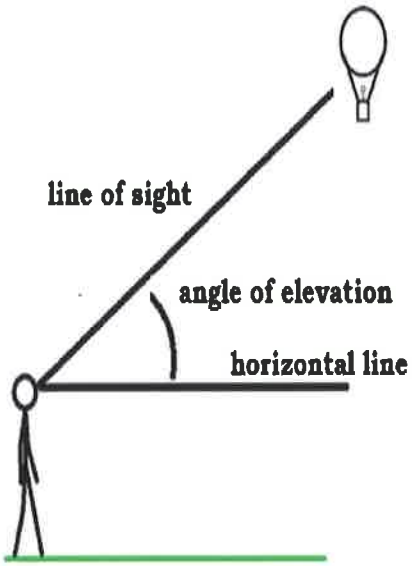
Angles of Elevation and Depression Notes and Practice

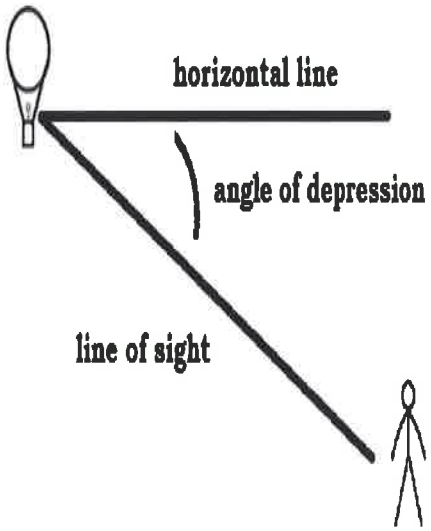
Angle of Elevation

The angle between the horizontal and the line of sight to an object when looking up



Angle of Depression

The angle between the horizontal and the line of sight to an object when looking down



You will usually be given two of the following three pieces of necessary information needed to set up your problem (you will solve a Trig Ratio to find the third):

- How far away from an object the viewer is
- What the altitude is from the ground to the object
- What the angle is between the horizontal and the line of sight (i.e. the angle of elevation or depression)

Procedure:

Step 1: Draw a picture of the situation

Step 2: Label ALL of the information on your picture

Step 3: Determine based on the angle and sides that you have labeled which trig ratio you are using

Step 4: Set up and solve your trig ratio

Angle of Elevation Examples:

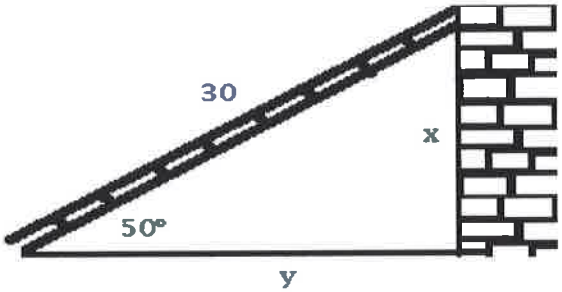
1. A hiker is standing 220 feet from the base of a hill. The angle of elevation from where he is standing to the top of the hill is $29°$. How tall is the hill?

$\tan 29 = \frac{x}{220}$

$220 (\tan 29) = x$

$x = 121.95$ ft

2. A 30 foot ladder forms an angle of $50°$ with the ground when place against a brick wall. How far up the wall will the ladder reach? How far away from the base of the wall is the ladder?

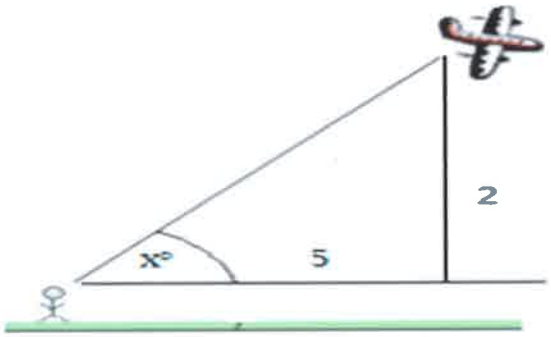


$\sin 50 = \frac{x}{30}$ $\quad$ $\cos 50 = \frac{y}{30}$

$30 (\sin 50) = x$ $\quad$ $30 (\cos 50) = y$

$x = 22.98$ ft $\quad$ $y = \cancel{19.98 \text{ ft}}$ 19.28

3. Alex is standing on the ground and looks up to see a plane flying in the sky. If it is flying at an altitude of 2 miles and the distance along the ground is 5 miles to a point directly below the plane, what is the angle of elevation that Alex has to look up?

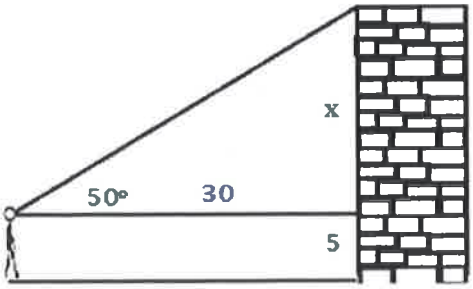


$\tan x = \frac{2}{5}$

$\tan^{-1}(\frac{2}{5}) = x$

$x = 22°$

4. Michael, whose eyes are five feet off of the ground, is standing 30 feet away from the base of a build and looking up at a 50° angle of elevation to point on the edge of building's roof. To the nearest foot, how tall is the building?



$\tan 50 = \frac{x}{30}$

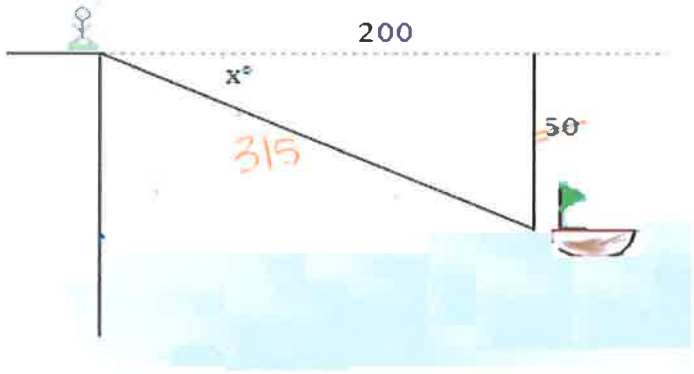
$30 (\tan 50) = x$

$x = 35.75$ ft

$35.75 + 5 = 40.75$ ft

Angle of Depression Examples:

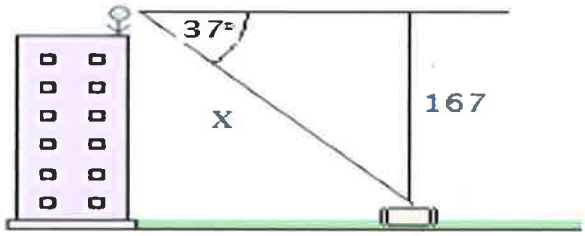
5. A little boy is standing on a cliff above the water and sees a boat that is 200 feet away from the base of the cliff. It is 315 feet away from him. What is the angle of depression from him to the boat?



$\cos x = \frac{200}{315}$

$x = 50.58°$

6. A princess is on the top of a 167 foot tower looking down at a 37° angle of depression at a package attached to a rope on the ground. How long is the rope?

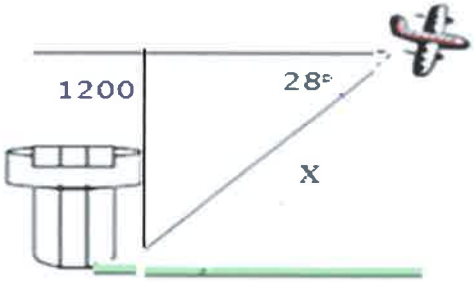


$\sin 37 = \frac{167}{x}$

$x = \frac{167}{\sin 37}$

$x = 277.49 \text{ ft}$

7. From an airplane at an altitude of 1200 m, the angle of depression to a building on the ground measures 28°. Find the distance from the plane to the base of the building.

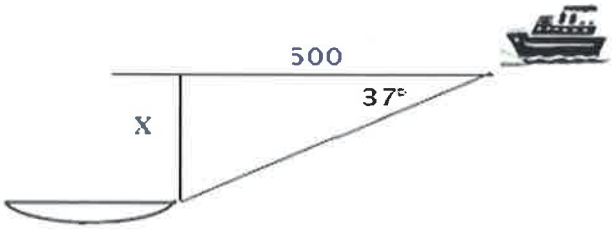


$\sin 28 = \frac{1200}{x}$

$x = \frac{1200}{\sin 28}$

$x = 2556.07 \text{ m}$

8. A sonar operator on a battleship detects a submarine at a distance of 500 m (horizontally) and at an angle of depression of 37°. How deep is the sub?



$\tan 28 = \frac{x}{500}$

$500 (\tan 28) = x$

$x = 376.78 \text{ m}$