

WA8MMGTW3

Two-dimensional space and structures

Core + Challenge

Pythagoras' Theorem: Finding the Hypotenuse

I can identify the hypotenuse and use Pythagoras' theorem to find its length, exactly or rounded.

Name: _____ Date: _____ Score: _____ / 58

Key idea

In a right-angled triangle the **hypotenuse** is the longest side. It is always **opposite the right angle**.

Pythagoras' theorem: $c^2 = a^2 + b^2$, where c is the hypotenuse and a and b are the two shorter sides (the legs).

Example: legs 6 cm and 8 cm $\rightarrow c^2 = 36 + 64 = 100 \rightarrow c = 10$ cm. Sets like 3, 4, 5 are **Pythagorean triples**.

Not a perfect square? Round at the end: legs 4 and 7 $\rightarrow c^2 = 65 \rightarrow c = \sqrt{65} = 8.062... \approx 8.1$ (1 d.p.).

A

Fluency *practise the skill*

/ 16 marks

Q1–4 use the triangles below. Q13–15: round to 1 decimal place. 1 mark each.

A



B



C



D



1. Hypotenuse of triangle A _____ 9. Hypotenuse: legs 9, 12 _____

2. Hypotenuse of triangle B _____ 10. Hypotenuse: legs 7, 24 _____

3. Hypotenuse of triangle C _____ 11. Hypotenuse: legs 20, 21 _____

4. Hypotenuse of triangle D _____ 12. Hypotenuse: legs 1.5, 2 _____

5. $3^2 + 4^2$ _____ 13. Hypotenuse: legs 2, 3 _____

6. $\sqrt{6^2 + 8^2}$ _____ 14. Hypotenuse: legs 5, 7 _____

7. Hypotenuse: legs 5, 12 _____ 15. Hypotenuse: legs 4, 4 _____

8. Hypotenuse: legs 8, 15 _____ 16. Next triple: 3, 4, 5 $\rightarrow$ 6, 8, 10 $\rightarrow$? _____

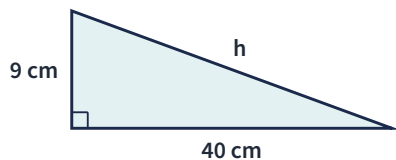
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B**Core** *apply the skill to problems*

/ 22 marks

- 1 Find the length of the hypotenuse, h . (Not to scale.)

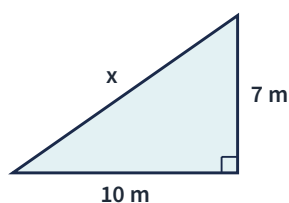
[2 marks]



Answer: _____

- 2 Find x , correct to 1 decimal place.

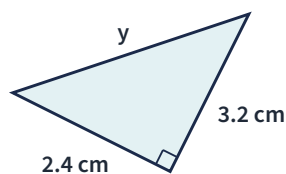
[2 marks]



Answer: _____

- 3 Find y . (Not to scale.)

[2 marks]



Answer: _____

- 4 From her home in Piara Waters, Ava rides her bike 600 m east and then 800 m north. How far is she from home in a straight line?

[2 marks]

Answer: _____

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- 5 Which of these are Pythagorean triples? Show working. (a) 10, 24, 26 (b) 6, 7, 9 (c) 15, 20, 25 [3 marks]

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Answer: _____

- 6 A shade sail is a right-angled triangle with shorter sides 1.2 m and 0.5 m. Find the length of the longest edge. [2 marks]

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Answer: _____

- 7 The shorter sides of a right-angled triangle are 3.5 cm and 6.1 cm. Find the hypotenuse correct to 2 decimal places. [2 marks]

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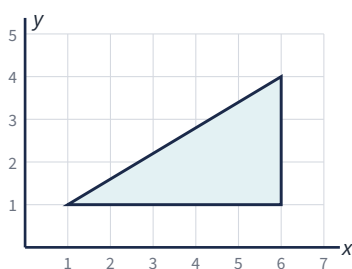
Answer: _____

- 8 Find the hypotenuse of a right-angled triangle with shorter sides 0.9 m and 4 m. Is your answer exact or rounded? [2 marks]

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Answer: _____

- 9 The triangle is drawn on a grid of 1 cm squares. Find the length of its longest side, correct to 1 decimal place. [2 marks]



Answer: _____

- 10 A right-angled triangle has shorter sides 12 cm and 35 cm. Find its hypotenuse, its perimeter and its area. [3 marks]

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Answer: _____

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C

Reasoning *explain, justify and check*

/ 9 marks

- 1 Explain why the hypotenuse is always the longest side of a right-angled triangle. [2 marks]

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- 2 Jai says, 'The shorter sides are 5 cm and 6 cm, so the hypotenuse is $5 + 6 = 11$ cm.' Explain his mistake and find the correct length to 1 decimal place. [2 marks]

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- 3 True or false: 'If both shorter sides of a right-angled triangle are doubled, the hypotenuse doubles.' Justify with an example or with algebra. [2 marks]

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- 4 Squares are drawn on each side of a 3-4-5 right-angled triangle. Use their areas to explain what Pythagoras' theorem says. [3 marks]

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D

Challenge *multi-step and problem-solving*

/ 11 marks

- 1 A spiral is built from right-angled triangles. Triangle 1 has shorter sides 1 and 1. Each new triangle uses the previous hypotenuse as one shorter side and 1 as the other. Find the hypotenuse of triangle 3, and which triangle is the first to have a hypotenuse of exactly 5. [3 marks]

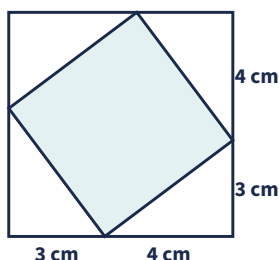
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Answer: _____

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- 2 A tilted square sits inside a 7 cm square, with its corners dividing each side into 3 cm and 4 cm. Find the area of the tilted square in two ways: (i) with Pythagoras, (ii) by subtracting the four corner triangles. [3 marks]



Answer: _____

- 3 Find every right-angled triangle with whole-number sides and a hypotenuse of 25. [3 marks]

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Answer: _____

- 4 The shorter sides of a right-angled triangle are consecutive whole numbers and the hypotenuse is 29. Find the shorter sides. [2 marks]

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Answer: _____

How did I go?

Fluency ____ / 16 Core ____ / 22 Reasoning ____ / 9 Challenge ____ / 11 **Total ____ / 58**

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