Momentum Problem Set 1

1.   Calculate the momentum of the following objects:
      a. A 10.0 kg ball moving 15.0 m/s 150 kg*m/s
      b. A 10.0 kg ball at rest. 0 kg*m/s
      c. A 10.0 kg ball moving 1.500×10^3 m/s 1.500×10^4 kg*m/s
      d. A 1.5000×10^4 kg wrecking ball moving 1.00 m/s 1.500×10^4 kg*m/s
      e. A 747 jumbo jet at rest. 0 kg*m/s

2.   What is the velocity of a 0.0250 g bullet that has a momentum of 31.4 kg*m/s 1.256×10^6 m/s

3.   Calculate the mass of Oil Tanker traveling at 0.0450 m/s. The momentum of the tanker is 1.46×10^4 kg*m/s) 324444 kg

4.   A 63.0 kg astronaut is on a spacewalk when the tether line to the shuttle breaks. The astronaut is able to throw a 10.0 kg oxygen tank in a direction away from the shuttle with a speed of 12.0 m/s, propelling the astronaut back to the shuttle.

      a. Assuming that the astronaut starts from rest, find the final speed of the
astronaut after throwing the tank. -1.9 m/s
      b. Determine the maximum distance the astronaut can be from the craft
when the line breaks in order to return to the craft within 60.0 s. 114 m

5.   An 85.0 kg fisherman jumps from a dock into a 135 kg rowboat at rest on the west side   of the dock. If the velocity of the fisherman is 4.30 m/s to the west as he leaves the dock,   what is the final velocity of the fisherman and the boat? -1.66 m/s

6.   Each croquet ball in a set has a mass of 0.500 kg. The green ball, traveling at 12.0 m/s, strikes the blue ball, which is at rest. Assuming that all collisions are head on, find the   final speed of the blue ball in each of the following situations:

      a. The green ball stops moving after it strikes the blue ball. 12 m/s
      b. The green ball continues to move after the collision at 2.40 m/s in
      the same direction.   9.6 m/s
      c. The green ball continues moving after the collision at 0.300 m/s in
      the same direction.   11.7 m/s
      d. The blue ball and the green ball move in the same direction after
      the collision; the green ball has a speed of 1.60 m/s. 10.4 m/s

7.   A boy stands at one end of a floating raft that is stationary relative to the shore. He then walks in a straight line to the opposite end of the raft, away from the shore. Does the raft move? Explain. What is the total momentum of the boy and the raft before the boy walks across the raft? The raft moves, because if the initial momentum was zero the final momentum must also be zero. If the boy has momentum in the forward direction, the boat must have momentum in the reverse direction. Therefore, the boat moves backward.

8.   High-speed stroboscopic photographs show the head of a 215 g golf club   traveling at 55.0 m/s just before it strikes the a 46.0 g golf ball at rest on a tee. After the   collision the club travels (in the same direction) at 42.0 m/s. Use the law of conservation   of momentum to find the speed of the golf ball just after impact. 60.8 m/s

9.   A 1550 kg car traveling at 15.0 m/s to the south collides with a 4530 kg truck that is   initially at rest at a stoplight. The car and truck stick together and move together after   the collision. What is the final velocity of the two-vehicle mass? 3.8 m/s