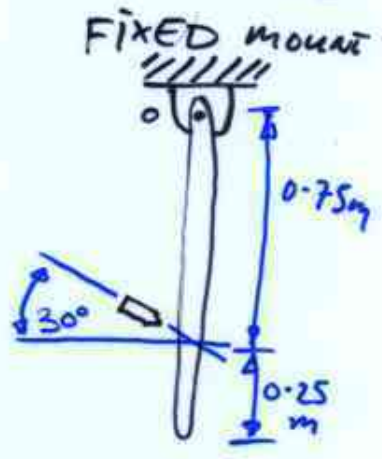
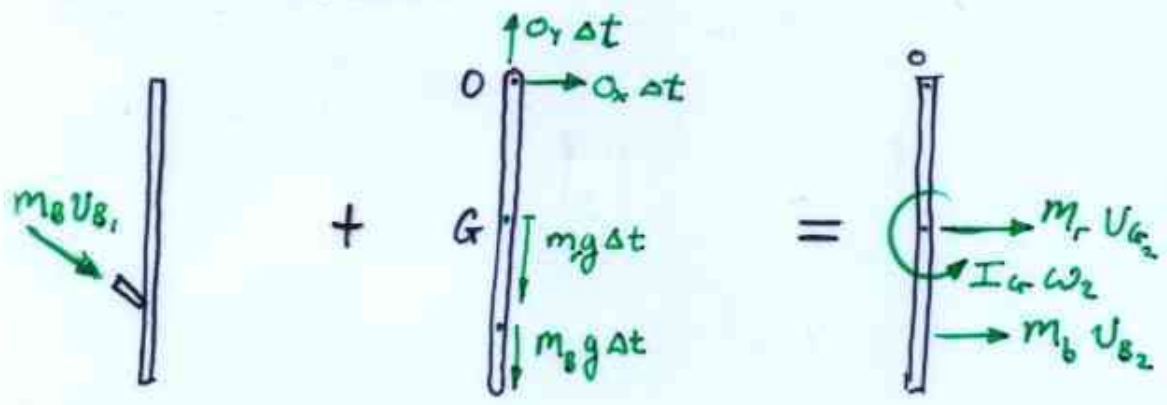


BULLET, $v_B = 400 \text{ m/s}$ embeds in
 5kg SLENDER ROD AS SHOWN
 find ω of ROD just
 after BULLET EMBEDS. (mass of Bullet = 4g)



ANALYSE BULLET & ROD AS
 A SINGLE SYSTEM



From this we see that there is no angular
 impulse about O ~~at G~~.

$$\Sigma (H_O)_1 = \Sigma (H_O)_2$$

$$m_B v_{B1} \cos(30^\circ)(0.75) = m_B v_{B2}(0.75m) + \left[m_R v_{G2}(0.5m) + I_G \omega_2 \right]$$

but note $v_{B2} = 0.75 \omega_2$
 $v_{G2} = 0.5 \omega_2$
 $I_G = \frac{1}{12} m l^2$] Kinematics

solve & get $\omega_2 = 0.62 \text{ rad/s}$

Approximation useful...

neglect bullet on R.H.S.

$$(m_B)(v_{B1})(\cos 30^\circ)(0.75) \approx I_G \omega_2 = \frac{1}{12} m l^2 \omega_2$$

$$\Rightarrow \omega_2 \approx \frac{(0.004)(400)(0.866)(0.75)}{\frac{1}{12}(5)(1.0)^2} = 0.624$$