Momentum Activity

Run the collision lab, found at http://phet.colorado.edu/en/simulation/collision-lab. Start in the advanced tab.

Part I—Momentum

For the following questions, observe the momentum of *one* object at a time.

1. Identify the factors that affect the momentum.

2. Write a short paragraph that describes how each factor affects momentum. Include a short description of your experimental methods and the conclusions you drew.

3. Develop an equation to calculate the momentum of an object. Test the equation to make sure it's accurate! Show your steps. Get this checked off.

Part II—Collisions

Add another ball the simulation. Make sure the 1-D box is checked. Adjust the slider to make the collisions completely *inelastic* or *elastic*. (Don't worry about collisions that are in between inelastic or elastic.)

4. During an inelastic collision, what remains the same? What changes? Describe your methods and your conclusions.

5. Develop an equation (using variables) to calculate the total momentum of two objects before and after one *inelastic* collision Test the equation to make sure it's accurate! Show your steps. Get this checked off.

6. During an elastic collision, what remains the same? What changes? Describe your methods and your conclusions.

7. Develop an equation (using variables) to calculate the total momentum of two objects before and after one *elastic* collision Test the equation to make sure it's accurate! Show your steps. Get this checked off.

Extension questions

8. On your own sheet of paper, set up a perfectly inelastic collision between unequal masses (that can be checked later with the Sim). Use the equation you developed in #5 (momentum conservation) to predict the final velocity of the combination after the collision. Show your steps.

9. Now test your prediction. Did you confirm your predicted result?

10. Set up a perfectly elastic collision between unequal masses, where one object starts out AT REST. Using ONLY variables, write the equation for momentum conservation in this situation. Using the same variables, write the equation for kinetic energy conservation for this situation. Derive equations for the final velocities of each of the two objects using these two equations. Check your results with me before proceeding.

11. Now test your prediction. Did you confirm your predicted result?