INVERSE TRIGONOMETRIC FUNCTIONS

TRIGONOMETRIC FUNCTION OF ANGLES

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TOPIC OUTLINE

Inverse Trigonometric Functions

Angle of Elevation and Depression

INVERSE TRIGONOMETRIC FUNCTIONS

INVERSE TRIGONOMETRIC FUNCTIONS

If x is within the valid range, then $\sin^{-1} x$, $\cos^{-1} x$, or $\tan^{-1} x$ **gives the angle** whose sine, cosine, or tangent, is x, respectively.

Inverse Trigonometric Functions

$$\theta = \sin^{-1}\left(\frac{\text{opposite}}{\text{hyptenuse}}\right)$$

$$\theta = \cos^{-1}\left(\frac{\text{adjacent}}{\text{hyptenuse}}\right)$$

$$\theta = \tan^{-1}\left(\frac{\text{opposite}}{\text{adjacent}}\right)$$

note

-1 is not an exponent, instead it simply means inverse function. Thus, $\sin^{-1}(x) \neq \frac{1}{\sin x}$.

EXERCISE

Find the value of θ.

$a.\ \sin\theta = \frac{1}{2}$

$b.\ \cos\theta = \frac{\sqrt{3}}{2}$

$c.\ \tan\theta = -\sqrt{3}$

$d.\ \csc\theta = -2$

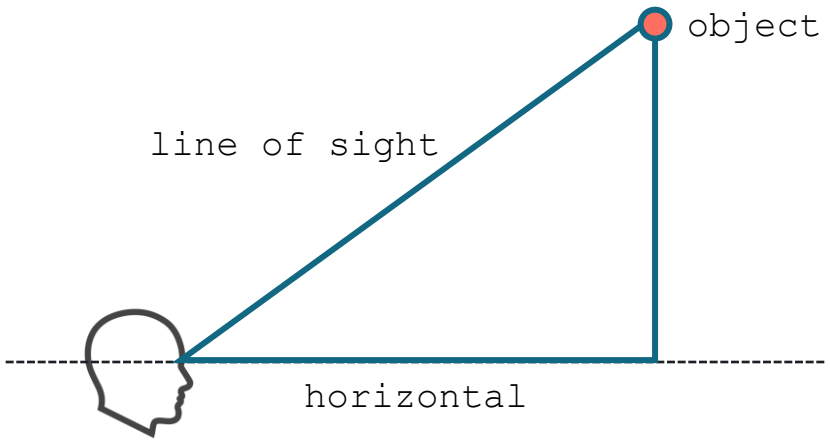
$e.\ \cot\theta = -\frac{\sqrt{3}}{3}$

Solution

ANGLE OF ELEVATION AND DEPRESSION

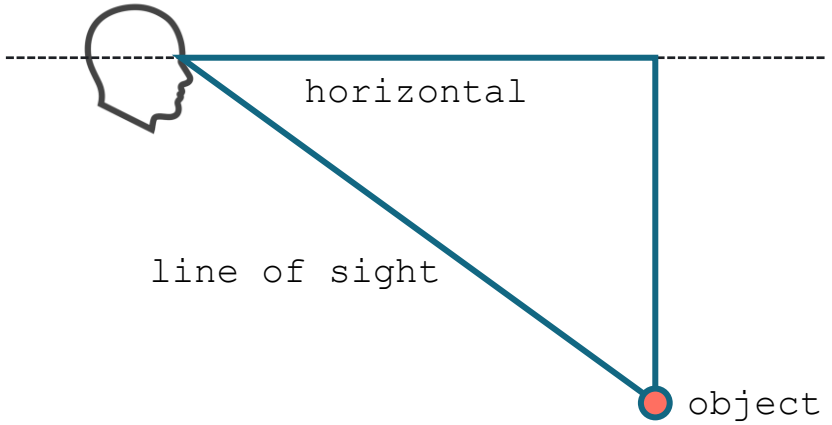
ANGLE OF ELEVATION AND DEPRESSION

Angle of Elevation



The **angle of elevation** is the angle between the horizontal and the line of sight to an object **above** the horizontal.

Angle of Depression

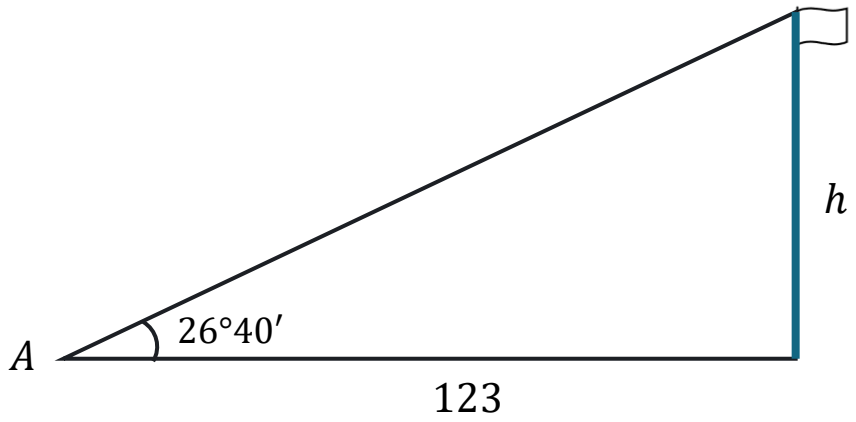


The **angle of depression** is the angle between the horizontal and the line of sight to an object **below** the horizontal.

EXERCISE

At a point A, 123 ft from the base of a flagpole, the angle of elevation to the top of the flagpole is 26°40′. Find the height of the flagpole.

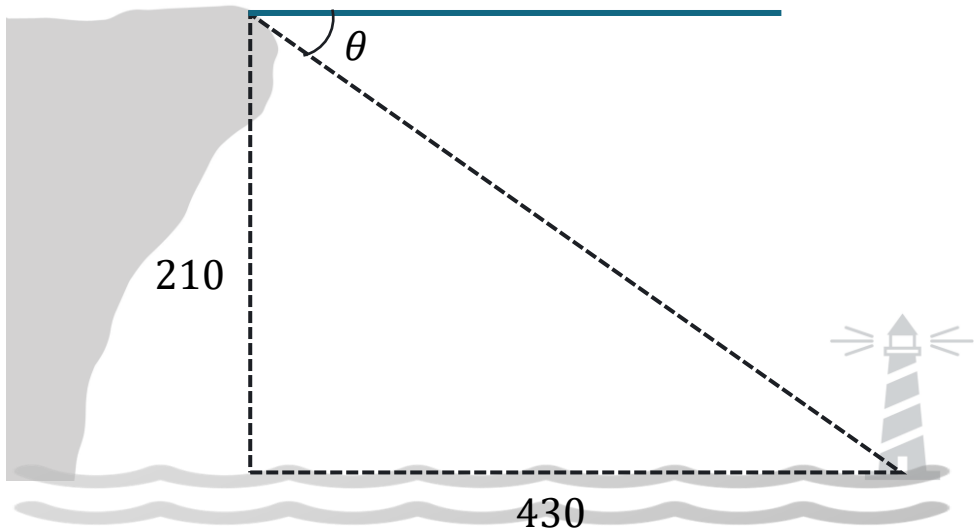
Solution



EXERCISE

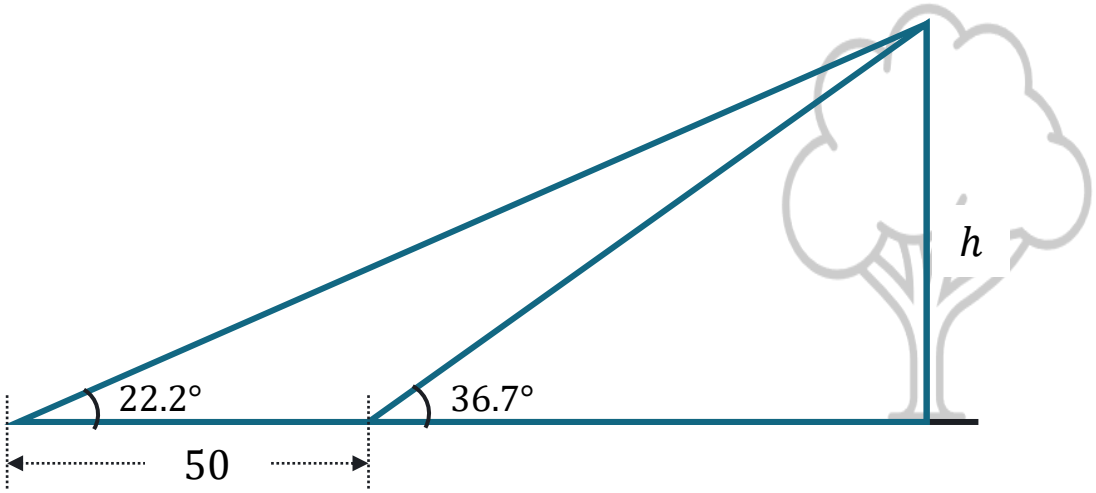
From the top of a 210-ft cliff, David observes a lighthouse that is 430 ft off-shore. Find the angle of depression from the top of the cliff to the base of the lighthouse.

Solution



EXERCISE

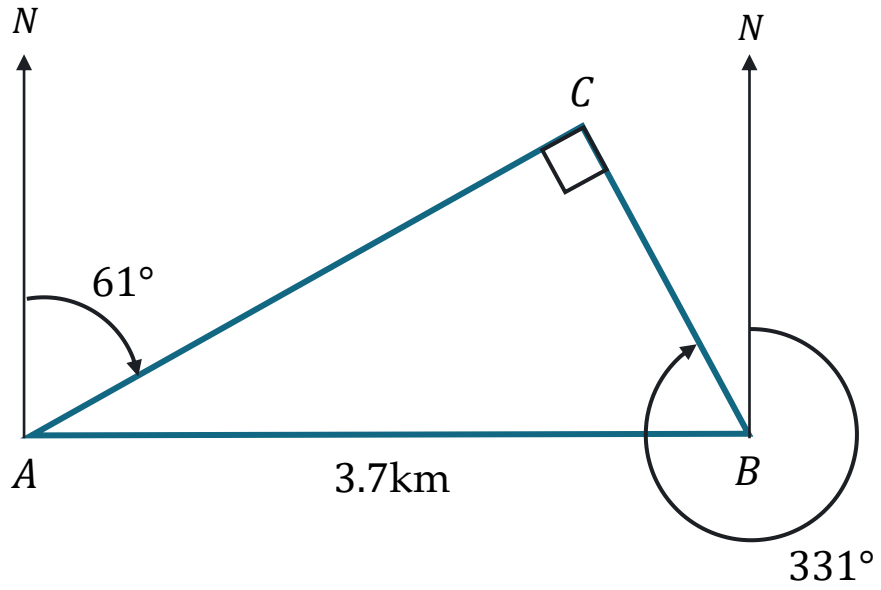
Francisco needs to know the height of a tree. From a given point on the ground, he finds that the angle of elevation to the top of the tree is 36.7°. He then moves back 50 ft. From the second point, the angle of elevation to the top of the tree is 22.2°. Find the height of the tree to the nearest foot.



Solution

EXERCISE

Radar stations A and B are on east-west line, 3.7 km apart. Station A detects a plane at C, on a bearing of 61°. Station B simultaneously detects the same plane, on a bearing of 331°. Find the distance form A to C.



Solution

EXERCISE

A tree is struck by lightning and snaps off 34 feet above the ground. The top part of the tree, 117 feet long, rests with the tip on the ground, the broken end rests on the top of the stump. What angle does the top part of the tree make with the ground?

Solution

EXERCISE

A submarine starts on the surface, and dives at an angle of 13° to the surface. It goes diagonally a distance of 890 meters before reaching the bottom. How deep is the water where the submarine reaches the bottom?

Solution

EXERCISE

An observer on a cliff 1000 dm above sea level sights two ships due east. The angles of depression of the ships are 47° and 32°. Find the distance between the two ships.

Solution

SEATWORK