Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Pages	Mark
3	
4 – 5	
6 – 7	
8 – 9	
10 – 11	
12 – 13	
14 – 15	
16 – 17	
18 – 19	
20 – 21	
TOTAL	

General Certificate of Secondary Education
Higher Tier
June 2013

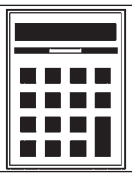
Mathematics 43603H

Unit 3

Friday 14 June 2013 9.00 am to 10.30 am

H

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



Time allowed
- 1 hour 30 minutes

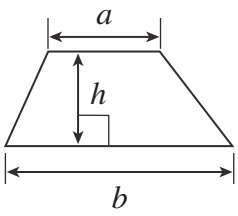
Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this 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 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.

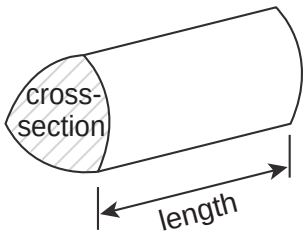
Advice
- In all calculations, show clearly how you work out your answer.

Formulae Sheet: Higher Tier

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

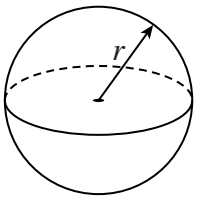


Volume of prism = area of cross-section × length



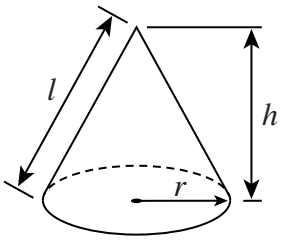
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

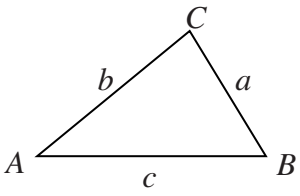
Curved surface area of cone = $\pi r l$



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

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

Do not write outside the box

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.

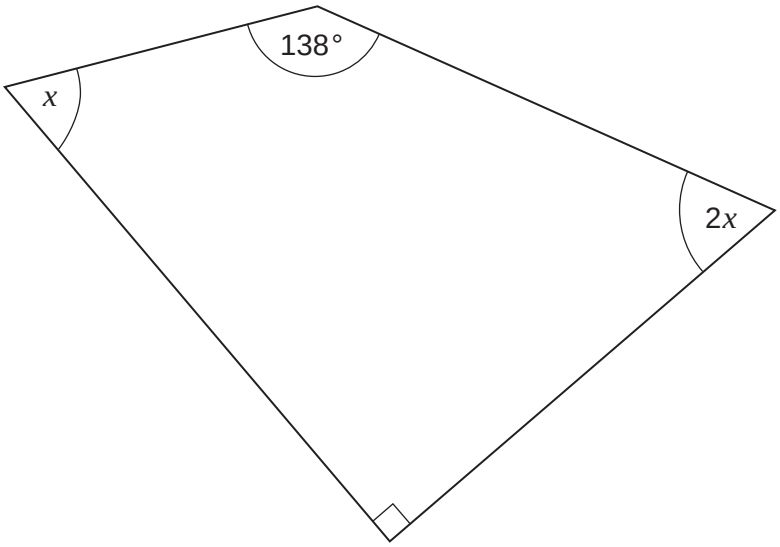
.....

.....

.....

Answer ..... cm^2 *(3 marks)*

2 Work out the value of x.



Not drawn accurately

.....

.....

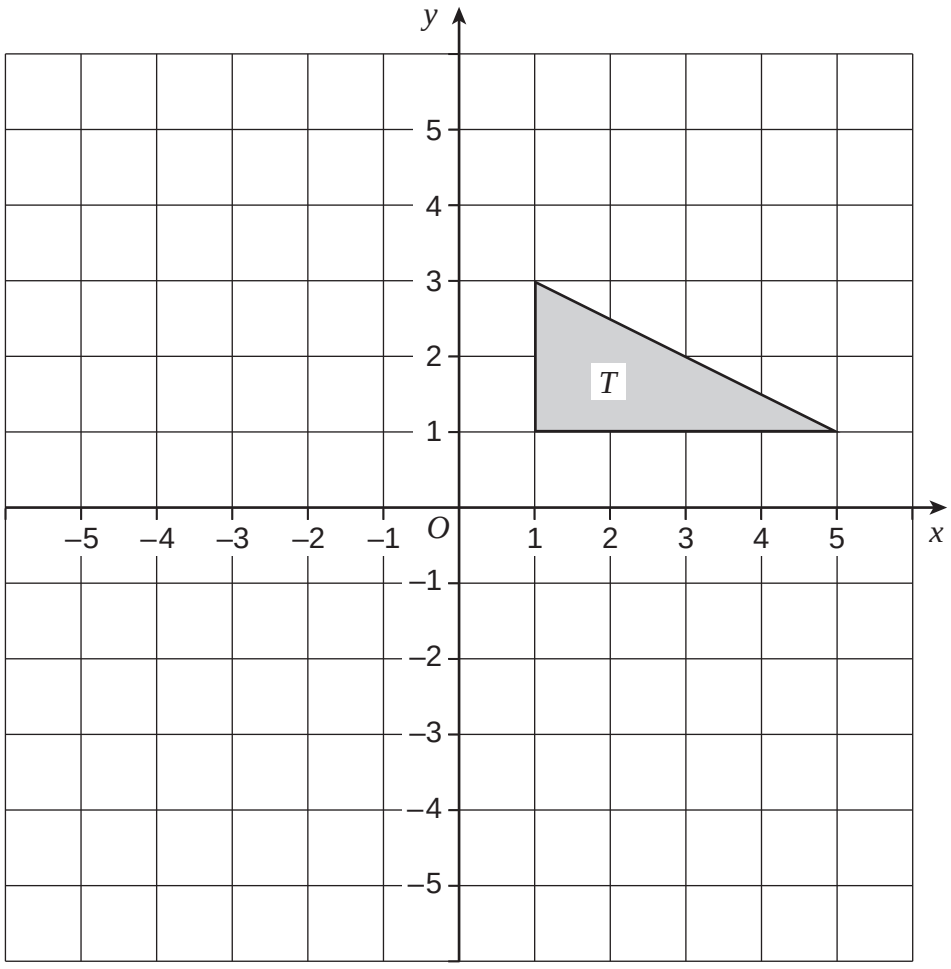
.....

Answer ..... degrees *(4 marks)*

7

Do not write outside the box

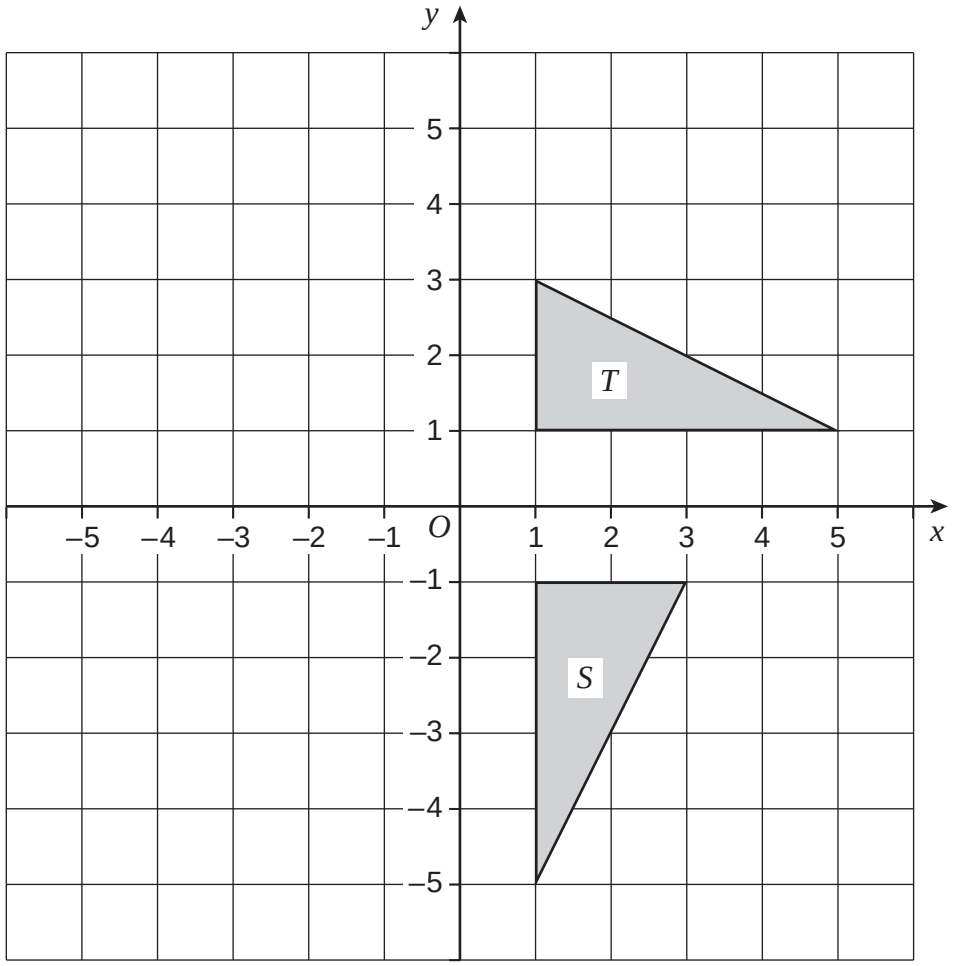
3 (a) Reflect triangle T in the line $y = -1$



(2 marks)

Do not write outside the box

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



.....

.....

(3 marks)

5

Do not write outside the box

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?

.....

.....

.....

.....

.....

.....

Answer £ ..... *(5 marks)*

Do not write outside the box

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.

.....

.....

.....

.....

.....

.....

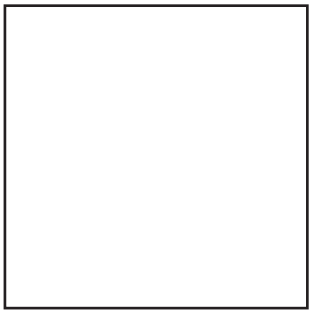
Answer ..... g *(4 marks)*

10

Turn over ▶

Do not write outside the box

***6** The diagram shows a square.



Not drawn accurately

Work out the perimeter of the square.

.....

.....

.....

.....

.....

.....

Answer ..... cm *(5 marks)*

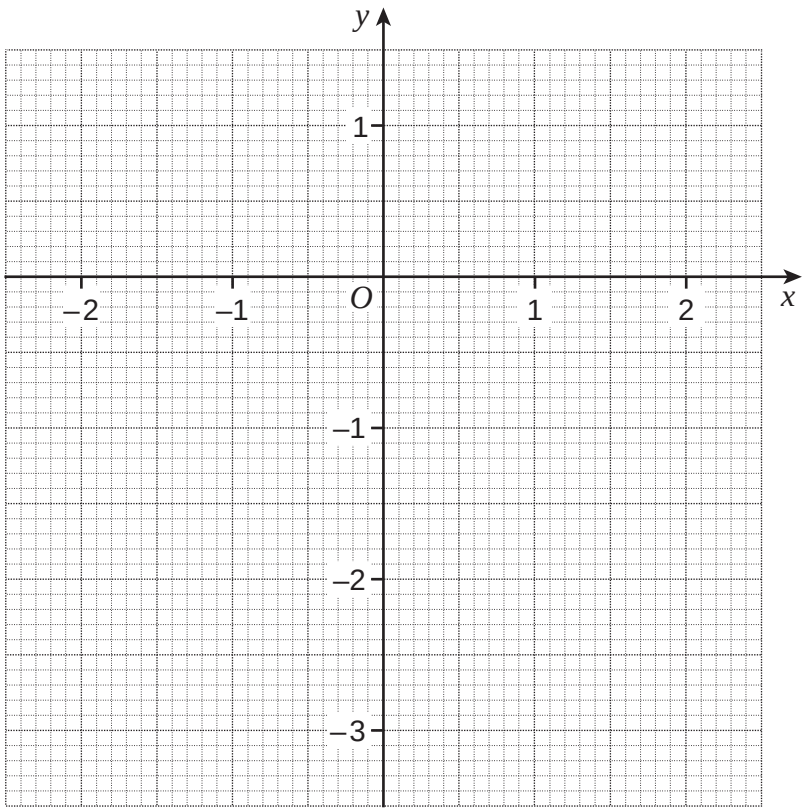
Do not write outside the box

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 $y = 0.5$

.....

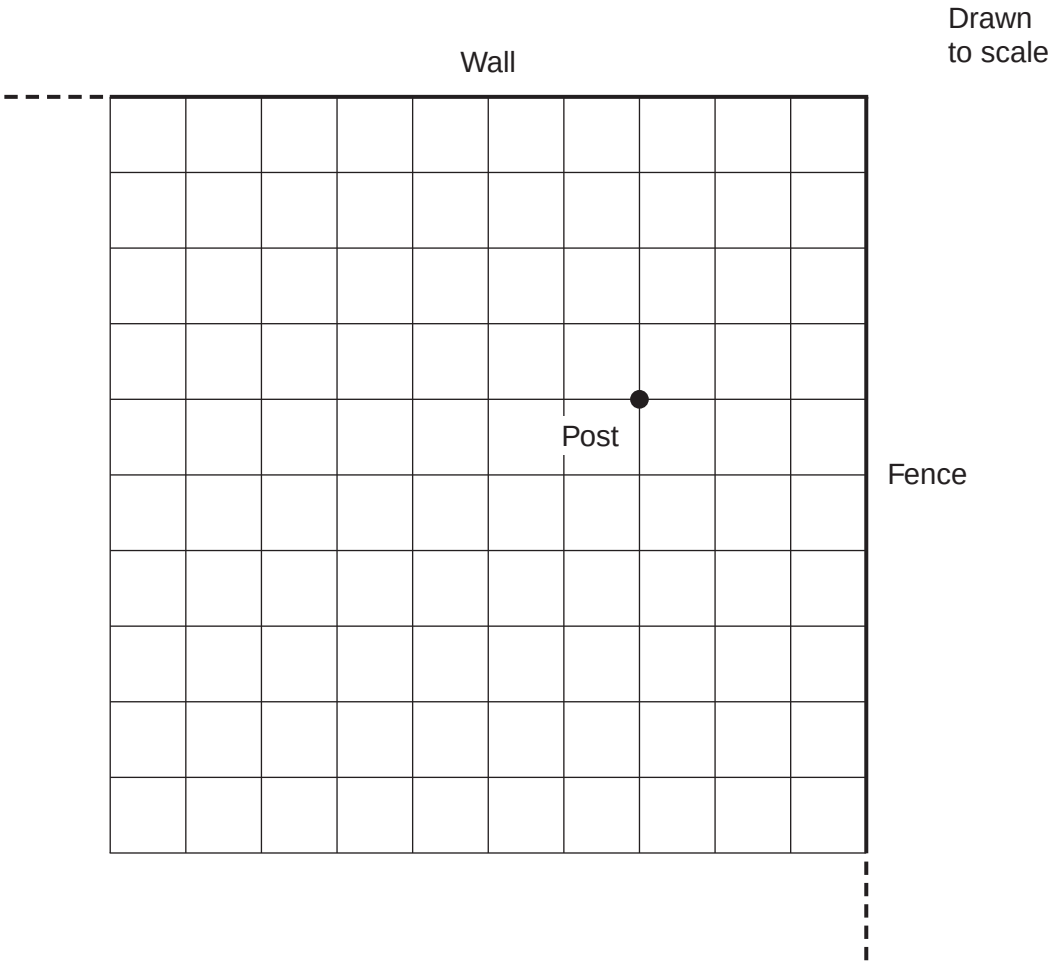
.....

Answer ..... and ..... *(2 marks)*

11

Turn over ▶

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?

.....

.....

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)

Do not write outside the box

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

.....

.....

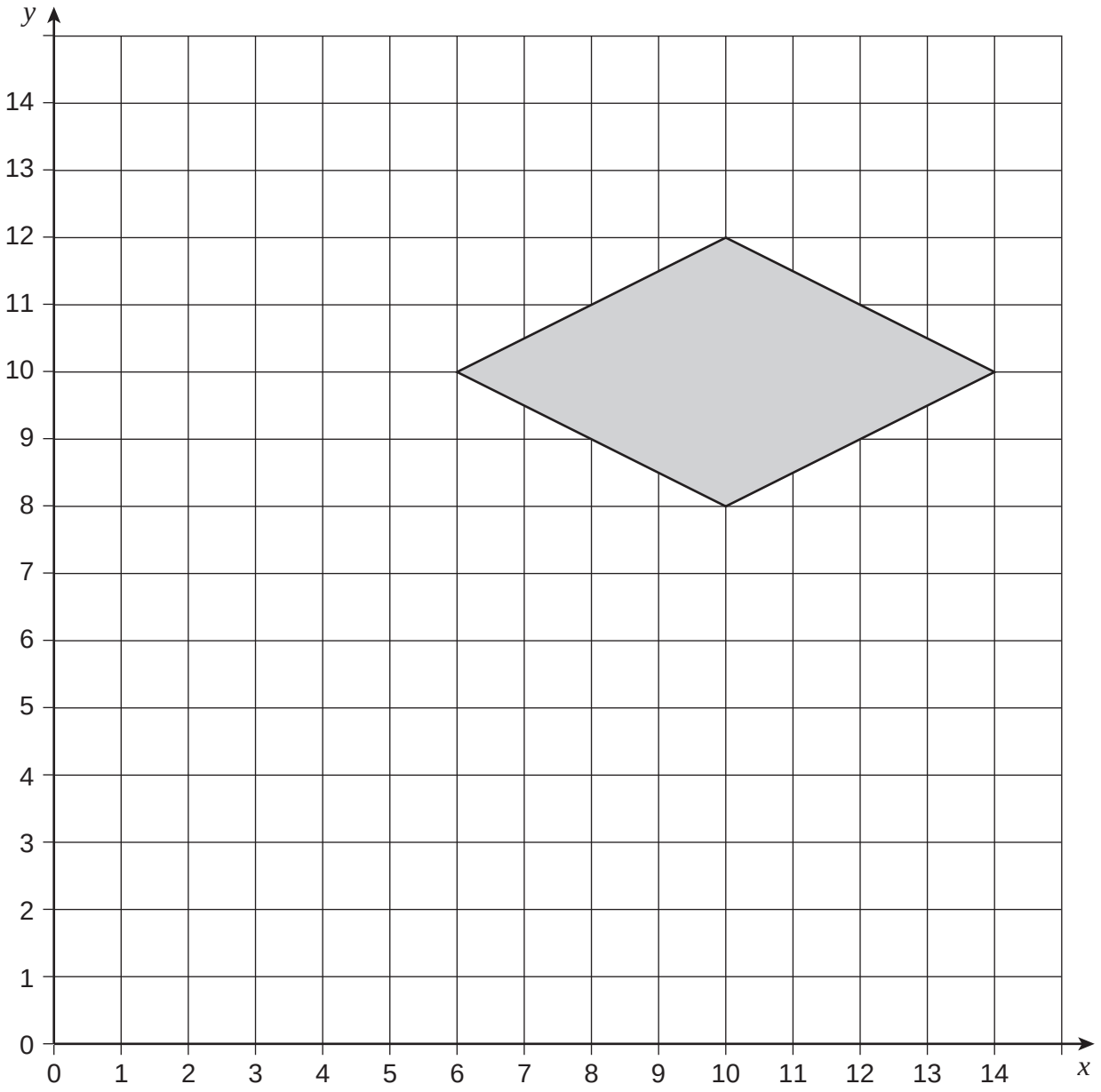
Scale ..... : ..... *(3 marks)*

Turn over for the next question

6

Do not write outside the box

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

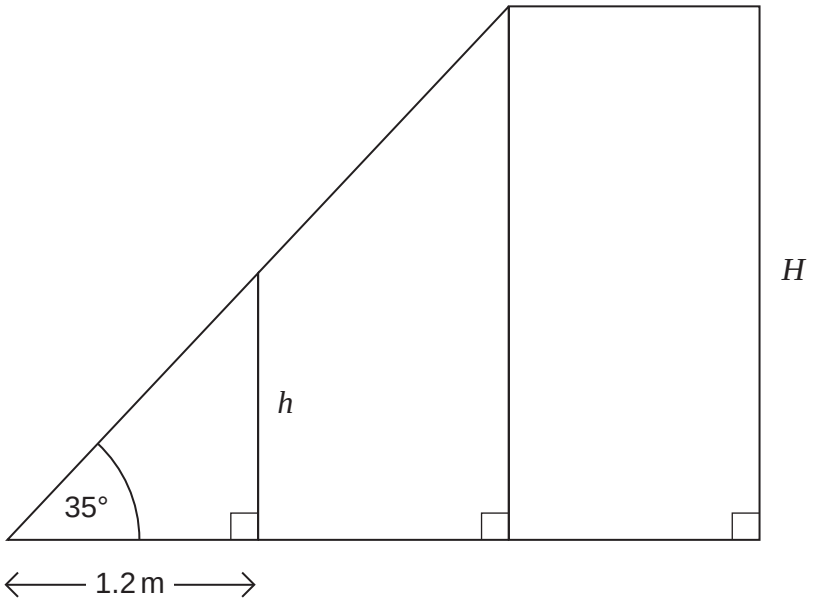


(2 marks)

Do not write outside the box

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.

.....

.....

.....

.....

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.

.....

.....

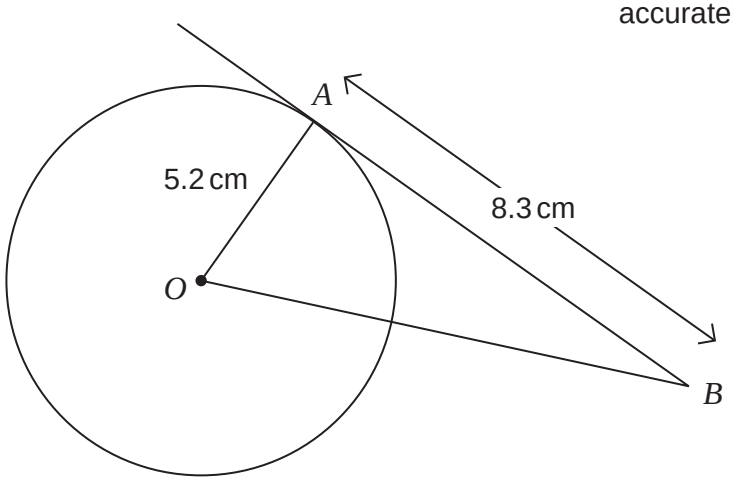
Answer ..... m *(2 marks)*

7

Do not write outside the box

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

Not drawn accurately



Work out the length OB.

.....

.....

.....

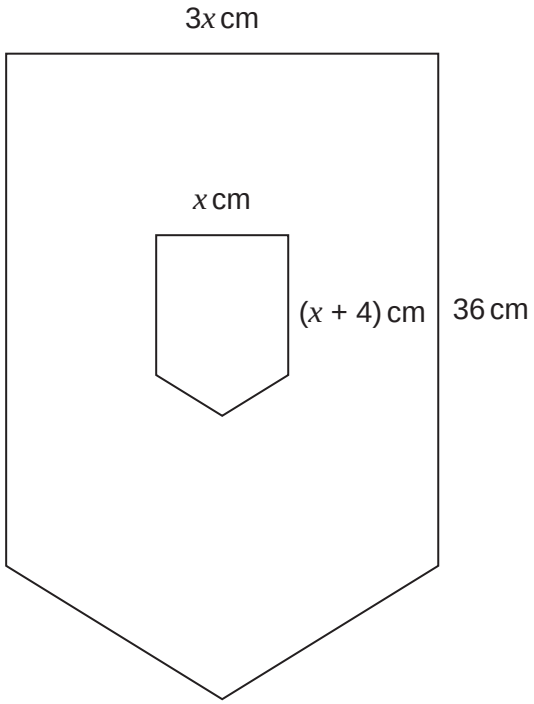
.....

Answer ..... cm *(4 marks)*

Do not write outside the box

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

Not drawn accurately



Work out the width of the badge.

.....

.....

.....

.....

.....

.....

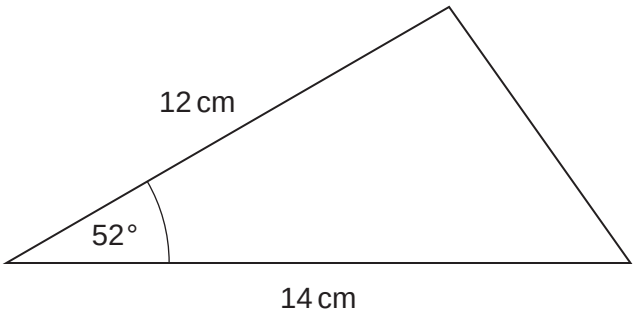
Answer ..... cm *(5 marks)*

9

Do not write outside the box

13 Work out the area of the triangle.

Not drawn accurately



State the units of your answer.

.....

.....

.....

.....

Answer ..... *(3 marks)*

Do not write outside the box

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

.....

.....

.....

.....

.....

.....

.....

.....

Answer ..... *(3 marks)*

Turn over for the next question

6

Do not write outside the box

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

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

.....

.....

.....

Answer ..... *(3 marks)*

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

.....

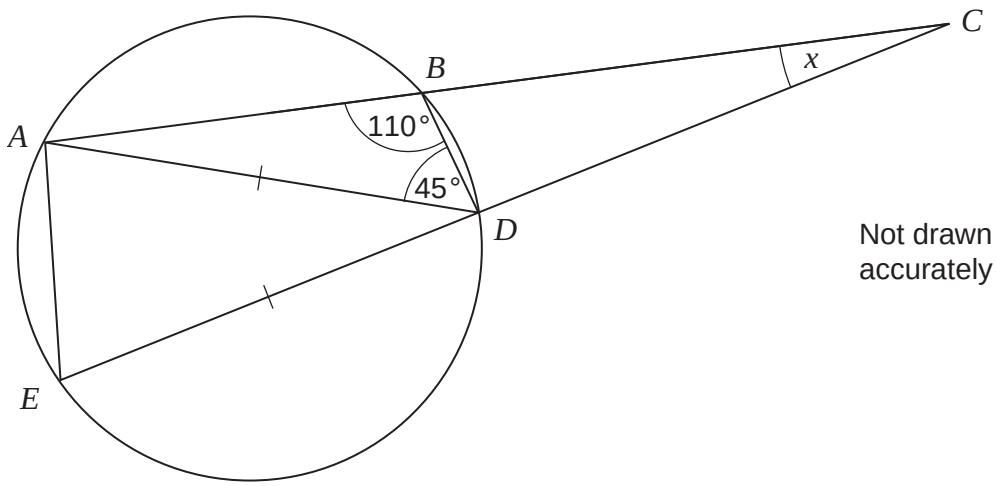
.....

.....

Answer ..... *(2 marks)*

Do not write outside the box

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



Not drawn accurately

***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.

.....

.....

.....

.....

.....

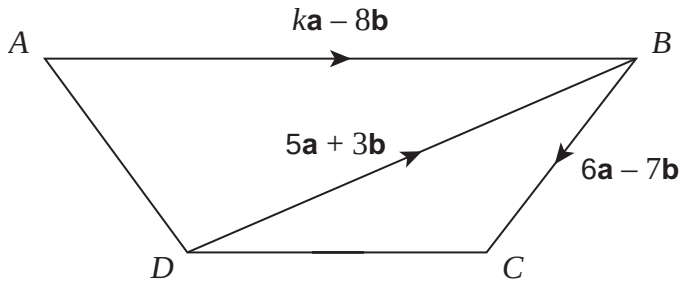
.....

Answer ..... degrees *(4 marks)*

11

Do not write outside the box

17



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

.....

.....

Answer ..... *(2 marks)*

17 (b) $ABCD$ is a trapezium.

Work out the value of k.

.....

.....

Answer ..... *(1 mark)*

Do not write outside the box

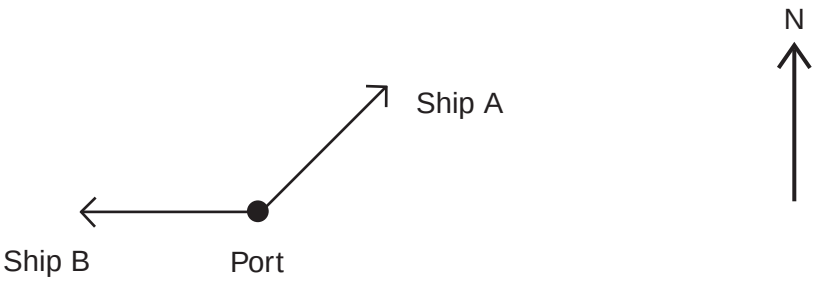
18 You are given that 1 knot = 1 nautical mile per hour.

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



.....

.....

.....

.....

.....

.....

Answer ..... nautical miles *(5 marks)*

END OF QUESTIONS

8

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED