

# The Pythagorean Theorem (Pages 366–371)

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. You can use the **converse** of this theorem to test whether a triangle is a right triangle.

<b>Pythagorean Theorem</b>	If $a$ and $b$ are the lengths of the legs of a right triangle and $c$ is the length of the hypotenuse, then $c^2 = a^2 + b^2$ .
<b>Converse of the Pythagorean Theorem</b>	If $c$ is the measure of the longest side of a triangle and $c^2 = a^2 + b^2$ , then the triangle is 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.

$$\begin{aligned} c^2 &= a^2 + b^2 && \text{Pythagorean Theorem} \\ 30^2 &= 24^2 + b^2 && \text{Substitute.} \\ 900 &= 576 + b^2 \\ 324 &= b^2 \\ \sqrt{324} &= b \\ 18 &= b \end{aligned}$$

The length of leg  $b$  is 18 units.

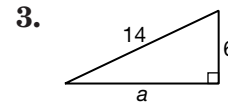
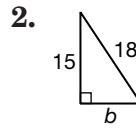
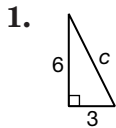
- B** The lengths of the sides of a triangle are 14 m, 12 m, and 10 m. Is the triangle a right triangle?

$$\begin{aligned} c^2 &= a^2 + b^2 && \text{Pythagorean Theorem} \\ 14^2 &\stackrel{?}{=} 12^2 + 10^2 && \text{Substitute.} \\ 196 &\stackrel{?}{=} 144 + 100 \\ 196 &\neq 244 \end{aligned}$$

The triangle is not a right triangle.

## PRACTICE

If  $c$  is the measure of the hypotenuse and  $a$  and  $b$  are the measures of the legs, find each missing measure. Round to the nearest tenth if necessary.



4.  $a = 12, b = 32, c = \underline{\quad ? \quad}$

5.  $a = 7, b = 10, c = \underline{\quad ? \quad}$

6.  $a = 16, c = 52, b = \underline{\quad ? \quad}$

7.  $a = 2, b = 4, c = \underline{\quad ? \quad}$

The lengths of three sides of a triangle are given. Determine whether each triangle is a right triangle.

8. 10 cm, 24 cm, 26 cm

9. 12 in., 14 in., 19 in.

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? Round to the nearest tenth.



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** 5.3 mi

**B** 5.4 mi

**C** 8.1 mi

**D** 9.3 mi

Answers: 1.  $c = 6.7$  2.  $b = 9.9$  3.  $a = 9.9$  4.  $c = 12.6$  5.  $c = 34.2$  6.  $b = 49.5$  7.  $c = 4.5$  8. yes 9. no 10. 14.4 in. 11. C