



Introducing Pythagoras' theorem

Year 8 About 70 minutes Calculator allowed 45 marks

Date _____

A Do Now

Quick questions to start.

- A1** Needed today [1 mark] **A2** Needed today [1 mark]
Work out $6^2 + 11^2$. Write down the value of $\sqrt{196}$.

Answer

Answer

- A3** Last lesson [1 mark] **A4** Year 7 [1 mark]
A number doubles every year. It is 40 now. What is it after 3 years? A triangle has base 10 cm and height 7 cm. Work out its area.

Answer

Answer

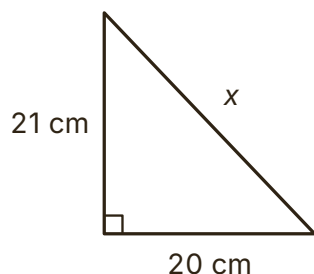
B Example, then your turn

Year 8

Your teacher works through each example with you. Then try the one beside it. Give lengths to 1 decimal place unless they are exact.

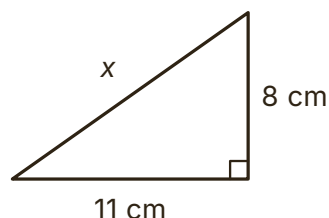
EXAMPLE 1

Work out the length of the hypotenuse, x .



Hint The hypotenuse is opposite the right angle. Square the two shorter sides, add, then square root.

- B1** [2 marks]
Work out the length of the hypotenuse, x . Give your answer to 1 decimal place.

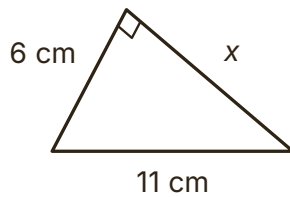


Not drawn accurately

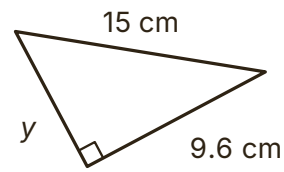
Answer $x = \dots$ cm

EXAMPLE 2

Work out the length of the side marked x .
Give your answer to 1 decimal place.



Hint x is a shorter side: 11 cm is opposite the right angle. Subtract the squares, then square root.

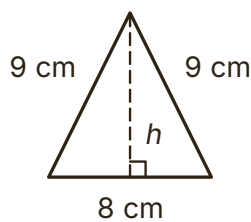
B2 Work out the length of the side marked y . Give your answer to 1 decimal place. [2 marks]

Not drawn accurately

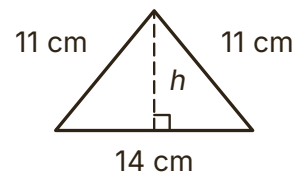
Answer $y = \dots$ cm

EXAMPLE 3

The triangle is isosceles. Work out (a) its height, h , (b) its area. Give your answers to 1 decimal place.



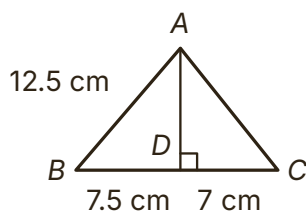
Hint The height cuts the base in half: a right-angled triangle with hypotenuse 9 cm and side 4 cm.

B3 The triangle is isosceles. Work out (a) its height, h , (b) its area. Give your answers to 1 decimal place. [4 marks]

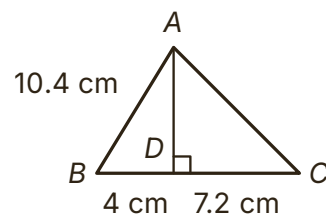
Not drawn accurately

EXAMPLE 4

In triangle ABC , AD is perpendicular to BC . Work out the length of AC . Give your answer to 1 decimal place.



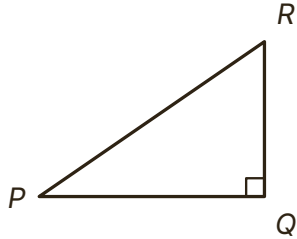
Hint First use triangle ABD to find AD , the side both triangles share.

B4 In triangle ABC , AD is perpendicular to BC . Work out the length of AC . [3 marks]

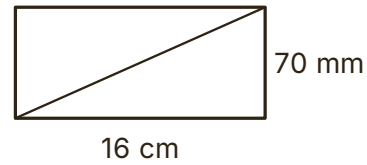
Not drawn accurately

Answer $AC = \dots$ cm

- C1** Triangle PQR has a right angle at Q . Which side is the hypotenuse? Write Pythagoras' theorem for this triangle, using the letters. [2 marks]



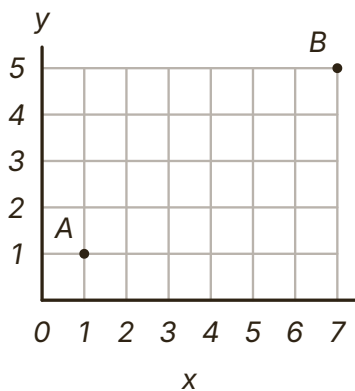
- C2** A rectangle is 16 cm long and 70 mm wide. Work out the length of its diagonal, in cm. [3 marks]



Not drawn accurately

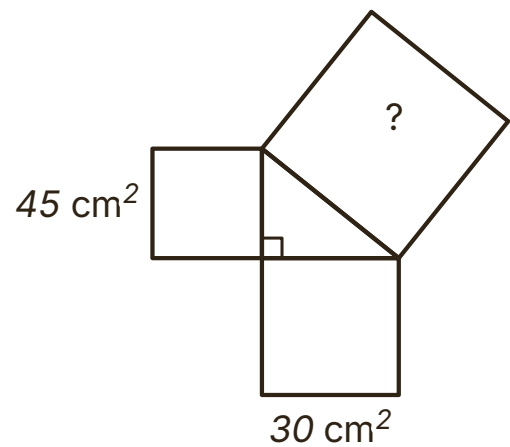
Answer ... cm

- C3** Work out the distance between the points A and B . Each square is 1 unit. [3 marks]



Answer ... units

- C4** Squares are drawn on the two shorter sides of a right-angled triangle. Their areas are 30 cm^2 and 45 cm^2 . Work out the length of the hypotenuse. [2 marks]



Not drawn accurately

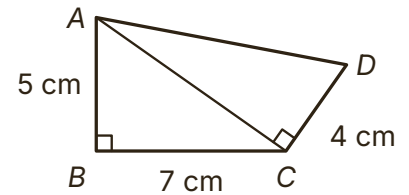
Answer ... cm

- D1** A right-angled triangle has a hypotenuse of 12 cm and one shorter side of 7 cm. Lily works out the other side like this: $12^2 + 7^2 = 193$, $\sqrt{193} = 13.9$ cm. [3 marks]

Explain what Lily has done wrong. Work out the correct length, to 1 decimal place.

- D2** $ABCD$ is a quadrilateral. Angle $ABC = 90^\circ$ and angle $ACD = 90^\circ$.

- (a) Show that $AC^2 = 74$. [1 mark]



Not drawn accurately

- (b) Work out the length of AD . Give your answer to 1 decimal place. [2 marks]

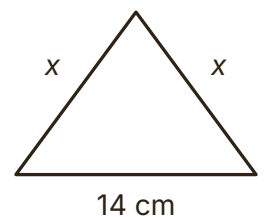
Answer ... cm

- (c) Work out the perimeter of $ABCD$. Give your answer to 1 decimal place. [2 marks]

Answer ... cm

Total for D2: 5 marks

- D3** The diagram shows an isosceles triangle. Its base is 14 cm and its area is 84 cm^2 . [4 marks]
Work out the length, x , of each sloping side. Give your answer to 1 decimal place.



Answer $x = \dots$ cm

Not drawn accurately

- D4** P is the point $(-3, -1)$, Q is the point $(5, 3)$ and R is the point $(4, -6)$.

- (a) Work out the length of PQ . Give your answer to 1 decimal place. [2 marks]

Answer ... units

(b) Which point, Q or R , is further from P ? You must show your working.

[2 marks]

Total for D4: 4 marks

E Extension

Stretch

No route is given. The hints are at the end of the sheet. Use one at a time.

E1 A rectangle has a diagonal of 25 cm and a perimeter of 62 cm. Work out the area [4 marks]
of the rectangle.

Answer

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** Call the sides a and b . What do you know about $a + b$, and about $a^2 + b^2$?
- Hint 2** $a + b = 31$ and $a^2 + b^2 = 625$. Try pairs of whole numbers that add to 31.
- Hint 3** $7 + 24 = 31$ and $7^2 + 24^2 = 49 + 576 = 625$. So the sides are 7 cm and 24 cm, and the area is $7 \times 24 = 168 \text{ cm}^2$.

How did it go?

Colour one circle on each line: not yet, nearly, yes.

- I can find the hypotenuse of a right-angled triangle. ☐ ☐ ☐
- I can find a shorter side of a right-angled triangle. ☐ ☐ ☐
- I can use Pythagoras' theorem for diagonals, isosceles triangles and points on a grid. ☐ ☐ ☐
- I can split a shape into right-angled triangles to find a length. ☐ ☐ ☐