DV QP CAT 2 Answers

1.b) What is dictionary? Explain the methods available in dictionary.

Ans.1.b)

- Dictionaries are used to store data values in key:value pairs.
- A dictionary is a collection which is ordered*, changeable and do not allow duplicates.
- Dictionaries are written with curly brackets and have keys and values.

The methods available in dictionary are

Functions Name	Descriptions
clear()	Removes all items from the dictionary
copy()	Returns a shallow copy of the dictionary
fromkeys()	Creates a dictionary from the given sequence
get()	Returns the value for the given key
items()	Return the list with all dictionary keys with values
keys()	Returns a view object that displays a list of all the keys in the dictionary in order of insertion
pop()	Returns and removes the element with the given key
popitem()	Returns and removes the key-value pair from the dictionary
setdefault()	Returns the value of a key if the key is in the dictionary else inserts the key with a value to the dictionary
values()	Updates the dictionary with the elements from another dictionary
update()	Returns a list of all the values available in a given dictionary

2.b) Compare the difference between Numpy and Pandas

Ans.2.b)

Sr.No	Pandas	Numpy
1	When we have to work on Tabular data, we prefer the pandas module.	When we have to work on Numerical data, we prefer the numpy module.
2	The powerful tools of pandas are Data frame and Series.	Whereas the powerful tool of numpy is Arrays.
3	Pandas consume more memory.	Numpy is memory efficient.
4	Pandas have a better performance when the number of rows is 500K or more.	Numpy has a better performance when number of rows is 50K or less.
5	Indexing of the pandas series is very slow as compared to numpy arrays.	Indexing of numpy arrays is very fast.
6	Pandas have 2d table object called DataFrame.	Numpy is capable of providing multi-dimensional arrays.
7	It was developed by Wes McKinney and was released in 2008.	It was developed by Travis Oliphant and was released in 2005.
8	It is used in a lot of organizations like Kaidee, Trivago, Abeja Inc. , and a lot more.	It is being used in organizations like Walmart Tokopedia, Instacart, and many more.
9	It has a higher industry application.	It has a lower industry application.

3.b) How to manually add a legend with a color box on a Matplotlib figure?.

Ans. 3.b)

Matplotlib is a popular data visualization library in Python known for its flexibility and high-quality visualizations. By following this tutorial, you will learn how to create a legend with a color box on your Matplotlib figure, making your visualizations more informative and visually appealing.

Before diving into the code, it is important to understand the different elements of a legend. A legend is a key that labels the elements in our plot with different colors, markers, or lines. By adding a legend, we can understand the data being presented and make it easier for the audience to interpret our visualizations. In the next section, we will look at the syntax for creating a legend with a color box on a Matplotlib figure.

Syntax

To manually add a legend with a color box on a Matplotlib figure in Python, we can use the following syntax −

```
# Import libraries
import matplotlib.patches as mpatches
# Creating legend with color box
color_patch = mpatches.Patch(color='red', label='legend')
plt.legend(handles=[color_patch])
```

3.c) How to Generate a Waffle chart? Write a script to plot a waffle chart.
***Assume data frame as follow- data ={‘printer': ['Nokia', 'Samsung'. 'canon', 'Epson', 'hp'], 'stock': [24, 12, 8, 15, 3] }**

Ans.3.c)

A Waffle Chart is a gripping visualization technique that is normally created to display progress towards goals. Where each cell in the Waffle Chart constitutes of 10 X 10 cell grid in which each cell represents one percentage point summing up to total 100%. It is commonly an effective option when you are trying to add interesting visualization features to a visual. Waffle Charts are widely used as an Excel dashboard.

For generating Waffle Chart in Python, modules needed are – matplotlib, pandas and pyWaffle.

To install these packages, run the following commands :

```
pip install matplotlib
pip install pandas
pip install pywaffle
```

The Script to plot waffle chart of printer:

```
# python program to generate Waffle Chart

# importing all necessary requirements
import pandas as pd
import matplotlib.pyplot as plt
from pywaffle import Waffle

# creation of a dataframe
data ={‘printer': ['Nokia', 'Samsung'. 'canon', 'Epson', 'hp'],
'stock': [24, 12, 8, 15, 3]
        }
df = pd.DataFrame(data)

# To plot the waffle Chart
fig = plt.figure(
   FigureClass = Waffle,
   rows = 5,
   values = df.stock,
   labels = list(df.printer)
)
```

4.b) Create a list of nested dictionaries into pandas dataframe.

Ans.4.b)

A list of the nested dictionary, a Python program to create a Pandas dataframe using it.

The stepwise procedure to create a Pandas Dataframe using the list of nested dictionary.

Step #1: Creating a list of nested dictionary.

Step #2: Adding dict values to rows.

Step #3: Pivoting DataFrame and assigning column names.

Example:

```
import pandas as pd

# List of nested dictionaries
data = [
   {'Name': 'Alice', 'Age': 25, 'City': 'New York'},
   {'Name': 'Bob', 'Age': 30, 'City': 'San Francisco'},
   {'Name': 'Charlie', 'Age': 28, 'City': 'Los Angeles'},
]

# Creating a Pandas DataFrame
df = pd.DataFrame(data)

# Displaying the DataFrame
print(df)
```

This will create a DataFrame with columns 'Name', 'Age', and 'City', and each row represents a person with their respective details.

Output:

	Name	Age	City
0	Alice	25	New York
1	Bob	30	San Francisco
2	Charlie	28	Las Angeles

You can customize the data in the nested dictionaries to fit your specific requirements. Each key in the dictionaries becomes a column in the DataFrame, and each dictionary becomes a row.

4.c) Explain the steps of Creating a Word Cloud in Python.

Ans.4.c)

Creating a word cloud in Python involves visualizing the frequency of words in a text dataset in a visually appealing manner.

The steps to create a Word Cloud using Python:

1. Install Required Libraries:

- First, make sure you have the necessary libraries installed. You can install them using:

```
pip install wordcloud matplotlib
```

2. Import Libraries:

- Import the required libraries in your Python script or Jupyter Notebook.

```
import matplotlib.pyplot as plt
from wordcloud import WordCloud
```

3. Prepare Text Data:

- Load or prepare the text data that you want to create a word cloud for. This could be a string of text or a document.

```
text_data = "Your text data goes here. This is a sample text for creating a word cloud."
```

4. Generate Word Cloud:

- Create a WordCloud object and generate the word cloud from the text data. You can customize parameters like the background color, maximum number of words, and font size.

```
wordcloud = WordCloud(width=800, height=400,
background_color='white').generate(text_data)
```

5. Display the Word Cloud:

- Use Matplotlib to display the generated word cloud.

```
plt.figure(figsize=(10, 5))
plt.imshow(wordcloud, interpolation='bilinear')
plt.axis('off')  # Turn off axis labels
plt.show()
```

6. Optional: Save Word Cloud to File:

- If you want to save the word cloud as an image file, you can use the `to_file` method.

```
wordcloud.to_file('wordcloud.png')
```

Complete Example:

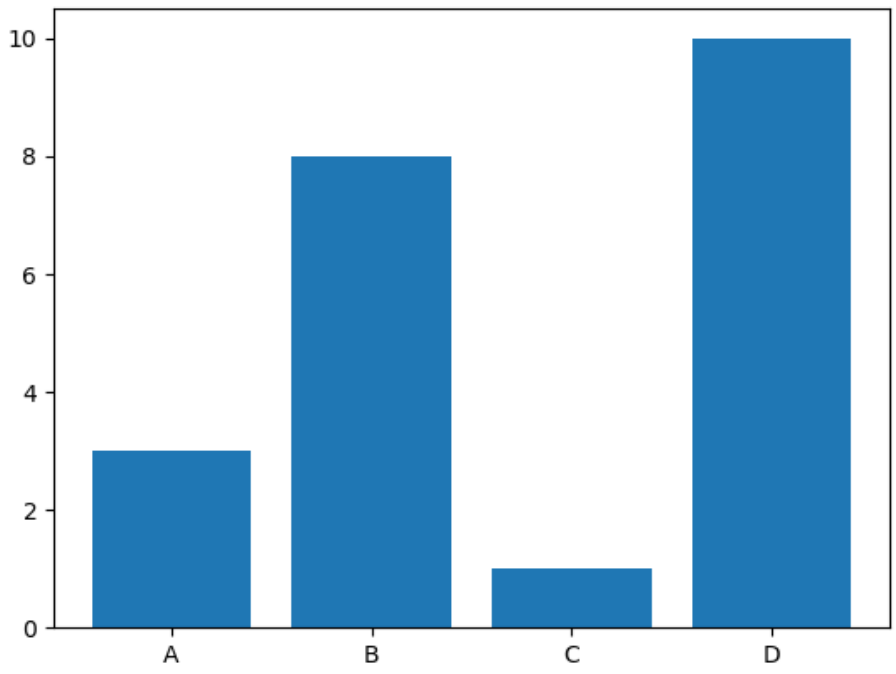
```
import matplotlib.pyplot as plt
from wordcloud import WordCloud

# Prepare Text Data
text_data = "Your text data goes here. This is a sample text for creating a word cloud."

# Generate Word Cloud
wordcloud = WordCloud(width=800, height=400,
background_color='white').generate(text_data)

# Display the Word Cloud
plt.figure(figsize=(10, 5))
plt.imshow(wordcloud, interpolation='bilinear')
plt.axis('off')
plt.show()

# Save Word Cloud to File (Optional)
# wordcloud.to_file('wordcloud.png')
```

5.b) Define following terms: i) Barplot, ii) Boxplot, iii) Stripplot

Ans.5.b)

i) Barplot

A barplot (or barchart) is one of the most common type of graphic. It shows the relationship between a numeric variable and a categoric variable.
Bar Plot are classified into four types of graphs - bar graph or bar chart, line graph, pie chart, and diagram.



Limitations of Bar Plot:

- When we try to display changes in speeds such as acceleration, Bar graphs won't help us.

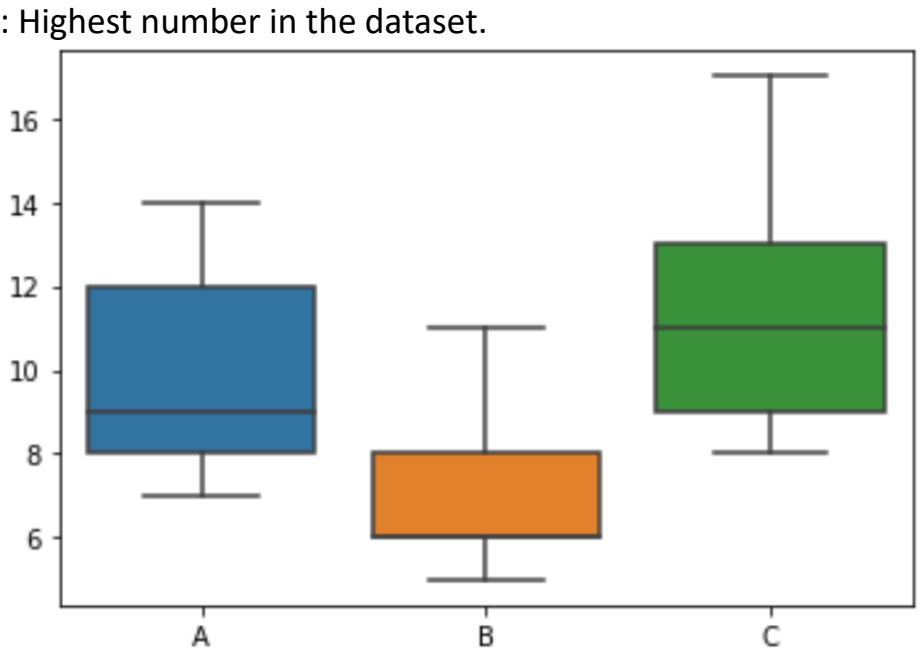
Advantages of Bar plot:

- Bar charts are easy to understand and interpret.
- Relationship between size and value helps for in easy comparison.
- They're simple to create.
- They can help in presenting very large or very small values easily.

ii) Boxplot

A box plot is a way of statistically representing the distribution of the data through five main dimensions :

- Minimum: Smallest number in the dataset.
- First quartile: Middle number between the minimum and the median.
- Second quartile (Median): Middle number of the (sorted) dataset.
- Third quartile: Middle number between median and maximum.
- Maximum: Highest number in the dataset.



Advantages:

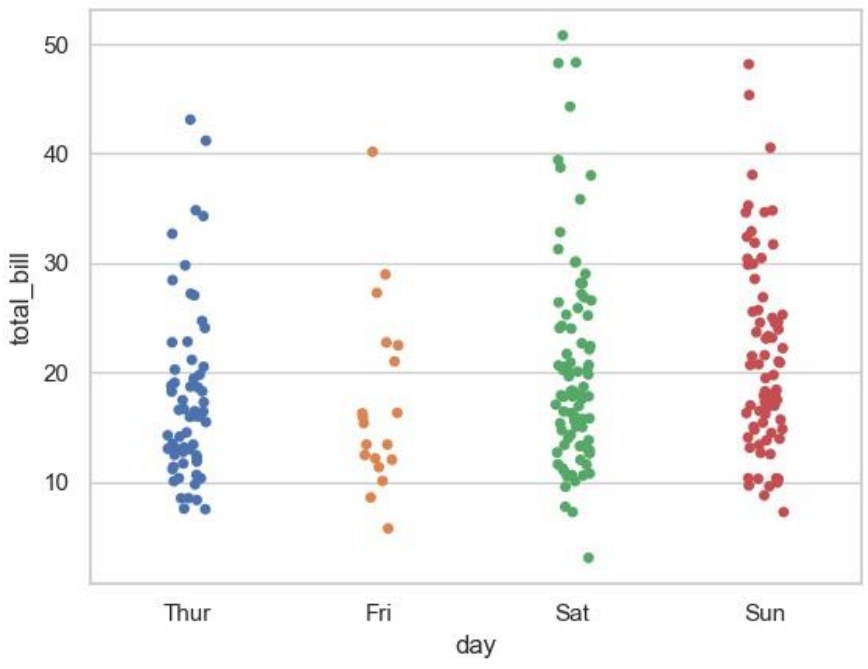
- The box plot organizes large amounts of data and visualizes outlier values.

Disadvantages:

- The box plot is not relevant for detailed analysis of the data as it deals with a summary of the data distribution.

iii) Stripplot

A strip plot is a type of categorical scatter plot that displays individual data points along a one dimensional axis. It is particularly useful for visualizing the distribution of data points within different categories. In a strip plot, each data point is represented as a dot, and the dots are aligned in a single line for each category.



Advantages

- Permits efficient application of factors that would be difficult to apply to small plots

Disadvantages

- Differential precision in the estimation of interaction and the main effects
- Complicated statistical analysis

5.c) How to create a Map with a Dataset? Explain with their syntax and parameter use.
Ans.5.c)
Creating a map with a dataset in Python can be achieved using various libraries, and one popular choice is `folium` for interactive maps. Below are the steps along with syntax and parameter explanations:

1. Install Required Library:
- Install the `folium` library if you haven't already:

```
pip install folium
```

2. Import Libraries:
- Import the necessary libraries in your Python script or Jupyter Notebook.

```
import folium
```

3. Load or Prepare the Dataset:
- Load or prepare the dataset containing geographical information (latitude, longitude, and any other relevant data).

4. Create a Map:
- Use the `folium.Map()` constructor to create a base map. Specify the initial center coordinates and zoom level.

```
my_map = folium.Map(location=[latitude, longitude], zoom_start=12)
```

- Parameters:
  - `location`: A list or tuple containing the latitude and longitude of the map's center.
  - `zoom_start`: Initial zoom level of the map.

5. Add Markers or GeoJSON Data:
- Add markers or custom data to the map using `folium.Marker()` for individual markers or `folium.GeoJson()` for GeoJSON data.

```
# Example with Marker
folium.Marker(location=[marker_latitude, marker_longitude], popup='Marker Popup').add_to(my_map)

# Example with GeoJSON data
folium.GeoJson(geojson_data).add_to(my_map)
```

- Parameters:
  - `location`: Latitude and longitude of the marker or GeoJSON data.
  - `popup`: Text or HTML content that appears when clicking on the marker.

6. Display or Save the Map:
- Use the `display()` function if using Jupyter Notebook, or save the map as an HTML file.

```
# Display the map (if using Jupyter Notebook)
my_map

# Save the map as an HTML file
my_map.save('my_map.html')
```

Complete Example:

```
import folium

# Create a Map
my_map = folium.Map(location=[37.7749, -122.4194], zoom_start=12)

# Add Marker
folium.Marker(location=[37.7749, -122.4194], popup='San Francisco').add_to(my_map)

# Display the Map (if using Jupyter Notebook)
my_map
```

6.b) i) What is Seaborn? ii) Different categories of plot in Seaborn.

Ans.6.b)

i) Seaborn:

Seaborn is a statistical data visualization library in Python that is based on Matplotlib. It provides a high-level interface for creating informative and attractive statistical graphics. Seaborn comes with several built-in themes and color palettes to make it easy to create aesthetically pleasing visualizations.

ii) Different Categories of Plots in Seaborn:

Seaborn provides a variety of plot types that are categorized into different functions. Here are some of the main categories of plots available in Seaborn:

1. Relational Plots:

- These plots are used to visualize the relationship between two variables.

2. Categorical Plots:

- Categorical plots are used to visualize the distribution of categorical data.

3. Distribution Plots:

- These plots are used to visualize the univariate distribution of a variable.

4. Regression Plots:

- Regression plots are used for visualizing the relationship between two variables and fitting a regression line.

5. Matrix Plots:

- Matrix plots are used to visualize data in matrix form.

6. Multi-plot Grids:

- Multi-plot grids allow the creation of complex visualizations with multiple plots.

7. Axis Grids:

- Axis grids provide a way to map the structure of a dataset onto the grid of subplots.

8. Color Palettes:

- Seaborn provides a variety of color palettes for enhancing the visual appeal of plots.

These categories cover a wide range of visualizations, making Seaborn a powerful tool for statistical data visualization in Python. The library is built on top of Matplotlib and integrates well with Pandas DataFrames.

6.c) Difference between Matplotlib and Seaborn with examples.

Ans.6.c)

Features	Matplotlib	Seaborn
Functionality	It is utilized for making basic graphs. Datasets are visualised with the help of bargraphs, histograms, piecharts, scatter plots, lines and so on.	Seaborn contains a number of patterns and plots for data visualization. It uses fascinating themes. It helps in compiling whole data into a single plot. It also provides distribution of data.
Syntax	It uses comparatively complex and lengthy syntax. Example: Syntax for bargraph- matplotlib.pyplot.bar(x_axis, y_axis).	It uses comparatively simple syntax which is easier to learn and understand. Example: Syntax for bargraph- seaborn.barplot(x_axis, y_axis).
Dealing Multiple Figures	We can open and use multiple figures simultaneously. However they are closed distinctly. Syntax to close one figure at a time: matplotlib.pyplot.close(). Syntax to close all the figures: matplotlib.pyplot.close("all")	Seaborn sets time for the creation of each figure. However, it may lead to (OOM) out of memory issues
Visualization	Matplotlib is well connected with Numpy and Pandas and acts as a graphics package for data visualization in python. Pyplot provides similar features and syntax as in MATLAB. Therefore, MATLAB users can easily study it.	Seaborn is more comfortable in handling Pandas data frames. It uses basic sets of methods to provide beautiful graphics in python.
Pliability	Matplotlib is a highly customized and robust	Seaborn avoids overlapping of plots with the help of its default themes
Data Frames and Arrays	Matplotlib works efficiently with data frames and arrays.It treats figures and axes as objects. It contains various stateful APIs for plotting. Therefore plot() like methods can work without parameters.	Seaborn is much more functional and organized than Matplotlib and treats the whole dataset as a single unit. Seaborn is not so stateful and therefore, parameters are required while calling methods like plot()
Use Cases	Matplotlib plots various graphs using Pandas and Numpy	Seaborn is the extended version of Matplotlib which uses Matplotlib along with Numpy and Pandas for plotting graphs