



Rewarding Learning

General Certificate of Secondary Education  
November 2024

Centre Number

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Candidate Number

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# Mathematics

Unit M3  
(With calculator)

Higher Tier

[GMC31]



\*GMC31\*

**TUESDAY 19 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-seven** 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.

14863



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

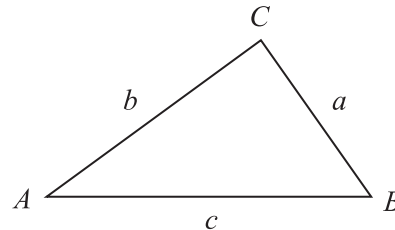


**Volume of cone** =  $\frac{1}{3}\pi r^2 h$

**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 Matthew, Karen and Jamie were trying to work out the value of  $5^3$

Matthew thought it was 15

Karen thought it was 125

Jamie thought it was 8

Who was correct?

**Explain your answer clearly.**

Answer \_\_\_\_\_ was correct because \_\_\_\_\_

[2]



2 Ciara and Len were each given £40 as a Christmas present.

Ciara spent  $\frac{17}{20}$  of the money she was given.

Len spent 80% of the money he was given.

Who spent more of their money?

**Explain your answer clearly.**

Answer \_\_\_\_\_ because \_\_\_\_\_

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



3 At a paint shop

Emulsion paint costs £4.25 per litre

Gloss paint costs £6 per litre

Masonry paint costs £10.50 per litre

Orla bought 12 litres of emulsion paint, 2.5 litres of gloss paint and some masonry paint.

She paid £134.25 in total.

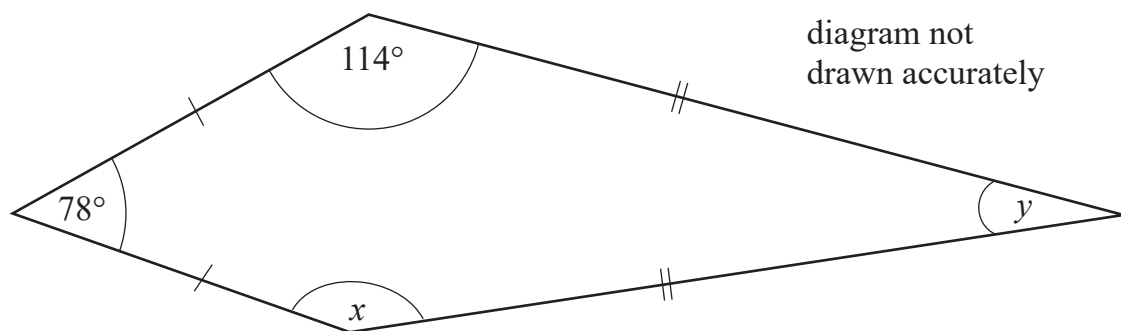
How many litres of masonry paint did she buy?

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

[Turn over



4



The diagram shows the size of two angles in a kite.

Find the size of

(a) angle  $x$

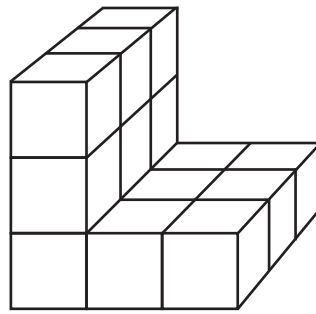
Answer \_\_\_\_\_° [1]

(b) angle  $y$

Answer \_\_\_\_\_° [2]

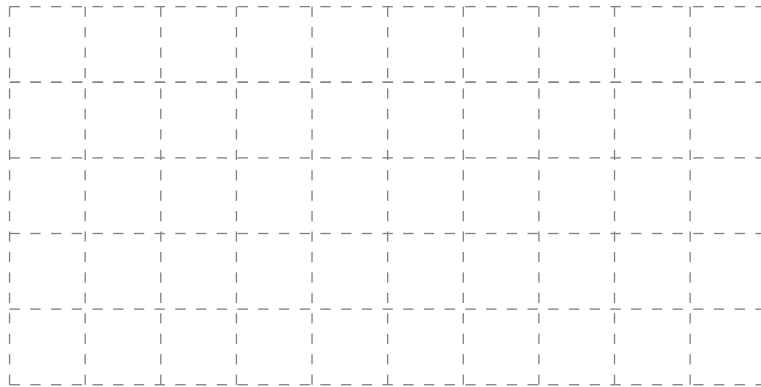


5 The diagram below shows a 3D shape made with centimetre cubes.

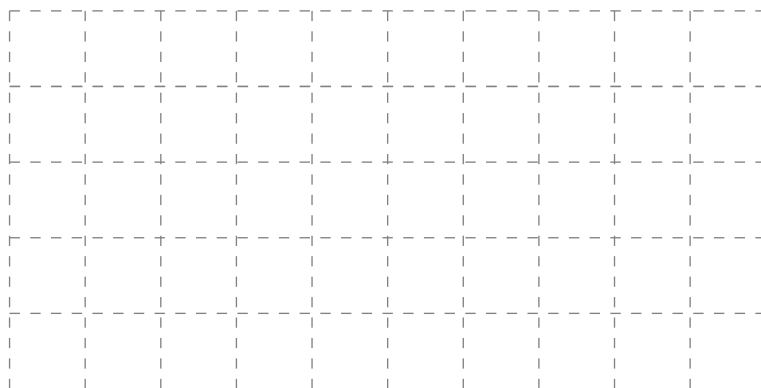


FRONT

(a) On the centimetre square grid below, draw the front elevation of the shape. [2]



(b) On the centimetre square grid below, draw the plan of the shape. [1]



[Turn over



- 6 The incomplete two-way table shows some information about cinema-goers one Saturday.

	Child	Adult	Senior citizen
Male		33	18
Female	78	27	

- (a) Use the following information to complete the two-way table.

In total there were 30 senior citizens.

There were 4 times as many children as senior citizens.

[2]

- (b) A child ticket is £3, an adult ticket is £7 and a senior citizen ticket is £5.50

The manager claims there was over £1000 in ticket sales.

Is he correct?

**Show your working out clearly.**

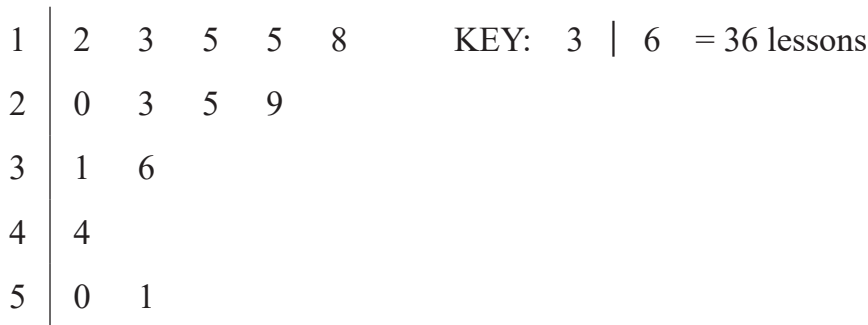
Answer \_\_\_\_\_ because \_\_\_\_\_

[2]



- 7 A group of people were surveyed about the number of driving lessons they had before passing their driving test.

The results are shown in the stem and leaf diagram.



- (a) What is the range?

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

- (b) Find the median.

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

- (c) Alice passes her test.

When her number of driving lessons is included in the stem and leaf diagram, the range increases by 2 and the median decreases by 1

Work out the number of driving lessons Alice had.

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

[Turn over



8 (a) Simplify  $7g - 5h - 2g + 8h$

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

(b) Solve  $\frac{t}{7} = 3.5$

Answer  $t =$  \_\_\_\_\_ [1]

(c) Solve  $4f + 9 = 37$

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

(d) Expand  $3(4e + 5)$

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

(e) Factorise  $18c - 30$

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



9 A club has 160 members.

104 members attended an event.

(a) What **percentage** of club members attended the event?

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

(b) The cost per ticket to attend the event last year was £7.50

This year it increased by 18%

How much did it cost per ticket to attend the event this year?

Answer £ \_\_\_\_\_ [3]

[Turn over



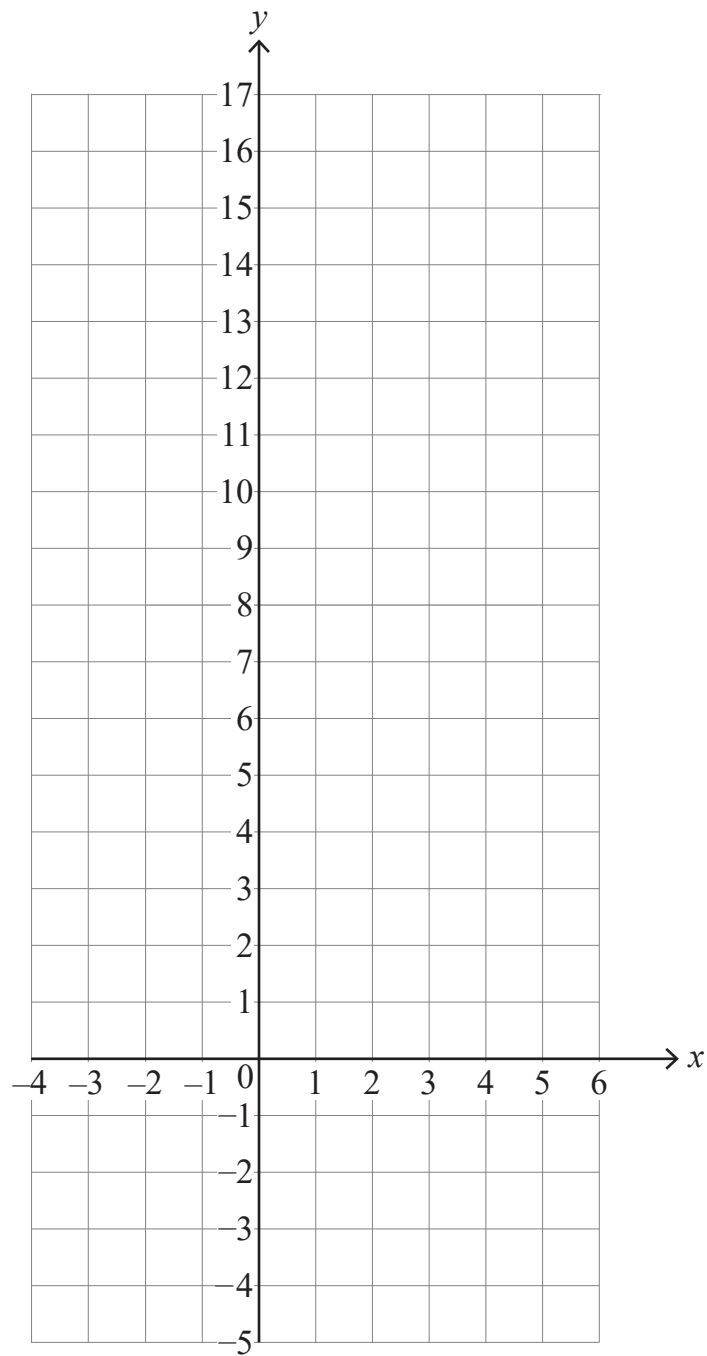
10 Astrid says  $\sqrt{16} + 3$  can equal 7 or  $-1$

Explain why she is correct.

[2]



11 Draw the graph of  $y = 3x + 4$  on the grid below.

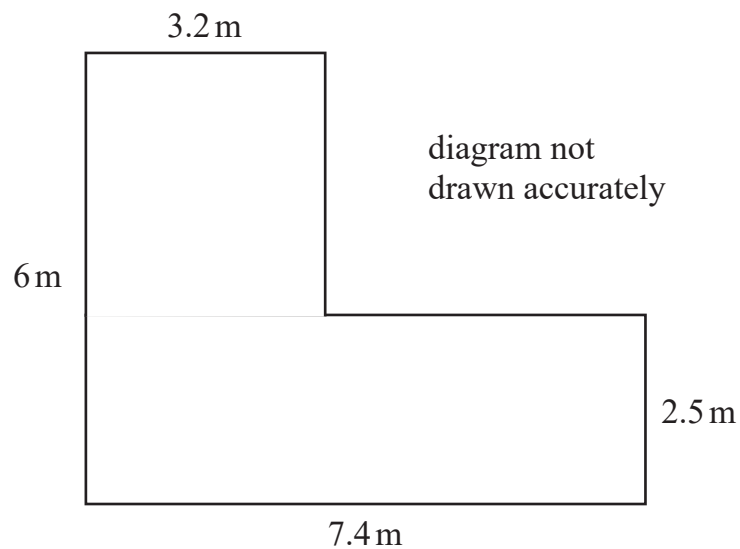


[3]

[Turn over



12 The diagram shows a sketch of a garden.



Rolls of grass are to be bought to cover the garden.

Each roll covers 1 square metre.

Each roll costs £4.50

Only **complete** rolls can be bought.

How much will it cost to buy enough rolls to cover the garden?

**Show your working out clearly.**

Answer £ \_\_\_\_\_ [4]



13

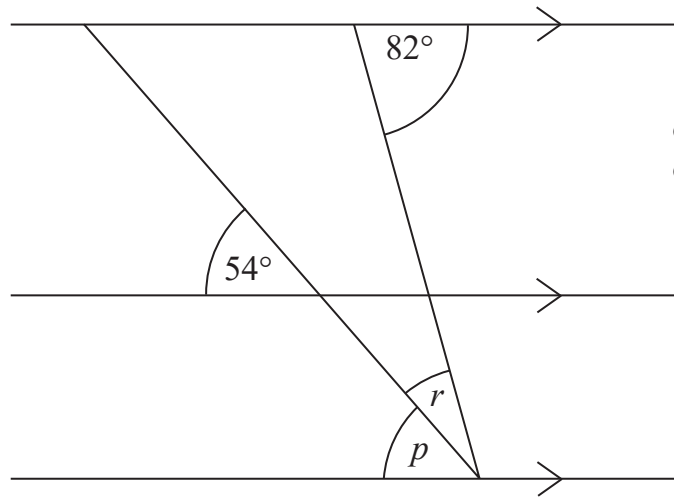


diagram not  
drawn accurately

Find

(a) angle  $p$

Answer \_\_\_\_\_ ° [1]

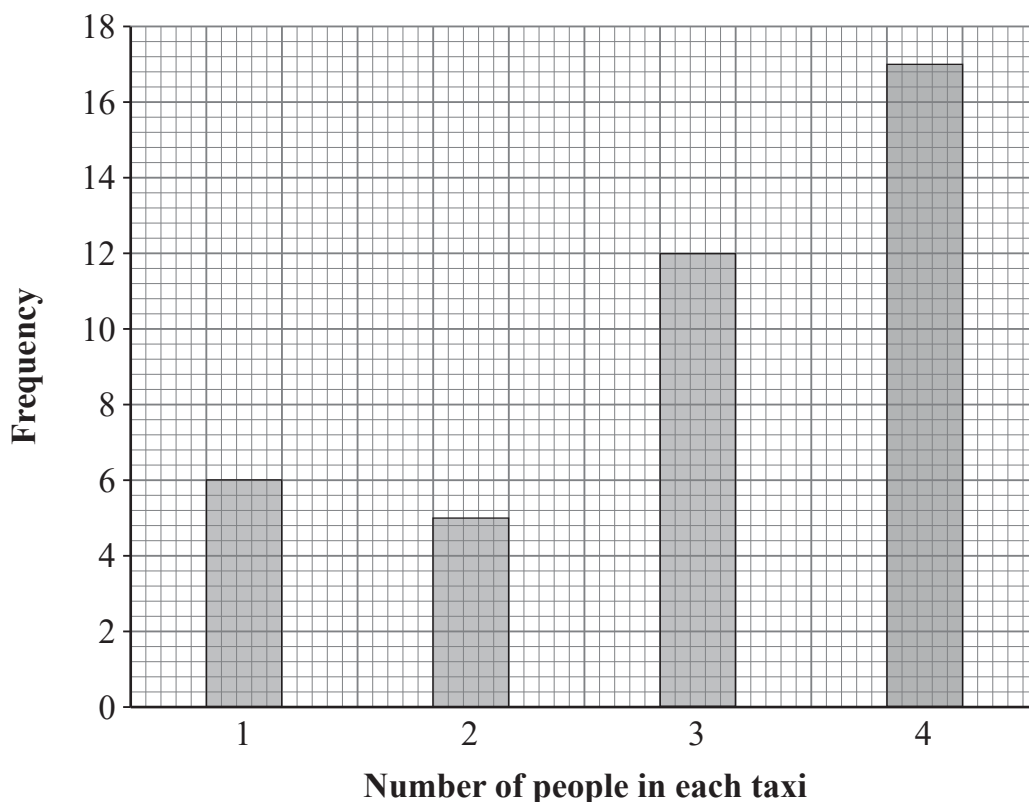
(b) angle  $r$

Answer \_\_\_\_\_ ° [2]

[Turn over



- 14 The bar chart shows the number of people in each taxi booked from a taxi company one Saturday night.



Calculate the mean number of people in each taxi.

Show your working out clearly.

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





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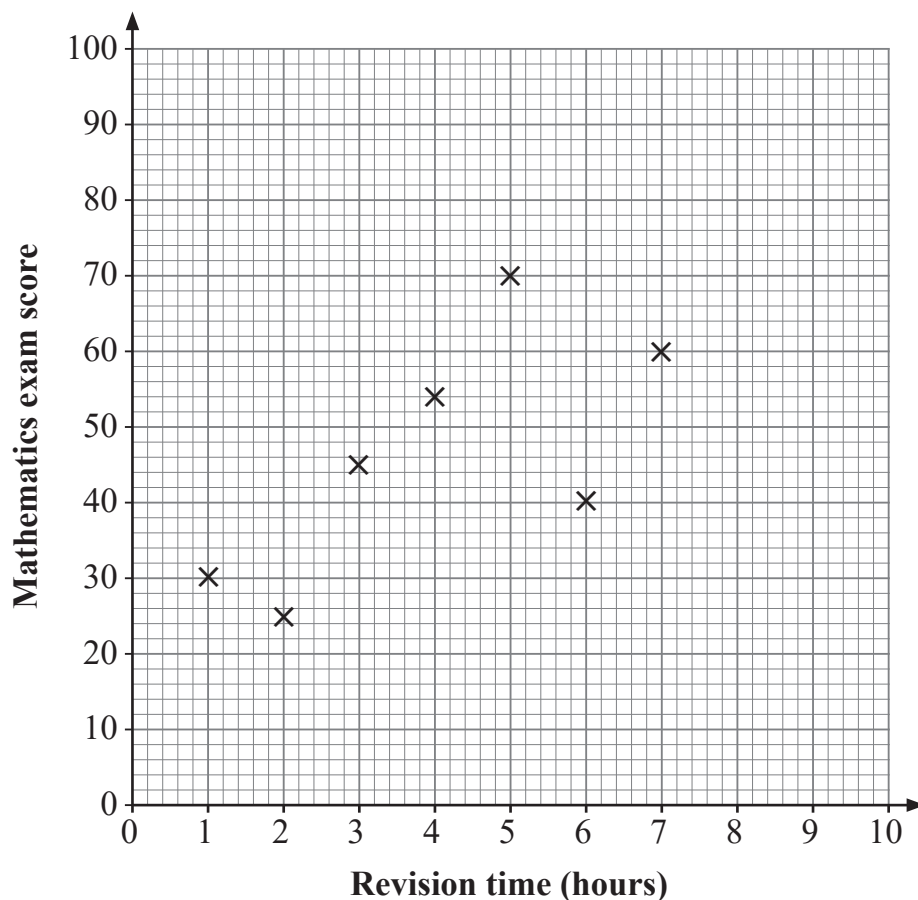
**[Turn over**

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\*32GMC3117\*

- 15 The scatter graph shows the number of hours of revision completed by seven students and their Mathematics exam scores.



- (a) Jake sat the exam late and his data was not recorded on the graph.

He spent 6 hours revising and scored 58

Plot Jake's point on the scatter graph.

[1]

- (b) Describe the relationship between the revision time in hours and the score in the Mathematics exam.

Answer \_\_\_\_\_

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



(c) Jake claims that if he had revised for 10 hours he would have scored above 90

Comment on the reliability of his claim.

Answer \_\_\_\_\_

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

16 Anne invested £18 000 in an account paying 4% per annum compound interest.

After how many years will the value of her investment exceed £20 200?

Show your working out clearly.

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

[Turn over



17  $x$  is a **two-digit** number.

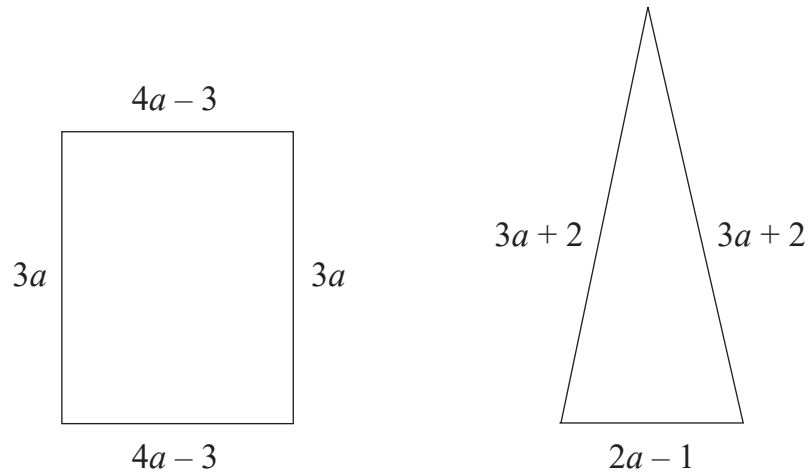
The LCM (lowest common multiple) of  $x$  and 55 is 110

Find a possible value of  $x$

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



18 The rectangle and triangle drawn below have the **same perimeter**.



Work out the value of  $a$ , showing your method clearly.

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

[Turn over



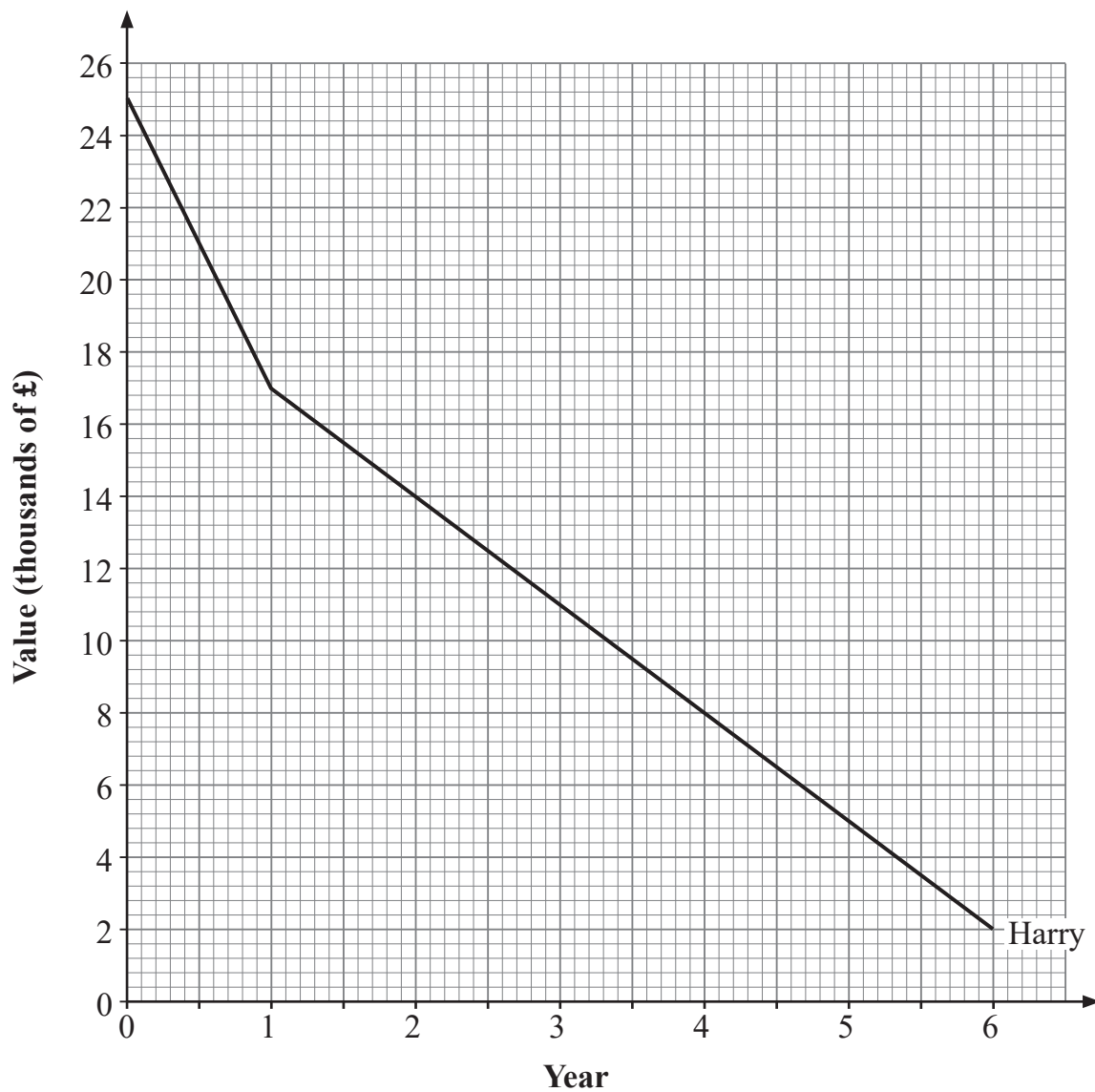
19 Six years ago, Harry and Jane each bought a new car.

Harry bought his car for £25 000

In the first year, it decreased in value by £8 000

After that, it decreased in value by £3 000 each year.

A graph showing the value of Harry's car each year is shown below.



Jane bought her car for £19 000

In the first year, it decreased in value by £5 000

After that, it decreased in value by £2 000 each year.



(a) On the grid opposite, draw a graph showing the value of Jane's car each year. [2]

(b) Use the graph you have drawn to write down the year when Harry's car and Jane's car had the same value.

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

20 A doormat is in the shape of a semicircle with diameter 82 cm.

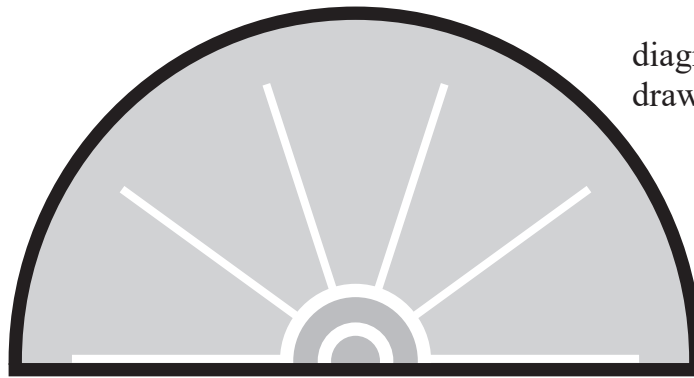


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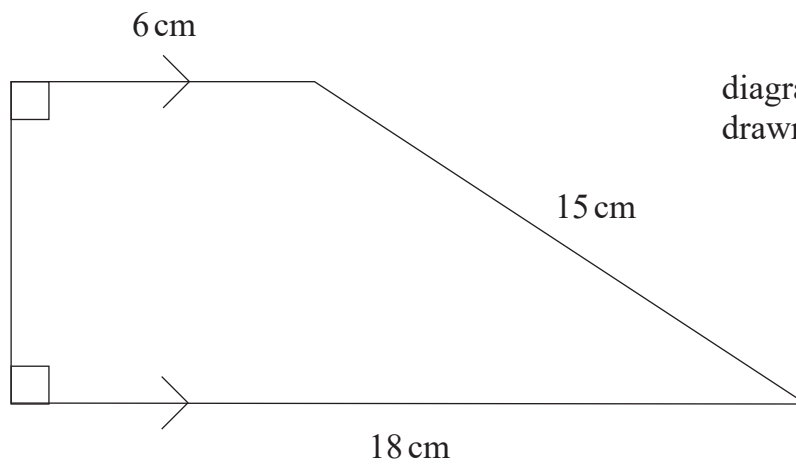
Calculate the perimeter of the doormat.

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

[Turn over



21



Calculate the area of the trapezium.

Answer \_\_\_\_\_  $\text{cm}^2$  [5]

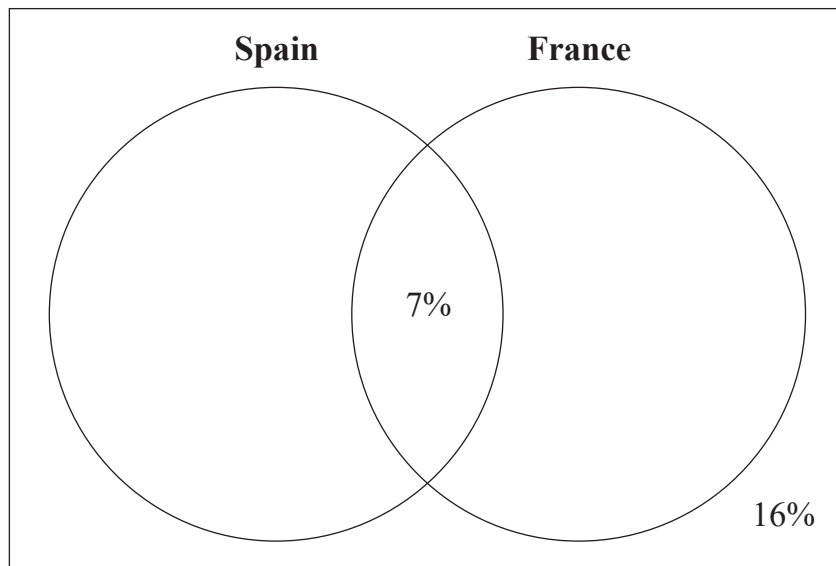


22 Pupils in a year group were asked whether they had travelled to Spain or France.

Some information is shown in the Venn diagram.

53% had travelled to France.

Complete the Venn diagram below.



[2]

[Turn over



23 (a) Expand and simplify  $(2x - 1)(3x + 4)$

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

(b) (i) Factorise  $x^2 + 6x - 16$

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

(ii) Hence solve  $x^2 + 6x - 16 = 0$

Answer  $x =$  \_\_\_\_\_ [1]

(c) Solve the equation

$$\frac{18 - x}{3} = 4 - 2x$$

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



24 In 2022 Rob sold his house for £227 700

This was a loss of 10%

He had bought the house from Lisa in 2019

She had made a profit of 15% in selling to Rob.

Work out how much Lisa originally paid for the house.

Answer £ \_\_\_\_\_ [4]

[Turn over

14863



\*32GMC3127\*

25 A ladder is placed against a vertical wall.

To be safe, it must be inclined at an angle between  $70^\circ$  and  $80^\circ$  to the ground.

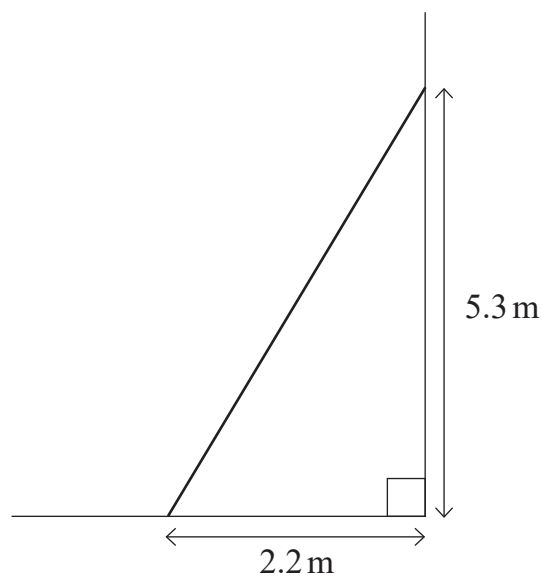


diagram not  
drawn accurately

Is the ladder positioned safely?

Show your working out clearly.

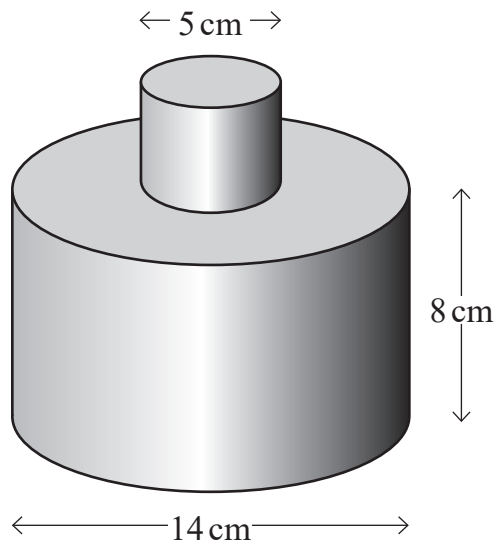
Answer \_\_\_\_\_ [3]



26 A solid is made from a cylinder of diameter 14 cm and height 8 cm, with a smaller cylinder of diameter 5 cm on top.

The total height of the solid is 12 cm.

Calculate the total surface area of the solid.



Answer \_\_\_\_\_  $\text{cm}^2$  [5]

[Turn over]



27 The grouped frequency table shows the time taken by 50 workers to travel to work.

Journey time ( $t$ mins)	Frequency	Journey time $\leq t$ mins	Cumulative frequency
$0 < t \leq 20$	7	20	7
$20 < t \leq 25$	11	25	18
$25 < t \leq 30$	18		
$30 < t \leq 35$	9		
$35 < t \leq 45$	4		
$45 < t \leq 60$	1		

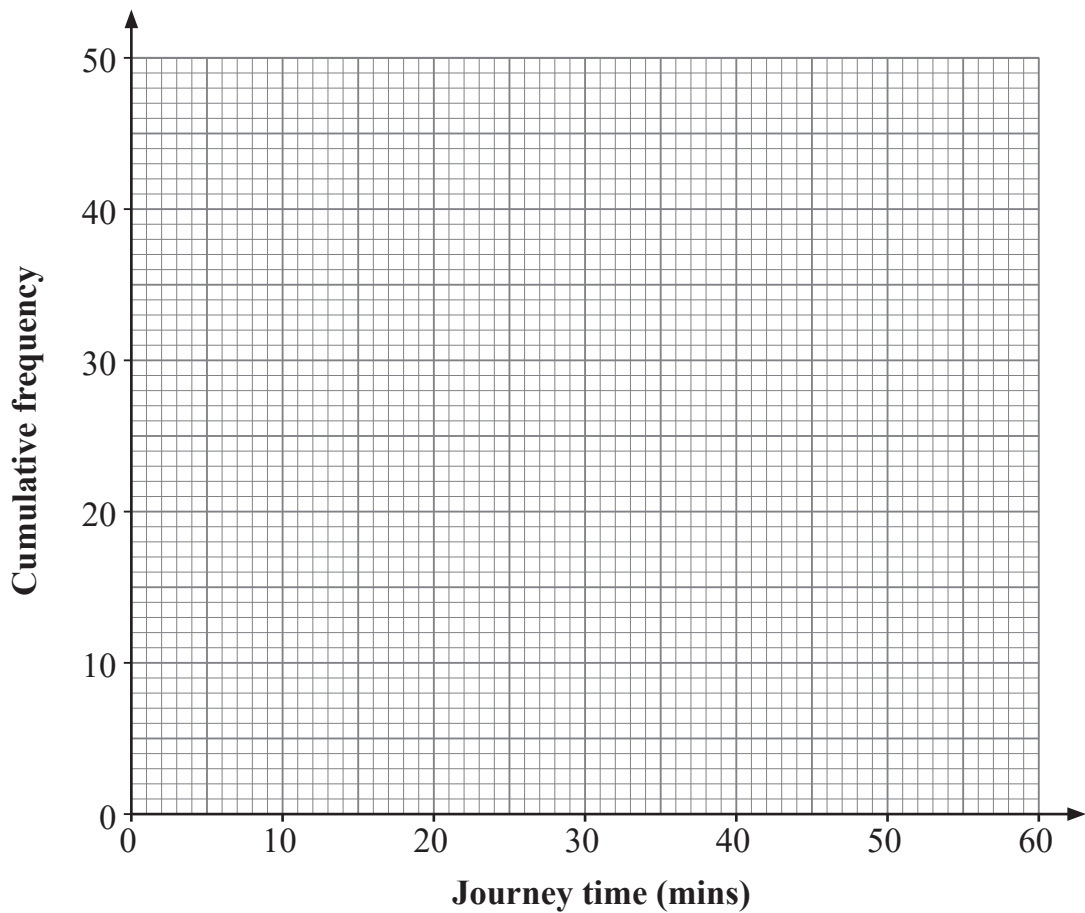
(a) Complete the table above.

[1]



(b) Draw the cumulative frequency graph on the grid below.

[2]



(c) Use your graph to estimate the number of journeys that took between 24 and 38 minutes.

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

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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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14863/5



\*32GMC3132\*