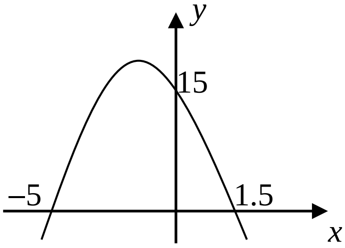
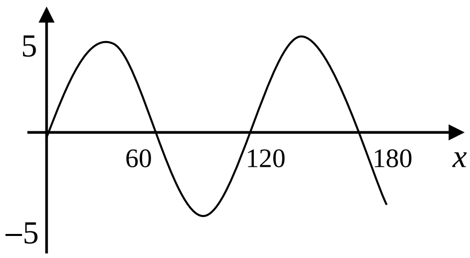
Question number	Scheme	Marks
1. (*a*)	$1 + n(3x), + \frac{n(n-1)}{2!}(3x)^2 + \frac{n(n-1)(n-2)}{3!}(3x)^3$	B1, B1 (2)
	$\frac{n(n-1)(n-2)}{6} \times 27 = 10 \times \frac{n(n-1)}{2} \times 9$	M1
(*b*)	$n = 12$	A1 (2)
	$\frac{n(n-1)(n-2)(n-3)}{4!}(3x)^4$ coefficient: 40 095	M1 A1 (2)
		(6 marks)
2.	*Complete* attempt at remainder theorem, or long division Either $f(3) = 27 + 9a + 3b - 10 = 14$, Or complete attempt at long division by (x-3) leading to equation. Either $f(-1) = -1 + a - b - 10 = -18$ or long division by (x+1) leading to equation.	M1
	Equation equivalent to $9a + 3b = -3$ $(3a + b = -1)$	A1
	Equation equivalent to $a - b = -7$	A1
	Solve two equations to get $a = -2, b = 5$	M1, A1 (5)
	Either $f(2) = 8 - 8 + 10 - 10 = 0$, Or complete division with no remainder.	M1,
	$\therefore (x-2)$ is a factor.	A1
	Or $f(x) = (x-2)(x^2+5)$	(M1 A1) (2)
		(7 marks)
3. (a)	$f(x) = 0 \Rightarrow 2x^2 + 7x - 15 = 0$	
	$(2x - 3)(x + 5) = 0$ attempt to solve $f(x) = 0$	M1
	$\therefore$ points are $(\frac{3}{2}, 0), (-5, 0)$; $(0, 15)$	A1 (both); B1 (3)
(*b*)	 shape	B1
	vertex in correct quadrant	B1 ft (2)
(*c*)	Symmetry: $x = \frac{1}{2}(-5 + 1.5)$ or Calculus: $-7 - 4x = 0$	
	or Algebra: $-2[(x + \frac{7}{4})^2 - k]$	M1
	$\Rightarrow x = -\frac{7}{4}, y = 21\frac{1}{8}$	A1, A1 (3)
		(8 marks)

Question number	Scheme	Marks
4. (*a*)	 shape	B1
	60, 120, 180 on x-axis	B1
	5, –5 on y-axis (may be implied by part (*b*))	B1 (3)
(*b*)	(30°, 5); (150°, 5); (90°, –5) one x-coordinate	B1
	all x-coordinates	B1
	all correct	B1 (3)
(*c*)	$f(x) = 2.5 \Rightarrow \sin 3x° = \frac{1}{2}$	
	$3x = 30$ (150, 390, 510) one correct value	B1
	$3x = (\alpha)$, $180 - \alpha$, $360 + \alpha$, $(540 - \alpha)$	M1, M1
	$x = 10, 50, 130, 170$	A1 (ignore extras out of range) (4)
		(10 marks)
5.	$2 \log x = \log x^2$	B1
	Combine logs, e.g. $\log_2 \left(\frac{y}{x^2}\right) = 3$	M1
	$\frac{y}{x^2} = 2^3$, $y = 8x^2$ (*)	A1 (3)
	$14x - 3 = 8x^2$	M1
	$(4x - 1)(2x - 3) = 0$ Roots $\frac{1}{4}$ and $\frac{3}{2}$	M1 A1 (3)
	$\log_2 \alpha = \log_2 \frac{1}{4} = \log_2 (2^{-2}) = -2$ (*)	B1 (1)
	$\log_2 1.5 = k$ $2^k = 1.5$	M1
	$k = \frac{\log 1.5}{\log 2} = 0.585$	M1 A1 (3)
		(10 marks)

Question number	Scheme	Marks
6. (a)	$2x^{\frac{3}{2}} - 3x^{-\frac{3}{2}} = 0$	M1
	$x^3 = \frac{3}{2}$	
	$x = \sqrt[3]{\frac{3}{2}}$ $x = \sqrt[3]{\alpha}$	M1
	$= 1.1447\ldots = 1.14$ (3 sf)	A1 cao (3)
(b)	$f(x) = 4x^3 + 9x^{-3} - 12 + 5$ $A = 4$	B1
	$= 4x^3 + \dfrac{9}{x^3} - 7$ $B = 9$, $C = -7$	B1, B1 (3)
	$\int_1^2 f(x)\ dx = \left[x^4 - \frac{9}{2}x^{-2} - 7x\right]_1^2$ $x^n \to x^{n+1}$	M1
		A2 ft (candidate's A B, C) (–1 eeoo)
	$= (2^4 - \frac{9}{2} \times 2^{-2} - 14) - (1 - \frac{9}{2} - 7)$ [2] – [1]	M1 (use of limits)
	$= 11\frac{3}{8}$ or 11.375	A1 (5)
		(11 marks)
7. (a)	$BM = \sqrt{(7^2 + 24^2)} = 25$ (*)	B1 (1)
(b)	$\tan \alpha = \dfrac{7}{24}$ or equiv. and $\angle BMC = 2\alpha$, or cosine rule	M1 A1
	$\angle BMC = 0.568$ radians (*)	A1 (3)
(c)	ΔABM: $\dfrac{1}{2}(14 \times 24)$ (= 168 mm^2) (or other appropriate Δ)	B1
	Sector: $\dfrac{1}{2}(25^2 \times 0.568)$	M1 A1
	Total: "168 + 168 + 177.5" = 513 mm^2 (or 514, or 510)	M1 A1 (5)
(d)	Volume = "513" × 85 mm^3 (M requires unit conversion)	M1
	= 44 cm^3	A1 (2)
		(11 marks)

Question number	Scheme	Marks
8. (*a*)	$S = a + (a + d) + (a + 2d) + \dots + [a + (n-1)d]$	B1
	$S = [a + (n-1)d] + [a + (n-2)d] + \dots + a$	M1
	Add: $2S = n[2a + (n-1)d] \Rightarrow S = \frac{1}{2}n[2a + (n-1)d]$	M1 A1 (4)
(*b*)	$a = 54000$ and $n = 9$	B1
	$619200 = \frac{1}{2} \times 9 \times (2 \times 54000 + 8d)$	M1 A1ft
	$d = 3700$	A1 (4)
(*c*)	$a + (n-1)d = a + 10d = 54000 + 10d =$ £91000	M1 A1 (2)
(*d*)	$ar^{n-1} = 54000 \times 1.06^{10}$ (ft their n)	M1 A1ft
	= £96700 (or £97000)	A1 (3)
		(13 marks)