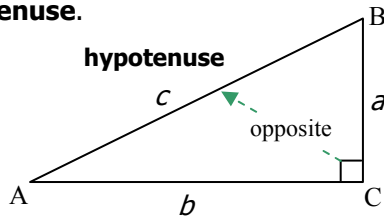


# Calculate Lengths using Pythagoras' Theorem – SS1

Pythagoras' theorem is used to calculate lengths of sides in triangles and can only be used on right-angled triangles. Start by identifying the **hypotenuse**.

Memorise the formula:  $a^2 + b^2 = c^2$



The **hypotenuse** is the longest side and is always 'opposite' the right angle. Draw an arrow from the right angle to be sure!

In the formula,  $c$  is the length of the hypotenuse and  $a$  and  $b$  the length of the two shorter sides. The formula  $a^2 + b^2 = c^2$  means that, for any right-angled triangle, the **sum** of the **squares** of the lengths of the **two shorter sides** is **equal** to the **square** of the length of the **hypotenuse**.

The formula can be re-arranged as:

$c = \sqrt{a^2 + b^2}$ , which is used to **calculate the hypotenuse** ( $c$ ), when the two shorter sides are given.

Notice the '+'

**Student Approach...**

Some students just remember this calculation as 'Square, Add, and Square Root'.

OR as:  $a = \sqrt{c^2 - b^2}$ , which is used to **calculate a shorter side** ( $a$ ) when the hypotenuse and one of the shorter sides is given.

Notice the '-'

**Student Approach...**

Some students just remember this calculation as 'Square, Subtract, and Square Root'.

**Remember...**

Subtract the smaller number from the bigger!

## Your Turn!!

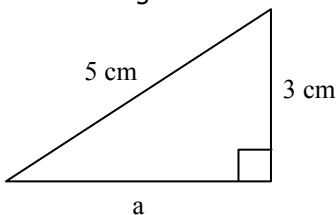
- Either a) learn the two additional formulae and when these are used **OR**  
b) learn to re-arrange the original formula!

## Strategy

1. Draw the triangle and label the shorter sides  $a$ ,  $b$ , and the longest side  $c$ .
- 2a. Substitute the numbers into the formula  $a^2 + b^2 = c^2$  OR use the rearranged formulae  $c = \sqrt{a^2 + b^2}$ ,  $a = \sqrt{c^2 - b^2}$ .
- 2b. Alternatively you can use the student approach as indicated above.

## Example

Find the length of side  $a$ :



Finding a shorter side

Subtract 9 from both sides

Take the square root on both sides

## Solution

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

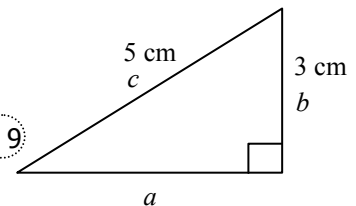
$$a^2 + 3^2 = 5^2$$

$$a^2 + 9 = 25$$

$$a^2 + 9 - 9 = 25 - 9$$

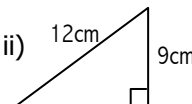
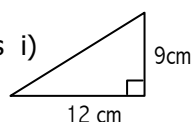
$$a^2 = 16$$

$$a = 4$$



## Your Turn!!

c) Calculate the missing lengths



**Ask yourself each time...**

Is the missing length the hypotenuse or one of the shorter sides?

## RAPID 'ACID' TEST – Blank out the page above before answering these!

1. Calculate the length of the line CD.

