

§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.

$$\left. \begin{aligned} a &\propto F \\ a &\propto \frac{1}{m} \end{aligned} \right\} \begin{aligned} a &\propto F \left(\frac{1}{m} \right) \\ a &\propto \frac{F}{m} \end{aligned}$$

This is a special k
 $k = \frac{1 \text{ N}}{1 \text{ kg} \cdot \text{m/s}^2}$



$F \propto ma$

$F = kma$

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

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/s²)

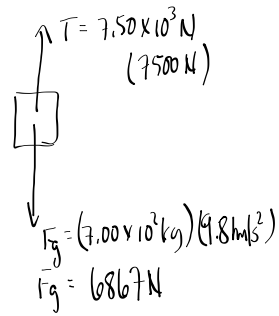
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$m = 7.00 \times 10^2 \text{ kg}$

$T = 7.50 \times 10^3 \text{ N}$

$\vec{a} = ?$

(up)



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

$T - F_g = ma$

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

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

$a = +0.90 \text{ m/s}^2$

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

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

elevator could be:
 moving up and speeding up
 moving down and slowing down.

TO DO

- ① PP/163
- ② Look at animation → Forces + Motion: Basics