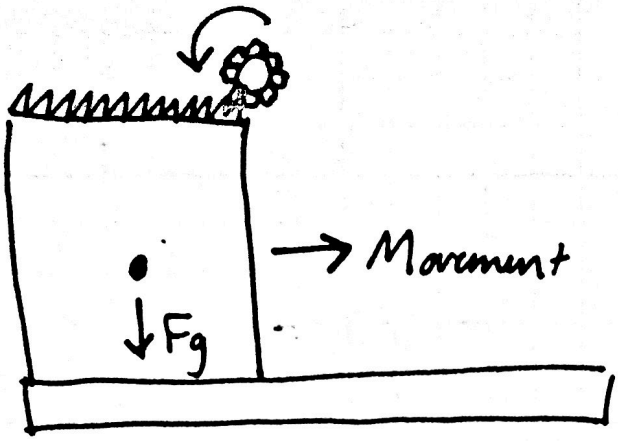
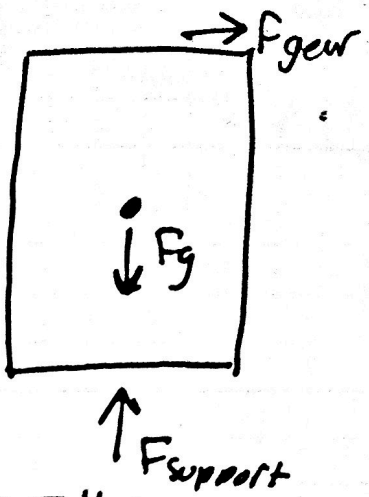




$F_{support} = F_{grav.}$ $F_{support} = .00545$ lbf

Assuming $\omega = 60$ rpm

$60 \frac{rev}{min} \cdot \frac{1\ min}{60\ sec} \cdot \frac{2\pi}{1\ rev} = 2\pi$ rad/s

V_o of gear $= 2.25 \cdot 2\pi = 14.13716694$ in/s

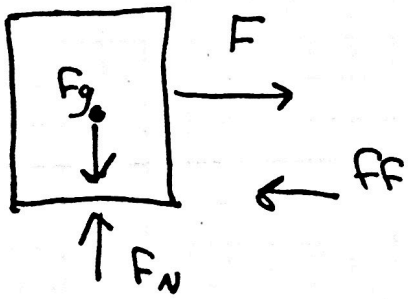
Assumptions Polyethylene door and steel track

$\mu_s = .2$

$F_f = F_N \cdot \mu_s$

$= .00545 \cdot (.2)$

$= .00109$ lbf to start moving



Minimum Torque

$.00109 \times 2.25 =$ .0024525 lb·in