Honors Physics - Chapter 6 Practice Problems

1. In 1987, Marisa Canofoglia, of Italy, roller-skated at a record-setting speed of 40.3 km/h. If the magnitude of Canofoglia's momentum was 6.60×10^2 kg·m/s, what was her mass?

2. In 1990, Gary Stewart of California made 177 737 jumps on a pogo stick. Suppose that the pogo stick reaches a height of 12.0 cm with each jump and that the average net force acting on the pogo stick during the contact with the ground is 330 N upward. What is the time of contact with the ground between the jumps? Assume the total mass of Stewart and the pogo stick is 65 kg. (Hint: The difference between the initial and final velocities is one of direction rather than magnitude.)

3. The most powerful tugboats in the world are built in Finland. These boats exert a force with a magnitude of 2.85×10^6 N. Suppose one of these tugboats is trying to slow a huge barge that has a mass of 2.0×10^7 kg and is moving with a speed of 3.0 m/s. If the tugboat exerts the maximum force for 21 s in the direction opposite to that in which the barge is moving, what will be the change in the barge's momentum? How far will the barge travel before it is brought to a stop?

4. The largest frog ever found was discovered in Cameroon in 1989. The frog's mass was nearly 3.6 kg. Suppose this frog is placed on a skateboard with a mass of 3.0 kg. The frog jumps horizontally off the skateboard to the right, and the skateboard rolls freely in the opposite direction with a speed of 2.0 m/s relative to the ground. If the frog and skateboard are initially at rest, what is the initial horizontal velocity of the frog?

5. Zorba, an English mastiff with a mass of 155 kg, jumps forward horizontally at a speed of 6.0 m/s into a boat that is floating at rest. After the jump, the boat and Zorba move with a velocity of 2.2 m/s forward. Calculate the boat's mass.

6. Yvonne van Gennip of the Netherlands ice skated 10.0 km with an average speed of 10.8 m/s. Suppose van Gennip crosses the finish line at her average speed and takes a huge bouquet of flowers handed to her by a fan. As a result, her speed drops to 10.01 m/s. If van Gennip's mass is 63.0 kg, what is the mass of the bouquet?

7. The heaviest wild lion ever measured had a mass of 313 kg. Suppose this lion is walking by a lake when it sees an empty boat floating at rest near the shore. The curious lion jumps into the boat with a speed of 6.00 m/s, causing the boat with the lion in it to move away from the shore with a speed of 2.50 m/s. How much kinetic energy is dissipated in this inelastic collision?

8. Speeds as high as 273 km/h have been recorded for golf balls. Suppose a golf ball whose mass is 45.0 g is moving to the right at 273 km/h and strikes another ball that is at rest. If after the perfectly elastic collision the golf ball moves 91 km/h to the left and the other ball moves 182 km/h to the right, what is the mass of the second ball?