Name_____

Date _____ **Pd**____

Unit IX: Worksheet 3

1. A ball of mass 3.0 kg, moving at 2 m/s eastward, strikes head-on a ball of mass 1.0 kg that is moving at 2 m/s westward. The balls stick together after the impact. What are the magnitude and direction of the velocity of the combined mass after the collision?

2. One way of measuring the muzzle velocity of a bullet is to fire it horizontally into a massive block of wood placed on a cart. Assuming no friction, we then measure the velocity with which the wood containing the bullet and cart begin to move. In one experiment the bullet had a mass of 50. g and the wood and its cart had a mass of 10. kg. After the shot, the cart, wood, and bullet moved at a constant speed, traveling 0.80 m in 0.40 s. From this data determine the original speed of the bullet.

3. A raft of mass 180 kg carries two swimmers of mass 50. kg and 80. kg. The raft is initially floating at rest. The two swimmers simultaneously dive off opposite ends of the raft, each with a horizontal velocity of 3 m/s. With what velocity and in what direction does the raft start to move?

4. Discuss the following in terms of impulse and momentum:
   a. Why are padded dashboards safer in automobiles?
   b. Why are nylon ropes, which stretch considerably under stress, favored by mountain climbers?
   c. Why is it preferred that railroad cars be loosely coupled with slack between cars?

5. If you throw a ball horizontally while standing on roller skates, you roll backwards. Will you roll backwards if you go through the motions of throwing the ball, but hold on to it instead? Explain your reasoning.

6. Why is it difficult for a fire-fighter to hold a hose that ejects large amounts of high-speed water?

7. If a Mack truck and a Geo traveling at equal speeds have a head-on collision, which vehicle will experience the greatest force of impact?
   Which will experience the greatest change in momentum?
   Which will experience the greatest acceleration?

8. A billiard ball will stop short when it collides head-on with another ball which is at rest. The ball cannot stop short, however, if the collision is not exactly head-on but is at an angle. Explain why this is so in terms of momentum.