**Python Libraries**

**NumPy -**

1. Write a Python program to convert a list of numeric value into a one-dimensional NumPy array.   
Expected Output:  
Original List: [12.23, 13.32, 100, 36.32]   
One-dimensional numpy array: [ 12.23 13.32 100. 36.32]   
  
2. Create a 3x3 matrix with values ranging from 2 to 10.   
Expected Output:  
[[ 2 3 4]   
[ 5 6 7]   
[ 8 9 10]]   
  
3. Write a Python program to create a null vector of size 10 and update sixth value to 11.   
[ 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.]   
Update sixth value to 11   
[ 0. 0. 0. 0. 0. 0. 11. 0. 0. 0.]  
  
4. Write a Python program to reverse an array (first element becomes last).   
Original array:   
[12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37]   
Reverse array:   
[37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12]   
  
5. Write a Python program to create a 2d array with 1 on the border and 0 inside.   
Expected Output:  
Original array:   
[[ 1. 1. 1. 1. 1.]   
[ 1. 1. 1. 1. 1.]   
[ 1. 1. 1. 1. 1.]   
[ 1. 1. 1. 1. 1.]   
[ 1. 1. 1. 1. 1.]]   
1 on the border and 0 inside in the array   
[[ 1. 1. 1. 1. 1.]   
[ 1. 0. 0. 0. 1.]   
[ 1. 0. 0. 0. 1.]   
[ 1. 0. 0. 0. 1.]   
[ 1. 1. 1. 1. 1.]]  
  
6. Write a Python program to add a border (filled with 0's) around an existing array.   
Expected Output:  
Original array:   
[[ 1. 1. 1.]   
[ 1. 1. 1.]   
[ 1. 1. 1.]]   
1 on the border and 0 inside in the array   
[[ 0. 0. 0. 0. 0.]   
[ 0. 1. 1. 1. 0.]   
[ 0. 1. 1. 1. 0.]   
[ 0. 1. 1. 1. 0.]   
[ 0. 0. 0. 0. 0.]]  
  
  
7. Write a Python program to create a 8x8 matrix and fill it with a checkerboard pattern.   
Checkerboard pattern:  
[[0 1 0 1 0 1 0 1]   
[1 0 1 0 1 0 1 0]   
[0 1 0 1 0 1 0 1]   
[1 0 1 0 1 0 1 0]   
[0 1 0 1 0 1 0 1]   
[1 0 1 0 1 0 1 0]   
[0 1 0 1 0 1 0 1]   
[1 0 1 0 1 0 1 0]]  
  
8. Write a Python program to convert a list and tuple into arrays.   
List to array:  
[1 2 3 4 5 6 7 8]   
Tuple to array:  
[[8 4 6]   
[1 2 3]]  
  
9. Write a Python program to append values to the end of an array.   
Expected Output:  
Original array:  
[10, 20, 30]   
After append values to the end of the array:  
[10 20 30 40 50 60 70 80 90]  
  
10. Write a Python program to find the real and imaginary parts of an array of complex numbers.   
Expected Output:  
Original array [ 1.00000000+0.j 0.70710678+0.70710678j]   
Real part of the array:   
[ 1. 0.70710678]   
Imaginary part of the array:  
[ 0. 0.70710678]   
  
  
11. Write a Python program to find the number of elements of an array, length of one array element in bytes and total bytes consumed by the elements.   
Expected Output:  
Size of the array: 3  
Length of one array element in bytes: 8   
Total bytes consumed by the elements of the array: 24   
  
  
12. Write a Python program to find common values between two arrays.   
Expected Output:  
Array1: [ 0 10 20 40 60]   
Array2: [10, 30, 40]  
Common values between two arrays:  
[10 40]   
  
13. Write a Python program to find the set difference of two arrays. The set difference will return the sorted, unique values in array1 that are not in array2.   
Expected Output:  
Array1: [ 0 10 20 40 60 80]  
Array2: [10, 30, 40, 50, 70, 90]   
Set difference between two arrays:  
[ 0 20 60 80]  
  
14. Write a Python program to find the set exclusive-or of two arrays. Set exclusive-or will return the sorted, unique values that are in only one (not both) of the input arrays.   
Array1: [ 0 10 20 40 60 80]   
Array2: [10, 30, 40, 50, 70]   
Unique values that are in only one (not both) of the input arrays:   
[ 0 20 30 50 60 70 80]  
  
15. Write a Python program compare two arrays using numpy.   
Array a: [1 2]  
Array b: [4 5]  
a > b   
[False False]  
a >= b   
[False False]   
a < b   
[ True True]   
a <= b   
[ True True]

**Pandas**

1. Write a Python program to create and display a one-dimensional array-like object containing an array of data using Pandas module.   
   
 2. Write a Python program to convert a Panda module Series to Python list and it's type.   
 3. Write a Python program to add, subtract, multiple and divide two Pandas Series.   
Sample Series: [2, 4, 6, 8, 10], [1, 3, 5, 7, 9]  
   
 4. Write a Python program to get the powers of an array values element-wise.   
 Note: First array elements raised to powers from second array  
 Expected Output:  
 Original array   
 [0 1 2 3 4 5 6]   
 First array elements raised to powers from second array, element-wise:   
 [ 0 1 8 27 64 125 216]  
  
 5. Write a Python program to create and display a DataFrame from a specified dictionary data which has the index labels.  
 Sample Python dictionary data and list labels:  
   
 exam\_data = {'name': ['Anastasia', 'Dima', 'Katherine', 'James', 'Emily', 'Michael', 'Matthew', 'Laura', 'Kevin', 'Jonas'],  
 'score': [12.5, 9, 16.5, np.nan, 9, 20, 14.5, np.nan, 8, 19],  
'attempts': [1, 3, 2, 3, 2, 3, 1, 1, 2, 1],  
'qualify': ['yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'no', 'yes']}  
labels = ['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j']  
  
  
 6. Write a Python program to display a summary of the basic information about a specified Data Frame and its data.  
Sample Python dictionary data and list labels:  
   
exam\_data = {'name': ['Anastasia', 'Dima', 'Katherine', 'James', 'Emily', 'Michael', 'Matthew', 'Laura', 'Kevin', 'Jonas'],  
'score': [12.5, 9, 16.5, np.nan, 9, 20, 14.5, np.nan, 8, 19],  
'attempts': [1, 3, 2, 3, 2, 3, 1, 1, 2, 1],  
'qualify': ['yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'no', 'yes']}  
labels = ['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j']  
  
 7. Write a Python program to get the first 3 rows of a given DataFrame.   
Sample Python dictionary data and list labels:  
exam\_data = {'name': ['Anastasia', 'Dima', 'Katherine', 'James', 'Emily', 'Michael', 'Matthew', 'Laura', 'Kevin', 'Jonas'],  
'score': [12.5, 9, 16.5, np.nan, 9, 20, 14.5, np.nan, 8, 19],  
'attempts': [1, 3, 2, 3, 2, 3, 1, 1, 2, 1],  
'qualify': ['yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'no', 'yes']}  
labels = ['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j']  
  
 8. Write a Python program to select the 'name' and 'score' columns from the following DataFrame.   
Sample Python dictionary data and list labels:  
exam\_data = {'name': ['Anastasia', 'Dima', 'Katherine', 'James', 'Emily', 'Michael', 'Matthew', 'Laura', 'Kevin', 'Jonas'],  
'score': [12.5, 9, 16.5, np.nan, 9, 20, 14.5, np.nan, 8, 19],  
'attempts': [1, 3, 2, 3, 2, 3, 1, 1, 2, 1],  
'qualify': ['yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'no', 'yes']}  
labels = ['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j']  
  
 9. Write a Python program to select the specified columns and rows from a given data frame.   
Select 'name' and 'score' columns in rows 1, 3, 5, 6 from the following data frame.  
exam\_data = {'name': ['Anastasia', 'Dima', 'Katherine', 'James', 'Emily', 'Michael', 'Matthew', 'Laura', 'Kevin', 'Jonas'],  
'score': [12.5, 9, 16.5, np.nan, 9, 20, 14.5, np.nan, 8, 19],  
'attempts': [1, 3, 2, 3, 2, 3, 1, 1, 2, 1],  
'qualify': ['yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'no', 'yes']}  
labels = ['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j']  
  
 10. Write a Python program to select the rows where the number of attempts in the examination is greater than 2.   
exam\_data = {'name': ['Anastasia', 'Dima', 'Katherine', 'James', 'Emily', 'Michael', 'Matthew', 'Laura', 'Kevin', 'Jonas'],  
'score': [12.5, 9, 16.5, np.nan, 9, 20, 14.5, np.nan, 8, 19],  
'attempts': [1, 3, 2, 3, 2, 3, 1, 1, 2, 1],  
'qualify': ['yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'no', 'yes']}  
labels = ['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j']  
  
 11. Write a Python program to count the number of rows and columns of a DataFrame.   
Sample data:  
exam\_data = {'name': ['Anastasia', 'Dima', 'Katherine', 'James', 'Emily', 'Michael', 'Matthew', 'Laura', 'Kevin', 'Jonas'],  
'score': [12.5, 9, 16.5, np.nan, 9, 20, 14.5, np.nan, 8, 19],  
'attempts': [1, 3, 2, 3, 2, 3, 1, 1, 2, 1],  
'qualify': ['yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'no', 'yes']}  
labels = ['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j']

**Python Matplotlib**

**1.** Write a Python program to draw a line with suitable label in the x axis, y axis and a title

**2.** Write a Python program to draw a line using given axis values with suitable label in the x axis , y axis and a title

**3.** Write a Python program to draw a line using given axis values taken from a text file, with suitable label in the x axis, y axis and a title.

*Test Data:*

test.txt

1 2

2 4

3 1

**4.** Write a Python program to draw line charts of the financial data of Alphabet Inc. between October 3, 2016 to October 7, 2016.

Sample Financial data (fdata.csv):

Date,Open,High,Low,Close

03-10-16,774.25,776.065002,769.5,772.559998

04-10-16,776.030029,778.710022,772.890015,776.429993

05-10-16,779.309998,782.070007,775.650024,776.469971

06-10-16,779,780.47998,775.539978,776.859985

07-10-16,779.659973,779.659973,770.75,775.080017

**5.** Write a Python program to plot two or more lines on same plot with suitable legends of each line.

**6.** Write a Python program to plot two or more lines with legends, different widths and colors.

**7.** Write a Python program to plot two or more lines with different styles

**Matplotlib Barchart**

**1.** Write a Python programming to display a bar chart of the popularity of programming Languages.

Sample data:

Programming languages: Java, Python, PHP, JavaScript, C#, C++

Popularity: 22.2, 17.6, 8.8, 8, 7.7, 6.7

**2.** Write a Python programming to display a horizontal bar chart of the popularity of programming Languages.

Sample data:

Programming languages: Java, Python, PHP, JavaScript, C#, C++

Popularity: 22.2, 17.6, 8.8, 8, 7.7, 6.7

**3.** Write a Python programming to display a bar chart of the popularity of programming Languages. Use uniform color.

Sample data:

Programming languages: Java, Python, PHP, JavaScript, C#, C++

Popularity: 22.2, 17.6, 8.8, 8, 7.7, 6.7

**4.** Write a Python programming to display a bar chart of the popularity of programming Languages. Use different color for each bar.

Sample data:

Programming languages: Java, Python, PHP, JavaScript, C#, C++

Popularity: 22.2, 17.6, 8.8, 8, 7.7, 6.7

**5.** Write a Python programming to display a bar chart of the popularity of programming Languages. Attach a text label above each bar displaying its popularity (float value).

Sample data:

Programming languages: Java, Python, PHP, JavaScript, C#, C++

Popularity: 22.2, 17.6, 8.8, 8, 7.7, 6.7

**6.** Write a Python programming to display a bar chart of the popularity of programming Languages. Make blue border to each bar.

Sample data:

Programming languages: Java, Python, PHP, JavaScript, C#, C++

Popularity: 22.2, 17.6, 8.8, 8, 7.7, 6.7

**Matplotlib Piechart**

**1.** Write a Python programming to create a pie chart of the popularity of programming Languages.

Sample data:

Programming languages: Java, Python, PHP, JavaScript, C#, C++

Popularity: 22.2, 17.6, 8.8, 8, 7.7, 6.7

**2.** Write a Python programming to create a pie chart with a title of the popularity of programming Languages.

Sample data:

Programming languages: Java, Python, PHP, JavaScript, C#, C++

Popularity: 22.2, 17.6, 8.8, 8, 7.7, 6.7

3**.** Write a Python programming to create a pie chart of gold medal achievements of five most successful countries in 2016 Summer Olympics. Read the data from a csv file.

Sample data:

**medal.csv**

country,gold\_medal

United States,46

Great Britain,27

China,26

Russia,19

Germany,17

**Matplotlib Scatterplot**

**1.** Write a Python program to draw a scatter graph taking a random distribution in X and Y and plotted against each other.

**2.** Write a Python program to draw a scatter plot with empty circles taking a random distribution in X and Y and plotted against each other.

**3.** Write a Python program to draw a scatter plot using random distributions to generate balls of different sizes.

**4.** Write a Python program to draw a scatter plot comparing two subject marks of Mathematics and Science. Use marks of 10 students.

Test Data:

math\_marks = [88, 92, 80, 89, 100, 80, 60, 100, 80, 34]

science\_marks = [35, 79, 79, 48, 100, 88, 32, 45, 20, 30]

marks\_range = [10, 20, 30, 40, 50, 60, 70, 80, 90, 100]

**5.** Write a Python program to draw a scatter plot for three different groups camparing weights and heights.

**Seaborn Bar plot**

1. Write a program to draw bar plot of sex against survived for a dataset given in the url

<https://github.com/mwaskom/seaborn-data/blob/master/titanic.csv>

**Seaborn pointplot**

1. Write a program to draw a point plot for sex against survived for a dataset given in url

<https://github.com/mwaskom/seaborn-data/blob/master/titanic.csv>

**Seaborn Scatterplot**

1. Write a program to draw a scatter plot of “day” against “total bill” for a dataset given in a url

<https://raw.githubusercontent.com/mwaskom/seaborn-data/master/tips.csv>

**Seaborn Violin Plot**

1. Write a program to draw a violin plot of sex against total\_bill for a given dataset

<https://raw.githubusercontent.com/mwaskom/seaborn-data/master/tips.csv>

2. Write a program to draw a violin plot of “species” against “sepal length” for a dataset given in a url

<https://github.com/mwaskom/seaborn-data/blob/master/iris.csv>

**Seaborn BoxPlot**

1. Write a program to draw box plot of life expectancy by continent for a data set given in a url <https://raw.githubusercontent.com/resbaz/r-novice-gapminder-files/master/data/gapminder-FiveYearData.csv>
2. Write a program to draw a box plot of day by tips for a dataset given in a url

<https://raw.githubusercontent.com/mwaskom/seaborn-data/master/tips.csv>

**Seaborn Swarm Plot**

1. Write a program to draw a swarm plot of total bill against size for a given dataset

<https://raw.githubusercontent.com/mwaskom/seaborn-data/master/tips.csv>

2. Write a program to draw swarm plot of “total bill” against day for a dataset given in url

<https://raw.githubusercontent.com/mwaskom/seaborn-data/master/tips.csv>

**Plotly Scatterplot**

1. Write a program to draw a scatter plot for random 1000 x and y coordinates

2. Write a program to draw line and scatter plots for random 100 x and y coordinates

3. Write a program to draw a scatter plot for random 500 x and y coordinates and style it

4. Write a program to draw a scatter plot for a given dataset and show datalabels on hover

https://raw.githubusercontent.com/plotly/datasets/master/2014\_usa\_states.csv