## §5-2 Motion + Newton's Second Law

Newton found that the acceleration of an object was directly related to the unbalanced (net) force acting on an object and inversely related to the mass of the object.

$$\left.\begin{array}{l} a \propto F \\ a \propto \frac{1}{m} \end{array}\right\} \quad a \propto F\left(\frac{1}{m}\right)$$

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

$$F \propto ma$$

This is a special k

$$k = \frac{1\ N}{1\ kg \cdot m/s^2}$$

$$F = kma$$

$$\vec{F}_{net} = m\vec{a}$$

Newton's Second Law

Where $\vec{F}_{net}$ is the unbalanced or net force (N)

$m$ is the mass (kg)

$\vec{a}$ is the acceleration ($m/s^2$)

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$m = 7.00 \times 10^2\ kg$

$T = 7.50 \times 10^3\ N$

$\vec{a} = ?$

up +

$T = 7.50 \times 10^3\ N$ (7500 N)

$F_g = (7.00 \times 10^2\ kg)(9.8\ m/s^2)$

$F_g = 6867\ N$

$\vec{F}_{net} = m\vec{a}$

$T - F_g = ma$

$7500\ N - 6867\ N = (7.00 \times 10^2\ kg)a$

$633\ N = (7.00 \times 10^2\ kg)\ a$

$a = +0.90\ m/s^2$

$\vec{a} = 0.90\ m/s^2\ [up]$

units:

$\frac{N}{kg} = \frac{kg \cdot m/s^2}{kg}$

elevator could be:

moving up and speeding up

moving down and slowing down.

TO DO

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② Look at animation → Forces + Motion: Basics