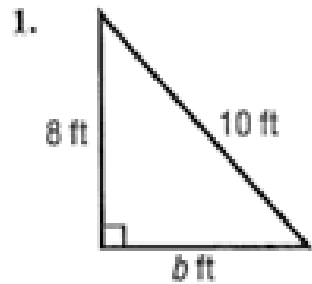# Get out your homework and have it ready to check. Target Check tomorrow!
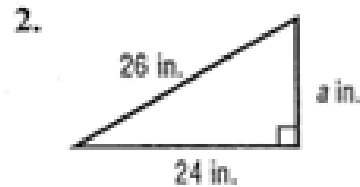
Classwork - Using the Pythagorean Theorem

Write an equation you could use to find the length of the missing side of each right triangle.
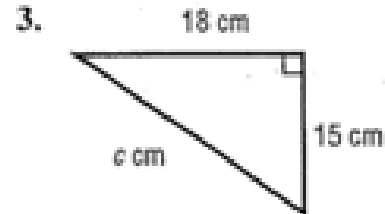Then find the missing length. Round to the nearest tenth if necessary.

1.

8 ft, 10 ft, b ft

$$8^2 + b^2 = 10^2$$
$$64 + b^2 = 100$$
$$-64 \qquad -64$$
$$\sqrt{b^2} = \sqrt{36}$$
$$\boxed{b = 6}$$

$b = \underline{6\ ft}$

2.

26 in., a in., 24 in.

$$a^2 + 24^2 = 26^2$$
$$a^2 + 576 = 676$$
$$-576 \qquad -576$$
$$\sqrt{a^2} = \sqrt{100}$$
$$\boxed{a = 10}$$

$a = \underline{10\ in}$

3.

18 cm, 15 cm, c cm

$$15^2 + 18^2 = c^2$$
$$225 + 324 = c^2$$
$$\sqrt{549} = \sqrt{c^2}$$
$$\boxed{23.4 \approx c}$$

$c = \underline{23.4\ cm\ or\ \sqrt{549}\ cm}$

4.

a yd

14 yd

28 yd
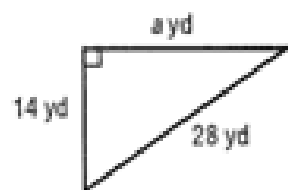
$$a^2 + 14^2 = 28^2$$

$$a^2 + 196 = 784$$

$$-196 \quad -196$$

$$\sqrt{a^2} = \sqrt{588}$$

$$\boxed{a \approx 24.2}$$

$a = \underline{24.2 \text{ yd}}$ or $\sqrt{588}$ yd

5.

50 mm

c mm

50 mm
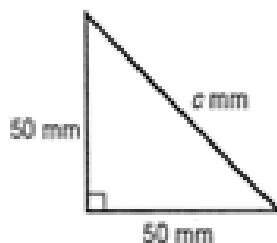
$$50^2 + 50^2 = c^2$$

$$2500 + 2500 = c^2$$

$$\sqrt{5000} = \sqrt{c^2}$$

$$\boxed{70.7 \approx c}$$

$c = \underline{70.7 \text{ mm}}$ or $\sqrt{5000}$ mm

6.

c m

45 m

64 m
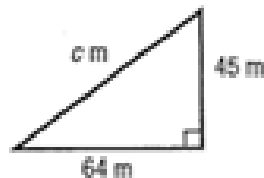
$$45^2 + 64^2 = c^2$$

$$2025 + 4096 = c^2$$

$$\sqrt{6121} = \sqrt{c^2}$$

$$78.2 \approx c$$

$c = \underline{78.2 \text{ m}}$ or $\sqrt{6121}$ m

7. a, 65 cm; c, 95 cm

$$65^2 + b^2 = 95^2$$

$$4225 + b^2 = 9025$$

$$-4225 \quad -4225$$

$$\sqrt{b^2} = \sqrt{4800} \quad b \approx 69.3$$

$b = \underline{69.3 \text{ cm}}$ or $\sqrt{4800}$ cm

8. a, 16 yd; b, 22 yd

$$16^2 + 22^2 = c^2$$

$$256 + 484 = c^2$$

$$\sqrt{740} = \sqrt{c^2}$$

$$27.2 \approx c$$

$c = \underline{27.2 \text{ yd}}$ or $\sqrt{740}$ yd

Determine whether each triangle with sides of given lengths is a right triangle.
Justify your answer.

9. 18 ft, 23 ft, 29 ft

$18^2 + 23^2 = 29^2$

$324 + 529 = 841$

$853 \neq 841$

(No)

10. 7 yd, 24 yd, 25 yd

$7^2 + 24^2 = 25^2$

$49 + 576 = 625$

$625 = 625$

(Yes)

Use the Pythagorean Theorem to find each missing length. It may help to draw a sketch. SHOW WORK

11. The hypotenuse of a right triangle is 15 inches, and one of its legs is 11 inches. Find the length of the other leg.
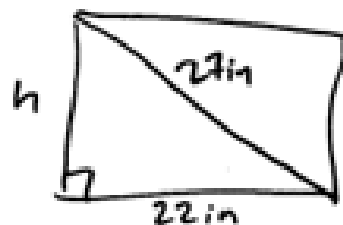
$a^2 + 11^2 = 15^2$

$a^2 + 121 = 225$

$\underline{-121 \quad -121}$

$\sqrt{a^2} = \sqrt{104}$

$\left(a = \sqrt{104} \text{ in or } 10.2 \text{ in} \right)$

$a \approx 10.2$

12. **TELEVISIONS** The diagonal of a television measures 27 inches. If the width of a 27-inch is 22 inches, calculate its height to the nearest inch.

$h^2 + 22^2 = 27^2$

$h^2 + 484 = 729$

$\underline{-484 \quad -484}$

$\sqrt{h^2} = \sqrt{245}$

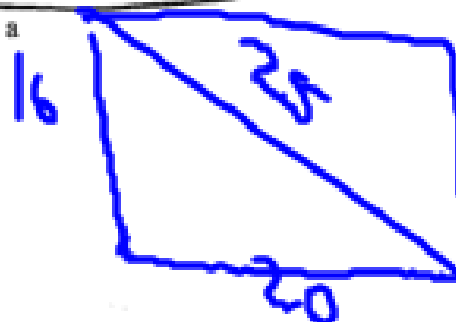$\left(h \approx 15.7 \text{ in or } \sqrt{245} \text{ in} \right)$

13. Nathan draws a quadrilateral. It has adjacent sides measuring 16 inches and 20 inches and a diagonal measuring 25 inches. Is his quadrilateral a rectangle? Explain.

$16^2 + 20^2 = 25^2$

$256 + 400 = 625$

$656 \neq 625$

(No it is not a rectangle)

Parasailing In parasailing, a towrope is used to attach a parasailer to a boat. Refer to the diagram below for Exercises 1–4.

1. What type of triangle is formed by the horizontal distance, the vertical height, and the length of the towrope? Explain.

_____

_____

_____

2. Suppose the wind picks up and the parasailer rises to 50 feet and remains 72 feet behind the boat. Write an equation that will help you find how much towrope c the parasailer will need.

_____

3. Solve the equation to find the amount of rope the parasailer will need. Round to the nearest foot. ☐ ft

4. Suppose the towrope is 300 feet long and the parasailer is 200 feet above the water surface. Write an equation to find the horizontal distance b behind the boat.

_____

75 ft

21 ft

72 ft
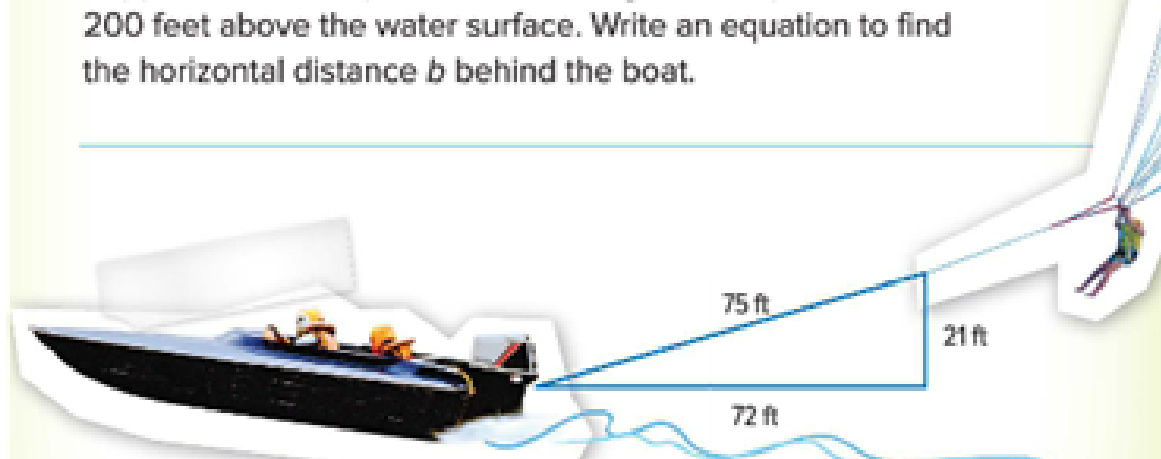
Solve a Right Triangle

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The Pythagorean Theorem can be used to solve a variety of problems. It is helpful to use a diagram to determine what part of the right triangle is unknown.
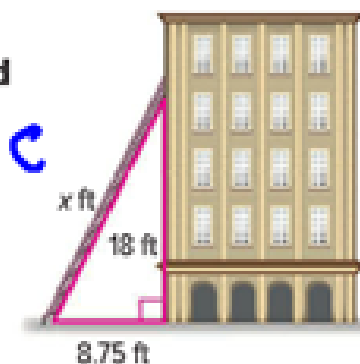
Examples

1. **Write an equation that can be used to find the length of the ladder. Then solve. Round to the nearest tenth.**

   Notice that the distance from the building, the building itself, and the ladder form a right triangle. Use the Pythagorean Theorem.

   x ft
   18 ft
   8.75 ft

   $a^2 + b^2 = c^2$ Pythagorean Theorem

   $8.75^2 + 18^2 = c^2$ Replace a with 8.75 and b with 18.

   $76.5625 + 324 = c^2$ Evaluate 8.75^2 and 18^2.

   $400.5625 = c^2$ Add 76.5625 and 324.

   $\pm\sqrt{400.5625} = c$ Definition of square root

   $\pm 20.0 \approx c$ Use a calculator.

   Since length cannot be negative, the ladder is about 20 feet long.

2. Write an equation that can be used to find the height of the plane. Then solve. Round to the nearest tenth.
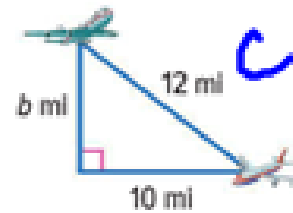
The distance between the planes is the hypotenuse of a right triangle. Use the Pythagorean Theorem.

$$a^2 + b^2 = c^2 \qquad \text{Pythagorean Theorem}$$

$$10^2 + b^2 = 12^2 \qquad \text{Replace } a \text{ with 10 and } c \text{ with 12.}$$

$$100 + b^2 = 144 \qquad \text{Evaluate } 10^2 \text{ and } 12^2.$$

$$-100 \qquad -100$$

$$b^2 = 44 \qquad \text{Subtraction Property of Equality}$$

$$b = \pm\sqrt{44} \qquad \text{Definition of square root.}$$

$$b \approx \pm 6.6 \qquad \text{Use a calculator.}$$

Since length cannot be negative, the height of the plane is about 6.6 miles.

a. Mr. Parsons wants to build a new banister for the staircase shown. If the *rise* of the stairs of a building is 5 feet and the *run* is 12 feet, what will be the length of the new banister?
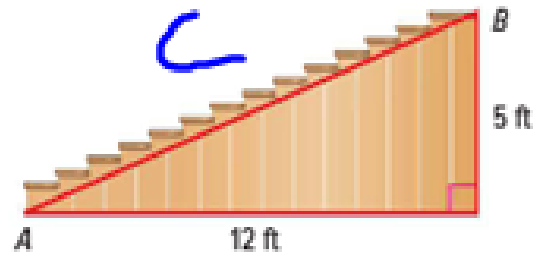
$$12^2 + 5^2 = c^2$$

$$144 + 25 = c^2$$

$$\sqrt{169} = \sqrt{c^2}$$

$$13.9 = C$$

The Pythagorean Theorem in Three-Dimensions

You can use the Pythagorean Theorem to find missing measures in three-dimensional figures.

Example

3. A 12-foot flagpole is placed in the center of a square area. To stabilize the pole, a wire will stretch from the top of the pole to each corner of the square. The flagpole is 7 feet from each corner of the square. What is the length of each wire? Round to the nearest tenth.
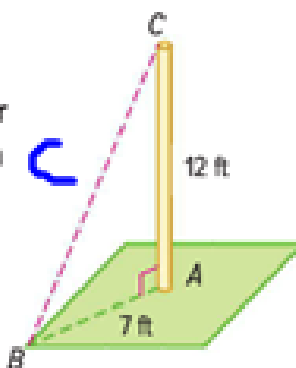
Draw right triangle ABC. You want to find the length of each wire or BC. This is the hypotenuse of a right triangle, so use the Pythagorean Theorem.

$$AB^2 + AC^2 = BC^2 \qquad \text{Pythagorean Theorem}$$

$$7^2 + 12^2 = BC^2 \qquad \text{Replace } AB \text{ with 7 and } AC \text{ with 12.}$$

$$49 + 144 = BC^2 \qquad \text{Evaluate } 7^2 \text{ and } 12^2.$$

$$193 = BC^2 \qquad \text{Simplify.}$$

$$\pm\sqrt{193} = BC \qquad \text{Definition of square root.}$$

$$\pm 13.9 \approx BC \qquad \text{Use a calculator.}$$

Since length cannot be negative, the length of the wire is about 13.9 feet.

b. The top part of a circus tent is in the shape of a cone. The tent has a radius of 50 feet. The distance from the top of the tent to the edge is 61 feet. How tall is the top part of the tent? Round to the nearest whole number.

61 ft

50 ft
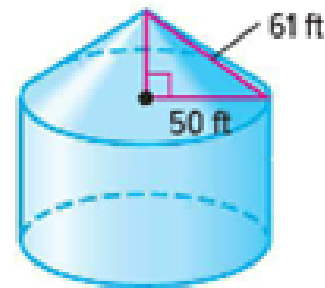
$$50^2 + b^2 = 61^2$$

$$2500 + b^2 = 3721$$

$$\underline{-2500 \qquad -2500}$$

$$\sqrt{b^2} = \sqrt{1221}$$

$$b = 34.9 \, ft \quad \boxed{35 \, ft}$$
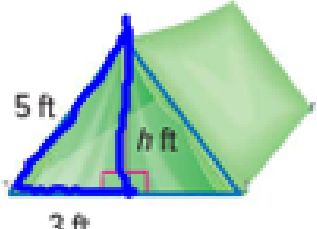
Write an equation that can be used to answer the question. Then solve. Round to the nearest tenth if necessary. (Examples 1 and 2)
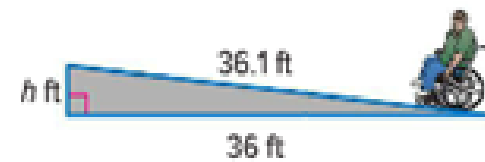
1. What is the height of the tent?

5 ft

h ft

3 ft

$3^2 + h^2 = 5^2$

$9 + h^2 = 25$

$-9 \qquad -9$

$h^2 = 16$

$\sqrt{h^2} = \sqrt{16}$

$\boxed{h = 4 ft}$

2. How high is the wheelchair ramp?

36.1 ft

h ft

36 ft

3. Merideth made a model of a pyramid like the one shown for history class.

What is the height of the model? (Example 3) _____

15 in.

9 in.