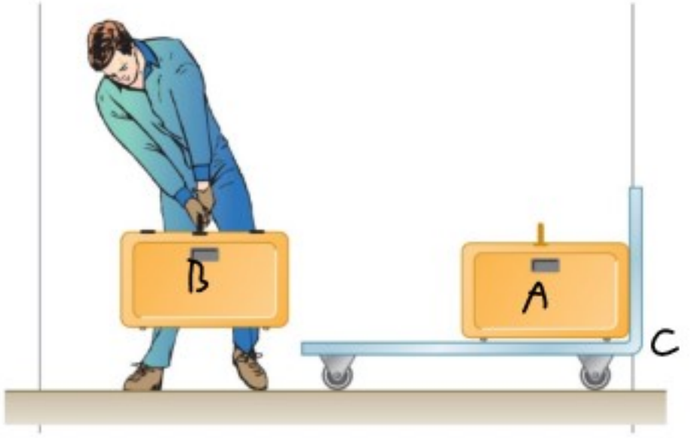
An airline employee tosses two suitcases in rapid succession, with a horizontal velocity of 7.2 ft/s, onto a 50-lb baggage carrier which is initially at rest. (*a*) Knowing that the final velocity of the baggage carrier is 3.6 ft/s and that the first suitcase the employee tosses onto the carrier has a weight of 30 lb, determine the weight of the other suitcase. (*b*) What would be the final velocity of the carrier if the employee reverses the order in which he tosses the suitcases?



$$m_A v_A + m_B v_B + m_C v_C = m_A v_A' + m_B v_B' + m_C v_C'$$

($v_C = 0$)

$$= (m_A + m_B + m_C) V$$

$$30 \cdot 7.5 + m_B 7.5 = (30 + m_B + 50) 3.6$$

$$225 + 7.5 m_B = 3.6 m_B + 288$$

$$7.5 m_B - 3.6 m_B = 288 - 225$$

$$3.9 m_B = 63$$

$$m_B = 16.2 \text{ lb}$$

$$v_A' = v_B' = v_C' = V$$

$$m_A v_A + m_B v_B = m_A v_A' + m_B v_B' \qquad m_A = \frac{w_A}{g}$$

$$\frac{w_A}{g} v_A + \frac{w_B}{g} v_B = \frac{w_A}{g} v_A' + \frac{w_B}{g} v_B'$$

$$\vec{L}_C + \vec{I}_{mp_A} + \vec{I}_{mp_B} = \vec{L}'_C$$

Energy in a System of Particles

$T_i = \frac{1}{2} m_i v_i^2$ $\qquad$ $T = \frac{1}{2} \sum_{i=1}^{n} m_i v_i^2$

$T_1 + U_{1 \to 2} = T_2$

$T_1 + V_1 = T_2 + V_2$

$V_i = \bar{V} + V_i'$

V_i velocity of P_i

$\bar{V}$ velocity of mass center

V_i' velocity of P_i relative to $\bar{V}$

$T = \frac{1}{2} m \bar{v}^2 + \frac{1}{2} \sum_{i=1}^{n} m_i v_i'^2$

Impulse for a System of Particles

$$\vec{L}_1 + \vec{I}_{imp_{1\to 2}} = \vec{L}_2 \qquad \vec{L}_1 + \int_{t_1}^{t_2} \vec{F}\, dt = \vec{L}_2$$

$$\vec{L}_1 + \sum_{i=1}^{n} \int_{t_1}^{t_2} \vec{F}_i\, dt = \vec{L}_2 \qquad (\vec{H}_o)_1 + \sum_{i=1}^{n} \int_{t_1}^{t_2} (M_o)_i\, dt = (\vec{H}_o)_2$$

A 15-lb block B starts from rest and slides on the 25-lb wedge A, which is supported by a horizontal surface. Neglecting friction, determine (*a*) the velocity of B relative to A after it has slid 3 ft down the inclined surface of the wedge, (*b*) the corresponding velocity of A.

$W_B = 25$ lb

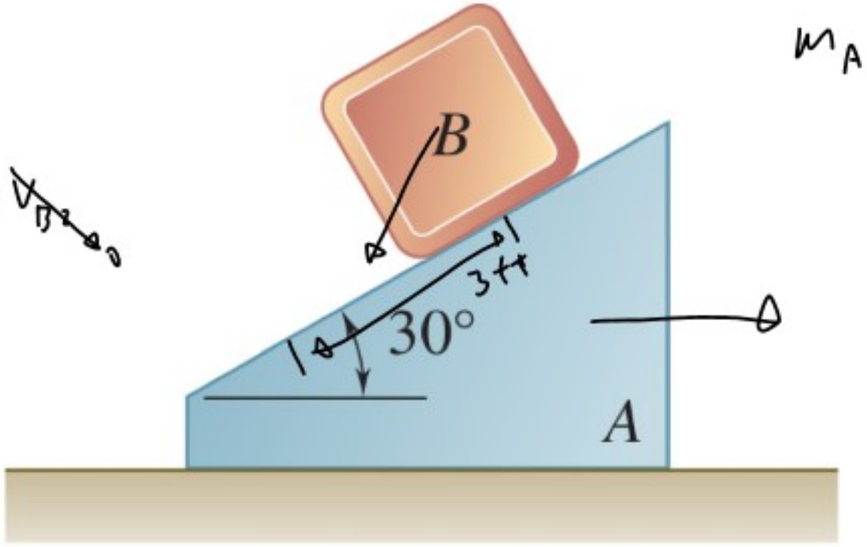
$m_B = \frac{W_B}{g}$

$T_1 + V_1 = T_2 + V_2$

$T_{A1} + T_{B1} + V_{A1} + V_{B1} = T_{A2} + T_{B2} + V_{A2} + V_{B2}$

$W_B h = m_B g h = \frac{1}{2} m_A v_A^2 + \frac{1}{2} m_B v_B^2$

$15 \cdot 3 \sin 30 = 22.5 = \frac{1}{2} m_A v_A^2 + \frac{1}{2} m_B v_B^2$



$m_A v_{Ax} + m_B v_{Bx} = m_A v'_{Ax} + m_B v'_{Bx}$

$0 = m_A v_{Ax} + m_B v_{Bx}$

$0 = 25 v_{Ax} + 15 v_{Bx}$

$25 v_{Ax} = -15 v_{Bx}$

$v_A = v_{Ax}$

$v_{Ax} = v_A = \frac{-15 v_{Bx}}{25} = -0.6 v_{Bx}$

$$22.5 = \frac{1}{2} m_A v_A^2 + \frac{1}{2} m_B v_B^2$$

$$= \frac{1}{2} \frac{W_A}{g} v_A^2 + \frac{1}{2} \frac{W_B}{g} v_B^2$$

$$= \frac{1}{2} \frac{25}{32.2} (-0.6 v_{Bx}^2) + \frac{1}{2} \frac{15}{32.2} v_B^2$$

$$22.5 \cdot 2 \cdot 32.2 = 25(-0.6 v_{Bx}^2) + 15 v_B^2$$

$$1449 = 25(-0.6 v_{Bx}^2) + 15 v_B^2$$

$$= 9 v_{Bx}^2 + 15 v_B^2$$