Question Number	Solution	Marks	Notes
1.	$\mathbf{I} = 2\left[\lambda\mathbf{i} + \lambda\mathbf{j} - 5\mathbf{i} - 3\mathbf{j}\right]$	M1	Use of $\mathbf{I} = m\left(\mathbf{v} - \mathbf{u}\right)$
	$= 2\left(\lambda - 5\right)\mathbf{i} + 2\left(\lambda - 3\right)\mathbf{j}$	A1	Any equivalent form
	$\left\|I\right\| = \sqrt{40} \Rightarrow \left(\lambda - 5\right)^2 + \left(\lambda - 3\right)^2 = 10$	M1	Correct use of Pythagoras and their impulse to form an equation in λ
	$\lambda^2 - 8\lambda + 12 = 0 \Rightarrow \lambda = 2$ or $\lambda = 6$	DM1	Solve to find both values for λ. Dependent on the 2 preceding M marks
	$\mathbf{I} = -6\mathbf{i} - 2\mathbf{j}$ or $\mathbf{I} = 2\mathbf{i} + 6\mathbf{j}$ $(a = -6, b = -2$ or $a = 2, b = 6)$	A1	And no others
		(5)	
	Alternative working:		
	$\mathbf{I}\left(= a\mathbf{i} + b\mathbf{j}\right) = 2\left(\mathbf{v} - \left(5\mathbf{i} + 3\mathbf{j}\right)\right)$	M1A1	
	$\mathbf{v} = \frac{a+10}{2}\mathbf{i} + \frac{b+6}{2}\mathbf{j} \quad \Rightarrow \quad \left(\Rightarrow a + 10 = b + 6\right)$		
	$a^2 + b^2 = 40 \Rightarrow b^2 - 4b - 12 = 0$ or $a^2 + 4a - 12 = 0$	M1	Correct use of Pythagoras and impulse to form an equation in a or b Any equivalent form
	$b^2 - 4b - 12 = 0 \quad \Rightarrow b = 6$ or $b = -2$	DM1	
	$\mathbf{I} = -6\mathbf{i} - 2\mathbf{j}$ or $\mathbf{I} = 2\mathbf{i} + 6\mathbf{j}$	A1	Or simplified equivalent
		[5]	