Variable: ***Impulse (J)*** *S.I. Unit:* ***kg m/s*** *or* ***Ns*** *Vector?* *Yes*

What does Impulse mean?

The Impulse J imparted by a force on a system is equal to the amount of force exerted on the object/system multiplied by the time during which the force has acted.

The **net Impulse ΣJ** on an object/system is **equal to the change in momentum** of that object/system.

Impulse J is a vector so it can be positive or negative! And J can have components.

$J = F\Delta t$

J = impulse imparted by force F

F = Force imparting the impulse

Δt = time during which the force F acts on the object

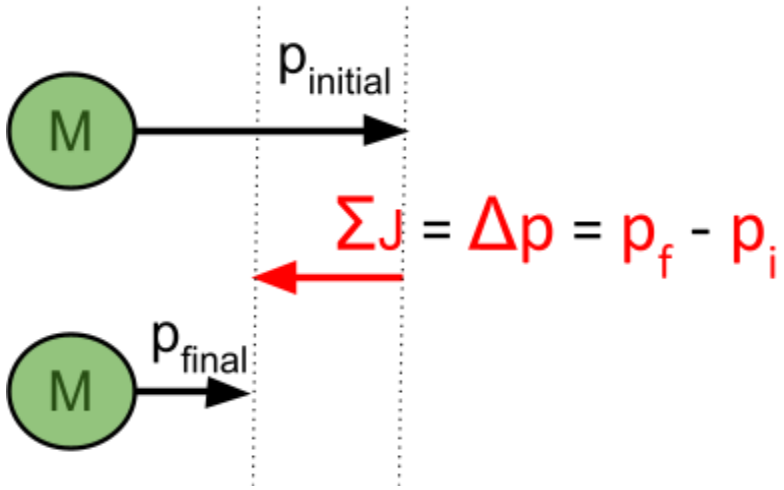
$$\Sigma F = ma = m\frac{\Delta v}{\Delta t} = \frac{m\Delta v}{\Delta t} = \frac{\Delta(mv)}{\Delta t} = \frac{\Delta p}{\Delta t}$$

$$\Sigma F = \frac{\Delta p}{\Delta t}$$

...or we can multiply both sides by Δt and get

$$\Delta p = \Sigma F \Delta t$$

$\Sigma J = \Delta p = \Sigma F \Delta t$



this eqn. works for each direction too

$\Sigma J_x = \Delta p_x = \Sigma F_x \Delta t$

$\Sigma J_y = \Delta p_y = \Sigma F_y \Delta t$

Are there any conditions that must be met in order for the formulas to be true?

$J = F\Delta t$ always gives the impulse from a force since it is the definition of impulse.

However, $\Sigma J = \Delta p$ is only true if you use the net impulse on the object as opposed to the impulse from only a single force.