Chapter 1 : Pythagoras theorem

Note : The longest side of the triangle is called the "hypotenuse".

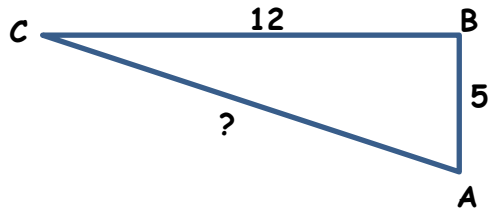
Theorem : In a right angled triangle : the square of the hypotenuse is equal to the sum of the squares of the other two sides.

Why Is This Useful?

If we know the lengths of two sides of a right angled triangle, we can find the length of the third side. (But remember it only works on right angled triangles!)

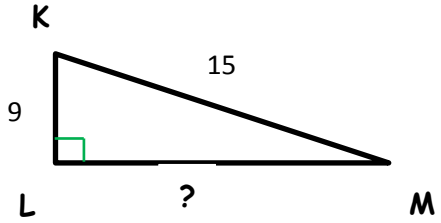
How Do I Use It ?

- **Example 1 :** In this right angles triangle ABC, find the length of AC !



Start with :	$AC^2 = AB^2 + BC^2$
Put in what we know :	$AC^2 = 5^2 + 12^2$
Calculate square :	$AC^2 = 25 + 144$
	$AC^2 = 169$
Square roots of both sides :	$AC = \sqrt{169}$
Calculate :	$AC = 13$

- **Example 2 :** In this right angles triangle MLK, find the length of ML !



Start with :	$KM^2 = LM^2 + KL^2$
Put in what we know :	$15^2 = LM^2 + 9^2$
Calculate square :	$225 = LM^2 + 81$

Subtract 81 $LM^2 = 225 - 81$ so $LM^2 = 144$

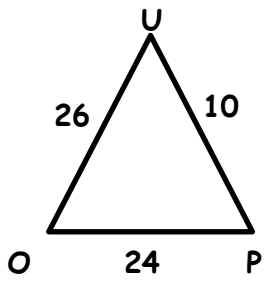
Square roots of both sides : $LM = \sqrt{144}$

Calculate : $LM = 12$

In The Other Way ?

It works the other way around, too: when the three sides of a triangle make $a^2 + b^2 = c^2$, then the triangle is right angled.

- **Example 3 :** Does this triangle have a Right Angle?



Does $OU^2 = OP^2 + UP^2$?

On the one hand : $OU^2 = 26^2 = 676$

On the other hand : $OP^2 + UP^2 = 24^2 + 10^2$
$= 576 + 100$
$= 676$

So **$OU^2 = OP^2 + UP^2$**

They are equal, so this triangle have a right angle !

- **Example 4 :** Does an 8, 15, 16 triangle have a Right Angle?

On the one hand : $16^2 = 256$

On the other hand : $8^2 + 15^2 = 64 + 225$
$= 289$

So, $256 \neq 289$ and $16^2 \neq 8^2 + 15^2$

No, this triangle do not have a right angle !