Question number		Scheme	Marks
1.	(*a*)	$\log_q 16 = \log_q 2^4,\ \therefore p = 4\log_q 2$ i.e $\log_q 2 = \frac{p}{4}$	M1, A1 (2)
	(*b*)	$\log_q (8_q) = \log_q 8 + \log_q q$	M1
		$= \ldots. + 1$	B1
		$= 3\ \text{logq}2 + \ldots$	M1
		$\therefore \log_q (8_q) = \frac{3}{4}p + 1$	A1 (4)
			(6 marks)
2.	(*a*)	$64 - 16 - 28 + c = 0$ $c = -20$	M1 A1 (2)
	(*b*)	$(x - 4)(x^2 + 3x + 5)$	B1 M1 A1 (3)
	(*c*)	For $x^2 + 3x + 5$, $b^2 - 4ac = -11 < 0$, $\therefore$ No real roots	M1 A1 ft (2)
			(7 marks)
3.	(*a*)	$2\sin^2\theta - 2\sin\theta = 1 - \sin^2\theta$	M1
		$3\sin^2\theta - 2\sin\theta - 1 = 0$	A1
		$(3\sin\theta + 1)(\sin\theta - 1) = 0$	M1 A1ft
		$\sin\theta = -\frac{1}{3}$ $\sin\theta = 1$	A1
		$\theta = -19.5° - 160.5°$ $90°$	A1 A1ft A1 (8)
			(8 marks)
4.	(*a*)	Attempting to get to a^6 = from $800 = \frac{2000a^6}{4 + a^6}$	M1
		$a^6 = \frac{3200}{1200}$	A1
		$a = \left(\frac{3200}{1200}\right)^{\frac{1}{6}} \rightarrow 1.1776$	M1 A1 cao (4)
	(*b*)	Substituting $P = 1800$ into formula with a^t as unknown	M1
		$a^t = 36 \rightarrow$, $t = 22$	A1 M1
		Number of years needed for P from 800 to 1800 = 16 years	A1 ft (4)
	(c)	$P = \frac{2000}{1 + 4a^{-t}}$, $4a^{-t} \rightarrow 0$ as $t \rightarrow \infty$	
		So $P \rightarrow 2000$ but does not exceed it	B1 (1)
			(9 marks)

Question number		Scheme	Marks
5.	(a)	Expanding using coefficients 1, 5, 10, 10, 5, 1 as necessary	M1
		Using powers x^5 $2x^4$ 2^2x^3 etc as necessary	M1
		Completing the method	M1
		$A = 64$	B1
		$B = 160$, $C = 20$	A2,1,0 (6)
	(b)	Candidate values of A, B, C used to form	
		$20x^4 + 160x^2 + 64 = 349$	M1
		$4y^2 = 32y - 57 = 0$	A1 ft
		Solving for y	M1
		Replacing by x^2 and completing to obtain all relevant values of x	M1
		$\pm\sqrt{\frac{3}{2}}$ or AWRT ± 1.22	A1 cao (5)
			(11 marks)
6.	(a)	$\frac{1}{2} R^2 \theta = \frac{49}{2}\theta$ or $\frac{1}{2} r^2 \theta = \frac{25}{2}\theta$	B1
		$\frac{1}{2} R^2 \theta - \frac{1}{2} r^2 \theta = \frac{49}{2}\theta - \frac{25}{2}\theta = 12\theta$	M1 A1 (3)
	(b)	$12\theta = 15$ $\theta = 1.25$ *	M1 A1 (2)
	(c)	$R\theta = 7 \times 1.25$ (or $r\theta = 5 \times 1.25$)	B1
		$R\theta + r\theta + 4 = 8.75 + 6.25 + 4 = 19$ m	M1 A1 (3)
	(d)	$\sin 0.625 = \frac{x}{5}$ $AD = 2x$ (= 5.851 m)	M1
		$6.25 - 5.85 = 0.399$ 40m	M1 A1 (3)
			(11 marks)

Question number	Scheme	Marks
7. (a)	$S = a + ar + ar^2 + \ldots + ar^{n-1}$	B1
	$rS = ar + ar^2 + \ldots + ar^n$	M1
	Subtract: $S(1 - r) = a(1 - r^n)$ $\quad S = \dfrac{a(1-r^n)}{1-r}$	M1 A1 (4)
(b)	$ar = 3$ $\quad ar^3 = 1.08$	B1 B1
	Divide: $r^2 = 0.36$ $\quad r = 0.6$	M1 A1
	$a = 6 \div 1.2 = 5$	A1 (5)
(c)	$S = \dfrac{5}{1-0.6}$	M1 A1 ft
	$= 12.5$	A1 (3)
		(12 marks)
8. (a)	$y = x(x^2 - 6x + 9) = (x - 3)^2$,* $\quad A$ (3, 0)	B1, B1 (2)
(b)	$\dfrac{dy}{dx} = 3x^2 - 12x + 9$	M1 A1
	$3(x^2 - 4x + 3) = 0$ $\quad 3(x - 1)(x - 3) = 0$	M1 A1
	At B, $\quad x = 1 \quad y = 4$ $\quad (1,4)$	A1 (5)
(c)	$\int (x^3 - 6x^2 + 9x)\,dx = \dfrac{1}{4}x^4 - 2x^3 + \dfrac{9}{2}x^2$	M1 A2, 1,0
	$[\dfrac{1}{4}x^4 - 2x^3 + \dfrac{9}{2}x^2]_3^0 = \dfrac{81}{4} - 54 + \dfrac{81}{2} = 6\dfrac{3}{4}$	M1 A1 (5)
		(12 marks)