

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										



General Certificate of Secondary Education
Higher Tier
November 2013

Mathematics (Linear)

4365/2H

Paper 2

Monday 11 November 2013 9.00 am to 11.00 am

H

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.

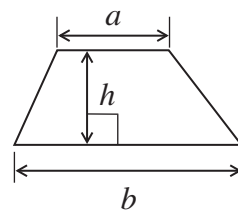
For Examiner's Use	
Examiner's Initials	
Pages	Mark
3	
4 – 5	
6 – 7	
8 – 9	
10 – 11	
12 – 13	
14 – 15	
16 – 17	
18 – 19	
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24 – 25	
TOTAL	



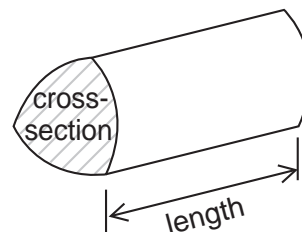
N 0 V 1 3 4 3 6 5 2 H 0 1

Formulae Sheet: Higher Tier

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

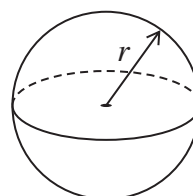


Volume of prism = area of cross-section \times length



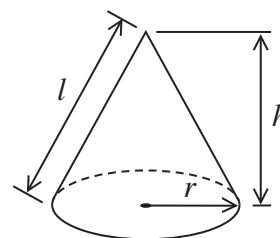
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

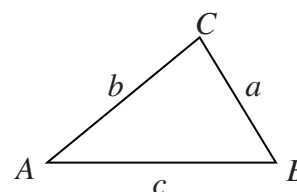


In any triangle ABC

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

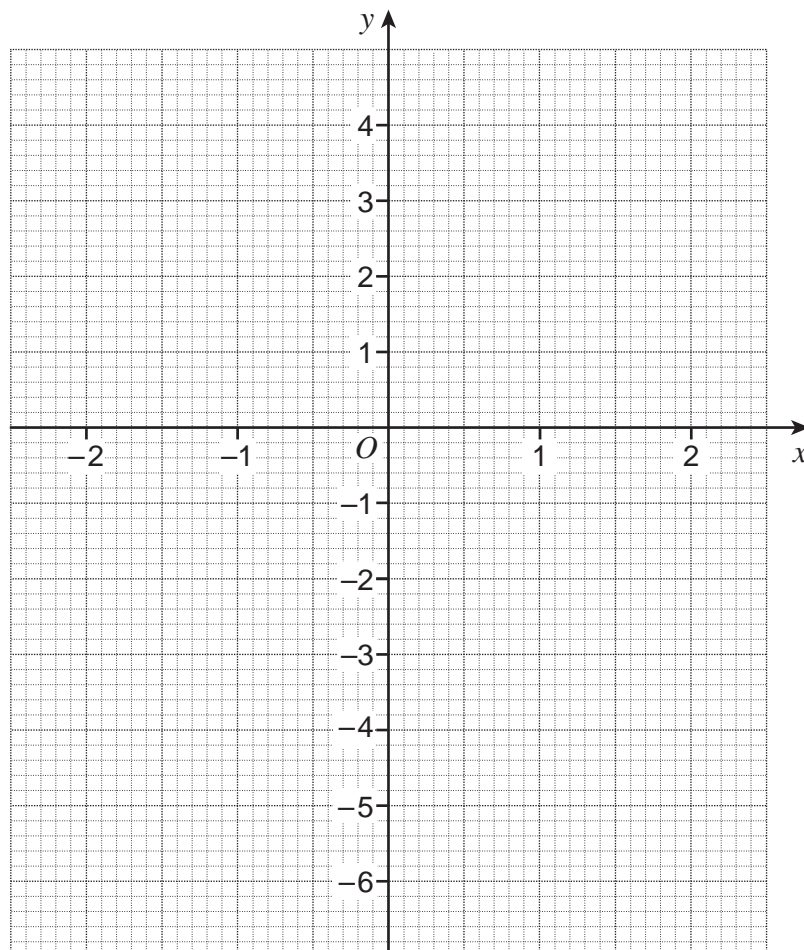
The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

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



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



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.

.....
.....
.....

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

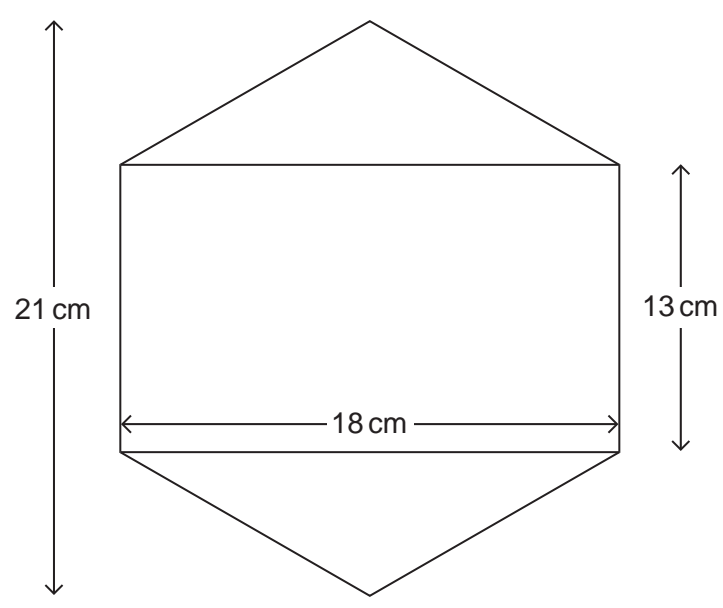
Continuous

(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 cm² (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?

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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)



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

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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 $3a - 2b$

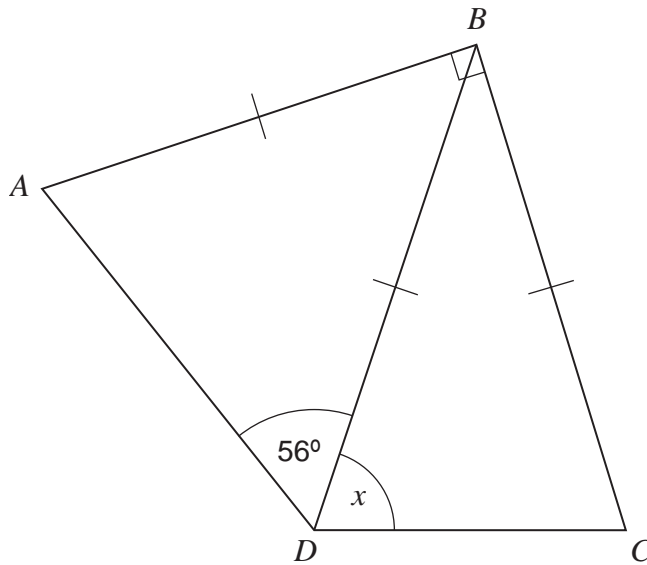
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Largest

Smallest (4 marks)



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



Not drawn accurately

Work out the size of angle x .

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Answer degrees (4 marks)



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

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Answer (2 marks)

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

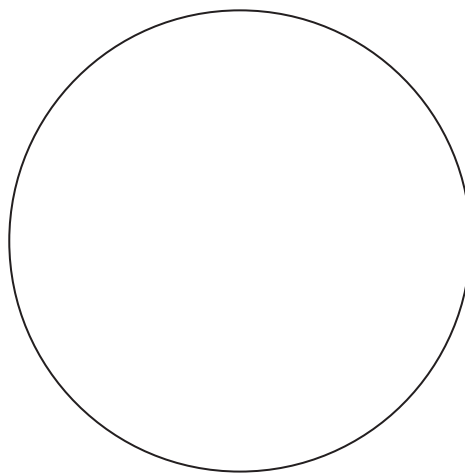
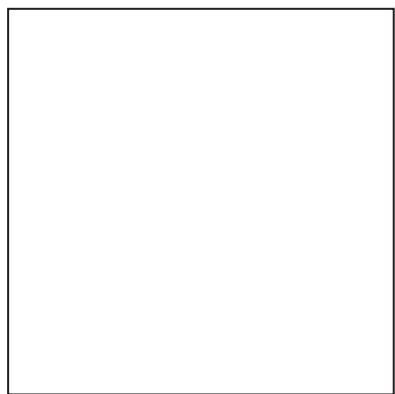
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$x =$ (4 marks)



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)

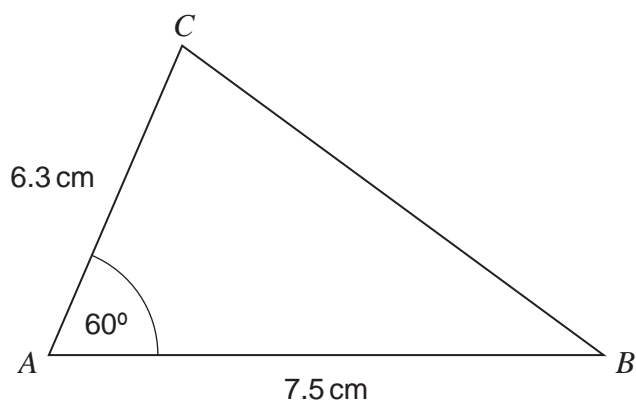
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Turn over ►



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)

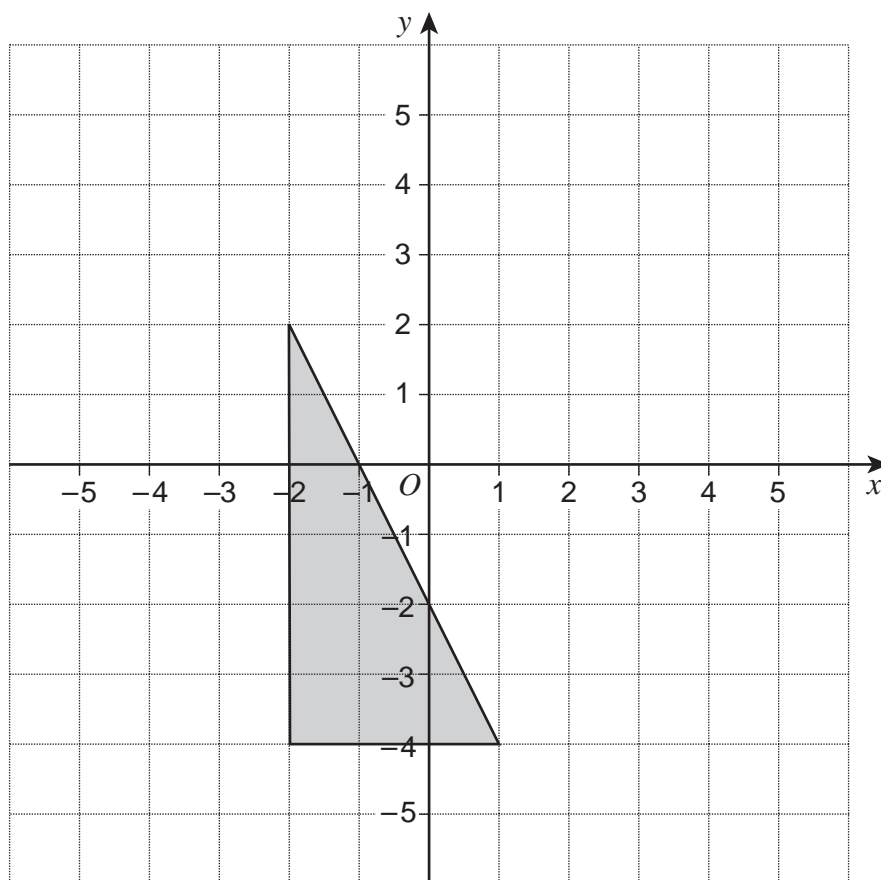
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6

Turn over ►



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

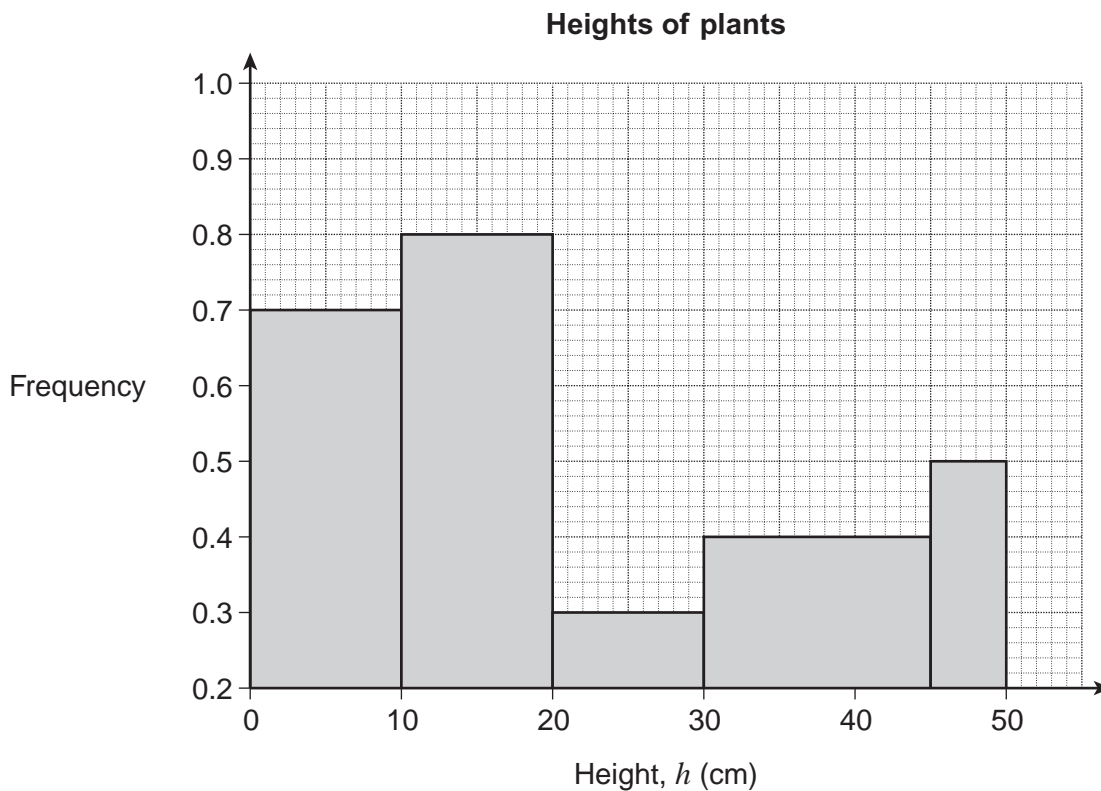


(2 marks)



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

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



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

Mistake 1

Mistake 2

Mistake 3

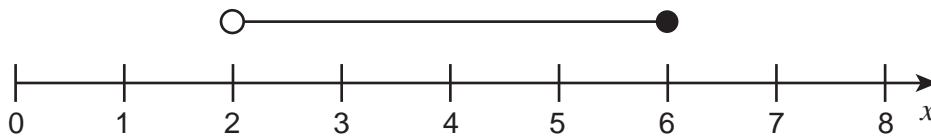
(3 marks)

5

Turn over ►



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



$2 < x < 6$

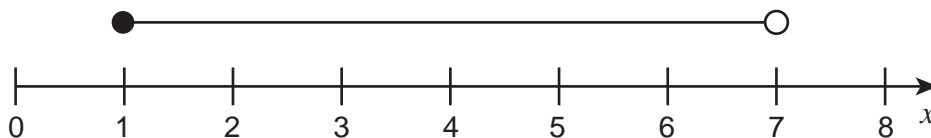
$2 \leq x < 6$

$2 < x \leq 6$

$2 \leq x \leq 6$

(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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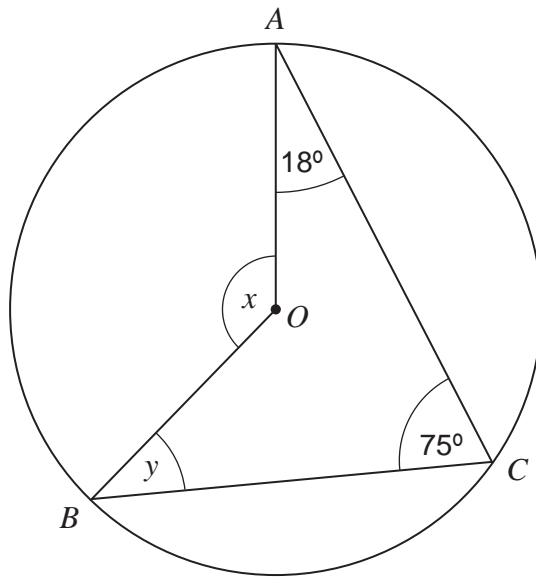
Answer (5 marks)

8

Turn over ►



16 The diagram shows a circle, centre O .



Not drawn accurately

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

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Answer degrees (1 mark)

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

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Answer degrees (3 marks)



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

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Answer (3 marks)

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

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Answer (2 marks)

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

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Answer (2 marks)

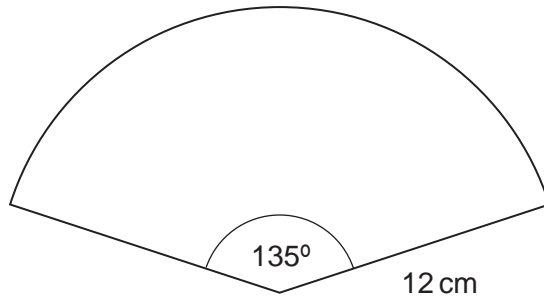
17 (d) Factorise fully $2x^2 - 50y^2$

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Answer (3 marks)



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



Not drawn
accurately

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

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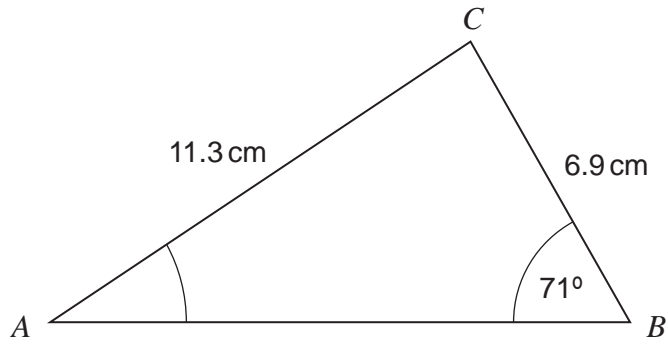
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(3 marks)



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)

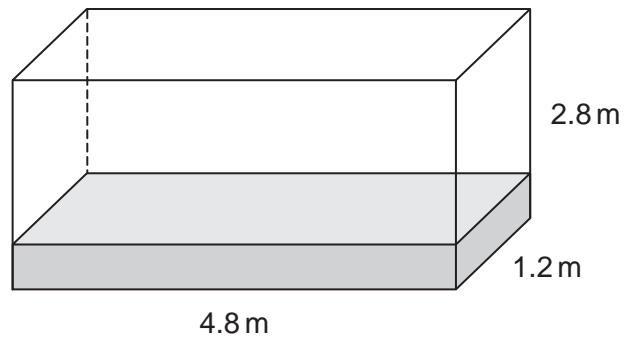
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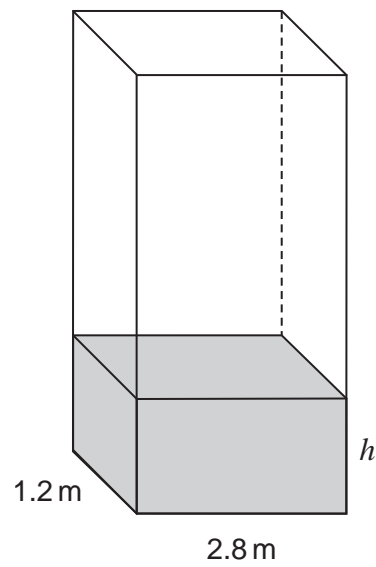
20

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

Turn over ►



***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 5th 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



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