Q1, (OCR H240/03, Sample Question Paper, Q4)

When θ is small $1+\cos\theta-3\cos^2\theta$ $\approx 1+\left(1-\frac{1}{2}\theta^2\right)-3\left(1-\frac{1}{2}\theta^2\right)^2$	**M1**	**1.1a**	Attempt to use $\cos\theta \approx 1-\frac{1}{2}\theta^2$ or $=1+\left(1-\frac{1}{2}\theta^2+\ldots\right)$ $-3\left(1-\frac{1}{2}\theta^2+\ldots\right)^2$	**OR** **M1** Attempt to use $\cos\theta \approx 1-\frac{1}{2}\theta^2$
$=1+\left(1-\frac{1}{2}\theta^2\right)-3\left(1-\theta^2+\frac{1}{4}\theta^4\right)$ $=1+1-\frac{1}{2}\theta^2-3+3\theta^2-\frac{3}{4}\theta^4$	**M1**	**1.1**	Multiply out	**M1** use trigonometric identity $1+\cos\theta-3\cos^2\theta$ $=1+\cos\theta-\frac{3}{2}-\frac{3}{2}\cos 2\theta$
Since θ is small, we can neglect the higher order terms	**E1**	**2.5**	For explanation of loss of θ^4 term and consistent use of notation throughout (Working need not be fully correct)	**E1** For showing clearly which identity has been used and consistent use of notation throughout
so $1+\cos\theta-3\cos^2\theta \approx -1+\frac{5}{2}\theta^2$ as required	**E1**	**2.1**	AG Clearly obtained www Condone θ^4 term missing without explanation and inconsistent notation	**E1** AG Clearly obtained www Condone inconsistent notation
	[4]			

Q2, (OCR H240/03, Practice Paper Set 1, Q3)

(i)	$\frac{AC}{\sin\frac{3}{4}\pi}=\frac{1}{\sin\left(\pi-\frac{3}{4}\pi-\theta\right)}$	**M1**	**2.1**	Attempt sine rule	
	$AC=\frac{\sin\frac{3}{4}\pi}{\sin\frac{1}{4}\pi\cos\theta-\cos\frac{1}{4}\pi\sin\theta}$	**M1**	**2.1**	For expanding $\sin\left(\frac{1}{4}\pi-\theta\right)$	
	$\sin\frac{3}{4}\pi=\sin\frac{1}{4}\pi=\cos\frac{1}{4}\pi$ so $AC=\frac{1}{\cos\theta-\sin\theta}$	**E1**	**2.2a**	**AG**, so must show sufficient working; e.g. stating $\sin\frac{3}{4}\pi=\sin\frac{1}{4}\pi=\cos\frac{1}{4}\pi$ or using $\frac{1}{\sqrt{2}}$ oe for each	
		[3]			
(ii)	$AC=\left(1+(-\theta-\frac{1}{2}\theta^2)\right)^{-1}$	**B1**	**1.1**	Using both small angle approximations	
	$AC=1+(-1)\left(-\theta-\frac{1}{2}\theta^2\right)+\frac{(-1)(-2)}{2}\left(-\theta-\frac{1}{2}\theta^2\right)^2+\ldots$	**M1**	**3.1a**	Attempt binomial expansion of AC, with at least the first two terms present	
	$AC\approx1+\theta+\frac{3}{2}\theta^2$	**A1**	**1.1**	$p=1$	
		A1	**1.1**	$q=\frac{3}{2}$	
		[4]			

Q3, (OCR H240/02, Practice Paper Set 3, Q3)

$\frac{1-\frac{1}{8}\theta^2}{1+\theta}=0.825$	**M1**	**1.1a**	
$0.125\theta^2+0.825\theta-0.175=0$	**A1**	**1.1**	
$\theta=0.206$ or -6.81 (3 sf)	**A1**	**1.1**	**BC**
Discard -6.81 as not small. $\theta=0.206$ (3 sf)	**A1**	**2.3**	Statement needed and $\theta=0.206$ alone
	[4]		