Question	Answer	Marks	Partial Marks
10(b)	[direction vector =] $24\mathbf{i} + 7\mathbf{j}$ or x-component: $\cos\alpha = \frac{24}{25}$ and y-component: $\sin\alpha = \frac{7}{25}$	**B1**	
	[velocity vector =] $\frac{75}{\sqrt{24^2+7^2}}(24\mathbf{i}+7\mathbf{j})$ oe	**M1**	**FT** *their* direction vector
	$72\mathbf{i}+21\mathbf{j}$ oe	**A1**	
	[position vector =] $-10\mathbf{i} + 18\mathbf{j} + t(72\mathbf{i} + 21\mathbf{j})$ or $(-10 + 72t)\mathbf{i} + (18 + 21t)\mathbf{j}$	**A1**	**FT** *their* velocity vector
10(c)	Solves $40t = -10 + 72t$ and $-30 + 42t = 18 + 21t$ or solves one equation and substitutes the value of t into the other equation	**M1**	**FT** *their* position vectors of P and Q at time t
	Shows correctly that the values of t are not consistent e.g. $t = \frac{10}{32}$ and $t = \frac{48}{21}$ oe so do not collide oe	**A1**	
11	A correct and simplified equation e.g. $n+1 = \frac{437}{n-3}$	**B2**	**B1** for an equation with $\left[\frac{(n+1)!}{n!} =\right]$ $n + 1$ and 437 or $\left[\frac{(n-3)!}{(n-4)!}\text{ oe } =\right]$ $n - 3$ and 437 OR for $\frac{(n+1)!}{437(n-4)!} = \frac{n!}{(n-3)!}$
	$n^2 - 2n - 440$ [= 0]	**B1**	**dep** on **B2**
	$n = 22$ as only solution	**B1**	**dep** on all previous marks awarded

Question	Answer	Marks	Partial Marks
12(a)	$15(1-\sin^2(3x+1.5))+7\sin(3x+1.5)-13\,[=0]$	**M1**	
	$15\sin^2(3x+1.5)-7\sin(3x+1.5)-2\,[=0]$	**A1**	
	$(5\sin(3x+1.5)+1)(3\sin(3x+1.5)-2)\,[=0]$	**M1**	Factorises or solves *their* 3-term quadratic in $\sin(3x + 1.5)$ **dep** on previous **M1**
	$3x + 1.5 = -0.201[3\ldots]$ or $3x + 1.5 = 0.729[7\ldots]$ or $3x + 1.5 = 2.41[1\ldots]$ or $3x+1.5=\sin^{-1}\left(their-\frac{1}{5}\right)$ or $3x+1.5=\sin^{-1}\left(their\frac{2}{3}\right)$	**M1**	**dep** on previous **M1** **FT** providing $-1 \leqslant their\ -\frac{1}{5} \leqslant 1$ and/or $-1 \leqslant their\ \frac{2}{3} \leqslant 1$
	$x = 0.304$ or $0.3039[54\ldots]$ and $x = -0.257$ or $-0.2567[57\ldots]$ and no extras	**A1**	