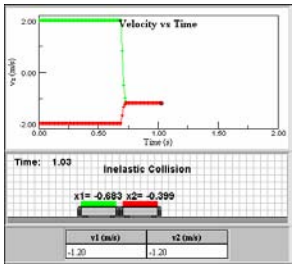
Worksheet for Exploration 8.3: An Inelastic Collision with Unknown Masses



The initial velocities of the two carts in the animation can be changed by entering new values into the text fields **(position is given in meters and time is given in seconds)**. As the carts approach one another they stick together. Restart.

Repeat the animation using varying velocities as you answer the following questions. Right-click on the graph to make a copy that can be expanded for better resolution.

NOTE: This is a completely, or perfectly inelastic collision!

a. Run the animation using 2 m/s and -2 m/s for the velocities of the left and right carts, respectively. What is the change in velocity of the left cart? The right cart? What is the ratio of these changes?

i. $v_{green\ i}$=_____ $v_{green\ f}$=_____

$v_{red\ i}$=_____ $v_{red\ f}$=_____

ii. Careful calculating the change in velocity for each cart. Direction and signs matter!

Δv_{green}=_____ Δv_{red}=_____

$$\frac{\Delta v_{green}}{\Delta v_{red}} = \_\_\_\_\_$$

b. Simulate collisions using other values of equal but opposite velocities. How does this effect the changes in the velocities? The ratio of the changes?

$v_{green\ i}$=_____ $v_{green\ f}$=_____

$v_{red\ i}$=_____ $v_{red\ f}$=_____

Δv_{green}=_____ Δv_{red}=_____

$$\frac{\Delta v_{green}}{\Delta v_{red}} = \_\_\_\_\_$$

c. Run the animation using 1 m/s and -2 m/s for the velocities of the left and right carts, respectively. What is the change in velocity of the left cart? The right cart? What is the ratio of these changes?
   i. First measure.

$v_{green\ i}$=_____ $v_{green\ f}$=_____

$v_{red\ i}$=_____ $v_{red\ f}$=_____

Δv_{green}=_____ Δv_{red}=_____

$$\frac{\Delta v_{green}}{\Delta v_{red}} = \_\_\_\_\_$$

   ii. Now use conservation of momentum to predict the ratio of the change in velocities. Your expression should be in terms of the masses only.

d. Is the ratio of the changes in the velocities always the same?

e. What is the mass ratio of the carts?