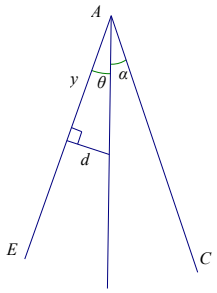
6a	Mass ratio $24a : 25a : 7\pi a : 7a(7+\pi)$	B1	Correct ratio seen or implied
	Moments about AE	M1	Need all terms, with their masses and horizontal distances Allow use of a parallel axis.
	$25a \times \frac{7}{2}a + 7\pi a \times \frac{14a}{\pi}$ $= 7a(7+\pi)d$	A1	Correct unsimplified equation
	$\frac{371}{2}a^2 = 7a(7+\pi)d$ $\Rightarrow d = \frac{53}{2(7+\pi)}a$ *	A1*	Obtain **given answer** from correct working Condone if they call it $\overline{x}$
		[4]	
6b	Centre of mass of semicircle lies $7a$ "vertically below" A	B1	Seen or implied e.g. $17a$ above E
	Moments about "horizontal" axis through A:	M1	Or a parallel axis. Need all terms, with their masses and distances.
	$24a \times 12a + 25a \times 12a + 7\pi a \times 7a$ $= 7a(7+\pi)y$	A1	Correct unsimplified equation
	$y = \frac{49a(12+\pi)}{7(7+\pi)}\left(= \frac{7a(12+\pi)}{7+\pi}\right)$	A1	Any equivalent form. Accept $\frac{84+17\pi}{7+\pi}a$ from E
	NB: A candidate might have a vector equation in (a) which provides evidence for some or all or the first 4 marks in (b).		
			
	$\theta° = \tan^{-1}\frac{d}{y} = \tan^{-1}\frac{53}{14(12+\pi)}(= 14.037...°)$	DM1	Use trig to find relevant angle $(\theta$ or $90-\theta)$ in a triangle with d and A (must now be working with vertical distance of C of M from A) Dependent on first M
	$\alpha° = \tan^{-1}\frac{7}{24} - \theta°$	DM1	Dependent on the previous M1. Complete method for the required angle
	$\alpha = 2.2$	A1	2.2 or better (2.22…)
		[7]	
		(11)	