Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

4813400774

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

Paper 1 **May/June 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 **16** pages.

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ELECTRONIC CALCULATORS MUST NOT BE USED IN THIS PAPER

1 Work out.

(a) $\frac{2}{3} + \frac{1}{6}$

..... [1]

(b) 0.4×0.2

..... [1]

2 Asha asks a group of students about their favourite fruit.
The table and pictogram show some of the results.

Fruit	Apple	Banana	Orange	Melon
Frequency	8		5	

Apple	
Banana	
Orange	
Melon	

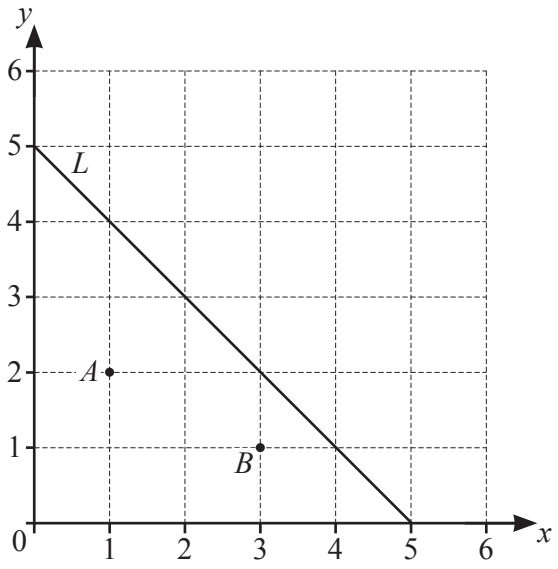
Key: represents 4 people

(a) Complete the table and pictogram. [3]

(b) Write down the mode.

..... [1]

3



A and *B* are vertices of a quadrilateral.
Line *L* is the line of symmetry of the quadrilateral.

Find the coordinates of the other two vertices of the quadrilateral.

(..... , ...) and (..... , ...) [2]

4 **(a)** The temperature inside Luke's house is 18 °C.
The temperature outside his house is −3 °C.

Find the difference between these temperatures.

..... °C [1]

(b) Luke's thermometer measures the temperature correct to the nearest degree.
At midnight, the thermometer measures the temperature outside as −6 °C.

Find the upper bound of the temperature outside at midnight.

..... °C [1]

5 The scale drawing shows the positions of two villages, A and B.
The scale is 1 cm to 2 km.

Scale: 1 cm to 2 km

(a) Find the actual distance between village A and village B.

..... km [2]

(b) Measure the bearing of B from A.

..... [1]

6 Kabir invests \$250 in a savings account.
The account pays simple interest at a rate of 1.5% per year.

Calculate the total amount of interest he will receive at the end of 4 years.

\$ ..... [2]

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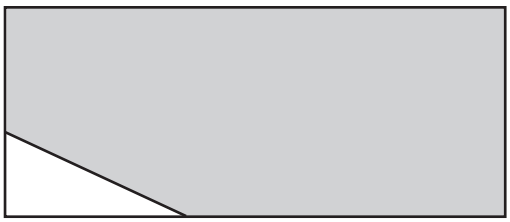
7



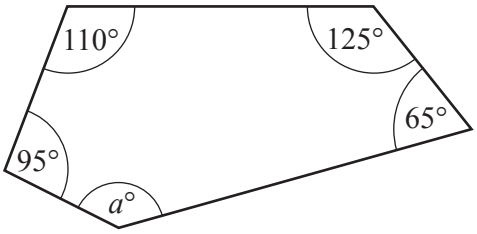
NOT TO SCALE

The area of the rectangle is $9\,\text{cm}^2$.
The area of the triangle is $85\,\text{mm}^2$.

Calculate the shaded area.
Give your answer in cm^2.

..... cm^2 [2]

8



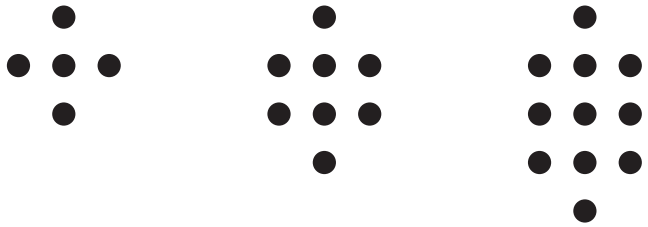
NOT TO SCALE

The diagram shows a pentagon.

Find the value of a.

$a =$ ..... [3]

9 Shani makes a sequence of patterns using counters.



Pattern 1 Pattern 2 Pattern 3

(a) Complete the table.

Pattern number	1	2	3	4	5
Number of counters	5	8	11		

[1]

(b) Find an expression, in terms of n, for the number of counters in Pattern n.

..... [2]

(c) Shani has 100 counters.
She uses some of the counters to make Pattern 20.
She uses all the remaining counters to make Pattern k.

Find the value of k.

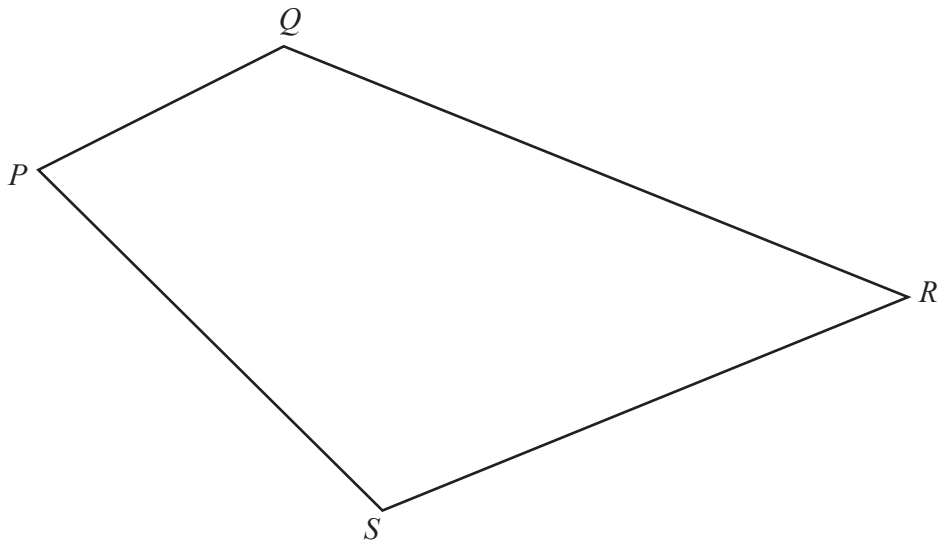
$k =$ ..... [3]

10 A bag contains red balls, blue balls and green balls.
The ratio red : blue = 3 : 8 .
The ratio green : blue = 2 : 5 .

Work out the fraction of the balls that are blue.

..... [3]

11



(a) **Use a straight edge and compasses only** to construct the bisector of angle *PSR*. [2]

(b) Point *X* lies inside quadrilateral *PQRS* and is closer to *PS* than to *RS*.

Shade the region in which *X* must lie. [1]

12 **(a)** Write 0.002 035 61 correct to 3 significant figures.

..... [1]

(b) By writing each number correct to 1 significant figure, estimate the value of

$$\frac{\sqrt{3.93} \times 63.7}{0.425}.$$

..... [2]

13 **(a)** Evaluate $\left(\sqrt{9} \times \sqrt[3]{64}\right)^2$.

..... [2]

(b) Write down an irrational value of n that satisfies this inequality.

$4.5 \leqslant n \leqslant 5.5$

..... [1]

14 **(a)** Write these numbers in order of size, starting with the smallest.

$$2000 \qquad 0.002 \qquad 2\times10^{-4} \qquad 2\times10^{-2}$$

..... , ... , ... , ... [1]
smallest

(b) This is a calculation using numbers in standard form.

$$a\times10^{-7}\div5\times10^{b}=4\times10^{-16}$$

Find the value of a and the value of b.

$a =$ .....

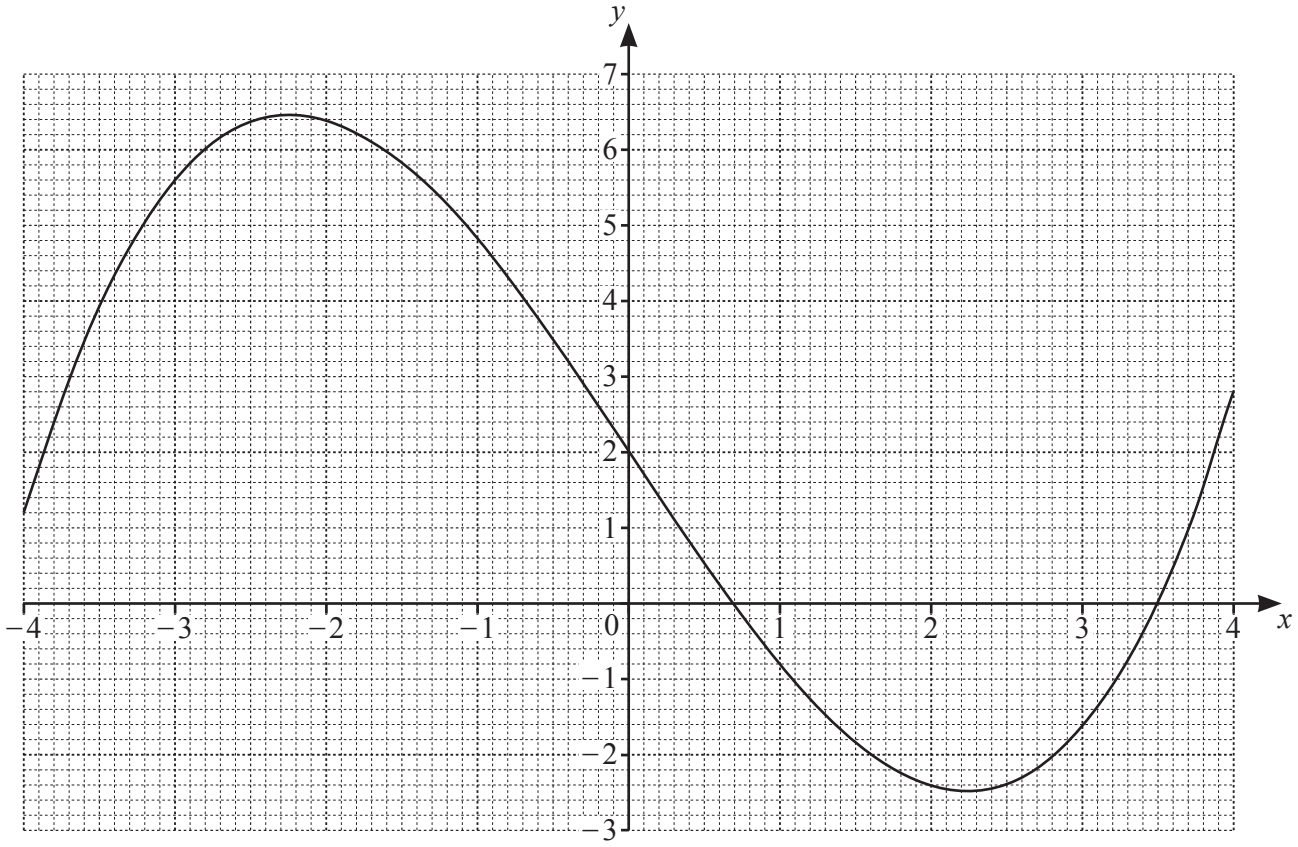
$b =$ ..... [2]

15 y is directly proportional to $(x-1)^2$.
When $x = 5$, $y = 32$.

Find the value of y when $x = -2$.

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

16 The graph of $y = \frac{x^3}{5} - 3x + 2$ is drawn on the grid.



(a) By drawing a tangent, estimate the gradient of the curve at $x = -1$.

..... [2]

(b) By drawing a suitable straight line on the graph, find the solutions of the equation $\frac{x^3}{5} - 3x = 0$.

..... [3]

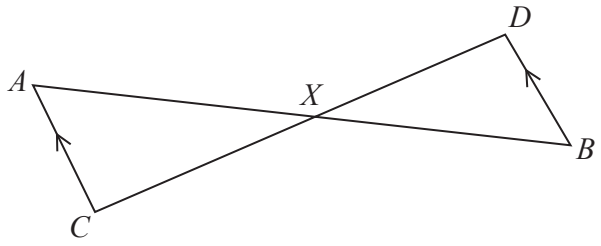
17 **(a)** Ryan says:

Each diagonal of quadrilateral Q divides it into two congruent isosceles triangles.

Draw a ring around each of the quadrilaterals in the list for which Ryan's statement is always true.

Square Rectangle Rhombus Parallelogram Trapezium Kite [1]

(b)



NOT TO SCALE

AXB and CXD are straight lines.
X is the midpoint of AB.
AC is parallel to DB.

Show that triangle AXC is congruent to triangle BXD.
Give a reason for each statement you make.

.....

.....

.....

..... [3]

18 $\mathrm{f}(x) = 3x - 7$

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

$\mathrm{f}^{-1}(x) =$ ..... [2]

19 **(a)** $\mathscr{E} = \{\mathrm{a, b, c, d, e, f, g, h, i, j}\}$
$P = \{\mathrm{a, e, i}\}$
$Q = \{\mathrm{f, g, h, i, j}\}$
$R = \{\mathrm{c, d, e, f, g}\}$

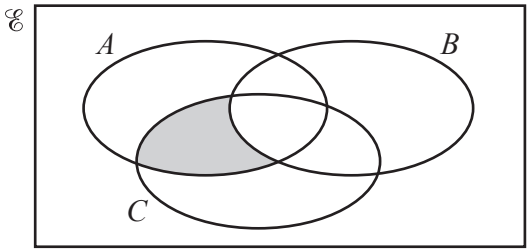
(i) Find $P \cup Q$.

..... [1]

(ii) Find $\mathrm{n}(P' \cap (Q \cup R))$.

..... [1]

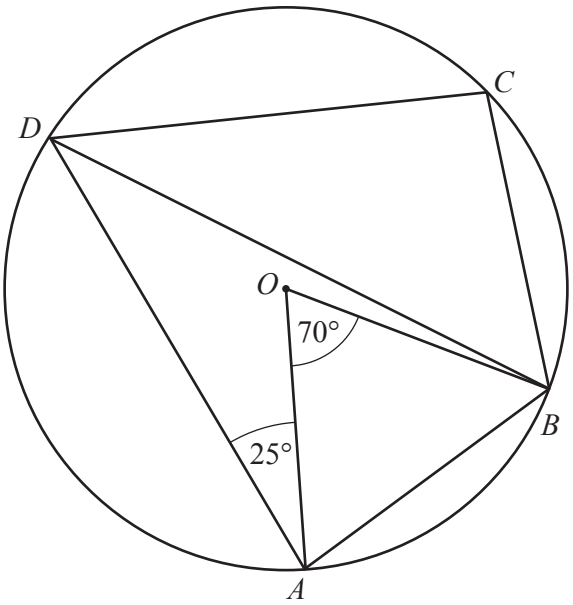
(b)



Use set notation to describe the shaded subset in the Venn diagram.

..... [1]

20



NOT TO SCALE

A, B, C and D are points on the circle, centre O.

(a) Find $A\hat{D}B$.

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

(b) Find $B\hat{C}D$.

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

21 **(a)** Factorise $4x^2 + 5x - 6$.

..... [2]

(b) Simplify $\left(\frac{16}{x^6}\right)^{-\frac{1}{2}}$.

..... [2]

22 A bag contains these 9 letter tiles.

I	S	O	S	C	E	L	E	S

(a) Nur takes one tile from the bag at random.
She notes the letter and then puts the tile back in the bag.

Find the probability that she does **not** take a letter E.

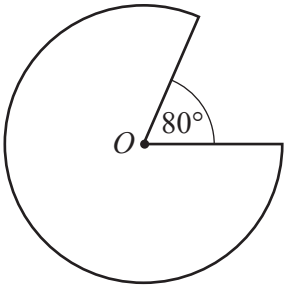
..... [1]

(b) Nur now takes two of the 9 letter tiles at random without replacement.

Find the probability that both tiles show the same letter.

..... [3]

23



NOT TO SCALE

The diagram shows the major sector of a circle with centre O and radius 3 cm.

Calculate the area of this sector.
Give your answer in the form $k\pi$, where k is an integer.

..... cm^2 [2]

24 **(a)** Solve $\dfrac{2-5x}{3x+10} = 3$.

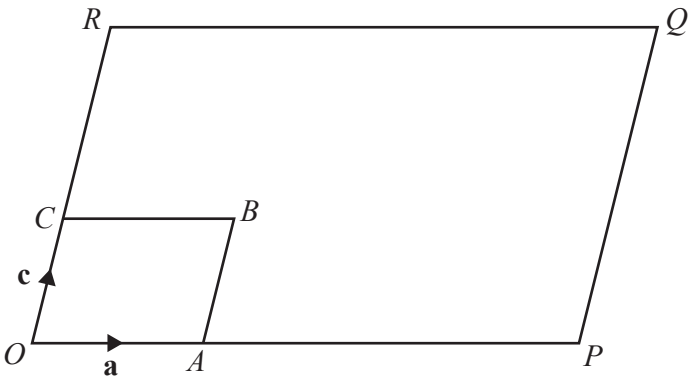
$x =$ ..... [3]

(b) Express as a single fraction in its simplest form $\dfrac{3}{x-2} - \dfrac{5}{2x+1}$.

..... [3]

Question 25 is printed on the next page.

25



NOT TO SCALE

$OABC$ and $OPQR$ are parallelograms.
A is a point on OP and C is a point on OR.
$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OC} = \mathbf{c}$.
$OA : OP = 1 : 4$ and $OC : CR = 2 : 3$.

(a) Find $\overrightarrow{OR}$ in terms of $\mathbf{c}$.

$\overrightarrow{OR} =$ ..... [1]

(b) Find $\overrightarrow{CQ}$, as simply as possible, in terms of $\mathbf{a}$ and $\mathbf{c}$.

$\overrightarrow{CQ} =$ ..... [2]

(c) Find the ratio area $OABC$: area $OPQR$.

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

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