OCR
Oxford Cambridge and RSA

Monday 13 November 2023 – Morning

GCSE (9–1) Mathematics

J560/03 Paper 3 (Foundation Tier)

Time allowed: 1 hour 30 minutes

You must have:
- the Formulae Sheet for Foundation Tier (inside this document)

You can use:
- a scientific or graphical calculator
- geometrical instruments
- tracing paper

F

Please write clearly in black ink. **Do not write in the barcodes.**

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

First name(s) _____

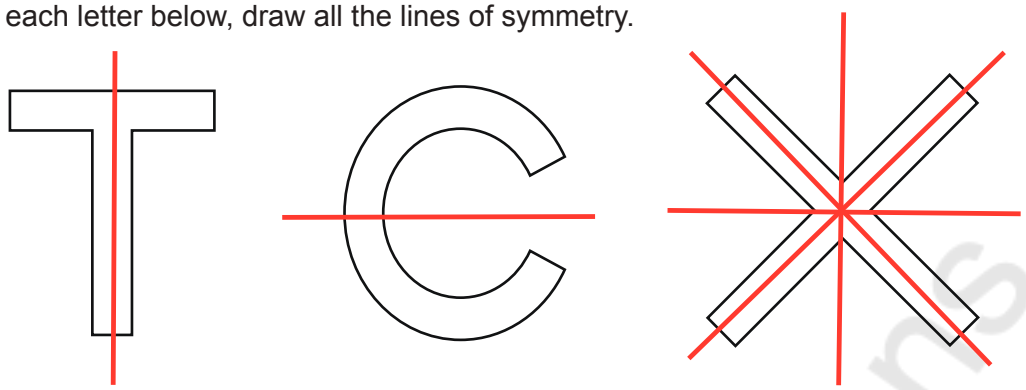
Last name _____

INSTRUCTIONS
- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. If you need extra space use the lined pages at the end of this booklet. The question numbers must be clearly shown.
- Answer **all** the questions.
- Where appropriate, your answer should be supported with working. Marks might be given for using a correct method, even if your answer is wrong.
- Use the π button on your calculator or take π to be 3.142 unless the question says something different.

INFORMATION
- The total mark for this paper is **100**.
- The marks for each question are shown in brackets **[ ]**.
- This document has **24** pages.

ADVICE
- Read each question carefully before you start your answer.

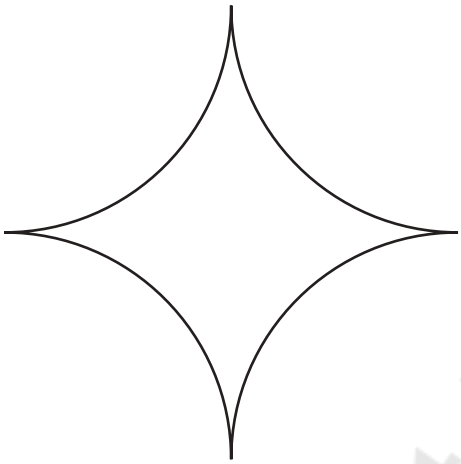
1 **(a)** For each letter below, draw all the lines of symmetry.



[3]

(b) This shape is drawn using four quarter circles.

Write down the order of rotation symmetry for the shape.



(b) 4 **[1]**

2 **(a)** In the number 34 752, the digit 4 represents four thousand.

Write in words what the digit 7 represents.

(a) seven hundred **[1]**

(b) Write eight million in figures.

(b) 8 000 000 **[1]**

3 **(a)** What type of numbers are 2, 3 and 5?

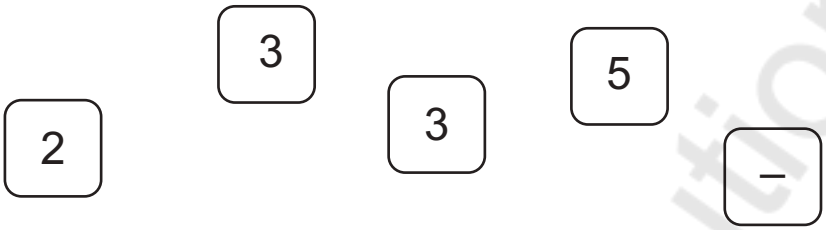
Circle **one** answer from the list.

cube numbers even numbers odd numbers prime numbers square numbers

1, 8, 27

[1]

(b) These are five tiles.



(i) Arrange the five tiles to make a calculation with the answer 3.

3 5 – 3 2 = 3

(b)(i) ..... **[1]**

(ii) Write down a multiple of 8 that can be made using two of the five tiles.

8 16 24 32 40 ...

3 2

(ii) ..... **[1]**

4 A fair spinner has five sides, numbered 1, 2, 3, 4 and 5.

(a) (i) Write down the probability of the spinner landing on 2.

(a)(i) $\frac{1}{5}$ ..... **[1]**

(ii) Write down the probability of the spinner **not** landing on 2.

$1 - \frac{1}{5}$

(ii) $\frac{4}{5}$ ..... **[1]**

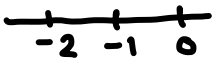
(b) Write down an outcome for the spinner that has a probability of 0.

Spinner landing on 0

..... **[1]**

5 Use one of these symbols $<$, $>$ or $=$ to make each statement true.

0 ..... $>$ ..... -2



3.5 ..... $=$ ..... $\frac{7}{2} = 3.5$

[2]

6 A family buys a television for £599.
They pay a deposit of £119.
They then pay the rest of the cost in 12 equal payments.

How much is each payment?

£599 − £119 = £480

£480 ÷ 12 = £40

£ 40 ..... **[2]**

7 **(a)** Write this ratio in its simplest form.

4 centimetres : 8 millimetres

1 cm ×10 → 10 mm

4cm = 40mm

40mm : 8mm

÷8 ÷8

5 : 1

(a) ..... 5 : 1 ..... **[2]**

(b) The ratio 4 : 5 can be written in the form 1 : n.

Find the value of n.

÷4 (4 : 5 → 1 : 1.25) ÷4

n

(b) n = ... 1.25 ..... **[1]**

8 **(a)** Simplify.

(i) $4a + 2a + 1a$

(a)(i) ..... 7a ..... **[1]**

(ii) $2x - 3y - 3x + 4$

$-x - 3y + 4$

(ii) ..... $-x - 3y + 4$ ..... **[2]**

(b) Solve.

$p - 5 = -4$

+5 +5

$p = 1$

(b) p = ... 1 ..... **[1]**

9 Insert one pair of brackets into each calculation to make it correct.

$$15 \div 7 - 2 = 3$$

$$5 \times 2 + 3 \times 2 = 26$$

[2]

10 **(a)** Factorise.

$5x - 20$

$5(x - 4)$

(a) $5(x-4)$ **[1]**

(b) Factorise fully.

$14x + 7x^2$

$7x(2 + x)$

(b) $7x(2+x)$ **[2]**

11 Gabi records the number of times a biased six-sided dice lands on each of its numbers.

(a) Complete the table to show the relative frequencies.

Number on the dice	1	2	3	4	5	6
Frequency	10	21	7	4	3	5
Relative frequency	0.2	0.42	0.14	0.08	0.06	0.10
	$\frac{10}{50}$	$\frac{21}{50}$	$\frac{7}{50}$	$\frac{4}{50}$		

$= 50$

[2]

(b) Use Gabi's results to estimate the probability that the spinner lands on 5 or 6.

$$P(5 \text{ or } 6) = 0.06 + 0.10$$
$$= 0.16$$

(b) 0.16 **[2]**

12 **(a)** Decrease 480 by 20%.

100% − 20% = 80%

80% $\xrightarrow{\div 100}$ 0.8

0.8 × 480 = 384

(a) ..... 384 ..... **[3]**

(b) Alex buys a new phone with 10.5 Gb (Gigabytes) of data.
This is 40% more data than on Alex's old phone.

Work out the amount of data Alex had on the old phone.

100% + 40% = 140%

140% = 10.5 Gb

÷1.4 ↓ ÷1.4

100% = 7.5 Gb

(b) ..... 7.5 ..... Gb **[3]**

13 A student has a pencil case containing 60 pencils.

$\frac{1}{4}$ of the pencils are red.

$\frac{2}{5}$ of the red pencils need sharpening.

Work out how many of the red pencils need sharpening.

Red pencils = $\frac{1}{4}$ × 60

= 15

Sharpening = $\frac{2}{5}$ × 15

= 6

..... 6 ..... **[3]**

14 **(a)** Show that the formula $v = u + at$ can be rearranged to $a = \frac{v-u}{t}$. **[1]**

$-u \quad -u$

$v - u = at$

$\div t \qquad \div t$

$\frac{v-u}{t} = a$

(b) Use the formula

$a = \frac{v-u}{t}$

to find the acceleration, a m/s^2, when a particle takes 4 seconds to increase from an initial velocity of 3 m/s to a final velocity of 9 m/s.

$v = 9$

$u = 3$

$t = 4$

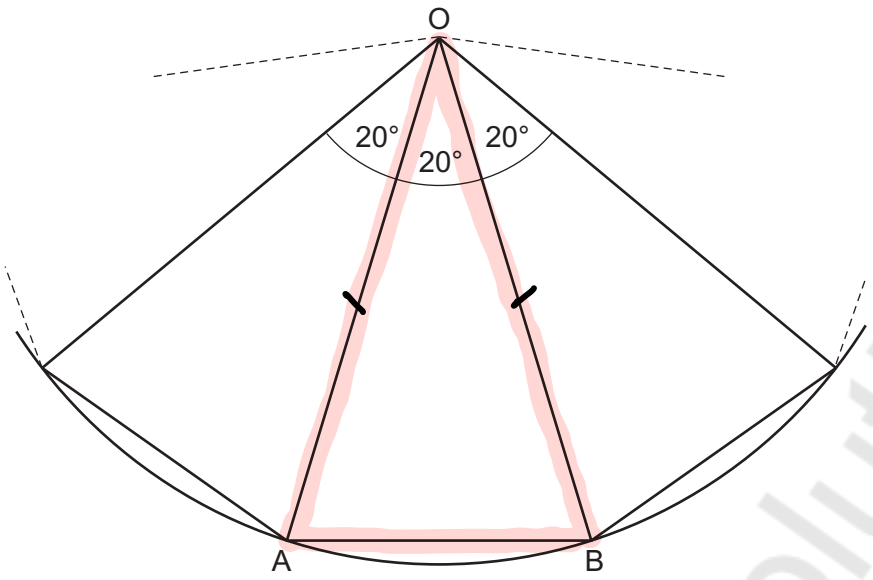
$a = \frac{9-3}{4}$

$= \frac{6}{4}$

$= 1.5$

(b) $a =$ 1.5 m/s^2 **[2]**

15 A regular polygon is being constructed inside a circle, centre O.
Part of the construction is shown in this diagram.



Not to scale

(a) (i) Give a reason why OA = OB.

They are radii [1]

(ii) Write down the mathematical name of triangle OAB.

(a)(ii) isosceles [1]

(b) The regular polygon is completed.

Work out the sum of the interior angles of the regular polygon.

$(n-2) \times 180$
↑
no. of sides

$360 \div 20 = 18$

$(18-2) \times 180$
16×180
$= 2880°$

(b) 2880 ° [3]

16 Dev and Emma share some money in the ratio 2 : 3.

(a) Dev says

I get $\frac{2}{3}$ of the money.

What mistake has Dev made?
Give the fraction of the money Dev actually receives.

He did not add 2 and 3 for the denominator

The fraction of the money Dev receives is $\frac{2}{5}$ **[2]**

(b) Dev receives £100.

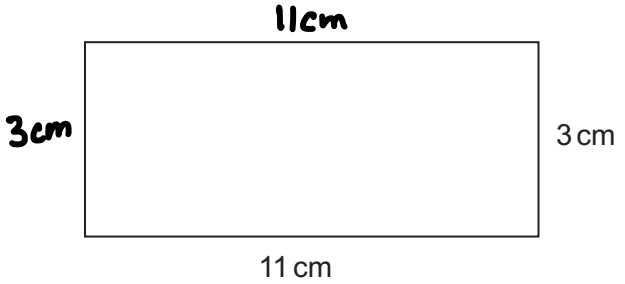
Work out how much money Dev and Emma shared between them.

D : E
2 : 3
×50 ×50
£100 : £150

Total = £100 + £150
= £250

£ 250 **[3]**

17 **(a)** Work out the perimeter of this rectangle.



Not to scale

Perimeter = add all sides

= 3 + 3 + 11 + 11

= 28 cm

(a) 28 cm **[2]**

(b) Finley draws a rectangle and says

The perimeter is 20 cm and the length is 10 cm.

Can Finley be correct?
Show how you decide.

No because the width cannot be 0cm.

[2]

18 Nina invests £540 at a simple interest rate of 2% per year.
Kareem invests £540 at a compound interest rate of 2% per year.

Work out the difference in value between the two investments at the end of 5 years.
You must show your working.

Nina

2% of 540

= 0.02 × 540

= £10.80 per year

£10.80 × 5 = £54

£540 + £54 = £594

Kareem

Final amount = investment × multiplier^{n} ← no. of years

Multiplier = 100% + 2% = 102% $\xrightarrow{\div 100}$ 1.02

Final amount = 540×1.02^{5}

= £596.20

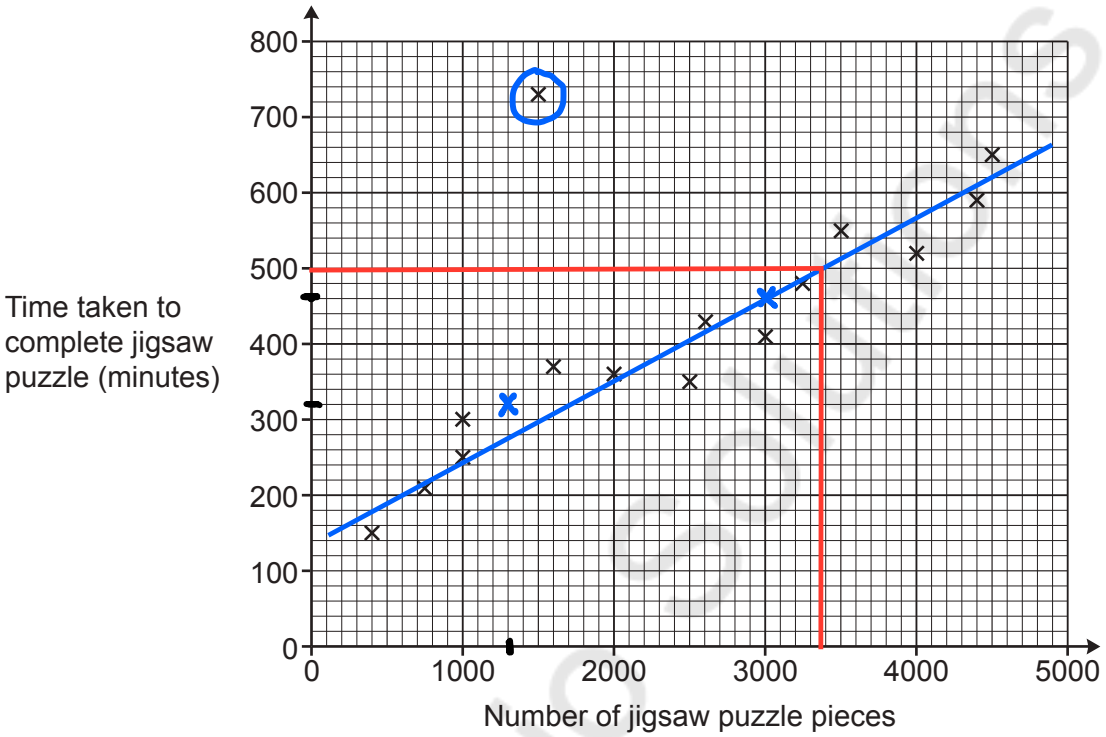
£596.20 − £594 = £2.20

£ 2.20 **[6]**

19 Beth completes some jigsaw puzzles and records the following information.

- The number of pieces in the jigsaw puzzle.
- The time taken to complete the jigsaw puzzle, in minutes.

Beth shows this information in a scatter diagram.



(a) **(i)** Beth completes two more jigsaw puzzles.

- A 3000 piece jigsaw puzzle taking 460 minutes.
- A 1300 piece jigsaw puzzle taking 320 minutes.

Show this information on the scatter diagram. **[1]**

(ii) Describe the type of correlation shown on the scatter diagram.

(a)(ii) Positive **[1]**

(b) One of Beth's jigsaw puzzles was described as "the most difficult jigsaw puzzle you will ever try".

(i) Circle the most likely jigsaw puzzle on the scatter diagram. **[1]**

(ii) Give a reason why you chose this jigsaw puzzle.

Similar number of pieces, but took the longest time.

[1]

(c) **(i)** Draw a line of best fit on the scatter diagram. **[1]**

(ii) Use your line of best fit to estimate how many pieces are in a jigsaw puzzle that takes Beth 500 minutes to complete.

(c)(ii) ..... 3350 ..... pieces **[1]**

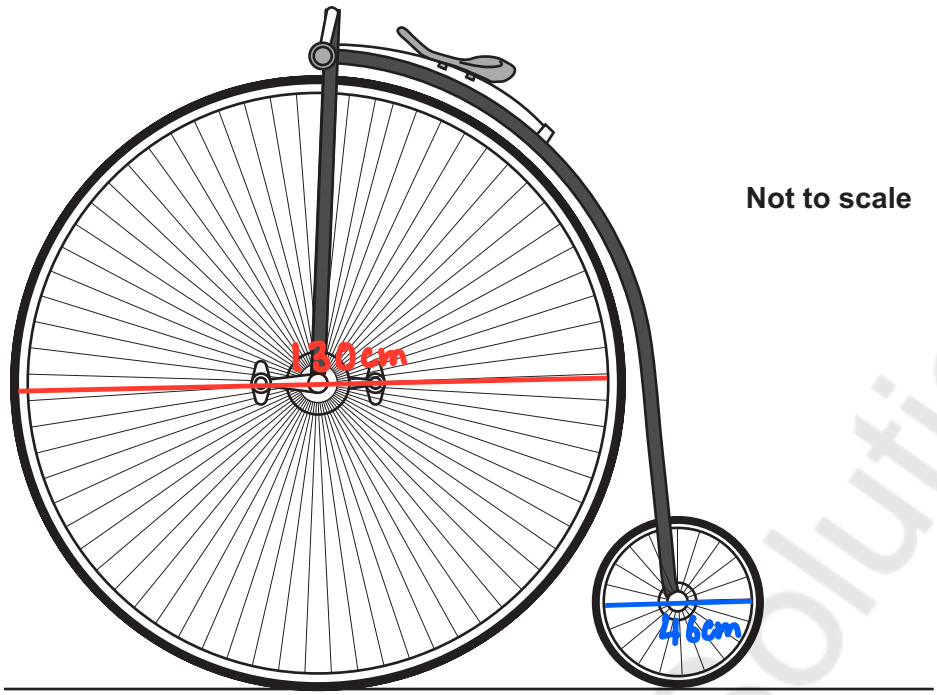
(d) Explain why Beth should **not** use her scatter diagram to estimate how long it will take to complete a jigsaw puzzle containing 8000 pieces.

..... 8000 pieces is outside the range of data. .....

.....

..... **[1]**

20 The diagram shows a Penny Farthing bicycle.



Not to scale

The diameter of the large wheel is 130 cm.
The diameter of the small wheel is 46 cm.

On a short journey, the large wheel makes exactly 69 rotations.
The small wheel also makes an exact number of rotations.

Work out the number of rotations made by the small wheel.

$C = \pi d$

Large wheel $d = 130$

$C = \pi(130)$

$= 130\pi$ cm

Distance: $130\pi \times 69 = 8970\pi$

Small wheel $d = 46$

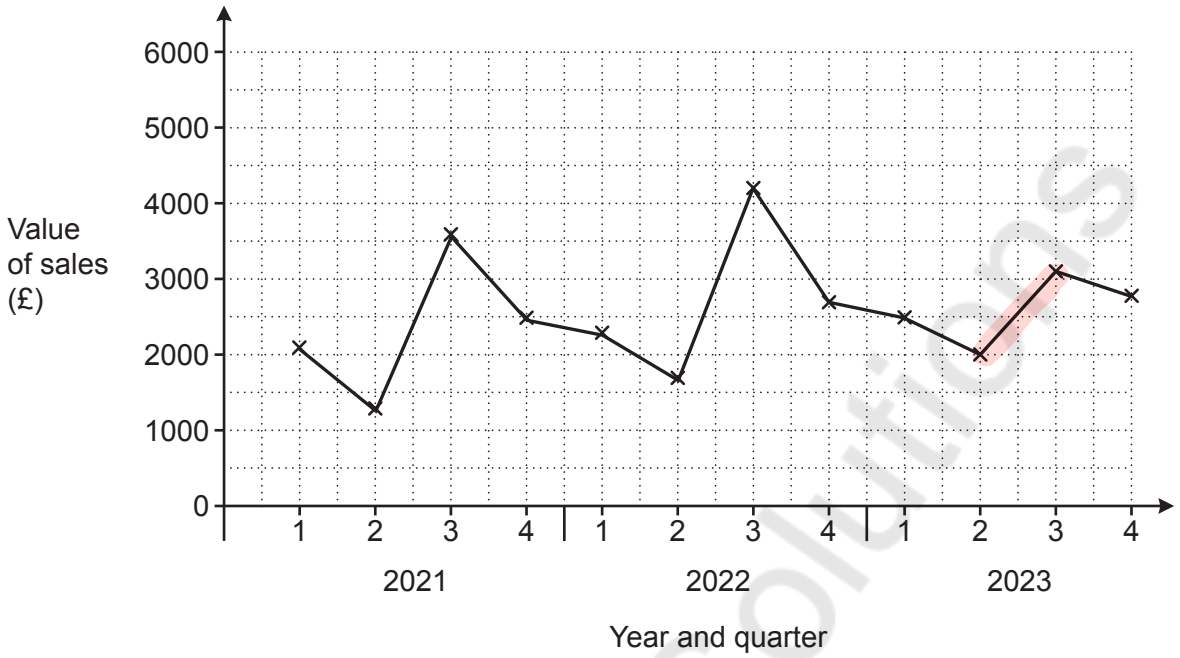
$C = \pi(46)$

$= 46\pi$

$8970\pi \div 46\pi = 195$ rotations

195 ..... **[4]**

21 The graph shows the value of sunscreen products sold in a shop for each quarter from quarter 1 of 2021 to quarter 4 of 2023.



(a) Make **one** comment about the **annual** variation shown in this graph.

Repeating pattern

..... **[1]**

(b) In one of these years, quarter 3 was very cloudy.
Write down which year this is most likely to be.
Give a reason for your answer.

Year 2023 because Q3 is lower than in the other years.

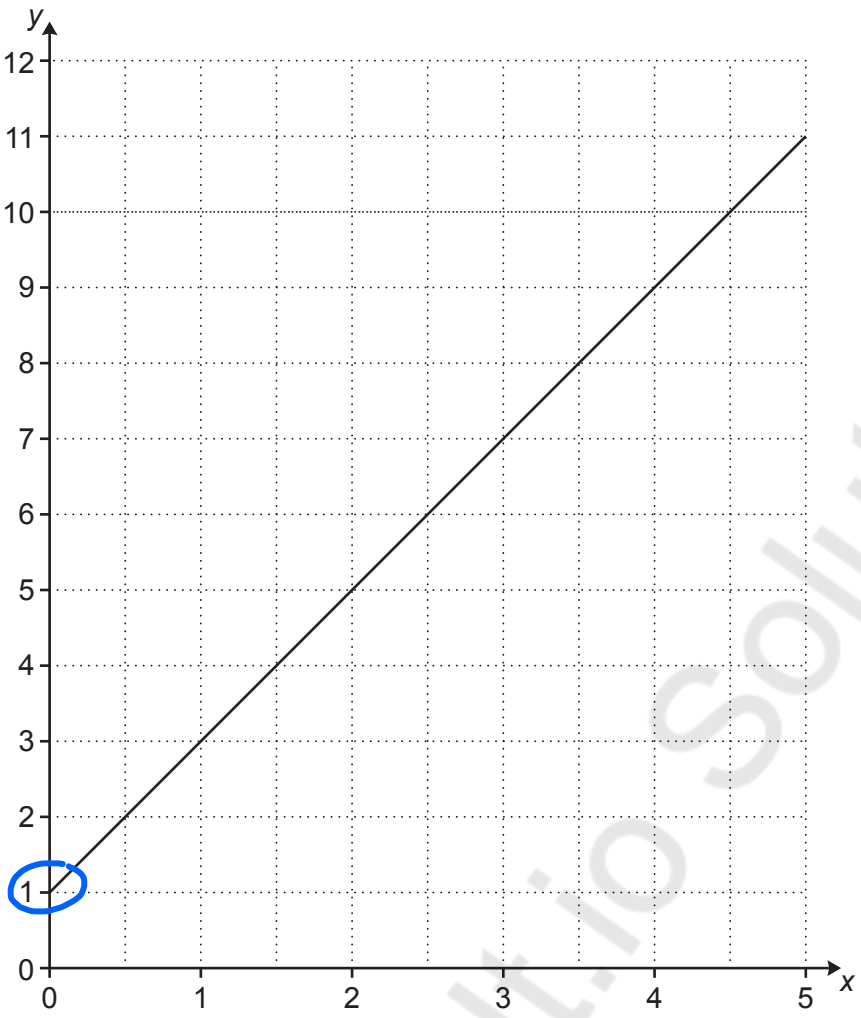
..... **[1]**

(c) The manager of the shop says that the value of sales in quarter 4 of 2024 will be £3100.
What assumption has the manager made?

The trend will continue.

..... **[1]**

22 Part of the graph of $y = 2x + 1$ is drawn on this grid.



(a) Write down the y-intercept.

(a) 1 **[1]**

(b) The line continues to the right.

Will the line pass above, below or through the point (40, 80)?
Show how you decide.

x y

$y = 2x + 1$

$80 = 2(40) + 1$

$80 \neq 81$

The line $y = 2x + 1$ will pass above the point (40, 80) because it will pass through (40, 81).

[2]

(c) Write down the equation of a line that is parallel to $y = 2x + 1$.

gradient = 2

same gradient

(c) $y = 2x + 5$ **[1]**

23 A number, r, is 6.2 when rounded correct to 2 significant figures. $6.15 \leq r < 6.25$
A number, h, is 6.2 when truncated to 1 decimal place. $6.2 \leq h < 6.3$

(a) Write down a possible value of r that will definitely be less than all possible values of h.

(a) $r =$ 6.15 **[1]**

(b) Write down a possible value of h that will definitely be greater than all possible values of r.

(b) $h =$ 6.27 **[1]**

(c) Write down a possible value of r and a possible value of h such that r is greater than h.

(c) $r =$ 6.21 and $h =$ 6.2 **[1]**

24 A restaurant menu has 4 main courses and 3 side dishes.
For their meal, each customer chooses 1 main course and 1 side dish.

Main course	
Beef burger	£6
Lasagna	£7
Veggie burger	£5
Turkey stew	£6

Side dish	
Salad	£2
Chips	£3
Garlic bread	£1

Work out the percentage of possible meals that cost less than £8.

Total combinations = 4×3
= 12

$\frac{4}{12} \times 100 = 33.\dot{3}\%$

33.3 % **[4]**

25 A sheet of A4 card weighs 1.19×10^{-2} kg.

(a) Work out the weight of 500 sheets of the A4 card.

$500 \times 1.19 \times 10^{-2} = 5.95\text{ kg}$

(a) ..... 5.95 ..... kg **[2]**

(b) Card is classified using *W*, the weight in grams per square metre (gsm).

$$W = \frac{\text{weight in grams}}{\text{area in square metres}}$$

A sheet of A4 card is a rectangle that is 21 cm by 29.7 cm.

Calculate *W* for this A4 card.

1 kg = 1000 g

×1000

Weight = 1.19×10^{-2} kg × 1000 = 11.9 g

29.7cm → 0.297m

21cm → 0.21m

1m = 100cm

÷100

Area = l × w

= 0.297 × 0.21

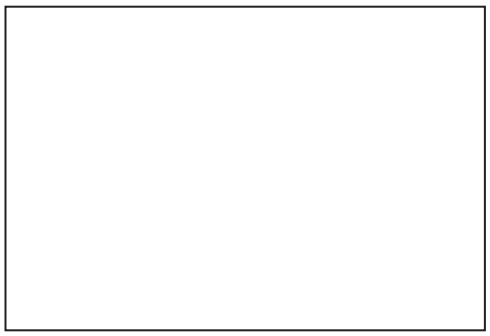
= 0.06237 m^2

$W = \frac{11.9}{0.06237}$

= 190.796875

(b) ..... 191 ..... gsm **[4]**

26 The area of this rectangle can be written as $ax^2 + bx - 10$.



Not to scale

Find the values of a, b and c.
You must show your working.

$A = l \times w$

$= (x + c)(3x + 2)$

$= 3x^2 + 2x + 3xc + 2c$

$ax^2 \quad + bx \quad -10$

$a = 3$

$c = -5$

$b = -13$

$2c = -10$

$\div 2 \qquad \div 2$

$c = -5$

$2x + 3xc$

$2x + 3(-5)x$

$2x - 15x$

$-13x = bx$

$-13 = b$

$a =$ 3 , $b =$ -13 and $c =$ -5 **[5]**

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).