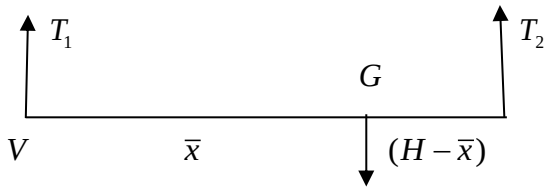
Question Number	Scheme	Marks
3(a)	Mass: $\frac{1}{3}\pi r^2 H$ $\frac{1}{3}\pi r^2 h$ $\frac{1}{3}\pi r^2 H - \frac{1}{3}\pi r^2 h$	B1
	Distance from V: $\frac{3H}{4}$ $H - \frac{1}{4}h$ $\bar{x}$	B1
	$\frac{1}{3}\pi r^2 H \times \frac{3H}{4} - \frac{1}{3}\pi r^2 h \times \left(H - \frac{1}{4}h\right) = \left(\frac{1}{3}\pi r^2 H - \frac{1}{3}\pi r^2 h\right)\bar{x}$	M1A1
	$\bar{x} = \frac{(3H-h)(H-h)}{4(H-h)} = \frac{1}{4}(3H-h)$ *	A1*
		(5)
3(b)		
	M(G), $T_1\bar{x} = T_2(H-\bar{x})$	M1
	$\frac{T_1}{T_2} = \frac{H - \frac{1}{4}(3H-h)}{\frac{1}{4}(3H-h)}$	A1
	$\frac{T_1}{T_2} = \frac{H+h}{3H-h}$	A1 (3)
		(8)

	Notes
3(a)	
B1	Three correct mass ratios: H h H - h
B1	Three correct distances (Allow if measured from some other axis)
M1	Moments equation with correct no. of terms, dim correct. Condone addition, treat as a sign error. Must be working with solids eg not a conical shell.
A1	Correct unsimplified equation (For their axis)
A1*	Given answer correctly obtained, including cancelling ($H - h$). A factorised expression should be seen to reach the GIVEN answer.
3(b)	
M1	Complete method to obtain an equation in H, h, T_1 and T_2 only . Must be dimensionally correct. May take moments about G and substitute for $\bar{x}$. Alternatively may use two equations, eliminate weight and substitute for $\bar{x}$.
A1	Correct equation in T_1, T_2, H and h only
A1	Correct answer. The question asks for simplest form.
3(a) ALT 1	**Distances measured from circular face**
B1	Mass: $\frac{1}{3}\pi r^2 H$ $\frac{1}{3}\pi r^2 h$ $\frac{1}{3}\pi r^2 H - \frac{1}{3}\pi r^2 h$
B1	Dist from Circular face: $\frac{H}{4}$ $\frac{1}{4}h$ d
M1A1	$\frac{1}{3}\pi r^2 H \times \frac{H}{4} - \frac{1}{3}\pi r^2 h \times \frac{1}{4}h = \left(\frac{1}{3}\pi r^2 H - \frac{1}{3}\pi r^2 h\right)d$

Question Number	Scheme	Marks
A1*	Leads to $d = \frac{H+h}{4}$ which must be subtracted from H to reach the required distance: $\bar{x} = H - \frac{H+h}{4} = \frac{1}{4}(3H-h)$ *	
3(b) ALT 1		
M1	May use two equations and eliminate weight/mass ratio to find an equation in terms of T_1, T_2, H and h only. Vert $T_1 + T_2 = W$ M(V), $W\bar{x} = T_2 H$ M(circular face), $T_1 H = W(H-\bar{x})$ Eliminate W	