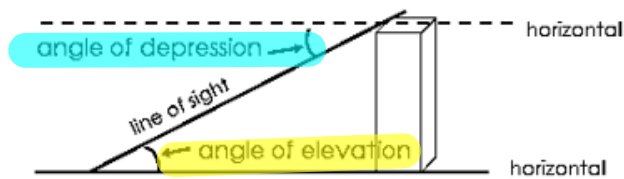
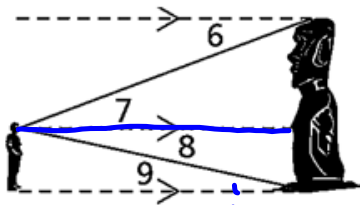


Applications of Right Triangle Trig

There are many real world uses for right triangle trig, but the most common use involves angles of elevation and depression. An **angle of elevation** is the angle formed by a horizontal line and a line of sight to a point above the line. An **angle of depression** is the angle from by a horizontal line and a line of sight below the line. In the figure below, the angle of depression and angle of elevation are congruent because of them being alternate interior angles.

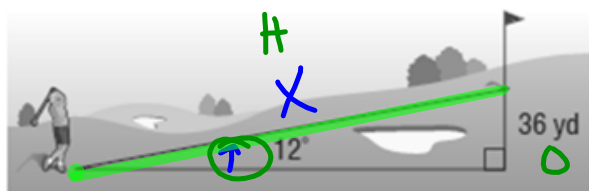


Example 1: Classify the angles in the following pictures as angles of depression or elevation.



$\angle 6 = \text{depression}$
 $\angle 7 = \text{elevation}$
 $\angle 8 = \text{depression}$
 $\angle 9 = \text{elevation}$

Example 2: A golfer is standing at the tee, looking up to the green on a hill. If the tee is 36 yards lower than the green and the angle of elevation from the tee to the hole is 12° , find the distance from the tee to the hole.



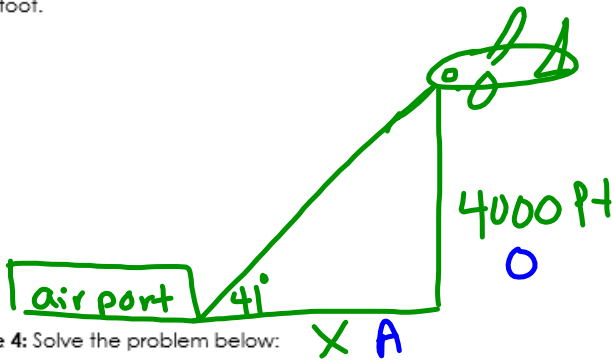
$$\frac{\sin 12}{1} = \frac{36}{x}$$

$$\cancel{x \cdot \sin 12} / \cancel{\sin 12} = \frac{36}{\sin 12}$$

$$x = 173.2 \text{ yards}$$

Example 3: Solve the problem below:

An air traffic controller at an airport sights a plane at an angle of elevation of 41° . The pilot reports that the plane's altitude is 4000 ft. What is the horizontal distance between the plane and the airport? Round to the nearest foot.



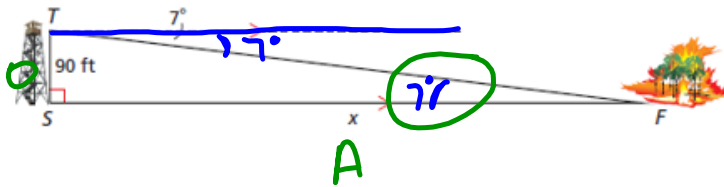
$$\frac{\tan 41}{1} = \frac{4000}{x}$$

$$x \cdot \frac{\cancel{\tan 41}}{\tan 41} = \frac{4000}{\cancel{\tan 41}}$$

$$x = 4601.5 \text{ ft}$$

Example 4: Solve the problem below:

A forest ranger in a 90 foot observation tower sees a fire. The angle of depression to the fire is 7° . What is the horizontal distance between the tower and the fire? Round to the nearest foot.



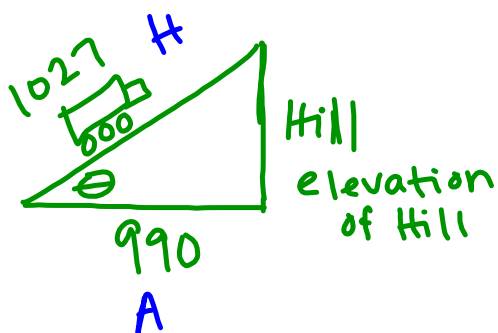
$$\frac{\tan 7^\circ}{1} = \frac{90}{x}$$

$$x \frac{\tan 7}{\tan 7} = \frac{90}{\tan 7}$$

$$x = 733 \text{ ft}$$

Not all uses for right triangle trig must include angles of depression and elevation. Solve the following problems.

Example 5: A truck driver drives 1,027 feet up a hill that has a constant slope. When the trucker reaches the top of the hill, he has traveled a horizontal distance of 990 feet. At what angle did the trucker drive to reach the top? Round your answer to the nearest degree.

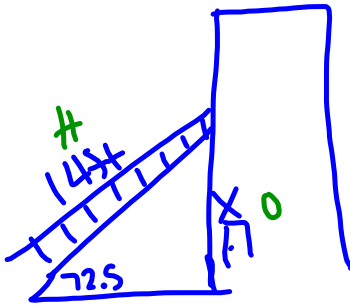


$$\cos \theta = \frac{990}{1027}$$

$$\theta = \cos^{-1}\left(\frac{990}{1027}\right)$$

$$\theta = 15^\circ$$

Example 6: A ladder manufacturer recommends that its ladders be used on level ground at an angle of 72.5° to the horizontal. At that angle, how far up the side of a building will the top of a 14 foot ladder reach?

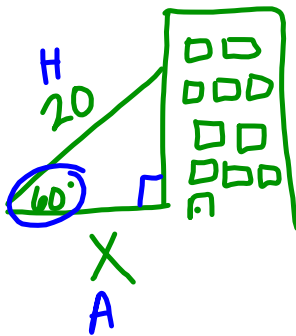


$$\frac{\sin 72.5}{1} = \frac{X}{14}$$

$$14 \cdot \sin 72.5 = X$$

$$13.4\text{ft} = X$$

Example 7: A construction worker leans his ladder against a building making a 60° angle with the ground. If his ladder is 20 feet long, how far away is the base of the ladder from the building? Round to the nearest tenth.

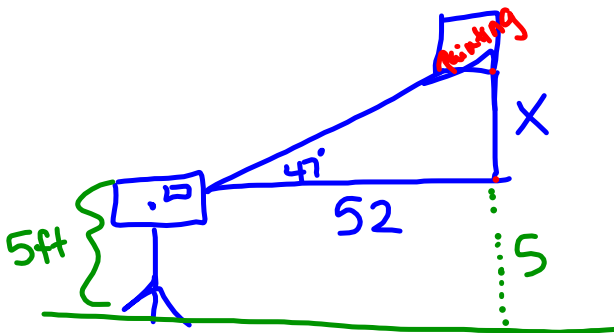


$$\frac{\cos 60}{1} = \frac{X}{20}$$

$$20 \cdot \cos 60 = X$$

$$10\text{ft} = X$$

Example 8: A photographer shines a camera light at a particular painting, forming an angle of 47° from the camera's horizontal line of sight. If the light is 52 feet from the wall where the painting hangs and the camera lens is 5 feet from the floor, how high above the floor is the painting?



$$\frac{\tan 47^\circ}{1} = \frac{x}{52}$$

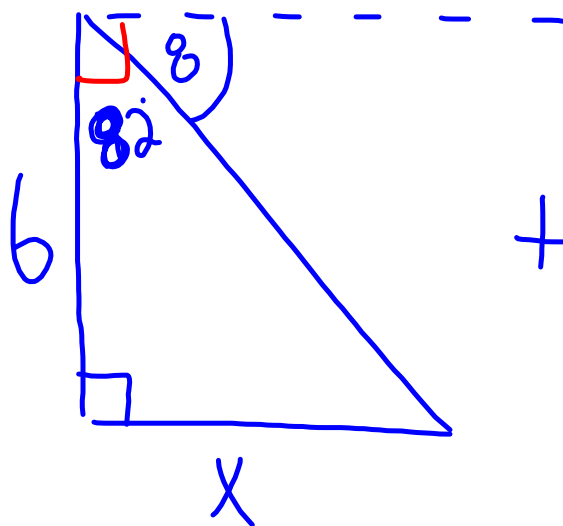
$$52 \cdot \tan 47 = x$$

$$55.8 = x$$

$$+ 5$$

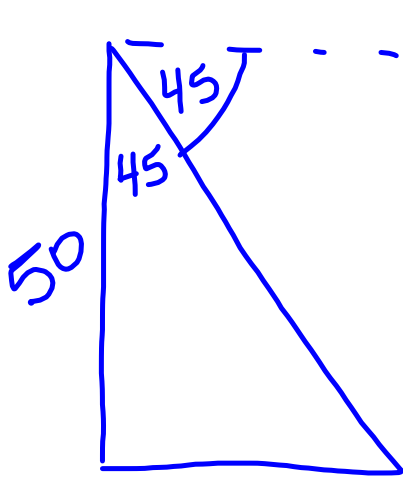
60.8 ft from
the ground

#3

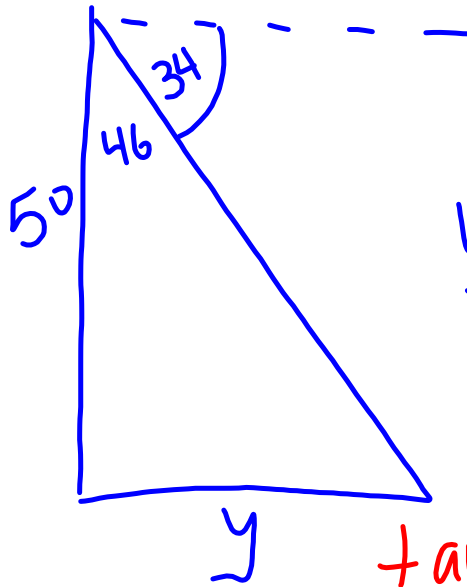


$$\tan 82 = \frac{x}{6}$$

5



$$\tan 45 = \frac{x}{50}$$



$$\tan 46 = \frac{y}{50}$$

$$y - x = ?$$