

Centre Number						Candidate Number				
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Other Names										
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For Examiner's Use	
Examiner's Initials	
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TOTAL	



General Certificate of Secondary Education
Higher Tier
June 2013

Mathematics

43603H

Unit 3

Friday 14 June 2013 9.00 am to 10.30 am

H

<p>For this paper you must have:</p> <ul style="list-style-type: none"> • a calculator • mathematical instruments. 	
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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 your written communication is specifically assessed in Questions 6 and 16. 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 book.

Advice

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



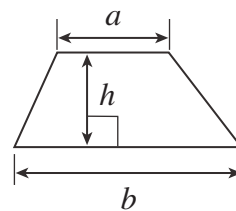
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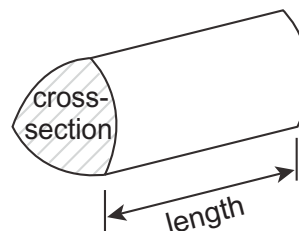
43603H

Formulae Sheet: Higher Tier

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

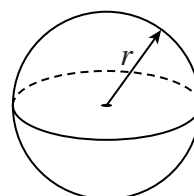


$$\text{Volume of prism} = \text{area of cross-section} \times \text{length}$$



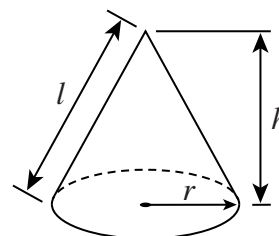
$$\text{Volume of sphere} = \frac{4}{3}\pi r^3$$

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



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

$$\text{Curved surface area of cone} = \pi r l$$

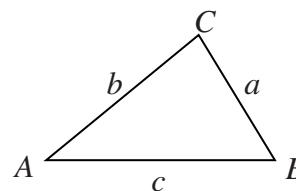


In any triangle ABC

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

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

$$\text{Cosine rule} \quad a^2 = b^2 + c^2 - 2bc \cos A$$



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 Work out the area of a circle, radius 3.5 cm.
Give your answer to 1 decimal place.

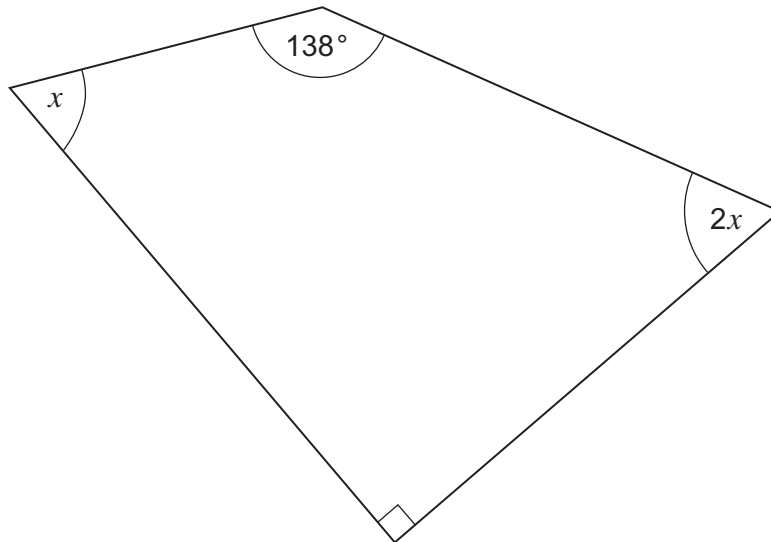
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Answer cm² (3 marks)

- 2 Work out the value of x .



Not drawn
accurately

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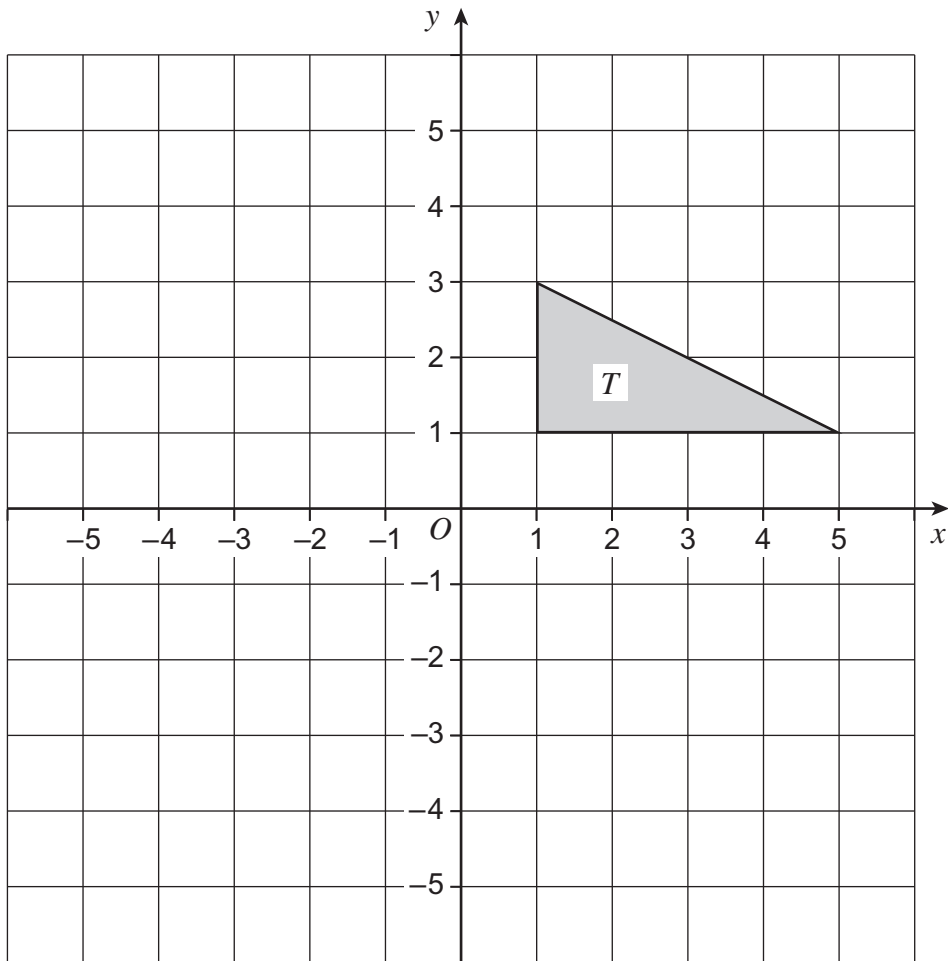
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Answer degrees (4 marks)

Turn over ►



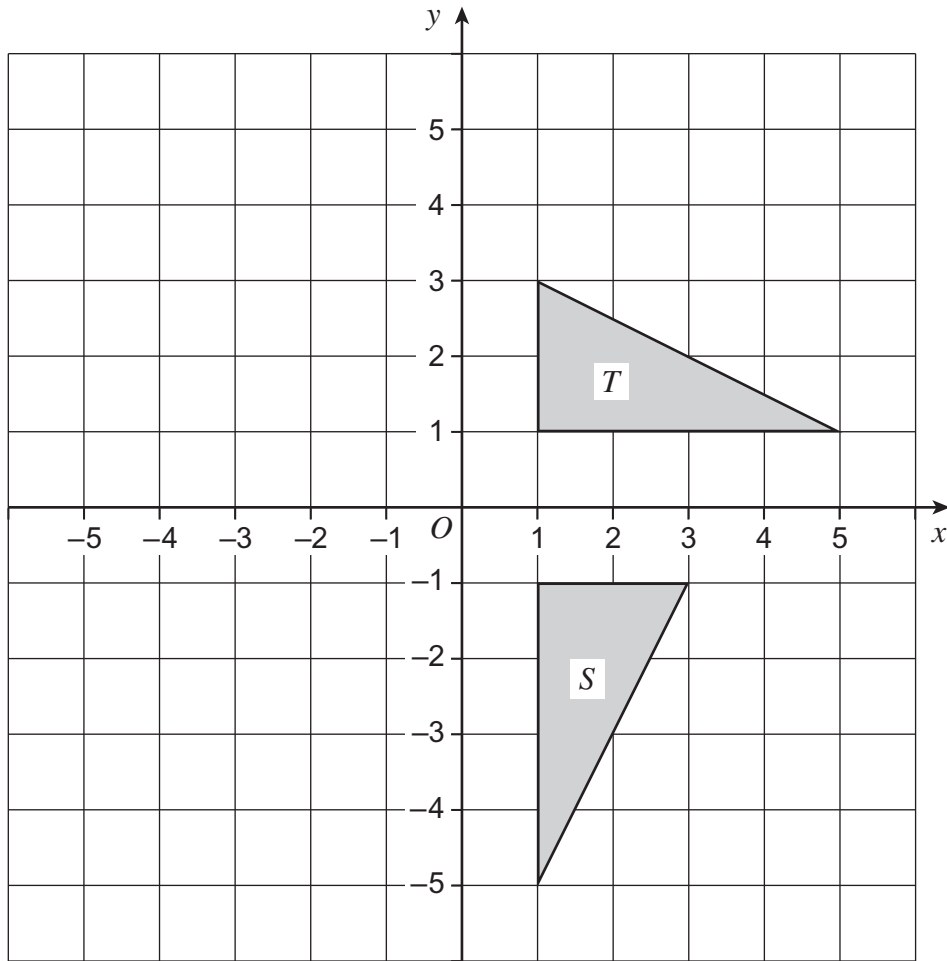
3 (a) Reflect triangle T in the line $y = -1$



(2 marks)



3 (b) Describe fully the **single** transformation that maps triangle T to triangle S .



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(3 marks)



4 A plasterer uses this formula to work out how much she charges (£ C).

$$C = 30 + 10A$$

A is the area to be plastered to the nearest square metre.

How much does she charge for a rectangular ceiling measuring 7.6 m by 2.4 m?

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Answer £ (5 marks)



5 (a) How many pounds are in a kilogram?
Circle your answer.

1.6

2.2

2.5

4.5

(1 mark)

5 (b) Matthew's grandmother asked him to buy $\frac{1}{2}$ pound of cherries.

Cherries are sold in 100 g, 250 g and 500 g packs.

Which pack should he buy to get the nearest amount?
You **must** show your working.

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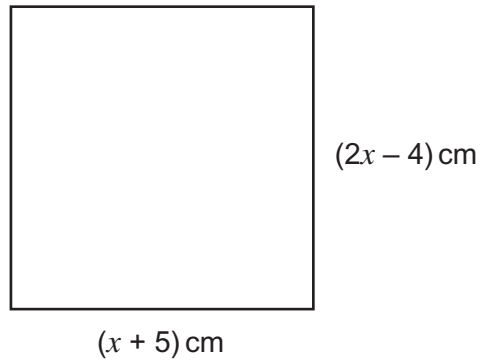
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Answer g (4 marks)



*6 The diagram shows a square.



Not drawn
accurately

Work out the perimeter of the square.

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Answer cm (5 marks)

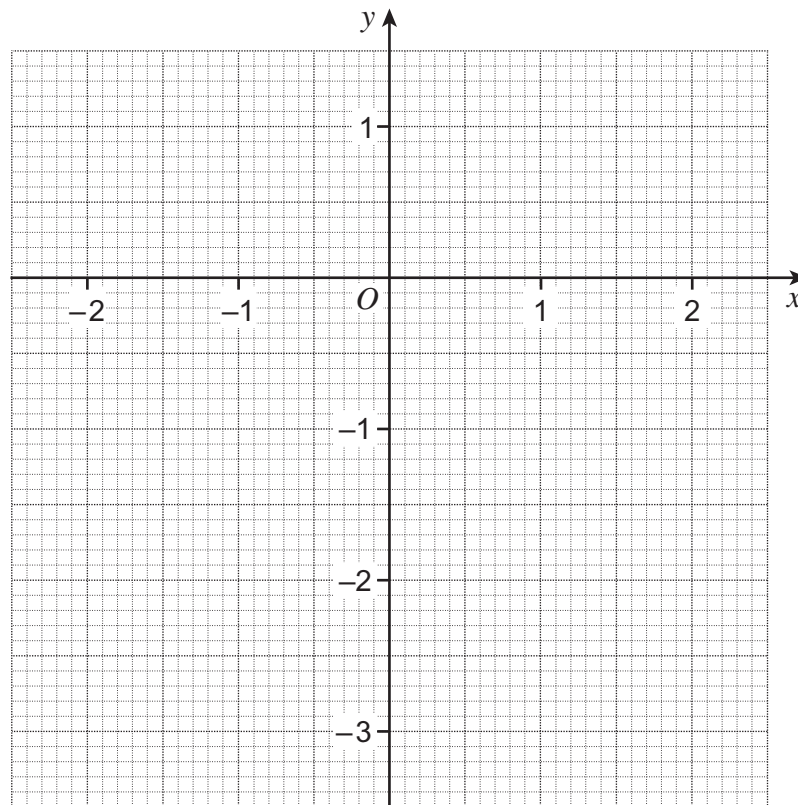


7 (a) Complete the table of values for $y = x^2 - 3$

x	-2	-1	0	1	2
y	1				1

(2 marks)

7 (b) Draw the graph of $y = x^2 - 3$ for values of x from -2 to 2.



(2 marks)

7 (c) Use your graph to work out the values of x when $y = 0.5$

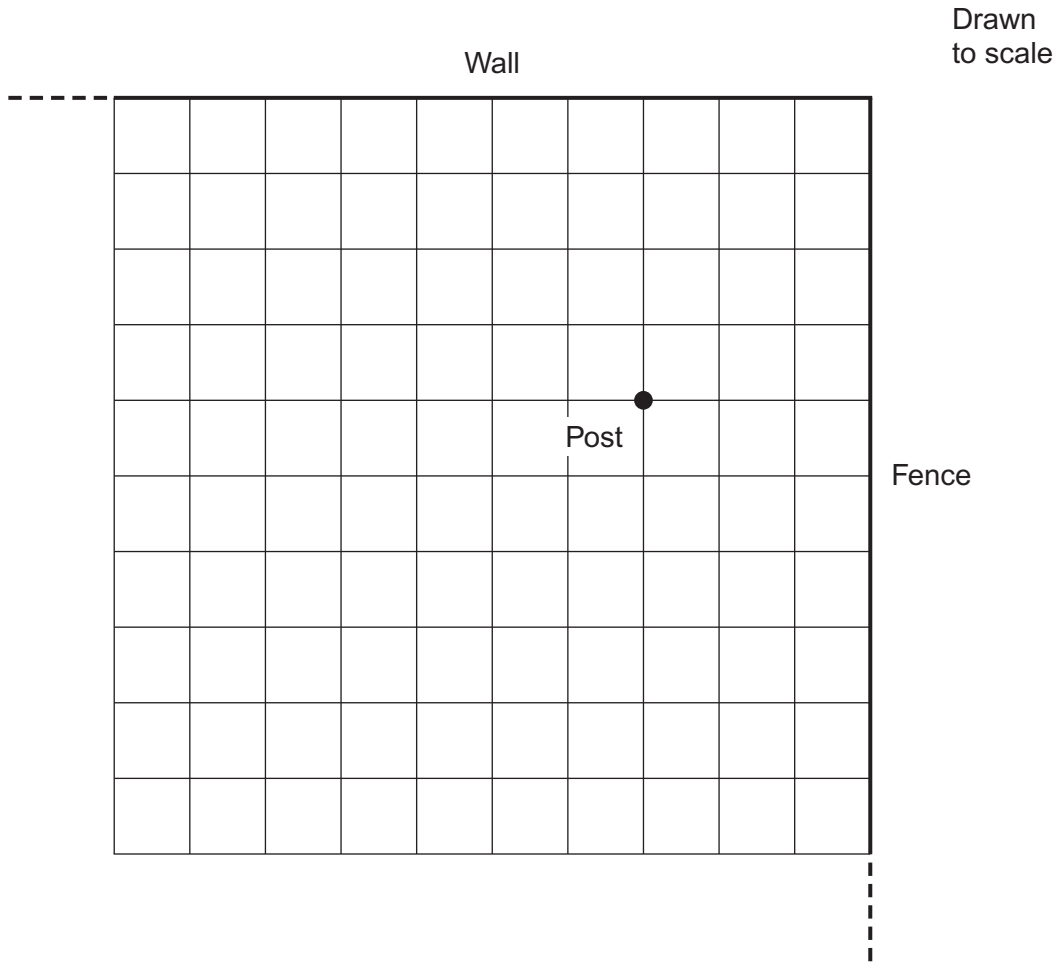
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Answer and (2 marks)



8 The scale drawing shows a post which is 1.5 metres from the fence.



8 (a) How far is the post from the wall?

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Answer metres (1 mark)

8 (b) A pony is tied to the post by a rope.
The pony can reach 2.5 metres from the post.

On the scale drawing, show accurately the area that the pony can reach. (2 marks)



8 (c) Work out the scale of the drawing as a ratio.
Give your answer in its simplest form.

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Scale : (3 marks)

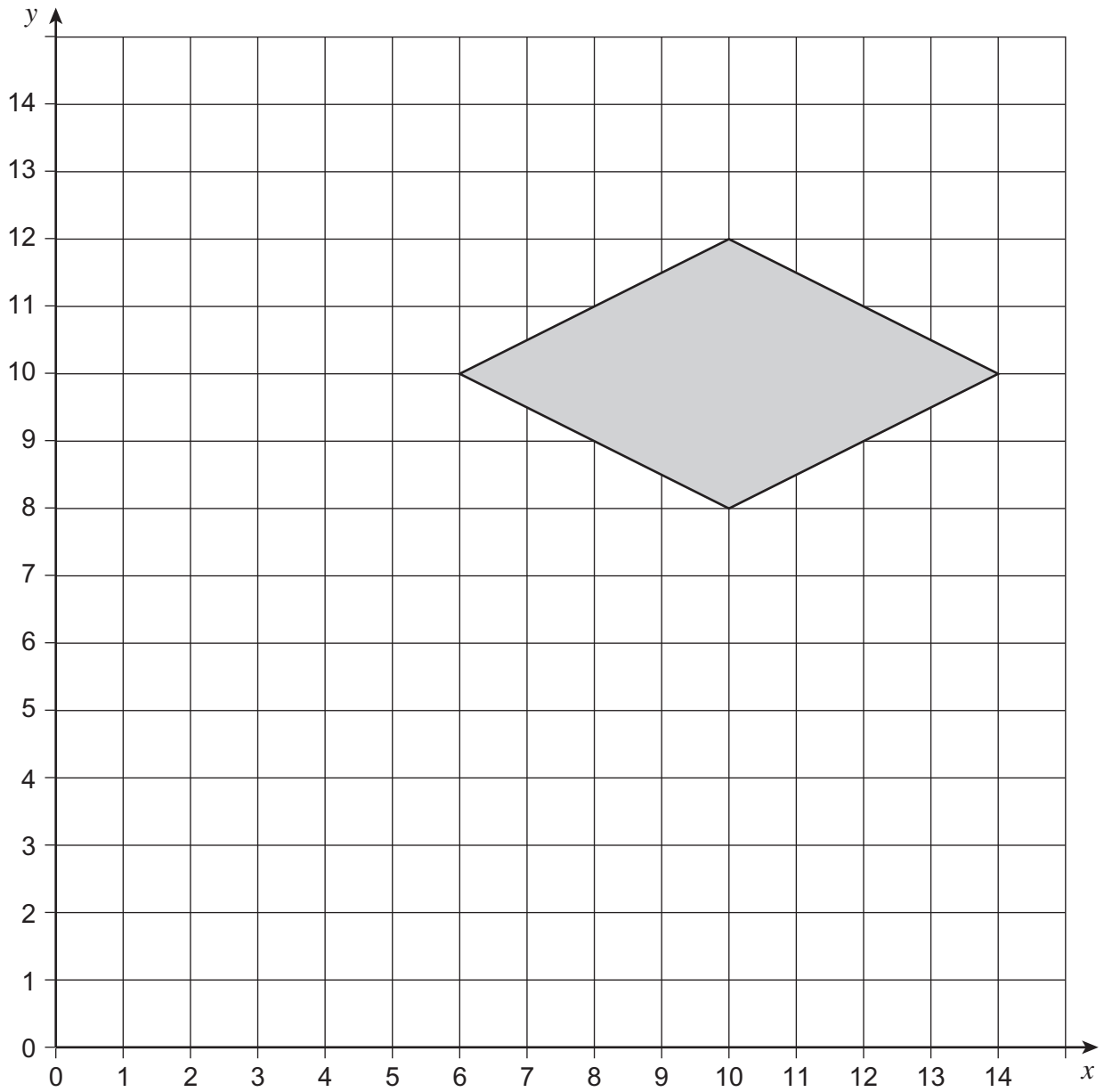
Turn over for the next question

6

Turn over ►



- 9 Enlarge the shape by scale factor $\frac{1}{2}$ with centre of enlargement $(0, 2)$.

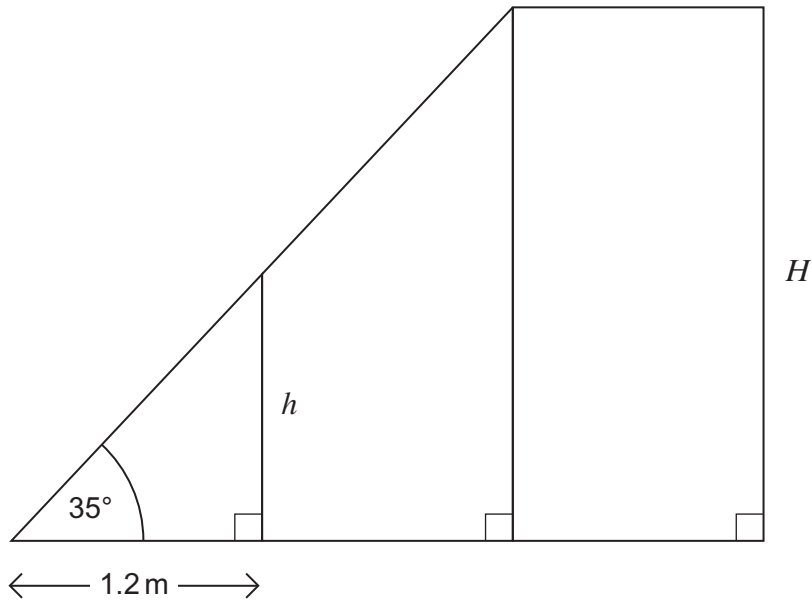


(2 marks)



10 The diagram shows three pieces of glass in a conservatory roof.

Not drawn
accurately



10 (a) Work out the height, h , of the smallest piece.

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Answer m (3 marks)

10 (b) Each piece of glass is the same width, 1.2 metres.
Work out the height, H , of the rectangular piece.

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Answer m (2 marks)

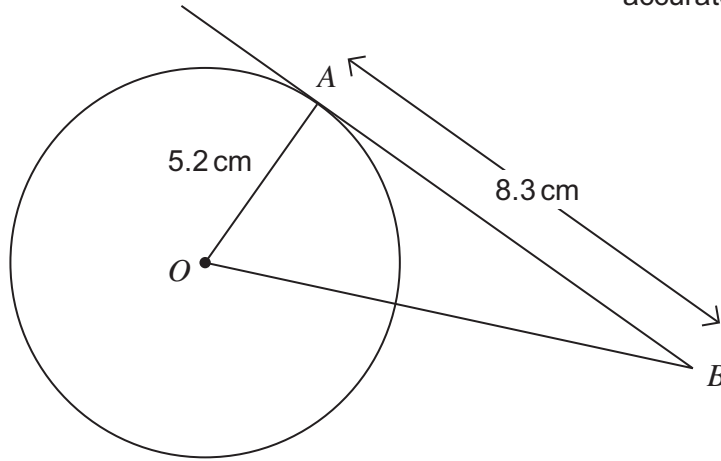
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Turn over ►



- 11 The diagram shows a circle, centre O .
 AB is a tangent.

Not drawn
accurately



Work out the length OB .

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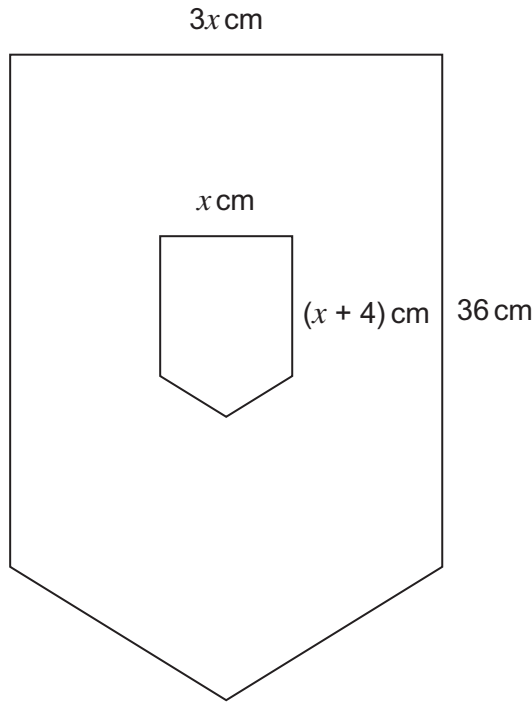
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Answer cm (4 marks)



12 The diagram shows a badge made from two similar pentagons.

Not drawn
accurately



Work out the width of the badge.

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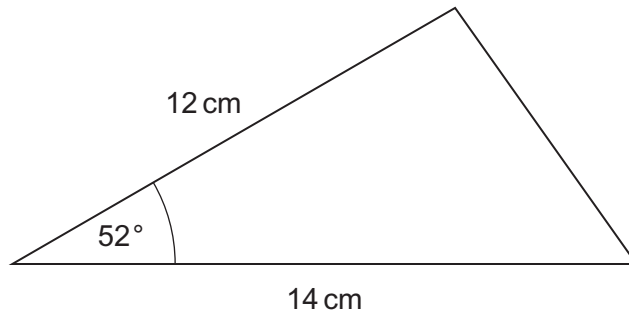
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Answer cm (5 marks)



- 13 Work out the area of the triangle.

Not drawn
accurately



State the units of your answer.

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Answer (3 marks)



14 Solve the quadratic equation $3x^2 + x - 5 = 0$
Give your answers to 3 significant figures.

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Answer (3 marks)

Turn over for the next question

6

Turn over ►



15 y is directly proportional to x .
When $y = 28$, $x = 7$

15 (a) Work out an equation connecting y and x .

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Answer (3 marks)

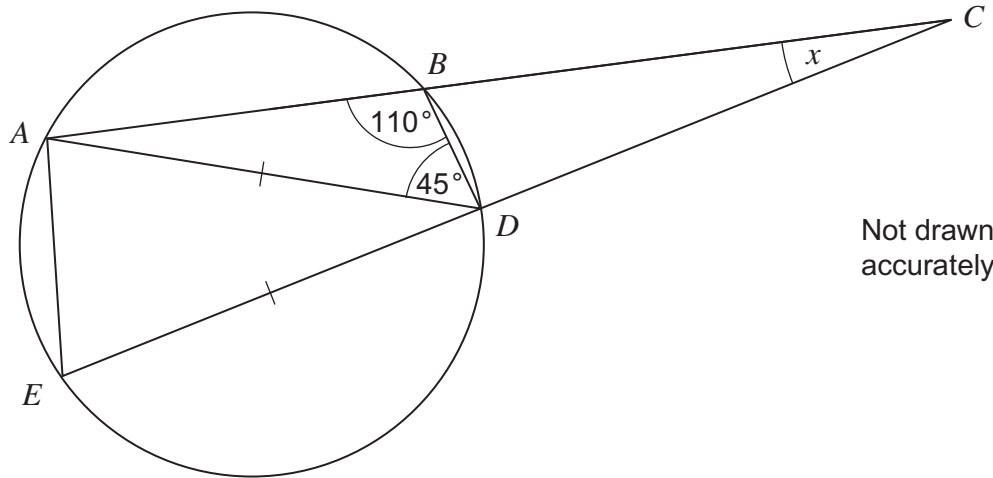
15 (b) Work out the value of y when $x = 12$

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Answer (2 marks)



16 ABC and EDC are straight lines.
 $AD = ED$



***16 (a)** Work out the size of angle AED .
Give a reason for your answer.

Answer degrees

Reason

..... (2 marks)

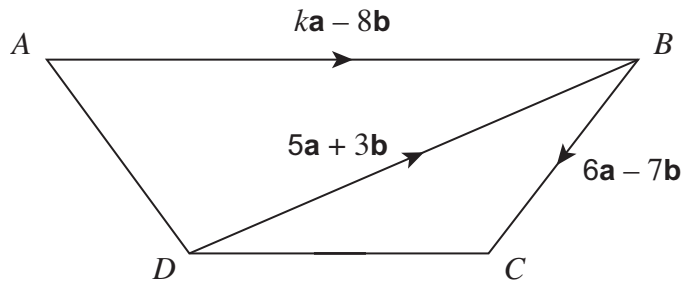
16 (b) Work out x .

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Answer degrees (4 marks)



17



17 (a) Work out \vec{DC} in terms of **a** and **b**.
Simplify your answer.

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Answer (2 marks)

17 (b) *ABCD* is a trapezium.

Work out the value of *k*.

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Answer (1 mark)



18 You are given that 1 knot = 1 nautical mile per hour.

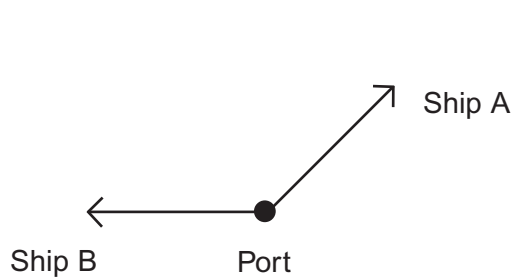
Two ships leave a port at the same time.

Ship A sails at 10 knots on a bearing of 035°

Ship B sails at 15 knots on a bearing of 270°

Calculate the distance between the ships after **2 hours**.
Do **not** use a scale drawing.

Not drawn
accurately



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Answer nautical miles (5 marks)

END OF QUESTIONS

8



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