

Pythagoras — Worded Problems

Starter

1. **(Review of last lesson)** Anna cycles 8 km due east and then 5 km due south. How far is she from her starting point (SP)?

Hint: Draw a diagram to help.

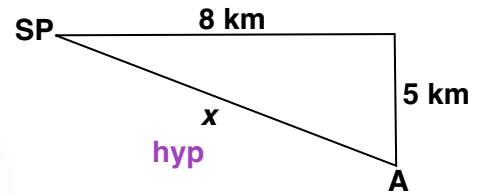
Working: Let the length of the hypotenuse be x .

$$5^2 + 8^2 = x^2$$

$$25 + 64 = x^2$$

$$x^2 = 89$$

$$x = \sqrt{89} = 9.43 \text{ km (3 s.f.)}$$



2. **(Review of last lesson)** The hypotenuse of a right-angled triangle is 70 cm. Given that the middle side is twice the length of the shorter side, find the length of the shorter side.

Working: Let the short side be of length x cm.

Then the middle side is of length $2x$ cm.

$$a^2 + b^2 = c^2 \Rightarrow x^2 + (2x)^2 = 70^2$$

$$x^2 + 4x^2 = 4900$$

$$5x^2 = 4900$$

$$x^2 = 980$$

$$\therefore x = \sqrt{980} = 31.3 \text{ (3 s.f.)}$$

- E.g. 1** A 5 m ladder stands against a vertical wall. If the foot of the ladder is 1 m away from the point where the wall meets the ground, how high does the ladder reach up the wall?

Hint: Draw a diagram.

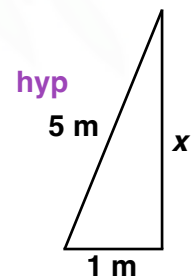
Working: Let x be the distance up the wall that the ladder reaches.

$$a^2 + b^2 = c^2 \Rightarrow x^2 + 1^2 = 5^2$$

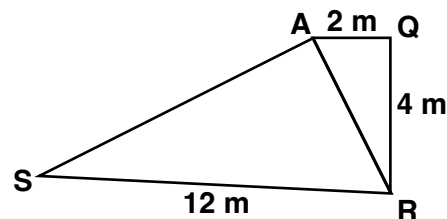
$$x^2 + 1 = 25$$

$$x^2 = 24$$

$$\therefore x = \sqrt{24} = 4.90 \text{ (3 s.f.)}$$



E.g. 2 Given that $\angle SAR$ and $\angle AQR$ are right-angles find the distance AS to 3 s.f..



Working: AS is in the $\triangle ARS$.
Before calculating AS , we need to work out AR .

Consider $\triangle AQR$: $AR^2 = AQ^2 + QR^2 \Rightarrow AR^2 = 2^2 + 4^2$
 $\Rightarrow AR^2 = 20 \quad \therefore AR = \sqrt{20}$ — avoid writing down the decimal answer for AR as this will bring in rounding error.

Consider $\triangle ARS$: $AS^2 + AR^2 = RS^2 \Rightarrow AS^2 + 20 = 12^2$
 $AS^2 = 124 \quad \therefore AS = 11.1 \text{ m (3 s.f.)}$

Video: [Pythagoras in rectangles and isosceles triangles](#)
Video: [Pythagoras](#)
Video: [Showing a triangle is right-angled](#)
Video: [Distance between two points](#)

[Solutions to Starter and E.g.s](#)

Exercise

CIMT 8A p57 Ex 3.4 Qu 1-10