

WA8MMGTW3

Two-dimensional space and structures

Core + Challenge

Pythagoras' Theorem: Finding a Shorter Side

I can rearrange Pythagoras' theorem to find a shorter side and decide whether to add or subtract.

Name: _____ Date: _____ Score: _____ / 58

Key idea

To find a **shorter side**: $a^2 = c^2 - b^2$. Subtract from the square of the hypotenuse.

Example: hypotenuse 13 cm, one side 5 cm $\rightarrow a^2 = 169 - 25 = 144 \rightarrow a = \sqrt{144} = 12$ cm.

Decide first: is the unknown opposite the right angle? **Yes** $\rightarrow$ hypotenuse, **add**. **No** $\rightarrow$ **subtract**.

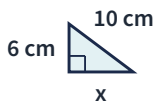
Check: the hypotenuse must be the longest side. $c = 9, b = 4 \rightarrow a = \sqrt{65} = 8.062... \approx 8.06$ (2 d.p.).

A Fluency *practise the skill*

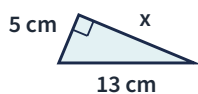
/ 16 marks

Q1–5 use the triangles below. Q13–15: round to 1 decimal place. 1 mark each.

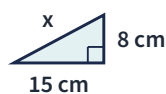
A



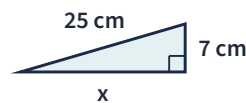
B



C



D



1. A: add or subtract the squares? _____
2. x in triangle A _____
3. x in triangle B _____
4. x in triangle C _____
5. x in triangle D _____
6. $10^2 - 6^2$ _____
7. $17^2 - 15^2$ _____
8. $\sqrt{(13^2 - 12^2)}$ _____
9. $c = 25, b = 20$: find a _____
10. $c = 41, b = 9$: find a _____
11. $c = 2.5, b = 1.5$: find a _____
12. $c = 61, b = 60$: find a _____
13. $c = 10, b = 7$: find a _____
14. $c = 12, b = 5$: find a _____
15. $c = 8, b = 3$: find a _____
16. $c = 5, b = 6$: find a _____

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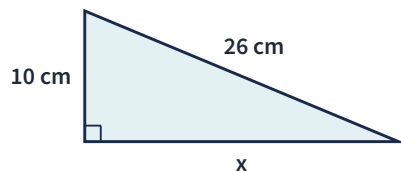
B

Core *apply the skill to problems*

/ 22 marks

- 1 Find x . (Not to scale.)

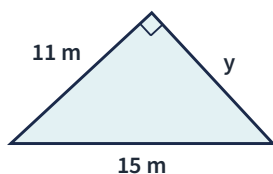
[2 marks]



Answer: _____

- 2 Find y , correct to 1 decimal place.

[2 marks]



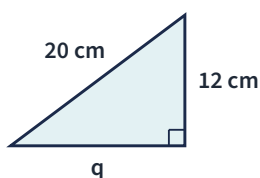
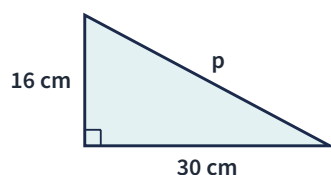
Answer: _____

- 3 Decide whether each unknown is the hypotenuse or a shorter side, then find p and q .

[3 marks]

(a)

(b)



Answer: _____

- 4 A rectangular sign at the Rottneest bike-hire shop has a diagonal of 50 cm and a width of 48 cm. Find its height.

[2 marks]

.....

Answer: _____

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- 5 A right-angled triangle has a hypotenuse of 7.5 cm and one shorter side of 4.5 cm. Find the third side. [2 marks]

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Answer: _____

- 6 An isosceles right-angled triangle has a hypotenuse of 10 cm. Find the length of each equal side, correct to 1 decimal place. [2 marks]

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Answer: _____

- 7 The hypotenuse of a right-angled triangle is 8.4 m and one shorter side is 5.3 m. Find the other side correct to 2 decimal places. [2 marks]

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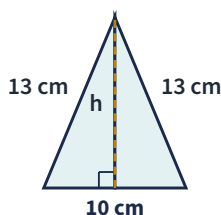
Answer: _____

- 8 Find the missing side in each right-angled triangle. (a) shorter sides 20 cm and 48 cm (b) hypotenuse 29 cm, one shorter side 21 cm [2 marks]

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Answer: _____

- 9 An isosceles triangle has equal sides of 13 cm and a base of 10 cm. The dashed line h is its height. Find h . [2 marks]



Answer: _____

- 10 A right-angled triangle has a hypotenuse of 17 cm and one shorter side of 8 cm. Find 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 Ben was given a hypotenuse of 10 cm and a shorter side of 6 cm. He wrote $a^2 = 10^2 + 6^2 = 136$, so $a \approx 11.7$ cm. Explain how you can tell he is wrong without redoing it, then find the correct answer. [2 marks]

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- 2 Explain how you decide whether to add or subtract when using Pythagoras' theorem. [2 marks]

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- 3 True or false: 'A right-angled triangle can have a hypotenuse of 7 cm and a shorter side of 7 cm.' Explain. [2 marks]

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- 4 Show how $a^2 = c^2 - b^2$ comes from $c^2 = a^2 + b^2$, and check it with the triple 5, 12, 13. [3 marks]

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D

Challenge *multi-step and problem-solving*

/ 11 marks

- 1 Find the height of an equilateral triangle with sides of 10 cm, correct to 1 decimal place. [2 marks]

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Answer: _____

- 2 In a right-angled triangle the hypotenuse is 1 cm longer than one of the shorter sides, and the other shorter side is 9 cm. Find the lengths of all three sides. [3 marks]

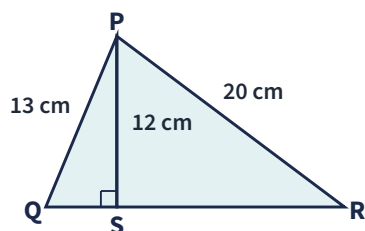
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Answer: _____

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- 3 In triangle PQR, PS is perpendicular to QR. PQ = 13 cm, PR = 20 cm and PS = 12 cm. Find the length of QR. [3 marks]



Answer: _____

- 4 Find all right-angled triangles with whole-number sides that have 12 as one of the shorter sides. [3 marks]

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Answer: _____

How did I go?

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

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