

Momentum Problems (SLAPT Prep)

For each situation, assume that there is no net external force on the system of two objects.

1. A 75000 kg boxcar filled with coal is sitting motionless on a frictionless track. It is struck by an empty 20000 kg boxcar moving 5.00 m/s. The two boxcars stick together. How fast are they moving? (1.05 m/s)
2. A 2.0 kg hoverpuck is gliding to the east at 2.5 m/s. It collides with a 1.5 kg hoverpuck at rest, sending the smaller puck scooting off to the east at 2.86 m/s. What is the velocity of the first hoverpuck? (0.36 m/s east)
3. Rex (86.0 kg) and Tex (92.0 kg) board the bumper cars at the local carnival. Rex is moving at a full speed of 2.05 m/s when he rear-ends Tex who is at rest in his path. Tex and his 125-kg car lunge forward at 1.40 m/s. Determine the post-collision speed of Rex and his 125-kg car. (0.61 m/s)
4. A 70.9-kg boy and a 43.2-kg girl, both wearing skates face each other at rest on a skating rink. The boy pushes the girl, sending her eastward with a speed of 4.64 m/s. Neglecting friction, determine the subsequent velocity of the boy. (2.83 m/s west)
5. A 50. kg skater is blindfolded and sent across the ice at 5.0 m/s. The skater collides head-on with a second blindfolded skater moving 4.0 m/s in the opposite direction. The two skaters grab hold of each other after the collision. They are moving 0.79 m/s in the direction of the second skater after the collision. What is the mass of the second skater? (90. kg)
6. Glider A travels to the right on a frictionless, level air track at 2.0 m/s to the right. It strikes Glider B, which has a mass of 1.2 kg and is moving 0.60 m/s to the right. After the collision, Glider B is moving 1.3 m/s to the right and Glider A is moving 0.10 m/s to the left. What is the mass of Glider A? (0.40 kg)
7. A baseball has a mass of 0.145 kg. It travels from the pitcher to home plate at 44.7 m/s. The ball is struck by a bat and sent back toward the pitcher at 38.9 m/s. The ball was in contact with the bat for 1.5 ms. What was the average force applied to the ball by the bat? (8080 N)
8. A 65 kg passenger in the seat of a car traveling 25 m/s is involved in an accident. The seatbelt and airbag bring the passenger to a stop with a force of 42000 N. What is the time that it takes to stop? (0.039 s)