Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

0000897944

MATHEMATICS (SYLLABUS D) **4024/12**

Paper 1 **October/November 2022**

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. Any blank pages are indicated.

ELECTRONIC CALCULATORS MUST NOT BE USED IN THIS PAPER

1 **(a)** Work out $80 \div 0.02$.

..... [1]

(b) Evaluate $\sqrt[3]{1000}$.

..... [1]

2 **(a)** Put **one** pair of brackets into this calculation to make it correct.

$$4 + 4 \times 4 - 4 = 4$$

[1]

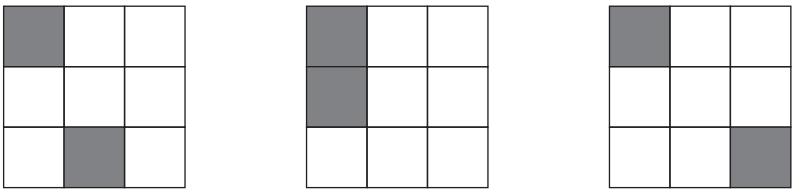
(b) Work out $-6 \times (-3 + 7)$.

..... [1]

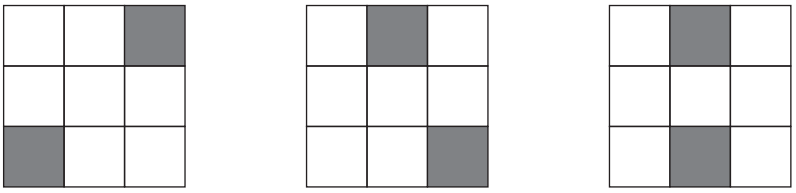
3 Write 7.54×10^{-4} as an ordinary number.

..... [1]

4 Sam has six square tiles labelled *A*, *B*, *C*, *D*, *E* and *F*.

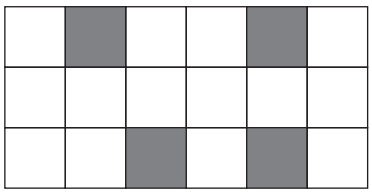


A *B* *C*



D *E* *F*

When Sam places tiles *E* and *F* side by side the resulting rectangle has no lines of symmetry and no rotational symmetry.



E *F*

Write down the two tiles that Sam should place side by side to make a rectangle that has

(a) one line of symmetry only,

..... [1]

(b) rotational symmetry of order 2.

..... [1]

5 The perimeter of a regular hexagon is equal to the perimeter of a regular octagon.
Each edge of the octagon is 9 cm long.

Find the length of one edge of the hexagon.

..... cm [2]

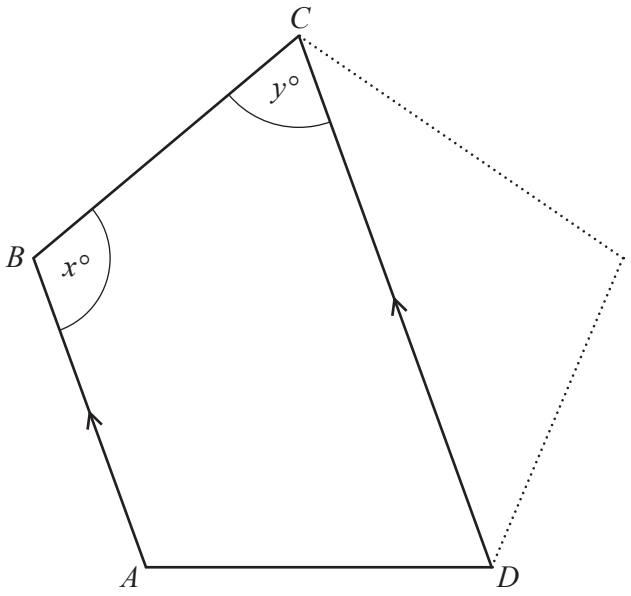
6 **(a)** Work out $\frac{11}{15} - \frac{2}{3}$.

..... [1]

(b) Work out $\frac{3}{10} \div 6$.
Write your answer as a fraction in its simplest form.

..... [2]

7



NOT
TO
SCALE

In the diagram, AD, AB and BC are three sides of a regular pentagon and DC is a diagonal of the pentagon.
AB is parallel to DC.

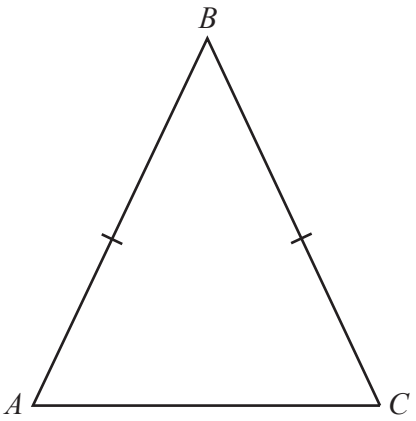
(a) Find the value of x.

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

(b) Find the value of y.

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

8



NOT TO SCALE

ABC is an isosceles triangle with $AB = BC$.
The ratio $A\hat{B}C : B\hat{A}C = 2 : 5$.

Find $A\hat{B}C$.

$A\hat{B}C =$ ..... [2]

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

$$\frac{47.5 + 36.1}{64.9 \div 17.7}.$$

..... [2]

10 **(a)** Write 420 as the product of its prime factors.

..... [2]

(b) Given that $1512 = 2^3 \times 3^3 \times 7$, find the highest common factor of 420 and 1512.

..... [1]

11 Azra has a spinner.
The sections are coloured red, blue, yellow or green.
The relative frequency of the spinner landing on red, blue or yellow is shown in the table.

Colour on spinner	Red	Blue	Yellow	Green
Relative frequency	0.15	0.3	0.2	

(a) Find the relative frequency of the spinner landing on green.

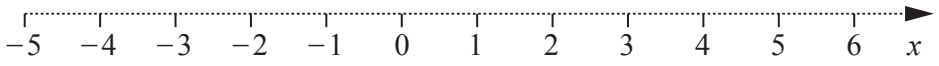
..... [2]

(b) Azra spins the spinner 150 times.

How many times would she expect the spinner to land on blue?

..... [1]

12 **(a)** Represent the inequality $-4 \leqslant x < 2$ on the number line below.



[1]

(b) Solve the inequality.

$$10 - n < 2n - 5$$

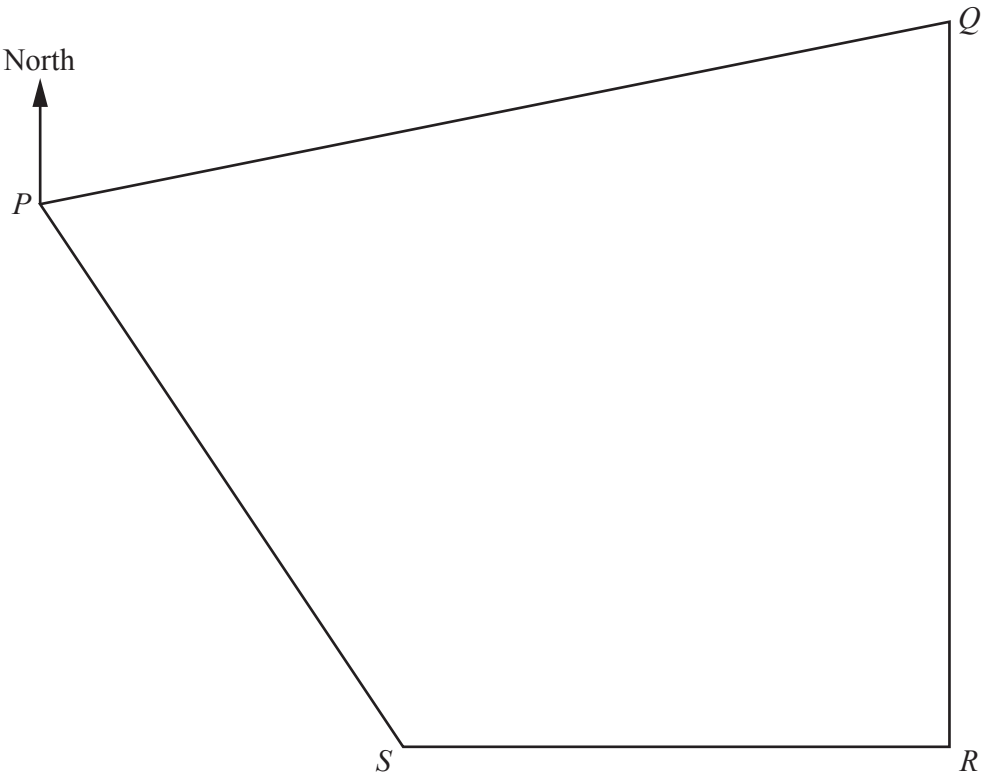
..... [2]

13 Sophie cycles 2600 metres in 12 minutes.

Work out Sophie's average speed in kilometres per hour.

..... km/h [3]

14 The scale drawing shows a plot of land, *PQRS*.
The scale is 1 cm to 20 m.



Scale: 1 cm to 20 m

(a) A path crosses the land.
The path is equidistant from *SP* and *SR*.
Use a straight edge and compasses only to construct the path. [2]

(b) Priya walks from point *P* to the path on a bearing of 104°.

(i) Draw a line to represent Priya's walk. [1]

(ii) Find the actual distance from *P* to where Priya meets the path.

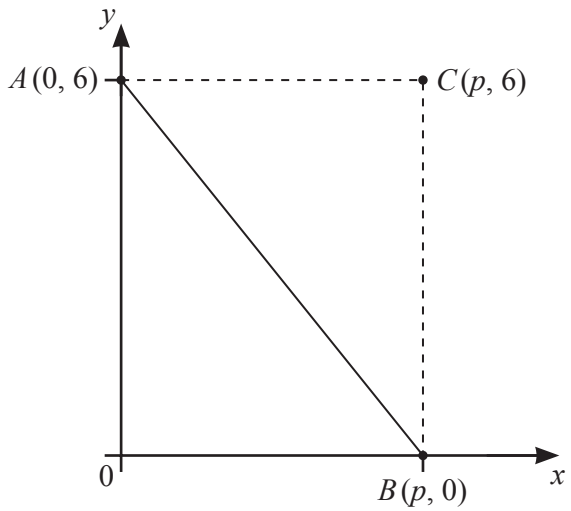
..... m [2]

(c) A car park is to be built on the plot of land.
On the scale drawing the area of the car park will be 2 cm^2.

Find the actual area of the car park.

..... m^2 [2]

15



NOT TO SCALE

The diagram shows the points $A(0, 6)$, $B(p, 0)$ and $C(p, 6)$.
The equation of the line AB is $3y + 4x = 18$.

(a) Find the value of p.

$p =$ ..... [1]

(b) Write down the three inequalities that define the region **inside** triangle ABC.

.....

.....

..... [2]

16 P is the point $(-2, 1)$ and Q is the point $(6, 13)$.
M is the midpoint of the line PQ.

(a) Find the coordinates of M.

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

(b) (i) Find the gradient of the line PQ.

..... [2]

(ii) Write down the gradient of a line that is perpendicular to the line PQ.

..... [1]

17 **(a)** Simplify.

$(x^2)^3$

..... [1]

(b) $t^{-2} = 9$

Find the value of t.

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

(c) $\sqrt{5} \times 5^0 = 5^k$

Find the value of k.

$k =$ ..... [1]

18 x is directly proportional to the square of $(y+1)$.
When $y = 2$, $x = 45$.

Find x when $y = 4$.

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

19 Solve.

$$\frac{3x-1}{6} + \frac{x+2}{4} = \frac{5}{3}$$

$x =$ ..... [4]

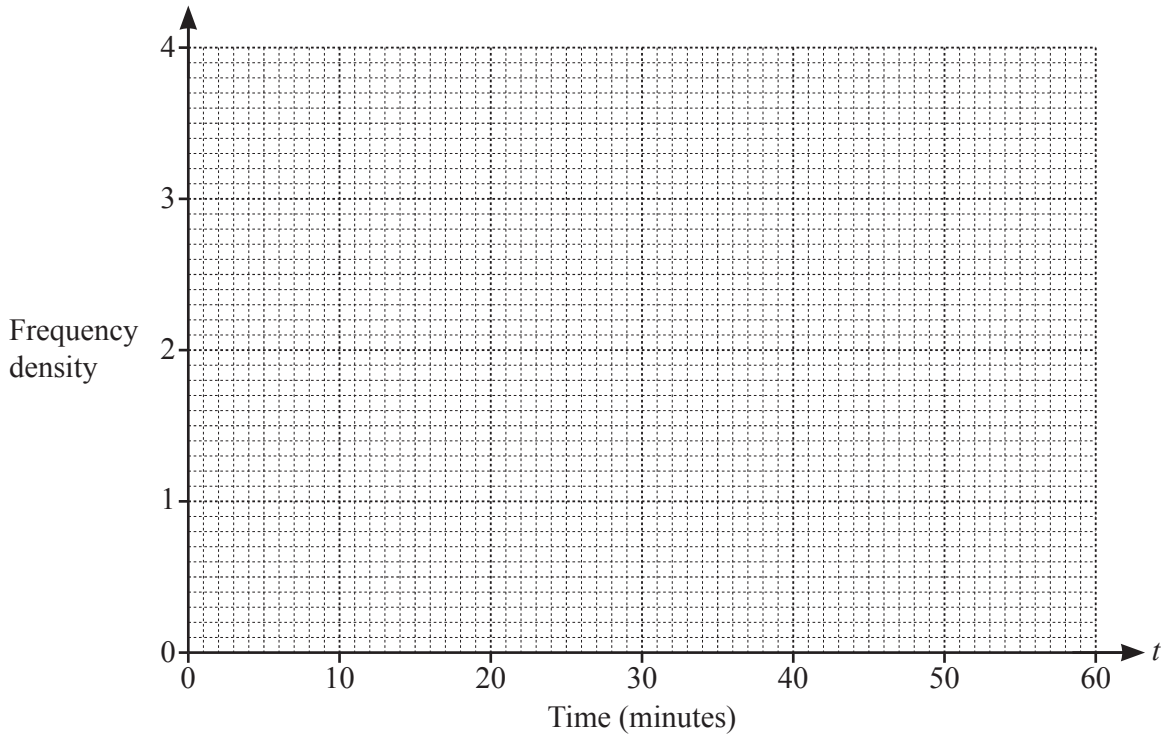
20 The table shows some information about the times each of 100 children spent reading in one day.

Time (t mins)	$x < t \leqslant 30$	$30 < t \leqslant 40$	$40 < t \leqslant 45$	$45 < t \leqslant 60$
Frequency	32	23	15	30
Frequency density	1.6	2.3		

(a) Find the value of x in the interval $x < t \leqslant 30$.

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

(b) On the grid, draw a histogram to represent the data for the 100 children.



[3]

21 $f(x) = 1 + \frac{3x}{2}$ $g(x) = \frac{2}{1-x}$

(a) Find $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [3]

(b) Solve $g(x) = f(-4)$.

$x =$ ..... [3]

22 Factorise.

(a) $9p^2 - q^2$

..... [1]

(b) $ac - 3bc + a - 3b$

..... [2]

23 Adam and Ben buy tickets for the cinema and the theatre.

(a) Adam buys 5 cinema tickets and 4 theatre tickets.
Ben buys 7 cinema tickets and 9 theatre tickets.

Complete the matrix, **X**, to represent this information.

$$\mathbf{X} = \begin{array}{c} \begin{array}{cc} \text{Cinema} & \text{Theatre} \end{array} \\ \begin{pmatrix} & \\ & \end{pmatrix} \end{array} \begin{array}{l} \\ \begin{array}{l} \text{Adam} \\ \text{Ben} \end{array} \end{array}$$

[1]

(b) Cinema tickets cost \$11 each and theatre tickets cost \$30 each.
The matrix **Y** represents this information.

$$\mathbf{Y} = \begin{pmatrix} 11 \\ 30 \end{pmatrix}$$

(i) $\mathbf{P} = \mathbf{XY}$

Find the matrix **P**.

$\mathbf{P} =$ [2]

(ii) Explain what the elements in matrix **P** represent.

.....

..... [1]

24 $\sin x° = \sin 50°$ and $90 < x < 180$.

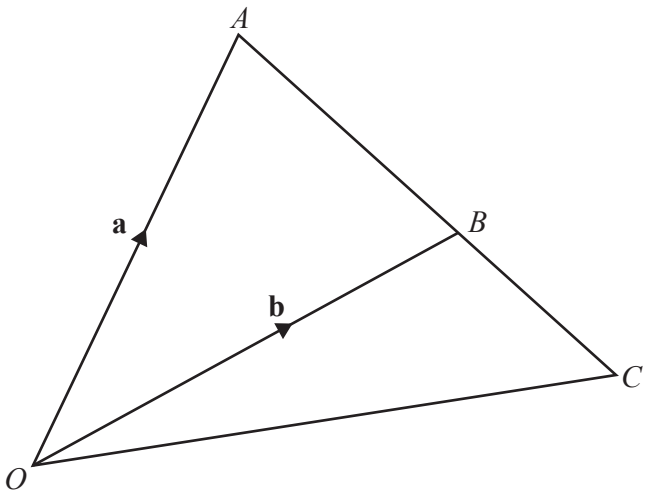
Find the value of x.

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

25 Simplify $\dfrac{x^2 - 4x}{x^2 - x - 12}$.

..... [3]

26



NOT TO SCALE

OAC is a triangle and B is a point on AC such that $AB : BC = 3 : 2$.
$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.

(a) Find $\overrightarrow{OC}$ in terms of **a** and **b**, giving your answer in its simplest form.

$\overrightarrow{OC} =$ ..... [3]

(b) D is a point on OC such that $\overrightarrow{OD} = \mathbf{b} - \frac{2}{5}\mathbf{a}$.

Show that $OABD$ is a trapezium.

[2]

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