

Question number	Scheme	Marks
1. (a) (b)	$f(1) = 0, 2 - 1 + p + 6 = 0$ so $p = -7$ $f(-\frac{1}{2}) = -\frac{1}{4} - \frac{1}{4} + \frac{7}{2} + 6 = 9$	M1 A1 (2) M1 A1 (2) (4 marks)
2. (a) (b)	$\int (3 + 4x^3 - \frac{2}{x^2}) dx = 3x + x^4 + \frac{2}{x} + c$ $\int_1^2 (3 + 4x^3 - \frac{2}{x^2}) dx = \left[3x + x^4 + \frac{2}{x} \right]_1^2$ $= (6 + 16 + 1) - (3 + 1 + 2)$ $= 17$	M1 A2(1, 0) (3) M1 A1 (2) (5 marks)
3. (a) (b) (c)	Arc $BD = r\theta = 0.4 \times 6 = 2.4$ Cosine Rule: $AB^2 = 6^2 + 12^2 - 2 \times 6 \times 12 \times \cos(0.4^c) = 47.36\dots$ $\therefore AB = 6.88\dots\dots$ Perimeter = $6 + 6.88 + 2.4 = 15.3$ (cm) (3 sig. figs)	B1 (1) M1 A1 A1 (3) B1ft (1) (5 marks)
4.	$\log_3 x^2 - \log_3 (x - 2) = 2$ $\log_3 \left(\frac{x^2}{x - 2} \right) = 2$ $\frac{x^2}{x - 2} = 3^2$ $x^2 - 9x + 18 = 0$ $(x - 6)(x - 3) = 0$ $x = 3, 6$	Use of $\log x^n$ rule M1 Use of $\log a - \log b$ rule M1 Getting out of logs M1 Correct 3TQ = 0 A1 Attempt to solve 3TQ M1 Both A1 (6 marks)

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<p>5. (a)</p> <p>(b)</p> <p>(c)</p>	<p>$ar = 9$ $ar^4 = 1.125$</p> <p>Dividing gives $r^3 = \frac{1.125}{9} = \frac{1}{8}$</p> <p>So $r = \frac{1}{2}$</p> <p>Using $ar = 9$, $a = \frac{9}{\frac{1}{2}} = 18$</p> <p>$S_\infty = \frac{a}{1-r} = \frac{18}{1-\frac{1}{2}} = 36$</p>	<p>M1</p> <p>M1</p> <p>A1 (3)</p> <p>M1, A1 (2)</p> <p>M1 A1 (2)</p> <p>(7 marks)</p>
<p>6. (a)</p> <p>(b)</p> <p>(c)</p>	<p>$(x-3)^2 + (y+2)^2 (= 9 + 4 + 12)$ Attempt to complete the square</p> <p>\therefore Centre is at $(3, -2)$</p> <p>$(\dots)^2 + (\dots)^2 = 12 + 4 + 9 = 25 = 5^2$ ft their centre</p> <p>\therefore Radius = 5</p> <p>$PQ = 10$ means PQ is a diameter and so angle PRQ is 90°</p> <p>Pythagoras' Theorem gives $QR^2 = 10^2 - 3^2 = 91$</p> <p>So $QR = 9.54\dots = 9.5$ (1 d.p.)</p>	<p>M1</p> <p>A1 (2)</p> <p>M1</p> <p>A1 (2)</p> <p>M1</p> <p>M1</p> <p>A1 (3)</p> <p>(7 marks)</p>
<p>7. (a)</p> <p>(b)</p>	<p>$\frac{n(n-1)}{2!}k^2 = \frac{n(n-1)(n-2)}{3!}k^3$ One coefficient (no $\binom{n}{r}$)</p> <p>e.g. $3k^2 = (n-2)k^3$ A correct equation, no cancelling</p> <p>$3 = (n-2)k$ (*) Cancel at least $n(n-1)$</p> <p>$A = nk = 4$</p> <p>$3 = 4 - 2k$</p> <p>So $k = \frac{1}{2}$, and $n = 8$</p>	<p>M1</p> <p>A1</p> <p>M1</p> <p>A1 cso (4)</p> <p>B1</p> <p>M1</p> <p>A1, A1 (4)</p> <p>(8 marks)</p>

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8.	(a) $x - 20^\circ = 115.9^\circ \dots$ Or $244.08^\circ \dots$ $x = 136^\circ, 264^\circ$	Any solution (awrt 116° or 244°) 360° – candidate's first answer + 20° at correct stage	B1 M1 M1 A1 (4)
	(b) $3 \frac{\sin \theta}{\cos \theta} = 2 \cos \theta$ $3 \sin \theta = 2 \cos^2 \theta = 2(1 - \sin^2 \theta)$ $2 \sin^2 \theta + 3 \sin \theta - 2 = 0$ $(2 \sin \theta - 1)(\sin \theta + 2) = 0$ $\sin \theta = -2$ (No solution) $\sin \theta = \frac{1}{2}$ So $\theta = 30^\circ, 150^\circ$	Use of $\tan \theta = \frac{\sin \theta}{\cos \theta}$ Use of $\cos^2 \theta = 1 - \sin^2 \theta$ 3 term quadratic in $\sin = 0$ Attempt to solve At least $\frac{1}{2}$ Both	M1 M1 A1 M1 A1 A1 (6) (10 marks)
	(a) Surface Area = $2\pi rh + \pi r^2$ $h = \frac{250 - \pi r^2}{2\pi r}$ $V = \pi r^2 h = \pi r^2 \times \frac{(250 - \pi r^2)}{2\pi r}$ $V = 125r - \frac{\pi r^3}{2}$ (*)	Attempt $h =$ $V =$ and sub for h	B1 M1 M1 A1 c.s.o. (4)
	(b) $\frac{dV}{dr} = 125 - \frac{3\pi}{2} r^2$ $\frac{dV}{dr} = 0 \Rightarrow r^2 = \frac{250}{3\pi}$ so $r = \sqrt{\frac{250}{3\pi}} = 5.15 \dots$		M1 M1 A1 (3)
	(c) $\frac{d^2V}{dr^2} = -3\pi r$ When $r = 5.15 \dots$ this is < 0 , therefore a maximum		M1 A1 (2)
	(d) Max V is $125(5.15 \dots) - \frac{\pi (5.15 \dots)^3}{2}$ i.e. Maximum volume is $429.19 \dots = 429 \text{ (cm}^3\text{)}$		M1 A1 (2) (11 marks)

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<p>10. (a)</p> <p>(b)</p> <p>(c)</p> <p>(d)</p>	$y = 9 - 8 - \frac{2}{\sqrt{4}} = 0 \therefore b = 4 \quad (*)$	<p>B1 c.s.o. (1)</p>
	$\frac{dy}{dx} = -2 + x^{-\frac{3}{2}}$	<p>M1</p>
	<p>When $x = 1$ gradient $= -2 + 1 = -1$</p>	<p>A1</p>
	<p>So equation of the tangent is $y - 5 = -1(x - 1)$</p>	<p>M1</p>
	<p>i.e. $y + x = 6 \quad (*)$</p>	<p>A1 c.s.o. (4)</p>
	<p>Let $y = 0$ and $x = 6$ so D is $(6, 0)$</p>	<p>B1 (1)</p>
	<p>Area of triangle $= \frac{1}{2} \times 5 \times 5 = 12.5$</p>	<p>B1</p>
	$\int_1^4 (9 - 2x - 2x^{-\frac{1}{2}}) dx = \left[9x - x^2 - 2\frac{x^{\frac{1}{2}}}{\frac{1}{2}} \right]_1^4$ $= (36 - 16 - 4 \times 2) - (9 - 1 - 4)$ $= 12 - 4$ $= 8$	<p>Ignore limits M1 A1</p> <p>Use of limits M1</p> <p>A1</p>
	<p>So shaded area is $12.5 - 8 = 4.5$</p>	<p>A1 (6)</p> <p>(12 marks)</p>

C2 Mock Paper SPECIFICATION and ASSESSMENT OBJECTIVES

Qn	Specification	AO1	AO2	AO3	AO4	AO5	Total
1	1	2	2				4
2	7.1	2	3				5
3	4.4, 4.2	1	1		1	2	5
4	5.2	3	3				6
5	3.1	3	4				7
6	2.1, 2.2	3	2	1		1	7
7	3.2	4	4				8
8	4.3 4.4, 4.5	5	3		2		10
9	6	2	2	4	2	1	11
10	7.2 +C1	5	5			2	12
	Totals	30	29	5	5	6	75