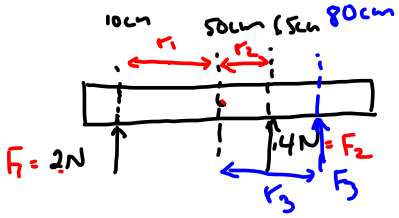



$\Sigma\tau = \tau_{cw} - \tau_{ccw}$

$= (2N)(0.40m) - (4ON)(0.15m)$

$= 0.2Nm$ CW

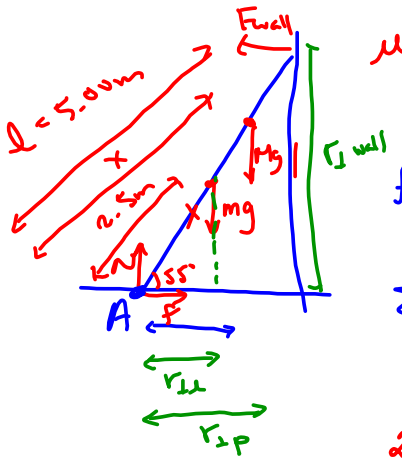
Since $\Sigma\tau = 0$

$\tau_3 = 0.2Nm$ CCW $= r_3 F_3$

$= (0.30m) F_3$

$0.\bar{6}N \quad \frac{2}{3}N$

$F_3 = 0.67N$ in same dir.




$\mu = 0.300$

$N = mg + Mg = 932\,N$

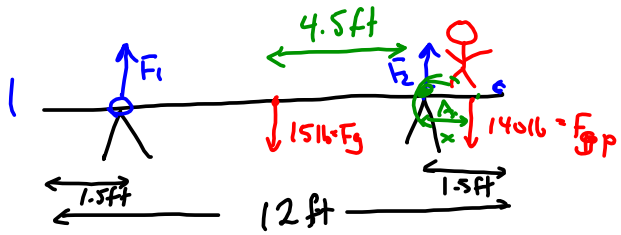
$f = F_{wall} = \mu N = (0.300)(932) = 279\,N$

$\Sigma\tau = \circlearrowleft \quad \Sigma\tau_{cw} = \Sigma\tau_{ccw}$

$r_{\perp l} \cdot mg + r_{\perp P} Mg = r_{\perp wall} F_{wall}$

$2.5m \cos 55° \cdot mg + x \cos 55° Mg = 5.0m \sin 55° (279N)$

$x = 2.05m$




At the tipping point

$\Rightarrow F_1 = 0$

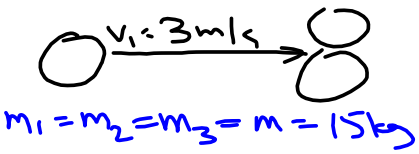
$\Sigma \tau_A = 0$ (1)

so $(14016)(x) = (1516)(4.5ft)$ (1)

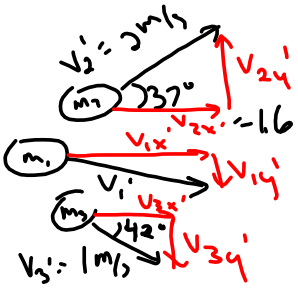
$x = \frac{67.5\ ft\,lb}{14016}$ (1)

$x = 0.48ft$

So he can get to within $1.5 - 0.48ft = 1.02ft$ from the end.




$m_1 = m_2 = m_3 = m = 15\,kg$




$\vec{0} = m_2\vec{v}_{2y}' + m_1\vec{v}_{1y}' + m_3\vec{v}_{3y}'$

$v_{3x}' = 1\cos 42° = 0.74$

$v_{3y}' = 1\sin 42° = 0.67$

$\Sigma p_x = \Sigma p_x'$

$m_1 v_1 = m_1 v_{1x}' + m_2 v_{2x}' + m_3 v_3'$

$3 = 1.6 + 0.74 + v_{1x}'$

$v_{1x}' = 0.66\,m/s$

$\Sigma p_y = \Sigma p_y' = 0$

$m_2 v_{2y}' = m_1 v_{1y}' + m_3 v_{3y}'$

$1.2 = v_{1y}' + 0.67$

$v_{1y}' = 0.53\,m/s$

$v_3' = \sqrt{0.66^2 + 0.53^2}$

$= 0.85\,m/s$

Is this collision elastic?

$\Sigma KE = \frac{1}{2} m_1 v_1^2$

$= \frac{1}{2}(15)(3)^2$

$= 67.5\,J$

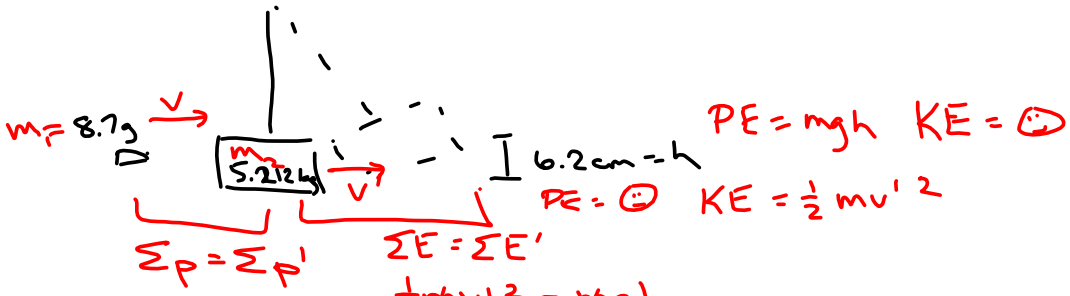
$\Sigma KE' = \frac{1}{2} m_1 v_1'^2 + \frac{1}{2} m_2 v_2'^2 + \frac{1}{2} m_3 v_3'^2$

$= \frac{1}{2}(15)\left[0.85^2 + 2^2 + 1^2\right]$

$= 43.5\,J$

$\Sigma KE \neq \Sigma KE'$

so it is inelastic




$\frac{1}{2}mv'^2 = mgh$

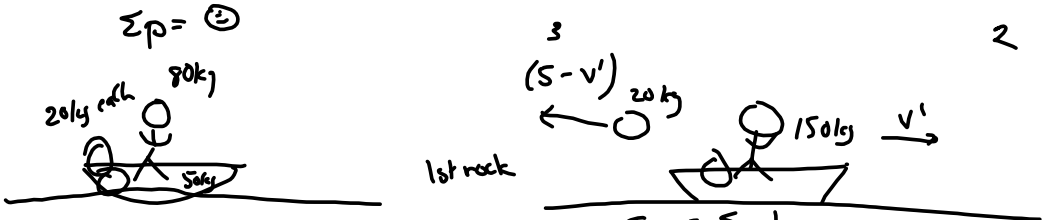
$v' = \sqrt{2gh}$

$m_1 v = (m_1 + m_2) v'$

$v = \frac{m_1 + m_2}{m_1} \sqrt{2gh}$

$= \frac{8.7 + 5212\,g}{8.7\,g} \sqrt{2\left(9.8 \frac{m}{s^2}\right)\left(6.2 \times 10^{-2}\,m\right)}$

$= 661\ m/s$




$\Sigma p = \Sigma p'$

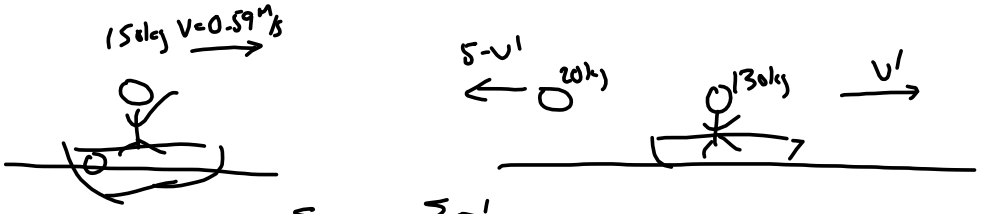
$\text{☺} = m_B v' - m_R(5 - v')$

$\text{☺} = 150v' - 5(20) + 20v'$

$100 = 170v'$

$v' = 0.59\ m/s$

2nd rock




$\Sigma p = \Sigma p'$

$m_{Bd} v = m_B v' - m_R(5 - v')$

$150(0.59) = 130v' - 20(5) + 20v'$

$= 150v' - 100$

$188.5 = 150v'$

$v' = 1.25\ m/s$