Worded Pythagoras 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.

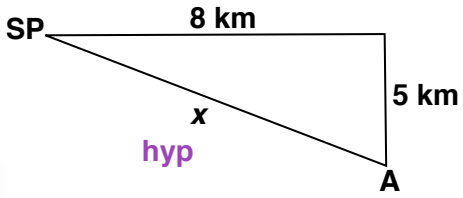
Working: Let the length of the hypotenuse be x.

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

$25 + 64 = x^2$

$x^2 = 89$

$x = \sqrt{89} = 9.43$ 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.

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

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

$5x^2 = 4900$

$x^2 = 980$

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

N.B. The symbol $\Rightarrow$ means "implies".
The symbol with the 3 dots, $\therefore$, means "therefore".
Use these symbols to connect the lines of your working.

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.

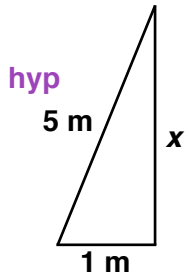
Working: Let x be the distance up the wall that the ladder reaches.

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

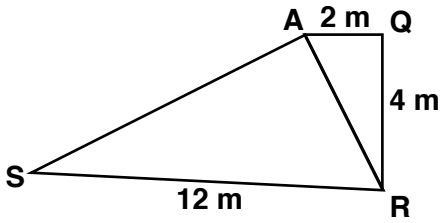
$x^2 + 1 = 25$

$x^2 = 24$

$\therefore x = \sqrt{24} = 4.90$ (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 $\triangle AQR$: $AR^2 = AQ^2 + QR^2 \Rightarrow \quad AR^2 = 2^2 + 4^2$

$\Rightarrow \quad AR^2 = 20 \quad \therefore AR = \sqrt{20}$ ***— avoid writing down the decimal answer for*** AR ***as this will bring in rounding error.***

Consider $\triangle ARS$: $AS^2 + AR^2 = RS^2 \Rightarrow \quad AS^2 + 20 = 12^2$

$AS^2 = 124 \quad \therefore AR = 10.8$ m (3 s.f.)

Video: Pythagoras

Video: Pythagoras in rectangles and isosceles triangles

Video: Showing a triangle is right-angled

Solutions to Starter and E.g.s

Exercise

p57 Ex 3.4 Qu 1-10

Textbook answers (only available during a lockdown)