Cambridge Assessment International Education

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4792580888

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/31**

Paper 3 (Core) **October/November 2020**

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 **20** pages. Blank pages are indicated.

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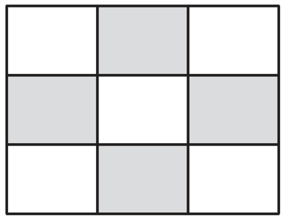
Formula List

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

Answer **all** the questions.

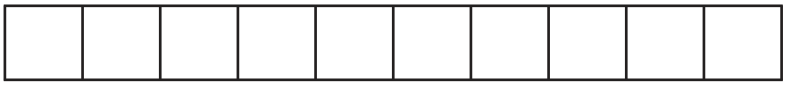
1 **(a)**



Write down the fraction of the shape that is shaded.

.... [1]

(b)



Shade 30% of this shape. [1]

(c) Write as a decimal.

(i) 60%

.... [1]

(ii) $\frac{3}{4}$

.... [1]

(d) Work out.

(i) 6^3

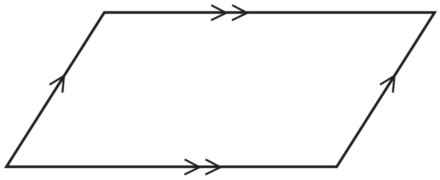
.... [1]

(ii) $5.9 + 3.3 \div 2.3$

Give your answer correct to 2 decimal places.

.... [2]

2 **(a)**



(i) Write down the mathematical name of this shape.

.... [1]

(ii) Write down the number of lines of symmetry of the shape.

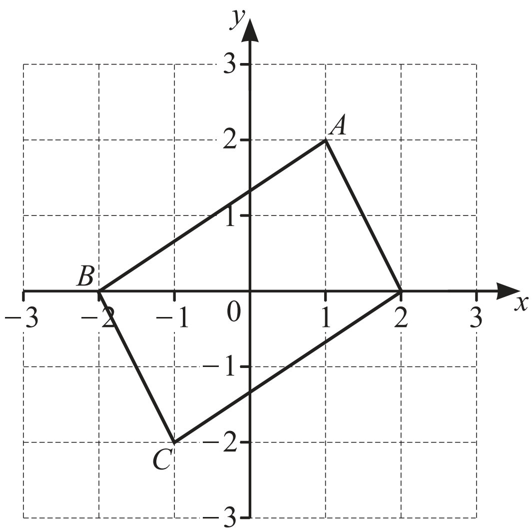
.... [1]

(iii) Write down the order of rotational symmetry of the shape.

.... [1]

(iv) On the shape, draw one line to divide it into two congruent triangles. [1]

(b)



(i) Write down the coordinates of

(a) point A,

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

(b) point B,

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

(c) point C.

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

(ii) The shape is drawn on a $1\,\text{cm}^2$ grid.

Find the area of the shape.

.... cm^2 [2]

3 **(a)** Sonny's old car is for sale at $5500.
Paula pays him $\frac{2}{3}$ of this price.

Work out how much Paula pays.
Give your answer correct to the nearest dollar.

$ .... [2]

(b) Sonny buys a new car in a sale.
The original price of the car is $18 000.
In the sale, this price is reduced by 12%.

Work out the sale price of the car.

$ .... [2]

(c) Sonny does some research about his new car.

(i) The car has a mass of 1.4 tonnes.

Work out the total mass of 8 of these cars.

.... t [1]

(ii) It took $4\frac{1}{2}$ years to develop the design of the car.

Change $4\frac{1}{2}$ years into months.

.... months [1]

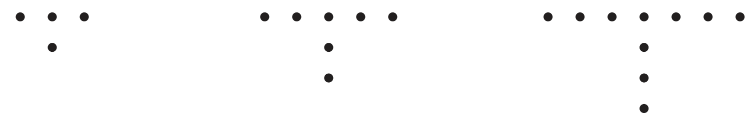
(iii) The car can travel 2 km in 1 minute 24 seconds.

Change 1 minute 24 seconds into seconds.

.... seconds [1]

4 **(a)** Here are the first three patterns in a sequence of dots.

Pattern 1 Pattern 2 Pattern 3 Pattern 4



(i) In the space above, draw Pattern 4. [1]

(ii) Complete the table.

Pattern number	1	2	3	4
Number of dots	4			

[1]

(iii) Write down the rule for continuing the sequence of dots.

.... [1]

(iv) Find the number of dots in Pattern 9.

.... [1]

(b) The nth term of another sequence is $n^2 - 2n$.

Find the first three terms of this sequence.

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

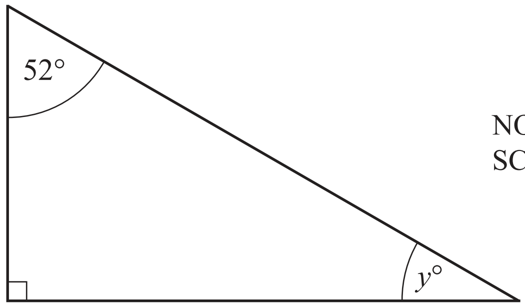
(c) These are the first five terms of a different sequence.

3 7 11 15 19

Find the nth term of this sequence.

.... [2]

5 (a) (i)



NOT TO SCALE

Work out the value of y.

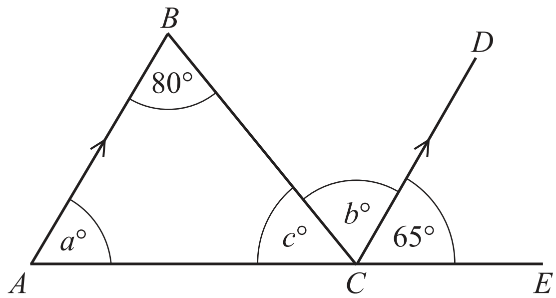
$y =$ .... [1]

(ii) For any right-angled triangle, explain why none of the angles can be obtuse.

....

.... [1]

(b)



NOT TO SCALE

In the diagram, ACE is a straight line.

Find the value of a, the value of b and the value of c.

$a =$ ....

$b =$ ....

$c =$ .... [3]

(c) Work out the size of one exterior angle of a regular hexagon.

.... [2]

6 This word formula can be used to work out the total number of points scored by a hockey team during one season.

Total number of points	$= 3 \times$ number of games won
	plus
	$1 \times$ number of games drawn

(a) One team had won 17 games and drawn 7 games.

Work out the total number of points scored by this team.

.... [2]

(b) Another team scored a total of 44 points.
This team had drawn 5 games.

Work out how many games this team had won.

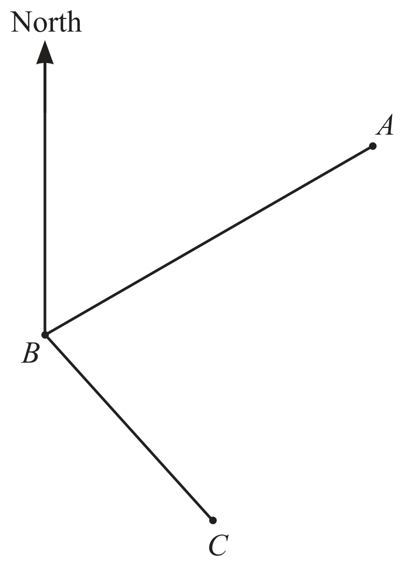
.... [2]

(c) A different team scored a total of 36 points.
This team had won and drawn exactly the same number of games.

Work out how many games this team had won.

.... [2]

7 **(a)** The diagram shows the path of a boat that sails from A to B to C.
The scale of the diagram is 1 cm represents 20 km.



Scale: 1 cm to 20 km

(i) Find the actual distance from A to B.

.... km [2]

(ii) The boat travels from A to B in 4 hours.

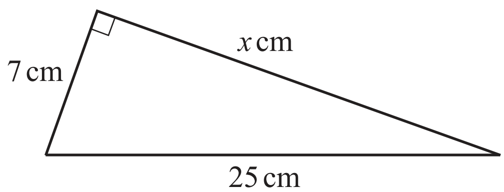
Work out the speed of the boat in kilometres per hour.

.... km/h [2]

(iii) Measure the bearing of C from B.

.... [1]

(b)



NOT TO SCALE

Find the value of x.

x = ... [3]

8 **(a)** Solve.

(i) $x + 3 = 8$

$x =$ .... [1]

(ii) $3(2x - 5) = 12$

$x =$ .... [3]

(b) Multiply out and simplify.

$$(x+7)(x-4)$$

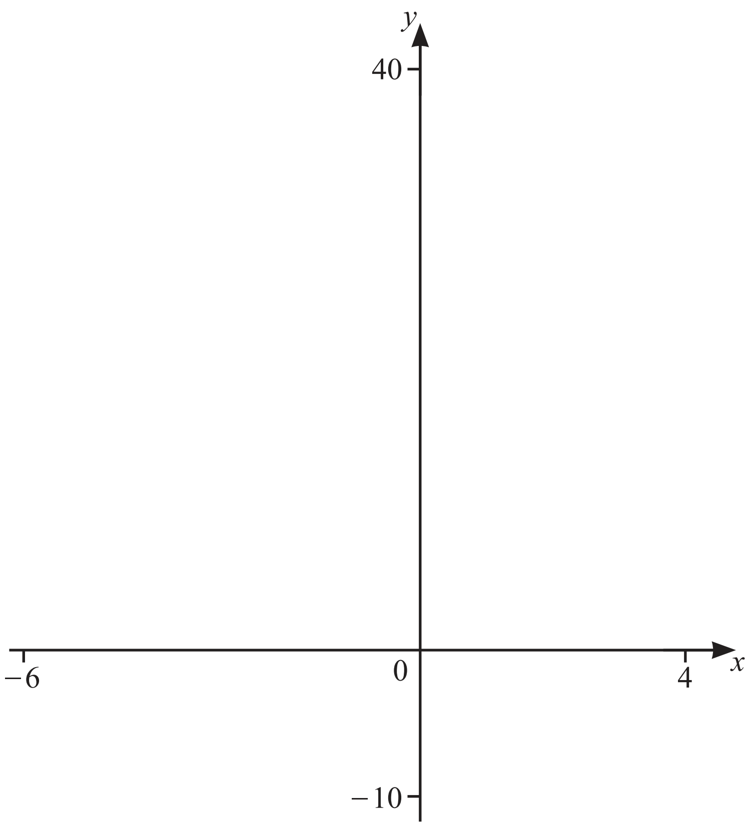
.... [2]

(c) Simplify.

$$\frac{20x}{y} \times \frac{y}{4}$$

.... [2]

9



(a) **(i)** On the diagram, sketch the graph of $y = x^2 + 4x + 3$ for $-6 \leqslant x \leqslant 4$. [2]

(ii) Write down the coordinates of the local minimum.

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

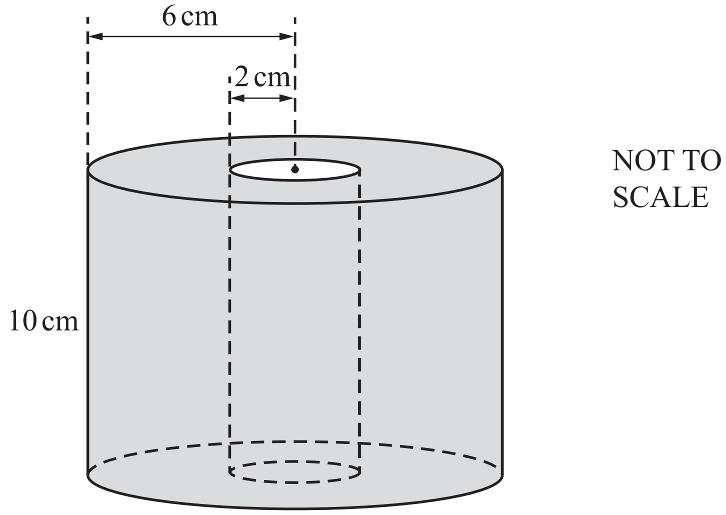
(b) On the diagram, sketch the graph of $y = -x^2 - 2x + 15$ for $-6 \leqslant x \leqslant 4$. [2]

(c) Find the x-coordinate of each point of intersection of

$$y = x^2 + 4x + 3 \quad \text{and} \quad y = -x^2 - 2x + 15.$$

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

10 (a)



A toilet roll is a cylinder with radius 6 cm and height 10 cm.
It has a hollow cylindrical centre of radius 2 cm.

Work out the volume of paper in the toilet roll.

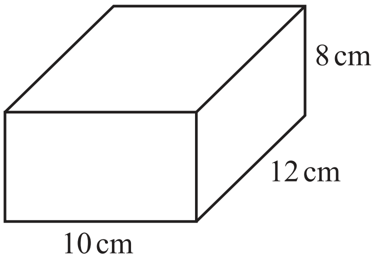
.... cm^3 [3]

(b) There are 325 million people in the USA.
On average, each person uses 23.6 toilet rolls during one year.

Calculate the total number of toilet rolls used in the USA in one year.
Give your answer in standard form.

.... [2]

(c)



NOT TO SCALE

Toilet paper can also be bought in a box.
The box is a cuboid.

(i) Work out the volume of the box.

.... cm^3 [2]

(ii) The box is completely filled with individual sheets of toilet paper, one sheet on top of another.
One sheet of toilet paper measures 12 cm by 10 cm and is 1.6×10^{-2} cm thick.
The box is 8 cm deep.

Work out the largest number of sheets of toilet paper that can be placed in the box.

.... [2]

11 The time taken, t seconds, for the first points to be scored in each of 100 basketball games is shown in the table.

Time (t seconds)	Frequency
$0 < t \leqslant 20$	1
$20 < t \leqslant 40$	4
$40 < t \leqslant 60$	22
$60 < t \leqslant 80$	26
$80 < t \leqslant 100$	31
$100 < t \leqslant 120$	16

(a) Write down the time interval that is the mode.

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

(b) One of these games is chosen at random.

Work out the probability that the first points in this game were scored in the first 60 seconds.

.... [2]

(c) Work out an estimate of the mean time.

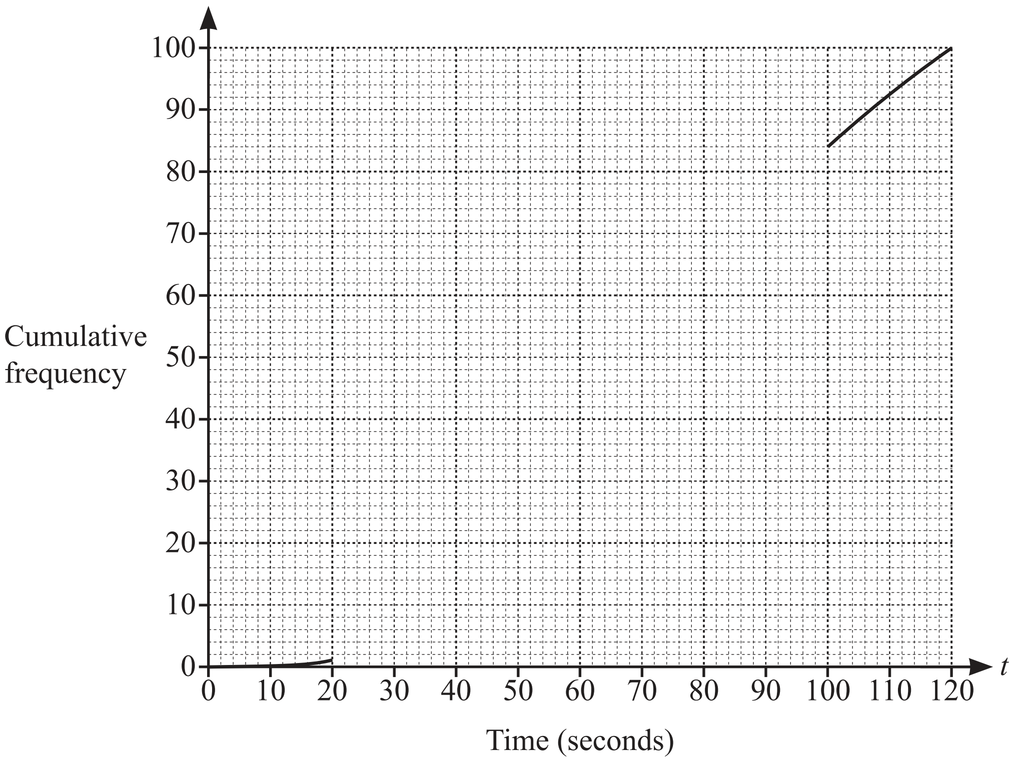
.... s [2]

(d) **(i)** Complete the cumulative frequency table.

Time (t seconds)	Cumulative frequency
$t \leqslant 20$	1
$t \leqslant 40$	
$t \leqslant 60$	
$t \leqslant 80$	
$t \leqslant 100$	84
$t \leqslant 120$	100

[2]

(ii) Complete the cumulative frequency curve.



[3]

(iii) Use your curve to find the median time.

.... s [1]

12 $\mathsf{U} = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$
$A = \{2, 3, 4, 5\}$

(a) Write down.

(i) $n(A)$

.... [1]

(ii) A'

{ .... } [1]

(b) Use a mathematical symbol to complete each of the following.

(i) 2 .... A [1]

(ii) $\{3, 4\}$ .... A [1]

(c) $B = \{7, 8, 9, 10\}$

(i) List the elements of $A \cup B$.

.... [1]

(ii) Find $A \cap B$.

.... [1]

(d) $\mathsf{U} = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$
$A = \{2, 3, 4, 5\}$
$B = \{7, 8, 9, 10\}$

Draw a Venn diagram to show this information.

U

[3]

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