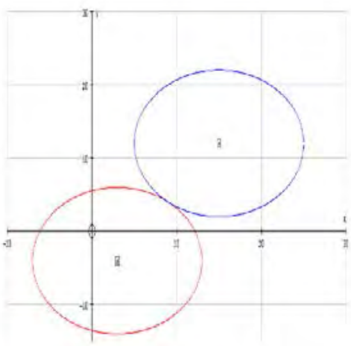
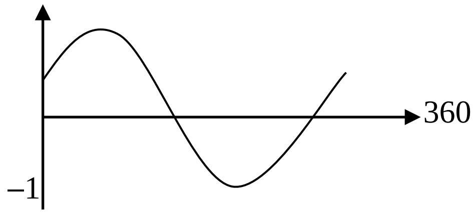
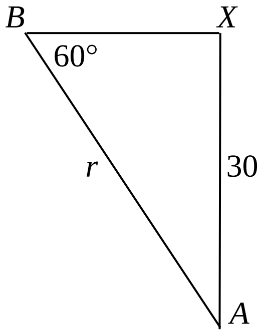
Question number	Scheme	Marks
1. (*a*)	$\log_q 16 = \log_q 2^4$, $\therefore p = 4 \log_q 2$ i.e $\log_q 2 = \frac{p}{4}$	M1, A1 (2)
(*b*)	$\log_q (8_q) = \log_q 8 + \log_q q$	M1
	$= \ldots + 1$	B1
	$= 3 \log_q 2 + \ldots$	M1
	$\therefore \log_q (8_q) = \frac{3}{4}p + 1$	A1 (4)
		(6 marks)
2. (a)	$(2 - px)^6 = 2^6 + \binom{6}{1} 2^5(-px) + \binom{6}{2} 2^4(-px)^2$ Coeff. of x or x^2	M1 $\binom{n}{r}$ okay
(b)	$= 64 + 6 \times 2^5(-px);\ + 15 \times 2^4(-px)^2$ No $\binom{n}{r}$	A1; A1
	$15 \times 16p^2 = 135 \quad \Rightarrow p^2 = \frac{9}{16}$ or $p = \frac{3}{4}$ (only)	M1, A1
	$-6.32p = A$	M1
	$\Rightarrow A = -144$	A1 ft (their p (> 0))
		(7 marks)
3. (*a*)	Centre is at (3,-4)	B1
	radius $= \sqrt{(3^2 + (-4)^2 - -75)} = 10$	M1 A1 (3)
(*b*)	1st circle	B1
	2nd circle	B1
	Circles touching	B1
	At (9 , 4 	B1 (4)
		(7 marks)

Question number	Scheme	Marks
4. (a)	 Scales (–1, 1 and 360) Shape, position	B1 B1 (2)
(b)	(0, 0.5) (150, 0) (330, 0)	B1 B1 B1 (3)
(c)	$(x+30=)210°\text{or}330°$ One of these x = 180° , 300° M: Subtract 30, A: Both	B1 M1 A1 (3) **(8 marks)**
5.	 $\sin 60° = \frac{3}{r}$ or $r = 2x$, $4x^2 = x^2 + 3^2$, $x = \sqrt{3}$ $r = \frac{\mathbf{6}}{\sqrt{\mathbf{3}}}$ or $r = 2\sqrt{3}$	M1 A1 (2)
(*b*)	Area = $\frac{1}{2}r^2\theta^c$ or $\frac{\theta°}{360°}\times \pi r^2$ = , $\frac{1}{6}\times\pi\times 12$ = 2π (cm^2)	M1, A1 (2)
(*c*)	Arc = $r^2\theta^c$ or $\frac{\theta°}{360°}\times 2\pi r$ = , $\frac{1}{6}\times 2\pi\times 2\sqrt{3}$ Perimeter = Arc + 2r = , $\frac{2\sqrt{3}}{3}\pi + 2\times 2\sqrt{3}$ = $\frac{\mathbf{2\sqrt{3}}}{\mathbf{3}}(\pi + 6)$ (cm) (*)	M1 M1, A1 cso (3) **(7 marks)**
6. (a)	Uses the remainder theorem with $x = \frac{1}{2}$, or long division, and puts remainder = 0 to obtain $p + 2q = -35$ or any correct equivalent (allow more than 3 terms) Uses the remainder theorem with x = 1, or long division, and puts remainder = $\pm$7 to obtain $p + q = -21$ or any correct equivalent (allow more than 3 terms) Solves simultaneous equations to give p = –7, and q = –14	M1 A1 M1 A1 M1 A1 (6)
(b)	Then $6x^3 - 7x^2 - 14x + 8 = (2x - 1)(3x^2 - 2x - 8$ So f(x) = $(2x - 1)(3x + 4)(x - 2)$	M1 A1 ft B1 (3) **(9 marks)**

Question number	Scheme	Marks
7. (a)	$\frac{a}{1-r} = \frac{1200}{1-r} = 960$	M1 A1
	960 (1 – r) = 1200 $r = -\frac{1}{4}$ (*)	A1 (3)
(b)	$T_9 = 1200 \times (-0.25)^8$ (or T_{10})	M1
	Difference = $T_9 - T_{10}$ = 0.0183105…– (– 0.0045776…)	M1
	= 0.023 (or – 0.023)	A1 (3)
(c)	$S_n = \frac{1200\left(1-(-0.25)^n\right)}{1-(-0.25)}$	M1 A1 (2)
(d)	Since n is odd, $(-0.25)^n$ is negative,	M1
	so $S_n = 960\,(1 + 0.25^n)$ (*)	A1 (2)
		(12 marks)
8. (a)	$(x-3)^2 + (y-4)^2 = 18$ (accept $(3\sqrt{2})^2$	M1 A1 (2)
(b)	Use $y = x + 3$ to obtain $(x-3)^3 + (x-1)^2 = 18$	M1
	And thus $2x^2 - 8x = 8$	A1
	Solve quadratic, to obtain $x = 2 \pm \sqrt{8}$, $y = 5 \pm \sqrt{8}$	M1, A1ft, A1ft (5)
(c)	Distance = $\sqrt{((2\sqrt{8})^2 + (2\sqrt{8})^2}$ = 8	M1 A1 cso (2)
		(9 marks)

Question number		Scheme	Marks	
9.	(a)	A: $y = 1$ B: $y = 4$	B1	(1)
	(b)	$\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{2x}{25}$ $= \frac{2}{5}$ where $x = 5$	M1 A1	
		Tangent: $y - 1 = \frac{2}{5}(x - 5)$ $(5y = 2x - 5)$	M1 A1	(4)
	(c)	$x = 5y^{\frac{1}{2}}$	B1 B1	(2)
	(d)	Integrate: $\frac{5y^{3/2}}{3/2}$ $\left(= \frac{10y^{3/2}}{3}\right)$	M1 A1ft	
		$[\ \ ]^4 - [\ \ ]_1 = \left(\frac{10 \times 4^{3/2}}{3}\right) - \left(\frac{10 \times 1^{3/2}}{3}\right)$, $= \frac{70}{3}$ $(23\frac{1}{3}, 23.3)$	M1 A1, A1	(5)
				(12 marks)