



# Cambridge IGCSE™

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**CAMBRIDGE INTERNATIONAL MATHEMATICS**

**0607/31**

Paper 3 (Core)

**October/November 2023**

**1 hour 45 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 graphic display calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly and you will be given marks for correct methods, including sketches, even if your answer is incorrect.
- 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 your calculator value.

## INFORMATION

- The total mark for this paper is 96.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **16** pages.

**Formula List**

Area,  $A$ , of triangle, base  $b$ , height  $h$ .  $A = \frac{1}{2}bh$

Area,  $A$ , of circle, radius  $r$ .  $A = \pi r^2$

Circumference,  $C$ , of circle, radius  $r$ .  $C = 2\pi r$

Curved surface area,  $A$ , of cylinder of radius  $r$ , height  $h$ .  $A = 2\pi rh$

Curved surface area,  $A$ , of cone of radius  $r$ , sloping edge  $l$ .  $A = \pi rl$

Curved surface area,  $A$ , of sphere of radius  $r$ .  $A = 4\pi r^2$

Volume,  $V$ , of prism, cross-sectional area  $A$ , length  $l$ .  $V = Al$

Volume,  $V$ , of pyramid, base area  $A$ , height  $h$ .  $V = \frac{1}{3}Ah$

Volume,  $V$ , of cylinder of radius  $r$ , height  $h$ .  $V = \pi r^2 h$

Volume,  $V$ , of cone of radius  $r$ , height  $h$ .  $V = \frac{1}{3}\pi r^2 h$

Volume,  $V$ , of sphere of radius  $r$ .  $V = \frac{4}{3}\pi r^3$

Answer **all** the questions.

- 1 (a) Write eighty thousand five hundred and two in figures.

..... [1]

- (b) Write 0.63 as a fraction.

..... [1]

- (c) Work out  $7.1^3$ .

Give your answer correct to the nearest 10.

..... [2]

- (d) Work out  $\frac{9.84}{2.16 \times 4.12}$ .

Give your answer correct to 4 significant figures.

..... [2]

- (e) Find the next two terms in this sequence.

8      15      22      29

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

- (f) Ahmed buys 8 roses each costing \$2.20.

- (i) Work out how much he pays for the 8 roses.

\$ ..... [1]

- (ii) Work out how much change he receives from \$20.

\$ ..... [1]

- (g) Find the lowest common multiple (LCM) and the highest common factor (HCF) of 14 and 21.

LCM = .....

HCF = ..... [3]

2 The ages, in years, of 15 teachers are shown below.

38 62 51 42 49 24 31 46  
60 58 29 36 38 48 54

(a) Draw a stem-and-leaf diagram for the 15 ages.


Key .....|..... = ..... [3]

(b) Find

(i) the mode

..... years [1]

(ii) the median

..... years [1]

(iii) the interquartile range

..... years [2]

(iv) the mean.

..... years [1]

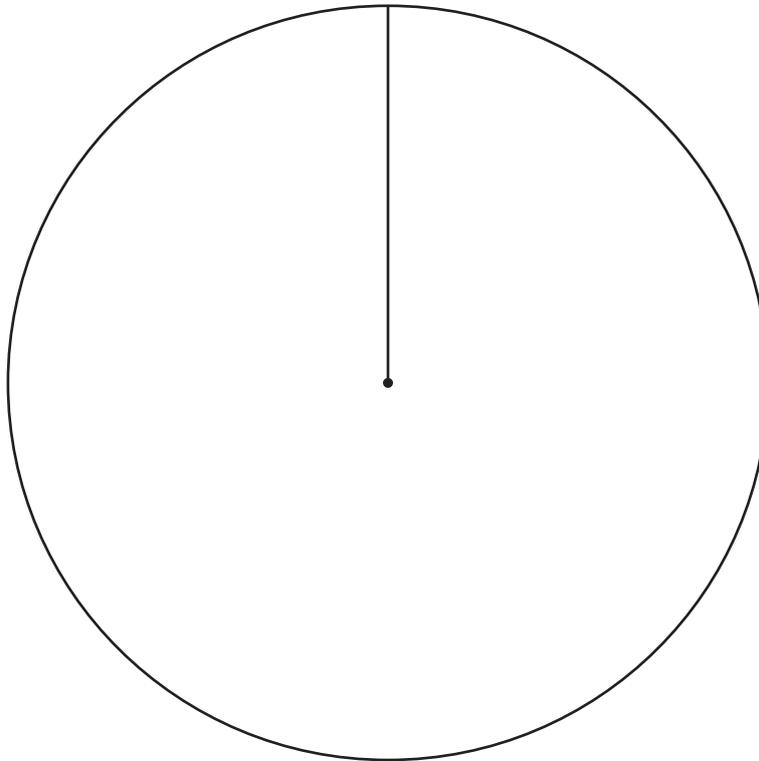
- 3 (a) Bettica invests \$12 000 at a rate of 1.8% per year simple interest.

Calculate the value of Bettica's investment at the end of 4 years.

\$ ..... [3]

- (b) Melanie has \$240.  
She spends \$50 on books, \$110 on food and \$80 on clothes.

Draw and label a pie chart to show this information.



[4]

- 4 (a) The Monaco Grand Prix is a car race.  
The cars race around a circuit.  
The length of one circuit is 3.337 kilometres.  
The drivers each complete 78 circuits in the race.

(i) Work out the total distance of the race.

..... km [1]

(ii) One driver completes one circuit at an average speed of 162 km/h.

Find the time taken.

Give your answer in minutes and seconds.

..... min ..... s [3]

(b) One car reaches a speed of 290 km/h.

Change 290 km/h to m/s.

..... m/s [2]

(c) The cost of entry to watch the race was \$450.  
The total amount collected was \$90 million.

Work out the number of people who paid to watch the race.

..... [2]

5 Marius, Silvia and Greta each roll fair six-sided dice numbered 1 to 6.

(a) Marius rolls one die.

Find the probability that he rolls a 4.

..... [1]

(b) Silvia rolls two dice.

Find the probability that she rolls a 6 on both dice.

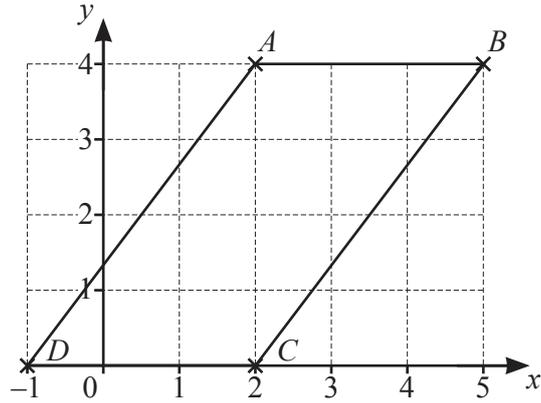
..... [2]

(c) Greta rolls one die 300 times.

Find the expected number of times that she rolls a 5.

..... [2]

6



The diagram shows quadrilateral  $ABCD$  drawn on a  $1\text{ cm}^2$  grid.

(a) Write down the coordinates of point  $B$  and point  $C$ .

$B$  (..... , .....) )

$C$  (..... , .....) [2]

(b) Write down the mathematical name for the quadrilateral.

..... [1]

(c) Work out the area of the quadrilateral.

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

(d) Write down the number of lines of symmetry of the quadrilateral.

..... [1]

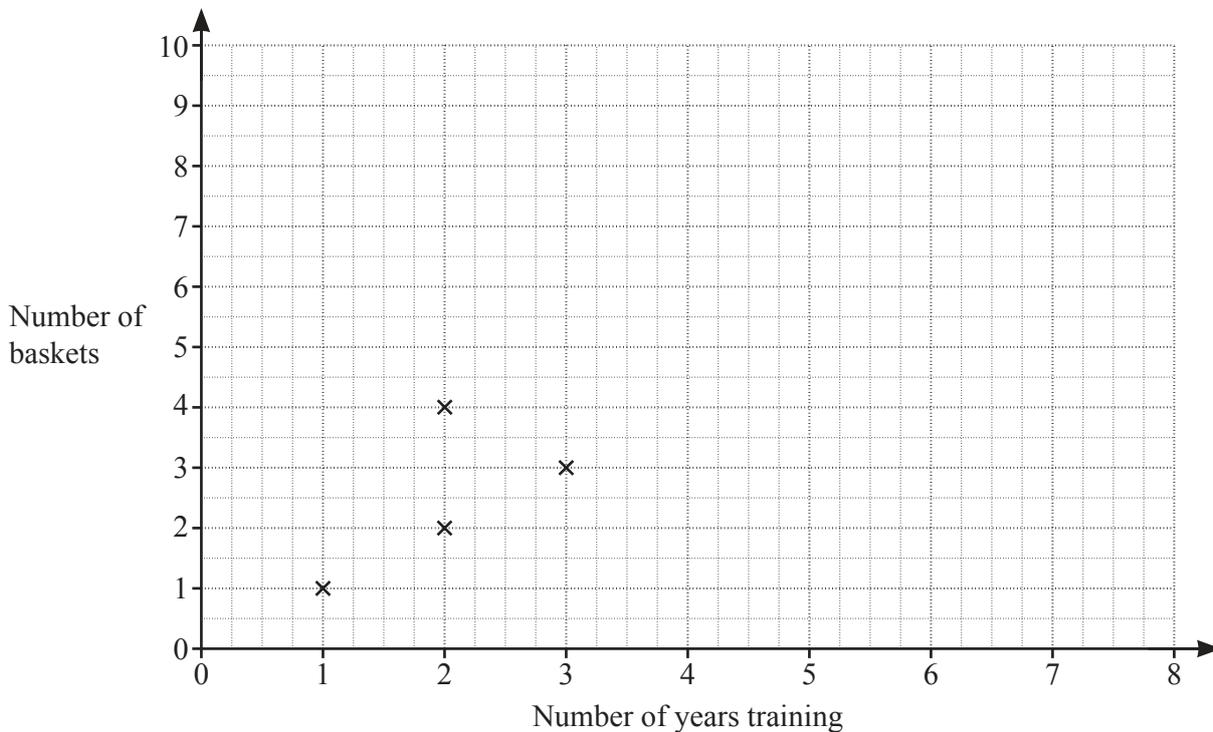
(e) Write down the order of rotational symmetry of the quadrilateral.

..... [1]

- 7 Eight students play basketball.  
 They each have ten attempts to score a basket.  
 The number of years training and the number of baskets scored are shown in the table.

Student	A	B	C	D	E	F	G	H
Number of years training	1	2	2	3	3	4	7	8
Number of baskets	1	2	4	3	5	7	8	10

- (a) Complete the scatter diagram.  
 The first 4 points have been plotted for you.



[2]

- (b) What type of correlation is shown in the scatter diagram?

..... [1]

- (c) The mean number of years training is 3.75 and the mean number of baskets scored is 5.

On the diagram, draw a line of best fit.

[2]

- (d) Use your line of best fit to estimate the number of baskets scored by a student with 5 years training.

..... [1]

- 8 Adil is an electrician.  
He works out the total amount that he charges his customers using this formula.

Total amount = hourly rate  $\times$  number of hours worked + fixed call-out fee

- (a) Adil's hourly rate is \$50 and the fixed call-out fee is \$85.

- (i) He works for one customer for 6 hours.

Find the total amount he charges that customer.

\$ ..... [2]

- (ii) Adil works in Sahdna's house.  
He charges Sahdna \$460.

Work out how many hours Adil worked for Sahdna.

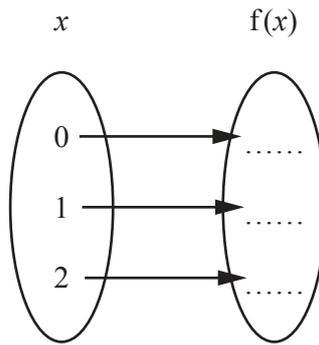
..... h [2]

- (b)  $T = rn + F$

Rearrange the formula to make  $r$  the subject.

$r =$  ..... [2]

9 (a) Complete the mapping diagram for  $f(x) = 3x - 1$ .



[2]

(b) Solve.

(i)  $\frac{x}{3} = 6$

$x = \dots\dots\dots$  [1]

(ii)  $6x - 4 = 12 - 2x$

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

(c) Complete this statement using one of  $>$  or  $<$  or  $=$ .

$(-2)^3 \dots\dots\dots (-2)^4$  [1]

(d) Factorise completely.

$6y^2 - 3y$

$\dots\dots\dots$  [2]

(e) Find each value of  $x$ .

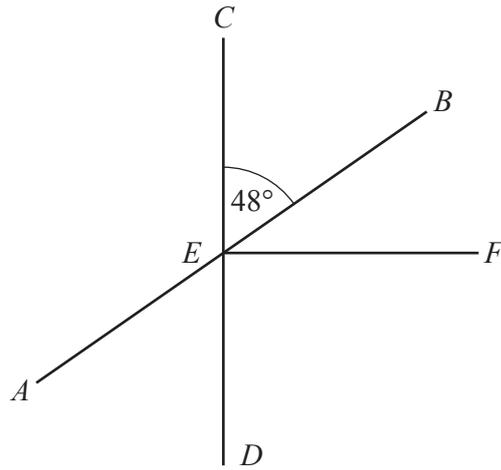
(i)  $2^x \times 2^5 = 2^{10}$

$x = \dots\dots\dots$  [1]

(ii)  $\frac{a^6}{a^x} = a^2$

$x = \dots\dots\dots$  [1]

10 (a)

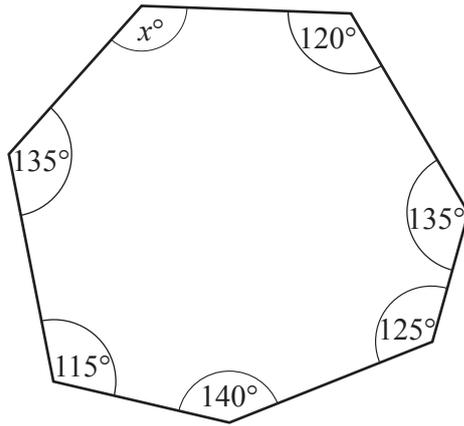
NOT TO  
SCALE

$AB$  and  $CD$  are straight lines that intersect at  $E$ .  
 $EF$  is perpendicular to  $CD$  and angle  $CEB = 48^\circ$ .

Find

(i) angle  $DEF$ Angle  $DEF = \dots\dots\dots$  [1](ii) angle  $AED$ Angle  $AED = \dots\dots\dots$  [1](iii) angle  $BEF$ Angle  $BEF = \dots\dots\dots$  [1](iv) angle  $CEA$ .Angle  $CEA = \dots\dots\dots$  [1]

(b)

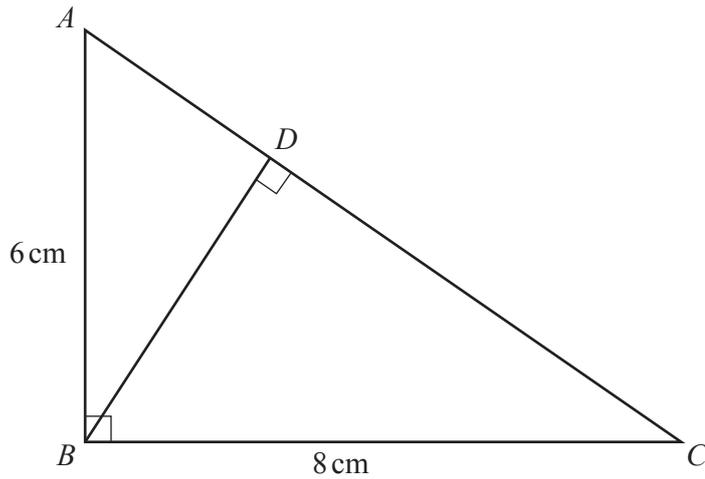
NOT TO  
SCALE

The diagram shows a seven-sided polygon.

Work out the value of  $x$ .

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

11

NOT TO  
SCALE

$ABC$  is a right-angled triangle.  
 $BDC$  is a right angle.

(a) Work out the area of triangle  $ABC$ .

.....  $\text{cm}^2$  [1]

(b) Use Pythagoras' Theorem to work out the length of  $AC$ .

$AC =$  .....  $\text{cm}$  [2]

(c) Use your answers to **part (a)** and **part (b)** to work out the length of  $BD$ .

$BD =$  .....  $\text{cm}$  [2]

12 A solid sphere has a surface area of  $581 \text{ cm}^2$ .

(a) Show that the radius of the sphere is 6.8 cm, correct to 1 decimal place.

[2]

(b) Work out the volume of the sphere.

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

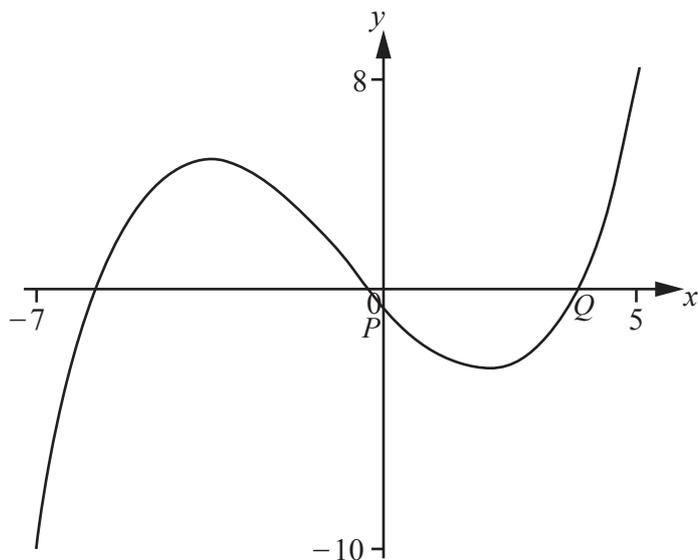
(c) A solid cube has the same volume as this sphere.

Find the length of one edge of this cube.

..... cm [2]

**Question 13 is printed on the next page.**

13



NOT TO  
SCALE

The diagram shows a sketch of the graph of  $y = 0.1x^3 + 0.25x^2 - 2x - 1$  for  $-7 \leq x \leq 5$ . Two points,  $P$  and  $Q$ , are also marked.

Draw the graph of  $y = 0.1x^3 + 0.25x^2 - 2x - 1$  on your calculator and use it to answer the following questions.

(a) Find the coordinates of point  $P$  and point  $Q$ .

$P = (\dots\dots\dots, \dots\dots\dots)$

$Q = (\dots\dots\dots, \dots\dots\dots)$  [2]

(b) Find the coordinates of

(i) the local maximum point

$(\dots\dots\dots, \dots\dots\dots)$  [2]

(ii) the local minimum point.

$(\dots\dots\dots, \dots\dots\dots)$  [2]

(c) The line  $y = a$  intercepts the graph of  $y = 0.1x^3 + 0.25x^2 - 2x - 1$  at 3 points.

Complete the range of values for  $a$ .

$\dots\dots\dots < a < \dots\dots\dots$  [2]

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