



General Certificate of Secondary Education  
2025

Centre Number

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Candidate Number

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# Mathematics

Unit M3  
(With calculator)

Higher Tier

[GMC31]



\*GMC31\*

**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-six** 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.

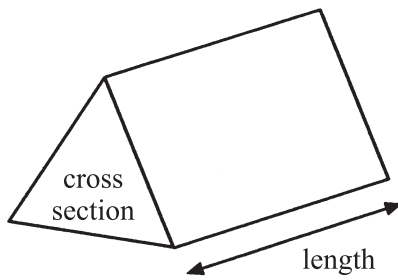
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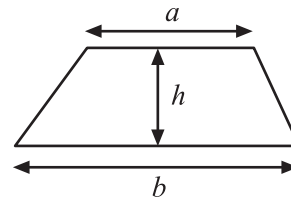
\*32GMC3101\*

# Formula Sheet

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

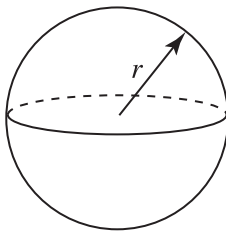


**Area of trapezium** =  $\frac{1}{2}(a+b)h$



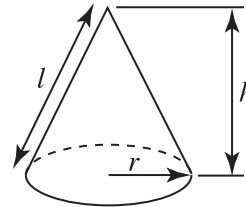
**Volume of sphere** =  $\frac{4}{3}\pi r^3$

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

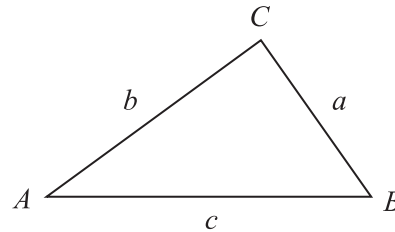


**Volume of cone** =  $\frac{1}{3}\pi r^2 h$

**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 Engine oil costs £14.80 per litre.

Jason buys 6.5 litres of engine oil.

He also buys 5 identical spark plugs.

The total cost is £113

How much does each spark plug cost?

Answer £ \_\_\_\_\_ [3]

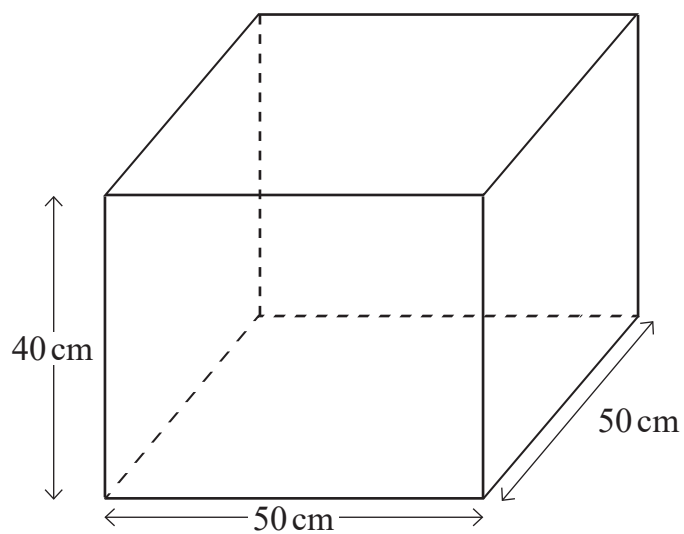
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\*32GMC3103\*

- 2 A container, in the shape of a cuboid, has dimensions as shown in the diagram.



60 litres of liquid are poured into the container.

How deep will the liquid be?

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



3 At the start of the year, Sue's caravan was worth £9 600

By the end of the year, Sue's caravan had lost 26% of its value.

At the start of the year, John's caravan was worth £9 975

By the end of the year, John's caravan had lost  $\frac{2}{7}$  of its value.

Whose caravan was worth more by the end of the year and by how much more?

Answer \_\_\_\_\_ by £ \_\_\_\_\_ [5]

[Turn over

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\*32GMC3105\*

4 (a) Simplify  $4c + 5d + c - 7d$

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

(b) Expand  $5(2t + 5)$

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



5

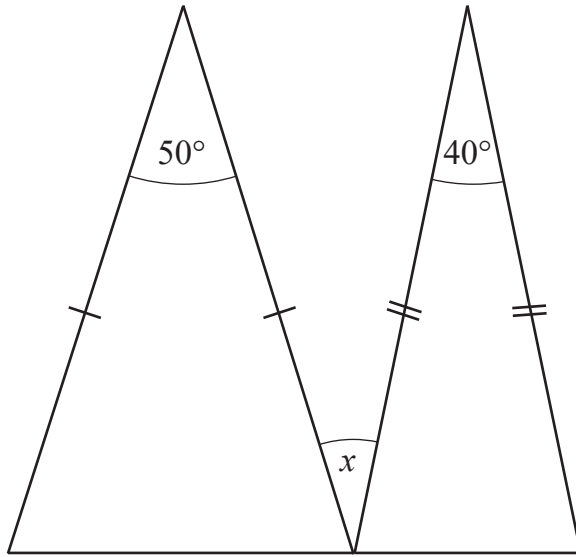


diagram not drawn accurately

Calculate the size of the angle marked  $x$

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

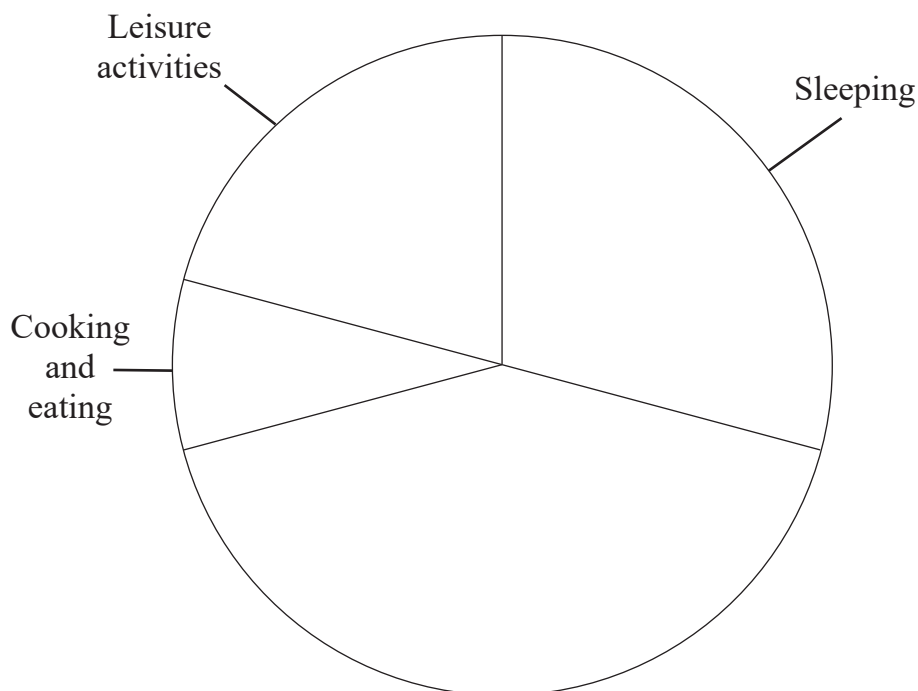
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- 6 Philip wanted to draw a pie chart to display the results of a study on how adults spend their time each day.

He used the information in the table to start drawing the pie chart.

Activity	No. of hours	Angle
Sleeping	7	$105^\circ$
Leisure activities	5	$75^\circ$
Cooking and eating	2	$30^\circ$
Working	9	
Housework	1	
<b>Total</b>	<b>24</b>	<b><math>360^\circ</math></b>



(a) Complete the table. [2]

(b) Complete the pie chart. [2]

(c) Philip says, "The angle for leisure activities is  $75^\circ$ . This means adults spend 75% of their time on leisure activities."

Is Philip correct? Explain your answer clearly.

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[2]

7 What is the difference in size between the largest and smallest of these numbers?

2     $2\frac{1}{2}$     0.02     $\frac{2}{10}$

Show your working out clearly.

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

[Turn over



8 Last season 103 750 people watched the Belfast Giants.

This season 8300 more people watched.

What was the percentage increase?

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



9 A charity holds a collection day.

During the collection day, 200 notes are donated to the charity.

25% of the notes are £10 notes.

$\frac{3}{5}$  of the notes are £5 notes.

There are eighteen £20 notes.

The rest of the notes are £50 notes.

What is the total value of all the notes donated?

**Show your working out clearly.**

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

[Turn over

15854



\*32GMC3111\*

10 A pencil cost  $x$  pence.

Bernie bought 3 pencils.

Bernie paid with a £2 coin.

Write an expression, in terms of  $x$ , for her change in **pence**.

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

11 Solve  $3(y - 7) = 18$

Answer  $y =$  \_\_\_\_\_ [3]



12 Simplify  $\frac{y}{3} + \frac{y}{5}$

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



- 13 Mia asked each person in her class how many devices they owned that could connect to the internet.

She recorded the results as follows.

3	2	2	1	4
1	1	3	4	2
2	2	3	3	2
4	3	1	2	2

- (a) Complete the frequency table below.

Number of devices	Number of pupils (frequency)	Total number of devices
1		
2		
3		
4		

[2]

- (b) Calculate the mean number of devices per pupil.

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

- (c) What was the range of the number of devices?

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





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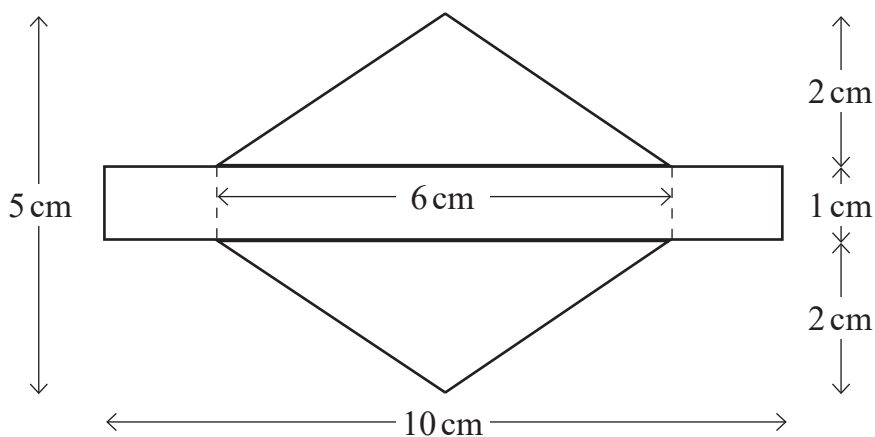
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\*32GMC3115\*

- 14 A badge is in the shape of two identical triangles and a rectangle, as shown in the diagram.

diagram not drawn accurately



The badges are cut from a square sheet of metal, of side 1 metre, in rows as shown.

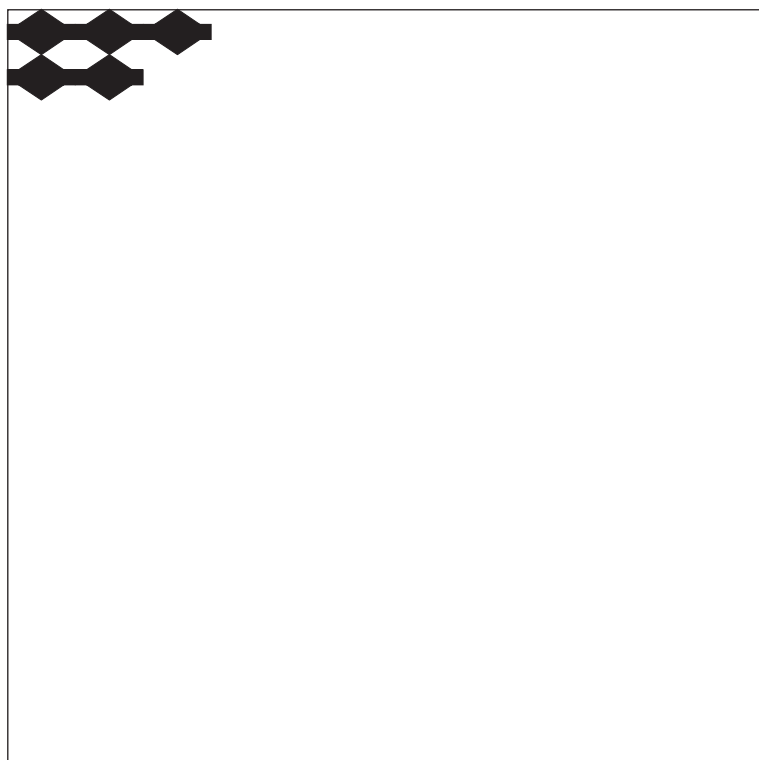


diagram  
not drawn  
accurately



What is the total **area** of the metal left over after the **maximum** number of badges have been cut from the sheet in rows as shown?

Answer \_\_\_\_\_ cm<sup>2</sup> [6]

[Turn over

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\*32GMC3117\*

15 ABCD is a square of side 60 cm.

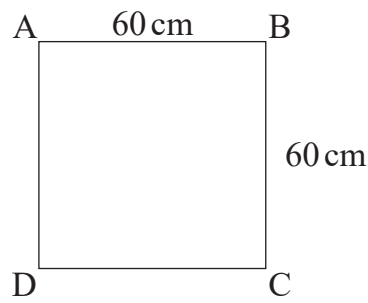


diagram not drawn accurately

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]



16 (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]

[Turn over



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

Answer  $a =$  \_\_\_\_\_ [3]

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

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





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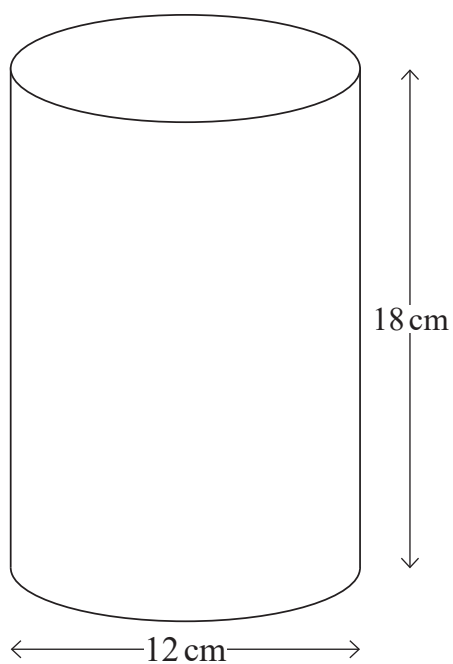
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\*32GMC3121\*

19 (a) Calculate the volume of the cylinder.



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



(b) The pressure exerted by the cylinder on the floor is  $0.3 \text{ N/cm}^2$

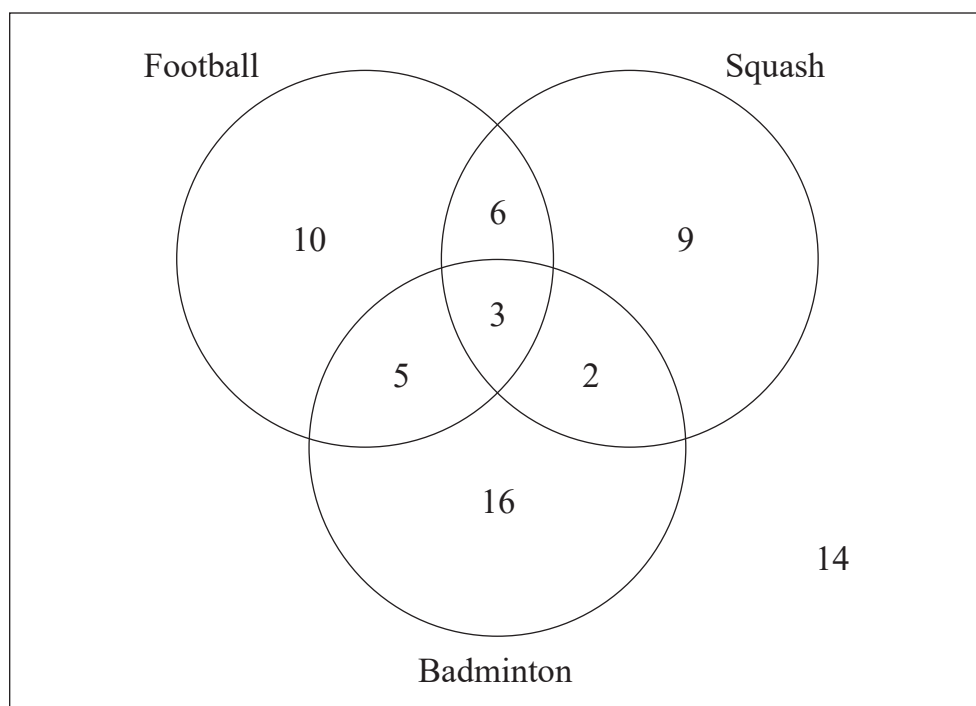
Find the force exerted by the cylinder on the floor.

Give your answer to the nearest whole number.

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



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



(a) How many members play Squash?

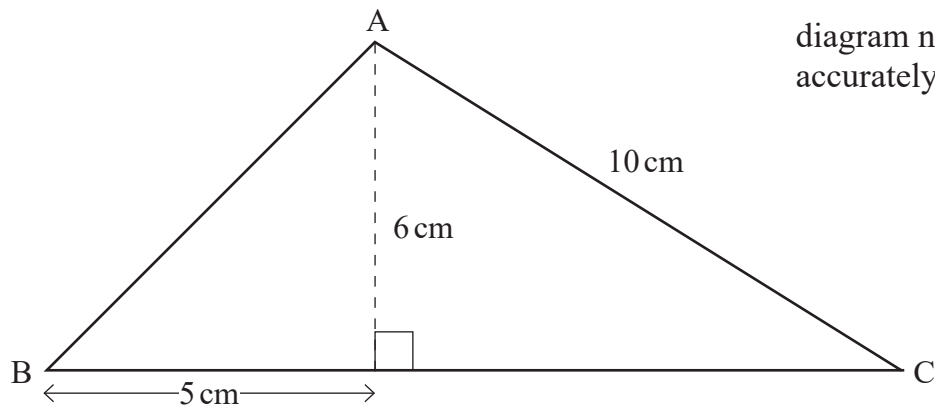
Answer \_\_\_\_\_ [1]

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

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



21 Find the area of the triangle ABC.



Answer \_\_\_\_\_  $\text{cm}^2$  [4]

[Turn over



22 A first class ticket is 24% more expensive than an economy ticket.

The difference in price between a first class ticket and an economy ticket is £20.64

Calculate the cost of the **first class ticket**.

Answer £ \_\_\_\_\_ [4]



23 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]

[Turn over

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\*32GMC3127\*

- 24 (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	

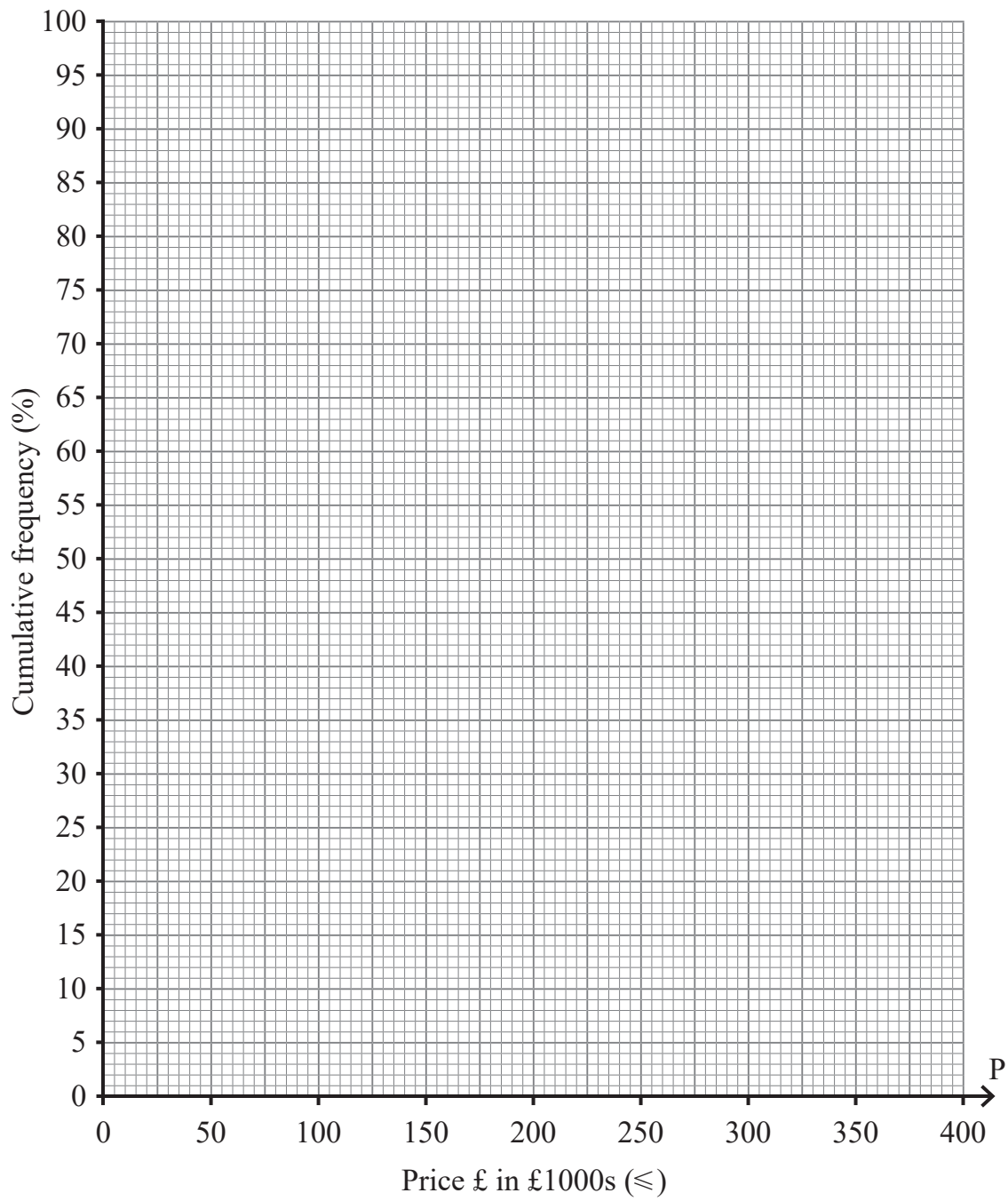
Complete the cumulative frequency column in the table.

[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



25 Factorise

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

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

(b)  $a^2 - 4a - 21$

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



26

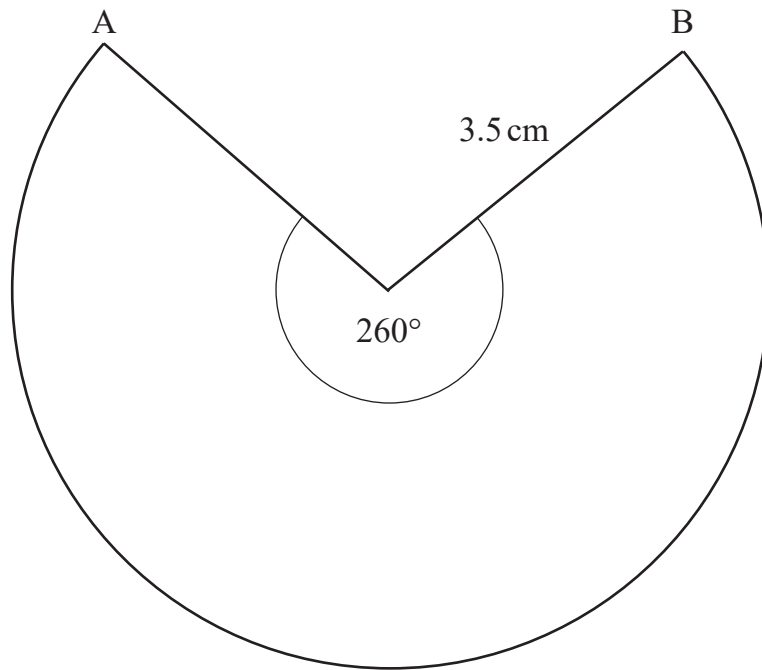


diagram not drawn accurately

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

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

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\*32GMC3131\*

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<b>Total Marks</b>	
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Examiner Number

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