Question	Scheme	Marks	AOs
8(a)	Use of $\mathbf{r} = \mathbf{u}t + \frac{1}{2}\mathbf{a}t^2$: $(7\mathbf{i} - 10\mathbf{j}) = 2(2\mathbf{i} - 3\mathbf{j}) + \frac{1}{2}\mathbf{a}2^2$	M1	3.1b
	a = (1.5i - 2j)	A1	1.1b
	$ \mathbf{a} = \sqrt{1.5^2 + (-2)^2}$	M1	1.1b
	$= 2.5 \text{ m s}^{-2} * \text{ GIVEN ANSWER}$	A1*	2.1
		(4)	
(b)	Use of $\mathbf{v} = \mathbf{u} + \mathbf{a}t = (2\mathbf{i} - 3\mathbf{j}) + 2(1.5\mathbf{i} - 2\mathbf{j})$	M1	3.1b
	=(5i - 7j)	A1	1.1b
	$\mathbf{v} = (5\mathbf{i} - 7\mathbf{j}) + t(4\mathbf{i} + 8.8\mathbf{j}) = (5 + 4t)\mathbf{i} + (8.8t - 7)\mathbf{j}$ and (5 + 4t) = (8.8t - 7)	M1	3.1b
	t = 2.5 (s)	A1	1.1b
		(4)	
(8 marks)			narks)

Notes: Allow column vectors throughout

(a)

No credit for individual component calculations

M1: Using a complete method to obtain the acceleration. **N.B.** Equation, in **a** only, could be obtained by two integrations

ALTERNATIVE

M1: Use velocity at half-time (t = 1) = Average velocity over time period

So at
$$t = 1$$
, $\mathbf{v} = \frac{1}{2}(7\mathbf{i} - 10\mathbf{j})$ so $\mathbf{a} = \frac{1}{2}(7\mathbf{i} - 10\mathbf{j}) - (2\mathbf{i} - 3\mathbf{j})$

N.B. could see $(7\mathbf{i} - 10\mathbf{j}) = (4\mathbf{i} - 6\mathbf{j}) + 2\mathbf{a}$ as first line of working

A1: Correct a vector

M1: Attempt to find magnitude of their **a** using form $\sqrt{a^2 + b^2}$

A1*: Correct GIVEN ANSWER obtained correctly

M1: Using a complete method to obtain the velocity at A e.g.by use of $\mathbf{v} = \mathbf{u} + \mathbf{a}t$ with t = 2 and

 $\mathbf{u} = 2\mathbf{i} - 3\mathbf{j}$ and their \mathbf{a}

OR: by use of $\mathbf{s} = \mathbf{v}t - \frac{1}{2}\mathbf{a}t^2$

OR: by integrating their **a**, with addition of C = 2i - 3j, and putting t = 2

A1: correct vector

M1: Complete method to find equation in *t* only

e.g. by using $\mathbf{v} = \mathbf{u} + \mathbf{a}t$, with their \mathbf{u} and equating \mathbf{i} and \mathbf{j} components

OR: by integrating $(4\mathbf{i} + 8.8\mathbf{j})$, with addition of a constant, and equating \mathbf{i} and \mathbf{j} components.

N.B. Must be equating **i** and **j** components of <u>a velocity vector</u> and must be their velocity at A, to give an equation in t only for this M mark

A1: 2.5 (s)