Momentum

Momentum - "Mass in Motion"

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

$\vec{p}$ -> momentum (kgm/s)
m -> mass (kg)
$\vec{v}$ -> velocity (m/s)

Change in Momentum

$$\Delta\vec{p} = \vec{p}_f - \vec{p}_i$$

$$\Delta\vec{p} = m\vec{v}_f - m\vec{v}_i$$

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

Impulse

$$\vec{J} = \vec{F}t$$

$\vec{J}$ -> impulse (Ns or kgm/s)
$\vec{F}$ -> force (N)
t -> time (s)

$$\vec{F}t = \Delta\vec{p}$$

$$\vec{F}t = \vec{p}_f - \vec{p}_i$$

$$\vec{F}t = m\vec{v}_f - m\vec{v}_i$$

$$\vec{J} = \vec{F}t = \Delta\vec{p} = m\vec{v}_f - m\vec{v}_i$$

$F = ma$

$F = m\left(\frac{v_f - v_0}{t}\right)$

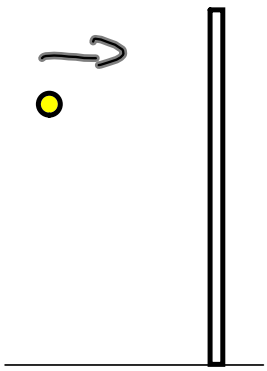
$Ft = mv_f - mv_0$

Model Problem - Page 201

A student practices her tennis volleys by hitting a tennis ball against a wall.

a) If the 0.060 kg ball travels 48 m/s before hitting the wall and then bounces directly backward at 35 m/s, what is the impulse of the interaction? (-5.0 kgm/s)

b) If the duration of the interaction is 25 ms, what is the average force exerted on the ball by the wall? (-2.0×10^2 N)



← 0.025 s

$J = Ft = mv_f - mv_0$ Impulse

$F(0.025) = (0.06)(-35-48)$

$F = -\frac{4.98}{0.025} = -200\ N$

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