Name:_____   **Partners:**   _____
Python Activity 26: Plotting Data
Plotting data is useful, but first we have to get data into the right format.

Learning Objectives
Students will be able to:
Content:
- Describe what is needed in order to plot data
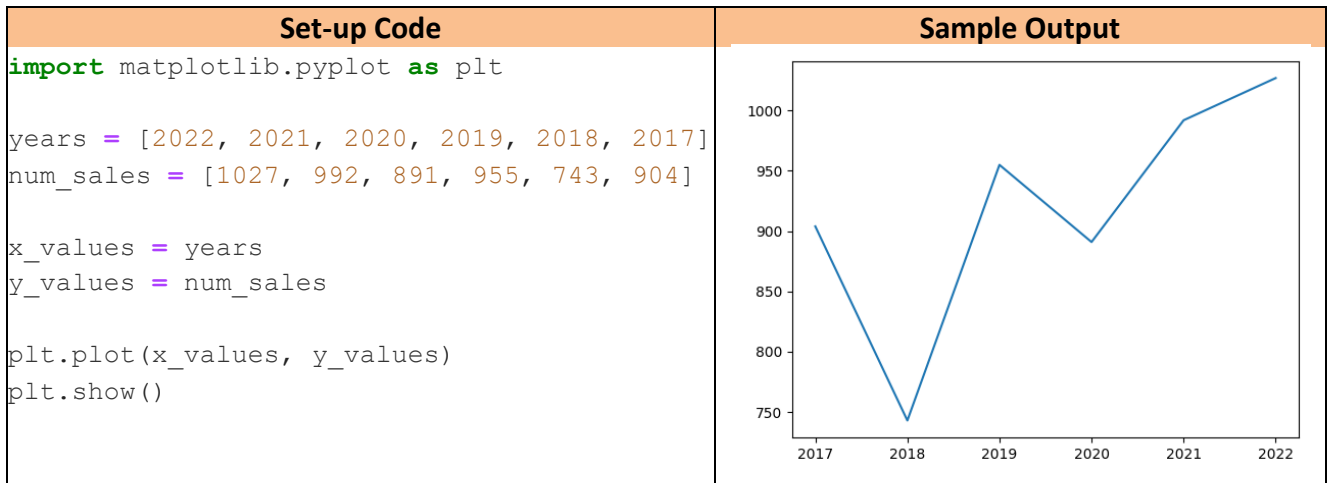- Predict what **matplotlib** code will do

Process:
- Write code that rearranges data for plotting
- Write code that plots data with appropriate labels

Prior Knowledge
- Python concepts: import, x&y axes, lists, loops

Critical Thinking Questions:

1. Examine the sample code below, which uses data on Lickety Split's yearly ice cream sales of their flavor, Purple Cow, and the output from this code:

Set-up Code	Sample Output
| ```python
import matplotlib.pyplot as plt

years = [2022, 2021, 2020, 2019, 2018, 2017]
num_sales = [1027, 992, 891, 955, 743, 904]

x_values = years
y_values = num_sales

plt.plot(x_values, y_values)
plt.show()
``` |  |

   a. Circle the code concepts that are new to us.

   b. What *type* of variable is num_sales?   _____

   What *type* of variable are the *elements* of num_sales?   _____

   What does the data in num_sales represent? _____

   What is the *smallest* value of the elements in num_sales? _____

   What is the *largest* value of the elements in num_sales? _____

   What is the *smallest* value of the X-axis in the sample output?   _____

What is the *largest* value of the X-axis in the sample output? _____

🔑 How might the data in `years` relate to the values in the X-axis of the output?

_____

c.   What *type* of variable is `num_sales`? _____

What *type* of variable are the *elements* of `num_sales`? _____

What does the data in `num_sales` represent? _____

What is the *smallest* value of the elements in `num_sales`? _____

What is the *largest* value of the elements in `num_sales`? _____

What is the *smallest* value of the Y-axis in the sample output? _____

What is the *largest* value of the Y-axis in the sample output? _____

🔑 How might the data in `num_sales` relate to the values in the Y-axis of the

output? _____

🔑 d.   What might the lines with, `plt.plot(x,y)` & `plt.show()`, be doing?

_____

e.   What might happen to the output, if we switched the `x_values` and `y_values`
where they're assigned?

_____

🔑 f.   What might the line, `import matplotlib.pyplot as plt`, do?

_____

2.   Examine the sample code and output below, which continues from Question 1:

Sample Code, continued	Sample Output
``` plt.plot(years, num_sales) plt.xticks(years[::2]) plt.show() ```	

a.   Circle the code that is different from Question1.

b.   Circle what is different in this sample output, compared to Question 1's output.

c. Which of this new code might be responsible for the changes we see in the sample output? _____

d. What might the `plt.xticks(..)` method do?

_____

e. If you had to guess, what might a `plt.yticks(..)` method do?

_____

f. If we replaced line 13 with `plt.xticks(years, ['Y1', 'Y2', 'Y3', 'Y4', 'Y5', 'Y6'])` the X-tick on our plot that currently says 2018 would be replaced with `Y2`, 2020 with `Y4`, and 2022 with `Y6`. Why might that be?

_____

What might the second parameter of `plt.xticks(..)` represent?

_____

3. Examine the sample code and output below, which continues from Questions 1 & 2:

Sample Code, continued	Sample Output
``` plt.figure(figsize=(4, 4)) plt.plot(years, num_sales) plt.xticks(years) plt.xlabel("Year") plt.ylabel("Num Cones Sold") plt.title("Num Cones Sold Per Year") plt.show() ```	

a. Circle the code that is different from Question 2.

b. Circle what is different in this sample output, compared to Question 2's output.

c. Match the function below, on the left, to what you think it might do, on the right:

```
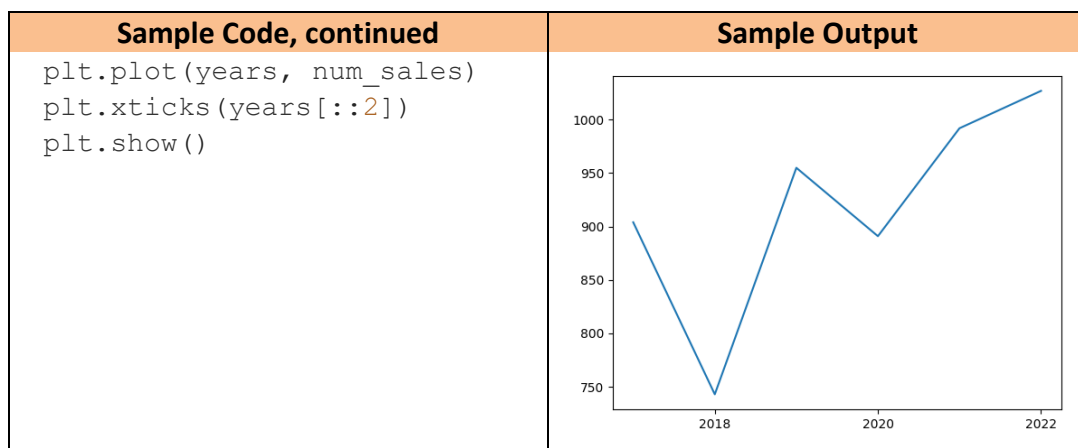plt.figure(figsize=(4, 4))
plt.plot(x_vals, y_vals)
plt.xticks(listXticks)
plt.yticks(l1,l2)
plt.xlabel(a_string)
plt.ylabel(a_string)
plt.title(a_string)
plt.show()
```

Specifies which values to show on the X-axis
The values to show on the Y-axis, and their labels
Specifies a top caption for the plot
Specifies the X-axis label
Specifies the size of the plot
Specifies the Y-axis label
Displays the the completed plot
Makes the plot

4. Examine the sample code and output below:

Sample Code	Sample Output
| ```python
import matplotlib.pyplot as plt

flavors = ["Purple Cow", "Sweet Cream", "Mudpie"]
num_sales = [1027, 1509, 2231]

# Create a new figure:
plt.figure()
# Create a bar chart
plt.bar(flavors, num_sales)
plt.xticks(flavors, flavors, rotation=90)

# axis labels and title
plt.xlabel("Flavor")
plt.ylabel("Num Cones Sold")
plt.title("Num Cones Sold in 2022")
plt.show()
``` |  |
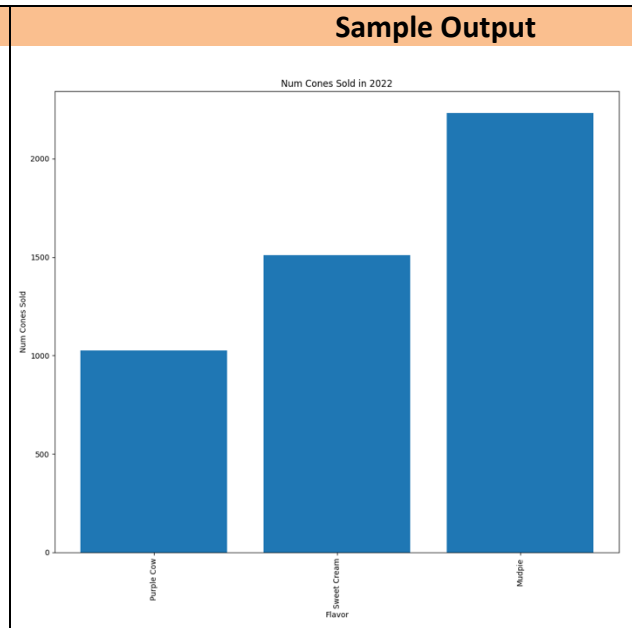
a. Circle the code that is different from Question 3.

b. Circle what is different in this sample output, compared to Question 1's output.

   What *kind* of chart did we make in Question 1-3?   _____

   What *kind* of chart did we make in this Question 4?   _____

   Which of the code we circled in (a) might be responsible for the change in chart type?

   _____

c. What variable represents the X-values in this example?   _____

   What variable represents the X-values in Question 1-3?   _____

   How do these two variables differ?

   _____

d. What variable represents the Y-values in this example?   _____

   What variable represents the Y-values in Question 1-3?   _____

   How do these two variables differ?

   _____

e. What *type* of object is flavors?   _____ of _____

   What does flavors represent in the above code?   _____

   What *type* of object is num_sales?   _____ of _____

What does `num_sales` represent in the above code? _____

f. If you had to guess, what might the `rotation=90` argument value do to our X-ticks?

_____

Application Questions: Use the Python Interpreter to check your work.

TBD.