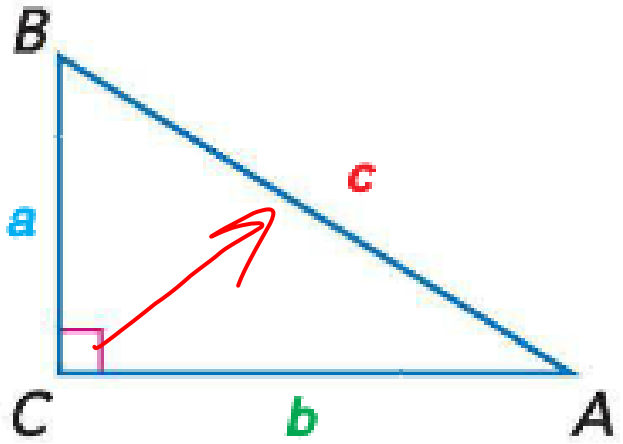
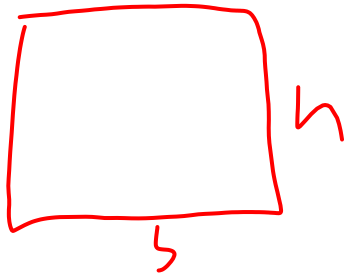
Pythagorean Theorem

Pythagorean Theorem

- In a right triangle, the sum of the squares of the lengths of the sides is equal to the square of the length of the hypotenuse.



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



$A = b \times h$

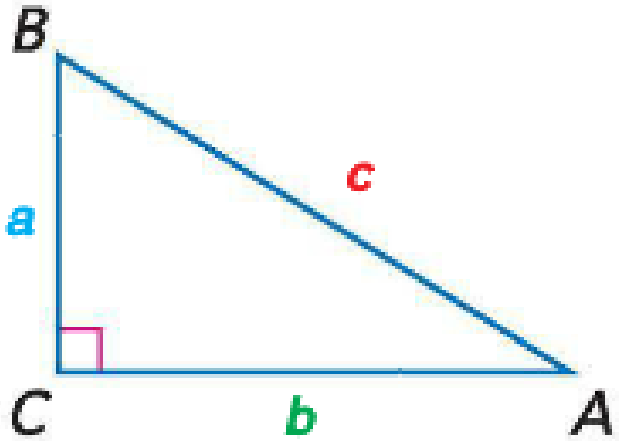
$= b \times b = b^2$

$= h \times h = h^2$

Converse of the Pythagorean Theorem

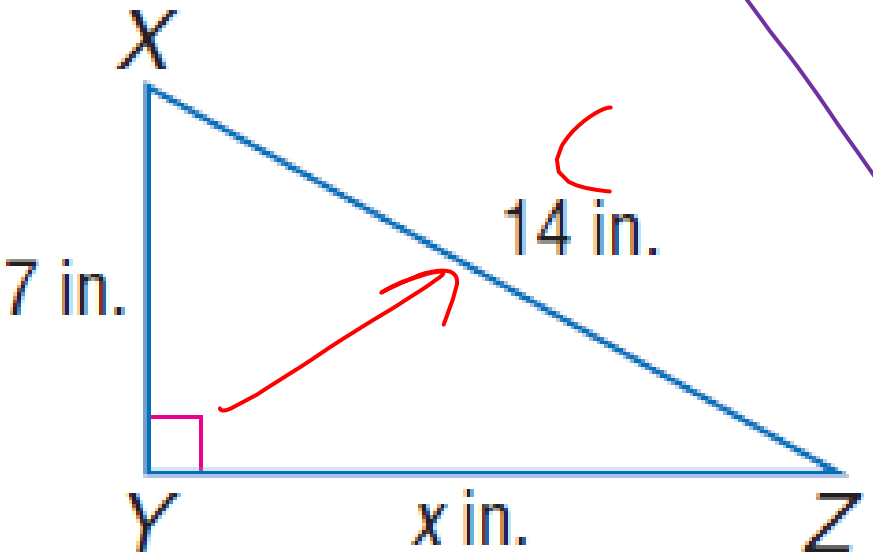
- If the sum of the squares of the measures of two sides of a triangle equals the square of the measure of the longest side, then the triangle is a right triangle.

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



Examples

- Find x.



$\sqrt{7 \cdot 3 \cdot 7}$

$7\sqrt{3}$

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

$7^2 + x^2 = 14^2$

$49 + x^2 = 196$

$-49 \quad -49$

$\sqrt{x^2} = \sqrt{147}$

$x = \sqrt{147}$ ← radical

$= \sqrt{3 \cdot 7 \cdot 7}$

$= 7\sqrt{3}$

147

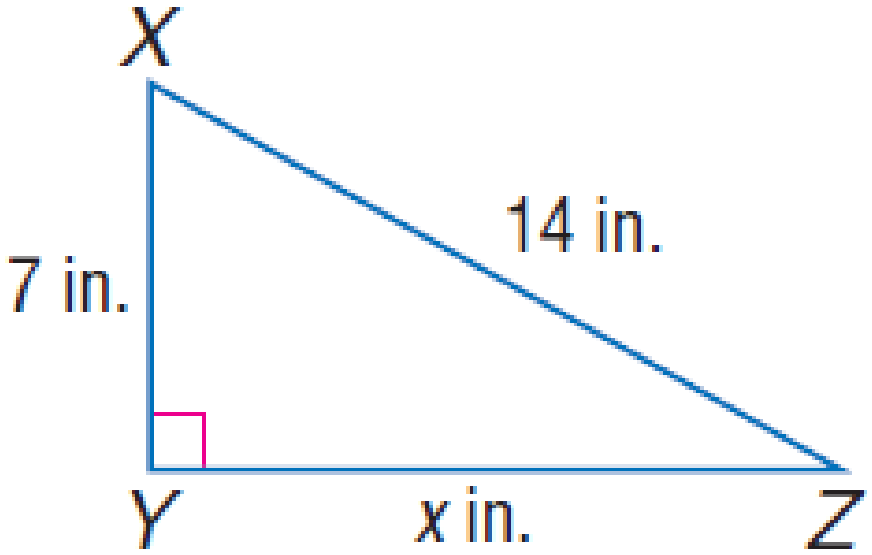
1 147

3 49

7 21

Examples

- Find x.



$7^2 + x^2 = 14^2$

$x^2 = 14^2 - 7^2$

$x^2 = 196 - 49$

$x^2 = 147$

$x = \sqrt{147} = \sqrt{7 * 21} = \sqrt{7 * 7 * 3}$

$x = 7\sqrt{3}$

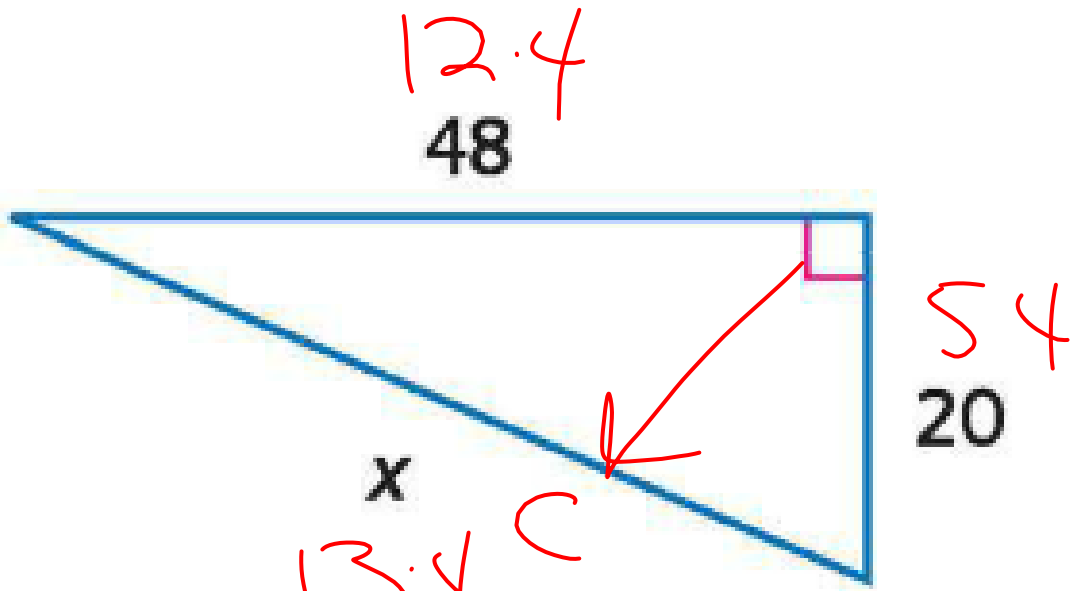
Pythagorean Triple

- A Pythagorean triple is a set of three nonzero whole numbers *a, b, and c,* such that $a^2 + b^2 = c^2$.

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
3x, 4x, 5x	5x, 12x, 13x	8x, 15x, 17x	7x, 24x, 25x

Examples

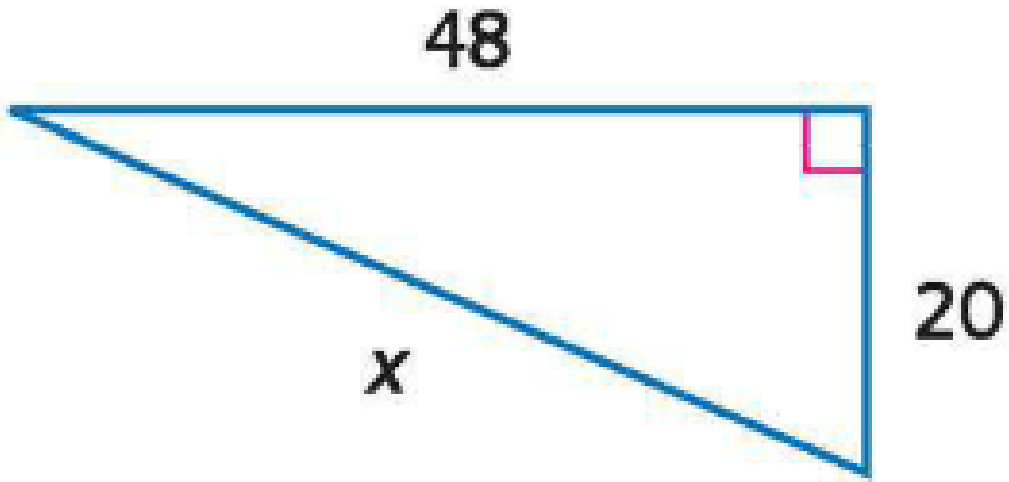
- Use a Pythagorean triple to find *x*. Explain your reasoning.



Examples

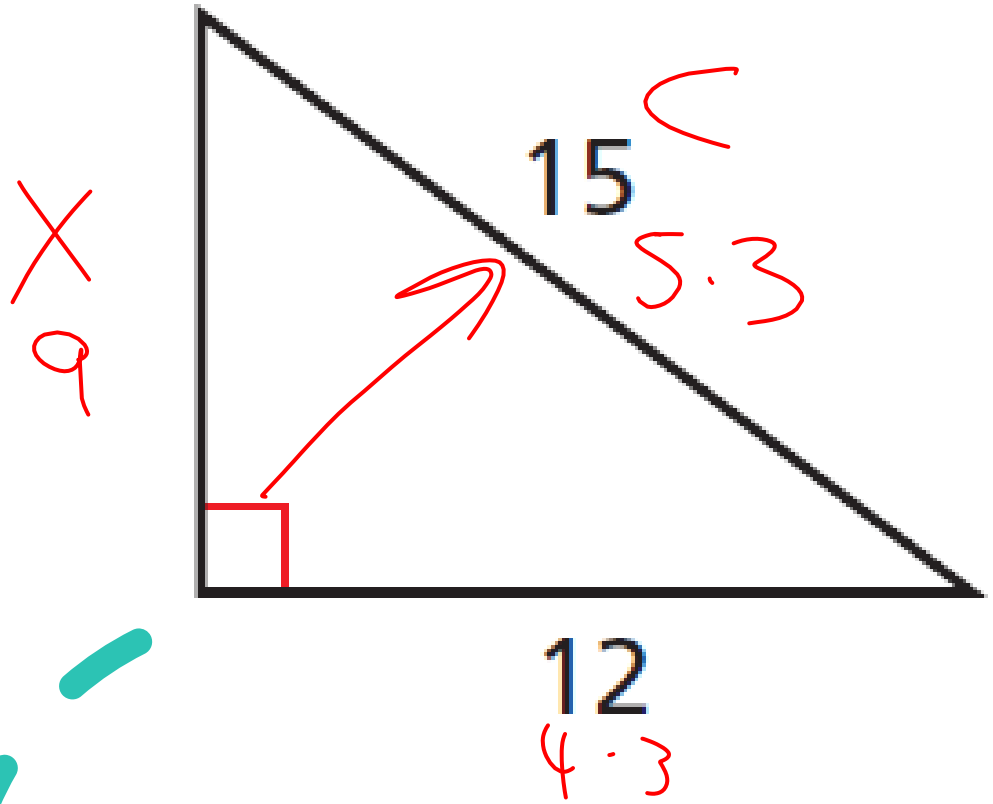
- Use a Pythagorean triple to find *x*. Explain your reasoning.

- 20 = 5*4
- 48 = 12*4
- x = 13*4 = 52



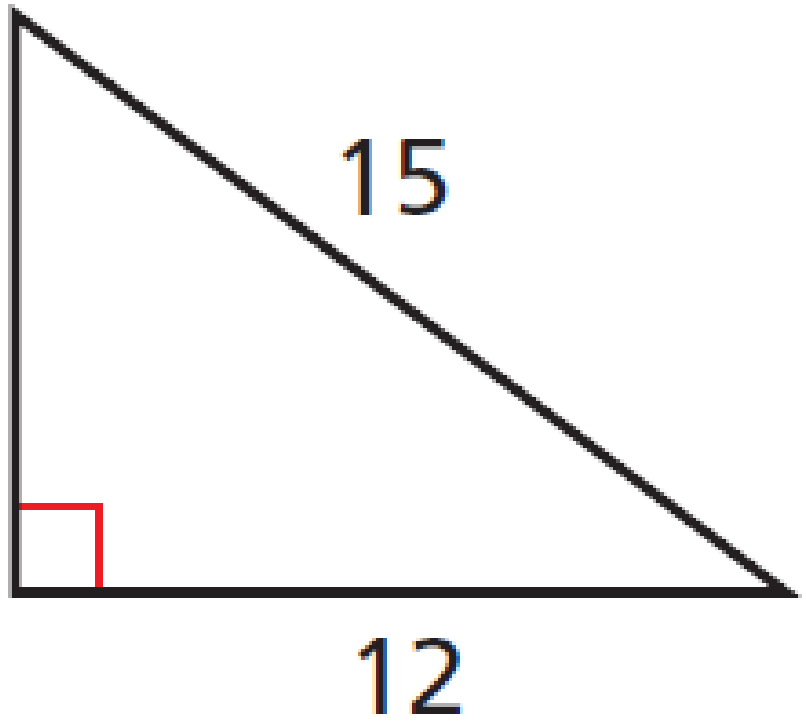
Examples

- Use a Pythagorean triple to find the missing side. Explain your reasoning.



Examples

- Use a Pythagorean triple to find the missing side. Explain your reasoning.



3, 4, 5:

15/3 = 5

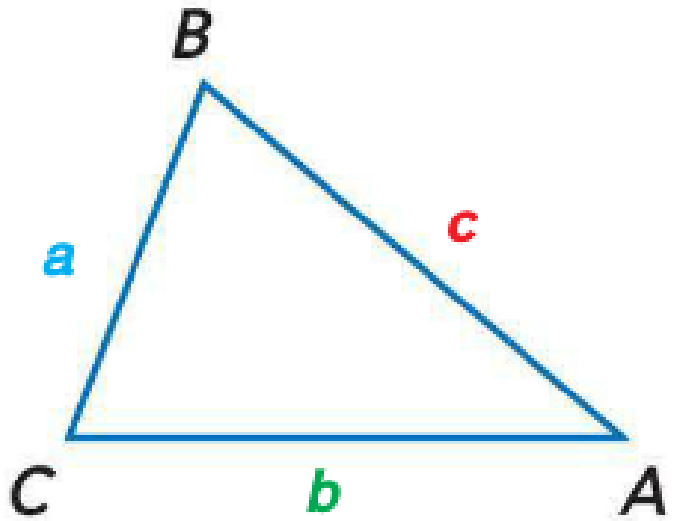
12/3 = 4

x/3 = 3

x = 9

Pythagorean Inequality Theorem

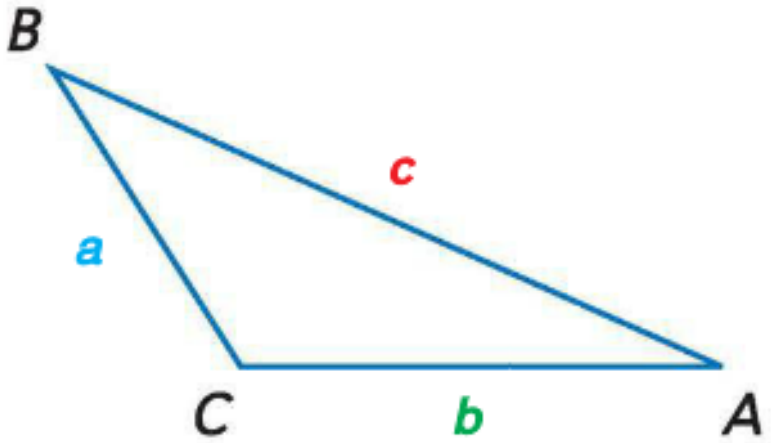
- If the square of the length of the hypotenuse is less than the sum of the squares of the lengths of the other two sides, then the triangle is an ~~acute~~ triangle.



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

Pythagorean Inequality Theorem

- If the square of the length of the hypotenuse is greater than the sum of the squares of the lengths of the other two sides, then the triangle is an obtuse triangle.



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

Examples

- Tell if the measures can be the side lengths of a triangle. If so, classify the triangle as acute, obtuse, or right.

- 8, 11, 13

$8+11>13$ ✓ $11+13>8$ ✓ $8+13>11$ ✓

$8^2+11^2 <=> 13^2$

$64+121 \quad 169$

$185 > 169$

Acute

Examples

- Tell if the measures can be the side lengths of a triangle. If so, classify the triangle as acute, obtuse, or right.

- 8, 11, 13

- $c^2 <=> a^2 + b^2$
- $13^2 <=> 11^2 + 8^2$
- $169 <=> 121 + 64$
- $169 < 185$
- Acute triangle