# Cambridge O Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

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

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 **20** pages. Any blank pages are indicated.

**[Turn over**

**ELECTRONIC CALCULATORS MUST NOT BE USED IN THIS PAPER**

**1** **(a)** Write down the value of the 5 in the number 253 624.

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

**(b)** The crowd at a sports event is exactly 35 687.

Write this number correct to the nearest ten.

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

**2** **(a)**
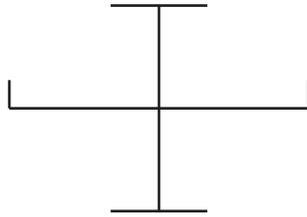
Write down the number of lines of symmetry of this diagram.

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

**(b)**
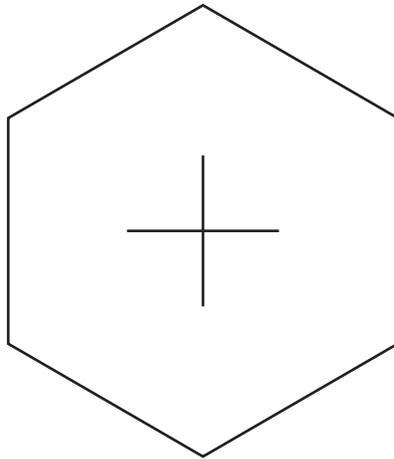
Write down the order of rotational symmetry of this diagram.

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

**3** The table shows the average monthly temperatures, in °C, in Vladivostok.

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| −12 | −8 | −2 | 5 | 10 | 14 | 18 | 20 | 16 | 9 | −1 | −9 |

**(a)** Find the difference between the highest and lowest of these temperatures.

..............................................°C [1]

**(b)** In February, the average temperature in Yakutsk is 37 °C below that in Vladivostok.

Find the average temperature in Yakutsk in February.

..............................................°C [1]

**4** Two cubes have a total volume of $152\,\text{cm}^3$.
One cube has an edge of length $5\,\text{cm}$.

**(a)** Calculate the length of the edge of the other cube.

.............................................. cm [2]

**(b)** Work out the **total** length of all of the edges of the larger cube.

.............................................. cm [1]

**5** The diagram shows the net of a solid drawn on a 1 cm grid.
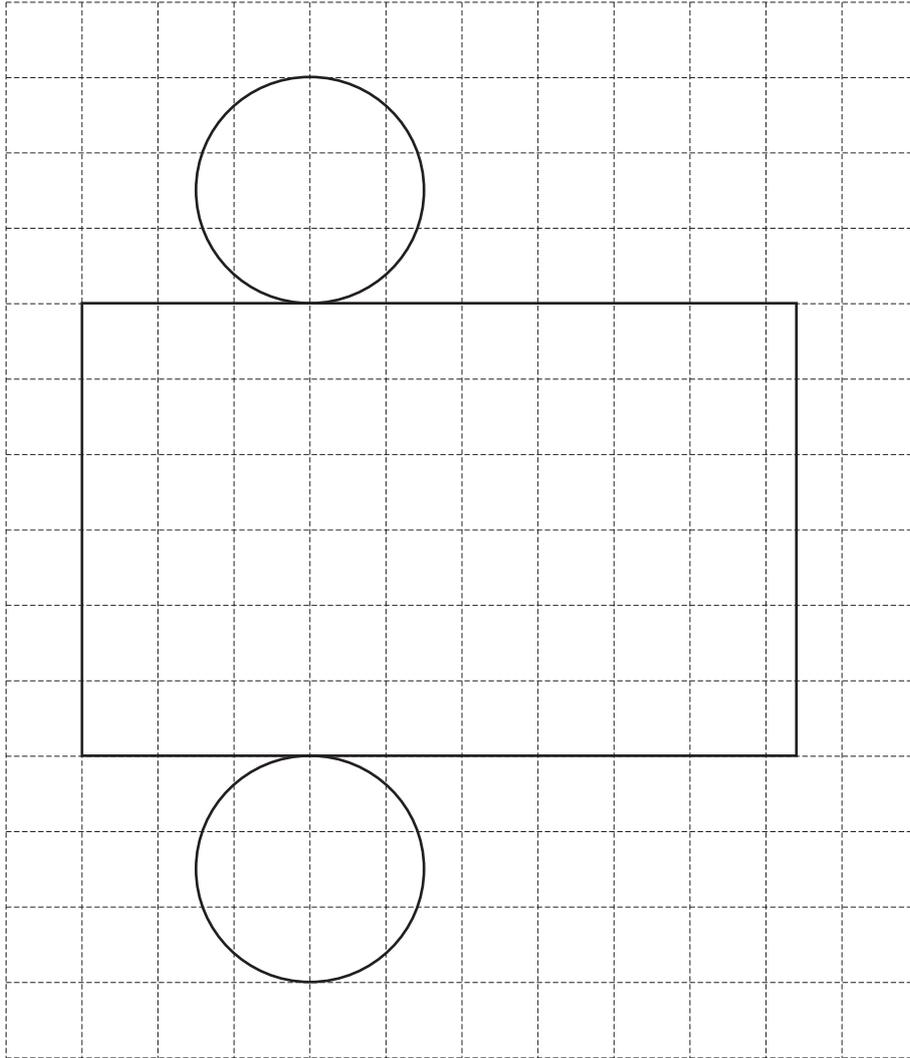


Name the solid formed by this net and describe fully the dimensions of this solid.

Name of solid ..................................................................

Dimensions .......................................................................................................................... [3]

**6** Write down

   **(a)** a prime number between 10 and 15,

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

   **(b)** an irrational number between 10 and 15.

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

**7** 20 students were asked how many pets they owned.
   The responses are shown in the table.

| Number of pets | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| Frequency | 3 | 8 | 3 | 4 | 0 | 2 |

   **(a)** Find the median number of pets.

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

   **(b)** Calculate the mean number of pets.

   .................................................... [2]

**8** Work out.

(a) $\frac{2}{3} - \frac{3}{5}$

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

(b) $\frac{3}{5} \div \frac{2}{3}$

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

**9** Write these lengths in order of size, starting with the smallest.

32 000 cm     3300 mm     3.1 km     34 m

.................................. , .................................. , .................................. , .................................. [2]
*smallest*

**10** The table below shows the monthly rent for nine apartments and the distance of these apartments from the city centre.

| Distance from the city centre (km) | 0.8 | 1.5 | 2.7 | 3.6 | 2.0 | 4.3 | 2.3 | 3.0 | 1.0 |
|---|---|---|---|---|---|---|---|---|---|
| Monthly rent ($) | 570 | 470 | 420 | 300 | 480 | 270 | 390 | 360 | 530 |
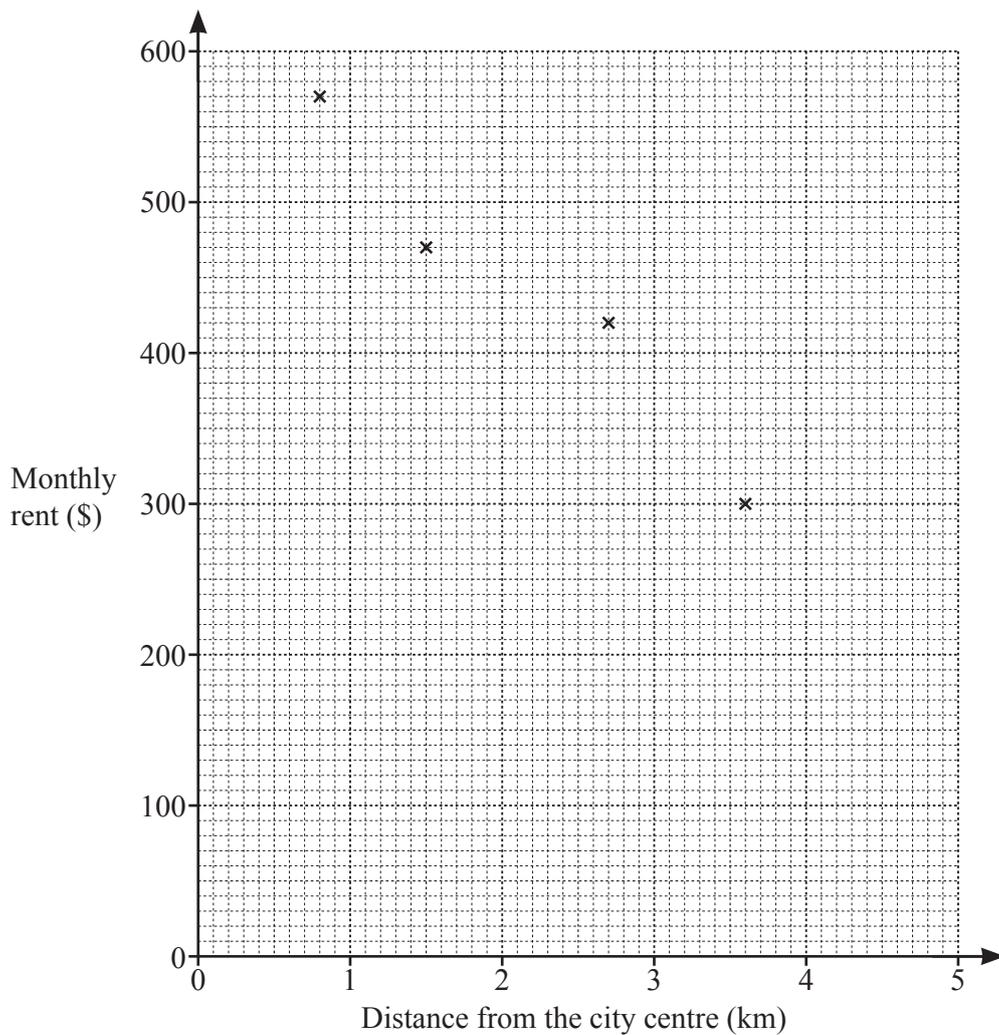


**(a)** Complete the scatter diagram.
The first four points have been plotted for you. [2]

**(b)** What type of correlation is shown on the scatter diagram?

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

**(c)** On the scatter diagram, draw a line of best fit. [1]

**(d)** Use your line of best fit to estimate the monthly rent for an apartment which is 4 km from the city centre.

$ .................................................. [1]

**11 (a)** 100 adults were asked the colour of their car.
The results are shown in the table.

| Colour of car | Red | Black | Blue | Silver |
|---|---|---|---|---|
| Frequency | 36 | 11 | 23 | 30 |

Write down the relative frequency that one of these cars is blue.

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

**(b)** A different group of 1200 adults were asked the colour of their car.
The relative frequency of one of these adults owning a white car is 0.3 .

Find the number of these adults who own a white car.

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

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

$$\frac{0.28 \times 37.4}{77.8}.$$

.................................................. [2]

**13 (a)** Expand and simplify.

**(i)** $(x+3)(x-4)$

.................................................. [2]

**(ii)** $5(x+2)-2(2x-1)$

.................................................. [2]

**(b)** Write as a single fraction in its simplest form.

$$\frac{4b}{3}+\frac{5b}{9}$$

.................................................. [2]

**14 (a)** Write   0.000 863   in standard form.

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

**(b)** The table below shows the approximate area of some deserts.

| Desert | Area in km$^2$ |
|---|---|
| Antarctica | $1.4 \times 10^7$ |
| Arabian | $2.3 \times 10^6$ |
| Gobi | $1.3 \times 10^6$ |
| Kalahari | $9.0 \times 10^5$ |
| Sahara | $9.0 \times 10^6$ |

**(i)** Write down the name of the desert with the largest area.

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

**(ii)** Calculate the **total** area of the Arabian and Kalahari deserts.
Give your answer in standard form.

......................................... km$^2$  [2]

**15 (a)** Evaluate $7^{-3} \div 7^{-4}$ .

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

**(b)** Find the value of $k$ when $(3^6)^k = 3^2$ .

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

**(c)** Simplify $3(2^2 \times 3^3 \times 5^4)^2$ .
Give your answer in the form $2^a \times 3^b \times 5^c$.

.................................................. [2]
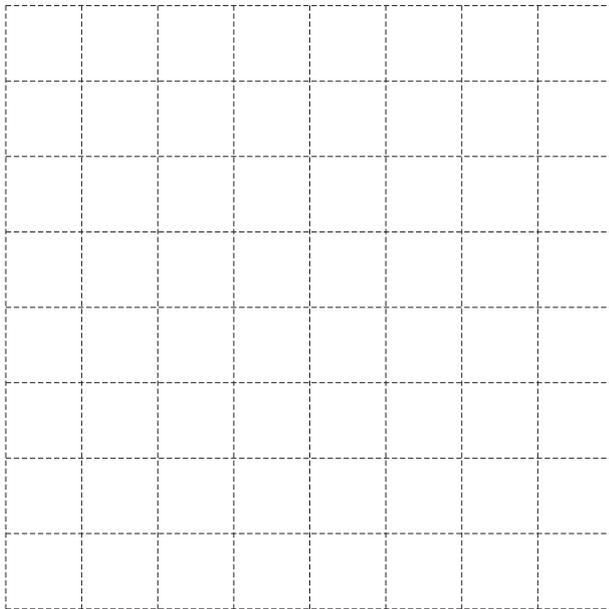
16  $\mathbf{p} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$    $\mathbf{q} = \begin{pmatrix} -3 \\ 2 \end{pmatrix}$

  **(a)** On the unit grid below, draw and label vector **p**.
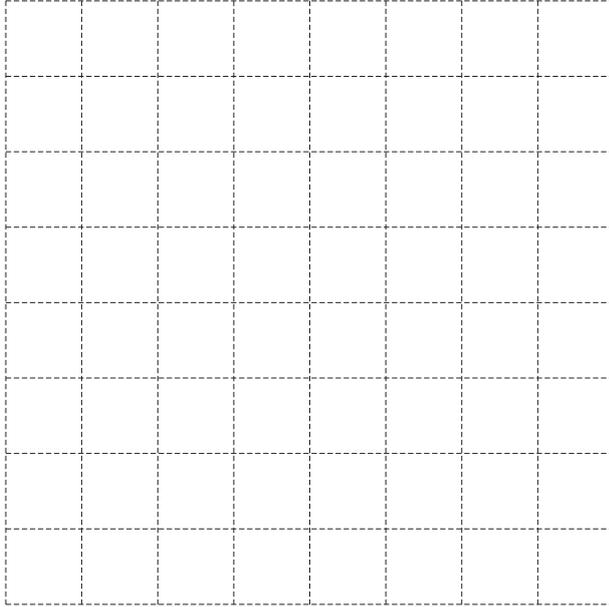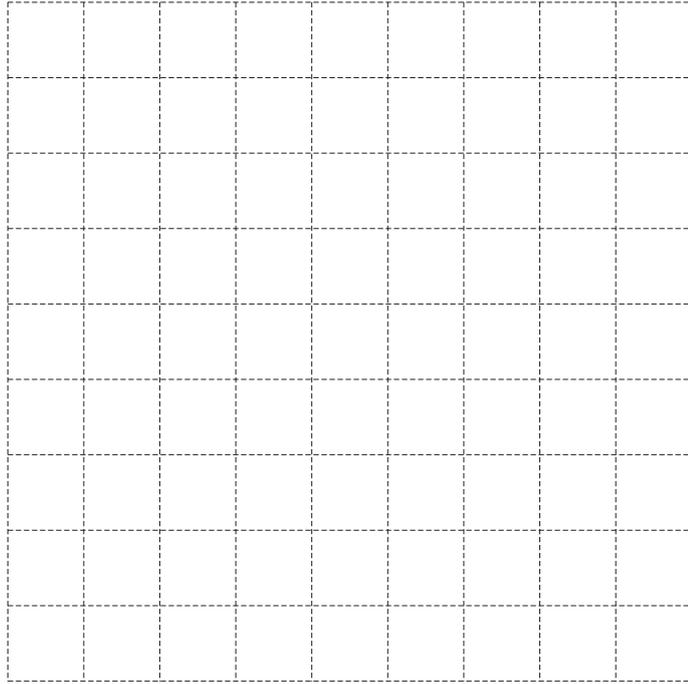
[1]

  **(b)** On the unit grid below, draw and label vector 2**q**.

[1]

**(c)** On the unit grid below, draw and label vector $\mathbf{p} - \mathbf{q}$.
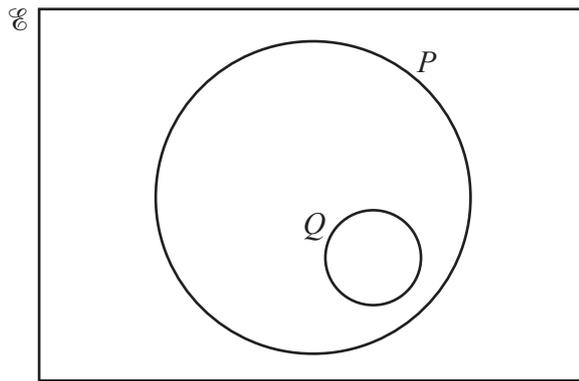
[2]

**17** The scale of a map is 2 cm to 1 km.
The area of a wood on the map is 6 cm$^2$.

Calculate the actual area of the wood in km$^2$.

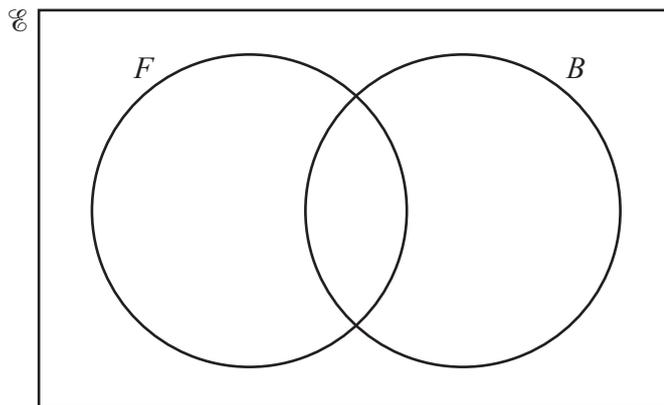.......................................... km$^2$ [2]

**[Turn over**

18 **(a)** In the Venn diagram, shade the region represented by $P \cap Q'$.
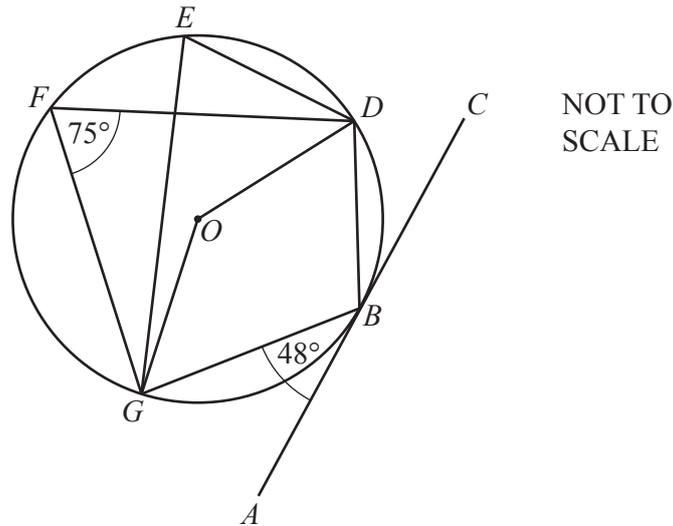


[1]

**(b)** A club has 32 members.
14 of the members are female and 18 of the members are male.
5 of the females have black hair.
6 of the males have black hair.

$\mathscr{E}$ = {members of the club}
$F$ = {females}
$B$ = {members with black hair}



Complete the Venn diagram to show this information. [2]

**19**



*B*, *D*, *E*, *F* and *G* are points on the circumference of a circle centre *O*.
*AC* is a tangent to the circle at *B*.
Angle *DFG* = 75° and angle *ABG* = 48°.

**(a)** Find angle *DEG*.

Angle *DEG* = .................................................. [1]

**(b)** Find angle *DOG*.

Angle *DOG* = .................................................. [1]

**(c)** Find angle *DBC*.

Angle *DBC* = .................................................. [2]

**20** $$f(x) = \frac{6x+2}{5}$$

**(a)** Find f(3).

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

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

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

**21** $y$ is inversely proportional to $(x+1)^2$.

Given that $y = 2$ when $x = 3$, find $y$ when $x = 9$.

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

**22** Factorise.

**(a)** $5ax - 3ay - 10cx + 6cy$

.................................................. [2]

**(b)** $15x^2 - 7x - 4$

.................................................. [2]

**23** $$y = \frac{3x + 2}{2x - 1}$$

Rearrange the formula to make $x$ the subject.

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

**24**        $\mathbf{M} = \begin{pmatrix} 1 & 0 \\ 4 & 3 \end{pmatrix}$       $\mathbf{N} = \begin{pmatrix} k & 0 \\ 1 & 4 \end{pmatrix}$

Given that $\mathbf{MN} = \mathbf{NM}$, find the value of $k$.

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

**25**
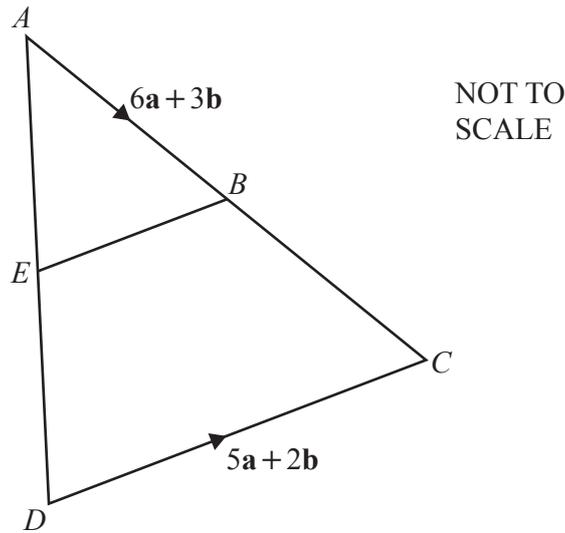


In triangle $ACD$, $B$ is the midpoint of $AC$ and $E$ is the midpoint of $AD$.
$\overrightarrow{AB} = 6\mathbf{a} + 3\mathbf{b}$ and $\overrightarrow{DC} = 5\mathbf{a} + 2\mathbf{b}$.

**(a)** Express, as simply as possible, in terms of **a** and **b**.

   **(i)** $\overrightarrow{AC}$

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

   **(ii)** $\overrightarrow{AD}$

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

**(b)** Show that $\overrightarrow{EB}$ is parallel to $\overrightarrow{DC}$.

..................................................................................................................................................

..................................................................................................................................................

..................................................................................................................................................

..................................................................................................................................................

..................................................................................................................................................

.............................................................................................................................................. [3]

**BLANK PAGE**