

The **converse** of a conditional switches the hypothesis and the conclusion. Sometimes the converse of a true conditional is not true.

You can write the Pythagorean Theorem as a conditional: "If a triangle is a right triangle with legs of lengths a and b and hypotenuse of length c , then $a^2 + b^2 = c^2$." The converse of the Pythagorean Theorem is always true.

Take note

Property The Converse of the Pythagorean Theorem

If a triangle has sides of lengths a , b , and c , and $a^2 + b^2 = c^2$, then the triangle is a right triangle with hypotenuse of length c .

You can use the Pythagorean Theorem and its converse to determine whether a triangle is a right triangle. If the side lengths satisfy the equation $a^2 + b^2 = c^2$, then the triangle is a right triangle. If they do not, then it is not a right triangle.



Problem 3 Identifying Right Triangles

Multiple Choice Which set of lengths could be the side lengths of a right triangle?

- (A) 6 in., 24 in., 25 in. (B) 4 m, 8 m, 10 m (C) 10 in., 24 in., 26 in. (D) 8 ft, 15 ft, 16 ft

Determine whether the lengths satisfy $a^2 + b^2 = c^2$. The greatest length is c .

$6^2 + 24^2 \stackrel{?}{=} 25^2$	$4^2 + 8^2 \stackrel{?}{=} 10^2$	$10^2 + 24^2 \stackrel{?}{=} 26^2$	$8^2 + 15^2 \stackrel{?}{=} 16^2$
$36 + 576 \stackrel{?}{=} 625$	$16 + 64 \stackrel{?}{=} 100$	$100 + 576 \stackrel{?}{=} 676$	$64 + 225 \stackrel{?}{=} 256$
$612 \neq 625$	$80 \neq 100$	$676 = 676 \checkmark$	$289 \neq 256$

By the Converse of the Pythagorean Theorem, the lengths 10 in., 24 in., and 26 in. could be the side lengths of a right triangle. The correct answer is C.



- Got It?** 3. a. Could the lengths 20 mm, 47 mm, and 52 mm be the side lengths of a right triangle? Explain.
 b. **Reasoning** If a , b , and c satisfy the equation $a^2 + b^2 = c^2$, are $2a$, $2b$, and $2c$ also possible side lengths of a right triangle? How do you know?

Plan

Why should you check each answer choice?

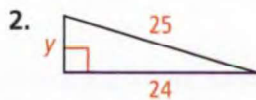
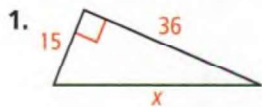
If you find two answer choices that appear to be correct, then you know you have made a mistake.



Lesson Check

Do you know HOW?

Find each missing side length.

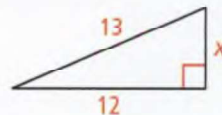


3. Could the lengths 12 cm, 35 cm, and 37 cm be the side lengths of a right triangle? Explain.

Do you UNDERSTAND?



4. **Vocabulary** What is the converse of the conditional, "If you study math, then you are a student"?
5. **Error Analysis** A student found the length x in the triangle at the right by solving the equation $12^2 + 13^2 = x^2$. Describe and correct the error.





Practice and Problem-Solving Exercises

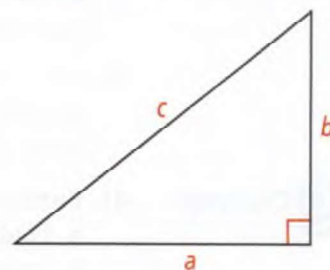


A Practice

Use the triangle at the right. Find the missing side length. If necessary, round to the nearest tenth.

See Problems 1 and 2.

- | | | |
|------------------------------|------------------------|-----------------------------|
| 6. $a = 3, b = 4$ | 7. $a = 6, c = 10$ | 8. $b = 1, c = \frac{5}{4}$ |
| 9. $a = 5, c = 13$ | 10. $a = 0.3, b = 0.4$ | 11. $a = 8, b = 15$ |
| 12. $a = 1, c = \frac{5}{3}$ | 13. $b = 6, c = 7.5$ | 14. $b = 3.5, c = 3.7$ |
| 15. $a = 1.1, b = 6$ | 16. $a = 8, c = 17$ | 17. $a = 9, b = 40$ |
| 18. $b = 2.4, c = 7.4$ | 19. $a = 4, b = 7.5$ | 20. $a = 0.9, c = 4.1$ |



21. **Fitness** A jogger goes half a mile north and then turns west. If the jogger finishes 1.3 mi from the starting point, how far west did the jogger go?

- STEM** 22. **Construction** A construction worker is cutting along the diagonal of a rectangular board 15 ft long and 8 ft wide. What will be the length of the cut?

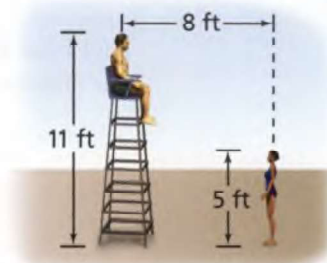
Determine whether the given lengths can be side lengths of a right triangle.

See Problem 3.

- | | | |
|-------------------------|----------------------------|----------------------------|
| 23. 15 ft, 36 ft, 39 ft | 24. 12 m, 60 m, 61 m | 25. 13 in., 35 in., 38 in. |
| 26. 16 cm, 63 cm, 65 cm | 27. 14 in., 48 in., 50 in. | 28. 16 yd, 30 yd, 34 yd |

B Apply

29. **Swimming** A swimmer asks a question to a lifeguard sitting on a tall chair, as shown in the diagram. The swimmer needs to be close to the lifeguard to hear the answer. What is the distance between the swimmer's head and the lifeguard's head?



Any set of three positive integers that satisfies the equation $a^2 + b^2 = c^2$ is a *Pythagorean triple*. Determine whether each set of numbers is a Pythagorean triple.

- | | | |
|------------------|------------------|----------------|
| 30. 11, 60, 61 | 31. 13, 84, 85 | 32. 40, 41, 58 |
| 33. 50, 120, 130 | 34. 32, 126, 130 | 35. 28, 45, 53 |
36. **Think About a Plan** A banner shaped like a right triangle has a hypotenuse of length 26 ft and a leg of length 10 ft. What is the area of the banner?
- What information do you need to find the area of a triangle?
 - How can you find the length of the other leg?
37. **History** Originally, each face of the Great Pyramid of Giza was a triangle with the dimensions shown. How far was a corner of the base from the pyramid's top? Round to the nearest foot.
38. Two sides of a right triangle measure 10 in. and 8 in.
- Writing** Explain why this is not enough information to be sure of the length of the third side.
 - Give two possible values for the length of the third side.

