

Master (Yachts)

Celestial Navigation

Lesson 1.2

Reading the Sextant



Note

Reading the sextant will be examined during the oral examination.

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Reading the sextant

The sextant must be read as accurately as possible.



Every ONE minute of arc has an equivalent distance of ONE Nautical Mile on the surface of the Earth!

Readings should be taken using the Index Mark and Micrometer to within 0.2 minutes of arc (equivalent to an accuracy of 0.2 nautical miles). With practice it is possible to obtain a reading to within 0.1 minutes of arc.

Reading the whole number of degrees

Degrees of altitude are read directly from the Arc of the Sextant (opposite the Index Mark on the Index Arm).

Reading the whole number of minutes

Minutes are read directly from the Micrometer drum.

Reading the number of tenths of a minute

These are read directly from the Micrometer drum using the Vernier scale which is graduated in 0.2 minute intervals. The reading is taken from where one of the Vernier graduations lines up with one of the Micrometer graduations.

Note that some older sextants may be graduated to 10 seconds of arc; others, like the one depicted in these notes to 0.2 minutes (12 seconds) of arc. It just depends on the age and model of sextant that you are using!

See figure 1 which shows the sextant reading $32^{\circ} 35.6'$.



Fig. 1 - Reading the sextant - 32° 35.6'.

Reading from the Micrometer

Figure 2 illustrates how to read the Vernier scale on the Micrometer; the decimals of a minute are taken from the right hand scale (graduated in 0.2 minute intervals) where a pair of the graduations are aligned.



0.0 minutes



0.2 minutes



0.4 minutes



0.6 minutes



0.8 minutes



1.0 minute

Fig. 2 - Reading from the Micrometer (0.0 to 1.0 minute shown).

Study the following examples.

Example 1

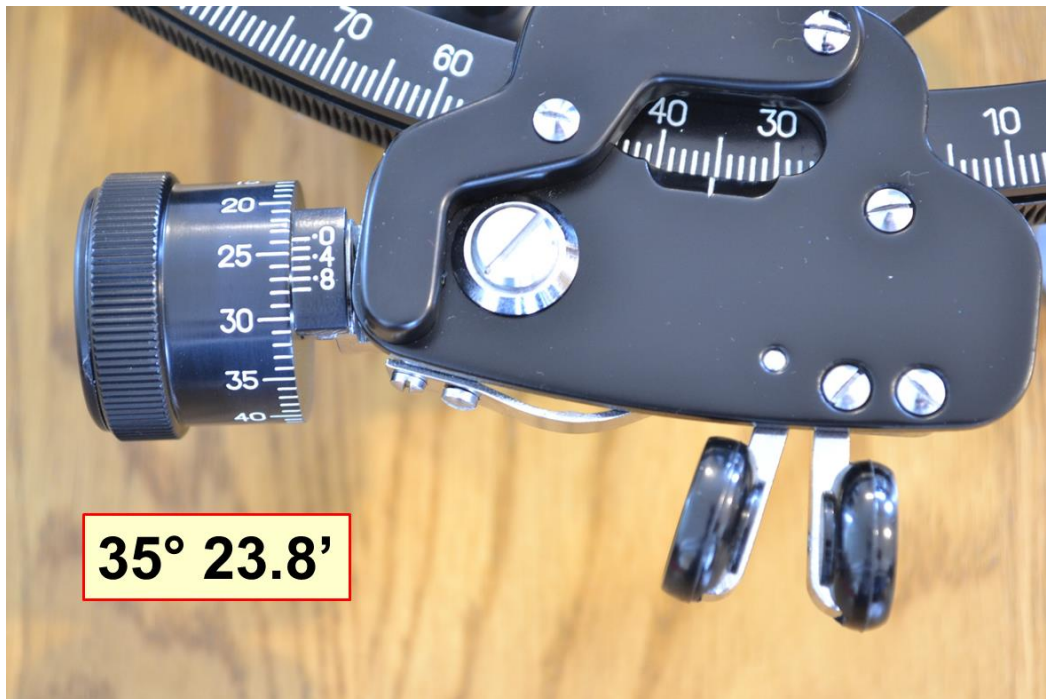


Fig. 3 - Example 1.

Example 2



Fig. 4 - Example 2.

Example 3



Fig. 5 - Example 3.

Example 4



Fig. 6 - Example 4.

Sextant readings 'On' and 'Off' the arc

It is essential to be able to read the sextant both *on* and *off* the Arc. To read angles (particularly very small angles) on and off the Arc it is helpful to understand the working of the Micrometer drum.

When holding the sextant with the right hand and the Micrometer drum with the left forefinger and thumb, the Micrometer will be viewed from the rear.

By turning the Micrometer drum CLOCKWISE (when viewed from the rear) the Micrometer reading will INCREASE.

By turning the Micrometer drum ANTI-CLOCKWISE the Micrometer reading will DECREASE.

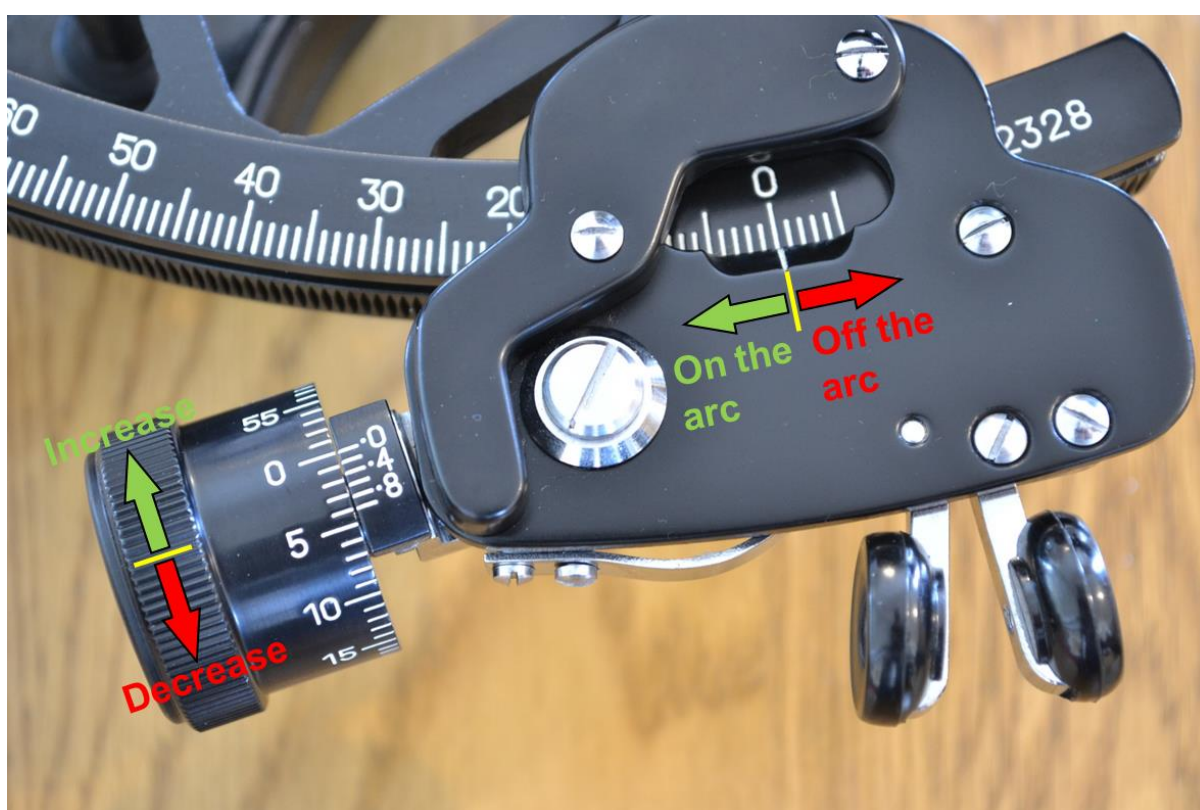


Fig. 7 - Readings 'On' and 'Off' the Arc.

The Micrometer drum is primarily designed for readings on the Arc; that is from 0° 00.0' upwards. If the Index Arm is moved to a position on the *arc of excess*; or off the Arc (that is BELOW the zero degree position) *readings of minutes on the Micrometer drum must be subtracted from 60* e.g. $60 - 57.2' = 2.8'$

Readings 'On' and 'Off' the Arc are necessary when checking the sextant's Index Error.

Study the following examples.

Example 5

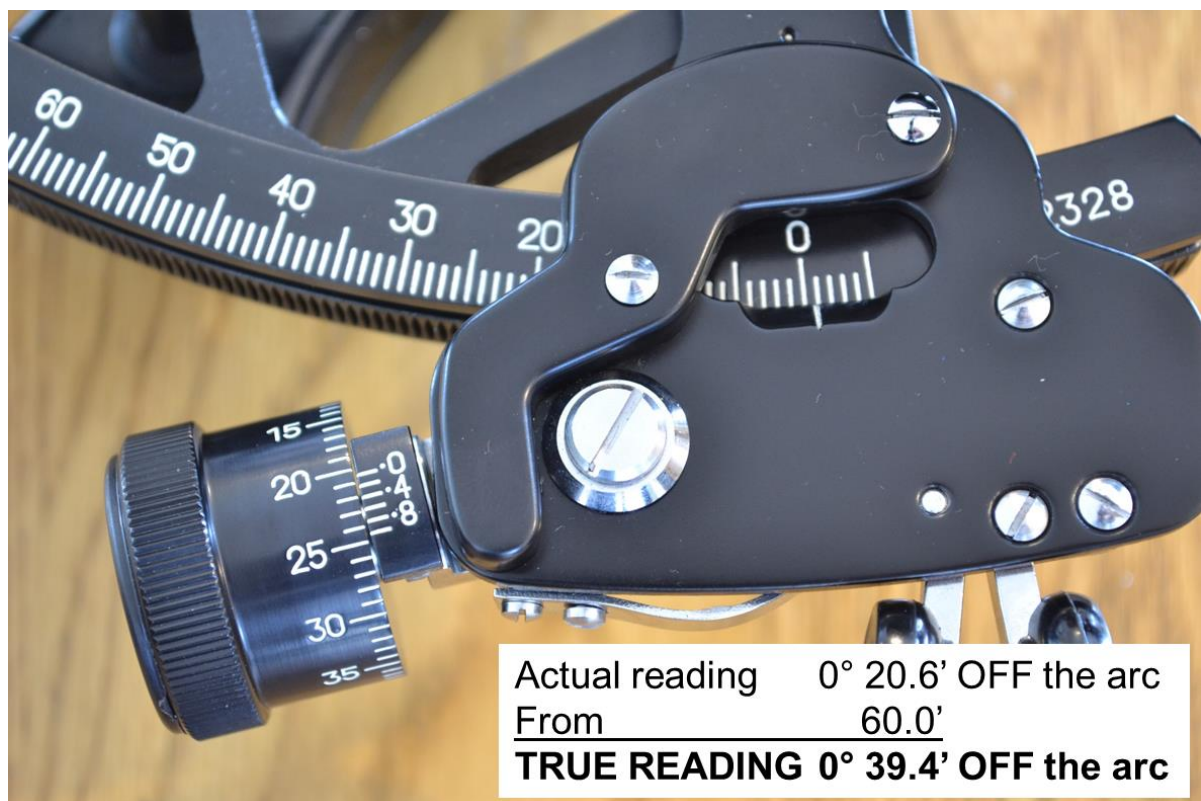


Fig. 8 - Example 5.

Example 6

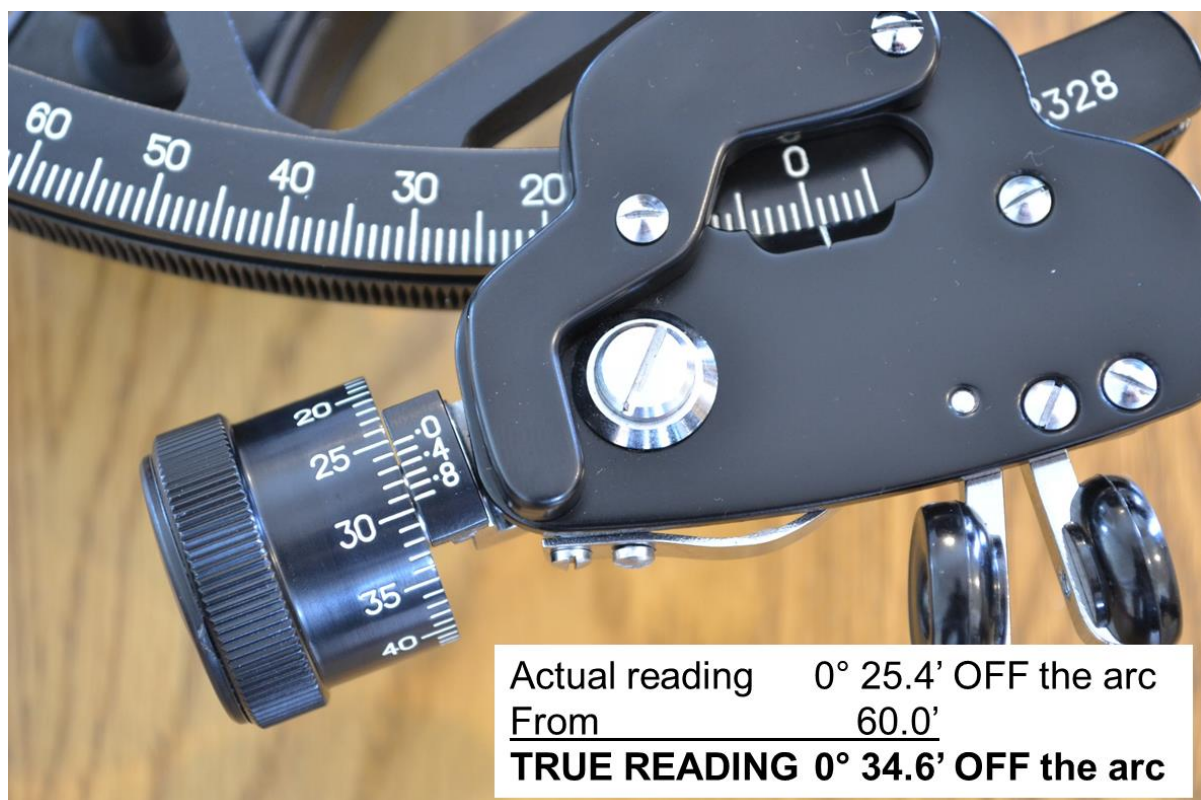


Fig. 9 - Example 6.

Example 7

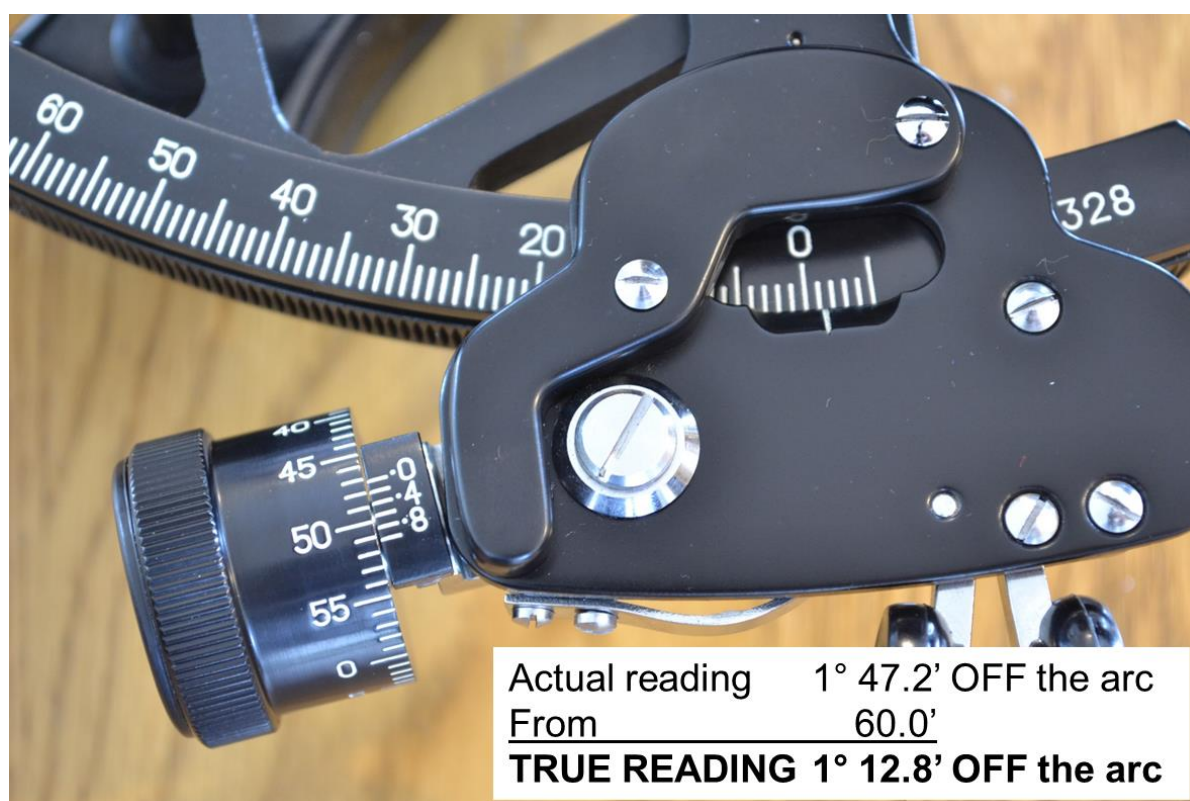


Fig. 10 - Example 7.



Note that only the minutes as read from the Micrometer are deducted from 60.0'; THE WHOLE NUMBER OF DEGREES REMAIN THE SAME!

Handling the sextant

All sextants; unless specifically ordered from the manufacturer, will be designed to be held in the right hand by the navigator when making observations. It follows that when taking the sextant from its box *it should be lifted out using the left hand* and placed in the right hand; we don't want to be 'juggling' with the instrument!

The sextant is a precision instrument however, the accuracy of any observations taken will be dependent on the user making the necessary instrument adjustments using the three adjustment screws on the Index and Horizon Mirrors prior to use. Index Error must be carefully evaluated; the procedure for this and conducting the necessary corrections to the instrument are discussed in detail in Lessons 1.5 and 1.6.

The box containing the sextant should be carefully stowed in the chartroom so as not to be allowed to move about in the cupboard in which it is stowed as the ship rolls and pitches at sea; constant minor knocks will cause misalignment of the mirrors. In any event, the user should verify any errors and make any necessary instrument adjustments *prior to initial use* and periodically thereafter.



Remember that every 0.1 minutes of arc error represents 0.1 nautical miles of error when plotting the position lines obtained!



Fig. 11 - Handling the sextant.



Complete the Tutorial Exercise that accompanies this Lesson.