	Allow column vectors throughout apart from in the answers to (b) and (c).		
7a	$\lvert\mathbf{a}\rvert = \sqrt{1^2+(-4)^2}$ or $\sqrt{1^2+4^2}$	M1	Complete method to find the magnitude using the correct vector or the correct vector with just a sign error. They may use $\mathbf{a} = \frac{\mathbf{v}_p - \mathbf{v}_q}{p-q}$ for two specific times p and q, allow subtraction either way round and slips in arithmetic
	$= \sqrt{17}$. Accept $4.1\left(\text{km h}^{-2}\right)$ or better	A1	$= 4.123105\ldots\ \left(\text{km h}^{-2}\right)$ Must come from a correct **a** (if seen.)
		(2)	
7b	$\frac{(\mathbf{i}-5\mathbf{j})-(4\mathbf{i}+\mathbf{j})}{3}$	M1	Condone subtraction the wrong way round
	$= -\mathbf{i}-2\mathbf{j}\quad\left(\text{km h}^{-2}\right)$	A1	Must be in **i** and **j**
		(2)	
7c	$4\mathbf{i}+\mathbf{j}-2(-\mathbf{i}-2\mathbf{j})$ **OR** $\mathbf{i}-5\mathbf{j}-5(-\mathbf{i}-2\mathbf{j})$	M1	Or equivalent for their **a**
	$= 6\mathbf{i}+5\mathbf{j}\quad\left(\text{km h}^{-1}\right)$	A1	Must be in **i** and **j**. Isw if they find the speed.
			N.B. In (b) and (c), penalise the use of column vectors in the answers ONCE.
		(2)	
7d	Express both velocities in component form, with **i**'s and **j**'s collected, using their answers to (b) and (c) for $\mathbf{v}_B$.	M1	$\mathbf{v}_A = (2+t)\mathbf{i}+(3-4t)\mathbf{j}$ $\mathbf{v}_B = (6-t)\mathbf{i}+(5-2t)\mathbf{j}$ Seen or implied. Allow slips. **N.B.** This mark can be earned in part (e).
	Correct use of Pythagoras to form an equation in T_1 (or t) only, with or without square roots.	M1	For given $\mathbf{v}_A$ and their $\mathbf{v}_B$
	$(6-T_1)^2+(5-2T_1)^2 = (2+T_1)^2+(3-4T_1)^2$ $\left(T_1^2+T_1-4=0\right)$	A1**ft**	Correct unsimplified equation in T_1 (or t), without square roots. Follow their answers from (b) and (c)
	$\frac{-1+\sqrt{17}}{2}$ only	A1	cao accept exact equivalent
		(4)	
7e	Use ratios to form an equation in T_2 (or t) only	M1	Allow reciprocal on one side **N.B**. Allow if **i**'s and **j**'s are left in

	$\Rightarrow \frac{5-2T_2}{6-T_2} = \frac{3-4T_2}{2+T_2}$ (allow *t* at this stage)	A1**ft**	Or equivalent ft on their $\mathbf{v_B}$
	$\Rightarrow 3T_2^{\,2} - 14T_2 + 4 = 0$ *	A1*	Obtain **correct answer** from full and correct working with no errors. Must see at least $10 + 5T_2 - 4T_2 - 2T_2^{\,2} = 18 - 24T_2 - 3T_2 + 4T_2^{\,2}$ **OR** $10 + T_2 - 2T_2^{\,2} = 18 - 27T_2 + 4T_2^{\,2}$ (Allow *t* at this stage but must be T_2 in final answer) $\Rightarrow 3T_2^{\,2} - 14T_2 + 4 = 0$ *
		(3)	
		(13)	