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

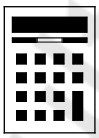
H

Higher Tier Paper 3 Calculator

Wednesday 11 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	

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

Do not write outside the box

1 Convert 8.25 pounds into kilograms.

Use 2.2 pounds = 1 kilogram

[2 marks]

8·25 pounds = x kilograms

2·2 × x = 1 × 8·25

÷ 2·2 ÷ 2·2

$x = \frac{8 \cdot 25}{2 \cdot 2}$

Answer 3·75 kg

2 Here are the temperatures in six cities in degrees Celsius.

0°C –3°C 0°C 1.5°C 23°C 4°C

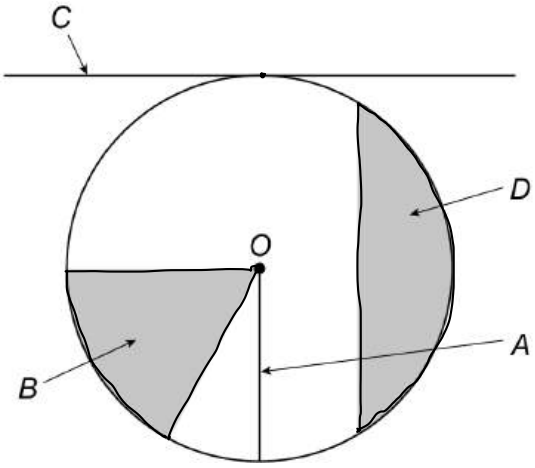
Write down the outlier.

[1 mark]

Answer 23 °C

Do not write outside the box

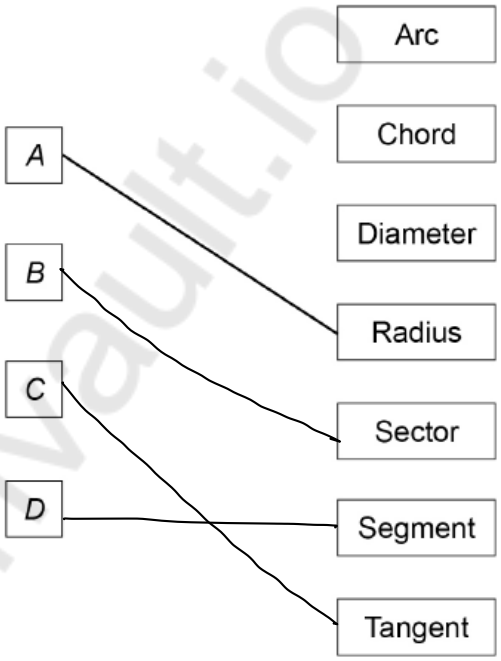
3 Here is a circle, centre *O*



Match each letter to the correct word.

One has been done for you.

[3 marks]



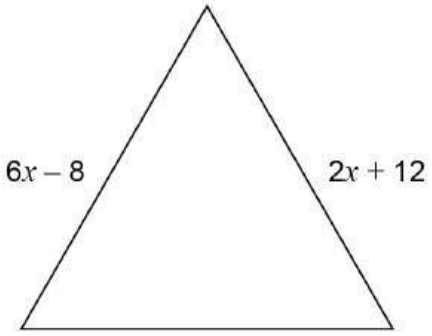
6

Do not write outside the box

4 Here is an equilateral triangle.

All measurements are in centimetres.

Not drawn accurately



Work out the value of the perimeter of the triangle.

[4 marks]

$6x - 8 = 2x + 12$

$-2x \quad -2x$

$4x - 8 = 12$

$+8 \quad +8$

$4x = 20$

$\div 4 \quad \div 4$

$x = 5$

$2(5) + 12$

$10 + 12$

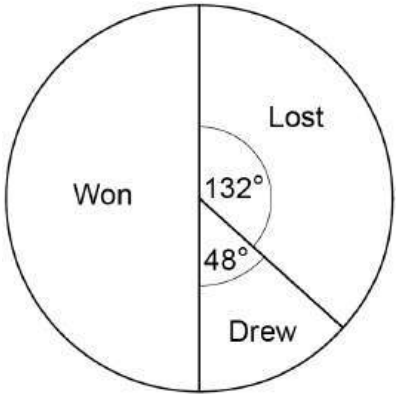
22 cm

$22 + 22 + 22 = 66\text{cm}$

Answer 66 cm

Do not write outside the box

5 The pie chart represents the results of matches played by a team.



30 matches were **won**.

How many matches were lost?

[3 marks]

Total matches = 30 × 2 = 60

$\frac{11}{30} = \frac{132}{360}$ = Fraction of lost games

$\frac{11}{30} \times 60 = 22$ lost games

Answer 22

Turn over for the next question

7

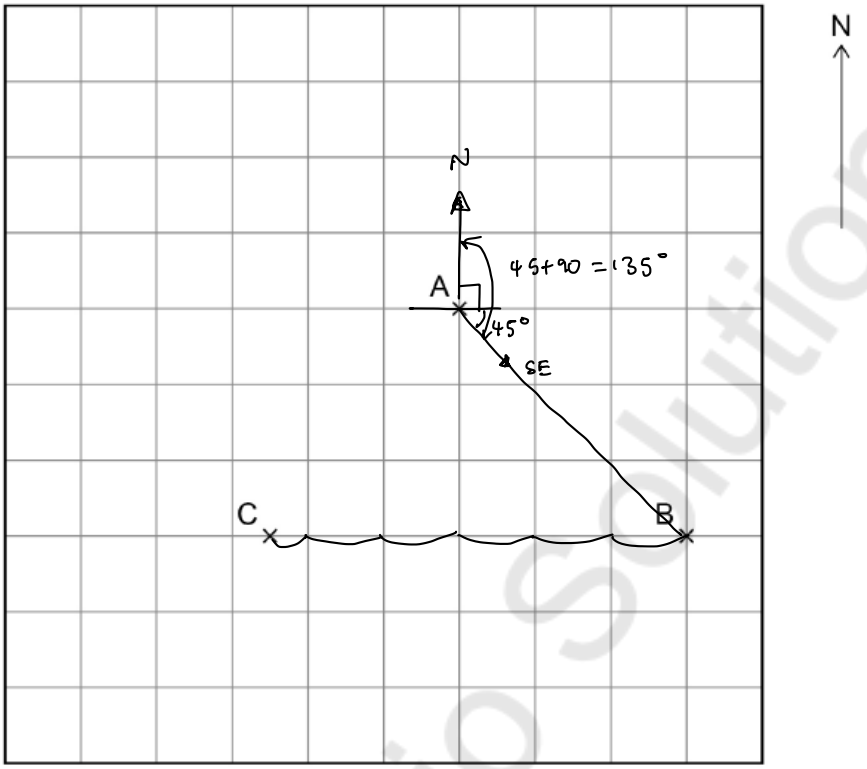
Turn over ►

Do not write outside the box

6 Here is a scale diagram showing towns A, B and C on a centimetre grid.

1cm : 200,000cm

Scale 1 : 200 000



6 (a) Work out the **actual** distance from B to C.

Give your answer in kilometres.

[4 marks]

5·5 cm : 1,100,000 cm (×5·5)

1 cm : 200000 cm (×5·5)

1 1cm = 1000 m

1 m = 100 cm

1 km = 100,000 cm

1 1 km = 1,100,000 cm

÷100,000

Answer 1 1 km km

Do not write outside the box

6 (b) B is South East of A.

Write down the bearing of B from A.

[1 mark]

Answer 135 °

7 (a) Write 2 weeks as a fraction of 8 days.

Give your answer in its simplest form.

[1 mark]

1 week = 7 days (x2)

2 weeks = 14 days (x2)

$\frac{14}{8} \div 2 = \frac{7}{4}$

Answer $\frac{7}{4}$

7 (b) Write 56 centimetres : 2.73 metres as a ratio in the form 1 : n

[1 mark]

56cm : 273 cm (x100)

1 cm : $\frac{39}{8}$ cm (÷56)

Answer 1 : $\frac{39}{8}$

7 (c) A : B = $\frac{1}{5} : \frac{7}{10}$

Write A as a fraction of B.

[2 marks]

A : B

$\frac{1}{5} : \frac{7}{10}$

x10 x10

2 : 7

A : B

Answer $\frac{2}{7}$

9

Do not write outside the box

8 A linear sequence has

- 2nd term = 6
- 5th term = 18

Work out the nth term of the sequence.

[3 marks]

□ 6 □ □ 18

−2c +2c +2c +2c

$6 + 3c = 18$

$-6 \quad -6$

$3c = 12$

$\div 3 \quad \div 3$

$c = 4$

$4n-2$ 2, 6, 10, 14, 18

−2 +2 +2 +2 +2

4n 4 8 12 16 20

Answer $4n - 2$

9 Ary, Bea and Cat each have an amount of money.

Cat has £280

- Cat's amount is $\frac{2}{3}$ of Bea's amount.
- Ary's amount : Bea's amount = 5 : 12

Work out how much money Ary has.

[3 marks]

$\frac{2}{3} \times B = 280$

$B = 280 \times \frac{3}{2}$

$B = £420$

A : B

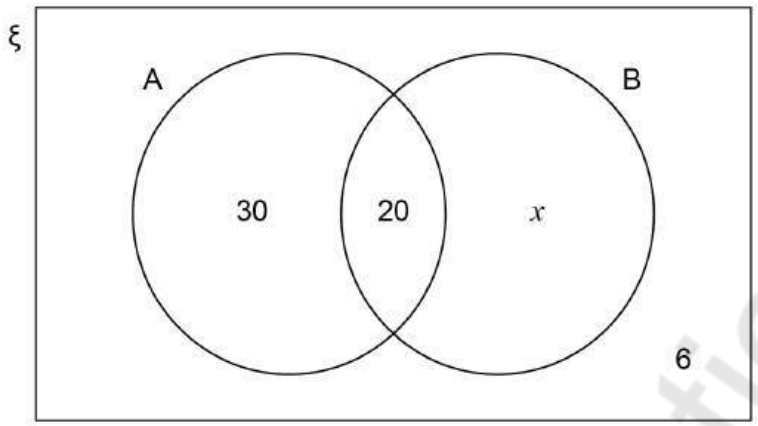
5 : 12

×35 ×35

175 : 420

Answer £ 175

10 The Venn diagram shows some of the **numbers** of items in each set.



$P(A) = \frac{1}{2}$

Work out the value of x.

[2 marks]

half of all items are in A = 30 + 20 = 50

Total items = 100

100 = 30 + 20 + x + 6

100 − 30 − 20 − 6 = x

x = 44

$x =$ 44

Turn over for the next question

8

Do not write outside the box

11 (a) Write down the equation of a straight line parallel to $y - 2x = 9$

[1 mark]

$y = mx + c$

$+2x \quad +2x$

$y = 2x + 9$

$m = 2$

Answer $y = 2x + 1$

11 (b) A straight line

- has gradient 5
- passes through the point (3, 7)

Circle the equation of the line.

[1 mark]

$15 \neq 7$

$y = 15$

$y = 5 \times 3$

$y = 3x - 2$ $y = 3x + 7$ $y = 5x$ $y = 5x - 8$

$y = 5 \times 3 - 8$

$y = 15 - 8$

$y = 7$

Do not write outside the box

12 Rob records the time he takes to drive to work every day for 80 days.

The table shows information about the results.

Midpoint	Time, t (minutes)	Frequency
$\frac{20+25}{2}$	$20 \leqslant t < 25$	16
$\frac{25+30}{2}$	$25 \leqslant t < 30$	32
$\frac{30+40}{2}$	$30 \leqslant t < 40$	24
$\frac{40+60}{2}$	$40 \leqslant t < 60$	8
		Total = 80

Midpoint	fx
22.5	$16 \times 22.5 = 360$
27.5	$32 \times 27.5 = 880$
35	$24 \times 35 = 840$
50	$8 \times 50 = 400$
	2480

Last year, the **mean** time Rob took to drive to work was 25 minutes.

Estimate the percentage increase in the **mean** driving time for these 80 days.

[4 marks]

Estimated Mean = $\frac{2480}{80} = 31$ minutes

$\frac{31 - 25}{25} \times 100 = 24\%$

Answer 24 %

6

Do not write outside the box

13 The table shows information about the salary of 90 employees.

Salary, s (£)	Frequency
$0 < s \leqslant 20\,000$	44
$20\,000 < s \leqslant 40\,000$	22
$40\,000 < s \leqslant 60\,000$	14
$60\,000 < s \leqslant 80\,000$	5
$80\,000 < s \leqslant 100\,000$	2
$100\,000 < s \leqslant 120\,000$	3

13 (a) Complete the cumulative frequency table.

[1 mark]

Salary, s (£)	Cumulative Frequency
$s \leqslant 20\,000$	44
$s \leqslant 40\,000$	66
$s \leqslant 60\,000$	80
$s \leqslant 80\,000$	85
$s \leqslant 100\,000$	87
$s \leqslant 120\,000$	90

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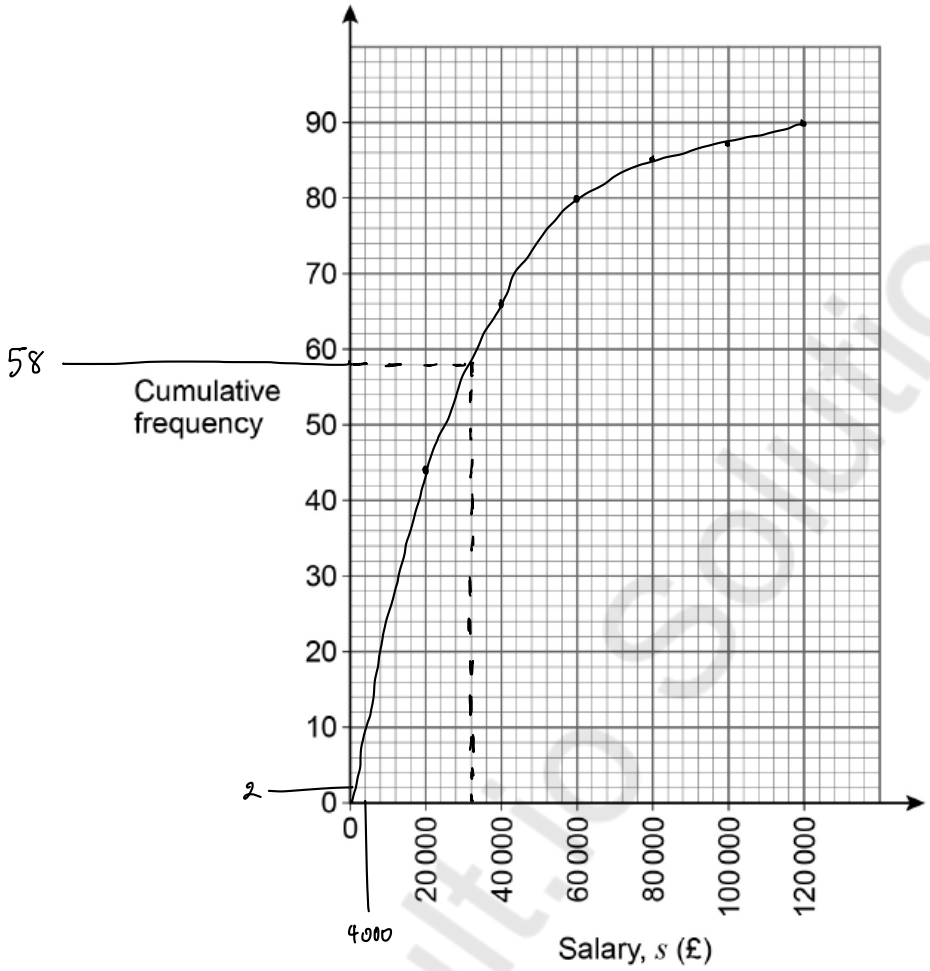
13 (b) Draw a cumulative frequency diagram to represent the data.

[2 marks]



13 (c) Estimate the number of employees with a salary **less** than £32 000

[2 marks]

Answer 58

5

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14 (a) For a small plane,

- the mass of the empty plane is 800 kg, to the nearest 100 kg
- the mass of fuel is 190 kg, to the nearest 5 kg
- the mass of the passengers is 163 kg, to the nearest kg

The total mass of a plane is calculated by adding these three masses.

The **maximum** mass for the plane to take off safely is 1200 kg

Can this plane definitely take off safely?

Tick a box.

Yes ☐ No ☑

Show working to support your answer.

[4 marks]

700 | 800 | 900 185 | 190 | 195

$750 \leq EP < 850$ $187.5 \leq F < 192.5$

162 | 163 | 164

$162.5 \leq P < 163.5$

Max possible mass $< 850 + 192.5 + 163.5$

Max possible mass < 1206

but $1206 > 1200$ Thus it is possible that the mass is a safety risk.

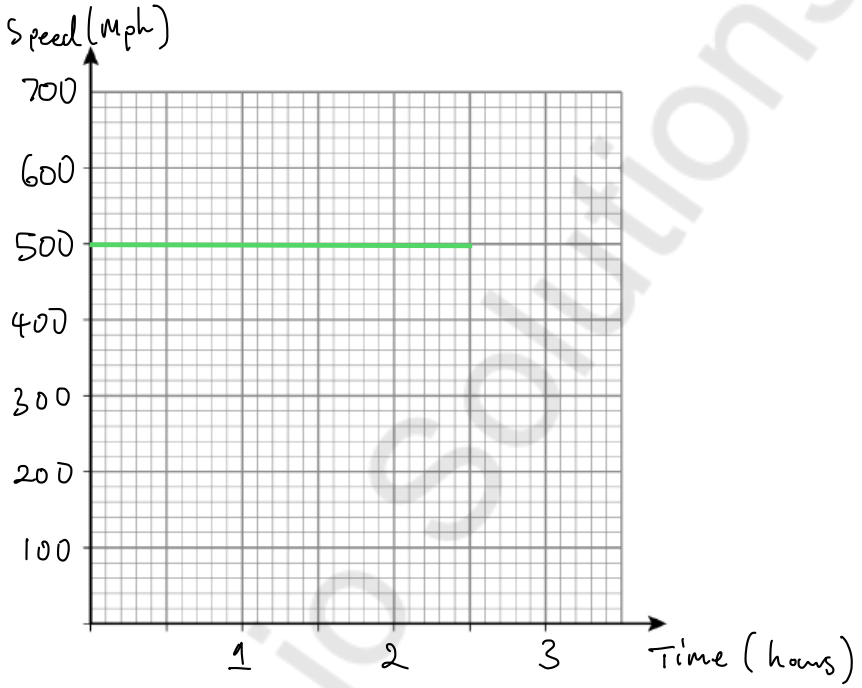
Do not write outside the box

14 (b) A different plane travels 1250 miles in 2 hours 30 minutes at a constant speed.

On the grid, draw a **speed/time** graph to represent this information.

[3 marks]

$$\text{Speed} = \frac{1250}{2.5} = 500 \text{ miles/hour}$$



Turn over for the next question

7

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15 Amy and Becky each make integers using **three** single digits.

In any integer, digits may be repeated.

- Amy makes **even** integers with a first digit greater than 7
- Becky makes **odd** integers with a first digit that is non-zero.

They each make as many different integers as possible.

How many **more** integers than Amy does Becky make?

[3 marks]

8, 9] Greater than 7 but still single digits

□ □ □ 5 even integers

Nº of possible numbers for Amy = 2 × 10 × 5 = 100

1, 2, 3, 4, 5, 6, 7, 8, 9] Possibilities for first digit.

□ □ □ Nº of possible numbers for Becky = 9 × 10 × 5 = 450

450 − 100 = 350

Answer 350

Do not write outside the box

16 x is a **positive even number**.

$y = (x - 3)(x - 5)(x + 6)$

Without expanding brackets,

explain why there is only one value of x for which y is **negative**.

[3 marks]

let $x = 2$

$y = (2-3)(2-5)(2+6)$

$y = -1 \times -3 \times 8 = 24$

let $x = 4$

$y = (4-3)(4-5)(4+6)$

$y = 1 \times -1 \times 10 = -10$

let $x = 6$

$y = (6-3)(6-5)(6+6)$

$y = 3 \times 1 \times 12 = 36$

Turn over for the next question

6

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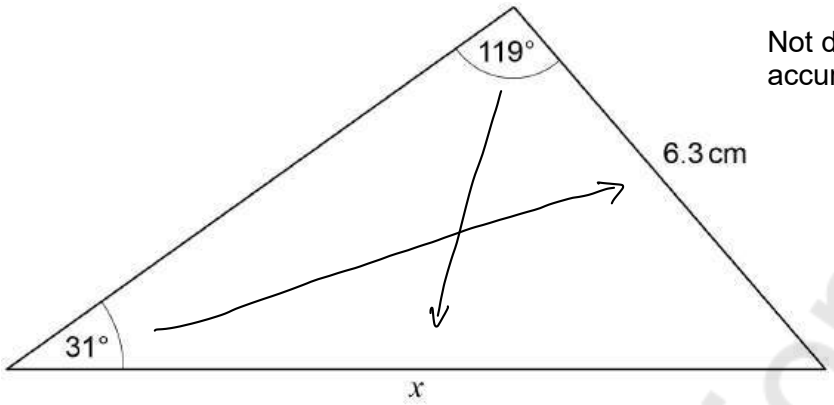
17



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Use the sine rule to work out x.

[2 marks]

$\frac{\sin 31}{6.3} = \frac{\sin 119}{x}$

$x \sin 31 = 6.3 \sin 119$

$x = \frac{6.3 \sin 119}{\sin 31}$

$x = 10.7$ cm (3 s.f.)

$x =$ 10.7 cm

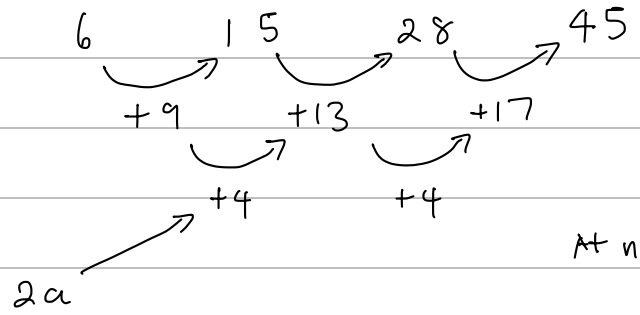
Do not write outside the box

18 Here are the first four terms of a quadratic sequence.

6 15 28 45

Work out an expression for the nth term.

[3 marks]



$2a = 4$

$a = 2$

$an^2 + bn + c$

$2n^2 + bn + c$

At $n=1$ $2(1)^2 + b(1) + c = 6$

$2 + b + c = 6$

$b + c = 4$

At $n=2$ $2(2)^2 + b(2) + c = 15$

$8 + 2b + c = 15$

$2b + c = 7$

$-\ b + c = 4$

$b = 3$

$3 + c = 4$

$c = 1$

Answer $2n^2 + 3n + 1$

Turn over for the next question

5

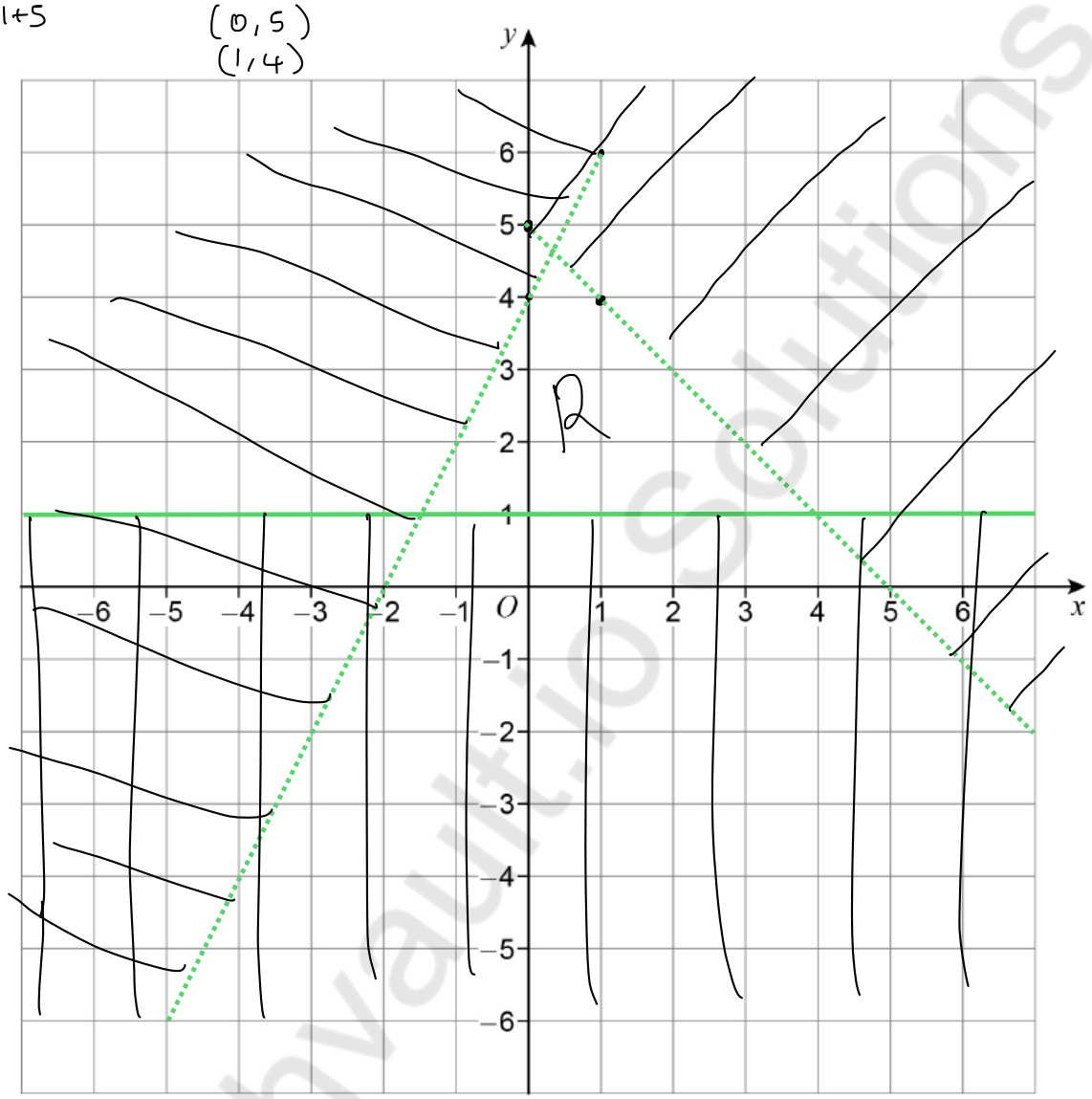
Do not write outside the box

19 On the grid, identify the region represented by

$x + y < 5$ and $y < 2x + 4$ and $y \geqslant 1$

Label the region R.

[4 marks]



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20 (a) Factorise fully $3n^2 + 5n + 2$

$3 \times 2 = 6$

6, 1

3 2

[2 marks]

$3n^2 + 3n + 2n + 2$

$3n(n+1) + 2(n+1)$

$(3n+2)(n+1)$

Answer $(3n+2)(n+1)$

20 (b) A sequence has nth term $3n^2 + 5n + 2$

Are any of the terms in the sequence a prime number?

Tick a box.

Yes ☐ No ☑

Give a reason for your answer.

[1 mark]

$3n^2$ is never a prime number

$5n$ is never a prime number

Turn over for the next question

7

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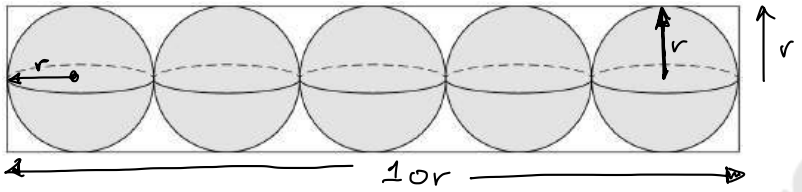
21 Five identical spheres just fit inside a **cylinder**.

Each sphere has radius r.



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

What fraction of the space inside the **cylinder** is filled by the spheres?

You **must** show your working.

[4 marks]

Volume of cylinder $= \pi r^2 h = \pi r^2 (10r) = 10\pi r^3$

Volume of 5 spheres $= 5 \times \frac{4}{3}\pi r^3 = \frac{20}{3}\pi r^3$

$$\frac{\frac{20}{3}\pi r^3}{10\pi r^3} = \frac{20}{3} \times \frac{1}{10} = \frac{2}{3}$$

Answer $\frac{2}{3}$

Do not write outside the box

22 Solve $2x^2 > 12 - 5x$ **[4 marks]**

$-12 \quad -12$

$2x^2 - 12 > -5x$

$+5x \quad +5x$

$2x^2 + 5x - 12 > 0$

$2x^2 + 8x - 3x - 12 > 0$

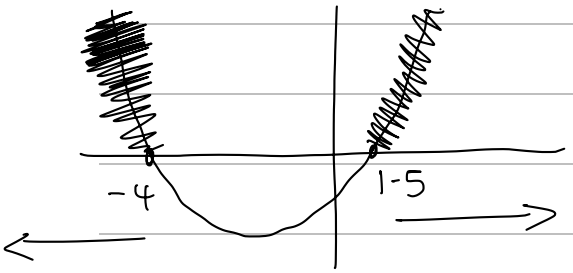
$2x(x+4) - 3(x+4) > 0$

$(2x-3)(x+4) > 0$

Critical Values: $x = 3/2 \quad x = -4$

$2x - 12 = -24$

$24, -1$
$12, -2$
$8, -3$



Answer $x < -4 \quad x > 1.5$

Turn over for the next question

8

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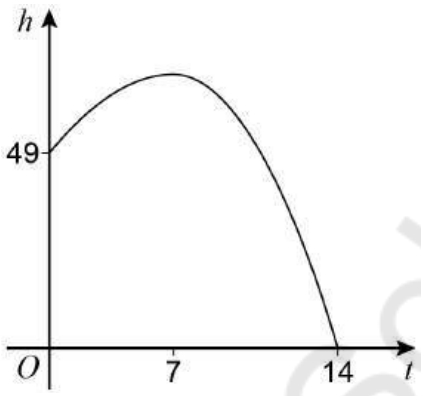
23 A roller coaster starts at ground level.

The height above ground level, h, in metres, of the roller coaster is given by

$$h = -(t-7)^2 + 49$$

where t is the time in seconds after the roller coaster starts.

Sam draws a graph of h against t for $0 \leqslant t \leqslant 14$



$h = -(0-7)^2 + 49$

$h = -49 + 49$

$h = 0$

Make **two** criticisms of Sam's graph.

[2 marks]

Criticism 1 y-intercept is incorrect it should be (0,0)

Criticism 2 The turning point is incorrect. It should be (7, 49)

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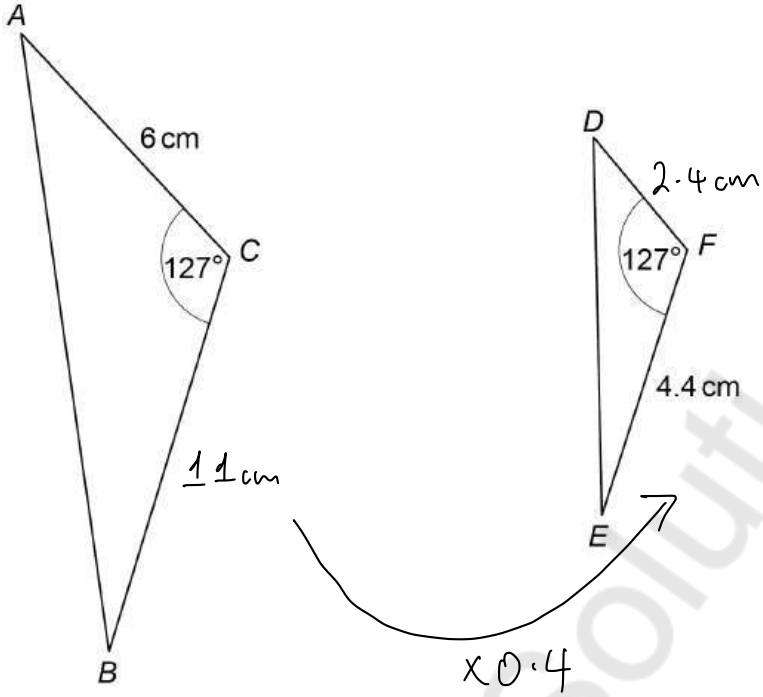
24 Triangles *ABC* and *DEF* are similar.



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The area of *ABC* is 26.355 cm^2

Work out the area of *DEF*.

[4 marks]

$26.355 = \frac{1}{2} \times 6 \times BC \times \sin 127$

$2 \times 26.355 = 6\,BC \sin 127$

$\frac{2 \times 26.355}{6 \sin 127} = BC$

$11\,cm = BC$

$DF = 6 \times 0.4 = 2.4cm$

Area of $\triangle DEF = \frac{1}{2} \times 4.4 \times 2.4 \times \sin 127 \approx 4.22cm^2$ (3 s.f.)

Answer 4.22 cm^2

END OF QUESTIONS

6

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ANSWER IN THE SPACES PROVIDED

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