Lab 9-2: **Explosions**

Purpose: To determine if momentum and kinetic energy are conserved in an explosion.

Materials: 1 track 1 cart with plunger 1 cart with no plunger
2 500 gram bars 2 motion detectors

Procedure:

1. As always, make sure the track is level on the lab table.
2. Start up Logger Pro and open the file "18 Momentum Energy Coll." The motion detector plugged into "Dig 1" is Position 1 (the red line) and the motion detector plugged into "Dig 2" is Position 2 (the blue line).
3. On the appropriate cart, push in the plunger so that it locks in place. Push it in and lift it up a little so that the notch in the plunger hooks on the cart. (Ask your teacher for help if needed. This is surprisingly difficult.)
4. Place both carts on the track. Start recording data by clicking on "Collect". Using a meter stick, tap the little knob on the cart to release the spring plunger, pushing the carts apart. Record the velocities for both carts after the spring is released. Include any negative signs!
5. Place a 500 gram mass on the non-spring cart, and repeat.
6. Place the second 500 gram mass on the same cart and repeat.
7. Calculate the momentums and kinetic energies in the rest of the table. Humor me and write the equations for momentum and kinetic energy below:

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	0					
Cart B	0.5	0					
Totals	---	---	---				

Cart A	0.5	0					
Cart B	1.0	0					
Totals	---	---	---				

Cart A	0.5	0					
Cart B	1.5	0					
Totals	---	---	---				

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Conclusions:

1. In terms of Newton's Third Law, why do the two carts go in opposite directions?

2. What was true about the initial momomentum of the two carts before the explosion? Why does this make total sense?

3. In general, compare the momentum of cart A to the momentum of cart B after each explosion.

4. What was true about the total momentum of the carts after the explosion?

5. What is meant by the phrase "conservation of momentum?" How can this apply when nothing was moving, and then both carts were moving after the explosion?

6. Was kinetic energy conserved in the explosion? How about energy in general? Explain.

7. The momentums of each cart were (hopefully) always equal and opposite. What was true about the kinetic energies of the two carts?

8. What was true about the total kinetic energies of the carts each trial? Also explain why your answer makes sense.

9. Imagine there is an explosion between two carts, A and B. A has more mass than B.
   a. Which will experience a greater change in momentum?
   b. Which will experience a greater impulse?
   c. Which will experience a greater change in velocity?
   d. Which will experience a greater force?
   e. Which will experience a greater acceleration?