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CANDIDATE
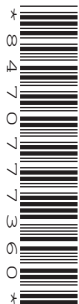NAME

CENTRE
NUMBER

CANDIDATE
NUMBER

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. $\qquad A = \frac{1}{2}bh$

Area, A, of circle, radius r. $\qquad A = \pi r^2$

Circumference, C, of circle, radius r. $\qquad C = 2\pi r$

Curved surface area, A, of cylinder of radius r, height h. $\qquad A = 2\pi rh$

Curved surface area, A, of cone of radius r, sloping edge l. $\qquad A = \pi rl$

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

Volume, V, of prism, cross-sectional area A, length l. $\qquad V = Al$

Volume, V, of pyramid, base area A, height h. $\qquad V = \frac{1}{3}Ah$

Volume, V, of cylinder of radius r, height h. $\qquad V = \pi r^2 h$

Volume, V, of cone of radius r, height h. $\qquad V = \frac{1}{3}\pi r^2 h$

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

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.
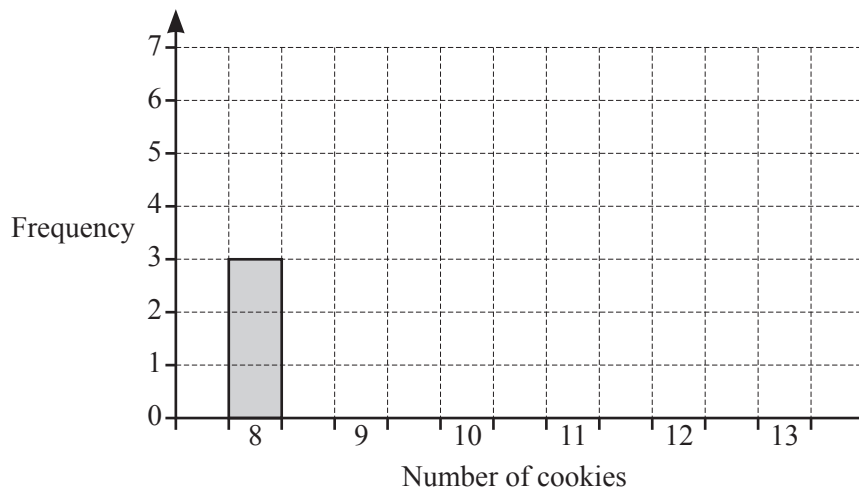
[2]

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) $\dfrac{2}{5} + \dfrac{1}{3}$

.... [1]

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

.... [1]

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

.... [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 nth 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 nth term of this sequence.

                         .... [2]

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

                         .... [1]

4
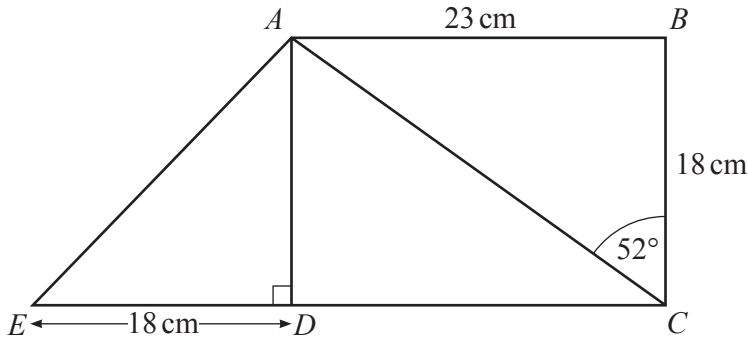
ABCD is a rectangle and *EDC* is a straight line.
DE = *BC* = 18 cm, *AB* = 23 cm and angle *BCA* = 52°.

Find

(a) angle *BAC*,

Angle *BAC* = ... [1]

(b) angle *AED*,

Angle *AED* = ... [1]

(c) angle *EAC*,

Angle *EAC* = ... [2]

(d) *AE*,

AE = ... cm [2]

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

.... 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.
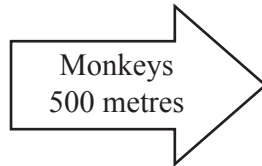
Monkeys
500 metres

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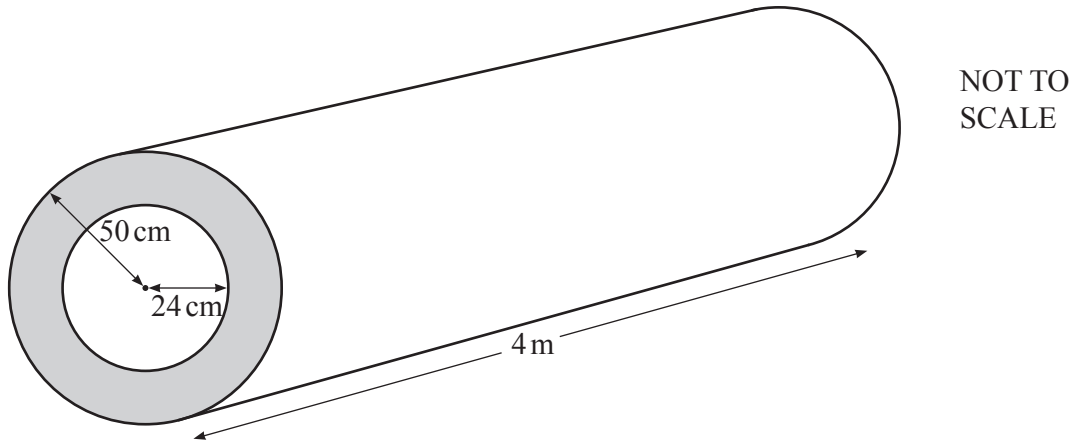
The diagram shows a cylindrical pipe.
The external radius is 50 cm and the internal radius is 24 cm.

(a) Find the shaded area.

.... cm^2 [3]

(b) The pipe is 4 metres long.

    (i) Change 4 metres into centimetres.

.... cm [1]

    (ii) Find the volume of the pipe.

.... cm^3 [1]

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

.... cm^2 [2]

7 **(a)** Solve.

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

  $x =$ .... [2]

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

  $x =$ .... [2]

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

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

  $C =$ .... [2]

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

  $M =$ .... [2]

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

  $N =$ .... [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.

North

NOT TO
SCALE

A

[4]

(b) Angle $ABC = 90°$.

(i) Calculate angle BAC.

Angle $BAC =$ .... [2]

(ii) Find the bearing of C from A.

.... [1]

9
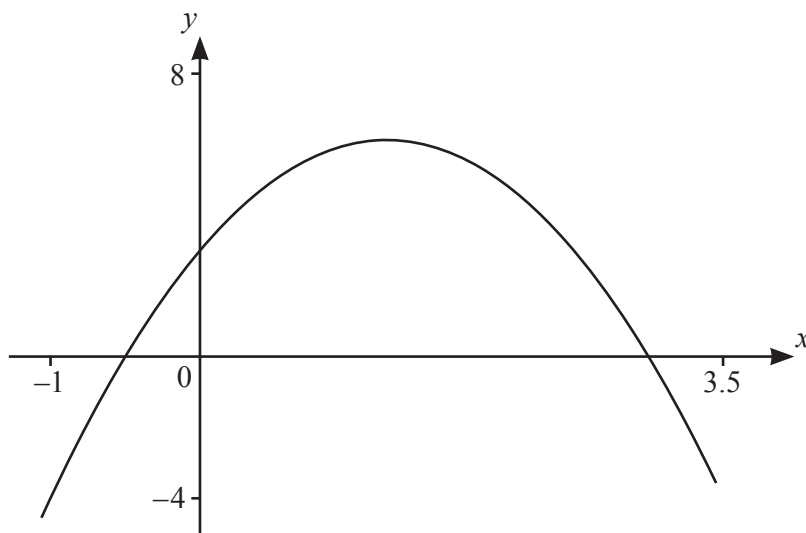
The diagram shows the graph of $y = -2x^2 + 5x + 3$ for $-1 \leqslant x \leqslant 3.5$.

(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

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

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

10
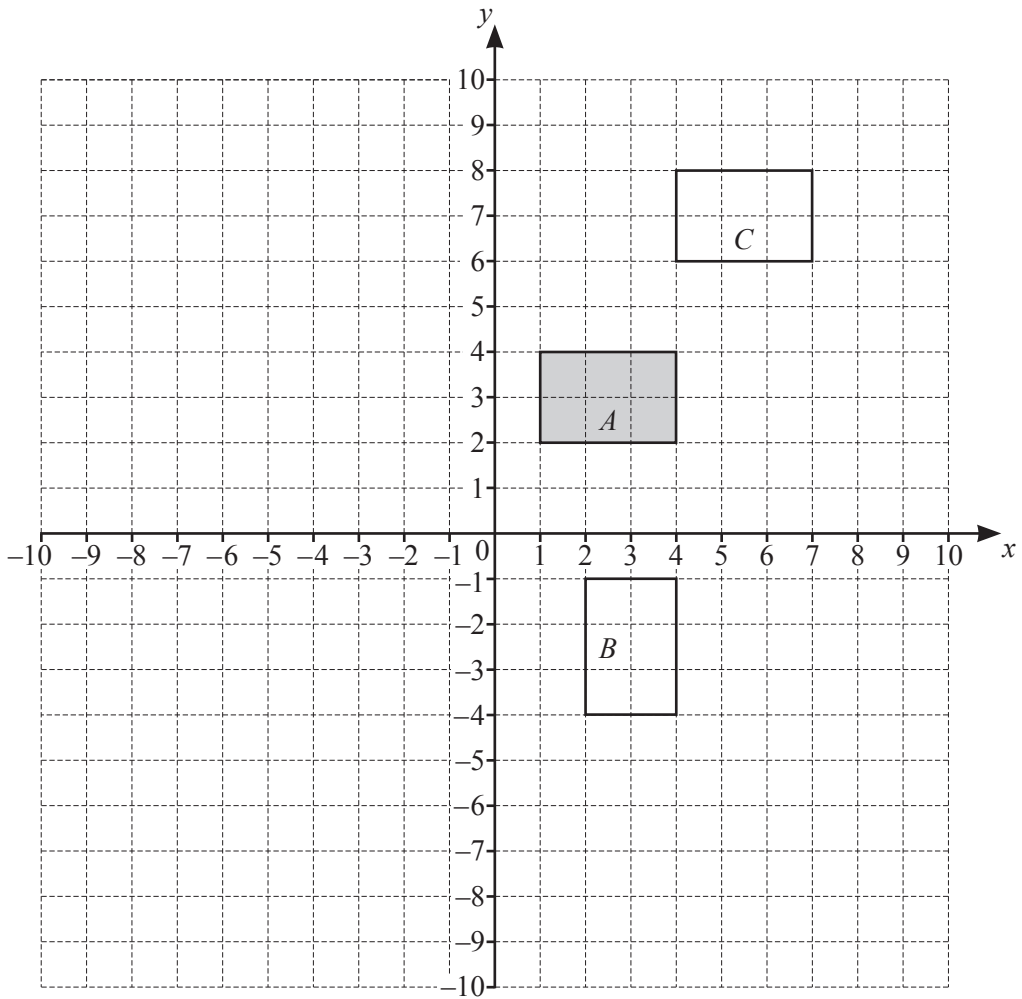
(a) Reflect shape *A* in the *y*-axis. [1]

(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.
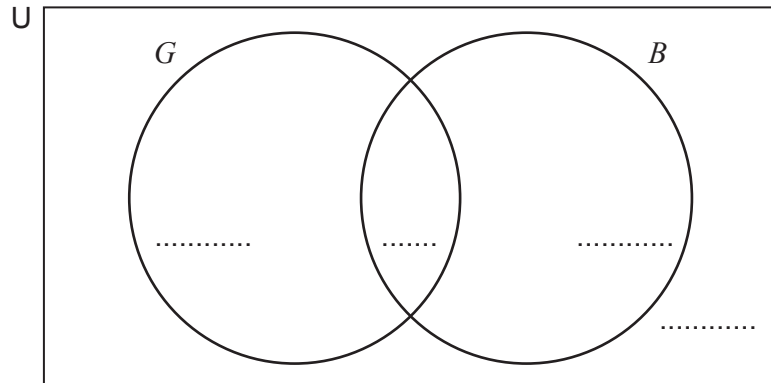
[2]

(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]

15
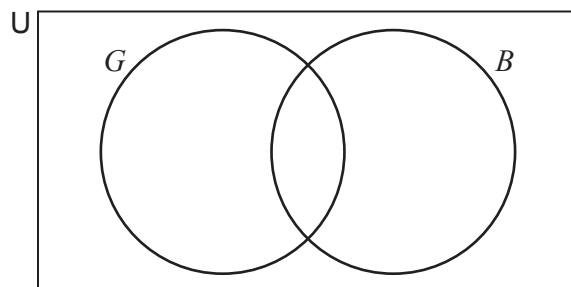
(b) Another class has 20 students.

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.
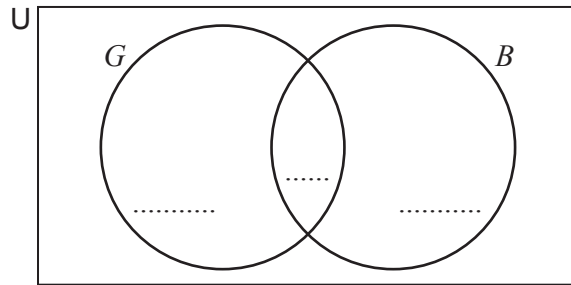
[2]

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

.... [1]

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