Momentum Questions

1. In a freight yard a train is being put together from freight cars. An empty freight car, coasting at 10 m/s, strikes a loaded car that is stationary, and the cars couple together. Each of the cars has a mass of 3000 kg when empty, and the loaded car contains 12,000 kg of ipods. With what speed does the combination of the two cars start to move?
2. When an apple falls from a tree and strikes the ground without bouncing, what becomes of the momentum?
3. A tennis player returns a 30. m/s serve straight back at 25. m/s, after making contact with the ball for 0.50 s. If the ball has a mass of 0.20 kg, what is the force she exerted on the ball?
4. If a Mack truck and a VW bug are in collision, which experiences a greater force? A greater impulse? A greater change in velocity?
5. You are sitting in the middle of a frozen lake. However, this is a special lake, in that the ice is frictionless. You only have you clothes with you. How do you get to the edge of the lake? Explain your answer.
6. A lunar vehicle is tested on earth at a speed of 10 km/h. When it travels on the moon with the same speed, is its momentum more, less or the same?
7. A 50. kg cart is moving across a frictionless floor at 2.0 m/s. A 70. kg boy, riding in the cart, jumps off so that he hits the floor with zero velocity.

a. What impulse did the boy give to the cart?

b. What was the velocity of the cart after the boy jumped?

1. Discuss the following in terms of impulse and momentum:

a. Why are padded dashboards safer in automobiles?

b. Why are nylon ropes, which stretch considerably under stress, favored by mountain climbers?

1. Ever tried to stop a 150 pound (68kg) cannonball fired towards you at 30 mph (48km/h)? No, probably not or you would not be in class today. But you may have tried to brace yourself in a car collision, or not worn a seatbelt in a car. How are the two situations similar?
2. If you throw a ball horizontally while standing on roller skates, you roll backwards. Will you roll backwards if you go through the motions of throwing the ball, but hold on to it instead?
3. A billiard ball will stop short when it collides head-on with another ball, which is at rest. The ball cannot stop short, however, if the collision is not exactly head-on but is at an angle. Explain why this is so in terms of momentum.