Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Pages	Mark
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24 – 25	
26 – 27	
TOTAL	

AQA

General Certificate of Secondary Education
Higher Tier
June 2015

Mathematics 43603H

Unit 3

H

Monday 8 June 2015 9.00 am to 10.30 am

For this paper you must have:
- a calculator
- mathematical instruments.

Time allowed
- 1 hour 30 minutes

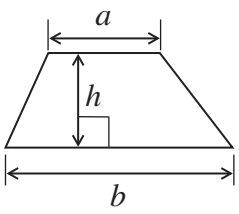
Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book.
- If your calculator does not have a π button, take the value of π to be 3.14 unless another value is given in the question.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- The quality of written communication is specifically assessed in Questions 3, 4, 5 and 17. These questions are indicated with an asterisk (*).
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer booklet.

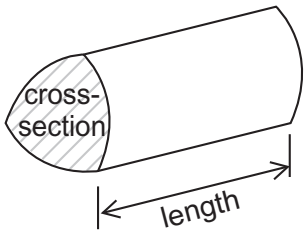
Advice
- In all calculations, show clearly how you work out your answer.

Formulae Sheet: Higher Tier

Area of trapezium = $\frac{1}{2}(a+b)h$

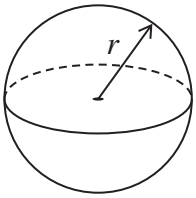


Volume of prism = area of cross-section × length



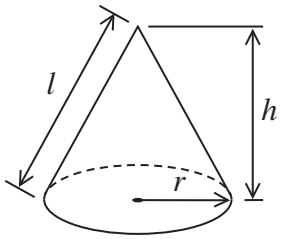
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



Volume of cone = $\frac{1}{3}\pi r^2 h$

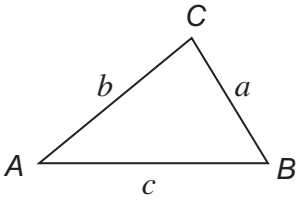
Curved surface area of cone = $\pi r l$



In any triangle *ABC*

Area of triangle = $\frac{1}{2}ab\sin C$

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$



Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

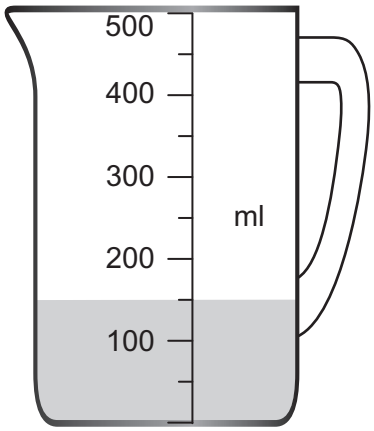
The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

Answer **all** questions in the spaces provided.

1 Some water is shown in a 500 ml measuring jug.



What percentage of the jug is filled with water?

[2 marks]

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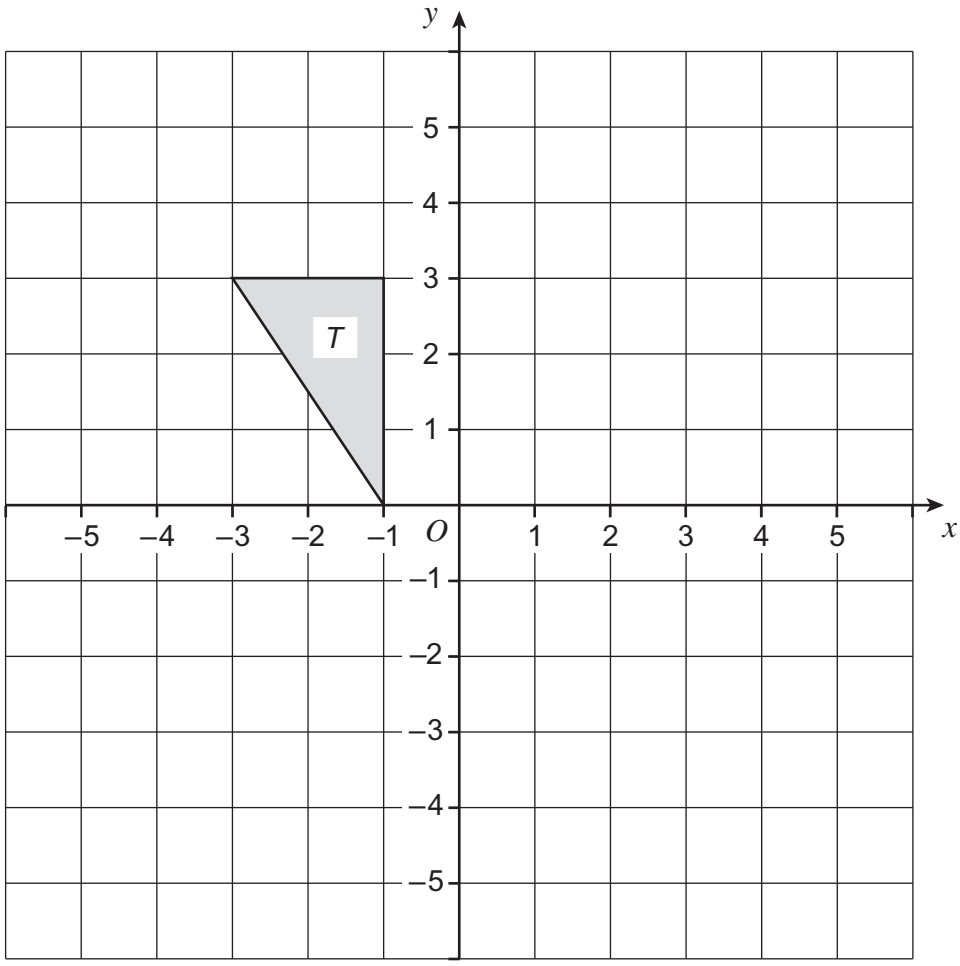
Answer ..... %

Turn over for the next question

2

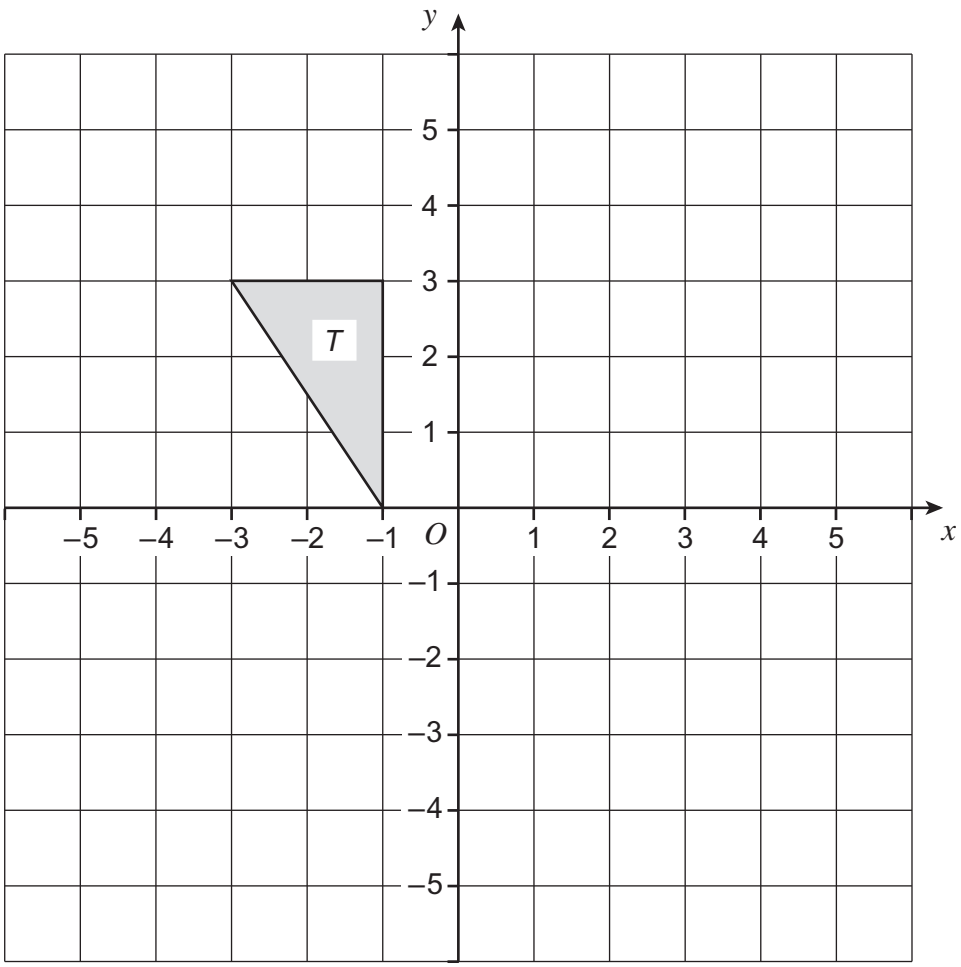
2 (a) Translate triangle T by the vector $\begin{pmatrix} 4 \\ -5 \end{pmatrix}$

[2 marks]



2 (b) Reflect triangle T in the line $y = -1$

[2 marks]



Turn over for the next question

4

***3** A company claims the following miles per gallon for two cars.

Car *A*	68 miles per gallon
Car *B*	55 miles per gallon

The driver of car *A*

gets 30% **fewer** miles per gallon than claimed
and drives 15 000 miles.

The driver of car *B*

gets three-quarters of the miles per gallon claimed
and drives 12 000 miles.

Which driver uses more fuel?
You **must** show your working.

[5 marks]

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Answer .....

4 A wheel has diameter 0.7 m

4 (a) Work out the circumference.

[2 marks]

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Answer ..... m

***4 (b)** Work out the number of complete turns when the wheel travels 1.6 km
You **must** show your working.

[4 marks]

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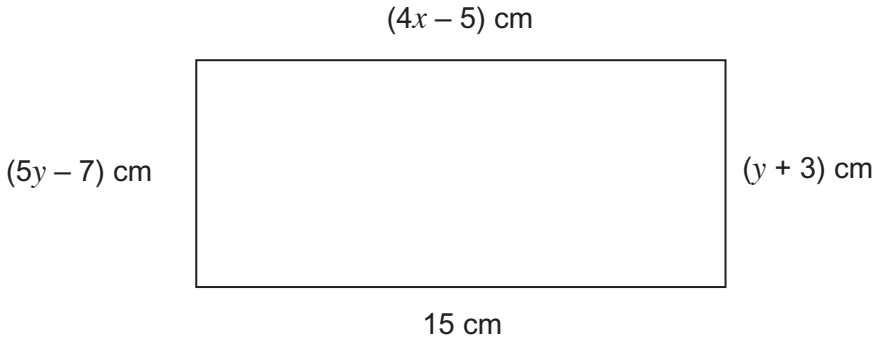
Answer .....

Turn over for the next question

11

5 The diagram shows a rectangle.

Not drawn accurately



***5 (a)** Set up and solve an equation to work out the value of x.

[3 marks]

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x = ...

5 (b) Work out the area of the rectangle.

[5 marks]

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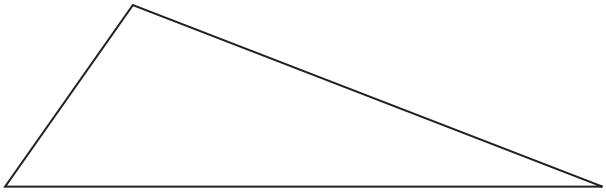
Answer ..... cm^2

Turn over for the next question

8

6 (a) The length of one side of a triangle is 10 cm



Not drawn accurately

Tick the correct box for this statement.

The perimeter of the triangle is between 10 cm and 20 cm

[1 mark]

☐ Always true

☐ Sometimes true

☐ Never true

6 (b) The length of one of the diagonals of a parallelogram is 10 cm

Not drawn accurately

Tick the correct box for this statement.

The perimeter of the parallelogram is greater than 20 cm

[1 mark]

☐ Always true

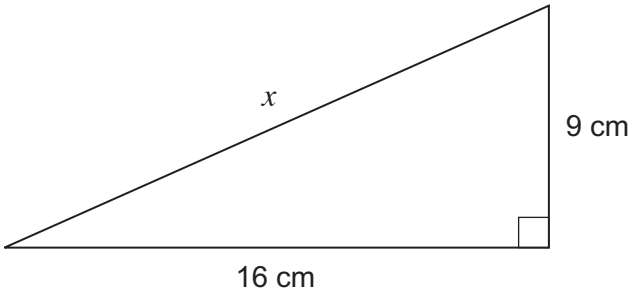
☐ Sometimes true

☐ Never true

Turn over for the next question

2

7



Not drawn accurately

Work out the length x.
Give your answer to 1 decimal place.

[4 marks]

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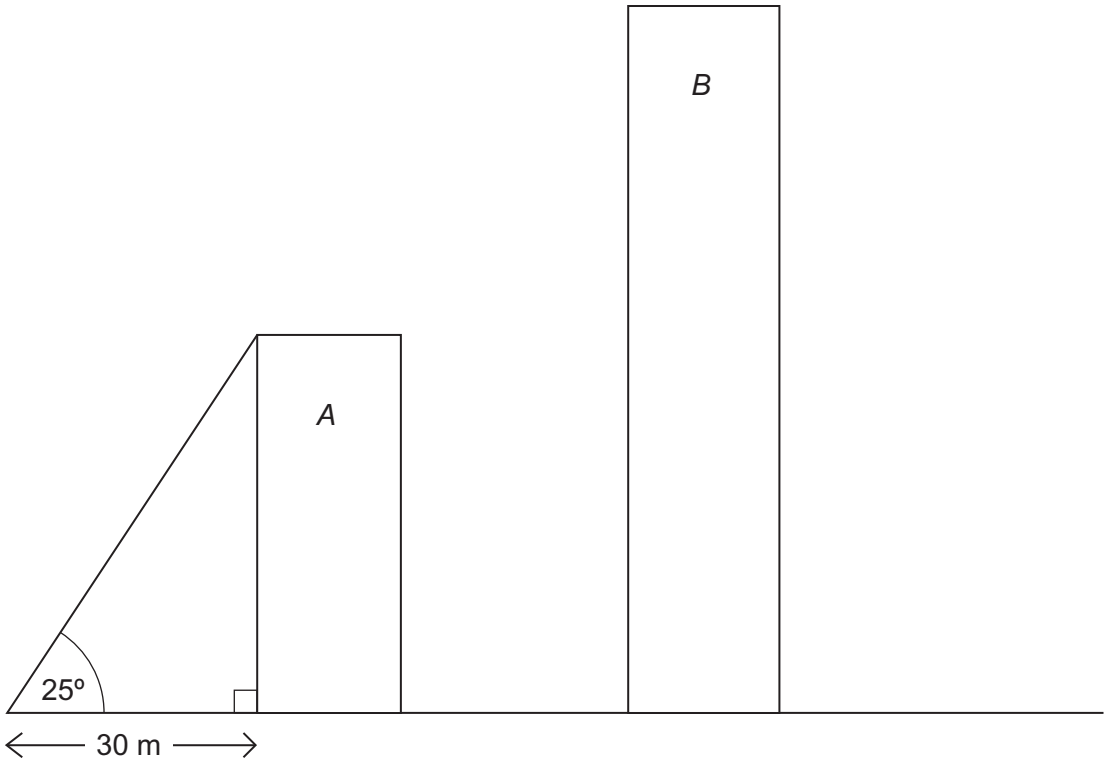
Answer ..... cm

8 The diagram shows two buildings, *A* and *B*.

The heights of the buildings are in the ratio 3 : 5

Not drawn accurately



Work out the height of building *B*.

[4 marks]

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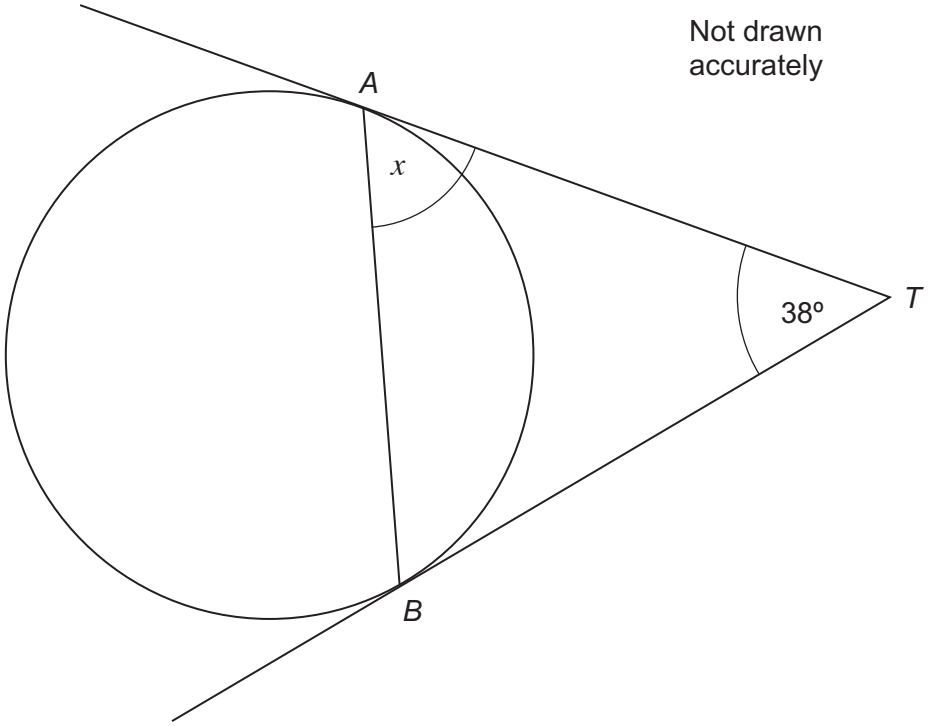
Answer ..... metres

8

Turn over ▶

9 (a) *AB* is a chord of the circle.
TA and *TB* are tangents to the circle.



Work out the size of angle x.

[2 marks]

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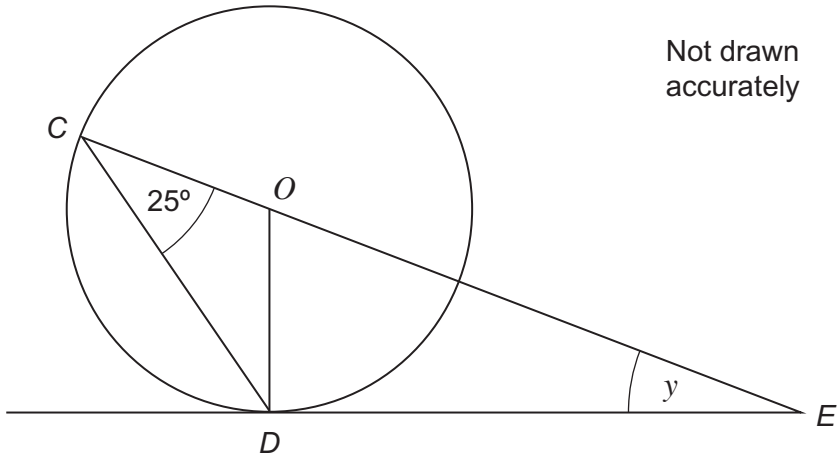
Answer ..... degrees

9 (b) The diagram shows a circle, centre O.
C and D are points on the circumference.
COE is a straight line.
DE is a tangent.



Work out the size of angle y.
You **must** show your working, which may be on the diagram.

[3 marks]

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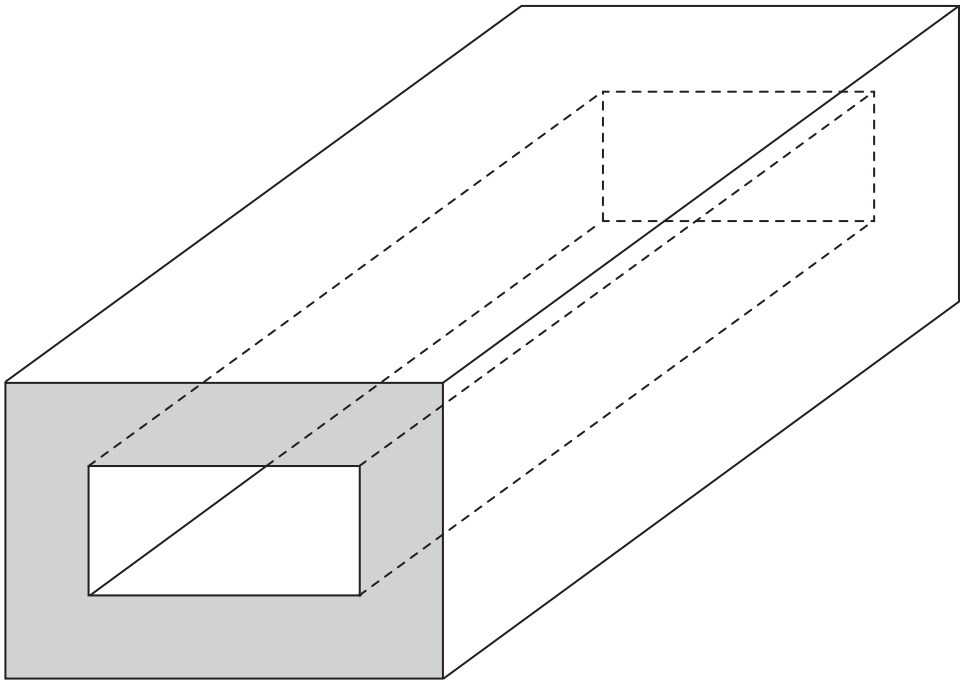
Answer ..... degrees

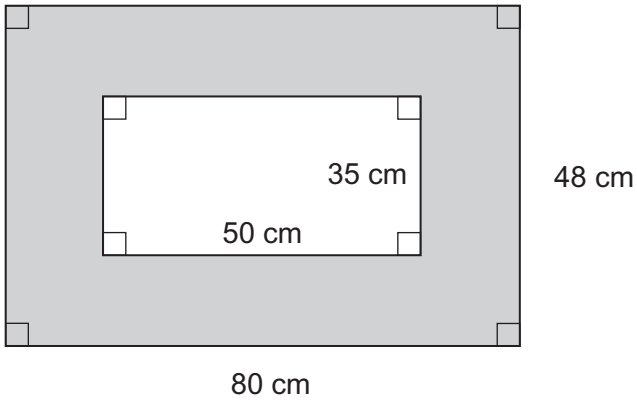
5

Turn over ▶

10 The diagram shows a hollow steel girder in the shape of a prism.



The diagram shows the dimensions of the cross-section.



The length of the girder is 20 metres.

The density of the steel is 7.9 tonnes per cubic metre.

Work out the mass of the girder.

[4 marks]

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Answer ..... tonnes

Turn over for the next question

4

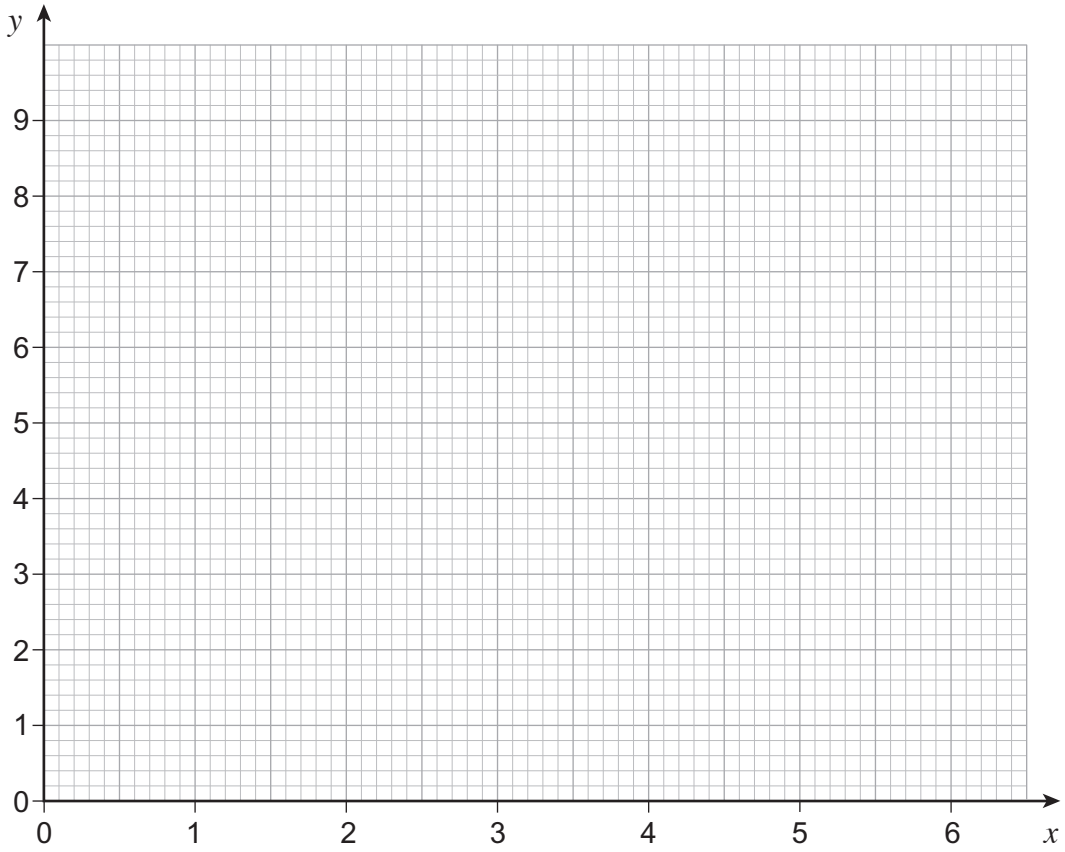
11 (a) Complete the table of values for $y = x^2 - 6x + 9$

[2 marks]

x	0	1	2	3	4	5	6
y	9	4			1		9

11 (b) Draw the graph of $y = x^2 - 6x + 9$ for values of x from 0 to 6

[2 marks]



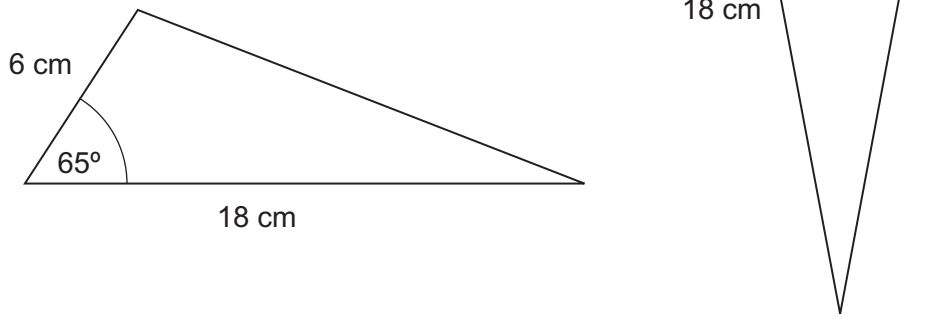
11 (c) Write down the solution of the equation $x^2 - 6x + 9 = 0$

[1 mark]

$x =$ .....

12 (a) These triangles are congruent.

Not drawn accurately



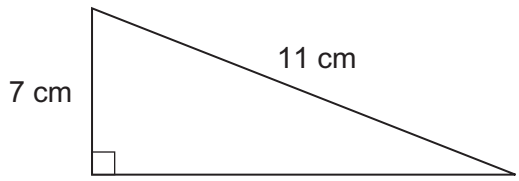
State the condition they satisfy.

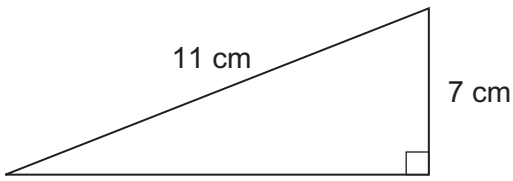
[1 mark]

Answer .....

12 (b) These triangles are congruent.

Not drawn accurately





State the condition they satisfy.

[1 mark]

Answer .....

7

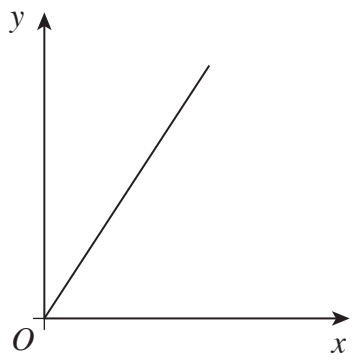
13 The fare, £y, for a journey is directly proportional to the square root of the distance, x miles.

13 (a) Which sketch graph represents this information?

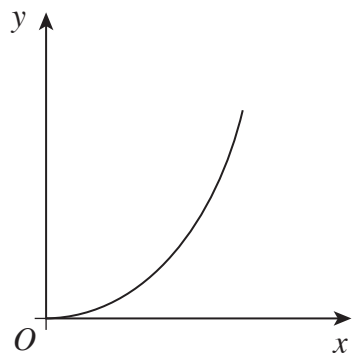
Circle the correct letter.

[1 mark]

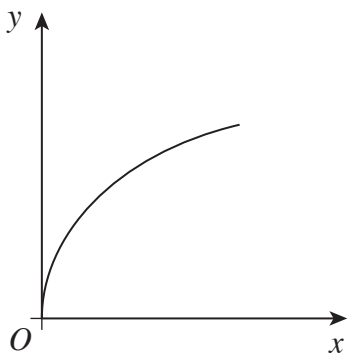
A



B



C



13 (b) A 100 mile journey costs £36

What is the cost of a 250 mile journey?
Give your answer to the nearest pound.

[4 marks]

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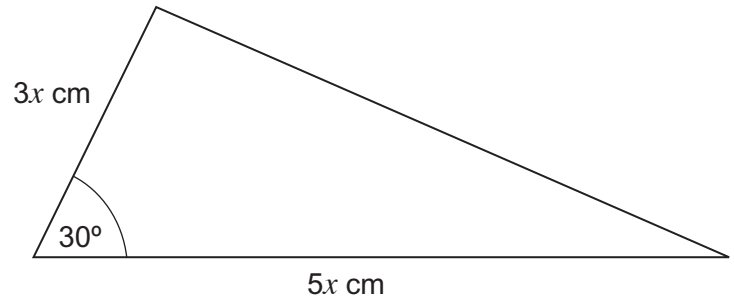
Answer £ .....

14 The area of the triangle is 45 cm^2

Not drawn accurately



Work out the value of x.

[4 marks]

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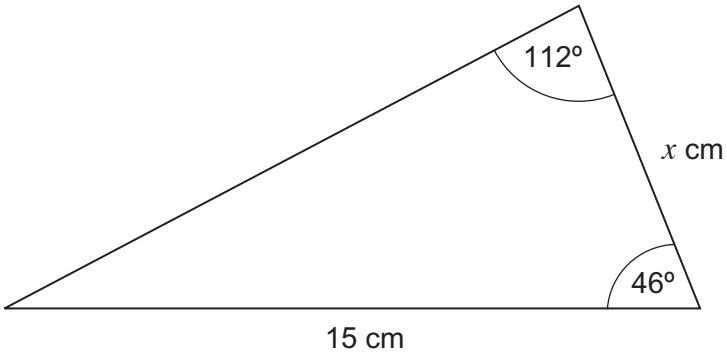
Answer .....

Turn over for the next question

9

15

Not drawn accurately



Work out the value of x.

[4 marks]

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Answer .....

16 Solve the quadratic equation $5x^2 + 8x + 2 = 0$

Give your answers to 1 decimal place.

[3 marks]

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Answer .....

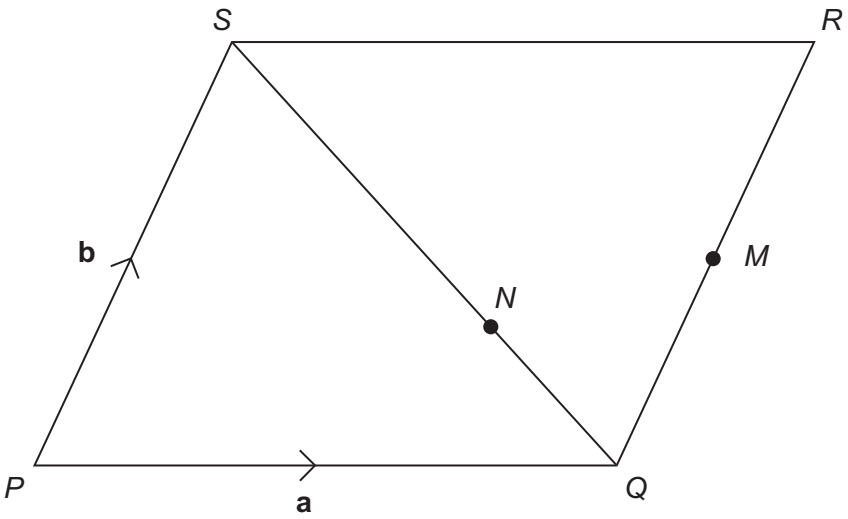
Turn over for the next question

7

17 *PQRS* is a parallelogram.
M is the midpoint of *QR*.
QN : *NS* = 1 : 2

$\overrightarrow{PQ}$ = **a**

$\overrightarrow{PS}$ = **b**



17 (a) Write the vector $\overrightarrow{PM}$ in terms of **a** and **b**.

[1 mark]

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Answer .....

***17 (b)** Prove that *PNM* is a straight line.

[4 marks]

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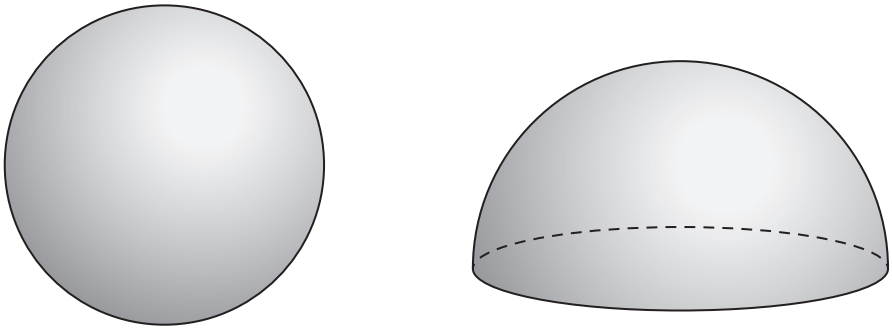
Turn over for the next question

5

18 The diagram shows a sphere, radius 6 cm, and a solid hemisphere, radius 9 cm



Work out the ratio

surface area of the sphere : **total** surface area of the hemisphere

Give your answer in its simplest form.

[5 marks]

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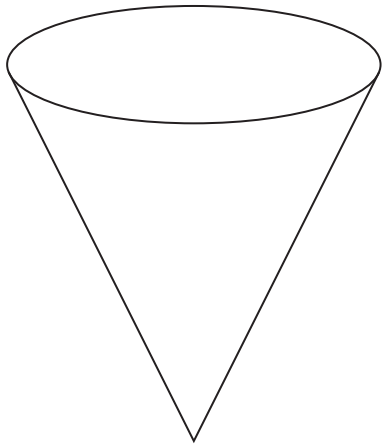
Answer ..... : .....

19 The diagram shows an empty cone of radius 1.5 metres and height 4 metres.



Sand is poured into the cone at a rate of 0.2 m^3 per minute.

Work out the number of minutes it takes to fill the cone.

[3 marks]

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Answer ..... minutes

END OF QUESTIONS

8

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED