Momentum

- Momentum is defined as product of mass & velocity.

  p= m x v

  SI Unit: kgm/s

Law of conservation of momentum: Momentum before collision is equal to the momentum after collision. The total momentum of the system always remain constant.

Total momentum before collision= Total momentum after collision.

$M_1U_1+M_2U_2=M_1V_1+M_2V_2$

$M_1V_1+0 = 0+M_2V_2$

$M_1V_1=M_2V_2$

Perfectly Inelastic Collisions:

- Since the objects stick together, they share the same velocity after the collision.
- $M_1V_{1i}+M_2V_{2i} = M_1V_1f+M_2V_2f$

Change in Momentum:

- An object with momentum is hard to stop.
- Greater changes in momentum require more force or more time.
- A loaded truck requires more time to stop.
  - Same stopping force.
  - Greater momentum for truck with more mass.

Impulse:

- Impulse is defined as product of force & time for which the force is applied.
- Impulse= F x Δt

  Impulse= (m x $\Delta v/\Delta t$) x Δt

  Impulse= Δ(m x v) = change in momentum

Impulse changes momentum:

- The change in momentum depends on the force that acts & the length of time it acts.
- Newton actually wrote his 2nd law (f=ma) as force = change in momentum/change in time.

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

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

$$F\Delta t = \Delta p = mv_f - mv_i$$