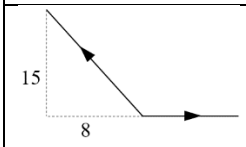
Question Number	Scheme	Marks
2(a)	$\mathbf{F}_3 + (3c\mathbf{i} + 4c\mathbf{j}) + (-14\mathbf{i} + 7\mathbf{j}) = \mathbf{0}$ oe	M1
	$\mathbf{F}_3 = (14 - 3c)\mathbf{i} + (-7 - 4c)\mathbf{j}$	A1
		(2)
2(b)	Resultant force $\mathbf{F}_1 + \mathbf{F}_2 = (6-14)\mathbf{i} + (8+7)\mathbf{j}$ $(= -8\mathbf{i} + 15\mathbf{j})$	M1
	 Find any relevant angle for **their (even if they've subtracted)** resultant (need not be acute nor positive)	M1
	any of $\tan^{-1}\left(\pm\frac{8}{15}\right), \tan^{-1}\left(\pm\frac{15}{8}\right), \sin^{-1}\left(\pm\frac{8}{17}\right), \cos^{-1}\left(\pm\frac{8}{17}\right), \ldots$	A1**ft**
	120° or better (118.0724…) **OR** 240° or better (241.9276..) In radians 2.1 or better (2.0607..) **OR** 4.2 or better (4.2224…)	A1
		(4)
2(c)	Use of Pythagoras on their resultant : $\sqrt{(-8)^2 + 15^2}$ **or** their acceleration: $\sqrt{(\frac{-8}{m})^2 + (\frac{15}{m})^2}$	M1
	Use of $\lvert\text{their } \mathbf{R}\rvert = 8.5m$ **or** their Resultant = $m\mathbf{a}$	M1
	A correct equation in m only eg $17 = m \times 8.5$	A1**ft**
	$m = 2$	A1
	N. B. $\sqrt{\left(\frac{-8}{8.5}\right)^2 + \left(\frac{15}{8.5}\right)^2}$ M1 $-8\mathbf{i} + 15\mathbf{j} = 8.5m$ M1 $\sqrt{\left(\frac{-8}{8.5}\right)^2 + \left(\frac{15}{8.5}\right)^2} = m$ A1ft $2 = m$ A1	
		(4)
		(10)

Notes	
	Accept column vectors throughout apart from answer for (a)
(a)	
M1	Uses the vector **sum** of all 3 forces being equal to zero oe **N.B.** $\mathbf{F_3} = \mathbf{F}_1 + \mathbf{F}_2$ is M0
A1	cao Must be in terms of c, **i** and **j** but allow uncollected **i**'s and **j**'s and apply isw if necessary.
(b)	
M1	Finds the resultant using $\mathbf{F}_1 + \mathbf{F}_2$ or $-$ their $\mathbf{F}_3$
M1	Uses trig to find a relevant angle **for their resultant**
A1ft	Any **correct** relevant angle (does not need to be acute), ft on their resultant
A1	Cso.
(c)	
M1	Use of Pythagoras to find the magnitude of their resultant force **or** their acceleration
M1	Allow their **R** = 8.5 m
A1ft	A correct scalar equation in m only eg $17 = m \times 8.5$, ft on their resultant
A1	cso