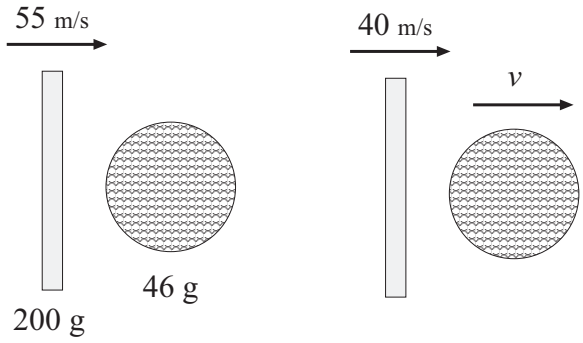
Name_____

Phys 2010 (NSCC), Fall 2005
Problem Set #9

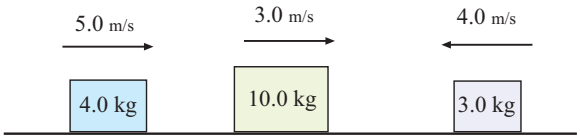
1. A pitcher throws a 0.15-kg baseball so that it crosses home plate horizontally with a speed of $20\,\frac{\text{m}}{\text{s}}$. The ball is hit straight back at the pitcher with a final speed of $22\,\frac{\text{m}}{\text{s}}$. (a) What is the impulse (magnitude of the momentum change) delivered to 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.

2. 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.



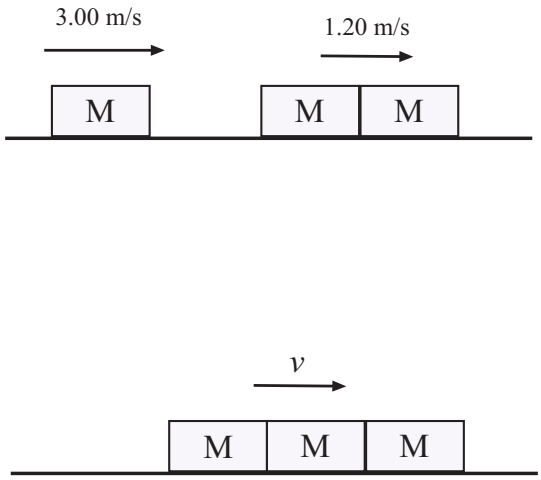
3. A 730-N man (that's his *weight*) stands in the middle of a frozen pond of radius 5.0 m. He is unable to get to the other side because of a lack of friction between his shoes and the ice. To overcome this difficulty, he throws his 1.2-kg physics textbook horizontally toward the north shore at a speed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

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?)

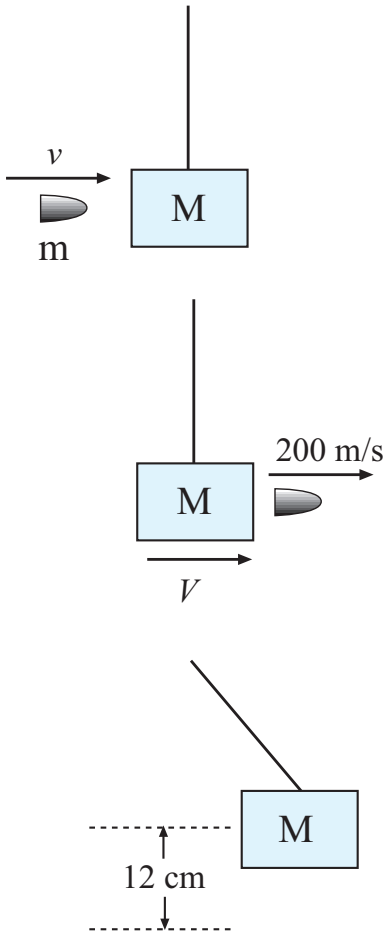
5. A railroad car of mass 2.00×10^4 kg moving at $3.00\,\frac{\text{m}}{\text{s}}$ collides and couples with two coupled railroad cars, each of the same mass as the single car and moving in the same direction at $1.20\,\frac{\text{m}}{\text{s}}$. What is the speed of the three coupled cars after the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



6. A 25.0-g object moving to the right at $20.0\,\frac{\text{cm}}{\text{s}}$ collides elastically with a 10.0-g object which is at rest. Find the *velocity* of each object after the collision.

7. A 7.0-g bullet is fired into a 1.5-kg ballistic pendulum. The bullet emerges from the block with a speed of 200 $\frac{\text{m}}{\text{s}}$ and the block rises to a maximum height of 12 cm.

Using energy conservation, find the speed which the pendulum bob must have had just after the collision.



8. In Problem 7, find the initial speed of the bullet.