

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

5	(i)	$\sin^2 x = 1 - \cos^2 x \Rightarrow 2 \cos^2 x + \cos x - 1 = 0$ Hence $(2 \cos x - 1)(\cos x + 1) = 0$ $\cos x = \frac{1}{2} \Rightarrow x = 60^\circ$ $\cos x = -1 \Rightarrow x = 180^\circ$	M1 M1 A1 A1	4	For transforming to a quadratic in $\cos x$ For solution of a quadratic in $\cos x$ For correct answer 60° 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)	$\tan 2x = -1 \Rightarrow 2x = 135 \text{ or } 315$ Hence $x = 67.5^\circ \text{ or } 157.5^\circ$ OR $\sin^2 2x = \cos^2 2x$ $2 \sin^2 2x = 1 \quad 2 \cos^2 2x = 1$ $\sin 2x = \pm \frac{1}{2} \sqrt{2} \quad \cos 2x = \pm \frac{1}{2} \sqrt{2}$ Hence $x = 67.5^\circ \text{ or } 157.5^\circ$	M1 M1 A1 A1 M1 M1 A1 A1	4	For transforming to an equation of form $\tan 2x = k$ For correct solution method, i.e. inverse tan followed by division by 2 For correct value 67.5 For correct value 157.5 Obtain linear equation in $\cos 2x$ or $\sin 2x$ Use correct solution method For correct value 67.5 For correct value 157.5 [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
				8	
6	(i)	(a) $100 + 239 \times 5 = \text{£}1295$	M1 A1	2	For relevant use of $a + (n - 1)d$ For correct value 1295
		(b) $\frac{1}{2} \times 240 \times (100 + 1295) = \text{£}167400$	M1 A1	2	For relevant use of $\frac{1}{2}n(a + l)$ or equivalent For correct value 167400
	(ii)	$100r^{239} = 1500 \Rightarrow r = 1.01139\dots$ Hence total is $\frac{100(1.01139^{240} - 1)}{1.01139 - 1} = \text{£}124359$	B1 M1 A1 M1 A1	5	For correct statement of $100r^{239} = 1500$ Attempt to find r For correct value 1.01 For relevant use of GP sum formula 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 $\triangle ACD$, 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 $= 25.3$ cm	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
				10	
8	(i)	$f(2) = 12 \Rightarrow 4a + 2b = 6$ $f(-1) = 0 \Rightarrow a - b = 12$ Hence $a = 5, b = -7$	M1 A1 M1 A1 M1 A1	6	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
	(ii)	Quotient is $2x^2 + x - 9$ Remainder is 8	B1 M1 A1 M1 A1	5	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
				11	

