The law of conservation of momentum 1/26/15

In a system, momentum is neither created nor destroyed. In other words, total momentum is constant.

**Two Types of Collisions**

**Elastic**: Kinetic energy is not lost to friction, acoustical (sound) energy, heat, etc.



For example: collisions on ice, in space, air hockey table



**Inelastic**: Kinetic is lost to friction, heat, acoustical energy, etc.

For example: car crash, train cars connecting

**Formulas:**

**Elastic collision:**

m1u1 + m2u2 = m1v1 + m2v2



m1 = the mass of object 1 -- kg

u1 = velocity BEFORE the collision of object 1 – m/s

v1 = velocity AFTER the collision of object 1 – m/s

m2 = the mass of object 2 -- kg

u2 = velocity BEFORE the collision of object 2 --- m/s

v2 = velocity AFTER the collision of object 2 --- m/s

**Inelastic collision:**

m1u1 + m2u2 = (m1 + m2)v

m1 = mass of object 1

u1 = velocity BEFORE collision of object 1

m2 = mass of object 2

u2 = velocity BEFORE collision of object 2

v = velocity of both objects AFTER collision

Example #1:

Two objects are on a course to collide with one another elastically. Object A is 20kg and is moving 8 m/s to the right. Object B is 10kg and is moving 12 m/s to the left. After the collision, object B is moving 2 m/s to the right. What is the magnitude and direction of Object A’s velocity after the collision?

Formula: m1u1 + m2u2 = m1v1 + m2v2

(20kg)(8m/s) + (10kg)(-12m/s) = (20kg)( v1) + (10kg)(2m/s)

Solve for V1

160kgm/s + - 120kgm/s = (20kg)(V1) + (20kgm/s)

40kgm/s = (20kg)(V1) + (20kgm/s)

Subtract 20kgm/s by both sides

20kgm/s = 20kg(V1)

Divide 20kg by both sides.

1m/s = V1

This is positive, so object A is moving to the RIGHT.