OCR
Oxford Cambridge and RSA

Thursday 15 May 2025 – Morning

GCSE (9–1) Mathematics

J560/04 Paper 4 (Higher Tier)

Time allowed: 1 hour 30 minutes

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

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

H

* J 5 6 0 0 4 *

* 1 8 6 3 4 3 3 1 6 9 *

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. You can use extra paper if you need to, but you must clearly show your candidate number, the centre number and the question numbers.
- 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 **20** pages.

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

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1 Calculate.

$$\frac{4.5^3}{1.8} + \frac{3.6}{2.4^2}$$

Give your answer correct to **3** significant figures.

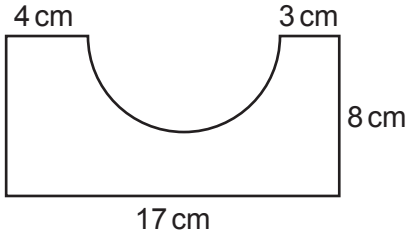
..... **[2]**

2 The ratio 40 grams to 1 kilogram can be written in the form 1 : n.

Find the value of n.

$n =$ ..... **[2]**

3 The diagram shows a shape formed from a rectangle measuring 8 cm by 17 cm with a semicircle removed from one side.



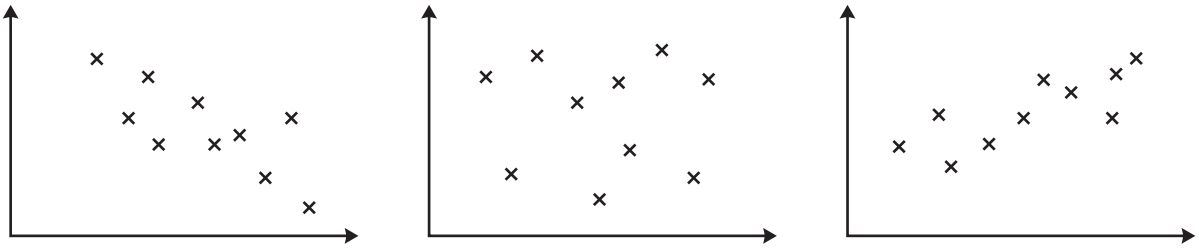
Not to scale

Calculate the perimeter of the shape.

..... cm **[4]**

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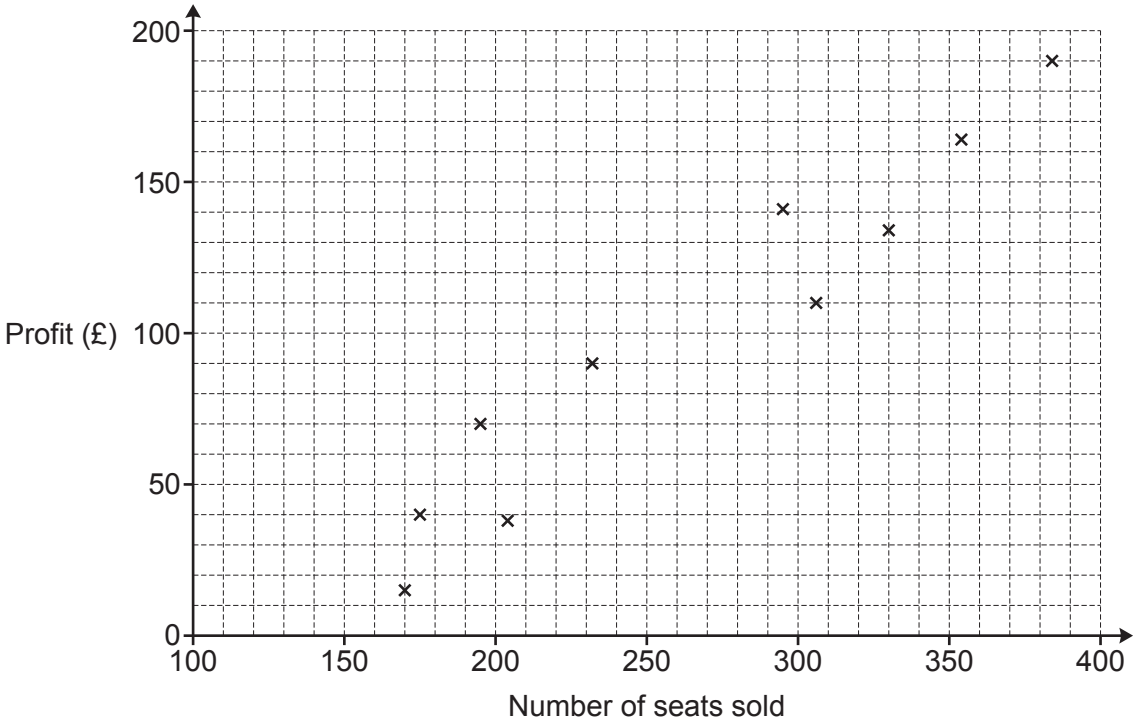
4 **(a)** Describe the correlation shown in each of these scatter diagrams.



....

[2]

(b) A theatre records the number of seats sold and the profit made for 10 performances. The scatter diagram shows these results.



By drawing a line of best fit, estimate the profit made when 250 seats are sold.

(b) £ ..... **[2]**

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5 **(a)** For each of the algebraic statements below decide whether it is an equation or an identity.

$(x-1)(x-2)=12$ is an .....

$(x-1)(x-2)=x^2-3x+2$ is an .....

$x^2=3x+10$ is an .....

[1]

(b) A straight line is parallel to $y=3x$ and passes through the point (2, 11).

Find the equation of the line in the form $y=mx+c$.

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

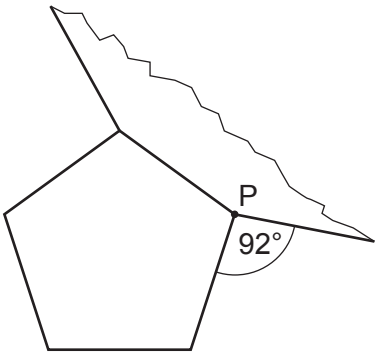
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6 The distance of a car race is 420 km.
A car completes the first 210 km at an average speed of 150 km/h.
The same car completes the final 210 km at an average speed of 100 km/h.

Show that the average speed of the car for the whole race is less than 125 km/h. **[5]**

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7 The diagram shows a regular pentagon and part of another regular polygon meeting at point P.
One of the angles at point P is 92°.



Not to scale

(a) Show that the size of one interior angle of a regular pentagon is 108°. **[2]**

(b) Find the number of sides of the other regular polygon.

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

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8 A town council are going to do a survey on how people travel to work or school and for how long they travel.

One day their interviewer stands outside the town railway station and chooses 20 people at random to form their sample.

Make **three different** criticisms or suggestions for improving the council's method for selecting their sample.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

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9 **(a)** Write 0.0037 in standard form.

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

(b) A country consists of a south island and a north island.
The table below shows the population and area of each island in June 2023.

	Population	**Area (km^2)**
South island	1.2×10^6	1.5×10^5
North island	4.0×10^6	1.1×10^5

Work out the overall population density of the country in June 2023.

(b) ..... people per km^2 **[4]**

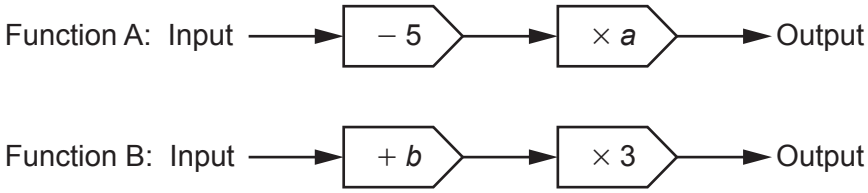
10 Find the value of k.

$$\frac{25 \times (5^3)^k}{5^4} = 5^{19}$$

$k =$ ..... **[3]**

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11 Function A and function B are shown below.



When the input for both machines is 11, the output of Function A is equal to the output of Function B.
When the input for both machines is 29, the output of Function A is twice the output of Function B.

Find the value of a and the value of b.

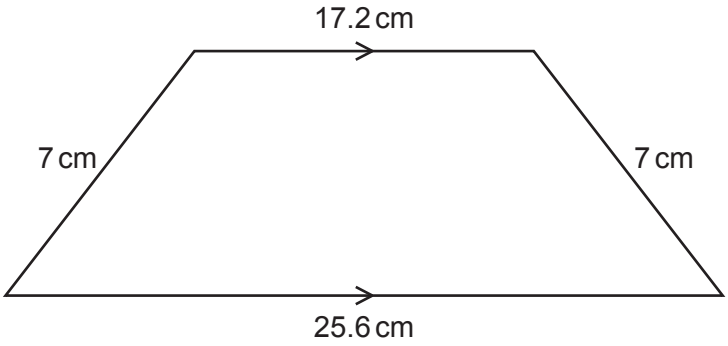
$a =$ .....

$b =$ .....

[5]

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12 The diagram shows a trapezium.



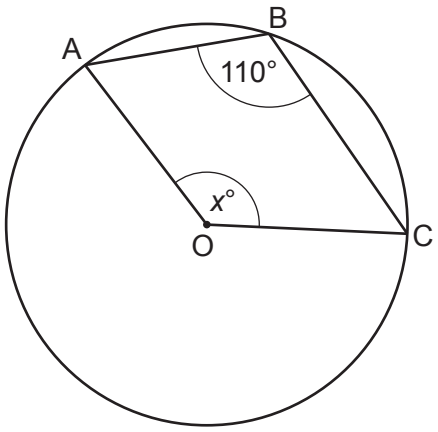
Not to scale

Calculate the area of the trapezium.
You must show your working.

..... cm^2 **[5]**

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13 A, B, and C are points on a circle, centre O.



Not to scale

(a) Explain why OABC is **not** a cyclic quadrilateral.

.....

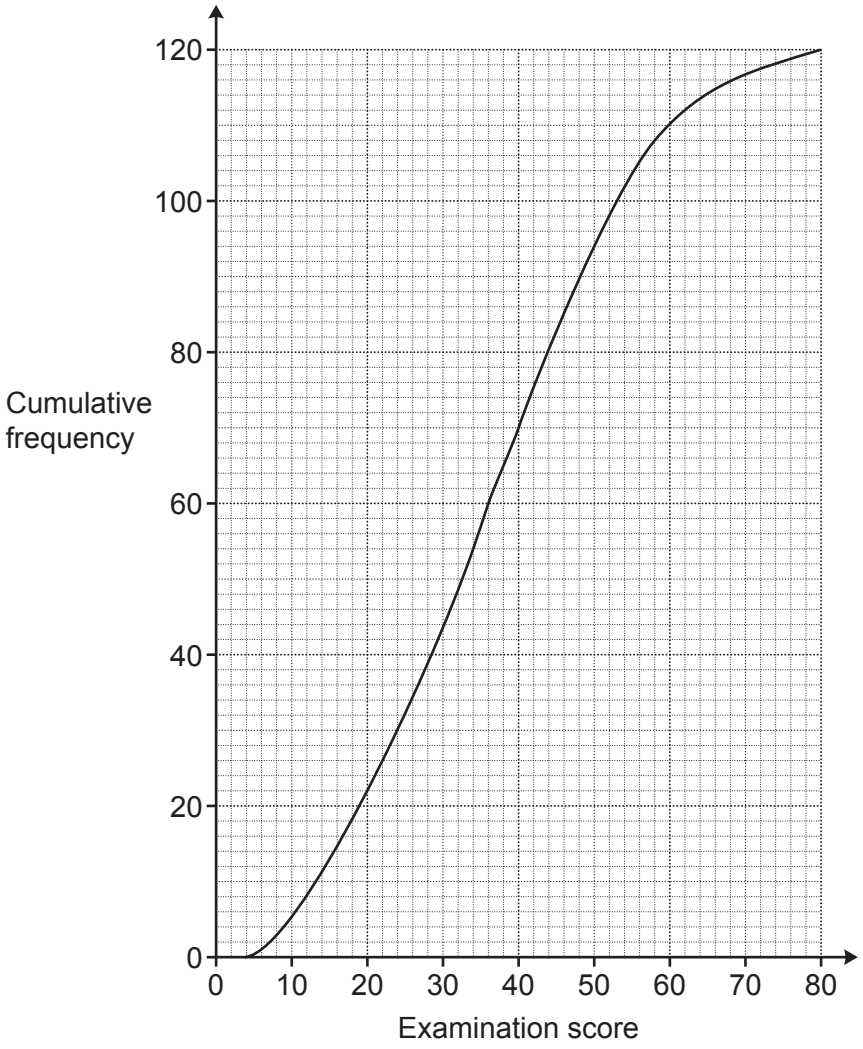
..... **[1]**

(b) Work out the value of x.

$x =$ ..... **[2]**

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14 The cumulative frequency graph shows the distribution of the examination scores for 120 students.



(a) A student says that they had an examination score of 34 and so were in the top half of the 120 students.

Is the student correct?
Give a reason for your decision.

..... because .....

..... **[2]**

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(b) The top 10% of the 120 students are awarded a commendation.

Find the minimum mark required for a commendation.

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

15 y is inversely proportional to the square of x.
$y = 5$ when $x = 6$.

Find a formula linking x and y.

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

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16 The population of fish, P, in a pond is predicted by the formula

$P = 640 \times 1.025^n$

where n is the number of years after 1st January 2020.

(a) Write down the population of fish on 1st January 2020.

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

(b) Write down the percentage increase per year used in the formula.

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

(c) **(i)** Show that the formula predicts that the population of fish will reach 1000 between 1st January 2038 and 1st January 2039. **[3]**

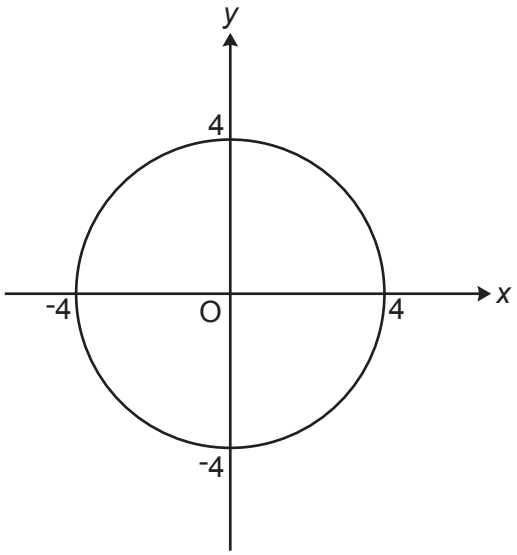
(ii) Give **one** reason why this might not happen.

.....

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

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17 The diagram shows a circle, centre $(0, 0)$.



(a) Write down the equation of the circle.

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

(b) Point A has coordinates (2.3, 3.3).

Show that point A does **not** lie on the circle and state, with a reason, whether it lies inside the circle or outside the circle.

Point A lies ..... the circle because .....

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

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18 **(a)** A sequence is defined by

$u_{n+1} = ku_n - 2$, $u_2 = 7$ and $u_3 = 29.5$.

Find the value of k.

(a) $k =$ ..... **[3]**

(b) Another sequence is defined by $u_{n+1} = 6u_n - 7$.

(i) Find the value of u_1 in the case when $u_2 = 2 \times u_1$.

(b)(i) $u_1 =$ ..... **[2]**

(ii) Explain what happens to the sequence $u_{n+1} = 6u_n - 7$ when $u_1 = 1.4$.

.....

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

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19 Multiply out and simplify.

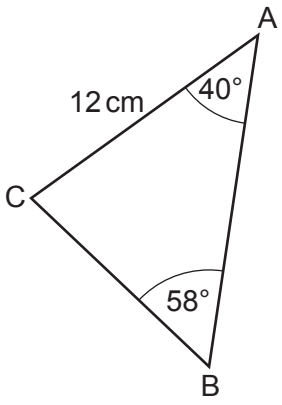
$(\sqrt{5}+1)(\sqrt{15}-\sqrt{3})$

Give your answer in the form $a\sqrt{b}$, where a and b are integers.

You must show each step in your working.

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

20 The diagram shows triangle ABC.



Not to scale

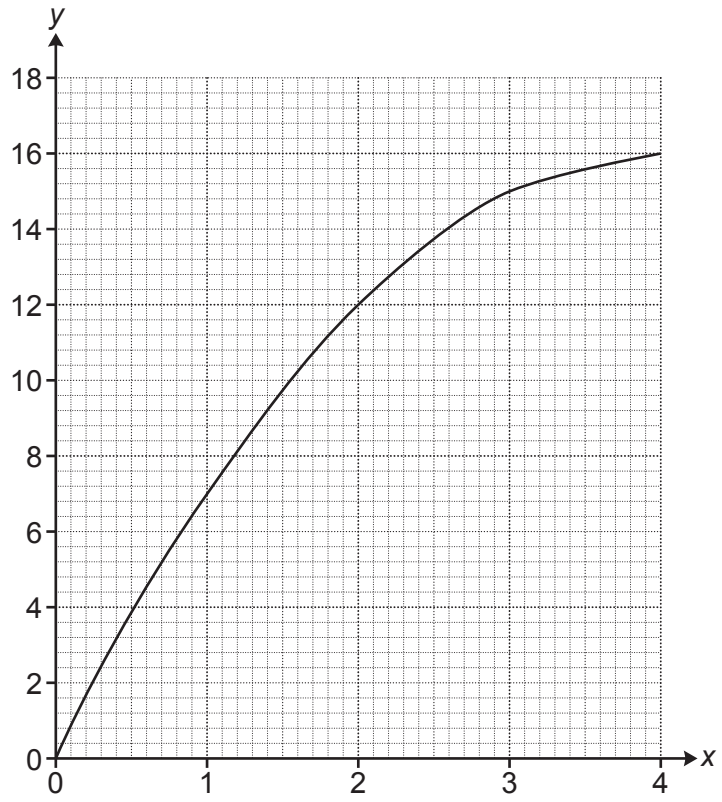
AC = 12 cm, angle CAB = 40° and angle ABC = 58°.

Calculate length BC.

..... cm **[3]**

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21 The graph of a function is drawn on the grid for $0 \leqslant x \leqslant 4$.



(a) Work out the average rate of change of the function between $x = 1$ and $x = 3$.

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

(b) Use the graph to estimate the gradient of the function at $x = 2.5$.
You must show working to support your estimate.

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

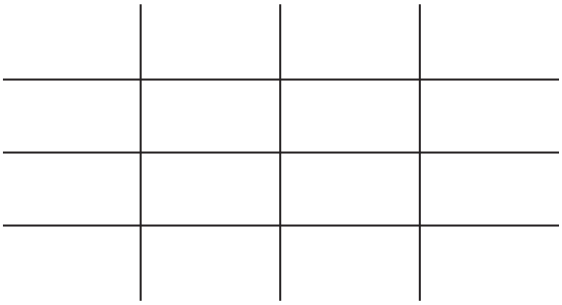
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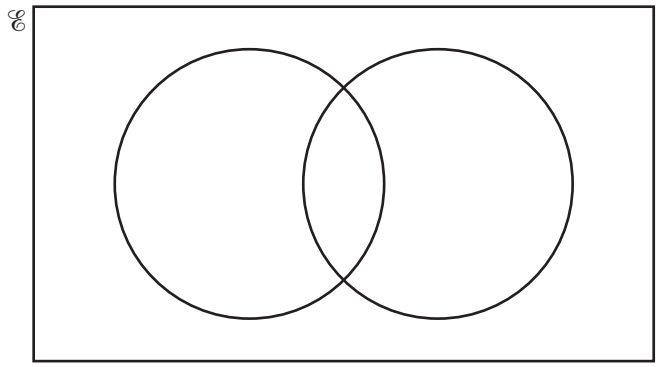
22 A school has 90 students in Year 11.

- 50 of the students study French.
- 59 of the students study Spanish.
- 4 of the students do not study either of these languages.

One the students is chosen at random.

Find the probability that the student studies French given that they study Spanish.
You may use the grid **or** the Venn diagram to help present your working if you wish.





..... **[5]**

Turn over for question 23

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23 **(a)** Write this expression in its simplest factorised form.

$(x+4)(x-4)^2 - x^2(x-5)$

You must show your working.

(a) ..... **[6]**

(b) Use your answer to part **(a)** to write down the value of x which gives the smallest value of this expression.

(b) $x =$ ..... **[1]**

END OF QUESTION PAPER

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