

Pythagoras' Theorem

GCSE Mathematics • Foundation Tier • Grades 4–5 • Non-calculator

WORKED SOLUTIONS

Name: _____ *worked example* _____

Class: _____

Total: _____ *65* _____ / 65

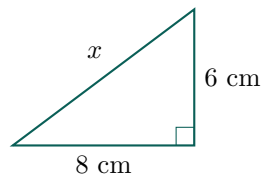
Show all your working. Marks are given for correct method as well as the final answer.

1. Write down Pythagoras' theorem for a right-angled triangle with shorter sides a and b and hypotenuse c . [1 mark]

c is always the longest side

Answer: _____ $a^2 + b^2 = c^2$ _____

2. Work out x in the triangle. [3 marks]



$$\begin{aligned}x^2 &= 8^2 + 6^2 \\&= 64 + 36 = 100 \\x &= \sqrt{100} = 10\end{aligned}$$

Answer: _____ *10* _____ cm

3. A right-angled triangle has shorter sides 5 cm and 12 cm. Work out the hypotenuse. [3 marks]

$$\begin{aligned}25 + 144 &= 169 \\ \sqrt{169} &= 13\end{aligned}$$

Answer: _____ *13* _____ cm

4. A right-angled triangle has shorter sides 9 cm and 12 cm. Work out the hypotenuse. [3 marks]

$$\begin{aligned}81 + 144 &= 225 \\ \sqrt{225} &= 15\end{aligned}$$

Answer: _____ *15* _____ cm

5. A right-angled triangle has hypotenuse 13 cm and one shorter side 5 cm. Work out the other shorter side. [3 marks]

$$\begin{aligned}169 - 25 &= 144 \\ \text{SUBTRACT when finding a shorter side} \\ \sqrt{144} &= 12\end{aligned}$$

Answer: _____ *12* _____ cm

6. A right-angled triangle has hypotenuse 25 cm and one shorter side 7 cm. Work out the other shorter side. [3 marks]

$$\begin{aligned}625 - 49 &= 576 \\ \sqrt{576} &= 24\end{aligned}$$

Answer: _____ *24* _____ cm

7. Work out the hypotenuse of a triangle with shorter sides 4 cm and 7 cm, to 1 decimal place. [3 marks]

$$16 + 49 = 65$$

$$\sqrt{65} = 8.06...$$

$$= 8.1$$

Answer: _____ **8.1** _____ cm

8. Work out the missing shorter side when the hypotenuse is 10 cm and one side is 6 cm. [3 marks]

$$100 - 36 = 64$$

$$\sqrt{64} = 8$$

Answer: _____ **8** _____ cm

9. A right-angled triangle has shorter sides 2 cm and 3 cm. Give the hypotenuse in surd form. [3 marks]

$$4 + 9 = 13$$

leave it as $\sqrt{13}$

surd form means do not round

Answer: _____ $\sqrt{13}$ _____ cm

10. A triangle has sides 6, 8 and 10 cm. Show that it is right-angled. [3 marks]

$$6^2 + 8^2 = 36 + 64 = 100$$

$$10^2 = 100$$

they match, so right-angled

Answer: ____ **$36 + 64 = 100 \checkmark$** ____

11. A triangle has sides 5, 7 and 9 cm. Is it right-angled? Show your working. [3 marks]

$$25 + 49 = 74$$

$$9^2 = 81$$

$74 \neq 81$, so not right-angled

Answer: ____ ***no ($74 \neq 81$)*** ____

12. Work out the distance between (0,0) and (3,4). [3 marks]

across 3, up 4

$$9 + 16 = 25$$

$$\sqrt{25} = 5$$

Answer: _____ **5** _____ units

13. Work out the distance between (1,2) and (7,10). [4 marks]

across 6, up 8

$$36 + 64 = 100$$

$$\sqrt{100} = 10$$

Answer: _____ **10** _____ units

14. Work out the distance between (-2,1) and (2,4). [4 marks]

across 4, up 3

$$16 + 9 = 25$$

$$= 5$$

Answer: _____ **5** _____ units

15. A ladder 5 m long leans against a wall with its foot 3 m from the base. Work out how far up the wall it reaches. [3 marks]

the ladder is the hypotenuse

$$25 - 9 = 16$$

$$= 4 \text{ m}$$

Answer: _____ 4 _____ m

16. A rectangle measures 12 cm by 5 cm. Work out the length of its diagonal. [3 marks]

$$144 + 25 = 169$$

$$= 13$$

Answer: _____ 13 _____ cm

17. A boat sails 9 km east then 12 km north. Work out how far it is from its start. [3 marks]

$$81 + 144 = 225$$

$$= 15 \text{ km}$$

Answer: _____ 15 _____ km

18. An isosceles triangle has two sides of 10 cm and a base of 12 cm. Work out its perpendicular height. [4 marks]

split it down the middle
base halves to 6
 $100 - 36 = 64$
height = 8

Answer: _____ 8 _____ cm

19. A rectangular field measures 40 m by 30 m.

- (a) Work out the length of the diagonal path across it. [3 marks]

$$1600 + 900 = 2500$$

$$\sqrt{2500} = 50 \text{ m}$$

- (b) Work out how much shorter the diagonal is than walking along two sides. [2 marks]

two sides = 40 + 30 = 70 m
 $70 - 50 = 20 \text{ m shorter}$

Answer: — 50 m ; 20 m shorter —

20. A right-angled triangle has hypotenuse 17 cm and one shorter side 8 cm.

- (a) Work out the third side. [3 marks]

$$289 - 64 = 225$$

$$\sqrt{225} = 15 \text{ cm}$$

- (b) Work out the area of the triangle. [2 marks]

$$\frac{1}{2} \times 8 \times 15$$

$$= 60 \text{ cm}^2$$

Answer: — 15 cm ; 60 cm² —