

Conservation of Momentum WS 58

9.0 m/s

1. Brianna is at the state fair playing some of the arcade games. At one booth she 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?



5.0 m/s

2. Jasmine rolls a 7.0 kg bowling ball down the alley for the league championship. One pin is still standing and Amy 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?

10. m/s

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

3.9 m/s



4. Job and Megan are participating in the "Roll-a-Rama" roller-skating dance championship. While 75.0 kg Job roller-skates backwards at 3.0 m/s, 60.0 kg Megan 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? B.) If Job is skating toward Megan when she jumps, would their combined final velocity be larger or smaller than you answer to part a) Why?



13 m/s

-0.67 m/s

5. Physics teacher, Miss Corralejo, 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. 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?

-0.35 m/s

43 s

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

9.42 m/s

7. A 620. kg moose stand in the by the lights of an on-coming 10.0 m/s. Engineer Julianne stop the train in time and the sitting on the cowcatcher. velocity of the locomotive

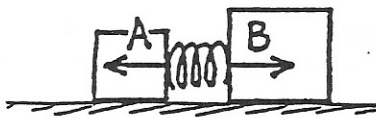


middle of the railroad tracks, frozen 10,000 kg locomotive traveling at sees the moose but is unable to moose rides down the track What is the new combined and the moose?

50, kg

8. Genevieve 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 Genevieve's mass?

Chapter 5 Momentum Systems



1. When the compressed spring is released, Blocks A and B will slide apart. There are 3 systems to consider here, indicated by the closed dashed lines below — System A, System B, and System A+B. Ignore the vertical forces of gravity and the support force of the table.

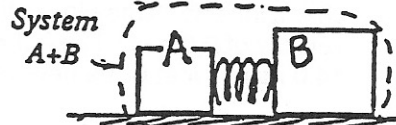
- a. Does an external force act on System A? (yes) (no)
Will the momentum of System A change? (yes) (no)



- b. Does an external force act on System B? (yes) (no)
Will the momentum of System B change? (yes) (no)

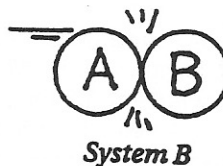
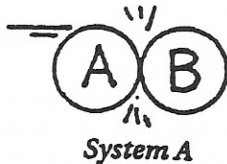


- c. Does an external force act on System A+B? (yes) (no)
Will the momentum of System A+B change? (yes) (no)



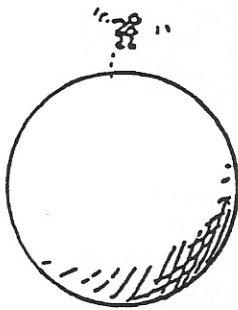
Note that external forces on System A and System B are internal to System A+B, so they cancel!

2. Billiard ball A collides with billiard ball B at rest. Isolate each system with a closed dashed line. Draw only the external force vectors that act on each system.



- a. Upon collision, the momentum of System A (increases) (decreases) (remains unchanged).
b. Upon collision, the momentum of System B (increases) (decreases) (remains unchanged).
c. Upon collision, the momentum of System A+B (increases) (decreases) (remains unchanged).

3. A girl jumps upward. In the sketch to the left, draw a closed dashed line to indicate the system of the girl.

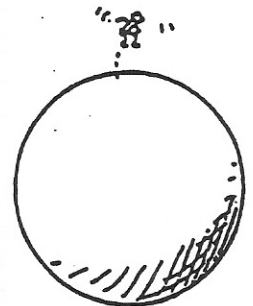


- a. Is there an external force acting on her? (yes) (no)

Does her momentum change? (yes) (no)

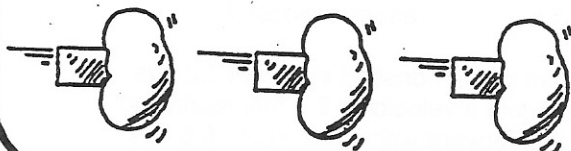
Is the girl's momentum conserved? (yes) (no)

- b. In the sketch to the right, draw a closed dashed line to indicate the system [girl + earth]. Is there an external force due to the interaction between the girl and the earth that acts on the system? (yes) (no)



Is the momentum of the system conserved? (yes) (no)

4. A block strikes a blob of jelly. Isolate 3 systems with a closed dashed line and show the external force on each. In which system is momentum conserved?



thx to Cedric Linder

5. A truck crashes into a wall. Isolate 3 systems with a closed dashed line and show the external force on each. In which system is momentum conserved?



#with it!