Introduction to Matplotlib

Course Code: CPE 031	**Program**: Computer Engineering
Course Title: Visualization and Data Analysis	**Date Performed**: 10 / 22 /24
Section: CPE21S4	**Date Submitted**: 10 / 22 /24
Name: Frederick D. Masangkay	**Instructor**: Engr. Ma. Rizette Sayo

Intended Learning Outcomes (ILO):

By the end of this laboratory session, learners will be able to:
1. Utilize Matplotlib's pyplot interface to create a variety of visualizations, including line plots, scatter plots, histograms, and box plots, demonstrating an understanding of the library's syntax and functionality.

2. Customize visual elements such as titles, labels, and legends to enhance the clarity and aesthetics of their plots, applying best practices in data visualization.

3. Analyze and interpret visual data representations to extract meaningful insights, effectively communicating findings through well-structured graphical presentations.

Part 1: Perform the following codes, and understand the difference between line plot, scatter plot, histogram, bar chart, box plot, and pie chart using matplotlib's pyplot sub-module.
(Provide a screenshot of your output.)

1. Line Plot

```python
import matplotlib.pyplot as plt

x = [1, 2, 3, 4]
y = [10, 20, 25, 30]
plt.plot(x, y)
plt.title("Line Plot Example")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.show()
```
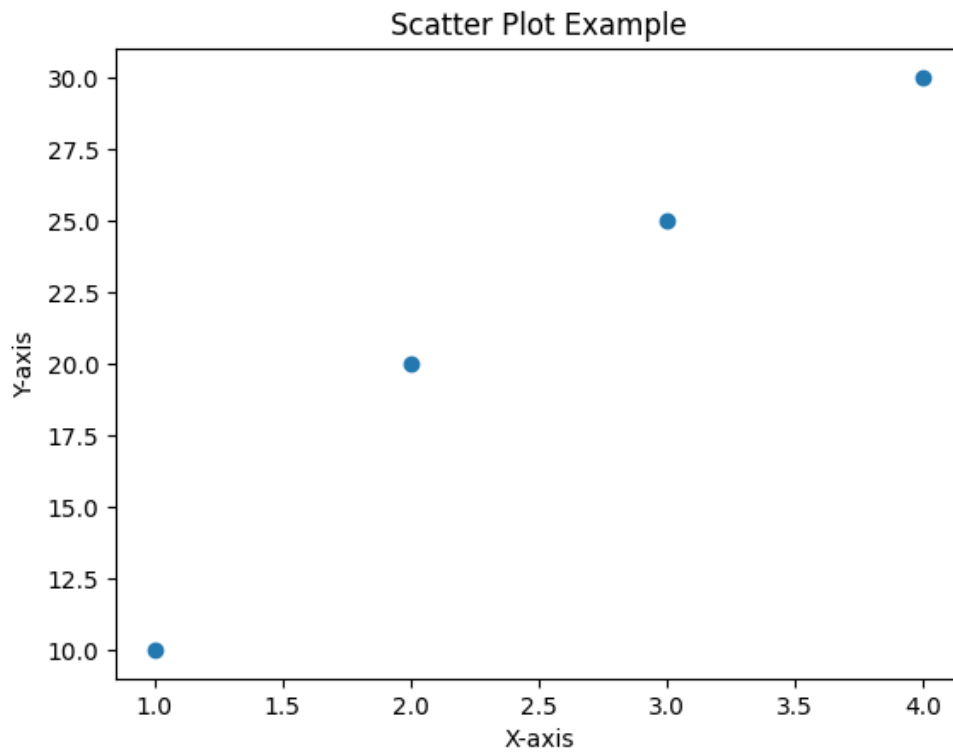

Line Plot Example
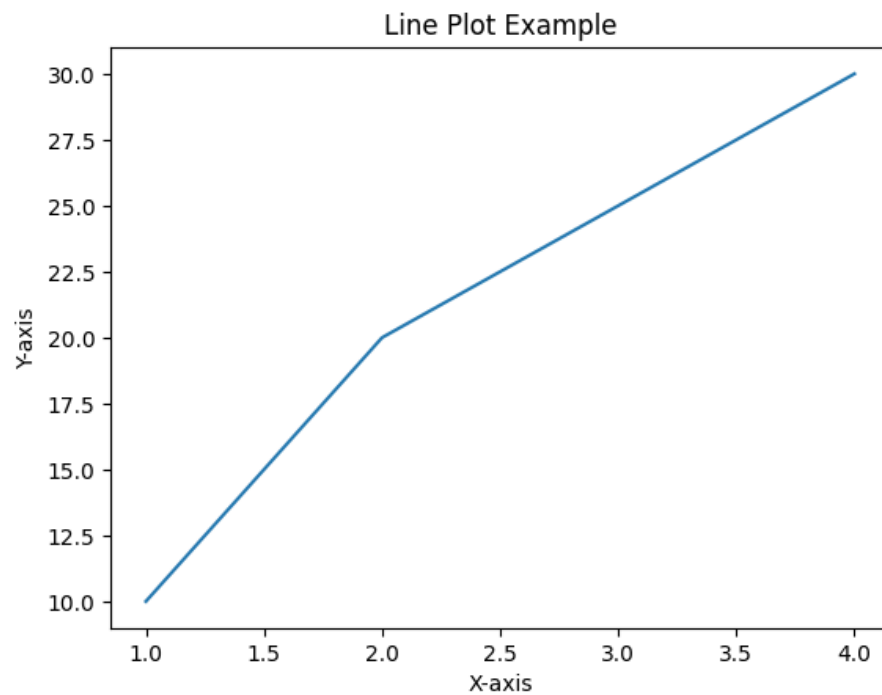
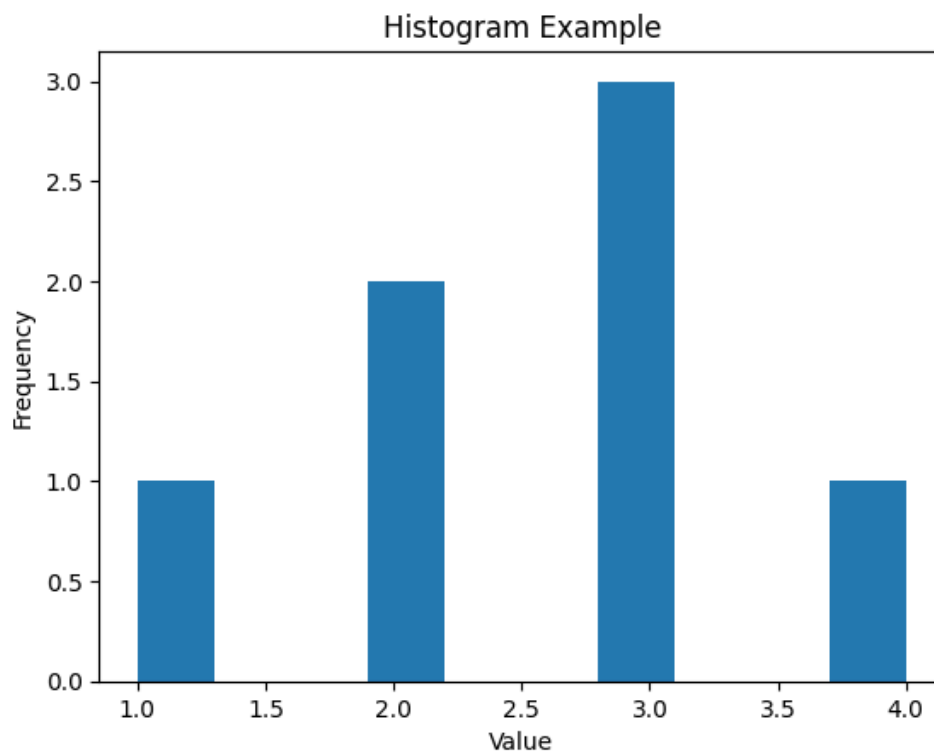2. Scatter Plot

```python
import matplotlib.pyplot as plt

x = [1, 2, 3, 4]
y = [10, 20, 25, 30]
plt.scatter(x, y)
plt.title("Scatter Plot Example")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.show()
```


Scatter Plot Example

3. Histogram

```python
import matplotlib.pyplot as plt

data = [1, 2, 2, 3, 3, 3, 4]
plt.hist(data)
plt.title("Histogram Example")
plt.xlabel("Value")
plt.ylabel("Frequency")
plt.show()
```


Histogram Example

4. Bar Chart

```python
import matplotlib.pyplot as plt

categories = ['A', 'B', 'C']
values = [5, 7, 3]
plt.bar(categories, values)
plt.title("Bar Chart Example")
plt.xlabel("Categories")
plt.ylabel("Values")
plt.show()
```
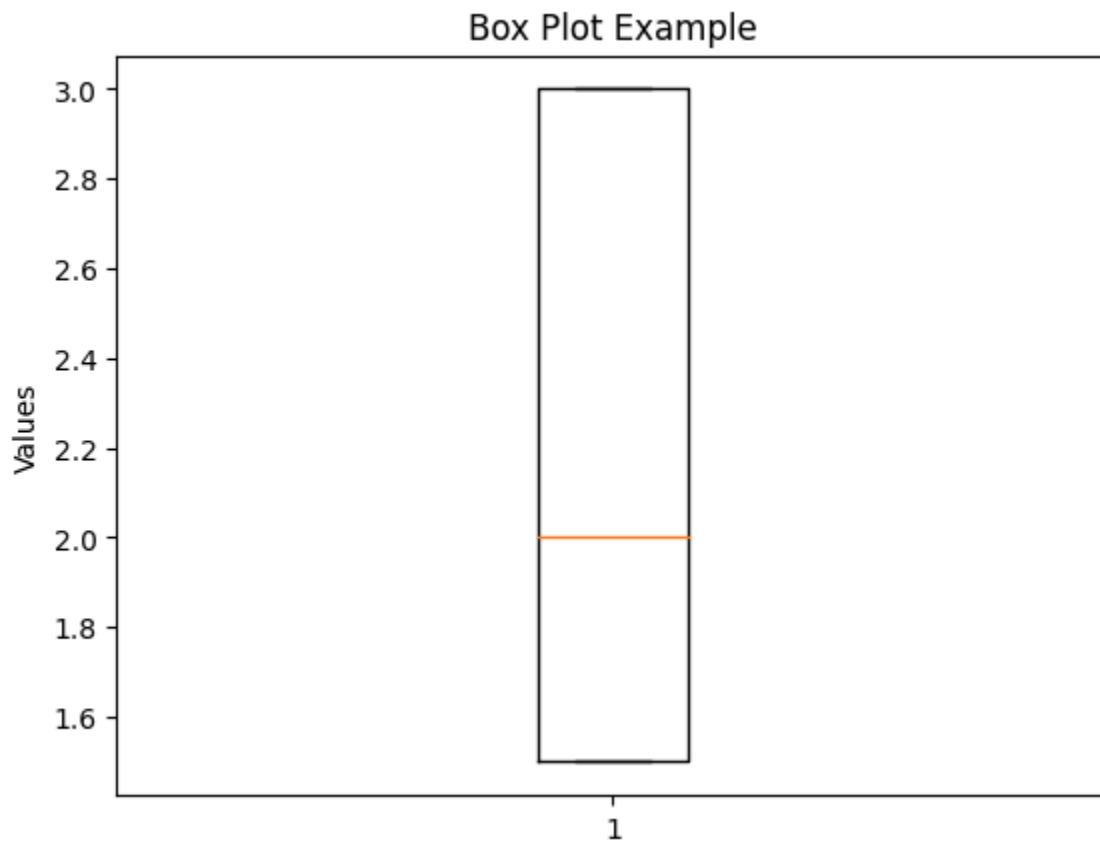

Bar Chart Example
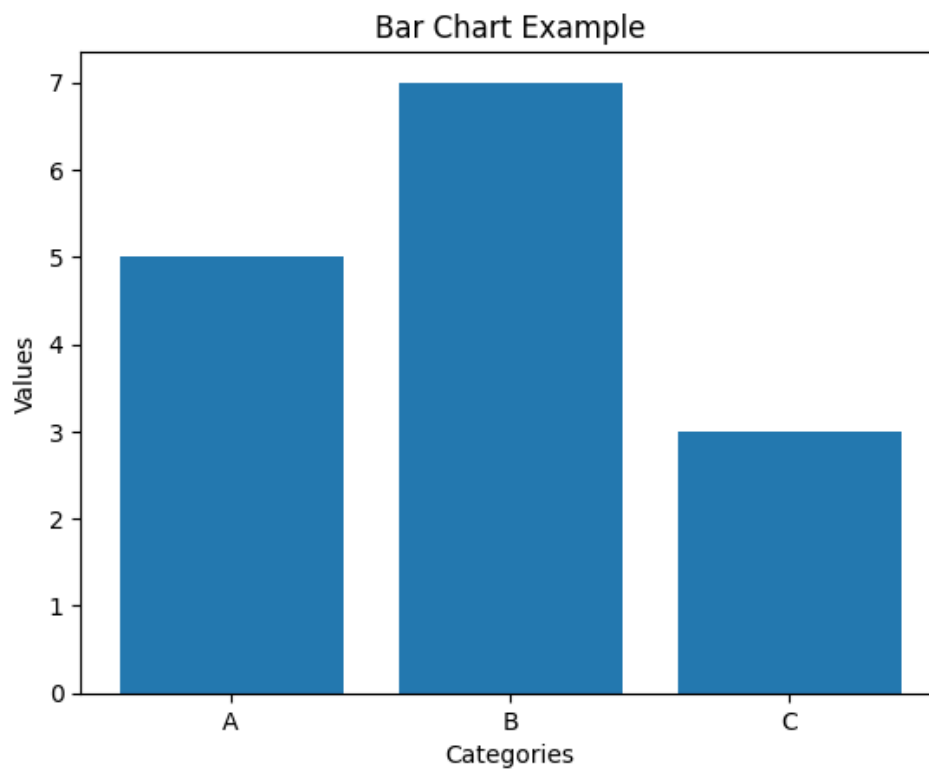
5. Box plot

```
import matplotlib.pyplot as plt

data = [[1.5]*10 + [2]*10 + [3]*10]

plt.boxplot(data)

plt.title("Box Plot Example")
plt.ylabel("Values")
plt.show()
```
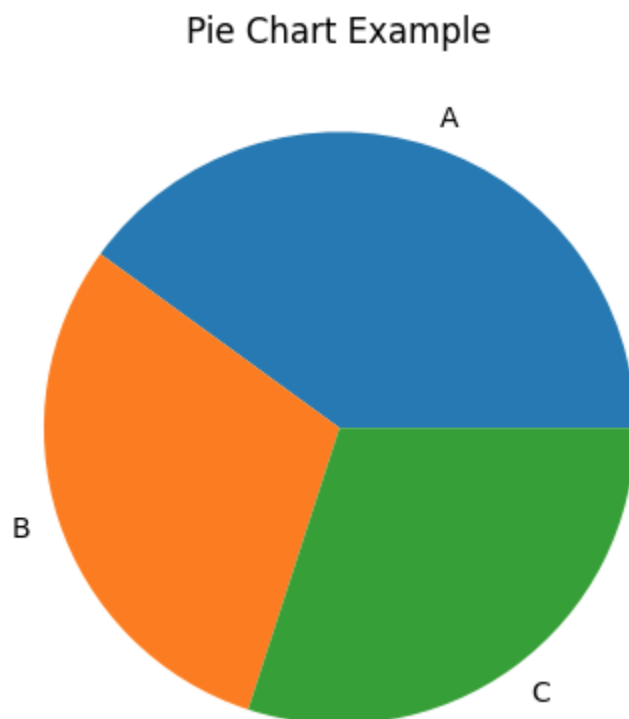

Box Plot Example

6. Pie chart

```python
import matplotlib.pyplot as plt

labels = ['A', 'B', 'C']
sizes = [40, 30, 30]

plt.pie(sizes, labels=labels)
plt.title("Pie Chart Example")
plt.show()
```

Pie Chart Example

DIfferences:
Line plots, scatter plots, histograms, bar charts, box plots, and pie charts has its own purpose but also it has differences. For example, line and scatter plots are used for continuous data and relationships. Histogram is used for understanding distribution. Bar charts is used for comparing categories. Box plot is used for summarizing distributions and spotting outliers.

Lastly, pie charts is for illustrating proportions of a whole.

Part 2: Refer to the instructions below.

1. **Find a dataset for this activity**: Please visit Kaggle and look for a new dataset that would allow you to perform visualization and analysis using matplotlib.

2. **Creating a dataframe from your CSV file:** Once you have successfully loaded your dataset, you need to create a dataframe from your uploaded CSV file

3. **Import the matplotlib.pyplot**

4. **Based on your chosen dataset, you will develop three questions that you will answer using pyplot visualizations. This means that you will need to produce at least three pyplot visualizations. You are also required to make certain customizations on your data vizes.**

5. Provide observations for each of your data viz, then **produce one insight not longer than five sentences given your three observations**. Your output shall follow this outline:
   a. Introduction (Describe your dataset)
   b. Questions
   c. Visualization and Observation
   d. Insight

Introduction:
The data set chosen was a representation of League of Legends champions Tank characters. Those attributes are the ones that are directly related to their role. There's also other attributes like movement speed and attack speed, it's like the general attributes for any character not specific for their role.

Questions:
"How does the balance between health and damage among these champions influence their effectiveness in different roles or matchups in the game?"

"What impact does attack speed have on the overall damage output and playstyle of these champions, and how does it compare to their other attributes like health and damage?"

"How do the differences in base armor and magic resistance among these champions affect their durability and effectiveness in both physical and magical damage matchups?"

Visualization and Observation:

Champion Health and Damage
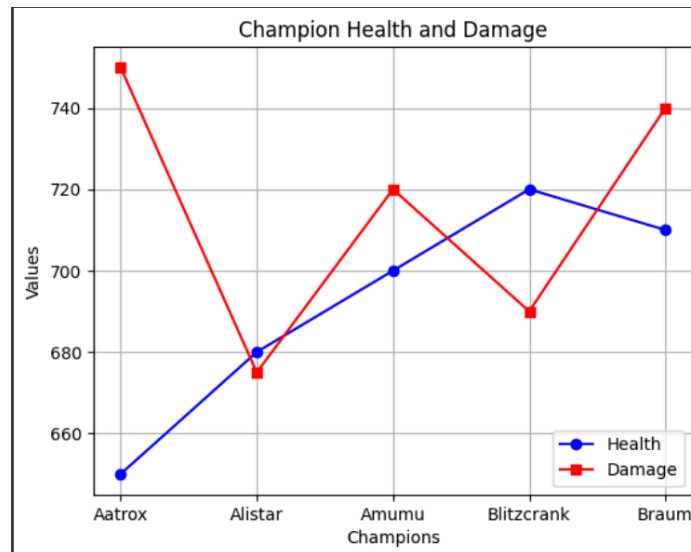
On this output, we can observe that the damage and health of the champions does not go too far besides to "Aatrox". We can safely say that the ankiness and damage output of each hero on average was already balanced in the game.
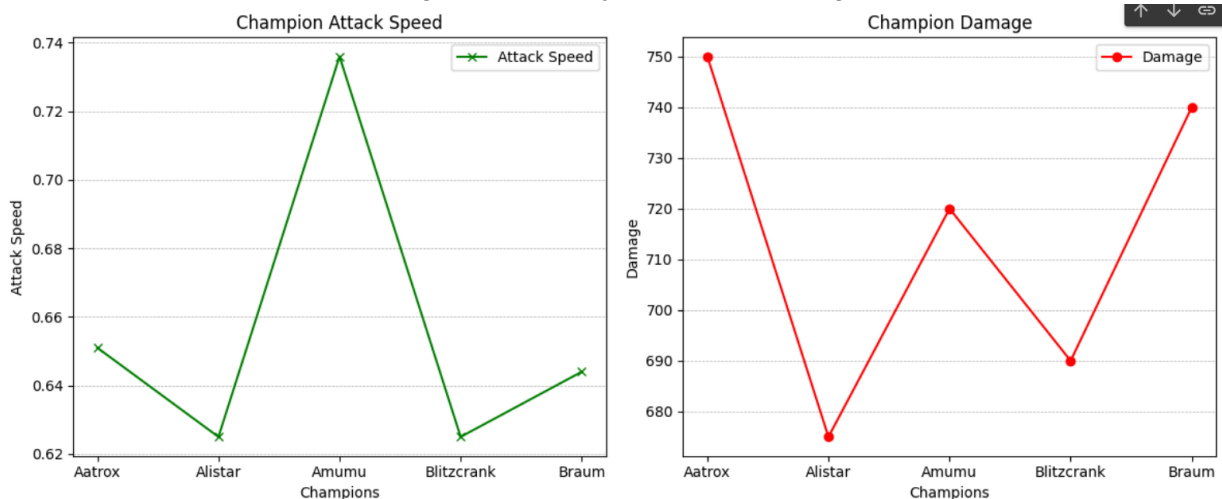
On this line graph, we can observe two attributes of the champions. Left is the attack speed then damage on the right side. It can also indicate a various playstyle for each character as they have their unique value of attack speed and damage combined.

Champion Armor and Magic Resistance
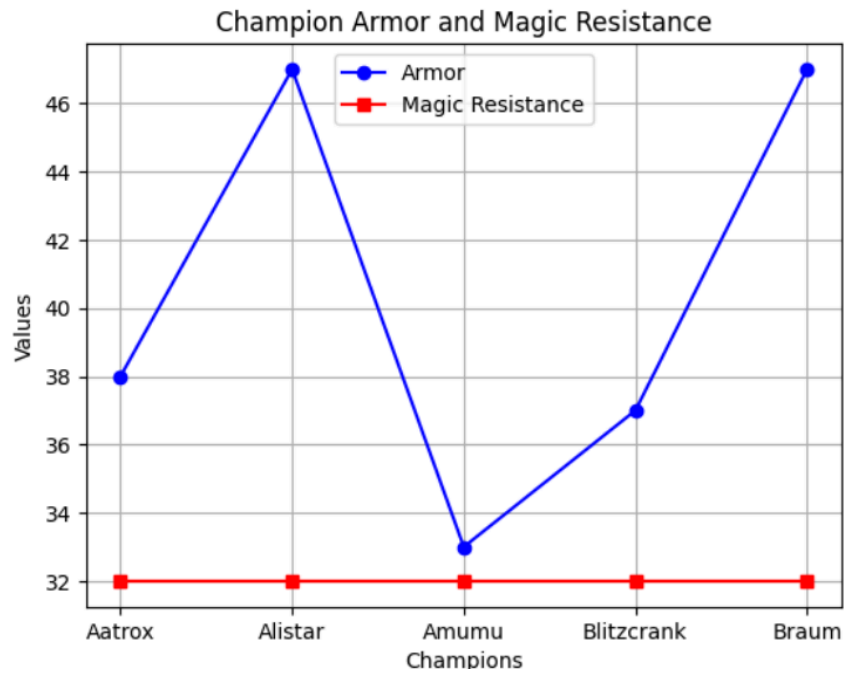
The line graph shows the base armor and base magic resistance, we can observe from this the defensive capabilities of each champion according to the type of damage they can handle. Generally, magic resistance has wider values because magic damage output are only limited from mages champion only unlike from armor that needs to be balanced because any attack especially auto attack can damage them. Auto attack can be cast frequently compared to magic spells.

6. Your grade will depend on the quality of the question, difficulty/complexity of the visualization, and value-add of the insight that you will generate.