Question	Scheme	Marks	AOs
3	Area enclosed by curve $= \dfrac{1}{2}\displaystyle\int \left(7.5+1.5\cos 6\theta\right)^2 \mathrm{d}\theta$	M1	3.1a
	$\left(7.5+1.5\cos 6\theta\right)^2 = 56.25 + 22.5\cos 6\theta + 2.25\cos^2 6\theta$ $= 56.25 + 22.5\cos 6\theta + 2.25\left(\dfrac{\cos 12\theta +1}{2}\right)$	M1	2.1
	$\dfrac{1}{2}\displaystyle\int \left(7.5+1.5\cos 6\theta\right)^2 \mathrm{d}\theta = \dfrac{459}{16}\theta + \dfrac{15}{8}\sin 6\theta + \dfrac{3}{64}\sin 12\theta\,(+c)$	A1ft	1.1b
	Area enclosed by curve $= \left[\dfrac{459}{16}\theta + \dfrac{15}{8}\sin 6\theta + \dfrac{3}{64}\sin 12\theta\right]_0^{2\pi}$	M1	3.1a
	$= \dfrac{459\pi}{8}\left(=180.24...\right)$	A1	1.1b
	Total shaded area $= \pi \times 10^2 - "\dfrac{459\pi}{8}" + \pi \times 5^2$ $= 314.15\ldots - 180.24\ldots + 78.53\ldots$	M1	3.1a
	$= \dfrac{541\pi}{8}\,\mathrm{mm}^2 = 2.12\,\mathrm{cm}^2$	A1	3.2a
		(7)	
			(7 marks)

Notes

M1: A correct strategy identified for finding the area enclosed by the polar curve using a correct formula

M1: Squares and uses $\cos^2 6\theta = \dfrac{\pm 1 \pm \cos 12\theta}{2}$ to obtain an expression in an integrable form

A1ft: Correct follow through integration

M1: Correct use of correct limits (e.g. may use $0 \to 2\pi$ or $2\times(0 \to \pi)$ etc.)

A1: Correct area enclosed by the curve

M1: Fully correct strategy for obtaining the area to be painted

A1: Correct area