Name_____

Phys 2010 (NSCC), Fall 2007
Problem Set #8

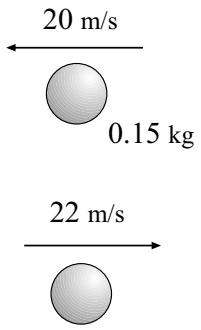
1. A 1500 kg race car can go from zero to 90 $\frac{\text{km}}{\text{hr}}$ in 5.0 s. What power is required to do this?

2. The electric motor of a model train accelerates the train from rest to 0.700 $\frac{\text{m}}{\text{s}}$ in 20.0 ms. The total mass of the train is 875 g. Find the work done on the train in the given time.

Find the average power delivered to the train during the acceleration.

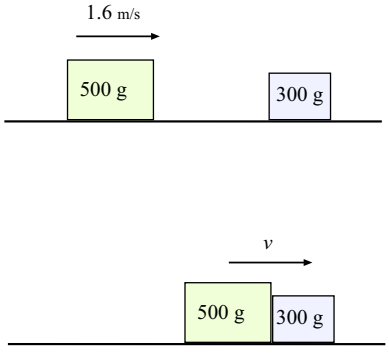
3. On a one-dimensional track, a 500 g cart moves to the right with speed 1.5 $\frac{\text{m}}{\text{s}}$ and a 400 g cart moves to the left with speed 2.5 $\frac{\text{m}}{\text{s}}$. What is the total momentum of this system?

4. 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.

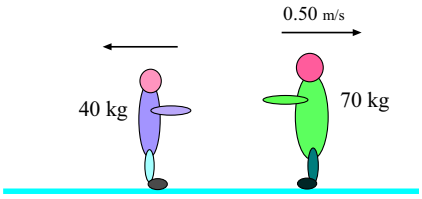


5. A pool player imparts an impulse of 3.0 $\mathrm{N} \cdot \mathrm{s}$ to a 0.25 kg cue ball (initially at rest) with a cue stick. What is the speed of the ball after the impact?

6. A 500 g cart moves to the right on a one-dimensional track with a speed of 1.6 $\frac{\mathrm{m}}{\mathrm{s}}$; it strikes and sticks to a 300 g cart which is at rest. What is the speed of (combined) mass after the collision?



7. A 70 kg man and his 40 kg daughter on skates stand together on a frozen lake. If they push each other apart and the father has a velocity of $0.50\,\frac{\text{m}}{\text{s}}$ eastward, what is the velocity of the daughter? (Neglect friction.)



8. A 820-N man (that's his *weight*) sits in the middle of a frozen pond of radius 6.0 m. He is unable to get to the other side because of a lack of friction between his posterior and the ice. To overcome this difficulty, he throws his 1.2-kg physics textbook horizontally toward the north shore at a speed of $6.0\,\frac{\text{m}}{\text{s}}$. How long does it take him to reach the south shore?