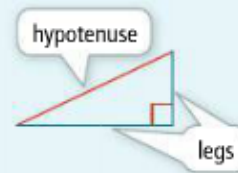


Lesson 10-1

The Pythagorean Theorem

There are special names for the sides of a right triangle like the one in the Solve It. The side opposite the right angle is the **hypotenuse**. It is the longest side. Each of the sides forming the right angle is a **leg**. The **Pythagorean Theorem**, named after the Greek mathematician Pythagoras, relates the lengths of the legs and the length of the hypotenuse.



Essential Understanding The lengths of the sides of a right triangle have a special relationship. If you know the lengths of any two of the sides, you can find the length of the third side.

Take note

Theorem The Pythagorean Theorem

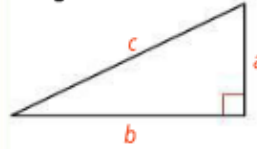
Words

In any right triangle, the sum of the squares of the lengths of the legs is equal to the square of the length of the hypotenuse. $\text{leg}^2 + \text{leg}^2 = \text{hyp}^2$

Algebra

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

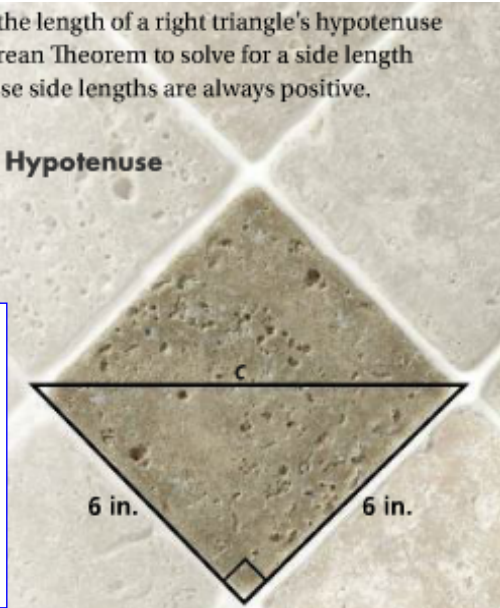
Diagram



You can use the Pythagorean Theorem to find the length of a right triangle's hypotenuse given the lengths of its legs. Using the Pythagorean Theorem to solve for a side length involves finding a principal square root, because side lengths are always positive.

Problem 1 Finding the Length of a Hypotenuse

The tiles at the right are squares with 6-in. sides. What is the length of the hypotenuse of the right triangle shown?

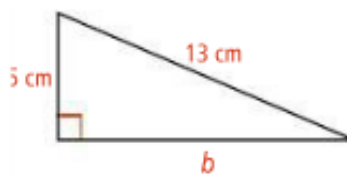


- Got It?** 1. What is the length of the hypotenuse of a right triangle with legs of lengths 9 cm and 12 cm?

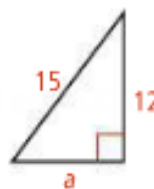
You can also use the Pythagorean Theorem to find the length of a leg of a right triangle.

Problem 2 Finding the Length of a Leg

What is the side length b in the triangle at the right?



Got It? 2. What is the side length a in the triangle at the right?



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

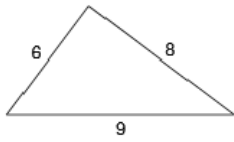
Multiple Choice Which set of lengths could be the side lengths of a right triangle?

- 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

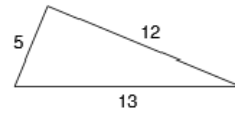
Got It? 3. a. Could the lengths 20 mm, 47 mm, and 52 mm be the side lengths of a right triangle? Explain.

Do the following lengths form a right triangle? Show how you know.

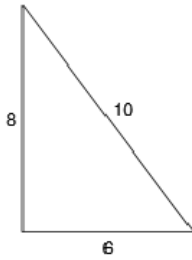
1)



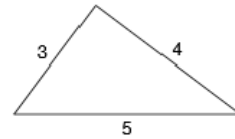
2)



3)



4)

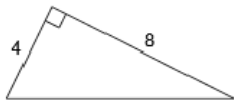


5) $a = 6.4$, $b = 12$, $c = 12.2$

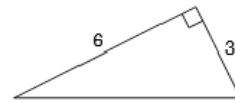
6) $a = 2.1$, $b = 7.2$, $c = 7.5$

Find each missing length to the nearest tenth. Show all your work clearly.

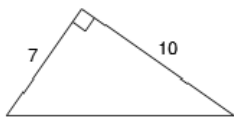
7)



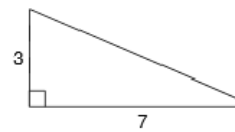
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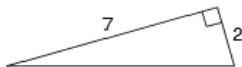
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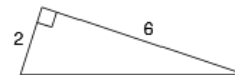
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11)

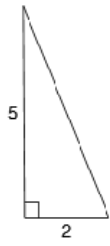


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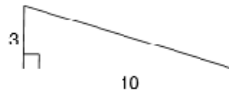


Show all your work clearly.

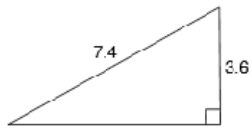
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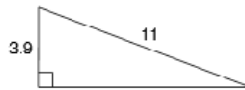
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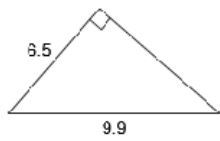
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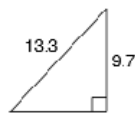
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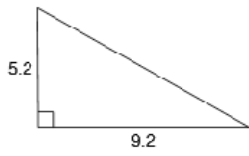
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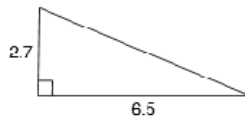
18)



19)



20)



21)



22)

