FOR OCR

GCE Examinations

Advanced / Advanced Subsidiary

Core Mathematics C2

Paper G

Time: 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

- Answer **all** the questions.
- Give non-exact numerical answers correct to 3 significant figures, unless a different degree of accuracy is specified in the question or is clearly appropriate.
- You are permitted to use a graphic calculator in this paper.

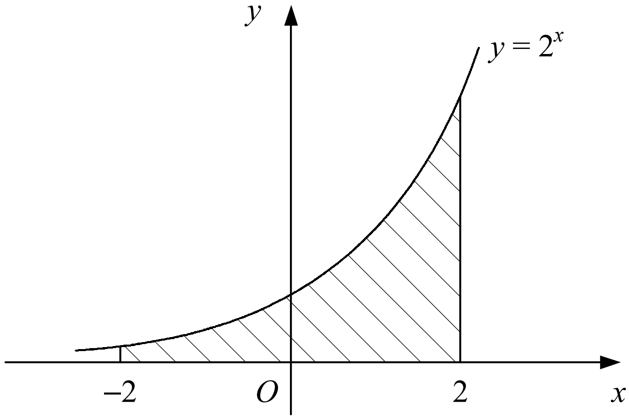
INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is 72.
- **You are reminded of the need for clear presentation in your answers.**

Written by Shaun Armstrong

1. Expand $(3-2x)^4$ in ascending powers of x and simplify each coefficient. [4]

2.



The diagram shows the curve with equation $y = 2^x$.

Use the trapezium rule with four intervals, each of width 1, to estimate the area of the shaded region bounded by the curve, the x-axis and the lines $x = -2$ and $x = 2$. [4]

3. *(i)* Given that

$$5\cos\theta - 2\sin\theta = 0,$$

show that $\tan\theta = 2.5$ [2]

(ii) Solve, for $0 \leq x \leq 180$, the equation

$$5\cos 2x° - 2\sin 2x° = 0,$$

giving your answers to 1 decimal place. [4]

4. *(a)* Given that $y = \log_2 x$, find expressions in terms of y for

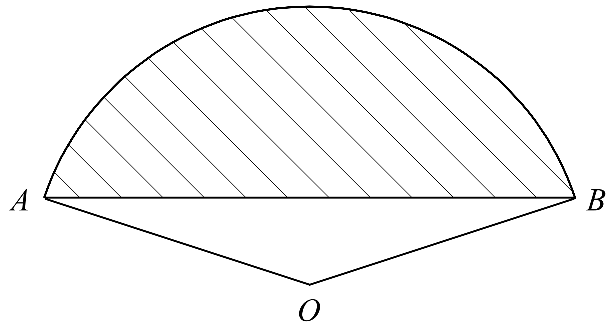
(i) $\log_2\left(\frac{x}{2}\right)$, [2]

(ii) $\log_2(\sqrt{x})$. [2]

(b) Hence, or otherwise, solve the equation

$$2\log_2\left(\frac{x}{2}\right) + \log_2(\sqrt{x}) = 8.$$ [3]

5.



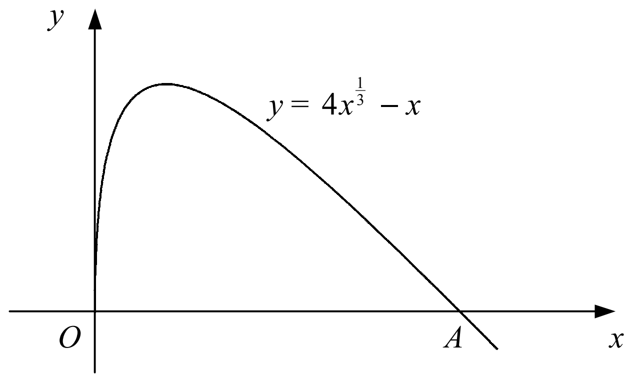
The diagram shows the sector OAB of a circle, centre O, in which $\angle AOB = 2.5$ radians.

Given that the perimeter of the sector is 36 cm,

(i) find the length OA, [2]

(ii) find the perimeter and the area of the shaded segment. [6]

6.



The diagram shows the curve with equation $y = 4x^{\frac{1}{3}} - x, \quad x \geq 0$.

The curve meets the x-axis at the origin and at the point A with coordinates $(a, 0)$.

(i) Show that $a = 8$. [3]

(ii) Find the area of the finite region bounded by the curve and the positive x-axis. [5]

Turn over

7. *(a)* Evaluate

$$\sum_{r=10}^{30} (7 + 2r). \qquad [4]$$

(b) *(i)* Write down the formula for the sum of the first n positive integers. [1]

(ii) Using this formula, find the sum of the integers from 100 to 200 inclusive. [3]

(iii) Hence, find the sum of the integers between 300 and 600 inclusive which are divisible by 3. [2]

8. The first three terms of a geometric series are $(x - 2)$, $(x + 6)$ and x^2 respectively.

(i) Show that x must be a solution of the equation

$$x^3 - 3x^2 - 12x - 36 = 0. \qquad \text{(I)} \qquad [3]$$

(ii) Verify that $x = 6$ is a solution of equation (I) and show that there are no other real solutions. [6]

Using $x = 6$,

(iii) find the common ratio of the series, [1]

(iv) find the sum of the first eight terms of the series. [2]

9. *(i)* Evaluate

$$\int_1^3 (3 - \sqrt{x})^2 \, dx,$$

giving your answer in the form $a + b\sqrt{3}$, where a and b are integers. [6]

(ii) The gradient of a curve is given by

$$\frac{dy}{dx} = 3x^2 + 4x + k,$$

where k is a constant.

Given that the curve passes through the points $(0, -2)$ and $(2, 18)$, show that $k = 2$ and find an equation for the curve. [7]