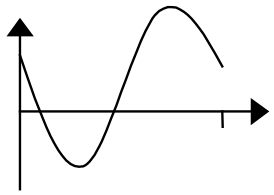
Question number		Scheme	Marks
1.	(*a*)	$p+6+12+q=-\frac{1}{8}p+\frac{6}{4}-6+q$	M1 , M1
	(*b*)	$\therefore \frac{9}{8}p=-22\frac{1}{2}$	M1
		$p=-20$	A1 (4)
		Remainder = $p + q + 18 = p + 21$ (=1)	B1√ ft on p (1)
			(5 marks)
2.	(a)	$a=4, \quad b=5$ (both are required)	B1 (1)
	(b)	$(x-4)^2+(y-5)^2=25$	M1A1ft (2)
	(c)	Finding the distance between centre and (8, 17), $\sqrt{[(8-a)^2+(17-b)^2}$	M1
		Complete method to find *PT*, i.e. use Pythagoras theorem and subtraction,	M1
		PT = 11.6	A1 (3)
			(6 marks)
3.	(*a*)	$4x + 9, +12\sqrt{x}$	B1, B1 (2)
	(*b*)	$\int\left(4x+12x^{1/2}+9\right)dx=2x^2+8x^{3/2}+9x$ (dep. on 3 terms)	M1 A1 ft
		$[\ldots\ldots]_1^2=\left(8+(8\times 2^{3/2})+18\right)-(2+8+9)$	M1
		$= 7+16\sqrt{2}$	M1 A1 (5)
			(7 marks)
4.		$(1 + px)^n \equiv 1 + npx, + \frac{n(n-1)p^2x^2}{2} + \ldots$	B1, B1
		Comparing coefficients: $np = -18$, $\frac{n(n-1)}{2} = 36$	M1, A1
		Solving $n(n – 1) = 72$ to give $n = 9$; $p = –2$	M1 A1; A1 ft
			(7 marks)

Question number		Scheme	Marks
5.	(a)	$\theta = -15°$, $\theta = 345°$ One of these…	B1
		$\theta + 75 = 360 - "60"$	M1
		$\theta = 225, 345$	A1 (3)
	(b)	$(2\theta) = 44.4$	B1
		$(2\theta) = 135.6$ One more sol.	B1 ft
		$(2\theta) = 404.4$ 495.6 Other 2 in range	B1 ft
		$\theta = 22.2, 67.8. 202.2, 247.8$ (÷2)	M1 A1 (5)
			(8 marks)
6.	(a)	$\log_2(16x) = \log_2 16 + \log_2 x$	M1
		$= \underline{\underline{4 + a}}$	A1 c.a.o (2)
	(b)	$\log_2\left(\frac{x^4}{2}\right) = \log_2 x^4 - \log_2 2$	M1
		$= 4\log_2 x - \log_2 2$	M1
		$= \underline{\underline{4a-1}}$ (accept $4\log_2 x$ - 1)	A1 (3)
	(c)	$\frac{1}{2} = 4 + a - (4a - 1)$	M1
		$a = \frac{3}{2}$	A1
		$\log_2 x = \frac{3}{2} \Rightarrow x = 2^{\frac{3}{2}}$	M1
		$\underline{\underline{x = \sqrt{8}\ or\ 2\sqrt{2}}}$ or $\sqrt{2^3}$ or $(\sqrt{2})^3$	A1 (4)
			(9 marks)

Question number	Scheme	Marks
7. (a)	 Shape Position	B1 B1 (2)
(b)	$\left(0,\frac{1}{\sqrt{2}}\right)$, $\left(\frac{\pi}{4},0\right)$, $\left(\frac{5\pi}{4},0\right)$	B1 B1 B1 (3)
(c)	$\left(x+\frac{\pi}{4}=\right)\quad\frac{\pi}{3}$	B1
	Other value $\left(2\pi-\frac{\pi}{3}=\right)\quad\frac{5\pi}{3}$	M1
	Subtract $\frac{\pi}{4}$ $\quad x=\frac{\pi}{12}, x=\frac{17\pi}{12}$	M1 A1 (4) **(9 marks)**
8. (a)	$y = x(x^2 - 6x + 9) = x(x-3)^2$, (*) $\quad A(3,0)$	B1, B1 (2)
(b)	$\frac{dy}{dx} = 3x^2 - 12x + 9$	M1 A1
	$3(x^2 - 4x + 3) = 0 \quad 3(x-1)(x-3) = 0$	M1 A1
	At B, $x = 1$ $y = 4$ $\quad (1,4)$	A1 (5)
(c)	$\int (x^3 - 6x^2 + 9x)\,dx = \frac{1}{4}x^4 - 2x^3 + \frac{9}{2}x^2$	M1 A2, 1,0
	$[\frac{1}{4}x^4 - 2x^3 + \frac{9}{2}x^2]_0^3 = \frac{81}{4} - 54 + \frac{81}{2} = 6\frac{3}{4}$	M1 A1 (5) **(12 marks)**

Question number		Scheme	Marks
9.	(a)	$100 = 81 + 25 - (2 \times 9 \times 5 \cos BAC)$	M1 A1
		$\cos BAC = \frac{81+25-100}{90} = \frac{1}{15}$, $BAC = 1.504$ radians. *	A1 (3)
	(b)	$\frac{1}{2} r^2\theta = \frac{1}{2} \times 9 \times 1.504 = 6.768$ cm^2	M1 A1 (2)
	(c)	Area of triangle $= \frac{1}{2} \times 45 \times \sin 1.504$ (= 22.450 cm^2)	M1 A1
		Shaded area = 22.450 – 6.768 = 15.682 cm^2 (15.68, 15.7)	A1 (3)
	(d)	Arc length = $r\theta = 3 \times 1.504$ (= 4.512 cm)	M1, A1
		Perimeter = 10 + 6 + 2 + 4.512 = 22.512 cm (22.51, 22.5)	M1 A1 ft (4)
			(12 marks)