11-4 The Pythagorean Theorem *(Pages 605–610)*

You can use the **Pythagorean Theorem** to find the length of any side of a right triangle if the lengths of the other two sides are known. A corollary to this theorem can be used to determine whether a triangle is a right triangle.

Pythagorean Theorem	If a and b are the measures of the legs of a right triangle and c is the measure of the hypotenuse, then $c^2 = a^2 + b^2$.
Corollary to the Pythagorean Theorem	If c is the measure of the longest side of a triangle and $c^2 \neq a^2 + b^2$, then the triangle is not a right triangle.

Examples

a. Find the length of leg b of a right triangle if the length of leg a is 24 and the length of the hypotenuse is 30.

$$c^2 = a^2 + b^2 \quad \textit{Pythagorean Theorem}$$
$$30^2 = 24^2 + b^2 \quad \textit{Substitute.}$$
$$900 = 576 + b^2 \quad \textit{Evaluate.}$$
$$324 = b^2 \quad \textit{Subtract 576 from each side.}$$
$$\sqrt{324} = b \quad \textit{Take square root of each side.}$$
$$18 = b \quad \textit{Simplify.}$$

The length of leg b is 18 units.

b. The lengths of the sides of a triangle are 14 m, 12 m, and 10 m. Is the triangle a right triangle?

$$c^2 = a^2 + b^2 \quad \textit{Pythagorean Theorem}$$
$$14^2 \stackrel{?}{=} 12^2 + 10^2 \quad \textit{Substitute.}$$
$$196 \stackrel{?}{=} 144 + 100 \quad \textit{Evaluate.}$$
$$196 \neq 244 \quad \textit{Add.}$$

The triangle is not a right triangle.

Practice

Find the length of each missing side. Round to the nearest hundredth.

1.

2.

3.
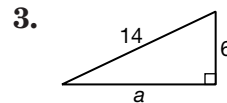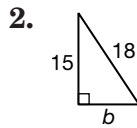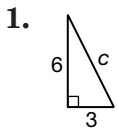
If c is the measure of the hypotenuse of a right triangle, find each missing measure. Round answers to the nearest hundredth.

4. $a = 12, b = 32, c =$ __?__

5. $a = 7, b = 10, c =$ __?__

6. $a = 16, c = 52, b =$ __?__

7. $a = 2, b = 4, c =$ __?__

8. $b = 18, c = \sqrt{740}, a =$ __?__

9. $a = 5, b = \sqrt{10}, c =$ __?__

10. Art Jessica is making a collage of rectangles for her art project. The largest rectangle is 12 inches long and 8 inches wide. What is the length of a diagonal of the rectangle?

11. **Standardized Test Practice** Jamal and Gloria start hiking from the same point. After Bill hikes 7 miles due east and Jamal hikes 4 miles due north, how far apart are the two hikers?

A 5.29 mi **B** 5.40 mi **C** 8.06 mi **D** 9.25 mi

Answers: 1. $c = 6.71$ 2. $b = 9.95$ 3. $a = 12.65$ 4. $c = 34.18$ 5. $c = 12.21$ 6. $b = 49.48$ 7. $c = 4.47$ 8. $a = 20.40$ 9. $c = 5.92$ 10. about 14.42 in. 11. C