

Collisions

1 Assignment

For this lab, you will be analyzing collisions between two pucks occurring at a number of different angles. You should conduct at least 8 different collision trials: one at about 180° (i.e., a ‘head on’ collision), one at about 90° , three other at angles between 0° and 90° , and three other at angles from 90° to 180° . When analyzing your collision data, you should calculate the *actual collision angle* from the data.

Your team is tasked with:

1. calculating the momentum before and after each collision and checking that momentum is conserved in these collisions
2. calculating the kinetic energy before and after each collision to determine the elasticity of the collision

When evaluating uncertainties in this lab, you may ignore the uncertainty in the mass of the puck.

2 Deliverables

For your lab report, 10% of the grade will be for following the guidelines in the lab report template. Another 10% will be allocated for the Abstract and Introduction of your report. The remaining percentage will be based on your inclusion of:

1. [15%] a discussion of how your team calculated collision angles from the collected data.
- for assignment 1:
 2. [15%] two plots, one for the x -component and one for the y -component, showing the total momentum before and after each collision as a function of collision angle for all collisions. Make sure to include uncertainties. See the first row of example plots in the next section.
 3. [15%] two plots, one for the x -component and one for the y -component, of the ratio of the total momentum before the collision to after the collision, as a function of collision angle for all collisions. Make sure to include uncertainties. See the second row of example plots in the next section.
 4. [10%] a discussion of whether or not the total momentum in the collisions was approximately conserved based on your plots. You should include a brief statement indicating what kind of effects will weaken conservation of momentum in real life experiments.
 - for assignment 2:
 7. [10%] a plot showing the total kinetic energy before and after each collision, as a function of collision angle. See the plot in the third row of example plots in the next section.
 8. [15%] a discussion of whether or not the collisions were approximately elastic, based on your plot.

3 Results Reporting

The values and uncertainties in the plots below are completely made up and may make no physical sense. These plots are here only to exemplify the type of plots and format that is requested in the report.

In the Canvas module for this lab, there is an Excel file named *CollisionsPlotsExample.xlsx* that can be used for reference in the making of these plots.

