Review of Momentum & Impulse

momentum $\Rightarrow$ $\vec{p} = m\vec{v}$

impulse $\Rightarrow$ $\vec{J} = \vec{F}\Delta t$ (area under a F-t graph)

impulse-momentum theorem $\vec{J} = \Delta\vec{p}$ (impulse = change in momentum)

$\vec{F}\Delta t = m\Delta\vec{v}$

same.

From HW (PP 203)

34. $\vec{J} = \vec{F}\Delta t$ ← we don't have info.

$\vec{J} = \Delta\vec{p}$

$\vec{J} = m\Delta\vec{v}$

$\vec{J} = m(\vec{v}_2 - \vec{v}_1)$

+ towards the batter

$m = 0.35\,kg$

$v_1 = +46\,m/s$

$v_2 = -62\,m/s$

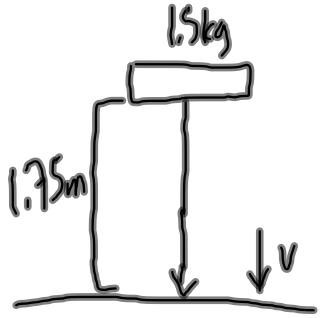
$J = 0.35kg(-62m/s - (+46m/s))$

$J = 0.35kg(-108m/s)$

$J = -37.8\,kg\cdot m/s$

$\vec{J} = 38\,kg\cdot m/s$ [away from the batter]

35.



$\vec{J} = ?$

down −
up +

$\vec{J} = \Delta\vec{p}$

$\vec{J} = m\Delta\vec{v}$ (don't know F and Δt)

The fall

$V_1 = 0$

$V_2 = ??$

Impact

$V_1 = ??$ $V_1 = -5.86$ m/s

$V_2 = 0$

$\Delta d = -1.75m$

$a = -9.81 m/s^2$

$V_2^2 = V_1^2 + 2a\Delta d$

$V_2^2 = 2(-9.81 m/s^2)(-1.75m)$

$V_2 = \pm 5.86 m/s$

Choose $V_2 = -5.86 m/s$

Impulse

$\vec{J} = m\Delta\vec{v}$

$\vec{J} = m(\vec{v}_2 - \vec{v}_1)$

$J = 1.5kg(0 - (-5.86 m/s))$

$J = 8.8 kg \cdot m/s$

$\vec{J} = 8.8 kg \cdot m/s$ [up]

From p209

34. $m \Rightarrow 2.6\ m/s^2$

$2m \Rightarrow ??$ $\quad 1.3\ m/s^2$

$\times 2$ and $\times \frac{1}{2}$

$F = ma$

$a = \frac{F}{m}$

$a \propto \frac{1}{m}$

Acc is inversely proportional to mass

46. $m = 75.0\ kg$

$V_1 = +28\ m/s$

$V_2 = 0$

$\Delta d = 1.0\ m$

$\Delta t = ??$

+ forward

car

$V_{ave} = \frac{\Delta d}{\Delta t}$

$\frac{V_1 + V_2}{2} = \frac{\Delta d}{\Delta t}$

$\frac{28\ m/s + 0}{2} = \frac{1.0\ m}{\Delta t}$

$14\ m/s = \frac{1.0\ m}{\Delta t}$

$\Delta t = \frac{1.0\ m}{14\ m/s}$

$\Delta t = 0.071\ s$

$F\Delta t = m\Delta v$

$F = \frac{m\Delta v}{\Delta t}$

$F = \frac{m(V_2 - V_1)}{\Delta t}$

$F = \frac{(75.0\ kg)(0 - 28\ m/s)}{0.071\ s}$

$F = -29400\ N$

$\vec{F} = 2.9 \times 10^4\ N$ [backwards]