# Conservation of Momentum Problem Set

## Physics 11

Complete the following problems on a separate piece of paper. At least one of these problems will be the quiz problem for next class.

(1) A 0.25 kg cue ball hits the 0.25 kg 8-ball in a perfectly elastic collision. If the cue ball was going 22 m/s, how fast does the 8-ball go after the collision? (Note: the cue ball will be at rest after a perfectly elastic collision.)

$\boxed{\text{22 m/s [in the same direction as the cue ball was]}}$

(2) A toy truck, with mass 20.0 g, travels along a level tabletop at 0.50 m/s. A miniature car, with mass 5.00 g, speeds headlong toward the toy truck at 0.75 m/s. After the collision, the toy truck continues in its original direction at 0.10 m/s. What is the velocity of the miniature car?

$\boxed{\text{0.85 m/s [in the opposite direction]}}$

(3) A boy, mass 65.0 kg, riding a skateboard, mass 2.0 kg, is traveling 3.0 m/s east when he attempts to jump forward from his skateboard. If his velocity immediately after leaving the skateboard is 3.1 m/s [E], what is the velocity of the skateboard?

$\boxed{\text{0.25 m/s [west]}}$

(4) A rifle has a mass of 7 kg and the bullet inside has a mass of 0.7 kg. If the velocity of the bullet is 350 m/s after the rifle is fired, what is the recoil velocity of the rifle?

$\boxed{\text{35 m/s [in the opposite direction]}}$

(5) Two people, one of mass 72.8kg and the other of mass 52.4kg, sit in a stationary rowboat of mass 81.6 kg

(a) If the lighter person jumps EAST out of the boat at 7 m/s, how fast will the heavier person and boat move?

$\boxed{\text{2 m/s [west]}}$

(b) If the heavier person jumps into the water at 4 m/s to rescue the lighter person, how fast will the rowboat move?

$\boxed{8 \text{ m/s [west]}}$

(6) A girl, mass 70.0 kg, is running 3.0 m/s east when she jumps onto a stationary skateboard, mass 2.0 kg. What is the velocity of the girl and skateboard assuming they move off together?

$\boxed{2.9 \text{ m/s [east]}}$

(7) Find the speed at which a super hero (mass=76.0 kg) must fly into a train (mass = 19537 kg) traveling at 35 m/s to stop it.

$\boxed{9.0 \times 10^3 \text{ m/s}}$