

Name:

Period:

Collision Lab- Conservation of Momentum (Newton's 3rd Law)

Directions: Go to the website <http://phet.colorado.edu/en/simulation/collision-lab>

Make sure the 1-d box is checked. Click on "More Data" to expand the data table.

Part 1

Scenario #1:

100% Elastic collision between balls of **equal mass**

1. Make a hypothesis about initial and final momentums *before* playing with the sim.

2. Complete the following data tables for each ball before and after each trial. Perform a trial with balls of **equal** masses.

Before Sim

Ball	Mass (kg)	Velocity (m/s)	Momentum (kg*m/s)
1			
2			
Total			

After Sim

Ball	Mass (kg)	Velocity (m/s)	Momentum (kg*m/s)
1			
2			
Total			

Scenario #2:

100% Elastic collision between balls of **unequal mass**

1. Make a hypothesis about initial and final momentums *before* playing with the sim.

2. Complete the following data tables for each ball before and after each trial. Perform a trial with balls of **unequal** masses.

Before Sim

Ball	Mass (kg)	Velocity (m/s)	Momentum (kg*m/s)
1			
2			
Total			

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After Sim

Ball	Mass (kg)	Velocity (m/s)	Momentum (kg*m/s)
1			
2			
Total			

3. What is the relationship between the initial and final *total* momentums in Scenario 1? In Scenario 2?

4. Describe the motion of the balls before and after the collision in Scenario 1. Describe the motion of the balls before and after the collision in Scenario 2.

Part 2

Create 2 more distinct scenarios in 1-d including one totally *inelastic* collision (0% elasticity) and one set at 50% elasticity. Make a hypothesis whether or not each will follow conservation of momentum. Collect some data and prove or disprove your hypothesis.

Scenario #1

Elasticity 0 %

Hypothesis:

Before Sim

Ball	Mass (kg)	Velocity (m/s)	Momentum (kg*m/s)
1			
2			
Total			

After Sim

Ball	Mass (kg)	Velocity (m/s)	Momentum (kg*m/s)
1			
2			
Total			

Hypothesis accepted or rejected?

Name:

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Scenario #2

Elasticity 50%

Hypothesis:

Before Sim

Ball	Mass (kg)	Velocity (m/s)	Momentum (kg*m/s)
1			
2			
Total			

After Sim

Ball	Mass (kg)	Velocity (m/s)	Momentum (kg*m/s)
1			
2			
Total			

Hypothesis accepted or rejected?

Analysis:

Think about the relationships you observed and then answer these questions:

a. What is the difference between the quantities that have vector drawings and the ones that don't?

b. In your own words, what does "elastic collision" mean?

c. List quantities that have the same value (and direction if a vector) before and after the collision. If a quantity has the same value (and direction if a vector), it is said to be "conserved".

d. What quantities are not "conserved"?

Summary

In a minimum of 3 sentences, describe the main ideas learned in this activity regarding initial and final total momentum in these collisions.