5 | −20·8 | 11 08 | +11·3 | −20·5 | 11 29 | −4·6 | | 3·8 −3·5 | 12·6 | m ′ |
| 11 15 | +11·6 | −20·7 | 11 23 | +11·4 | −20·4 | 11 45 | −4·5 | Jan. 5-Feb. 25 | 4·0 −3·6 | 13·3 | 20 — 7·9 |
| 11 30 | +11·7 | −20·6 | 11 38 | +11·5 | −20·3 | 12 01 | −4·4 | ° ′ | 4·3 −3·7 | 14·1 | 22 — 8·3 |
| 11 46 | +11·8 | −20·5 | 11 54 | +11·6 | −20·2 | 12 18 | −4·3 | 41 + 0·2 | 4·5 −3·8 | 14·9 | 24 — 8·6 |
| 12 02 | +11·9 | −20·4 | 12 10 | +11·7 | −20·1 | 12 35 | −4·2 | 76 + 0·1 | 4·7 −3·9 | 15·7 | 26 — 9·0 |
| 12 19 | +12·0 | −20·3 | 12 28 | +11·8 | −20·0 | 12 54 | −4·1 | | 5·0 −4·0 | 16·5 | 28 — 9·3 |
| 12 37 | +12·1 | −20·2 | 12 46 | +11·9 | −19·9 | 13 13 | −4·0 | Feb. 26-Dec. 31 | 5·2 −4·1 | 17·4 | |
| 12 55 | +12·2 | −20·1 | 13 05 | +12·0 | −19·8 | 13 33 | −3·9 | ° ′ | 5·5 −4·2 | 18·3 | 30 — 9·6 |
| 13 14 | +12·3 | −20·0 | 13 24 | +12·1 | −19·7 | 13 54 | −3·8 | 60 + 0·1 | 5·8 −4·3 | 19·1 | 32 — 10·0 |
| 13 35 | +12·4 | −19·9 | 13 45 | +12·2 | −19·6 | 14 16 | −3·7 | | 6·1 −4·4 | 20·1 | 34 — 10·3 |
| 13 56 | +12·5 | −19·8 | 14 07 | +12·3 | −19·5 | 14 40 | −3·6 | | 6·3 −4·5 | 21·0 | 36 — 10·6 |
| 14 18 | +12·6 | −19·7 | 14 30 | +12·4 | −19·4 | 15 04 | −3·5 | **MARS** | 6·6 −4·6 | 22·0 | 38 — 10·8 |
| 14 42 | +12·7 | −19·6 | 14 54 | +12·5 | −19·3 | 15 30 | −3·4 | Jan. 1-Dec. 31 | 6·9 −4·7 | 22·9 | |
| 15 06 | +12·8 | −19·5 | 15 19 | +12·6 | −19·2 | 15 57 | −3·3 | ° ′ | 7·2 −4·8 | 23·9 | 40 — 11·1 |
| 15 32 | +12·9 | −19·4 | 15 46 | +12·7 | −19·1 | 16 26 | −3·2 | 60 + 0·1 | 7·5 −4·9 | 24·9 | 42 — 11·4 |
| 15 59 | +13·0 | −19·3 | 16 14 | +12·8 | −19·0 | 16 56 | −3·1 | | 7·9 −5·0 | 26·0 | 44 — 11·7 |
| 16 28 | +13·1 | −19·2 | 16 44 | +12·9 | −18·9 | 17 28 | −3·0 | | 8·2 −5·1 | 27·1 | 46 — 11·9 |
| 16 59 | +13·2 | −19·1 | 17 15 | +13·0 | −18·8 | 18 02 | −2·9 | | 8·5 −5·2 | 28·1 | 48 — 12·2 |
| 17 32 | +13·3 | −19·0 | 17 48 | +13·1 | −18·7 | 18 38 | −2·8 | | 8·8 −5·3 | 29·2 | ft. ′ |
| 18 06 | +13·4 | −18·9 | 18 24 | +13·2 | −18·6 | 19 17 | −2·7 | | 9·2 −5·4 | 30·4 | 2 — 1·4 |
| 18 42 | +13·5 | −18·8 | 19 01 | +13·3 | −18·5 | 19 58 | −2·6 | | 9·5 −5·5 | 31·5 | 4 — 1·9 |
| 19 21 | +13·6 | −18·7 | 19 42 | +13·4 | −18·4 | 20 42 | −2·5 | | 9·9 −5·6 | 32·7 | 6 — 2·4 |
| 20 03 | +13·7 | −18·6 | 20 25 | +13·5 | −18·3 | 21 28 | −2·4 | | 10·3 −5·7 | 33·9 | 8 — 2·7 |
| 20 48 | +13·8 | −18·5 | 21 11 | +13·6 | −18·2 | 22 19 | −2·3 | | 10·6 −5·8 | 35·1 | 10 — 3·1 |
| 21 35 | +13·9 | −18·4 | 22 00 | +13·7 | −18·1 | 23 13 | −2·2 | | 11·0 −5·9 | 36·3 | See table ← |
| 22 26 | +14·0 | −18·3 | 22 54 | +13·8 | −18·0 | 24 11 | −2·1 | | 11·4 −6·0 | 37·6 | |
| 23 22 | +14·1 | −18·2 | 23 51 | +13·9 | −17·9 | 25 14 | −2·0 | | 11·8 −6·1 | 38·9 | ft. ′ |
| 24 21 | +14·2 | −18·1 | 24 53 | +14·0 | −17·8 | 26 22 | −1·9 | | 12·2 −6·2 | 40·1 | 70 — 8·1 |
| 25 26 | +14·3 | −18·0 | 26 00 | +14·1 | −17·7 | 27 36 | −1·8 | | 12·6 −6·3 | 41·5 | 75 — 8·4 |
| 26 36 | +14·4 | −17·9 | 27 13 | +14·2 | −17·6 | 28 56 | −1·7 | | 13·0 −6·4 | 42·8 | 80 — 8·7 |
| 27 52 | +14·5 | −17·8 | 28 33 | +14·3 | −17·5 | 30 24 | −1·6 | | 13·4 −6·5 | 44·2 | 85 — 8·9 |
| 29 15 | +14·6 | −17·7 | 30 00 | +14·4 | −17·4 | 32 00 | −1·5 | | 13·8 −6·6 | 45·5 | 90 — 9·2 |
| 30 46 | +14·7 | −17·6 | 31 35 | +14·5 | −17·3 | 33 45 | −1·4 | | 14·2 −6·7 | 46·9 | 95 — 9·5 |
| 32 26 | +14·8 | −17·5 | 33 20 | +14·6 | −17·2 | 35 40 | −1·3 | | 14·7 −6·8 | 48·4 | |
| 34 17 | +14·9 | −17·4 | 35 17 | +14·7 | −17·1 | 37 48 | −1·2 | | 15·1 −6·9 | 49·8 | |
| 36 20 | +15·0 | −17·3 | 37 26 | +14·8 | −17·0 | 40 08 | −1·1 | | 15·5 −7·0 | 51·3 | 100 — 9·7 |
| 38 36 | +15·1 | −17·2 | 39 50 | +14·9 | −16·9 | 42 44 | −1·0 | | 16·0 −7·1 | 52·8 | 105 — 9·9 |
| 41 08 | +15·2 | −17·1 | 42 31 | +15·0 | −16·8 | 45 36 | −0·9 | | 16·5 −7·2 | 54·3 | 110 — 10·2 |
| 43 59 | +15·3 | −17·0 | 45 31 | +15·1 | −16·7 | 48 47 | −0·8 | | 16·9 −7·3 | 55·8 | 115 — 10·4 |
| 47 10 | +15·4 | −16·9 | 48 55 | +15·2 | −16·6 | 52 18 | −0·7 | | 17·4 −7·4 | 57·4 | 120 — 10·6 |
| 50 46 | +15·5 | −16·8 | 52 44 | +15·3 | −16·5 | 56 11 | −0·6 | | 17·9 −7·5 | 58·9 | 125 — 10·8 |
| 54 49 | +15·6 | −16·7 | 57 02 | +15·4 | −16·4 | 60 28 | −0·5 | | 18·4 −7·6 | 60·5 | |
| 59 23 | +15·7 | −16·6 | 61 51 | +15·5 | −16·3 | 65 08 | −0·4 | | 18·8 −7·7 | 62·1 | 130 — 11·1 |
| 64 30 | +15·8 | −16·5 | 67 17 | +15·6 | −16·2 | 70 11 | −0·3 | | 19·3 −7·8 | 63·8 | 135 — 11·3 |
| 70 12 | +15·9 | −16·4 | 73 16 | +15·7 | −16·1 | 75 34 | −0·2 | | 19·8 −7·9 | 65·4 | 140 — 11·5 |
| 76 26 | +16·0 | −16·3 | 79 43 | +15·8 | −16·0 | 81 13 | −0·1 | | 20·4 −8·0 | 67·1 | 145 — 11·7 |
| 83 05 | +16·1 | −16·2 | 86 32 | +15·9 | −15·9 | 87 03 | 0·0 | | 20·9 −8·1 | 68·8 | 150 — 11·9 |
| 90 00 | | | 90 00 | | | 90 00 | | | 21·4 | 70·5 | 155 — 12·1 |

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

## ANNEXURE 4 – CONVERSION OF ARC TO TIME

### 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

## ANNEXURE 5 – NAUTICAL ALMANAC – 1987 MAY 4, 5, 6

### 1987 MAY 4, 5, 6 (MON., TUES., WED.)          93

| G.M.T. (UT) | SUN G.H.A. | SUN Dec. | MOON G.H.A. | v | Dec. | d | H.P. |
|---|---|---|---|---|---|---|---|
| d h | ° ′ | ° ′ | ° ′ | ′ | ° ′ | ′ | ′ |
| 4 00 | 180 47.0 | N15 44.9 | 108 48.2 | 10.7 | N27 01.3 | 5.0 | 54.2 |
| 01 | 195 47.0 | 45.6 | 123 17.9 | 10.8 | 26 56.3 | 5.2 | 54.2 |
| 02 | 210 47.1 | 46.4 | 137 47.7 | 10.9 | 26 51.1 | 5.2 | 54.2 |
| 03 | 225 47.2 .. | 47.1 | 152 17.6 | 10.9 | 26 45.9 | 5.4 | 54.2 |
| 04 | 240 47.2 | 47.8 | 166 47.5 | 11.0 | 26 40.5 | 5.5 | 54.2 |
| 05 | 255 47.3 | 48.6 | 181 17.5 | 11.0 | 26 35.0 | 5.6 | 54.2 |
| 06 | 270 47.4 | N15 49.3 | 195 47.5 | 11.1 | N26 29.4 | 5.8 | 54.2 |
| 07 | 285 47.4 | 50.0 | 210 17.6 | 11.1 | 26 23.6 | 5.8 | 54.2 |
| 08 | 300 47.5 | 50.7 | 224 47.7 | 11.2 | 26 17.8 | 6.0 | 54.2 |
| M 09 | 315 47.5 .. | 51.5 | 239 17.9 | 11.3 | 26 11.8 | 6.1 | 54.2 |
| O 10 | 330 47.6 | 52.2 | 253 48.2 | 11.3 | 26 05.7 | 6.3 | 54.2 |
| N 11 | 345 47.7 | 52.9 | 268 18.5 | 11.3 | 25 59.4 | 6.3 | 54.2 |
| D 12 | 0 47.7 | N15 53.7 | 282 48.8 | 11.4 | N25 53.1 | 6.5 | 54.2 |
| A 13 | 15 47.8 | 54.4 | 297 19.2 | 11.5 | 25 46.6 | 6.6 | 54.2 |
| Y 14 | 30 47.8 | 55.1 | 311 49.7 | 11.5 | 25 40.0 | 6.7 | 54.2 |
| 15 | 45 47.9 .. | 55.8 | 326 20.2 | 11.6 | 25 33.3 | 6.8 | 54.2 |
| 16 | 60 48.0 | 56.6 | 340 50.8 | 11.7 | 25 26.5 | 6.9 | 54.2 |
| 17 | 75 48.0 | 57.3 | 355 21.5 | 11.7 | 25 19.6 | 7.1 | 54.2 |
| 18 | 90 48.1 | N15 58.0 | 9 52.2 | 11.7 | N25 12.5 | 7.1 | 54.2 |
| 19 | 105 48.1 | 58.7 | 24 22.9 | 11.8 | 25 05.4 | 7.3 | 54.2 |
| 20 | 120 48.2 | 15 59.5 | 38 53.7 | 11.9 | 24 58.1 | 7.4 | 54.2 |
| 21 | 135 48.3 | 16 00.2 | 53 24.6 | 11.9 | 24 50.7 | 7.5 | 54.2 |
| 22 | 150 48.3 | 00.9 | 67 55.5 | 12.0 | 24 43.2 | 7.6 | 54.2 |
| 23 | 165 48.4 | 01.6 | 82 26.5 | 12.0 | 24 35.6 | 7.7 | 54.2 |
| 5 00 | 180 48.4 | N16 02.4 | 96 57.5 | 12.1 | N24 27.9 | 7.8 | 54.3 |
| 01 | 195 48.5 | 03.1 | 111 28.6 | 12.2 | 24 20.1 | 8.0 | 54.3 |
| 02 | 210 48.5 | 03.8 | 125 59.8 | 12.2 | 24 12.1 | 8.0 | 54.3 |
| 03 | 225 48.6 .. | 04.5 | 140 31.0 | 12.3 | 24 04.1 | 8.2 | 54.3 |
| 04 | 240 48.7 | 05.2 | 155 02.3 | 12.3 | 23 55.9 | 8.2 | 54.3 |
| 05 | 255 48.7 | 06.0 | 169 33.6 | 12.4 | 23 47.7 | 8.4 | 54.3 |
| 06 | 270 48.8 | N16 06.7 | 184 05.0 | 12.5 | N23 39.3 | 8.5 | 54.3 |
| 07 | 285 48.8 | 07.4 | 198 36.5 | 12.5 | 23 30.8 | 8.6 | 54.3 |
| T 08 | 300 48.9 | 08.1 | 213 08.0 | 12.6 | 23 22.2 | 8.6 | 54.3 |
| U 09 | 315 48.9 .. | 08.8 | 227 39.6 | 12.6 | 23 13.6 | 8.8 | 54.3 |
| E 10 | 330 49.0 | 09.5 | 242 11.2 | 12.7 | 23 04.8 | 8.9 | 54.3 |
| S 11 | 345 49.1 | 10.3 | 256 42.9 | 12.7 | 22 55.9 | 9.0 | 54.3 |
| D 12 | 0 49.1 | N16 11.0 | 271 14.6 | 12.8 | N22 46.9 | 9.1 | 54.4 |
| A 13 | 15 49.2 | 11.7 | 285 46.4 | 12.9 | 22 37.8 | 9.2 | 54.4 |
| Y 14 | 30 49.2 | 12.4 | 300 18.3 | 12.9 | 22 28.6 | 9.3 | 54.4 |
| 15 | 45 49.3 .. | 13.1 | 314 50.2 | 12.9 | 22 19.3 | 9.4 | 54.4 |
| 16 | 60 49.3 | 13.8 | 329 22.1 | 13.1 | 22 09.9 | 9.4 | 54.4 |
| 17 | 75 49.4 | 14.6 | 343 54.2 | 13.0 | 22 00.5 | 9.6 | 54.4 |
| 18 | 90 49.4 | N16 15.3 | 358 26.2 | 13.2 | N21 50.9 | 9.7 | 54.4 |
| 19 | 105 49.5 | 16.0 | 12 58.4 | 13.1 | 21 41.2 | 9.8 | 54.4 |
| 20 | 120 49.5 | 16.7 | 27 30.5 | 13.3 | 21 31.4 | 9.8 | 54.4 |
| 21 | 135 49.6 .. | 17.4 | 42 02.8 | 13.3 | 21 21.6 | 10.0 | 54.5 |
| 22 | 150 49.6 | 18.1 | 56 35.1 | 13.3 | 21 11.6 | 10.1 | 54.5 |
| 23 | 165 49.7 | 18.8 | 71 07.4 | 13.4 | 21 01.5 | 10.1 | 54.5 |
| 6 00 | 180 49.7 | N16 19.5 | 85 39.8 | 13.5 | N20 51.4 | 10.3 | 54.5 |
| 01 | 195 49.8 | 20.3 | 100 12.3 | 13.5 | 20 41.1 | 10.3 | 54.5 |
| 02 | 210 49.8 | 21.0 | 114 44.8 | 13.6 | 20 30.8 | 10.4 | 54.5 |
| 03 | 225 49.9 .. | 21.7 | 129 17.4 | 13.6 | 20 20.4 | 10.6 | 54.5 |
| 04 | 240 49.9 | 22.4 | 143 50.0 | 13.6 | 20 09.8 | 10.6 | 54.6 |
| 05 | 255 50.0 | 23.1 | 158 22.6 | 13.8 | 19 59.2 | 10.7 | 54.6 |
| 06 | 270 50.1 | N16 23.8 | 172 55.4 | 13.7 | N19 48.5 | 10.7 | 54.6 |
| W 07 | 285 50.1 | 24.5 | 187 28.1 | 13.8 | 19 37.8 | 10.9 | 54.6 |
| E 08 | 300 50.2 | 25.2 | 202 00.9 | 13.9 | 19 26.9 | 11.0 | 54.6 |
| D 09 | 315 50.2 .. | 25.9 | 216 33.8 | 13.9 | 19 15.9 | 11.0 | 54.6 |
| N 10 | 330 50.3 | 26.6 | 231 06.7 | 14.0 | 19 04.9 | 11.2 | 54.6 |
| E 11 | 345 50.3 | 27.3 | 245 39.7 | 14.0 | 18 53.7 | 11.2 | 54.7 |
| S 12 | 0 50.3 | N16 28.0 | 260 12.7 | 14.0 | N18 42.5 | 11.3 | 54.7 |
| D 13 | 15 50.4 | 28.7 | 274 45.7 | 14.1 | 18 31.2 | 11.3 | 54.7 |
| A 14 | 30 50.4 | 29.4 | 289 18.8 | 14.2 | 18 19.9 | 11.5 | 54.7 |
| Y 15 | 45 50.5 .. | 30.1 | 303 52.0 | 14.1 | 18 08.4 | 11.6 | 54.7 |
| 16 | 60 50.5 | 30.8 | 318 25.1 | 14.3 | 17 56.8 | 11.6 | 54.8 |
| 17 | 75 50.6 | 31.5 | 332 58.4 | 14.2 | 17 45.2 | 11.7 | 54.8 |
| 18 | 90 50.6 | N16 32.3 | 347 31.6 | 14.4 | N17 33.5 | 11.8 | 54.8 |
| 19 | 105 50.7 | 33.0 | 2 05.0 | 14.3 | 17 21.7 | 11.8 | 54.8 |
| 20 | 120 50.7 | 33.7 | 16 38.3 | 14.4 | 17 09.9 | 12.0 | 54.8 |
| 21 | 135 50.8 .. | 34.4 | 31 11.7 | 14.5 | 16 57.9 | 12.0 | 54.8 |
| 22 | 150 50.8 | 35.1 | 45 45.2 | 14.4 | 16 45.9 | 12.1 | 54.9 |
| 23 | 165 50.9 | 35.8 | 60 18.6 | 14.5 | 16 33.8 | 12.2 | 54.9 |
| | S.D. 15.9 | d 0.7 | S.D. 14.8 | | 14.8 | | 14.9 |

Twilight / Sunrise / Moonrise

| Lat. | Naut. | Civil | Sunrise | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| ° | h m | h m | h m | h m | h m | h m | h m |
| N 72 | //// | //// | 01 20 | ▢ | ▢ | ▢ | 09 54 |
| N 70 | //// | //// | 02 10 | ▢ | ▢ | 07 27 | 10 25 |
| 68 | //// | //// | 02 41 | ▢ | ▢ | 08 34 | 10 47 |
| 66 | //// | 01 33 | 03 04 | ▢ | 06 36 | 09 09 | 11 05 |
| 64 | //// | 02 09 | 03 22 | ▢ | 07 38 | 09 34 | 11 19 |
| 62 | //// | 02 34 | 03 37 | 06 23 | 08 12 | 09 54 | 11 30 |
| 60 | 01 22 | 02 54 | 03 49 | 07 04 | 08 37 | 10 10 | 11 40 |
| N 58 | 01 55 | 03 10 | 03 59 | 07 31 | 08 57 | 10 23 | 11 49 |
| 56 | 02 19 | 03 23 | 04 09 | 07 53 | 09 13 | 10 35 | 11 57 |
| 54 | 02 37 | 03 34 | 04 17 | 08 11 | 09 27 | 10 45 | 12 03 |
| 52 | 02 52 | 03 44 | 04 24 | 08 26 | 09 39 | 10 54 | 12 09 |
| 50 | 03 05 | 03 53 | 04 31 | 08 39 | 09 49 | 11 02 | 12 15 |
| 45 | 03 31 | 04 12 | 04 45 | 09 06 | 10 12 | 11 19 | 12 26 |
| N 40 | 03 50 | 04 26 | 04 56 | 09 27 | 10 29 | 11 33 | 12 36 |
| 35 | 04 06 | 04 39 | 05 06 | 09 44 | 10 44 | 11 44 | 12 44 |
| 30 | 04 18 | 04 49 | 05 14 | 10 00 | 10 57 | 11 54 | 12 51 |
| 20 | 04 38 | 05 06 | 05 29 | 10 25 | 11 19 | 12 12 | 13 04 |
| N 10 | 04 54 | 05 20 | 05 42 | 10 47 | 11 38 | 12 27 | 13 14 |
| 0 | 05 07 | 05 32 | 05 53 | 11 07 | 11 55 | 12 41 | 13 24 |
| S 10 | 05 18 | 05 43 | 06 05 | 11 28 | 12 13 | 12 55 | 13 34 |
| 20 | 05 28 | 05 54 | 06 17 | 11 50 | 12 31 | 13 10 | 13 45 |
| 30 | 05 38 | 06 06 | 06 31 | 12 15 | 12 53 | 13 27 | 13 57 |
| 35 | 05 43 | 06 13 | 06 39 | 12 29 | 13 05 | 13 36 | 14 04 |
| 40 | 05 48 | 06 20 | 06 48 | 12 47 | 13 20 | 13 48 | 14 12 |
| 45 | 05 53 | 06 28 | 06 59 | 13 07 | 13 37 | 14 01 | 14 21 |
| S 50 | 05 58 | 06 37 | 07 12 | 13 33 | 13 58 | 14 17 | 14 32 |
| 52 | 06 01 | 06 41 | 07 18 | 13 45 | 14 08 | 14 24 | 14 37 |
| 54 | 06 03 | 06 46 | 07 24 | 13 59 | 14 19 | 14 32 | 14 43 |
| 56 | 06 06 | 06 51 | 07 31 | 14 16 | 14 31 | 14 42 | 14 49 |
| 58 | 06 09 | 06 56 | 07 40 | 14 35 | 14 46 | 14 52 | 14 56 |
| S 60 | 06 12 | 07 03 | 07 49 | 15 00 | 15 03 | 15 04 | 15 03 |

Twilight / Moonset

| Lat. | Sunset | Civil | Naut. | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| ° | h m | h m | h m | h m | h m | h m | h m |
| N 72 | 22 44 | //// | //// | ▢ | ▢ | ▢ | 04 57 |
| N 70 | 21 49 | //// | //// | ▢ | ▢ | 05 50 | 04 24 |
| 68 | 21 16 | //// | //// | ▢ | ▢ | 04 42 | 04 00 |
| 66 | 20 52 | 22 27 | //// | ▢ | 05 03 | 04 05 | 03 41 |
| 64 | 20 34 | 21 49 | //// | ▢ | 04 00 | 03 39 | 03 26 |
| 62 | 20 19 | 21 22 | //// | 03 34 | 03 25 | 03 18 | 03 13 |
| 60 | 20 06 | 21 02 | 22 37 | 02 53 | 02 59 | 03 02 | 03 02 |
| N 58 | 19 56 | 20 46 | 22 02 | 02 24 | 02 39 | 02 47 | 02 52 |
| 56 | 19 46 | 20 32 | 21 37 | 02 02 | 02 22 | 02 35 | 02 44 |
| 54 | 19 38 | 20 21 | 21 18 | 01 44 | 02 08 | 02 24 | 02 36 |
| 52 | 19 31 | 20 10 | 21 03 | 01 29 | 01 56 | 02 15 | 02 29 |
| 50 | 19 24 | 20 01 | 20 50 | 01 15 | 01 45 | 02 06 | 02 23 |
| 45 | 19 10 | 19 43 | 20 24 | 00 48 | 01 21 | 01 48 | 02 10 |
| N 40 | 18 58 | 19 28 | 20 04 | 00 26 | 01 03 | 01 33 | 01 59 |
| 35 | 18 48 | 19 16 | 19 49 | 00 08 | 00 47 | 01 20 | 01 50 |
| 30 | 18 40 | 19 05 | 19 36 | 24 33 | 00 33 | 01 09 | 01 41 |
| 20 | 18 25 | 18 48 | 19 15 | 24 10 | 00 10 | 00 50 | 01 27 |
| N 10 | 18 12 | 18 34 | 19 00 | 23 50 | 24 33 | 00 33 | 01 14 |
| 0 | 18 00 | 18 22 | 18 47 | 23 31 | 24 17 | 00 17 | 01 02 |
| S 10 | 17 48 | 18 10 | 18 36 | 23 12 | 24 02 | 00 02 | 00 50 |
| 20 | 17 36 | 17 59 | 18 25 | 22 51 | 23 44 | 24 37 | 00 37 |
| 30 | 17 22 | 17 47 | 18 15 | 22 27 | 23 25 | 24 22 | 00 22 |
| 35 | 17 14 | 17 40 | 18 11 | 22 13 | 23 13 | 24 13 | 00 13 |
| 40 | 17 05 | 17 33 | 18 05 | 21 57 | 23 00 | 24 03 | 00 03 |
| 45 | 16 54 | 17 25 | 18 00 | 21 37 | 22 44 | 23 51 | 24 59 |
| S 50 | 16 41 | 17 16 | 17 54 | 21 12 | 22 24 | 23 37 | 24 50 |
| 52 | 16 35 | 17 11 | 17 52 | 21 00 | 22 15 | 23 30 | 24 45 |
| 54 | 16 29 | 17 07 | 17 49 | 20 46 | 22 04 | 23 22 | 24 41 |
| 56 | 16 21 | 17 02 | 17 46 | 20 30 | 21 52 | 23 14 | 24 35 |
| 58 | 16 13 | 16 56 | 17 43 | 20 11 | 21 38 | 23 04 | 24 30 |
| S 60 | 16 04 | 16 50 | 17 40 | 19 47 | 21 21 | 22 53 | 24 23 |

| Day | SUN Eqn. of Time 00ʰ | SUN Eqn. of Time 12ʰ | SUN Mer. Pass. | MOON Mer. Pass. Upper | MOON Mer. Pass. Lower | Age | Phase |
|---|---|---|---|---|---|---|---|
| | m s | m s | h m | h m | h m | d | |
| 4 | 03 08 | 03 11 | 11 57 | 17 19 | 04 55 | 06 | |
| 5 | 03 14 | 03 16 | 11 57 | 18 06 | 05 43 | 07 | ◖ |
| 6 | 03 19 | 03 21 | 11 57 | 18 51 | 06 29 | 08 | |

## ANNEXURE 6 – NAUTICAL ALMANAC – 1987 JUNE 18, 19, 20

### 1987 JUNE 18, 19, 20 (THURS., FRI., SAT.)    123

| G.M.T. (UT) | SUN G.H.A. | Dec. | MOON G.H.A. | v | Dec. | d | H.P. |
|---|---|---|---|---|---|---|---|
| d h | o ' | o ' | o ' | ' | o ' | ' | ' |
| **18** 00 | 179 47.0 | N23 23.4 | 273 52.8 | 13.1 | S 5 12.0 | 16.1 | 58.4 |
| 01 | 194 46.8 | 23.5 | 288 24.9 | 13.1 | 4 55.9 | 16.1 | 58.4 |
| 02 | 209 46.7 | 23.5 | 302 57.0 | 13.2 | 4 39.8 | 16.2 | 58.3 |
| 03 | 224 46.6 | .. 23.6 | 317 29.2 | 13.3 | 4 23.6 | 16.1 | 58.3 |
| 04 | 239 46.4 | 23.7 | 332 01.5 | 13.3 | 4 07.5 | 16.1 | 58.3 |
| 05 | 254 46.3 | 23.7 | 346 33.8 | 13.3 | 3 51.4 | 16.1 | 58.2 |
| 06 | 269 46.2 | N23 23.8 | 1 06.1 | 13.4 | S 3 35.3 | 16.2 | 58.2 |
| 07 | 284 46.0 | 23.9 | 15 38.5 | 13.5 | 3 19.1 | 16.1 | 58.2 |
| T 08 | 299 45.9 | 23.9 | 30 11.0 | 13.5 | 3 03.0 | 16.1 | 58.1 |
| H 09 | 314 45.7 | .. 24.0 | 44 43.5 | 13.5 | 2 46.9 | 16.1 | 58.1 |
| U 10 | 329 45.6 | 24.0 | 59 16.0 | 13.6 | 2 30.8 | 16.1 | 58.1 |
| R 11 | 344 45.5 | 24.1 | 73 48.6 | 13.7 | 2 14.7 | 16.1 | 58.0 |
| S 12 | 359 45.3 | N23 24.2 | 88 21.3 | 13.6 | S 1 58.6 | 16.1 | 58.0 |
| D 13 | 14 45.2 | 24.2 | 102 53.9 | 13.8 | 1 42.5 | 16.1 | 58.0 |
| A 14 | 29 45.1 | 24.3 | 117 26.7 | 13.7 | 1 26.4 | 16.0 | 57.9 |
| Y 15 | 44 44.9 | .. 24.3 | 131 59.4 | 13.8 | 1 10.4 | 16.1 | 57.9 |
| 16 | 59 44.8 | 24.4 | 146 32.2 | 13.9 | 0 54.3 | 16.0 | 57.9 |
| 17 | 74 44.7 | 24.5 | 161 05.1 | 13.9 | 0 38.3 | 16.1 | 57.8 |
| 18 | 89 44.5 | N23 24.5 | 175 38.0 | 13.9 | S 0 22.2 | 16.0 | 57.8 |
| 19 | 104 44.4 | 24.6 | 190 10.9 | 13.9 | S 0 06.2 | 15.9 | 57.8 |
| 20 | 119 44.3 | 24.6 | 204 43.8 | 14.0 | N 0 09.7 | 16.0 | 57.7 |
| 21 | 134 44.1 | .. 24.7 | 219 16.8 | 14.0 | 0 25.7 | 16.0 | 57.7 |
| 22 | 149 44.0 | 24.7 | 233 49.8 | 14.1 | 0 41.7 | 15.9 | 57.7 |
| 23 | 164 43.9 | 24.8 | 248 22.9 | 14.0 | 0 57.6 | 15.9 | 57.6 |
| **19** 00 | 179 43.7 | N23 24.8 | 262 55.9 | 14.1 | N 1 13.5 | 15.9 | 57.6 |
| 01 | 194 43.6 | 24.9 | 277 29.0 | 14.1 | 1 29.4 | 15.9 | 57.6 |
| 02 | 209 43.4 | 24.9 | 292 02.1 | 14.2 | 1 45.3 | 15.8 | 57.5 |
| 03 | 224 43.3 | .. 25.0 | 306 35.3 | 14.1 | 2 01.1 | 15.8 | 57.5 |
| 04 | 239 43.2 | 25.0 | 321 08.4 | 14.2 | 2 16.9 | 15.8 | 57.5 |
| 05 | 254 43.0 | 25.1 | 335 41.6 | 14.2 | 2 32.7 | 15.8 | 57.4 |
| 06 | 269 42.9 | N23 25.1 | 350 14.8 | 14.2 | N 2 48.5 | 15.7 | 57.4 |
| 07 | 284 42.8 | 25.2 | 4 48.0 | 14.3 | 3 04.2 | 15.7 | 57.4 |
| 08 | 299 42.6 | 25.2 | 19 21.3 | 14.2 | 3 19.9 | 15.7 | 57.4 |
| F 09 | 314 42.5 | .. 25.2 | 33 54.5 | 14.3 | 3 35.6 | 15.6 | 57.3 |
| R 10 | 329 42.4 | 25.3 | 48 27.8 | 14.3 | 3 51.2 | 15.6 | 57.3 |
| I 11 | 344 42.2 | 25.3 | 63 01.1 | 14.2 | 4 06.8 | 15.6 | 57.3 |
| D 12 | 359 42.1 | N23 25.4 | 77 34.3 | 14.3 | N 4 22.4 | 15.5 | 57.2 |
| A 13 | 14 42.0 | 25.4 | 92 07.6 | 14.3 | 4 37.9 | 15.5 | 57.2 |
| Y 14 | 29 41.8 | 25.5 | 106 40.9 | 14.4 | 4 53.4 | 15.5 | 57.2 |
| 15 | 44 41.7 | .. 25.5 | 121 14.3 | 14.3 | 5 08.9 | 15.4 | 57.1 |
| 16 | 59 41.5 | 25.5 | 135 47.6 | 14.3 | 5 24.3 | 15.4 | 57.1 |
| 17 | 74 41.4 | 25.6 | 150 20.9 | 14.3 | 5 39.7 | 15.3 | 57.1 |
| 18 | 89 41.3 | N23 25.6 | 164 54.2 | 14.4 | N 5 55.0 | 15.3 | 57.0 |
| 19 | 104 41.1 | 25.6 | 179 27.6 | 14.3 | 6 10.3 | 15.3 | 57.0 |
| 20 | 119 41.0 | 25.7 | 194 00.9 | 14.3 | 6 25.6 | 15.2 | 57.0 |
| 21 | 134 40.9 | .. 25.7 | 208 34.2 | 14.4 | 6 40.8 | 15.2 | 57.0 |
| 22 | 149 40.7 | 25.8 | 223 07.6 | 14.3 | 6 56.0 | 15.1 | 56.9 |
| 23 | 164 40.6 | 25.8 | 237 40.9 | 14.3 | 7 11.1 | 15.1 | 56.9 |
| **20** 00 | 179 40.5 | N23 25.8 | 252 14.2 | 14.4 | N 7 26.2 | 15.0 | 56.9 |
| 01 | 194 40.3 | 25.9 | 266 47.6 | 14.3 | 7 41.2 | 15.0 | 56.8 |
| 02 | 209 40.2 | 25.9 | 281 20.9 | 14.3 | 7 56.2 | 14.9 | 56.8 |
| 03 | 224 40.0 | .. 25.9 | 295 54.2 | 14.3 | 8 11.1 | 14.9 | 56.8 |
| 04 | 239 39.9 | 25.9 | 310 27.5 | 14.3 | 8 26.0 | 14.9 | 56.8 |
| 05 | 254 39.8 | 26.0 | 325 00.8 | 14.3 | 8 40.9 | 14.8 | 56.7 |
| 06 | 269 39.6 | N23 26.0 | 339 34.1 | 14.2 | N 8 55.7 | 14.7 | 56.7 |
| 07 | 284 39.5 | 26.0 | 354 07.3 | 14.3 | 9 10.4 | 14.7 | 56.7 |
| S 08 | 299 39.4 | 26.1 | 8 40.6 | 14.2 | 9 25.1 | 14.6 | 56.6 |
| A 09 | 314 39.2 | .. 26.1 | 23 13.8 | 14.2 | 9 39.7 | 14.6 | 56.6 |
| T 10 | 329 39.1 | 26.1 | 37 47.0 | 14.3 | 9 54.3 | 14.5 | 56.6 |
| U 11 | 344 39.0 | 26.1 | 52 20.3 | 14.2 | 10 08.8 | 14.5 | 56.6 |
| R 12 | 359 38.8 | N23 26.2 | 66 53.5 | 14.1 | N10 23.3 | 14.4 | 56.5 |
| D 13 | 14 38.7 | 26.2 | 81 26.6 | 14.2 | 10 37.7 | 14.3 | 56.5 |
| A 14 | 29 38.5 | 26.2 | 95 59.8 | 14.1 | 10 52.0 | 14.3 | 56.5 |
| Y 15 | 44 38.4 | .. 26.2 | 110 32.9 | 14.1 | 11 06.3 | 14.3 | 56.4 |
| 16 | 59 38.3 | 26.3 | 125 06.0 | 14.1 | 11 20.6 | 14.1 | 56.4 |
| 17 | 74 38.1 | 26.3 | 139 39.1 | 14.1 | 11 34.7 | 14.1 | 56.4 |
| 18 | 89 38.0 | N23 26.3 | 154 12.2 | 14.0 | N11 48.8 | 14.1 | 56.4 |
| 19 | 104 37.9 | 26.3 | 168 45.2 | 14.1 | 12 02.9 | 13.9 | 56.3 |
| 20 | 119 37.7 | 26.3 | 183 18.3 | 13.9 | 12 16.8 | 14.0 | 56.3 |
| 21 | 134 37.6 | .. 26.4 | 197 51.2 | 14.0 | 12 30.8 | 13.8 | 56.3 |
| 22 | 149 37.5 | 26.4 | 212 24.2 | 13.9 | 12 44.6 | 13.8 | 56.3 |
| 23 | 164 37.3 | 26.4 | 226 57.1 | 14.0 | 12 58.4 | 13.7 | 56.2 |
| | S.D. 15.8 | d 0.0 | S.D. 15.8 | | 15.6 | | 15.4 |

**Twilight / Sunrise / Moonrise**

| Lat. | Naut. | Civil | Sunrise | Moonrise 18 | 19 | 20 | 21 |
|---|---|---|---|---|---|---|---|
| o | h m | h m | h m | h m | h m | h m | h m |
| N 72 | □ | □ | □ | 00 50 | {00 15 / 23 39} | 22 54 | 21 19 |
| N 70 | □ | □ | □ | 00 43 | {00 16 / 23 49} | 23 16 | 22 25 |
| 68 | □ | □ | □ | 00 38 | {00 12 / 23 57} | 23 34 | 23 02 |
| 66 | □ | □ | □ | 00 33 | 00 18 | {00 04 / 23 48} | 23 28 |
| 64 | //// | //// | 01 31 | 00 29 | 00 19 | 00 10 | {00 / 23 49} |
| 62 | //// | //// | 02 09 | 00 25 | 00 20 | 00 15 | 00 10 |
| 60 | //// | 00 49 | 02 35 | 00 22 | 00 21 | 00 20 | 00 19 |
| N 58 | //// | 01 40 | 02 56 | 00 19 | 00 21 | 00 24 | 00 27 |
| 56 | //// | 02 10 | 03 13 | 00 17 | 00 22 | 00 27 | 00 34 |
| 54 | 00 45 | 02 32 | 03 27 | 00 14 | 00 23 | 00 31 | 00 40 |
| 52 | 01 32 | 02 50 | 03 39 | 00 12 | 00 23 | 00 34 | 00 45 |
| 50 | 02 00 | 03 06 | 03 50 | 00 10 | 00 23 | 00 36 | 00 50 |
| 45 | 02 46 | 03 35 | 04 13 | 00 06 | 00 24 | 00 42 | 01 01 |
| N 40 | 03 16 | 03 58 | 04 31 | 00 03 | 00 25 | 00 47 | 01 10 |
| 35 | 03 39 | 04 16 | 04 46 | 00 00 | 00 26 | 00 52 | 01 18 |
| 30 | 03 58 | 04 31 | 04 59 | 24 27 | 00 27 | 00 55 | 01 25 |
| 20 | 04 27 | 04 56 | 05 21 | 24 28 | 00 28 | 01 02 | 01 37 |
| N 10 | 04 50 | 05 17 | 05 40 | 24 29 | 00 29 | 01 08 | 01 48 |
| 0 | 05 09 | 05 35 | 05 58 | 24 30 | 00 30 | 01 14 | 01 58 |
| S 10 | 05 26 | 05 52 | 06 15 | 24 31 | 00 31 | 01 19 | 02 08 |
| 20 | 05 42 | 06 09 | 06 34 | 24 32 | 00 32 | 01 26 | 02 19 |
| 30 | 05 58 | 06 28 | 06 55 | 24 33 | 00 33 | 01 33 | 02 32 |
| 35 | 06 07 | 06 39 | 07 07 | 24 34 | 00 34 | 01 37 | 02 39 |
| 40 | 06 17 | 06 51 | 07 21 | 24 35 | 00 35 | 01 41 | 02 47 |
| 45 | 06 27 | 07 04 | 07 38 | 24 36 | 00 36 | 01 47 | 02 57 |
| S 50 | 06 39 | 07 20 | 07 59 | 24 37 | 00 37 | 01 53 | 03 09 |
| 52 | 06 44 | 07 28 | 08 09 | 24 37 | 00 37 | 01 56 | 03 15 |
| 54 | 06 50 | 07 36 | 08 20 | 24 38 | 00 38 | 02 00 | 03 21 |
| 56 | 06 56 | 07 45 | 08 33 | 24 39 | 00 39 | 02 03 | 03 28 |
| 58 | 07 03 | 07 55 | 08 47 | 24 39 | 00 39 | 02 08 | 03 36 |
| S 60 | 07 10 | 08 07 | 09 05 | 24 40 | 00 40 | 02 12 | 03 45 |

**Sunset / Twilight / Moonset**

| Lat. | Sunset | Civil | Naut. | Moonset 18 | 19 | 20 | 21 |
|---|---|---|---|---|---|---|---|
| o | h m | h m | h m | h m | h m | h m | h m |
| N 72 | □ | □ | □ | 11 39 | 13 52 | 16 11 | 19 22 |
| N 70 | □ | □ | □ | 11 42 | 13 45 | 15 51 | 18 17 |
| 68 | □ | □ | □ | 11 44 | 13 39 | 15 35 | 17 42 |
| 66 | □ | □ | □ | 11 46 | 13 35 | 15 23 | 17 17 |
| 64 | 22 32 | //// | //// | 11 48 | 13 31 | 15 12 | 16 58 |
| 62 | 21 54 | //// | //// | 11 50 | 13 27 | 15 04 | 16 42 |
| 60 | 21 27 | 23 14 | //// | 11 51 | 13 24 | 14 56 | 16 29 |
| N 58 | 21 07 | 22 22 | //// | 11 52 | 13 22 | 14 49 | 16 18 |
| 56 | 20 50 | 21 52 | //// | 11 54 | 13 19 | 14 44 | 16 08 |
| 54 | 20 36 | 21 30 | 23 18 | 11 54 | 13 17 | 14 39 | 16 00 |
| 52 | 20 23 | 21 12 | 22 31 | 11 55 | 13 15 | 14 34 | 15 52 |
| 50 | 20 12 | 20 57 | 22 03 | 11 56 | 13 14 | 14 30 | 15 45 |
| 45 | 19 50 | 20 27 | 21 17 | 11 58 | 13 10 | 14 21 | 15 31 |
| N 40 | 19 32 | 20 05 | 20 46 | 11 59 | 13 07 | 14 13 | 15 19 |
| 35 | 19 17 | 19 46 | 20 23 | 12 00 | 13 04 | 14 07 | 15 09 |
| 30 | 19 04 | 19 31 | 20 04 | 12 01 | 13 02 | 14 01 | 15 00 |
| 20 | 18 41 | 19 06 | 19 35 | 12 03 | 12 58 | 13 51 | 14 45 |
| N 10 | 18 22 | 18 46 | 19 13 | 12 05 | 12 54 | 13 43 | 14 32 |
| 0 | 18 05 | 18 27 | 18 54 | 12 06 | 12 51 | 13 35 | 14 20 |
| S 10 | 17 47 | 18 10 | 18 37 | 12 08 | 12 47 | 13 27 | 14 07 |
| 20 | 17 29 | 17 53 | 18 20 | 12 09 | 12 44 | 13 18 | 13 54 |
| 30 | 17 08 | 17 34 | 18 04 | 12 11 | 12 40 | 13 09 | 13 40 |
| 35 | 16 55 | 17 23 | 17 55 | 12 12 | 12 37 | 13 03 | 13 31 |
| 40 | 16 41 | 17 12 | 17 46 | 12 13 | 12 35 | 12 57 | 13 22 |
| 45 | 16 24 | 16 58 | 17 35 | 12 14 | 12 32 | 12 50 | 13 10 |
| S 50 | 16 03 | 16 42 | 17 24 | 12 15 | 12 28 | 12 42 | 12 57 |
| 52 | 15 54 | 16 34 | 17 18 | 12 16 | 12 27 | 12 38 | 12 50 |
| 54 | 15 42 | 16 26 | 17 13 | 12 17 | 12 25 | 12 33 | 12 43 |
| 56 | 15 30 | 16 17 | 17 06 | 12 17 | 12 23 | 12 29 | 12 36 |
| 58 | 15 15 | 16 07 | 17 00 | 12 18 | 12 21 | 12 23 | 12 27 |
| S 60 | 14 57 | 15 55 | 16 52 | 12 19 | 12 18 | 12 17 | 12 17 |

| Day | SUN Eqn. of Time 00h | 12h | Mer. Pass. | MOON Mer. Pass. Upper | Lower | Age | Phase |
|---|---|---|---|---|---|---|---|
| | m s | m s | h m | h m | h m | d | |
| 18 | 00 52 | 00 58 | 12 01 | 05 55 | 18 18 | 22 | |
| 19 | 01 05 | 01 11 | 12 01 | 06 40 | 19 02 | 23 | |
| 20 | 01 18 | 01 24 | 12 01 | 07 24 | 19 46 | 24 | ◖ |

## ANNEXURE 7 – INCREMENTS AND CORRECTIONS

### 12ᵐ  INCREMENTS AND CORRECTIONS  13ᵐ

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

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