Question Number	Scheme	Notes	Marks
1(i)	$(8)\int \frac{1}{16+x^2}\,\mathrm{d}x = (8)\left(\frac{1}{4}\arctan\left(\frac{x}{4}\right)\right)$	Obtains …arctan (kx) Allow $k = 1$	M1
	$2\left[\arctan\left(\frac{x}{4}\right)\right]_4^{4\sqrt{3}} = 2(\arctan\sqrt{3} - \arctan 1) = \ldots$	Substitutes the given limits, subtracts either way round and obtains a value (could be a decimal). The substitution does not need to be seen explicitly and may be implied by their value.	**d**M1
	$\frac{\pi}{6}$ or $p = \frac{1}{6}$ Correct exact value (or value for p) Accept equivalent exact expressions e.g. $\frac{2\pi}{12}$ or $p = \frac{2}{12}$ and isw if necessary.		A1
			(3)
(ii)	$2\int \frac{1}{\sqrt{9-4x^2}}\,\mathrm{d}x = 2\left(\frac{1}{2}\arcsin\frac{2x}{3}\right)$ $\left(\text{or e.g. } \arcsin\frac{x}{3/2}\right)$ **M1**: Obtains ...arcsin (kx). Allow $k = 1$ so allow just arcsin x. **A1**: Fully correct integration but allow unsimplified as above		M1 A1
	$\left[\arcsin\left(\frac{2x}{3}\right)\right]_{\frac{3}{4}}^{k} = \arcsin\left(\frac{2k}{3}\right) - \arcsin\left(\frac{1}{2}\right) = \frac{\pi}{12}$ $\Rightarrow \arcsin\left(\frac{2k}{3}\right) = \frac{\pi}{12} + \frac{\pi}{6} \Rightarrow \frac{2k}{3} = \sin\left(\frac{\pi}{4}\right) \Rightarrow \frac{2k}{3} = \frac{\sqrt{2}}{2} \Rightarrow k = \ldots$ Substitutes the given limits, subtracts either way round, sets = $\frac{\pi}{12}$, uses $\arcsin\left(\frac{1}{2}\right) = \frac{\pi}{6}$ and the correct **order** of operations condoning sign errors only to reach a value for k e.g. $\pm\alpha\left(\arcsin\left(\frac{2k}{3}\right) - \frac{\pi}{6}\right) = \frac{\pi}{12} \Rightarrow \arcsin\left(\frac{2k}{3}\right) = \frac{\pi}{12\alpha} \pm \frac{\pi}{6} \Rightarrow k = \frac{3\sin\left(\frac{\pi}{12\alpha} \pm \frac{\pi}{6}\right)}{2}$ Note that k may be inexact (decimal) or may be in terms of "sin" but must have a simplified argument e.g. $k = \frac{3\sin\left(\frac{\pi}{4}\right)}{2}$		**d**M1
	$k = \frac{3\sqrt{2}}{4}$ or exact equivalent e.g., $\frac{3}{2\sqrt{2}}$ Note that a common incorrect answer is $k = \frac{3}{2}\sin\left(\frac{5\pi}{24}\right)(= 0.913...)$ which comes from an incorrect integral of $2\arcsin\left(\frac{2x}{3}\right)$ (generally scoring 1010) Condone $x = \frac{3\sqrt{2}}{4}$		A1
			(4)
			Total 7