

### Extra Practice Problems for Chapter 9

1. A 2,145-kg car is driving down the road with a momentum of  $39,100 \frac{\text{kg}\cdot\text{m}}{\text{s}}$  south. What is its velocity?
2. A 245-g ball is traveling at 12.3 m/s directly towards a person. The person catches the ball, applying a force of 2,500 Newtons. How long does it take for the ball to come to rest in the person's hands?
3. A 143-g baseball is traveling at a speed of 49.1 m/s is hit by a bat. It leaves the bat traveling in the opposite direction. If the bat exerted a force of 12,300 N for 0.00091 seconds, what is the velocity of the ball after it is hit by the bat?
4. A 676-g pistol fires 2.05-gram bullets with a muzzle velocity of 292 m/s. What is its recoil velocity?
5. A 14.5-kg rifle shoots bullets with a muzzle velocity of 1,050 m/s. If the rifle has a recoil velocity of 1.78 m/s, what is the mass of the bullets?
6. In a training exercise, an astronaut is floating in a weightless environment with no velocity. A 19.7-kg object moves towards him with a speed of 22.1 m/s. If the mass of the astronaut and suit is 175 kg, what will the velocity of the astronaut be after catching the object? Is this an elastic or inelastic collision?
7. Two balls are rolling towards one another on a level surface. The first has a mass of 1.7 kg and a speed of 3.2 m/s. The second has a mass of 2.2 kg and is rolling at 4.8 m/s. They collide head-on. After the collision, the first one is rolling with a speed of 3.8 m/s in the opposite direction compared to how it was rolling initially. What is the velocity of the second ball? Is this an elastic or inelastic collision?
8. A gun is used to shoot a 7.23-g bullet into a 915-g ballistic pendulum. The pendulum rises to a height of 0.12 m. At what speed do the bullets leave the gun?
9. A gun is used to shoot a 15-g bullet into a 772-g ballistic pendulum. If the gun shoots the bullet at 292 m/s, what is the maximum height to which the ballistic pendulum rises?
10. A particle is moving in a circle of radius 1.3 m with a speed of 1,456 m/s. A force that exerts no torque is applied, and the radius increases to 2.1 m. What is the new speed of the particle?