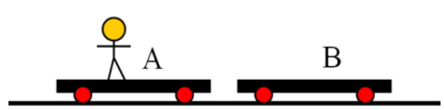
Momentum Practice Questions for 7.2

1. A 1200 Kg car going 13 m/s collides with a 4200 Kg truck at rest. Their bumpers lock. What is their speed afterwards? (2.89 m/s)
2. A 60.0 Kg person running 3.00 m/s East collides head on with a 100. Kg person running 2.00 m/s the other way. What is their final velocity if they stick together? (0.125 m/s West)
3. A 50. Kg ice skater at rest throws a 5.0 Kg shot put at a velocity of +3.5 m/s. What is the recoil velocity of the skater? (-0.35 m/s)
4. A 1200 Kg car going 15 m/s rear-ends with a 800. Kg car going 5.0 m/s in the same direction. Their bumpers lock. What is their speed afterwards? (11 m/s)
5. A bullet going 375 m/s imbeds in a stationary block of wood. The 1.42 kg bullet and block combo are going 16.5 m/s after the collision. What was the mass of the bullet? (0.0625 kg)
6. Two football players strike each other head on. Player 1 has a mass of 72.0 kg and is running 5.20 m/s to the East, and player 2 has a mass of 86.0 kg is running to the West. If they stick together, and are together moving 1.60 m/s to the West after the collision, was the velocity of player 2 before the collision? (Speed and direction) (7.29 m/s to the West)
7. Two football players strike each other head on. Player 1 has a mass of 119 kg and is running 6.20 m/s to the East, and player 2 has a mass of 102 kg is running 4.20 m/s to the West. What is their post-collision velocity if they stick together? (Speed and direction) (1.40 m/s East)
8. A 2000. Kg airplane going 45.0 m/s fires a 2.00 Kg shell forward at a speed of 1200. m/s. What is the final velocity of the plane? (Planes crashed because of this!) (43.8 m/s)
9. A 14.5 g bullet traveling 783 m/s horizontally strikes a 9.24 Kg block of wood at rest on a level frictionless table. The bullet goes through the block, but is traveling only 382 m/s in the same direction after the collision. What is the velocity of the block after the collision? (Assume the block loses no mass) (0.629 m/s)
10. Bumper car A (326 Kg) with velocity 3.7 m/s East collides with the rear of car B (536 Kg) which has a velocity of 2.4 m/s East. After the collision, car A has a velocity of 1.2 m/s to the West. What is the velocity of car B after the collision? (5.38 m/s East)
11. Bumper car A (428 Kg) with velocity 2.40 m/s East collides with the front of car B (509 Kg) which has a velocity of 3.10 m/s West. After the collision, car A has a velocity of 2.30 m/s to the West. What is the velocity of car B after the collision? (Speed and direction) (0.852 m/s to the East)
12. 95.0 kg Thor is standing on a 65.0 kg cart, and is holding a 8.90 kg hammer. Everything is moving to the right at 1.80 m/s. What is the velocity of Thor and cart if he throws the hammer 12.5 m/s to the right? (1.205 m/s)
13. 82.0 kg Big J Sandvik is standing on a 23.0 kg golf cart, and is holding a 3.60 kg golf club. Everything is moving to the right at 1.45 m/s. After he throws the golf club, he and his cart are moving 2.16 m/s to the right. What speed and in what direction did Big J Sandvik throw the golf club? (19.3 m/s to the left)
14. 96.0 kg Thor is standing on a 45 kg cart, and is holding a 9.40 kg hammer. Everything is moving to the right at 2.30 m/s. After he throws the hammer, he is moving 1.70 m/s to the right. What speed and in what direction did he throw the hammer? (11.3 m/s to the right)
15. 78.0 kg Big J Sandvik is standing on a 15.0 kg golf cart, and is holding a 3.40 kg golf club. Everything is moving to the right at some speed. After he throws the club, he is moving on the cart 3.00 m/s to the right and the golf club is moving to the right at 23.0 m/s. What speed and in what direction was he, his cart and his club going to begin with? (3.71 m/s to the right)
16. A 132.45 g bullet traveling at 386 m/s rips a hole through a 1.34 Kg block of wood at rest on some frictionless ice. The bullet is traveling 153 m/s following the collision, what is the speed of the block? (23.0 m/s)
17. A 153 gram bullet going 452 m/s goes through the first of two stationary 3.50 kg blocks of wood, and sticks in the second. After this, the first block is traveling at 6.50 m/s in the same direction. What speed are the second block and bullet going? (12.7 m/s) What is the bullet's velocity between the blocks? (303 m/s)
18. 60.0 kg Brennen is playing on two flatbed rail cars initially at rest. Car A has a mass of 560. kg and B 780. kg. He reaches a velocity of +5.20 m/s on A, before jumping to B where he slows to +3.40 m/s before jumping off the other end. The cars are uncoupled, and rest on a frictionless track:



    i. What is the velocity of car A when he is in midair? (-0.557 m/s)
    ii. What is the velocity of car B when he leaves it? (+0.138 m/s)
    iii. What would have been the velocity of car B had he remained there, and not jumped off? (+0.371 m/s)
    iv. What would the velocity of car B have been had he jumped off the back of it to give himself a velocity of zero? (+0.40 m/s)