1		$(3x-2)^4 = 81x^4 - 216x^3 + 216x^2 - 96x + 16$	M1		Attempt binomial expansion, including attempt at coeffs.
			A1		Obtain one correct, simplified, term
			A1		Obtain a further two, simplified, terms
			A1	4	Obtain a completely correct expansion
				4	
2	(i)	$u_2 = -1, u_3 = 2, u_4 = -1$	B1		For correct value -1 for u_2
			B1	2	For correct values for both u_3 and u_4
	(ii)	Sum is $(2+(-1))+(2+(-1))++(2+(-1))$	M1		For correct interpretation of Σ notation
			M1		For pairing, or $50 \times 2 - 50 \times 1$
		i.e. $50 \times (2 + (-1)) = 50$	A1	3	For correct answer 50
				<u>5</u>	
3		$y = 4x^{\frac{1}{2}} + c$	M1		For attempt to integrate
		y - 4x + c	A1		For integral of the form $kx^{\frac{1}{2}}$
			A1		For $4x^{\frac{1}{2}}$, with or without +c
		Hence $5 = 4 \times 4^{\frac{1}{2}} + c \Rightarrow c = -3$	M1		For relevant use of (4, 5) to evaluate c
			A1√		For correct value –3 (or follow through on integral
					of form $kx^{\frac{1}{2}}$)
		So equation of the curve is $y = 4x^{\frac{1}{2}} - 3$	A1	6	For correct statement of the equation in full (aef)
			/ ()	6	
4	(i)	Intersect where $x^2 + x - 2 = 0 \Rightarrow x = -2,1$	M1		For finding <i>x</i> at both intersections
			A1	2	For both values correct
	(ii)	Area under curve is $\left[4x - \frac{1}{3}x^3\right]_{2}^{1}$	M1		
		L 3 J-2			For integration attempt with any one term correct For use of limits – subtraction and correct order
			M1		For use of lifflits – subtraction and correct order
		i.e. $\left(4-\frac{1}{3}\right)-\left(-8+\frac{8}{3}\right)=9$	A1		For correct area of 9
			M1		Attorney and of triangle (1/ bb an integration)
		Area of triangle is 4½	A1		Attempt area of triangle (½bh or integration)
			A1	6	Obtain area of triangle as 4 ½ Obtain correct final area of 4 ½
		Hence shaded area is $9 - 4\frac{1}{2} = 4\frac{1}{2}$	AI		Obtain correct final area of 4 72
		OR	M1		
					Attempt subtraction – either order
		Area under curve is $\int_{-2}^{1} (2-x-x^2) dx$	M1		For integration attempt with any one term correct
		$= \left[-\frac{1}{3}x^3 - \frac{1}{2}x^2 + 2x \right]_{2}^{1}$	A1		Obtain $\pm \left[-\frac{1}{3} x^3 - \frac{1}{2} x^2 + 2x \right]$
		$=(-\frac{1}{3}-\frac{1}{2}+2)-(\frac{8}{3}-2-4)$	N/14		For use of limits – subtraction and correct order
		$= 4\frac{1}{2}$	M1 A1		Obtain \pm 4 ½ - consistent with their order of
		$-\frac{1}{2}$	^		subtraction
			A1		Obtain 4 ½ only, following correct method only
				8	
			1	ı –	

5 (i	i)	$\sin^2 x = 1 - \cos^2 x \Rightarrow 2\cos^2 x + \cos x - 1 = 0$	M1		For transforming to a quadratic in cos <i>x</i>
	,	Hence $(2\cos x - 1)(\cos x + 1) = 0$	M1		For solution of a quadratic in cos <i>x</i>
		, , , ,			-
		$\cos x = \frac{1}{2} \Longrightarrow x = 60^{\circ}$	A1		For correct answer 60°
		$\cos x = -1 \Rightarrow x = 180^{\circ}$	A1	4	For correct answer 180° [Max 3 out of 4 if any extra answers present in range, or in radians] SR answer only is B1, B1 justification – ie graph or substitution is B2, B2
(ii	ii)	$\tan 2x = -1 \Rightarrow 2x = 135 \text{ or } 315$	M1 M1		For transforming to an equation of form tan2x = k For correct solution method, i.e. inverse tan followed by division by 2
		Hence $x = 67.5^{\circ} \text{ or } 157.5^{\circ}$	A1		For correct value 67.5
		THE REPORT OF 137.3	A1	4	For correct value 157.5
		$ \mathbf{OR} \\ \sin^2 2x = \cos^2 2x $	M1 M1		Obtain linear equation in cos 2x or sin 2x Use correct solution method
		$2\sin^2 2x = 1 \qquad 2\cos^2 2x = 1$	A1		For correct value 67.5
		$\sin 2x = \pm \frac{1}{2}\sqrt{2} \cos 2x = \pm \frac{1}{2}\sqrt{2}$	A1		For correct value 157.5
		Hence $x = 67.5^{\circ}$ or 157.5°			[Max 3 out of 4 if any extra answers present in
		THE NOTE $x = 07.5$ of 157.5			range, or in radians] SR answer only is B1, B1
					justification – ie graph or substitution is B2,
					B2
				<u>8</u>	
6 (i)	i)	(a) $100 + 239 \times 5 = £1295$	M1 A1	2	For relevant use of <i>a</i> + (<i>n</i> – 1) <i>d</i> For correct value 1295
		(b) $\frac{1}{2} \times 240 \times (100 + 1295) = £167400$	M1		For relevant use of $\frac{1}{2}n(a+l)$ or equivalent
		(b) 2 ~ 2 + 0 ~ (100 + 12)3) - £10/400	A1	2	For correct value 167400
(ii	ii)	$100r^{239} = 1500 \Rightarrow r = 1.01139$	B1	<u>.</u>	For correct statement of $100r^{239} = 1500$
'"	,	1001 — 1300 — 1 — 1.01137	M1		Attempt to find r
			A1		For correct value 1.01
		$100(1.01139^{240}-1)$	M1	_	For relevant use of GP sum formula
		Hence total is $\frac{100(1.01139^{240} - 1)}{1.01139 - 1} = £124359$	A1	5	For correct value 124359 (3 s.f. or better)
				9	

7	(i)	$AC^2 = 11^2 + 8^2 - 2 \times 11 \times 8 \times \cos 0.8$ = 62.3796 Hence AC=7.90 cm	M1 A1 A1	3	Attempt to use the cosine formula Correct unsimplified expression Show the given answer correctly
	(ii)	Area of sector = $\frac{1}{2} \times 7.90^2 \times 1.7 = 53.0$ Area of triangle = $\frac{1}{2} \times 7.90^2 \times \sin 1.7 = 30.9$ Hence shaded area = 22.1 cm ²	M1 M1 A1	3	Attempt area of sector using $(\frac{1}{2})r^2\theta$ Attempt area of ΔACD , using $(\frac{1}{2})r^2\sin\theta$, or equiv Obtain 22.1
	(iii)	(arc) $DC = 7.90 \times 1.7 = 13.4$ (line) $DC^2 = 7.90^2 + 7.90^2 - 2 \times 7.90 \times 7.90 \times \cos 1.7$ DC = 11.9 Hence perimeter = 25.3cm	M1 A1 M1 A1	4	Use $r\theta$ to attempt arc length Obtain 13.4 Attempt length of line DC using cosine rule or equiv. Obtain 25.3
8	(i) (ii)	$f(2) = 12 \Rightarrow 4a + 2b = 6$ $f(-1) = 0 \Rightarrow a - b = 12$ Hence $a = 5$, $b = -7$ Quotient is $2x^2 + x - 9$ Remainder is 8	M1 A1 M1 A1 M1 A1 B1 M1 A1 M1	6 5 11	For equating $f(2)$ to 12 For correct equation $4a + 2b = 6$ For equating $f(-1)$ to 0 For correct equation $a - b = 12$ For attempt to find a and b For both values correct For correct lead term of $2x^2$ For complete division attempt or equiv For completely correct quotient For attempt at remainder – either division or $f(-2)$ For correct remainder

9	(i)		M1 A1 B1	3	Attempt sketch of any exponential graph, in at least first quadrant Correct graph – must be in both quadrants For identification of (0, 1)
	(ii)	$A \approx \frac{1}{2} \times 0.5 \times \left\{ 1 + 2\left(0.5^{\frac{1}{2}} + 0.5 + 0.5^{\frac{3}{2}}\right) + 0.5^{2} \right\}$ ≈ 1.09	B1 M1 A1 A1	4	State, or imply, at least three correct <i>y</i> -values For correct use of trapezium rule, inc correct <i>h</i> For correct unsimplified expression For the correct value 1.09, or better
	(iii)	$\left(\frac{1}{2}\right)^x = \frac{1}{6} \Rightarrow x \log_{10} \frac{1}{2} = \log_{10} \frac{1}{6}$	M1		For equation $\left(\frac{1}{2}\right)^x = \frac{1}{6}$ and attempt at logs
		$x = \frac{\log_{10} \frac{1}{6}}{\log_{10} \frac{1}{2}} = \frac{-\log_{10} 6}{-\log_{10} 2}$	A1		Obtain $x \log(\frac{1}{2}) = \log(\frac{1}{6})$, or equivalent
		Hence $= \frac{\log_{10} 2 + \log_{10} 3}{\log_{10} 2}$	M1	4	For use of log 6 = log 2 + log 3
		$=1+\frac{\log_{10} 3}{\log_{10} 2}$	A1		For showing the given answer correctly
		OR	M1 A1		For equation $2^x = 6$ and attempt at logs Obtain $x \log 2 = \log 6$, or equivalent
		$=\frac{\log_{10} 2 + \log_{10} 3}{\log_{10} 2}$	M1		For use of log 6 = log 2 + log 3
		$=1+\frac{\log_{10} 3}{\log_{10} 2}$	A1		For showing the given answer correctly
		OR			
		$\left(\frac{1}{2}\right)^x = \frac{1}{6} \Rightarrow 2^x = 6$ $2^{x-1} = 3$	M1		Attempt to rearrange equation to $2^n = 3$
		$(x-1)\log_{10} 2 = \log_{10} 3$	A1		Obtain $2^{x-1} = 3$
		Hence $x = 1 + \frac{\log_{10} 3}{\log_{10} 2}$	M1		For attempt at logs
			A1		For showing the given answer correctly
		$x = \frac{\log_{10} 2 + \log_{10} 3}{2}$			
		$\log_{10} 2$ $= \log_{10} 6$	M1		Use log 2 + log 3 = log 6
		$\overline{\log_{10} 2}$	A1		Obtain xlog 2 = log 6
		$x \log_{10} 2 = \log_{10} 6$ $\log_{10} 2^x = \log_{10} 6$	M1		Attempt to remove logarithms
		$2^x = 6$			
		$\left(\frac{1}{2}\right)^x = \frac{1}{6}$	A1		Show $\left(\frac{1}{2}\right)^x = \frac{1}{6}$ correctly
		(-) ·		<u>11</u>	