Question number		Scheme	Marks	
1.	(*a*)	Centre is (5, –3)	M1 A1	(2)
	(*b*)	Radius is 7	M1 A1	(2)
			(4 marks)	
2.	(a)	Uses f(1) = 9, $\Rightarrow$ $a + b = 2$ (o.e)	M1, A1	(2)
	(b)	Uses f(–2) = 0, $\Rightarrow$ $-8a + 4b = -28$ (o.e)	M1, A1	
		$\therefore a = 3, b = -1$ (solves to find both values M1)	M1 A1 cao	(4)
			(6 marks)	
3.	(*a*)	$\theta = -15°, \theta = 345°$ One of these…	B1	
		$\theta + 75 = 360 - \text{“}60\text{”}$	M1	
		$\theta = 225, 345$	A1	(3)
	(*b*)	$(2\theta) = 44.4$	B1	
		$(2\theta) = 135.6$ one more soln.	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)	
4.	(*a*)	$5 + 2x - x^2 = 2$ or $x^2 - 2x - 3 = 0$	M1	
		$(x - 3)(x + 1) = 0$ $x = -1, x = 3$	M1 A1	(3)
	(*b*)	$\int (5 + 2x - x^2)\,dx = [5x + x^2 - \frac{1}{3}x^3]$	M1 A1	
		Using limits: $(15 + 9 - 9) - (-5 + 1 + \frac{1}{3})$ $(= 18\frac{2}{3})$	M1 A1	
		Shaded area $= 18\frac{2}{3} - 8 = 10\frac{2}{3}$	M1 A1	(6)
			(9 marks)	
5.	(a)	$r = 5.12 \div 6.4$ $= 0.8$	M1 A1	(2)
	(b)	$a = 6.4 \div 0.64$ $= 10$	M1 A1 ft	(2)
	(c)	Sum to $\infty = a \div (1 - r) = 10 \div (1 - 0.8)$ $= 50$	M1 A1	(2)
	(d)	$S_{25} = 10(1 - 0.8^{25}) \div)1 - 0.8)$ $(= 49.8111)$	M1 A1 ft	
		$50 - 49.8111 = 0.189$	M1 A1	(4)
			(10 m arks)	

Question number		Scheme	Marks	
6.	(a)	$100 = 81 + 25 - (2 \times 9 \times 5 \cos BAC)$	M1 A1	
		$\cos BAC = \dfrac{81 + 25 - 100}{90} \; (= \dfrac{1}{15})$, $BAC = 1.504$ radians. *	A1	(3)
	(b)	$\dfrac{1}{2} r^2 \theta = \dfrac{1}{2} \times 9 \times 1.504 = 6.768$ cm^2 (6.77)	M1 A1	(2)
	(c)	Area of triangle $= \dfrac{1}{2} \times 45 \times \sin 1.504$ $(= 22.450$ 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)	
7.	(a)	Area of $X = 2d^2 + \dfrac{1}{2} \pi d^2$, Area of $Y = \dfrac{1}{2} (4\,d^2)\, \theta$	B1, M1 A1	
		Equate and divide by d^2: $2 + \dfrac{1}{2} \pi = 2\theta$, $\theta = 1 + \dfrac{1}{4} \pi$. *	M1 A1	(5)
	(b)	$12 + 3\pi$	B1 B1	(2)
	(c)	$4d + r\theta, = 12 + 6\,(1 + \dfrac{1}{4} \pi), = 18 + \dfrac{3}{2} \pi$	M1, A1, A1,	(3)
	(d)	X: $12 + 3\pi = 21.425$ cm, Y: $18 + \dfrac{3}{2} \pi = 22.712$ cm		
		Difference $= 13$ mm (or 12.9 mm) or 12.88 mm	M1 A1	(2)
			(12 marks)	

Question number	Scheme	Marks
8. (a)	$2x^2h = 1030,$ $\qquad\qquad\qquad$ $h = \dfrac{515}{x^2}$	M1, A1 $\qquad$ (2)
(b)	$A = 4x^2 + 6xh$ $\qquad\qquad$ (or unsimplified version)	B1
	$A = 4x^2 + \dfrac{3090}{x}.$ $\qquad\qquad\qquad\qquad$ *	M1 A1 $\qquad$ (3)
(c)	$\dfrac{dA}{dx} = 8x - 3090x^{-2}$	M1 A1
	$8x - 3090x^{-2} = 0$	M1
	$x^3 = (386.25)$	M1
	$x = 7.283$ $\qquad\qquad\qquad$ (7.28, 7.3)	A1 $\qquad$ (5)
(d)	$A = 4 \times 7.28^2 + \dfrac{3090}{7.28}$	M1
	$= 636.4 \text{ cm}^2$	A1 $\qquad$ (2)
(e)	Second derivative $= 8 + 6180x^{-3}$	M1
	Correct deriv, $> 0,$ $\qquad\qquad$ $\therefore$ Min	A1 $\qquad$ (2)
		(14 marks)