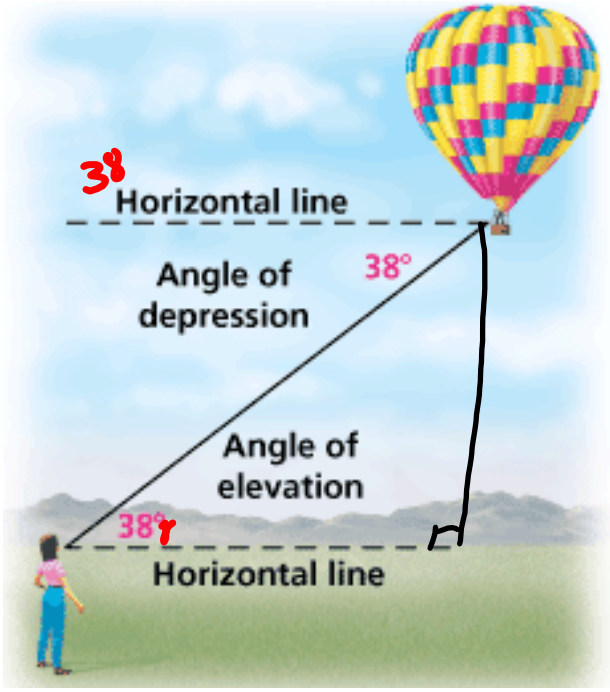
Section 8.5 Angles of Elevation and Depression

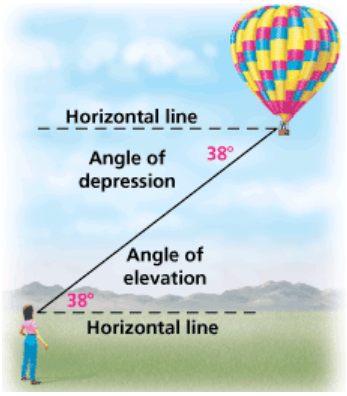


Angle of elevation: an angle of elevation is the angle formed by a horizontal line of sight to an object above the horizontal line.

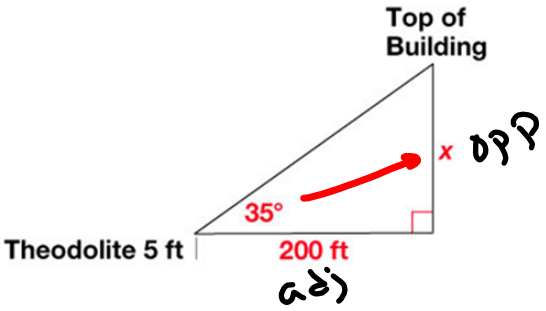
Angle of depression: an angle of depression if the angle formed by a horizontal line and the line of sight to an object below the horizontal line

angle of elevation = angle of depression

Why?



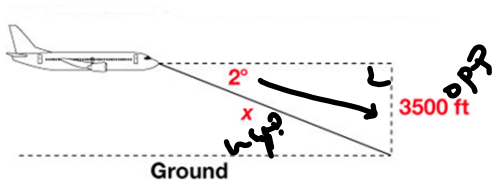
2 EXAMPLE A surveyor stands 200 ft from a building to measure its height with a 5-ft tall theodolite. The angle of elevation to the top of the building is 35°. How tall is the building?



$\tan 35° = \frac{x}{200}$

$x = 140$ ft

An airplane flying 3500 ft above ground begins a 2° descent to land at an airport. How many miles from the airport is the airplane when it starts its descent?



$\sin 2 = \frac{3500}{x}$

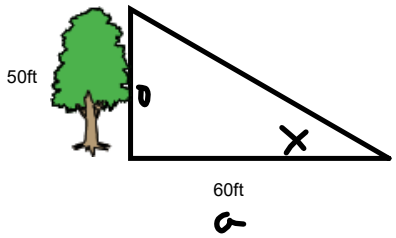
$x = \frac{3500}{\sin 2}$

5280

$x = 100287.9$ ft

$\frac{100287.9}{5280} = 18.9$ miles

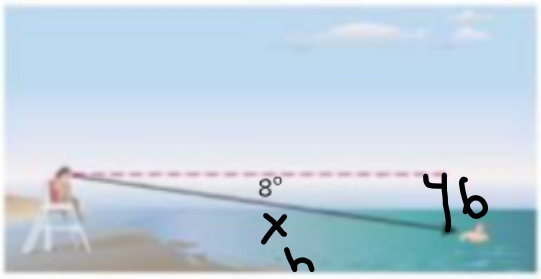
Suppose a tree 50 feet in height casts a shadow of length 60 feet. What is the angle of elevation from the end of the shadow to the top of the tree with respect to the ground?



$\tan^{-1} x = \frac{50}{60}$

$x = 39.8^\circ$

LIFEGUARDING A lifeguard is watching a beach from a line of sight 6 feet above the ground. She sees a swimmer at an angle of depression of 8°. How far away from the tower is the swimmer?

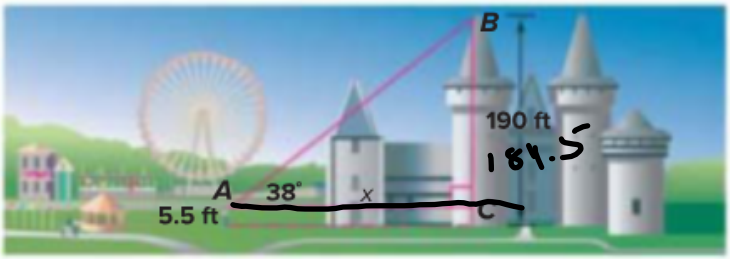


$\sin 8 = \frac{6}{x}$

$x = \frac{6}{\sin 8}$ $x = 43.1$ ft

VACATION Leah wants to see a castle in an amusement park. She sights the top of the castle at an angle of elevation of 38°. She knows that the castle is 190 feet tall. If Leah is 5.5 feet tall, how far is she from the castle to the nearest foot?

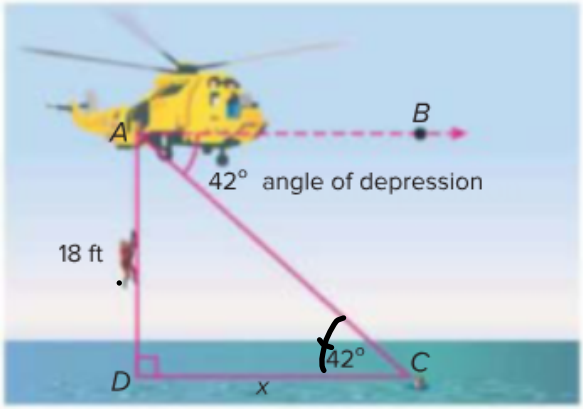
Make a sketch to represent the situation.



$\tan 38 = \frac{184.5}{x}$

$x = 236.1$ ft

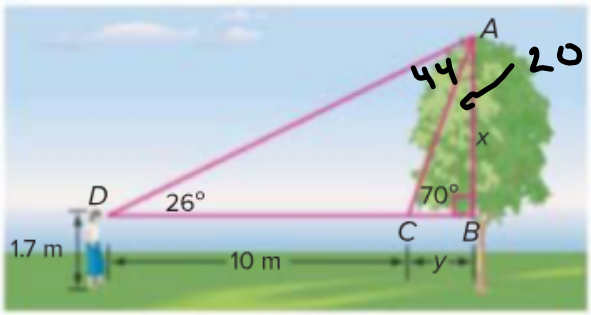
EMERGENCY A search and rescue team is airlifting people from the scene of a boating accident when they observe another person in need of help. If the angle of depression to this other person is 42° and the helicopter is 18 feet above the water, what is the horizontal distance from the rescuers to this person to the nearest foot?



$\tan 42 = \frac{18}{x}$

$x = 20$ ft

TREE REMOVAL To estimate the height of a tree she wants removed, Mrs. Long sights the tree's top at a 70° angle of elevation. She then steps back 10 meters and sights the top at a 26° angle. If Mrs. Long's line of sight is 1.7 meters above the ground, how tall is the tree to the nearest meter?



$\tan 26 = \frac{x}{10+y}$

$(10+y)\tan 26 = x$

$\tan 70 = \frac{x}{y}$

$y \cdot \tan 70 = x$