

Edexcel GCE
Core Mathematics C2
Practice Paper A3
(Mark Scheme)

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Question number	Scheme	Marks
<p>1. (a)</p> <p>(b)</p>	<p>Complete attempt at remainder theorem, or long division</p> <p>Either $f(3) = 27 + 9a + 3b - 10 = 14$,</p> <p>Or complete attempt at long division by $(x-3)$ leading to equation.</p> <p>Either $f(-1) = -1 + a - b - 10 = -18$ or long division by $(x+1)$ leading to equation.</p> <p>Equation equivalent to $9a + 3b = -3$ ($3a + b = -1$)</p> <p>Equation equivalent to $a - b = -7$</p> <p>Solve two equations to get $a = -2, b = 5$</p> <p>Either $f(2) = 8 - 8 + 10 - 10 = 0$, or complete division with no remainder.</p> <p>$\therefore (x - 2)$ is a factor.</p> <p>or $f(x) = (x - 2)(x^2 + 5)$</p>	<p>M1</p> <p>A1</p> <p>A1</p> <p>M1, A1 (5)</p> <p>M1,</p> <p>A1 cso</p> <p>(M1 A1) (2)</p> <p>(7 marks)</p>
<p>2. (a)</p> <p>(b)</p> <p>(c)</p>	<p>$1 + nax + \frac{n(n-1)}{2}(ax)^2 + \frac{n(n-1)(n-2)}{6}(ax)^3 + \dots$</p> <p>$na = 8, \frac{n(n-1)}{2}a^2 = 30$</p> <p>$\frac{n(n-1)}{2} \cdot \frac{64}{n^2} = 30, \frac{\frac{8}{a}(\frac{8}{a}-1)a^2}{2} = 30$</p> <p>either</p> <p>$n = 16, a = \frac{1}{2}$</p> <p>$\frac{16 \cdot 15 \cdot 14}{6} \cdot \left(\frac{1}{2}\right)^3 = 70$</p>	<p>accept 2!, 3!</p> <p>B1, B1 (2)</p> <p>both</p> <p>M1</p> <p>M1</p> <p>A1 A1 (4)</p> <p>M1 A1 (2)</p> <p>(8 marks)</p>

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<p>3. (a)</p> <p>(b)</p> <p>(c)</p>	<p>Attempting to get to $a^6 =$ from $800 = \frac{20000a^6}{4+a^6}$</p> <p>$a^6 = \frac{3200}{1200}$</p> <p>$a = \left(\frac{3200}{1200}\right)^{\frac{1}{6}} \rightarrow 1.1776$ (4 dp)</p> <p>Substituting $P = 1800$ into formula with a^t as unknown</p> <p>$a^t = 36 \rightarrow t = 22$</p> <p>Number of years needed for p from 800 to 1800 = 16 years</p> <p>$P = \frac{2000}{1+4a^{-t}}$, $4a^{-t} \rightarrow 0$ as $t \rightarrow \infty$</p> <p>So $P \rightarrow 2000$ but does not exceed it</p>	<p>M1</p> <p>A1</p> <p>M1 A1 cao (4)</p> <p>M1</p> <p>A1, M1</p> <p>A1 ft (4)</p> <p>B1 (1)</p> <p>(9 marks)</p>
<p>4. (a)</p> <p>(b)</p> <p>(c)</p>	<p>$2x^{\frac{3}{2}} - 3x^{-\frac{3}{2}} = 0$</p> <p>$x^3 = \frac{3}{2}$</p> <p>$x = \sqrt[3]{\frac{3}{2}}$</p> <p>$= 1.1447... = 1.14$ (3 sf)</p> <p>$f(x) = 4x^3 + 9x^{-3} - 12 + 5$</p> <p>$= 4x^3 + \frac{9}{x^3} - 7$</p> <p>$\int_1^2 f(x) dx = \left[x^4 - \frac{9}{2}x^{-2} - 7x\right]_1^2$</p> <p>$= (2^4 - \frac{9}{2} \times 2^{-2} - 14) - (1 - \frac{9}{2} - 7)$</p> <p>$= 11\frac{3}{8}$ or 11.375</p>	<p>M1</p> <p>$x = \sqrt[3]{a}$ M1</p> <p>A1 cao (3)</p> <p>$A = 4$ B1</p> <p>$B = 9, C = -7$ B1, B1 (3)</p> <p>$x^n \rightarrow x^{n+1}$ M1</p> <p>A2 ft (candidate's A, B, C) (-1 eeo)</p> <p>M1 (use of limits)</p> <p>A1 (5)</p> <p>(11 marks)</p>

Question number	Scheme	Marks
5.	(a) $BM = \sqrt{7^2 + 24^2} = 25$ (*)	B1 (1)
	(b) $\tan \alpha = \frac{7}{24}$ or equiv. and $\angle BMC = 2\alpha$, or cosine rule	M1 A1
	$\angle BMC = 0.568$ radians (*)	A1 (3)
	(c) ΔABM : $\frac{1}{2}(14 \times 24)$ (= 168 mm ²) (or other appropriate Δ)	B1
	Sector: $\frac{1}{2}(25^2 \times 0.568)$ Total: "168 + 168 + 177.5" = 513 mm ² (or 514, or 510)	M1 A1 (5)
(d)	Volume = "513" \times 85 mm ³ (M requires unit conversion) = 44 cm ³	M1 A1 (2) (11 marks)
6.	(a) $5 + 2x - x^2 = 2$ or $x^2 - 2x - 3 = 0$	M1
	$(x - 3)(x + 1) = 0$ $x = -1, x = 3$	M1 A1 (3)
	(b) $\int (5 + 2x - x^2) dx = [5x + x^2 - \frac{1}{3}x^3]$	M1 A1
	Using limits: $(15 + 9 - 9) - (-5 + 1 + \frac{1}{3})$ (18 $\frac{2}{3}$)	M1 A1
	Shaded area = $18\frac{2}{3} - 8 = 10\frac{2}{3}$	M1 A1 (6) (9 marks)

Question number	Scheme	Marks
7. (a)	$\theta - 10 = 15 \quad \theta = 25$ (cos($\theta - 10$) = cos $\theta - \cos 10$, etc, is B0) $\theta - 10 = 345 \quad \theta = 355$ M: Using 360 – “15” (can be implied) Stating $\theta = 345$ scores M1 A0 (Other methods: M1 for <u>complete</u> method, A1 for 25 and A1 for 355)	B1 M1 A1 (3)
7. (b)	$2\theta = 21.8\dots (\alpha)$ (At least 1 d.p.) (Could be implied by a correct θ). $2\theta = \alpha + 180$ or $2\theta = \alpha + 360$ or $2\theta = \alpha + 540$ (One more solution) $\theta = 10.9, 100.9, 190.9, 280.9$ (M1: divide by 2) (A1ft: 2 correct, ft their α) (A1: all 4 correct cao, at least 1 d .p.)	B1 M1 M1 A1ft A1 (5)
7. (c)	$2\sin\theta\left(\frac{\sin\theta}{\cos\theta}\right) = 3,$ $2\sin^2\theta = 3\cos\theta$ $2(1 - \cos^2\theta) = 3\cos\theta$ $2\cos^2\theta + 3\cos\theta - 2 = 0$ $(2\cos\theta - 1)(\cos\theta + 2) = 0 \quad \cos\theta = \frac{1}{2}$ (M: solve 3 term quadratic up to $\cos\theta = \dots$ or $x = \dots$) $\theta = 60, \theta = 300$	M1, A1 M1 M1 A1 A1 (6) (14 marks)