



General Certificate of Secondary Education  
November 2025

Centre Number

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Candidate Number

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# Mathematics

Unit M4  
(With calculator)

Higher Tier

[GMC41]



\*GMC41\*

**TUESDAY 18 NOVEMBER, 9.15am–11.15am**

## TIME

2 hours.

## INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

**You must answer the questions in the spaces provided.**

**Do not write outside the boxed area on each page or on blank pages.**

Complete in black ink only. **Do not write with a gel pen.**

Questions which require drawing or sketching should be completed using an HB pencil. All working **must** be clearly shown in the spaces provided. Marks may be awarded for partially correct solutions.

You **may** use a calculator for this paper.

Answer **all twenty-four** questions.

## INFORMATION FOR CANDIDATES

The total mark for this paper is 100.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

You should have a calculator, ruler, compasses and a protractor.

The Formula Sheet is on page 2.

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\*32GMC4101\*

# Formula Sheet

**Volume of prism** = area of cross section  $\times$  length



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



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

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

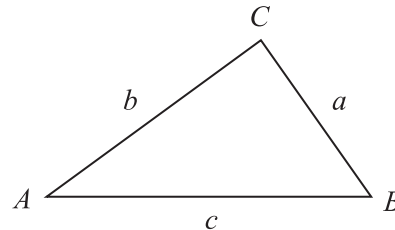


**Volume of cone** =  $\frac{1}{3}\pi r^2 h$

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



**In any triangle ABC**



## Quadratic Equation

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

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

**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** =  $\frac{1}{2} ab \sin C$





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**(Questions begin overleaf)**

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\*32GMC4103\*

1 Claire bought bonds at a cost of £2500

The “return on investment” value is the percentage profit she made.

Claire sold the bonds a year later for a total of £2850

What was her “return on investment” value?

**Show your working out clearly.**

Answer \_\_\_\_\_ % [2]



2 In March, a household electricity bill was £340

In June, the electricity bill was 15% less than in March.

In September, the electricity bill was 15% more than in June.

How much **less** was the bill in September than the bill in March?

Answer £ \_\_\_\_\_ [4]

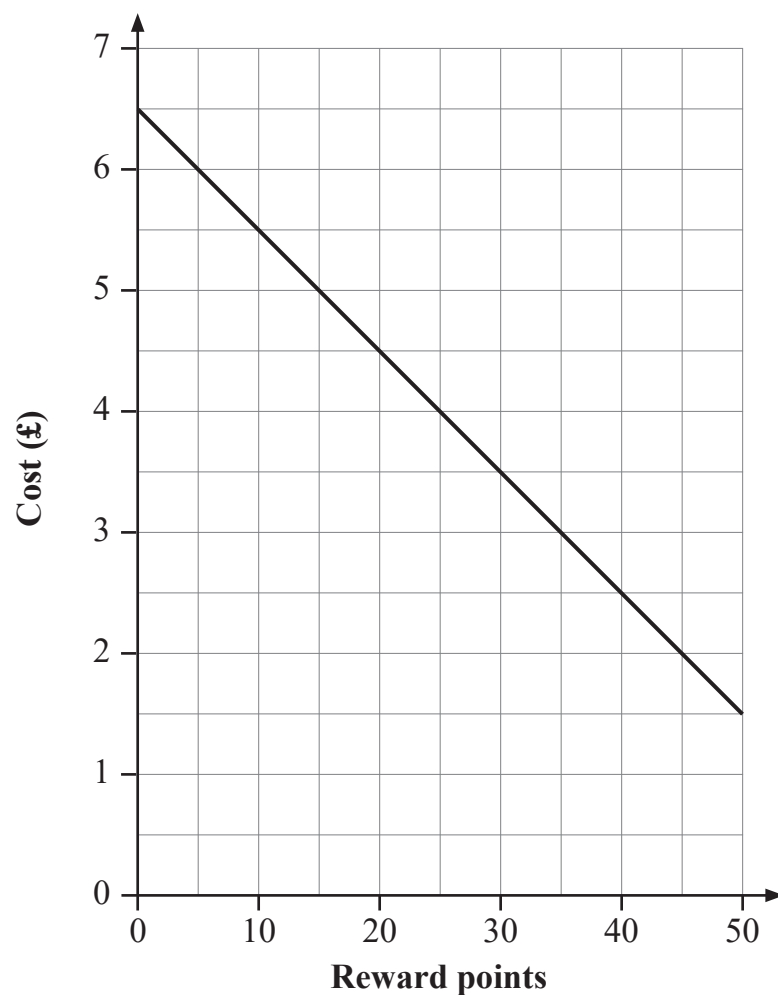
[Turn over



3 A supermarket offers discounts for customers who have collected reward points.

The graph shows the price of a tin of biscuits with reward points.

Customers can use a maximum of 50 reward points for each tin of biscuits.



(a) How much does a tin of biscuits cost with no reward points?

Answer £ \_\_\_\_\_ [1]



(b) How much is each reward point worth in pence?

Answer \_\_\_\_\_ p [2]

(c) A customer wants to buy two tins of biscuits.

They have 85 reward points.

How much will they have to pay in total?

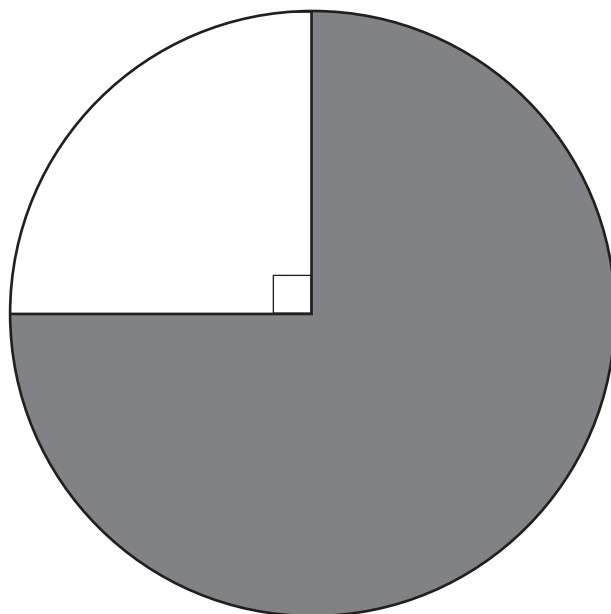
Answer £ \_\_\_\_\_ [2]

[Turn over



4 The circle below has a diameter of 8 cm.

Calculate the shaded area.



Answer \_\_\_\_\_  $\text{cm}^2$  [3]



5 150 expressed as a product of prime factors is  $2 \times 3 \times 5^2$

What is the smallest number that 150 can be multiplied by to give a **square** number?

Answer \_\_\_\_\_ [2]



6 Calculate the perimeter of the shape shown.

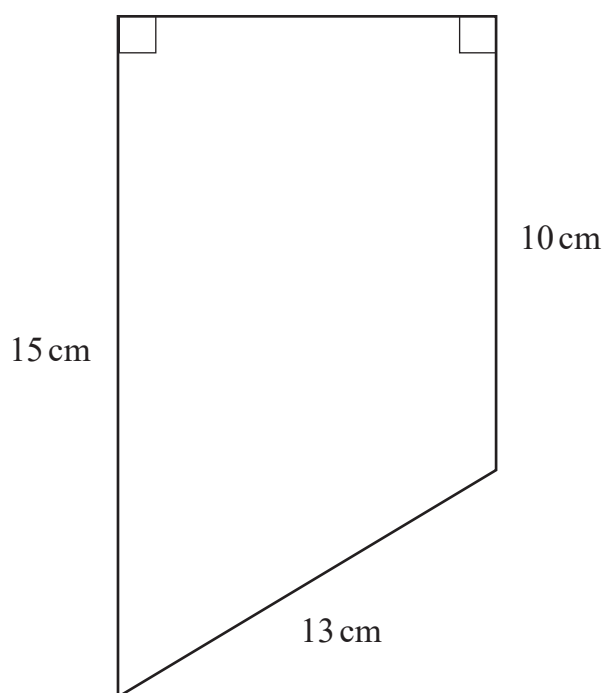


diagram  
not drawn  
accurately

Show your working out clearly.

Answer \_\_\_\_\_ cm [4]



7 The grouped frequency table shows the journey times to school for pupils.

Time $t$ (minutes)	Frequency		
$10 \leq t < 20$	13		
$20 \leq t < 30$	23		
$30 \leq t < 40$	9		
$40 \leq t < 50$	5		

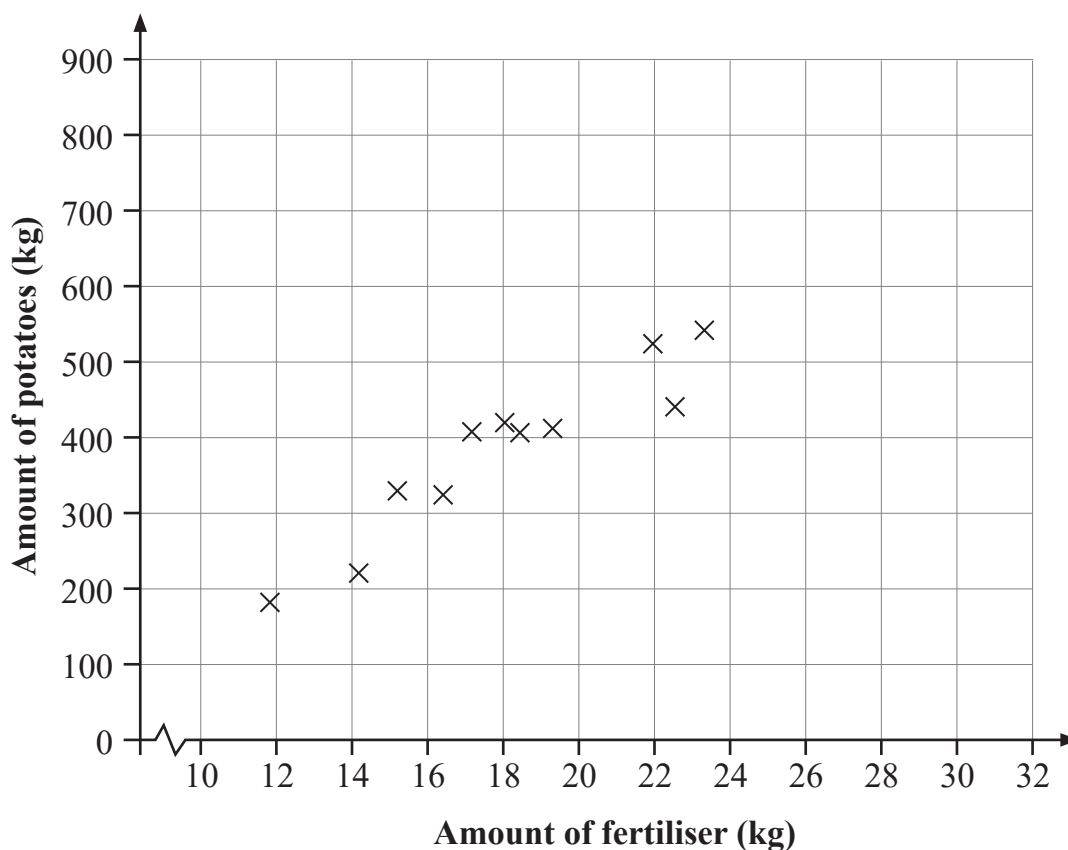
Calculate an estimate for the mean journey time to school for pupils.

Answer \_\_\_\_\_ minutes [4]

[Turn over



- 8 The scatter graph shows positive correlation between the amount of potatoes produced (kg) and the amount of fertiliser used (kg).



Zara suggests drawing a line of best fit to estimate the amount of potatoes produced when the amount of fertiliser used is 32 kg.

- (a) Give a statistical reason why this would not be recommended.

\_\_\_\_\_ [1]

- (b) Suggest an amount of fertiliser for which a line of best fit could be used.

Answer \_\_\_\_\_ kg [1]



9

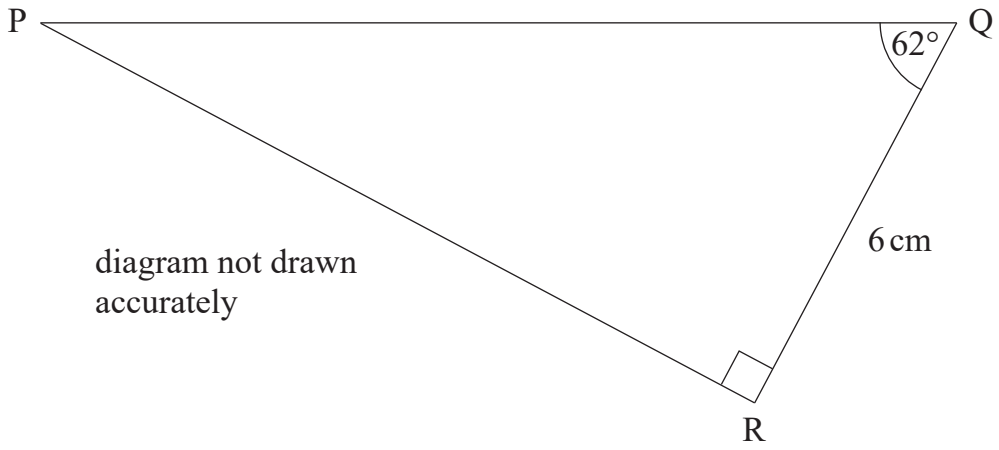


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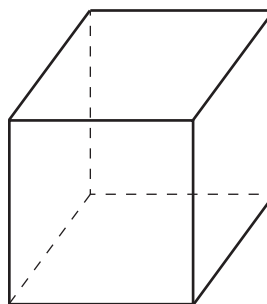
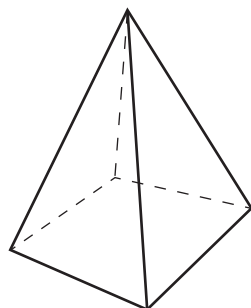
Calculate the length of PQ.

Answer \_\_\_\_\_ cm [3]

[Turn over



10 A square-based pyramid and a cube both exert the same **pressure** on the ground.



The cube exerts a force of 560 N.

The pyramid exerts a force of 140 N.

The length of the sides of the cube is 5 cm.

Calculate the length of the sides of the square base of the pyramid.

Answer \_\_\_\_\_ cm [3]



11 The percentage scores in a Maths test were analysed.

The maximum score was 98%

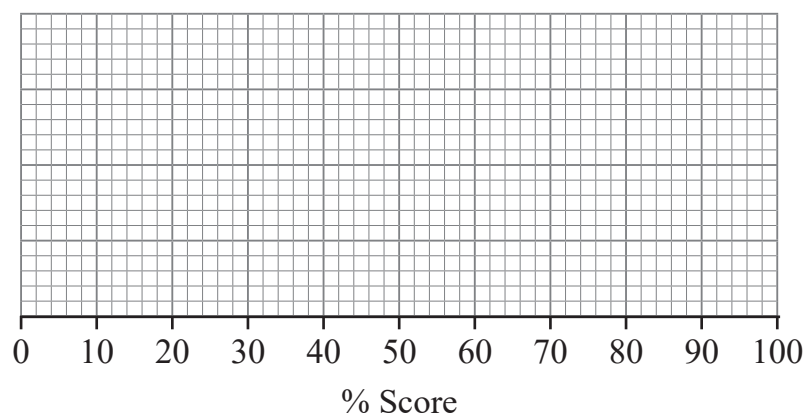
The median score was 36%

The upper quartile was 54%

The range was 82%

The interquartile range was 30%

(a) Draw a box plot to represent this data set.



[4]

(b) Explain why the interquartile range is more representative of the data set than the range.

Answer \_\_\_\_\_

\_\_\_\_\_ [1]

[Turn over



12 A rectangular pitch has length  $(4x - 1)$  and width  $(2x + 5)$ .

Find an expression for the area of the pitch.

Expand and simplify your answer.

Answer \_\_\_\_\_ [2]



13 Factorise

(a)  $c^2 - 12c + 27$

Answer \_\_\_\_\_ [2]

(b)  $t^2 - 64$

Answer \_\_\_\_\_ [1]

[Turn over



14 Solve the equation

$$\frac{3x-1}{2} - \frac{1}{3} = \frac{4x-3}{3}$$

Answer  $x =$  \_\_\_\_\_ [4]

15 A car depreciated in value by 6.2%

The value is now £22 512

What was the value before the depreciation?

Answer £ \_\_\_\_\_ [3]



16 Find the equation of the straight line passing through the points (0, 8) and (6, -4).

Give your answer in the form  $y = mx + c$

Answer \_\_\_\_\_ [3]



17

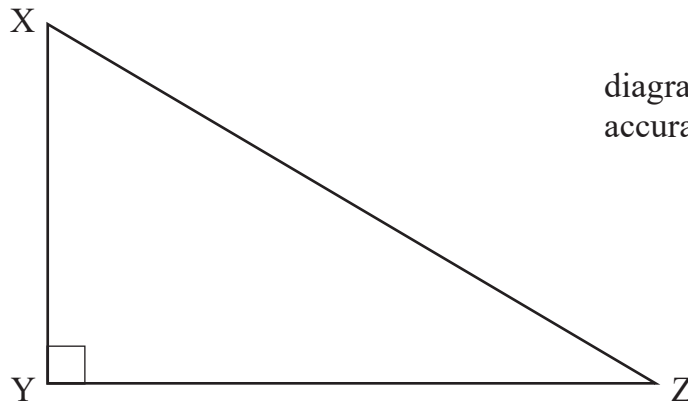


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For the triangle XYZ the following measurements are given.

$XZ = 4.68$  cm correct to 3 significant figures.

$XY = 2.7$  cm correct to 1 decimal place.

Calculate the upper bound for the length of YZ.

Answer \_\_\_\_\_ cm [4]



18 Line L passes through the points  $(3, -2)$  and  $(9, -1)$ .

Line K passes through the points  $(d, 23)$  and  $(-1, 5)$ .

Lines L and K are perpendicular.

Find the value of  $d$ .

Answer  $d =$  \_\_\_\_\_ [4]

[Turn over



19 The diagram shows a shape made from two rectangles.

All lengths are given in cm.

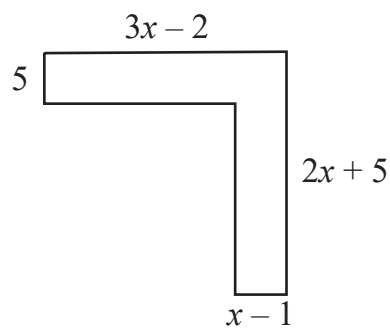


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The area of the shape is  $122 \text{ cm}^2$

By setting up and solving a quadratic equation find the value of  $x$

Answer  $x =$  \_\_\_\_\_ [5]



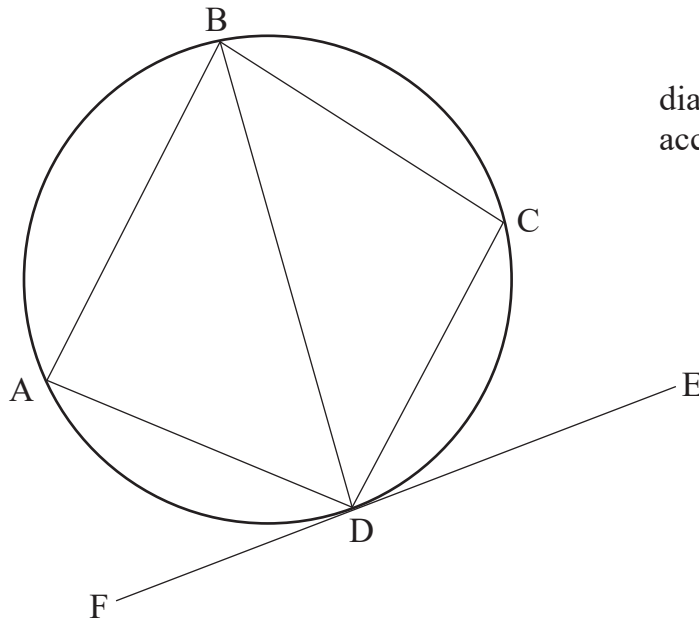


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A, B, C and D are points on the circumference of a circle.

EF is a tangent to the circle.

Angle BAD =  $88^\circ$

Angle CBD =  $27^\circ$

(a) Angle BCD = \_\_\_\_\_  $^\circ$  because \_\_\_\_\_  
\_\_\_\_\_ [2]

(b) Angle CDE = \_\_\_\_\_  $^\circ$  because \_\_\_\_\_  
\_\_\_\_\_ [2]

(c) Explain why BD cannot be a diameter of the circle.  
\_\_\_\_\_  
\_\_\_\_\_ [2]

[Turn over



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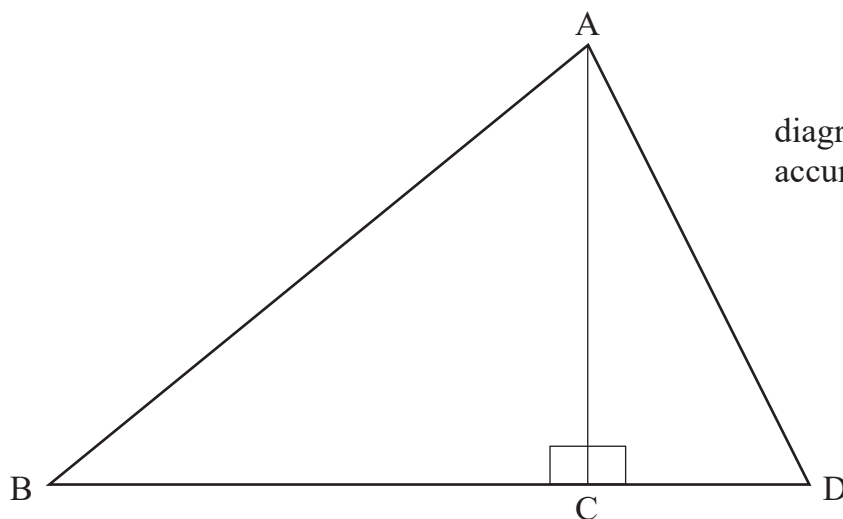


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Angle CAD =  $36^\circ$

AD = 9.5 cm

AC is 5 cm shorter than AB

Work out the size of angle ABC. Give your answer to 1 decimal place.

Answer \_\_\_\_\_  $^\circ$  [5]

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22 (a) Factorise fully

$$3ax^2 - 108ay^2$$

Answer \_\_\_\_\_ [3]

(b) Hence, simplify

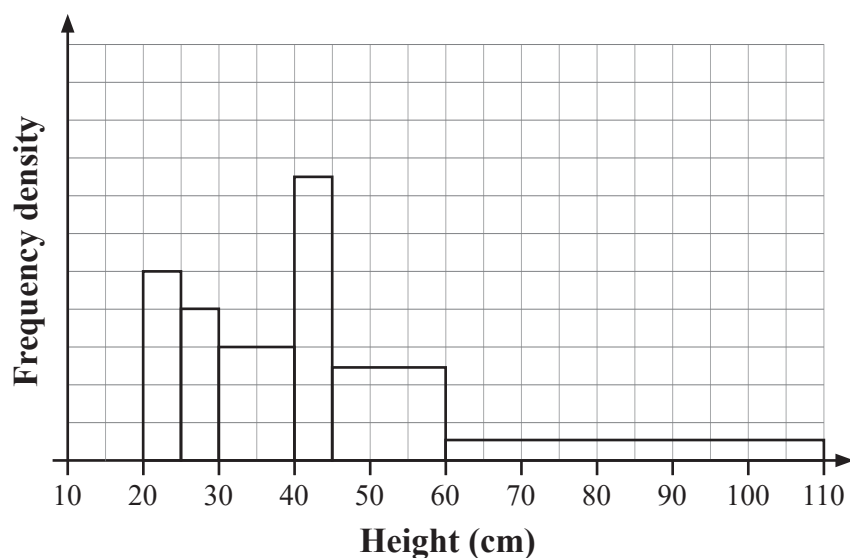
$$\frac{3ax^2 - 108ay^2}{5x^2 + 30xy} \div \frac{6a^2}{3x^2 - 2x}$$

Answer \_\_\_\_\_ [3]

[Turn over



23 The histogram gives information about the heights of some plants.



The number of plants with a height between 45 cm and 60 cm is 25 more than the number of plants with a height between 20 cm and 25 cm.

(a) Calculate the total number of plants represented by the histogram.

Answer \_\_\_\_\_ [4]



(b) (i) Calculate an estimate for the median height.

Answer \_\_\_\_\_ cm [3]

(ii) Give a reason why your answer for the median height is only an estimate.

\_\_\_\_\_ [1]

(c) A stratified sample of 80 plants is taken from this data.

Calculate an estimate for how many plants in the stratified sample have height more than 55 cm.

Answer \_\_\_\_\_ [3]

[Turn over



24 Solve the equation

$$\frac{4}{p-1} - \frac{5}{2p+1} = \frac{2}{3}$$

Give your answers to 2 decimal places.

Answer  $p =$  \_\_\_\_\_ [7]





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<b>Total Marks</b>	
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