Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

5874665862

MATHEMATICS (SYLLABUS D) **4024/11**

Paper 1 **October/November 2020**

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.
- Calculators must **not** be used in this paper.
- You may use tracing paper.
- You must show all necessary working clearly.

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Blank pages are indicated.

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ELECTRONIC CALCULATORS MUST NOT BE USED IN THIS PAPER

1 **(a)** Evaluate $\frac{4}{7} - \frac{1}{3}$.

..... [1]

(b) Evaluate $2 - 1.2 \times 0.3$.

..... [1]

2 **(a)** Factorise $4p^2 - 1$.

..... [1]

(b) Factorise $10xy - 12 + 15x - 8y$.

..... [2]

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3 **(a)** Solve the equation $9 - 5x = 2x - 12$.

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

(b) Simplify $16 + 2y - 3(3 - y)$.

..... [2]

4 **(a)** Write the number 3456.789 correct to the nearest 100.

..... [1]

(b) Evaluate $\sqrt{160\,000}$.

..... [1]

(c) Evaluate $1 - 3^{-1}$.

..... [1]

5 y is directly proportional to the cube of x.
When $x = 2$, $y = 4$.

Find y when $x = 3$.

$y =$ ..... [2]

6 **(a)** Mariah's age is 17 years 5 months.
Her brother is 20 months younger.

Find the age of her brother.

..... years ..... months [1]

(b) Write $\dfrac{48 \text{ minutes}}{2 \text{ hours } 18 \text{ minutes}}$ as a fraction in its simplest form.

..... [2]

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7 **(a)** The numbers of emails received by 18 students in a class one Monday are given below.

4	12	14	6	3	6	9	7	11
8	7	11	14	6	13	5	12	9

Complete the grouped frequency table for these emails.

Number of emails		Frequency
0 to 5		
6 to 10		
11 to 15		

[1]

(b) A student is chosen, at random, from a different class.
The probability that this student received five emails is $\frac{9}{20}$.

Write down the probability that this student did **not** receive five emails.

..... [1]

8 By writing each number correct to 1 significant figure, estimate the value of

$$\frac{6013 \times 0.0405}{\sqrt{8.986}}.$$

..... [2]

9 **(a)** Express 0.043×100^2 in standard form.

..... [1]

(b) Evaluate $\dfrac{1.2 \times 10^7}{2 \times 10^{-3}}$, giving your answer in standard form.

..... [2]

10 **(a)** A football team recorded the number of goals scored in each of their 20 games.
The table shows the results.

Number of goals scored	0	1	2	3	4
Frequency	6	5	4	4	1

(i) Write down the mode.

..... [1]

(ii) Find the median.

..... [1]

(b) In the football team

- the 2 tallest players have a mean mass of 75 kg
- the 8 shortest players have a mean mass of 60 kg.

Calculate the mean mass of these 10 players.

..... kg [2]

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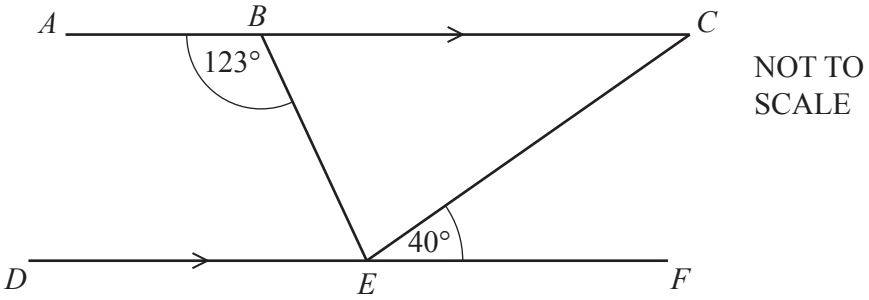
11



In the diagram, ABC and DEF are parallel lines.
$A\hat{B}E = 123°$ and $C\hat{E}F = 40°$.

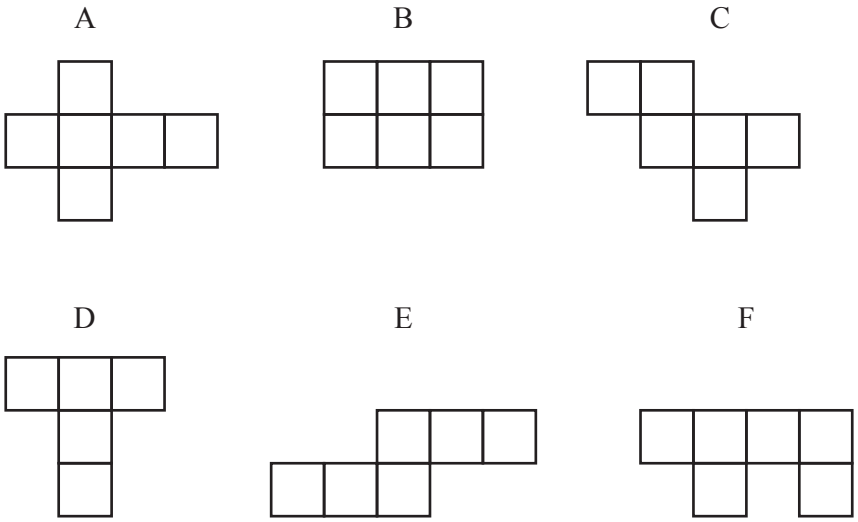
(a) Calculate $D\hat{E}B$.

$D\hat{E}B =$ ..... [1]

(b) Calculate $B\hat{E}C$.

$B\hat{E}C =$ ..... [1]

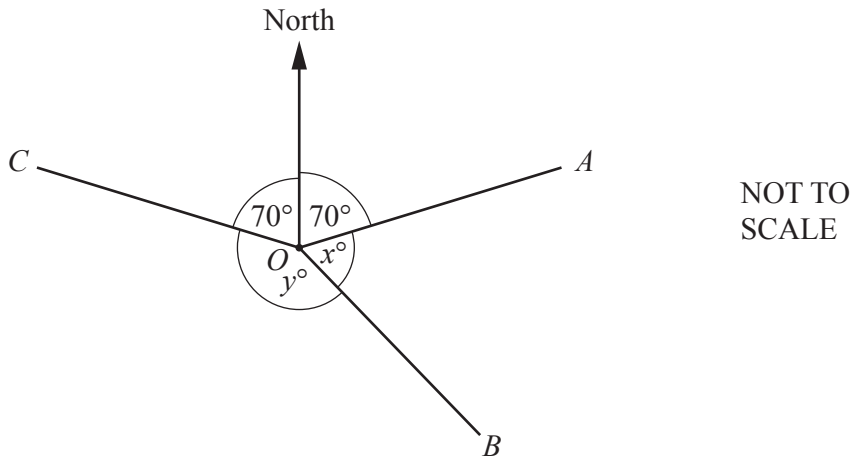
12



Write the letter of each drawing that is the net of a cube.

..... [2]

13



In the diagram, OC and OA each make an angle of 70° with the North line.
$A\hat{O}B = x°$ and $B\hat{O}C = y°$.

(a) $x : y = 3 : 7$.

Find the value of x.

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

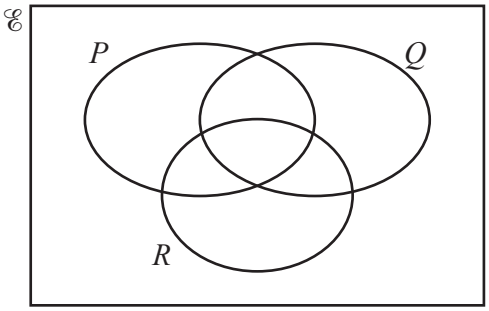
(b) Find the bearing of C from O.

..... [1]

(c) Find the bearing of O from A.

..... [1]

14 **(a)**



In the Venn diagram, shade the subset $(P \cup Q) \cap R'$. [1]

(b) In a group of 42 people,

- 30 people speak Spanish
- 20 people speak French.

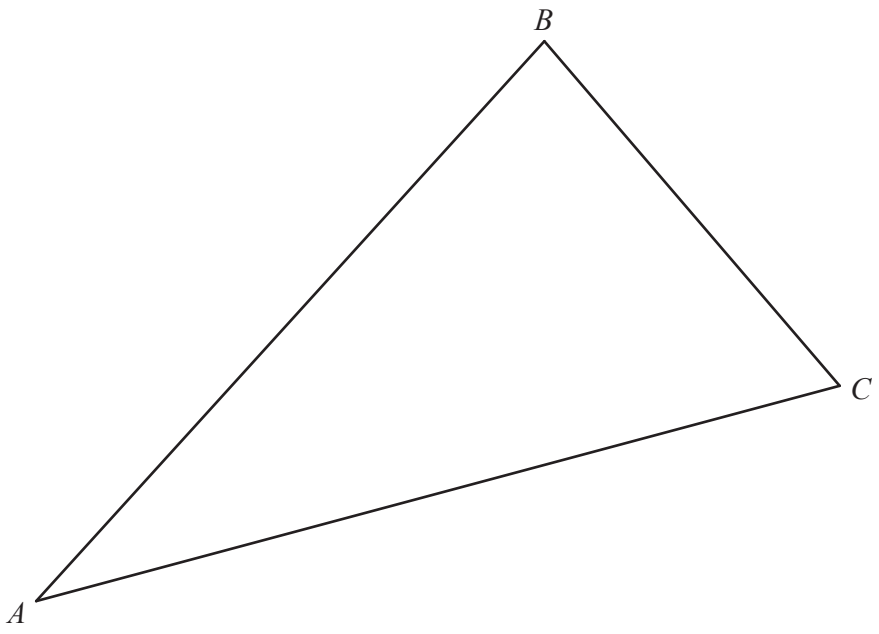
(i) Find the smallest possible number of people who speak both Spanish and French.

..... [1]

(ii) Find the largest possible number of people who speak neither Spanish nor French.

..... [1]

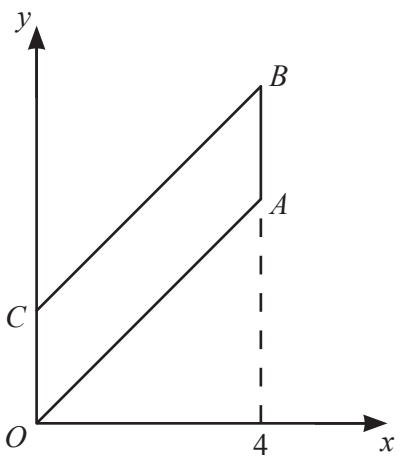
15



(a) **Using compasses and a straight edge only**, construct the bisector of $A\hat{B}C$. [2]

(b) On the diagram, draw the locus of points **inside** triangle ABC that are 3 cm from AC. [1]

16



NOT TO SCALE

In the diagram, *OABC* is a parallelogram.
The equation of the line *CB* is $y = x + 2$.

(a) The region **inside** the parallelogram is defined by four inequalities.
One of these is $y < x + 2$.

Write down the other three inequalities.

.....

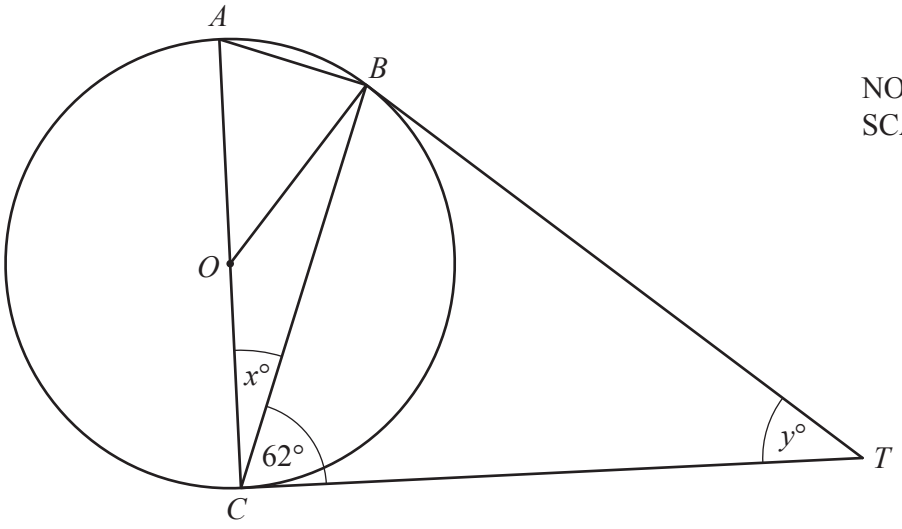
.....

..... [2]

(b) Calculate the area of parallelogram *OABC*.

..... units^2 [1]

17



NOT TO SCALE

In the diagram, AC is a diameter of the circle centre O.
The tangents from T touch the circle at B and C.
$B\hat{C}T = 62°$.

(a) Find x.

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

(b) Find y.

$y =$ ..... [2]

18 Some numbers are arranged in rows.
Each row contains one more number than the previous row.
The numbers in each row are two more than the numbers in the previous row.

Row 1	3	3			
Row 2	5	5	5		
Row 3	7	7	7	7	
Row 4	9	9	9	9	9
Row 5					

(a) Complete Row 5. [1]

(b) Write down an expression, in terms of n, for each number in Row n.

..... [1]

(c) Write down an expression, in terms of n, for the number of numbers in Row n.

..... [1]

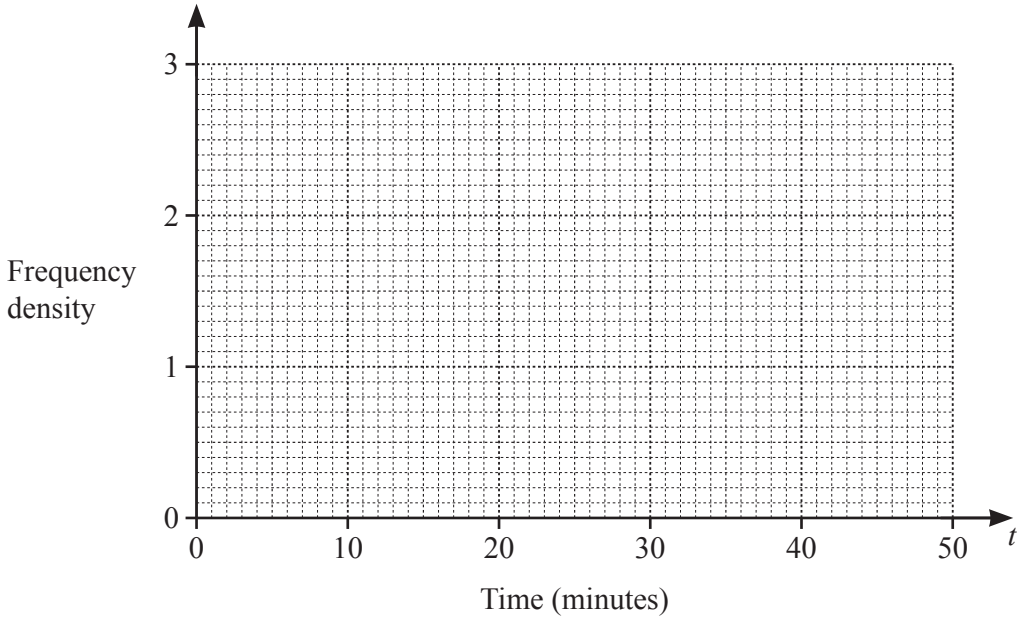
(d) Write down an expression, in terms of n, for the sum of the numbers in Row n.

..... [1]

19 The times, t minutes, taken by some people to travel to work are shown in the table.

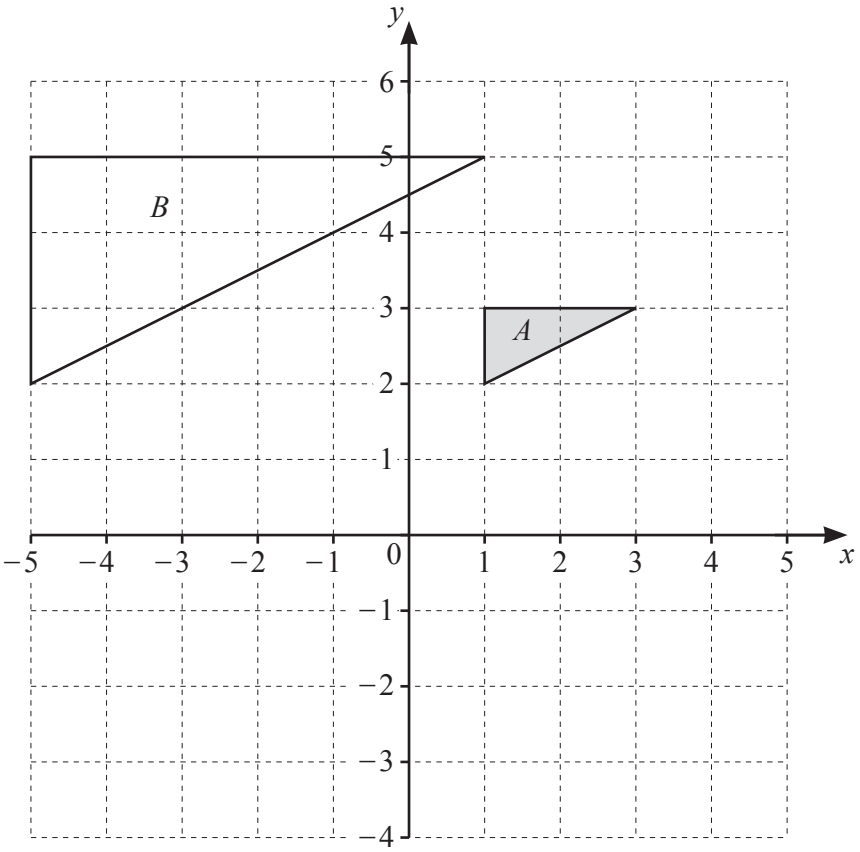
Time (t minutes)	$10 < t \leqslant 20$	$20 < t \leqslant 25$	$25 < t \leqslant 30$	$30 < t \leqslant 50$
Frequency	16	15	10	12

On the grid, draw a histogram to represent this data.



[3]

20



Triangle A and triangle B are drawn on the grid.

(a) Complete the description of the transformation that maps triangle A onto triangle B.

Enlargement ..... [2]

(b) Triangle A is mapped onto triangle C by a reflection in the line $y = -x$.

On the grid, draw and label triangle C. [2]

21 Line L is perpendicular to the line $y = -\frac{1}{2}x + 3$.
Line L passes through the point (8, 9).

Find the equation of line L.

..... [3]

22 $\mathbf{A} = \begin{pmatrix} 1 & 2 \\ -4 & 3 \end{pmatrix}$ $\mathbf{B} = \begin{pmatrix} 0 & 2 \\ 2 & -3 \end{pmatrix}$

(a) Find **AB**.

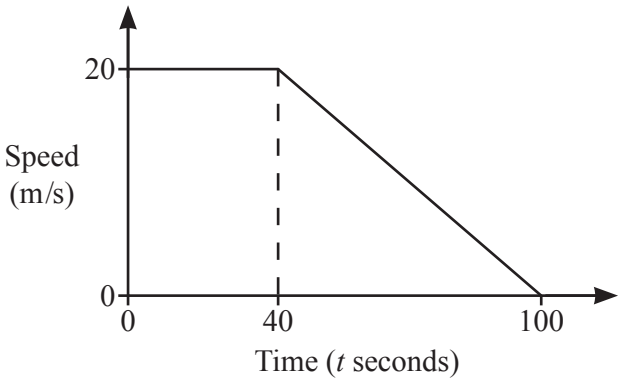
$\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

(b) **C** and $\mathbf{C}^{-1}$ are 2 by 2 matrices.

Write down the 2 by 2 matrix which is equivalent to $\mathbf{CC}^{-1}\mathbf{B}$.

$\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [1]

23 The diagram is the speed–time graph representing part of a train's journey.



NOT TO SCALE

The train moves at a constant speed of 20 m/s for 40 seconds.
It then slows down uniformly for a further 60 seconds until it stops.

(a) Find the deceleration between $t = 40$ and $t = 100$.

..... m/s^2 [1]

(b) Find the value of t when the speed is 10 m/s.

$t =$ ..... [1]

(c) Find the average speed during the 100 seconds.

..... m/s [3]

24 **(a)** Express 99 as the product of prime factors.

..... [1]

(b) Expressed as the product of prime factors,

$$p = 2^{n+2} \times 3^n \times 5 \quad \text{and} \quad q = 2^n \times 3^{n+1} \times 5^2$$

where n is a positive integer.

(i) The lowest common multiple (LCM) of p and q is $2^n \times 3^n \times R$.

Express R as the product of prime factors.

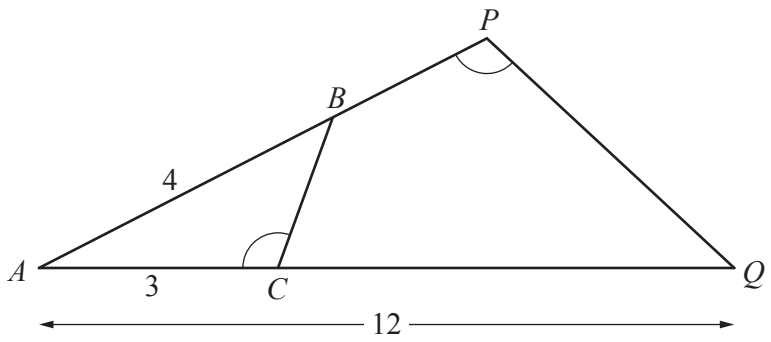
$R =$ ..... [2]

(ii) Express $p + q$ as the product of prime factors.

..... [2]

Question 25 is printed on the next page.

25



NOT TO SCALE

In the diagram, ABP and ACQ are straight lines.
$A\hat{C}B = A\hat{P}Q$.

(a) Show that triangle ABC is similar to triangle AQP.
Give a reason for each statement you make.

.....

.....

.....

..... [2]

(b) $AB = 4$ cm, $AC = 3$ cm and $AQ = 12$ cm.

Calculate AP.

$AP =$ ..... cm [2]

(c) The area of triangle ABC is x cm^2.

Find an expression, in terms of x, for the area of quadrilateral $BPQC$.

..... cm^2 [1]

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