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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 π , 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]

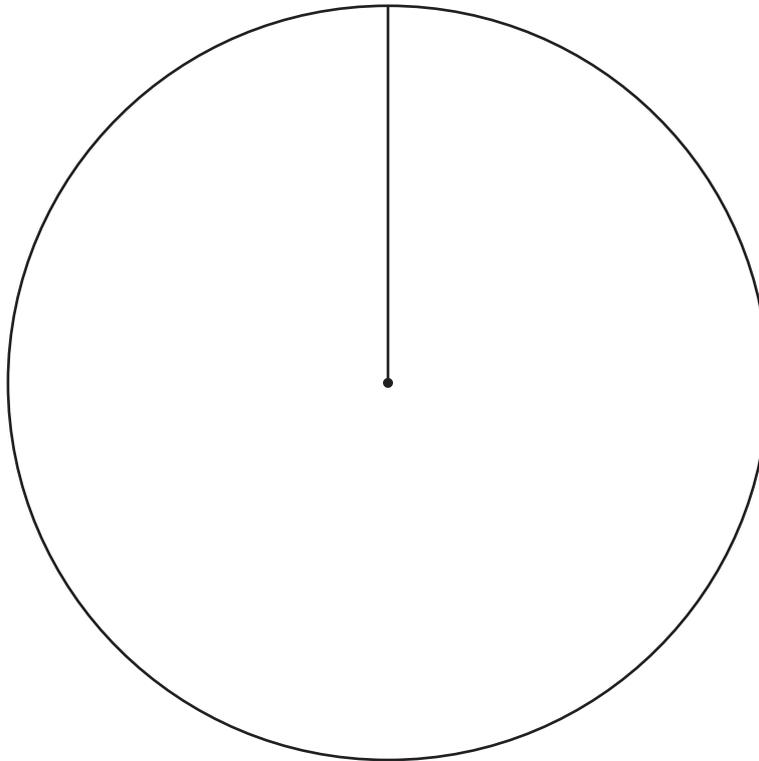
- 3 (a) Bettica invests \$12 000 at a rate of 1.8% per year simple interest.

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.

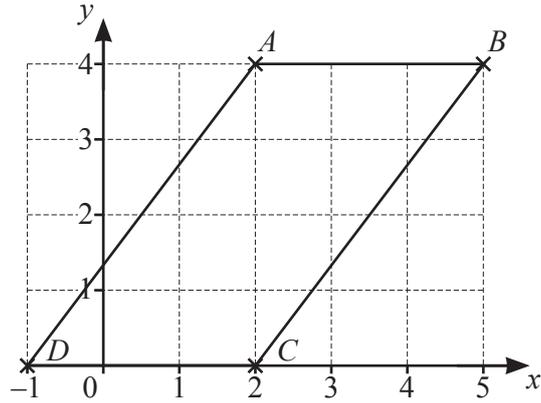
..... [2]

(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 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.

..... cm^2 [2]

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

..... [1]

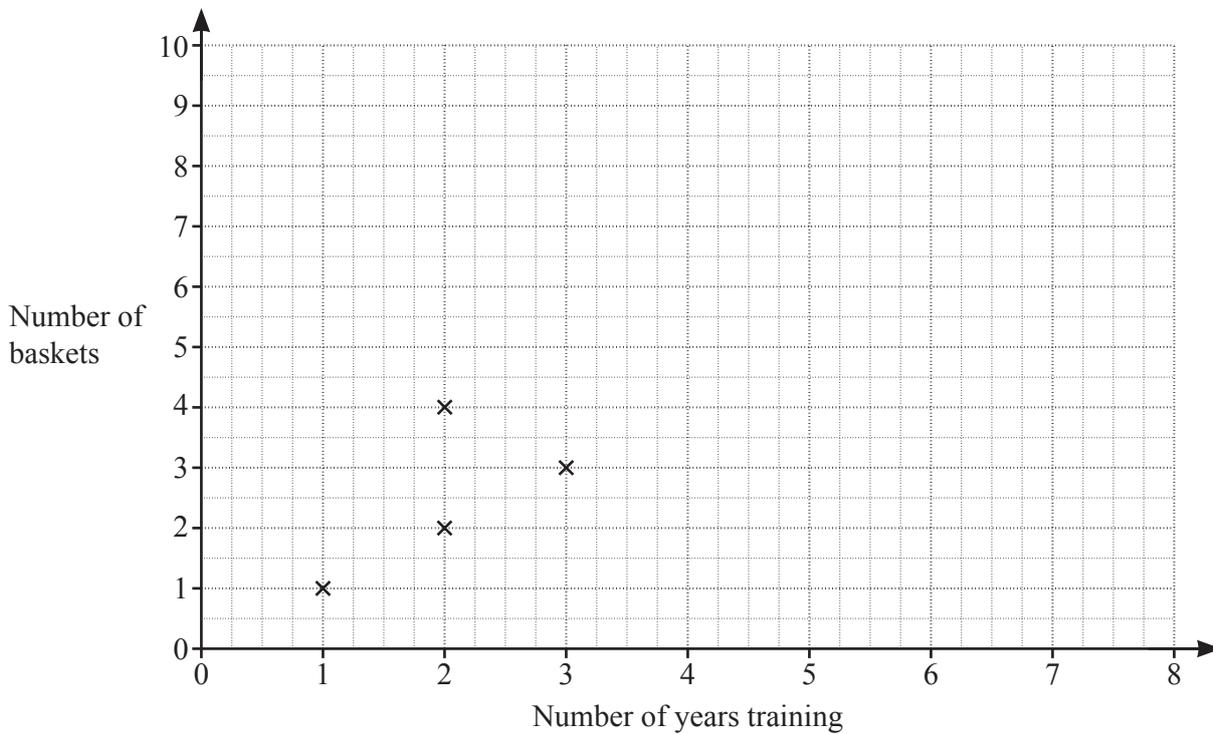
(e) Write down the order of rotational symmetry of the quadrilateral.

..... [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.

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

- (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.

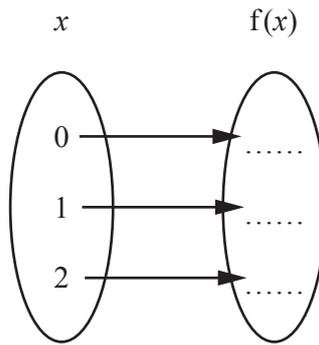
..... h [2]

- (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 .

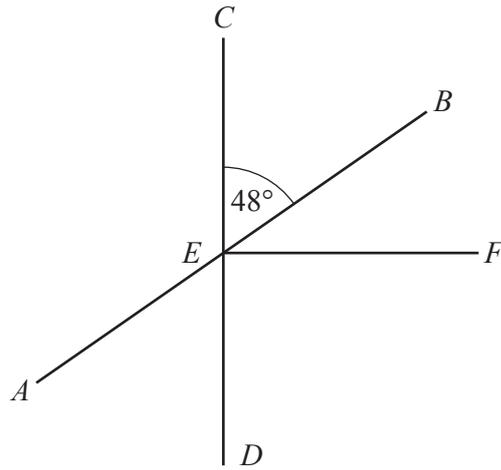
(i) $2^x \times 2^5 = 2^{10}$

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

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

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

10 (a)

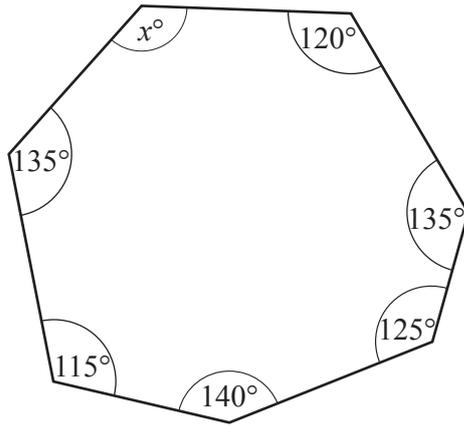
NOT TO
SCALE

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)

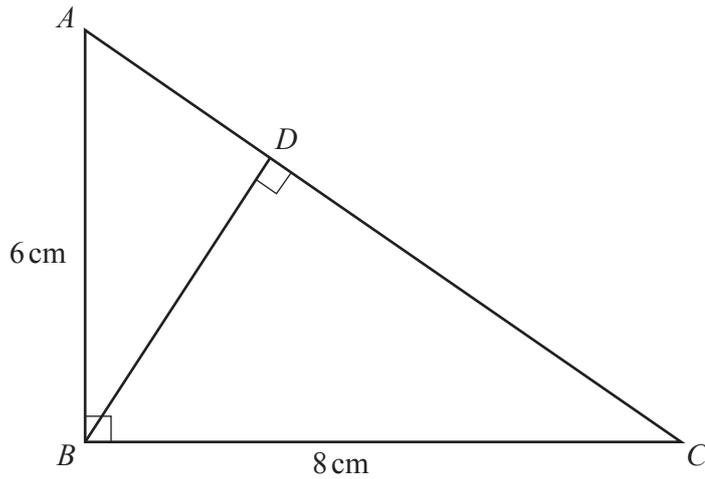
NOT TO
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The diagram shows a seven-sided polygon.

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 .

..... cm^2 [1]

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

$AC =$ cm [2]

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

$BD =$ cm [2]

12 A solid sphere has a surface area of 581 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.

..... cm^3 [2]

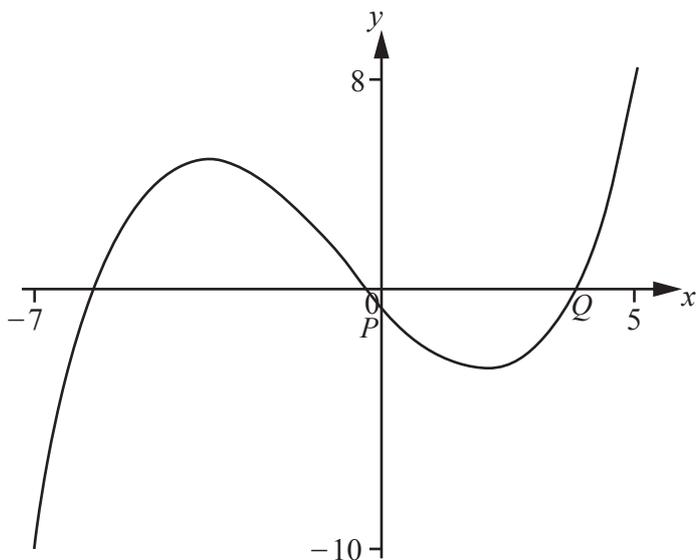
(c) A solid cube has the same volume as this sphere.

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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