Name: ______________________________ Date:____________________

Mr. Croom's Physics Chapter 6: Momentum

<u>Elastic Collisions</u>

<u>and</u>

<u>Nearly Elastic (Inelastic Every Day Collisions)</u>

<u>Solve the following problems</u>

1. Two trains collide head on with each other. Train 1 had a mass of 2500 kg and was traveling at 20 m/s. Train 2 had a mass of 4000 kg and was traveling at 31 m/s. If they collide elastically, and Train #1 is traveling at 25 m/s backwards after the collision, what is the velocity of Train #2 after the collision?

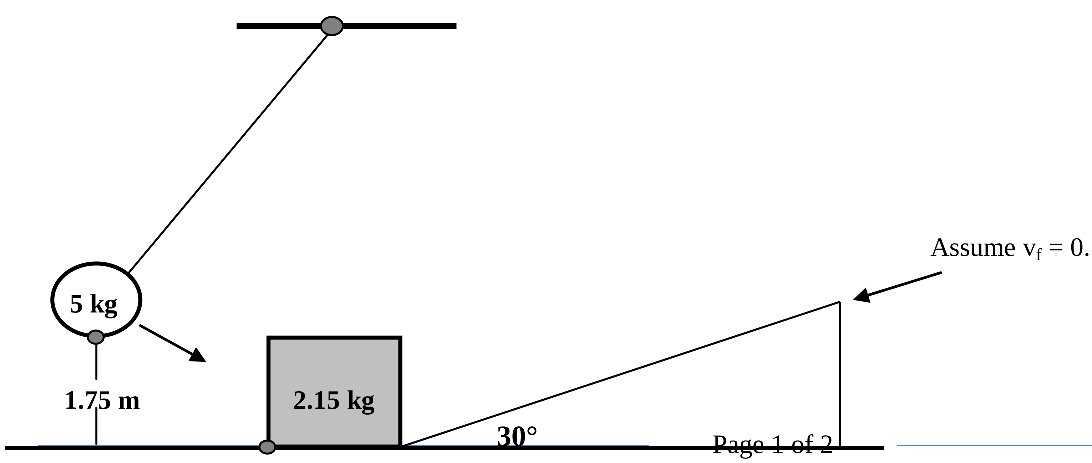
2. Calculate the velocity of each mass after the **<u>perfectly elastic</u>** collision below.

3. As everyone knows, bullets bounce off Superman's™ chest. Suppose Superman™, whose mass is 104 kg, *while not moving*, is struck by a 4.2–g bullet moving with a velocity of 835 m/s. If the collision is perfect *elastic*, find the **<u>velocity</u>** that Superman™ had *after* the collision. Assume the bottoms of his "super feet" are frictionless. Don't forget about the **<u>direction</u>** of each object in this system.

4. A pendulum swings downward and strikes a block. Assuming the block moves to the top of the incline after the elastic collision, what is the **<u>length</u>** (Δ**x**) of the incline?

<u>HINT 1</u>: Assume an **<u>elastic</u>** collision, and assume that the pendulum **<u>stops</u>** after the collision.

<u>HINT 2</u>: You can solve this problem either with energy methods or using N2L / kinematics.



5. A ball of mass 3 kg is traveling at 16 m/s toward another ball of mass 10 kg that is at rest. After the elastic collision, the first ball is moving with a velocity of 2m/s. What is the velocity of the second ball after the collision?

6. (Serway, p. 219, #1)A 0.015 kg marble sliding to the right at 22.5 cm/s on a frictionless surface makes an elastic head-on collision with a 0.015 kg marble moving to the left at 18.0 cm/s. After the collision, the first marble moves to the left at 18.0 cm/s. Find the velocity of the second marble after the collision. Verify your answer by calculating the total kinetic energy before and after the collision.

7. (Serway, p. 219, #2)A A 16.0 kg canoe moving to the left at 12.5 m/s makes an elastic head-on collision with a 14.0 kg raft moving to the right at 16.0 m/s. After the collision, the raft moves to the left at 14.4 m/s. Disregard any effects of the water. Find the velocity of the canoe after the collision. Verify your answer by calculating the total kinetic energy before and after the collision.

8. (Serway, p. 219, #3)A A 4.0 kg bowling ball sliding to the right at 8.0 m/s has an elastic head-on collision with another 4.0 kg bowling ball initially at rest. The first ball stops after the collision. Find the velocity of the second ball after the collision. Verify your answer by calculating the total kinetic energy before and after the collision.

9. (Serway, p. 219, #4)A A 25.0 kg bumper car moving to the right at 5.00 m/s overtakes and collides elastically with a 35.0 kg bumper car moving to the right. After the collision, the 25.0 kg bumper car slows to 1.50 m/s to the right, and the 35.0 kg car moves at 4.50 m/s to the right. (a) Find the velocity of the 35 kg bumper car before the collision. (b)Verify your answer by calculating the total kinetic energy before and after the collision.

10. (Walker, p. 268, # 32) The collision between a hammer and a nail can be considered to be approximately perfect elastic. Estimate the kinetic energy acquired by a 12-g nail when it is struck by a 550-g hammer moving with a speed of 4.5 m/s.