Practice 6.2 – Conservation of Momentum

1. a. A bullet going 560. m/s imbeds in a stationary block of wood. The 272 g bullet and block combo are going 26.0 m/s after the collision. What was the **mass** of the bullet? (12.6 g)
b. Big J Sandvik (at rest) fires a 2.80 g rifle bullet to the left at 530. m/s. He recoils at 0.0220 m/s to the right after this. What must be the **mass** of Big J Sandvik? (67.5 kg)
c. A 2960 kg Mazda Protégé going 34.0 m/s strikes a 1410 kg Ford Escort traveling in the same direction at 18.0 m/s from behind. The two cars stick together. What is the **velocity** of the cars as they are stuck together? (28.8 m/s)
d. Two football players strike each other head on. Player 1 has a mass of 110. kg and is running 3.20 m/s to the East, and player 2 has a mass of 85.0 kg is running 8.30 m/s to the West. What is their post-collision **velocity** if they stick together? (Speed and direction) (1.81 m/s west)
e. 85.0 kg Big J Sandvik is standing on a 35.0 kg golf cart, and is holding a 8.20 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 41.0 m/s. What **speed and in what direction** was he, his cart and his club going to begin with? (5.44 m/s right)

2. a. A 3.5 g bullet going 960. m/s imbeds in a stationary block of wood. The bullet and block combo are going 17.0 m/s after the collision. What was the **mass** of the bullet and block combo? (0.198 kg)
b. Big J Sandvik fires a rifle bullet to the right at 870. m/s. He has a mass of 72.0 kg. If he is initially at rest on a frictionless surface, and has a recoil velocity of 0.0450 m/s to the left, what is the **mass** of the bullet? (0.00372 kg)
c. A 12.0 kg cat moving an unknown velocity to the right strikes a 13.0 kg cat traveling to the right at 15.0 m/s. The two cats stick together and have a velocity of 18.0 m/s to the right. What **velocity** was the first cat going before the collision? (21.3 m/s)
d. Bumper car A (470. Kg) with velocity 3.80 m/s East collides with the front of car B (420. Kg) which has a velocity of 5.20 m/s West. After the collision, car A has a velocity of 1.30 m/s to the West. What is the velocity of car B after the collision? (Speed and direction) (0.507 m/s east)
e. 71.0 kg Big J Sandvik is standing on a 28.0 kg golf cart, and is holding a 3.60 kg golf club. Everything is moving to the right at 1.10 m/s. After he throws the golf club, he and the cart are moving 2.50 m/s to the right. What **speed and in what direction** did Big J Sandvik throw the golf club? (37.4 m/s left)

3. a. A 6.20 g bullet going 860. m/s imbeds in a stationary 340. g block of wood. What is the **velocity** of the block of wood just after the collision? (15.4 m/s)
b. A person at rest fires a 1.30 g rifle bullet to the right at 1120. m/s. The person recoils at 0.0240 m/s to the left after this. What must be the **mass** of the person? (60.7 kg)
c. A 3520 kg car (going an unknown velocity) strikes a 1020 kg car traveling in the same direction at 15.0 m/s from behind. The two cars stick together and have a velocity of 21.0 m/s. What **velocity** was the first car going before the collision? (22.7 m/s)
d. Bumper car A (310. Kg) with velocity 4.60 m/s East collides with the rear of car B (540. Kg) which has a velocity of 2.50 m/s East. After the collision, car A has a velocity of 1.20 m/s to the West. What is the velocity of car B after the collision? (Speed and direction) (5.83 m/s east)
e. 95.0 kg Thor is standing on a 43.0 kg cart, and is holding a 5.20 kg hammer. Everything is moving to the right at 2.40 m/s. What is the **velocity** of Thor and cart if he throws the hammer 32.0 m/s to the left? (Speed and direction) (3.70 m/s right)

4. a. A 6.80 g bullet imbeds in a stationary 150. g block of wood. The bullet and block combo are going 24.0 m/s after the collision. What was the **velocity** of the bullet before the collision? (553 m/s)
b. A 55.0 kg person at rest fires a 0.0130 kg rifle bullet to the right. The person recoils at 0.0890 m/s to the left after this. What must be the **velocity** of the bullet? (377 m/s left)
c. A 3570 kg car going 21.2 m/s strikes a 1470 kg car traveling in the same direction at 15.0 m/s from behind. The two cars stick together. What **velocity** are they going after the collision? (19.4 m/s)
d. Two football players strike each other head on. Player 1 has a mass of 110. kg and is running 7.20 m/s to the East, and player 2 has a mass of 95.0 kg is running 4.30 m/s to the West. What is their post-collision **velocity** if they stick together? (Speed and direction) (1.87 m/s east)
e. 115 kg Thor is standing on a 23.0 kg cart, and is holding a 4.20 kg hammer. Everything is moving to the right at 1.40 m/s. What is the **velocity** of Thor and cart if he throws the hammer 15.9 m/s to the right? (Speed and direction) (0.959 m/s right)

5. a. A 4.50 g bullet going 770. m/s imbeds in a stationary 210. g block of wood. What is the **velocity** of the block of wood just after the collision? (16.2 m/s)
b. A 62.0 kg person fires a 5.90 g rifle shell at 820. m/s. If the person is initially at rest on a frictionless surface, what is their recoil **velocity** after firing? (0.0780 m/s)
c. A 3230 kg car going 24.0 m/s strikes a 2610 kg car traveling in the same direction from behind. The two cars stick together and are going 18.0 m/s just after the collision. What **velocity** did the other car have before the collision? (10.6 m/s)
d. Two football players strike each other head on. Player 1 has a mass of 120. kg and is running 5.10 m/s to the East, and player 2 has a mass of 99.0 kg is running to the West. If they stick together, and are together moving 1.50 m/s to the West after the collision, was the **velocity** of player 2 before the collision? (Speed and direction) (9.50 m/s west)
e. 105 kg Thor is standing on a 45.0 kg cart, and is holding a 8.30 kg hammer. Everything is moving to the right at 2.30 m/s. After he throws the hammer, he and the cart are moving 1.60 m/s to the right. What **speed and in what direction** did he throw the hammer? (15.0 m/s right)