FOR OCR

GCE Examinations
Advanced / Advanced Subsidiary

Core Mathematics C2

Paper D

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 D – Marking Guide

1.	$= \int (3x^2 + \frac{1}{2}x^{-2})\ dx$	B1	
	$= x^3 - \frac{1}{2}x^{-1} + c$	M1 A2	**(4)**

2.	$(7 - x)^2 = x^2 + (x + 1)^2 - [2 \times x \times (x + 1) \times \cos 60]$	M1 A1	
	$49 - 14x + x^2 = x^2 + x^2 + 2x + 1 - x^2 - x$		
	$15x = 48$		
	$x = \frac{16}{5}$	M1 A1	**(4)**

---

3. *(i)*

x	0	0.25	0.5	0.75	1
$\frac{4x}{(x+1)^2}$	0	0.64	0.8889	0.9796	1

M1 A1

area $\approx \frac{1}{2} \times 0.25 \times [0 + 1 + 2(0.64 + 0.8889 + 0.9796)]$ — B1 M1

$= 0.752$ (3sf) — A1

(ii) under-estimate — B1

the curve passes above the top edge of each trapezium — B1 **(7)**

---

4. *(i)* $(1 + kx)^7 = \ldots + \binom{7}{2}(kx)^2 + \ldots$ — B1

$\therefore\ \frac{7\times6}{2} \times k^2 = 525$

$k^2 = \frac{525}{21} = 25$ — M1

$k > 0\ \therefore\ k = 5$ — A1

(ii) $(1 + 5x)^7 = \ldots + \binom{7}{3}(5x)^3 + \ldots$

$\therefore$ coeff. of $x^3 = \frac{7\times6\times5}{3\times2} \times 125 = 4375$ — M1 A1

(iii) $(1 + 5x)^7 = 1 + 35x + 525x^2 + \ldots$ — B1

$(2 - x)(1 + 5x)^7 = (2 - x)(1 + 35x + 525x^2 + \ldots)$

$= 2 + 70x + 1050x^2 - x - 35x^2 + \ldots$ — M1

$= 2 + 69x + 1015x^2 + \ldots$ — A1 **(8)**

---

5. *(i)* $\frac{8\sin x}{\cos x} - 3\cos x = 0$ — M1

$8\sin x - 3\cos^2 x = 0$

$8\sin x - 3(1 - \sin^2 x) = 0$ — M1

$3\sin^2 x + 8\sin x - 3 = 0$ — A1

(ii) $(3\sin x - 1)(\sin x + 3) = 0$ — M1

$\sin x = -3$ (no solutions) or $\frac{1}{3}$ — A1

$x = 0.34,\ \pi - 0.3398$ — B1 M1

$x = 0.34,\ 2.80$ (2dp) — A1 **(8)**

---

6. (a)	$= \text{f}(\frac{1}{2}) = \frac{1}{4} + \frac{3}{4} - 3 + 1 = -1$	M1 A1	
(b) (i)	$= \text{f}(-2) = -16 + 12 + 12 + 1 = 9$	B1	
(ii)	$x = -2$ is a solution to $\text{f}(x) = 9$ i.e. $2x^3 + 3x^2 - 6x - 8 = 0$	M1 A1	
	$$\begin{array}{r} 2x^2 - x - 4 \\ x+2 \overline{) 2x^3 + 3x^2 - 6x - 8} \\ \underline{2x^3 + 4x^2} \\ -x^2 - 6x \\ \underline{-x^2 - 2x} \\ -4x - 8 \\ \underline{-4x - 8} \end{array}$$	M1 A1	
	$\therefore \ (x + 2)(2x^2 - x - 4) = 0$		
	$x = -2$ or $\frac{1 \pm \sqrt{1+32}}{4} = -2, -1.19$ (3sf), 1.69 (3sf)	M1 A1	**(9)**
7. (i)	$\log_2 (y - 1) - \log_2 x = 1, \quad \log_2 \frac{y-1}{x} = 1$	M1	
	$\frac{y-1}{x} = 2^1 = 2$	M1	
	$y - 1 = 2x, \quad y = 2x + 1$	A1	
(ii)	$2 \log_3 y = 2 + \log_3 x \Rightarrow \log_3 y^2 - \log_3 x = 2$	M1	
	$\frac{y^2}{x} = 3^2 = 9$	M1	
	$y^2 = 9x$	A1	
	sub. $y = 2x + 1$ $(2x + 1)^2 = 9x$	M1	
	$4x^2 - 5x + 1 = 0$		
	$(4x - 1)(x - 1) = 0$	M1	
	$x = \frac{1}{4}, 1$	A1	
	$\therefore \ x = \frac{1}{4}, y = \frac{3}{2}$ or $x = 1, y = 3$	A1	**(10)**
8. (a) (i)	$= (t^2 - 5) - (t - 1) = t^2 - t - 4$	M1 A1	
(ii)	$= (t^2 - 5) + (t^2 - t - 4) = 2t^2 - t - 9$	M1 A1	
(b)	$2t^2 - t - 9 = 19$		
	$2t^2 - t - 28 = 0$		
	$(2t + 7)(t - 4) = 0$	M1	
	$t > 0 \ \therefore \ t = 4$	A1	
(c)	$a = 4 - 1 = 3, \ d = 16 - 4 - 4 = 8$	B1	
	$u_{10} = 3 + (9 \times 8) = 3 + 72 = 75$	M1 A1	
(d)	$= \frac{40}{2}[6 + (39 \times 8)] = 20 \times 318 = 6360$	M1 A1	**(11)**
9. (i)	$2x^2 - 6x - 3 = 9 + 3x - x^2$		
	$3x^2 - 9x - 12 = 0$	M1	
	$3(x + 1)(x - 4) = 0$	M1	
	$x = -1, 4$	A1	
	$\therefore \ (-1, 5), (4, 5)$	A1	
(ii)	area $= \int_{-1}^{4} [(9 + 3x - x^2) - (2x^2 - 6x - 3)] \, dx$	M1	
	$= \int_{-1}^{4} (12 + 9x - 3x^2) \, dx$	A1	
	$= [12x + \frac{9}{2}x^2 - x^3]_{-1}^{4}$	M1 A2	
	$= (48 + 72 - 64) - (-12 - \frac{9}{2} + 1) = 62\frac{1}{2}$	M1 A1	**(11)**
		Total	**(72)**

Performance Record – C2 Paper D

Question no.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	Total
Topic(s)	integr.	cosine rule	trapezium rule	binomial	trig. eqn	remain. theorem, alg. div.	logs	AP	area by integr.	
Marks	4	4	7	8	8	9	10	11	11	72
Student										