

## 7.3 The Pythagorean Theorem

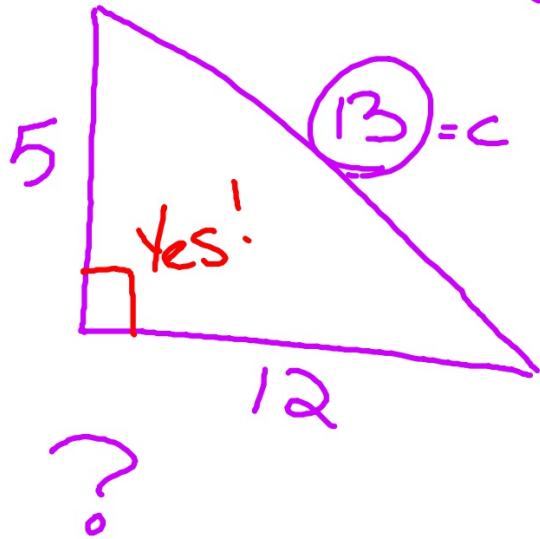
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### Learning Targets



- Find the Length of the Hypotenuse
- Find the Length of a Leg
- Use in a Real-Life Application

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

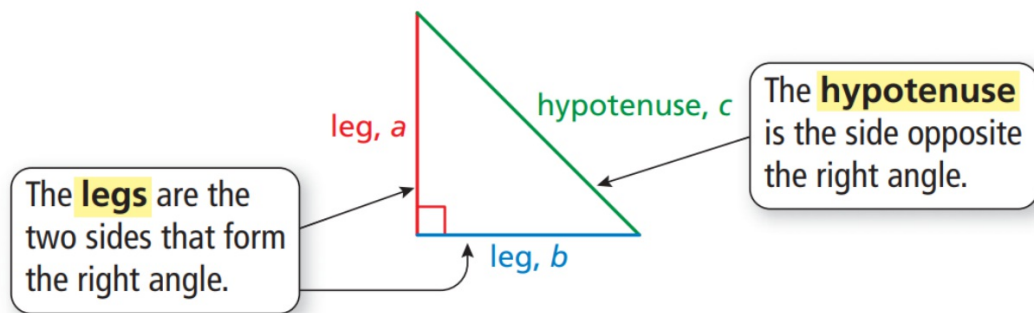


does  $a^2 + b^2 = c^2$  work?

$$\begin{aligned} 5^2 + 12^2 &= 13^2 \\ 25 + 144 &= 169 \\ 169 &= 169 \checkmark \end{aligned}$$

## Sides of a Right Triangle

The sides of a right triangle have special names.



## 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.

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

Learning  
Target 1

## Find the Length of a Hypotenuse

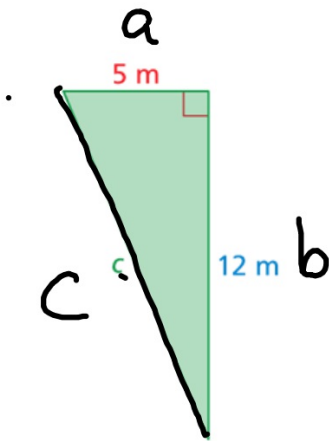
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$$\underline{a}^2 + \underline{b}^2 = c^2$$

- 1st:** Substitute for the legs **a** and **b**
- 2nd:** Square **a** and **b**
- 3rd:** Add the squared values
- 4th:** Find the Positive Square Root

Learning  
Target 1

## Find the Length of a Hypotenuse



Find the length of the hypotenuse of the triangle.

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

Write the Pythagorean Theorem.

$$5^2 + 12^2 = c^2$$

Substitute 5 for  $a$  and 12 for  $b$ .

$$25 + 144 = c^2$$

Evaluate powers.

$$169 = c^2$$

Add.

$$\sqrt{169} = \sqrt{c^2}$$

Take positive square root of each side.

$$13 = c$$

Simplify.

$$\sqrt{169}$$

∴ The length of the hypotenuse is 13 meters.


Learning  
Target 2

## Find the Length of a Leg

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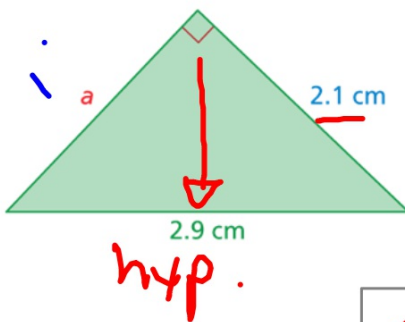
$$a^2 + b^2 = \underline{c^2}$$

- 1st:** Substitute for one leg, **b**  
and the hypotenuse, **c**
- 2nd:** Square **b** and **c**
- 3rd:** Subtract the square of **b** from  
both sides
- 4th:** Find the Positive Square Root

Learning  
Target 2

## Find the Length of a Leg

Find the missing length of the triangle.



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

Write the Pythagorean Theorem.

Substitute 2.1 for  $b$  and 2.9 for  $c$ .

Evaluate powers.

Subtract 4.41 from each side.

Take positive square root of each side.

$$a^2 + (2.1)^2 = (2.9)^2$$

$$a^2 + 4.41 = 8.41$$
$$- 4.41 \quad - 4.41$$

$$\sqrt{a^2} = \sqrt{4}$$

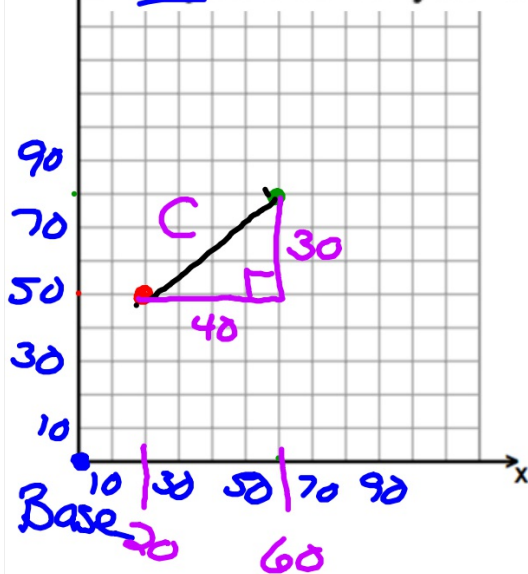
$$a = 2$$



Learning  
Target 3

## Real-Life Application

You are playing capture the flag. You are 50 yards north and 20 yards east of your team's base. The other team's base is 80 yards north and 60 yards east of your base. How far are you from the other team's base?



$$30^2 + 40^2 = C^2$$
$$900 + 1600 = C^2$$
$$\sqrt{2500} = \sqrt{C^2}$$

$$50 = C$$

# Homework

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#1, 2, 3-11 odd

12, 16, and 17