ALTERNATIVELY we could sum moments about O

$$\sum M_O = I_O \alpha$$

$$-60 + mgr_G = -I_O \alpha$$

$$\Rightarrow \alpha = \frac{60 + mgr_G}{I_O} =$$

$$I_O = \frac{1}{3} m l^2 = \frac{(20)(3)^2}{3} = 60$$

Note $I_O = \underbrace{\frac{1}{12} m l^2}_{I_G} + m d^2$

$$= \frac{1}{12} m l^2 + m\left(\frac{l}{2}\right)^2$$

$$= \frac{1}{3} m l^2$$

$$\alpha = \left[\frac{60 + (20)(9.81)(1.5)}{60}\right] = 5.905 \text{ rad s}^{-2}$$

this is quick route to α. CAN FIND O_N, O_t later if needed.

$1 Mg = 1 ton$

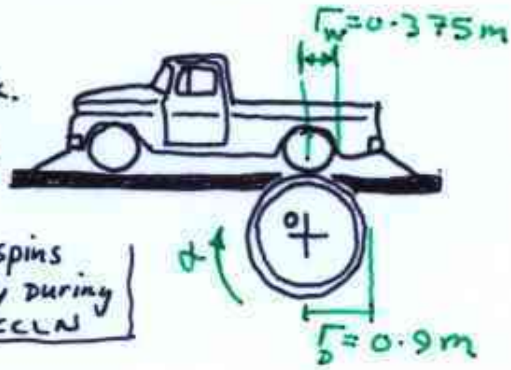
THIS DYNAMOMETER CAN SIMULATE accln of 0.6 g for the Loaded truck.

MASS OF TRUCK is 2.8 Mg (10^6 kg = ton)

FIND REQUIRED I_O of the DRUM if it spins freely during ACCLN

radius of wheel = 375 mm

" " DRUM = 900 mm



$$F = ma = (2800)(0.6)(9.81) = 16\,475 \text{ N}$$ acting @ wheel

(2800 kg; 9.81 ms^{-2})

$$a_t = (0.6)(9.81) = 5.884 \text{ ms}^{-2} \qquad a = r\alpha \text{ for wheel \& DRUM}$$

so... $\alpha_{D_{rum}} = \frac{a}{r_D} = \frac{5.884}{0.9} = 6.538 \text{ rad s}^{-2}$

$\alpha_W = \frac{a}{r_W} = \frac{5.884}{0.375} = 15.69 \text{ rad s}^{-2}$ ← unnecessary

$$\sum M_O = I_O \alpha_D \quad \text{for DRUM}$$

$$\Rightarrow (F)(r_D) = I_O \alpha_D \iff I_O = \frac{(F)(r_D)}{\alpha_D}$$

$$I_O = \frac{(16\,475)(0.9)}{(6.538)} = 2268 \text{ kg m}^2$$