



4.9H Pythagoras: Higher Tier Practice

EDEXCEL Edexcel 1MA1 · Calculator allowed · about 75 minutes

Total Marks

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** Work out the length of the hypotenuse of a right-angled triangle with legs 8 cm and 15 cm.

(Total for Question 1 is 1 mark)

- 2** A square field has diagonal length 26 m. Work out the side length of the square.

(Total for Question 2 is 2 marks)

- 3** Show that a triangle with sides 7 cm, 24 cm and 25 cm is a right-angled triangle. State which side is the hypotenuse.

(Total for Question 3 is 3 marks)

- 4** The ends of a horizontal metal rod are 3 m apart. A support is placed so that the two halves of the rod form a right triangle with the ground: one half makes a vertical support of 1.2 m from the ground to the rod's midpoint. Calculate the length of one half of the rod. (Diagram: right triangle with vertical 1.2 m and horizontal half-base 1.5 m.)

(Total for Question 4 is 4 marks)

- 5 Points A and B have coordinates A(2, -1) and B(11, 5). Work out the distance AB. Give your answer to 1 decimal place.

(Total for Question 5 is 4 marks)

- 6 A circle has centre O and a chord AB of length 14 cm. The perpendicular from O to AB meets AB at M and OM = 6 cm. Find the radius of the circle.

(Total for Question 6 is 5 marks)

- 7 An engineer fits a diagonal brace across a rectangular panel 2.4 m by 1.6 m. The brace runs from one corner to the opposite corner. The engineer cuts the brace from a straight length of metal so it overhangs by 5 cm at each end. Calculate the required length of metal to order, correct to the nearest centimetre.

(Total for Question 7 is 6 marks)

- 8** A ladder of length 5.5 m leans against a vertical wall. The foot of the ladder is 2.1 m from the base of the wall. Work out the height up the wall the ladder reaches. Give your answer to 2 decimal places.

(Total for Question 8 is 6 marks)

- 9** Give a proof that for any positive real number x , the triangle with sides 1, x and $\sqrt{1 + x^2}$ is right-angled. Your proof should show which angle is right and use algebraic manipulation.

(Total for Question 9 is 5 marks)

Mark scheme · 4.9H Pythagoras: Higher Tier Practice

Question 1

- **B1** 17 cm cao
- **Answer: 17 cm**

Question 2

- **M1** use $2 \times \text{side}^2 = 26^2$ or $\text{side}^2 = 26^2 / 2$ oe
- **A1** $\text{side} = 26 / \sqrt{2} = 13\sqrt{2}$ cao
- **Answer: $13\sqrt{2}$ m**

Question 3

- **M1** identify largest side 25 and calculate $7^2 + 24^2 = 49 + 576 = 625$ oe
- **A1** compare with $25^2 = 625$ and conclude equality oe
- **B1** state: triangle is right-angled with hypotenuse 25 cm cao
- **Answer: 25 cm**

Question 4

- **M1** identify half-base = $3/2 = 1.5$ m and use Pythagoras: $\text{length}^2 = 1.5^2 + 1.2^2$ oe
- **M1** calculate $1.5^2 + 1.2^2 = 2.25 + 1.44 = 3.69$
- **A1** $\text{length} = \sqrt{3.69} = 1.92\ldots$ m oe
- **A1** give final answer 1.92 m to 2 decimal places awrt
- **Answer: 1.92 m**

Question 5

- **M1** use distance formula: $\text{sqrt}[(11-2)^2 + (5-(-1))^2]$ oe
- **M1** compute differences: $9^2 + 6^2 = 81 + 36 = 117$
- **A1** $\sqrt{117}$ seen
- **A1** distance = 10.8 to 1 dp (10.816... $\rightarrow$ 10.8) cao
- **Answer: 10.8**

Question 6

- **M1** half-chord AM = $14/2 = 7$ cm and right triangle OMA used
- **M1** use Pythagoras: $\text{radius}^2 = OM^2 + AM^2$ oe
- **M1** compute $\text{radius}^2 = 6^2 + 7^2 = 36 + 49 = 85$
- **A1** radius = $\sqrt{85}$ oe
- **A1** give decimal to 3 s.f. 9.22 cm ($\sqrt{85} = 9.2195\ldots$) awrt
- **Answer: 9.22 cm**

Question 7

- **M1** use diagonal = $\sqrt{2.4^2 + 1.6^2}$ oe
- **M1** compute $2.4^2 + 1.6^2 = 5.76 + 2.56 = 8.32$
- **M1** diagonal = $\sqrt{8.32} = 2.884\ldots$ m
- **M1** add overhangs: total length = diagonal + 0.05 + 0.05 = diagonal + 0.10 m
- **A1** compute total = $2.884\ldots + 0.10 = 2.984\ldots$ m
- **A1** convert to cm and round to nearest cm: $2.984\ldots \text{ m} = 298.4\ldots \text{ cm} \rightarrow 298 \text{ cm}$ cao
- **Answer: 298 cm**

Question 8

- **M1** use Pythagoras: $\text{height}^2 = 5.5^2 - 2.1^2$ oe
- **M1** compute $5.5^2 - 2.1^2 = 30.25 - 4.41 = 25.84$
- **M1** take square root: $\text{height} = \sqrt{25.84}$ oe
- **A1** height = 5.083... m
- **A1** round to 2 dp: 5.08 m cao
- **A1** state final answer 5.08 m awrt
- **Answer: 5.08 m**

Question 9

- **M1** square the two shorter sides: $1^2 + x^2 = 1 + x^2$ oe
- **M1** compare with square of longest side: $(\sqrt{1 + x^2})^2 = 1 + x^2$ oe
- **M1** establish equality $1 + x^2 = 1 + x^2$ and conclude Pythagoras holds
- **A1** state triangle is right-angled with hypotenuse $\sqrt{1 + x^2}$ cao
- **A1** explicitly state the right angle is between sides of length 1 and x (i.e. the angle opposite $\sqrt{1 + x^2}$)
- **Answer: The triangle is right-angled with hypotenuse $\sqrt{1 + x^2}$**