Physics: 1D Collisions

Objective: To explore conservation of momentum in 1-Dimensional elastic and inelastic collisions (Refer to Ch. 7.3, p. 310 for information and equations).

Materials: Wiimote, sensor bar, PASCO track, two PASCO cars, silver masses, magnetic end stop.

Procedure Part I: Elastic Collisions

1. Connect the Wii remote to the PC (click on the CPU Devices shortcut on the desktop then click add a device)
2. Start *Wii Physics* and change the collection mode to measure the 1D motion, distance and y-acceleration only.
3. Right click on the blank Wii Physics screen and select *Show Point Values*.
4. Measure the mass of all objects.
5. Make sure the track is as level as possible. Attach the wiimote to a cart and place it at the end of the track without the magnetic bumper.
6. Attach the sensor bar somewhere behind the magnetic bumper such that it is level with the IR camera on the wiimote.
7. Start collecting data then send the cart gently toward the bumper.
8. When the cart is moving in the opposite direction stop collecting data.
9. What was the acceleration acting on the cart during the collision?
10. Use your results (velocities of the cart before and after) to check if the momentum before the collision equals the momentum after.
11. Repeat the experiment one more time with a different starting velocity.
12. Now reposition the cars so the magnetic ends face each other. Begin recording data and send the wiimote car towards the other, non-moving car. Using the data calculate the velocity of the wiimote car before and after the collision. Calculate the velocity of the second car.

Procedure Part II: Inelastic Collisions

1. Place an additional car on the track.
2. Make sure the Velcro sections of the cars face each other.
3. Start collecting data and send the wiimote car towards the other (the cars should stick together).
4. Stop collecting data a couple of seconds after the collision.
5. Determine the momentum before and after the collision.
6. Repeat with two silver masses on the second car.

Analysis Questions

1. Show all calculations for both procedures.
2. What effect did adding more mass to the second car have on the end velocity of the two cars?

Summarize your data and calculations in a table.