

# LAB: Conservation of Momentum

## CONCEPTUAL PHYSICS: UNIT 3

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 2 trials with 2 different sets of balls of **equal** masses.

#### Trial 1 Before Sim

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

#### Trial 1 After Sim

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

#### Trial 2 Before Sim

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

#### Trial 2 After Sim

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

**Part 1: 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 2 trials with 2 different sets of balls of **unequal** masses.

Trial 1 Before Sim

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

Trial 1 After Sim

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

Trial 2 Before Sim

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

Trial 2 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 3 more distinct scenarios in 1-d including one totally *inelastic* collision (0% elasticity). For each scenario, list the elasticity percentage, fill out the data tables, and make a hypothesis whether or not each will follow conservation of momentum. Collect some data and prove or disprove your hypothesis.

### Scenario #1

**Elasticity %:**

**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? EXPLAIN**

### Scenario #2

**Elasticity %:**

**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? EXPLAIN**

Scenario #3

**Elasticity %:**

**Hypothesis:**

Before Sim

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

After Sim

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

**Hypothesis accepted or rejected? EXPLAIN**

**Summary**

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