Conservation of Momentum

- Momentum in an isolated system in which a collision occurs is conserved
- An isolated system will not have external forces
- Specifically, the total momentum before the collision will equal the total momentum after the collision

Conservation of Momentum, cont.

- Mathematically:
  \[ m_1 \mathbf{v}_{1i} + m_2 \mathbf{v}_{2i} = m_1 \mathbf{v}_{1f} + m_2 \mathbf{v}_{2f} \]
- Can be generalized to any number of objects

Notes About A System

- Remember conservation of momentum applies to the system
- You must define the isolated system

So it's not the velocity which is conserved but the momentum \(mv\).

Types of Collisions

- Momentum is conserved in any collision
- Inelastic collisions
  - Kinetic energy is not conserved
    - Some of the kinetic energy is converted into other types of energy such as heat, sound, work to permanently deform an object (momentum is still conserved)
    - Perfectly inelastic collisions occur when the objects stick together (momentum is still conserved)
    - Not all of the KE is necessarily lost

Types of Collisions

- Elastic collision
  - both momentum and kinetic energy are conserved
- Actual collisions
  - Most collisions fall between elastic and perfectly inelastic collisions