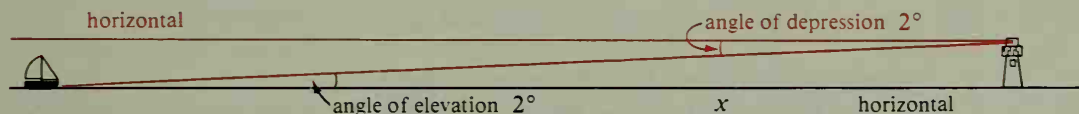


8-7 Applications of Right Triangle Trigonometry

Suppose an operator at the top of a lighthouse sights a sailboat on a line that makes a 2° angle with a horizontal line. The angle between the horizontal and the line of sight is called an **angle of depression**. At the same time, a person in the boat must look 2° above the horizontal to see the tip of the lighthouse. This is an **angle of elevation**.



If the top of the lighthouse is 25 m above sea level, the distance x between the boat and the base of the lighthouse can be found in these two ways:

Method 1

$$\begin{aligned}\tan 2^\circ &= \frac{25}{x} \\ x &= \frac{25}{\tan 2^\circ} \\ x &\approx \frac{25}{0.0349} \\ x &\approx 716.3\end{aligned}$$

Method 2

$$\begin{aligned}\tan 88^\circ &= \frac{x}{25} \\ x &= 25(\tan 88^\circ) \\ x &\approx 25(28.6363) \\ x &\approx 715.9\end{aligned}$$

Because the tangent values in the table are approximations, the two methods give slightly different answers. In practice, the angle measurement will not be exact, and the boat may be moving. In a case like this we cannot claim high accuracy for our answer. A good answer would be: The boat is roughly 700 m from the lighthouse.

Classroom Exercises

- Two people at points X and Y sight an airplane at A .
 - What is the angle of elevation from X to A ?
 - What is the angle of depression from A to X ?
 - What is the angle of depression from A to Y ?
 - What is the angle of elevation from Y to A ?
 - Is the measure of the angle of elevation from Z to A greater or less than 35° ?

