4.9 Pythagoras: Test Pack

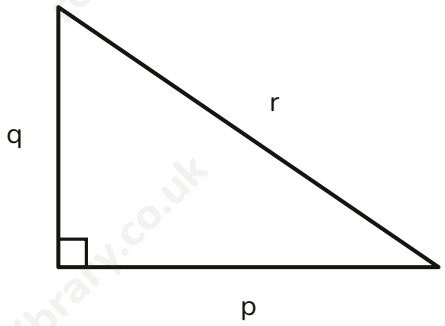
EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 The diagram shows a right-angled triangle with the right angle marked. The sides are labelled p, q and r, where r is the side opposite the right angle.
Which side is the hypotenuse?



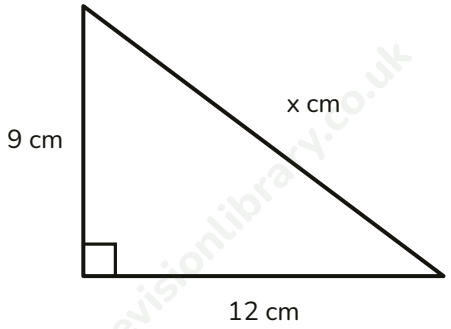
- ☐ A) p
- ☐ B) q
- ☐ C) r

(Total for Question 1 is 1 mark)

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2 A right-angled triangle has two shorter sides of length 9 cm and 12 cm.
Calculate the length of the hypotenuse.

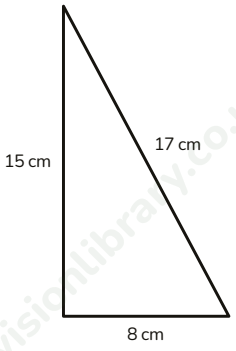
Diagram NOT accurately drawn



(Total for Question 2 is 2 marks)

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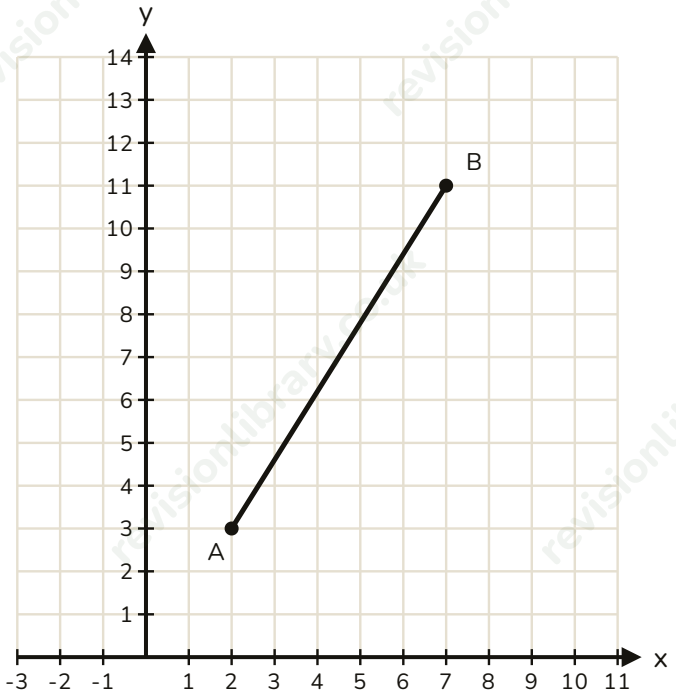
3 A triangle has sides 8 cm, 15 cm and 17 cm. Is this triangle right-angled? Give a reason for your answer.



(Total for Question 3 is 2 marks)

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4 Point A has coordinates (2, 3) and point B has coordinates (7, 11).
Work out the distance AB. Give your answer correct to 3 significant figures.

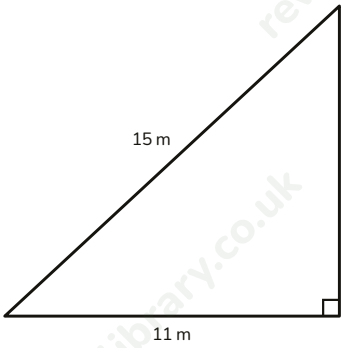


(Total for Question 4 is 3 marks)

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5 A right-angled triangle has hypotenuse 15 m and one shorter side 11 m.
Work out the length of the third side. Give your answer correct to 3 significant figures.

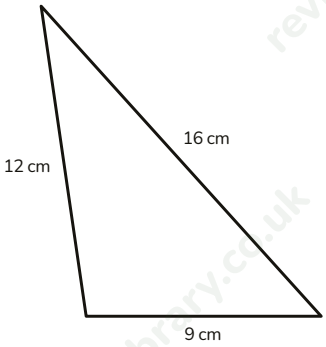
Diagram NOT accurately drawn



(Total for Question 5 is 3 marks)

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6 A triangle has sides of length 9 cm, 12 cm and 16 cm.
Determine, showing your working, whether this triangle is a right-angled triangle.



(Total for Question 6 is 3 marks)

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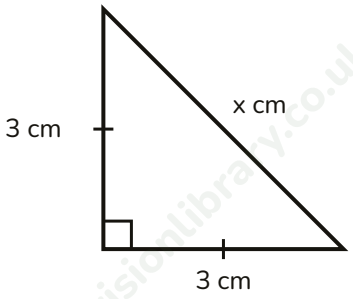
7 A square carpet has diagonal length 5.0 m. Work out the length of one side of the carpet. Give your answer to 2 decimal places.

(Total for Question 7 is 3 marks)

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8 A right-angled isosceles triangle has two shorter sides, each of length 3 cm.
Calculate the length of the hypotenuse, x. Give your answer as a surd in its simplest form.

Diagram NOT accurately drawn

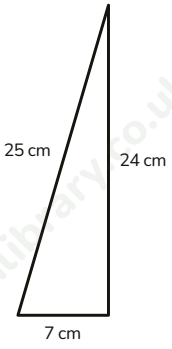


(Total for Question 8 is 3 marks)

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

Diagram NOT accurately drawn

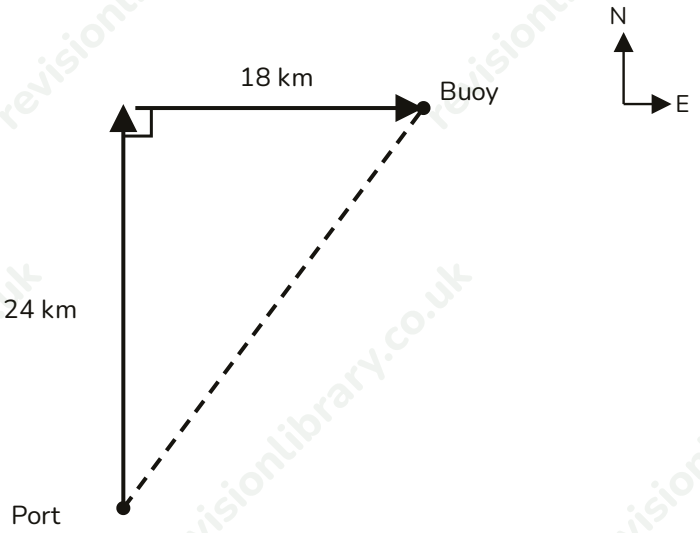


(Total for Question 9 is 3 marks)

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10 A ship sails 24 km due north from port, then sails 18 km due east to reach a buoy.

Diagram NOT accurately drawn



(a) Calculate the direct distance from the port to the buoy. **(3)**

.....

(b) The ship then sails directly back to port along the straight line shown, instead of retracing its outward route. Calculate how much shorter this direct return journey is compared with retracing the original route (24 km then 18 km). **(2)**

.....

(Total for Question 10 is 5 marks)

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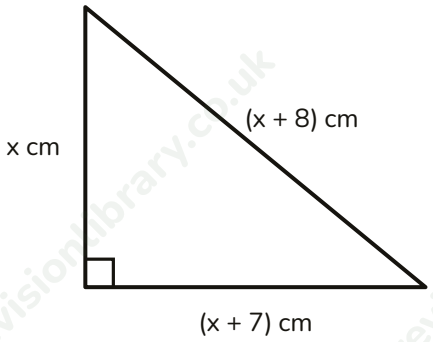
11 A circle has centre O and a chord AB of length 14 cm. The perpendicular from O to AB meets AB at M and OM = 6 cm. Find the radius of the circle.

(Total for Question 11 is 5 marks)

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12 A right-angled triangle has legs of length x cm and (x + 7) cm, and hypotenuse (x + 8) cm.

Diagram NOT accurately drawn



(a) Form an equation in x and show that it simplifies to $x^2 - 2x - 15 = 0$. **(2)**

(b) Solve the equation to find the value of x, explaining why the other solution is rejected. **(2)**

.....

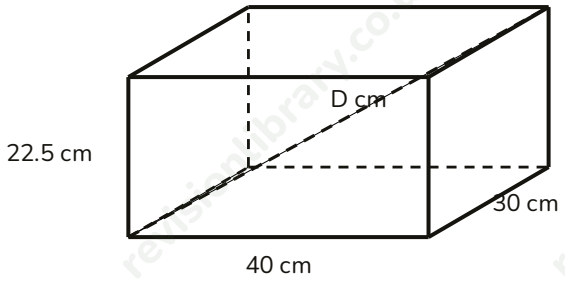
(c) State the lengths of the three sides of the triangle. **(1)**

(Total for Question 12 is 5 marks)

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13 A wooden storage box has internal dimensions 30 cm by 40 cm by 22.5 cm. Priti wants to know whether a thin metal rod of length 55 cm will fit inside the box in a single straight line. Determine, showing your working, whether the rod fits inside the box.

Diagram NOT accurately drawn



(Total for Question 13 is 5 marks)

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Mark scheme · 4.9 Pythagoras: Test Pack

Question 1

r stated as the hypotenuse cao	**B1**

Answer: C) r

Question 2

$\sqrt{9^2 + 12^2}$ oe	**M1**
15 cm cao	**A1**

Answer: 15 cm

Question 3

Yes, because $8^2 + 15^2 = 64 + 225 = 289$ which equals 17^2	**B1**
reason stated that square of longest side equals sum of squares of other two sides oe	**B1**

Answer: Yes. $8^2 + 15^2 = 17^2$ (64 + 225 = 289), so it is right-angled.

Question 4

$(7-2)^2 + (11-3)^2$ oe (= 89)	**M1**
$\sqrt{\text{their } 89}$	**M1**
awrt 9.43	**A1**

Answer: 9.43 (3 s.f.)

Question 5

$15^2 - 11^2 = 104$	**M1**
$\sqrt{104}$	**M1**
10.2 m	**A1**

Answer: 10.2 m

Question 6

$9^2 + 12^2$ (= 225)	**M1**
16^2 (= 256)	**M1**
correct conclusion: since 225 does not equal 256, the triangle is not right-angled cso	**C1**

Answer: Not a right-angled triangle, since $9^2 + 12^2 = 225$ but $16^2 = 256$, and 225 is not equal to 256.

Question 7

use method: $\text{side}^2 + \text{side}^2 = 5.0^2$ or $2*\text{side}^2 = 25$	**M1**
calculate side = $\sqrt{25/2}$	**M1**
3.54 m awrt	**A1**

Answer: 3.54 m

Question 8

$3^2 + 3^2$ oe (= 18)	**M1**
$\sqrt{18} = \sqrt{9 \times 2}$	**M1**
$3\sqrt{2}$ cm oe, simplest form	**A1**

Answer: $3\sqrt{2}$ cm

Question 9

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

Answer: 25 cm

Question 10

(a) $24^2 + 18^2$ oe (= 900)	**M1**
(a) $\sqrt{\text{their } 900}$	**M1**
(a) 30 km cao	**A1**

(a) Answer: 30 km

(b) 24 + 18 oe (= 42 km)	**M1**
(b) 12 km cao (42 - 30)	**A1**

(b) Answer: 12 km

Question 11

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

Answer: 9.22 cm

Question 12

(a) $x^2 + (x + 7)^2 = (x + 8)^2$ oe	**M1**
(a) correct expansion and simplification to $x^2 - 2x - 15 = 0$ cso	**C1**

(a) Answer: $x^2 - 2x - 15 = 0$ (shown)

(b) (x - 5)(x + 3) = 0 oe, or correct use of the quadratic formula	**M1**
(b) x = 5, rejecting x = -3 since a length cannot be negative	**A1**

(b) Answer: x = 5 (x = -3 is rejected as a length cannot be negative)

(c) 5 cm, 12 cm, 13 cm cao (ft their x)	**B1**

(c) Answer: 5 cm, 12 cm, 13 cm

Question 13

$30^2 + 40^2$ oe (= 2500)	**M1**
their 2500 + 22.5^2 oe (= 3006.25)	**M1**
$\sqrt{\text{their } 3006.25}$	**M1**
awrt 54.8 cm	**A1**
correct conclusion with valid comparison to 55 cm, e.g. since 54.8 < 55, the rod does NOT fit, because the space diagonal is the longest straight line that fits inside the box (ft, must not round up to conclude incorrectly that it fits)	**B1**

Answer: No, the rod does not fit, since the internal space diagonal is approximately 54.8 cm, which is less than the 55 cm rod.

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