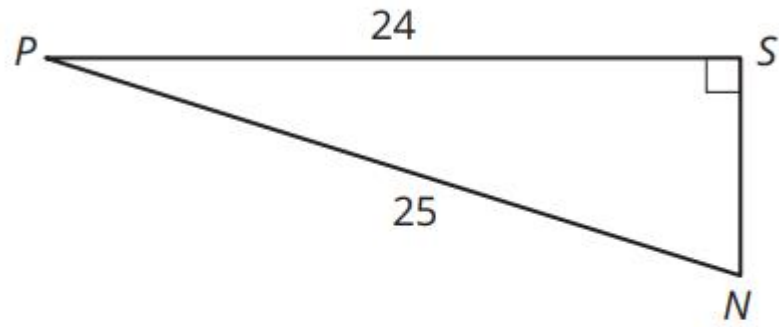


## Warm Up

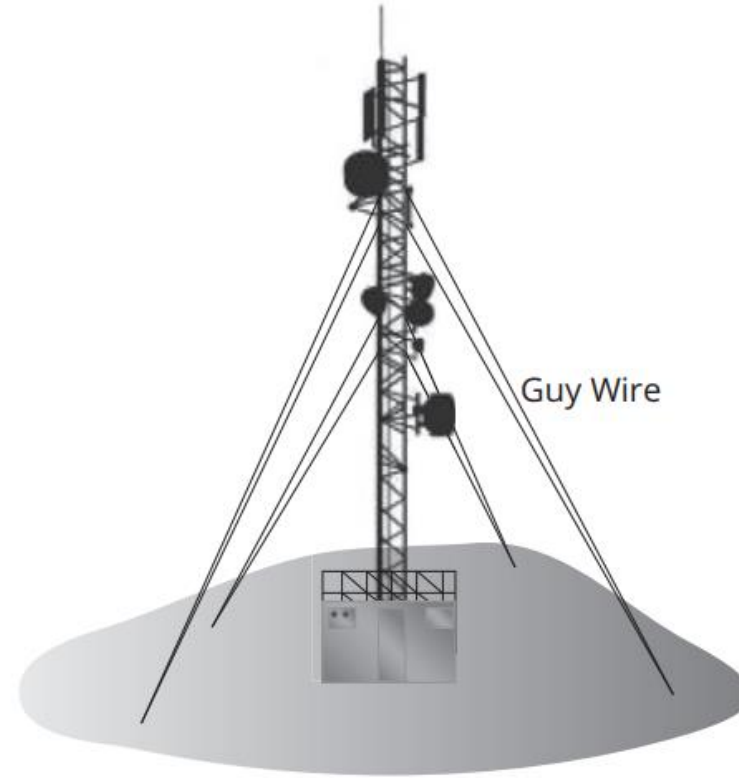
Consider  $\triangle NPS$ .



1. Calculate the value of  $\sin P$ .
2. Calculate  $m\angle P$ .
3. Calculate  $m\angle N$ .

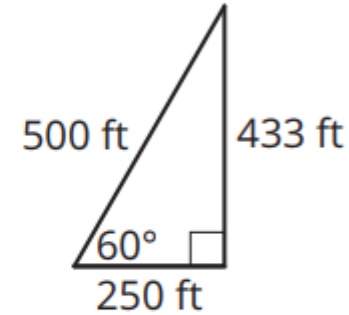
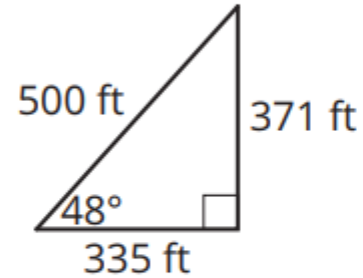
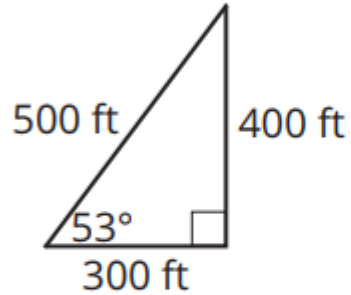
Radio masts and radio towers are both tall human-made structures. The difference between a mast and a tower is that a mast has guy wires attached to it to provide stability. Guy wires are attached near the top of a mast and are attached to the ground. Radio masts are usually found in more open areas where there is room for the guy wires.

M2-172



Each triangle shown represents the triangle formed by a mast and guy wire. The angle formed by the wire and the ground is given in each triangle.

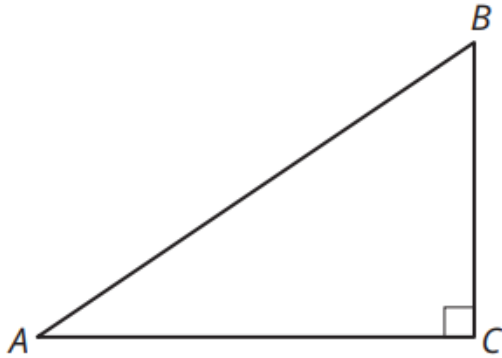
M2-173



**2. For each acute angle formed by the wire and the ground, write the ratio of the side length adjacent to the angle to the hypotenuse length. Write your answers as decimals rounded to the nearest hundredth if necessary.**

**3. What happens to this ratio as the angle gets larger?**

The **cosine (cos)** of an acute angle in a right triangle is the ratio of the length of the side that is adjacent to the angle to the length of the hypotenuse.



1. Complete the ratio to represent the cosine of  $\angle A$ .

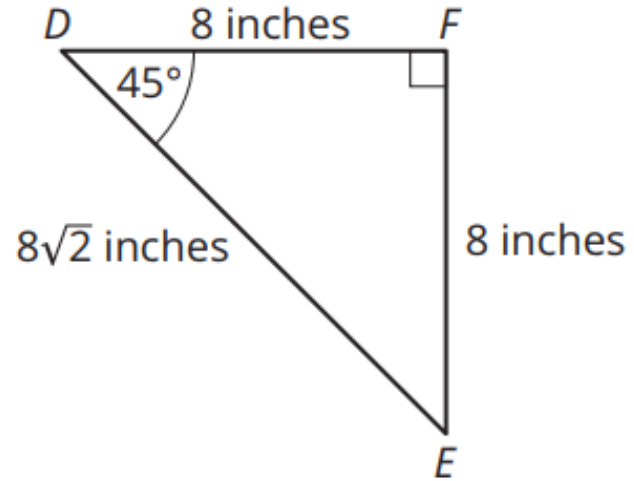
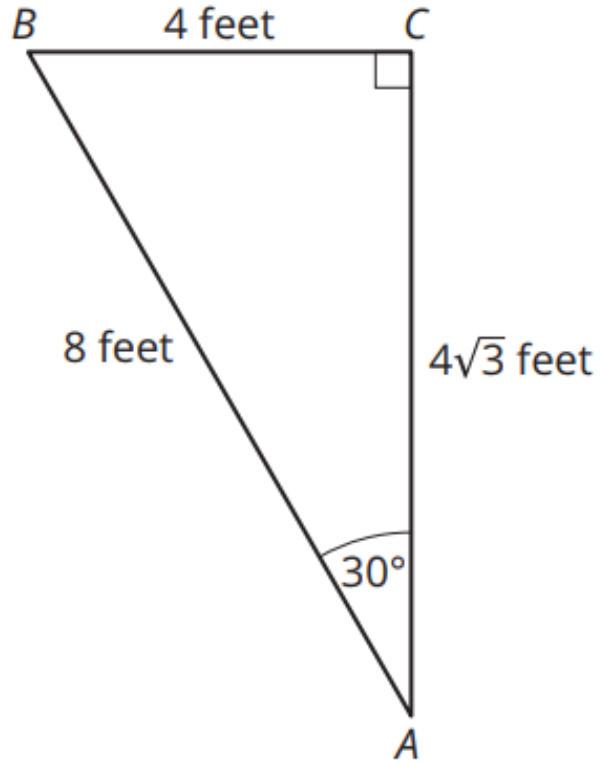
$$\cos A = \frac{\text{length of side adjacent to } \angle A}{\text{length of hypotenuse}} = \frac{\boxed{\phantom{0000}}}{\boxed{\phantom{0000}}}$$

The **secant (sec)** of an acute angle in a right triangle is the ratio of the length of the hypotenuse to the length of the side that is adjacent to the angle.

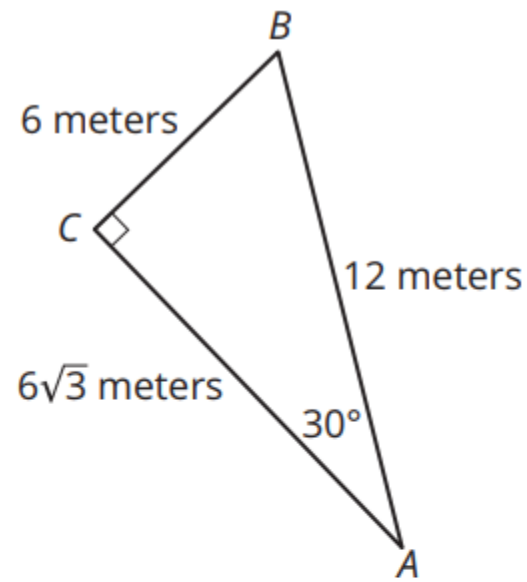
2. Complete the ratio to represent the secant of  $\angle A$ .

$$\sec A = \frac{\text{length of hypotenuse}}{\text{length of side adjacent to } \angle A} = \frac{\boxed{\phantom{0000}}}{\boxed{\phantom{0000}}}$$

8. Use the right triangles shown to calculate the values of  $\cos 30^\circ$ ,  $\cos 45^\circ$ , and  $\cos 60^\circ$ . Leave your answers as exact values and rationalize the denominator.



9. A guy wire is 600 feet long and forms a  $55^\circ$  angle with the ground. First, draw a diagram of this situation. Then, calculate the number of feet from the tower's base to where the wire is attached to the ground.



10. Consider the triangle shown. Leave your answers as exact values and rationalize the denominator.

a. Calculate the values of  $\sin 30^\circ$ ,  $\cos 30^\circ$ , and  $\tan 30^\circ$ .

b. Calculate the value of  $\frac{\sin 30^\circ}{\cos 30^\circ}$ .

c. What do you notice about the value of  $\frac{\sin 30^\circ}{\cos 30^\circ}$ ?

- 11. Do you think that the relationship between the sine, cosine, and tangent values of an angle is true for any angle? Explain your reasoning.**