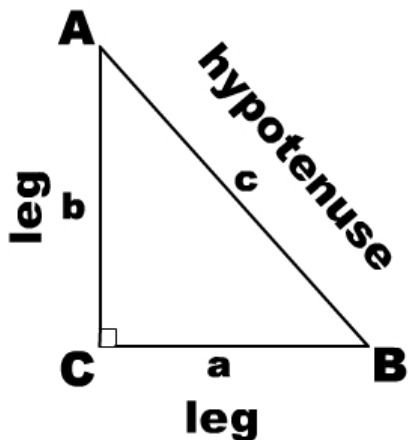


# Pythagorean Theorem

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



## Use for Pythagorean Theorem:

Check for square corners.

Find distance between two points.

## New Terms:

Right triangle

Leg

Hypotenuse

## Finding the hypotenuse.

$$\text{Hypotenuse} = \sqrt{(\text{leg})^2 + (\text{leg})^2}$$

$$c = \sqrt{(a)^2 + (b)^2}$$

## Finding a leg.

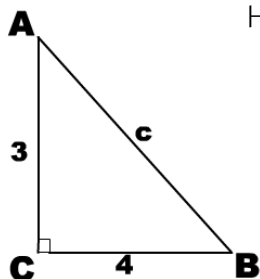
$$\text{Leg} = \sqrt{(\text{hypotenuse})^2 - (\text{leg})^2}$$

$$a = \sqrt{(c)^2 - (b)^2} \quad \text{or} \quad b = \sqrt{(c)^2 - (a)^2}$$

## Examples

Find the hypotenuse.

$a = 4$ ,  $b = 3$ ,  $c = ?$



$$\text{Hypotenuse} = \sqrt{(\text{leg})^2 + (\text{leg})^2}$$

$$c = \sqrt{(4)^2 + (3)^2}$$

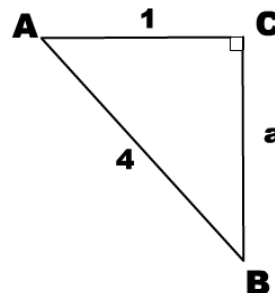
$$c = \sqrt{16+9}$$

$$c = \sqrt{25}$$

$$c = 5$$

Find the missing leg.

$a = ?$ ,  $b = 1$ ,  $c = 4$



$$\text{Leg} = \sqrt{(\text{hypotenuse})^2 - (\text{leg})^2}$$

$$a = \sqrt{(4)^2 + (1)^2}$$

$$a = \sqrt{16+1}$$

$$a = \sqrt{17}$$

$$a = \sqrt{17} \approx 4.1$$

## Practice

Given the parts of a right triangle, find the missing side. Round your answer to the nearest tenths place.

(1)  $a = 5$ ,  $b = 12$ ,  $c = ?$

$$c = \sqrt{(5)^2 + (12)^2}$$

$$c = \sqrt{25+144}$$

$$c = \sqrt{169}$$

$$c = 13$$

(2)  $a = 2$ ,  $b = 3$ ,  $c = ?$

$$c = \sqrt{(2)^2 + (3)^2}$$

$$c = \sqrt{4+9}$$

$$c = \sqrt{13}$$

$$c = \sqrt{13} \approx 3.6$$

(3)  $a = 1.5$ ,  $b = 2.5$ ,  $c = ?$

$$c = \sqrt{(1.5)^2 + (2.5)^2}$$

$$c = \sqrt{2.25 + 6.25}$$

$$c = \sqrt{8.5}$$

$$c = \sqrt{8.5} \approx 2.9$$

(4)  $a = 6$ ,  $b = ?$ ,  $c = 10$

$$b = \sqrt{(10)^2 - (6)^2}$$

$$b = \sqrt{100 - 36}$$

$$b = \sqrt{64}$$

$$b = 8$$

(5)  $a = 0.7$ ,  $b = ?$ ,  $c = 2.5$

$$b = \sqrt{(2.5)^2 - (0.7)^2}$$

$$b = \sqrt{6.25 - 0.49}$$

$$b = \sqrt{5.76}$$

$$b = 2.4$$

(6)  $a = ?$ ,  $b = 2$ ,  $c = 5$

$$a = \sqrt{(5)^2 - (2)^2}$$

$$a = \sqrt{25 - 4}$$

$$a = \sqrt{21}$$

$$a = \sqrt{21} \approx 4.6$$

**Think About:**

In the movie *The Wizard of Oz*, the scarecrow receives an honorary degree of Th.D. – *Doctor of Thinkology* from the wizard. The scarecrow shows his brain power by saying: “The sum of the square roots of any two sides of an isosceles triangle is equal to the square root of the remaining side. Oh, joy, oh rapture. I’ve got a brain!” What is wrong with this statement? What should he have said?

***What is wrong with this statement?***

The Pythagorean Theorem only works with right triangles.

The sides of an isosceles triangle are the same length. Adding the square of two of the sides will not give the square of the third side.

***How should he have said it?***

“The sum of the squares of the legs of a right triangle is equal to the square of the hypotenuse. Cool! Math rocks!”

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