Homework Set #5 Solutions (9/29 - 10/3):

Chapter 6: **Questions** 14, 33, 39 **Exercises** 17

Questions:

14. Momentum is a vector. Both balls have the same initial momentum. The change in momentum is greater for the ball that bounces and so it must experience the greater impulse.

33. The momentum remains zero because the forces are internal.

39. The magnitude of the momentum of the eastbound object is greater than the magnitude of the momentum of the northbound object. Therefore the final momentum must be more east than north, which is path D.

Exercises:

17. $p_i = p_f = m_1 v_1 + m_2 v_2 = (1200\text{ kg})(14\text{ m/s}) + (2000\text{ kg})(25\text{ m/s}) = 66{,}800\text{ kg}\cdot\text{m/s (north)}$

Chapter 7: **Questions** 3, 9 **Exercises** 3, 5

Questions:

3. Momentum is always conserved in a collision where as kinetic energy is rarely conserved.

9. The minivan has the larger kinetic energy because the kinetic energy is proportional to the mass.

Exercises:

3. $p_i = (4\text{ kg})(6\text{ m/s}) - (1\text{ kg})(6\text{ m/s}) = 18\text{ kg}\cdot\text{m/s}$

   $p_f = (4\text{ kg})(2\text{ m/s}) + (1\text{ kg})(10\text{ m/s}) = 18\text{ kg}\cdot\text{m/s}$ momentum is conserved

   $KE_i = \frac{1}{2}(4\text{ kg})(6\text{ m/s})^2 + \frac{1}{2}(1\text{ kg})(6\text{ m/s})^2 = 90\text{ J}$

   $KE_f = \frac{1}{2}(4\text{ kg})(2\text{ m/s})^2 + \frac{1}{2}(1\text{ kg})(10\text{ m/s})^2 = 58\text{ J}$ kinetic energy is <u>not</u> conserved

   Momentum is always conserved in a collision. This collision could have taken place.

5. $KE_i = \frac{1}{2}m_1 v_1{}^2 + \frac{1}{2}m_2 v_2{}^2 = \frac{1}{2}(3\text{ kg})(6\text{ m/s})^2 + \frac{1}{2}(2kg)(4m/s)^2 = 70\text{ J}$

$KE_f = \frac{1}{2}(m_1 + m_2)v^2 = \frac{1}{2}(5\text{ kg})(2\text{ m/s})^2 = 10\text{ J} \quad \Rightarrow \ \Delta KE = -60\text{ J}$