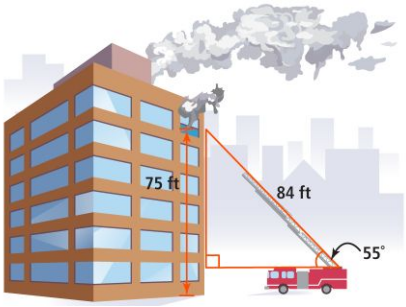
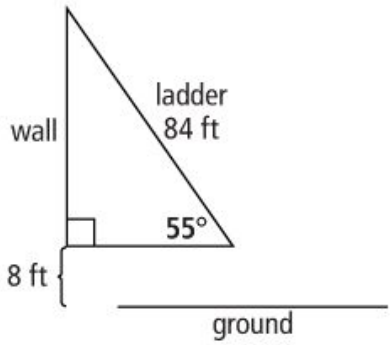
Ratios Extension Activity Rational Student: Date:

The trigonometric ratios are used in some cases where we already know the angle in the triangle. In that case, we can use our calculator to input the trig ratio we need and the angle we have. See the example below.

A fire truck has an 84 foot-long ladder but can only extend at a 55° angle (the angle made between the ladder and the truck). The truck is 8 feet tall and is trying to reach a window on a building that is 75 feet above the ground. Can the truck's ladder reach the window?



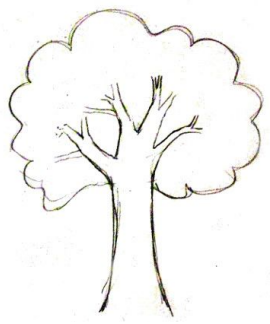


We know the angle measure, and the ladder length (hypotenuse). **We want to know** the height that the ladder reaches on the wall (opposite of the angle). Given that we know the hypotenuse and want to know the opposite side, we are going to use Sine (sine is opposite over hypotenuse).

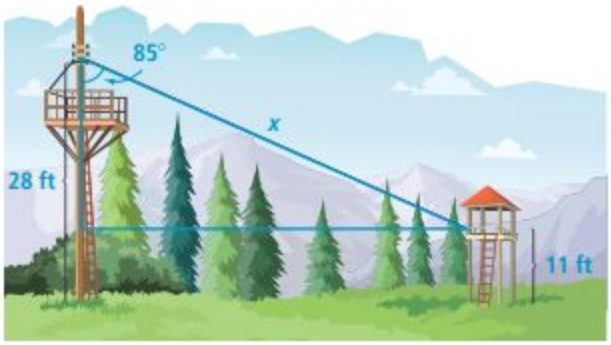
$$sin(\theta) = \frac{opp}{hyp} \quad \rightarrow \quad sin(55°) = \frac{x}{84}.$$

Entering $sin(55°)$ into the calculator gives us 0.819, so our equation is now $0.819 = \frac{x}{84}$.
Solving the equation then gives us $68.808 = x$.
Little under the 75 that we wanted, but the ladder also starts 8 feet above the ground, on top of the truck, so that gives us a total height of 76.808 ft which means we can reach the window.

1. Surveying equipment uses distances and angles to calculate the height of very tall objects. A surveying camera is 5 feet above the ground and uses a 65° angle to view the top of a tree. If the horizontal distance between the camera and the tree is 82 feet, how tall is the tree?



2. A zip line starts 28 feet in the air and ends 11 feet in the air. The zip line drops at an angle of 85°. How long is the zip line cable? Round your answer to the nearest whole number.



3. A 42 feet tall inflatable figure is a decoration at Ali's Shop. A rope is used to secure the figure down. The angle that the rope makes with the ground is 80°, how long does the rope need to be to properly secure the figure?

4. An umbrella casts a shadow that is 24 feet long when the sun shines at a 16.3° angle with the ground. How tall is the umbrella? Round your answer to the nearest tenth.