AQA

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

# GCSE MATHEMATICS

**H**

Higher Tier

Paper 1 Non-Calculator

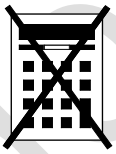
Shadow paper based on June 2022 question paper

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]**

$y = 9x^2$ $y = \frac{9}{x}$ $y = x^2 - 9$ $y = x + 9$

**2** What is 0.44 as a fraction of 0.8?

Circle your answer.

**[1 mark]**

$\frac{11}{20}$ $\frac{2}{11}$ $\frac{20}{11}$ $\frac{11}{2}$

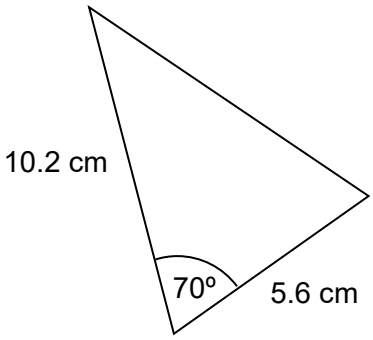
**3** Circle the calculation that increases 350 by 11.5%

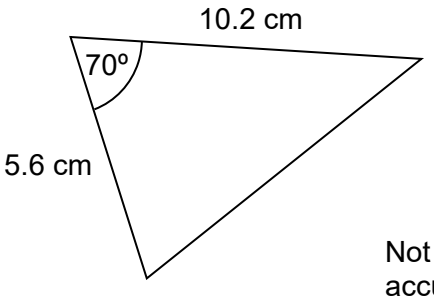
**[1 mark]**

350 × 1.0115 350 × 1.115 350 × 2.0115 350 × 2.115

*Do not write outside the box*

**4**




Not drawn accurately

Circle the reason why the triangles are congruent.

**[1 mark]**

ASA RHS SAS SSS

**5** Work out 900 000 000 ÷ 300

Give your answer in standard form.

**[2 marks]**

Answer _____

**6**

**Turn over ►**

*Do not write outside the box*

**6 (a)** Work out $\frac{5^{13}}{5^{10}}$

Give your answer as a whole number.

**[2 marks]**

Answer _____

**6 (b)** Simplify $9 \times 3^6 \times 3^4$

Give your answer as a power of 3

**[2 marks]**

Answer _____

*Do not write outside the box*

**7** In a group of 100 students

25 study both Maths and Biology

10 study Maths but do not study Biology

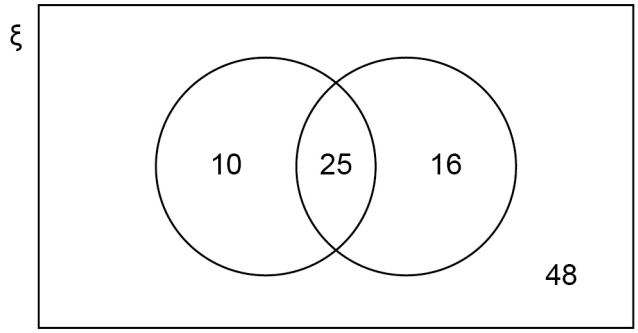
41 study Biology.

Jenni draws this Venn diagram to represent the information.

ξ = the group of 100 students

M = the students who study Maths

B = the students who study Biology




Make **two** criticisms of her diagram.

**[2 marks]**

Criticism 1 _____

_____

Criticism 2 _____

_____

6

**Turn over ►**

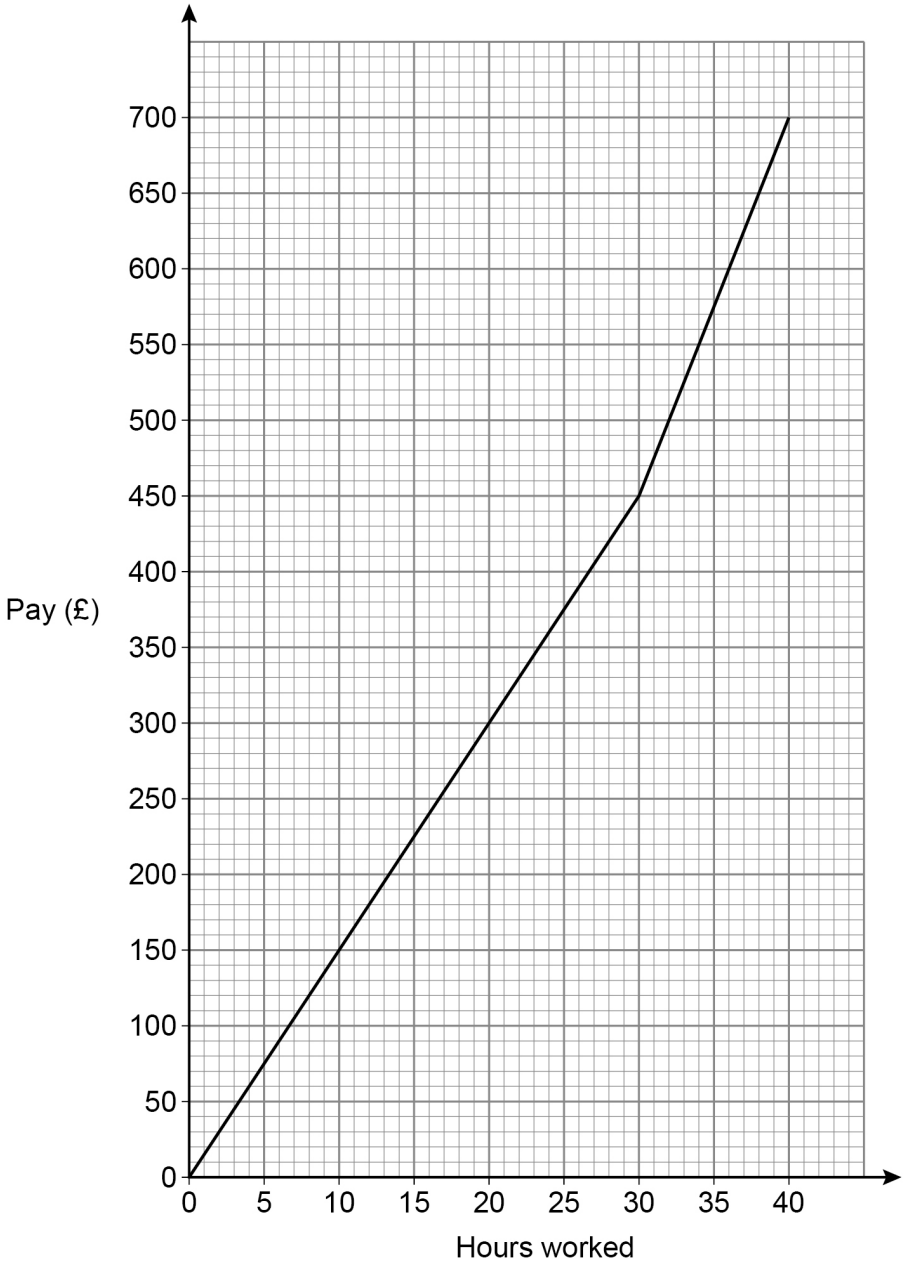
*Do not write outside the box*

**8** In a week, Louisa is paid

a basic hourly rate for the first 30 hours worked

an overtime hourly rate for any extra hours worked.

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



*Do not write outside the box*

Work out the ratio overtime hourly rate : basic hourly rate

Give your answer in its simplest form.

**[3 marks]**

Answer _____ : _____

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

**[1 mark]**

$$\frac{\square}{\square} \times \frac{\square}{\square} = \frac{3}{8}$$

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

**[1 mark]**

$$\square \times \square = 0.18$$

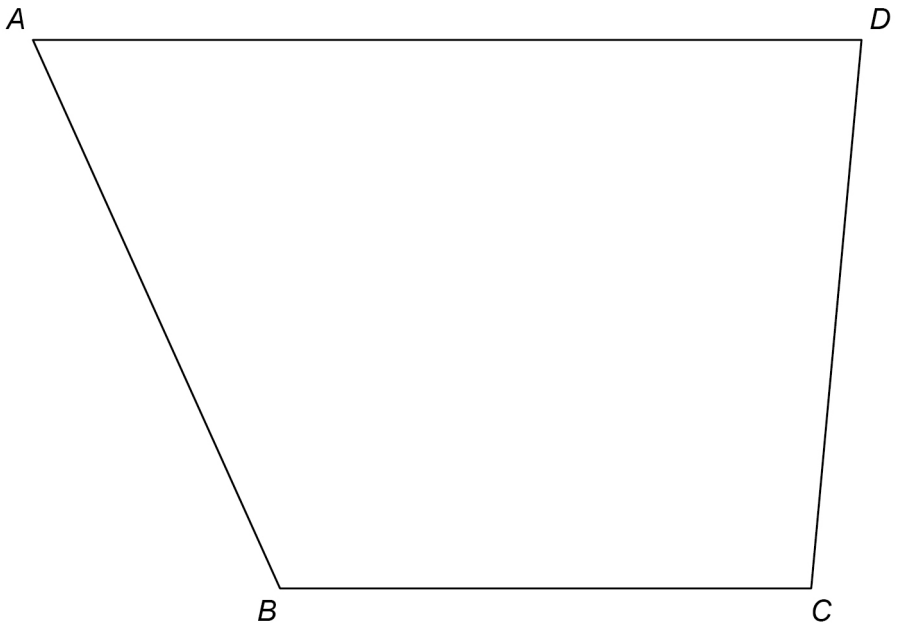
**5**

**Turn over ►**

*Do not write outside the box*

**10** Use a ruler and compasses in this question.

*ABCD* represents a car park.




A ticket machine is to be placed in the car park.

The ticket machine will be placed in the region that is closer to *BC* than to *AB*.

Label the region, R, where the ticket machine could be placed.

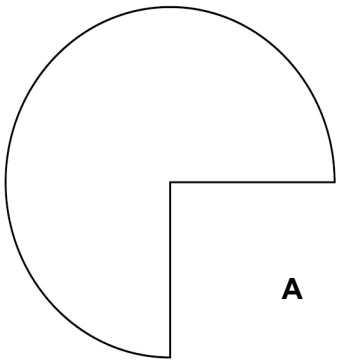
Show all your construction lines.

**[3 marks]**

*Do not write outside the box*

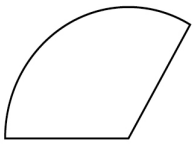
**11** Here are two shapes, A and B.

$\frac{3}{4}$ of a circle, radius 10 cm



**A**

$\frac{2}{5}$ of a circle, radius 5 cm



**B**

Not drawn accurately

How many times bigger is the area of A than the area of B?

You **must** show your working.

**[4 marks]**

Answer _____

7

**Turn over ►**

*Do not write outside the box*

**12** In a game, two boxes, A and B, contain counters.

Each counter is blue or green.

The table shows the number of each colour of counter in the boxes.

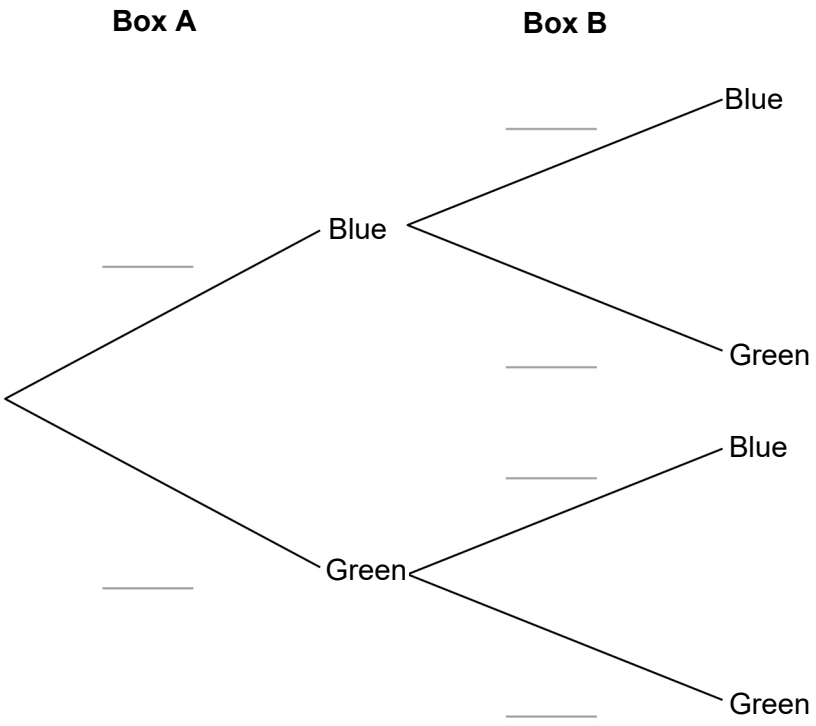
| | **Blue** | **Green** |
|---|---|---|
| **Box A** | 2 | 3 |
| **Box B** | 1 | 3 |

In the game, a player picks one counter at random from each box.

The counters are then put back into the boxes.

**12 (a)** Complete the tree diagram.

**[2 marks]**



**12 (b)** To win a prize, a player must pick two blue counters.

420 people each play the game once.

How many people are expected to win a prize?

**[3 marks]**

Answer _____

**13** Solve $\frac{3h}{20} = \frac{3}{5}$

**[2 marks]**

$h =$ _____

7

*Do not write outside the box*

**14** 20 workers can complete a job in 6 days.

How many **more** workers are needed to complete the job in 5 days?

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

**[3 marks]**

Answer _____

**15** The cross section of a prism has $n$ sides.

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

**[1 mark]**

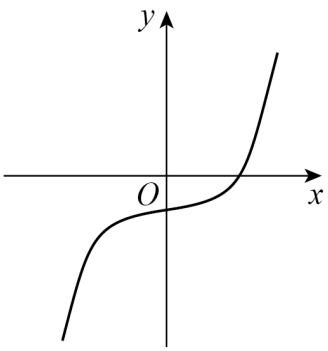
$n$ $2n$ $3n$ $n+2$

*Do not write outside the box*

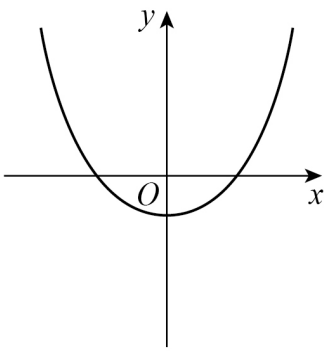
**16** Circle the letter of the possible sketch graph of $y = x^3 + 3$

**[1 mark]**

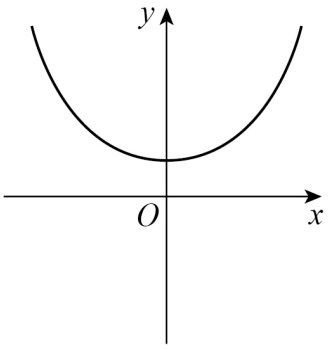
**A**



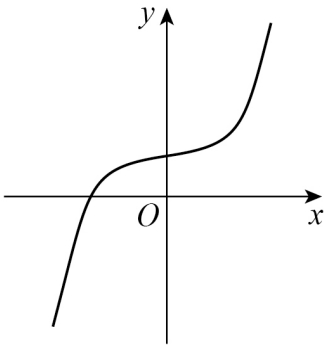

**B**




**C**




**D**



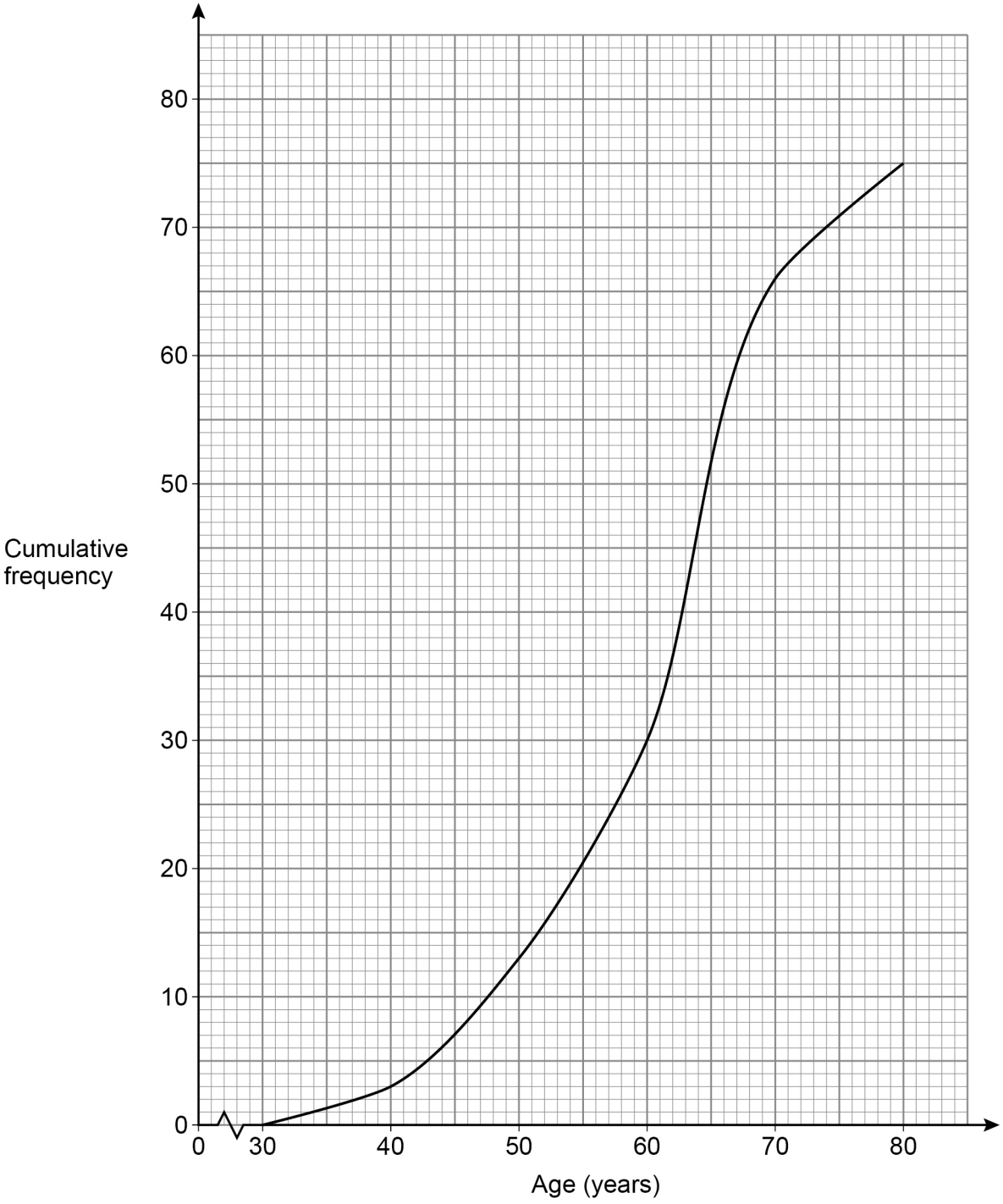

**Turn over for the next question**

5

*Do not write outside the box*

**17** 75 people are in a hospital.

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



*Do not write outside the box*

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

She says,

"More than twice as many people are in their 50s as in their 70s."

Is she correct?

Tick a box.

Yes ☐ No ☐

Show working to support your answer.

**[3 marks]**

**Turn over for the next question**

3

*Do not write outside the box*

**18** $10x^3 - 6x^2 + 9x - 4 \equiv 2(ax^3 - 2x^2 + 3x - 2) + x(bx + c)$

Work out the values of $a$, $b$ and $c$.

**[3 marks]**

$a =$ _____ $b =$ _____ $c =$ _____

*Do not write outside the box*

**19** The first three terms of a sequence are $x \quad y \quad xy$

The sequence is continued by multiplying the previous two terms.

**19 (a)** Circle the 6th term of the sequence.

**[1 mark]**

$x^3y^3$ $x^6y^6$ $x^3y^5$ $x^3y^4$

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

The value of this term is 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*** | | | |

**Turn over for the next question**

6

*Do not write outside the box*

**20** Rearrange $p = \dfrac{7q + 5}{q}$ to make $q$ the subject.

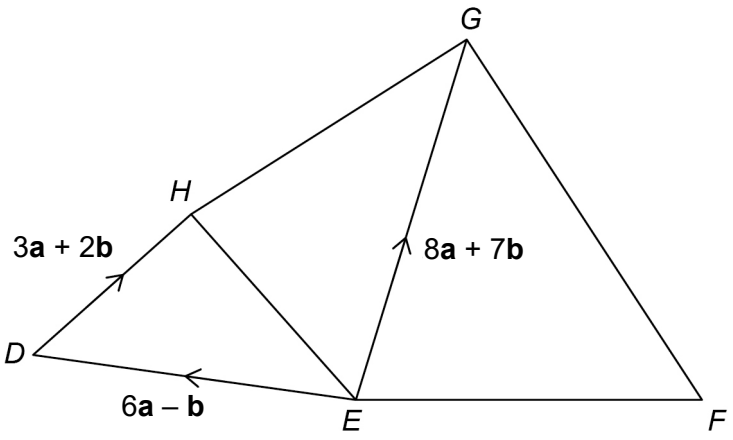
**[4 marks]**

Answer _____

*Do not write outside the box*

**21** Five points are connected by vectors.

Not drawn accurately




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

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

**[4 marks]**

Answer _____

8

**Turn over ►**

*Do not write outside the box*

**22** Work out $0.7\dot{9} - 0.4\dot{4}$

Give your answer as a fraction in its simplest form.

**[5 marks]**

Answer _____

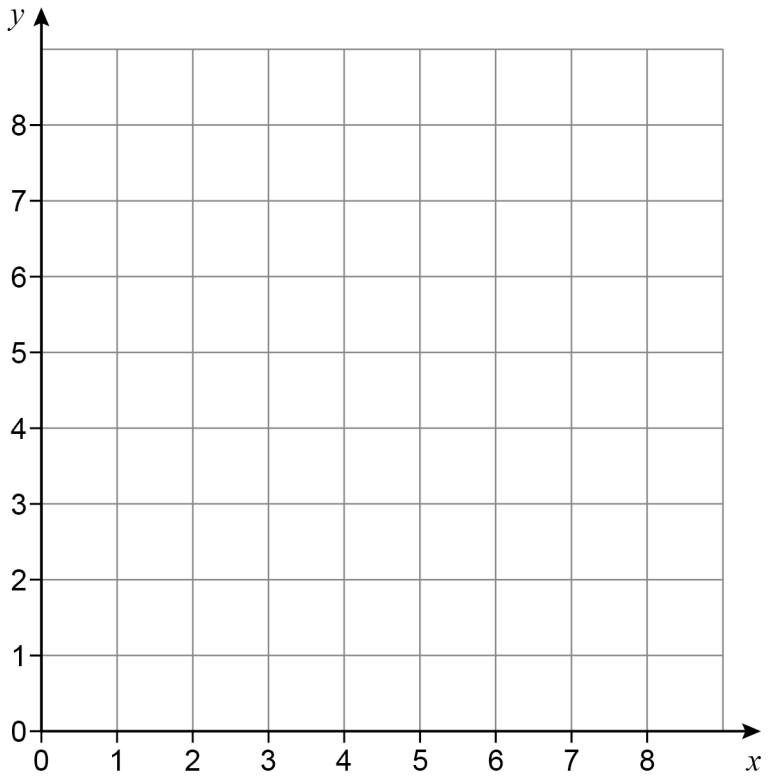
*Do not write outside the box*

**23** On the grid, identify the region represented by

$x < 6$ and $y < 5$ and $x + y \leqslant 8$

Label the region R.

**[3 marks]**




**Turn over for the next question**

8

*Do not write outside the box*

**24 (a)** Simplify fully $\frac{5}{x} - \frac{17}{6x}$

**[2 marks]**

Answer _____

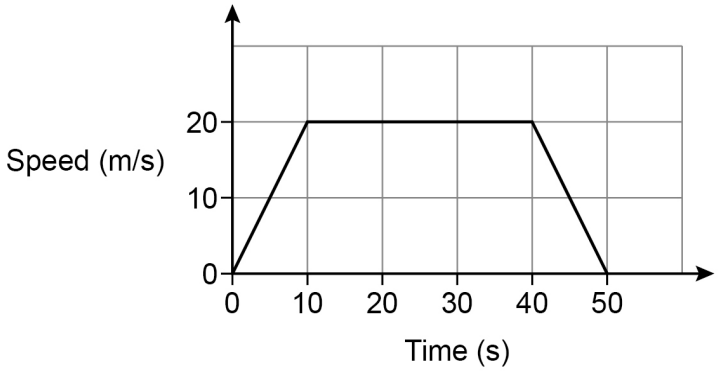
**24 (b)** Simplify fully $(2x^2 - 4x) \times \frac{x^2 + 7x + 10}{x^2 - 4}$

**[4 marks]**

Answer _____

*Do not write outside the box*

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




**25 (a)** Circle the acceleration, in $m/s^2$, in the first ten seconds of the journey.

**[1 mark]**

0 2 10 20

**25 (b)** Work out the total distance travelled in the first 30 seconds.

**[2 marks]**

Answer _____ m

9

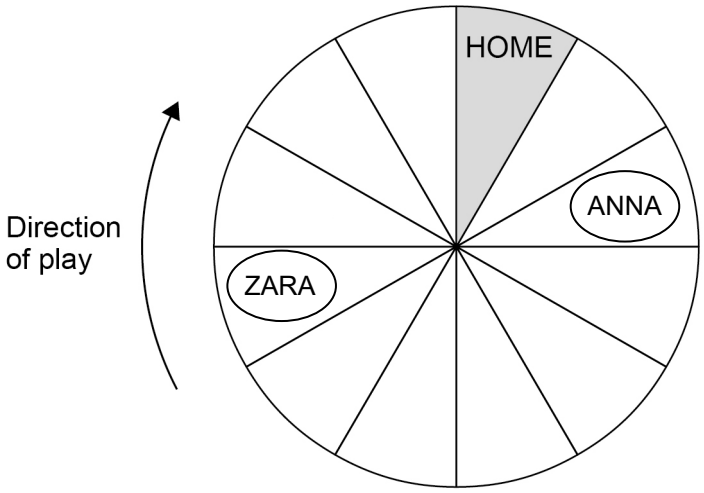
**Turn over ►**

*Do not write outside the box*

**26** Zara and Anna 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 Anna's turn.



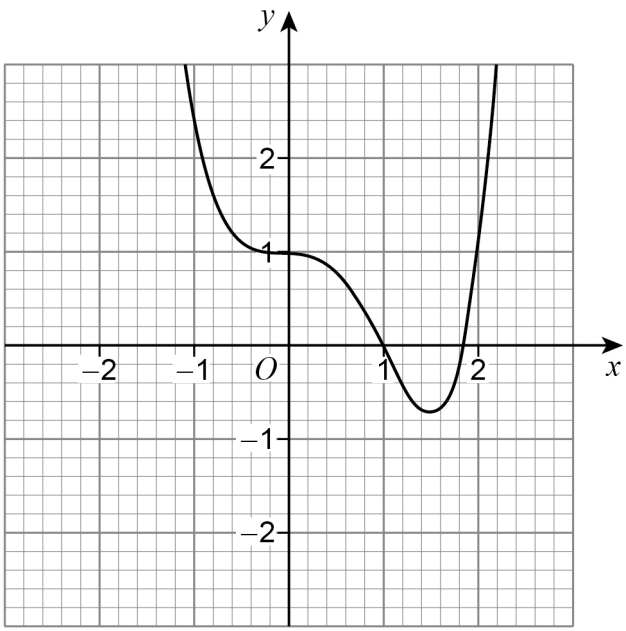

Work out the probability that Zara wins within her next two turns.

**[4 marks]**

Answer _____

*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

**Turn over ►**

*Do not write outside the box*

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

**[4 marks]**

Answer _____

4

**END OF QUESTIONS**