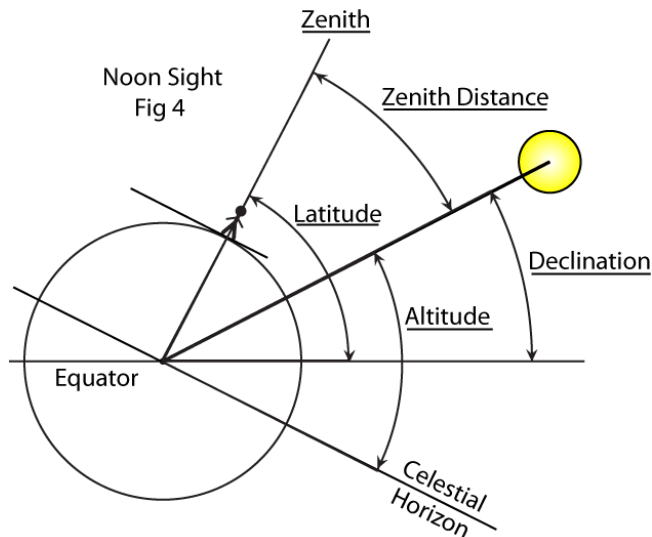


Celestial Navigation

13 Latitude from the Sun



From the diagram we can deduce that:

$$\text{Zenith Distance} = 90^\circ - \text{Altitude}$$

$$\text{ZD} = 90^\circ - \text{Ho}$$

$$\text{Latitude} = \text{Zenith Distance} + \text{Declination}$$

$$\text{L} = \text{ZD} + \text{Dec}$$

$$\text{Substituting for ZD}$$

$$\text{L} = 90^\circ - \text{Ho} + \text{Dec}$$

The altitude (Ho) we get with the sextant. The Declination we look up in the Nautical Almanac. Remember to use the declination for noon at your longitude not noon at Greenwich! If we make sure we measure the angle when the Sun is at its highest point in the sky it must be local noon. We do not need accurate time because the Sun's altitude changes very little either side of noon - it seems to hang in the sky for a few minutes. Determining Latitude is then just some simple math.

Celestial Navigation



13.1 Noon Sight Scenarios

There are three possible scenarios involving taking a noon sight of the Sun.

In the list of scenarios below scenario 1 is covered by the previous explanation.

Your homework task is to develop formulae for scenarios 2 and 3. Draw some sketches similar to the diagram on the previous page to help you visualise the interactions of the various angles.

1. The latitude of the observer and the declination of the Sun both have the same name with the latitude numerically greater.
2. As above but the latitude of the observer is the opposite name to the declination of the Sun.
3. The latitude of the observer and the declination of the Sun both have the same name with the latitude numerically less.

Now all of the foregoing apply to any body at its meridian passage. For bodies other than the Sun there is a fourth scenario. If you want to torture your mind further go ahead and identify the scenario and develop a formula for it.

This is a situation that only extreme sailors will encounter. This is definitely not required for the exam!

13.2 Noon Sight Fix

Although accurate time is not required to determine Latitude if it is available it is possible to determine longitude as well as latitude; in other words obtain a fix. Your longitude is simply the GHA of the Sun at noon converted to longitude East or West as appropriate.