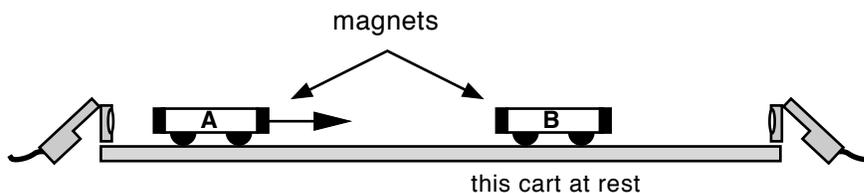


### Lab 9-4: Elastic Collisions

- Purpose:**
- To examine the instantaneous momentum and kinetic energy during an elastic collision between two carts.
  - To determine if momentum / kinetic energy are conserved in an elastic collision.

**Materials:** 1 track      2 carts (one of each)      two 500 gram bars      2 motion detectors

**Procedure:**



- Make sure the track is level and place one of the carts in the middle of the track. Place the second cart at one end of the track. Place the two motion detectors at either end of the track. (see diagram above.) Make sure that the magnets in the carts are facing each other, so that the carts bounce without touching.
- Start Logger Pro and open the file "18 Momentum Energy Coll."
- Start the motion detectors and give cart A a small push so that it "crashes" into cart B. Make sure the carts don't physically touch – the collision should all happen through the magnetic fields. Record the velocities of the carts both before and after the collision. Keep the signs!
- Place two 500 gram bars in cart B (the target cart) and repeat.
- Place two 500 gram bars in cart A instead and repeat.
- For the last trial, give both carts a push towards each other. You can do what you want with the masses – just make sure that if the masses are the same you don't push them with the same speed.
- By creating new calculated columns as needed, make the following two graphs for the last trial. Check with your teacher before printing.
  - $p_A$ ,  $p_B$  and  $p_{total}$  vs time. and
  - $K_A$ ,  $K_B$  and  $K_{total}$  vs time.

**Data and Results:**

	Mass (kg)	Initial Velocity (m/s)	Final Velocity (m/s)	Initial Momentum (kg•m/s)	Final Momentum (kg•m/s)	Initial Kinetic Energy (J)	Final Kinetic Energy (J)
Cart A	0.5						
Cart B	0.5	0					
<i>Totals</i>	---	---	---				

Cart A	0.5						
Cart B	1.5	0					
<i>Totals</i>	---	---	---				

Cart A	1.5						
Cart B	0.5	0					
<i>Totals</i>	---	---	---				

**Lab 9-4: Elastic Collisions**

Cart A							
Cart B							
<i>Totals</i>	---	---	---				

**Conclusions:**

1. In general, how did the total momentum before the carts crashed and bounced compare to the total momentum after the carts crashed?
2. In general, how did the total kinetic energy before the carts crashed and bounced compare to the total kinetic energy after the carts crashed?
3. What happened to momentum during the collision in the last trial? (Look at the graph you printed in step 7.) Can you say that it was conserved?
4. What happened to kinetic energy during the collision in the last trial? (Look at the graph you made in step 7.) Can you say that it was conserved?
5. Compare and contrast an *inelastic* collision with an *elastic* collision.