Relative Velocity mini-lab: "Paper River"

Name: __________________________period: _____ Date: ________

Note—Since we don't have a real river, nor do we have boats, the "river" is a strip of butcher paper, and our "boat" is a Tumble Buggy. Have fun!! ☺

Complete the post-lab WebAssign using your answers below.

1. Measure and record the time required for the car to move 1.50 m while rolling on the "river". Record 5 trials in the data table below:

Table 1: Time required for car to travel 1.50 ± 0.05 m

Distance	**Time (± 0.1 s)**				
(± 0.01 m)	**Trial 1**	**Trial 2**	**Trial 3**	**Trial 4**	**Trial 5**
1.50					

Average Time to travel 1.50 m = _________± ____ s

$$\overline{V_{cart}} = \frac{d}{t} =$$

- Draw a straight line across your strip of butcher paper to mark your starting position.
- Tape the measuring tape to the floor so that the 0.00 m mark is at the starting line and extends in the positive direction.

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2. For this section, you will be pulling the butcher paper in the **positive direction** while the car is moving. Measure and record the distance (along the measuring tape on the floor) that the car travels in approximately **the <u>same average time you determined in question 1</u>**. (use the same time for all 5 trials) Record your measurements in Table 2.

Table 2: Distance (measured along the floor) that the car travels with a positive "current"

Time	**Distance (± 0.01 m)**				
(± _____ s)	**Trial 1**	**Trial 2**	**Trial 3**	**Trial 4**	**Trial 5**

Average distance traveled = _____________

$$\overline{V} = \frac{d}{t} =$$

3. What is the average velocity of the "current"? How do you know?

4. For this section, you will be pulling the butcher paper in the **negative** direction while the car is moving. Try to pull the paper at the same rate and for the same time that you did in the previous question. **Measure and record the distance** (relative to the floor) that the car travels in the **same average time you determined in question 1**.

Table 2: Distance (measured along the floor) that the car travels with a negative direction "current"

Time	Distance (± 0.01 m)				
(± _____ s)	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5

Average distance traveled = ____________

$$\overline{V} = \frac{d}{t} =$$

5. What is the average velocity of the "current"? How do you know?

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6. Sometimes boats try to cross the river's width. Draw a vector diagram to show what the velocity of the boat would appear to be according to someone standing on shore if the boat were to move at its constant speed, pointed perpendicularly to the current.

7. Predict (calculate) the overall velocity of the "boat" according to someone standing on the shore using your previous velocity data and your vector diagram.

8. Predict the overall displacement of the "boat" by the time it has crossed the "river". Predict how far downstream the boat will land if it remains perpendicular to the current for its entire crossing.

9. Try it! Measure the downstream distance when your "boat" has finished crossing the river. Use that data, and the width of the river, to calculate the overall displacement. How does your experimental result compare to your expected(predicted) result?