

## Colliding Carts

A group of physics students are investigating the effect of the mass of two colliding carts upon their post-collision velocities. Being vectors, the velocities can be positive (for moving rightward) or negative (for moving leftward).

### Experiment 1

In **Experiment 1**, Cart B is at rest on the track. They push Cart A towards it. The carts are equipped with Velcro strips so they stick together when they collide. The two carts collide and move with the same speed after the collision. A motion detector is used to determine the before- and after-collision velocity of Cart A. For subsequent trials, the mass of the carts are varied by adding bricks to them. Their data is shown in **Table 1**.

**Table 1**

Trial	Mass of A (kg)	Mass of B (kg)	Pre-Collision Velocity of A (cm/s)	Post-Collision Velocity of A (cm/s)
1	0.50	0.50	34	17
2	0.50	1.00	42	14
3	0.50	1.50	36	9
4	0.50	2.00	40	8
5	1.00	0.50	33	22
6	1.50	0.50	36	27
7	1.00	1.00	36	18

### Experiment 2

In **Experiment 2**, the carts have embedded magnets that repel each other before contact is made. Cart B is at rest on the track and Cart A is in motion. *After the collision*, the carts move at separate velocities. Several trials are conducted using different mass combinations. Their data is shown in **Table 2**.

**Table 2**

Trial	Mass of A (kg)	Mass of B (kg)	Pre-Collision Velocity of A (cm/s)	Post-Collision Velocity of A (cm/s)	Post-Collision Velocity of B (cm/s)
8	0.50	0.50	32	0	32
9	0.50	1.00	36	-12	24
10	0.50	1.50	42	-21	21
11	0.50	2.00	38	-23	15
12	1.00	0.50	33	11	44
13	1.50	0.50	32	16	48
14	1.00	1.00	40	0	40