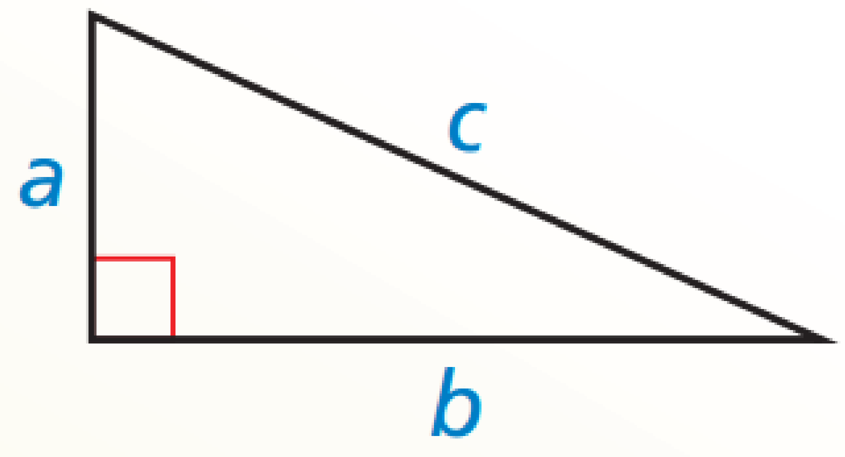
The Pythagorean Theorem

Lesson 9.1

Using the Pythagorean Theorem

In a right triangle the sum of the squares of the legs equals the square of the hypotenuse.



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

Pythagorean Triple

The set of 3 positive integers a, b, and c that satisfy the equation $c^2 = a^2 + b^2$.

$3^2 + 4^2 = 25$

3, 4, 5	5, 12, 13	8, 15, 17	7, 24, 25
6, 8, 10	10, 24, 26	16, 30, 34	14, 48, 50
9, 12, 15	15, 36, 39	24, 45, 51	21, 72, 75
12, 16, 20	20, 48, 52	32, 60, 68	28, 96, 100

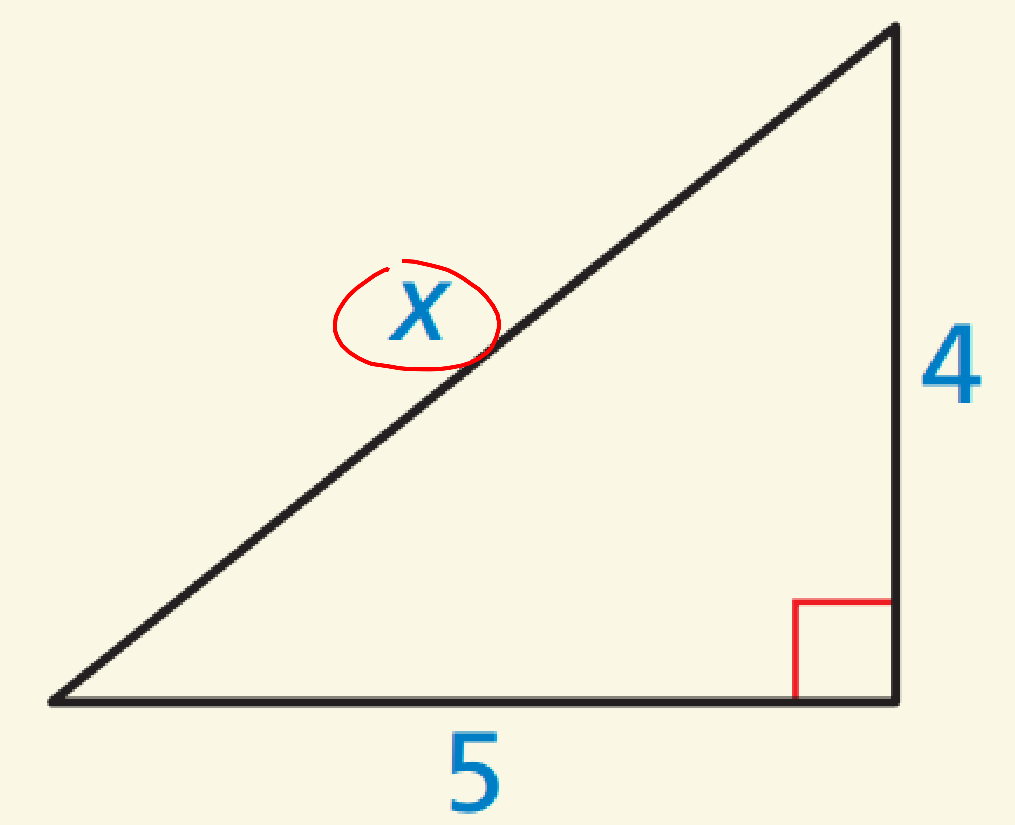
Find the value of x. Then tell whether the side lengths form a Pythagorean triple.

$x^2 = 5^2 + 4^2$

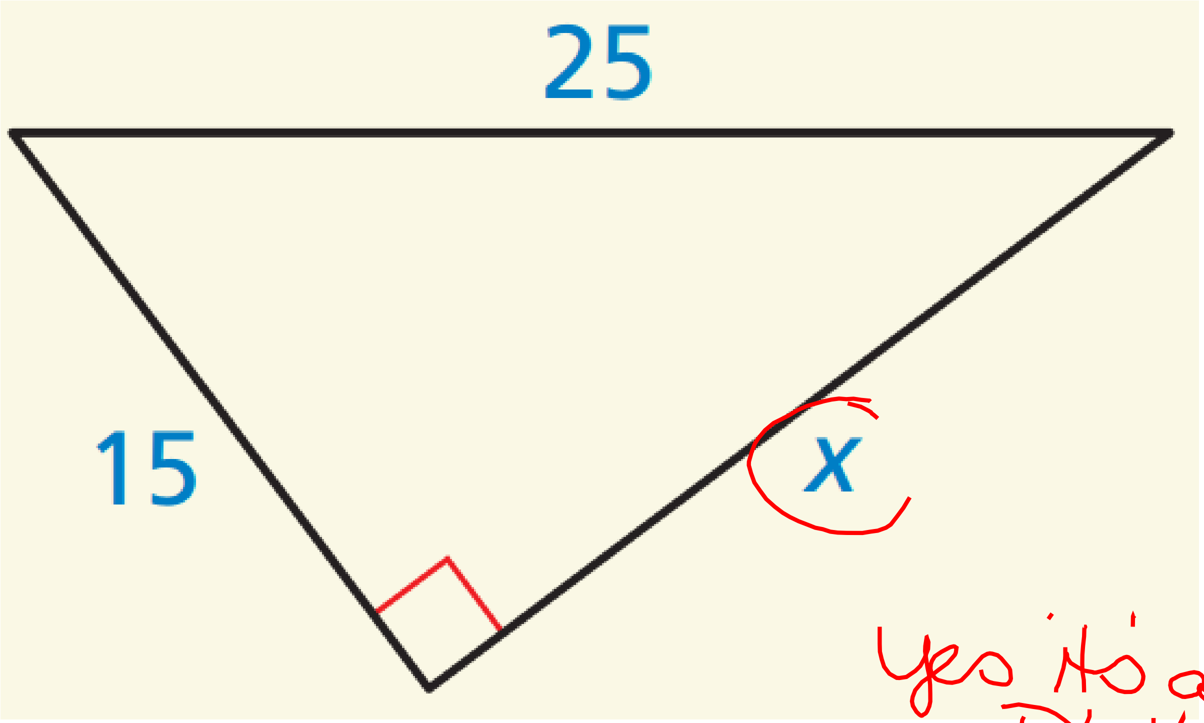
$x^2 = 25 + 16$

$\sqrt{x^2} = \sqrt{41}$

$x = \sqrt{41}$



Find the value of x. Then tell whether the side lengths form a Pythagorean triple.



$$x^2 + 15^2 = 25^2$$

$$x^2 + 225 = 625$$

$$-225 \qquad -225$$

$$\sqrt{x^2} = \sqrt{400}$$

$$x = 20$$

Yes it's a Pyth. triple

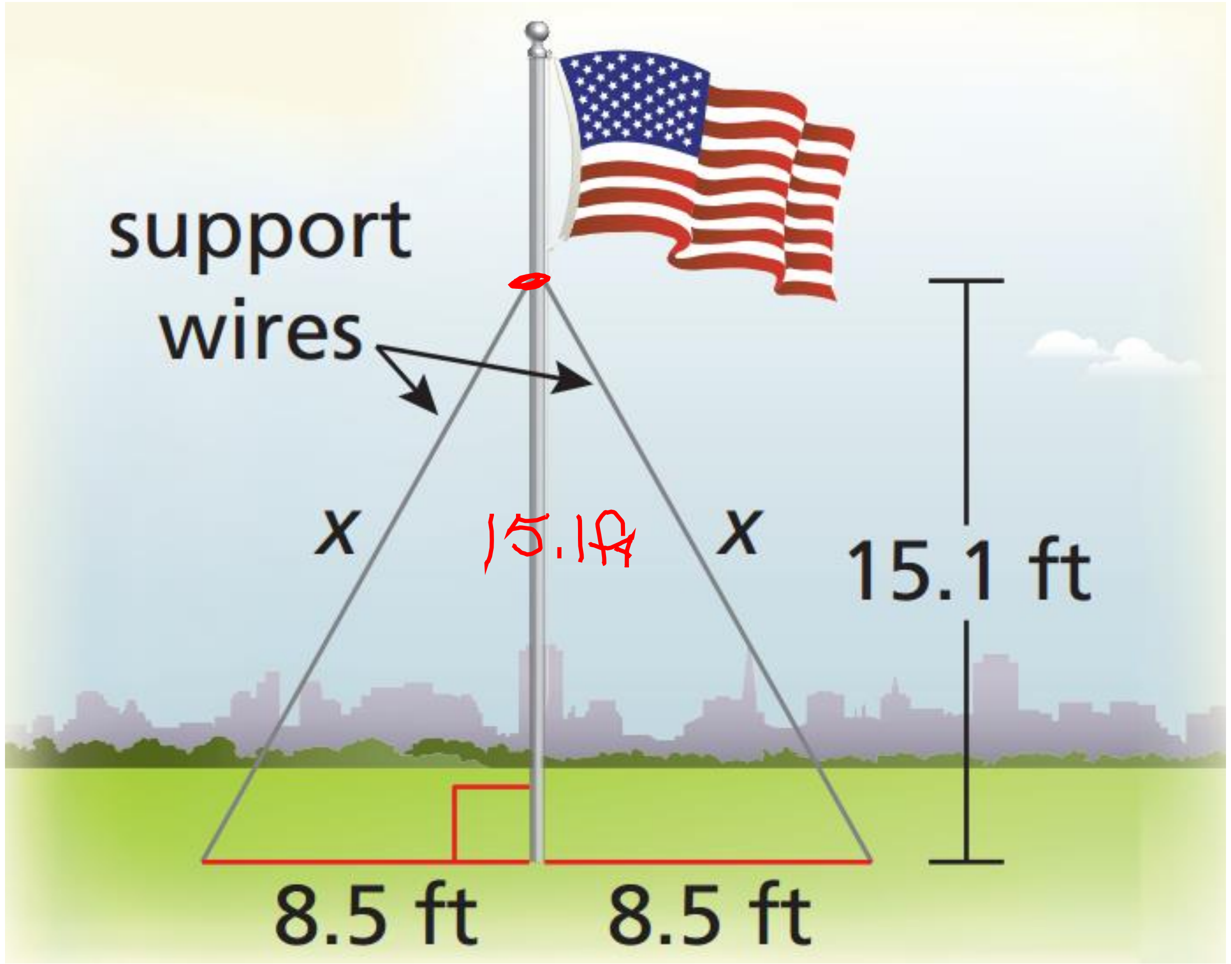
The flagpole shown is supported by two wires. Use the Pythagorean Theorem to approximate the length of each wire.

$x^2 = 8.5^2 + 15.1^2$

$72.25 + 228.01$

$\sqrt{x^2} = \sqrt{300.26}$

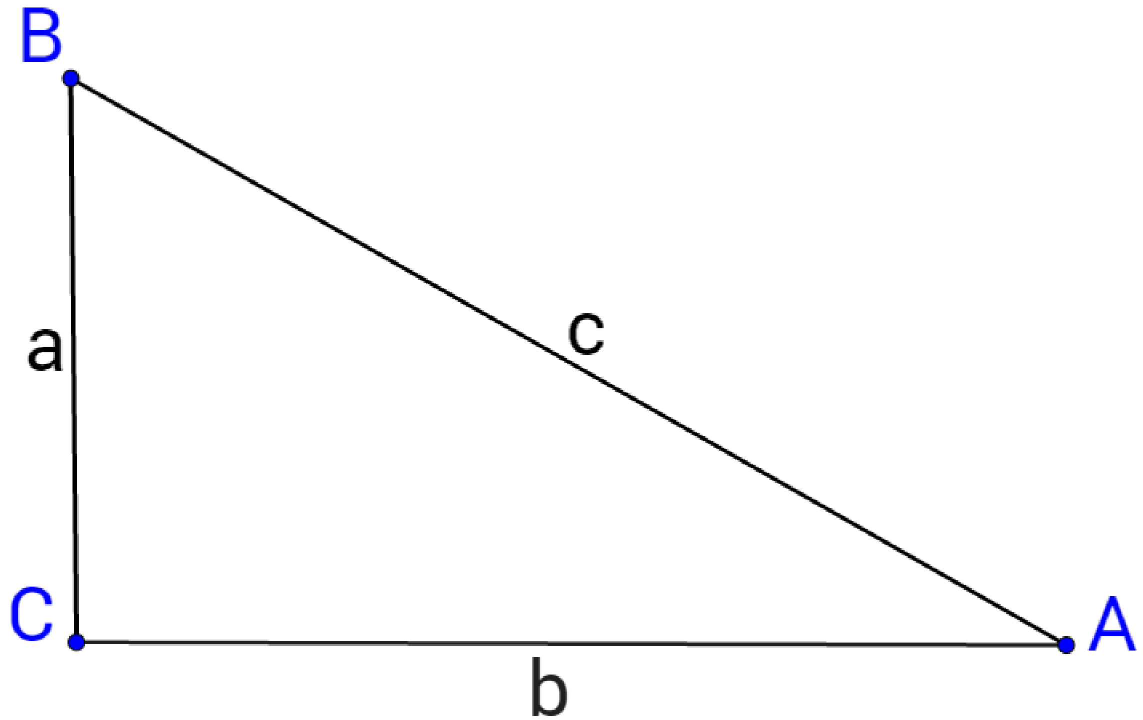
$x \approx 17.33\text{ ft}$



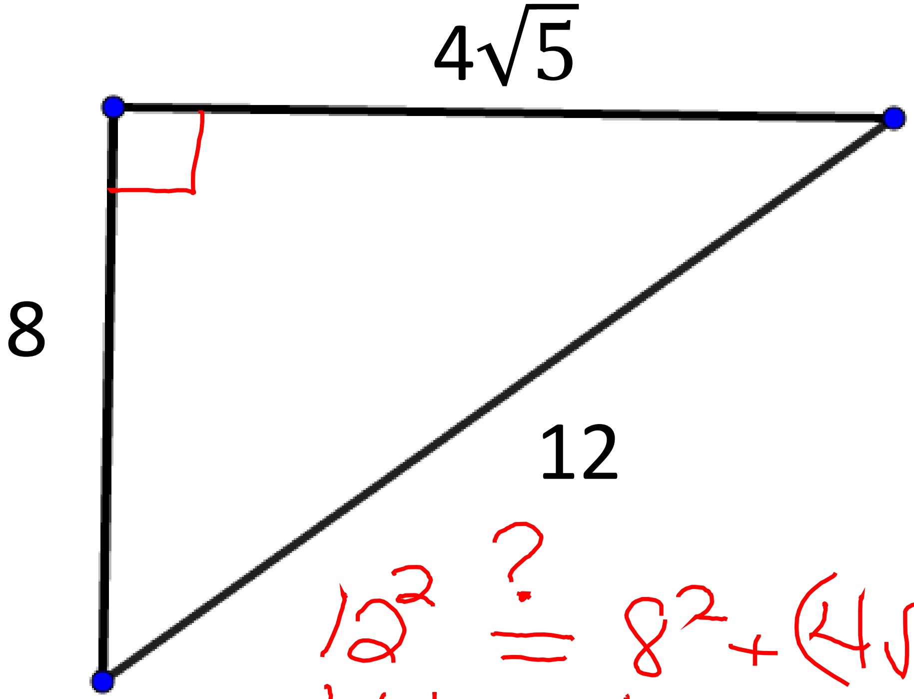
Converse of the Pythagorean Theorem

If the square of the length of the longest side of a triangle is equal to the sum of the squares of the lengths of the other two sides, then the triangle is a right triangle.

If $c^2 = a^2 + b^2$ then rt $\triangle$



Tell whether each triangle is a right triangle.



$4\sqrt{5}\ 4\sqrt{5}$

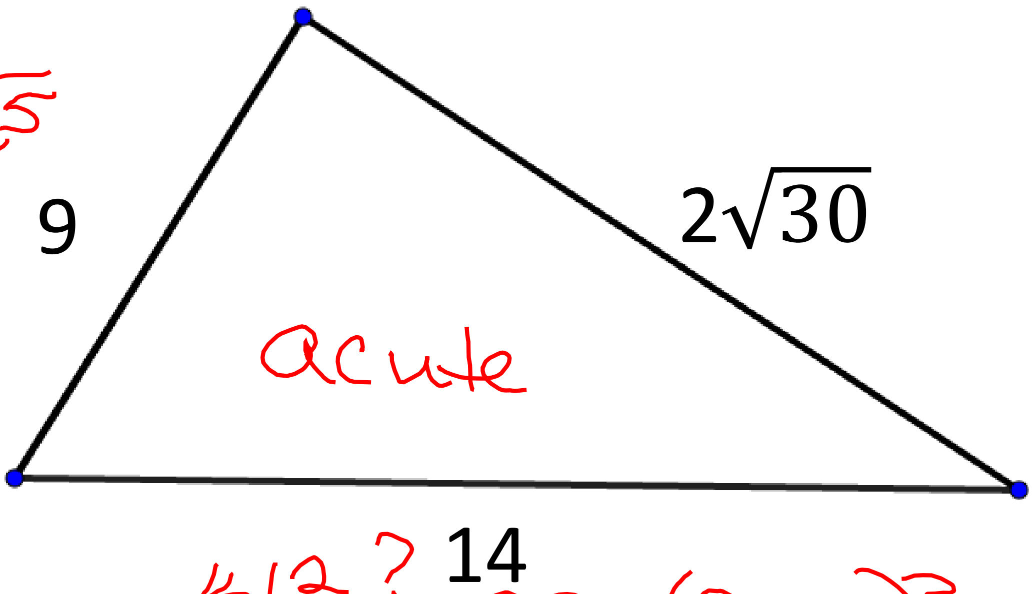
$16\quad 5$

$$12^2 \stackrel{?}{=} 8^2 + (4\sqrt{5})^2$$

$$144 = 64 + 16 \cdot 5$$

$$144 = 64 + 80$$

yes



$$14^2 \stackrel{?}{=} 9^2 + (2\sqrt{30})^2$$

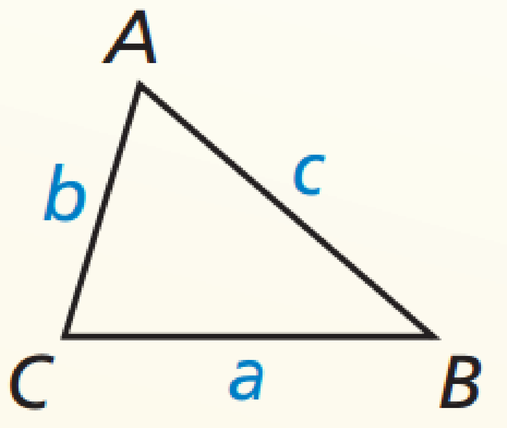
$$196 \stackrel{?}{=} 81 + 120$$

$$196 \neq 201$$

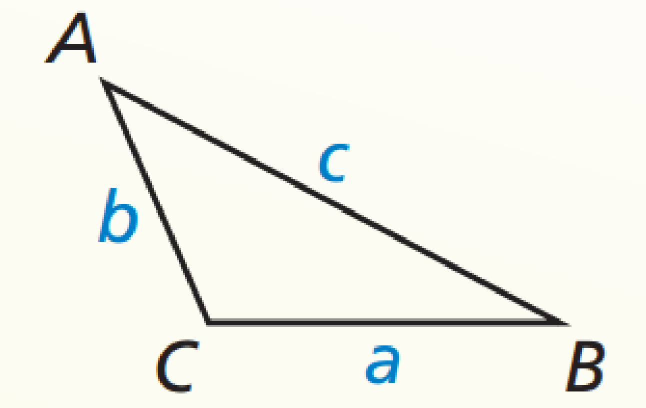
Pythagorean Inequalities Theorem

For any $\triangle ABC$, where c is the length of the longest side, the following statements are true.

If $c^2 < a^2 + b^2$, then $\triangle ABC$ is acute.   If $c^2 > a^2 + b^2$, then $\triangle ABC$ is obtuse.



$c^2 < a^2 + b^2$



$c^2 > a^2 + b^2$

Lesson 9.1 p 468; 1, 2, 4-32 even, 44-47