60. $V_{A_f} = ?$ $\Sigma F_{ext} = 0$ so . . .

$$m_A V_{A_0} + m_B V_{B_0} = m_A V_{A_f} + m_B V_{B_f}$$

$$(1.6)(5.5) + (2.4)(2.5) = (1.6)(V_{A_f}) + (2.4)(4.9)$$

$$8.8 + 6 = 1.6\,V_{A_f} + 11.76$$

$$+1.9 = V_{A_f}$$

c) elastic? (Is $K_f = K_0$?)

$$K_0 = \tfrac{1}{2}(1.6)(5.5)^2 + \tfrac{1}{2}(2.4)(2.5)^2 = 31.7\,J$$

$$K_f = \tfrac{1}{2}(1.6)(1.9)^2 + \tfrac{1}{2}(2.4)(4.9)^2 = 31.7\,J$$

✓ is elastic!

64. $V_{f_{block}} = ?$ $V_{f_{ball}} = ?$ (after hit)

Swing

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

$U_0 = K_f$

$mgy_0 = \frac{1}{2}mv^2$

$(9.8)(0.7) = \frac{1}{2}v^2$

$v = 3.7 \text{ m/s}$

hit (elastic!)

$$V_{1_f} = \frac{m_1 - m_2}{m_1 + m_2} V_{1_0}$$

$$V_{ball_f} = \left(\frac{0.5 - 2.5}{0.5 + 2.5}\right) 3.7$$

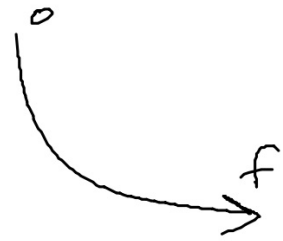
$V_{ball_f} = -2.47 \text{ m/s}$

$$V_{2_f} = \frac{2\,m_1}{m_1 + m_2} V_{1_f}$$

block

$$V_{block_f} = \frac{2(0.5)}{0.5 + 2.5}(3.7) = 1.23\,m/s$$

68.



$\Delta x = ?$ (skid)

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

$mgy_o = \frac{1}{2}mv_f^2$

$gy_o = \frac{1}{2}v_f^2$

$\sqrt{2gy_o} = v_f$

$v_f = \sqrt{2g(2.5)}$

$v_f = 7\ m/s$

collisions

a) elastic

$$V_{2_f} = \frac{2m_1}{m_1+m_2} V_{1_0} = \frac{2(m)}{m+2m}(7)$$

$$= 4.67 \text{ m/s}$$

b) completely inelastic $\Sigma F_{ext} = 0$ so $\vec{P}_0 = \vec{P}_f$

$$m_1 V_{1_0} = (m_1+m_2) V_f \quad m(7) = (3m) V_f$$

$$V_f = 2.33 \text{ m/s}$$

Skid

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

$$K_0 + W_f = 0$$

$$\tfrac{1}{2}mv_0^2 + (f)(\Delta x)\cos 180^\circ = 0$$

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

OR $\Sigma F = ma$ then $v_f^2 = v_0^2 + 2a(\Delta x)$

a) $\tfrac{1}{2}(2m)(4.67)^2 + \left(0.5(2m)(9)\right)\Delta x(-1) = 0$

$\Delta x = 2.23\ m$

b) $\tfrac{1}{2}(3m)(2.33)^2 + \left(0.5(3m)(9)\right)\Delta x(-1) = 0$

$\Delta x = 0.554\ m$