Year 9- Reasoning With Geometry- Pythagoras' Theorem

Essential knowledge

- Use square and square roots
- Identify the hypotenuse
- Determine whether a triangle is right-angled
- Calculate the hypotenuse
- Find a missing side in a right angled triangle
- Use Pythagoras' theorem on coordinate axes

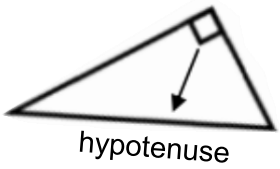
Key Vocabulary

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

Prior learning links

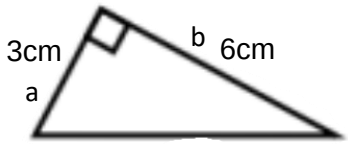
Understanding square numbers (Y5 and Y6)
Substitution (Y7)
Solve algebraic equations (Y8)

Identifying the Hypotenuse



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

Calculate the Hypotenuse



Either of the short sides can be called a or b

$a^2 + b^2 = hypotenuse^2$

Step 1- Substitute in the values for a and b

$3^2 + 6^2 = hypotenuse^2$

$9 + 36 = hypotenuse^2$

$45 = hypotenuse^2$

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

hypotenuse = $\sqrt{45}$

hypotenuse = 6.71 cm

Squares and Square Roots

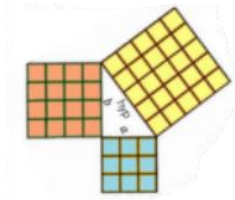
$1 \times 1 = 1$ $2 \times 2 = 4$ $3 \times 3 = 9$ $4 \times 4 = 16$

$5^2 = 25$

$\sqrt{25} = 5$

Determine if a Triangle is Right-Angled

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



$a^2 + b^2 = hypotenuse^2$

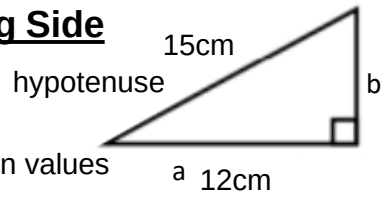
e.g. $a^2 + b^2 = hypotenuse^2$
$3^2 + 4^2 = 5^2$
$9 + 16 = 25$

a = 3 b = 4 c = 5

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

Calculate a Missing Side

$a^2 + b^2 = hypotenuse^2$



Step 1- Substitute the given values

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

$144 + b^2 = 225$

Step 2- Rearrange and solve the equation

$144 + b^2 = 225$

-144 -144

$b^2 = 81$

$\sqrt{}$ $\sqrt{}$

b = 9cm

Year 9- Reasoning With Geometry- Pythagoras' Theorem

Prior learning links

If $3^2 = 9$ then $\sqrt{9} = 3$

Complete the sentences…

If $4^2 = 16$ then $\sqrt{16} =$ __

If $5^2 =$ __ then $\sqrt{\_\_} = 5$

If $\_\_^2 = 36$ then $\sqrt{36} =$ __

If $\_\_^2 =$ __ then $\sqrt{100} =$ __

Key Vocabulary

Define the following key words:

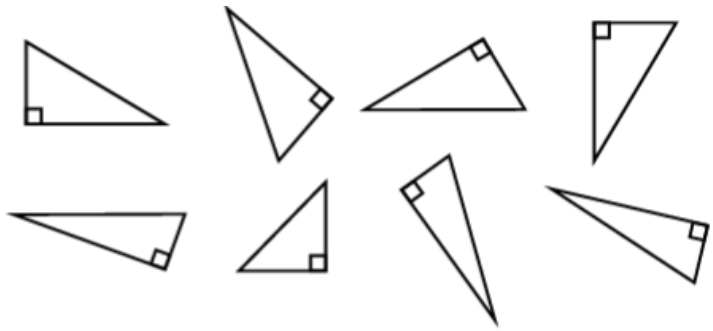
Square number:

Square root:

Hypotenuse:

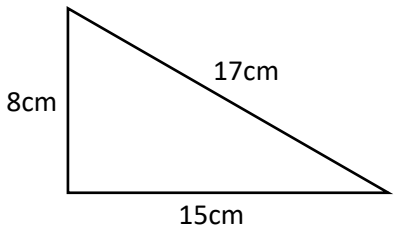
Identifying the Hypotenuse

Identify the hypotenuse on each of these right-angled triangles



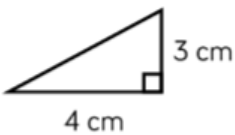
Determine if a Triangle is Right-Angled

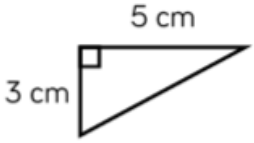
Show that this triangle contains a right-angle



Calculate the Hypotenuse

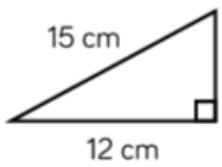
Calculate the hypotenuse of each of these triangles

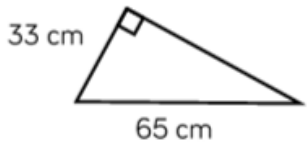




Calculate a Missing Side

Calculate the missing sides of each of these triangles





Problem Solving

Calculate the area of each of these triangles