Conservation of Momentum

1. A 95 kg fullback, running at 8.2 m/s, collides in midair with a 128 kg defensive tackle moving in the opposite direction. Both players end up with zero speed. How fast was the tackle moving originally?

2. Ball A (5.0 g) moves at a velocity of 20.0 cm/s to the right. It collides with ball B (10.0 g) moving along the same line with a velocity of 10.0 cm/s to the right. After the collision, ball A is still moving but with a velocity of 8.0 cm/s in the same direction. What is the velocity of ball B after the collision?

3. Before a collision, a 25 kg object is moving at 12 m/s to the right. After a collision with stationary box, the 25 kg object moves at 8 m/s to the right. What is the resulting momentum of the box?

4. A 2575 kg van runs into the back of a 835 kg compact car at rest. They move off together at 8.5 m/s. Assuming no friction with the ground, find the initial speed of the van.

5. A 15 g bullet is shot into a 5085 g wooden block standing on a frictionless surface. The block, with the bullet in it, acquires a velocity of 1.0 m/s. Calculate the velocity of the bullet before striking the block.

6. A hockey puck, mass 0.115 kg, moving at 35.0 m/s, strikes an octopus thrown on the ice by a fan. The octopus has a mass of 0.265 kg. The puck and octopus slide off together. Find their velocity.

7. A 50 kg woman, riding on a 10 kg cart is moving east at 5.0 m/s. The woman jumps off the cart and hits the ground at 7.0 m/s eastward, relative to the ground. Calculate the velocity of the cart after she jumps off.

8. A car with mass 1245 kg, moving at 29 m/s strikes a 2175 kg car at rest. If the two cars stick together, with what speed do they move?

9. A 92 kg fullback, running at 5.0 m/s, attempts to dive across the goal line for a touchdown. Just as he reaches the goal line, he is met head-on in midair by two 75 kg linebackers, one moving at 2.0 m/s and the other at 4.0 m/s. If they all become entangled as one mass, with what velocity do they travel? Does the fullback score?

10. A 5.00 g bullet is fired with a velocity of 100 m/s toward a 10.00 kg stationary solid block resting on a frictionless surface.
    a. What is the change in momentum of the bullet if it is embedded in the block?
    b. What is the change in momentum of the bullet if it ricochets in the opposite direction with a speed of 99 m/s?