Cambridge Assessment International Education

# Cambridge IGCSE™

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*7001125135*

**MATHEMATICS** **0580/42**

Paper 4 (Extended) **October/November 2022**

**2 hours 30 minutes**

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.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For $\pi$, use either your calculator value or 3.142.

**INFORMATION**

- The total mark for this paper is 130.
- 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**

**1** **(a)** **(i)** At a football club, season tickets are sold for seated areas and for standing areas.
The cost of season tickets are in the ratio seated : standing = 5 : 3.
The cost of a season ticket for the standing area is $45.

Find the cost of a season ticket for the seated area.

$ ..... [2]

**(ii)** In 2021, the value of the team's players was $2.65 million.
In 2022 this value has decreased by 12%.

Find the value in 2022.

$ ..... million [2]

**(iii)** The number of people at a football match is 1455.
This is 6.25% of the total number of people allowed in the stadium.

Find the total number of people allowed in the stadium.

..... [2]

**(iv)** The average attendance increased exponentially by 4% each year for the three years from 2016 to 2019.
In 2019 the average attendance was 1631.

Find the average attendance for 2016.

..... [3]

**(b)** Another club sells season tickets for individuals and for families.
In 2018, the number of season tickets sold is in the ratio family : individual = 2 : 7.

**(i)** The number of family season tickets sold is $x$.

Write an expression, in terms of $x$, for the number of individual season tickets sold.

..... [1]

**(ii)** In 2019, the number of family season tickets sold increases by 12 and the number of individual season tickets sold decreases by 26.

Complete the table by writing expressions, in terms of $x$, for the number of tickets sold each year.

| Year | Family tickets | Individual tickets |
|---|---|---|
| 2018 | $x$ | |
| 2019 | | |

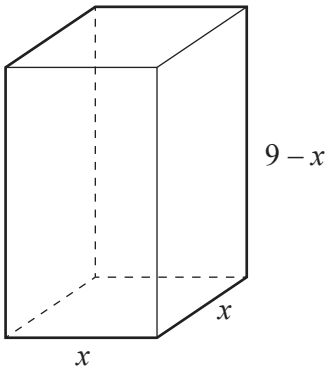
[2]

**(iii)** In 2019, the number of individual season tickets sold is 3 times the number of family season tickets sold.

Write an equation in $x$ and solve it to find the number of family tickets sold in 2018.

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

**2** All the lengths in this question are measured in centimetres.




NOT TO SCALE

The diagram shows a solid cuboid with a square base.

**(a)** The volume, $V\,\text{cm}^3$, of the cuboid is $V = x^2(9-x)$.
The table shows some values of $V$ for $0 \leqslant x \leqslant 9$.

| $x$ | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| $V$ | 0 | 8 | | 54 | 80 | 100 | 108 | 98 | 64 | 0 |

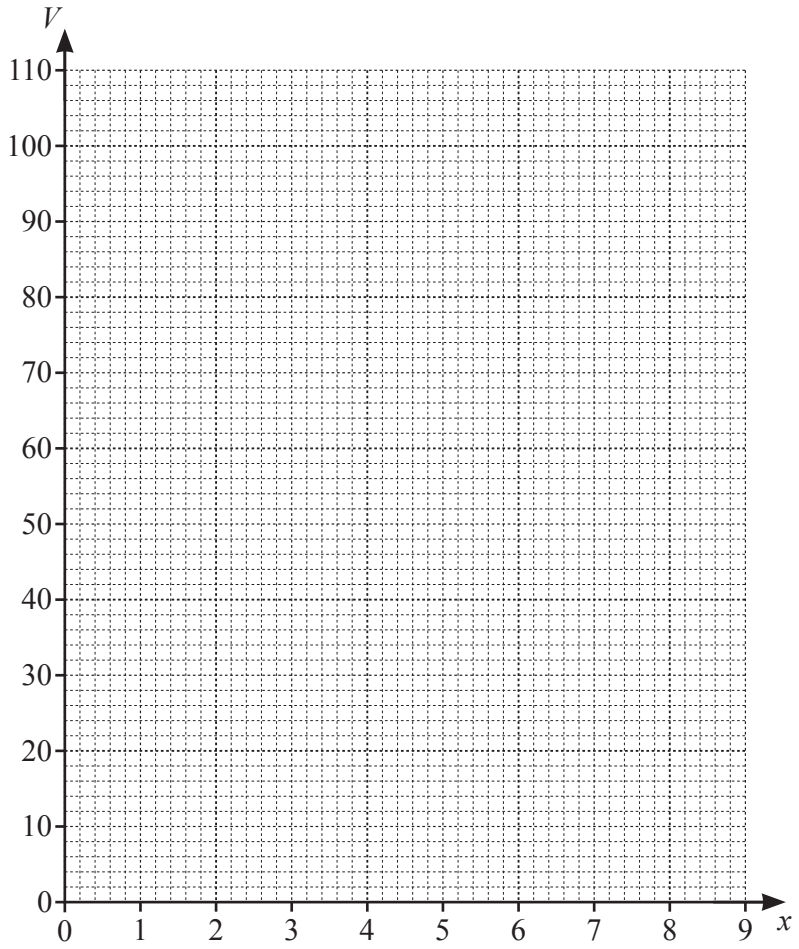
**(i)** Complete the table.

[1]

**(ii)** On the grid on the opposite page, draw the graph of $V = x^2(9-x)$ for $0 \leqslant x \leqslant 9$. [4]

**(iii)** Find the values of $x$ when the volume of the cuboid is $44\,\text{cm}^3$.

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




**(b) (i)** Show that the total surface area of the cuboid is $(36x - 2x^2)\text{cm}^2$.

[2]

**(ii)** Find the surface area when the volume of the cuboid is a maximum.

..... $\text{cm}^2$ [3]

**3** Kai and Ann carry out a survey on the distances travelled, in kilometres, by 200 cars.

Kai completes this frequency table for the data collected.

| Distance ($d$ km) | $80 < d \leqslant 100$ | $100 < d \leqslant 150$ | $150 < d \leqslant 200$ | $200 < d \leqslant 300$ | $300 < d \leqslant 400$ |
|---|---|---|---|---|---|
| Frequency | 7 | 33 | 76 | 52 | 32 |

**(a) (i)** Calculate an estimate of the mean.

..... km [4]

**(ii)** Ann uses this frequency table for the same data.
There is a different interval for the final group.

| Distance ($d$ km) | $80 < d \leqslant 100$ | $100 < d \leqslant 150$ | $150 < d \leqslant 200$ | $200 < d \leqslant 300$ | $300 < d \leqslant 360$ |
|---|---|---|---|---|---|
| Frequency | 7 | 33 | 76 | 52 | 32 |

Without calculating an estimate of the mean for this data, find the difference between Ann's and Kai's estimate of the mean.
You must show all your working.

..... km [2]

**(iii)** A histogram is drawn showing the information in **Kai's** frequency table.
The height of the block for the interval $200 < d \leqslant 300$ is 2.6 cm.

Calculate the height of the block for each of the following intervals.

$80 < d \leqslant 100$ ..... cm

$150 < d \leqslant 200$ ..... cm

$300 < d \leqslant 400$ ..... cm [3]

**(b)** One car is picked at random.

Find the probability that the car has travelled more than 300 km.

..... [1]

**(c)** Two of the 200 cars are picked at random.

Find the probability that

**(i)** both cars have travelled 150 km or less,

..... [2]

**(ii)** one car has travelled more than 200 km and the other car has travelled 100 km or less.

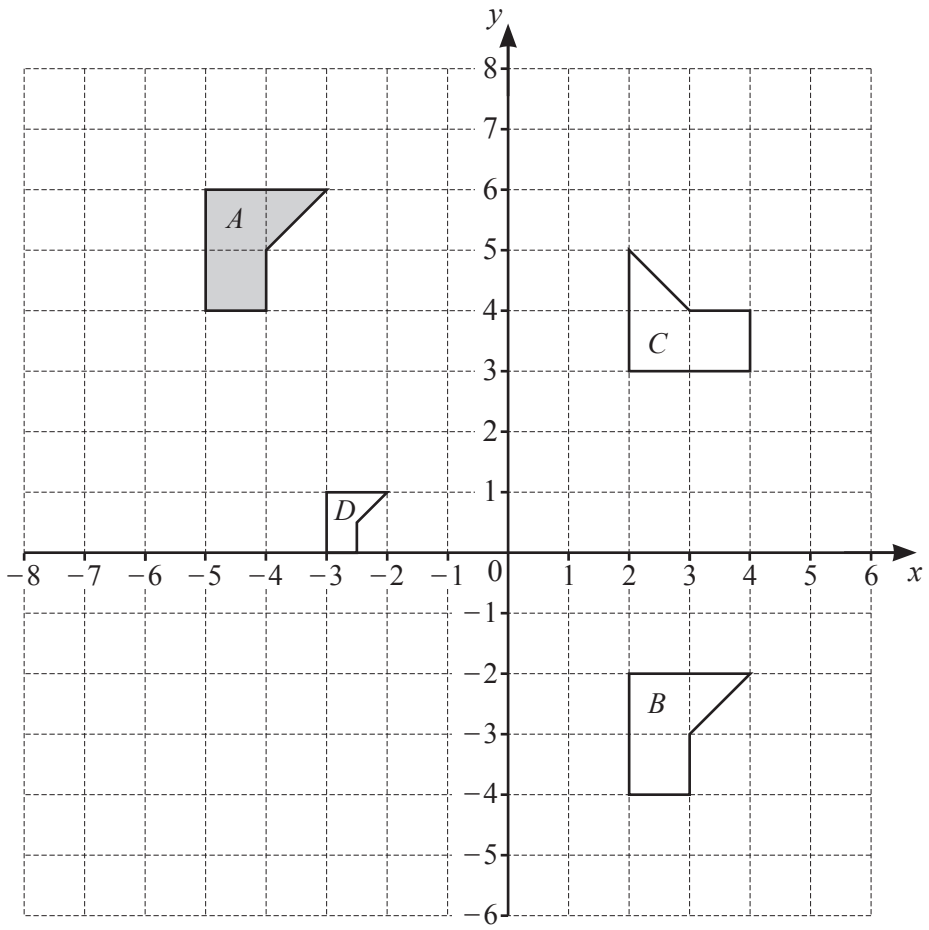
..... [3]





**[Turn over**

**4**




**(a)** Describe fully the **single** transformation that maps

**(i)** shape $A$ onto shape $B$,

.....

..... [2]

**(ii)** shape $A$ onto shape $C$,

.....

..... [3]

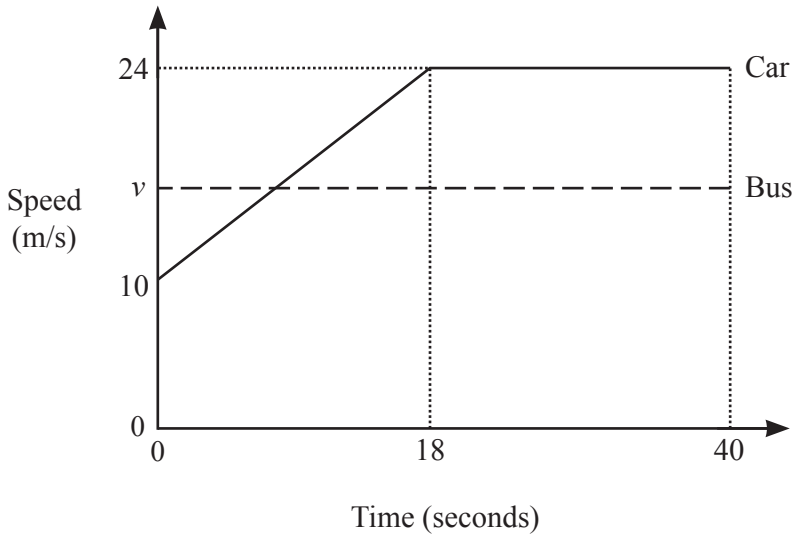
**(iii)** shape $A$ onto shape $D$.

.....

..... [3]

**(b)** On the grid, draw the image of shape $A$ after a reflection in the line $y = x + 8$. [2]

**5** **(a)** The diagram shows the speed–time graph for part of a journey for two vehicles, a car and a bus.




NOT TO SCALE

**(i)** Calculate the acceleration of the car during the first 18 seconds.

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

**(ii)** In the first 40 seconds the car travelled 134 m more than the bus.

Calculate the constant speed, $v$, of the bus.

$v$ = ..... m/s [4]

**(b)** A train takes 10 minutes 30 seconds to travel 16 240 m.

Calculate the average speed of the train.
Give your answer in kilometres per hour.

..... km/h [3]





**[Turn over**

**6** **(a)** Solve.

$$4x + 15 = 9$$

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

**(b)** Factorise.

$$a^2 - 9$$

..... [1]

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

$$\frac{4a}{5} \div \frac{3ad}{10c}$$

..... [3]

**(d)** $5^n + 5^n + 5^n + 5^n + 5^n = 5^m$

Find an expression for $m$ in terms of $n$.

$m =$ ..... [2]

**(e)** Solve by factorisation.

$$4x^2 + 8x - 5 = 0$$

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

**(f)** **(i)** $y$ is directly proportional to $(x+3)^3$.
When $x = 2,\ y = 13.5$ .

Find $x$ when $y = 108$.

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

**(ii)** $g$ is inversely proportional to the square of $d$.
When $d$ is halved, the value of $g$ is multiplied by a factor $n$.

Find $n$.

$n =$ ..... [2]

**(g)** Expand and simplify.

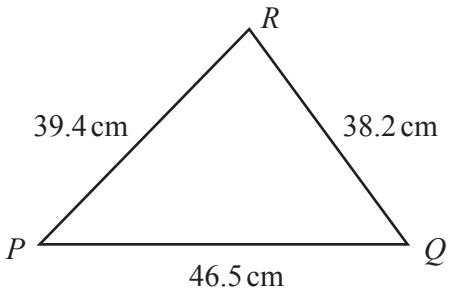
$$(2x+3)(x-1)(x+3)$$

..... [3]

**(h)** Find the derivative, $\frac{\mathrm{d}y}{\mathrm{d}x}$, of $y = 3x^2 + 4x - 1$.

..... [2]

**7** **(a)**




NOT TO SCALE

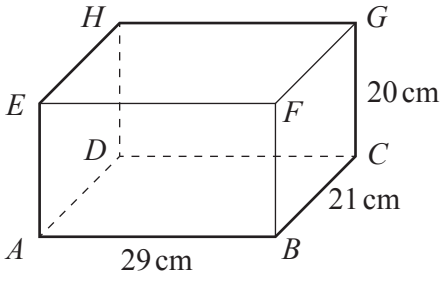
**(i)** Calculate angle $QPR$.

Angle $QPR$ = ..... [4]

**(ii)** Find the shortest distance from $Q$ to $PR$.

..... cm [3]

**(b)** The diagram shows a cuboid.




NOT TO SCALE

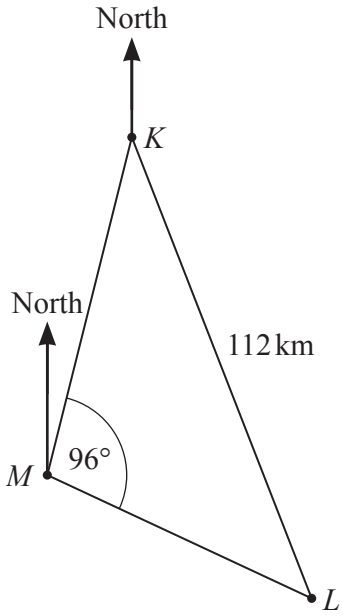
**(i)** Calculate the length $AG$.

$AG$ = ..... cm [3]

**(ii)** Calculate the angle between $AG$ and the base $ABCD$.

..... [3]

**(c)**




NOT TO SCALE

The diagram shows the positions of a lighthouse, $L$, and two ships, $K$ and $M$.
The bearing of $L$ from $K$ is 155° and $KL = 112\,\text{km}$.
The bearing of $K$ from $M$ is 010° and angle $KML = 96°$.

Find the bearing and distance of ship $M$ from the lighthouse, $L$.

Bearing .....

Distance ..... km [5]

**8** $AB$ is a line with midpoint $M$.
$A$ is the point (2, 3) and $M$ is the point (12, 7).

**(a)** Find the coordinates of $B$.

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

**(b)** Show that the equation of the perpendicular bisector of $AB$ is $2y + 5x = 74$.

[4]

**(c)** The perpendicular bisector of $AB$ passes through the point $N$.
The point $N$ has coordinates $(2, n)$.

Find the value of $n$.

$n =$ ..... [1]

**(d)** Points $A$, $M$ and $N$ form a triangle.

Find the area of the triangle.

..... [2]

**9**


**(a)** On the diagram, sketch the graph of $y = \sin x$ for $0° \leqslant x \leqslant 360°$. [2]

**(b)** Solve the equation $5\sin x + 4 = 0$ for $0° \leqslant x \leqslant 360°$.

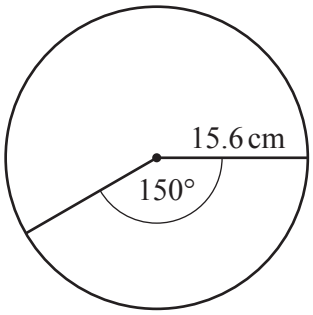
$x =$ ..... or $x =$ ..... [3]

**10** **(a)** The lengths of the sides of a triangle are 11.4 cm, 14.8 cm and 15.7 cm, all correct to 1 decimal place.

Calculate the upper bound of the perimeter of the triangle.

..... cm [2]

**(b)**



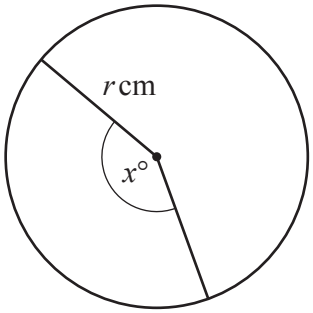

NOT TO SCALE

The diagram shows a circle, radius 15.6 cm.
The angle of the minor sector is 150°.

Calculate the area of the minor sector.

..... $cm^2$ [2]

**(c)**




NOT TO SCALE

The diagram shows a circle, radius $r$ cm and minor sector angle $x°$.
The **perimeter** of the major sector is three times the **perimeter** of the minor sector.

Show that $x = \dfrac{90(\pi - 2)}{\pi}$.

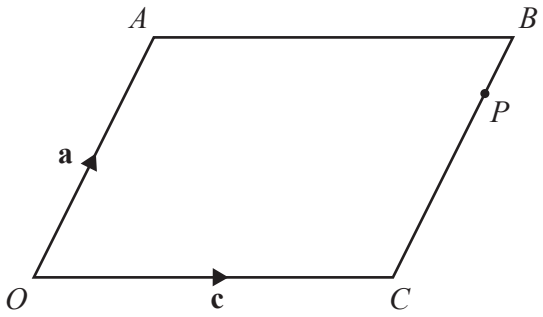
[4]

**11** **(a)** $\left|\begin{pmatrix} 9m \\ 40m \end{pmatrix}\right| = \frac{205}{2}$

Find the two possible values of $m$.

$m =$ ..... or ..... [3]

**(b)**




NOT TO SCALE

$OABC$ is a parallelogram.
$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OC} = \mathbf{c}$.
$P$ is the point on $CB$ such that $CP : PB = 3 : 1$.

**(i)** Find, in terms of **a** and/or **c**, in their simplest form,

**(a)** $\overrightarrow{AC}$,

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

**(b)** $\overrightarrow{CP}$,

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

**(c)** $\overrightarrow{OP}$.

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

**(ii)** $OP$ and $AB$ are extended to meet at $Q$.

Find the position vector of $Q$.

..... [2]

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