

# Cambridge IGCSE™

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## 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.

- 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 |                |                    |

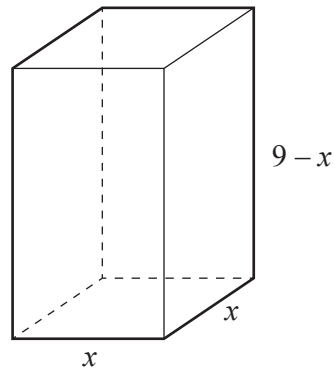
[2]

- (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  $0 \leq x \leq 9$ .

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

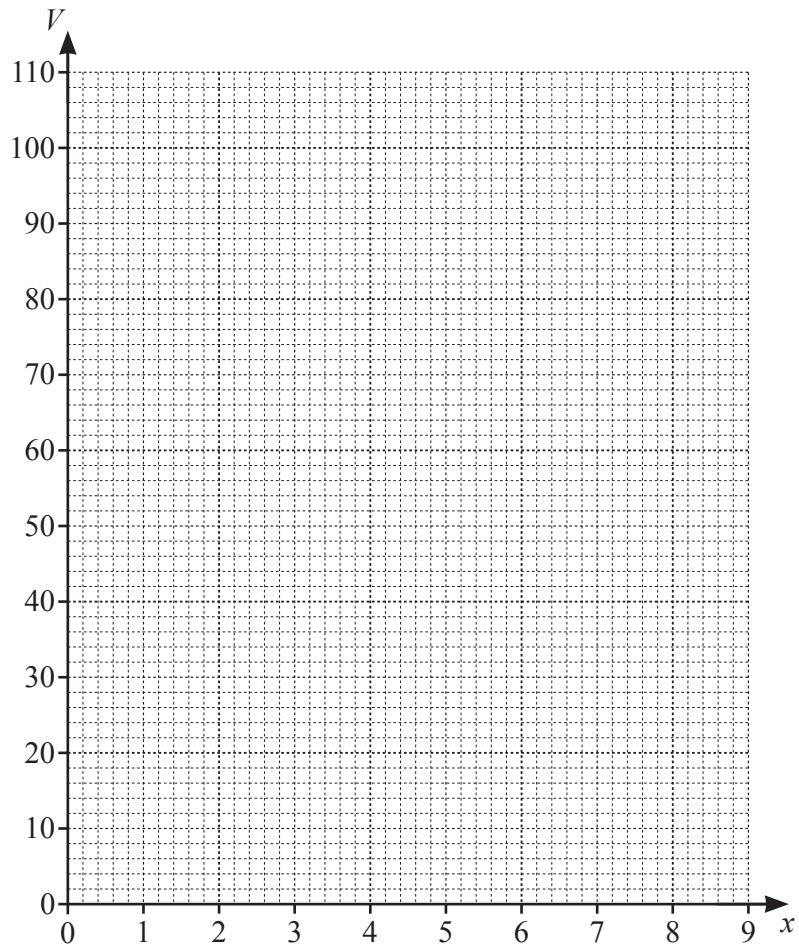
- (i) Complete the table.

[1]

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

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

$x = \dots\dots\dots$  or  $x = \dots\dots\dots$  [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) | $80 < d \leq 100$ | $100 < d \leq 150$ | $150 < d \leq 200$ | $200 < d \leq 300$ | $300 < d \leq 400$ |
| 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) | $80 < d \leq 100$ | $100 < d \leq 150$ | $150 < d \leq 200$ | $200 < d \leq 300$ | $300 < d \leq 360$ |
| 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  $200 < d \leq 300$  is 2.6 cm.

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

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

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

$300 < d \leq 400$  ..... 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.

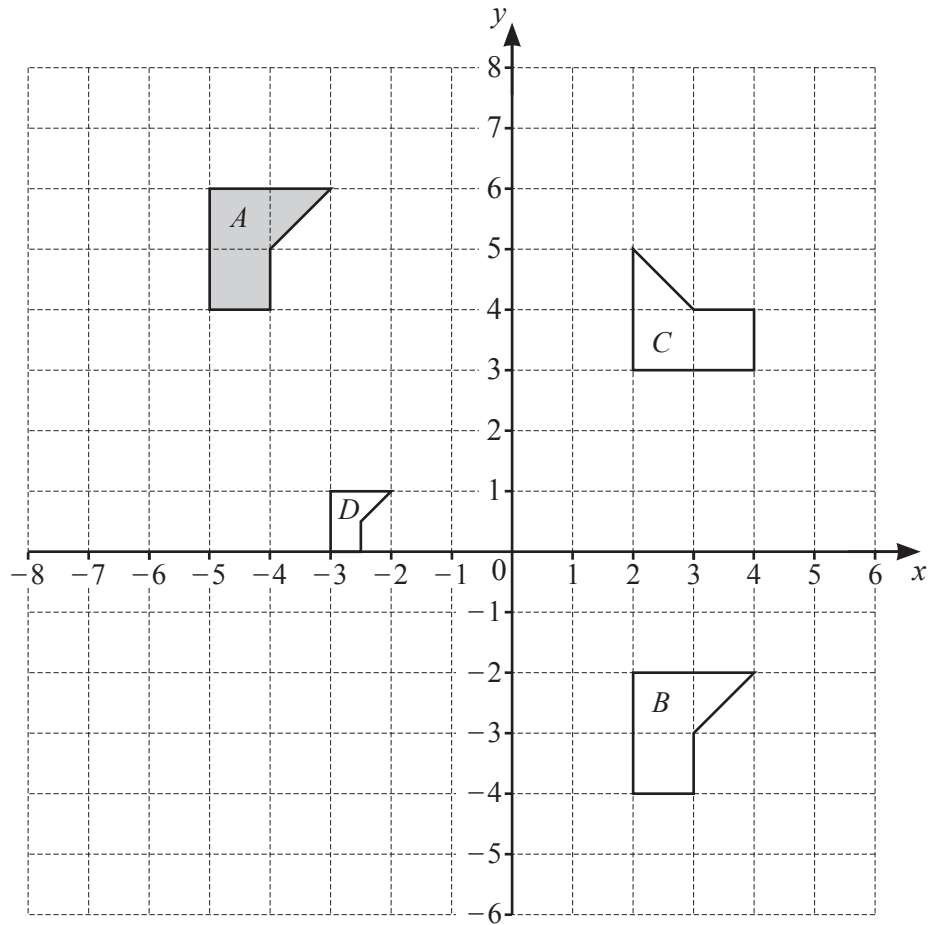
Find the probability that

- (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]



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

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

..... [2]

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

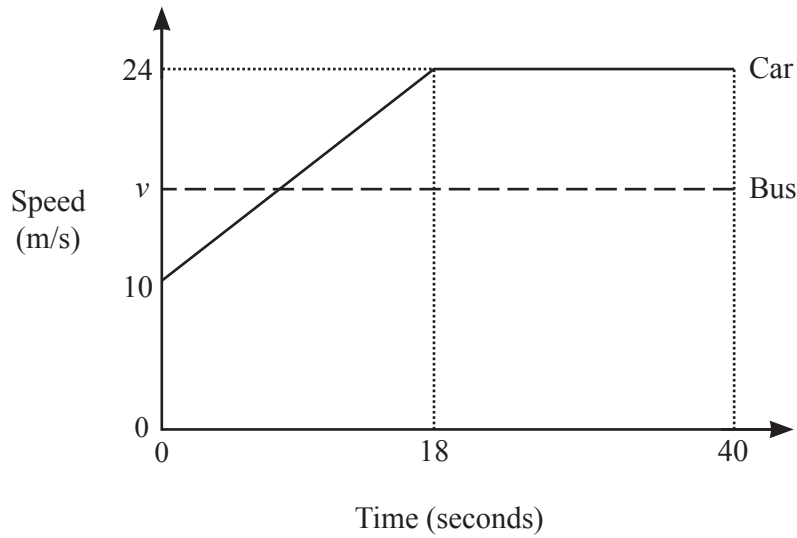
..... [3]

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

.....  $\text{m/s}^2$  [1]

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

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

$v =$  .....  $\text{m/s}$  [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.

.....  $\text{km/h}$  [3]

- 6 (a) Solve.

$$4x + 15 = 9$$

$$x = \dots\dots\dots [2]$$

- (b) Factorise.

$$a^2 - 9$$

$$\dots\dots\dots [1]$$

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

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

$$\dots\dots\dots [3]$$

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

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

$$m = \dots\dots\dots [2]$$

- (e) Solve by factorisation.

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

$$x = \dots\dots\dots \text{ or } x = \dots\dots\dots [3]$$

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

Find  $x$  when  $y = 108$ .

$x = \dots\dots\dots$  [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  $n$ .

$n = \dots\dots\dots$  [2]

- (g) Expand and simplify.

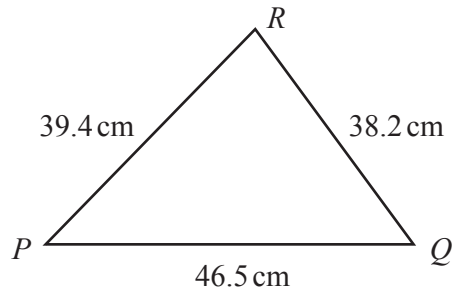
$$(2x+3)(x-1)(x+3)$$

$\dots\dots\dots$  [3]

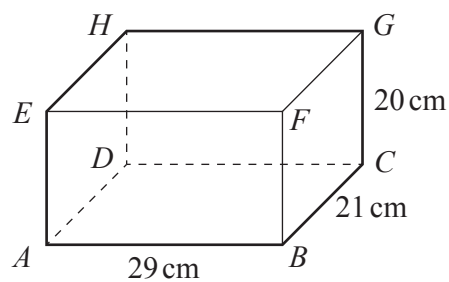
- (h) Find the derivative,  $\frac{dy}{dx}$ , of  $y = 3x^2 + 4x - 1$ .

$\dots\dots\dots$  [2]

7 (a)

NOT TO  
SCALE(i) Calculate angle  $QPR$ .Angle  $QPR = \dots\dots\dots$  [4](ii) Find the shortest distance from  $Q$  to  $PR$ . $\dots\dots\dots$  cm [3]

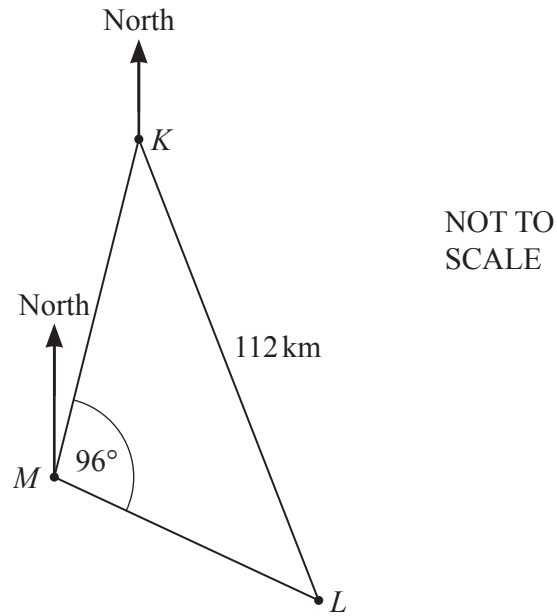
(b) The diagram shows a cuboid.

NOT TO  
SCALE(i) Calculate the length  $AG$ . $AG = \dots\dots\dots$  cm [3]

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

..... [3]

(c)



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

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  $n$ .

$n = \dots\dots\dots$  [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  $0^\circ \leq x \leq 360^\circ$ . [2]

(b) Solve the equation  $5 \sin x + 4 = 0$  for  $0^\circ \leq x \leq 360^\circ$ .

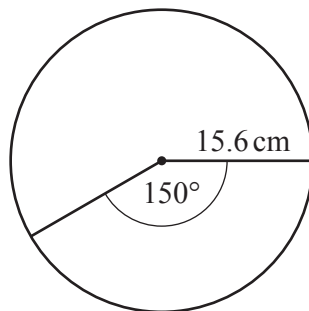
$x = \dots\dots\dots$  or  $x = \dots\dots\dots$  [3]

- 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)**



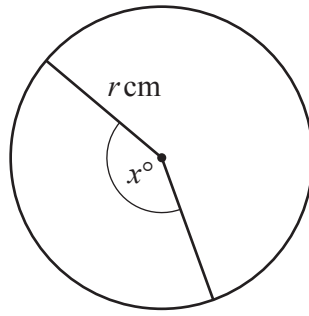
NOT TO  
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The diagram shows a circle, radius 15.6 cm.  
The angle of the minor sector is  $150^\circ$ .

Calculate the area of the minor sector.

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

(c)

NOT TO  
SCALE

The diagram shows a circle, radius  $r \text{ cm}$  and minor sector angle  $x^\circ$ .

The **perimeter** of the major sector is three times the **perimeter** of the minor sector.

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

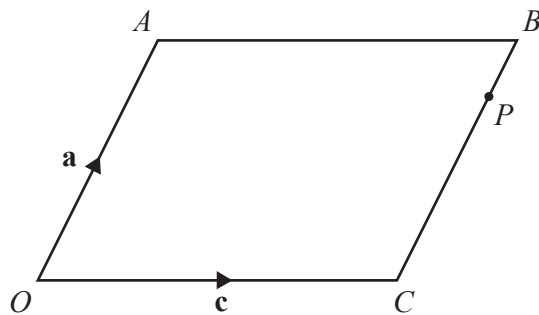
[4]

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

Find the two possible values of  $m$ .

$m = \dots\dots\dots$  or  $\dots\dots\dots$  [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  $\mathbf{a}$  and/or  $\mathbf{c}$ , in their simplest form,

(a)  $\overrightarrow{AC}$ ,

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

(b)  $\overrightarrow{CP}$ ,

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

(c)  $\overrightarrow{OP}$ .

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

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

Find the position vector of  $Q$ .

..... [2]

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