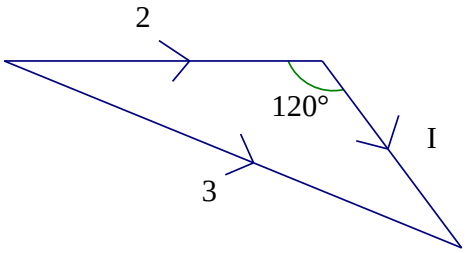
Question	Scheme	Mark	Notes
3	Form impulse-momentum equation	M1	Dimensionally correct. Accept answers in "vector" form, or as separate components. Condone sine / cosine confusion.
	One correct equation	A1	e.g. one correct component of $\begin{pmatrix} I\cos 60° \\ I\sin 60° \end{pmatrix} = \frac{1}{4}\left[\begin{pmatrix} 12\cos\alpha \\ 12\sin\alpha \end{pmatrix} - \begin{pmatrix} 8 \\ 0 \end{pmatrix}\right]$ or $\left(= \begin{pmatrix} 3\cos\alpha - 2 \\ 3\sin\alpha \end{pmatrix}\right)$ $\begin{pmatrix} I\cos 60° \\ I\sin 60° \end{pmatrix} = \frac{1}{4}\left[\begin{pmatrix} v_x \\ v_y \end{pmatrix} - \begin{pmatrix} 8 \\ 0 \end{pmatrix}\right]$ $\left(= \begin{pmatrix} 3\cos\alpha - 2 \\ 3\sin\alpha \end{pmatrix}\right)$ if working parallel and perpendicular to the initial direction or one of $8\sin 60° = 12\cos(30° + \alpha)$ or $I = 0.25(12\sin(30° + \alpha) - 8\cos 60°)$ if working parallel and perpendicular to the impulse
	Form a second impulse-momentum equation	M1	
	correct second equation	A1	
	Complete method to solve for I	DM1	Dependent on the two preceding M marks. e.g. from $36 = (I+4)^2 + 3I^2 \quad (4I^2 + 8I - 20 = 0)$
	$I = \sqrt{6} - 1$ (or 1.45 or 1.4)	A1	
		[6]	
3 alt		**M1**	Use of $I = mv - mu$ to draw a vector triangle. Dimensionally consistent.
		A1	Correct diagram
	Form an equation in I	**M1**	e.g. by using cosine rule
	$4 + I^2 - 4I\cos 120° = 9$	**A1**	Correct unsimplified equation A correct cosine rule equation can imply the first M1A1 if no diagram seen
	Solve for I	**DM1**	Dependent on the 2 preceding M marks $I^2 + 2I - 5 = 0$
	$I = \sqrt{6} - 1$ (or 1.45 or 1.4)	**A1**	
		(6)	