Question	Scheme	Marks
4(a)	$\overrightarrow{OB} = \overrightarrow{OA} + \overrightarrow{AB} = 5\mathbf{i} + 7\mathbf{j} + a\mathbf{i} + 16\mathbf{j} = (5+a)\mathbf{i} + 23\mathbf{j}$	M1A1
	$\left(5\sqrt{29}\right)^2 = (5+a)^2 + 23^2 \Rightarrow 5 + a = \pm\sqrt{196} \Rightarrow a = 9, -19$	M1A1
		[4]
(b)	$\overrightarrow{AB} = \text{"9"}\mathbf{i} + 16\mathbf{j} \Rightarrow \left\lvert\overrightarrow{AB}\right\rvert = \sqrt{\text{"9"}^2 + 16^2} = \sqrt{337}$	M1
	Unit vector: $\dfrac{1}{\sqrt{\text{"337"}}}\left(\text{"9"}\mathbf{i} + 16\mathbf{j}\right)$ oe.	A1 [2]
		Total 6 marks

Part	Mark	Notes
(a)	M1	For the correct vector statement for $\overrightarrow{OB}$ For example, accept $\overrightarrow{AB} = \overrightarrow{A0} + \overrightarrow{OB}$ This mark can be implied by a correct vector for $\overrightarrow{OB}$
	A1	For the correct vector in terms of a [simplified or unsimplified].
	M1	For using Pythagoras theorem with $\left(5\sqrt{29}\right)$ and their vector for $\overrightarrow{OB}$ and solving the equation to find **two** values of a
	A1	For the **two** correct values. $a = 9, -19$ seen in their working
(b)	M1	For finding |AB| by using a correct Pythagoras and writing down the unit vector where $\overrightarrow{AB} = k\mathbf{i} + 16\mathbf{j}$ where k is a **positive** value. Award for $\dfrac{\text{"9"}\mathbf{i} + 16\mathbf{j}}{\sqrt{\text{"9"}^2 + 16^2}}$ $\sqrt{9^2 + 16^2}$ can be implied by sight of $\sqrt{337}$ If they have an incorrect value for a, full substitution using Pythagoras theorem must be seen for the award of this mark.
	A1	For the correct unit vector. Accept any correct equivalent unit vectors. For example; $\dfrac{\sqrt{\text{"337"}}}{\text{"337"}}\left(\text{"9"}\mathbf{i} + 16\mathbf{j}\right)$ or $\dfrac{\text{"9"}\mathbf{i}}{\sqrt{\text{"337"}}} + \dfrac{16\mathbf{j}}{\sqrt{\text{"337"}}}$ Accept decimal answers. Eg., $0.054\left(\text{"9"}\mathbf{i} + 16\mathbf{j}\right)$ for awrt 0.054 Or $0.49\mathbf{i} + 0.87\mathbf{j}$ or better. Allow $\pm\dfrac{1}{\sqrt{\text{"337"}}}\left(\text{"9"}\mathbf{i} + 16\mathbf{j}\right)$

Useful Sketch