Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4370/06

S16-4370-06

MATHEMATICS – LINEAR
PAPER 2
HIGHER TIER

A.M. THURSDAY, 9 June 2016

2 hours

ADDITIONAL MATERIALS

A calculator will be required for this paper.

A ruler, a protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

Write your name, centre number and candidate number in the spaces at the top of this page.

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

If you run out of space, use the continuation page at the back of the booklet, taking care to number the question(s) correctly.

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **8**.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**4**	
2.	**2**	
3.	**4**	
4.	**6**	
5.	**5**	
6.	**8**	
7.	**6**	
8.	**7**	
9.	**4**	
10.	**9**	
11.	**2**	
12.	**6**	
13.	**5**	
14.	**2**	
15.	**3**	
16.	**2**	
17.	**3**	
18.	**3**	
19.	**4**	
20.	**8**	
21.	**7**	
Total	**100**	

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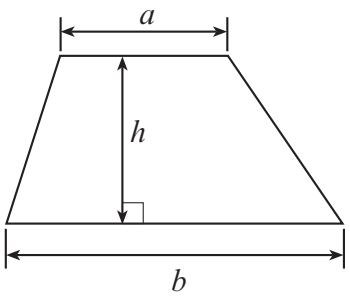
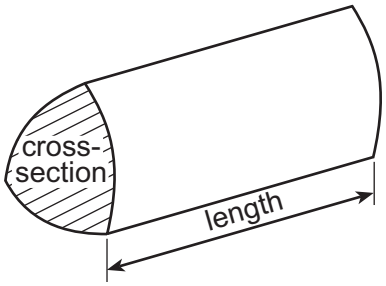
Formula List

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

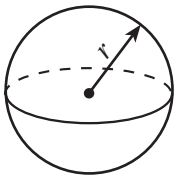


Volume of prism = area of cross-section × length



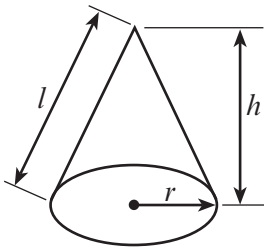
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

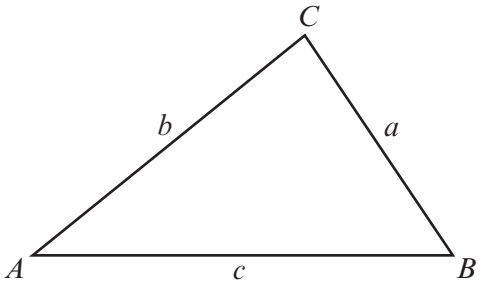


In any triangle ABC

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

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

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



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$ are given by

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

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1. Given that $k = -3$, $m = 7$ and $p = 10$, find the value of the following expressions.

(a) $\dfrac{5(k^2 - m)}{p}$ [2]

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(b) $(2m)^3$ [2]

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2. Find the larger share when £1400 is shared in the ratio of 1 : 4. [2]

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Larger share is £ .....

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3. In 2014, the average amount of paper used per person in China was 74 kg, and in the USA it was 228 kg.

(a) Insert a value, correct to 2 significant figures, in the following statement. [2]

'In 2014, on average, each person in the USA used ..... times as much paper as each person in China.'

.....

.....

(b) Between 55% and 60% of the paper used in the USA is recycled paper.
Insert values, correct to the nearest kg, in the following statement. [2]

'In 2014, of the average 228 kg of paper used by each person in the USA,

between ..... kg and ..... kg of this was recycled paper.'

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4. *(a)*

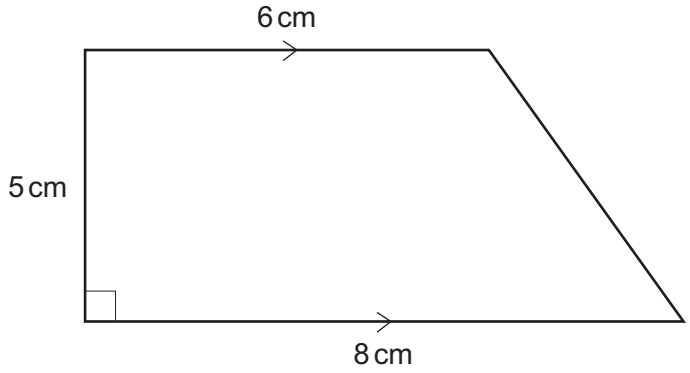

Diagram not drawn to scale

Calculate the area of the trapezium. [2]

Area = ... cm^2

(b) Each exterior angle of a regular polygon is 30°.
How many sides are there in this regular polygon? [2]

Number of sides = ...

(c) A cylinder has a radius of 4 cm and a height of 9 cm.
Calculate the volume of the cylinder. [2]

Volume = ... cm^3

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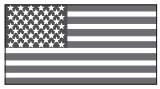
5. Some measures for mass are the same in the USA as they are in the UK.
Some measures are different.

A **pound** is the same measure in both the USA and the UK.
The measures known as **hundredweights** and **tons** are different in the USA and the UK.

1 ton = 20 hundredweight in both the USA and the UK.

USA 	UK 
1 hundredweight = 100 pounds	1 hundredweight = 112 pounds

(a) Complete the statement, [1]

43·5 tons = ... hundredweight

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(b) A truck in the USA carries a load of 28 USA tons. 

A lorry in the UK carries a load of 26 UK tons. 

Calculate the difference between the two loads **in pounds**.
Express this difference as a percentage of the load carried by the USA truck. [4]

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Turn over.

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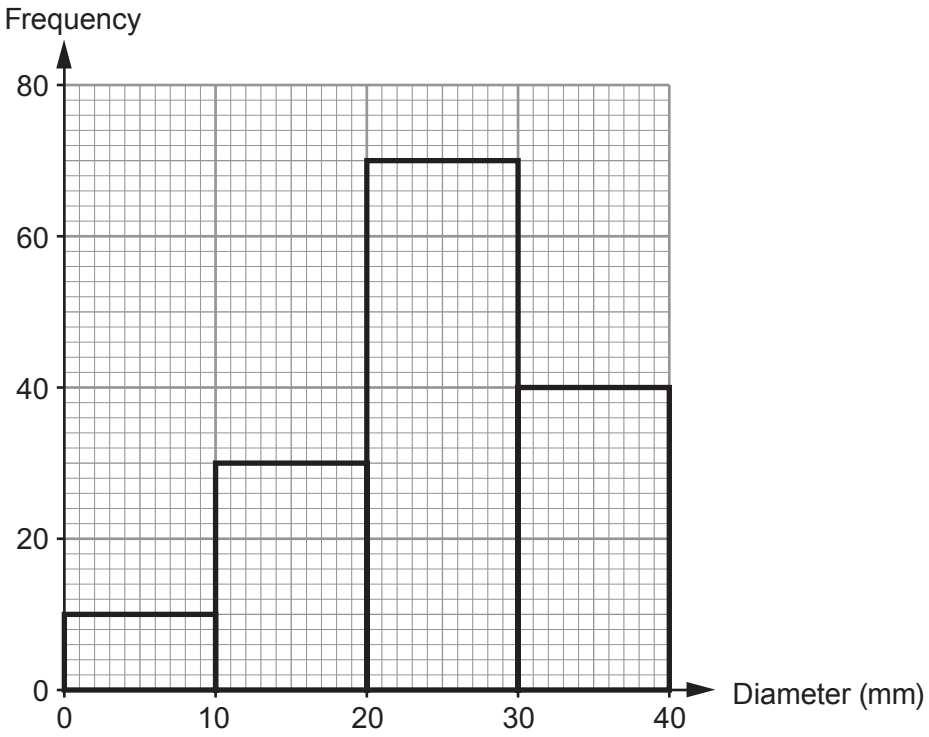
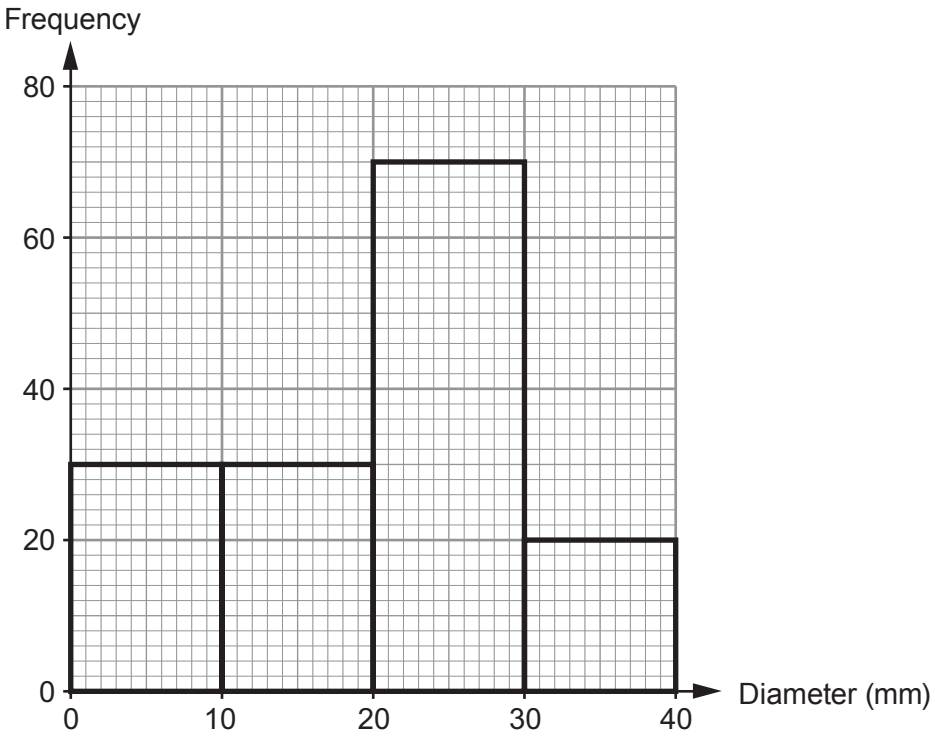
6. One day in November, Bryn and Luke cut some branches off some trees.
The grouped frequency diagrams show the diameters of the branches they cut.

Branches cut by Bryn



Branches cut by Luke



(a) How many of the branches that Luke cut had diameters between 10 mm and 30 mm? [1]

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(b) Who cut more of the branches with the greater diameters on this day? Give a reason for your answer. [1]

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(c) Calculate an estimate for the mean diameter of all the branches that Bryn cut on this day. [5]

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(d) The median diameter of the branches cut by Bryn lies in the group 20 mm to 30 mm. Explain how this can be checked using the frequency diagrams. [1]

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7. The table shows some of the values of $y = 3x^2 + x + 2$ for values of x from –2 to 3.

(a) Complete the table by finding the value of y for x = –1 and x = 2. [2]

x	–2	–1	0	1	2	3
$y = 3x^2 + x + 2$	12		2	6		32

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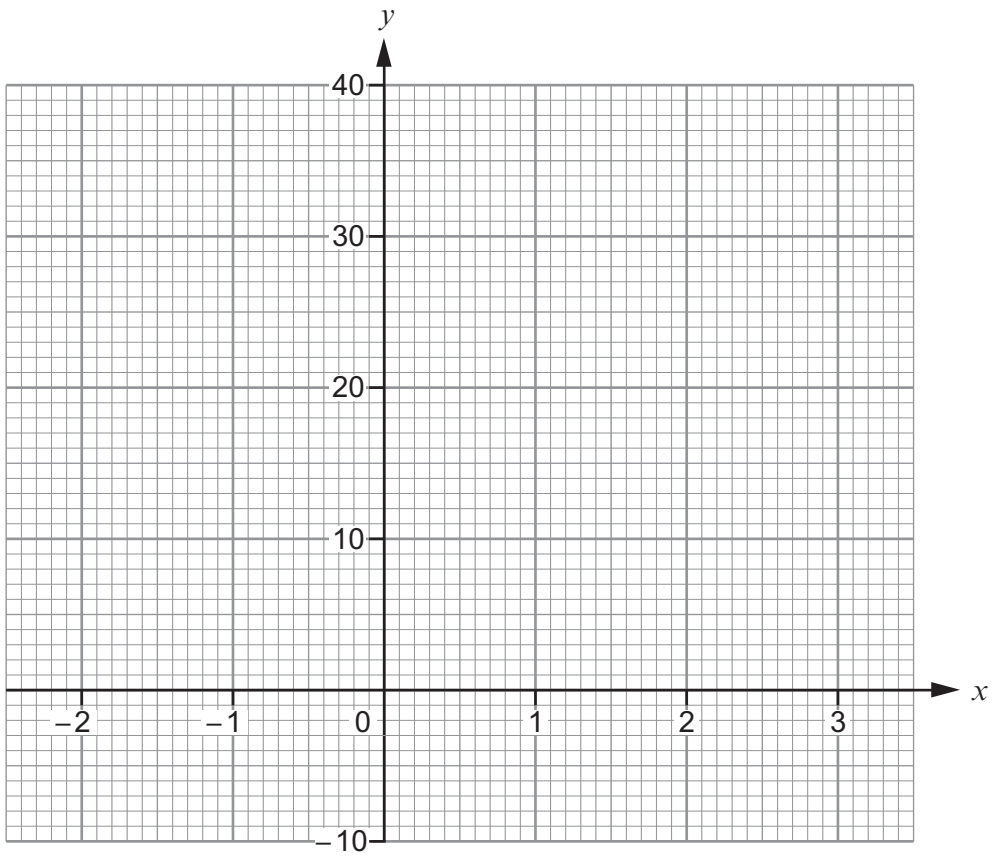
(b) On the graph paper below, draw the graph of $y = 3x^2 + x + 2$ for values of x from –2 to 3. [2]



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(c) Use your graph to solve the equation $3x^2 + x + 2 = 7$. [2]

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8. *You will be assessed on the quality of your written communication in this question.*

The currency in Brazil is known as the Brazilian Real, BRL.

		
Year	Pound (£)	Brazilian Real (BRL)
2010	1	2.86
2014	1	3.71

In 2010, Ava bought £3400 worth of Brazilian Real, BRL.
In 2014, Ava exchanged this money back into pounds.

Did Ava gain or lose money?
State how much money Ava gained or lost, giving your answer correct to the nearest pound.

[7]

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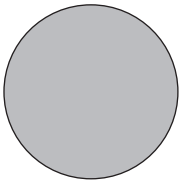
9. Rayner plans to make a circular garden pond.



She has bought 10 metres of edging to place around the circumference of the pond.

Because of where the pond is to be placed, it must have a **diameter** that is a **multiple** of 0·9 m.
Rayner decides to make the largest pond she can with the edging she has bought.

What length of edging will she have left over?
Give your answer in metres, correct to 2 decimal places. [4]

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10. *(a)*

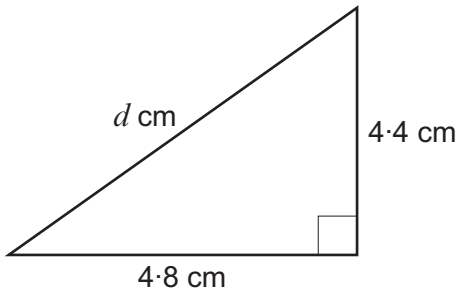

Diagram not drawn to scale

Calculate the value d. [3]

(b)

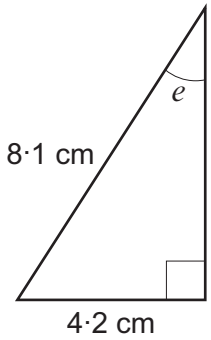

Diagram not drawn to scale

Calculate the size of angle e. [3]

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(c)

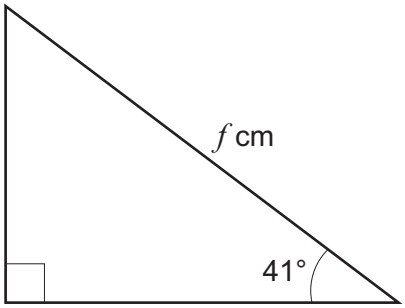

Diagram not drawn to scale

Calculate the value f. [3]

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11. Simplify $5a^2b^3 \times 3a^5b$. [2]

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12. The dimensions and perimeters of two rectangles, G and H, are shown below.

Rectangle G

$(3a + 5b)$ cm

$(2a + 3b)$ cm

Perimeter = 96 cm

Rectangle H

$(3a + b)$ cm

$(a + 3b)$ cm

Perimeter = 69·6 cm

Diagrams not drawn to scale

Freya has written an equation for rectangle G:

$$10a + 16b = 96$$

(a) Write down an equation for rectangle H. [1]

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(b) Use an algebraic method to calculate a and b.
Hence, calculate the dimensions of rectangle H. [5]

Length of rectangle H is ..... cm

Width of rectangle H is ..... cm

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13. Wood pulp is used to make paper.
In 2012, Brazil produced 14 million tons of wood pulp.

In each of the next 3 years, Brazil's production of wood pulp increased by 1·7% of the previous year's production.
After 2015, it is expected that the production of wood pulp will increase by 2% of each previous year's production.

What quantity of wood pulp would you expect Brazil to produce in 2017? [5]

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14. Evaluate the following.
Give your answer in standard form, correct to 2 significant figures. [2]

$$\frac{2{\cdot}4 \times 10^{5}}{3{\cdot}4^{3} + \sqrt{5{\cdot}6 \times 10^{-2}}}$$

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15. One of the two solutions of a quadratic equation is $x = -6$.
The quadratic equation is $x^2 + bx + 12 = 0$, where b is an integer.
Find the other solution of the equation.
You must show all your working. [3]

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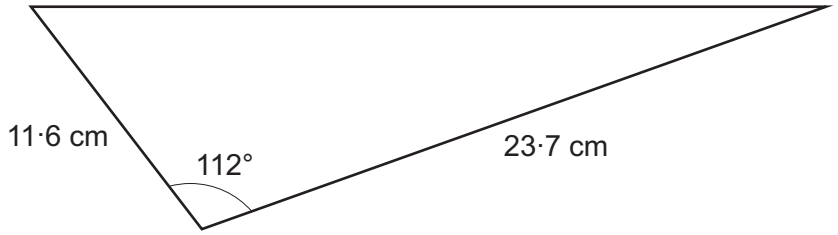

Diagram not drawn to scale

Calculate the area of the triangle. [2]

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17. The arrows shown below are similar.

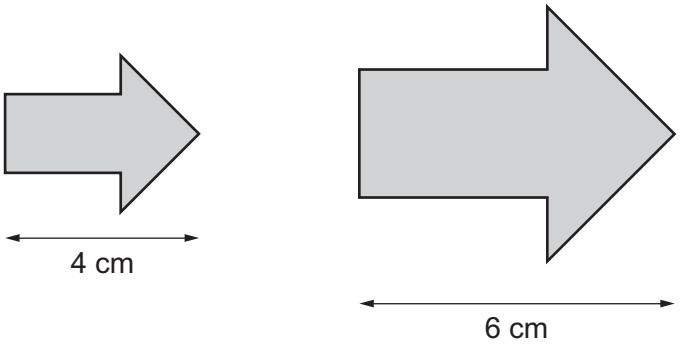

Diagram not drawn to scale

The area of the smaller arrow is $7{\cdot}6\,cm^2$.
Calculate the area of the larger arrow. [3]

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Area of the larger arrow is ..... cm^2

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18. Use the quadratic formula to solve the following equation.
Give your answers correct to 2 decimal places. [3]

$$4x^2 + 7x - 5 = 0$$

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19. *(a)* You are given that y is inversely proportional to x^2, and that $y = 50$ when $x = 3$. Find an expression for y in terms of x. [3]

(b) Use the expression you found in *(a)* to complete the following table. [1]

x	$\frac{1}{2}$	3
y		50

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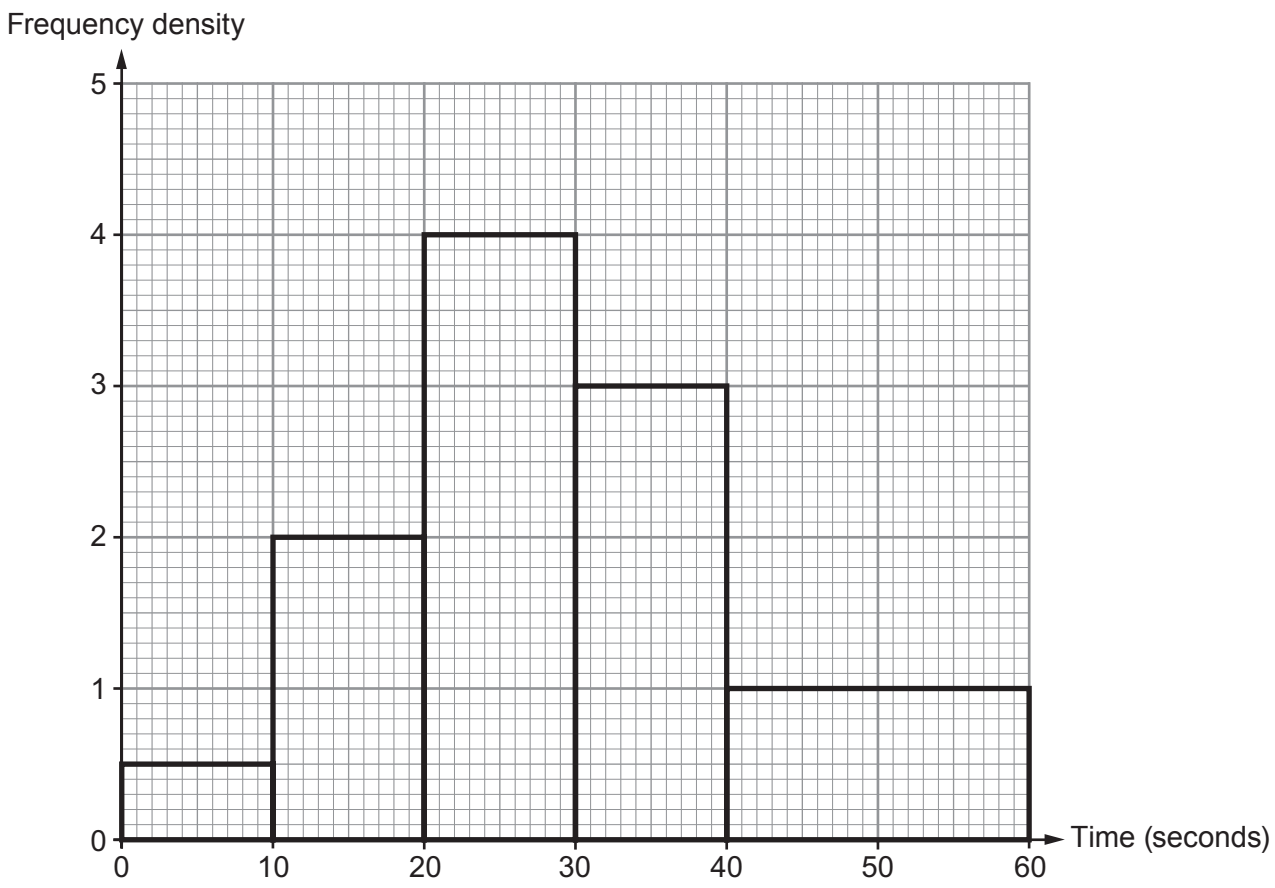
20. A cinema investigates the time taken for people to be served at the pay desk.
They carried out a survey between 2 p.m. and 2:30 p.m. on a Thursday.
The histogram shows the results of the survey.



(a) How many people were served at the pay desk? [3]

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..... people

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(b) Calculate an estimate for the number of people who were served in less than 12·5 seconds. [2]

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..... people

(c) The cinema target is to serve 80% of people in less than 40 seconds per person. How many more people than the target were served in less than 40 seconds? [3]

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..... extra people above the target

TURN OVER

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21.

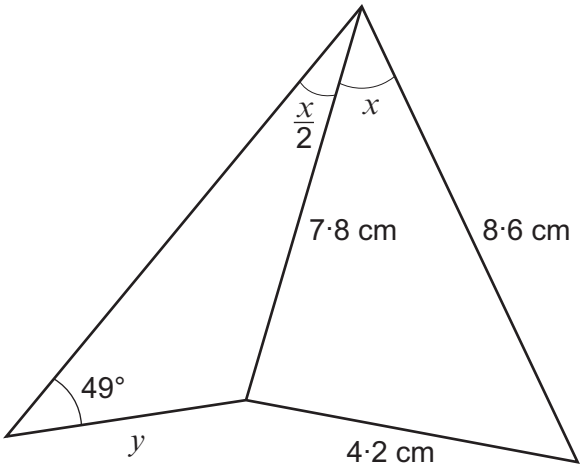

Diagram not drawn to scale

Calculate the length y. [7]

END OF PAPER

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Question number	Additional page, if required. Write the question number(s) in the left-hand margin.

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