Defenders Lab 1: Comparing Two Medicines

Introduction

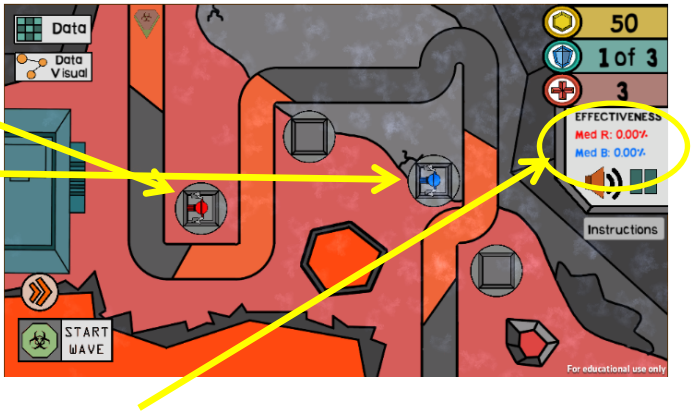
In this lab, you will be playing an online videogame, **Defenders**. In this game, there is an outbreak of new viruses. Two potential medicines are currently being tested to stop the viruses from spreading. For simplicity, we will refer to them as **Med R** and **Med B**. Both have shown some evidence of success when compared against a placebo. However, neither is 100% effective and more testing is needed to determine which treatment is best. Your task is to determine the best treatment strategy to stop the spread of the viruses.

Go to the web site: https://stat2games.sites.grinnell.edu.
Click on the **Defenders** tab, then click **Play Defenders**
Note: ***This site may take a few minutes to load.***

- Input your own **Player ID**: This will be on the web. ***Do not use a player name that will identify you.*** However, make sure you print your Player ID on this worksheet. Player ID_____.
- Your instructor will tell you your **Group ID** _____. ***Every person in the class needs an identical Group ID.***
- Click the yellow play button: ▶
- Click on the blue land to complete the **Tutorial**.

TASK #1: Collecting Level 1 Information

After entering Level 1, select **Pillshooter Fast Lvl1** with **Med R** at Location 1 and **Pillshooter Fast Lvl1** with **Med B** at Location 3.



*Pillshooter Fast Lvl1 is the upgrade of Pillshooter. The upgrade action can be completed after you choose the medicine for the turrets.

Wave1: Click the **Start Wave** button and record your results for **Wave 1** (the first Round) below.

Med R Effectiveness_____ **Med B Effectiveness**_____

Wave2: Using the same settings, click the **Start Wave** button and record your results after **Wave 2** below.

Med R Effectiveness_____ **Med B Effectiveness**_____

Strategy for Wave 3: After Wave 2, hover over the Start Wave button and you will see that there will be 5 Red and 25 Blue Enemies in Wave 3. Do not make any changes to the location or upgrades in each turret. Provide a strategy *only based upon changing the type of medicine* for **Wave 3**. Will you use Med R for both locations, Med B for both locations, or some other combination?

Location 1 Med ___ Location 3 Med ____

Play Wave 3 and record your results:

Remaining Funds at the end of Level 1 _____

Med R Effectiveness_____ **Med B Effectiveness**_____

TASK #2: Meaningful Data Summaries:

Click on the **Data Visuals** button, and choose **Percent Destroyed** for the dropdown that currently displays "Total Shots" and check the **Show Averages** check box. Hover over each of the points representing averages on the graph and record the following:

Med R: Percent Red Enemy Destroyed_____ Percent Blue Enemy Destroyed_____
Med B: Percent Red Enemy Destroyed_____ Percent Blue Enemy Destroyed_____

***Note that Percent Destroyed is the same as the effectiveness of the medicine against that enemy.**

In the **Data Visuals**, change **Dot Plot** to **Bar Chart** and record the following information:

Med R	Destroyed	Missed	Total Shots
Red Enemy			
Blue Enemy			
Total			

Med B	Destroyed	Missed	Total Shots
Red Enemy			
Blue Enemy			
Total			

Show how you can use the Med **R** table to calculate the overall **Medicine R (Red) Effectiveness** for Level 1.

What information do these graphs provide? In particular, does there appear to be a pattern between the effectiveness of the medicine and the type of enemy? Knowing that a majority of Wave 3 enemies are blue, should you make any changes to your strategy? If so, what medicines will you use?

Location 1 Med ___ Location 3 Med ____ Instructor's signature_____

TASK #3: Design A New Strategy For Level 1

Now that you have seen some patterns related to the medicine effectiveness, play Level 1 again. Do the data visualizations provide any indication that you should change medicines between each of the waves? In the table below, list whether you use Med R or Med B in each level. Explain your reasoning.

*If you didn't build a turret at that location, leave it empty.

Wave 1	Wave 2	Wave 3
Location ___ Med___ Upgrade_____	Location ___ Med___Upgrade_____	Location ___ Med___Upgrade_____
Location ___ Med___ Upgrade_____	Location ___ Med___Upgrade_____	Location ___ Med___Upgrade_____
Location ___ Med___ Upgrade_____	Location ___ Med___Upgrade_____	Location ___ Med___Upgrade_____
Location ___ Med___ Upgrade_____	Location ___ Med___ Upgrade_____	Location ___ Med___ Upgrade_____

Play through all of Level 1 again with this new strategy. Record your results below.

Remaining Funds at the end of Level 1 _____

Med R Effectiveness_____ Med B Effectiveness_____

Did your performance (total funds and health at the end of the level) improve? Describe why you believe the strategy used here is better (or worse) than the one used before.

Task #4: Find a Winning Strategy

Graph 1: Go to the app that shows data for every player: http://shiny.grinnell.edu/Defenders_Visualizations/ . Create a graph (using only Level 1 data) that provides evidence that the effectiveness of the medicines depends on the type of enemy. Take a screenshot of the graph and post it below.

Graph 2: Create a graph (using only Level 1 data) that helps you determine whether the effectiveness of the medicines depends upon the wave. Take a screenshot of the graph, post it below, and state your conclusions.

Graph 3: Create a graph (using only Level 1 data) that helps you determine whether the effectiveness of the medicines depends upon the type of upgrade. Take a screenshot of the graph, post it below, and state your conclusions.

With this additional information, design a strategy that you believe would give the best performance for Level 1. List the medicine type (Med R or Med B) and upgrade (Fast, Far, None) for each location you use for each wave.

Wave 1	Wave 2	Wave 3
Location ___ Med___ Upgrade_____	Location ___ Med___Upgrade_____	Location ___ Med___Upgrade_____
Location ___ Med___ Upgrade_____	Location ___ Med___Upgrade_____	Location ___ Med___Upgrade_____
Location ___ Med___ Upgrade_____	Location ___ Med___Upgrade_____	Location ___ Med___Upgrade_____
Location ___ Med___ Upgrade_____	Location ___ Med___ Upgrade_____	Location ___ Med___ Upgrade_____

Remaining Funds at the end of Level 1 _____ Health _____

Did your performance (total funds and health at the end of the level) improve? Describe why you believe the strategy used in Task #4 is better than (or worse) than the one used in Task #1 or Task #3.