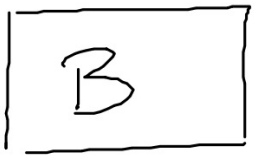
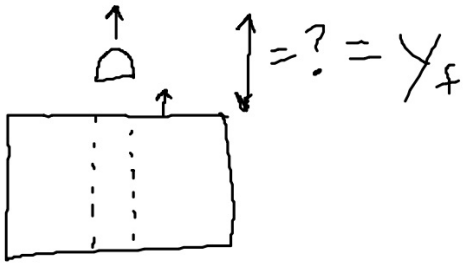
52.



splat



rise

Splat $\Sigma F_{ext} = 0$

$\vec{P}_o = \vec{P}_f$

$m_b v_{b_o} = m_b v_{b_f} + m_B v_B$

$(0.01)(1000) = (0.01)(400) + (5)(V_B)$

$V_B = 1.2 m/s$

$U_o + K_o + W_{nc} = U_f + K_f$

$K_o = U_f$

$\frac{1}{2} m_B v_B^2 = m_B g Y_f$

$\frac{1}{2}(1.2)^2 = (9.8) Y_f$

$0.073m = Y_f$

51

$\Sigma F_{ext} = 0$ so $\vec{P}_o = \vec{P}_f$

collision 1

$m_b V_{b_o} = m_b V_b + m_1 V_{1_f}$

$V_{b_o} = ?$

$V_b = ?$

collision 2

$m_b V_b = (m_b + m_2) V_f$

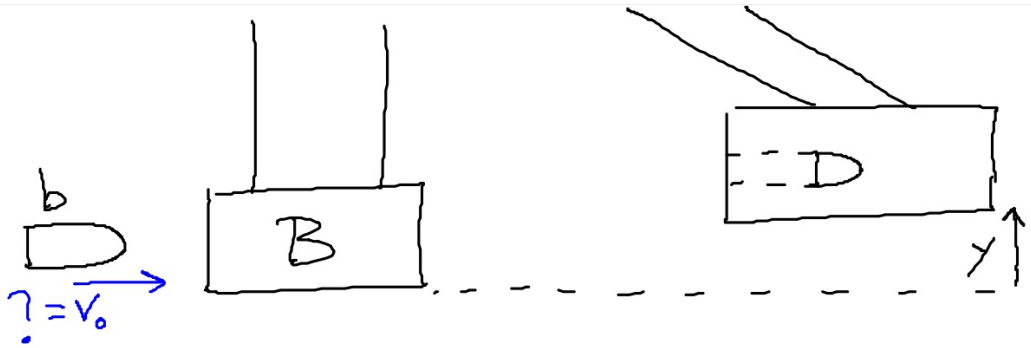
$(0.0035) V_b = (1.8035)(1.4)$

$V_b = 721 \text{ m/s}$

$(0.0035) V_{b_o} = (0.0035)(721) + (1.2)(0.630)$

$V_{b_o} = 937 \text{ m/s}$

49.



thunk:
completely inelastic collision

$\Sigma F_{ext} = 0$ so $\vec{p}_0 = \vec{p}_f$

$m_b v_{b_0} = (m_b + m_B) V$

$v_{b_0} = \dfrac{(m_b + m_B)\sqrt{2gy}}{m_b}$

swing:

$U_0 + K_0 + W_{NC} = U_f + K_f$

$K_0 = U_f$

$\frac{1}{2}(m_b + m_B) V^2 = (m_b + m_B) g y$

$V = \sqrt{2gy}$

$$V_{b_0} = \frac{m_b + m_B}{m_b} \sqrt{2gY}$$

$$V_{b_0} = \frac{(0.01) + (2)}{(0.01)} \sqrt{2(9.8)(0.12)}$$

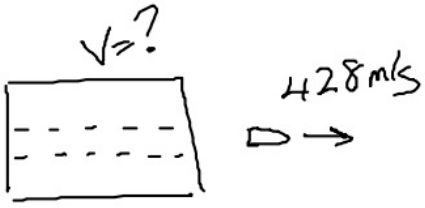
$$V_{b_0} = 308 \text{ m/s}$$

50. $V_{b_f} = ?$

$\Sigma F_{ext} = 0$, so

$\vec{P}_i = \vec{P}_f$

then...



$$m_1 V_{1_i} + m_2 V_{2_i} = m_1 V_{1_f} + m_2 V_{2_f}$$

$$(0.0052)(672) + 0 = (0.0052)(428) + (0.7) V_f$$

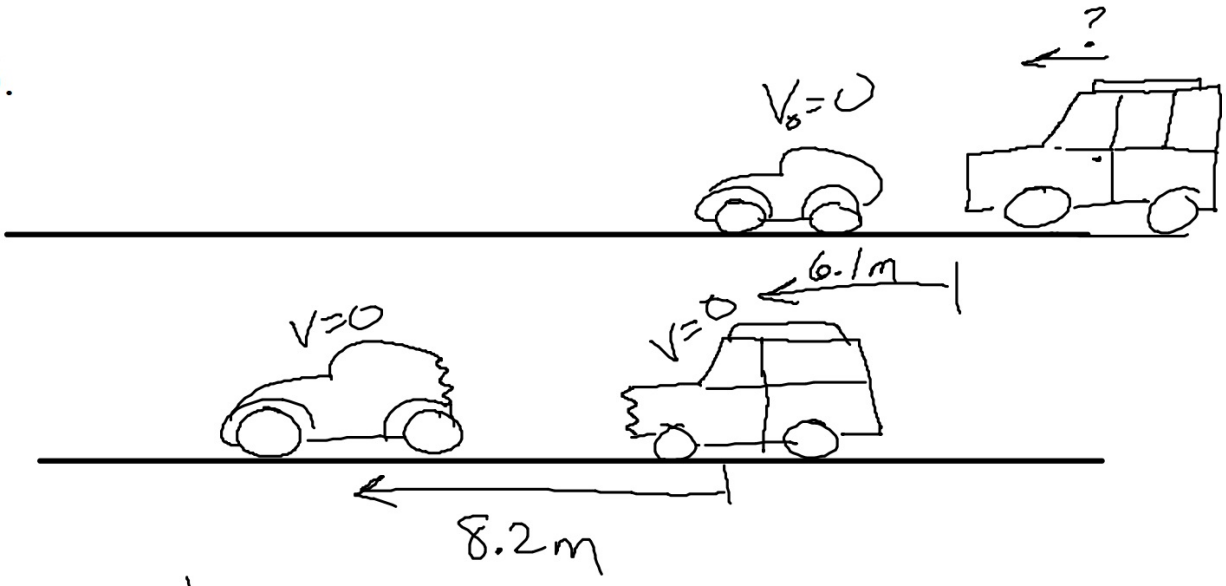
$$V_{2_f} = 1.81 \text{ m/s}$$

b) $V_{com} = ?$

$$V_{com} = \frac{m_1 V_1 + m_2 V_2}{M} = \frac{(0.0052)(672) + 0}{0.7052}$$

$$V_{com} = 4.96 \text{ m/s}$$

56.



crash

$\Sigma F_{ext} = 0$

$\vec{p}_0 = \vec{p}_f$

$U + K + W = U + K$ Skid

$K_0 + W_f = 0$ or $a = \frac{\Sigma F}{m}$

and kinematics

ugh!

crash

$$m_B v_{B_0} = m_A v_{A_f} + m_B v_{B_f}$$

$$(1400)\, v_{B_0} = (1100)(4.57) + (1400)(3.94)$$

$$v_{B_0} = 7.53 \text{ m/s}$$

skid

$$K_0 + W_f = 0$$

$$\tfrac{1}{2}mv^2 + (f)(\Delta x)\cos 180^\circ = 0$$

$$\tfrac{1}{2}mv^2 = (f)(\Delta x)$$

$$\tfrac{1}{2}mv^2 = \mu F_N (\Delta x)$$

$$\tfrac{1}{2}mv^2 = \mu mg (\Delta x)$$

$$v = \sqrt{2\mu g (\Delta x)}$$

$$v_A = \sqrt{2(0.13)(9.8)(8.2)}$$

$$v_A = 4.57 \text{ m/s} \qquad v_B = 3.94 \text{ m/s}$$