b?

c?

b

c?

a

a

① Make a right triangle!

② $a^2 + b^2 = c^2$ + calculator!

Parasailing In parasailing, a towrope is used to attach a parasailer to a boat.

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

   right triangle; Since the sum of the squares of two sides is equal to the square of the third side, the triangle is a right triangle; $21^2 + 72^2 = 75^2$.

75 ft

21 ft

72 ft

[handwritten: towrope]

[handwritten: $\sqrt{7684}$; $7684 = c^2$; $5184 + 2500 = 7684 = c^2$; $72^2 + 50^2 = c^2$; 50; 72]

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.

   $50^2 + 72^2 = c^2$

3. Solve the equation to find the amount of rope the parasailer will need. Round to the nearest foot. **88** 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.

   $300^2 = 200^2 + b^2$
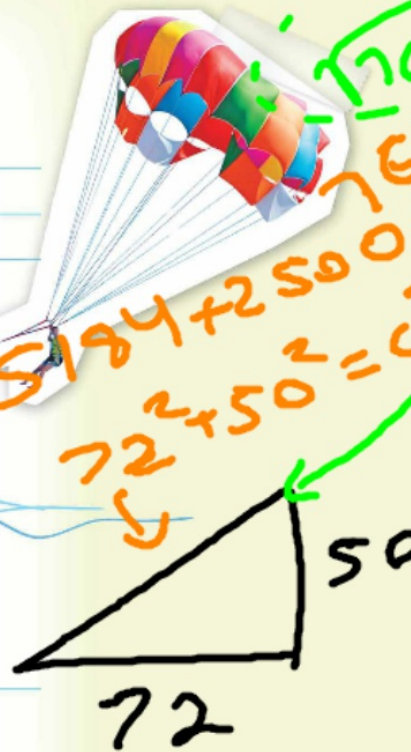
Calculator

Sqrt(7684) = 87.658428

87.658428

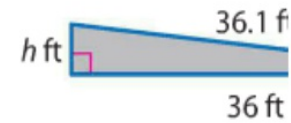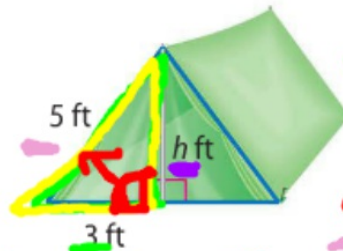| ←			CE	C
MC	7	8	9	÷	Sqrt
MR	4	5	6	×	x²
MS	1	2	3	-	1/x
M+	0	.	±	+	=

Guided Practice

Write an equation that can be used to answer the question. Then solve. Round to the nearest tenth if necessary. (Examples 1 and 2)
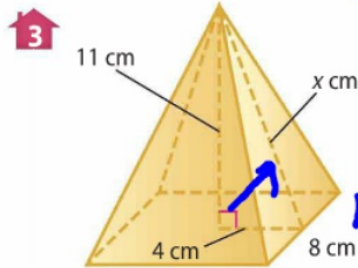
1. What is the height of the tent?

5 ft

h ft

3 ft

Show your work.

$a = 3$
$b = h$
$c = 5$

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

$3^2 + b^2 = 5^2$

$9 + b^2 = 25$
$ -9 -9$
$b^2 = 16 \rightarrow b = 4$

2. How high is the wheelc

36.1 f

h ft

36 ft

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

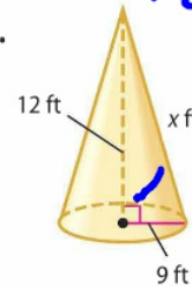**Find the missing measure in each figure below. Round to the nearest tenth if necessary.** (Example 3)

3. $\sqrt{137}$

11.7 cm

11 cm

x cm

4 cm   8 cm

$11^2 + 4^2 = x^2$

$121 + 16 = x^2$

$137 = x^2$
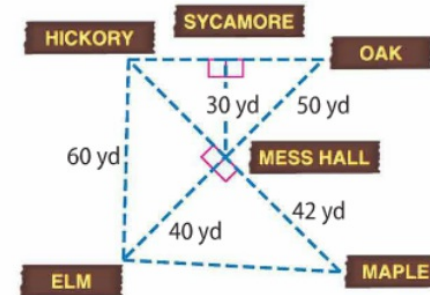
4. $\sqrt{229}$

15 ft

12 ft

x ft

9 ft

$12^2 + 9^2 = x^2$

$144 + 81 = x^2$

$229 = x^2$

5. Refer to the map of the Woodlands Camp at the right. Round your answers to the nearest tenth.

SYCAMORE
HICKORY
OAK
30 yd   50 yd
60 yd
MESS HALL
42 yd
40 yd
ELM
MAPLE

a. How far is it from Sycamore cabin to Oak cabin? **40 yd**

b. A camper in Hickory cabin wants to visit a friend in Elm cabin. How much farther is it if she walks to the Mess Hall first? **24.7 yd**

6. CCSS **Justify Conclusions** Rodrigo is buying a $5\frac{1}{2}$-foot-long fishing rod for his father for his birthday. He wants to put it in a box so that his dad will not be able to guess what is in the box. The box he wants to use is 4 feet long and 4 feet wide. Will the pole fit in the box? Justify your reasoning.
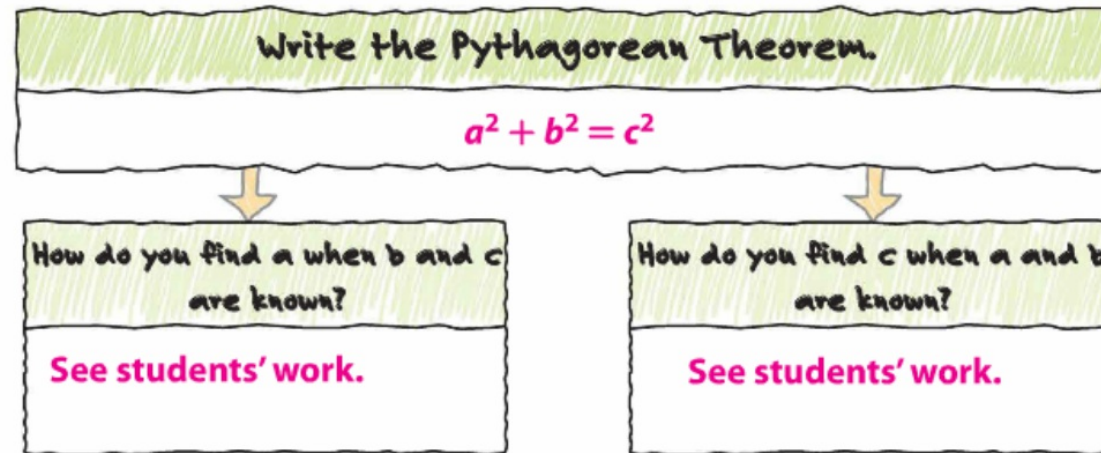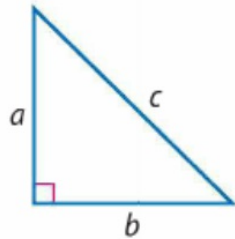
yes; Sample answer: The corner of the box is a right angle. Find the length of the diagonal using the Pythagorean Theorem. $4^2 + 4^2 = 32$, $\sqrt{32} \approx 5.66$.

Since the fishing rod is 5.5 feet long, it will fit diagonally in the box.

7. **CCSS** **Identify Structure** How do you use the Pythagorean Theorem?

Write the Pythagorean Theorem.

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

How do you find a when b and c are known?

See students' work.

How do you find c when a and b are known?

See students' work.

H.O.T. Problems Higher Order Thinking

8. **CCSS** **Model with Mathematics** Write a real-world problem that can be solved by using the Pythagorean Theorem. Then explain how to solve the problem.

Sample answer: Sam leaves his house. He walks 2 miles north, and then turns and walks 3 miles west. How far is Sam from his house? Using the Pythagorean Theorem, $c^2 = 2^2 + 3^2$. Solving for c, Sam is about 3.6 miles from his house.

9. **CCSS** **Which One Doesn't Belong?** Each set of numbers represents the side measures of a triangle. Identify the set that does not belong with the other three. Explain your reasoning.

| 3-4-5 | 12-35-37 | 3-5-7 | 6-8-10 |

3–5–7; $3^2 + 5^2 \neq 7^2$

10. **CCSS** **Persevere with Problems** Suppose a ladder 20 feet long is placed against a vertical wall 20 feet high. How far would the top of the ladder move down the wall by pulling out the bottom of the ladder 5 feet? Explain your reasoning.

about 0.6 ft; By solving $20^2 = x^2 + 5^2$, you find that the ladder reaches approximately 19.4 ft up the wall. Therefore, the top of the ladder would move down 20 ft − 19.4 ft or 0.6 ft. by pulling out the bottom of the ladder 5 feet.

a ft
20 ft
20 ft
←5 ft→
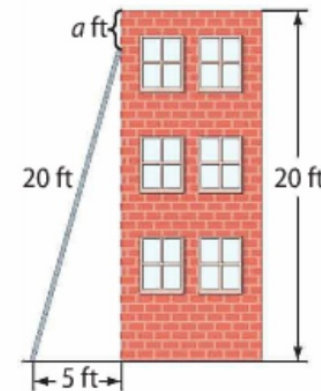
11. **CCSS** **Model with Mathematics** Write and solve a real-world problem that involves using the Pythagorean Theorem or its converse.

See students' work.