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Conservation of Momentum:

Show all work on a separate sheet of paper. Box the final answer.

1. Jonathan is at the state fair playing some of the arcade games. At one booth he throws a 0.50 kg ball forward with a velocity of 21.0 m/s in order to hit a 0.20 kg bottle sitting on a shelf, and when he makes contact the bottle goes flying forward at 30.0 m/s. a.) what is the velocity of the ball after it hits the bottle? B.) if the bottle were more massive how would this affect the final velocity of the ball? (9.0 m/s)

2. Emily rolls a 7.0 kg bowling ball down the alley for the league championship. One pin is still standing and Emily hit it head-on with a velocity of 9.0 m/s. The 2.0 kg pin acquires a forward velocity of 14.0 m/s. What is the new velocity of the bowling ball? (5.0 m/s)



3. Running at 2.0 m/s Neima, the 45.0kg quarterback, collides with Will, the 90.0 kg tackle, who is traveling at 7.0 m/s in the other direction. Upon collision, Will continues to travel at 1.0 m/s. How fast is Neima knocked backwards? (10.m/s)



- 4.Coleman and Stephanie are participating in the "Roll-a-Rama" roller-skating dance championship. While 75.0 kg Coleman roller-skates backwards at 3.0 m/s, 60.0 kg Stephanie jumps into his arms with a velocity of 5.0 m/s in the same direction. A.) How fast does the pair roll backwards together? (3.9 m/s)

B.) If Stephanie is skating toward Coleman when she jumps, would their combined final velocity be larger or smaller than you answer to part a? Why?

5. Mr. Fulmer, shoots a 0.22 caliber rifle at a 0.30 kg block of wood. The rifle and the wood are mounted on carts that sit on an air track(frictionless). The

6.0 kg gun fires a 0.020 kg bullet with a speed of 200. m/s. (13m/s)

a.) what is the final velocity of the block of wood with the bullet lodged inside?

B.) what is the recoil velocity of the gun? (-0.67 m/s)



6. Bo, the Russian Cosmonaut, goes outside his ship for a spacewalk, but when he is floating 15.0 m from the ship, his tether catches on a sharp piece of metal and is severed. Bo tosses his 2.0 kg camera away from the spaceship with a speed of 12 m/s. a.) How fast will Bo, whose mass is now 68 kg, travel toward the spaceship? (-0.35 m/s) B.) Assuming the spaceship remains at rest with respect to Bo, how long will it take her to reach the ship? (43 s)



- 7.A 620. kg moose stand in the middle of the railroad tracks, frozen by the lights of an on-coming 10,000 kg locomotive traveling at 10.0 m/s. Engineer Julianne sees the moose but is unable to stop the train in time and the moose rides down the track sitting on the cowcatcher. What is the new combined velocity of the locomotive and the moose? (9.42 m/s)

- 8.Dylan is rolling along on his 4.0 kg skateboard with a constant speed of 3.0 m/s when he jumps off the back and continues forward with a velocity of 2.0 m/s relative to the ground. This causes the skateboard to go flying forward with a speed of 15.5 m/s relative to the ground. What is Dylan's mass? (50. kg)

