Cambridge Assessment International Education

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7435356855

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/42**

Paper 4 (Extended) **May/June 2023**

2 hours 15 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 120.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

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Formula List

For the equation $ax^2 + bx + c = 0$ $\quad x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

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

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

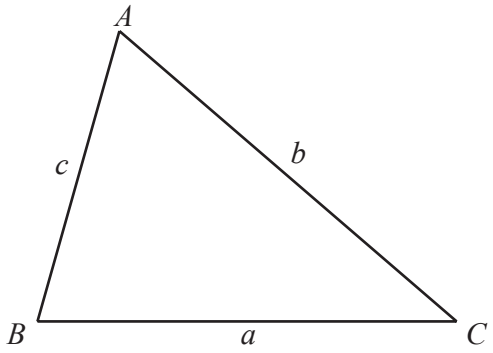
Curved surface area, A, of sphere of radius r. $\quad A = 4\pi r^2$

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

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

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

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



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$\text{Area} = \frac{1}{2}bc\sin A$$

Answer **all** the questions.

1 For each of these sequences, find the next term and an expression for the nth term.

(a) 17 14 11 8 5 …

next term .....

nth term ..... [3]

(b) $\frac{1}{2}$ $\frac{2}{3}$ $\frac{3}{4}$ $\frac{4}{5}$ $\frac{5}{6}$ …

next term .....

nth term ..... [2]

(c) 4 8 16 32 64 …

next term .....

nth term ..... [3]

(d) -2 5 24 61 122 …

next term .....

nth term ..... [3]

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2 The population of a species of bird is estimated to be decreasing by 4% per year.
At the end of 2020 the population was 4.32 million.

(a) Find the population at the end of 2019.

..... million [2]

(b) Calculate an estimate for the population at the end of 2025.

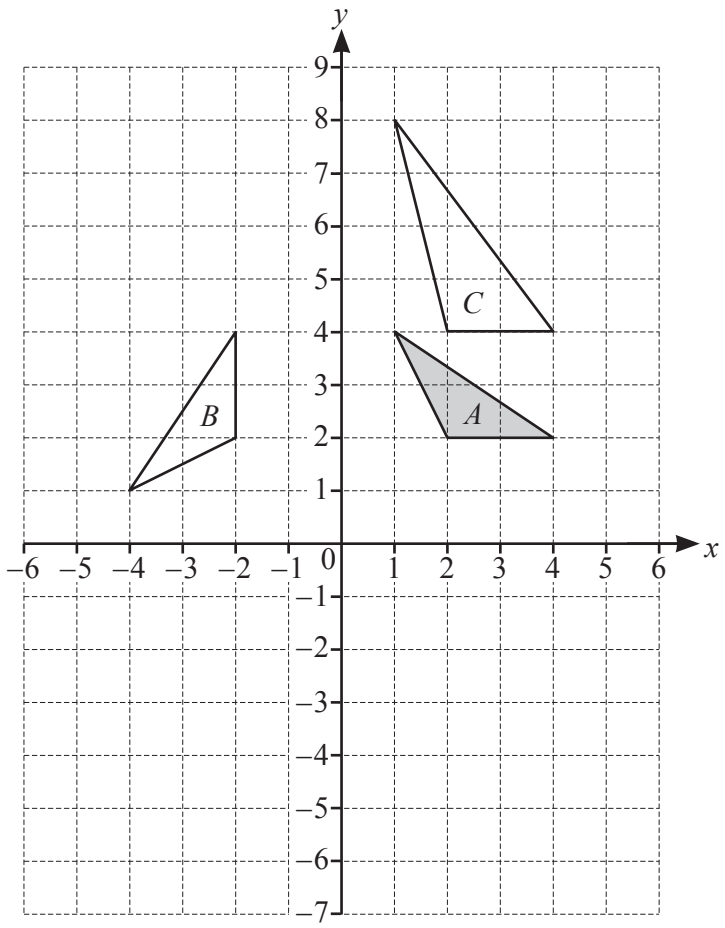
..... million [2]

(c) Find the year in which the population is first expected to be below 2 million.

..... [4]

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3



(a) Reflect triangle A in the line $y = -1$. [2]

(b) Translate triangle A by the vector $\begin{pmatrix} -5 \\ 3 \end{pmatrix}$. [2]

(c) Describe fully the **single** transformation that maps triangle A onto triangle B.

.....

..... [3]

(d) Describe fully the **single** transformation that maps triangle A onto triangle C.

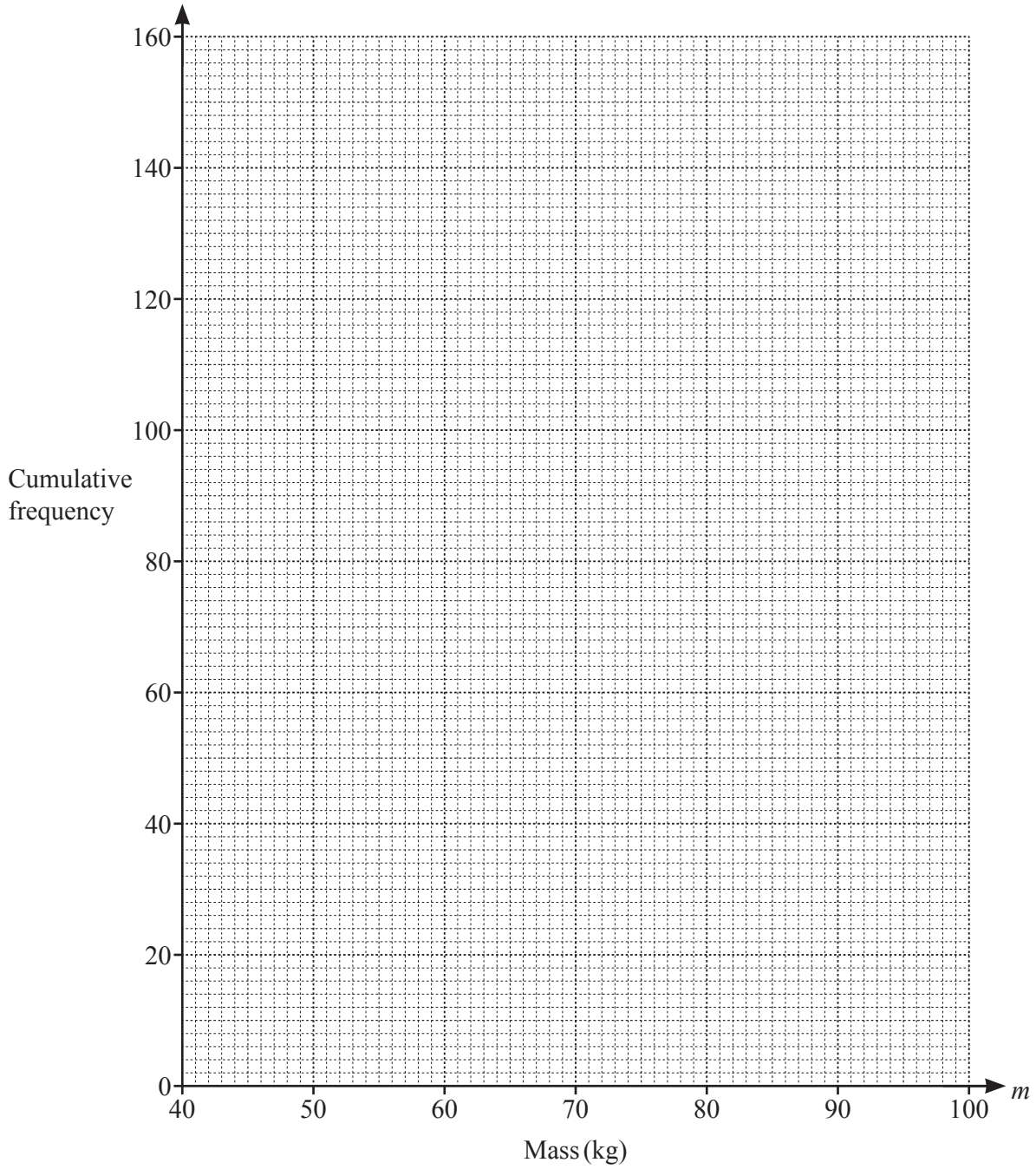
.....

..... [3]

4 The masses, m kg, of 160 students are recorded in the table.

Mass, m kg	$40 < m \leqslant 50$	$50 < m \leqslant 60$	$60 < m \leqslant 70$	$70 < m \leqslant 80$	$80 < m \leqslant 90$	$90 < m \leqslant 100$
Frequency	6	18	66	40	18	12

(a) Draw a cumulative frequency curve for these results.



[4]

(b) Use your cumulative frequency curve to estimate

(i) the median

..... kg [1]

(ii) the interquartile range.

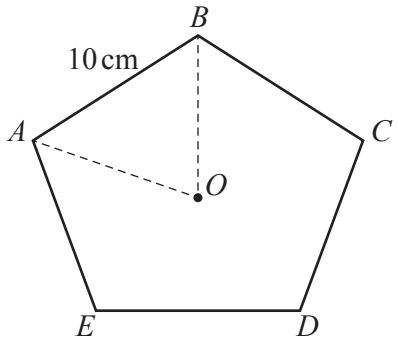
..... kg [2]

(c) The masses of 60% of the students lie in the range $p\,\text{kg} < m\,\text{kg} \leqslant 80\,\text{kg}$.

Use your cumulative frequency curve to estimate the value of p.

$p =$ ..... [3]

5 **(a)** The diagram shows a regular pentagon with sides of 10 cm and centre O.



NOT TO SCALE

(i) Find angle AOB.

Angle AOB = ... [1]

(ii) Show that $OA = 8.51$ cm correct to 3 significant figures.

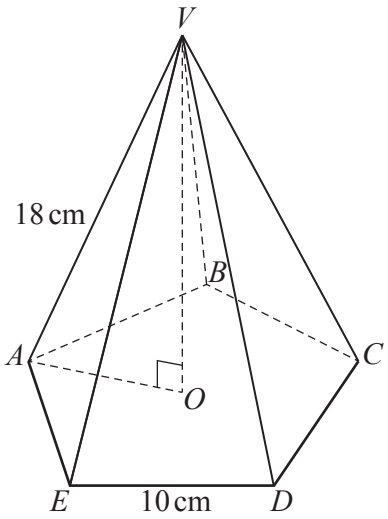
[3]

(iii) Find the area of the pentagon.

..... cm^2 [2]

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(b)



NOT TO SCALE

The regular pentagon in **part (a)** is the base of a pyramid.
The sloping edges, VA, VB, VC, VD, and VE, are each of length 18 cm.

(i) Calculate the perpendicular height, VO, of the pyramid.

$VO =$ ..... cm [3]

(ii) Calculate the volume of the pyramid.

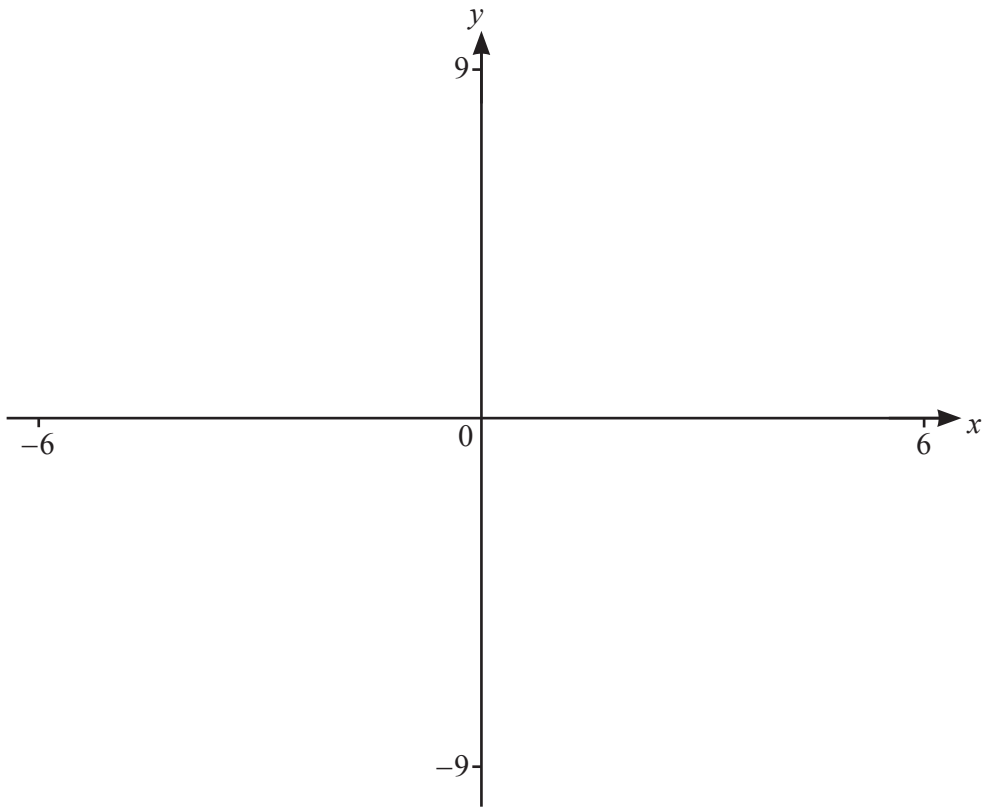
..... cm^3 [2]

(iii) A geometrically similar pyramid has volume 1500 cm^3.

Calculate the length of a side of the base of this pyramid.

..... cm [3]

6



$$f(x) = \frac{x^2 + 3x}{(x-2)(x+1)}$$

(a) On the diagram sketch the graph of $y = f(x)$ for values of x between -6 and 6. [3]

(b) Write down the equations of the asymptotes parallel to the y-axis.

..... [2]

(c) Find the zeros of the graph of $y = f(x)$.

..... [2]

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(d) $g(x) = x - 3$

(i) On the diagram sketch the graph of $y = g(x)$ for $-6 \leqslant x \leqslant 6$. [1]

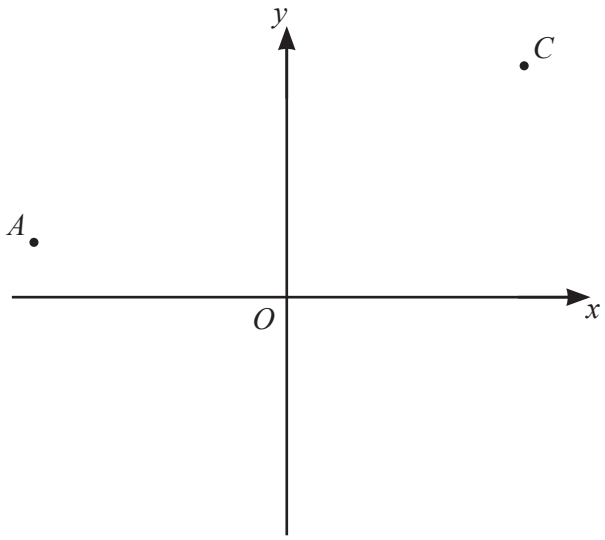
(ii) Use your graphs to solve $f(x) = g(x)$.

..... [3]

(iii) Solve $g(x) > f(x)$.

..... [3]

7 A is the point $(-8, 2)$ and C is the point $(8, 10)$.



NOT TO SCALE

(a) Find the equation of the line AC.

..... [3]

(b) N is the point $(4, 8)$.

Show that N lies on AC.

[1]

(c) Find the equation of the line that is perpendicular to AC and passes through N.

..... [3]

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(d) A and C are two vertices of a quadrilateral $ABCD$.
B is the point (2, 12).
D is the reflection of B in the line AC.

(i) Find the coordinates of D.

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

(ii) Write down the name of the special quadrilateral $ABCD$.

..... [1]

(iii) Find the length AC.

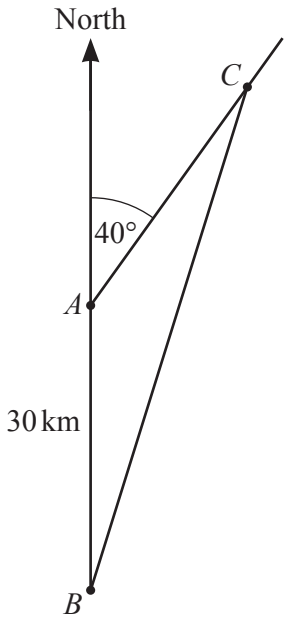
..... [2]

(iv) Find the area of the quadrilateral $ABCD$.

..... [3]

8 A ship sails from port A at a constant speed of 18 km/h on a bearing of 040°.
A motorboat sails in a straight line at a constant speed from port B to intercept the ship.

Port B is 30 km due south of port A.
The ship leaves port A at 08 20 and the motorboat leaves port B at 08 30.
The motorboat intercepts the ship at point C at 09 50.



NOT TO SCALE

(a) Find the speed of the motorboat.

..... km/h [5]

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(b) Find the bearing on which the motorboat sails.

..... [3]

9



Asa and Bernice have these 10 letter cards.
A, E, I, O and U are vowels. All other letters are consonants.

(a) Asa picks a card at random.

Write down the probability that Asa's card shows the letter **T**.

..... [1]

(b) Asa replaces his card.
Bernice picks two cards at random without replacement.

Calculate the probability that both of Bernice's cards are vowels.

..... [2]

(c) Bernice replaces her cards.
Asa picks 3 cards at random without replacement.

Calculate the probability that Asa's cards can be arranged to spell the word **PEN**.

..... [3]

(d) Asa replaces his cards.
Bernice picks cards at random **with replacement** until she first gets a consonant.
The probability that she first gets a consonant on her nth pick is $\frac{48}{3125}$.

Find the value of n.

..... [3]

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10 **(a)** Simplify.

$3x - 5y + 4x - 6y$

..... [2]

(b) Expand.

$x(x + 2)$

..... [1]

(c) Factorise.

$10ab + 8ac - 15b^2 - 12bc$

..... [2]

(d) $\dfrac{2}{2x+1} - \dfrac{5}{x-3} = 3$

(i) Show that $6x^2 - 7x + 2 = 0$.

[4]

(ii) Solve $6x^2 - 7x + 2 = 0$.
You must show all your working.

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

11 $f(x) = 2x + 5$ $g(x) = 1 - 3x$

(a) Find $f(-2)$.

..... [1]

(b) Solve $f(g(x)) = 19$.

..... [3]

(c) Find $g^{-1}(x)$.

$g^{-1}(x) =$ ..... [2]

(d) $y = \dfrac{g(x)}{f(x)}$

Find x in terms of y.

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

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