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	
22 – 23	
24 – 25	
TOTAL	

General Certificate of Secondary Education
Higher Tier
November 2013

Mathematics (Linear) 4365/2H

Paper 2

H

Monday 11 November 2013 9.00 am to 11.00 am

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

Time allowed
- 2 hours

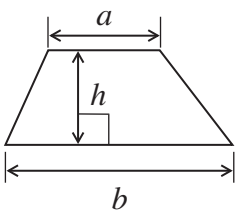
Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this 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 105.
- The quality of your written communication is specifically assessed in Questions 5, 6 and 21. These questions are indicated with an asterisk (*).
- You may ask for more answer paper, tracing paper and graph paper. These must be tagged securely to this answer book.

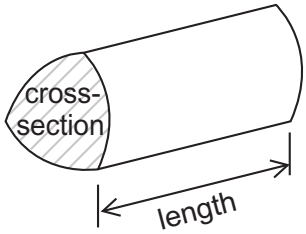
Advice
- In all calculations, show clearly how you work out your answer.

Formulae Sheet: Higher Tier

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

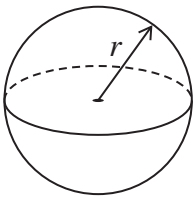


Volume of prism = area of cross-section × length



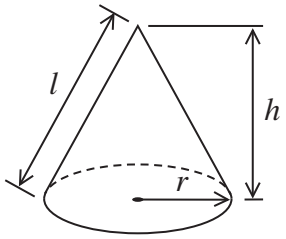
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

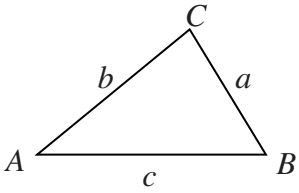
Curved surface area of cone = $\pi r l$



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

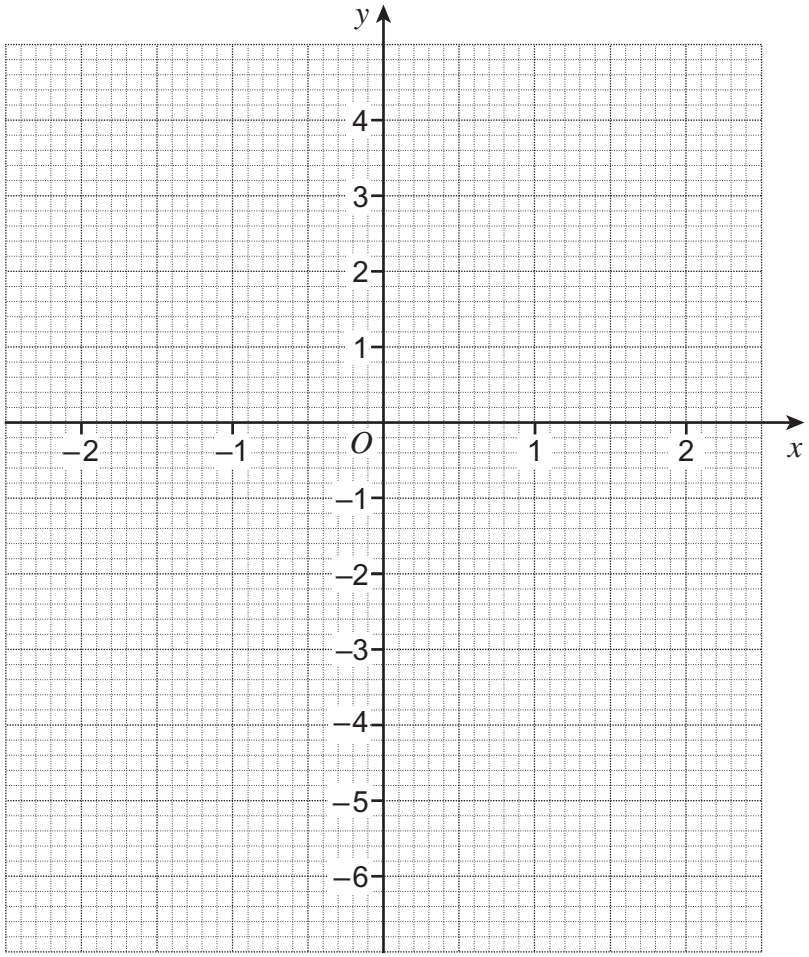
The Quadratic Equation

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

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

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

1 On the grid, draw the graph of $y = 2x - 1$ for values of x from -2 to 2.



(3 marks)

Turn over for the next question

3

Turn over ▶

2 In this question, assume that the car uses the same amount of petrol for each mile it travels.

2 (a) A car uses 55 litres of petrol to travel 495 miles.

How far would the car travel on 80 litres of petrol?

.....

.....

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

2 (b) How much petrol would the car use on a trip of 160 miles?
Give your answer to the nearest litre.

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Answer ..... litres *(4 marks)*

3 Decide whether each of these sets of data is discrete or continuous.

Tick the correct box.

3 (a) The heights of people.

☐ Discrete ☐ Continuous

(1 mark)

3 (b) The number of coins in a bag.

☐ Discrete ☐ Continuous

(1 mark)

3 (c) The weights of bicycles.

☐ Discrete ☐ Continuous

(1 mark)

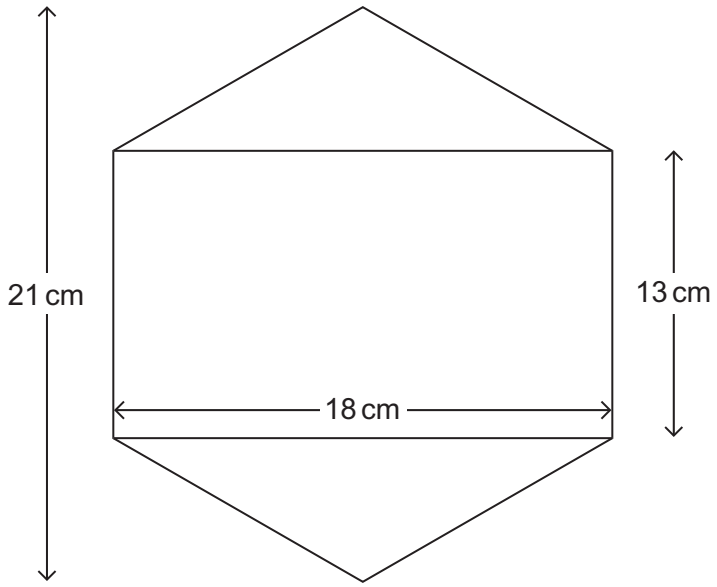
3 (d) The shoe sizes of women.

☐ Discrete ☐ Continuous

(1 mark)

Turn over for the next question

4 The hexagon is made from a rectangle and two congruent triangles.



Not drawn accurately

Work out the area of the hexagon.

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Answer ..... cm^2 *(5 marks)*

5 20 students choose a sport.

	Tennis	Basketball	Football
Boys	4	3	5
Girls	5	2	1

5 (a) How many students did **not** choose football?

.....

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

5 (b) What percentage of the students choose tennis?

.....

.....

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

***5 (c)** Considering the boys and the girls separately, compare their relative frequencies of choosing basketball.

.....

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(3 marks)

13

6 (a) Multiply out and simplify $2(3x + 2) - (x + 7)$

.....

.....

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

***6 (b)** Matt knows the value of a is 6 or 7 and the value of b is -4 or -5.

Work out the largest and smallest possible values of $3a - 2b$

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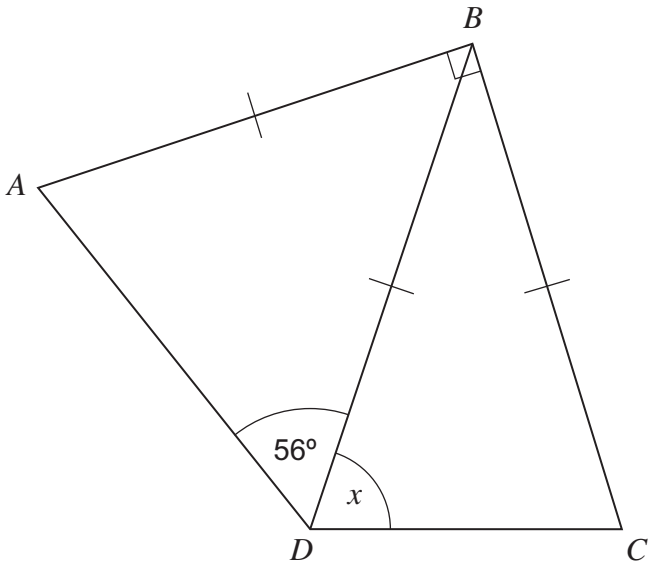
Largest .....

Smallest ..... *(4 marks)*

7 Triangles ABD and BCD are isosceles.
Angle ABC is 90°



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Work out the size of angle x.

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

11

8 (a) Rearrange the formula to make w the subject of $y = 3w + 8$

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

8 (b) Solve $5(x + 4) = 3(x + 7) + 2$

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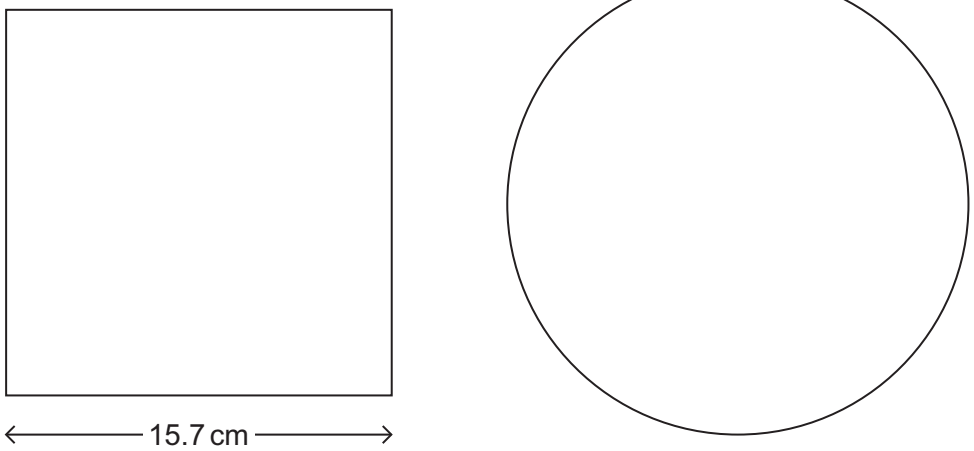
x = ... *(4 marks)*

9 A square of side 15.7 cm is made from a length of wire.

The same length of wire is then made into a circle.

Not drawn accurately



Work out the diameter of the circle.

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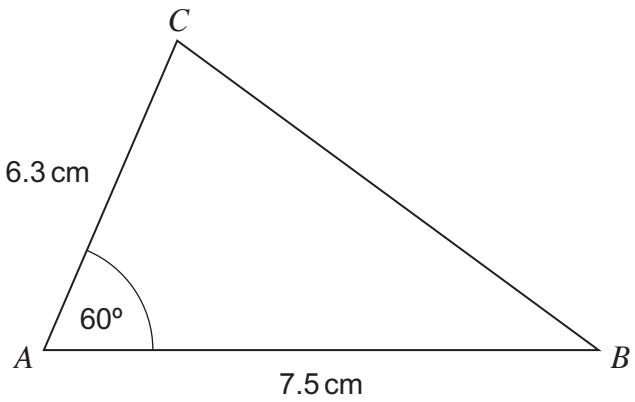
Answer ..... cm *(4 marks)*

10

Turn over ▶

10 The diagram shows a sketch of triangle ABC.



Using ruler and compasses only, make an accurate drawing of triangle ABC.

(3 marks)

11 The population of England in 2013 is approximately 53 million.

It is predicted that

the population in 2018 will be 4% more than the population in 2013

and the population in 2023 will be 4% more than the population in 2018.

Work out the predicted population of England in 2023.

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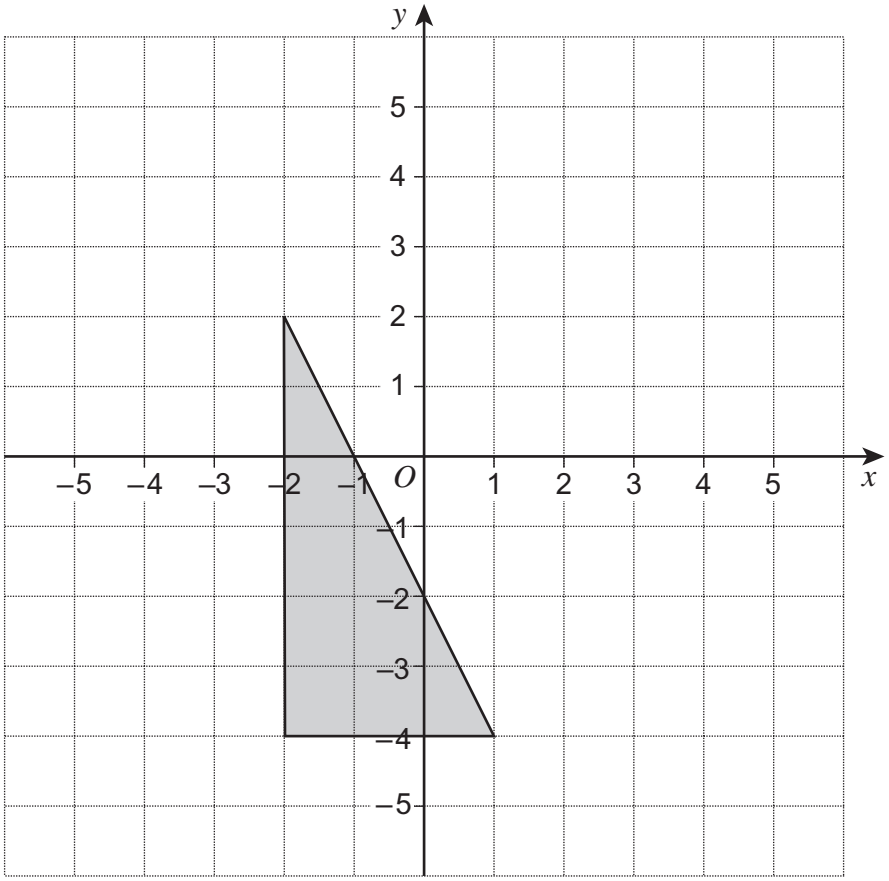
Answer ..... *(3 marks)*

Turn over for the next question

6

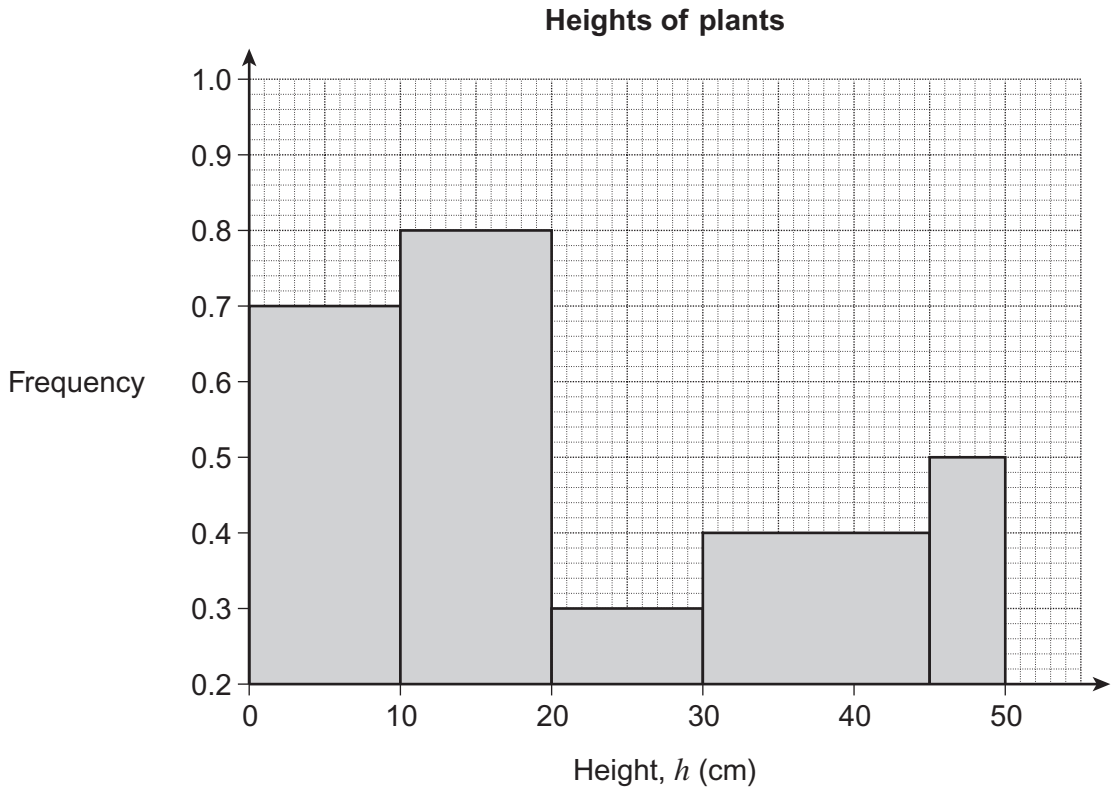
12 Enlarge the triangle by scale factor $\frac{1}{3}$ with centre (–5, –4).



(2 marks)

13 Jon uses this data about the heights of plants (h) to draw the histogram below.

Height, h (cm)	$0 < h \leqslant 10$	$10 < h \leqslant 20$	$20 < h \leqslant 30$	$30 < h \leqslant 45$	$45 < h \leqslant 50$
Frequency	7	8	3	6	5



Write down **three different** types of mistake that he has made.

Mistake 1 .....

Mistake 2 .....

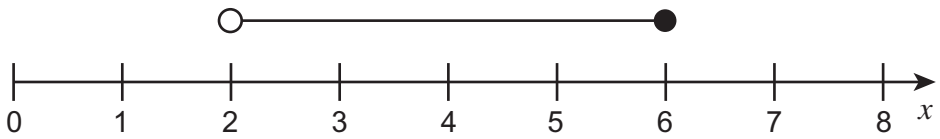
Mistake 3 .....

(3 marks)

5

Turn over ▶

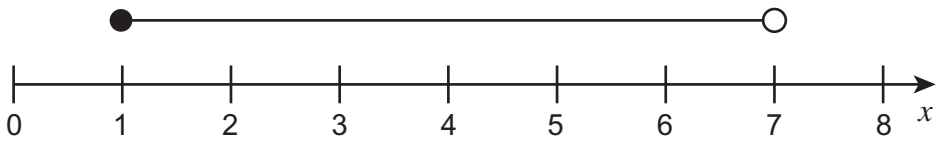
14 (a) Circle the inequality shown by the diagram.



$2 < x < 6$ $2 \leqslant x < 6$ $2 < x \leqslant 6$ $2 \leqslant x \leqslant 6$

(1 mark)

14 (b) Write down the integer values satisfied by this diagram.



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

15 Each number in the grid is double the previous number.
The first **seven** numbers are shown.

1	2	4	8	16
32	64			
				x

Work out the number for the last cell, marked x.

Give your answer in standard form to 3 significant figures.
You **must** show your working.

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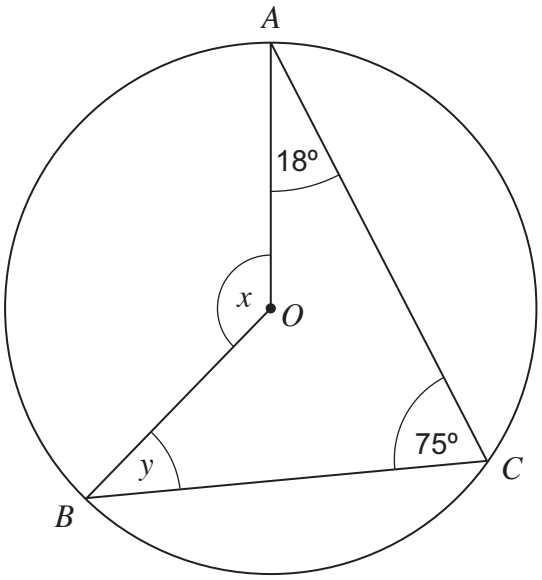
Answer ..... *(5 marks)*

8

16 The diagram shows a circle, centre O.



Not drawn accurately

16 (a) Work out the size of angle x.

.....

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

16 (b) Work out the size of angle y.

.....

.....

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

17 (a) Simplify $(2x^5y^4z^6) \times (7x^2y^3z)$

.....

.....

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

17 (b) Simplify fully $\dfrac{6(x-5)^2}{3(x-5)(x+4)}$

.....

.....

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

17 (c) Factorise $(x+1)^2 + 4(x+1)$

.....

.....

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

17 (d) Factorise fully $2x^2 - 50y^2$

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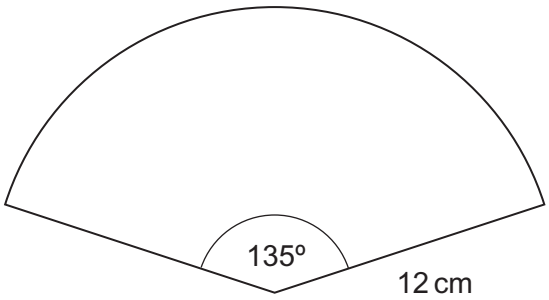
Answer ..... *(3 marks)*

14

18 The diagram shows a sector of a circle, radius 12 cm.



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Show that the perimeter of the sector is greater than 52 cm.

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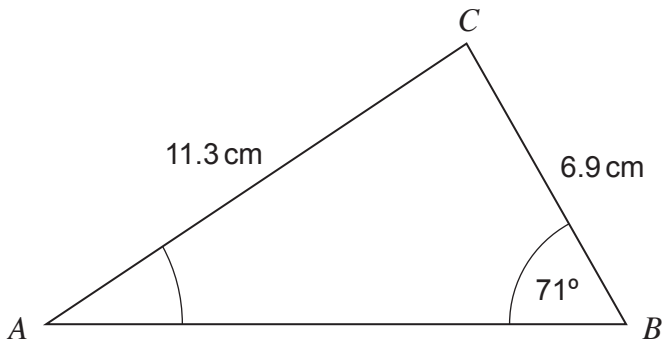
(3 marks)

19 Work out the size of angle A.



Not drawn accurately

Give your answer to a suitable degree of accuracy.

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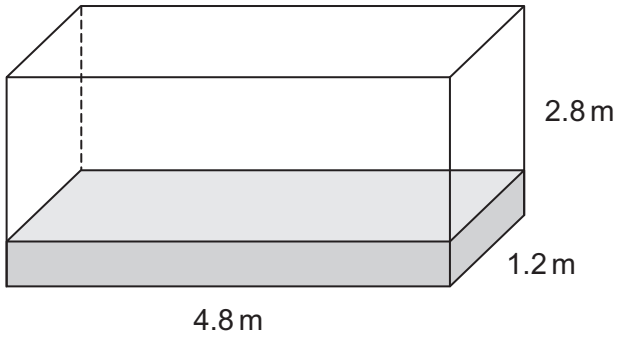
Answer ..... degrees *(4 marks)*

Turn over for the next question

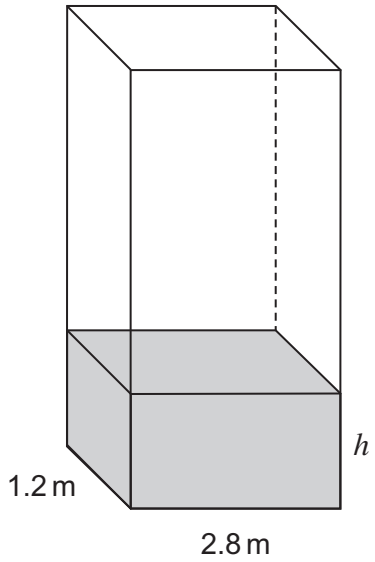
7

20 The measurements on this tank are exact.

Water is put in the tank to a height of 0.7 m **to the nearest tenth of a metre**.



The tank is now turned on its side as shown.



Work out the minimum height of water in the tank, marked, h.
Give your answer to 1 decimal place.

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Answer ..... m *(5 marks)*

Turn over for the next question

5

***21** n is an integer.

$S = \frac{1}{2} n(n + 1)$

Prove that $8S + 1$ is an odd square number.

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(5 marks)

22 Robin is firing arrows at a target.

The probability that he hits the target on his x^{th} attempt is $\frac{x + 2}{x + 3}$

For example Probability (hit on his 5^{th} attempt) = $\frac{7}{8}$

22 (a) Work out the probability that he hits the target with both his 1st and 2nd attempts.

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

22 (b) Work out the probability that he hits the target **exactly** once on his first two attempts.

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

END OF QUESTIONS

12

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