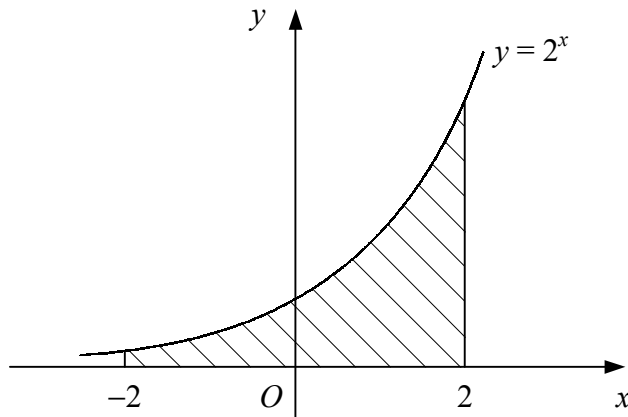# Core Mathematics C2 Paper G

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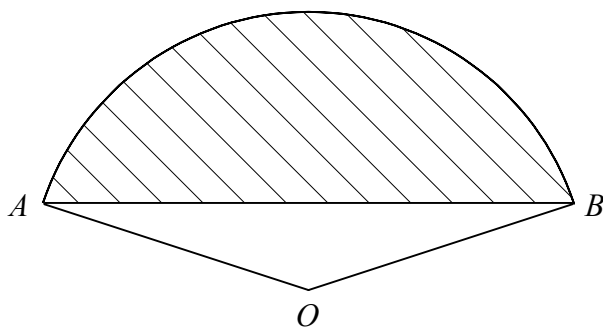
(i) $\log_2 \left(\dfrac{x}{2} \right),$ [2]

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

(b) Hence, or otherwise, solve the equation

$$2 \log_2 \left(\dfrac{x}{2} \right) + \log_2 (\sqrt{x}) = 8.$$ [3]
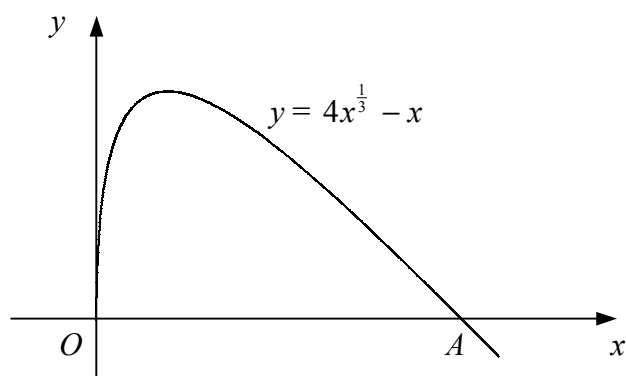
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5.

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 $y = 4x^{\frac{1}{3}} - x, \ \ x \geq 0$.

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

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

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

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

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

$$\frac{\mathrm{d}y}{\mathrm{d}x} = 3x^2 + 4x + k,$$

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]

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