

Pythagoras' Theorem

Year 9 Mathematics
Mainstream

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Learning Objectives

By the end of the lesson I hope that you understand and can apply the following to a range of questions from the Year 9 Mathematics course.

- To know that the hypotenuse is the longest side of a right angled triangle
- To know the rule which Pythagoras might have come up with(!) to find the missing lengths of sides.
- To be able to use Pythagoras' Theorem to find the missing side lengths
- To be able to express lengths as surds.

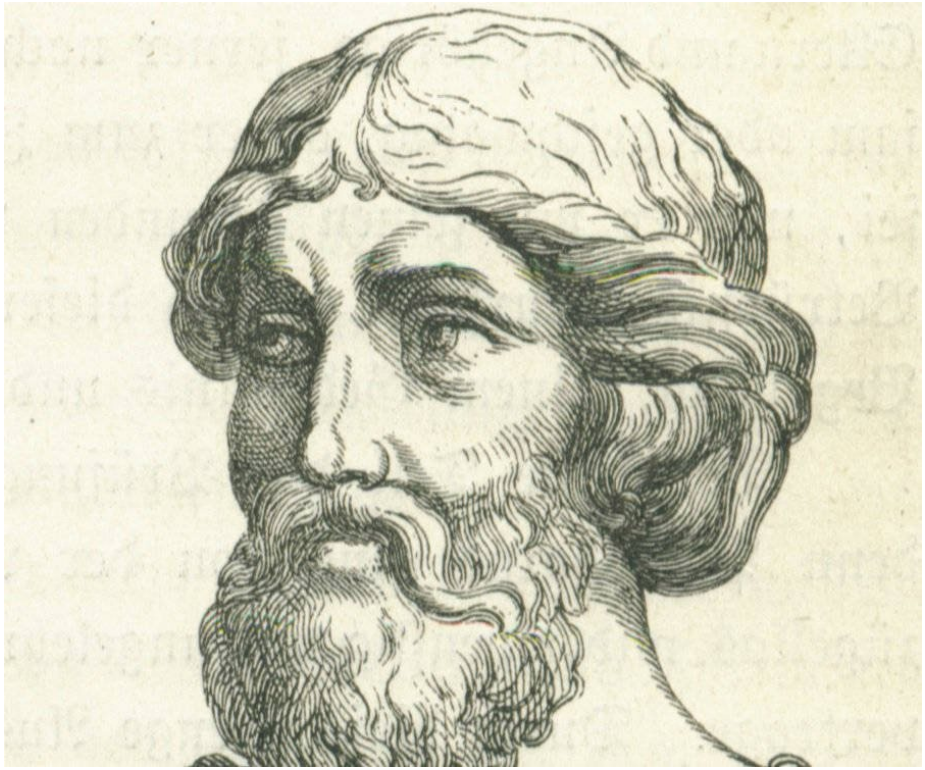


RECAP

You may have met this in previous years but it's pretty important concept which is used in Mathematics. It allows us to find missing side lengths for right angled triangles when we know two of the sides.

This section, once again makes use of algebra to be able to transpose equations and find missing values.

You will also be introduced to something called a **surd**.



He's a jolly good looking fellow isn't he!
Not too sure what's the matter with one of his eyes though.
Perhaps this isn't the most flattering of images!

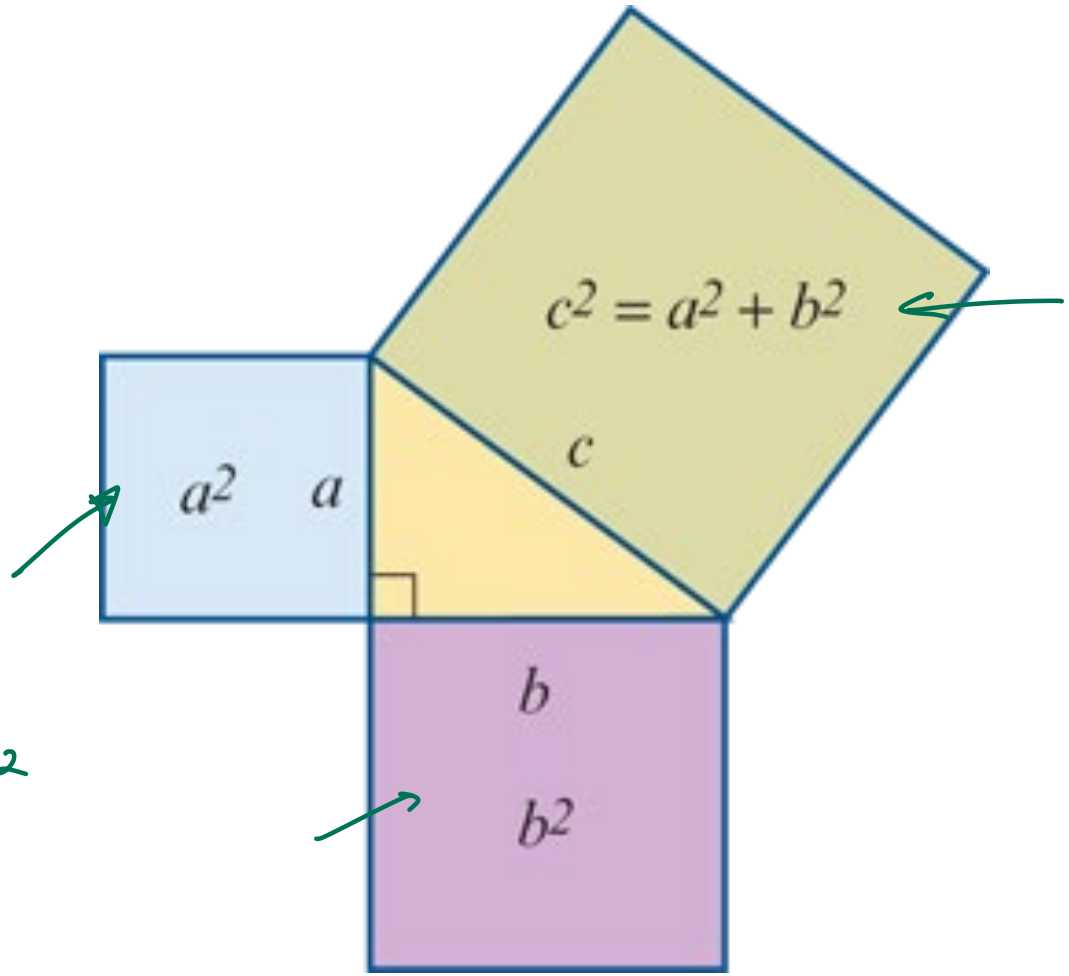


His theorem … or someone else's theorem

We all know that it has something to do with right angled triangles, but it makes more sense to look at areas of squares!

If we take different sizes of squares and try and put them together so their corners meet, we find that some of them make a right angled triangle. What is more interesting is that when we take the areas of these three squares, we see that the area of the two smaller squares when added makes the area of the larger square.

This is where we get the formula from!



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



The longest side has a name!

The longest side is called the Hypotenuse.

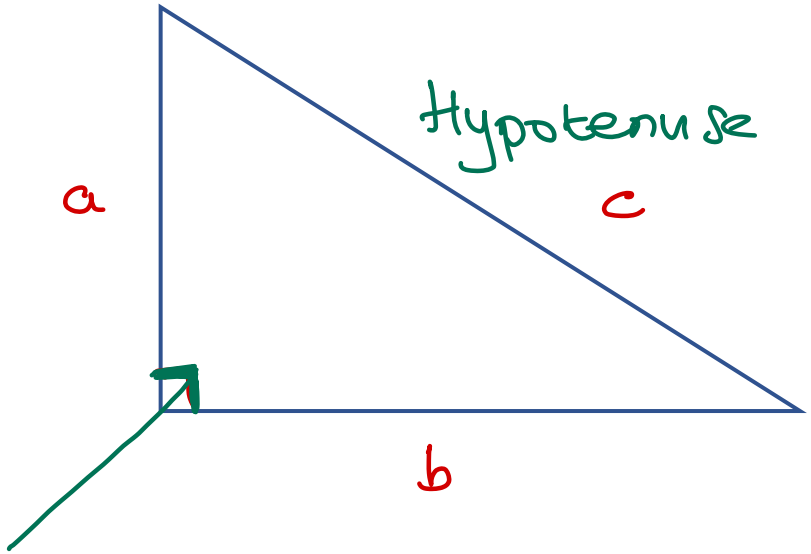
It is the side which is **opposite the right angle**.

I think of the right angle as an arrow head pointing to the longest side!

The other sides don't have a name (for Pythagoras' Theorem).

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

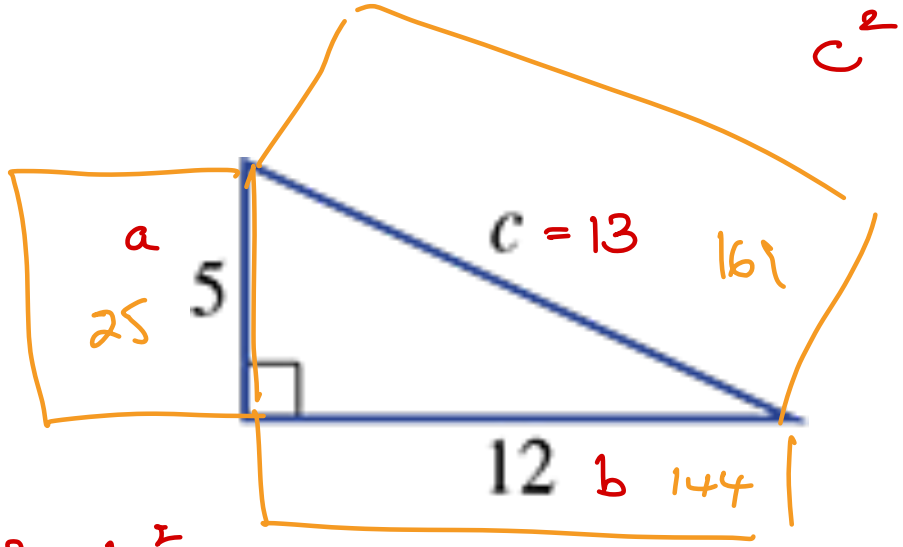
$a^2 + b^2 = c^2$





Example 1

Find the length of the hypotenuse in these right-angled triangles.
Round to two decimal places in part b.



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

25 169 144

$\sqrt{169} = 13$

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

$c^2 = 5^2 + 12^2$

$c^2 = 25 + 144$

$c^2 = 169$

$c = \sqrt{169}$

$c = 13$



What is an exact value

Sometimes it makes sense to NOT turn something into a decimal value. When using Pythagoras' Theorem, we can keep an answer as an exact value using surds.

On the right there are examples of surds.

This is a whole topic on it's own! And I will just do the basics for the time being. There will be more to come!

Some of the questions you will do will ask you to leave answers in **exact form**. This means you leave them with the square roots.

$\sqrt{3}$

$\sqrt{5}$

$\sqrt{10}$

$2\sqrt{3}$

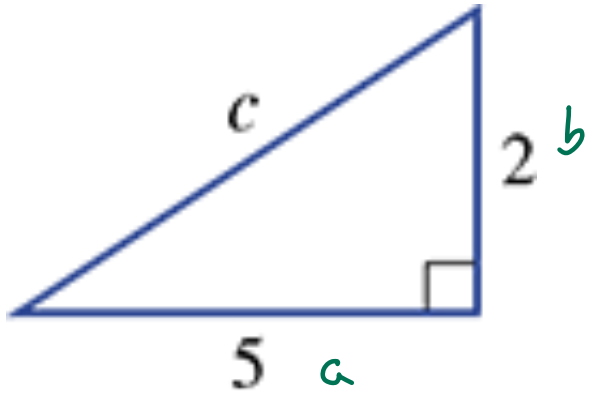
$\sqrt{9} = 3$



Example 3

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

Find the length of the hypotenuse in this right-angled triangle, leaving your answer as an exact value.



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

$c^2 = 5^2 + 2^2$

$c^2 = 25 + 4$

$c^2 = 29$

$c = \sqrt{29}$

1
4
9
16
25
36
⋮



Questions to complete:

The questions I would like you to complete for this lesson are:

Exercise 3A: Pythagoras' Theorem
Questions: 1a, 2ace, 3be, 4ace, 5aef, 6abc, 7, 8, 10, 11





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