Cambridge Assessment International Education

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9845900167

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/31**

Paper 3 (Core) **October/November 2022**

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.

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

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Answer **all** the questions.

1 Every week, a city company pays its workers travel expenses.
Each worker can travel for work either by car or by bicycle.
This is how travel expenses are worked out.

Travel by car	Number of kilometres × \$0.40
Travel by bicycle	\$15 + number of kilometres × \$0.25

(a) One week, Anna cycles a total of 45 km for work.

Work out her travel expenses.

\$ ..... [2]

(b) Raza has a car and a bicycle.
He travels 120 km for work.

Will he be paid more travel expenses if he uses his car or if he uses his bicycle?
Work out how much more he would receive.

..... pays more by \$ ..... [3]

(c) Tyson always travels for work by car.
One week he receives \$14.80 in travel expenses.

Work out how many kilometres he travels for work that week.

..... km [1]

(d) A worker cycles for work.

Write a formula for the travel expenses, \$$E$, this worker receives when they travel k kilometres for work one week.

..... [2]

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2 **(a)** This table shows how Toby spent money on his holiday.

Travel	Accommodation	Food	Entertainment
$60	$168	$116	$56

(i) Work out how much Toby spent in total.

$ ..... [1]

(ii) Work out how much **more** money Toby spent on Food than on Entertainment.

$ ..... [1]

(iii) What fraction of the total amount did Toby spend on Travel?
Give your answer as a fraction in its simplest form.

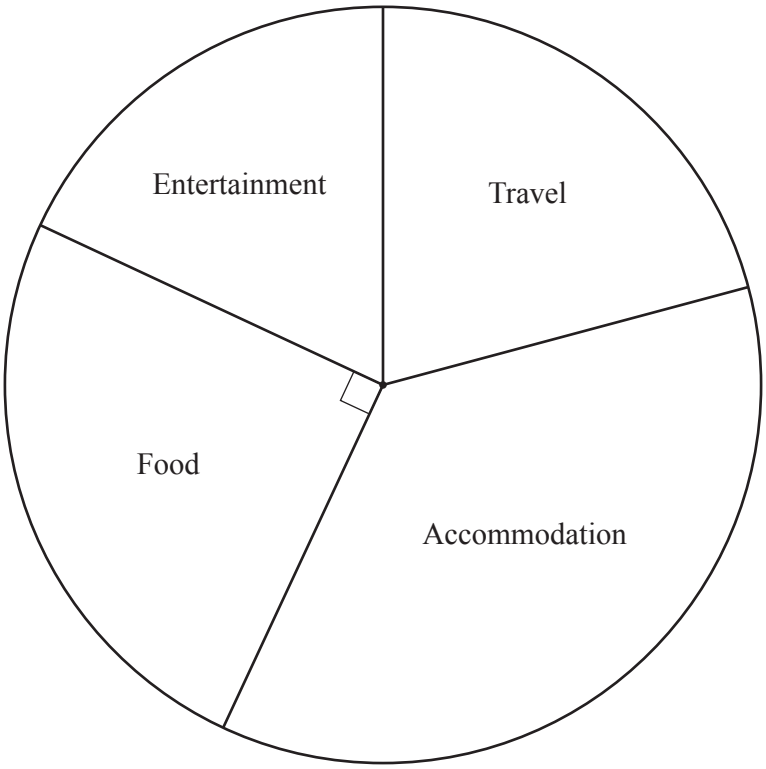
..... [2]

(iv) Work out the percentage of the total amount that Toby spent on Travel and Accommodation.

..... % [2]

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(b) This pie chart shows how Neesha spent her money on holiday.



(i) Measure the angle for Travel.

..... [1]

(ii) Work out the fraction of the total amount that was spent on Accommodation.

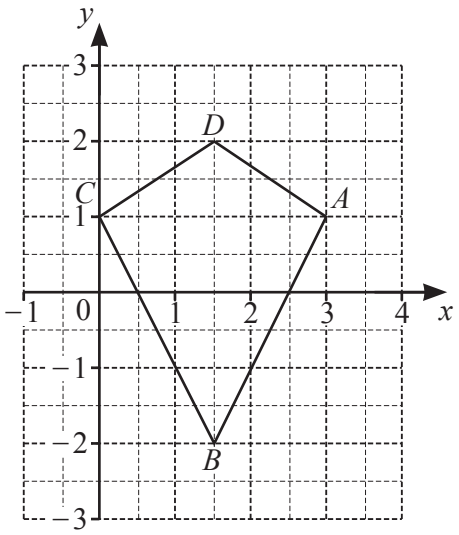
..... [1]

(iii) Neesha spent $540 in total.

Work out how much she spent on Food.

$ ..... [2]

3 **(a)** The diagram shows a quadrilateral, $ABCD$, drawn on a 1 cm square grid.



(i) Write down the mathematical name of the quadrilateral.

..... [1]

(ii) Write down the coordinates of point A, point B and point C.

A = (..... , ...)

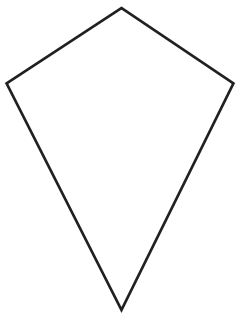
B = (..... , ...)

C = (..... , ...) [3]

(iii) Find the area of the quadrilateral.

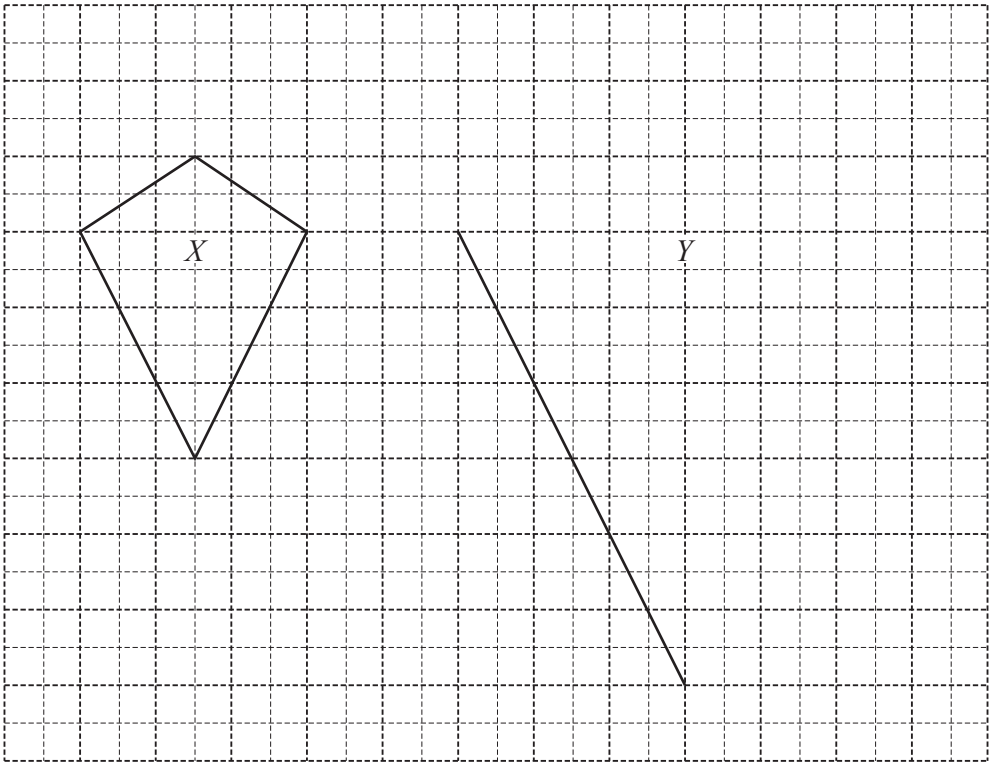
..... cm^2 [2]

(b) On the diagram below, draw any lines of symmetry.



[1]

(c) The diagram below shows quadrilateral X and one side of quadrilateral Y.
Quadrilateral Y is an enlargement of quadrilateral X.

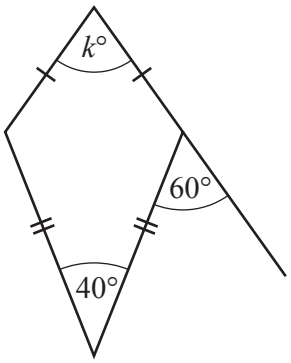


(i) Write down the scale factor of the enlargement.

..... [1]

(ii) Complete the drawing of quadrilateral Y. [2]

(d) Here is a quadrilateral with one of its sides extended.



NOT TO SCALE

Work out the value of k.

$k =$ ..... [3]

4 **(a)** Write the number seven thousand and twenty-four in figures.

..... [1]

(b) Find the value of

(i) 8.4^2 ,

..... [1]

(ii) $\sqrt[3]{163}$.
Give your answer correct to 2 significant figures.

..... [2]

(c) Work out.

(i) $\frac{16.28+9.2}{14.1-9.2}$

..... [1]

(ii) $\frac{-18.6}{-3.1}$

..... [1]

(d) **(i)** Write down a square number between 30 and 40.

..... [1]

(ii) Write down a prime number between 30 and 40.

..... [1]

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5 **(a)** Factorise.

$4x + 10$

..... [1]

(b) Expand.

$x(x^3 + 3x)$

..... [2]

(c) Solve.

$2(3x - 5) = 26$

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

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

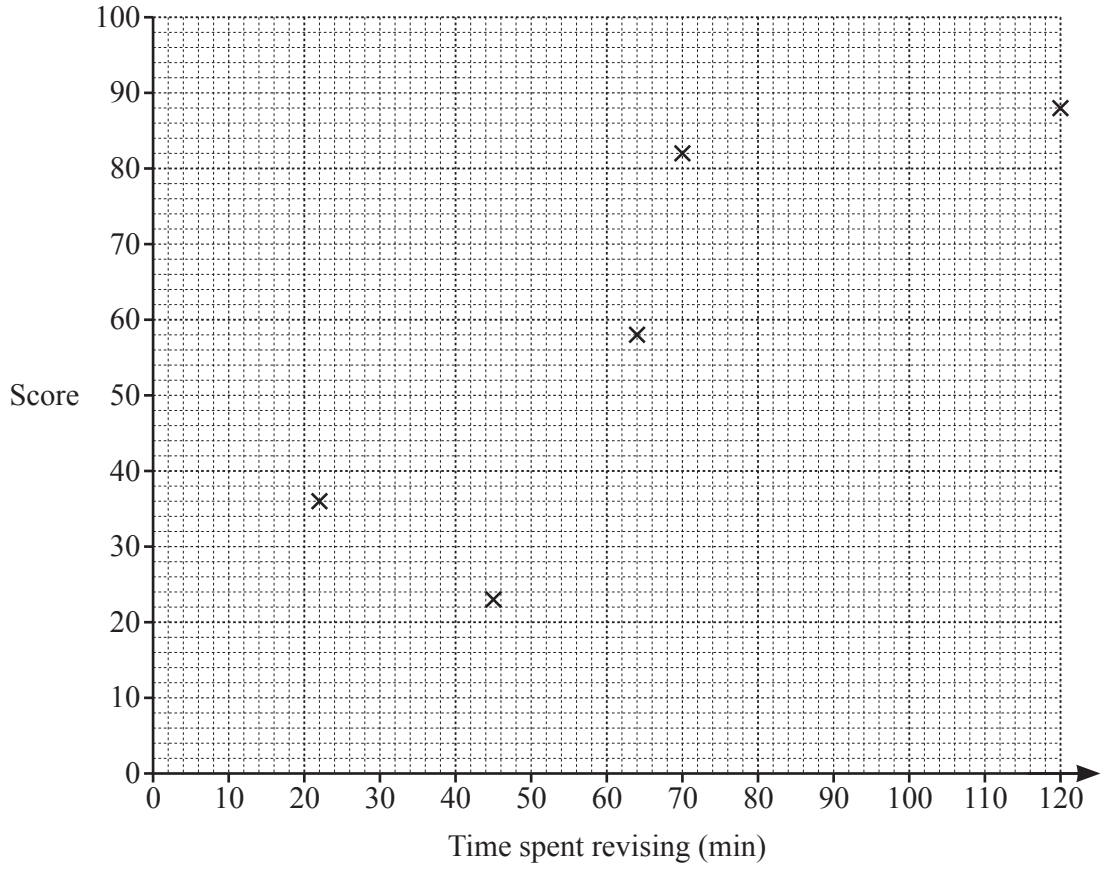
$\frac{3x}{2} \div \frac{5}{y}$

..... [2]

6 Karim asked ten students how much time, in minutes, they spent revising for a Maths test and what score they gained.
His results are shown in the table.

Time spent revising (minutes)	120	64	70	22	45	100	34	115	0	50
Score	88	58	82	36	23	100	54	88	16	45

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



[2]

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

..... [1]

(c) **(i)** Work out the mean time spent revising and the mean score.

Mean time = ... min

Mean score = ... [2]

(ii) On the scatter diagram, draw a line of best fit. [2]

(d) Sonya revised for 90 minutes but was absent for the test.

Use your line of best fit to estimate a score for Sonya.

..... [1]

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7 **(a)** A small lake has an area of $3500\,m^2$.
One winter, 68% of this area is covered with ice.
All the ice is 0.12 m thick.

Calculate the volume of ice on this lake.

..... m^3 [3]

(b) Another lake has an area of $124\,000\,m^2$.
One winter, the surface is covered in the ratio
ice : water = 5 : 3.

Calculate the area covered by ice and the area covered by water.

ice ..... m^2

water ..... m^2 [2]

(c) An ice crystal is 8.6×10^{-7} m thick.

Write 8.6×10^{-7} as an ordinary number.

..... [1]

(d) Lake Superior, Lake Erie and Lake Manitoba are three lakes in North America.

(i) Lake Erie has an area of 25 700 000 000 square metres.

Write 25 700 000 000 in standard form.

..... [1]

(ii) Lake Superior has an area of 8.2×10^{10} square metres and Lake Manitoba has an area of 4.6×10^{9} square metres.

Calculate the difference between the areas of these two lakes.
Give your answer in standard form.

..... m^2 [1]

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8 **(a)** A flower bed is a circle of radius 130 cm.
A layer of compost, 15 cm thick, is spread on the flower bed.

(i) Work out the volume of compost used.

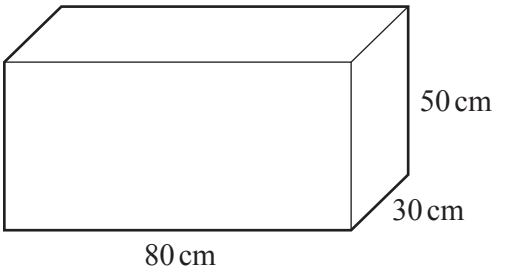
..... cm^3 [2]

(ii) Compost is sold in 120-litre bags.

Work out the number of these bags of compost that are needed.

..... [3]

(b) A bag of compost is a cuboid measuring 80 cm by 30 cm by 50 cm.



NOT TO SCALE

Work out the **total** surface area of the cuboid.

..... cm^2 [3]

9 Nina asks 100 students the time, in minutes, they spent exercising one weekend.
Her results are shown in the table.

Time (t minutes)	Frequency
$0 \leqslant t < 20$	2
$20 \leqslant t < 40$	4
$40 \leqslant t < 60$	9
$60 \leqslant t < 80$	34
$80 \leqslant t < 100$	27
$100 \leqslant t < 120$	24

(a) Calculate an estimate of the mean time.

..... min [3]

(b) Write down the modal group.

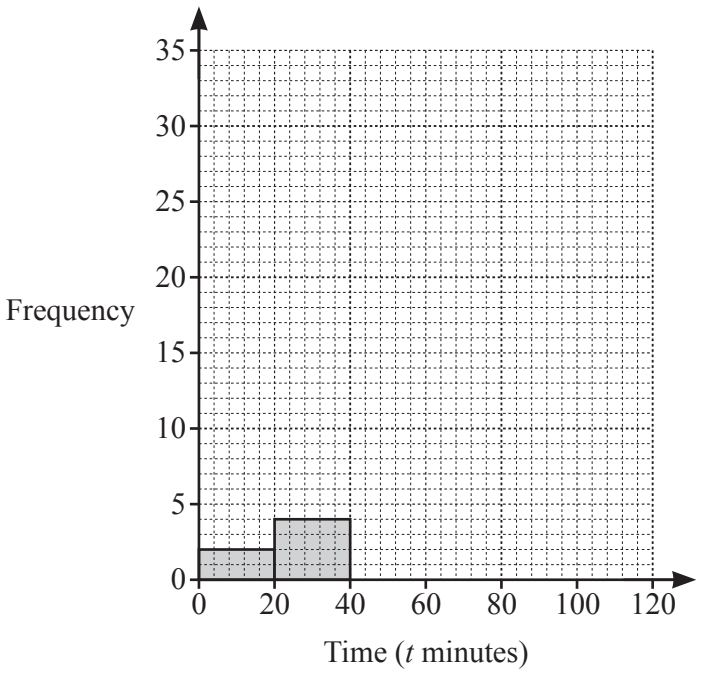
..... $\leqslant t <$ ..... [1]

(c) One of the 100 students is chosen at random.

Work out the probability that this student exercised for less than one hour.

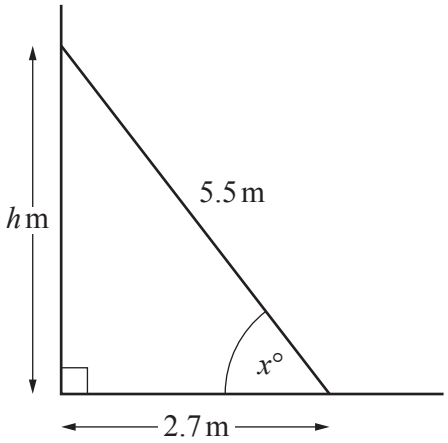
..... [2]

(d) Complete the grouped frequency diagram for these results.



[2]

10 (a)



NOT TO SCALE

The diagram shows a ladder of length 5.5 m standing on horizontal ground and leaning against a vertical wall.
The bottom of the ladder is 2.7 m away from the wall.

(i) Show that $h = 4.79$, correct to 3 significant figures.

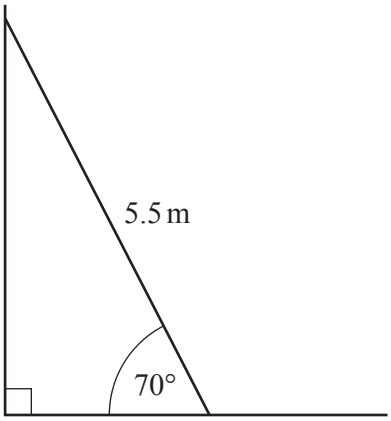
[3]

(ii) Calculate the value of x, the angle between the ladder and the ground.

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

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(b)



NOT TO SCALE

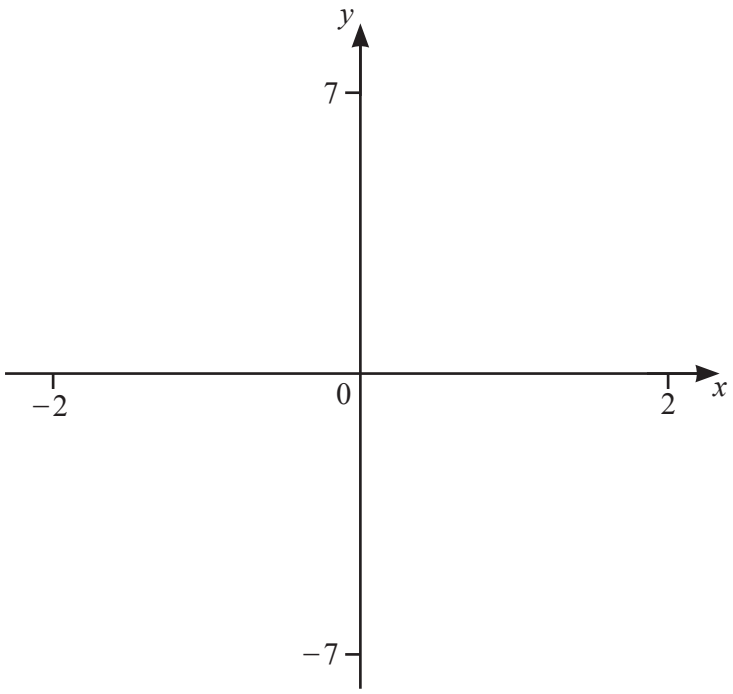
The bottom of the ladder is moved closer to the wall.
The ladder now makes an angle of 70° with the ground.

Work out the distance the top of the ladder has moved up the wall.

..... m [3]

Question 11 is printed on the next page.

11



(a) (i) On the diagram, sketch the graph of $y = x^2 - 1$ for $-2 \leqslant x \leqslant 2$. [2]

(ii) Find the coordinates of the local minimum.

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

(b) (i) On the diagram, sketch the graph of $y = x^3 - x$ for $-2 \leqslant x \leqslant 2$. [2]

(ii) Find the coordinates of the local maximum.

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

(c) Find the x-coordinate of each point of intersection of $y = x^3 - x$ and $y = x^2 - 1$.

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

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