



General Certificate of Secondary Education  
November 2025

Centre Number

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Candidate Number

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# Mathematics

Unit M3  
(With calculator)

Higher Tier

[GMC31]



\*GMC31\*

**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 thirty-one** 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.

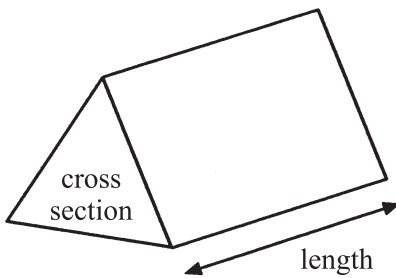
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\*32GMC3101\*

# 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** =  $4\pi r^2$

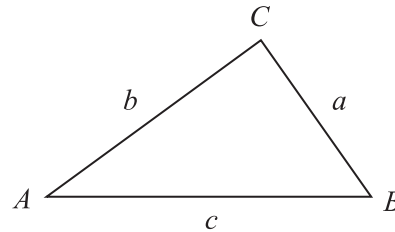


**Volume of cone** =  $\frac{1}{3}\pi r^2 h$

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



1 Work out the value of  $2^3 + 3^2$

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

2 Kasper wants to set a new 4-digit passcode for his phone.

He wants the first 2 digits to be a prime number between 20 and 30

He wants the last 2 digits to be a square number between 20 and 30

Write down both passcodes that he could use.

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

[Turn over

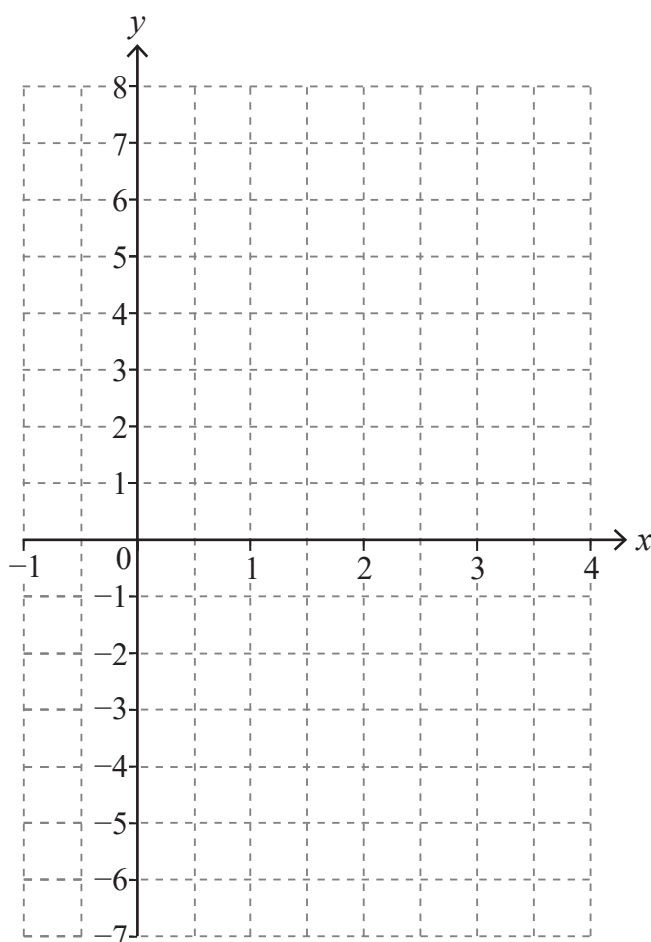


3 (a) (i) Complete the table for  $y = 3x - 2$

$x$	-1	0	1	2	3
$y$	-5				7

[1]

(ii) On the grid below, draw the graph of  $y = 3x - 2$



[2]

(b) Solve the equation  $3x - 2 = 5.5$

Answer  $x =$  \_\_\_\_\_ [2]



4 (a) Claire bought 350 bonds at a cost of £4.20 per bond.

Later she bought another 200 bonds, but cannot remember how much she paid per bond.

The total amount she paid for all the bonds was £2500

Calculate how much Claire paid per bond when she bought the 200 bonds.

**Show your working out clearly.**

Answer £ \_\_\_\_\_ [4]

(b) The “return on investment” value is the percentage profit Claire made.

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

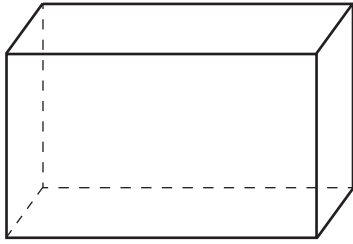
What was her “return on investment” value?

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

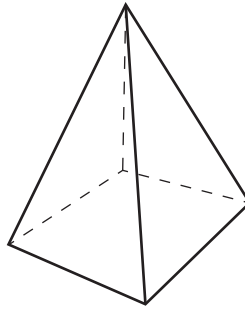
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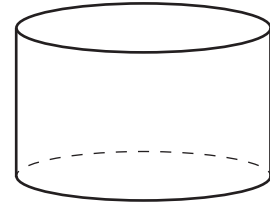
5



Shape A



Shape B



Shape C

(a) What is the mathematical name of Shape A?

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

(b) Complete the sentences.

(i) Shape B has \_\_\_\_\_ edges. [1]

(ii) Shape B has \_\_\_\_\_ vertices. [1]

(c) Complete the sentence with the correct shape.

A net of Shape C would consist of 2 circles and a

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



6 The six angles in two different triangles are listed in descending order.

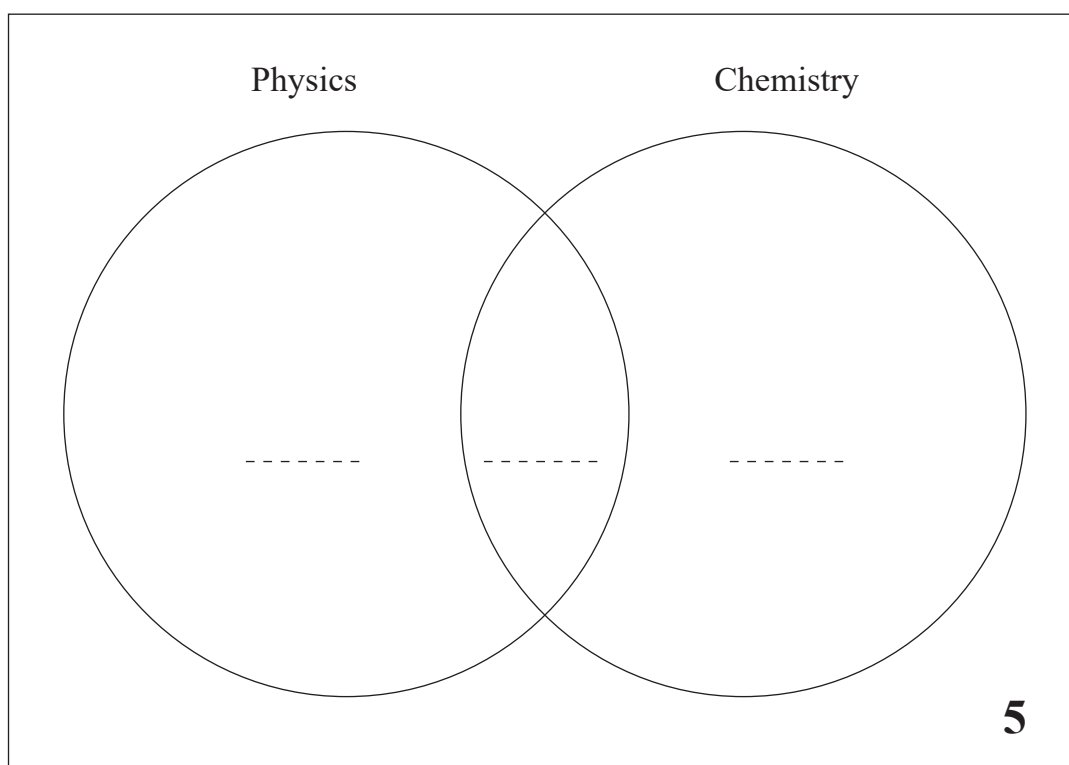
The first four angles are  $120^\circ$   $80^\circ$   $72^\circ$   $40^\circ$

Find the size of the **smallest** angle that would complete the list.

Answer \_\_\_\_\_  $^\circ$  [3]



7



The Venn diagram represents 50 students.

12 students study Physics but not Chemistry.

28 students study Physics.

Complete the Venn diagram to find the number of students who study Chemistry but not Physics.

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



8 Pupils were asked to vote for how much homework they should get each week.

85 voted to have homework every night

105 voted not to have homework at all

110 voted to have homework on three nights per week

What percentage of pupils voted not to have homework at all?

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

9 Use your calculator to find the value of

$$\frac{47.8 - 4.5^2}{15.6 + 4.85}$$

Round your answer to 2 decimal places.

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

[Turn over



10 At a sports match

$\frac{5}{8}$  of the crowd supported the home team

$\frac{1}{3}$  of the crowd supported the away team

The rest of the crowd did not support either team.

What fraction of the crowd did not support either team?

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



11 A property developer bought a house for £84 000

He sold the house, making a profit of 12%

How much did he sell the house for?

Answer £ \_\_\_\_\_ [3]



12 A quadrilateral has angles as shown in the diagram below.

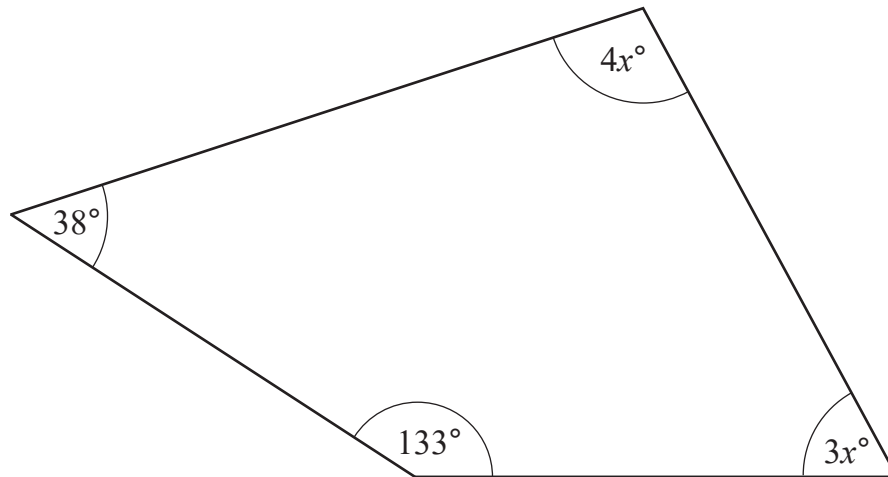


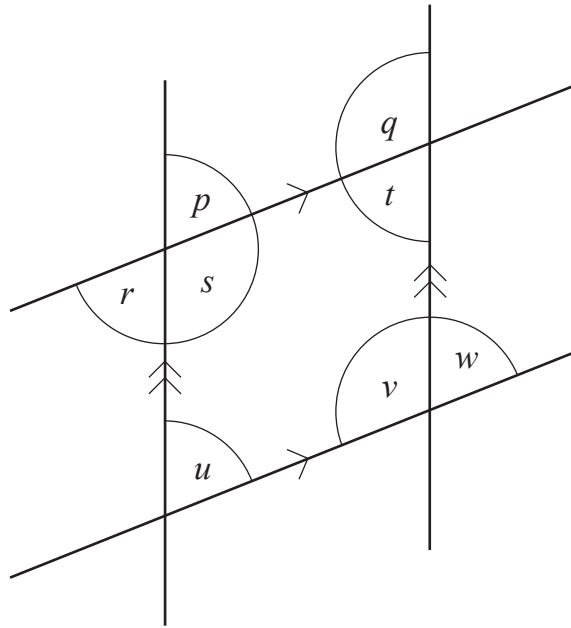
diagram  
not drawn  
accurately

Find the value of  $x$

**Show your working out clearly.**

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



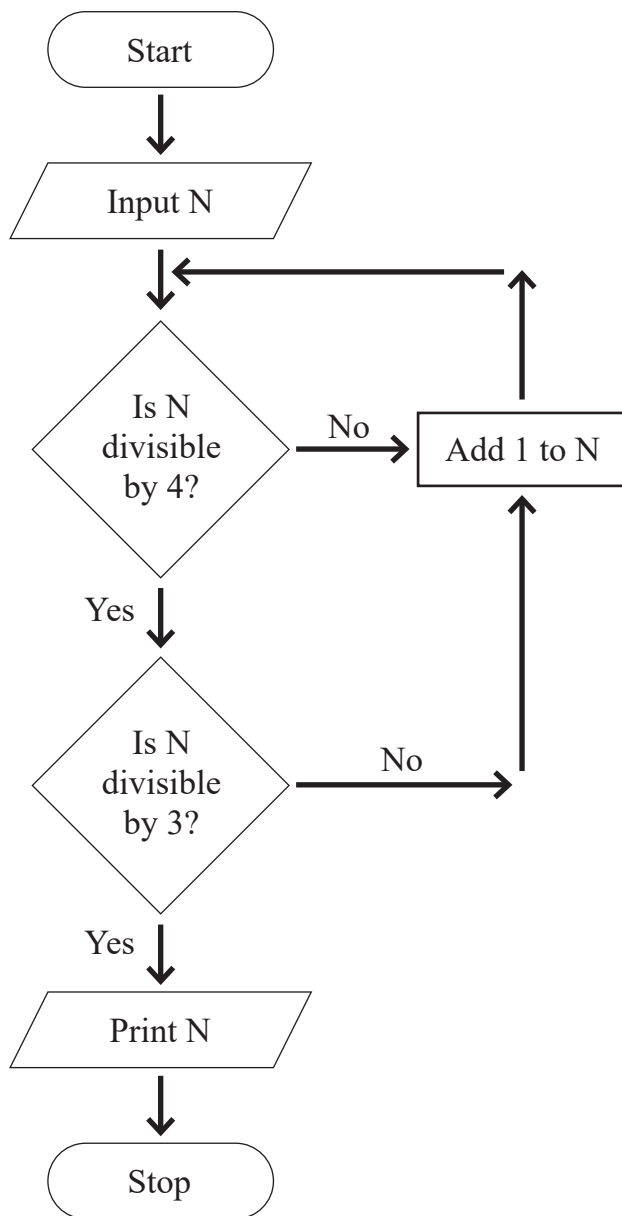


- (a) Name an angle alternate to angle  $r$                       Answer \_\_\_\_\_ [1]
- (b) Name an angle corresponding to angle  $u$                       Answer \_\_\_\_\_ [1]
- (c) What is the sum of angle  $t$  and angle  $v$ ?                      Answer \_\_\_\_\_ ° [1]

[Turn over



14 (a) Starting with  $N = 31$ , use the flow chart to find the number printed.

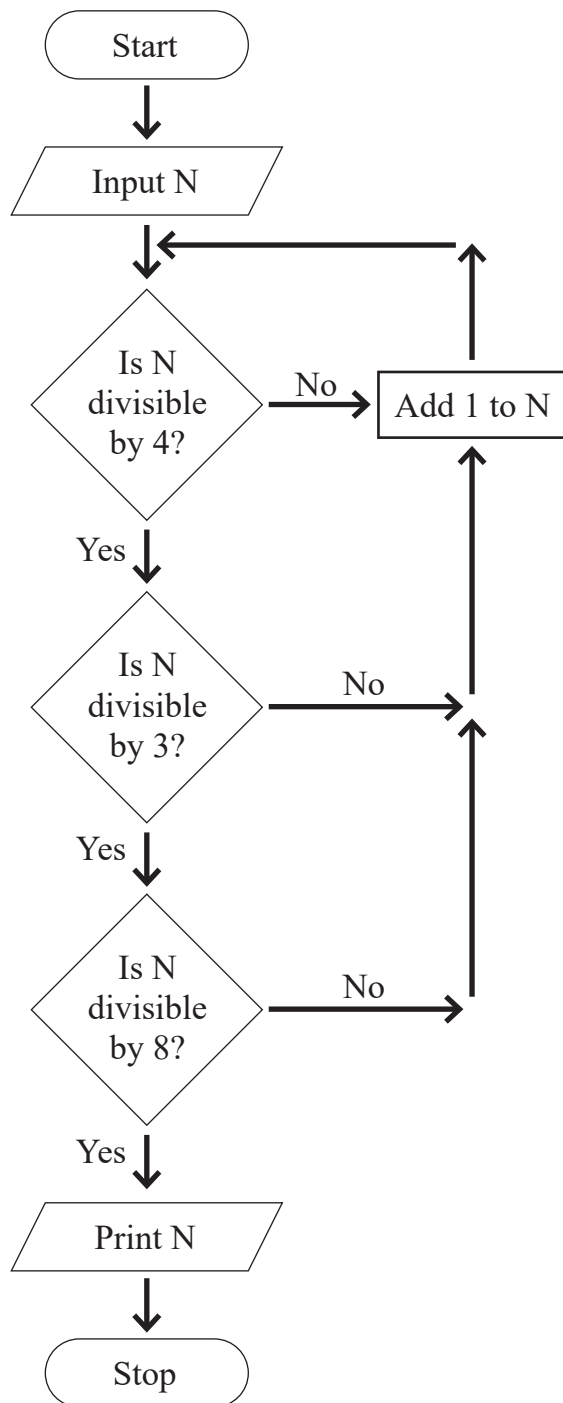


Answer \_\_\_\_\_ [2]



(b) A third decision box is added.

Starting with  $N = 31$ , find the number printed now.



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

[Turn over



- 15 Barbara wants to investigate the number of hours adults spend on social media. She gives a questionnaire to a random sample of 60 members of a pensioners' club. One of the questions is shown below.

How many hours do you spend on social media?	
1 – 5	<input type="checkbox"/>
5 – 10	<input type="checkbox"/>
10 – 20	<input type="checkbox"/>

- (a) Give **one** criticism of the **sample** she has selected.

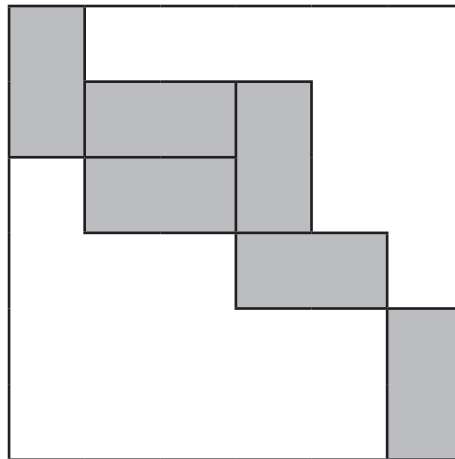
Answer \_\_\_\_\_  
\_\_\_\_\_ [1]

- (b) Give **two** criticisms of the **questionnaire**.

1 \_\_\_\_\_  
\_\_\_\_\_  
2 \_\_\_\_\_  
\_\_\_\_\_ [2]



16 Six equal rectangles are placed inside a square of side 60 cm as shown in the diagram.



Calculate the area of the **unshaded** part of the square.

**Show your working out clearly.**

Answer \_\_\_\_\_ cm<sup>2</sup> [4]

[Turn over



17 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]

18 150 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]





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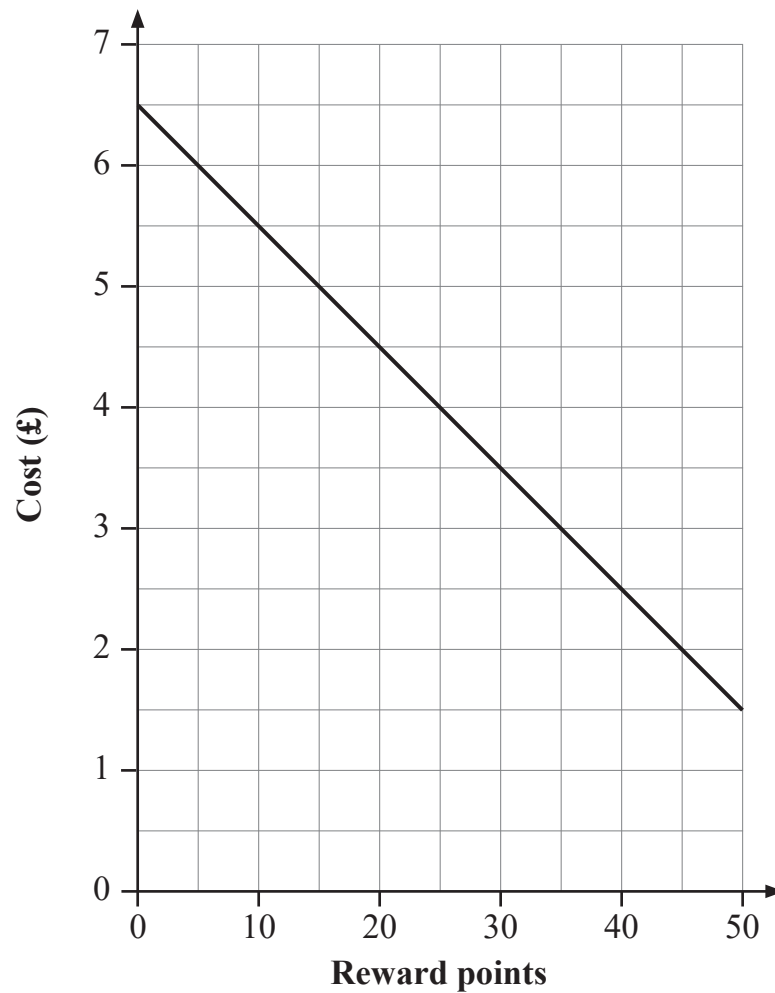


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19 A supermarket offers discounts for customers who have collected reward points.

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?

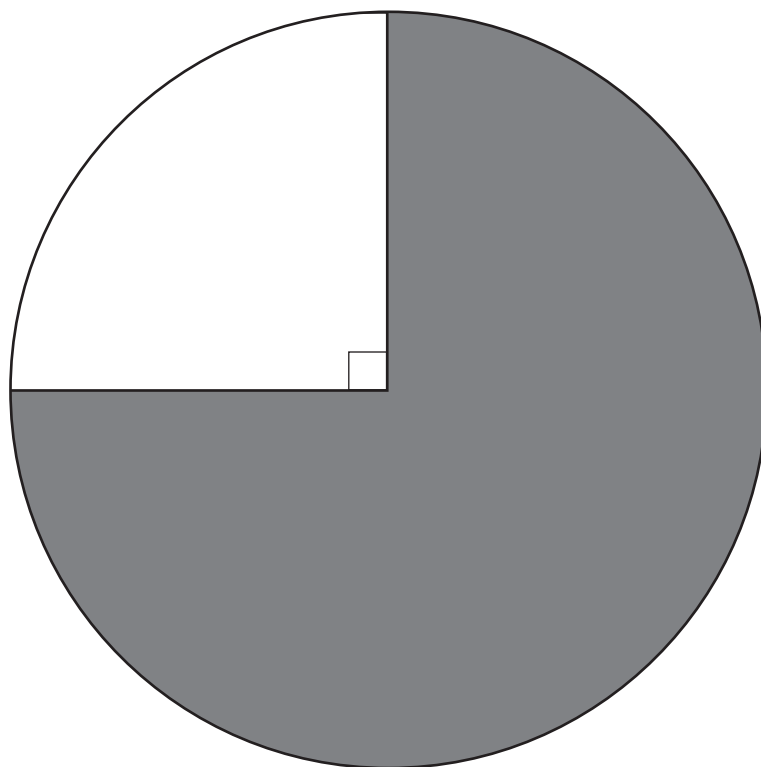
Answer £ \_\_\_\_\_ [2]

[Turn over



20 The circle below has a diameter of 8 cm.

Calculate the shaded area.



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



21 Calculate the perimeter of the shape shown.

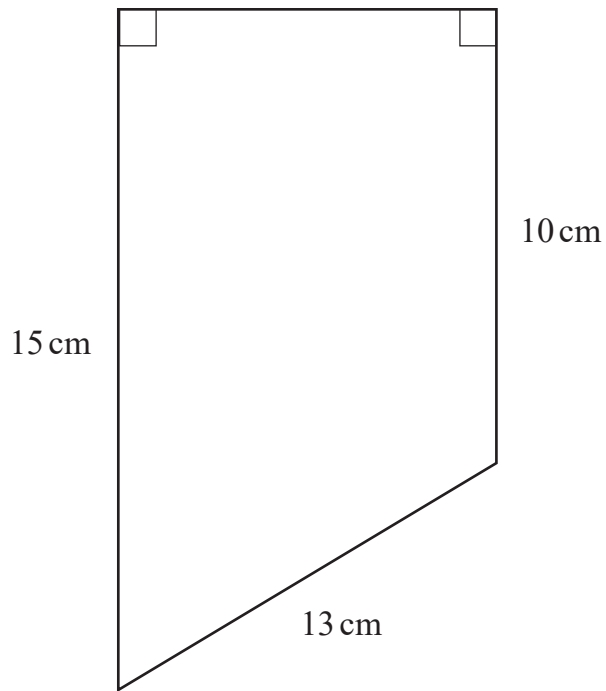


diagram  
not drawn  
accurately

Show your working out clearly.

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

[Turn over



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

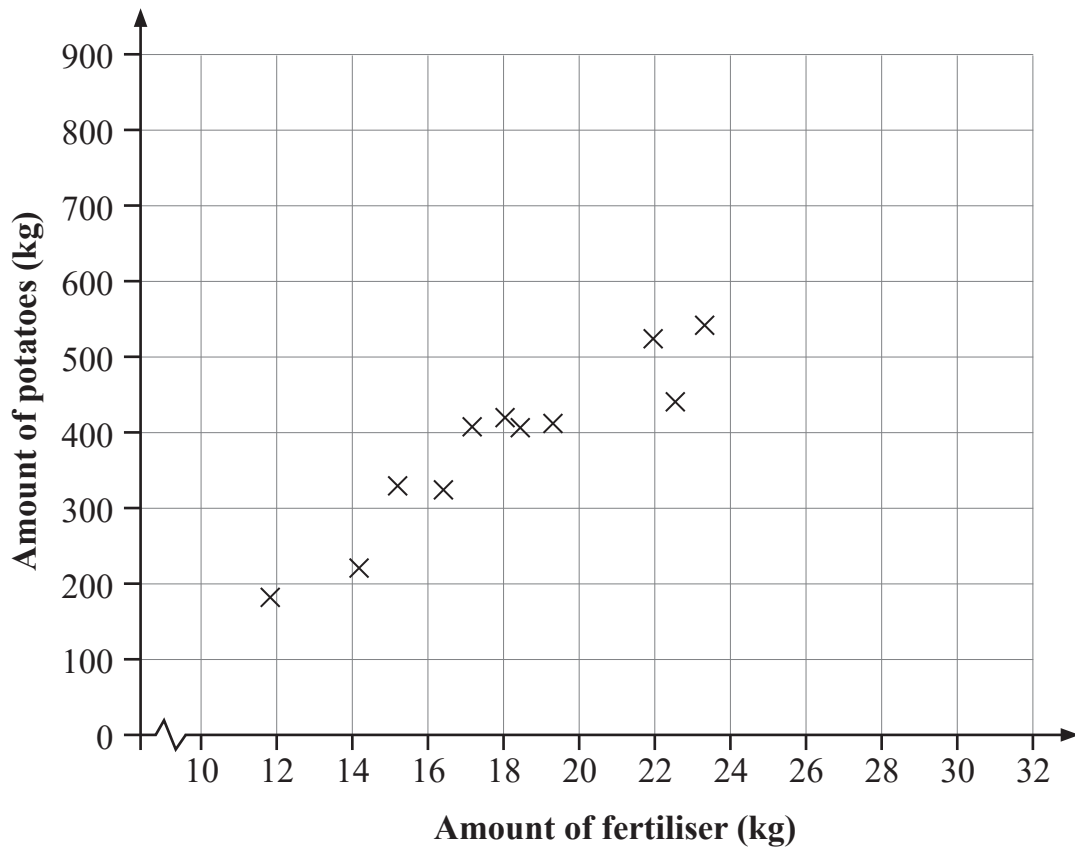
Time $t$ (minutes)	Frequency		
$10 \leq t < 20$	13		
$20 \leq t < 30$	23		
$30 \leq t < 40$	9		
$40 \leq t < 50$	5		

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

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



- 23 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]

[Turn over



24

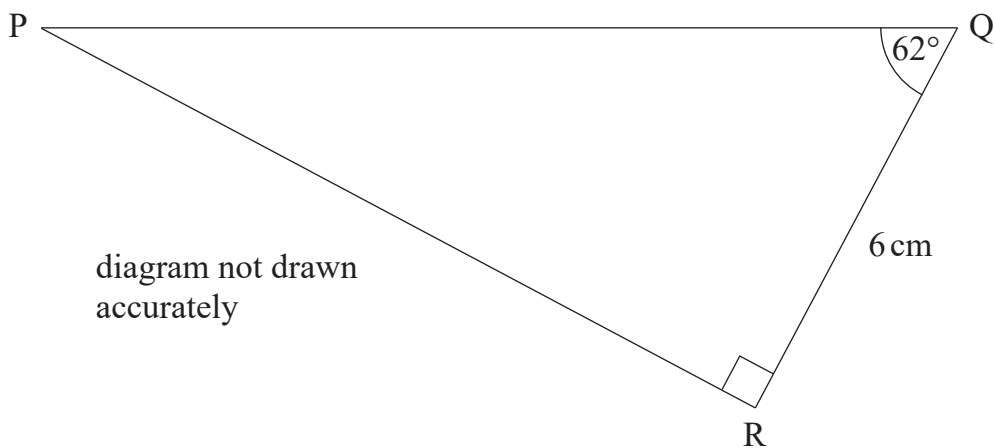


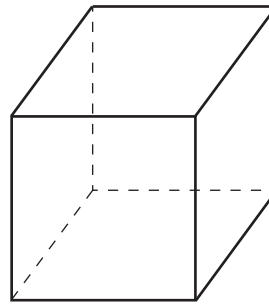
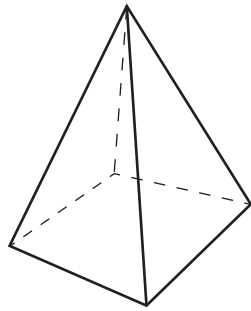
diagram not drawn  
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Calculate the length of PQ.

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



25 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]

[Turn over



26 The percentage scores in a Maths test were analysed.

The maximum score was 98%

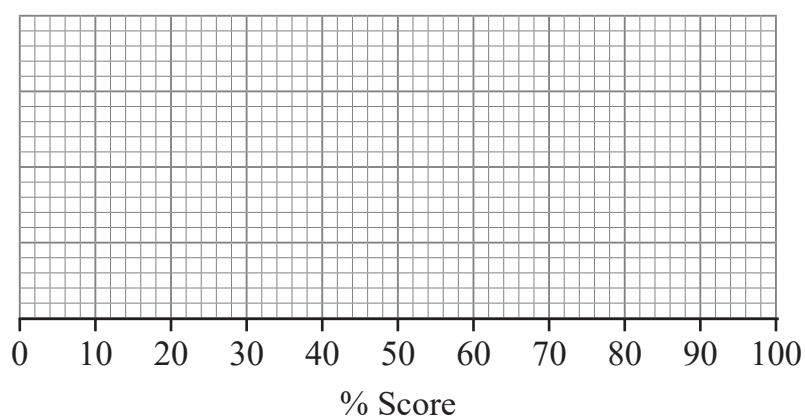
The median score was 36%

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]



27 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]

28 Factorise

$$c^2 - 12c + 27$$

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

[Turn over



29 Solve the equation

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

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

30 A car depreciated in value by 6.2%

The value is now £22 512

What was the value before the depreciation?

Answer £ \_\_\_\_\_ [3]



31 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]

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**THIS IS THE END OF THE QUESTION PAPER**

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Question Number	Marks
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<b>Total Marks</b>	
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