Homework 7.

1. } 2. } → Newton's first law

N3. → Newton's second law.

$$F = const = m_1 a_1 = m_2 a_2$$

$$\frac{a_2}{a_1} = \frac{m_1}{m_2}$$

$$\frac{a_2}{a_1} > 1 \Rightarrow \frac{m_1}{m_2} > 1 \Rightarrow m_2 < m_1$$

bigger a ⇒ smaller m

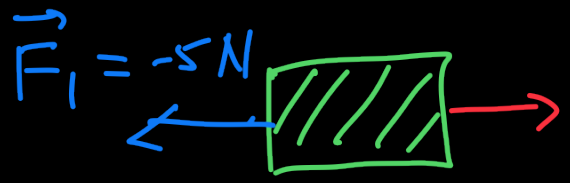
N4.

$$\vec{a} = \frac{\Delta \vec{v}}{\Delta t} = \frac{\vec{v}}{t}$$

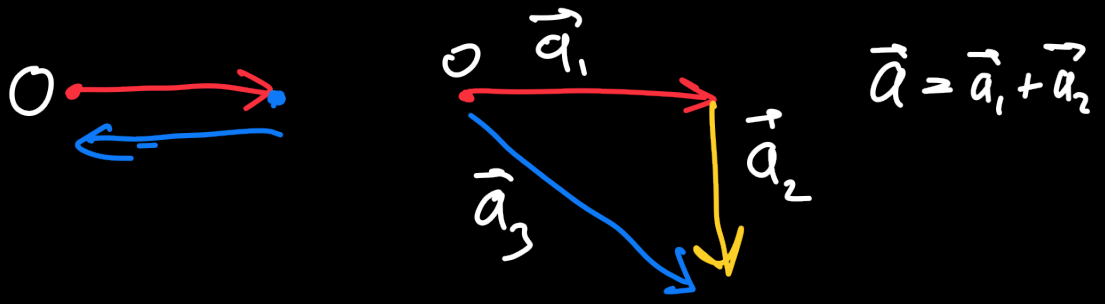
$$a = \frac{10}{3} \frac{m}{s^2} \; ; \quad F = m a$$

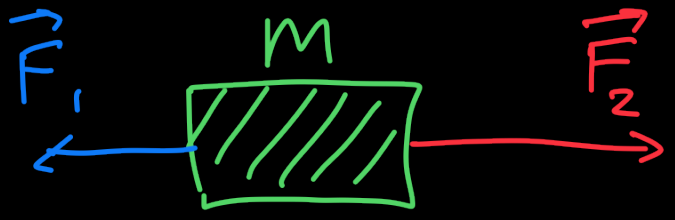
$$\Rightarrow F = 6 \cdot 10^4 \cdot \frac{10}{3} \left[\frac{kg \cdot m}{s^2} \right] = 2 \cdot 10^5 N = 20 kN$$

Net Force



$$\vec{F}_{Net} = \vec{F}_2 + \vec{F}_1 = 0\,N$$





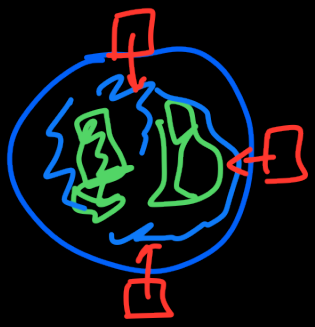
$$\Rightarrow \boxed{\vec{F}_{Net} = 5N}$$

$\vec{F}_2 = +10\,N$ $\quad$ $\vec{F}_1 = -5N$

$$\boxed{\vec{F}_{Net} = m \cdot \vec{a}}$$

In general: $\boxed{\vec{F}_{Net} = \vec{F}_1 + \vec{F}_2 + \vec{F}_3 + \ldots}$

Gravity Force (Weight)



$$\vec{W} = m_{grav} \cdot \vec{g}$$

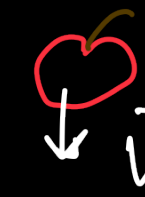
gravitational mass.

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

inertial mass!

Throw objects fall from a tower:
apple, anvil, box with nails:

$$\vec{w} = m \cdot \vec{g}$$

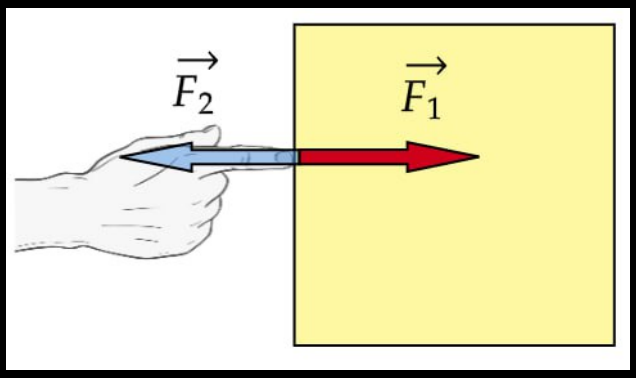


$$m_{grav}\,\vec{g} = m \cdot \vec{a}$$

$$\vec{a} = \vec{g} \Rightarrow m_{grav} = m \;!$$

Equivalence principle

Newton's third law



what is the relation between $\vec{F}_2$ and $\vec{F}_1$?

1) depends on whether the block is moving or not?

Does not depend on whether the block is moving!

$\vec{F}_2$ is applied to the finger!

$\vec{F}_1$ is applied to the block!

$\vec{F}_{Net}$ (on the block) $= \vec{F}_1$

$$\vec{F}_2 = -\vec{F}_1$$

Newton's 3rd law: For any action there is an equal and opposite reaction.

$$|F_2 = F_1|$$