Work Sheet

Student Name: _____

Team members:
1.- _____ 2.- _____

3.- _____ 4.- _____

Instructor: _____

Introduction[1]

Analysis

One-Dimensional, Perfectly Elastic Collision:

1. Calculate the velocities of Car 1, v_1, and Car 2, v_2. Do this by dividing the length of the sail by the respective times.

2. Calculate the percent error as stated in the analysis section of the lab manual.

One-Dimensional, Partially Elastic Collision:

1. Calculate the initial velocity, v_{1i}, of Car 1 by dividing the length of the sail by the initial time of Car 1. Then determine the initial momentum, p_i, of the system. Note that Car 2 is initially at rest.

2. Calculate the final velocity, v_{1f}, of Car 1 as well as the final velocity, v_{2f}, of Car 2 using the corresponding final times. Determine the momentum separately for each car, and then add them to get the final momentum, p_f, of the system.

3. Calculate the percent error. Use p_i as the theoretical value, and p_f as the experimental value.

4. Calculate the energy loss, Q. Use Equation 8.4 from the lab manual. Make sure to label each kinetic energy accordingly and show your work, as usual!

5. Calculate the fraction of loss to the initial kinetic energy: $\frac{Q}{K_i}$

One-Dimensional Totally Inelastic Collision:

1. Calculate the initial velocity, v_i, and the final velocity, v_f, of the system.

2. Calculate the percent error, where v_i is the theoretical value. Is your percent error close to 50%? Why or why not?

3. Calculate initial, p_i, and final, p_f, momenta of the system as done previously.

4. Calculate the percent error where p_i is the theoretical value and p_f the experimental value.

5. Calculate the fraction of kinetic energy lost, i.e. $\frac{Q}{K_i}$. Use Equation 8.4 from the lab manual.

6. **Show in general** that the theoretical value of $\frac{Q}{K_i}$ is equal to $\frac{1}{2}$. Compare this theoretical value to your experimental value by percent error and explain your result.

Two-Dimensional Elastic Collision:

1. Calculate the initial and final momenta in each x, y direction using Equations 8.10 from the lab manual. Label them accordingly!

2. Calculate the percent error for each component. Note that you should get two percentages.

Conclusion

[1]This is an adaption from S. Sugaya's original version