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Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

1834223144

MATHEMATICS (SYLLABUS D) **4024/21**

Paper 2 **October/November 2024**

2 hours 30 minutes

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 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.

[Turn over

1 Basma owns a toy shop.

(a) The sign shows the opening hours for the shop.

Saturday to Wednesday	10 30 to 18 00
Thursday and Friday	10 00 to 19 30

Work out the length of time the shop is open in one week.

..... hours [1]

(b) Basma employs 5 sales assistants and 2 supervisors.
On one particular week, the 5 sales assistants each work for 30 hours and the 2 supervisors each work for 38 hours.

For that week, the total amount Basma pays these 7 employees is $3324.70 .
Basma pays each sales assistant $13.45 per hour.

Calculate the amount Basma pays each supervisor per hour.

$ ..... per hour [3]

(c) The exchange rate between dollars ($) and pounds (£) is $1 = £0.77 .

Basma buys 50 identical games for a total of £245.
She makes a profit of 39% when she sells each game.

Calculate the selling price of one game in dollars.
Give your answer correct to the nearest cent.

$ ..... [4]

(d) Basma invests $12 000 in an account paying compound interest at a rate of 1.5% per year.

At the end of year 1, she invests another $12 000 in the same account.
At the end of year 4, she takes $20 000 out of the account.

Calculate the amount of money remaining in the account at the end of year 4.
Give your answer correct to the nearest cent.

$ ..... [3]

2 In a traffic survey, information about the vehicles passing a checkpoint is recorded.

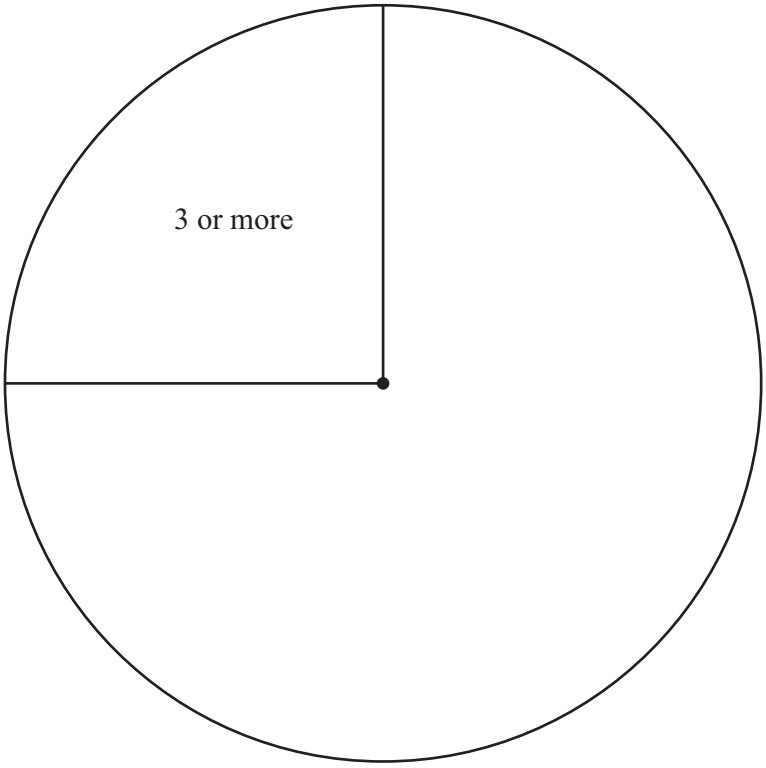
(a) 160 vehicles pass the checkpoint in the morning.
The table shows the number of people in each of these vehicles.

Number of people	Frequency	Pie chart angle
1	72	
2	48	
3 or more	40	90°

(i) Complete the table.

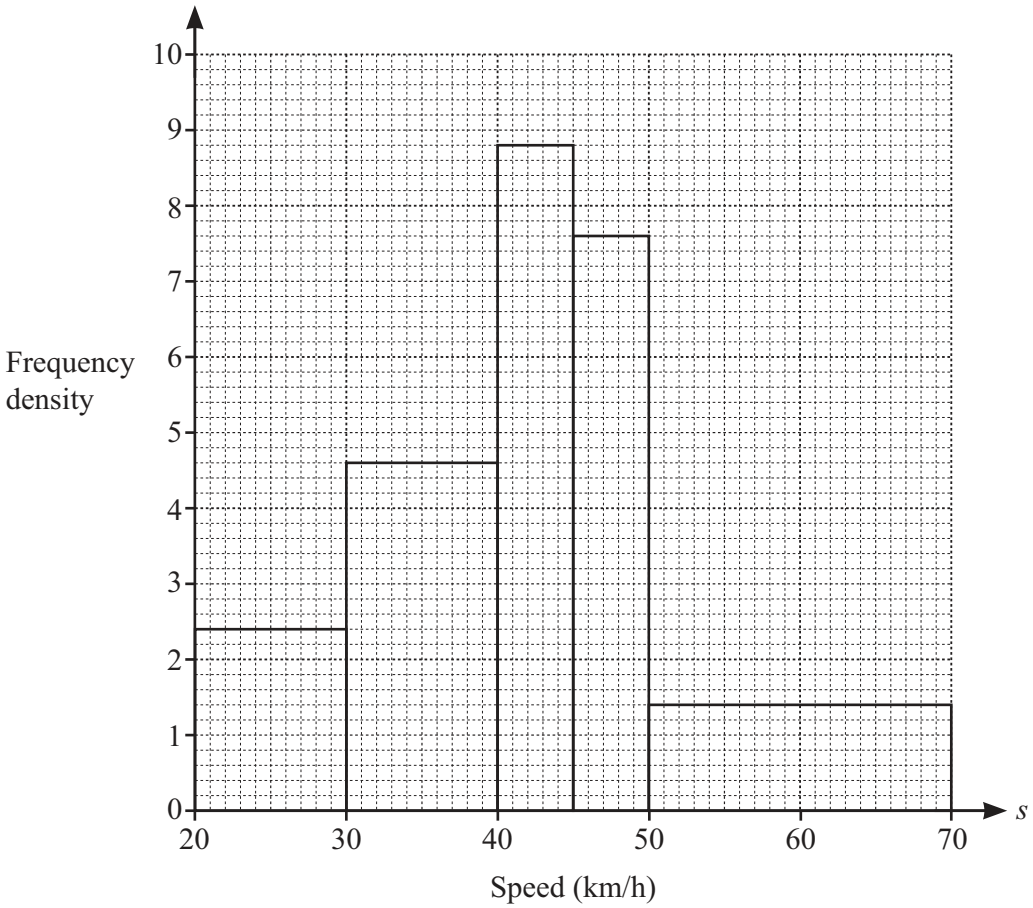
[2]

(ii) Complete the pie chart to show the results.



[1]

(b) The histogram shows the speeds of vehicles passing the checkpoint in the afternoon.



(i) Sanjay says the histogram shows that the range of the speeds is 50 km/h.

Explain why he may **not** be correct.

.....

..... [1]

(ii) Complete the frequency table.

Speed (s km/h)	$20 < s \leqslant 30$	$30 < s \leqslant 40$	$40 < s \leqslant 45$	$45 < s \leqslant 50$	$50 < s \leqslant 70$
Frequency	24				

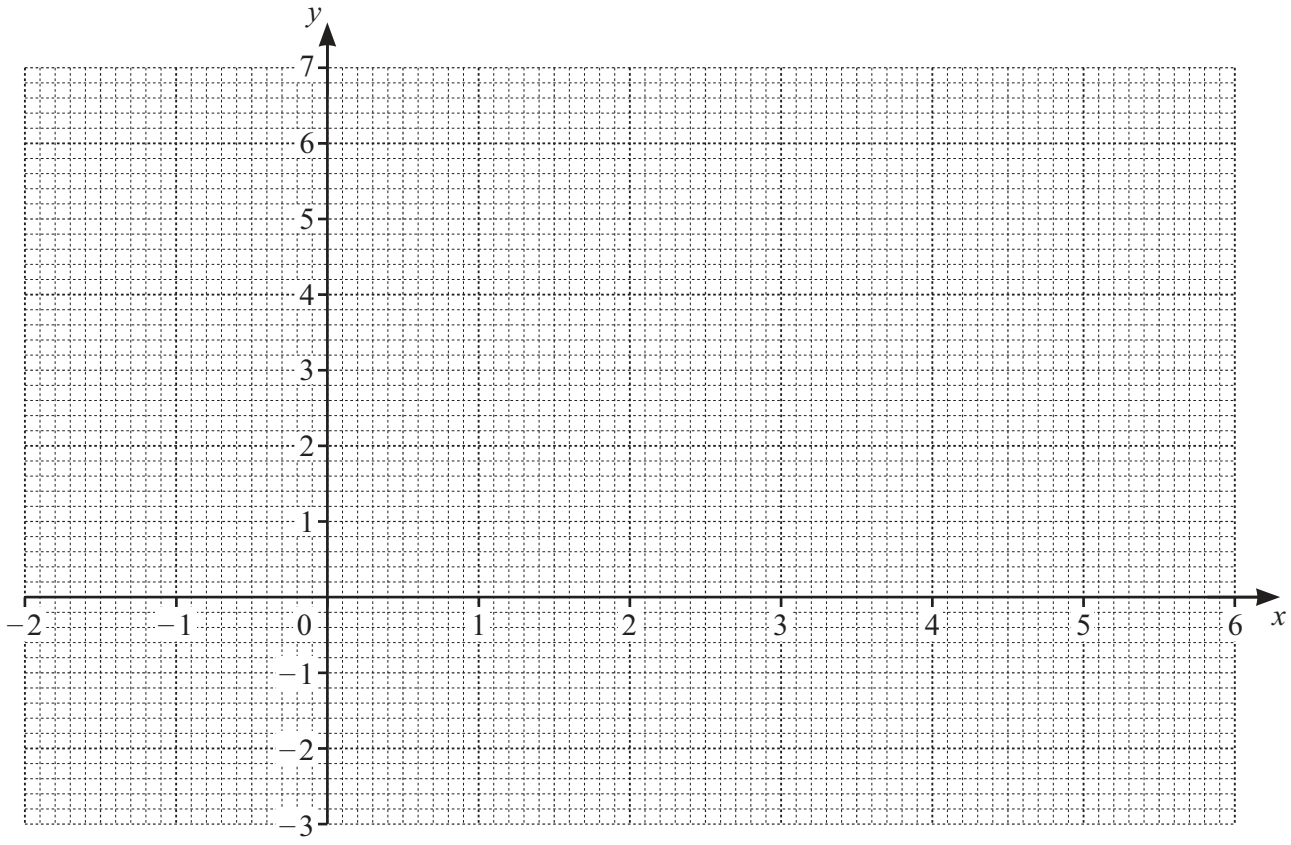
[3]

3 **(a)** Complete the table for $y = 4 + 2x - \frac{x^2}{2}$.

x	-2	-1	0	1	2	3	4	5	6
y		1.5	4	5.5	6	5.5	4	1.5	

[2]

(b) Draw the graph of $y = 4 + 2x - \frac{x^2}{2}$ for $-2 \leqslant x \leqslant 6$.



[3]

(c) Find the equation of the line of symmetry of the graph of $y = 4 + 2x - \frac{x^2}{2}$.

..... [1]

(d) On the grid, draw the line $3y = x + 6$ for $-2 \leqslant x \leqslant 6$.

[2]

(e) Write down the x-coordinates of the points of intersection of the graphs of $y = 4 + 2x - \frac{x^2}{2}$ and $3y = x + 6$.

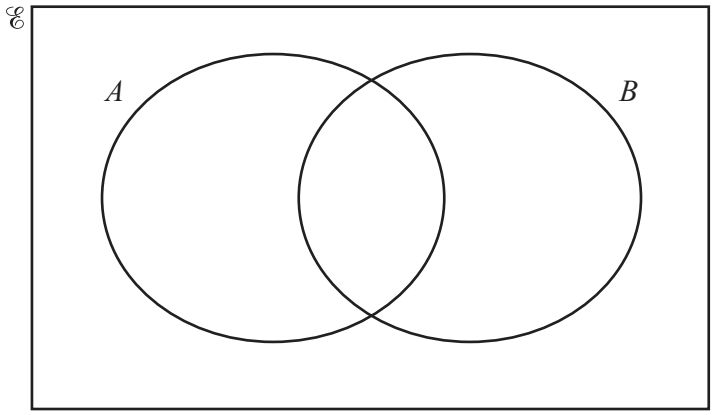
$x =$ ..... and $x =$ ..... [1]

4 $\mathscr{E} = \{x: x \text{ is an integer } 1 \leqslant x \leqslant 15\}$
$A = \{x: x \text{ is a multiple of } 3\}$
$B = \{x: x \text{ is a factor of } 30\}$

(a) Write down the elements of A.

..... [1]

(b) Complete the Venn diagram.



[2]

(c) $x \in (A \cup B)'$

Find the smallest value of x.

..... [1]

(d) Find $\mathrm{n}(A \cap B')$.

..... [1]

5 **(a)** Solve.

(i) $\frac{y}{4} = 8$

$y =$ ..... [1]

(ii) $3 - 4x = 2x + 12$

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

(b) $w = 5x - 6y$

(i) Find the value of w when $x = 6.2$ and $y = -1.8$.

$w =$ ..... [2]

(ii) Rearrange the formula to make x the subject.

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

(c) Factorise.

$$15y - x^2 - 3xy + 5x$$

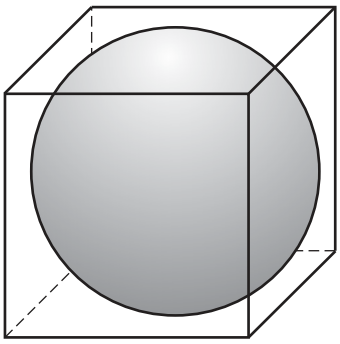
..... [2]

(d) Write as a single fraction in its simplest form.

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

..... [4]

6 (a) **[Volume of sphere = $\frac{4}{3}\pi r^3$]**



The diagram shows a sphere inside a cube.
The sphere touches all 6 faces of the cube.
The volume of the cube is 343 cm^3.

Calculate the volume of the sphere.

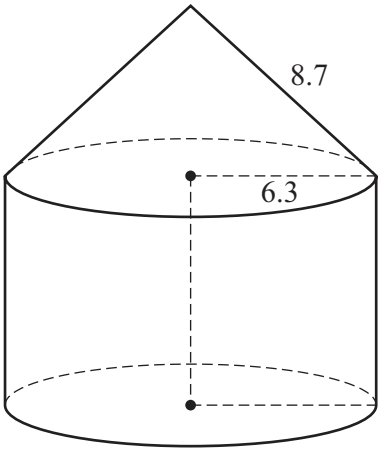
..... cm^3 [3]

(b) Solid *A* is mathematically similar to solid *B*.
The volume of solid *A* is 540 cm^3 and its height is 15 cm.
The volume of solid *B* is 1280 cm^3.

Calculate the height of solid *B*.

..... cm [2]

(c) [Curved surface area of a cone = πrl]



NOT TO SCALE

The diagram shows a solid formed by joining a cone to a cylinder.

The cone and the cylinder each have radius 6.3 cm.
The slant height of the cone is 8.7 cm.
The ratio height of cone : height of cylinder = 2 : 3.

Calculate the total surface area of the solid.

..... cm^3 [5]

7 $ABCD$ is a parallelogram with sides AB, BC, CD and DA.
A is the point $(-3, 7)$ and B is the point $(2, 5)$.

$\overrightarrow{AD} = \begin{pmatrix} -1 \\ -6 \end{pmatrix}$

(a) Find the coordinates of point D.

(..... , ...) [1]

(b) Find $\left|\overrightarrow{AD}\right|$.

$\left|\overrightarrow{AD}\right| =$ ..... [2]

(c) Find $\overrightarrow{AC}$.

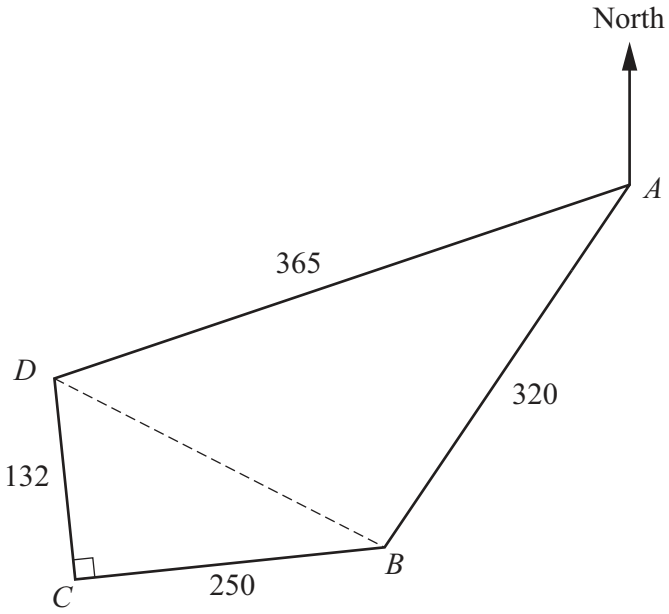
$\overrightarrow{AC} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [3]

(d) Line L is the line perpendicular to AB that passes through point D.

Find the equation of line L.

..... [4]

8



NOT TO SCALE

ABCD is a field.
AB = 320 m, *BC* = 250 m, *CD* = 132 m and *AD* = 365 m.
Angle *BCD* = 90°.

(a) Ray walks from *A* to *B* at an average speed of 1.6 m/s.
He then runs from *B* to *C* at an average speed of 2.8 m/s.

Calculate Ray's average speed from *A* to *B* to *C*.

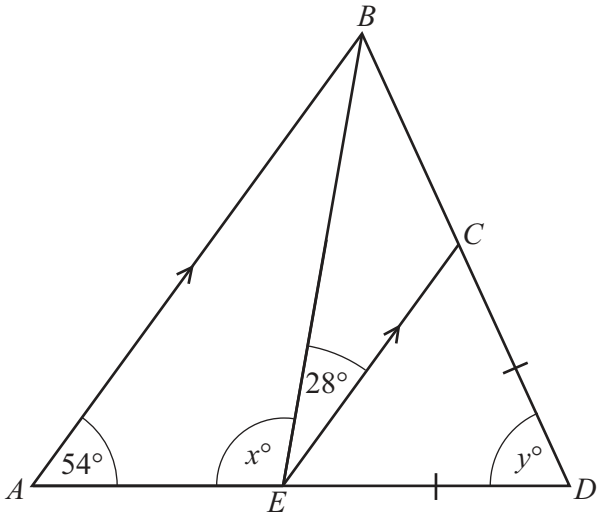
..... m/s [3]

(b) The bearing of D from A is 243°.

Calculate the bearing of B from A.

..... [5]

9 (a)



NOT TO SCALE

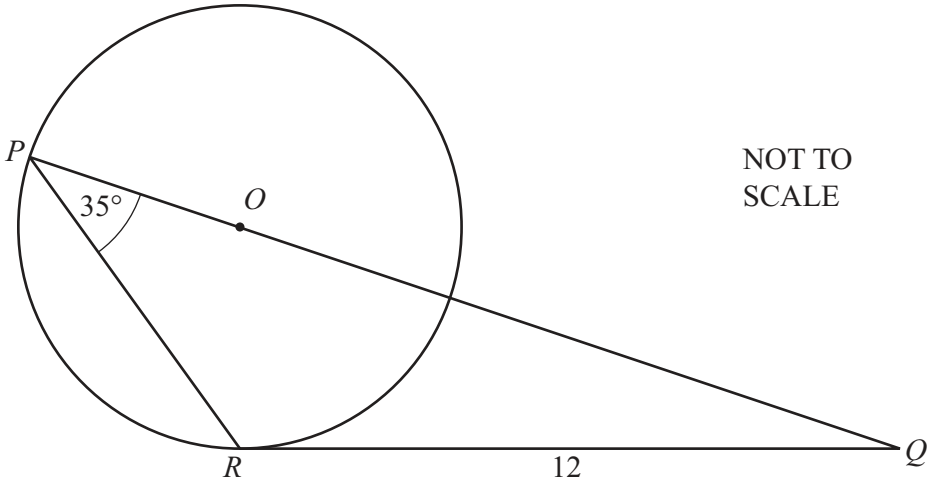
ABD is a triangle.
C is a point on *BD* and *E* is a point on *AD*.
AB is parallel to *EC* and *CD* = *DE*.

Find the value of *x* and the value of *y*.

x = ...

y = ... [4]

(b)



PQR is a triangle.

P and *R* are points on a circle, centre *O*.
O is a point on *PQ*.
QR is a tangent to the circle at *R*.
QR = 12 cm and angle *RPQ* = 35°.

Calculate the area of triangle *PQR*.

..... cm^2 [6]

10 Bag A contains red balls and green balls.
The total number of balls in the bag is x.
The number of green balls in the bag is 6 more than the number of red balls.

(a) Show that the fraction of the balls in bag A that are red is $\frac{x-6}{2x}$.

[2]

(b) Bag B also contains red balls and green balls.
The number of red balls in bag B is x.
The number of green balls in bag B is 4 times the number of green balls in bag A.

Show that the fraction of the balls in bag B that are red is $\frac{x}{3x+12}$.

[2]

(c) $\dfrac{x-6}{2x} = \dfrac{x}{3x+12}$

Show that $x^2 - 6x - 72 = 0$.

[3]

(d) Solve by factorisation $x^2 - 6x - 72 = 0$.

$x =$ ..... or $x =$ ..... [2]

(e) x is the total number of balls in bag A.

Use your answer to **part (d)** to find the number of green balls in bag A.

..... [1]

Question 11 is printed on the next page.

11 Mia has 25 shapes.
She uses their properties to sort them into groups.
The table shows the number of shapes in each group.

	Triangle	Quadrilateral
Line symmetry	4	9
No line symmetry	5	7

(a) Mia takes one of the triangles at random, notes its properties and replaces it.

Find the probability that it has line symmetry.

..... [2]

(b) Mia takes one of the 25 shapes at random, notes its properties and replaces it.
She then takes a second shape at random, notes its properties and replaces it.

Find the probability that both shapes are quadrilaterals.

..... [2]

(c) Mia takes three of the 25 shapes at random without replacement.

Find the probability that only one of the shapes is a triangle with line symmetry.

..... [3]