Momentum

- A quantity of motion

→ the product of an object's mass and velocity:

$$p = m \cdot V$$

$$p = kg \cdot m \cdot s^{-1} = \frac{kg \cdot m}{s}$$

Units →

How is this related to Newton's 2^{nd} Law?

$$F_{net} = m \cdot a \longrightarrow 2^{nd} \text{ Law}$$

Based on the definition of acceleration:

$$a = \frac{V_2 - V_1}{t} = \frac{\Delta V}{t}$$

Therefore, the 2^{nd} Law can be rewritten:

$$F_{net} = m\left(\frac{\Delta V}{t}\right)$$

or,

$$\underbrace{F \cdot t}_{\text{Impulse}} = \underbrace{m(\Delta V)}_{\Delta P} = \text{change in momentum}$$

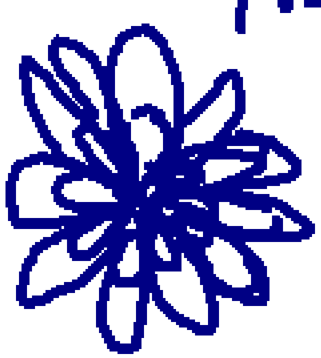
Impulse-Momentum Theorem:

* The change in momentum for an object is equal to the impulse acted upon that object.
* For a constant change in momentum, the applied force is inversely proportional to the time interval through which it is applied.

Momentum:

Create a list of items in order of increasing momenta:

dropped penny
clock pendelum
walking toddler
swinging monkey
cannon ball
Hulk jumping



Michael Phelps

Sports car speeding

train - choo choo

Cruiseship at full throttle

Momentum:

A quantity of motion

→ equal to the product of an object's mass and its velocity.

$$p = m \cdot v$$

units: $p = kg \cdot m \cdot s^{-1} = \frac{kg \cdot m}{s}$

How is momentum related to the 2nd Law of motion?

$$F = m \cdot a \rightarrow 2^{nd} \text{ Law}$$

According to the definition of acceleration

$$a = \frac{V_2 - V_1}{t} = \frac{\Delta V}{t}$$

Therefore: $F = m\left(\frac{\Delta v}{t}\right)$

or: $F \cdot t = m(\Delta V)$

$$F \cdot t = m \cdot (\Delta v)$$

Impulse

Δp = Change in momentum

Impulse Momentum Theorem

The change of momentum an object experiences is equal to the impulse exerted on that object.