

2.2 Newton's Second Law

"Any net force produces an acceleration in the direction of the force. The magnitude of the acceleration is directly proportional to the force and inversely proportional to the mass of the object."

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



"Directly Proportional"

- as the force increases, the acceleration increases

$$\uparrow F = ma \uparrow$$

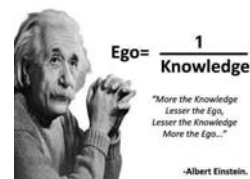
constant

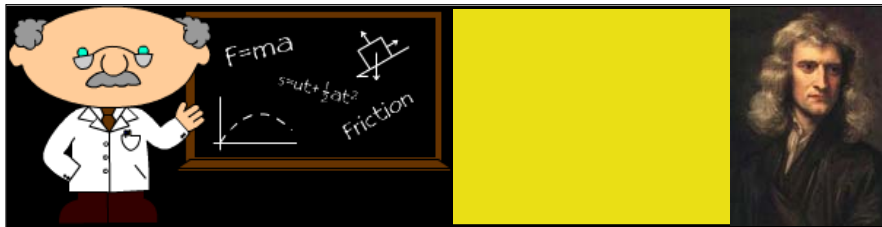
"Indirectly Proportional"

- as the mass increases the acceleration decreases

$$F = ma \downarrow$$

constant





Ex.) Joe has a mass of 100 kg. What force is needed to accelerate Joe to 1.5 m/s²?

$$\begin{aligned}\vec{F} &= m\vec{a} \\ &= 100 \cdot 1.5 \\ &= \boxed{150 \text{ N}}\end{aligned}$$

Ex.) A spring-scale can pull with a force of 2.0 N. What is the maximum acceleration such a scale could give to a 3.5 kg object?

$$\begin{aligned}\vec{F} &= m\vec{a} \\ 2.0 &= 3.5\vec{a} \\ \frac{2.0}{3.5} &= \frac{3.5\vec{a}}{3.5} \\ \vec{a} &= \boxed{0.57 \text{ m/s}^2}\end{aligned}$$



Ex.) A person's mass is 88.18 kg. What is their weight?

$$\begin{aligned}\text{Weight} &= m\vec{g} \\ &= 88.18 \cdot 9.81 \\ &= 865.0 \text{ N}\end{aligned}$$

$$N = \frac{\text{kgm}}{\text{s}^2}$$

Questions: Pg. 149 # 1, 2.

Read: - example 3.6 on pg. 150 and do the practice problem

- example 3.0 on pg. 153 and do the 2 practice problems