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Unit 2 - Worksheet 1

Simulating Motion

Today we will be taking the data you collected in lab and using them to produce a working simulation of the motion of the buggy. In order to do this, we must first describe the motion of your buggy as a ***function***.

Load the program found at the following URL: https://goo.gl/3zJsp7. There are two things you need to fill in before this simulation will run. The first is the identifier `delta-t`. As the comment indicates, this value represents how much time passed between each tick of the metronome. When we did this experiment as a class, the metronome was set to tick every two seconds, so for now set the value of `delta-t` to `2` (you will be able to play around with this later).

1. Use the design recipe to help you figure out how to write the function `next-x` and update your program accordingly.

2. Once you've finished editing your program, run the simulation and describe what happens.

3. Does your simulation behave the way you expected it to? Explain.

4. How far did the buggy go before the simulation ended? How many ticks did that take? How much time passed?

5. Now let's say we repeated this experiment, but with the metronome ticking twice as fast. Change your code so that the metronome ticks once a second. What changes did you make?

6. Run your modified simulation and record what you see. What changed?

7. How far did the buggy go before the simulation ended? How many ticks did that take? How much time passed?

8. Was your buggy moving at the same speed it was before you changed the metronome? How do you know?

9. Change the definition of your `next-x()` function so that your buggy has the same speed for the following values of `delta-t`. Write the code you alter in the table below.

`next-x()` Definition	**`delta-t`**
	`1`
	`2`
	`0.5`
	`4`

10. How could we write this function so that we do not need to change it whenever we change the value of `delta-t`?

11. Based on these questions, what was the speed of your buggy?

12. Set the value of `delta-t` to `0.05` (so the metronome ticks 20 times a second) and run your simulation. This time, copy the data table that pops up when the simulation finishes into LoggerPro. Sketch the graph you get of ***position*** vs. ***time*** in the space below.

13. Can you figure out the velocity of your buggy from this graph? How would you do that?

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Design Recipe

Contract & Purpose Statement

Every contract has three parts:

```
# _____ :: _____ -> _____
```
name — Domain — Range

```
# _____
```
What does the function do?

Contract & Purpose Statement

Write examples of your function in action

```
examples:
```

_____ (_____)
The user types…

is _____
…which should become

_____ (_____)
The user types…

is _____
…which should become

```
end
```

Function

Circle the changes in the examples, and name the variables.

```
fun _____ ( _____ ):
```

_____

```
end
```


