Cambridge Assessment International Education

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8923045149

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/41**

Paper 4 (Extended) **October/November 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. $\quad A = \pi rl$

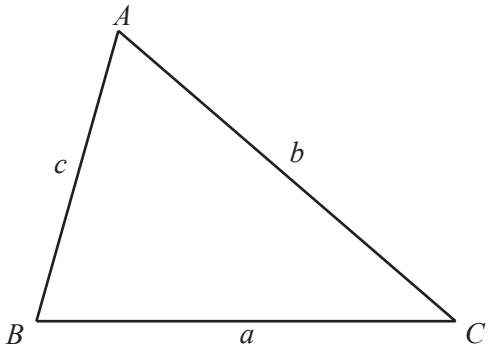
Curved surface area, A, of sphere of radius r. $\quad A = 4\pi r^2$

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 **(a)** Find \$2.40 as a percentage of \$1.60 .

..... % [1]

(b) Calculate 7.2% of 2.5 g.

..... g [2]

(c) Amir invests \$400 at a rate of 1.8% per year compound interest.

Calculate the value of this investment at the end of 6 years.

\$ ..... [2]

(d) Each year the population of a small town increases by 4% of its value in the previous year. The population is now 29 640.

(i) Calculate the population last year.

..... [2]

(ii) Calculate the number of complete years it will take for the population of 29 640 to be first greater than 40 000.

..... years [4]

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[Turn over

2



$\mathrm{f}(x) = \dfrac{1}{\sin x°}$ for $0 \leqslant x \leqslant 360$

(a) On the diagram, sketch the graph of $y = \mathrm{f}(x)$. [3]

(b) Find the coordinates of the local minimum point.

(..... , ...) [1]

(c) Write down the equations of the three asymptotes of the graph of $y = \mathrm{f}(x)$.

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

(d) The equation $\mathrm{f}(x) = k$ has no solutions.

Write down the range of values of k.

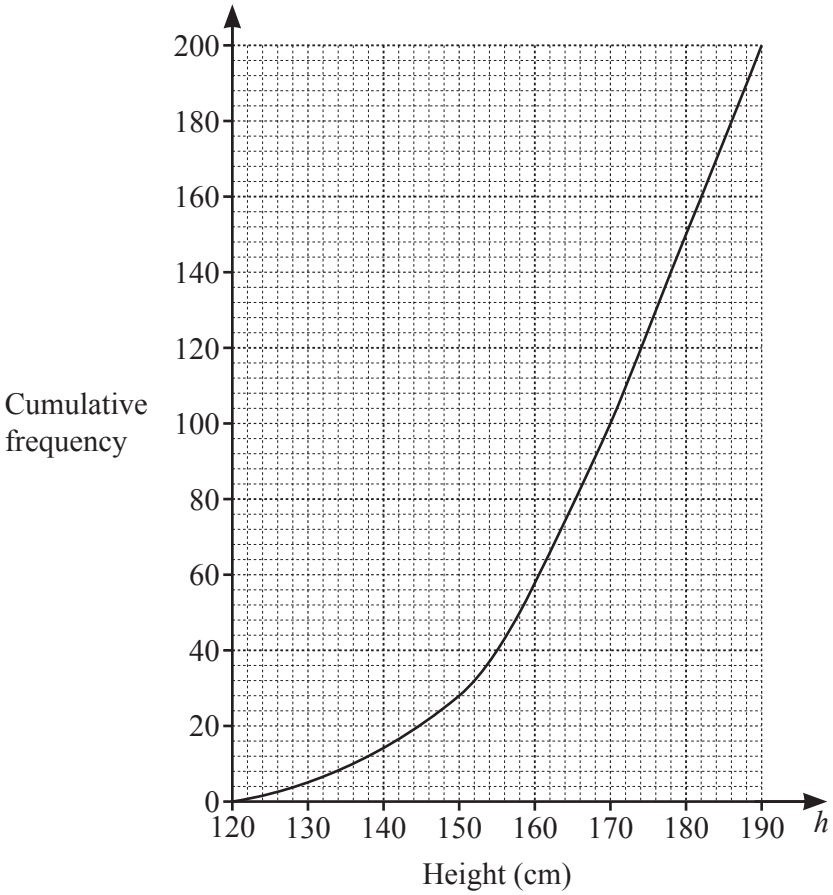
..... [2]

(e) By sketching another graph on the diagram, solve the equation $\dfrac{1}{\sin x°} = 5\sin\left(\dfrac{x}{2}\right)°$ for $0 \leqslant x \leqslant 360$.

..... [3]

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3 Each of 200 students records their height, h cm.
The results are shown on the cumulative frequency curve.



(a) Use the cumulative frequency curve to find

(i) the median

..... cm [1]

(ii) the interquartile range

..... cm [2]

(iii) the number of students with a height greater than 150 cm.

..... [2]

(b) Use the cumulative frequency curve to complete the frequency table.

Height (h cm)	$120 < h \leqslant 150$	$150 < h \leqslant 170$	$170 < h \leqslant 180$	$180 < h \leqslant 190$
Frequency				

[2]

(c) Use the frequency table to calculate an estimate of the mean height.

..... cm [2]

4 **(a)** $\mathbf{p} = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$ $\mathbf{q} = \begin{pmatrix} -5 \\ 1 \end{pmatrix}$

(i) Work out $\mathbf{p} + 2\mathbf{q}$.

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

(ii) A is the point (2, 6) and B is the image of point A after a translation by the vector $\mathbf{p}$.

Find the coordinates of B.

(..... , ...) [1]

(iii) Find the magnitude of $\mathbf{q}$.

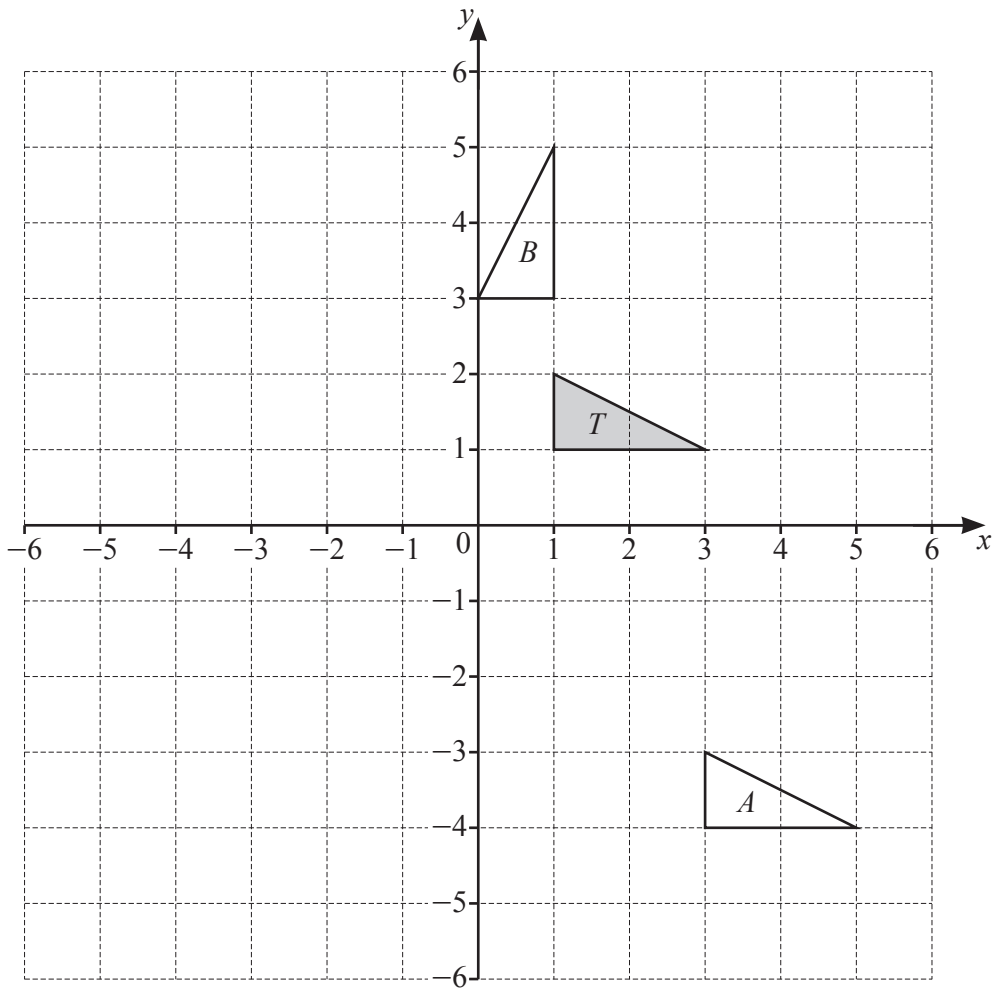
..... [2]

(b) Find the vector that translates the point (1, 5) to the point (−1, 7).

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

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(c)



(i) Describe fully the **single** transformation that maps triangle T onto triangle A.

.....

..... [2]

(ii) Describe fully the **single** transformation that maps triangle T onto triangle B.

.....

..... [3]

(iii) Reflect triangle T in the y-axis. [1]

(iv) Stretch triangle T with factor 3 and invariant line $y = 3$. [2]

5 $f(x) = 2x - 5$ $g(x) = x^2 + x + 3$ $h(x) = x^3$ $j(x) = 3^x$

(a) The domain of $f(x)$ is $0 \leqslant x \leqslant 10$.

Find the range of $f(x)$.

..... [2]

(b) Solve.

(i) $f(x) = -2$

$x =$ ..... [2]

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

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

(c) Find $g(f(4))$.

..... [2]

(d) Find $h(2) - j(2)$.

..... [2]

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(e) Find $h^{-1}(x)$.

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

(f) Find $j^{-1}(x)$.

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

6 **(a)** Jade and Kim share \$160.
Jade receives \$8 more than Kim.

Find the ratio Jade's money : Kim's money.
Give your answer in its simplest form.

..... : ..... [2]

(b) Each year the height of a bush increases by x% of its height at the start of the year.
It takes 6 years for the bush to grow from 1.2 m to 1.664 m.

Find the value of x.

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

(c) Work out, giving each answer in standard form.

(i) $(4.5 \times 10^{85}) \times (3 \times 10^{36})$

..... [2]

(ii) $(2 \times 10^{n}) + (2 \times 10^{n-2})$

..... [2]

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7 **(a)** Marcus runs for 1 hour at x km/h and then walks for 2 hours at $(x-5)$ km/h.
He travels a total distance of 14 km.

Find his running speed.

..... km/h [3]

(b) Nina runs 5 km at y km/h and then walks 7 km at $(y-7)$ km/h.
She takes a total of 2 hours.

(i) Show that $2y^2-26y+35=0$.

[3]

(ii) Solve $2y^2-26y+35=0$.

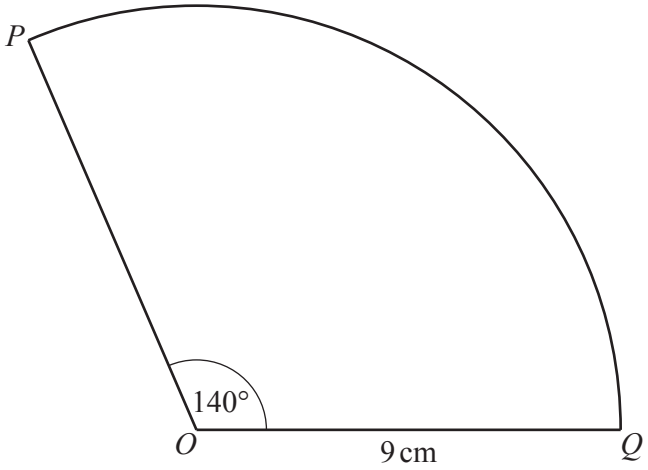
$y =$ ..... or $y =$ ..... [3]

(iii) Find Nina's walking speed.

..... km/h [1]

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NOT TO SCALE

The diagram shows the sector of a circle with radius 9 cm and sector angle 140°.

(a) Calculate the length of the arc PQ.

..... cm [2]

(b) Calculate the area of the sector.

..... cm^2 [2]

(c) The sector is the cross-section of a solid of length 20 cm.

Calculate the **total** surface area of the solid.

..... cm^2 [4]

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(d) Another solid is mathematically similar to the solid in **part (c)**.
The radius of the sector in this solid is 10 cm.

Calculate the total surface area of this solid.

..... cm^2 [2]

9 On any day the probability that Samira cycles to school is $\frac{5}{6}$.

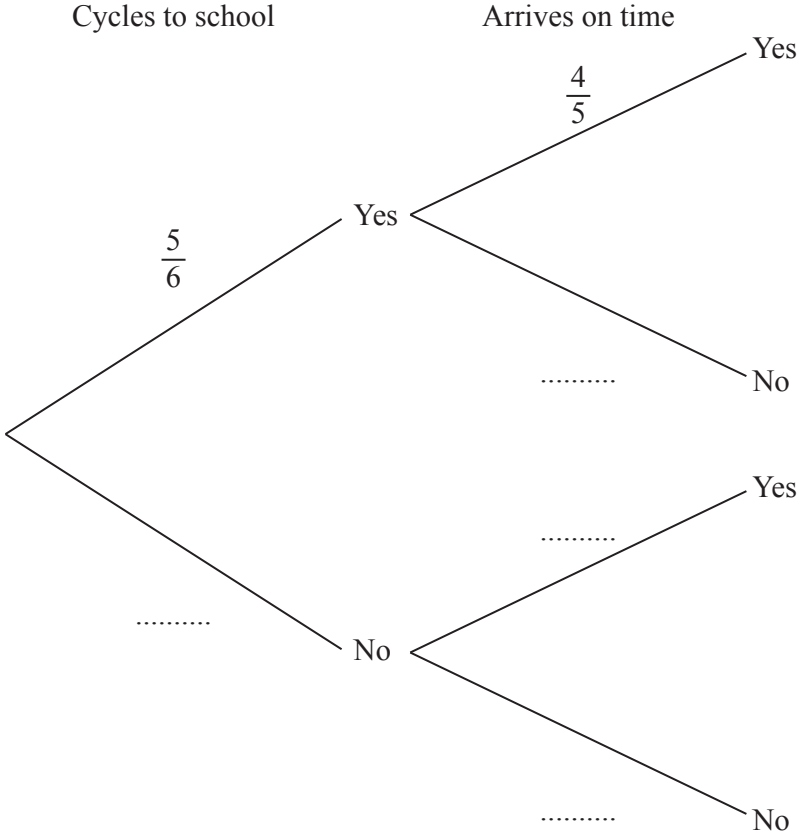
When Samira cycles to school the probability that she arrives on time is $\frac{4}{5}$.

When Samira does not cycle to school the probability that she arrives on time is $\frac{2}{5}$.

(a) Find the number of days Samira is expected to cycle to school in a school term of 54 days.

..... [1]

(b) Complete the tree diagram.



[2]

(c) Calculate the probability that on any day Samira arrives at school on time.

..... [3]

(d) In a school week of 5 days, find the probability that Samira cycles to school on exactly 1 day.

..... [3]

10 **(a)** Simplify.

(i) $\frac{k}{2p} \times \frac{t}{3}$

..... [1]

(ii) $\frac{u}{7} + \frac{2u}{21}$

..... [2]

(b) Simplify.

$$\frac{x^2 - x - 42}{2x^2 - 98}$$

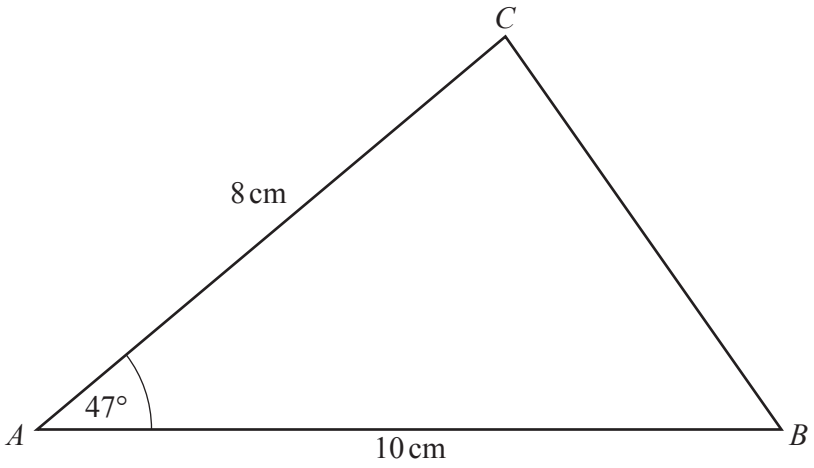
..... [4]

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

$$\frac{g-1}{g+1} - \frac{2g}{5} + 4$$

..... [3]

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(a) Calculate the area of triangle ABC.

..... cm^2 [2]

(b) Calculate the shortest distance from C to AB.

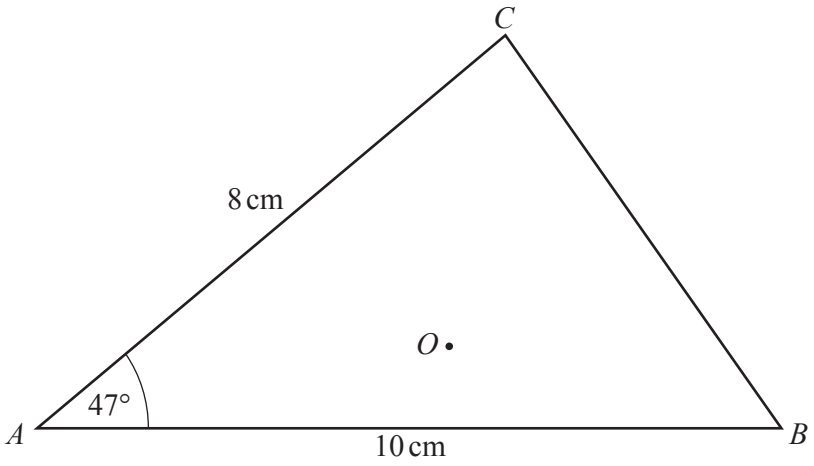
..... cm [3]

(c) Show that $BC = 7.41\,cm$ correct to 2 decimal places.

[3]

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(d)



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In triangle ABC, O is the centre of the circle that passes through A, B and C.

Calculate the radius of this circle.

..... cm [4]

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