Elastic and Inelastic Collisions

6.3

Objectives

- **Identify** different types of collisions.

- **Determine** the changes in kinetic energy during perfectly inelastic collisions.

- **Compare** conservation of momentum and conservation of kinetic energy in perfectly inelastic and elastic collisions.

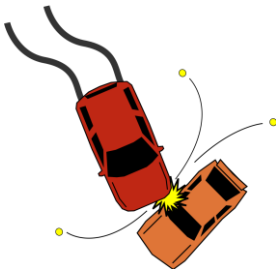- **Find** the final velocity of an object in perfectly inelastic and elastic collisions

Collisions

- Collisions happen every day!
  - What are some examples?

- The momentum remains constant in these instances, but not always the total KE
  - Sometimes it is converted into internal NRG
    - Deformation

Perfectly Inelastic Collisions

- A collision in which two objects stick together after colliding and move together as one mass Is called a **perfectly inelastic collision**
- In these collisions, the mass of the 2 objects become the mass of the object at the end

$$m_1 v_{1,i} + m_2 v_{2,i} = (m_1 + m_2) v_f$$

Make sure to watch the Perfectly Inelastic Collisions Math Help Video

KE is NOT conserved in inelastic collisions!

- During these collisions some of the NRG is converted into ….
  - Sound
  - Heat
  - Deformation
- We can calculate the amount of KE lost!

Math…

$$\Delta KE = KE_f - KE_i$$

$$KE = \frac{1}{2}mv^2$$

so …..

$$\Delta KE = \frac{1}{2}mv_f{}^2 - \frac{1}{2}mv_i{}^2$$

Make sure to watch the KE in Perfectly Inelastic Collisions Math Help Video

Elastic Collisions

- A collision in which the total momentum and the total kinetic energy are conserved is called an **elastic collision**
- These collisions result in the objects NOT sticking together
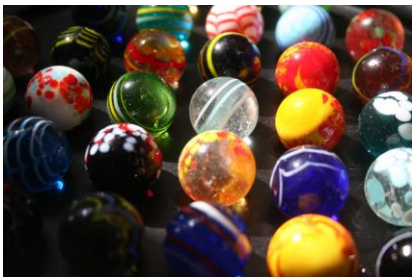- BOTH KE and p are conserved in an elastic collision

The Math!

Momentum
$$m_1 v_{1,i} + m_2 v_{2,i} = m_1 v_{1,f} + m_2 v_{2,f}$$

_KE_
$$\frac{1}{2} m_1 v_{1,i}{}^2 + \frac{1}{2} m_2 v_{2,i}{}^2 = \frac{1}{2} m_1 v_{1,f}{}^2 + \frac{1}{2} m_2 v_{2,f}{}^2$$

Make sure to watch the Elastic Collisions Math Help Video

Collisions

- Most collision in the "real world" are not perfectly inelastic or elastic collisions.

- Even when 2 marbles collide, some of the KE is lost to sound and heat.

- Most collision are inelastic (not perfectly)