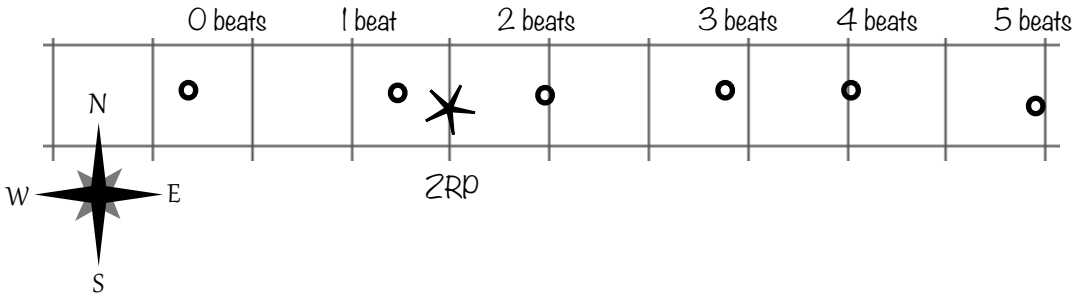
Name: _____

Groovy Dune Buggy Lab Preparation

Date: _____ Period: _____



During the Dune Buggy Lab, you will record your raw measurement data in Table 1. Here is Table 1 for the pattern of washers above.

Table 1. Position vs. time point for a groovy dune buggy traveling along the floor of the physics classroom

Time Point (beats)	Position (tiles, direction)
0 beats	2.7 tiles, W
1 beat	0.6 tiles, W
2 beats	0.9 tiles, E
3 beats	2.8 tiles, E
4 beats	4.1 tiles, E
5 beats	5.9 tiles, E

Next, calculate the *displacement* during the interval between each time point and the next. *Rather than write out the calculation for every interval, please just write **one** sample calculation below Table 2.* Perform the remaining calculations without writing them down and record all of your answers in Table 2. I have printed out a sample calculation below so you will know what they should look like.

Table 2. Displacement vs. time interval for a yellow buggy traveling along the floor of the physics classroom

Beginning & ending time points (beats)	Duration of Time Interval, (beats)	Displacement (tiles, direction)
0 beats → 1 beat	1 beat	
3 beats → 4 beats		1.5 tiles, Eward

Sample Calculations

$\text{time interval}_{3\rightarrow4} = \text{time point}_4 - \text{time point}_3$ $\text{time interval}_{3\rightarrow4} = (4 - 3)\ \text{beats}$ $\text{time interval}_{3\rightarrow4} = 1\ \text{beat}$

$\text{displacement}_{3\rightarrow4} = \text{position}_4 - \text{position}_3$ $\text{displacement}_{3\rightarrow4} = (4.1 - 2.8)\ \text{tiles}$ $\text{displacement}_{3\rightarrow4} = 1.3\ \text{tiles, Eward}$

Answers (approximately): Time Intervals are all equal to 1 beat.
Displacements, from top row to bottom: 2.1 tiles, Eward; 1.5 tiles, Eward; 1.9 tiles, Eward; 1.3 tiles, Eward; 1.8 tiles, Eward

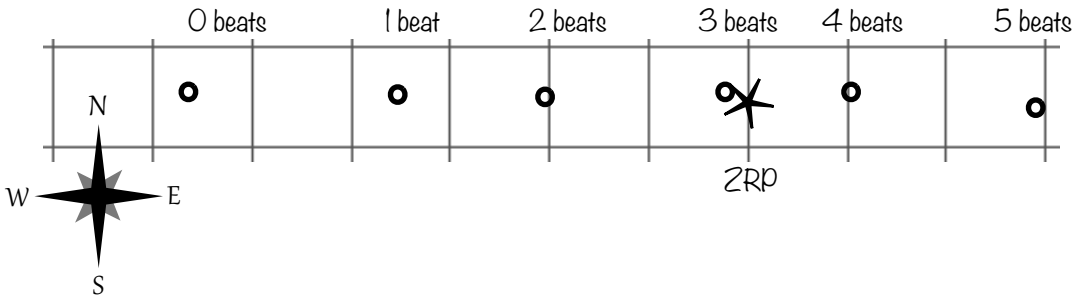
Name: _____

Homework: Dune Buggy Lab Preparation

Date: _____ Period: _____

Please answer the following questions neatly, in pencil, on a nice, clean sheet of lined notebook paper. Express your ideas as complete thoughts written in clear, declarative English sentences. Let every pronoun refer unmistakably to a definite antecedent.

Here is another pattern of washers that mark the positions passed by a dune buggy as it traveled along the floor of the physics classroom. The ZRP is in a different place, however.



1) On your notebook paper, prepare Table 1. (*See the example on page 1 of the lesson.*)
   a) On the third blue line down from the top of the front side of your notebook paper, write the title for Table 1; write the column headings with units.
   b) Record your *position* measurements in the body of the table. *Remember to write the unit after every number!*

2) Prepare Table 2. (*See the example on page 2 of the lesson.*)
   a) On the third line down from the top of the back of your notebook paper, write the title for Table 2; write the column headings with units.
   b) Write one sample *time interval* calculation and one sample *displacement* calculation below Table 2. (*See the example on page 2 of the lesson.*)
   c) Record your calculations in the body of the table. *Remember to write the unit (and direction of displacement) after every number!*

3) Compare the position values in Table 1 on page 2 of the lesson and those you obtained in question 1b above. Both were obtained for the same pattern of washers, but the ZRP was located in a different place.

   Did moving the ZRP change the values of *position* by more than 0.3 tiles? Why? Explain why your answer makes sense.

4) Compare the *displacement* values you recorded in Table 2 on page 2 of the lesson with those you obtained in question 2b above. Both were obtained for the same pattern of washers, but the ZRP was located in a different place.

   Did moving the ZRP change the values of *displacement* by more than 0.3 tiles? Why? Explain why your answer makes sense.

Name: _____

Dune Buggy Paradigm Lab

Date: _____ Period: _____

Post-Lab Reflections

Objectives

Compare your data values with your expectations and with the predictions of the descriptive model of an object traveling at a constant speed.

Reflection Questions

What experimental question do you seek to answer in the Groovy Dune Buggy Lab?

_____

_____

Before you ever started the lab, you had already made two important observations about the dune buggies:

- The buggies are *supposed* to travel at a constant speed; they were designed to do so.
- The buggies *look* like they travel at a constant speed; that is, their speed does not *appear* to vary as they travel along.

Such observations are important! They justify the *expectation* that the buggy *does* travel at a constant speed. However, such observations and expectations are not enough: science requires *measurements*. You must determine whether your *measurement results* justify the conclusion that the buggy did, indeed do so. And, in order to determine *that*, you must compare your data to the prediction of the descriptive model of an object traveling at a constant speed.

How did you know *when* to place each washer on the floor?

_____

How did you know *where* to place each washer on the floor?

_____

Considering your answers to the preceding questions, what does *each washer* show?

_____

What do the *spaces between the washers* show?

_____

1) Choose the trial during which you think you did the best job of placing washers as the buggy traveled along the floor.
2) Using *your own* best trial, calculate the buggy's displacement during each one-beat time interval.
3) Write out *one sample calculation* below Table 2.
4) Record *your* calculated displacements in Table 2 below.
5) Copy your partners' calculated displacements into Table 2. (*If you were in a group of two, you had only one partner!*)

Table 2. Displacement vs. time interval for a groovy dune buggy traveling along the physics classroom floor

Beginning & Ending Time Points	Duration of Time Interval	Displacement		
		A's Calculated Values	B's Calculated Values	C's Calculated Values
0 beats → 1 beat	1 beat			
1 beat→ 2 beats				

Group Member Names:

Student A: _____

Student B: _____

Student C: _____

Sample Calculation:

displacement = later position − earlier position (formula)

displacement = _____ (calculation)

displacement = _____ (answer)

According to the descriptive model, what should be true about the spaces between the washers if the groovy dune buggy traveled at a constant speed?

Carefully explain whether your displacement values are *exactly* as predicted by the descriptive model of an object moving at a constant speed.

If your displacement values are *not exactly* as the model predicts, do they show some other pattern? For example:

- Do they tend to get bigger as time passes?
- Do they tend to get smaller as time passes?
- Do they just get bigger and smaller in a seemingly random way, without increasing or decreasing in size overall?

You have good reasons to *expect* your data to show that the buggy traveled at a constant speed: it was designed to do so, and it *looks* like it does. Yet, your data values (most certainly) do not show *exactly* equal changes of position during equal time intervals. So, during the next few lessons, we will try to find out two things:

- Why do the data values vary as they do?
- Is it possible to explain the variations in such a way that you may yet *honestly* conclude that the buggy traveled at a constant speed, as you expect?