FOR EDEXCEL

GCE Examinations
Advanced Subsidiary

Core Mathematics C2

Paper E

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 knowing and using a method.

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

(B) marks are independent of method marks.

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C2 Paper E – Marking Guide

1. $= [2x + x^{-1}]_2^4$ M1 A1

$= (8 + \frac{1}{4}) - (4 + \frac{1}{2}) = 3\frac{3}{4}$ M1 A1 **(4)**

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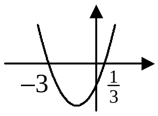
2. $f'(x) = 3x^2 + 8x - 3$ M1 A1

increasing when $3x^2 + 8x - 3 \geq 0$ M1

$(3x - 1)(x + 3) \geq 0$ M1

$x \leq -3$ or $x \geq \frac{1}{3}$ A1 **(5)**



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3. *(a)* $= \log_2 (3^2 \times 5)$ B1

$= 2 \log_2 3 + \log_2 5 = 2p + q$ M1 A1

(b) $= \log_2 \frac{3}{5\times2} = \log_2 3 - \log_2 5 - \log_2 2$ M1

$= p - q - 1$ B1 A1 **(6)**

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

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

$k^2 = \frac{525}{21} = 25$ M1

$k > 0 \;\therefore k = 5$ A1

(b) $(1 + 5x)^7 = ... + \binom{7}{3}(5x)^3 + ...$

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

(c) $(1 + 5x)^7 = 1 + 35x + 525x^2 + ...$ B1

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

$= 2 + 70x + 1050x^2 - x - 35x^2 + ...$ M1

$= 2 + 69x + 1015x^2 + ...$ A1 **(8)**

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5. *(a)* $\frac{1}{2}\sqrt{3}$ B1

(b)

x	0	$\frac{\pi}{6}$	$\frac{\pi}{3}$
$\cos^2 x$	1	$\frac{3}{4}$	$\frac{1}{4}$

M1 A1

area $\approx \frac{1}{2} \times \frac{\pi}{6} \times [1 + \frac{1}{4} + 2(\frac{3}{4})]$ B1 M1

$= 0.720$ (3sf) A1

(c) area of $S = \int_0^{\frac{\pi}{3}} \sin^2 x \; dx = \int_0^{\frac{\pi}{3}} (1 - \cos^2 x) \; dx$ M1

$= \frac{\pi}{3} - 0.71995 = 0.327$ (3sf) M1 A1 **(9)**

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6. *(a)* isosceles $\therefore \angle AMB = 90°$ B1

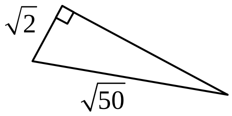
$BM = 4 \tan 30° = \frac{4}{\sqrt{3}}$ M1 A1

area $= \frac{1}{2} \times 8 \times \frac{4}{\sqrt{3}} = \frac{16}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{16}{3}\sqrt{3}$ cm^2 M1 A1

(b) area of sector $= \frac{1}{2} \times 4^2 \times \frac{\pi}{6} = \frac{4}{3}\pi$ B1 M1

shaded area $= \frac{16}{3}\sqrt{3} - (2 \times \frac{4}{3}\pi)$ M1

$= \frac{16}{3}\sqrt{3} - \frac{8}{3}\pi = \frac{8}{3}(2\sqrt{3} - \pi)$ cm^2 A1 **(9)**

7.	*(a)*	$(-6, 5)\ \therefore\ 36 + 25 - 60 - 40 + k = 0$	M1	
		$k = 39$	A1	
	(b)	$(x + 5)^2 - 25 + (y - 4)^2 - 16 + 39 = 0$	M1	
		$(x + 5)^2 + (y - 4)^2 = 2$		
		$\therefore$ centre $(-5, 4)$, radius $= \sqrt{2}$	A2	
	(c)	 dist. (2, 3) to centre $= \sqrt{49+1} = \sqrt{50}$	B1	
		$\therefore\ AB^2 = (\sqrt{50})^2 - (\sqrt{2})^2 = 48$	M1 A1	
		$AB = \sqrt{48} = \sqrt{16\times 3} = 4\sqrt{3}$	M1 A1	**(10)**
8.	*(a)*	end of 1st year: $500 \times 1.06 = 530$	M1	
		start of 2nd year: $530 + 500 = 1030$		
		interest at end of 2nd year $= 0.06 \times 1030 = £61.80$	M1 A1	
	(b)	end of 8th year: $500 \times (1.06 + 1.06^2 + 1.06^3 + ... + 1.06^8)$		
		$= 500 \times S_8$; GP, $a = 1.06$, $r = 1.06$	B1	
		$= 500 \times \frac{1.06[(1.06)^8 - 1]}{1.06 - 1}$	M1 A1	
		$= 5245.66\ \therefore$ £5246 (nearest pound)	A1	
	(c)	$(1.005)^{12} = 1.0617...$	M1 A1	
		end of 8th year: $500 \times \frac{1.0617[(1.0617)^8 - 1]}{1.0617 - 1} = 5285.71$	M1 A1	
		$\therefore$ £40 more in account (nearest pound)	A1	**(12)**
9.	*(a)*	$f(-1) = r\ \therefore\ -1 + k + 7 - 15 = r$	M1	
		$k = r + 9$	A1	
		$f(3) = 3r\ \therefore\ 27 + 9k - 21 - 15 = 3r$	M1	
		$3k = r + 3$		
		subtracting, $2k = -6$	M1	
		$k = -3$	A1	
	(b)	$r = -3 - 9 = -12$	B1	
	(c)	$f(x) = x^3 - 3x^2 - 7x - 15$		
		$f(5) = 125 - 75 - 35 - 15 = 0\ \therefore\ (x - 5)$ is a factor	M1 A1	
	(d)	$$\begin{array}{r\|rrrr} & x^2 & +\ 2x & +\ 3 & \\ \hline x-5 & x^3 & -\ 3x^2 & -\ 7x & -\ 15 \\ & x^3 & -\ 5x^2 & & \\ \hline & & 2x^2 & -\ 7x & \\ & & 2x^2 & -\ 10x & \\ \hline & & & 3x & -\ 15 \\ & & & 3x & -\ 15 \\ \hline \end{array}$$	M1 A1	
		$\therefore\ (x - 5)(x^2 + 2x + 3) = 0$		
		$x = 5$ or $x^2 + 2x + 3 = 0$		
		$b^2 - 4ac = 2^2 - (4 \times 1 \times 3) = -8$	M1	
		$b^2 - 4ac < 0\ \therefore$ no real solutions to quadratic		
		$\therefore$ only one real solution	A1	**(12)**

Total	**(75)**

Performance Record – C2 Paper E

Question no.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	Total
Topic(s)	integr.	increasing function	logs	binomial	trapezium rule	sector of a circle	circle	GP	remain. theorem, alg. div.	
Marks	4	5	6	8	9	9	10	12	12	75
Student										