Calculating the Length of Other Sides

Starter

1. **(Review of last lesson)** State two ways of describing which is the hypotenuse side.

2. **(Review of last lesson)** The two equal sides of a right-angled isosceles triangle are 25 mm. What is the length of the third side to 3 s.f.?
   Hint: Draw a diagram if you are unsure.

3*. In a triangle, when $a^2 + b^2 = c^2$, the largest angle is a right-angled triangle.
What would it mean about the largest angle if:
(a) $a^2 + b^2 < c^2$ (b) $a^2 + b^2 > c^2$

Notes

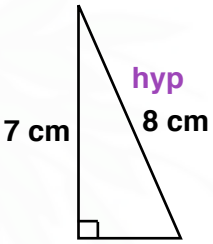
When we are finding the length of one of the shorter sides, we do not need to worry which side is a and which side is b.

Success criteria — finding the length of the hypotenuse side

1. Label the hypotenuse "hyp" — this number will replace c in the formula
2. Substitute the numbers into the formula $a^2 + b^2 = c^2$
3. Rearrange the formula to find the missing side — remember to square root at the end

N.B. Give answers to 3 s.f. unless otherwise stated.

E.g. 1 Calculate the length of the remaining side in the right-angled triangle.



Working:

$$a^2 + b^2 = c^2 \Rightarrow \quad a^2 + 7^2 = 8^2$$
$$a^2 + 49 = 64$$
$$a^2 = 64 - 49 = 15$$
$$a = \sqrt{15} \approx 3.87 \text{ cm}$$

The remaining side is 3.87 cm (3 s.f.).

N.B. The question does not ask us to find a so it is important to answer the questions asked — that is why we write "The remaining side is…"

E.g. 2 A right-angled triangle has hypotenuse of length 18 cm and one of the shorter sides is 11 cm. Find the length of the other shorter side.

E.g. 3 Find the height of an equilateral triangle whose sides measure 44 mm.
Hint: Draw a diagram.

E.g. 4 A right-angled isosceles triangle has hypotenuse of length 84 cm. Find the length of the shorter sides. Give your answer to 4 s.f.

E.g. 5 If an equilateral triangle has a height of 8 cm, find the length of each side.
Hint: Let the side length of the equilateral triangle be $2x$.

Video: Pythagoras

Video: Pythagoras in rectangles and isosceles triangles

Solutions to Starter and E.g.s

Exercise
p53 Ex 3.3 Qu 1-11

Summary
When finding the length of one of the shorter sides, do not worry which side is a and b.

Finding the length of the hypotenuse side:
1. Label the hypotenuse "hyp" — this number will replace c in the formula
2. Substitute the numbers into the formula $a^2 + b^2 = c^2$
3. Rearrange the formula to find the missing side — remember to square root at the end

Textbook answers (only available during a lockdown)