

Momentum--product of an object's mass and velocity!!

Law of Conservation of Momentum--As long as there are no dissipative forces acting on a system of objects (like friction), the total vector momentum of a system will remain constant!

$$\mathbf{p}_i = \mathbf{p}_f$$

3 types of problems:

1. Explosions

2. Elastic collisions--bounce apart.

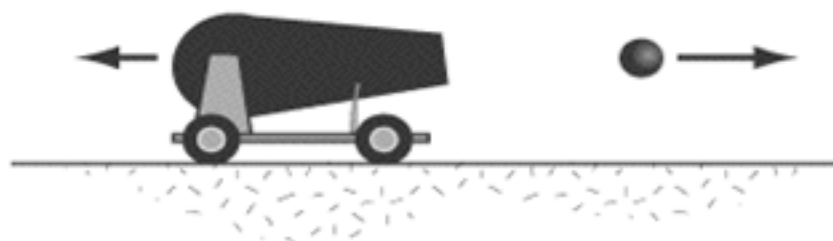
3. Inelastic collisions--stay together.

Explosions--objects start out with an initial vector momentum of ZERO and move off in opposite directions!!

before



after

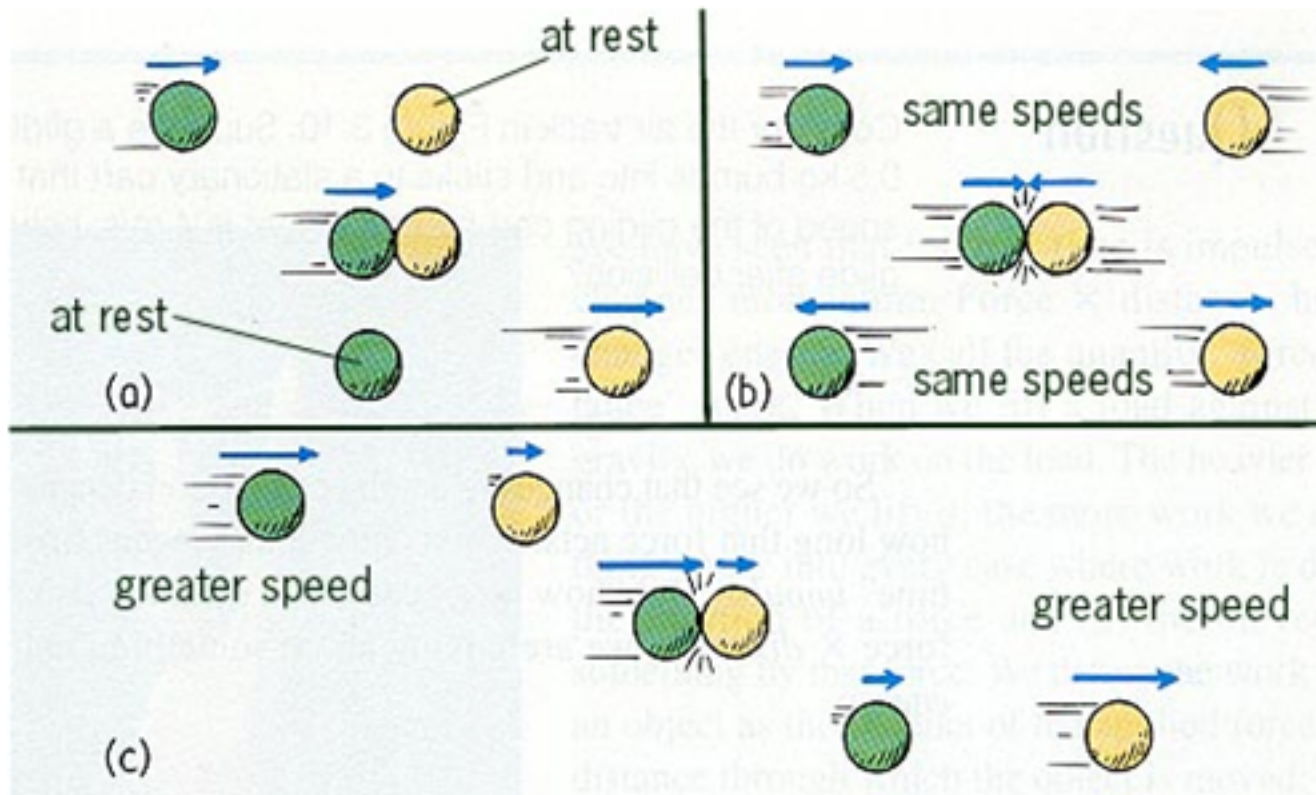


A 25 kg cannon ball is shot from a 475 kg cannon with a velocity of 40 m/s. What is the recoil velocity of the cannon?

A 2.5 kg model rocket is launched straight up in the air. The .03 kg of gas being expelled from the engine are moving at 125 m/s. How fast does the rocket leave the ground?

A 5.5 kg rifle is used to shoot a bullet. The bullet leaves the rifle at a velocity of 75 m/s and the rifle has a recoil velocity of 6.5 m/s. Find the mass of the bullet.

Elastic Collisions--Colliding objects bounce off of each other after contact.



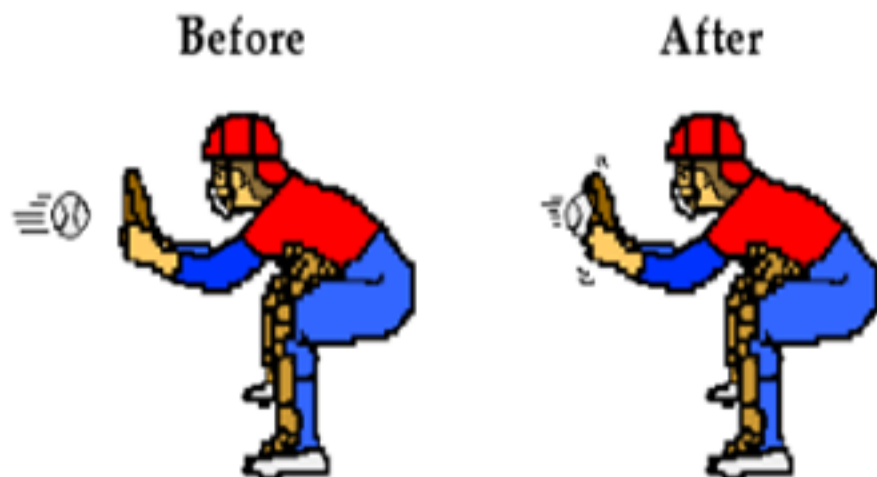
A 1500 kg car is moving down the road at 12 m/s when it runs into the back of a 2200 kg truck sitting at a stoplight. After the collision, the two cars separate and the car slows to 7 m/s. Determine the velocity of the truck after the collision.

A 2.5 kg basketball is rolling across the floor at 4 m/s when it collides head on with a 5.8 kg bowling ball moving in the opposite direction at 4 m/s. After the collision, the bowling ball continues in its same direction, but slows to 3.5 m/s. Find the final velocity of the basketball.

A 1200 kg car moving at 14 m/s collides elastically with a 1500 kg car moving in the same direction at 8 m/s. The 1500 kg car speeds up to 10 m/s. Determine the final velocity of the 1200 kg car.

A 1000 kg car rearends a 800 kg car, initially at rest. After the collision, the 800 kg car moves off at 6 m/s and the 1000 kg car slows to 8 m/s. Find the initial velocity of the 1000 kg car.

Inelastic collision--Two colliding objects "stick together" after the collision.



A 1.2 kg baseball is thrown with a velocity of 22 m/s. The baseball is caught using a 3.5 kg baseball glove. How fast does the baseball glove move when the baseball is caught?

A 1500 kg truck moving at 10 m/s toward the east collides head on inelastically with a 1200 kg car moving 14 m/s toward the west. Determine the velocity of the two vehicle system after the collision.

A 1400 kg car moving at 15 m/s collides with a 1200 kg car moving at 10 m/s in the same direction. Their bumpers lock. How fast do the cars move off after the collision?

Assignment:

p. 238 # 13 - 17

p. 240 # 19, 21

p. 243 # 22, 23