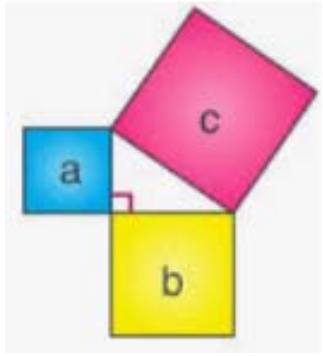
Geometry and measure 2 – Calculating with space – Right angled triangle theorem (aka Pythagoras' theorem)

Knowledge Organiser

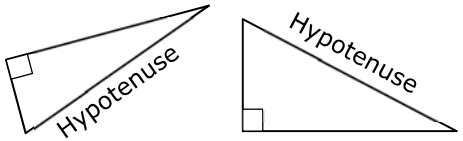
Objective
Investigate the lengths of sides in right angled triangles
Know and use the 'Right Angled Triangle Theorem' to find lengths in right-angled triangles
Solve problems involving 'Right Angled Triangle Theorem' Theorem

The 'Right Angled Triangle Theorem' was independently discovered in many cultures. In the UK this theorem is commonly called **Pythagoras' Theorem**.



Key Facts

The hypotenuse of a right angled triangle is the longest side and is opposite the right angle.

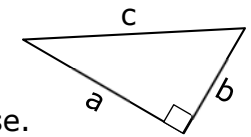


The right angled triangle theorem states that 'the square of the length of the hypotenuse of a right triangle equals the sum of the squares of the lengths of the other two sides'.

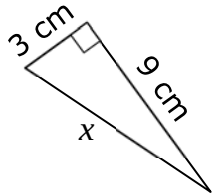
Or as a formula

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

where c is the hypotenuse.



Finding the hypotenuse



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

$3^2 + 9^2 = x^2$

$9 + 81 = x^2$

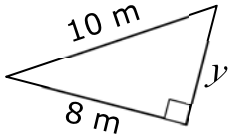
$90 = x^2$

$\sqrt{90} = x$

$9.49 \text{ cm} = x$

(2 d.p)

Finding one of the shorter sides



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

$y^2 + 8^2 = 10^2$

$y^2 + 64 = 100$

$y^2 = 100 - 64$

$y^2 = 36$

$y = \sqrt{36}$

$y = 6 \text{ m}$

Key Concept Check

- $\sqrt{a^2 + b^2} = a + b$; $always, sometimes \text{ or } never$? Explain your answer.
- A triangle has side lengths 8cm, 15cm and 19cm. Ava thinks that all the angles in the triangle are acute, Liam thinks that it is a right angled triangle and Elijah thinks that one of the angles in the triangle is obtuse. Who is correct? Justify your answer.

Key words used in this unit:

Integer - a whole number
e.g. -3, -2, -1, 0, 1, 2, 3 etc.

Square Number - the result of multiplying an integer by itself, the symbol is ^{2} e.g. $4^2 = 4 \times 4 = 16$

Square Root - a number when multiplied by itself gives the original number, the symbol is $\sqrt{}$ e.g. $\sqrt{16} = 4$

Right Angle - an angle of 90°

Triangle - a two dimensional figure with three straight sides and three angles.

Right Angled Triangle - a triangle where one of the angles is 90°.

Hypotenuse - the side opposite the right angle in a right-angled triangle. It is the longest side of the right-angled triangle.

Line Segment - the part of a line that connects two points. It is the shortest distance between the two points.