

Conservation of momentum

1. 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.
 - 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.
2. An 85.0 kg fisherman jumps from a dock into a 135.0 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?
3. Each croquet ball in a set has a mass of 0.50 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.
 - b. The green ball continues moving after the collision at 2.4 m/s in the same direction.
 - c. The green ball continues moving after the collision at 0.3 m/s in the same direction.
 - d. The blue ball and the green ball move in the same direction after the collision; the green ball has a speed of 1.6 m/s.