Question Number	Scheme	Marks
8(a)	$\mathbf{v}_B = (40\cos 60)\mathbf{i} + (-40\sin 60)\mathbf{j}$	M1A1
	$= 20\mathbf{i} - 20\sqrt{3}\mathbf{j}$	A1 (3)
8(b)	$\mathbf{r} = 60\mathbf{i} + t(-20\mathbf{i})$	M1 A1
	$\mathbf{s} = t(20\mathbf{i} - 20\sqrt{3}\mathbf{j})$	B1**ft** (3)
8(c)	$\overrightarrow{AB} = \mathbf{s} - \mathbf{r} = t(20\mathbf{i} - 20\sqrt{3}\mathbf{j}) - \left[60\mathbf{i} + t(-20\mathbf{i})\right]$	M1
	$\sqrt{(40t-60)^2 + (-20t\sqrt{3})^2} = 60$ **OR** $(40t-60)^2 + (-20t\sqrt{3})^2 = 60^2$	M1 A2**ft**
	$2800t^2 - 4800t = 0$	M1 A1
	$t = \frac{12}{7}$	A1
	13 43 OR 1 43 pm (nearest minute)	A1 **cso** (8)
		(14)
	Notes for qu 8	
	For (a) and (b) allow working in column vector form	
8(a)	M1 for 40 resolved in both components but allow sin/cos confusion and sign errors	
	First A1 for two correct unsimplified components	
	Second A1 for a correct vector, allow 2SF or better for the **j** component **N.B.** Need to see a complete velocity vector not just $p =$, $q =$	
8(b)	M1 for $\mathbf{r} = 60\mathbf{i} \pm 20t\mathbf{i}$	
	A1 for $\mathbf{r} = 60\mathbf{i} + t(-20\mathbf{i})$	
	B1 ft on their answer for (a)	
8(c)	M1 for finding either $\mathbf{s} - \mathbf{r}$ or $\mathbf{r} - \mathbf{s}$. Allow missing brackets if they recover.	
	Second M1 for obtaining an equation in t only by using the magnitude of their $\mathbf{s} - \mathbf{r}$ or $\mathbf{r} - \mathbf{s}$ and equating it to 60 (allow the square on both sides). Must be a clear attempt to use Pythagoras	
	First and Second A1 **ft** for a correct equation, **ft** on their $\mathbf{s} - \mathbf{r}$ or $\mathbf{r} - \mathbf{s}$	
	Third M1 for a simplified quadratic equation = 0 with at least a t^2 and a t term	
	Third A1 for a correct equation from correct working (**N.B**. Coefficient of t^2 must be in range $[2797, 2825]$)	
	Fourth A1 for a correct value of t (allow AWRT 1.7) from correct working	
	Fifth A1 for a correct time to the nearest minute **cso**	
	SC: If using $+20\sqrt{3}$ oe for the coefficient of j in part (a) , can score for (c) **max M1M1A2 M1A1A1A0**	

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