Skateboard physics: Conservation of momentum

Background. During the mid 1700's, scientists began to understand laws of conservation. (several of these moments are captured in the film: Einstein's Big Idea). One of the laws of conservation, is the Conservation of Momentum.

Momentum is defined as P = mass x velocity(P=mv).

What the law states then is, that the momentum of "the system" must be 'the same' before an action (a collision together or an explosion apart) as it is AFTER the action. We write that law this way:

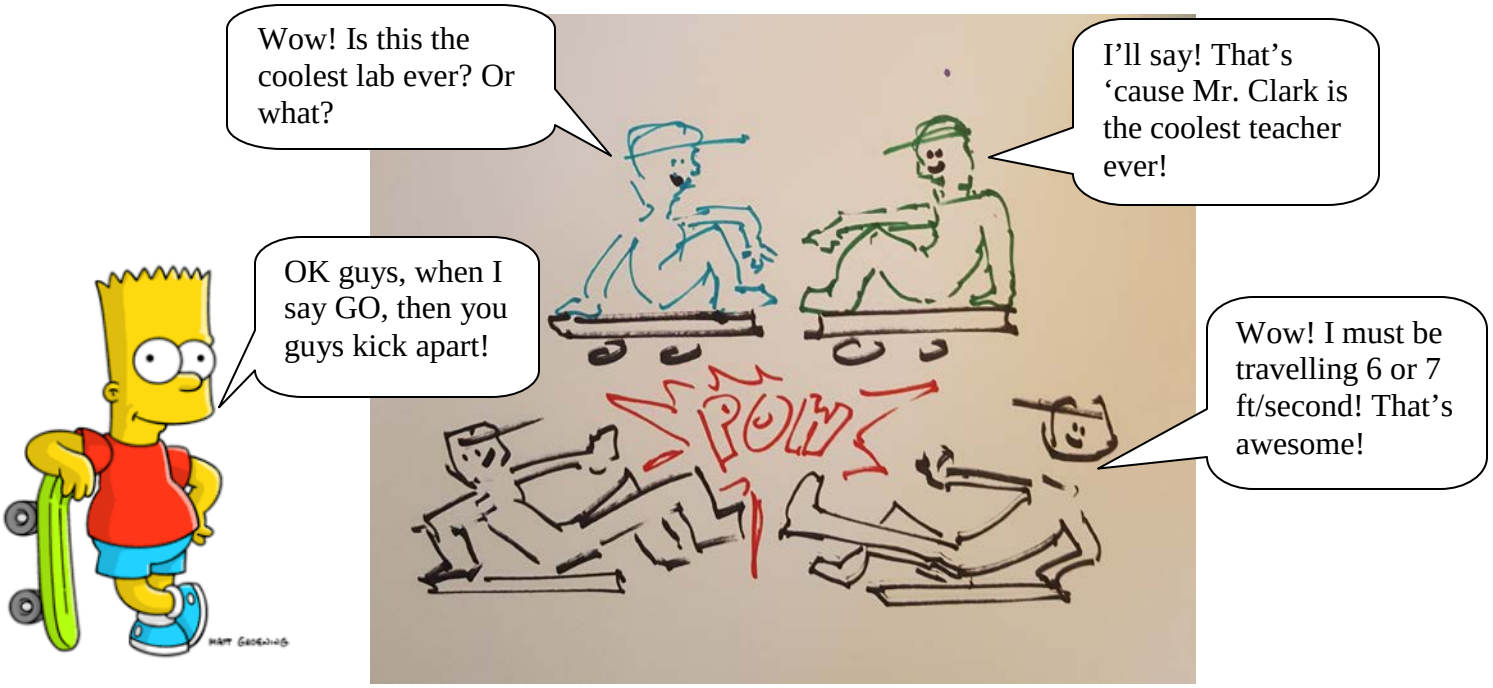
$$M_1V_1 + M_2V_2 = M_1V_1' + M_2V_2'$$

Measured values BEFORE the event Measured values AFTER the event

Where M1 is the mass of the first object, and V1 is the INITIAL speed of the first object and M2 is the mass of the second object and V2 is the INITIAL speed of the second object.

To the right side of the equation, the 'prime' next to the V's represents the NEW SPEED of the objects after the action.

In this lab, two students will face each other, sitting on skate boards as shown below. And then, with someone else(?) holding a stop watch (cell phone stop watch?) The person will start the stopwatch and shout NOW!.. counting for three seconds.. At the three second-mark they will shout TIME! (or something else entertaining).. and the skateboarders will drop a marker (keys? A Rock?) or some how mark the distance they travelled in those three seconds. ***(more on the back side).***



Details:

Both students must first weight themselves, with skateboards in hand, on a bathroom scale. Students then take those numbers and divide by 2.2 to determine their mass in Kilograms. (these numbers become M_1 and M_2)

The two students then, get as close as they can to each other with feet touching.. but not moving.. and only when the person holding the stop watch shouts GO! (while STARTING the stop watch) to the two skateboarders kick apart, shooting in opposite directions away from each other. After three seconds, the 'timer' shouts Now (or something like that) and the two boarders somehow, mark their distance (as they continue to roll)..

Next each distance (in opposite directions is measured, ideally with a tape measure, to determine the distances rolled during those three seconds. Dividing the distance rolled by three seconds give each persons NEW speeds.. (this is the V_1' and V_2')

Then you just plug the numbers in to the equation for conservation of motion and see how close you get to Zero (the two numbers.. the PRODUCTS of Mass x Velocity) should be equal and opposite (remember, moving left is negative and moving right is positive).

Suggestions:

Do several trials (3 or 4?) .. you are more likely to get at least one good data set where the numbers might actually work..

When you are done! Write a short, one-two page report on this experiment. Including the following sections.

A good title (a sentence which summarizes the lab).
A paragraph describing 'the law of physics' that you are exploring in this lab..
A drawing illustrating how you were going to do the lab.
An organized sections showing the data you collected.
A math section which shows how the math worked out.
A summary statement describing how the results compared to what you expected.

Note: Up to four students can hand in ONE report.. just put everyone's FULL NAMES on the top of the page.

Have a fourth person take a cell phone video of the lab.. edit it and have some fun.. (treat it like a professional event with reporters asking questions of the athletes? Or have someone doing a tick-tock dance in the background? Create a short skit in which the lab is a part of a story? This will count as extra credit..

Completed the assignment? *(just the minimum or perhaps something more?)*	5	4	3	2	1	0
Clear progression of ideas? *(can a reader easily and clearly follow what you did and why?)*	5	4	3	2	1	0
Accurate science and conclusions (did you achieve the educational goals of the assignment?)	5	4	3	2	1	0
Creativity in writing, layout and use of illustrations? *(how well do you capture the readers interest?)*	5	4	3	2	1	0
Overall professional layout and construction *(i.e. overall craftsmanship of product)*	5	4	3	2	1	0

5 = superior. Teacher is impressed
4 = "good job". (you took 3rd in the race).
3 = you understood the directions and made a minimum effort to comply.
2 -1 = your effort is less than satisfactory

0 = item is absent altogether.

Your score _____ / **(23 pts**. = default)

*Comments:*_____