Name: _____

# Study Guide - Momentum

*Physical Science and Technology*

Solve the following problems on your own paper. Use the Five Steps where indicated.

1. A bowling ball is rolling down the street at 2.3 m/s. It has a mass of 6.2 kg. It strikes another bowling ball that is sitting motionless in the street. As a result of the collision, the first bowling ball comes to a complete stop and the second bowling ball goes flying off.
    a. What is the momentum of the first bowling ball before the collision? Use the Five Steps.
    b. What is the momentum of the second bowling ball after the collision? You do not need to use the Five Steps.

2. Three bowling balls are rolling down the street with identical velocities (3.5 m/s). One bowling ball has a mass of 4.2 kg, one has a mass of 7.6 kg, and one has a mass of 3.2 kg.
    a. What is the total momentum of all three bowling balls combined? Use the Five Steps.

    b. The three bowling balls strike two other bowling balls that are sitting motionless in the middle of the street. As a result of the collision, the first set of bowling balls comes to a complete stop and the second set of bowling balls go flying off. One bowling ball in the second set has a mass of 5.2 kg; the other has a mass of 2.3 kg. What is the total momentum of the second set of bowling balls after the collision? You do not need to use the Five Steps.

    c. After the collision, the bowling balls in the second set stick together and go flying off with the exact same velocity. What is their velocity? Use the Five Steps.

3. A giant fermented lizard is gamboling down the street. The lizard has a mass of 45.29382 kg and is moving with a velocity of 4.222222 m/s. The lizard strikes 14 bowling balls sitting motionless in the middle of the street. Each of these bowling balls has a different mass: the mass of the first bowling ball is 4.3 times the square root of the mass of the last bowling ball. The other bowling balls have a mass that falls evenly between the masses of the first and last bowling ball, except when the third and fourth decimal places of the masses turn out to be a prime number less than 43. In this case, the mass of that bowling ball would be 16 less the cubic root of the natural logarithm of the average of the two bowling balls nearest the mass of that bowling ball. As a result of the collision, the lizard comes to a complete stop and all fourteen bowling balls go flying off. The velocities of the bowling balls, in order of mass, are 1.2 m/s, 3.2 m/s, 3.1 m/s, 7.6 m/s, 1.2 m/s, 8.7 m/s, 4.4 m/s, 3.6 m/s, 1.8 m/s, 7.7 m/s, 2.2 m/s, 8.4 m/s, 9.1 m/s, and 0.00328 m/s. What is the total momentum of the second set of bowling balls after the collision? You will need to use the Five Steps for part of this problem.