# 4.9 Pythagoras: 30-minute Pack

EDEXCEL 1MA1 · Calculator allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

**Answer ALL questions. Show all your working.**

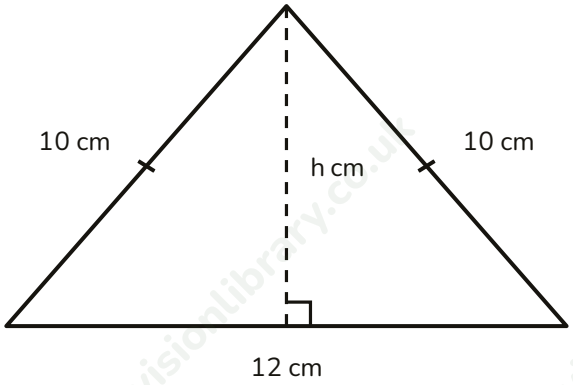
**1** A ladder of length 5.0 m leans against a wall and reaches 4.0 m up the wall. Work out the distance from the foot of the ladder to the wall. Give your answer in metres.

**(Total for Question 1 is 2 marks)**


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**2** An isosceles triangle has two equal sides of length 10 cm and a base of length 12 cm. A line is drawn from the apex of the triangle perpendicular to the base, meeting the base at its midpoint.

Diagram NOT accurately drawn




**(a)** Explain why the perpendicular line splits the base into two lengths of 6 cm each. **(1)**

**(b)** Calculate the perpendicular height, h, of the triangle. **(3)**

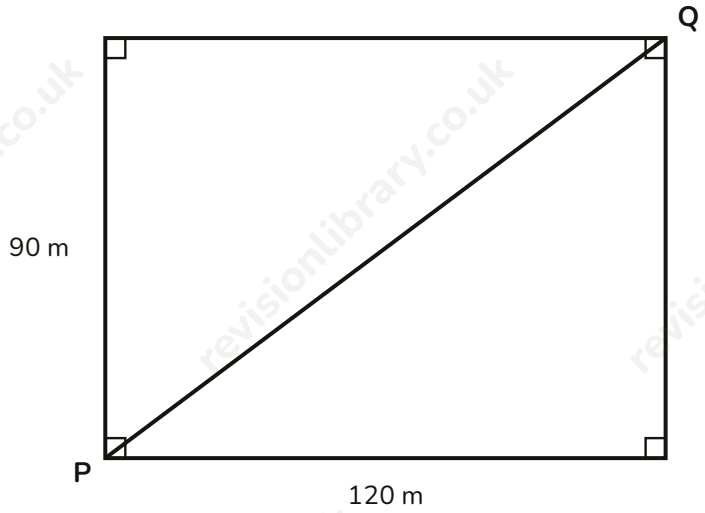
**(Total for Question 2 is 4 marks)**


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**3** A rectangular field measures 120 m by 90 m. Instead of walking along two sides of the field to get from corner P to the opposite corner Q, Priya walks directly across the field along the diagonal.

Work out how much shorter Priya's direct route is compared with walking along two sides of the field.

Diagram NOT accurately drawn

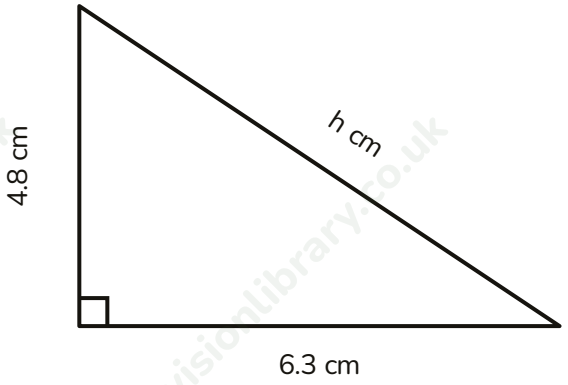



**(Total for Question 3 is 4 marks)**


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**4** A right-angled triangle has two shorter sides of length 4.8 cm and 6.3 cm.
Calculate the length of the hypotenuse. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

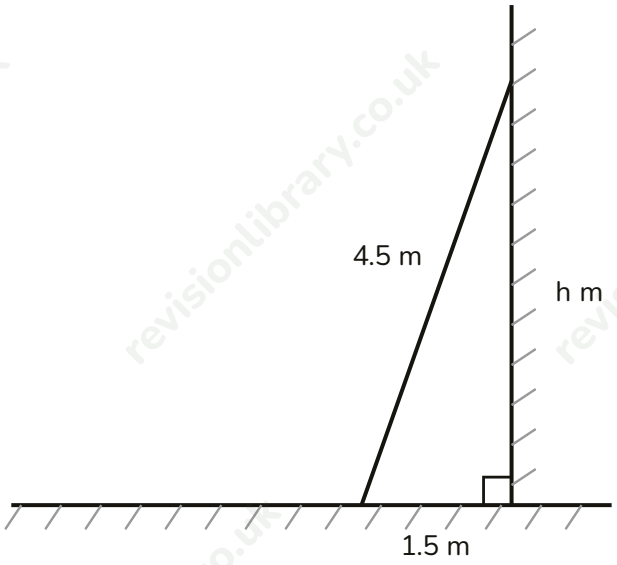



**(Total for Question 4 is 3 marks)**


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**5** A ladder of length 4.5 m leans against a vertical wall. The foot of the ladder is 1.5 m from the base of the wall.
Calculate how far up the wall the ladder reaches. Give your answer correct to 3 significant figures.

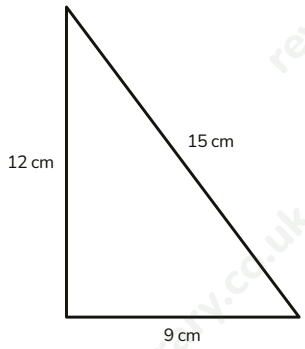
Diagram NOT accurately drawn




**(Total for Question 5 is 3 marks)**


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**6** A triangle has sides of length 9 cm, 12 cm and 15 cm.
Determine, showing your working, whether this triangle is right-angled.




**(Total for Question 6 is 3 marks)**

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**7** A square garden has side length 9.0 m. Work out the length of the diagonal of the garden. Give your answer to 1 decimal place.

**(Total for Question 7 is 3 marks)**

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**8** 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 8 is 5 marks)**


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# Mark scheme · 4.9 Pythagoras: 30-minute Pack

## Question 1

use method: base$^2$ = 5.0$^2$ - 4.0$^2$ or show 25 - 16 **M1**

3.0 m cao **A1**

**Answer: 3.0 m**

## Question 2

(a) correct reason, e.g. the perpendicular from the apex of an isosceles triangle bisects the base (by symmetry), so each half is 12 / 2 = 6 cm oe **B1**

**(a) Answer: The perpendicular from the apex of an isosceles triangle bisects the base by symmetry, so each half is 12 divided by 2 = 6 cm.**

(b) 10$^2$ - 6$^2$ oe (= 64) **M1**

(b) $\sqrt{\text{their } 64}$ **M1**

(b) 8 cm cao **A1**

**(b) Answer: 8 cm**

## Question 3

$\sqrt{120^2 + 90^2}$ oe **M1**

150 m (diagonal distance) **A1**

120 + 90 (= 210 m, distance via two sides) **M1**

60 m cao (210 - 150) **A1**

**Answer: 60 m**

## Question 4

4.8$^2$ + 6.3$^2$ oe (= 62.73) **M1**

$\sqrt{\text{their } 62.73}$ **M1**

awrt 7.92 cm **A1**

**Answer: 7.92 cm (3 s.f.)**

## Question 5

4.5$^2$ - 1.5$^2$ oe (= 18) **M1**

$\sqrt{\text{their } 18}$ **M1**

awrt 4.24 m **A1**

**Answer: 4.24 m (3 s.f.)**

## Question 6

9$^2$ + 12$^2$ (= 225) **M1**

15$^2$ (= 225) **M1**

correct conclusion: since 9$^2$ + 12$^2$ = 15$^2$ (225 = 225), the triangle is right-angled cso **C1**

**Answer: Right-angled, since 9$^2$ + 12$^2$ = 15$^2$ (225 = 225).**

## Question 7

use method: diagonal$^2$ = 9.0$^2$ + 9.0$^2$ or show 81 + 81 **M1**

calculate diagonal = $\sqrt{162}$ with a calculator **M1**

12.7 m awrt **A1**

**Answer: 12.7 m**

## Question 8

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 **M1**

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 $\sqrt{1 + x^2}$) **A1**

**Answer: The triangle is right-angled with hypotenuse $\sqrt{1 + x^2}$**


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