Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

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

Paper 2 **October/November 2018**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Geometrical instruments
Electronic calculator

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

If working is needed for any question it must be shown in the space below that question.
Omission of essential working will result in loss of marks.
You are expected to use an electronic calculator to evaluate explicit numerical expressions.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142, unless the question requires the answer in terms of π.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 100.

This document consists of **20** printed pages.

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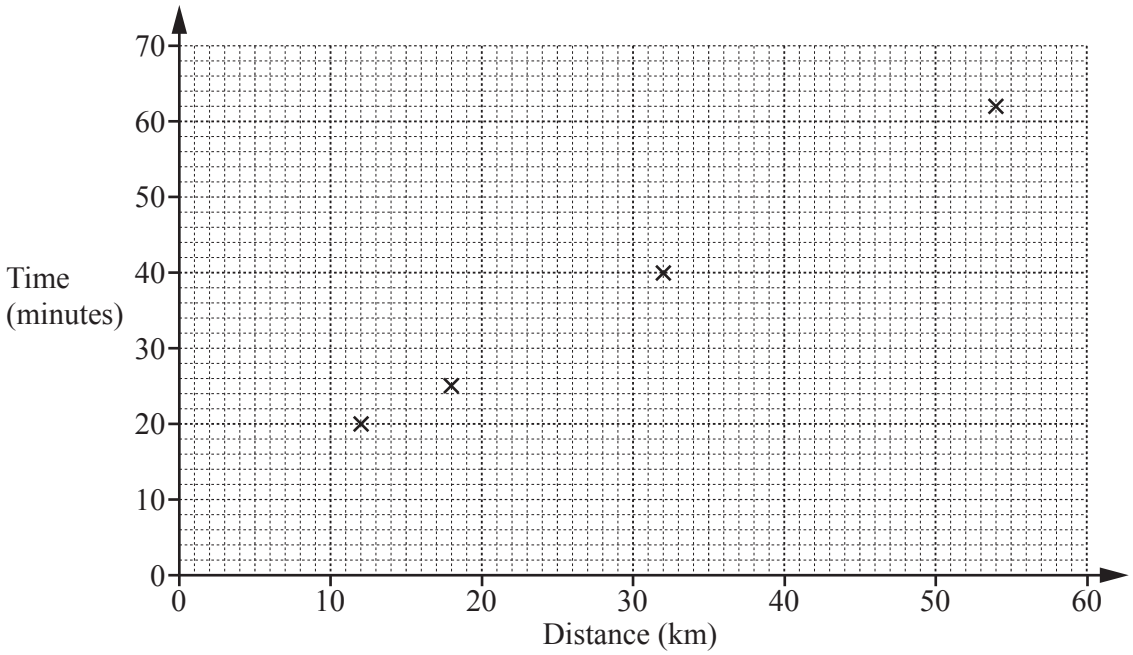
1 **(a)** The table shows the distances 10 people drive to work and the times they take.

Distance (km)	12	32	18	54	26	36	29	15	20	42
Time (minutes)	20	40	25	62	35	34	32	18	32	50

(i) On the grid, complete the scatter diagram to show this information.
The first four points have been plotted for you.



[2]

(ii) What type of correlation does the scatter diagram show?

Answer ..... [1]

(iii) One of these 10 people is selected at random.

Find the probability that this person drove less than 30 km to work.
Give your answer as a fraction in its simplest form.

Answer ..... [2]

(iv) Ateeq drives 48 km to work.

By drawing a line of best fit on the scatter diagram, estimate the time Ateeq takes to travel to work.

Answer ..... minutes [2]

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(b) The table summarises the times taken by the 120 employees in a company to travel to work.

Time (t minutes)	$0 < t \leqslant 20$	$20 < t \leqslant 40$	$40 < t \leqslant 60$	$60 < t \leqslant 80$	$80 < t \leqslant 100$
Frequency	29	38	26	21	6

(i) Write down the modal class.

Answer ..... [1]

(ii) Calculate an estimate of the mean time.

Answer ..... minutes [3]

(iii) Work out the percentage of employees who took more than 1 hour to travel to work.

Answer ..... % [2]

2 Dina owns a clothes shop.

(a) Maryam works in the shop.
She works for 5 days each week from 10 am until 6.30 pm.
She has a break of 45 minutes each day.
She is paid $10.20 for each hour she works but she is not paid for her breaks.

Work out how much Maryam earns for one week's work.

Answer $ ..... [3]

(b) Dina buys 25 dresses from a manufacturer.
She pays a total of $400 for these dresses.
She sells all the dresses for $19.80 each.

Calculate her percentage profit.

Answer ..... % [2]

(c) Dina sells a shirt for $15.66 .
The price includes 8% sales tax.

Calculate the cost of the shirt excluding sales tax.

Answer $ ..... [2]

(d) Dina is saving to make improvements to her shop.
She invests $3500 for 4 years at 1.7% per year compound interest.

Calculate the value of Dina's investment after 4 years.
Give your answer correct to the nearest cent.

Answer $ ..... [3]

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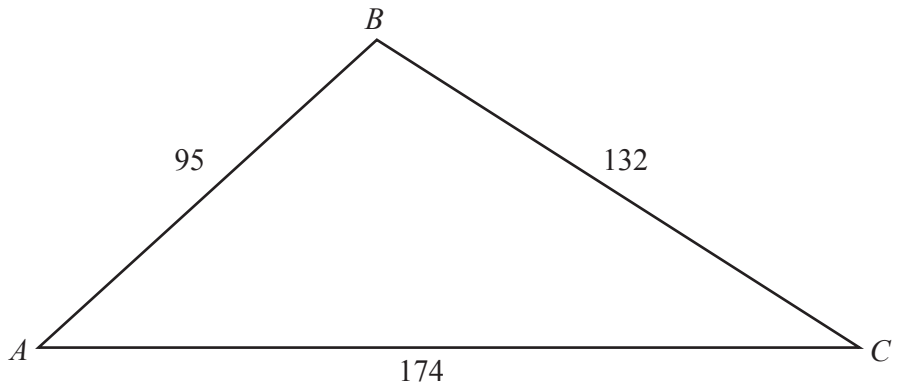
3



The diagram shows a triangular field ABC.
$AB = 95$ m, $BC = 132$ m and $AC = 174$ m.

(a) Show that $B\hat{A}C = 48.6°$, correct to 1 decimal place.

[3]

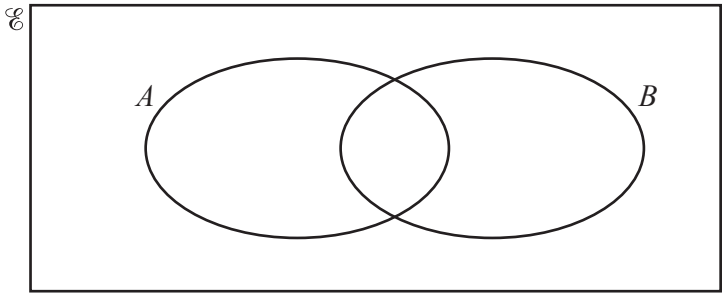
(b) The field is sown with flower seeds.
Each square metre of the field is sown with 3 grams of seed.
The seed costs \$8.50 for 100 grams.

Calculate the cost of the flower seed needed for the field.

Answer \$ ..... [4]

4 **(a)** $\mathscr{E} = \{x : x \text{ is an integer } 1 \leqslant x \leqslant 10\}$
$A = \{x : x \text{ is a factor of } 20\}$
$B = \{x : x \text{ is a multiple of } 4\}$

(i) Complete the Venn diagram.



[2]

(ii) State $\mathrm{n}(A \cup B)$.

Answer ..... [1]

(iii) Describe in words the set $A \cap B'$.

Answer ..... [1]

(b) 30 people are asked what type of fruit they like.
Of these people,

- 5 say they like both oranges and bananas
- 12 say they like oranges
- 8 say they like neither oranges nor bananas.

(i) By drawing a Venn diagram, or otherwise, find the number of people who like bananas but not oranges.

Answer ..... [2]

(ii) Two of the 30 people are selected at random.

Find the probability that they both like oranges but not bananas.

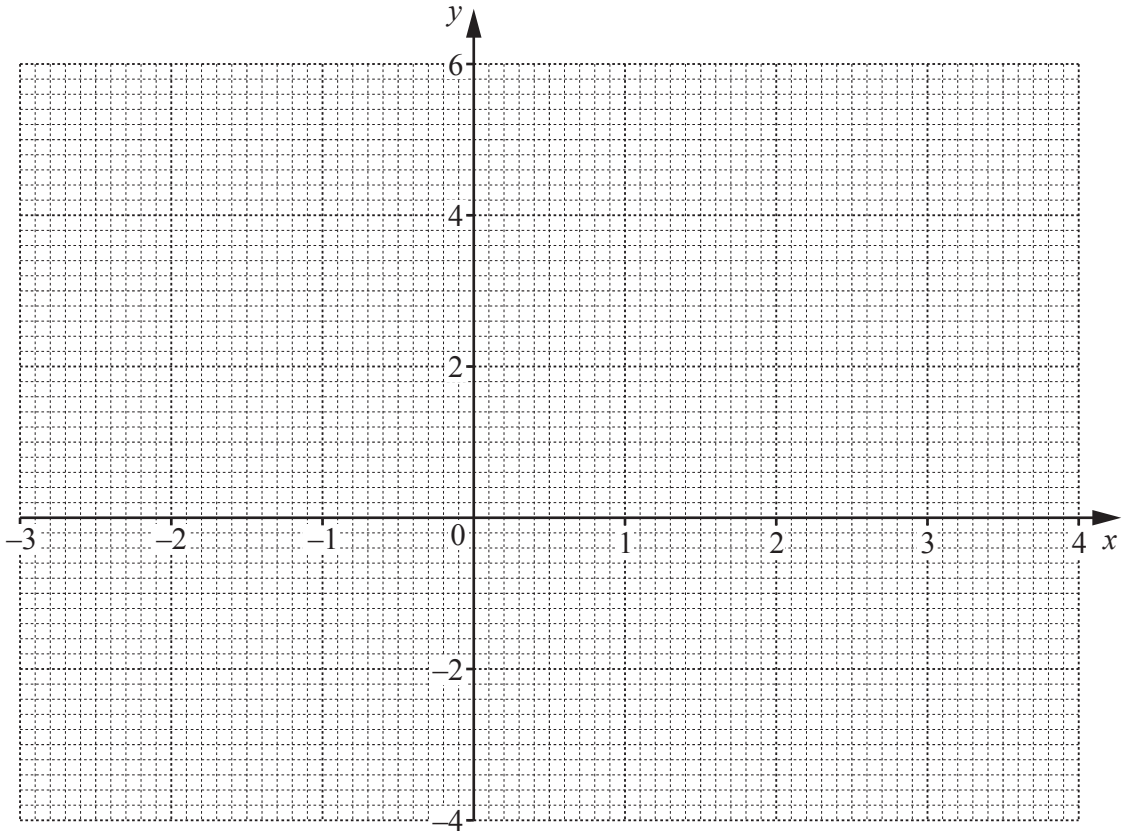
Answer ..... [2]

5 **(a)** Complete the table for $y = \frac{x}{5}(6 + 2x - x^2)$.

x	–3	–2	–1	0	1	2	3	4
y	5.4	0.8	–0.6	0	1.4	2.4	1.8	

[1]

(b) Draw the graph of $y = \frac{x}{5}(6+2x-x^2)$ for $-3 \leqslant x \leqslant 4$.



[3]

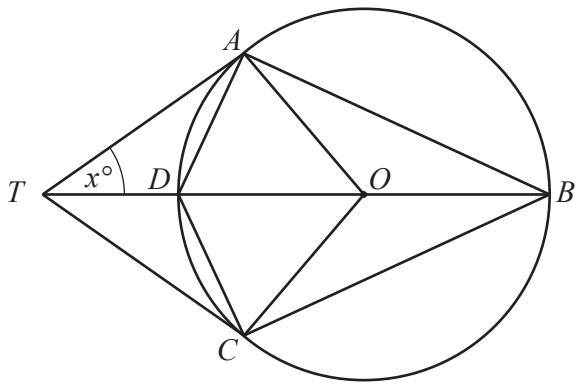
(c) By drawing a tangent, estimate the gradient of $y = \frac{x}{5}(6 + 2x - x^2)$ at (–2, 0.8).

Answer ..... [2]

(d) Use your graph to solve the equation $x(6 + 2x - x^2) = 10$.

Answer ..... [3]

6



A, B, C and D are points on the circle centre O.
TA and TC are tangents to the circle.
$TDOB$ is a straight line.
$A\hat{T}O = x°$.

(a) Show that triangle OAT is congruent to triangle OCT.
Give a reason for each statement you make.

.....

.....

.....

..... [3]

(b) Find, in terms of x, giving your answers as simply as possible

(i) $A\hat{O}T$,

Answer $A\hat{O}T =$ ..... [1]

(ii) $O\hat{A}B$,

Answer $O\hat{A}B =$ ..... [1]

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(iii) reflex $A\hat{D}C$.

Answer reflex $A\hat{D}C =$ ..... [1]

(c) The radius of the circle is 6 cm.

Given that $x = 35°$, work out BT.

Answer ..... cm [3]

7 The position vector, $\overrightarrow{OA}$, of point A is $\begin{pmatrix} -4 \\ 7 \end{pmatrix}$ and $\overrightarrow{AB} = \begin{pmatrix} 6 \\ -3 \end{pmatrix}$.

(a) Find the position vector, $\overrightarrow{OB}$, of point B.

Answer $\overrightarrow{OB} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(b) Find $|\overrightarrow{AB}|$.

Answer ..... [2]

(c) Given that $\overrightarrow{AB} = 3\overrightarrow{CB}$, find the coordinates of point C.

Answer (..... , ...) [2]

(d) Line L is parallel to $\overrightarrow{AB}$ and passes through the point (–2, 5).

(i) Find the equation of line L.

Answer ..... [3]

(ii) Line M is perpendicular to line L and passes through the origin.

Find the equation of line M.

Answer ..... [1]

8 The diagram shows part of a number grid.

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25

A vertical rectangle enclosing three numbers, as shown, can be placed anywhere on the grid.

The grid is continued downwards.

(a) If n represents the number in the top of the rectangle, complete the rectangle with expressions, in terms of n, for the other two numbers.

n

[1]

(b) Omar multiplies the top number in the rectangle by the bottom number.
He then squares the middle number in the rectangle.
He finds the difference between these two results.

Using your answers to part (a), show that this difference is always 25.

[2]

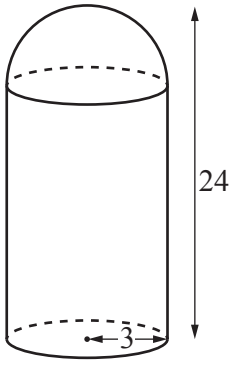
(c) Lena places a rectangle on the grid.
She adds the three numbers in her rectangle.
The sum of the three numbers is 174.

Find the **largest** number in Lena's rectangle.

Answer ..... [3]

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

[Surface area of a sphere = $4\pi r^2$]



The diagram shows lamp A.
It is made in the shape of a cylinder with a hemisphere on top.
The radius of the hemisphere and the radius of the cylinder are both 3 cm.
The total height of the lamp is 24 cm.

(i) Show that the volume of lamp A is 650 cm^3, correct to 3 significant figures.

[4]

(ii) Calculate the curved surface area of lamp A.

Answer ..... cm^2 [3]

(iii) Lamp B is mathematically similar to lamp A.
The volume of lamp B is 450 cm^3.

Calculate the total height of lamp B.

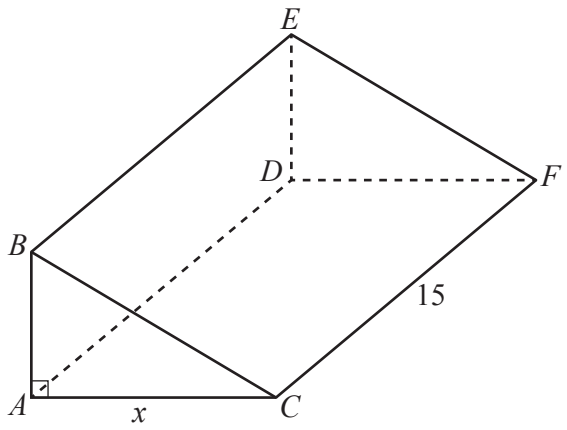
Answer ..... cm [2]

(b) The mass of lamp C is 340 g, correct to the nearest 10 g.
8 of these lamps are placed in a packing case.
The total mass of the packing case and the 8 lamps is 4.2 kg, correct to the nearest 0.1 kg.

Calculate the upper bound of the mass of the packing case when empty.
Give your answer in kilograms.

Answer ..... kg [3]

10



The diagram shows a prism with a rectangular base of length 15 cm and width x cm.
The cross section of the prism is a right-angled triangle.
The height of the prism is 4 cm less than its width.
The volume of the prism is 440 cm^3.

(a) Show that $3x^2 - 12x - 176 = 0$.

[3]

(b) Solve the equation $3x^2 - 12x - 176 = 0$.
Show your working and give your answers correct to 2 decimal places.

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

(c) Find the height of the prism.

Answer ..... cm [1]

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(d) A line is drawn on the surface of the prism from B to F.
Another line is drawn on the surface of the prism from A to F.
Calculate angle AFB.

Answer Angle AFB = ... [4]

Question 11 is printed on the next page

11 **(a)** Express as a single fraction in its simplest form $\dfrac{4}{2x-3} - \dfrac{3}{x-2}$.

Answer ..... [3]

(b) Simplify $\dfrac{4x^2-9}{2x^2-7x-15}$.

Answer ..... [3]

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