

Calculating the Length of Other Sides

Starter

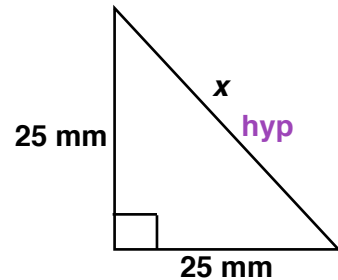
1. **(Review of last lesson)** State two ways of describing which is the hypotenuse side.

Working: 1. The hypotenuse side is opposite the right angle
 2. The hypotenuse side is the longest 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.

Working: Let the length of the hypotenuse be x .
 $25^2 + 25^2 = x^2$
 $625 + 625 = x^2$
 $x^2 = 1250$
 $x = \sqrt{1250} = 35.4 \text{ cm (3 s.f.)}$



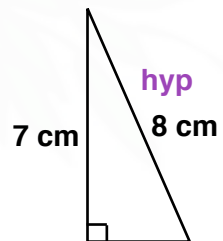
- 3*. In a triangle, when $a^2 + b^2 = c^2$, the largest angle is a right-angled triangle. What would it mean about the largest angle if:

(a) $a^2 + b^2 < c^2$ (b) $a^2 + b^2 > c^2$

Working: (a) The largest angle is obtuse.
 (b) The largest angle is acute.

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

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

Working: $a^2 + b^2 = c^2 \Rightarrow$ $a^2 + 11^2 = 18^2$
 $a^2 + 121 = 324$
 $a^2 = 203$
 $a = \sqrt{203} \approx 14.2 \text{ cm}$
 The other shorter side is 14.2 cm

E.g. 3 Find the height of an equilateral triangle whose sides measure 44 mm.

Hint: Draw a diagram.

Working: Let h be the height of the equilateral triangle.

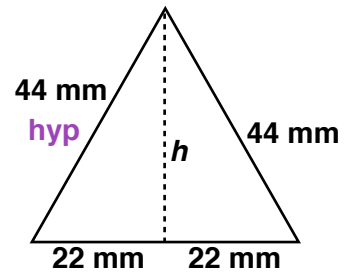
$$a^2 + b^2 = c^2 \Rightarrow h^2 + 22^2 = 44^2$$

$$h^2 + 484 = 1815$$

$$h^2 = 1452$$

$$h = \sqrt{1452} \approx 38.1 \text{ cm}$$

The height of the equilateral triangle is 38.1 cm



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.

Working: Let the shorter sides be of length x cm.

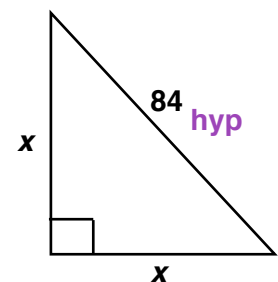
$$a^2 + b^2 = c^2 \Rightarrow x^2 + x^2 = 84^2$$

$$2x^2 = 7056$$

$$x^2 = \frac{7056}{2} = 3528$$

$$x = \sqrt{3528} \approx 59.40 \text{ cm}$$

The length of the shorter sides is 59.40 cm (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 $2x$.

Working: Let the side length of the equilateral triangle be $2x$.

$$a^2 + b^2 = c^2 \Rightarrow x^2 + 8^2 = (2x)^2$$

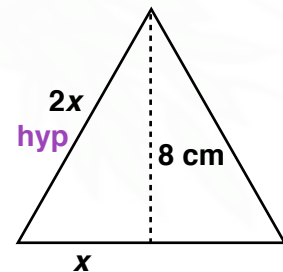
$$x^2 + 64 = 4x^2$$

$$64 = 3x^2$$

$$x^2 = \frac{64}{3}$$

$$x = \sqrt{\frac{64}{3}} \approx 9.24 \text{ cm}$$

The side length of the equilateral triangle is 9.24 cm (3 s.f.)



Video:

Video: [Pythagoras in rectangles and isosceles triangles](#)

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

Exercise

p53 Ex 3.3 Qu 1-11

[Textbook answers \(only available during a lockdown\)](#)