



# Cambridge IGCSE™

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**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  $\pi$ , 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.

## Formula List

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

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  $l$ .  $A = \pi rl$

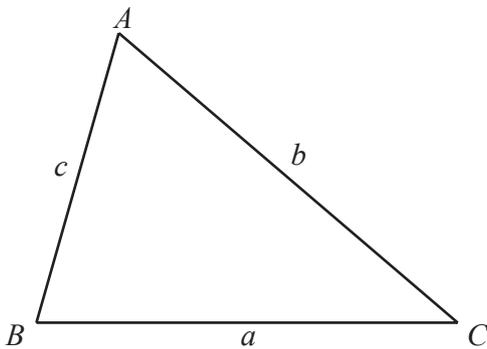
Curved surface area,  $A$ , of sphere of radius  $r$ .  $A = 4\pi r^2$

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



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

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

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

Answer **all** the questions.

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

(a) 17    14    11    8    5    ...

next term .....

$n$ th term ..... [3]

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

next term .....

$n$ th term ..... [2]

(c) 4    8    16    32    64    ...

next term .....

$n$ th term ..... [3]

(d) -2    5    24    61    122    ...

next term .....

$n$ th term ..... [3]

- 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.

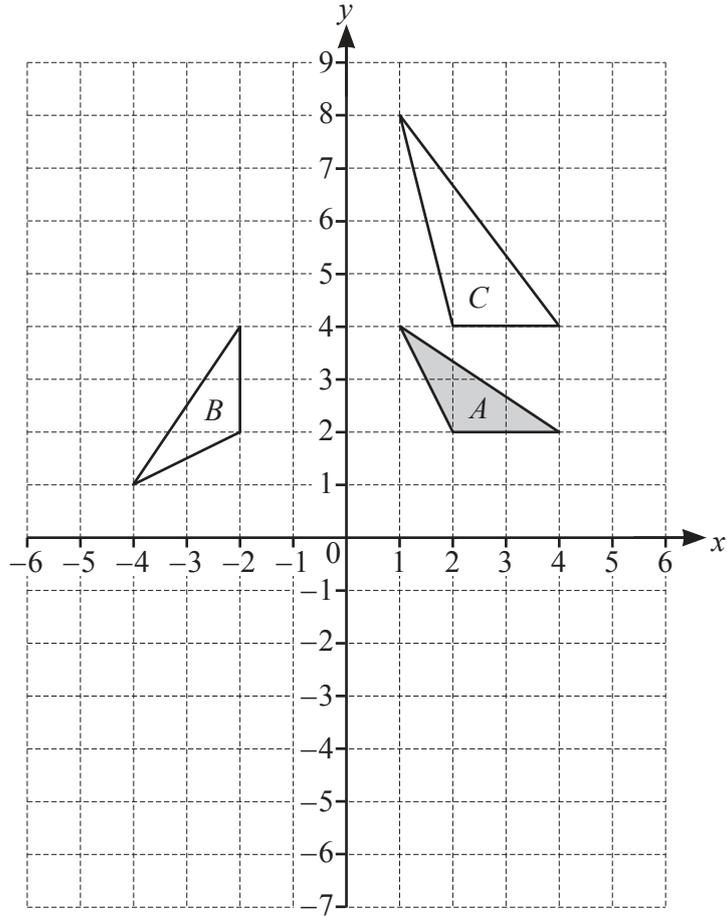
..... million [2]

(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]



(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*.

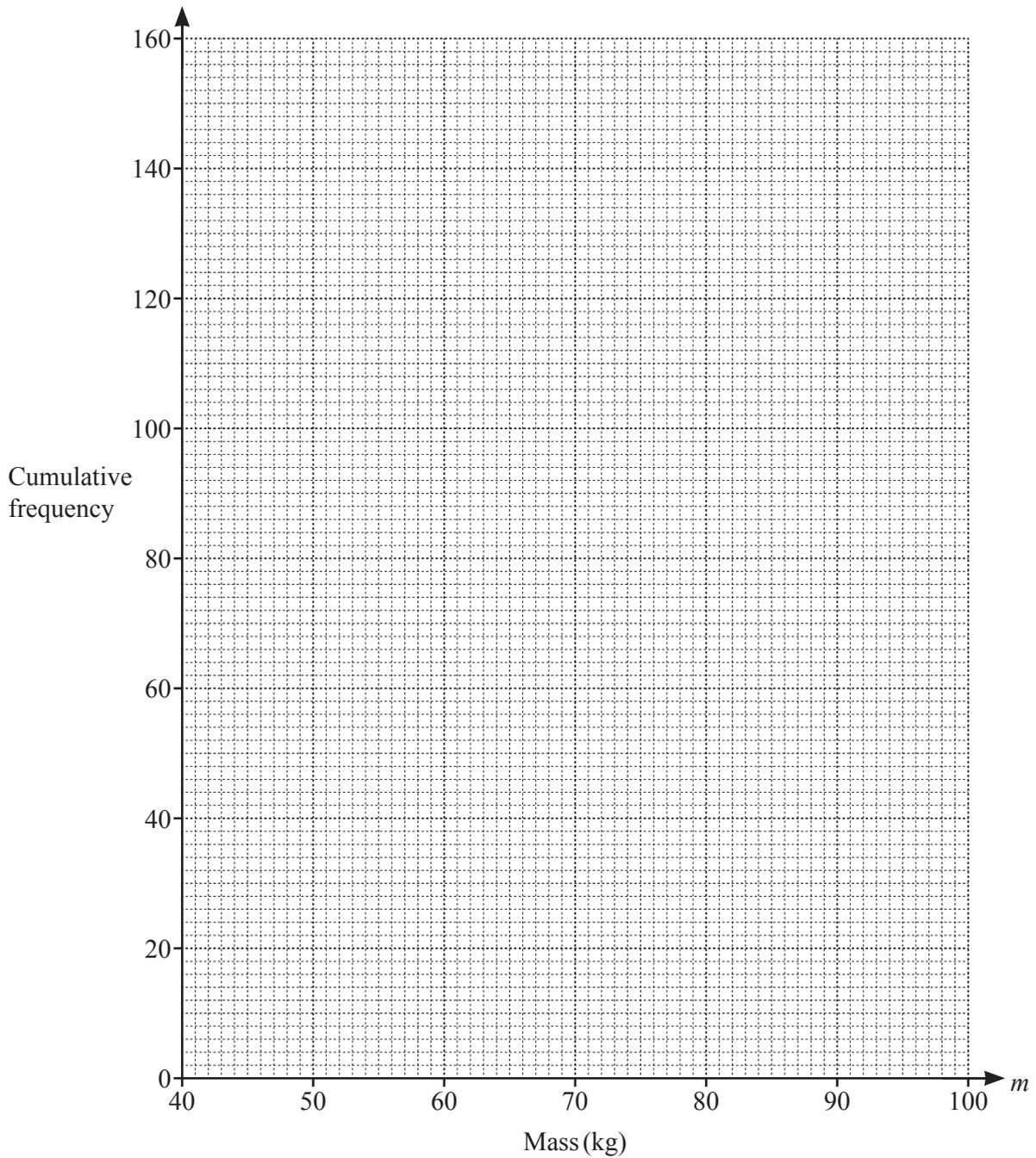
..... [3]

.....

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

Mass, $m$ kg	$40 < m \leq 50$	$50 < m \leq 60$	$60 < m \leq 70$	$70 < m \leq 80$	$80 < m \leq 90$	$90 < m \leq 100$
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.

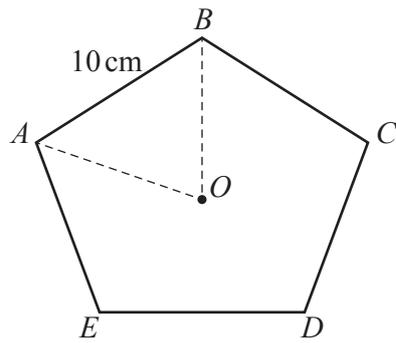
..... kg [2]

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

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  $O$ .



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- (i) Find angle  $AOB$ .

Angle  $AOB = \dots\dots\dots$  [1]

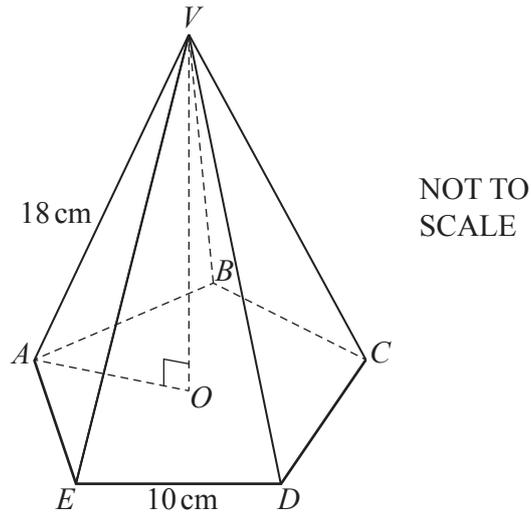
- (ii) Show that  $OA = 8.51$  cm correct to 3 significant figures.

[3]

- (iii) Find the area of the pentagon.

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

(b)



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.

$VO = \dots\dots\dots$  cm [3]

(ii) Calculate the volume of the pyramid.

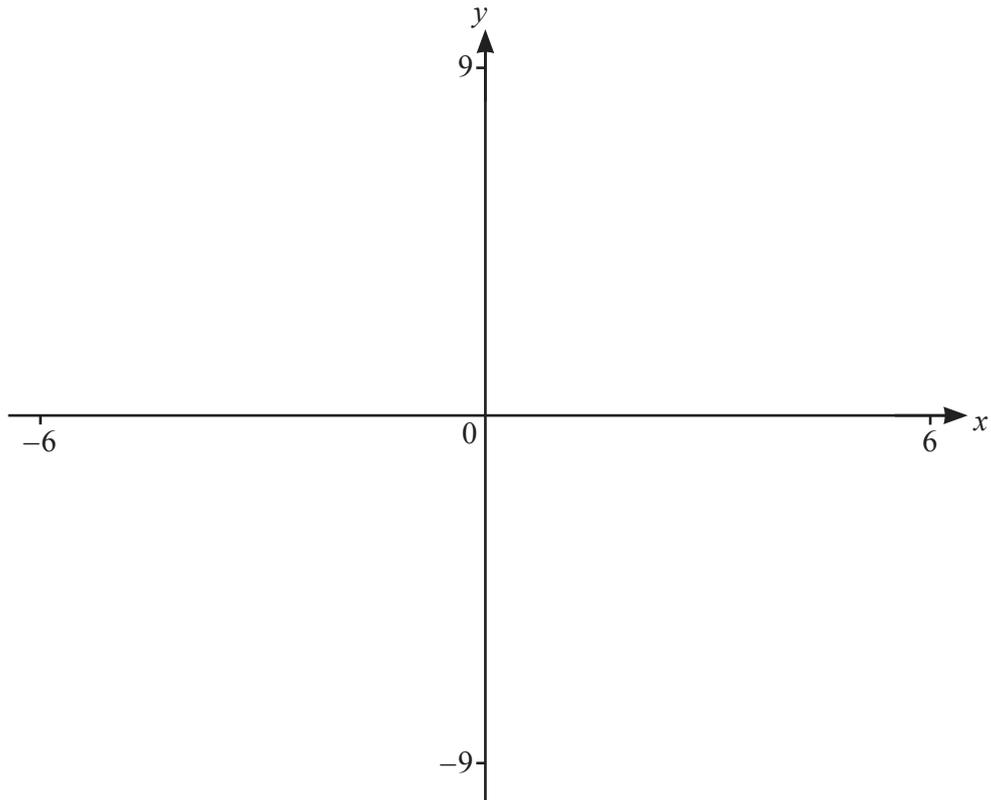
$\dots\dots\dots$  cm<sup>3</sup> [2]

(iii) A geometrically similar pyramid has volume 1500 cm<sup>3</sup>.

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

$\dots\dots\dots$  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]

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

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

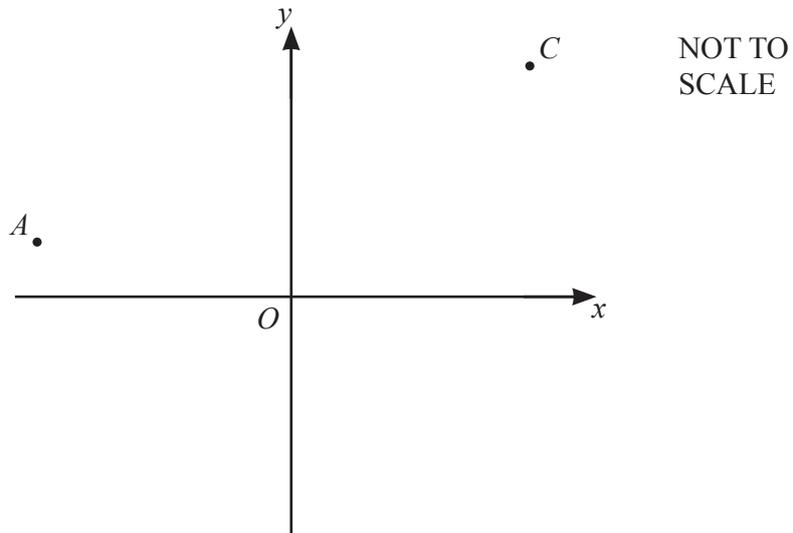
(ii) Use your graphs to solve  $f(x) = g(x)$ .

..... [3]

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

..... [3]

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



(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]

- (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  $ABCD$ .

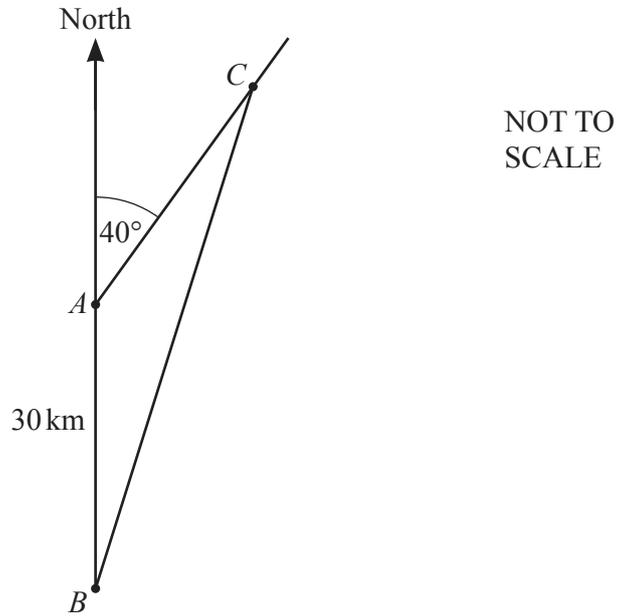
..... [3]

- 8 A ship sails from port  $A$  at a constant speed of 18 km/h on a bearing of  $040^\circ$ .  
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.



- (a) Find the speed of the motorboat.

..... km/h [5]

(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  $n$ th pick is  $\frac{48}{3125}$ .

Find the value of  $n$ .

..... [3]

10 (a) Simplify.

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

..... [2]

(b) Expand.

$$x(x+2)$$

..... [1]

(c) Factorise.

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

..... [2]

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

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

[4]

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

$x = \dots\dots\dots$  or  $x = \dots\dots\dots$  [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)  $y = \frac{g(x)}{f(x)}$

Find  $x$  in terms of  $y$ .

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



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