**Name**_____

**Date**_____ **Pd**____

## Impulsive Force Model Worksheet 2:
# Impulsive Forces and Momentum

1. Two objects, A & B, have identical velocities. Object A has 3 times the mass of object B.
   a. Find the value of the ratio of momentum A to momentum B. Justify your answer.

   b. Find the value of the ratio of kinetic energy A to kinetic energy B. Justify your answer.

2. Two objects, C & D, have the same momentum. Object C has ½ the mass of object D.
   a. Find the value of the ratio of velocity C to velocity D. Justify your answer.

   b. Find the value of the ratio of kinetic energy C to kinetic energy D. Justify your answer.

3. The following questions refer to the motion of a baseball.

   a. While being thrown, a net force of 132 N acts on a baseball (mass = 140 g) for a period of $4.5 \times 10^{-2}$ sec. What is the magnitude of the change in momentum of the ball?

   b. If the initial speed of the baseball is v = 0.0 m/s, what will its speed be when it leaves the pitcher's hand?

   c. When the batter hits the ball, a net force of 1150 N, opposite to the direction of the ball's initial motion, acts on the ball for $9.0 \times 10^{-3}$ s during the hit. What is the final velocity of the ball?

   d. How large is the force the ball exerts on the bat? Explain.

4. A rocket, weighing $4.36 \times 10^4$N, has an engine that provides an upward force of $1.2 \times 10^5$N. It reaches a maximum speed of 860 m/s.

    a. Draw a force diagram for the rocket.

    b. For how much time must the engine burn during the launch in order to reach this speed?

5. A golf ball that weighs 0.45 N is dropped from a height of 1.0 m. Assume that the golf ball has a perfectly elastic collision with the floor.

    a. Construct a motion map for the golf ball from the time it is dropped until it reaches its highest point of rebound.

    b. Determine the time required for the ball to reach the floor.

    c. What will the instantaneous momentum of the golf ball be immediately *before* it strikes the floor?

    d. What will be the change in momentum, ($\Delta p$) from the instant before the ball collides with the floor until the instant after it rebounds from the floor? (Illustrate with a vector diagram.)

    e. Suppose that the golf ball was in contact with the floor for $4.0 \times 10^{-4}$s. What was the average force on the ball while it was in contact with the floor?