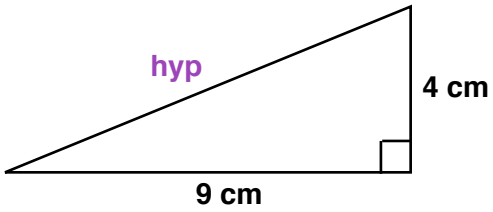
Calculating the Length of the Hypotenuse

E.g. 1 Find the length of the hypotenuse in the diagram. Give your answer to 3 s.f..



Working: Let the length of the hypotenuse be x.

$4^2 + 9^2 = x^2$

$16 + 81 = x^2$

$x^2 = 97$

$x = \sqrt{97} = 9.85$ cm (3 s.f.)

N.B. Make sure you include units in your answers.

E.g. 2 The two shorter sides of a right-angled triangle are 5 cm and 7 cm. How long is the hypotenuse? Give your answer to 3 s.f..

Working: Let the length of the hypotenuse be x.

$5^2 + 7^2 = x^2$

$25 + 49 = x^2$

$x^2 = 74$

$x = \sqrt{74} = 8.60$ cm (3 s.f.)

E.g. 3 Find the length of the diagonals of a square whose sides measure 14 cm. Give your answer to 3 s.f..

Working: Let the length of the hypotenuse be x.

$14^2 + 14^2 = x^2$

$196 + 196 = x^2$

$x^2 = 392$

$x = \sqrt{392} = 19.8$ cm (3 s.f.)

E.g. 4 A4 sheet of paper measure 210 mm by 297 mm. Find the length of the longest straight line that can be drawn on an A4 sheet of paper, giving your answer to the nearest mm.

Working: Let the length of the hypotenuse be x.

$210^2 + 297^2 = x^2$

$x^2 = 132309$

$x = \sqrt{132309} = 364$ mm (nearest mm)

Introduction of irrational numbers

E.g. 5 Find the length of the hypotenuse of a right-angled triangles whose other lengths are both of length 1 unit.

Working: Let the length of the hypotenuse be x.

$1^2 + 1^2 = x^2$

$x^2 = 2$

$x = \sqrt{2}$

The number $\sqrt{2}$ is an irrational number i.e. it cannot be written as a fraction, so it is a non-repeating decimal. Pythagoras thought irrational numbers were heretical so when one of his disciples, Hippasus, proved that $\sqrt{2}$ was irrational it is said that he was drowned in the sea.

Video: Pythagoras

Solutions to Starter and E.g.s

Exercise
p50 Ex 3.2 Qu 1-10

Textbook answers (only available during a lockdown)