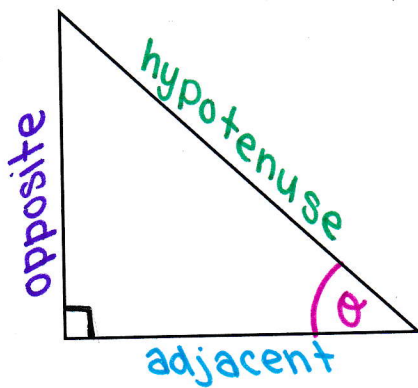


Lesson 6.4: Inverse Trigonometric Functions & Right Triangles

Solving for Angles in Right Triangles

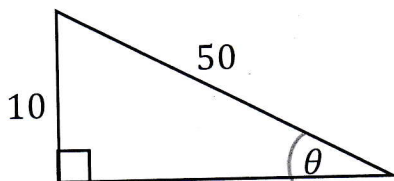


$\sin(\theta) = \frac{o}{h}$	$\sin^{-1}\left(\frac{o}{h}\right) = \theta$
$\cos(\theta) = \frac{a}{h}$	$\cos^{-1}\left(\frac{a}{h}\right) = \theta$
$\tan(\theta) = \frac{o}{a}$	$\tan^{-1}\left(\frac{o}{a}\right) = \theta$

**Don't forget range restrictions*

Examples:

1. Find the measure of angle θ in the diagram below.

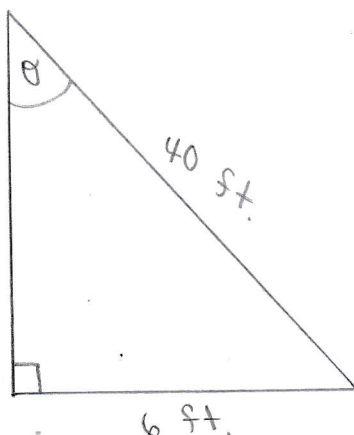


$$\sin(\theta) = \frac{10}{50} = \frac{1}{5}$$

$$\sin^{-1}\left(\frac{1}{5}\right) = \theta$$

$$\theta \approx 11.537^\circ$$

2. A 40 ft. ladder leans against a building. If the base of the ladder is 6 ft. from the base of the building, what is the angle formed by the ladder and the building?



$$\sin(\theta) = \frac{6}{40} = \frac{3}{20}$$

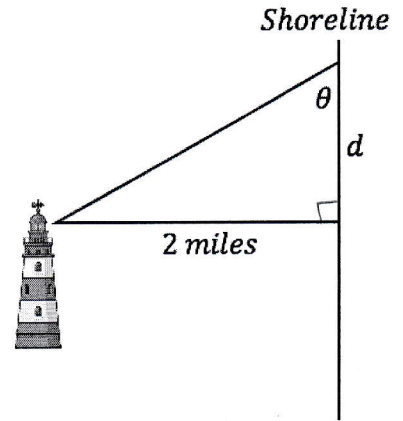
$$\sin^{-1}\left(\frac{3}{20}\right) = \theta$$

$$\theta \approx 8.627^\circ$$

3. A lighthouse is located on an island that is 2 miles off a straight shoreline. Express the angle formed by the beam of light and the shoreline in terms of the distance d in the figure below.

$$\tan(\theta) = \frac{2}{d}$$

$$\tan^{-1}\left(\frac{2}{d}\right) = \theta$$



4. Find all the angles θ between 0° and 180° satisfying the given equations:

a. $\sin(\theta) = 0.4$

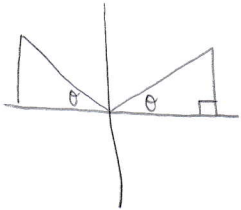
$$\sin^{-1}(0.4) = \theta_1 \quad (\text{where } \theta \in [-\frac{\pi}{2}, \frac{\pi}{2}])$$

$$\theta_1 \approx 23.58^\circ$$

* But, is there another solution on $[0, \pi]$?

$$\theta_2 \approx 180^\circ - 23.58^\circ$$

$$\theta_2 \approx 156.42^\circ$$



b. $\cos(\theta) = 0.4$

$$\cos^{-1}(0.4) = \theta \quad (\text{where } \theta \in [0, \pi])$$

$$\theta \approx 66.42^\circ \quad \leftarrow \text{only solution}$$