Y9 Pythagoras' Theorem

What do I need to be able to do?

By the end of this unit you should be able to:

- Use square and cube roots
- Identify the hypotenuse
- Calculate the hypotenuse
- Find a missing side in a Right angled triangle
- Use Pythagoras' theorem on axes
- Explore proofs of Pythagoras' theorem

Keywords

Square number: the output of a number multiplied by itself
Square root: a value that can be multiplied by itself to give a square number
Hypotenuse: the largest side on a right angled triangle. Always opposite the right angle.
Opposite: the side opposite the angle of interest
Adjacent: the side next to the angle of interest

Squares and square roots (R)

This can also be written as 6^2

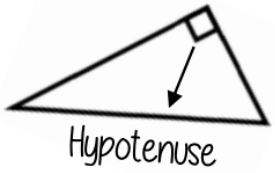
$\sqrt{\ }$ is the square root symbol

e.g $\sqrt{64} = 8$
Because $8 \times 8 = 64$

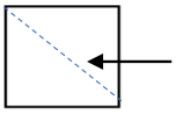
1 × 1	2 × 2	3 × 3	4 × 4	5 × 5	6 × 6	7 × 7	8 × 8	9 × 9	10 × 10
1	4	9	16	25	36	49	64	81	100

Square numbers

Identify the hypotenuse

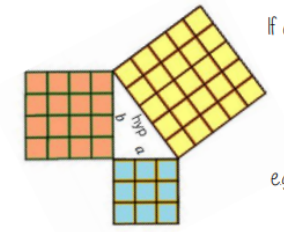


The hypotenuse is always the longest side on a triangle because it is opposite the biggest angle



Polygons can still have a hypotenuse if it is split up into triangles and opposite a right angle

Determine if a triangle is right-angled



a = 3 b = 4 c = 5

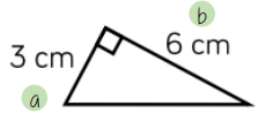
If a triangle is right-angled, the sum of the squares of the shorter sides will equal the square of the hypotenuse

$a^2 + b^2 = \text{hypotenuse}^2$

e.g $a^2 + b^2 = hypotenuse^2$
$3^2 + 4^2 = 5^2$
$9 + 16 = 25$

Substituting the numbers into the theorem shows that this is a right-angled triangle

Calculate the hypotenuse



Either of the short sides can be labelled a or b

$a^2 + b^2 = \text{hypotenuse}^2$

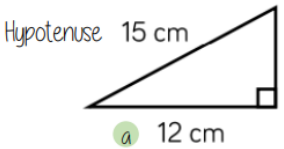
1. Substitute in the values for a and b

$3^2 + 6^2 = \text{hypotenuse}^2$
$9 + 36 = \text{hypotenuse}^2$
$45 = \text{hypotenuse}^2$

2. To find the hypotenuse square root the sum of the squares of the shorter sides

$\sqrt{45} = \text{hypotenuse}$
$6.71cm = \text{hypotenuse}$

Calculate missing sides



Either of the short sides can be labelled a or b

$a^2 + b^2 = \text{hypotenuse}^2$

$12^2 + b^2 = 15^2$

1. Substitute in the values you are given

$144 + b^2 = 225$
$-144 \quad -144$

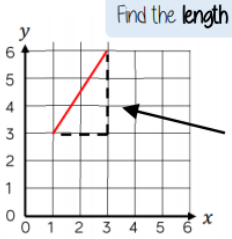
Rearrange the equation by subtracting the shorter square from the hypotenuse squared

Square root to find the length of the side

$b^2 = 111$
$b = \sqrt{111} = 10.54\ cm$

Pythagoras' theorem on a coordinate axis

Find the **length** of the line segment



The segment can be made into a right-angled triangle by adding the sides on the diagram

The line segment is the **hypotenuse**

$a^2 + b^2 = \text{hypotenuse}^2$

The lengths of a and b are the sides of the triangle

Be careful to check the scale on the axes