(33)

"a" can be answered because you can find the change in momentum

$$J = \Delta p$$

$$J = mv_f - mv_i$$

$$J = (1000)(0) - (1000)(20)$$

$$J = -20{,}000 \text{ kgm/s}$$

"b" cannot be solved because the problem does not give time

$$J = Ft$$

(34)

$$J = \Delta p \qquad J = Ft$$

$$\Delta p = Ft$$

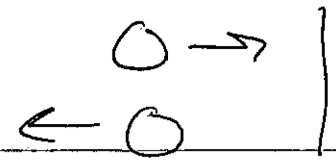
$$mv_f - mv_i = Ft$$

$$(1000)(0) - (1000)(20) = F(10)$$

$$-20000 = 10F$$

$$\boxed{-2000\ N = F}$$

35



a) $p = mv$

$p = (8)(-2)$

$\boxed{p = -16 \text{ kgm/s}}$

b) $\Delta p = mv_f - mv_i$

$\Delta p = (8)(-2) - (8)(2)$

$\Delta p = -16 - 16$

$\boxed{\Delta p = -32 \text{ kgm/s}}$

c) $J = \Delta p \quad J = Ft$

$\Delta p = Ft$

$-32 = F(.5)$

$\boxed{-64 \text{ N} = F}$

d) in problem 19 the Force is half as much. Less force is required to stop an object than to have the object bounce.

(36)

$$m_A V_A + m_B V_B = (m_A + m_B) V_{A+B}$$

m_A = engine m_B = car

$$m_A = 4 m_B$$

$$4 m_B (5) + m_B (0) = (4 m_B + m_B) V_{A+B}$$

$$20 m_B + 0 = 5 m_B V_{A+B}$$

$$\frac{20 \cancel{m_B}}{5 \cancel{m_B}} = V_{A+B}$$

$$\boxed{4 \text{ km/h} = V_{A+B}}$$

37

$$m_A v_A + m_B v_B = (m_A + m_B) v_{A+B}$$

a) $(5)(1) + (1)(0) = (5+1) v_{A+B}$

$$5 + 0 = 6 v'_{A+B}$$

$\boxed{.833 \text{ m/s}} = 5/6 = v_{A+B}$

b) $m_A v_A + m_B v_B = (m_A + m_B) v'_{A+B}$

$$(5)(1) + (1)(-4) = (5+1) v_{A+B}$$

$$5 - 4 = 6 v_{A+B}$$

$$1 = 6 v_{A+B}$$

$\boxed{.167 \text{ m/s}} = 1/6 = v'_{A+B}$

(38)

$$m_A V_A + m_B V_B = (m_A + m_B) V_{A+B}$$

m_A = superman m_B = asteroid

$$1000 m_A = m_B$$

$$m_A V_A + (1000 m_A) V_B = (m_A + 1000 m_A) V_{A+B}$$

$$m_A V_A + 1000 m_A (100) = 1001 m_A (0)$$

$$m_A V_A + 100000 m_A = 0$$

$$m_A V_A = -100000 m_A$$

$$\boxed{V_A = -100000 \text{ m/s}}$$

$$\frac{-100000 \text{ m}}{\text{s}} \cdot \frac{1 \text{ km}}{1000 \text{ m}} \cdot \frac{1 \text{ mile}}{1.61 \text{ km}} \cdot \frac{3600 \text{ sec}}{1 \text{ hr}}$$

223602.48 miles per hour