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

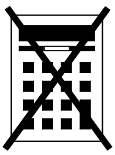
Higher Tier Paper 1 Non-Calculator

Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:

- mathematical instruments
- the Formulae Sheet (enclosed).



You must **not** use a calculator.

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	
26	
TOTAL	

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

Do not write outside the box

1 Which of these is the equation of a straight line?

Circle your answer.

[1 mark]

$y = 6x^2$ $\quad$ $y = x - 6$ $\quad$ $y = x^2 + 6$ $\quad$ $y = \frac{6}{x}$

1

2 What is 0.28 as a fraction of 0.8 ?

$\frac{0.28}{0.8} = \frac{28 \div 4}{80 \div 4} = \frac{7}{20}$

Circle your answer.

[1 mark]

$\frac{7}{20}$ $\quad$ $\frac{2}{7}$ $\quad$ $\frac{20}{7}$ $\quad$ $\frac{7}{2}$

1

3 Circle the calculation that increases 240 by 7.5%

[1 mark]

240 × 1.0705 $\quad$ 240 × 1.705 $\quad$ 240 × 1.075 $\quad$ 240 × 1.75

1

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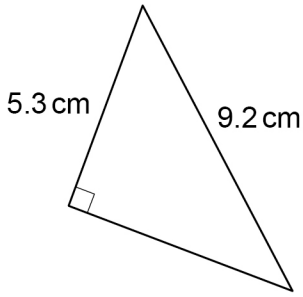
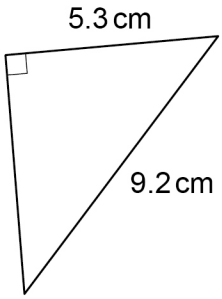
4





Not drawn accurately

Circle the reason why the triangles are congruent.

[1 mark]

ASA RHS SAS SSS

(1)

5 Work out 80 000 000 ÷ 200

Give your answer in standard form.

[2 marks]

$\frac{80\,000\,000}{200} = 400\,000$

$= 4 \times 10^5$ (2)

Answer 4×10^5

6

Do not write outside the box

6 (a) Work out $\frac{3^{12}}{3^7}$

Give your answer as a whole number.

[2 marks]

$3^{12-7} = 3^5$

$= 243$ (2)

Answer 243

6 (b) Simplify $8 \times 2^6 \times 2^4$

Give your answer as a power of 2

[2 marks]

$8 = 2^3$

$2^3 \times 2^6 \times 2^4$

$= 2^{3+6+4} = 2^{13}$

Answer 2^{13} (2)

Do not write outside the box

7 In a group of 98 students

25 study both Art and French

10 study Art but do not study French

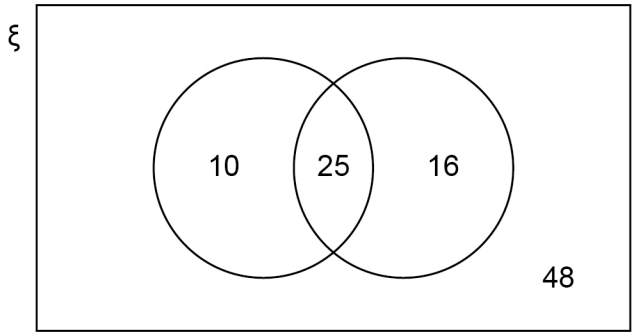
41 study French.

Joel draws this Venn diagram to represent the information.

ξ = the group of 98 students

A = the students who study Art

F = the students who study French



Make **two** criticisms of his diagram.

[2 marks]

Criticism 1 No labels A and F on Venn diagram (1)

Criticism 2 Total group is more than 98 (1)

Turn over for the next question

6

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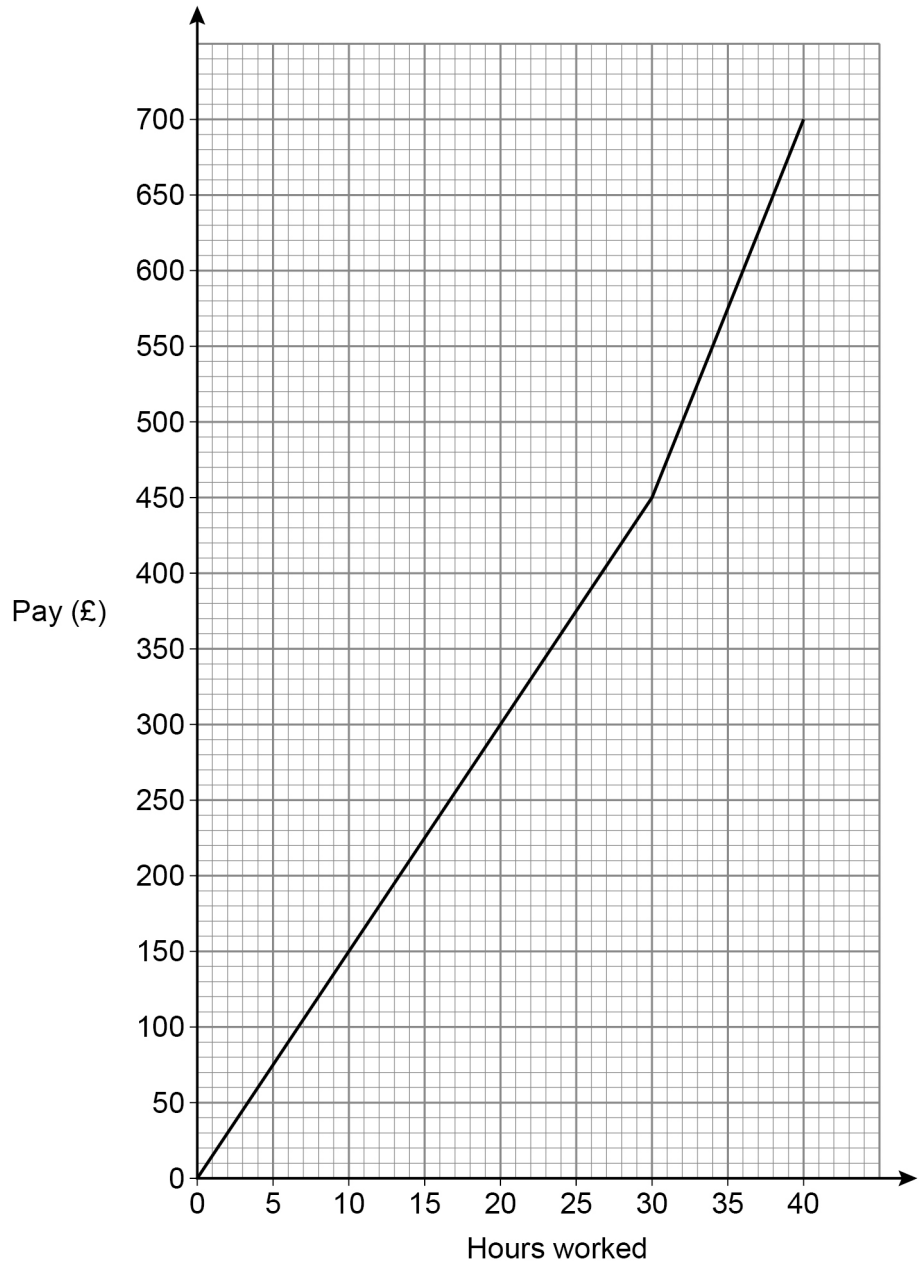
8 In a week, Samir is paid

a basic hourly rate for the first 30 hours worked

an overtime hourly rate for any extra hours worked.

The graph shows his pay for working up to 40 hours in a week.



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Work out the ratio basic hourly rate : overtime hourly rate

Give your answer in its simplest form.

[3 marks]

Basic hourly rate $= \frac{450}{30} = 15$ (1)

Overtime hourly rate $= \frac{(700-450)}{40-30} = \frac{250}{10} = 25$ (1)

ratio $= 15 : 25$

$\div 5$

$= 3 : 5$

Answer 3 : 5 (1)

9 (a) In each box, write a fraction **less** than 1 to make a correct calculation.

[1 mark]

$\frac{1}{2} \times \frac{3}{5} = \frac{3}{10}$ (1)

9 (b) In each box, write a decimal **less** than 1 to make a correct calculation.

[1 mark]

$0.2 \times 0.3 = 0.06$ (1)

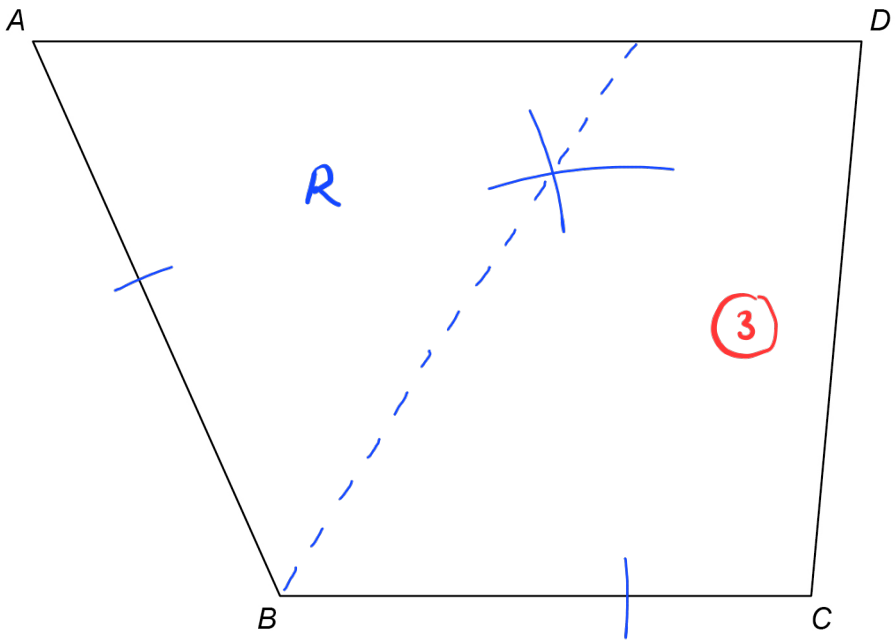
5

Turn over ►

Do not write outside the box

10 Use a ruler and compasses in this question.

ABCD represents a garden.



A tree is to be planted in the garden.

The tree will be in the region that is closer to *AB* than to *BC*.

Label the region, R, where the tree could be planted.

Show all your construction lines.

[3 marks]

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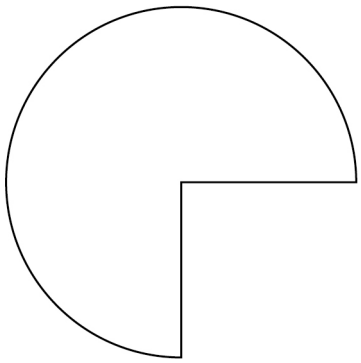
11 Here are two shapes, P and Q.

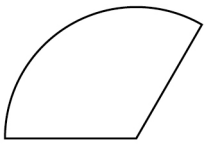
P

$\frac{3}{4}$ of a circle, radius 20 cm



Q

$\frac{1}{3}$ of a circle, radius 15 cm



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How many times bigger is the area of P than the area of Q?

You **must** show your working.

[4 marks]

Area of P : $\frac{3}{4} \times (\pi \times 20^2)$

$= \frac{3}{4} \times 400\pi$ (1)

$= 300\pi$ (1)

Area of Q : $\frac{1}{3} \times (\pi \times 15^2)$

$= \frac{1}{3} \times 225\pi$

$= 75\pi$ (1)

$\frac{P}{Q} = \frac{300}{75} = 4$ (1)

Answer 4

7

Do not write outside the box

12 In a game, two bags, A and B, contain cards.

Each card is marked Yes or No.

The table shows the number of each type of card in the bags.

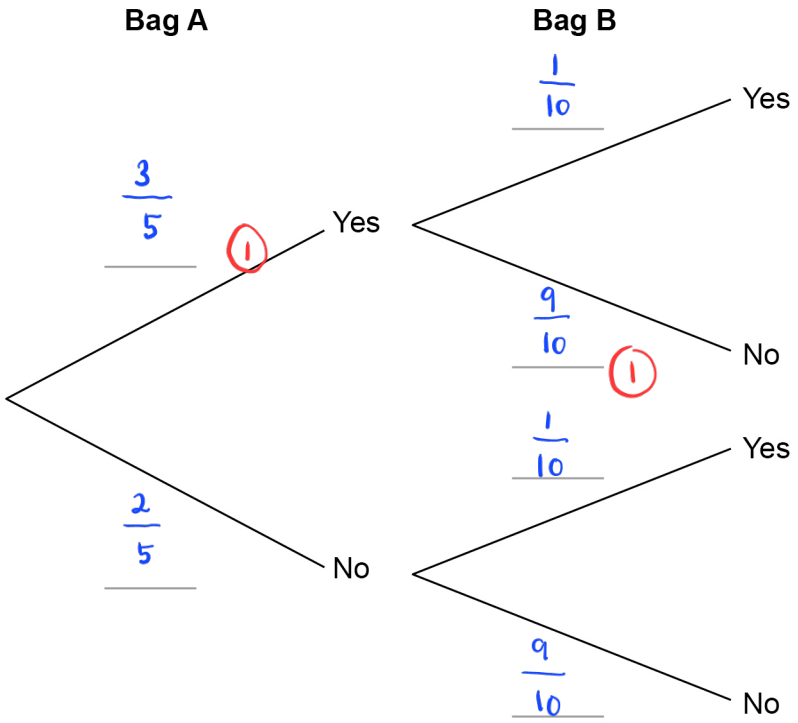
	Yes	**No**
Bag A	3	2
Bag B	1	9

In the game, a player picks one card at random from each bag.

The cards are then put back into the bags.

12 (a) Complete the tree diagram.

[2 marks]



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12 (b) To win a prize, a player must pick two cards marked Yes.

450 people each play the game once.

How many people are expected to win a prize?

[3 marks]

$\frac{3}{5} \times \frac{1}{10} = \frac{3}{50}$ (1)

$\frac{3}{50} \times 450 = 27$ (1) (1)

Answer 27

13 Solve $\frac{2w}{15} = \frac{4}{5}$

[2 marks]

$2w = \frac{4}{5} \times 15$ (1)

$2w = 12$

$w = 6$ (1)

$w =$ 6

7

Do not write outside the box

14 15 workers can complete a job in 8 days.

How many **more** workers are needed to complete the job in 6 days?

Assume that all of the workers work at the same rate.

[3 marks]

$15 \times 8 = 120$ (1)

$120 \div 6 = 20$ workers (1)

$20 - 15 = 5$ more workers (1)

Answer 5

15 The cross section of a prism has n sides.

Circle the expression for the number of faces of the prism.

[1 mark]

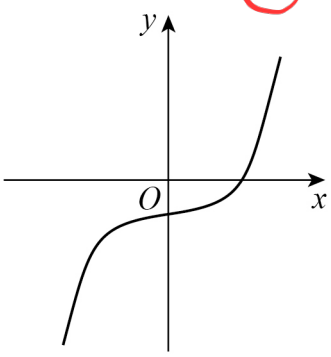
n $\quad$ $2n$ $\quad$ $3n$ $\quad$ $n + 2$ (1)

Do not write outside the box

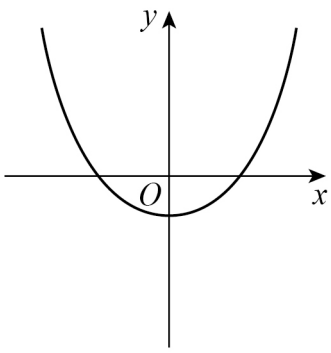
16 Circle the letter of the possible sketch graph of $y = x^3 - 4$ **[1 mark]**

cubic graph with y-intercept = -4

A



B



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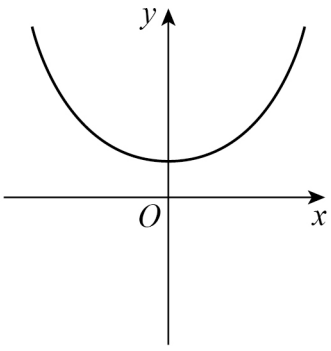

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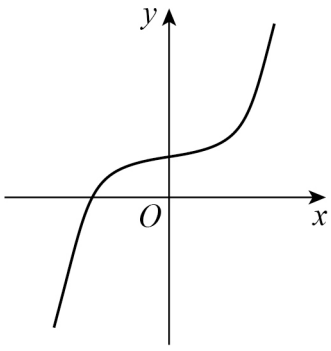

Turn over for the next question

5

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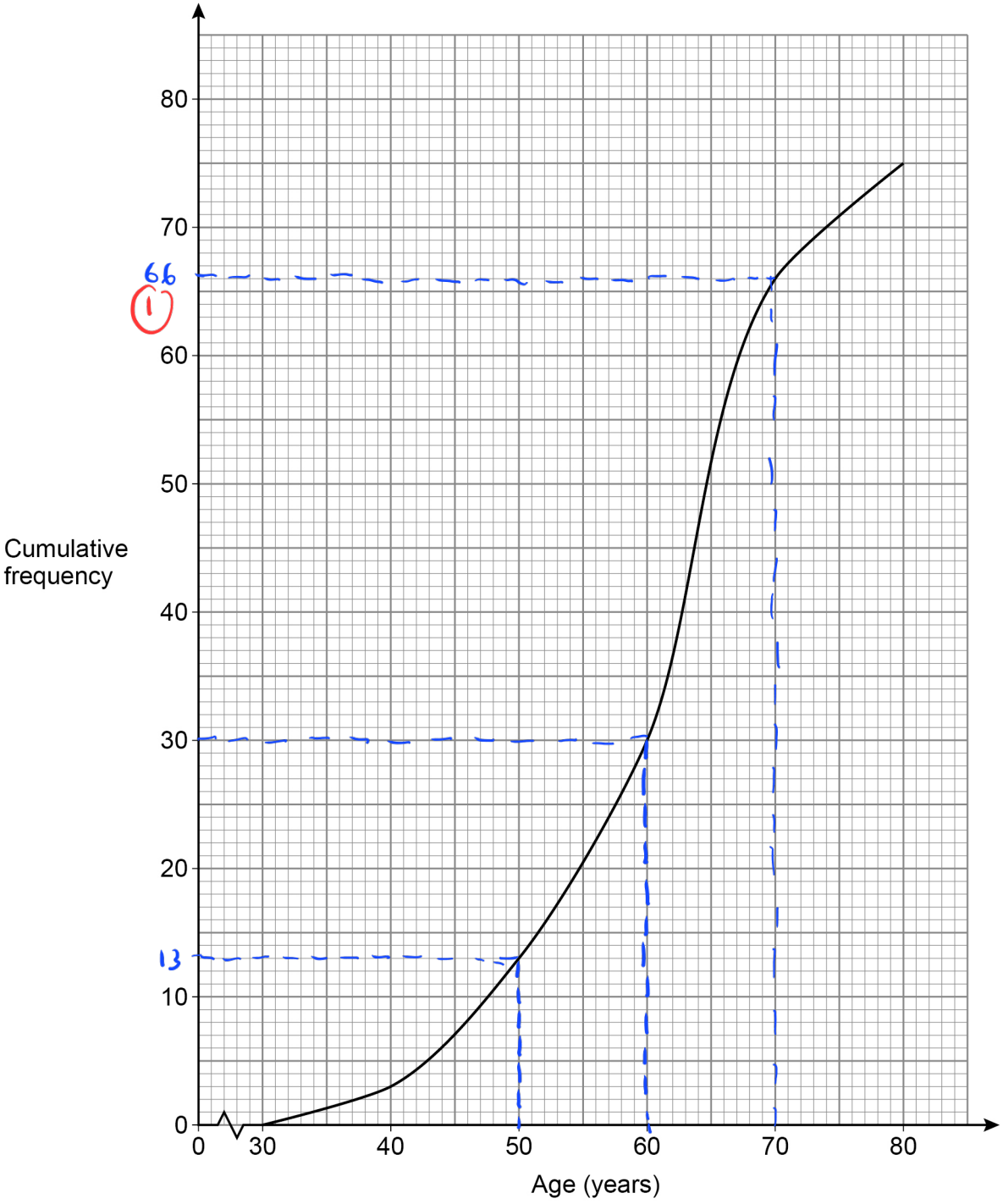
17 75 people attend a clinic.

Their ages are recorded and a cumulative frequency diagram is drawn.



Do not write outside the box

A nurse makes a statement about the **ages** of the people at the clinic.

He says,

"More than twice as many people are in their 60s as in their 50s."

Is he correct?

Tick a box.

Yes [✓] (1) No [ ]

Show working to support your answer.

[3 marks]

60s : 66 - 30 = 36 people

(1)

50s : 30 - 13 = 17 people

17 × 2 = 34 < 36.

Turn over for the next question

3

Do not write outside the box

18 $12x^3 + 7x^2 + 3x - 10 \equiv 2(ax^3 + x^2 + 2x - 5) + x(bx + c)$

Work out the values of a, b and c.

[3 marks]

$2ax^3 + 2x^2 + 4x - 10 + bx^2 + cx$

$= 2ax^3 + (2+b)x^2 + (4+c)x - 10$ (1)

(1)

$2a = 12$, $2+b = 7$, $4+c = 3$

$a = 6$, $b = 5$, $c = -1$

(1)

$a =$ 6 $b =$ 5 $c =$ −1

Do not write outside the box

19 The first three terms of a sequence are x y xy xy^2 xy^3

The sequence is continued by multiplying the previous two terms.

19 (a) Circle the 5th term of the sequence.

[1 mark]

x^3y^3 x^5y^5 x^3y^4 x^2y^3

(1)

19 (b) The 8th term of the sequence is x^8y^{13}

The value of this term is negative.

x^8 is always positive

What does this mean about the values of x and y ?

Tick **one** box for each row.

[2 marks]

	Must be positive	Must be negative	Could be either
x			✓
y		✓	

(1) (1)

Turn over for the next question

6

Do not write outside the box

20 Rearrange $y = \dfrac{5x + 9}{x}$ to make x the subject.

[4 marks]

$yx = 5x + 9$ (1)

$yx - 5x = 9$ (1)

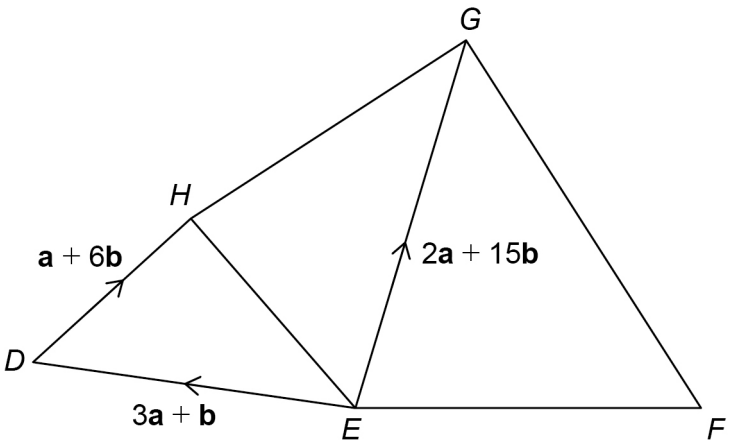
$(y-5)x = 9$ (1)

$x = \dfrac{9}{y-5}$ (1)

Answer $x = \dfrac{9}{y-5}$

Do not write outside the box

21 Five points are connected by vectors.



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$\overrightarrow{FG} = 2\overrightarrow{EH}$

Work out $\overrightarrow{FE}$ in terms of **a** and **b**.

[4 marks]

$\overrightarrow{EH} = \overrightarrow{ED} + \overrightarrow{DH}$

$= 3\underline{a} + \underline{b} + \underline{a} + 6\underline{b}$

$= 4\underline{a} + 7\underline{b}$ (1)

$\overrightarrow{FG} = 2(4\underline{a} + 7\underline{b}) = 8\underline{a} + 14\underline{b}$ (1)

$\overrightarrow{FG} = \overrightarrow{FE} + \overrightarrow{EG}$

$\overrightarrow{FE} = \overrightarrow{FG} - \overrightarrow{EG}$

$= 8\underline{a} + 14\underline{b} - 2\underline{a} - 15\underline{b}$ (1)

$= 6\underline{a} - \underline{b}$ (1)

Answer $6\underline{a} - \underline{b}$

8

Do not write outside the box

22 Work out $0.6\dot{8} - 0.4\dot{5}$

Give your answer as a fraction in its simplest form.

[5 marks]

$0.6\dot{8} - 0.4\dot{5} = 0.2\dot{3}$ (1)

Let $x = 0.23\ldots$

$10x = 2.33$ (1)

$10x - x = 2.33 - 0.23$

$9x = 2.1$ (1)

$x = \frac{2.1}{9} = \frac{21}{90} = \frac{7}{30}$ (1) (1)

Answer $\frac{7}{30}$

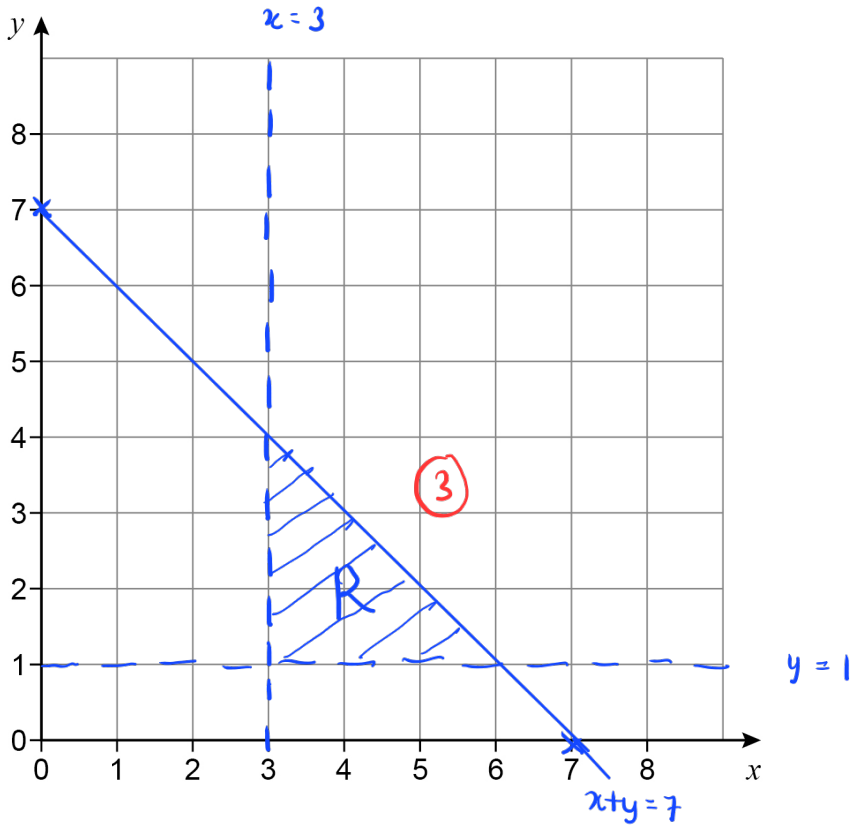
Do not write outside the box

23 On the grid, identify the region represented by

$$x > 3 \quad \text{and} \quad y > 1 \quad \text{and} \quad x + y \leqslant 7$$

Label the region R.

[3 marks]



Turn over for the next question

8

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24 (a) Simplify fully $\frac{6}{a} - \frac{11}{4a}$

[2 marks]

$\frac{6}{a} \times \frac{4}{4} = \frac{24}{4a}$ (1)

$\frac{24}{4a} - \frac{11}{4a} = \frac{13}{4a}$

Answer $\frac{13}{4a}$ (1)

24 (b) Simplify fully $(y^2 - 3y) \times \frac{y^2 + 10y + 21}{y^2 - 9}$

[4 marks]

$y^2 - 3y = y(y-3)$ (1)

$y^2 + 10y + 21 = (y+7)(y+3)$ (1)

$y^2 - 9 = (y+3)(y-3)$ (1)

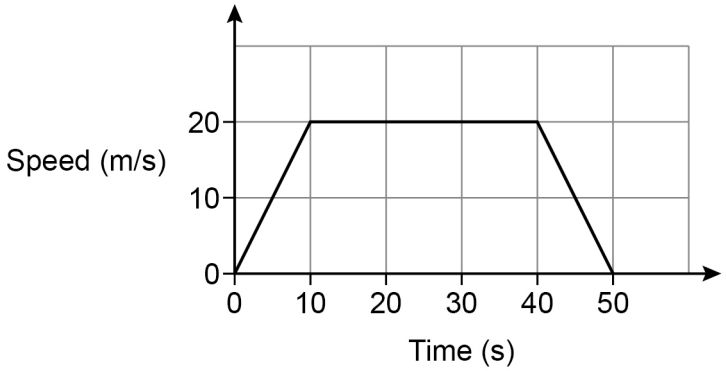
$\frac{y(y-3) \times (y+7)(y+3)}{(y+3)(y-3)}$

$= y(y+7)$ (1)

Answer $y(y+7)$

Do not write outside the box

25 Here is the speed-time graph for a 50-second journey.



25 (a) Circle the acceleration, in m/s^2, halfway through the journey.

[1 mark]

(0) (1) 2 20 25

25 (b) Work out the total distance travelled.

[2 marks]

Distance = area under the graph

$\frac{1}{2} \times 20 \times (50 + 30)$ (1)

= 800 m

Answer 800 (1) m

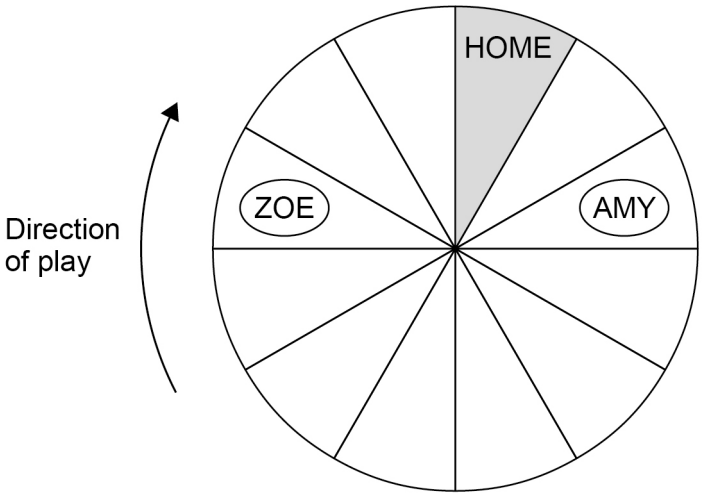
9

Do not write outside the box

26 Zoe and Amy are playing a board game.

- They each have one disc and take turns to roll a fair, ordinary dice.
- The player moves their disc **clockwise** the number of spaces shown on the dice.
- The winner is the first player whose disc is on HOME at the end of a turn.

Here is the board after Amy's turn.



Work out the probability that Zoe wins within her next two turns.

[4 marks]

For Zoe to win, he needs to either get 3 in one turn, or 2 and 1 (vice versa) in 2 turns.

$P(3) = \frac{1}{6}$ (1)

$P(1,2) = \frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$ (1)

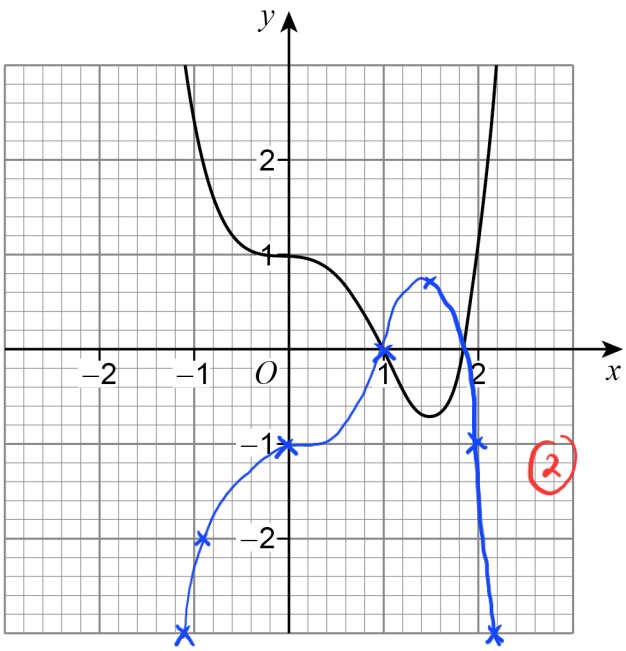
$P(2,1) = \frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$

$= \frac{1}{6} + \frac{1}{36} + \frac{1}{36}$ (1) $= \frac{8 \div 4}{36 \div 4} = \frac{2}{9}$

Answer $\frac{2}{9}$ (1)

Do not write outside the box

27 The grid shows the graph of $y = f(x)$



On the grid, draw the graph of $y = -f(x)$

[2 marks]

Turn over for the next question

6

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28 Work out the value of $(\cos 30° \times \sin 45° \times \tan 60°)^2$

[4 marks]

$\cos 30° = \frac{\sqrt{3}}{2}$

$\sin 45° = \frac{\sqrt{2}}{2}$ (1)

$\tan 60° = \sqrt{3}$

$= \left(\frac{\sqrt{3}}{2} \times \frac{\sqrt{2}}{2} \times \sqrt{3}\right)^2$ (1)

$= \left(\frac{\sqrt{18}}{4}\right)^2$ (1)

$= \frac{18}{16} = \frac{9}{8}$ (1)

Answer $\frac{9}{8}$

END OF QUESTIONS

4

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