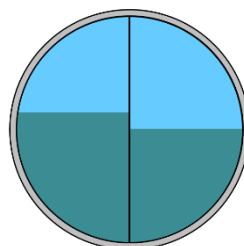
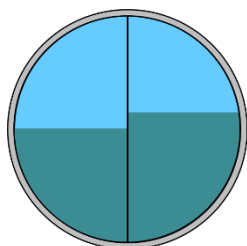
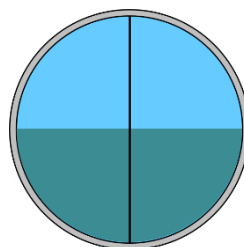


Master (Yachts)

Celestial Navigation

Lesson 1.4

Index Error



Note

Index Error (IE) of the sextant will be examined during the oral examination.

Lesson 1.4

Index Error



Ideally you should have a sextant to practice the techniques described in this Lesson.

As with any instrument the sextant is subject to certain errors, and some of them can be removed by adjusting the mirrors. The only one that concerns us here is called *Index Error*. When the Index Mirror and Horizon Mirror are parallel, the sextant should be reading exactly at $0^{\circ} 00.0'$; if it is not then Index Error exists and the angle read from the instrument will be incorrect.

Index Error can either be removed or evaluated and allowed for as a correction to the Sextant Altitude read from the instrument.

The procedure to remove or reduce Index Error is described in Lesson 1.5.

Evaluation of Index Error

Set the sextant to a reading of exactly $0^{\circ} 00.0'$ and view the horizon through the Monocle with the sextant held vertically.

The true and reflected images should appear as one continuous straight line. If this is the case then NO Index Error exists. See figure 1.

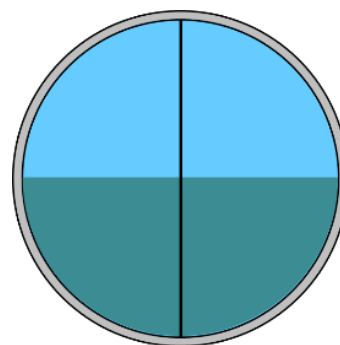


Fig. 1 - With sextant set at exactly $0^{\circ} 00.0'$ the horizon should appear as a continuous straight line.

If the horizon does NOT appear as a continuous straight line then Index Error DOES exist as seen in figure 2.

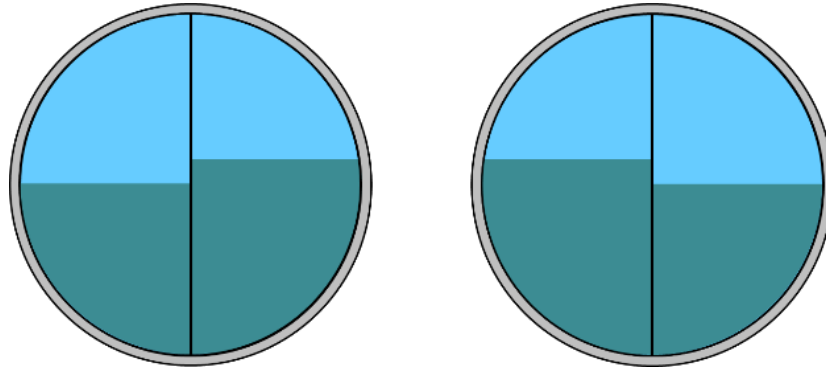


Fig. 2 - When the sextant is set at exactly $0^{\circ} 00.0'$ and the horizon does NOT appear as a continuous straight line then Index Error exists.

In this instance turn the Micrometer drum until the true and reflected images of the horizon become aligned; the direction in which to rotate the Micrometer will depend on which of the cases in figure 2 is evident.

Once the horizon is perfectly aligned see how the Index Mark is positioned and note the reading on the Micrometer and Vernier scale. This reading will give the value of the Index Error.

If it is *ON the Arc* the instrument will read *too HIGH* and the Index Error must be SUBTRACTED from the observed Sextant Altitude. If however the Index Mark is *OFF the Arc* the sextant will read *too LOW* and the Index Error must be ADDED.

See figures 3 and 4.

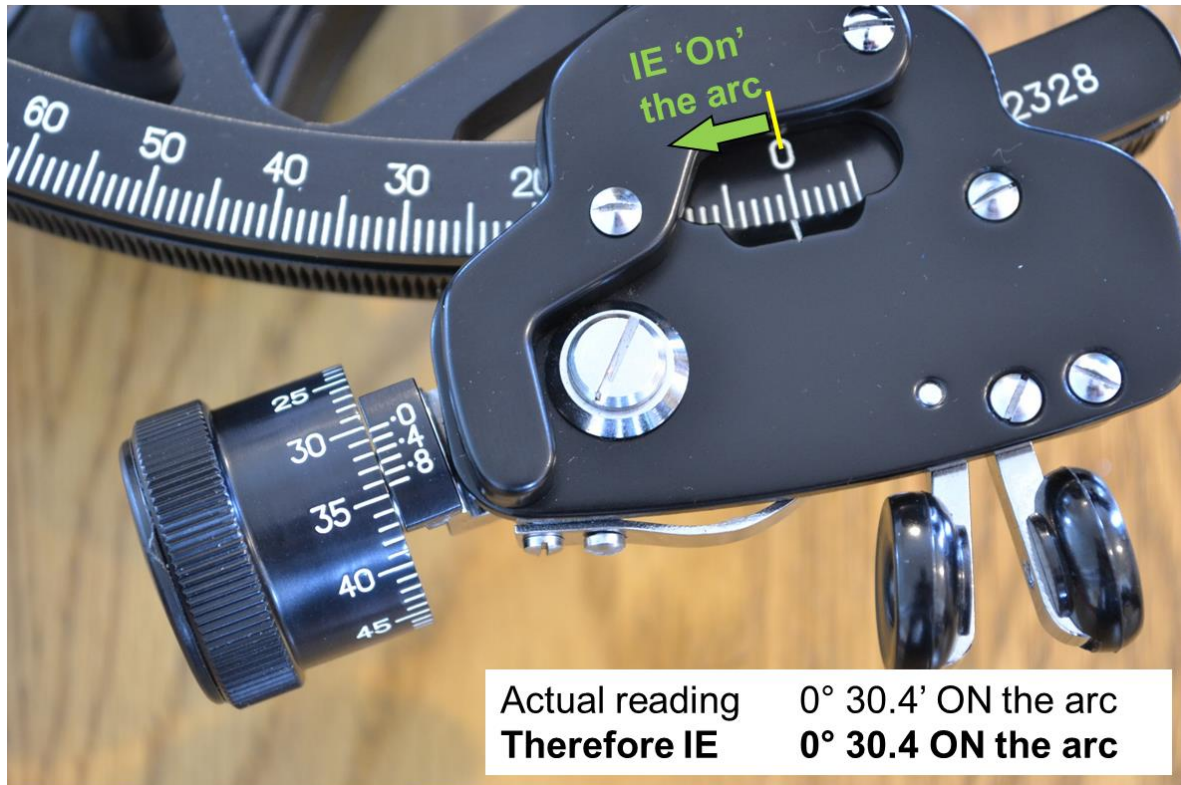


Fig. 3 - Index error (IE) is 30.4' ON the arc.

The sextant will be reading 30.4' TOO HIGH, therefore the IE must be SUBTRACTED from any Sextant Altitude reading.

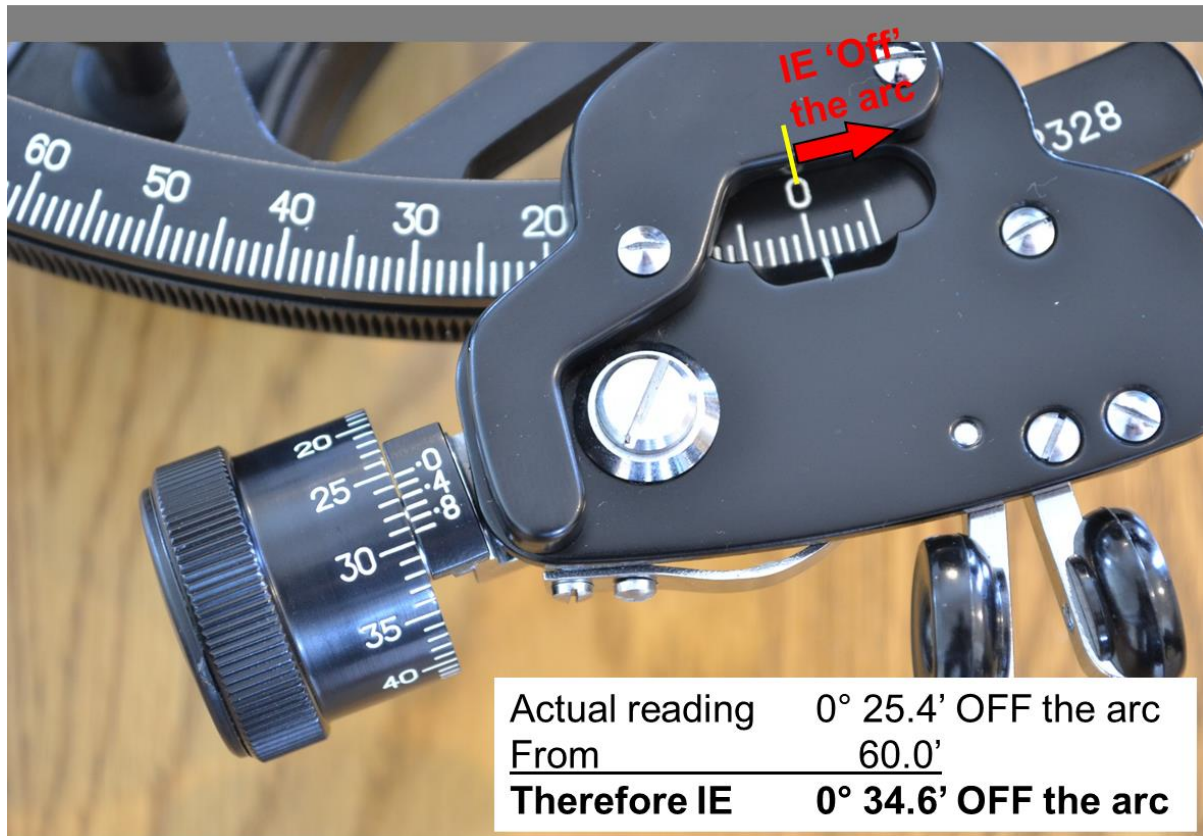


Fig. 4 - Index error (IE) is 34.6' OFF the arc.

The sextant will be reading 34.6' TOO LOW, therefore the IE must be ADDED to any Sextant Altitude reading.

Thus, to correct the Sextant Altitude for index error:



Index error ON THE ARC: TAKE IT OFF (subtract)

Index error OFF THE ARC: PUT IT ON (add)

The altitude read from the sextant is termed the *Sextant Altitude* and after correction for Index Error it is termed the *Observed Altitude*.

Acceptable value for Index Error

The value of Index Error should not exceed 5 minutes; if the navigator finds that the sextant has greater values, as was illustrated in figures 3 and 4, then the sextant needs to be adjusted as detailed in the next Lesson.

Examples 3 and 4 illustrated the concept of the Index Mark clearly being 'on' or 'off' the Arc. With only a small value of Index Error the reading on the Micrometer must be carefully noted as it is often the case that the whole degree graduations on the

Arc are not graduated as accurately as they should be. This is often the case with less expensive sextants.

It is common for any sextant to have some Index Error; it might not always be possible to remove the error completely - see next Lesson.

Follow the examples which clearly demonstrate how to obtain the Observed Altitude.

Example 1

Sextant Altitude is $27^{\circ} 34.8'$; Index Error is 2.6' OFF the arc. Find the Observed Altitude.

Solution

$$\begin{array}{r} \text{Sextant Altitude} \quad 27^{\circ} 34.8' \\ \text{IE (Off)} \quad \quad \quad +2.6' \\ \hline \text{Observed Altitude} \quad 27^{\circ} 37.4' \end{array}$$

Example 2

Sextant Altitude is $53^{\circ} 01.2'$; Index Error is 3.4' ON the arc. Find the Observed Altitude.

Solution

$$\begin{array}{r} \text{Sextant Altitude} \quad 53^{\circ} 01.2' \\ \text{IE (On)} \quad \quad \quad -3.4' \\ \hline \text{Observed Altitude} \quad 52^{\circ} 57.8' \end{array}$$

Example 3

Sextant Altitude is $39^{\circ} 58.7'$; Index Error is 1.4' OFF the arc. Find the Observed Altitude.

Solution

$$\begin{array}{r} \text{Sextant Altitude} \quad 39^{\circ} 58.7' \\ \text{IE (Off)} \quad \quad \quad +1.4' \\ \hline \text{Observed Altitude} \quad 40^{\circ} 00.1' \end{array}$$



With a sextant obtain the Index Error as described in this Lesson and see if the value is acceptable for celestial observation use.