



General Certificate of Secondary Education
2025

Centre Number

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Candidate Number

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Mathematics

Unit M4
(With calculator)

Higher Tier

[GMC41]



GMC41

THURSDAY 15 MAY, 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-two** 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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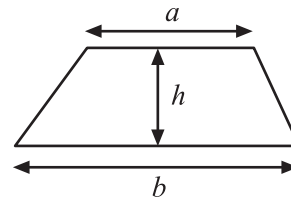
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Formula Sheet

Volume of prism = area of cross section \times length

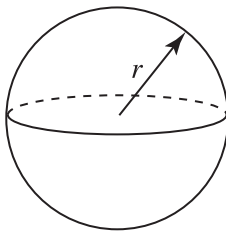


Area of trapezium = $\frac{1}{2}(a+b)h$



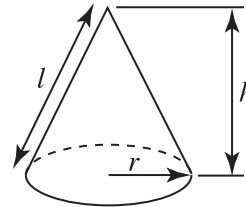
Volume of sphere = $\frac{4}{3}\pi r^3$

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

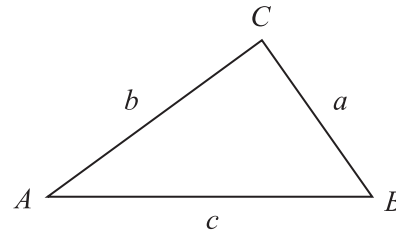


Volume of cone = $\frac{1}{3}\pi r^2 h$

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 ABCD is a square of side 60 cm.

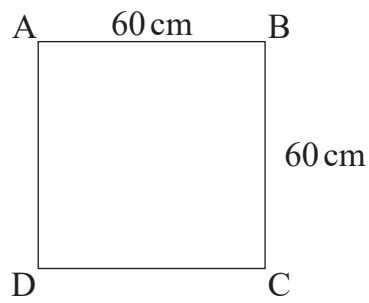


diagram not drawn accurately

The lengths of AB and DC are **increased** by 15% and the lengths of BC and AD are **decreased** by 20% to form a rectangle.

State whether the **perimeter** has increased or decreased, and by what percentage.

Answer Perimeter has _____ by _____ % [6]

[Turn over



2 (a) Calculate the midpoint of the line joining the points (0, 6) and (2, 14).

Answer (_____ , _____) [2]

(b) Find the equation of the straight line joining the points (0, 6) and (2, 14).

Answer _____ [3]



3 Solve $\frac{4a - 2}{3} = 8$

Answer $a =$ _____ [3]

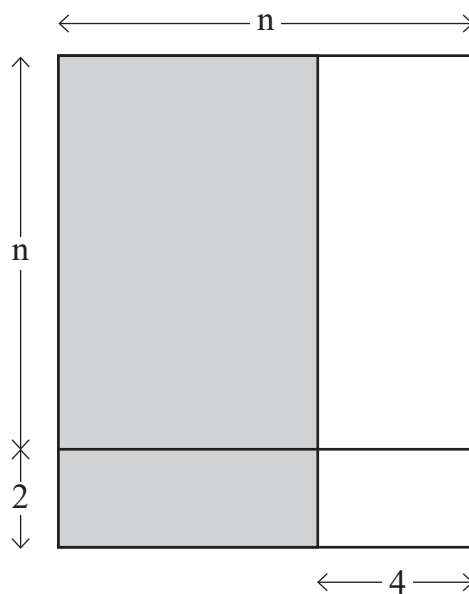
4 Expand and simplify $m^2 + (m + 7)(m - 2)$

Answer _____ [3]

[Turn over



5 A shape is split into four rectangles.



Find an expression for the shaded area.

Write your answer as a quadratic expression, simplifying where necessary.

Answer _____ [3]





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(Questions continue overleaf)

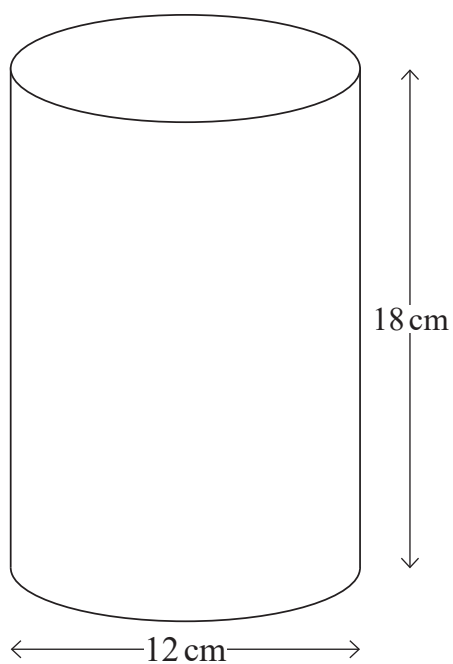
[Turn over

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6 (a) Calculate the volume of the cylinder.



Answer _____ cm^3 [3]



(b) The pressure exerted by the cylinder on the floor is 0.3 N/cm^2

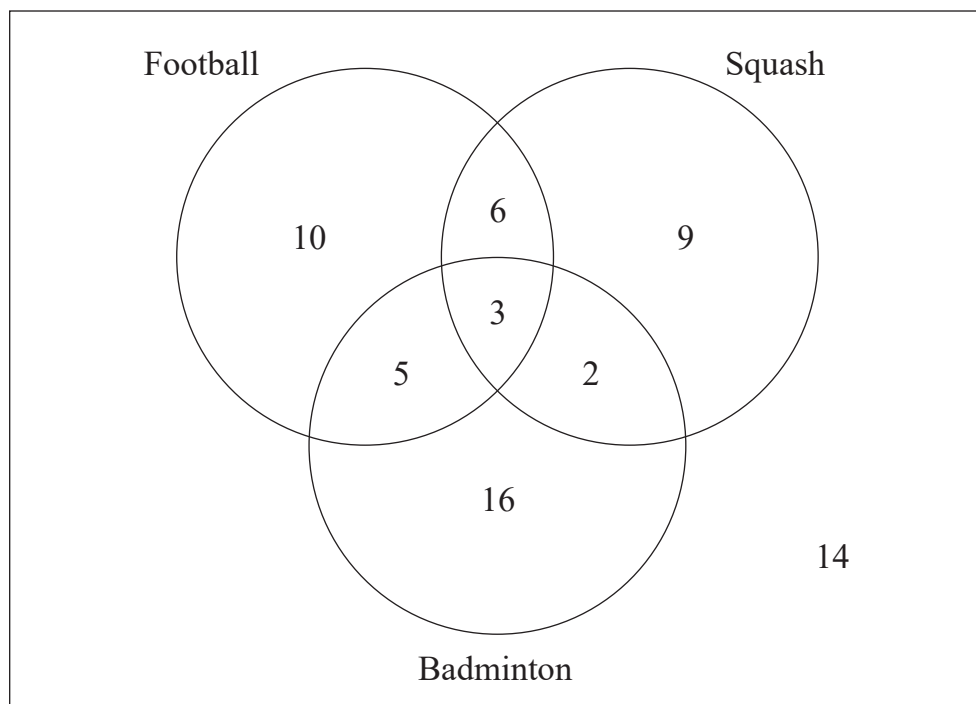
Find the force exerted by the cylinder on the floor.

Give your answer to the nearest whole number.

Answer _____ N [3]



7 The Venn diagram shows which sports members play at a leisure centre.



(a) How many members play Squash?

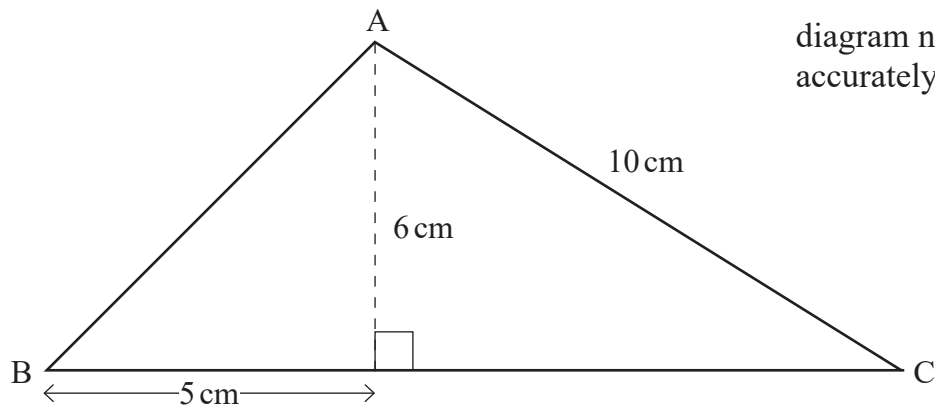
Answer _____ [1]

(b) How many members play both Football and Badminton?

Answer _____ [1]



8 Find the area of the triangle ABC.



Answer _____ cm^2 [4]

[Turn over



9 Ben is making lemonade.

He can buy bottles in packs of 12

He can buy labels in packs of 33

Ben does not want to have any bottles or labels left over.

What is the **minimum** number of **packs of labels** he needs to buy?

Answer _____ [3]



10 (a) Factorise

(i) $8a^2b + 12a$

Answer _____ [2]

(ii) $p^2 - 49$

Answer _____ [1]

(b) Solve the equation $w^2 - 2w - 35 = 0$

Answer $w =$ _____ [3]

[Turn over



- 11 (a) The table shows the percentage distribution of house prices, P , in a town in Northern Ireland in 2020

House prices, P , in £	Percentage of houses	Cumulative frequency
$50\,000 < P \leq 100\,000$	4	4
$100\,000 < P \leq 150\,000$	18	22
$150\,000 < P \leq 200\,000$	30	
$200\,000 < P \leq 250\,000$	24	
$250\,000 < P \leq 300\,000$	14	
$300\,000 < P \leq 350\,000$	7	
$350\,000 < P \leq 400\,000$	3	

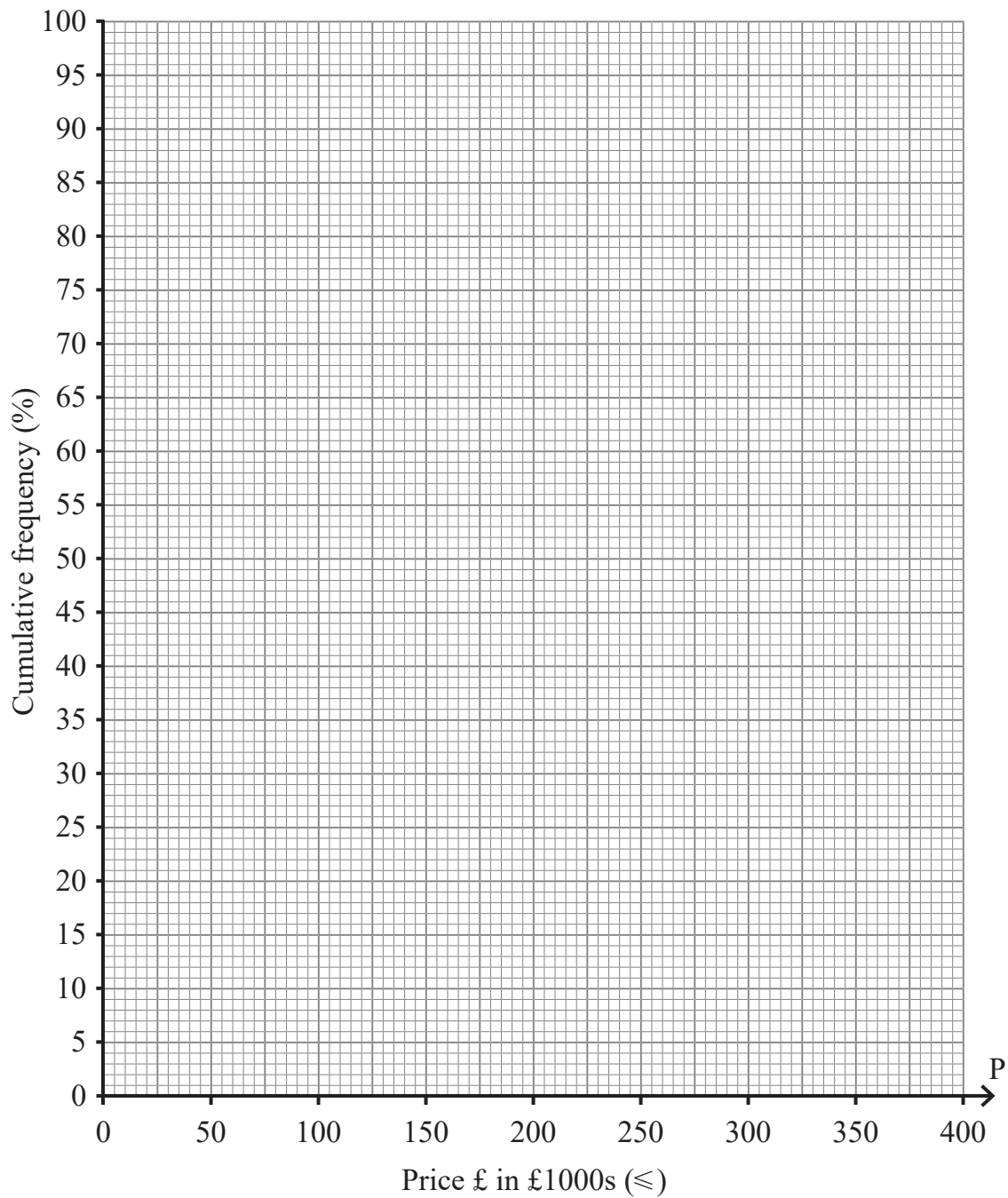
Complete the cumulative frequency column in the table.

[1]



(b) Plot the cumulative frequency graph on the given axes.

[3]



(c) Use your graph to estimate the interquartile range.

Answer £ _____ [2]

[Turn over



12

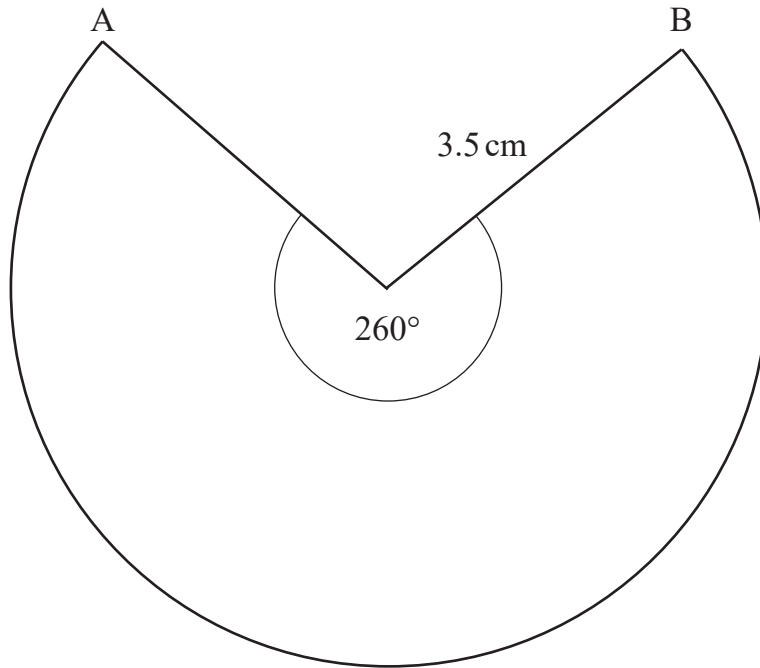


diagram not drawn accurately

Calculate the length of the arc AB, giving your answer to 1 decimal place.

Answer _____ cm [3]



13 Pam has to deliver containers of food.

Each container weighs 50 kg, to the nearest 5 kg.

The maximum load her van can carry is 1500 kg, measured to the nearest 100kg.

What is the greatest possible number of containers that Pam can carry in her van?

Show your working out clearly.

Answer _____ [4]

[Turn over

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- 14 Find the equation of the line which passes through the point (8, 3) and is perpendicular to the line $y = 4x$

Answer _____ [4]



15

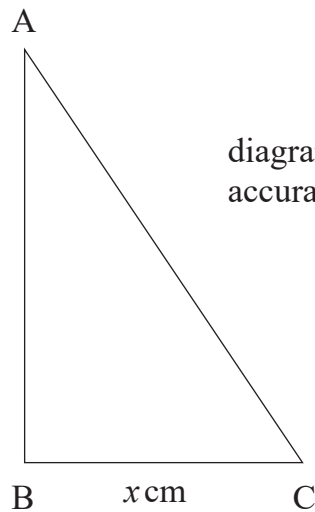


diagram not drawn
accurately

In the right-angled triangle, AB is 4 cm longer than BC.

The area of the triangle is 38.5 cm^2

(a) Show that $x^2 + 4x - 77 = 0$

[3]

(b) Hence calculate the size of angle C.

Answer _____ ° [3]

[Turn over

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28GMC4119

16 Find the value of the angle marked x .

Give your answer correct to 1 decimal place.

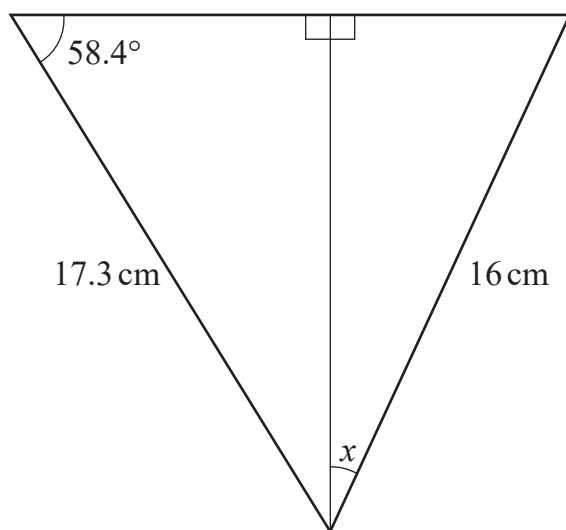
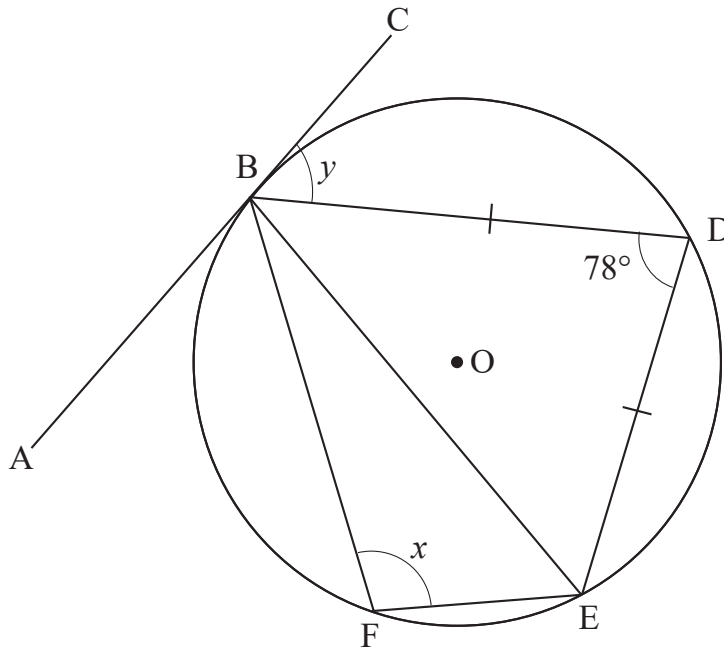


diagram not drawn accurately

Answer $x =$ _____ $^{\circ}$ [4]



diagram not drawn accurately



ABC is a tangent to the circle.

O is the centre of the circle.

(a) Work out the value of angle x , giving a reason for your answer.

Answer $x =$ _____ $^\circ$ because _____
 _____ [2]

(b) Work out the value of angle y , giving full reasons for your answer.

Answer $y =$ _____ $^\circ$ because _____

 _____ [3]

[Turn over



18 Mr Clarke wants to take a 30% random sample of the Year 12 boys in his school.

There are 40 boys in his sample.

There are 142 boys in Year 12

Jim says this is a fair representation of the number of boys in the year group.

Jenny says this is not a fair representation of the number of boys in the year group.

Give possible reasons for their answers.

Jim says this is fair because _____

_____ [1]

Jenny says this is not fair because _____

_____ [1]



19 Darren bought an antique clock at a showroom price.

He sold it to Edith for £1008 and made 12% profit.

Edith sold it to Fran at 17.6% above the **showroom** price.

Calculate how much profit Edith made.

Answer £ _____ [4]

[Turn over



20 Simplify

$$\frac{10 + 2w + 5c + cw}{75 - 3w^2}$$

Answer _____ [4]



21 An expression is written as

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

Simplify the expression to a single fraction whose numerator is a quadratic expression.

Answer _____ [5]

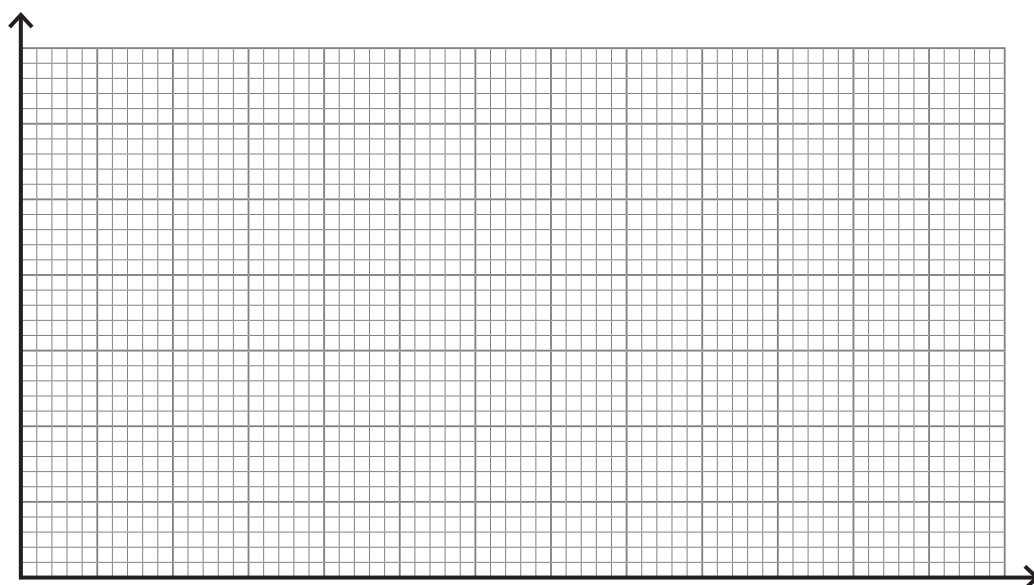
[Turn over



- 22 (a) The table shows the waiting times, h , in hours, for patients at an Emergency Department one evening.

Waiting time, h (hours)	Frequency
$0 < h \leq 0.5$	2
$0.5 < h \leq 1.5$	5
$1.5 < h \leq 3$	3
$3 < h \leq 5$	12
$5 < h \leq 8$	9
$8 < h \leq 12$	10

Draw a histogram on the axes provided to illustrate this data.



[4]



(b) Calculate an estimate for the median waiting time.

Answer _____ hours [4]

(c) A stratified sample of five patients is to be selected from those waiting longer than 6 hours.

Estimate how many patients in this sample would have waiting times between 7 and 10 hours.

Show your working out clearly.

Answer _____ [4]



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THIS IS THE END OF THE QUESTION PAPER

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Question Number	Marks
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Total Marks	
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Examiner Number

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