Question	Scheme	Marks
4(a)	$\overrightarrow{AB} = \overrightarrow{OB} - \overrightarrow{OA} \Rightarrow \overrightarrow{AB} = (5\mathbf{i} + 9p\mathbf{j}) - (p\mathbf{i} + 2p\mathbf{j})$	M1A1
	$\mathbf{i}(5-p) + \mathbf{j}(7p) = Q(\mathbf{i} - 2\mathbf{j}) \Rightarrow 5-p = Q \text{ and } 7p = -2Q$	M1M1
	$7p = -2(5-p) \Rightarrow p = -2$	M1A1 [6]
(b)	$7('-2') = -2Q \Rightarrow Q = 7,\ \overrightarrow{AB} = 7(\mathbf{i} - 2\mathbf{j}) = 7\mathbf{i} - 14\mathbf{j}$	M1A1ft [2]
	OR	
	$\overrightarrow{AB} = (5\mathbf{i} + 9(-2)\mathbf{j}) - ((-2)\mathbf{i} + 2(-2)\mathbf{j}) = 7\mathbf{i} - 14\mathbf{j}$	[M1A1ft]
(c)	$\overrightarrow{OA} = -2\mathbf{i} - 4\mathbf{j} \Rightarrow \left|\overrightarrow{OA}\right| = \sqrt{(-2)^2 + (-4)^2} = \sqrt{20}$	M1A1ft
	Unit vector is $\dfrac{1}{\sqrt{20}}(-2\mathbf{i} - 4\mathbf{j}) = \dfrac{\sqrt{5}}{5}(-\mathbf{i} - 2\mathbf{j})$	M1A1 [4]
		Total 12 marks

Question	Notes	Marks
4(a)	For the basic vector statement $$\overrightarrow{AB} = \overrightarrow{OB} - \overrightarrow{OA}$$	M1
	For the correct vector (simplified or unsimplified) $$\overrightarrow{AB} = (5\mathbf{i}+9p\mathbf{j})-(p\mathbf{i}+2p\mathbf{j})=\left[\mathbf{i}(5-p)+\mathbf{j}(7p)\right]$$	A1
	For setting their $\overrightarrow{AB} = Q(\mathbf{i}-2\mathbf{j})$ where $Q \neq 1$, $Q \neq 0$ $$\mathbf{i}(5-p)+\mathbf{j}(7p)=Q(\mathbf{i}-2\mathbf{j})$$	M1
	For equating components of **i** and **j** **i** $\quad 5-p=Q$ **j** $\quad 7p=-2Q$	M1
	Solving the simultaneous equations by any method to find the value of p $$7p=-2(5-p)\Rightarrow p=\dots$$	M1
	For the value of $p=-2$	A1 [6]
(b)	For finding the value of k and using it to find the vector $\overrightarrow{AB}$ $$7('-2')=-2Q\Rightarrow Q=7$$	M1
	For the correct vector $$\overrightarrow{AB}=7(\mathbf{i}-2\mathbf{j})=7\mathbf{i}-14\mathbf{j}$$	A1ft [2]
	ALT	
	For substituting their value of p to find the vector $\overrightarrow{AB}$ $$\overrightarrow{AB}=\mathbf{i}(5-[-2])+\mathbf{j}(7[-2])=\dots$$	M1
	$$\overrightarrow{AB}=\mathbf{i}(5-p)+\mathbf{j}(7p)\Rightarrow\overrightarrow{AB}=7\mathbf{i}-14\mathbf{j}$$	A1ft [2]
(c)	$$\overrightarrow{OA}=-2\mathbf{i}-4\mathbf{j}\Rightarrow\left|\overrightarrow{OA}\right|=\sqrt{(-2)^2+(-4)^2}=\dots$$	M1
	$$\left|\overrightarrow{OA}\right|=\sqrt{20}$$	A1ft
	Unit vector in the direction of $\overrightarrow{OA}$ is $\dfrac{1}{\sqrt{20}}(-2\mathbf{i}-4\mathbf{j})$	M1
	Unit vector in the required form $\dfrac{\sqrt{5}}{5}(-\mathbf{i}-2\mathbf{j})$ Allow $\dfrac{\sqrt{5}}{5}(\mathbf{i}+2\mathbf{j})$ **provided** no processing errors seen.	A1 [4]
		Total 12 marks