AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

GCSE MATHEMATICS

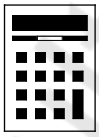
H

Higher Tier Paper 2 Calculator

Wednesday 4 June 2025 Morning Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:



- a calculator
- mathematical instruments
- the Formulae Sheet (enclosed).

Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- 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.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- 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	
TOTAL	

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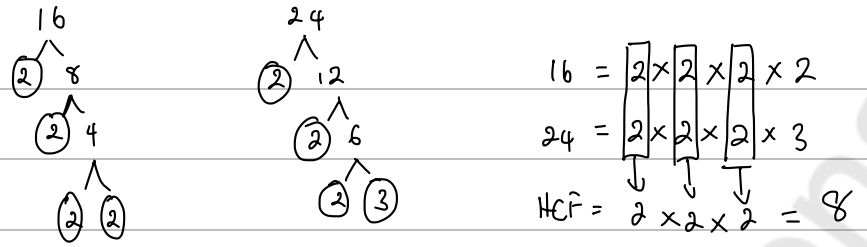
Answer **all** questions in the spaces provided.

1 (a) Work out the highest common factor (HCF) of 16 and 24

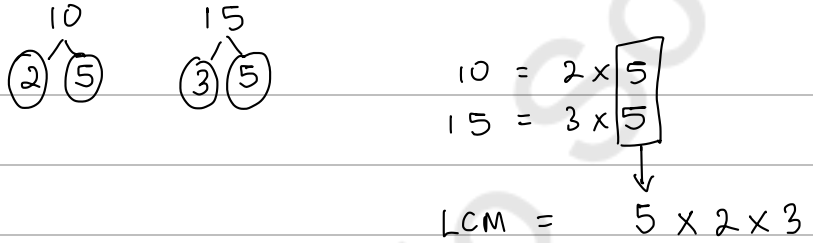
[1 mark]



Answer 8

1 (b) Work out the lowest common multiple (LCM) of 10 and 15

[1 mark]



Answer 30

1 (c) Write 42 as a product of its prime factors.

[1 mark]

Answer 2 × 3 × 7

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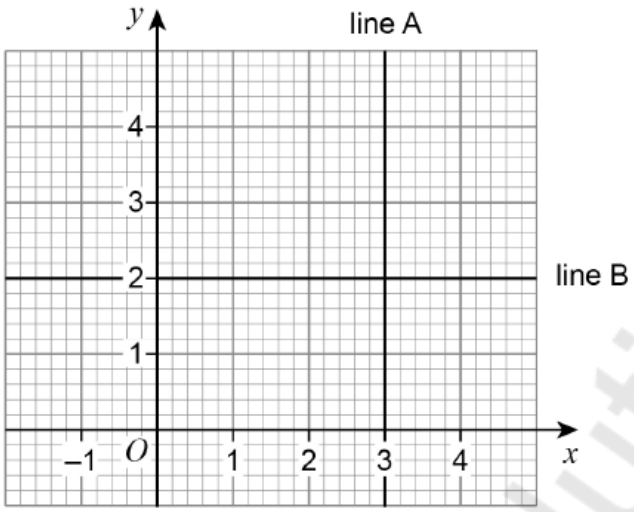
2 Here are lines A and B.



Complete these statements.

[2 marks]

The **equation** of line A is $x = 3$

The **gradient** of line B is 0

Turn over for the next question

5

Do not write outside the box

3 Youssuf posted an advert on his social media channel.

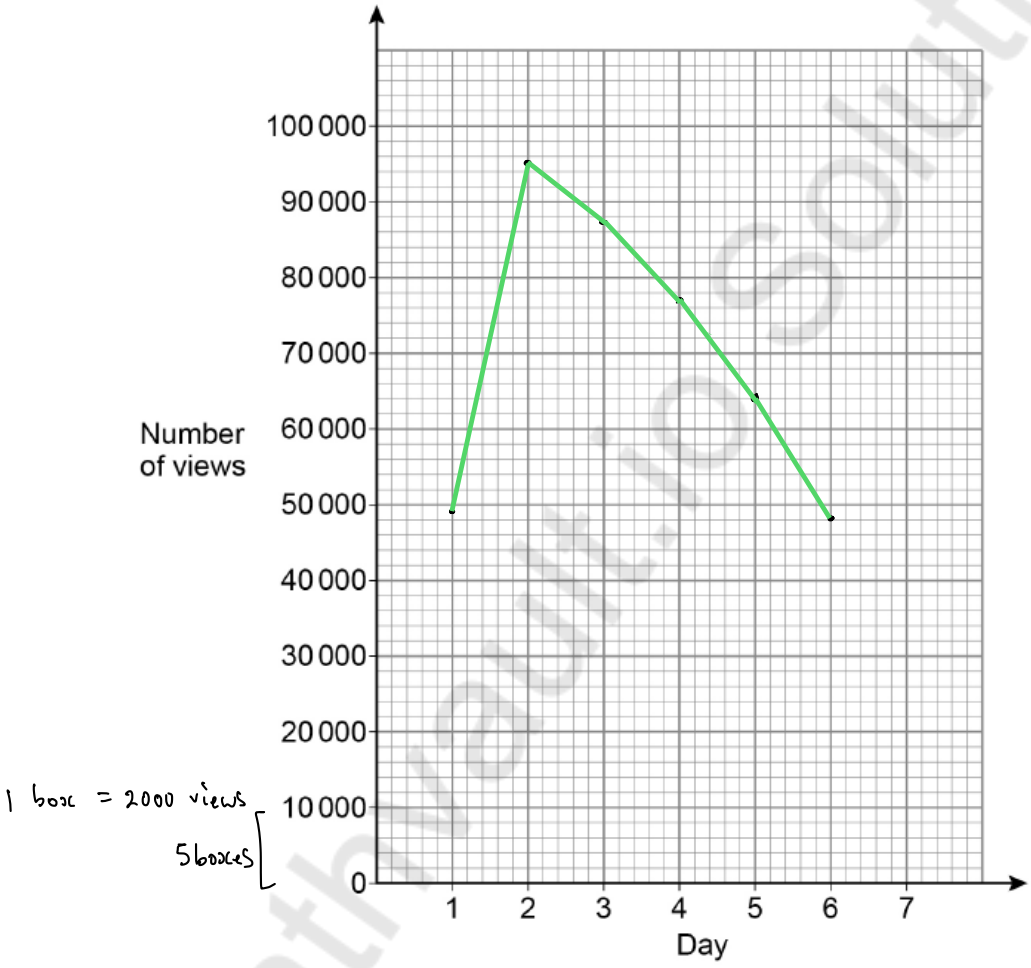
The table shows the number of views of the advert during its first 6 days.

Day	1	2	3	4	5	6
Number of views	49 000	95 000	87 000	77 000	64 000	48 000

-8000 -10,000 -13000 -16000 -19000 -29000

3 (a) On the grid, draw a time series graph to represent the data.

[2 marks]



1 box = 2000 views

5 boxes

Do not write outside the box

3 (b) Youssuf receives 0.018p for each view of the advert.

Estimate how much he receives from views of the advert on **day 7**

[3 marks]

Money for Day 7 = 29000 × 0.018p = 522p

522p ÷ 100 = £5.22

Answer £ 5.22

4 70% of the discs in a box are red and the rest are blue.

- 40% of the red discs are removed.
- 50% of the blue discs are removed.

In total, what percentage of the discs are removed from the box?

[3 marks]

Assume total number of discs = x

Blue = $0.3x$

Red = $0.7x$

Red removed = $0.4 \times 0.7x = 0.28x$

Blue removed = $0.5 \times 0.3x = 0.15x$

$0.43x$ = Total removed

Answer 43 %

8

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5 (a) The length of a fence panel is 160 cm to the nearest 10 cm

Complete the error interval.

[2 marks]

150 ⋮ 160 ⋮ 170

$155 \leq L < 165$

Answer 155 cm ⩽ length < 165 cm

5 (b) A different fence panel measures 2 metres to the nearest 10 cm

Kim says that the total length of **three** of these fence panels must be less than 6.2 m

Show that Kim is correct.

[2 marks]

2m = 200 cm

190 ⋮ 200 ⋮ 210

$195 \leq f < 205$

$205 \times 3 = 615$ cm upper limit for Total length of fence.

615cm = 6.15m

6.15m < 6.2m Thus Kim is correct.

6 Circle the expression which is a factor of $3x + 15$

[1 mark]

$3x$ $x + 12$ $x + 5$ $x + 15$

$3x + 15 \equiv 3(x + 5)$

Do not write outside the box

7 The five possible outcomes of an event are A, B, C, D and E.

The table shows some of the probabilities.

Outcome	A	B	C	D	E
Probability	0.18	0.2	0.3	0.16	0.16

P(C) = P(B) + 0.1

P(D) = P(E) = x

Work out P(D)

[3 marks]

$P(C) = 0.2 + 0.1 = 0.3$

$0.18 + 0.2 + 0.3 + x + x = 1$

$0.68 + 2x = 1$

$-0.68 \quad -0.68$

$2x = 0.32$

$\div 2 \quad \div 2$

$x = 0.16$

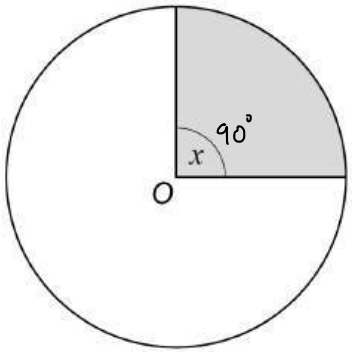
Answer 0.16

Turn over for the next question

8

Do not write outside the box

8 Here is a circle, centre *O*.



Not drawn accurately

8 (a) The circle has a circumference of 20 cm

Assume that angle x is 90°

Work out the shaded area.

Give your answer as a decimal.

[3 marks]

$C = \pi \times D$

$20 = \pi \times D$

$\frac{20}{\pi} = D$

$r = \frac{1}{2} \times D$

$r = \frac{1}{2} \times \frac{20}{\pi}$

$r = \frac{10}{\pi}$ cm

$\text{Area} = \frac{\theta}{360} \times \pi r^2$

$\text{Area} = \frac{90}{360} \times \pi \times \left(\frac{10}{\pi}\right)^2$

$= \frac{1}{4} \times \pi \times \frac{100}{\pi^2}$

$\text{Area} = \frac{25}{\pi}$ cm^2

Answer 7.96 cm^2

Do not write outside the box

8 (b) In fact, angle x is smaller than 90°


What does this mean about the shaded area?

Tick **one** box.

[1 mark]

- [x] It is smaller than the answer to part (a)
- [ ] It is the same as the answer to part (a)
- [ ] It is larger than the answer to part (a)
- [ ] It could be any of the above

9 The number of people that follow an influencer increases from 35 000 to 70 000

The influencer says,

"My number of followers has increased by 200%, because 70 000 is 35 000 times 2"

Are they correct?

Tick a box.

Yes [ ] No [x]

Give a reason for your answer.

[1 mark]

Number of followers actually increased by 100% not 200%

$\%\ \text{increase} = \frac{35000}{35000} \times 100 = 100\%$

5

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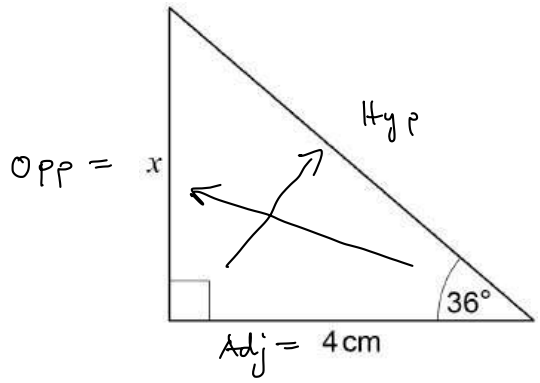
10



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Use trigonometry to work out the value of x.

You **must** show your working.

[3 marks]

Tan θ = Opp / Adj

SOH CAH TOA

✓ ✓

Tan 36 = $\frac{x}{4}$

4 Tan 36 ≈ 2.91 cm (3 s.f.)

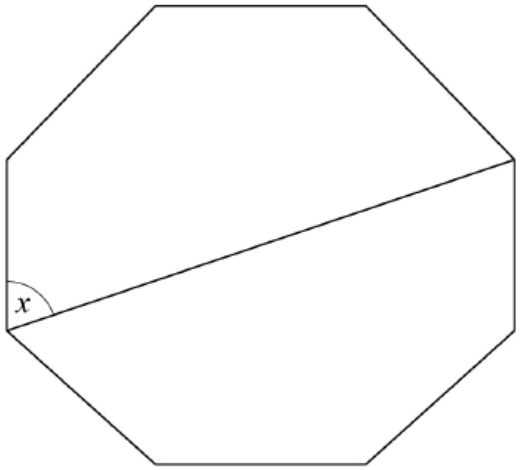
$x =$ 2.91 cm

Do not write outside the box

11 A straight line is drawn across a **regular** octagon.

$n = 8$

Not drawn accurately



Work out the size of angle x.

[3 marks]

$(n-2) \times 180$ = Sum of interior angles

$(8-2) \times 180$

6×180

1080°

One interior angle $= \frac{1080}{8} = 135^\circ$

$x = 135^\circ \div 2 = 67.5^\circ$

$x =$ 67.5 °

6

Do not write outside the box

12 Greg and Hanna want to know if students at their school think lunchtime clubs are important.

12 (a) Greg asks 15 people at the lunchtime chess club.

Give **one** reason why his results may **not** represent the whole school.

[1 mark]

Only students at chess club were asked so the sample / survey is biased.

12 (b) Here are Hanna's results.

- 62% answered Important.
- 24% answered Not Important.
- The rest answered Don't Know.

93 students answered Important.

How many students answered Don't Know?

[3 marks]

% of don't know = 100% − 62% − 24%

% of don't know = 14%

Percentage : No. of students

62% : 93

÷62 1% : 1.5 ÷62

×14 14% : 21 ×14

Answer 21

Do not write outside the box

13 Emma and Chan each drive 154 miles from A to B.

Emma drives the whole way at an average speed of 56 miles per hour.

Chan drives

85 miles at an average speed of 50 miles per hour

and then

the rest of the way at an average speed of 60 miles per hour.

Who takes **less** time, Emma or Chan?

Show working to support your answer.

[4 marks]

$S = \frac{D}{T}$

$T \times S = \frac{D}{T} \times T$

$T \times S = D$

$\div S \quad \div S$

$T = \frac{D}{S}$

Time for Emma = $\frac{154}{56}$ = 2.75 hours

154 − 85

69 miles

Time for Chan (part 1) = $\frac{85}{50}$ = 1.7 hours

Time for Chan (Part 2) = $\frac{69}{60}$ = 1.15 hours

Total time for Chan = 2.85 hours

2.75 < 2.85 so Emma takes less time

Answer Emma

8

Do not write outside the box

14 a, b and c are **positive integers**.

$$a(9x + 2) \equiv 45x + 3b + c$$

Work out **one** possible set of values for a, b and c.

[3 marks]

$9ax + 2a \equiv 45x + 3b + c$

$9a = 45$

$\div 9 \quad \div 9$

$a = 5$

$2a = 3b + c$

$2(5) = 3b + c$

$10 = 3b + c$

$10 = 9 + 1 \qquad c = 1$

$3b = 9$

$\div 3 \quad \div 3$

$b = 3$

$a =$ 5 $b =$ 3 $c =$ 1

Do not write outside the box

15 Solve $3x^2 + 5x - 9 = 0$

Give your solutions as decimals.

[2 marks]

$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$ $a = 3, b = 5, c = -9$

$x = \frac{-5 \pm \sqrt{(5)^2-4(3)(-9)}}{2(3)}$

$x = \frac{-5 \pm \sqrt{133}}{6}$

$x = \frac{-5 + \sqrt{133}}{6}$ $x = \frac{-5 - \sqrt{133}}{6}$

$x \approx 1.09$ (3 s.f.) $x \approx -2.76$ (3 s.f.)

Answer 1.09 and −2.76

16 The value of a second-hand car decreases by 12.1% per year.

Work out the number of full years until the car loses **more** than half its value.

You **must** show your working.

[3 marks]

Assume value of car is x

$100\% - 12.1\% = 87.9\% = 0.879$

After 1 year $= 0.879x$

After 2 years $= 0.879 \times 0.879x = 0.773x$ (3sf)

After 3 years $= 0.879^3 x = 0.679x$ (3 sf.)

After 4 years $= 0.879^4 x = 0.597x$ (3 sf.)

After 5 years $= 0.879^5 x = 0.525x$ (3sf)

After 6 years $= 0.879^6 x = 0.461x$ (3 s.f)

Answer 6 years

8

Do not write outside the box

17 When a biased coin is spun, P(Heads) : P(Tails) = 5 : 2

In a game, the player spins the coin four times. 7 total

The player can win in **two** ways.

1st way to win	**2nd way to win**
Spin 4 heads	Spin a Head, then a Tail, then a Head, then a Tail

How many times more likely is a player to win the 1st way than the 2nd way?

[3 marks]

$P(H) = \frac{5}{7}$

$P(T) = \frac{2}{7}$

$P(\text{1st way win}) = \frac{5}{7} \times \frac{5}{7} \times \frac{5}{7} \times \frac{5}{7} = \frac{625}{2401}$

$P(\text{2nd way win}) = \frac{5}{7} \times \frac{2}{7} \times \frac{5}{7} \times \frac{2}{7} = \frac{100}{2401}$

$\frac{625}{2401} \div \frac{100}{2401} = 6.25$

Answer 6.25

Do not write outside the box

18 Lines *AB*, *BC*, *CD* and *AD* form two triangles.

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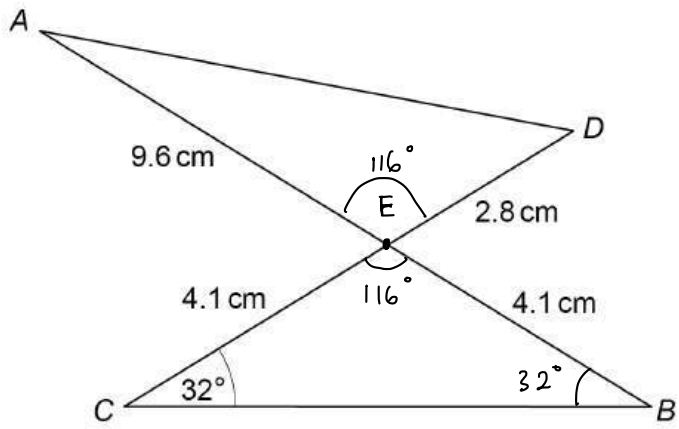


Work out the length of *AD*.

[4 marks]

$C\hat{B}E = 32°$

$C\hat{E}B = 180 - 32 - 32 = 116°$

$A\hat{E}D = 116°$ (vertically opposite angles are equal)

$AD^2 = 9.6^2 + 2.8^2 - 2(9.6)(2.8)\cos 116$

$AD = \sqrt{9.6^2 + 2.8^2 - 2(9.6)(2.8)\cos 116}$

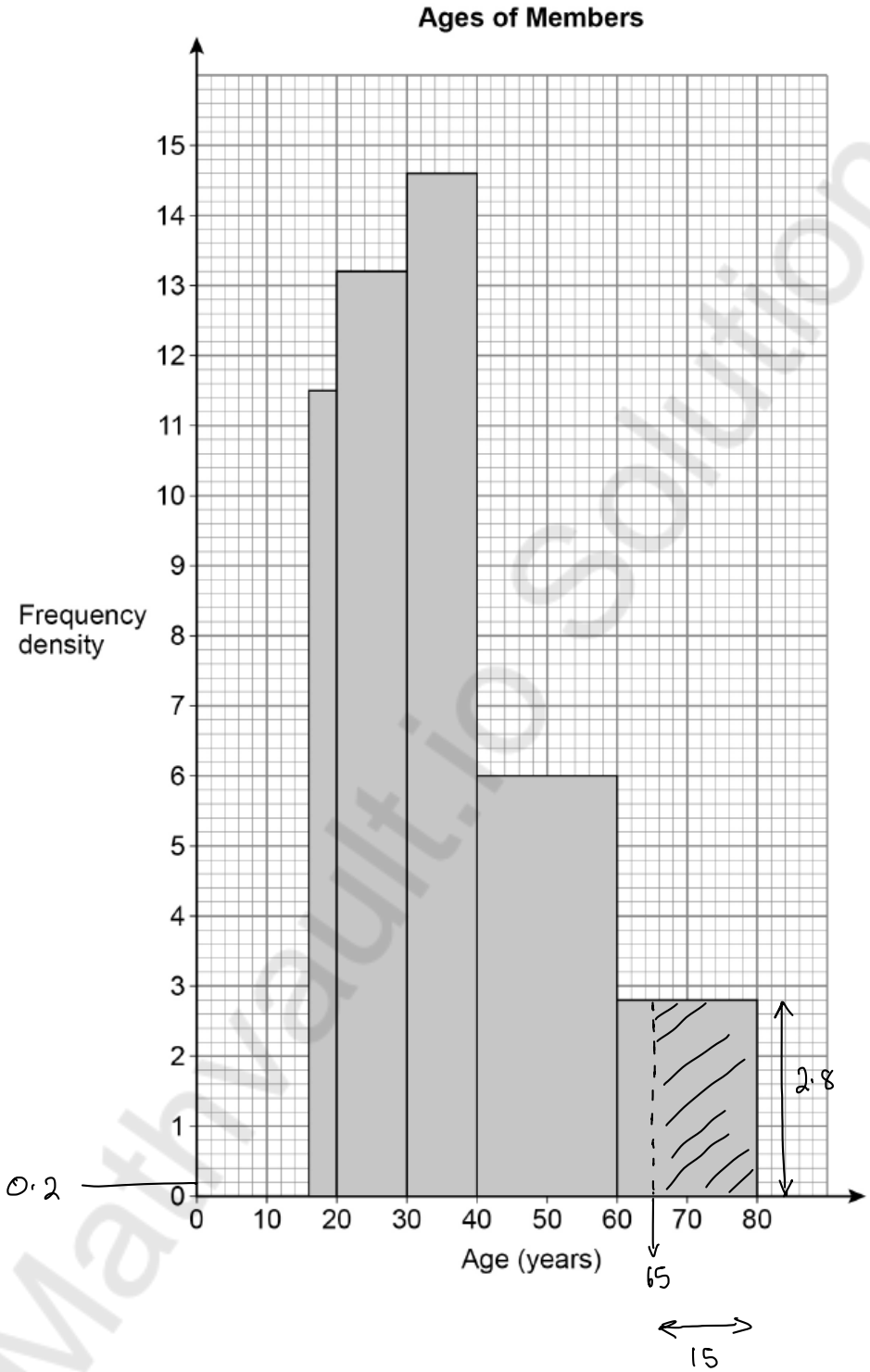
Answer 11.1 cm

7

Do not write outside the box

19 The histogram represents the ages of the 500 members of a gym.

The first bar represents the members aged at least 16 and under 20



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Each member pays an annual fee based on their age.

Age	Under 65	65 or over
Annual fee	£275	£129

Use the histogram to estimate the **total** annual fees paid by these members.

[4 marks]

N° of 65 or over = 2·8 x 15 = 42

Fees from 65 or over = 42 x 129 = £5418

N° of under 65 = 500 − 42 = 458

Fees from under 65 = 458 x 275 = £125,950

Total annual fees = 125950 + 5418

Answer £ 131,368

4

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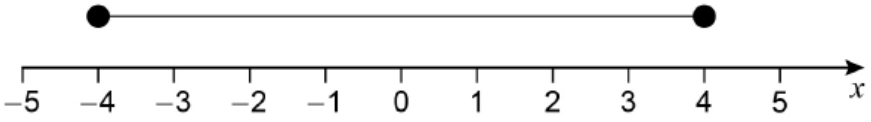
20 David has solved the inequality $x^2 < 16$ and represented his solution on the number line below.



Give **one** reason why David's solution is wrong.

[1 mark]

$(-4)^2 = 16$

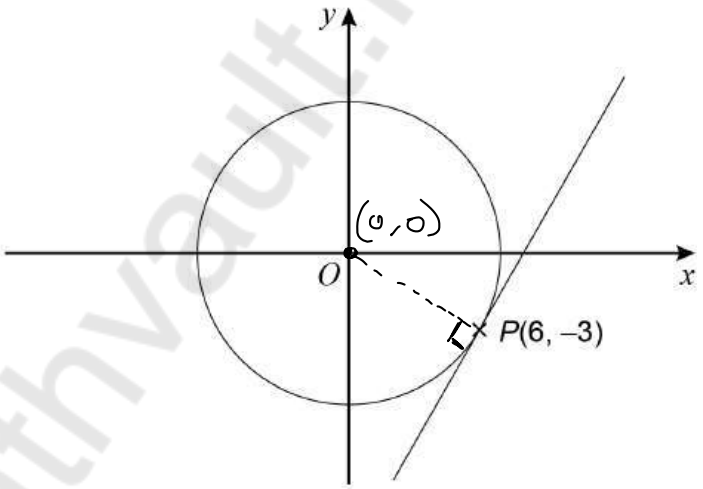
$16 \neq 16$

$\therefore x = -4$ is not a solution

Circle at -4 and 4 should not be shaded

21 A circle with centre O and radius $\sqrt{45}$ has a tangent drawn at point $P(6, -3)$

Not drawn accurately



21 (a) Write down the equation of the **circle**.

[1 mark]

Answer $x^2 + y^2 = 45$

Do not write outside the box

21 (b) Work out the equation of the **tangent**.

Give your answer in the form $y = mx + c$

[4 marks]

$m_r = \frac{-3-0}{6-0} = \frac{-3}{6} = -\frac{1}{2}$

$m_T = 2$ $\quad P(6, -3)$

$y = mx + c$

$y = 2x + c$

$-3 = 2(6) + c$

$-3 = 12 + c$

$-12 \quad -12$

$-15 = c$

$\therefore \quad y = 2x - 15$

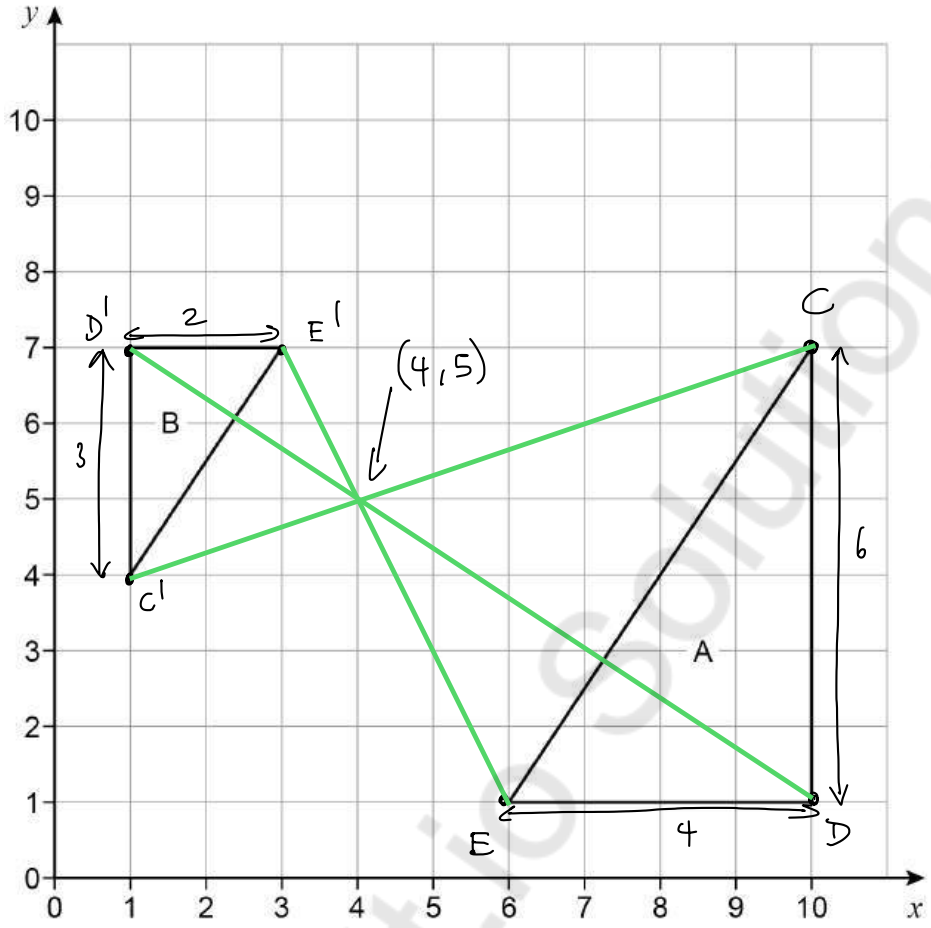
Answer $y = 2x - 15$

Turn over for the next question

6

Do not write outside the box

22 Shape A and shape B are shown on the grid.



Describe the **single** transformation that maps shape A to shape B.

[3 marks]

Enlargement by a scale factor of $-\frac{1}{2}$ with a centre of enlargement at (4,5)

Do not write outside the box

23 *ABCD* is a quadrilateral.

AC and *BD* intersect at *P*.

$\overrightarrow{AB} = 9\mathbf{b} - 2\mathbf{a}$

$\overrightarrow{BC} = 5\mathbf{a}$

$\overrightarrow{DC} = 10\mathbf{b}$

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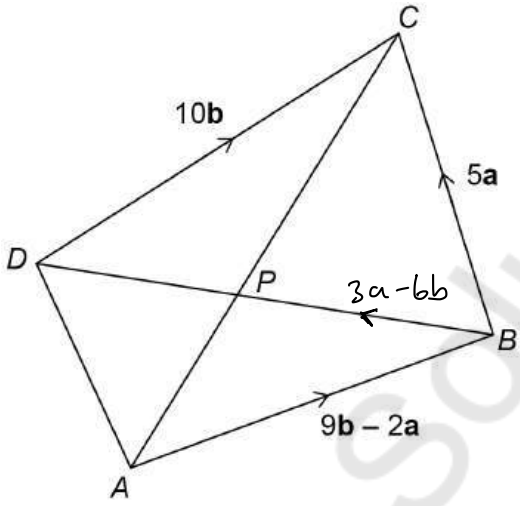

$BP : PD = 3 : 2$

$AP : PC = 1 : k$

Work out the value of k.

You **must** show your working.

[5 marks]

$\overrightarrow{BD} = \overrightarrow{BC} + \overrightarrow{CD}$

$\overrightarrow{BD} = 5a - 10b$

$\overrightarrow{BP} = \frac{3}{5}\overrightarrow{BD} = \frac{3}{5}(5a-10b) = 3a - 6b$

$\overrightarrow{PD} = \frac{2}{5}\overrightarrow{BD} = \frac{2}{5}(5a-10b) = 2a - 4b$

$\overrightarrow{AP} = \overrightarrow{AB} + \overrightarrow{BP}$

$\overrightarrow{AP} = 9b - 2a + 3a - 6b$

$\overrightarrow{AP} = a + 3b$

$\overrightarrow{PC} = \overrightarrow{PB} + \overrightarrow{BC}$

$\overrightarrow{PC} = -\overrightarrow{BP} + \overrightarrow{BC}$

$\overrightarrow{PC} = -(3a - 6b) + 5a$

$\overrightarrow{PC} = -3a + 6b + 5a$

$\overrightarrow{PC} = 2a + 6b$

$\overrightarrow{PC} = 2\overrightarrow{AP}$

$\frac{1}{2} = \frac{\overrightarrow{AP}}{\overrightarrow{PC}}$

$1 : 2 = \overrightarrow{AP} : \overrightarrow{PC}$

$k =$ 2

8

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24 A study suggests a student's exam mark, m, is directly proportional to the cube root of total revision time, t hours.

A student doubles their total revision time.

Work out the percentage increase in their exam mark.

[3 marks]

$m \propto \sqrt[3]{t}$

$m = k\sqrt[3]{t}$

$m_1 = k\sqrt[3]{t}$

$m_2 = k\sqrt[3]{2t}$

$m_2 = k \times \sqrt[3]{2} \times \sqrt[3]{t}$

$m_2 = 1.26\, k\sqrt[3]{t}$

$m_2 = 1.26\, m_1$

26% increase

Answer 26 %

Do not write outside the box

25 $f(x) = ax + b$ and $g(x) = \frac{x+b}{a}$ where a and b are positive integers.

Prove that $fg(x) - af^{-1}(x)$ is always a multiple of 3

[4 marks]

$fg(x) = f[g(x)] = a\left[\frac{x+b}{a}\right] + b$

$x + b + b$

$fg(x) = x + 2b$

$x = ay + b$

$x - b = ay$

$\frac{x-b}{a} = y$

$f^{-1}(x) = \frac{x-b}{a}$

$af^{-1}(x) = a \times \frac{x-b}{a} = x - b$

$fg(x) - af^{-1}(x)$

$x + 2b - (x - b)$

$x + 2b - x + b$

$3b$

$3b$ is always a multiple of 3

END OF QUESTIONS

7

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ANSWER IN THE SPACES PROVIDED

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Question number	**Additional page, if required.** **Write the question numbers in the left-hand margin.**

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