Question number	Scheme	Marks
3 (a)	$\overrightarrow{PQ} = -(5\mathbf{i}+6\mathbf{j})+(3\mathbf{i}-4\mathbf{j}) = -2\mathbf{i}-10\mathbf{j}$	M1A1 (2)
(b)	$\left\|\overrightarrow{PQ}\right\| = \sqrt{(-2)^2+(-10)^2}$ $\left(=\sqrt{104}\right)$ oe	M1
	Unit vector parallel to $\overrightarrow{PQ}$: $\overrightarrow{XY} = \frac{1}{\sqrt{104}}(-2\mathbf{i}-10\mathbf{j})$	A1
	or $\overrightarrow{XY} = -\frac{1}{\sqrt{104}}(-2\mathbf{i}-10\mathbf{j})$ or $\frac{1}{\sqrt{104}}(2\mathbf{i}+10\mathbf{j})$ oe eg $\pm\frac{(\mathbf{i}+5\mathbf{j})}{\sqrt{26}}$	(2)
(c)	$\overrightarrow{QR} = \overrightarrow{QP}+\overrightarrow{PR}$	
	$5(2\mathbf{i}+10\mathbf{j}) = (2\mathbf{i}+10\mathbf{j})+(8\mathbf{i}+\mathbf{j}(a-6))$	
	$\Rightarrow 50 = 10+a-6 \Rightarrow a = 46$	M1
	$\overrightarrow{QR} = \overrightarrow{OR}-\overrightarrow{OQ}$	A1
	$5(2\mathbf{i}+10\mathbf{j}) = (13\mathbf{i}+a\mathbf{j})-(3\mathbf{i}-4\mathbf{j})$	(2)
	$\Rightarrow 50 = a+4 \Rightarrow a = 46$	[6]
	ALT	
	$\sqrt{(13-3)^2+(a--4)^2} = 5\times 2\sqrt{26}$	
	$\sqrt{10^2+(a+4)^2} = 10\sqrt{26}$	
	$100+(a+4)^2 = 2600 \Rightarrow (a+4) = \pm 50$	M1
	$a>0$, so $a=46$	A1cao {2}
	Allow column vectors throughout. Deduct max 2A marks if final vectors are column vectors inc **i**, **j**	
(a)		
M1	Attempt $\overrightarrow{PO}+\overrightarrow{OQ}$ (oe)	
A1	Correct answer	
(b)		
M1	Attempt the modulus of their $\overrightarrow{PQ}$ using +/- their components squared and added	
A1	Correct unit vector in any equivalent form. (parallel or anti-parallel)	
(c)		
M1	Any complete correct method that leads to a value of a (value to be shown)	
A1cao	$a = 46$	