

January 2022  
4PM1 Paper 1  
Mark Scheme

Question	Scheme	Marks
1	$\int \cos 4\theta \, d\theta = \left[ \frac{\sin 4\theta}{4} \right]$ <p>For an attempt to evaluate <b>their</b> integral using the given values and reach a value</p> $\int_{\frac{\pi}{4}}^{\frac{\pi}{3}} \cos 4\theta \, d\theta = \left[ \frac{\sin 4\theta}{4} \right]_{\frac{\pi}{4}}^{\frac{\pi}{3}} = \frac{\sin\left(4 \times \frac{\pi}{3}\right)}{4} - \frac{\sin\left(4 \times \frac{\pi}{4}\right)}{4} = \dots$ $\int_{\frac{\pi}{4}}^{\frac{\pi}{3}} \cos 4\theta \, d\theta = -\frac{\sqrt{3}}{8}$	<p>M1A1</p> <p>M1</p> <p>A1 [4]</p>
Total 4 marks		

Mark	Notes
M1	For an attempt to integrate $\cos 4\theta$ obtaining: $\pm \frac{\sin 4\theta}{4}$ For this mark ignore incorrect / absent limits
A1	For the correct integrated expression: $\frac{\sin 4\theta}{4}$
M1	For an attempt to evaluate <b>their</b> integral using the given values and reach a value. Must be substituting into $k \sin 4\theta$ Condone candidates who convert to working in degrees to evaluate.
A1	For the correct value $\int_{\frac{\pi}{4}}^{\frac{\pi}{3}} \cos 4\theta \, d\theta = -\frac{\sqrt{3}}{8}$ Note: question requires answer to be given in the form $-\frac{\sqrt{a}}{b}$ and therefore equivalent answers are not acceptable.