Experiment on Momentum and Collision

Name

Simulation Experiment

The goal of this activity is for you to:

1. Understand the mechanics behind perfectly elastic and perfectly inelastic collisions
2. Make observations and conclusions on the different cases of each type of collision
3. Understand that momentum is always conserved in all collisions *where external forces are negligible*.

Procedure:

Part A: Perfectly Elastic Collision

1. Run the simulation Collision Lab.
2. On the right pane, tick 1 Dimension and untick Reflecting Border. Check if the Elasticity is 100%.
3. On the bottom pane, click More Data. We shall focus on Mass and V_x only in this experiment. Please remember that V_x changes from the ball's initial velocity before collision to its final velocity after collision. The right direction is taken as positive in this simulation.
4. In each of the cases below, you will just consider the collision of two balls. And in all cases, Ball 2 will have *zero initial speed*. All you need to do is vary the mass to suit each case and set the initial speed of Ball 1 until you have three sets of data.
5. Click Rewind (below the collision area) each time you want to do another trial or another case. *Do not click Reset All*. Otherwise, you will have to start from step 2 all over again.

Case 1: Mass of Ball 1 equal to mass of Ball 2; Ball 2 initially at rest.

Mass of Ball 1 _____ **Mass of Ball 2 _____**

Ball 1				**Ball 2**		**Comparison of V_2 and U_1**
Initial		**Final**		**Final**		
Speed, U_1	**Direction**	**Speed, V_1**	**Direction**	**Speed, V_2**	**Direction**	

Observation:

Case 2: Mass of Ball 1 greater than mass of Ball 2; Ball 2 initially at rest.

Mass of Ball 1 _____ **Mass of Ball 2 _____**

Ball 1				**Ball 2**		**Comparison of V_2 and U_1**
Initial		**Final**		**Final**		
Speed, U_1	**Direction**	**Speed, V_1**	**Direction**	**Speed, V_2**	**Direction**	

Observation:

Case 3: Mass of Ball 1 less than mass of Ball 2; Ball 2 initially at rest.

Mass of Ball 1 _____ **Mass of Ball 2 _____**

Ball 1				**Ball 2**		**Comparison of V_2 and U_1**
Initial		**Final**		**Final**		
Speed, U_1	**Direction**	**Speed, V_1**	**Direction**	**Speed, V_2**	**Direction**	

Observation:

Part B: Perfectly Inelastic Collision

1. Keeping all the other settings, adjust the Elasticity to zero for a perfectly inelastic collision.
2. In each of the cases below, the initial speed of Ball 1 is equal to the initial speed of Ball 2 but opposite in direction. You may choose any *one* value for the whole case but do not forget to put a negative sign on the initial speed of Ball 2.
3. Make three sets of data by varying the masses of the balls.

Case 1: Mass of Ball 1 equal to Mass of Ball 2; initial speeds are the same.

Mass of Ball 1	Mass of Ball 2	Initial Speed of Balls 1 and 2, U	Final speed of Balls 1 and 2, V	Comparison of U and V

Observation:

Case 2: Mass of Ball 1 less than mass of Ball 2; initial speeds are the same.

Mass of Ball 1	Mass of Ball 2	Initial Speed of Balls 1 and 2, U	Final speed of Balls 1 and 2, V	Comparison of U and V

Observation:

Case 1: Mass of Ball 1 greater than mass of Ball 2; initial speeds are the same.

Mass of Ball 1	Mass of Ball 2	Initial Speed of Balls 1 and 2, U	Final speed of Balls 1 and 2, V	Comparison of U and V

Observation: