# Conservation of Momentum Lab

Name:_____

Block_____

Date:_____

**Purpose:**

To determine if momentum is conserved.

**Materials:**

Skates
rolling chair
stop watches
tape
tape measure
helmet
volunteers
scale.

**Procedure:**

1) Near the middle of length of the hallway, put tape markers at 5 m intervals.
2) Determine the mass of all the students who will be used in the lab (all other students will be timers or announcers)
3) Have the first seated volunteer set up in a rolling chair at the second tape marker.
4) Have the first roller skating volunteer set up at the end of the hallway.
5) Have timers stationed at the tape lines (3 timers at each of the second and third line. One announcer at the first).
6) The skater will get to speed and coast from the first tape line (the announcer will say "go" when the skater reaches this point)
7) The first timers will start the clock when the announcer says "go" and stop when the skater reaches the seated student.
8) The second timers will start the clock when the collisions occurs (this should be obvious) and stop when the chair and students cross the third tape line.
9) Record all data in the table provided.
10) Repeat (3)-(9) with second set of volunteers.

**Sample Calculations: (show all work)**

Show how you determined the velocities for one of the trials

**Prelab questions (these must be completed before the lab begins)**

1) Assume the skater and chair person are identical twins and have identical masses. How will the initial velocity of the skater relate to the final velocity of the skater and chair person assuming no outside forces

2) Assume that rather than twins, we have a football player as the skater who has a mass of twice the twin in the chair. If the football player has the same initial velocity as the skating twin did, how does the final velocity here compare to the answer in (1)?

**Questions:**

1)

a. Calculate the momenta of each system before the collision (fill these values in on the table and show one calculation here)

b. Calculate the momenta of each system after the collision (fill these values in on the table and show one calculation here)

c. Was momentum conserved in each collision?

2) Define the law of conservation of momentum

3)

a. If momentum was not conserved, explain. Where did the missing momentum go?

b. Under what conditions IS momentum conserved.

**Conclusion**

9 kg is mass of chair.

| | $m_{total}$ | $t_{total,1}$ | $t_{total,2}$ | $t_{total,3}$ | $t_{total,ave}$ | $v_{total}$ | $p_{total}$ | $m_1$ | $t_{1,1}$ | $t_{1,2}$ | $t_{1,3}$ | $t_{1,ave}$ | $v_1$ | $p_1$ | $m_2$ | $v_1$ | $p_2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Trial 1 | | 2.71 s | 2.37 s | 2.54 s | | | | 71 kg | 0.67 s | 0.80 s | 0.68 s | | | | 69 + 9 kg | 0 | 0 |
| Trial 2 | | 3.02 s | 3.58 s | 3.18 s | | | | 52 kg | 1.64 s | 1.78 s | 1.55 s | | | | 9 kg | 0 | 0 |
| Trial 3 | | 3.73 s | 3.72 s | 3.13 s | | | | 59 kg | 1.13 s | 0.86 s | 0.81 s | | | | 40 + 9 kg | 0 | 0 |
| Trial 4 | | 2.33 s | | | | | | 71 kg | 0.81 s | 0.66 s | 0.62 s | | | | 40 + 9 kg | 0 | 0 |

final

initial.