Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME

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5363128286

MATHEMATICS (SYLLABUS D) **4024/22**

Paper 2 Calculator **May/June 2025**

2 hours

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a scientific calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

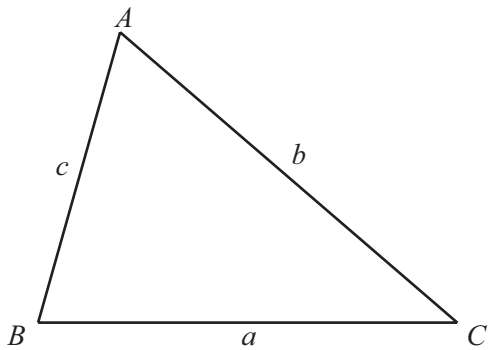
- The total mark for this paper is 100.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

List of formulas

Area, A, of triangle, base b, height h.	$A = \frac{1}{2}bh$
Area, A, of circle of radius r.	$A = \pi r^2$
Circumference, C, of circle of radius r.	$C = 2\pi r$
Curved surface area, A, of cylinder of radius r, height h.	$A = 2\pi rh$
Curved surface area, A, of cone of radius r, sloping edge l.	$A = \pi rl$
Surface area, A, of sphere of radius r.	$A = 4\pi r^2$
Volume, V, of prism, cross-sectional area A, length l.	$V = Al$
Volume, V, of pyramid, base area A, height h.	$V = \frac{1}{3}Ah$
Volume, V, of cylinder of radius r, height h.	$V = \pi r^2 h$
Volume, V, of cone of radius r, height h.	$V = \frac{1}{3}\pi r^2 h$
Volume, V, of sphere of radius r.	$V = \frac{4}{3}\pi r^3$
For the equation $ax^2 + bx + c = 0$, where $a \neq 0$	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

For the triangle shown,

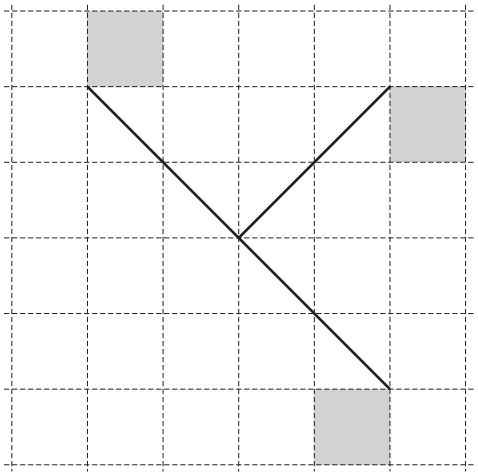


$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$\text{Area} = \frac{1}{2}ab\sin C$$

1



The diagram shows part of a pattern with rotational symmetry of order 4.

Complete the diagram. [1]

2 **(a)** Write eighteen thousand and twelve in figures.

..... [1]

(b) Write down a prime number between 20 and 30.

..... [1]

(c) Find the reciprocal of $\frac{1}{9}$.

..... [1]

3 **(a)** Write the ratio 175 ml : 2.5 litres in its simplest form.

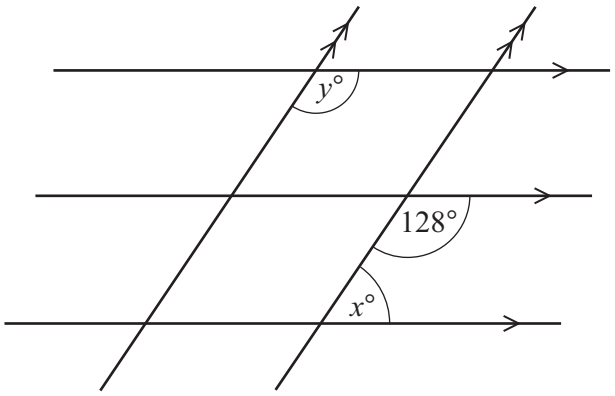
..... : ..... [2]

(b) Dan, Erika and Fatik share \$540 in the ratio 4 : 5 : 3 .

Find the amount that Erika receives.

\$ ..... [2]

4



NOT TO SCALE

Find the value of x and the value of y.

$x =$ .....

$y =$ .....

[2]

5 Convert 6.1 m^2 to cm^2.

..... cm^2 [1]

6 In a survey, students are asked to choose their favourite type of movie.
The table shows the results.

Type of movie	Romance	Thriller	Science Fiction	Other
Relative frequency	0.1		0.35	0.3

(a) Calculate the relative frequency of a student choosing Thriller.

..... [2]

(b) 500 students take part in the survey.

Calculate the number of students who choose Science Fiction.

..... [1]

7 Chris wants to exchange \$350 for euros (€) at the bank.
The bank only gives euros in multiples of €5.
The exchange rate is \$1 = €0.92 .

Calculate the number of euros he receives and his change from \$350.

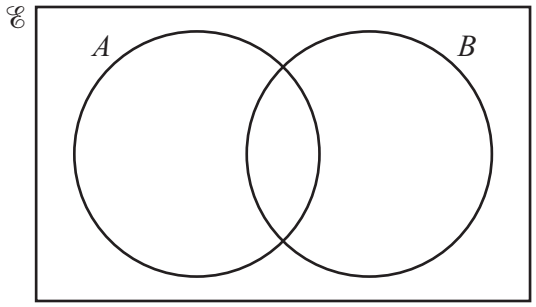
Chris receives € .....

His change is \$ .....
[3]

8 Calculate the interior angle of a regular octagon.

..... [2]

9 **(a)** On the Venn diagram, shade the region represented by $(A \cap B)'$.



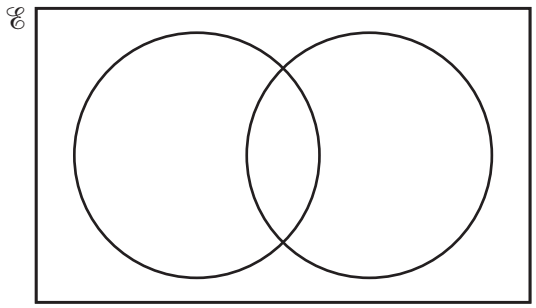
[1]

(b) In a class of 22 students:

- 12 play the piano
- 9 play the guitar
- 6 do **not** play the piano or the guitar.

Find the number of students who play both the piano and the guitar.

You may use the Venn diagram to help you.



..... [2]

10 Simplify.

$$\frac{7x^2y^5}{x^3y^2}$$

..... [2]

11 **(a)** Zaya invests $4500 in a savings account.
The account pays **simple interest** at a rate of 3.2% per year.

Calculate the value of the investment at the end of 5 years.

$ ..... [3]

(b) Aisha invests $2750 in a different savings account.
This account pays **compound interest** at a rate of 2.1% per year.

Calculate the total amount of interest she receives at the end of 3 years.

$ ..... [3]

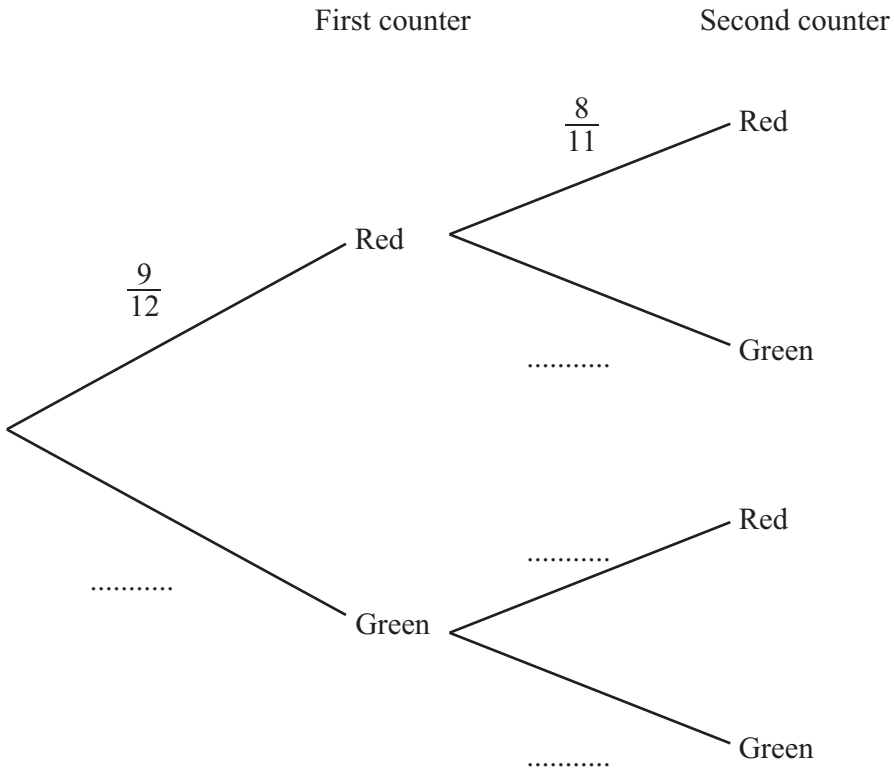
12 Factorise.

$$7hx + 6fy - 21fx - 2hy$$

..... [2]

13 A bag contains 9 red counters and 3 green counters.
Lee takes two counters from the bag at random without replacement.

(a) Complete the tree diagram.

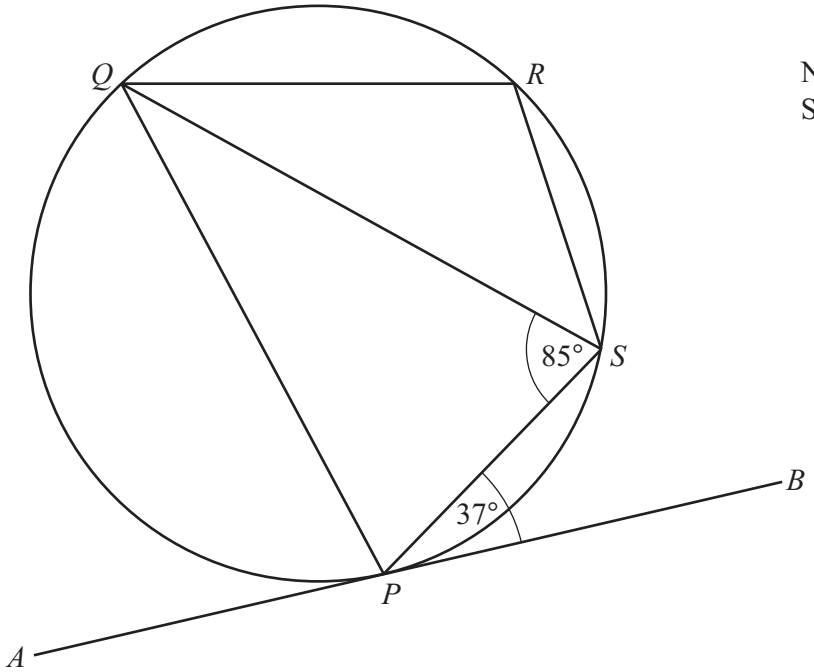


[2]

(b) Work out the probability that both counters are red.

..... [1]

14



NOT TO SCALE

PQRS is a cyclic quadrilateral.
APB is a tangent to the circle at *P*.
Angle *SPB* = 37° and angle *PSQ* = 85°.

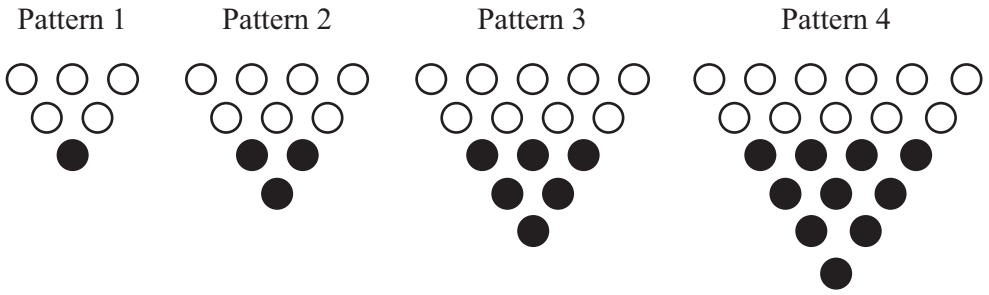
(a) Find angle *PQS*.

Angle *PQS* = ... [1]

(b) Find angle *QRS*.

Angle *QRS* = ... [2]

15 These are the first four patterns in a sequence made from black beads and from white beads.



(a) Complete the table for Pattern 5.

Pattern number	1	2	3	4	5
Number of white beads	5	7	9	11	
Total number of beads	6	10	15	21	

[1]

(b) Find an expression for

(i) the number of white beads in Pattern n

..... [2]

(ii) the total number of beads in Pattern n.

..... [2]

(c) Bill has only 88 white beads but lots of black beads.
Pattern p is the largest possible pattern he can make using these beads.

Work out the value of p.

$p =$ ..... [2]

16 The population of Kenya is 5.71×10^7 people.
The area of Kenya is $6 \times 10^5 \text{ km}^2$.
The population density is the number of people per km^2.

Calculate the population density of Kenya.

..... people / km^2 [2]

17 **(a)** $f(x) = \dfrac{10 - x}{3}$

Find $f(-8)$.

..... [1]

(b) $g(x) = 4x + 3$

Find $g^{-1}(x)$.

$g^{-1}(x) =$ ..... [2]

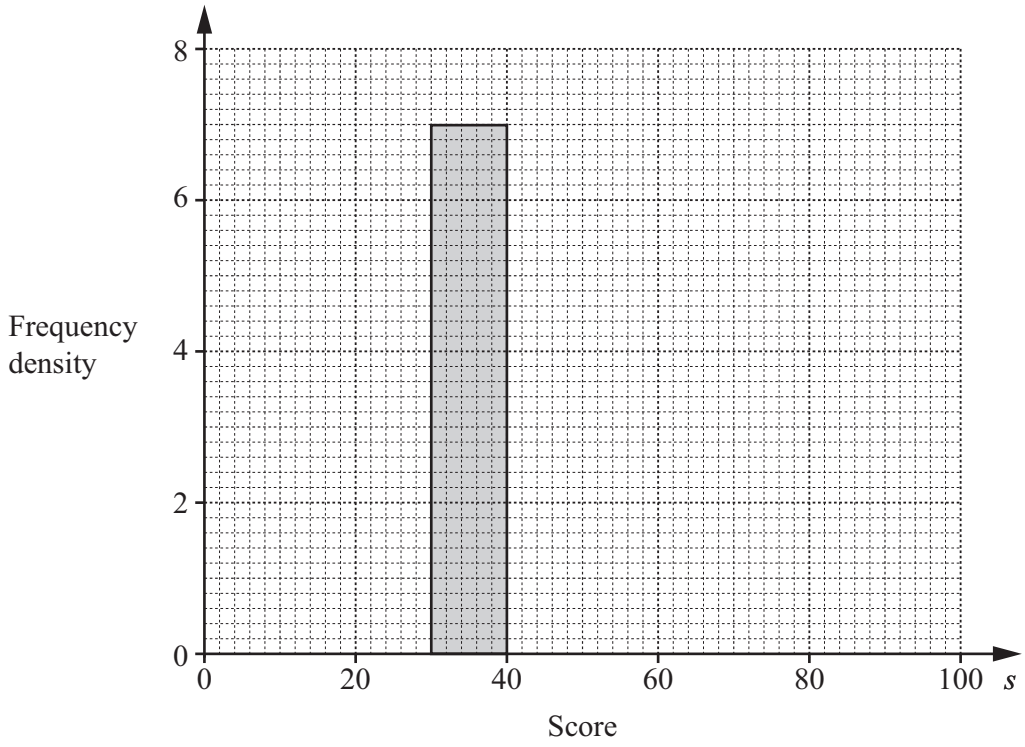
18 300 students take part in a competition.
The table shows information about their scores.

Score (s)	$0 < s \leqslant 30$	$30 < s \leqslant 40$	$40 < s \leqslant 60$	$60 < s \leqslant 70$	$70 < s \leqslant 100$
Frequency	24	70	88	76	42

(a) Calculate an estimate of the mean score.

..... [4]

(b)



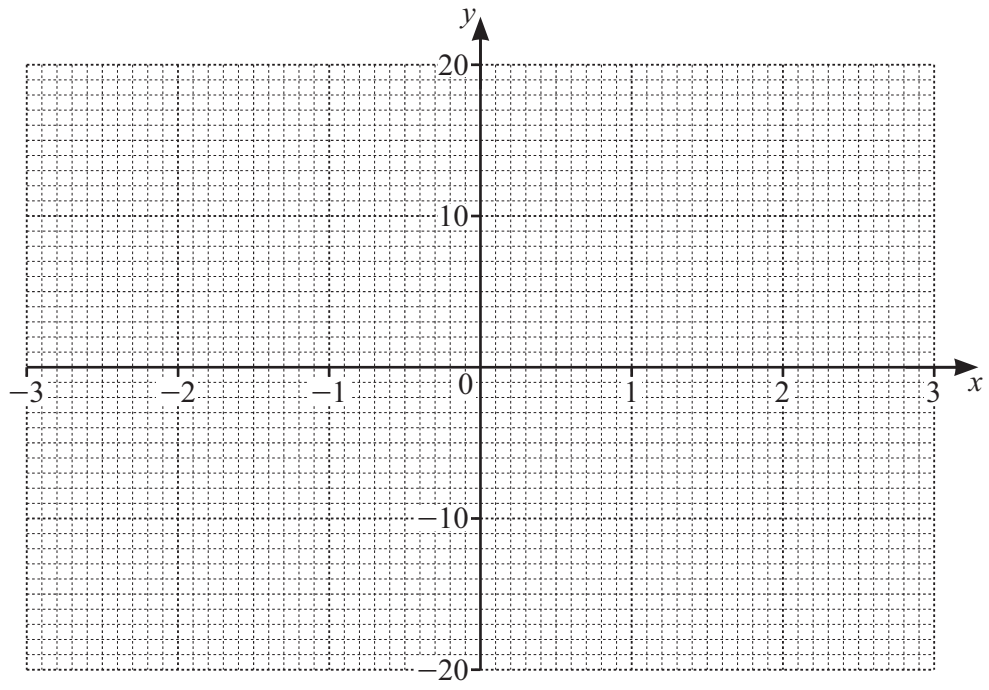
On the grid, complete the histogram to represent the data in the table. [3]

19 **(a)** Complete the table of values for $y = x^3 - 5x + 4$.

x	-3	-2	-1	0	1	2	3
y		6	8	4	0	2	16

[1]

(b) Draw the graph of $y = x^3 - 5x + 4$ for $-3 \leqslant x \leqslant 3$.

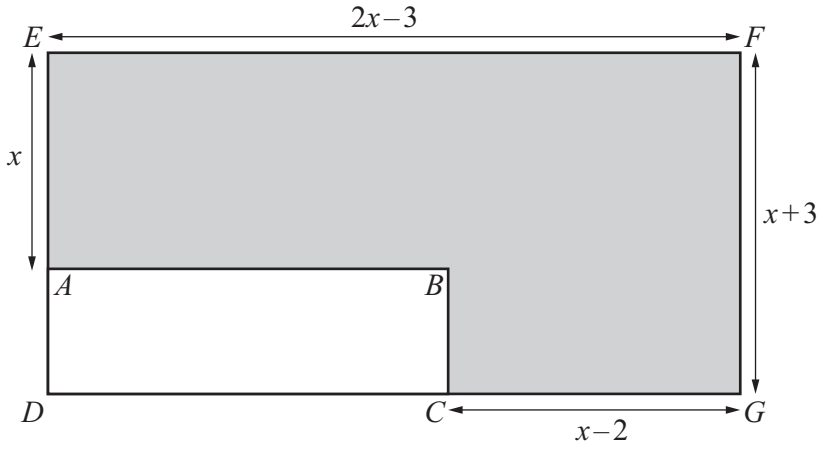


[4]

(c) By drawing a suitable straight line on the grid, find the solutions of the equation $x^3 - 5x - 3 = 0$.

$x =$ ..... , $x =$ ..... , $x =$ ..... [3]

20 *ABCD* and *EFGD* are rectangles.



NOT TO SCALE

(a) (i) Show that $CD = x - 1$.

[1]

(ii) The area of rectangle *ABCD* is $\frac{1}{5}$ of the area of rectangle *EFGD*.

Form an equation in x and show that it simplifies to $x^2 - 6x + 3 = 0$.

[3]

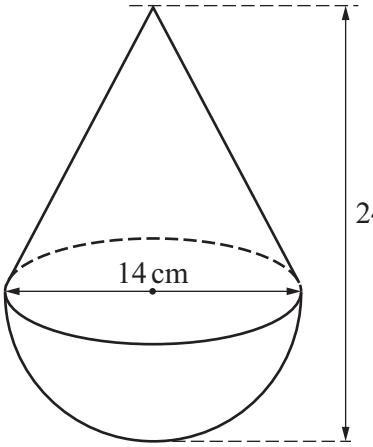
(b) (i) Use the quadratic formula to solve the equation $x^2 - 6x + 3 = 0$.
You must show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [3]

(ii) Calculate the shaded area.

..... units^2 [2]

21



NOT TO SCALE

The diagram shows a solid formed by joining a cone to a hemisphere.
The diameter of the cone is 14 cm and the diameter of the hemisphere is 14 cm.
The total height of the solid is 24 cm.

(a) Calculate the volume of the solid.

..... cm^3 [3]

(b) Show that the total surface area of the solid is $712\,cm^2$, correct to the nearest integer.

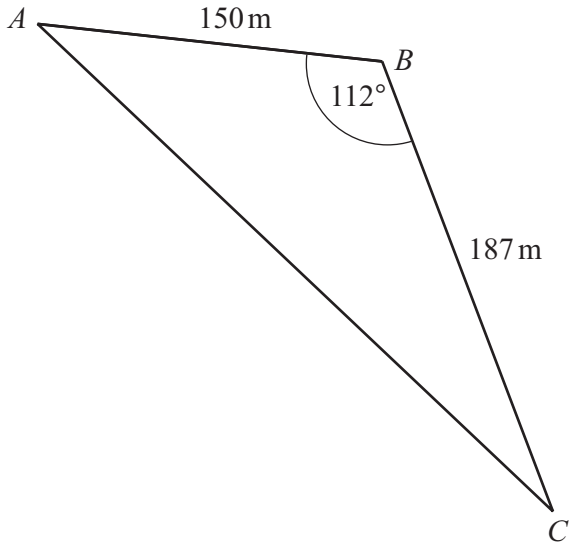
[5]

(c) A smaller solid is mathematically similar to this solid.
The total surface area of the smaller solid is $242\,cm^2$.

Calculate the total height of the smaller solid.

..... cm [3]

22



NOT TO SCALE

The diagram shows a triangular field ABC.
$AB = 150$ m, $BC = 187$ m and angle $ABC = 112°$.

(a) Fencing is needed for the perimeter of the field.
Fencing is sold in rolls of length 20 m.

Calculate the number of rolls of fencing needed.

..... [5]

(b) Calculate the shortest distance from B to AC.

..... m [4]

23 Zara cycles a distance of 500 metres, correct to the nearest 5 metres.
This takes 24.7 seconds, correct to the nearest 0.1 seconds.

Calculate the lower bound of her average speed.

..... m/s [3]

24 Express as a single fraction in its simplest form.

$$\frac{5}{2x+1} - \frac{2}{4x-3}$$

..... [3]

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