FOR OCR

GCE Examinations
Advanced / Advanced Subsidiary

# Core Mathematics C2

## Paper G

## MARKING GUIDE

This guide is intended to be as helpful as possible to teachers by providing concise solutions and indicating how marks could be awarded. There are obviously alternative methods that would also gain full marks.

Method marks (M) are awarded for using a valid method.

Accuracy marks (A) can only be awarded when a correct method has been used.

(B) marks are independent of method marks.

*Written by Shaun Armstrong*

## C2 Paper G – Marking Guide

| | | | |
|---|---|---|---|
| **1.** | $= 3^4 + 4(3^3)(-2x) + 6(3^2)(-2x)^2 + 4(3)(-2x)^3 + (-2x)^4$ | M2 | |
| | $= 81 - 216x + 216x^2 - 96x^3 + 16x^4$ | A2 | **(4)** |

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|---|---|---|---|---|---|---|
| **2.** $x$ | $-2$ | $-1$ | $0$ | $1$ | $2$ | |
| $2^x$ | $\frac{1}{4}$ | $\frac{1}{2}$ | $1$ | $2$ | $4$ | M1 |

area $\approx \frac{1}{2} \times 1 \times [\frac{1}{4} + 4 + 2(\frac{1}{2} + 1 + 2)]$ — B1 M1

$= 5\frac{5}{8}$ or $5.63$ (3sf) — A1 **(4)**

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|---|---|---|---|---|
| **3.** | *(i)* | $5 \cos \theta = 2 \sin \theta$ | | |
| | | $\frac{5}{2} = \frac{\sin\theta}{\cos\theta}$ | M1 | |
| | | $\tan \theta = 2.5$ | A1 | |
| | *(ii)* | $\tan 2x = 2.5$ | | |
| | | $2x = 68.199,\ 180 + 68.199$ | B1 M1 | |
| | | $2x = 68.199,\ 248.199$ | | |
| | | $x = 34.1,\ 124.1$ (1dp) | M1 A1 | **(6)** |

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|---|---|---|---|---|
| **4.** | *(a)* | *(i)* $= \log_2 x - \log_2 2 = y - 1$ | M1 A1 | |
| | | *(ii)* $= \log_2 x^{\frac{1}{2}} = \frac{1}{2}\log_2 x = \frac{1}{2}y$ | M1 A1 | |
| | *(b)* | $2(y - 1) + \frac{1}{2}y = 8$ | | |
| | | $y = 4$ | M1 | |
| | | $\log_2 x = 4, \quad x = 2^4 = 16$ | M1 A1 | **(7)** |

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|---|---|---|---|---|
| **5.** | *(i)* | $P = 2r + (r \times 2.5) = \frac{9}{2}r = 36$ | M1 | |
| | | $OA = r = 8$ cm | A1 | |
| | *(ii)* | perimeter $= (2 \times 8 \sin 1.25) + (8 \times 2.5) = 35.2$ cm (3sf) | M2 A1 | |
| | | area $= (\frac{1}{2} \times 8^2 \times 2.5) - (\frac{1}{2} \times 8^2 \times \sin 2.5) = 60.8\text{ cm}^2$ (3sf) | M2 A1 | **(8)** |

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| **6.** | *(i)* | $4x^{\frac{1}{3}} - x = 0$ | | |
| | | $x^{\frac{1}{3}}(4 - x^{\frac{2}{3}}) = 0$ | M1 | |
| | | $x^{\frac{1}{3}} = 0$ (at $O$) or $x^{\frac{2}{3}} = 4$ | M1 | |
| | | $x \geq 0 \ \therefore x = (\sqrt{4})^3 = 8,\ a = 8$ | A1 | |
| | *(ii)* | $= \int_0^8 (4x^{\frac{1}{3}} - x)\ dx$ | | |
| | | $= [3x^{\frac{4}{3}} - \frac{1}{2}x^2]_0^8$ | M1 A2 | |
| | | $= (48 - 32) - (0) = 16$ | M1 A1 | **(8)** |

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| **7.** | *(a)* | AP: $a = 27, l = 67$ | B1 | |
| | | $n = 30 - 9 = 21$ | B1 | |
| | | $S_{21} = \frac{21}{2}(27 + 67)$ | M1 | |
| | | $= \frac{21}{2} \times 94 = 987$ | A1 | |
| | *(b)* | *(i)* $\frac{1}{2}n(n + 1)$ | B1 | |
| | | *(ii)* $= S_{200} - S_{99}$ | M1 | |
| | | $= \frac{1}{2} \times 200 \times 201 - \frac{1}{2} \times 99 \times 100$ | M1 | |
| | | $= 20\,100 - 4950 = 15\,150$ | A1 | |
| | | *(iii)* $= 3 \times 15\,150 = 45\,450$ | M1 A1 | **(10)** |

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|---|---|---|---|---|
| **8.** | *(i)* | $r = \frac{x+6}{x-2} = \frac{x^2}{x+6}$ | M1 | |
| | | $(x + 6)^2 = x^2(x - 2)$ | M1 | |
| | | $x^2 + 12x + 36 = x^3 - 2x^2, \quad x^3 - 3x^2 - 12x - 36 = 0$ | A1 | |
| | *(ii)* | when $x = 6$, LHS $= 216 - 108 - 72 - 36 = 0$ $\therefore$ $x = 6$ is a solution | B1 | |
| | | $$\begin{array}{r} x^2 + 3x + 6 \\ x - 6 \overline{) x^3 - 3x^2 - 12x - 36} \\ \underline{x^3 - 6x^2} \qquad\qquad \\ 3x^2 - 12x \qquad \\ \underline{3x^2 - 18x} \qquad \\ 6x - 36 \\ \underline{6x - 36} \end{array}$$ | M1 A1 | |
| | | $\therefore$ $(x - 6)(x^2 + 3x + 6) = 0$ | | |
| | | $x = 6$ or $x^2 + 3x + 6 = 0$ | | |
| | | $b^2 - 4ac = 3^2 - (4 \times 1 \times 6) = -15$ | M1 A1 | |
| | | $b^2 - 4ac < 0$ $\therefore$ no real solutions to quadratic | | |
| | | $\therefore$ no other solutions | A1 | |
| | *(iii)* | $r = \frac{6+6}{6-2} = 3$ | B1 | |
| | *(iv)* | $a = 6 - 2 = 4$ | | |
| | | $S_8 = \frac{4(3^8 - 1)}{3 - 1} = 13\,120$ | M1 A1 | **(12)** |

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| **9.** | *(i)* | $= \int_1^3 (9 - 6\sqrt{x} + x)\ dx$ | M1 | |
| | | $= [9x - 4x^{\frac{3}{2}} + \frac{1}{2}x^2]_1^3$ | M1 A2 | |
| | | $= (27 - 12\sqrt{3} + \frac{9}{2}) - (9 - 4 + \frac{1}{2})$ | M1 | |
| | | $= 26 - 12\sqrt{3}$ | A1 | |
| | *(ii)* | $y = \int (3x^2 + 4x + k)\ dx$ | | |
| | | $y = x^3 + 2x^2 + kx + c$ | M1 A2 | |
| | | $(0, -2)$ $\therefore$ $c = -2$ | B1 | |
| | | $(2, 18)$ $\therefore$ $18 = 8 + 8 + 2k - 2$ | M1 | |
| | | $k = 2$ | A1 | |
| | | $\therefore$ $y = x^3 + 2x^2 + 2x - 2$ | A1 | **(13)** |

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Total **(72)**

# Performance Record – C2 Paper G

| Question no. | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Topic(s) | binomial | trapezium rule | trig. eqn | logs | sector of a circle | area by integr. | AP | GP, factor theorem, alg. div. | integr. | |
| Marks | 4 | 4 | 6 | 7 | 8 | 8 | 10 | 12 | 13 | 72 |
| Student | | | | | | | | | | |
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