

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

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Forename(s)

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Candidate signature

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# GCSE MATHEMATICS

# H

Higher Tier      Paper 2 Calculator

Monday 6 November 2017

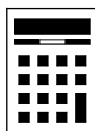
Morning

Time allowed: 1 hour 30 minutes

## Materials

For this paper you must have:

- a calculator
- mathematical instruments.



## Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

## Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer book.

## Advice

- In all calculations, show clearly how you work out your answer.

| For Examiner's Use |      |
|--------------------|------|
| Pages              | Mark |
| 2–3                |      |
| 4–5                |      |
| 6–7                |      |
| 8–9                |      |
| 10–11              |      |
| 12–13              |      |
| 14–15              |      |
| 16–17              |      |
| 18–19              |      |
| 20–21              |      |
| 22–23              |      |
| 24–25              |      |
| 26–27              |      |
| 28–29              |      |
| <b>TOTAL</b>       |      |



Answer **all** questions in the spaces provided

1 Circle the fraction that is equivalent to 3.875

[1 mark]

$$\frac{15}{4}$$

$$\frac{29}{8}$$

$$\frac{31}{8}$$

$$\frac{15}{8}$$

2 What is 50 as a percentage of 20?

Circle your answer.

[1 mark]

10%

40%

150%

250%

3 Circle the point that does **not** lie on the curve  $y = x^3$

[1 mark]

$$\left(-\frac{1}{2}, -\frac{1}{8}\right)$$

(5, 125)

$$\left(\frac{1}{3}, \frac{1}{9}\right)$$

(-1, -1)



4 Which **one** of these is a unit of density?

Circle your answer.

[1 mark]

$\text{kg/m}^2$

$\text{m}^2/\text{kg}$

$\text{kg/m}^3$

$\text{m}^3/\text{kg}$

5 Solve  $4(3x - 2) = 2x - 5$

[3 marks]

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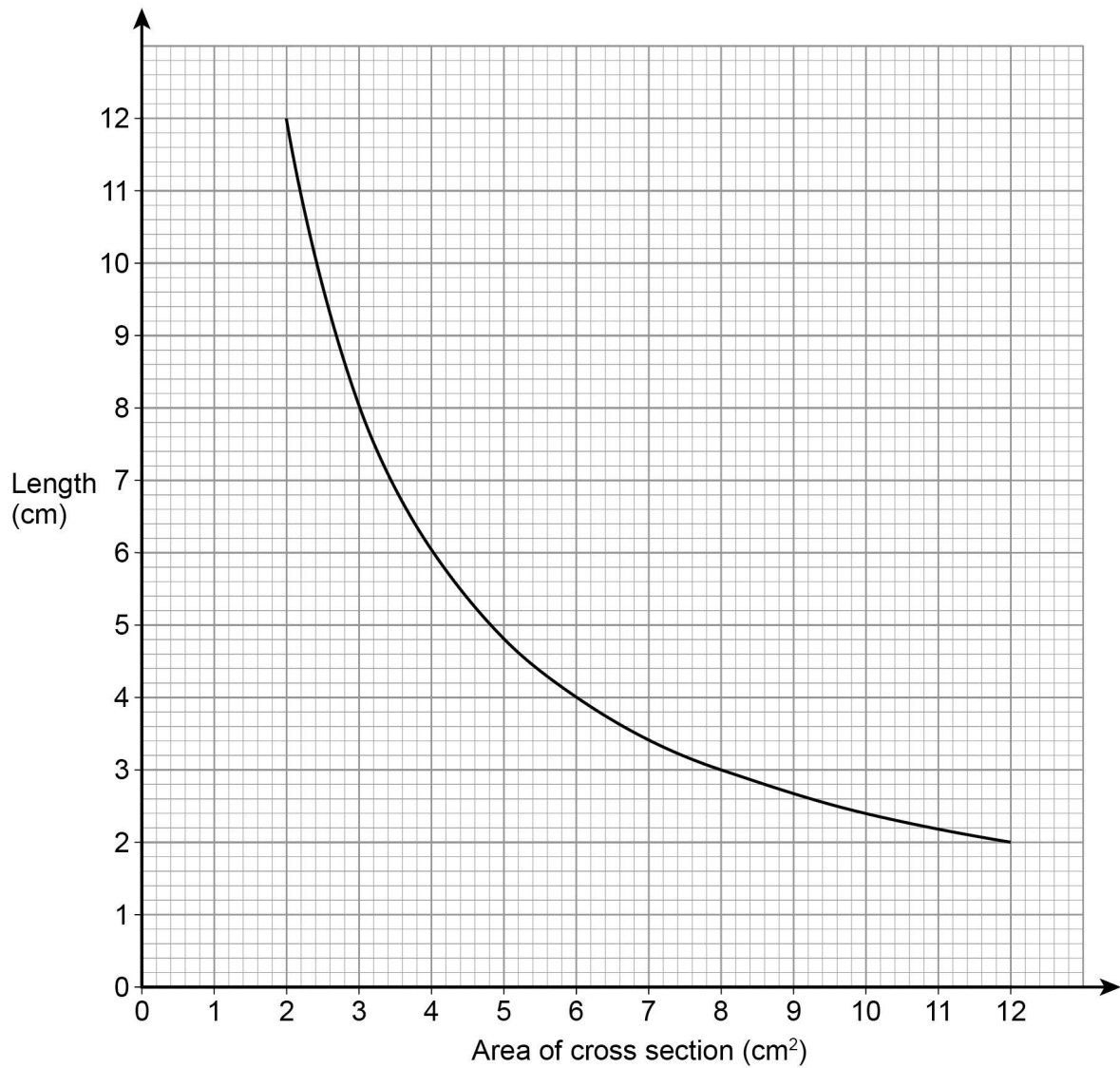
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$x =$  \_\_\_\_\_

Turn over for the next question



6 The graph shows information about prisms with the same volume.



6 (a) Give **one** example to show the volume is  $24 \text{ cm}^3$

[1 mark]

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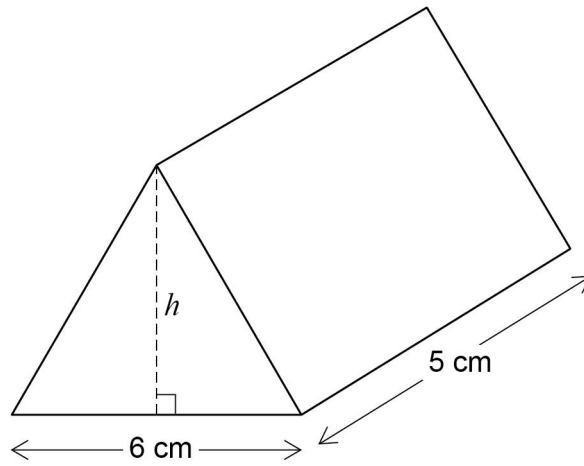
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- 6 (b) The diagram shows a prism with volume  $24 \text{ cm}^3$   
The height of the triangular cross section is  $h$ .



Work out the height,  $h$ .

[3 marks]

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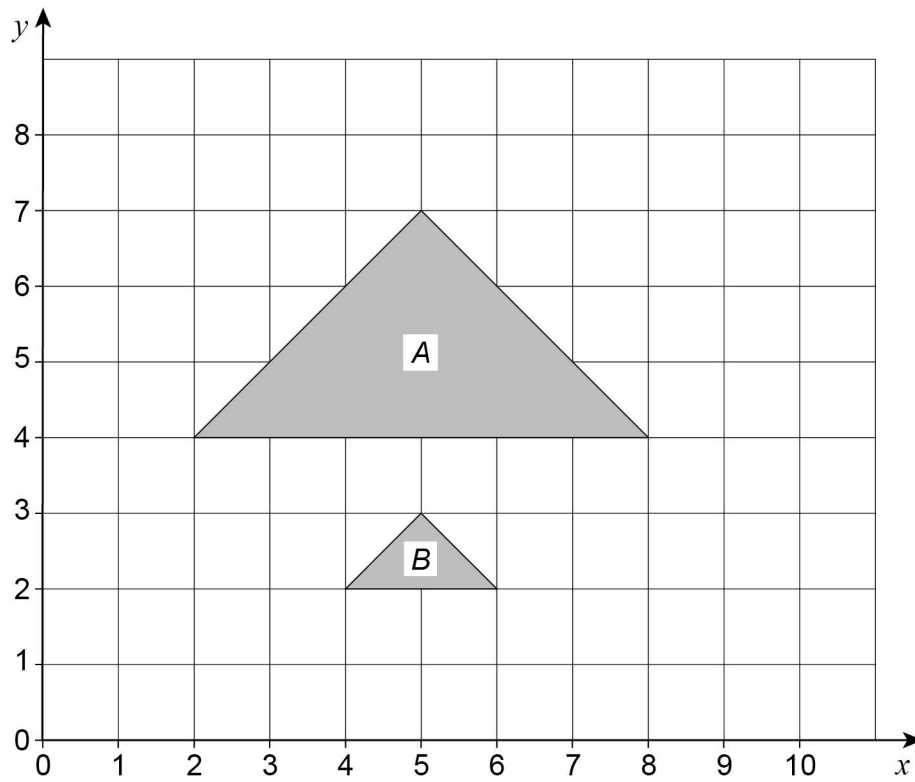
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Answer \_\_\_\_\_ cm

Turn over for the next question



7 Describe fully the **single** transformation that maps triangle *A* to triangle *B*.



[3 marks]

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- 8 The table shows information about the distances walked by 120 students on their way to school one week.

| Distance, $x$ (miles) | Frequency   |  |  |
|-----------------------|-------------|--|--|
| $0 < x \leq 5$        | 20          |  |  |
| $5 < x \leq 10$       | 48          |  |  |
| $10 < x \leq 15$      | 30          |  |  |
| $15 < x \leq 20$      | 22          |  |  |
|                       | Total = 120 |  |  |

Work out an estimate for the mean distance.

[3 marks]

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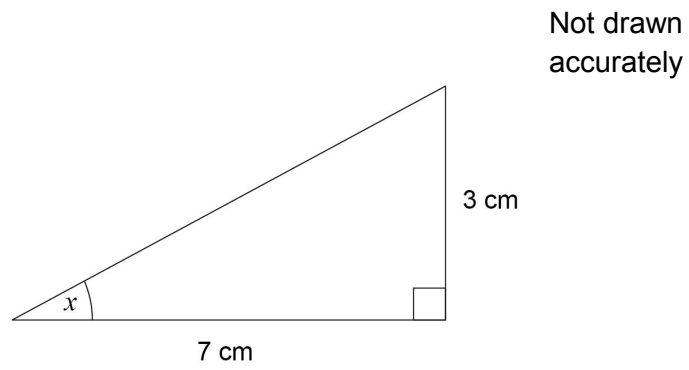
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Answer \_\_\_\_\_ miles

Turn over for the next question



9 Work out the size of angle  $x$ .



[2 marks]

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Answer \_\_\_\_\_ degrees





10 Work out the next term of this quadratic sequence.

[2 marks]

5                      8                      14                      23                      .....

Answer \_\_\_\_\_

11 Circle the expression that is equivalent to

$$\frac{3x^2}{6x^2 + 3}$$

[1 mark]

$$\frac{x^2}{2x^2 + 3}$$

$$\frac{x^2}{6x^2 + 1}$$

$$\frac{x^2}{2x^2 + 1}$$

$$\frac{1}{2} + x^2$$

Turn over for the next question

Turn over ►



**12** The table shows information about the UK and Germany.

|                | <b>Population</b> | <b>Area (square miles)</b> |
|----------------|-------------------|----------------------------|
| <b>UK</b>      | 64 000 000        | 95 000                     |
| <b>Germany</b> | 82 000 000        | 140 000                    |

$$\text{Population density} = \frac{\text{population}}{\text{area}}$$

Compare the population densities of the UK and Germany.

**[3 marks]**

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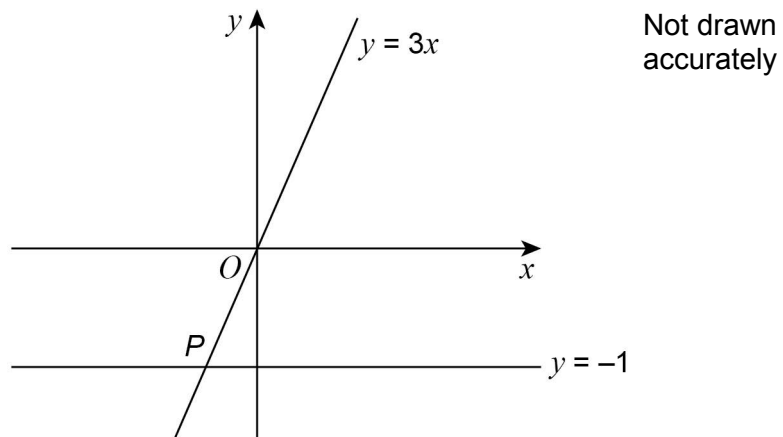
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- 13 Two straight lines intersect at point  $P$ .



Circle the coordinates of  $P$ .

[1 mark]

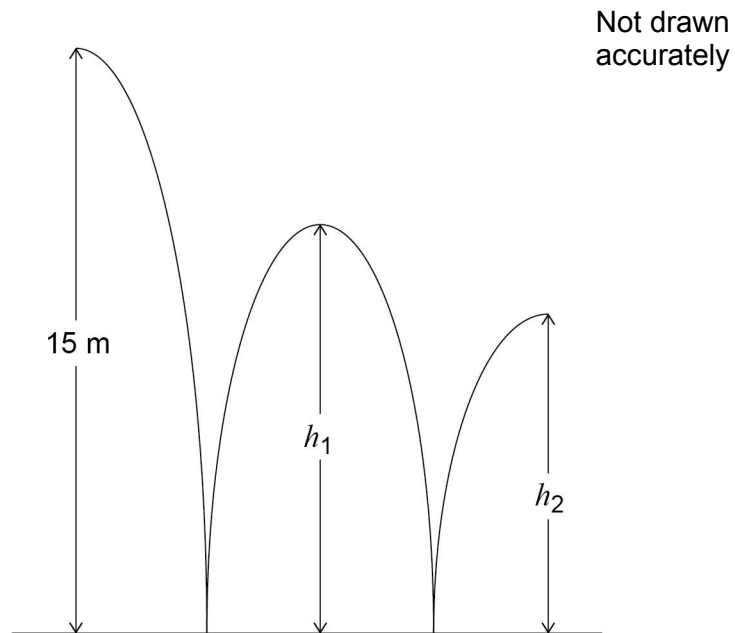
$(-3, -1)$        $\left(-1, -\frac{1}{3}\right)$        $(-1, -3)$        $\left(-\frac{1}{3}, -1\right)$

Turn over for the next question

Turn over ►



- 14** A ball is thrown from a height of 15 metres.  
It bounces to height  $h_1$ , then to height  $h_2$  as shown.



$h_1$  is three quarters of the original height.

- 14 (a)** Jack expects  $h_2$  to be three quarters of  $h_1$

Work out the value of  $h_2$  that he expects.

**[2 marks]**

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Answer \_\_\_\_\_ metres



**14 (b)** In fact,  $h_2$  is two thirds of  $h_1$

How does this affect the answer to part (a)?

Tick a box.

The ball bounced higher than he expected

The ball bounced lower than he expected

Show working to support your answer.

**[2 marks]**

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**Turn over for the next question**

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| 4 |

**Turn over ►**





16 (a) Factorise fully  $9y^3 - 6y$

[2 marks]

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Answer \_\_\_\_\_

16 (b) Factorise  $3x^2 - 22x + 7$

[2 marks]

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Answer \_\_\_\_\_

Turn over for the next question

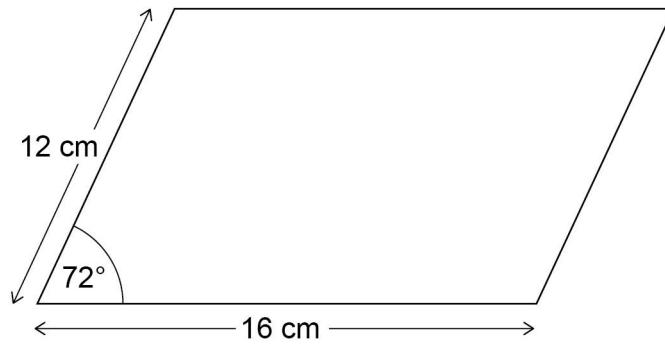
7

Turn over ►



17

Work out the area of the parallelogram.

Not drawn  
accurately**[3 marks]**

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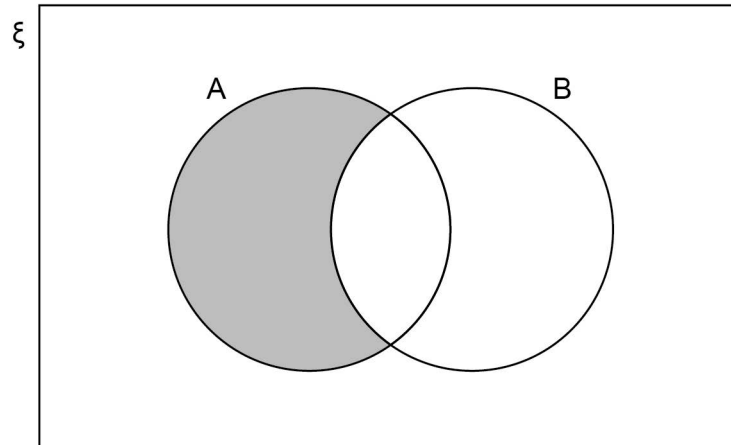
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Answer \_\_\_\_\_  $\text{cm}^2$ 



18 (a)



Which of these represents the shaded region?

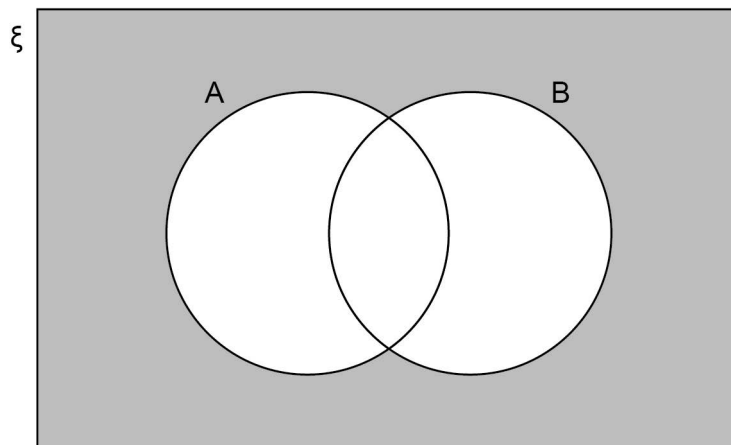
Circle your answer.

[1 mark]

A

 $B'$  $A \cap B'$  $A \cup B'$ 

18 (b)



Which of these represents the shaded region?

Circle your answer.

[1 mark]

 $(A \cup B)'$  $(A \cap B)'$  $A' \cap B$  $A' \cup B'$ 

- 19** The length of a rectangle is five times the width.  
The area of the rectangle is  $1620 \text{ cm}^2$

Not drawn  
accurately



Work out the width of the rectangle.

**[3 marks]**

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Answer \_\_\_\_\_ cm



**20**

A stone is thrown upwards with a speed of  $v$  metres per second.

The stone reaches a maximum height of  $h$  metres.

$h$  is directly proportional to  $v^2$

When  $v = 10$ ,  $h = 5$

Work out the maximum height reached when  $v = 24$

**[4 marks]**

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Answer \_\_\_\_\_ m

**Turn over for the next question**

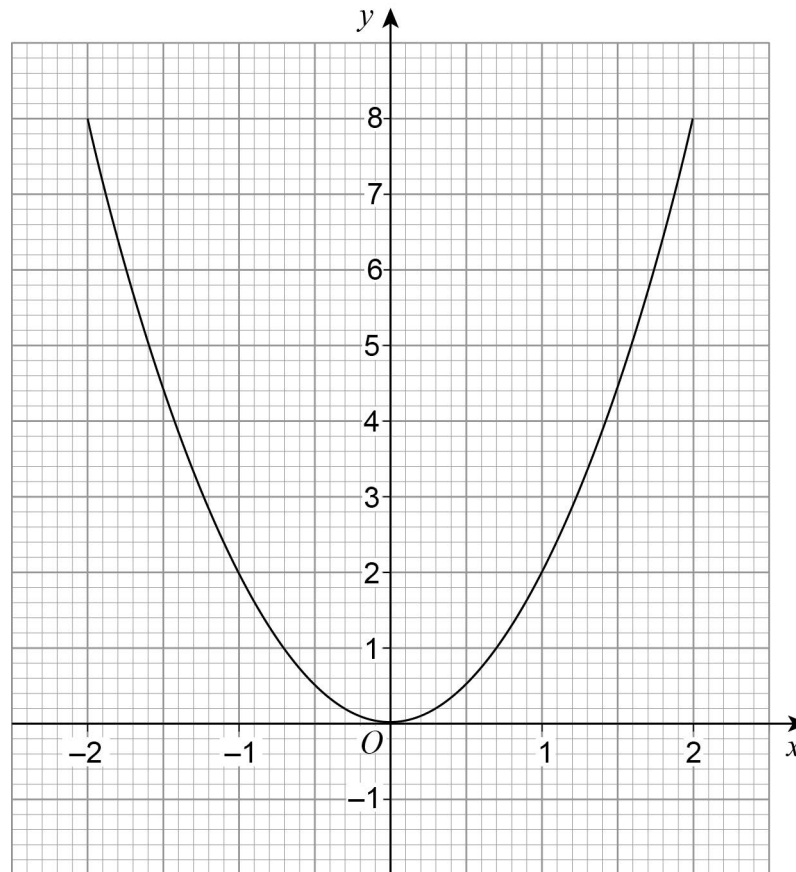
|   |
|---|
| 7 |
|---|

**Turn over ►**

**21 (a)** Meera is using a **graphical** method to solve  $2x^2 - 3x = 0$

She draws the graph of  $y = 2x^2$  and a straight line graph on the same grid.

Here is the graph of  $y = 2x^2$



Complete her method to solve  $2x^2 - 3x = 0$

**[2 marks]**

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Answer \_\_\_\_\_



- 21 (b)** Levi is solving  $2x^2 + 5x = 0$   
He uses this method.

$$2x^2 + 5x = 0 \quad \text{subtract } 5x \text{ from both sides}$$

$$2x^2 = -5x \quad \text{divide both sides by } x$$

$$2x = -5 \quad \text{divide both sides by 2}$$

$$x = -2.5$$

Evaluate his method and his answer.

**[2 marks]**

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**Turn over for the next question**

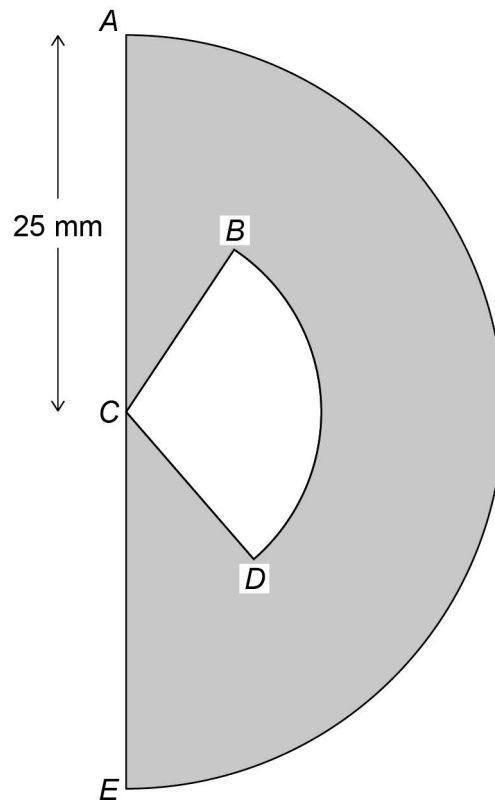


22

The cross section of an earring is a semicircle, centre  $C$ , radius 25 mm

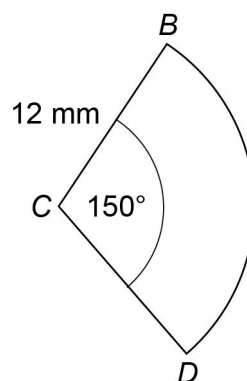
The earring is black and white.

The shaded area is black.



Not drawn  
accurately

Sector  $BCD$  is white and has radius 12 mm



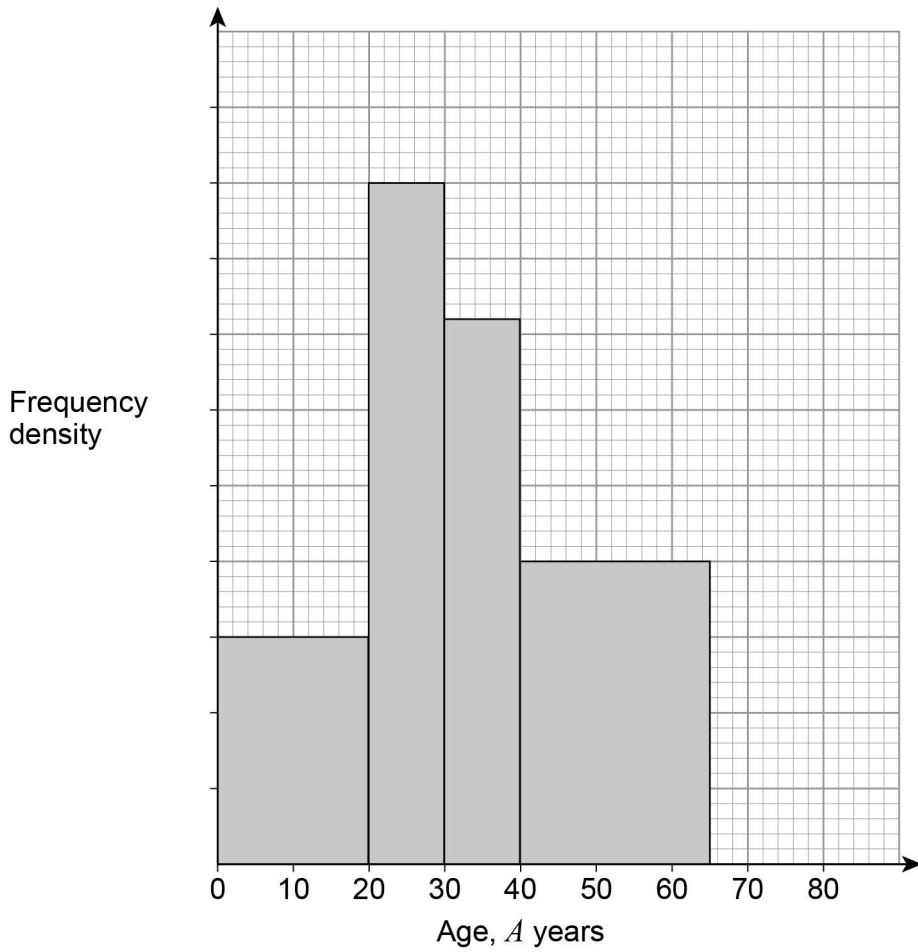
Not drawn  
accurately





23 Here is some information about a tennis club.

**Members of a tennis club**



There are 30 members with  $A < 20$

There are 12 members with  $65 \leq A < 80$

There are no members with  $A \geq 80$

23 (a) Complete the histogram.

**[3 marks]**

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**23 (b)** Work out the total number of members of the club.

**[2 marks]**

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Answer \_\_\_\_\_

**Turn over for the next question**



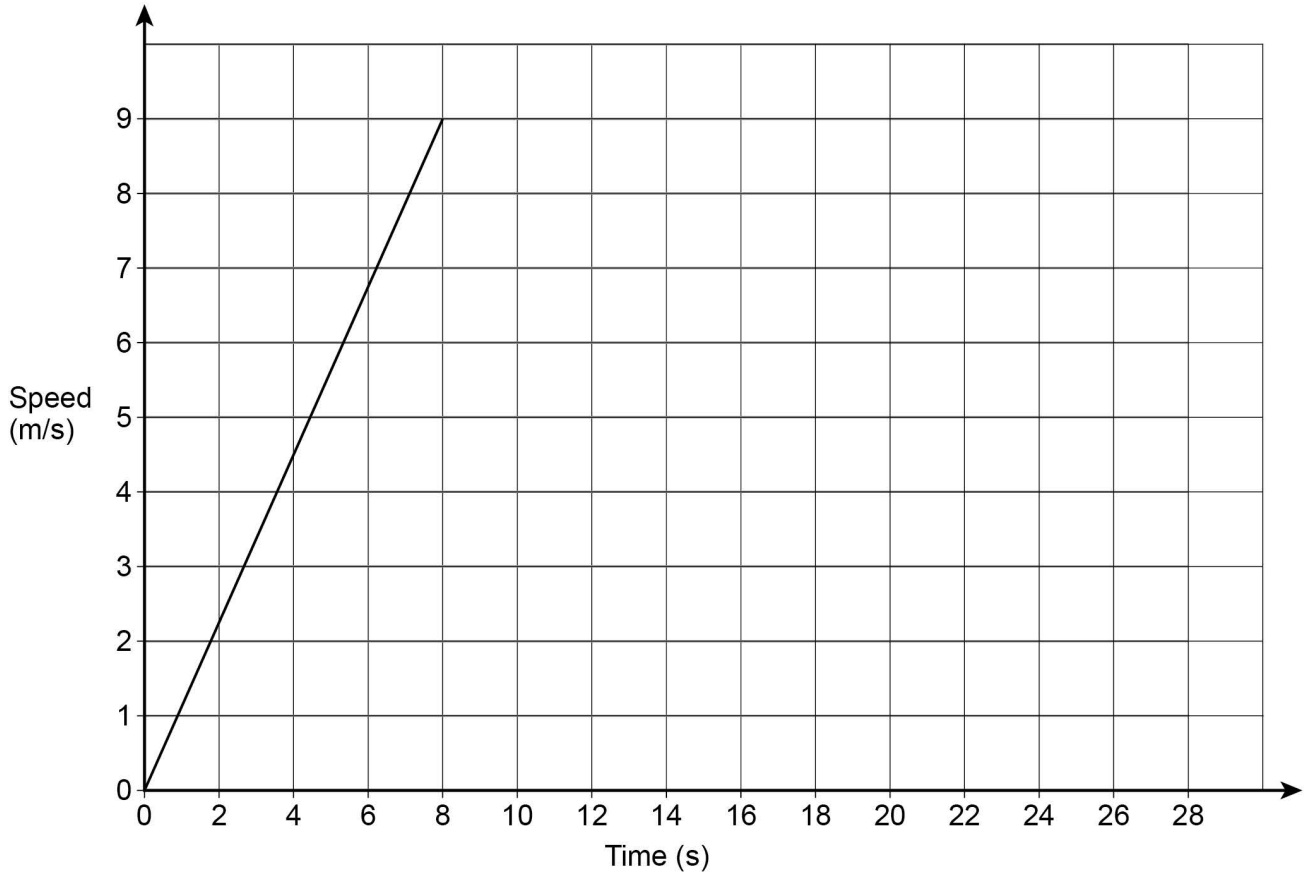
24

Beth ran a 200 metre race.

Here is a graph of the first 8 seconds of her race.

She completed the race at a constant speed of 9 m/s

Speed-time graph for Beth



Amy completed the race in 27 seconds.

Did Beth finish before Amy?

You **must** show your working.**[3 marks]**


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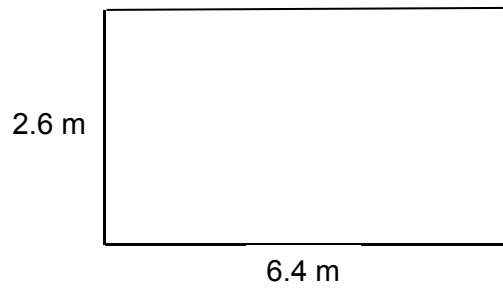


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Answer \_\_\_\_\_



25 The dimensions of a rectangular floor are to the nearest 0.1 metres.



Not drawn  
accurately

A force of 345 Newtons is applied to the floor.

The force is to the nearest 5 Newtons.

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

Work out the upper bound of the pressure.

Give your answer to 4 significant figures.

You **must** show your working.

[5 marks]

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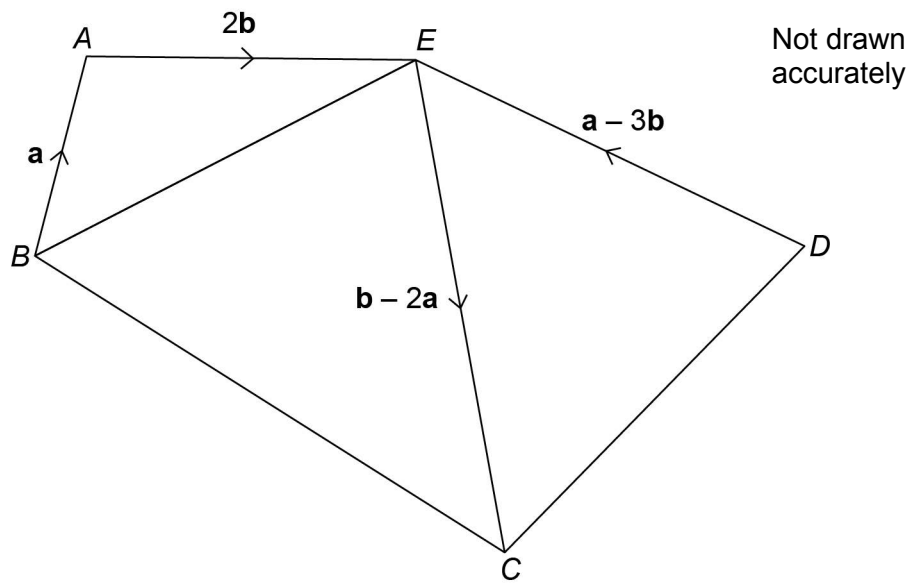
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Answer \_\_\_\_\_ N/m<sup>2</sup>



26

 $ABCDE$  is a pentagon.Show that  $BCDE$  is a parallelogram.**[3 marks]**

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