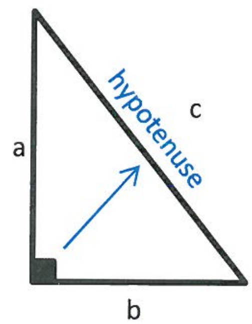
Pythagorean Theorem

Theorem: is a proposition that has been proven true.

Pythagorean Theorem: The theorem states that the squared sum of the two smaller sides of a right triangle is equal the square of the longest side of the triangle.

Hypotenuse: The longest side of a right triangle, it is the opposite of the 90° angle.



Formula: $\boldsymbol{a^2 + b^2 = c^2}$

The formula can be written different ways:

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

$$a^2 = c^2 - b^2$$

$$b^2 = c^2 - a^2$$

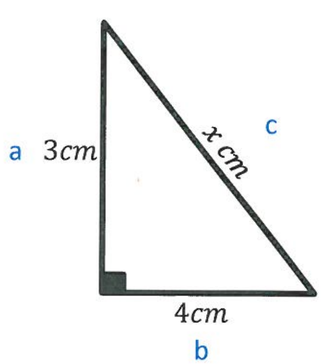
$$c = \sqrt{a^2 + b^2}$$

$$a = \sqrt{c^2 - b^2}$$

$$b = \sqrt{c^2 - a^2}$$

From the theorem we can state that if we know the measure of any two sides of a right angle triangle, we can find the third side.

Example 1:



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

$$3^2 + 4^2 = x^2$$

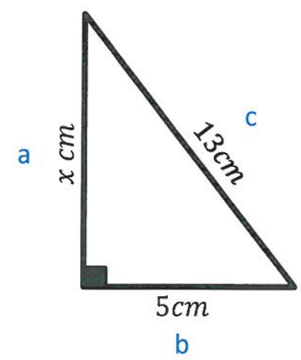
$$9 + 16 = x^2$$

$$25 = x^2$$

$$\sqrt{25} = \sqrt{x^2}$$

$$5 = x$$

Example 2:



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

$$x^2 + 5^2 = 13^2$$

$$x^2 + 25 = 169$$

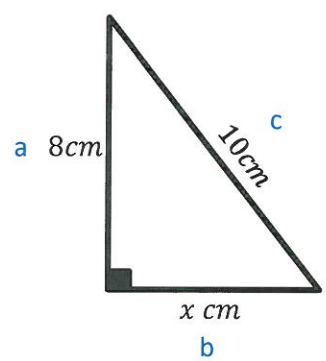
$$x^2 = 169 - 25$$

$$x^2 = 144$$

$$\sqrt{x^2} = \sqrt{144}$$

$$x = 12$$

Example 3:



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

$$8^2 + x^2 = 10^2$$

$$64 + x^2 = 100$$

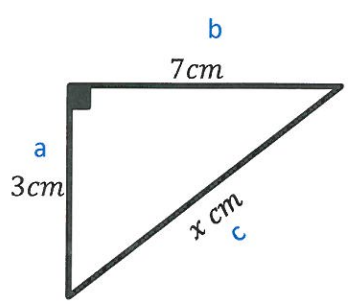
$$x^2 = 100 - 64$$

$$x^2 = 36$$

$$\sqrt{x^2} = \sqrt{36}$$

$$x = 6$$

Example 4:



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

$$3^2 + 7^2 = x^2$$

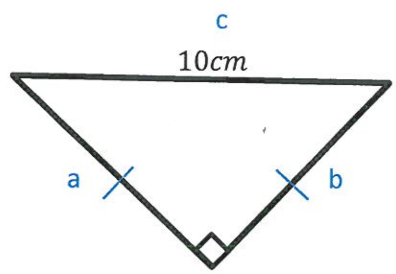
$$9 + 49 = x^2$$

$$58 = x^2$$

$$\sqrt{58} = \sqrt{x^2}$$

$$c \approx 7.615$$

Example 5:



"a" and "b" must be equal be equal since it is an isosceles triangle

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

$$x^2 + x^2 = 10^2$$

$$2x^2 = 100$$

$$\frac{2x^2}{2} = \frac{100}{2}$$

$$x^2 = 50$$

$$\sqrt{x^2} = \sqrt{50}$$

$$x \approx 7.07$$

Pythagorean Triple: Consists of three positive integers that satisfy the Pythagorean Theorem. The integers are listed from lowest to highest making the last integer the hypotenuse.

Example:

- (3, 4, 5) and any multiple of: (6, 8, 10)
  (30, 40, 50)
  (60, 80, 100) ....

- (5, 12, 13) and any multiple of: (10, 24, 26)
  (15, 36, 39)
  (25, 60, 65) ....