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CAMBRIDGE INTERNATIONAL MATHEMATICS

0607/31

Paper 3 (Core)

May/June 2020

1 hour 45 minutes

You must answer on the question paper.

You will need: Geometrical instruments

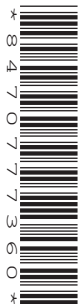
INSTRUCTIONS

- 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 **16** pages. Blank pages are indicated.



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 24 people take part in a cookie-eating competition.
The number of cookies eaten by each person in two minutes is recorded.

11 12 13 8 12 8 12 10
9 11 8 13 11 10 12 9
9 10 10 9 10 9 9 12

- (a) Complete the frequency table.

Number of cookies	8	9	10	11	12	13
Frequency	3					

[2]

- (b) Find

(i) the mode,

..... [1]

(ii) the range,

..... [1]

(iii) the median,

..... [1]

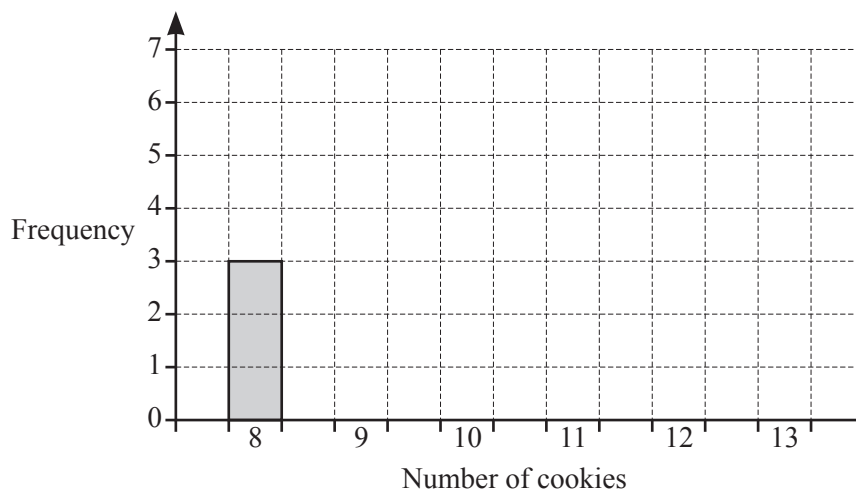
(iv) the mean,

..... [1]

(v) the interquartile range.

..... [2]

- (c) Complete the bar chart.



[2]

2 (a) 1 2 3 4 5 6 7 8 9 10

From this list of numbers, write down

(i) a square number,

..... [1]

(ii) a triangle number,

..... [1]

(iii) a prime number,

..... [1]

(iv) a factor of 13,

..... [1]

(v) a multiple of 6.

..... [1]

(b) Work out 65% of 34.

..... [2]

(c) Write 9876.543

(i) correct to 2 decimal places,

..... [1]

(ii) correct to 4 significant figures,

..... [1]

(iii) correct to the nearest hundred.

..... [1]

(d) Write your answer to **part (c)(iii)** in standard form.

..... [1]

- (e) Work out.
Give each answer as a fraction in its simplest form.

(i) $\frac{2}{5} + \frac{1}{3}$

..... [1]

(ii) $\frac{5}{8} - \frac{1}{4}$

..... [1]

(iii) $3\frac{3}{10} \times \frac{5}{6}$

..... [1]

3 (a) Write down the rule for continuing each sequence.

(i) 86, 78, 70, 62, ...

..... [1]

(ii) 4, 12, 36, 108, ...

..... [1]

(iii) 80, 40, 20, 10, ...

..... [1]

(b) The n th term of a sequence is $2n^2 + 1$.

Work out the first two terms of this sequence.

....., [2]

(c) These are the first four terms of another sequence.

8 19 30 41

(i) Find the next two terms of this sequence.

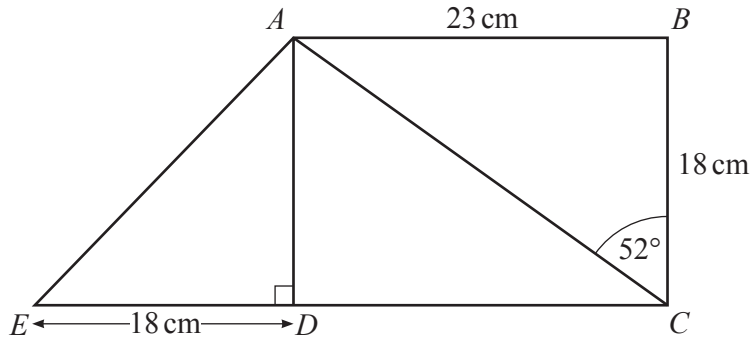
....., [2]

(ii) Find the n th term of this sequence.

..... [2]

(iii) Use your expression from **part (ii)** to find the 30th term.

..... [1]



NOT TO
SCALE

$ABCD$ is a rectangle and EDC is a straight line.
 $DE = BC = 18$ cm, $AB = 23$ cm and angle $BCA = 52^\circ$.

Find

(a) angle BAC ,

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

(b) angle AED ,

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

(c) angle EAC ,

Angle $EAC = \dots\dots\dots$ [2]

(d) AE ,

$AE = \dots\dots\dots$ cm [2]

(e) the total perimeter of the shape $ABCE$.

$\dots\dots\dots$ cm [1]

- 5 (a) Cinzia goes to the zoo with her mother.
Cinzia is 12 years old.
The entrance fee is \$25 for each adult and \$14 for each child under the age of 16 years.

Work out the **total** entrance fee for Cinzia and her mother and how much change they receive from \$50.

Total entrance fee \$

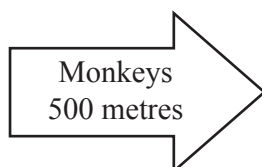
Change \$ [2]

- (b) Cinzia and her mother arrive at the zoo at 11 35 and leave at 15 45.

Find the time, in hours and minutes, that they are at the zoo.

..... h min [1]

- (c) Cinzia sees this notice.

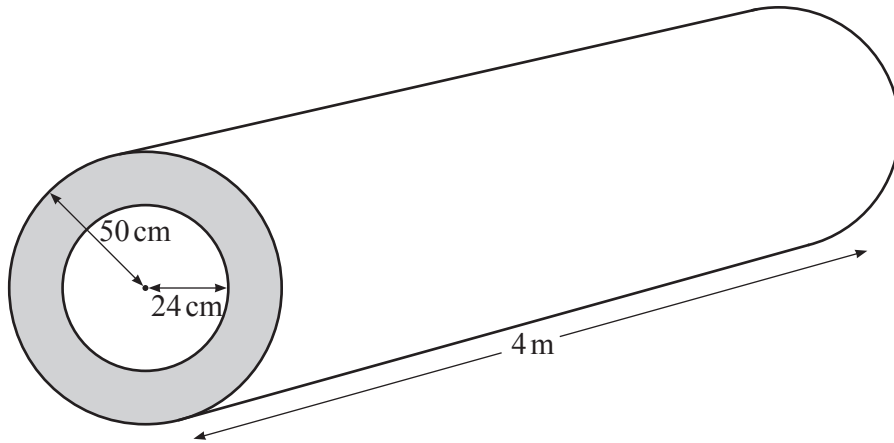


Cinzia can walk at 5 km/h.

Find how many minutes it takes Cinzia to walk to the monkeys.

..... min [3]

6



NOT TO SCALE

The diagram shows a cylindrical pipe.
The external radius is 50 cm and the internal radius is 24 cm.

(a) Find the shaded area.

..... cm² [3]

(b) The pipe is 4 metres long.

(i) Change 4 metres into centimetres.

..... cm [1]

(ii) Find the volume of the pipe.

..... cm³ [1]

(c) Work out the area of the outside curved surface of the pipe.

..... cm² [2]

7 (a) Solve.

(i) $4x - 6 = 8x + 14$

$x = \dots\dots\dots$ [2]

(ii) $2(x + 3) = 11$

$x = \dots\dots\dots$ [2]

(b) $C = 2M + 3N$

(i) Find C when $M = 1.8$ and $N = 1.3$.

$C = \dots\dots\dots$ [2]

(ii) Find M when $C = 8.4$ and $N = 0.6$.

$M = \dots\dots\dots$ [2]

(iii) Rearrange the formula to make N the subject.

$N = \dots\dots\dots$ [2]

8 A boat sails 300 m on a bearing of 060° from A to B .
It then changes course and sails 220 m on a bearing of 150° from B to C .
The boat then returns directly to A .

- (a) On the diagram, sketch the path of the boat.
Show the distances and bearings that you have been given.



NOT TO
SCALE

[4]

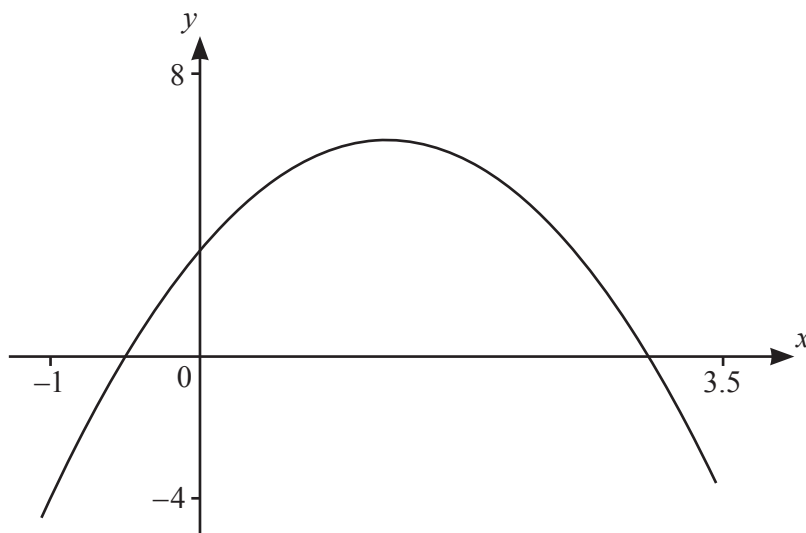
(b) Angle $ABC = 90^\circ$.

- (i) Calculate angle BAC .

Angle $BAC = \dots\dots\dots$ [2]

(ii) Find the bearing of C from A .

$\dots\dots\dots$ [1]



The diagram shows the graph of $y = -2x^2 + 5x + 3$ for $-1 \leq x \leq 3.5$.

(a) Use your calculator to find

(i) the coordinates of the point of intersection of the graph with the y -axis,

(..... ,) [1]

(ii) the coordinates of the points of intersection of the graph with the x -axis,

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

(iii) the coordinates of the local maximum.

(..... ,) [2]

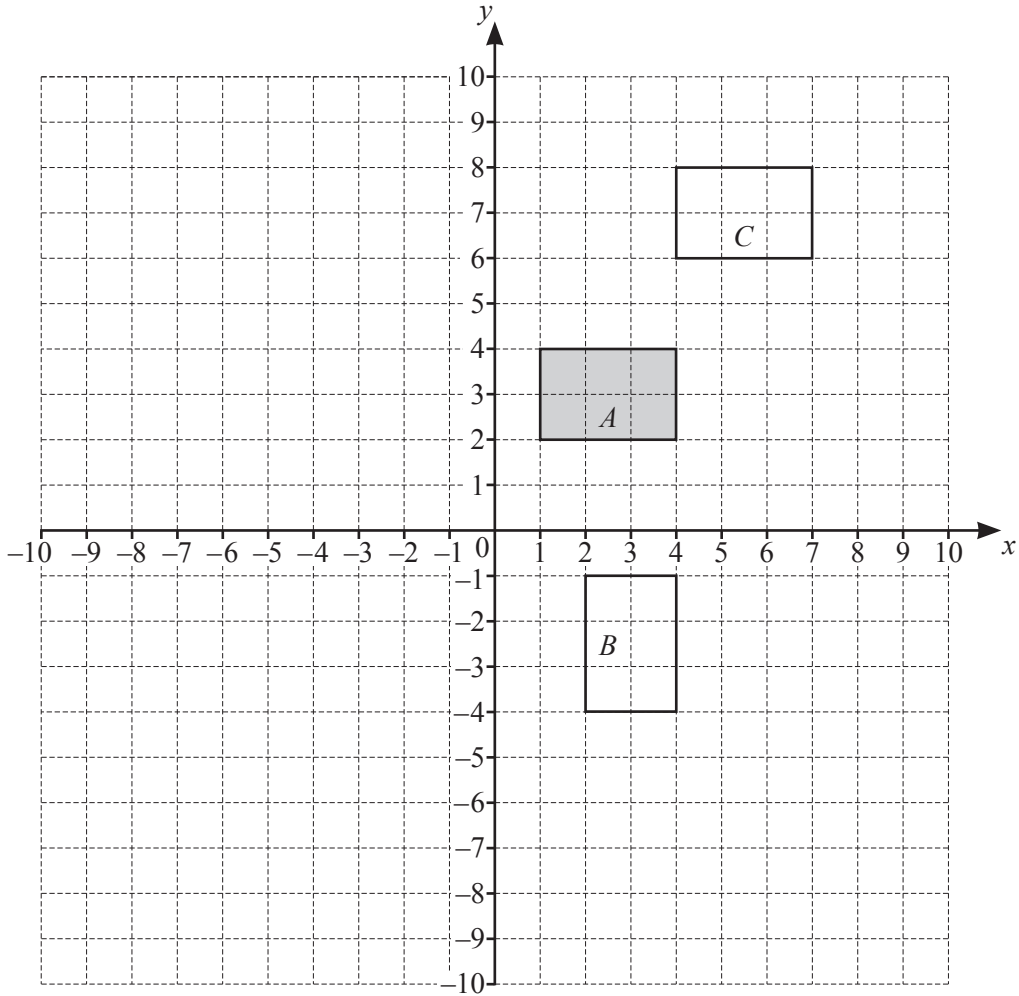
(b) On the diagram, sketch the graph of $y = 2x + 1$.

[2]

(c) Find the coordinates of the points of intersection of

$$y = -2x^2 + 5x + 3 \text{ and } y = 2x + 1.$$

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



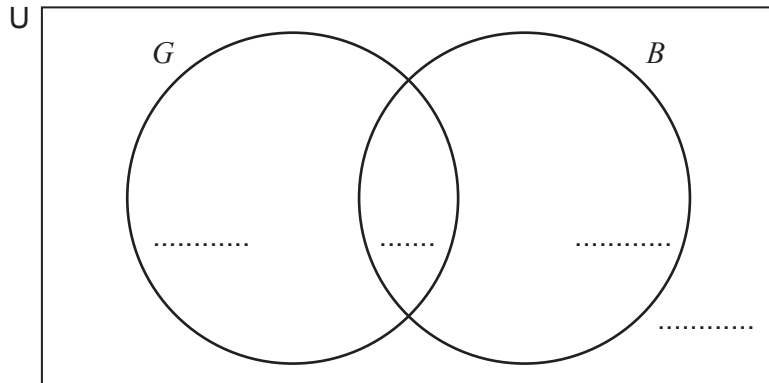
- (a) Reflect shape *A* in the *y*-axis. [1]
- (b) Describe fully the **single** transformation that maps shape *A* onto shape *B*.

 [3]
- (c) Describe fully the **single** transformation that maps shape *A* onto shape *C*.

 [2]
- (d) Enlarge shape *A* with centre (0, 0) and scale factor -2 . [2]

- 11 (a) In a class of 24 students
- 10 students wear glasses (G)
 - 12 students have black hair (B)
 - 5 students do not wear glasses and do not have black hair.

(i) Complete the Venn diagram.



[2]

(ii) Describe in words the set $G \cap B$.

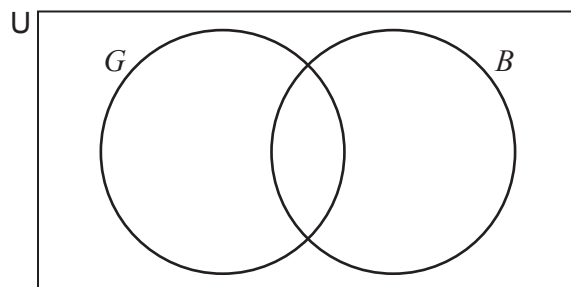
Students who

[1]

(iii) One of the 24 students is chosen at random.
Write down the probability that this student wears glasses but does not have black hair.

..... [1]

(iv) On the Venn diagram below, shade the region $G' \cap B$.



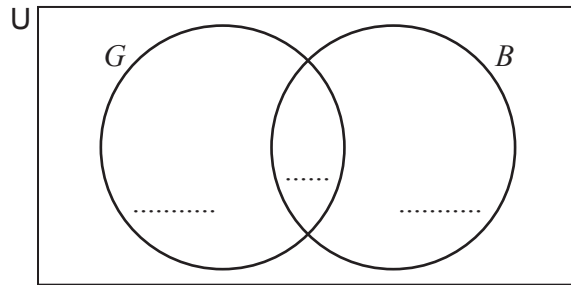
[1]

(b) Another class has 20 students.

In this class

- 5 students wear glasses and have black hair
- 8 students wear glasses and do not have black hair
- all the students either wear glasses or have black hair or both.

(i) Complete the Venn diagram.



[2]

(ii) Write down the number of students in this class who have black hair.

..... [1]

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