

1. A 7 kg bowling ball collides head on with a 2 kg bowling pin. The pin flies forward with a velocity of 3 m/s. If the ball continues forward with a speed of 1.8 m/s, what was the initial velocity of the ball?

2. A 0.05 kg cue ball is traveling at 3 m/s across a pool table collides with the 8 ball and comes to a complete stop. How fast is the 8 ball moving after the collision if its mass is 0.03 kg?

3. Two pieces of "silly putty" are thrown toward one another and stick together after the collision. If one piece has a mass of 2 grams and is traveling with a speed of 4 m/s, and the second ball of silly putty has a mass of 3 grams and is traveling at 3 m/s in the opposite direction, what is the speed of the combined lump of silly putty after the collision? How fast would the 3 g mass need to be traveling to bring the combination to rest?

  

4. A car moving at a speed of 5 m/s crashes into an identical car stopped at a light. What is the velocity of the wreckage immediately after the collision, assuming the two cars stick together?

5. A railroad car of mass  $2 \times 10^4$  kg moving with a speed of 3 m/s collides and couples with two other coupled cars (each has the same mass as the first car) which are moving in the same direction at a speed of 1.2 m/s. What is the velocity of the three joined cars after the collision?

6. A 3 gram bullet is fired from a gun. The bullet leaves the 2 kg gun traveling at 450 m/s. With what speed does the gun recoil?

7. A child in a motionless boat throws a 3.4 kg package horizontally from the boat with a velocity of 10 m/s. If the combined mass of the child and the boat is 60 kg, how fast will the child and boat be moving after the throw?

8. A 15.0 kg sled carrying a 22.0 kg gazelle is moving with a speed of 3.50 m/s when it collides with a snowman that is initially at rest. If the speed of the snowman, sled, and gazelle is 2.90 m/s, what is the snowman's mass?