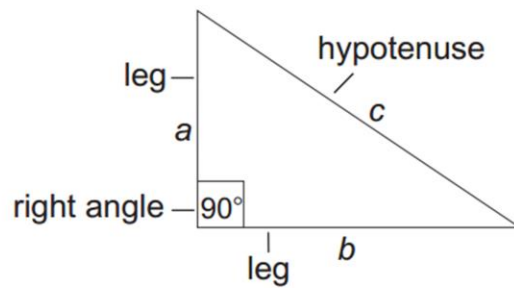


Pythagorean Theorem

A **right triangle** is a **triangle** with a **90 degree (°)** or **right angle** in it. This *right angle* is often indicated with a tiny box in the corner of the **angle** (\angle). The two **sides** of the *triangle* that meet at the right angle are called the **legs** of the triangle. The remaining *side* is called the **hypotenuse**. Notice in the figure below that the *hypotenuse* is across the triangle from the right angle. It is also the longest side of the triangle.



A right triangle—a triangle with a 90° or right angle in it.

Vocabulary: Right triangle, hypotenuse, leg of a right triangle, Pythagorean Theorem, distance

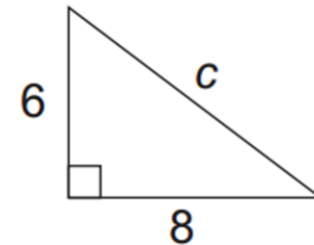
Pythagorean Theorem

Pythagorean theorem—In a right triangle, $a^2 + b^2 = c^2$, if a and b are the *legs* and c is the *hypotenuse*.

Example : Calculating the length of the hypotenuse

First label the side $a=6$, $b=8$ and $c=?$

Then use Pythagorean Theorem



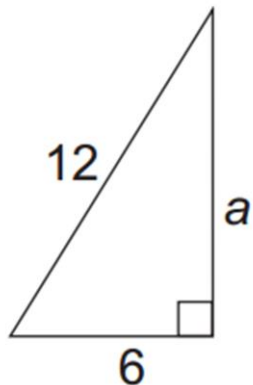
$$\begin{aligned} a^2 + b^2 &= c^2 \\ 6^2 + 8^2 &= c^2 \\ 36 + 64 &= c^2 \\ 100 &= c^2 \\ 10 &= c \end{aligned}$$

Note: $\sqrt{100} = 10$, since 10^2 is 100

Example : Calculating the length of the leg

First label the side a, b and c

Then use Pythagorean Theorem



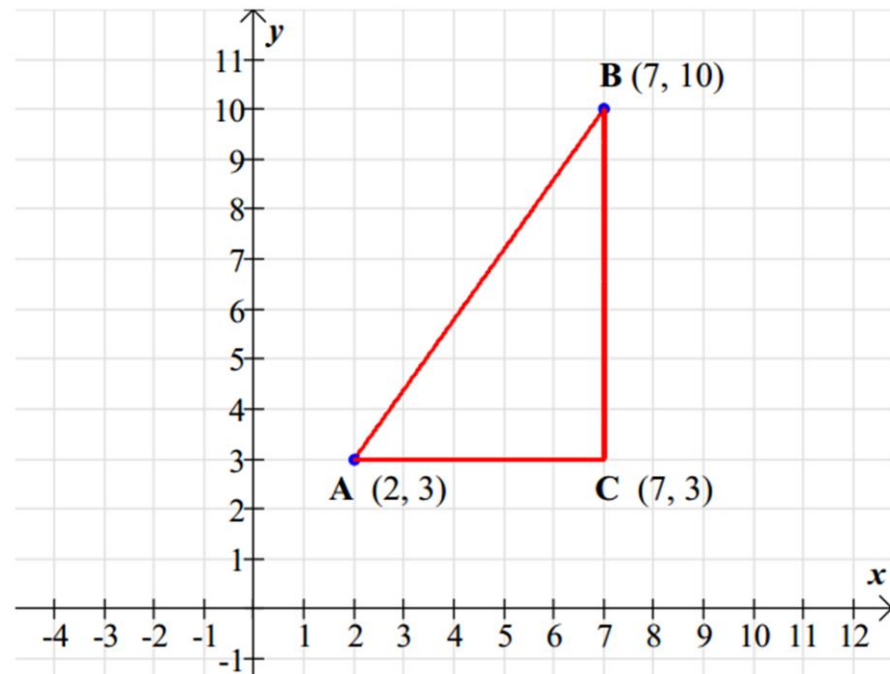
$$\begin{aligned}a^2 + b^2 &= c^2 \\a^2 + 6^2 &= 12^2 \\a^2 + 36 &= 144 \\a^2 + 36 - 36 &= 144 - 36 \\a^2 &= 108 \\a &= \sqrt{108} \\a &= \sqrt{36} \sqrt{3} \\a &= 6\sqrt{3}\end{aligned}$$

Example: Pythagorean Theorem and the distance formula

Use the Pythagorean Theorem to find the distance between the point A(2,3) and B(7,10). Write your answer in simplest form

Solution to #1:

We first plot the points A(2, 3) and B(7, 10) on the coordinate plane. We want to find the distance AB. Next, we draw a right triangle ABC that has hypotenuse \overline{AB} , as shown below.



We can see that length of AC = 5 and length of CB = 7

We can now use the Pythagorean Theorem:

$$5^2 + 7^2 = (AB)^2$$

$$25 + 49 = (AB)^2$$

$$74 = (AB)^2$$

$$AB = \sqrt{74}$$