Cambridge
O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

8157184132

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

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.

DC (LK/SW) 153138/3

CAMBRIDGE
International Examinations

1 **(a)** Kamal earned a total of $32 500 in 2017.
He paid 9% of this amount into his pension.
He paid 22% tax on the remainder of his earnings.

Calculate the amount left after paying his pension and his tax.

Answer $ ..... [3]

(b) Kamal invested $1200 in a savings account paying 1.8% per year compound interest.
He left the money in the account for 5 years.

Calculate the amount of money in the account at the end of 5 years.
Give your answer correct to the nearest cent.

Answer $ ..... [3]

(c) Kamal also invested some money in a different savings account for 5 years.
This account paid 2.1% per year **simple** interest.
At the end of 5 years there was $828.75 in the account.

Calculate the amount of money he invested in this account.

Answer $ ..... [3]

(d) The exchange rate between dollars ($) and pounds (£) is $1 = £0.72.
The exchange rate between dollars and euros (€) is $1 = €1.10.

Kamal has $275.
He changes part of the $275 into pounds and receives £79.20.
He changes the remaining dollars into euros.

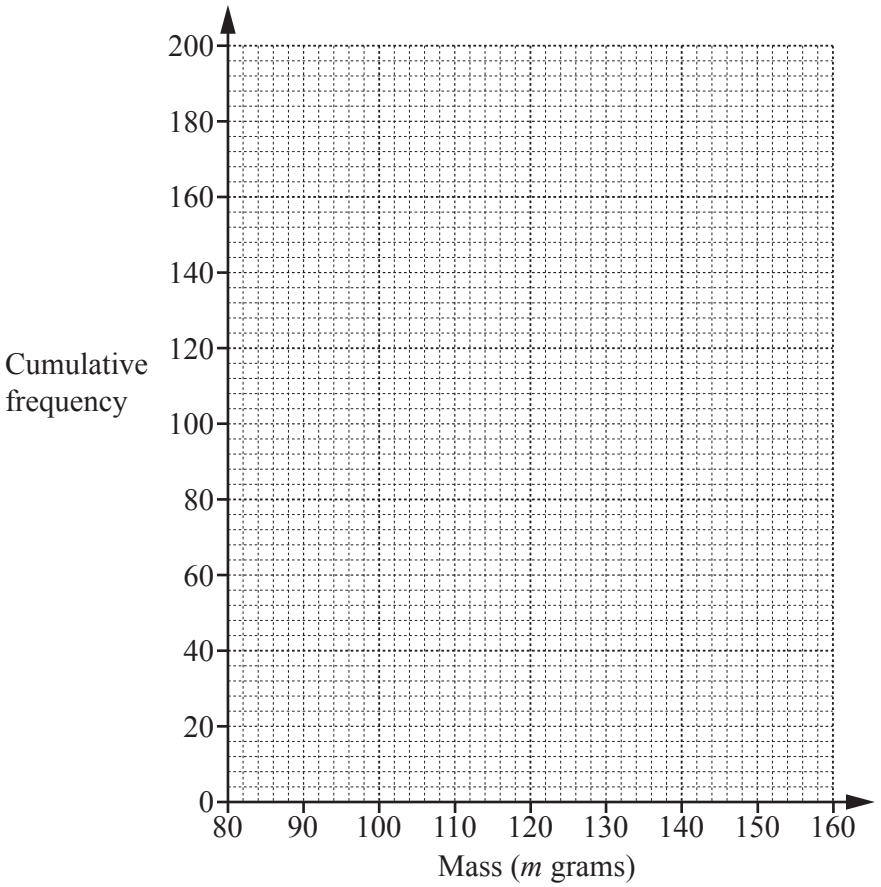
Calculate the amount of money he receives in euros.

Answer € ..... [3]

2 Lim grows tomatoes.
The masses, m grams, of 200 of her tomatoes are recorded.
The cumulative frequency table shows the results.

Mass (m grams)	$m \leqslant 80$	$m \leqslant 100$	$m \leqslant 110$	$m \leqslant 120$	$m \leqslant 130$	$m \leqslant 140$	$m \leqslant 160$
Cumulative frequency	0	20	48	112	158	184	200

(a) On the grid, draw a cumulative frequency diagram to represent these results.



[2]

(b) Use your diagram to estimate

(i) the median,

Answer ..... g [1]

(ii) the interquartile range.

Answer ..... g [2]

(c) Ravi also grows tomatoes.
The masses of 200 of his tomatoes are also recorded.
For Ravi's tomatoes, the median mass was 124 g and the interquartile range of the masses was 12 g.

Make two comments comparing the masses of tomatoes grown by Lim with those grown by Ravi.

1 .....

.....

2 .....

..... [2]

(d) **(i)** Complete the frequency table for the masses of tomatoes grown by Lim.

Mass (m grams)	Frequency
$80 < m \leqslant 100$	20
$100 < m \leqslant 110$	28
$110 < m \leqslant 120$	64
$120 < m \leqslant 130$	
$130 < m \leqslant 140$	
$140 < m \leqslant 160$	16

[1]

(ii) Write down the modal class.

Answer ..... [1]

(iii) Calculate an estimate for the mean mass of these tomatoes.

Answer ..... g [3]

3 **(a)** Express as a single fraction in its simplest form $\frac{3}{y-1} - \frac{5}{y+6}$.

Answer ..... [3]

(b) Simplify $\frac{2v^2 - 5v - 12}{v^2 - 16}$.

Answer ..... [3]

(c) Solve $3(x^2 + 3) = 11x$.
Show your working and give your answers correct to 3 significant figures.

Answer $x =$ ..... or $x =$ ..... [4]

4 **(a)** Anna drives 45 km to work each day.
One day she drives the first 25 km at an average speed of 82 km/h.
She takes 36 minutes to drive the remaining distance.

Calculate her average speed, in km/h, for the whole journey.

Answer ..... km/h [3]

(b) Anna's journey home is 47 km, correct to the nearest kilometre.
One day her journey home takes 65 minutes, correct to the nearest 5 minutes.

Calculate the upper bound of her average speed, in km/h, for the journey home.

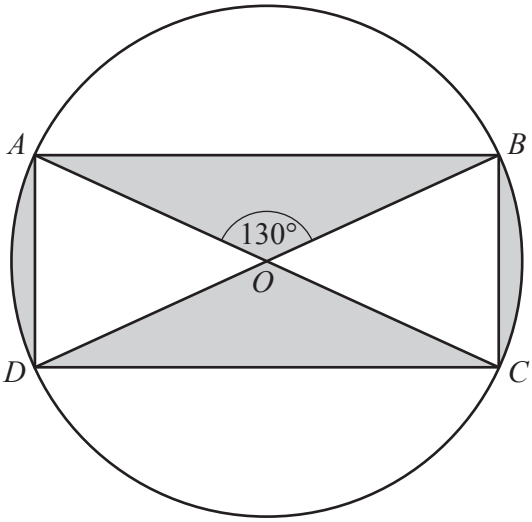
Answer ..... km/h [3]

(c) The probability that Anna arrives at work on time or early on any given day is $\frac{5}{8}$.

Calculate the probability that she is **late** on both Monday and Tuesday.
Give your answer as a fraction.

Answer ..... [2]

5



AC and BD are diameters of the circle, centre O.
$AC = 12$ cm and $A\hat{O}B = 130°$.

(a) Calculate the area of triangle AOB.

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

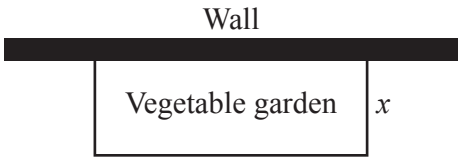
(b) Calculate the area of the sector AOD.

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

(c) Calculate the percentage of the area of the circle that is shaded.

Answer ..... % [4]

6 Zara fences off a piece of land next to a wall to make a vegetable garden.



The garden is a rectangle with the wall as one side of the rectangle.
The area of the garden is 18 square metres.
The width of the garden is x metres.

(a) The total length of fencing required for the garden is y metres.

Show that $y = 2x + \frac{18}{x}$.

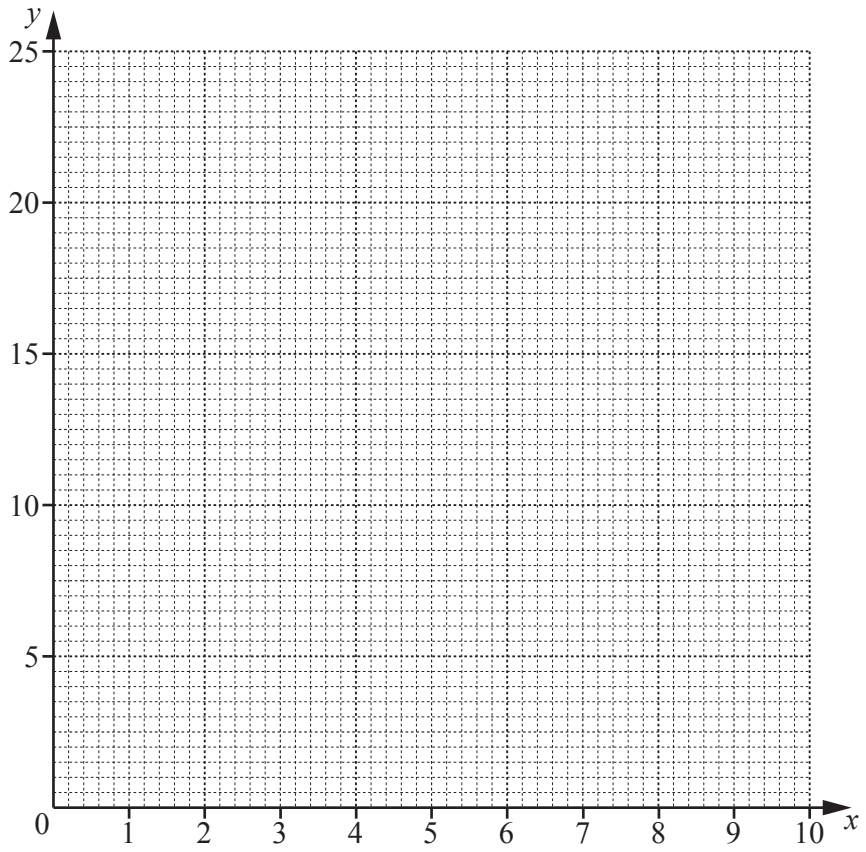
[1]

(b) (i) Complete the table for $y = 2x + \frac{18}{x}$.

x	1	2	3	4	5	6	7	8	9
y			12	12.5	13.6	15	16.6	18.3	

[2]

(ii) On the grid, draw the graph of $y = 2x + \frac{18}{x}$ for $1 \leqslant x \leqslant 9$.



[3]

(c) Use your graph to find the two possible widths of the garden if 14 metres of fencing is used.

Answer ..... m or ..... m [2]

(d) The fencing costs \$20 per metre.

(i) Find the minimum amount it will cost Zara to build the fence.

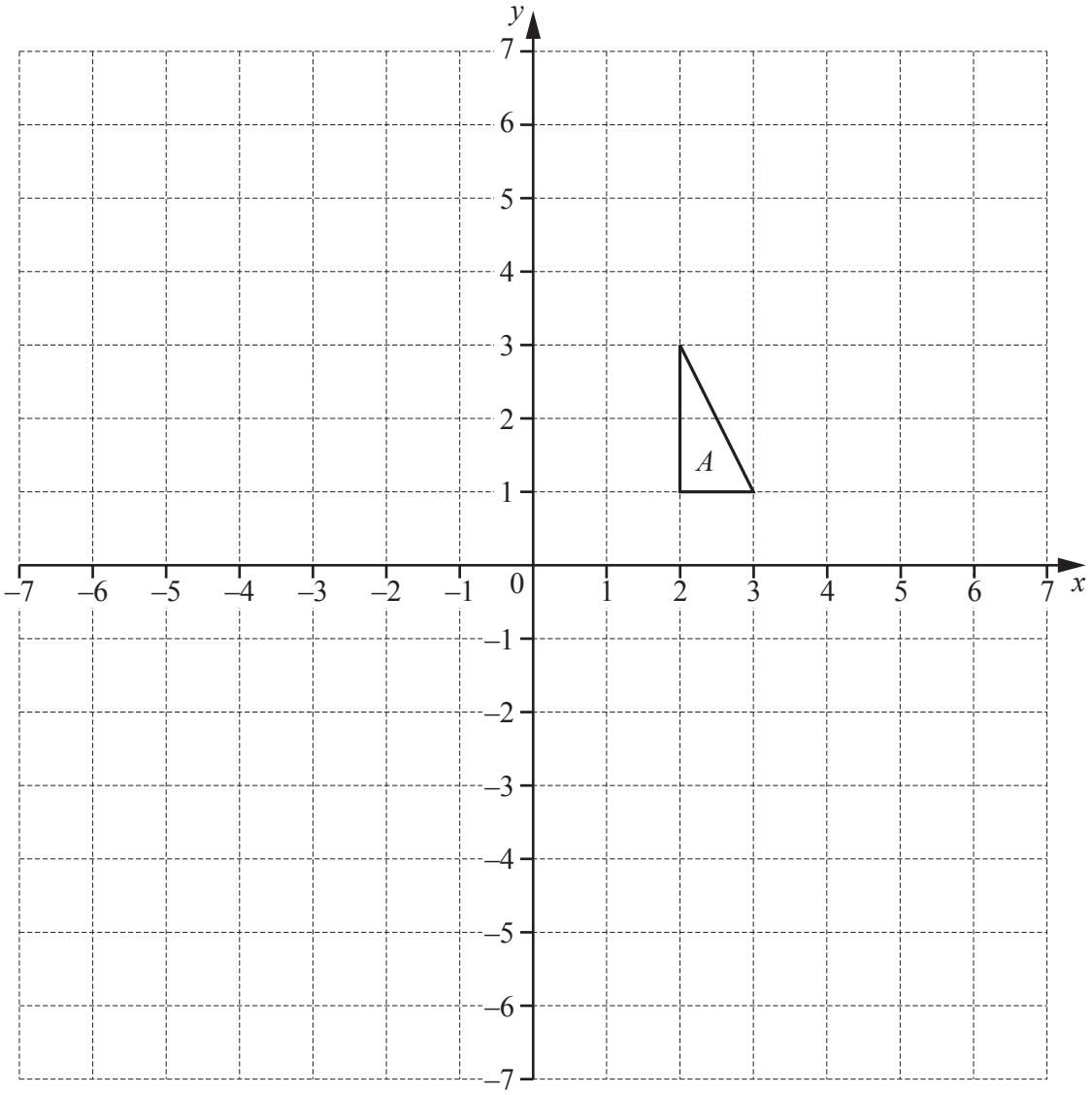
Answer \$ ..... [2]

(ii) Zara wants to spend no more than \$350 on the fence.

Find the greatest possible width of the garden Zara can make.

Answer ..... m [2]

7



Triangle A is drawn on the grid.

(a) Transformation P is represented by the matrix $\begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}$.

P maps triangle A onto triangle B.

(i) Draw and label triangle B.

[2]

(ii) Describe fully the single transformation P.

.....

..... [2]

(iii) Write down the ratio area of triangle A : area of triangle B.

Answer ..... : ..... [1]

(b) Transformation Q is represented by the matrix $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$.

Q maps triangle B onto triangle C.

Draw and label triangle C. [2]

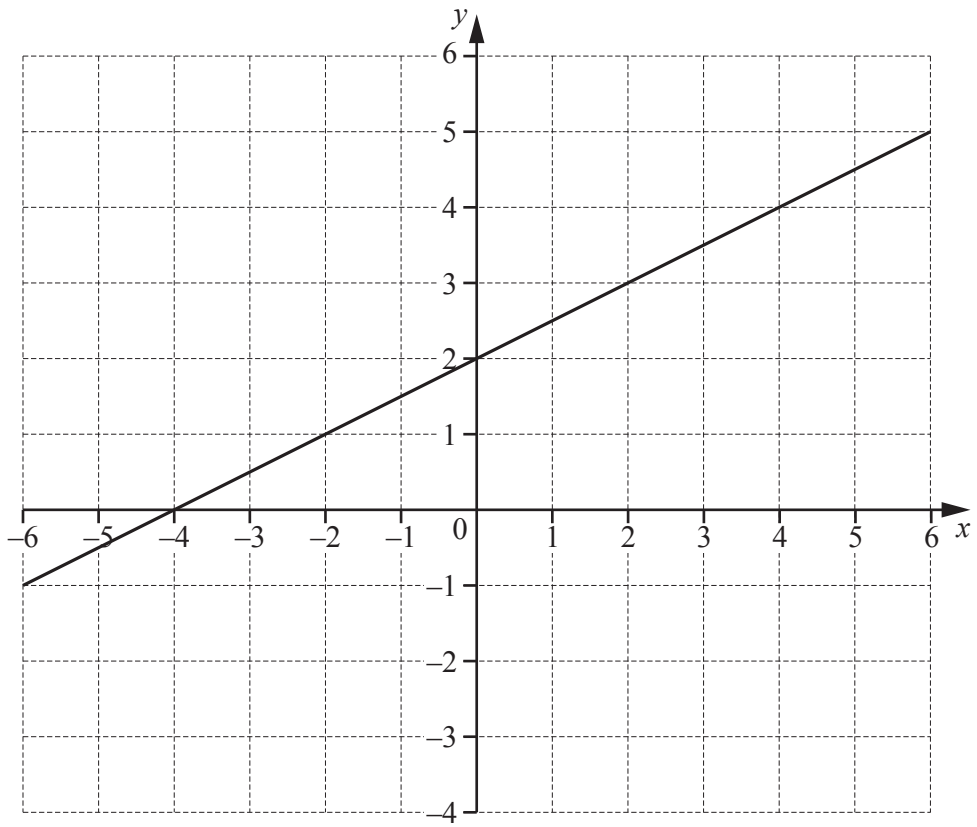
(c) Transformation Y is represented by the matrix $\begin{pmatrix} 1 & 0 \\ 0 & 3 \end{pmatrix}$.

Y maps triangle A onto triangle D.

Find the matrix that represents the transformation that maps triangle D onto triangle A.

Answer $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

8



The line $2y = x + 4$ is drawn on the grid.

(a) (i) On the grid, draw the line $x + y + 2 = 0$. [2]

(ii) The region R is represented by these three inequalities.

$$2y \geqslant x + 4$$
$$x + y + 2 \geqslant 0$$
$$y \leqslant 2$$

On the grid, shade and label the region R. [2]

(b) Line L is perpendicular to the line $2y = x + 4$.
Line L passes through the point (1, 8).

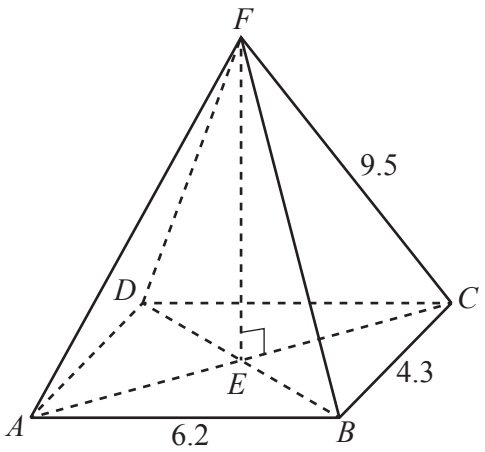
Show that the equation of line L is $y = 10 - 2x$.

[3]

(c) Use an algebraic method to find the coordinates of the point of intersection of the lines $2y = x + 4$ and $y = 23 - 2x$.

Answer (..... , ...) [3]

9 **[Volume of a pyramid $= \frac{1}{3}$ × base area × height]**



The diagram shows a pyramid with a rectangular, horizontal base.
Vertex F of the pyramid is vertically above the centre of the base, E.
$AB = 6.2$ cm and $BC = 4.3$ cm.
The length of each sloping edge of the pyramid is 9.5 cm.

(a) Show that the height, EF, of the pyramid is 8.72 cm, correct to 3 significant figures.

[4]

(b) Calculate the volume of the pyramid.

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

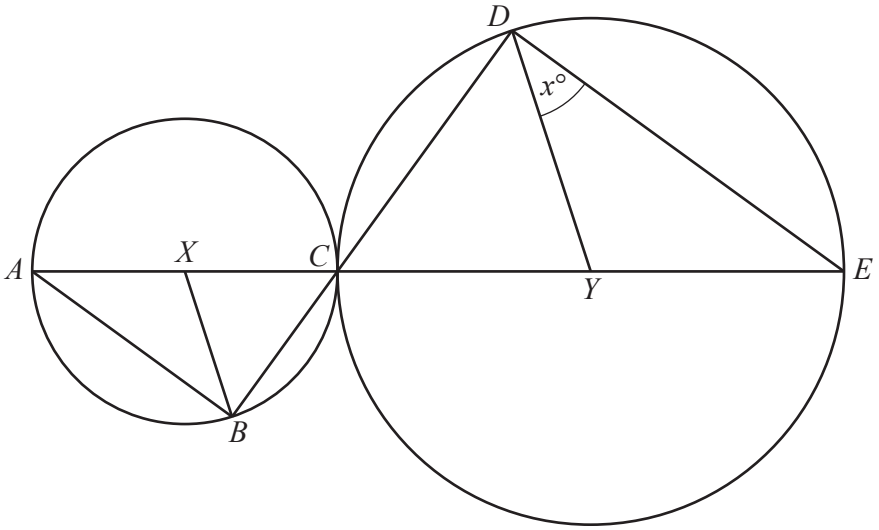
(c) Calculate angle AFB.

Answer ..... [3]

(d) Calculate the angle of elevation of F from the midpoint of AB.

Answer ..... [2]

10



The diagram shows two circles that touch at C.
A, B and C are points on the small circle, centre X.
C, D and E are points on the large circle, centre Y.
$AXCYE$ and BCD are straight lines and $\hat{YDE} = x°$.

(a) Prove that triangle BCX is similar to triangle DCY.
Give a reason for each statement you make.

[3]

(b) Find, in terms of x,

(i) $D\hat{C}Y$,

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

(ii) $B\hat{X}A$.

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

(c) Given that $BC = 3.5$ cm, $CX = 3.2$ cm and $CD = 5.6$ cm, find the length of AE.

Answer $AE =$ ..... cm [3]

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