# Impulse and Momentum

$\vec{F}_{2,1} = -\vec{F}_{1,2}$

Newton's 3rd Law, only when $\sum \vec{F} = 0$

$$\sum \vec{F}_{2,1} = m_2 a_2$$

$$\sum \vec{F} = m\vec{a}$$

$$= m\frac{d\vec{v}}{dt}$$

$$= \frac{d}{dt}(m\vec{v})$$

$$= \frac{d}{dt}\vec{p}$$

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

$$\int d\vec{p} = \int \sum \vec{F}\ dt$$

$$\Delta \vec{p} = \int \sum \vec{F}\ dt = \text{impulse in } kg\frac{m}{s} = Ns$$

$$\Delta \vec{p}_1 + \Delta \vec{p}_2 = 0$$

$$\int_0^t \left( \vec{F}_{1,2} + \vec{F}_{2,1} \right) dt = 0$$

$$\vec{p}_{o1} + \vec{p}_{o2} = \vec{p}_{f1} + \vec{p}_{f,2} = \text{Conservation of Momentum}$$