Jupyter Notebook Activity Sheet Key

Directions Open the file WhatisAWave_NOTEBOOK.ipynb in <u>Google Colaboratory</u> by selecting "File->Open Notebook" (NOTE: You will need a Google Account to use Google Colaboratory.) Read each cell (block) of text and run each cell of code by clicking the play button on the left side of the block as indicated by the red circle in the figure below.	
= + Code + Text	Connect 👻 🎤 Editing 🖍
 Introduction to Plotting in Python 	
This notebook will walk you through the basics of using Python's libraries to create and plot basic functions and tangent lines! In high school, you probably learned about how to plot and analyze basic functions like lines, parabolas, exponentials, and trigonometic functions. While a TI-	
89 works fine for plotting these, it can be useful to know how to use Python to customize and plot these functions as well! First, let's walk	
through how to create and plot a linear function.	↑ ↓ © 🔲 💠 🔋 :
<pre>through how to create and plot a linear function. Pirst let's import some libraries import matplotlib.pyplot as plt tmatplotlib inline </pre>	

1. Set the **amplitude** of the wave to 0. Describe the graph. The graph is a horizontal line

2. Now, set the **amplitude** to a positive value. Then, set the **amplitude** to a negative value of the same magnitude (i.e. if you used a +2 in the previous step, you should use -2 for this step). How does the plot with a positive amplitude differ from the plot with the negative value?

The graph with the negative amplitude should start at zero then move downward first The graph with the positive amplitude should start at zero then move upward first OPTIONAL/BONUS: The magnitude of the amplitude is the same for each graph

 Reset the plot (re-run the code cell). Now, set the **frequency** to 0 and adjust the **phase** shift. Describe the graph and how it changes in response to a change in **phase shift**.
 When the frequency is 0, the graph is a horizontal line

Changing the phase shift causes the line to move up (phase shift is positive) or down (phase shift is negative)



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4. Reset the plot. Now, set the **amplitude** to 2 and the **frequency** to 0.1. How many **zeroes** are in the plot? How does the number of **zeroes** change when you **double** the frequency?

There are 5 zeroes (x-intercepts) if you count the beginning and end of the wave (3 is also a suitable answer if the beginning and end are not counted)

The number of zeroes increases when the frequency is doubled—there should be 9 (or 7, if the beginning and end aren't counted)

5. Create your own sine wave by adjusting all four properties to values of your choice. Provide the equation below, along with a sketch of the graph.

All answers are suitable here—just make sure students include the values of A, f, p, and v in an equation and include a small sketch of their wave.

OPTIONAL: Have students group together and try to recreate each other's waves based ONLY on their sketches!

Name:



Using Jupyter Notebook to Explore Waves Activity - Jupyter Notebook Activity Sheet Key