

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname StemUp Model Solution

Forename(s) _____

Candidate signature _____

I declare this is my own work.

GCSE MATHEMATICS

H

Higher Tier

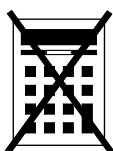
Paper 1 Non-Calculator

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	



J U N 2 2 8 3 0 0 1 H 0 1

Answer **all** questions in the spaces provided.**1** Which of these is the equation of a straight line?

Circle your answer.

[1 mark]

$y = 6x^2$

$y = x - 6$

$y = x^2 + 6$

$y = \frac{6}{x}$

2 What is 0.28 as a fraction of 0.8 ?

Circle your answer.

[1 mark]

$\frac{7}{20}$

$\frac{2}{7}$

$\frac{20}{7}$

$\frac{7}{2}$

3 Circle the calculation that increases 240 by 7.5%**[1 mark]**

240×1.0705

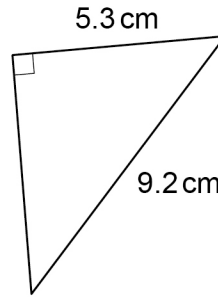
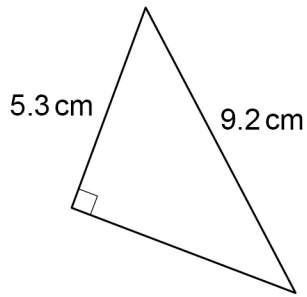
240×1.705

240×1.075

240×1.75



4

Not drawn
accurately

Circle the reason why the triangles are congruent.

[1 mark]

ASA

RHS

SAS

SSS

5

Work out $80\,000\,000 \div 200$

Give your answer in standard form.

[2 marks]

$$80\,000\,000 \div 200$$

$$= 800\,000 \div 2$$

$$= 400\,000$$

$$= 4 \times 10^5$$

Answer 4×10^5

Turn over ►



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

Give your answer as a whole number.

[2 marks]

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

$$3^5 = 3 \times 3 \times 3 \times 3 \times 3$$

$$= 9 \times 9 \times 3 = 81 \times 3 = 243$$

Answer 243

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

Give your answer as a power of 2

[2 marks]

$$8 = 2 \times 2 \times 2 = 2^3$$

$$2^3 \times 2^6 \times 2^4 = 2^{3+6+4}$$

$$= 2^{13}$$

Answer 2^{13}



7

In a group of 98 students

25 study both Art and French

10 study Art but do not study French

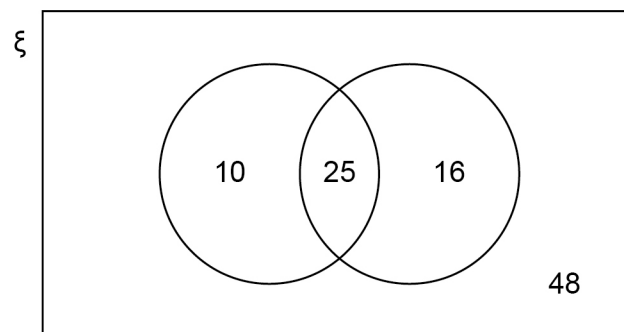
41 study French.

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 The circles are not labelled A and F.

Criticism 2 The numbers add up to 99, not 98

(the 48 outside should be 47).

Turn over for the next question

Turn over ►



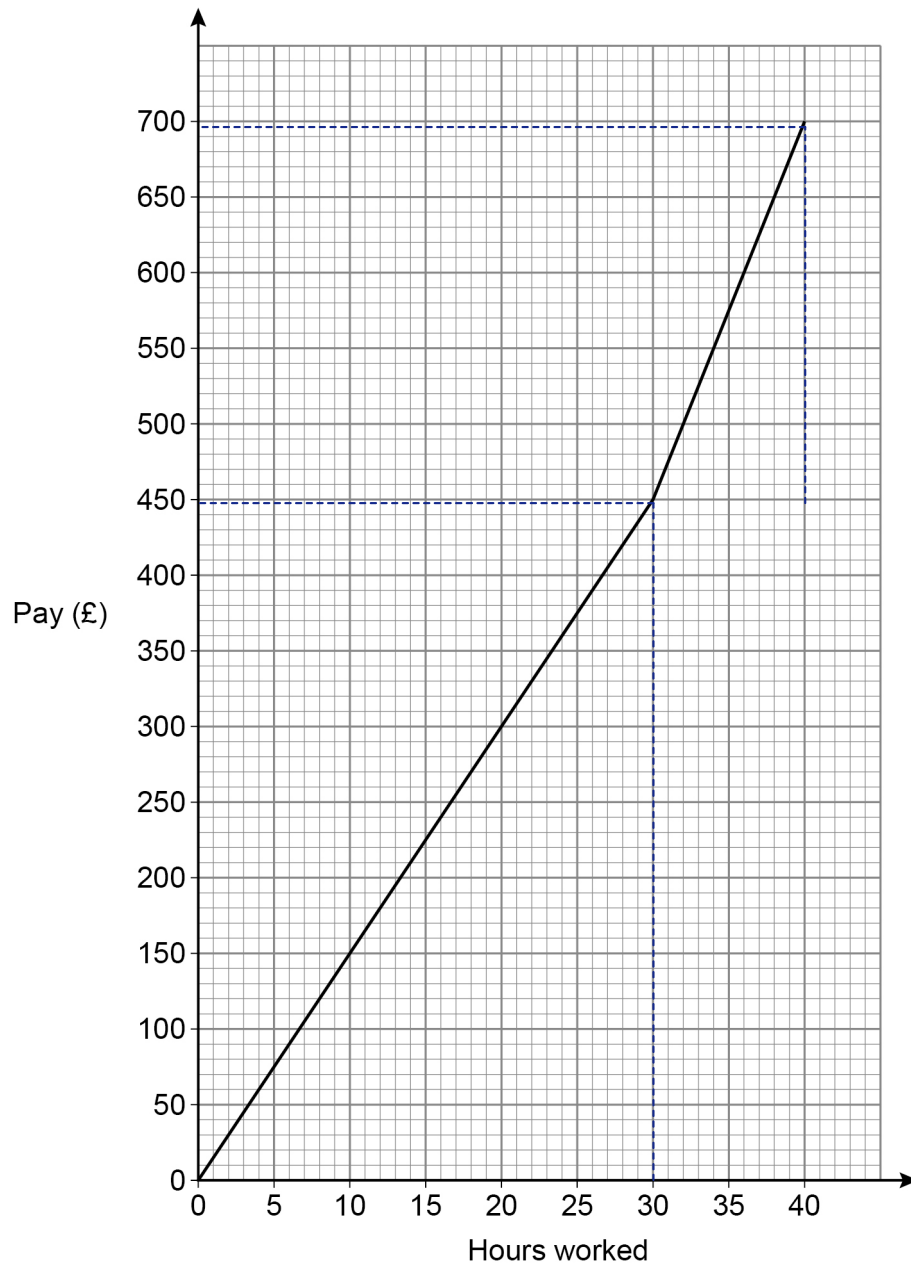
8

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.



Work out the ratio basic hourly rate : overtime hourly rate

Give your answer in its simplest form.

[3 marks]

Basic: 30 hours = £450, $450 \div 30 = \text{£}15$ per hour

Overtime: 10 hours = $700 - 450 = \text{£}250$

$250 \div 10 = \text{£}25$ per hour

15 : 25 ($\div 5$)

= 3 : 5

Answer 3 : 5

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

[1 mark]

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

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

[1 mark]

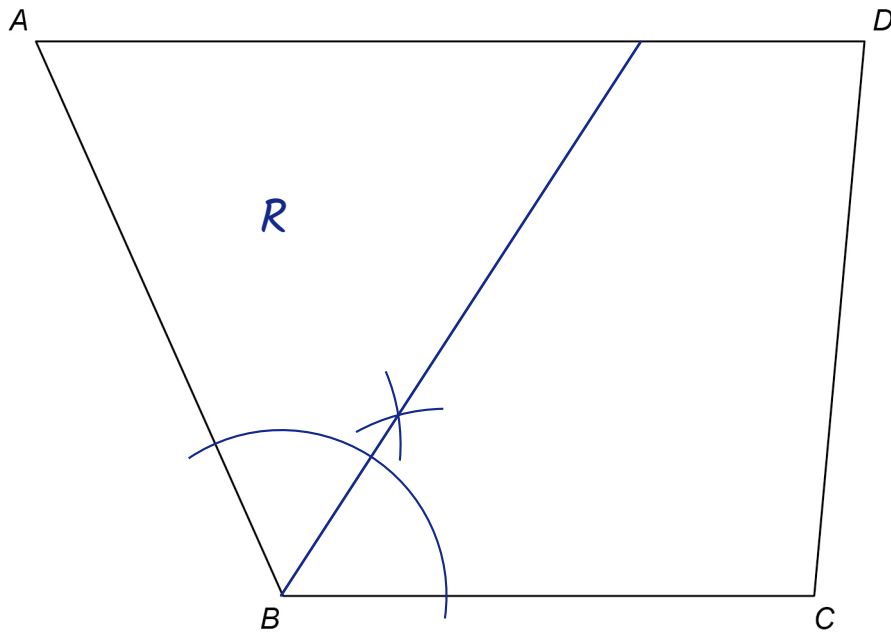
$$\boxed{0.3} \times \boxed{0.2} = 0.06$$



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.

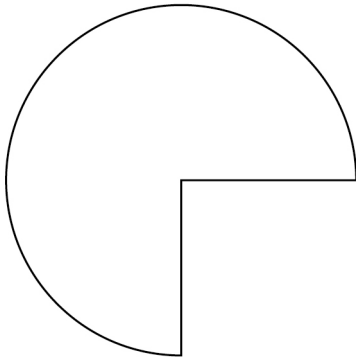
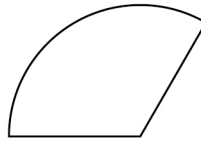
Show all your construction lines.

[3 marks]



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 cmNot drawn
accurately

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

You **must** show your working.**[4 marks]**

$$\text{Area P} = \frac{3}{4} \times \pi \times 20^2 = \frac{3}{4} \times 400\pi = 300\pi$$

$$\text{Area Q} = \frac{1}{3} \times \pi \times 15^2 = \frac{1}{3} \times 225\pi = 75\pi$$

$$300\pi \div 75\pi = 4$$

P is 4 times bigger than Q

Answer 4



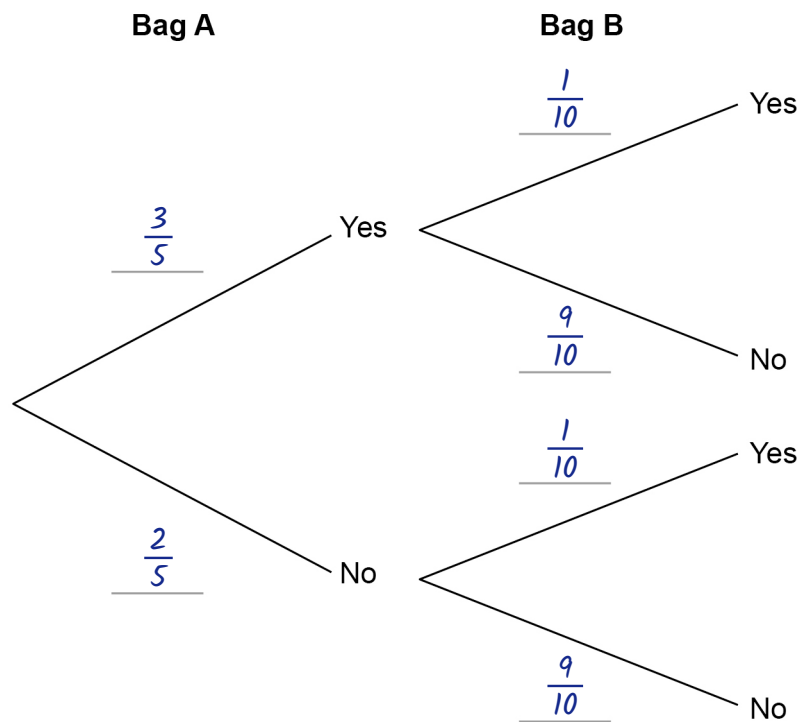
- 12** In a game, two bags, A and B, contain cards.
Each card is marked Yes or No.
The table shows the number of each type of card in the bags.

	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]



- 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]

$$P(\text{Yes and Yes}) = \frac{3}{5} \times \frac{1}{10} = \frac{3}{50}$$

$$\frac{3}{50} \times 450$$

$$450 \div 50 = 9$$

$$3 \times 9 = 27 \text{ people}$$

Answer 27

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

[2 marks]

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

$$2w = 12$$

$$w = 12 \div 2 = 6$$

$w =$ 6



- 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]

$$15 \times 8 = 120 \text{ worker-days}$$

$$120 \div 6 = 20 \text{ workers needed}$$

$$20 - 15 = 5 \text{ more workers}$$

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

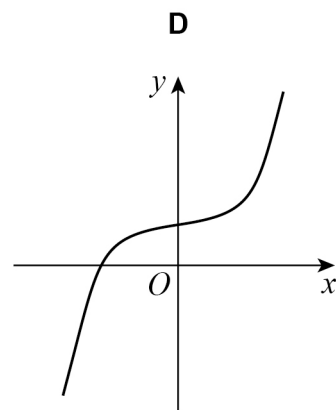
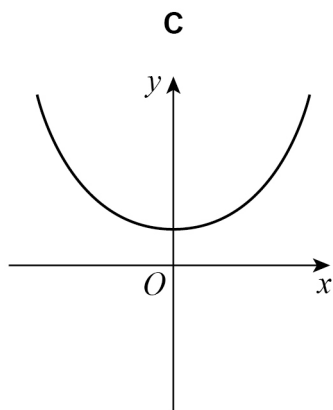
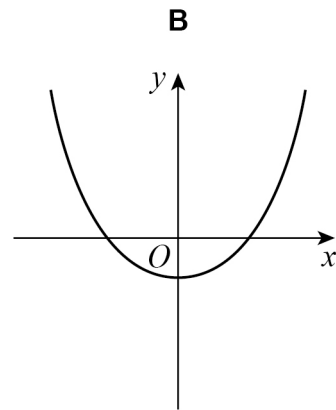
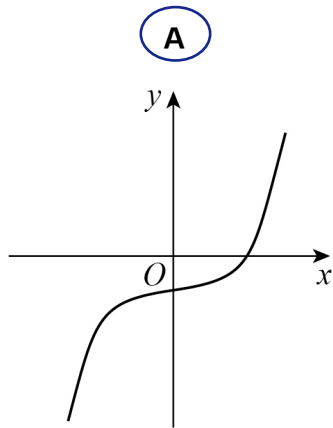
$2n$

$3n$

$n + 2$



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



Turn over for the next question

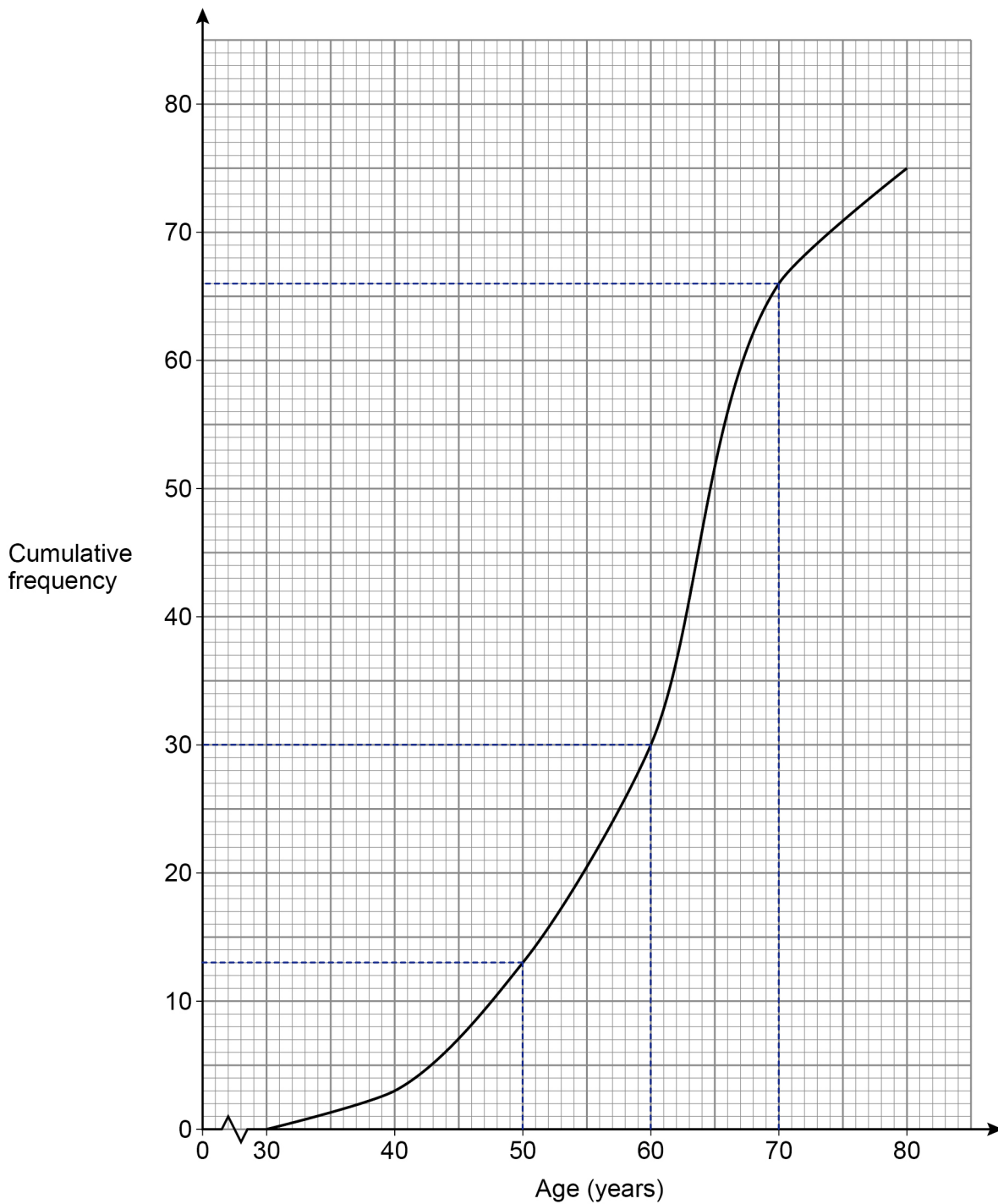
Turn over ►



17

75 people attend a clinic.

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



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

☒

No

☐

Show working to support your answer.

[3 marks]

Readings: 13 at 50 years, 30 at 60 years, 66 at 70 years

In their 50s: $30 - 13 = 17$ people

In their 60s: $66 - 30 = 36$ people

Twice $17 = 34$, and $36 > 34$

So yes, more than twice as many are in their 60s.

Turn over for the next question

Turn over ►



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]

$$2(ax^3 + x^2 + 2x - 5) + x(bx + c)$$

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

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

$$x^3: 2a = 12, \text{ so } a = 6$$

$$x^2: 2 + b = 7, \text{ so } b = 5$$

$$x: 4 + c = 3, \text{ so } c = -1$$

$$a = \underline{6} \quad b = \underline{5} \quad c = \underline{-1}$$



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

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

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

The value of this term is negative.

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



20

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

[4 marks]

$$y = \frac{5x+9}{x}$$

$$xy = 5x + 9$$

$$xy - 5x = 9$$

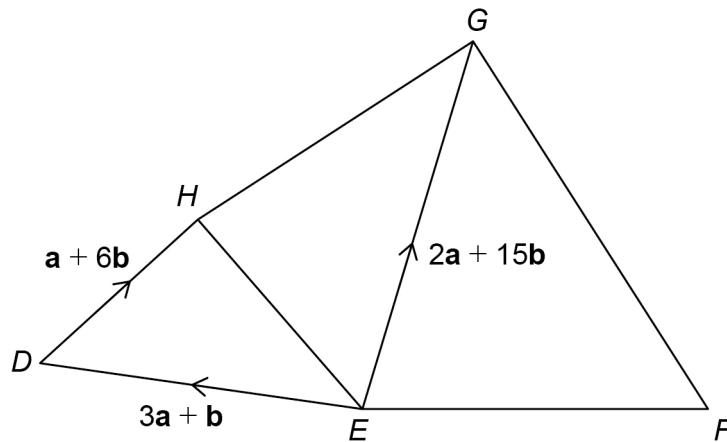
$$x(y - 5) = 9$$

$$x = \frac{9}{y-5}$$

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

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]

$$\overrightarrow{EH} = \overrightarrow{ED} + \overrightarrow{DH} = (3a + b) + (a + 6b)$$

$$\overrightarrow{EH} = 4a + 7b$$

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

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

$$\overrightarrow{FE} = (8a + 14b) - (2a + 15b)$$

$$\overrightarrow{FE} = 6a - b$$

Answer 6a - b

Turn over ►



22

Work out $0.\dot{6}\dot{8} - 0.4\dot{5}$

Give your answer as a fraction in its simplest form.

[5 marks]

$$0.6888... - 0.4555... = 0.2333...$$

$$\text{Let } x = 0.2333...$$

$$10x = 2.3333...$$

$$10x - x = 2.3333... - 0.2333...$$

$$9x = 2.1$$

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

Answer $\frac{7}{30}$

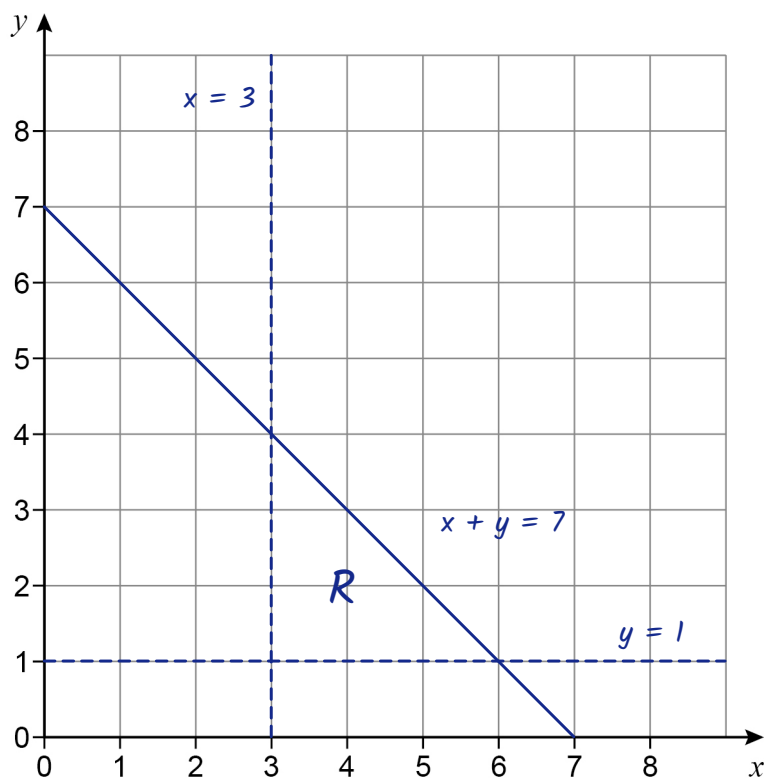


23

On the grid, identify the region represented by

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

Label the region R.

[3 marks]

Turn over for the next question

Turn over ►



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

[2 marks]

$$\frac{6}{a} = \frac{24}{4a}$$

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

Answer $\frac{13}{4a}$

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

[4 marks]

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

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

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

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

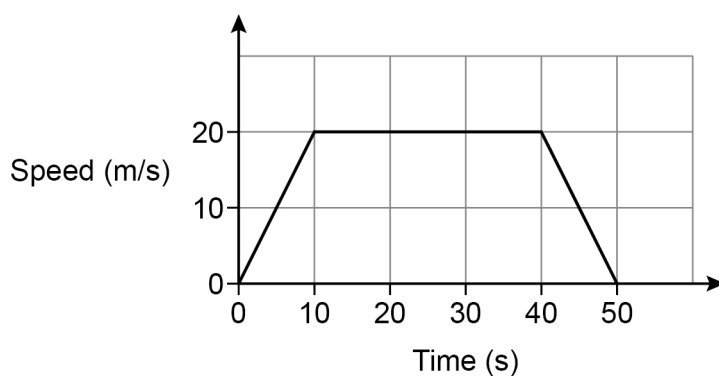
$$= y(y + 7)$$

$$= y^2 + 7y$$

Answer $y(y + 7)$



- 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

2

20

25

- 25 (b)** Work out the total distance travelled.

[2 marks]

Distance = area under the graph (trapezium)

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

$$= 40 \times 20 = 800$$

Answer 800 m

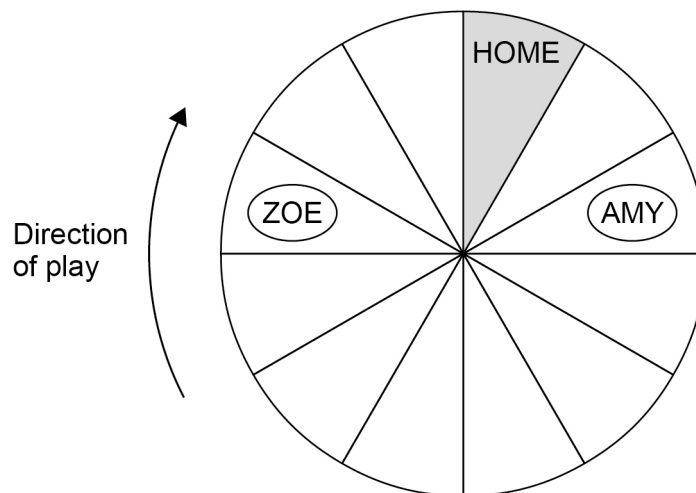


26

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]

Zoe is 3 spaces (clockwise) from HOME.

Win on 1st turn (roll 3): $P = \frac{1}{6}$

Win on 2nd turn: roll 1 then 2, or 2 then 1

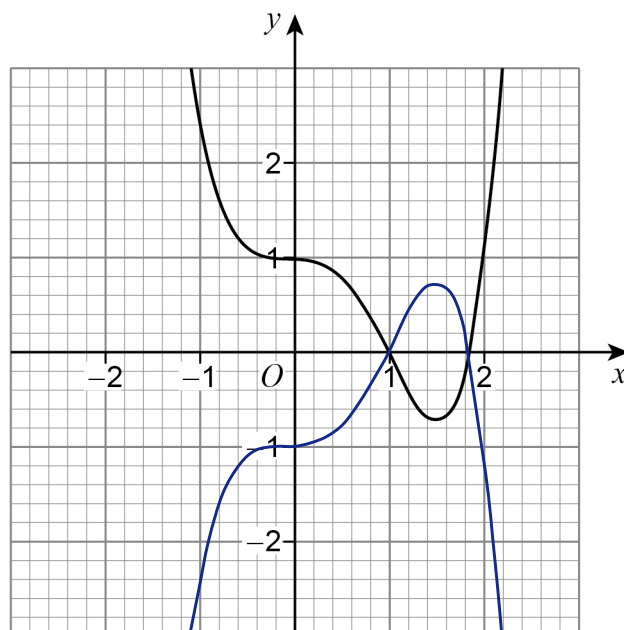
$$P = \frac{1}{6} \times \frac{1}{6} + \frac{1}{6} \times \frac{1}{6} = \frac{2}{36}$$

$$\text{Total} = \frac{1}{6} + \frac{2}{36} = \frac{6}{36} + \frac{2}{36} = \frac{8}{36} = \frac{2}{9}$$

Answer $\frac{2}{9}$



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****Turn over ►**

28

Work out the value of $(\cos 30^\circ \times \sin 45^\circ \times \tan 60^\circ)^2$ **[4 marks]**

$$\cos 30^\circ = \frac{\sqrt{3}}{2}, \quad \sin 45^\circ = \frac{\sqrt{2}}{2}, \quad \tan 60^\circ = \sqrt{3}$$

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

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

$$= \frac{3}{4} \times \frac{2}{4} \times 3 = \frac{3}{4} \times \frac{1}{2} \times 3$$

$$= \frac{9}{8}$$

Answer $\frac{9}{8}$

END OF QUESTIONS

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3 2



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