

**Work each of the following problems. SHOW ALL WORK.**

1. A 1 kg blob of clay moving at 8 m/s collides inelastically with a 3 kg wooden block that is initially at rest.

a. What is the initial momentum of the system?

b. What must be the final momentum of the system?

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c. Calculate the velocity of the blob and block immediately after the collision.

2. A 1,250 kg car is stopped at a traffic light. A 3,550 kg truck moving at 8.33 m/s hits the car from behind.

a. What is the initial momentum of the system?

b. What must be the final momentum of the system?

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c. If the bumpers of the car and truck lock, how fast will the two vehicles move together?

**Work each of the following problems. SHOW ALL WORK.**

3. Twins Bo and Joe have a combined mass of 200 kg and are zooming along at 10 m/s in a 100 kg amusement park bumper car. They bump into Melinda's car, which is sitting still. Melinda has a mass of 25 kg and is also in a 100 kg car. After the collision, the twins continue moving with a speed of 4.12 m/s.

a. What is the initial momentum of the system?

b. What must be the final momentum of the system?

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c. How fast is Melinda's car bumped across the floor?

4. Jamal is playing in the arcade at Six Flags. At one booth, he throws a 0.5 kg ball with a velocity of 21 m/s and hits a 0.2 kg bottle sitting on a shelf. The bottle goes flying forward at 30 m/s.

a. What is the velocity of the ball after it hits the bottle?

b. If the bottle was more massive but flew forward with the same final velocity, how would this affect the final velocity of the ball?

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5. Valentina, a Russian cosmonaut, exits her ship for a space walk. When she is 15 m from the ship and floating motionless, her tether catches on a sharp piece of metal and is severed. Valentina quickly reacts by tossing her 2 kg camera away from the spaceship with a speed of 12 m/s.
- How fast will Valentina, whose mass is 68 kg, float toward the spaceship?
  
  
  
  
  
  
  
  
  
  
  - Assuming the spaceship remains at rest with respect to Valentina, how long will it take her to reach the ship?
6. A 4 kg bowling ball rolls at 8 m/s to the right and strikes a 6 kg bowling ball that is rolling at 2 m/s to the left. If the 4 kg ball bounces back with a velocity of 4 m/s to the left, what is the velocity of the 6 kg ball after the collision?