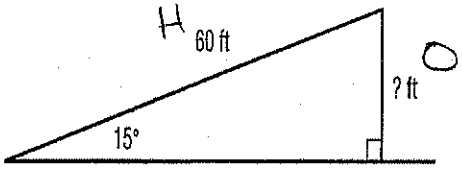
February 10, 2014

8.5 Warm-Up Soh-Cah-Toa

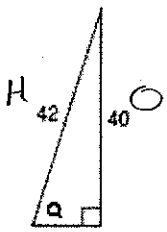
1. RAMPS Louie makes a 60-foot ramp that rises from the first floor to the second floor of a parking garage. The ramp makes a 15° angle with the ground. How high above the first floor is the second floor?



$\sin 15 = \frac{x}{60}$ $(\sin 15) \cdot 60 = 15.53$

2.

Find the measure of the indicated angle to the nearest degree.

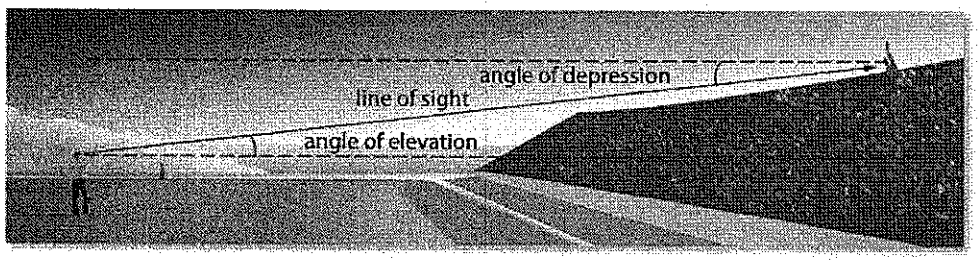


$\sin^{-1} = \frac{40}{42} = 72.2°$

8.5 Angles of Elevation and Depression

Target: Use properties of angles and trig to solve problems

Angles of Elevation and Depression An **angle of elevation** is the angle formed by a horizontal line and an observer's line of sight to an object above the horizontal line. An **angle of depression** is the angle formed by a horizontal line and an observer's line of sight to an object below the horizontal line.



Horizontal lines are parallel, so the angle of elevation and the angle of depression in the diagram are congruent by the Alternate Interior Angles Theorem.

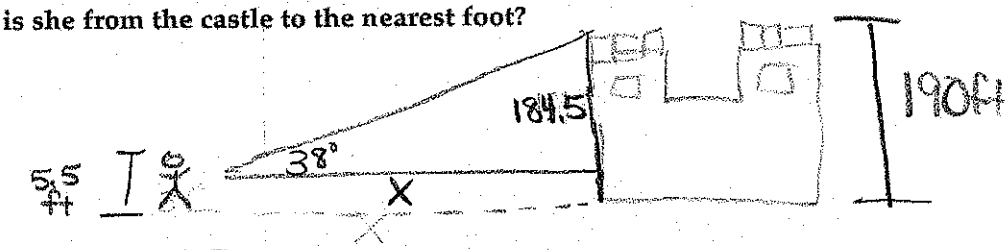
Steps to Solve

1. Draw a picture indicate angle of elevation or depression.
2. Label O-H-A
3. Use Soh-Cah-Toa
4. If finding a side use sin, cos, tan if finding an angle use $sin^{-1} cos^{-1} tan^{-1}$

Example 1 Angle of Elevation

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.



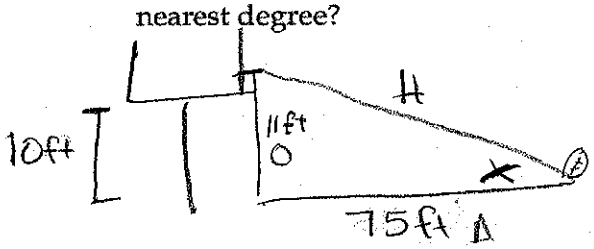
$190 - 5.5 = 184.5$

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

$x = \frac{184.5}{\tan 38} = x = 236.1\text{ ft}$

Guided Practice

1. **FOOTBALL** The cross bar of a goalpost is 10 feet high. If a field goal attempt is made 25 yards from the base of the goalpost that clears the goal by 1 foot, what is the smallest angle of elevation at which the ball could have been kicked to the nearest degree?



$25 - 3 = 75\text{ft}$

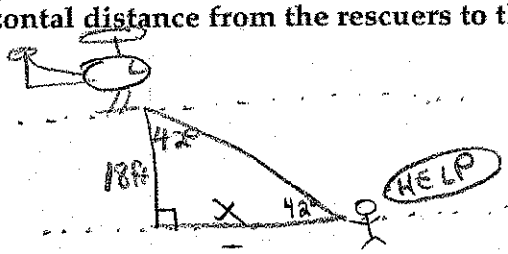
$\tan x = \frac{11}{75}$

$\tan^{-1} = \frac{11}{75} = \boxed{8.3°}$

Example 2 Angle of Depression

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?**

- Make a sketch of the situation.

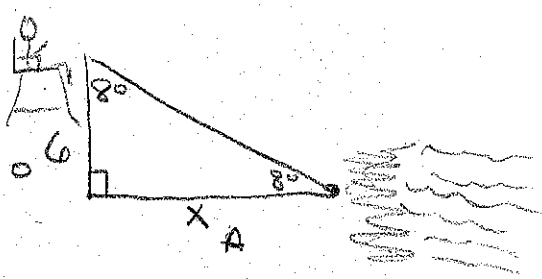


$\tan 42 = \frac{18}{x}$

$\frac{18}{\tan 42} = \boxed{20}$

Guided Practice

2. **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?



$\tan 8 = \frac{6}{x}$ $\quad \frac{6}{\tan 8} = \boxed{42.7}$