**Unit 4 – Solving Complex Problems**

**\*\*Instructions:** Please change the text color of your responses to red text. Please organize the endings to each page.

**ACTIVITY 4.1.2 – Simulations to Predict Growth Rates**

**GOALS:**

* Use models and simulations to find trends in data.
* Differentiate between correlation and causation.
* Identify bias while deriving meaning from a simulation.
* Compare a simulated event with a real-world event.

You will be using NetLogo for this assignment. Please make sure that you have it installed on your laptop.   
  
Complete the following:

Step 3: Record the value of the Num Turtles reporter in the table as you step through the simulation using the go once button.

|  |  |
| --- | --- |
| Iteration Num | Num Turtles |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

Step 7: Explore how color is managed in NetLogo because it is an important part of this model. Select **Tools > Color Swatches** to see NetLogo's color names and values.  If you were to set **color-inc** to **0** and **init-color** to **55**, what color(s) will be used to render the tree?

|  |
| --- |
|  |

Step 8: If you were to set **color-inc** to 1**0** and **init-color** to **50**, what color(s) will be used to render the tree?

|  |
| --- |
|  |

Step 9: Keep **color-inc set**to 10 and change **init-color** to **105**. What are the colors of the tree.

|  |
| --- |
|  |

Step 12: What if you wanted to create a fractal with many different shades of the same color? Create this pattern.

|  |
| --- |
|  |

Step 18: Modify the model so that one simulation parameter, the length of time a person stays immune, is part of the interface. What parameter did you add or remove to make this simulation work correctly?

|  |
| --- |
|  |

With a highly infectious disease that has little chance of recovery, will a larger population spread the disease and make it worse or will it mean a faster elimination of the virus? Use the simulation to justify your prediction. Describe your conclusion and how you used the simulation to justify it.

|  |
| --- |
|  |

Step 22: Describe the different states of the nodes in the network. Use the HOW IT WORKS description on the **Info** page to help you answer this question.

1. What do you think a red node indicates?

|  |
| --- |
|  |

1. What does gray indicate for both the node and its links?

|  |
| --- |
|  |

1. When a node alternates between blue and red, what does it represent?

|  |
| --- |
|  |

Step 23: Eventually, this simulation will automatically stop. Observe the world and the Network Status plot to describe the state of the model when this occurs.

|  |
| --- |
|  |

Step 24: Run the simulation without **view updates** at least five times. What is the fastest and slowest rate of virus eradication (when the virus is gone from the network)?

|  |
| --- |
|  |

Step 25: Keeping other parameters at their default value, increase the **number-of-nodes** to 300. Does this affect the rate of growth? Why or why not?

|  |
| --- |
|  |

Step 30: Observe the effect of a real-life virus called Code Red that began at midnight on July 19, 2001. Search internet images for **“code red virus” graph**. The quotation marks will help you narrow your search results. Using the data visualizations in your search results, how fast did the virus spread and then how long did it take to become (mostly) eradicated? How does your simulated virus spread to reflect the real-world spread?

|  |
| --- |
|  |

Conclusion: How can simulations be used to predict growth?

|  |
| --- |
|  |