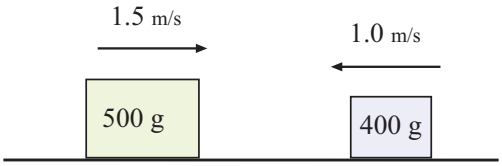
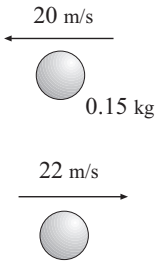
Name_____

Phys 2010 (NSCC), Fall 2006
Problem Set #8

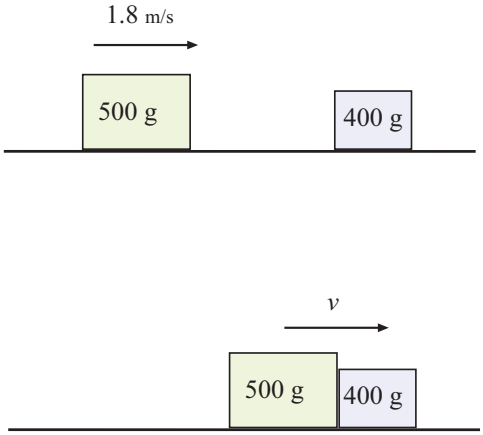
1. On a one-dimensional track, a 500 g cart moves to the right with speed 1.5 $\frac{\text{m}}{\text{s}}$ and a 400 g cart moves to the left with speed 1.0 $\frac{\text{m}}{\text{s}}$. What is the total momentum of this system?



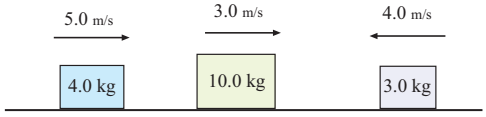
2. A pitcher throws a 0.15-kg baseball so that it crosses home plate horizontally with a speed of 20 $\frac{\text{m}}{\text{s}}$. The ball is hit straight back at the pitcher with a final speed of 22 $\frac{\text{m}}{\text{s}}$. (a) What is the impulse (magnitude of the momentum change) delivered to the ball? (b) Find the average force exerted by the bat on the ball if the two are in contact for 2.0×10^{-3} s.



3. A 500 g cart moves to the right on a one-dimensional track with a speed of 1.8 $\frac{\text{m}}{\text{s}}$; it strikes and sticks to a 400 g cart which is at rest. What is the speed of (combined) mass after the collision?

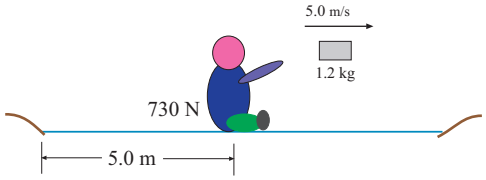


4. Three carts of masses 4.0 kg, 10 kg and 3.0 kg move on a frictionless horizontal track with speeds of 5.0 $\frac{\text{m}}{\text{s}}$, 3.0 $\frac{\text{m}}{\text{s}}$ and 4.0 $\frac{\text{m}}{\text{s}}$ as shown at the right. The carts stick together after colliding. Find the final velocity of the three carts.

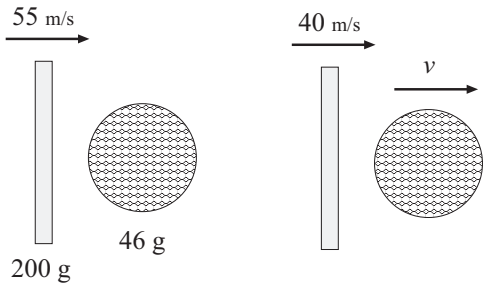


(Does your answer require that all carts collide and stick together at the same time?)

5. A 730-N man (that's his *weight*) stands in the middle of a frozen pond of radius 5.0 m. He is unable to get to the other side because of a lack of friction between his shoes and the ice. To overcome this difficulty, he throws his 1.2-kg physics textbook horizontally toward the north shore at a speed of 5.0 $\frac{\text{m}}{\text{s}}$. How long does it take him to reach the south shore?



6. High-speed photographs show that the head of a 200-g golf club is traveling at 55 $\frac{\text{m}}{\text{s}}$ just before it strikes a 46-g golf ball at rest on a tee. After the collision, the club head travels (in the same direction) at 40 $\frac{\text{m}}{\text{s}}$. Find the speed of the golf ball just after impact.



7. Find the total kinetic energy of the objects before and after the collision in problem 6. How much kinetic energy was lost?

8. A railroad car of mass 2.00×10^4 kg moving at $3.00\,\frac{\text{m}}{\text{s}}$ collides and couples with two coupled railroad cars, each of the same mass as the single car and moving in the same direction at $1.20\,\frac{\text{m}}{\text{s}}$. What is the speed of the three coupled cars after the collision? How much kinetic energy is lost in the collision?