

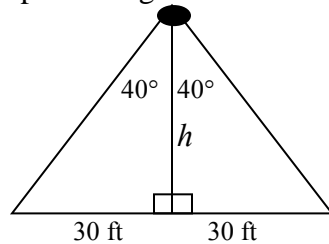


We now have two powerful tools for working with right triangles – the Pythagorean theorem and *trigonometry*. Fortunately, situations involving right triangles are very common. Let's practice finding missing sides, to the nearest tenth.

Example 1: A street light spreads out its light at an 80° angle. When the light is suspended on a pole above a sidewalk, 60 feet of sidewalk are illuminated. How high up is the light?

Solution:

First, draw a sketch:



Second, write an equation. Since we know only 1 side, we must use *trigonometry* rather than the Pythagorean theorem. We know the side *opposite* the *reference angle*, and we need the side *adjacent* to it. We should use the *tangent* ratio.

$$\tan 40^\circ = \frac{30}{h}$$

Third, solve the equation:

$$0.8391 = \frac{30}{h}$$

$$\frac{0.8391}{1} = \frac{30}{h}$$

$$0.8391 \cdot h = 1 \cdot 30$$

$$h = \frac{30}{0.8391} = 35.7525920629 \approx 35.8$$

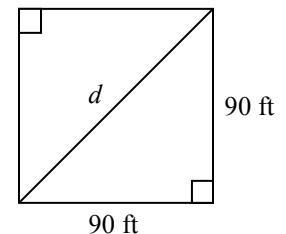
Fourth, answer the original question in a sentence:

The light is about 35.8 ft above the sidewalk.

Example 2: A baseball diamond is a square 90 ft on each side. How far is it across the diagonal, from home plate to second base?

Solution:

First, draw a sketch:



Second, write an equation. Since the angles are right angles and we know 2 sides of each triangle, we can use the Pythagorean theorem to find the third.

$$90^2 + 90^2 = d^2$$

Third, solve the equation:

$$8100 + 8100 = d^2$$

$$16200 = d^2$$

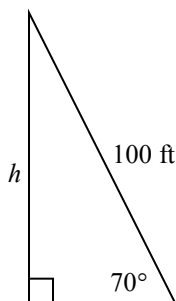
$$\sqrt{16200} = d$$

$$127.3 \approx d$$

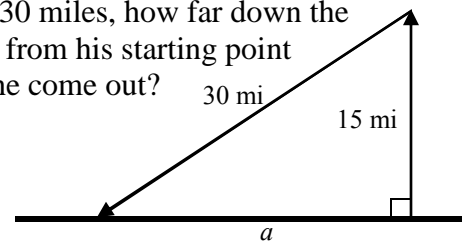
Fourth, answer the original question in a sentence:

The distance from home plate to second base is about 127.3 ft.

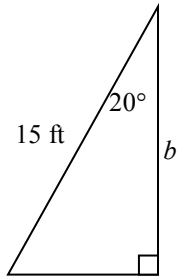
1. A 100 ft guy wire from an airport communication tower forms a 70° angle with the ground. How tall is the tower?



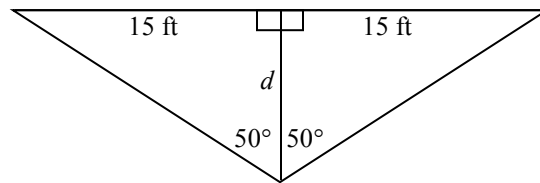
2. An off-road enthusiast drove 15 miles from a highway, straight out into the desert. He came back at a different angle. If the trip back to the highway was 30 miles, how far down the road from his starting point did he come out?



3. A 15-ft ladder is leaning against a building. If the top of the ladder makes a 20° angle with the building, how high up the building does the ladder reach?

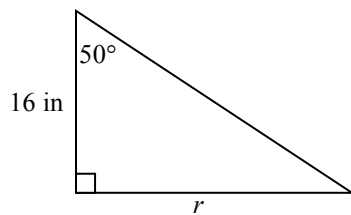


4. A flood light with a dispersion angle of 100° needs to illuminate the front of a building 30 ft wide. How far from the wall should the light be positioned?

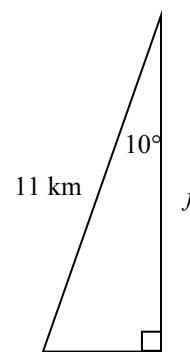


For problems 5-8, assume each diagram represents a situation. Solve for the missing side represented by the variable. Give your answer to the nearest tenth, with units.

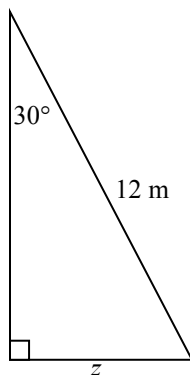
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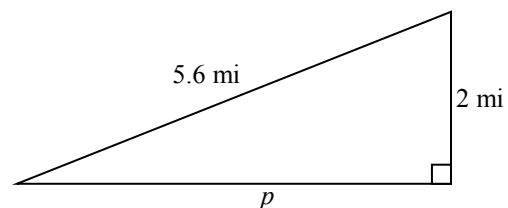
6.



7.



8.



Scrambled answers: ~ 5.2 , 6.0, ~ 10.8 , ~ 12.6 , ~ 14.1 , ~ 19.1 , ~ 26.0 , ~ 94.0

Planes, Trains, and Automobiles



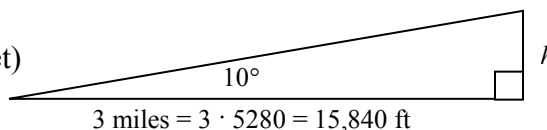
The previous activities have all included the diagrams for you. In this activity, you will need to draw your own as part of the solving process. Follow these steps as you solve each problem:

- Step 1: Draw a **diagram**. Label the information given, use a variable for what you need to find.
- Step 2: Use trigonometry to write an **equation** that can be solved for the variable.
- Step 3: **Solve** the equation.
- Step 4: Write the **answer** in a complete sentence. (Find sides to the nearest tenth, and angles to the nearest degree.)

Example: After takeoff, a plane's flight path sends it directly over a town 3 miles from the airport. If it climbs at an angle of 10° , how high above the ground will the airplane be when it flies over the town (in feet)?

Diagram: (Let h = the plane's height in feet)

$$\text{Equation: } \tan 10^\circ = \frac{h}{15,840}$$



Solve: Since $\tan 10^\circ \approx 0.176$, we get

$$0.1763 \approx \frac{h}{15,840}$$

Multiplying both sides by 15,840 we get
 $2792.592 \approx h$

Answer: The plane will be about 2,792.6 feet above the ground when it flies over the town.

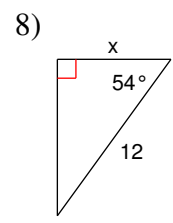
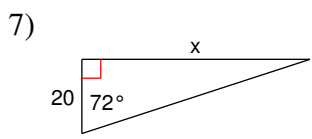
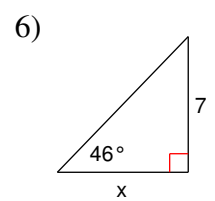
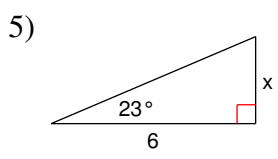
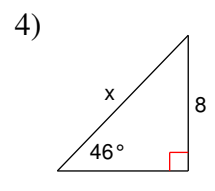
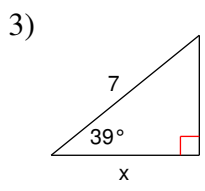
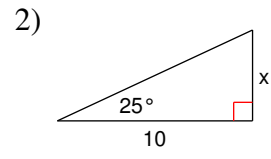
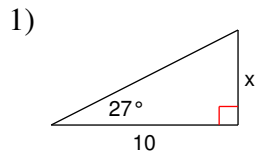
Use the steps shown in the example above as you solve each word problem below.

1. A fireman, preparing to rescue a child from a burning building, leaned a 35-foot ladder against the building at a 70° angle (the angle between the ladder and the ground). How high up the building did the ladder reach?

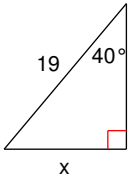
2. Bob and Rob were visiting the New York City. They observed that while standing 750 feet from Central Station, and looking up at a 23° angle, they could just see the top of the building. Using this information, find the height of the Central Station building.

Using Trigonometry To Find Lengths

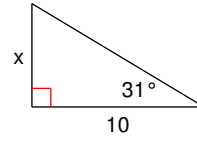
Find the missing side. Round to the nearest tenth.



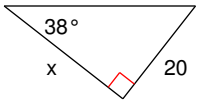
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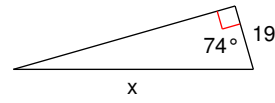
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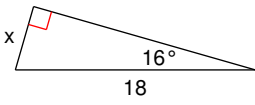
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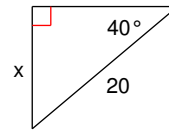
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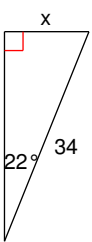
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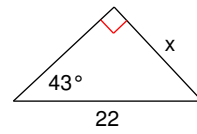
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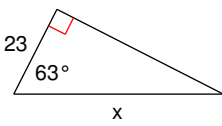
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17)



18)

