Question Number	Scheme	Marks
3(a)	Slant height, $l = \sqrt{\left(\frac{7a}{4}\right)^2 + (6a)^2}$ $\left(= \frac{25a}{4}\right)$	M1
	Masses Square $16a^2$ Circle $\pi\left(\frac{7a}{4}\right)^2$ Conical shell $\pi \times \frac{7a}{4} \times \frac{25a}{4}$ Total $\left[16a^2 - \pi\left(\frac{7a}{4}\right)^2 + \pi \times \frac{7a}{4} \times \frac{25a}{4}\right]$	B1 square B1 circle B1ft (shell and total)
	Distances Square 0 Circle 0 Conical shell $2a$: Total $\bar{x}$	B1
	$\pi \times \frac{7a}{4} \times \frac{25a}{4} \times 2a = \left[16a^2 - \pi\left(\frac{7a}{4}\right)^2 + \pi \times \frac{7a}{4} \times \frac{25a}{4}\right]\bar{x}$	M1 A1
	$\bar{x} = \frac{175\pi a}{(63\pi + 128)}$ *	A1*
		(8)
3(b)	$\tan\alpha = \frac{2a}{\left(\frac{175\pi a}{(63\pi + 128)}\right)}$	M1
	$\tan\alpha = \frac{126\pi + 256}{175\pi}$ (or $\frac{2(63\pi + 128)}{175\pi}$)	A1
		(2)
		(10)

Notes	
(a)	
M1	Use of Pythagoras (unsimplified). May be seen on the diagram.
B1	Mass/area of square
B1	Mass/area of circle
B1 ft	Mass/area of conical shell and total. A common error is to use 6*a* as slant height, only ft on their calculated slant height. May derive conical shell formula from area of a sector.
B1	All distances correct
M1	Dimensionally correct moments equation. Must have correct number of terms including an attempt to subtract the circle. Condone a slip with an '*a*' in one term.
A1	Correct equation (no ft)
A1*	Given answer correctly obtained. Condone missing brackets from denominator and terms reversed.
(b)	
M1	Allow reciprocal. Must use 2*a* and given $\bar{x}$.
A1	Cao Exact fraction required.