Question Number	Scheme	Marks
4(a)	Ratio of masses: $4\pi a^2 \quad 4\pi a \times ka \quad 8\pi a^2 \quad 12\pi a^2 + 4k\pi a^2$	B1
	Distances: $(0) \quad \frac{k}{2}a \quad (1+k)a \quad \bar{y}$	B1
	$(0+)k \times \frac{k}{2}a + 2(1+k)a = (k+3)\bar{y}$	M1A1ft
	$\left(\frac{k^2}{2} + 2 + 2k\right)a = (k+3)\bar{y}$	
	$\bar{y} = \frac{(k^2+4k+4)}{2(k+3)}a$ *	A1 * (5)
(b)	$\tan 60° = \frac{(k^2+4k+4)}{2(k+3)}a \div 2a$	M1
	$k^2 + 4k(1-\sqrt{3}) + (4-12\sqrt{3}) = 0$	A1
	$k > 0 \Rightarrow k = 5.8147... = 5.8$ or 5.81 or better	A1 (3) **[8]**

(a)

B1 Correct ratio of masses – any equivalent to that shown

B1 Correct distances from *O* or a parallel axis.

M1 Attempt a moments equation. Must be dimensionally correct (not using volumes) and have no extra terms.

A1ft Correct equation, follow through their ratio of masses and distances

A1* Correct **given** expression with sufficient working

(b)

M1 Use $\tan 60 = \frac{\bar{y}}{2a}$ or $\frac{2a}{\bar{y}}$ May also use $\tan 30$

A1 Obtain the correct 3TQ

A1 Correct value for *k*.

Note for (a):

The distance from O for the **combined** cylinder and base is $\frac{ak^2}{2(1+k)}$.