Newton's Laws

Newton's First Law (the Law of Inertia)

An object at rest or in uniform motion will remain at rest or in uniform motion unless acted on by an external force.

Newton's Second Law

Newton found that acceleration varies directly with the unbalanced force acting on an object and inversely with the mass of the object.

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

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

So: $F \propto ma$

$F = kma$ ← Special k

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

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

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

m is the mass (kg)

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

* the direction of the acceleration is the same as the net force.

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

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

$\vec{a} = ?$

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

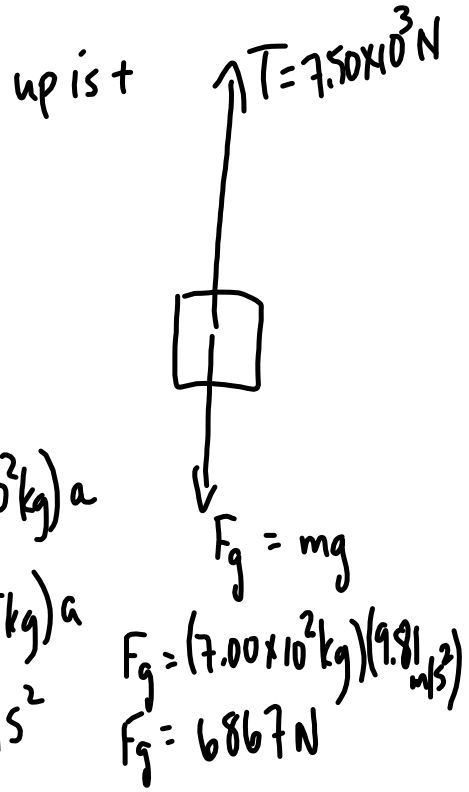
$T - F_g = ma$

$7.50 \times 10^3 \text{ N} - 6867 \text{ N} = (7.00 \times 10^2 \text{ kg})a$

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

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

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



Speeding up going up

OR

slowing down going down

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