Show all work

1. A 2.0-kg ball rolls at 4.5 m/s into a 1.0-kg container at rest on the floor. Determine the final velocity of the ball and the container.

2. A 15-kg medicine ball is thrown east at 10 m/s to a 60-kg person who is moving on ice at 2.0 m/s to the west. The person catches the ball and subsequently slides with the ball across the ice. Determine the velocity of the person and the ball after the collision.

3. How much braking force would be required to slow a 1200-kg car down from 15 m/s to 3.0 m/s in 3.0 s?

4. A sticky ball and a perfectly bouncy ball both have a mass of 0.5 kg and are both thrown horizontally toward a wall at 8.0 m/s.
   a) Determine the impulse experienced by the sticky ball after hitting the wall.
   b) Determine the impulse experienced by the bouncy ball after hitting the wall.

5. A 60-kg astronaut in the International Space Station is moving toward an interior wall below her at 0.5 m/s. Upon reaching the wall, she pushes against it and begins moving upward at 1.0 m/s. She eventually reaches an interior wall above and then grabs onto the surface, bringing herself to a stop.
   a) What impulse does she experience while pushing herself off the wall?
   b) What impulse does she experience while grabbing onto the other wall?

6. Two children, one with a mass of 30 kg and another with a mass of 40 kg, are moving together on ice skates in an ice rink at 1.0 m/s. At some point they push off each other, causing the 30-kg child to move at 2.0 m/s. What is the final velocity of the 40-kg child?

7. A bowling ball initially moving at 2.0 m/s bumps into an identical bowling ball. It then moves at 1.00 m/s after the collision
   a) If the second bowling ball was initially at rest, what is its final velocity?
   b) If the second bowling ball was initially moving at 1.00 m/s in the same direction, what is its final velocity?