Cambridge O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

5798021 32

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

Paper 2 **May/June 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 below that question.
Essential working must be shown for full marks to be awarded.

Electronic calculators should be used.
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.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is 100.

This document consists of **19** printed pages and **1** blank page.

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CAMBRIDGE International Examinations

[Turn over

1 **(a)** Each week Leah works 5 days and is paid a total of \$682.
Each day she works from 08 45 until 12 15 and then from 13 15 until 17 30.

Calculate Leah's hourly rate of pay.

Answer \$ ..... [2]

(b) Carlos buys a new bicycle.
After one year he sells it for \$231.
He makes a loss of 16% on the price he paid.

Calculate the price Carlos paid for the bicycle.

Answer \$ ..... [2]

(c) The exchange rate between dollars (\$) and euros (€) is \$1 = €0.44 .
Henry changes \$850 to euros for his holiday.

He spends €260 when he is on holiday.
He changes the rest of the money back to dollars at the same exchange rate.

Calculate how much money in dollars he receives.
Give your answer correct to the nearest dollar.

Answer \$ ..... [3]

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(d) Anya has \$3000 to invest in a savings account for 3 years.
She can choose from these two accounts.

Account A	
Year 1	1.1% interest
Year 2	1.2% interest added to end of Year 1 total
Year 3	1.4% interest added to end of Year 2 total

Account B
Fixed rate of compound interest 1.3% per year

She chooses the account that will give her more money at the end of the 3 years.

Decide which account she chooses and find the amount she will have in her account at the end of 3 years.

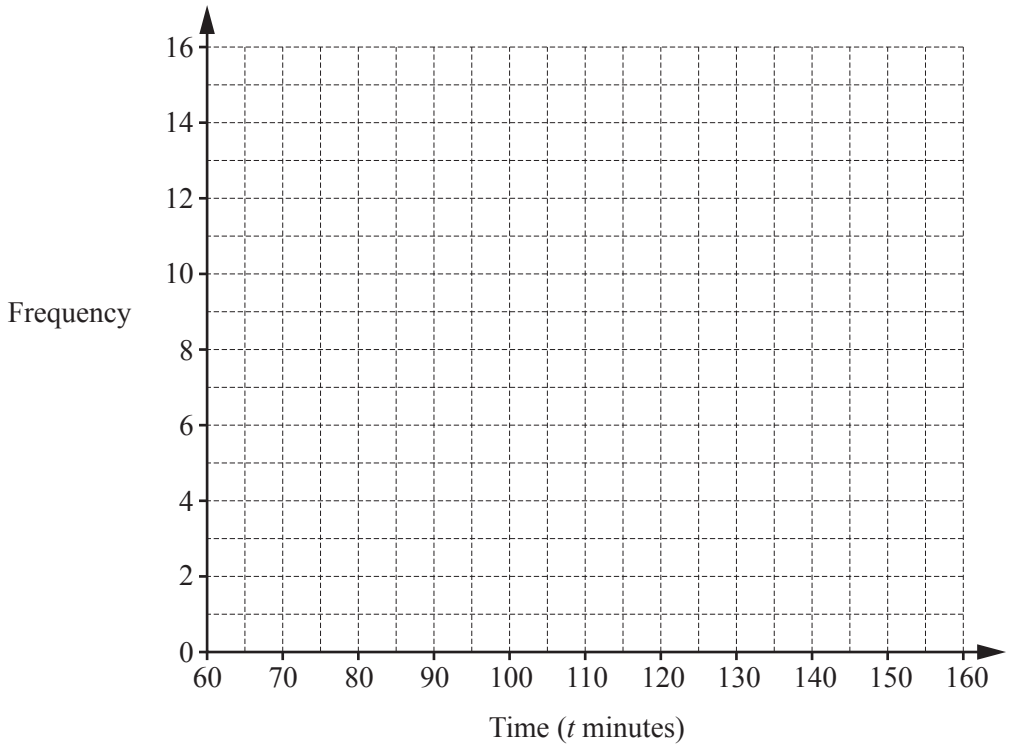
Answer Account .....

\$ ..... [4]

2 **(a)** Jenny recorded the time, in minutes, of 40 movies.
The table summarises her results.

Time (t minutes)	$60 < t \leqslant 80$	$80 < t \leqslant 100$	$100 < t \leqslant 120$	$120 < t \leqslant 140$	$140 < t \leqslant 160$
Frequency	2	7	15	11	5

On the grid, draw a frequency polygon to represent this information.



[2]

(b) Jenny asked 60 people how many movies they had each watched in the last month.
The table summarises her results.

Number of movies	0	1	2	3	4	5	6
Frequency	p	14	15	7	q	5	2

The mean number of movies watched is 2.3 .

Find the value of p and the value of q.

Answer $p =$ .....

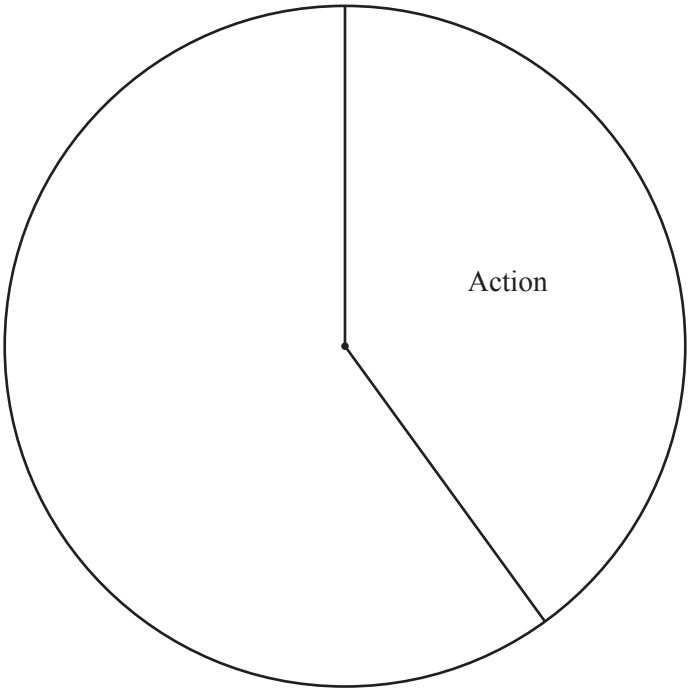
$q =$ ..... [3]

(c) Jenny also asked which type of movie each of the 60 people preferred.

The table summarises her results.

Type of movie	Action	Comedy	Drama	Horror
Frequency	24	15	9	12

(i) Complete the pie chart to represent the results.



[3]

(ii) One of the 60 people is chosen at random.

Find the probability that this person preferred drama or horror movies.

Answer ..... [1]

(iii) Two of the 60 people are chosen at random.

Calculate the probability that they both preferred comedy movies.

Answer ..... [2]

3 **(a)** Solve $3(x + 10) = 12 - 7x$.

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

(b) Solve the simultaneous equations.
Show your working.

$$4x - 3y = 28$$
$$6x + y = 9$$

Answer $x =$ .....

$y =$ ..... [3]

(c) Simplify $\dfrac{v^2 - 8v}{2v^2 - 13v - 24}$.

Answer ..... [3]

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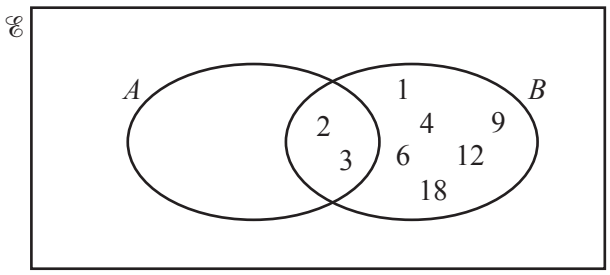
4 **(a)** $\mathscr{E} = \{x : x \text{ is an integer } 1 \leqslant x \leqslant 18\}$
$A = \{x : x \text{ is a prime number}\}$
$B = \{1, 2, 3, 4, 6, 9, 12, 18\}$



(i) Complete the Venn diagram to illustrate this information. [1]

(ii) Complete the description of the set B.

Answer $B = \{ x : x \text{ is a factor of } \ldots\ldots\ldots\ldots \}$ [1]

(iii) Find $n(A \cup B)$.

Answer ..... [1]

(iv) List the elements of $A' \cap B$.

Answer ..... [1]

(b) Find the lowest common multiple (LCM) of 140 and 770.

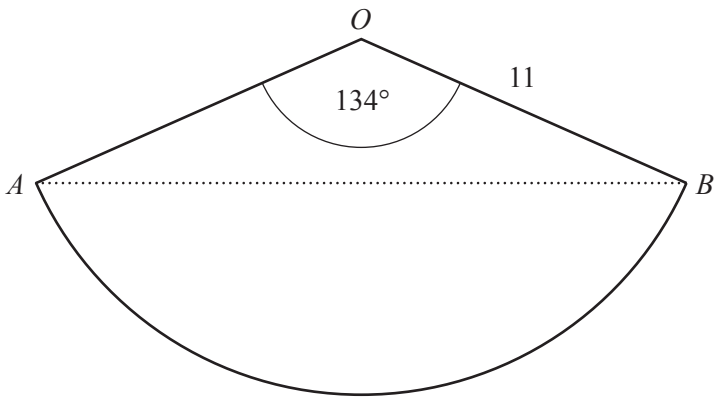
Answer ..... [2]

(c) A rectangular field measures 450 m by 306 m.
The whole field is divided into identical square plots with no land remaining.

Find the largest possible side length for the squares.

Answer ..... m [2]

5 **(a)**



OAB is a sector of a circle, centre O, radius 11 cm.
$A\hat{O}B = 134°$.

(i) Calculate the length of the arc AB.

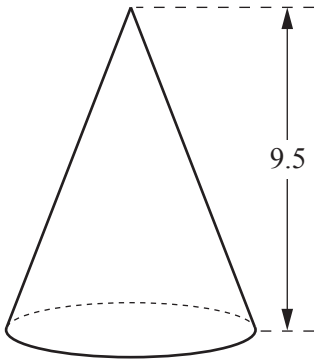
Answer ..... cm [2]

(ii) Calculate the shortest distance from O to the line AB.

Answer ..... cm [2]

(b) **[Volume of a cone = $\frac{1}{3}\pi r^2 h$]**

[Curved surface area of a cone = πrl]



A cone has height 9.5 cm and volume 115 cm^3.

(i) Show that the radius of the base of the cone is 3.4 cm, correct to 1 decimal place.

[2]

(ii) Calculate the curved surface area of the cone.

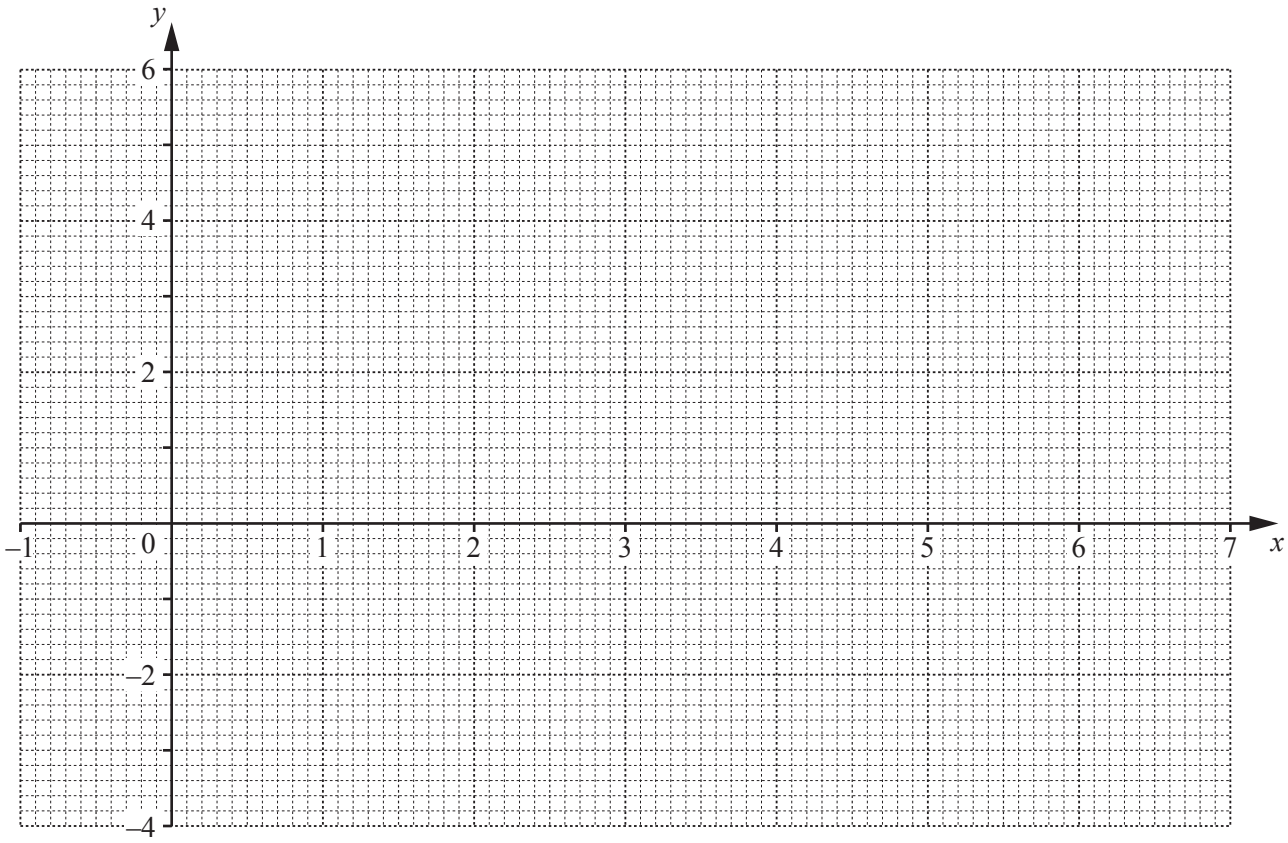
Answer ..... cm^2 [3]

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

x	-1	0	1	2	3	4	5	6	7
y		2	–0.5	–2	–2.5	–2	–0.5	2	

[1]

(b) Draw the graph of $y = \frac{x^2}{2} - 3x + 2$ for $-1 \leqslant x \leqslant 7$.



[3]

(c) By drawing a tangent, estimate the gradient of the curve at $x = 1.5$.

Answer ..... [2]

(d) Complete these inequalities to describe the range of values of x where $y \geqslant 0$.

Answer $x \leqslant$ .....

$x \geqslant$ ..... [2]

(e) **(i)** On the same grid, draw the line $4y + 3x = 12$. [2]

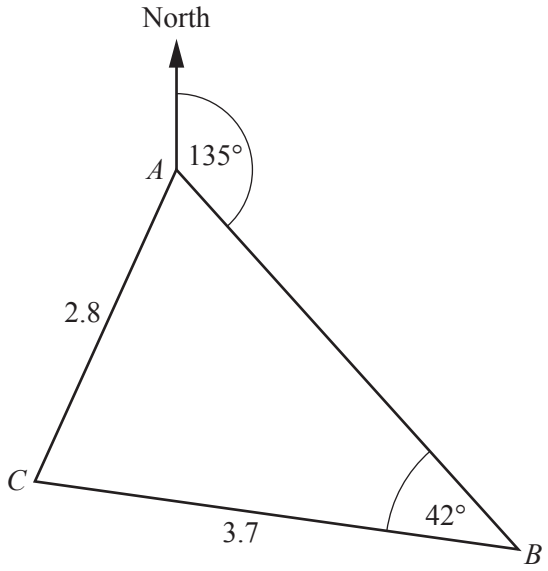
(ii) The x-coordinates of the points of intersection of this line and the curve are the solutions of the equation $2x^2 + Ax + B = 0$.

Find the value of A and the value of B.

Answer $A =$ .....

$B =$ ..... [2]

7



A yacht sails the triangular route shown.
The bearing of B from A is 135°.
$BC = 3.7$ km, $AC = 2.8$ km and $A\hat{B}C = 42°$.

(a) Show that $C\hat{A}B = 62.2°$, correct to 1 decimal place.

[3]

(b) Find the bearing of A from C.

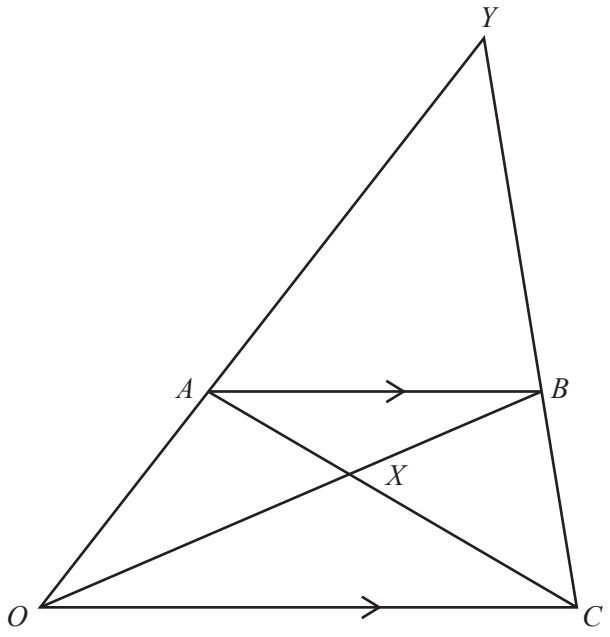
Answer ..... [2]

(c) The yacht sails from A to B to C to A.

Calculate the total length of the route.

Answer ..... km [4]

8



OYC is a triangle.
A is a point on *OY* and *B* is a point on *CY*.
AB is parallel to *OC*.
AC and *OB* intersect at *X*.

(a) Prove that triangle *ABX* is similar to triangle *COX*.
Give a reason for each statement you make.

.....

.....

.....

..... [3]

(b) $\overrightarrow{OA} = 3\mathbf{a}$ and $\overrightarrow{OC} = 6\mathbf{c}$ and $CB : BY = 1 : 2$.

Find, as simply as possible, in terms of **a** and/or **c**

(i) $\overrightarrow{AB}$,

Answer $\overrightarrow{AB} =$ ..... [1]

(ii) $\overrightarrow{CY}$.

Answer $\overrightarrow{CY} =$ ..... [2]

(c) Find, in its simplest form, the ratio

(i) $OX : XB$,

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

(ii) area of triangle COX : area of triangle ABX,

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

(iii) area of triangle AYB : area of trapezium $OABC$.

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

9 **(a)** On Monday, Ravi goes on a 20 km run.

(i) His average speed for the first 12 km is x km/h.

Write down an expression, in terms of x, for the time taken for the first 12 km.
Give your answer in minutes.

Answer ..... minutes [1]

(ii) His average speed for the final 8 km of the run is 1.5 km/h slower than for the first 12 km.

Write an expression, in terms of x, for the time taken for the final 8 km of the run.
Give your answer in minutes.

Answer ..... minutes [1]

(iii) Ravi takes 110 minutes to complete the full 20 km.

Form an equation in x and show that it simplifies to $22x^2 - 273x + 216 = 0$.

[4]

(iv) Solve the equation $22x^2 - 273x + 216 = 0$.
Show your working and give each answer correct to 2 decimal places.

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

(b) On Friday, Ravi ran the whole 20 km at the same average speed that he ran the final 8 km on Monday.

Calculate the time Ravi took to run 20 km on Friday.
Give your answer in hours and minutes, correct to the nearest minute.

Answer ..... hours ..... minutes [3]

10 A is the point $(-4, -1)$, B is the point $(2, 2)$ and $\overrightarrow{BC} = \begin{pmatrix} 4 \\ -8 \end{pmatrix}$.

(a) Find the coordinates of the midpoint of AB.

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

(b) Find the gradient of AB.

Answer ..... [1]

(c) Show that BC is perpendicular to AB.

[2]

(d) $ABCD$ is a rectangle.

Find the coordinates of point D.

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

(e) Calculate the perimeter of rectangle *ABCD*.

Answer .....units [4]

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