# Elastic Collisions

**Purpose:** To gather evidence that can be used to support a claim that total system momentum is or is not conserved in an elastic collision.

**Background**: The objects involved in a collision are often considered as a system. Provided that the system of two objects is not experiencing a net external impulse, there would be no change in momentum of the system. If one object within the system loses momentum, it is gained by the other object within the system. The combined momentum of both objects would be conserved.

**Getting Ready:** Navigate to the Collision Carts Interactive in the Physics Interactives section of The Physics Classroom website:

<http://www.physicsclassroom.com/Physics-Interactives/Momentum-and-Collisions/Collision-Carts> Path:

physicsclassroom.com => Physics Interactives => Momentum and Collisions => Collision Carts

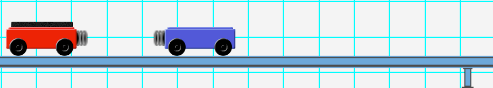
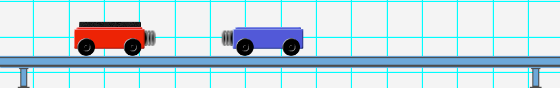
Once the Interactive opens, resize it as desired. Select the **Elastic Collisions** option. Experiment with changing the **Mass** and the **Initial Velocity** of the two carts. Observe how the position of the carts along the track can be changed by dragging. Learn to **Start**, **Pause**, and **Reset** the animation.

# Collision 1: Blue Cart Initially at Rest

Set the initial blue cart velocity to 0 m/s. Set the mass values to different values. Run the simulation and record the mass and velocity values.

# Before Collision After Collision

**vred = m/s vred = m/s vblue = m/s**



# mRed = kg mBlue = kg

Use mass and velocity values to complete the following momentum table.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Before Collision** | **After Collision** | **∆Momentum** |
| **Red Cart** | kg x m/s  = kg•m/s | kg x m/s  = kg•m/s |  |
| **Blue Cart** | kg x m/s  = kg•m/s | kg x m/s  = kg•m/s |  |
| **System Total** |  |  |  |

# Collision 2: Blue Cart Moving Slower than the Red Cart

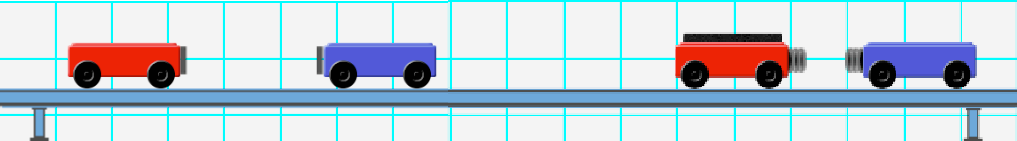
Set the initial blue cart velocity to less than the red cart velocity. Position the blue cart near the red cart so that the collision occurs near the middle of the track. Give the blue cart a smaller mass. Run the simulation and record the post-collision mass and velocity values.

# Before Collision After Collision

**vred = m/s**

**vblue = m/s**

**vred = m/s vblue = m/s**



# mRed = kg mBlue = kg

Use mass and velocity values to complete the following momentum table.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Before Collision** | **After Collision** | **∆Momentum** |
| **Red Cart** | kg x m/s  = kg•m/s | kg x m/s  = kg•m/s |  |
| **Blue Cart** | kg x m/s  = kg•m/s | kg x m/s  = kg•m/s |  |
| **System Total** |  |  |  |

# Conclusion

Make a **Claim** as to whether momentum is conserved or not conserved. Identify the **Evidence** that supports your claim; refer to specific sets of values in each data table. Write a paragraph or more of sound **Reasoning** to argue why the evidence logically lead to the claim you are making. Write well. Write logically. Write thoroughly. Use a separate page of paper if necessary.