```
pip install matplotlib

WARNING: Skipping /opt/homebrew/lib/python3.11/site-packages/six-
1.16.0-py3.11.egg-info due to invalid metadata entry 'name'
WARNING: Skipping /opt/homebrew/lib/python3.11/site-packages/Pygments-
2.16.1.dist-info due to invalid metadata entry 'name'
Requirement already satisfied: matplotlib in
/opt/homebrew/lib/python3.11/site-packages (3.7.2)
Requirement already satisfied: contourpy>=1.0.1 in
/opt/homebrew/lib/python3.11/site-packages (from matplotlib) (1.1.0)
Requirement already satisfied: cycler>=0.10 in
/opt/homebrew/lib/python3.11/site-packages (from matplotlib) (0.11.0)
Requirement already satisfied: fonttools>=4.22.0 in
/opt/homebrew/lib/python3.11/site-packages (from matplotlib) (4.42.0)
Requirement already satisfied: kiwisolver>=1.0.1 in
/opt/homebrew/lib/python3.11/site-packages (from matplotlib) (1.4.4)
Requirement already satisfied: numpy>=1.20 in
/opt/homebrew/lib/python3.11/site-packages (from matplotlib) (1.25.2)
Requirement already satisfied: packaging>=20.0 in
/Users/pulkitbatra/Library/Python/3.11/lib/python/site-packages (from
matplotlib) (23.1)
Requirement already satisfied: pillow>=6.2.0 in
/opt/homebrew/lib/python3.11/site-packages (from matplotlib) (10.0.0)
Requirement already satisfied: pyparsing<3.1,>=2.3.1 in
/opt/homebrew/lib/python3.11/site-packages (from matplotlib) (3.0.9)
Requirement already satisfied: python-dateutil>=2.7 in
/Users/pulkitbatra/Library/Python/3.11/lib/python/site-packages (from
matplotlib) (2.8.2)
Requirement already satisfied: six>=1.5 in
/Users/pulkitbatra/Library/Python/3.11/lib/python/site-packages (from
python-dateutil>=2.7->matplotlib) (1.16.0)
WARNING: Skipping /opt/homebrew/lib/python3.11/site-packages/six-
1.16.0-py3.11.egg-info due to invalid metadata entry 'name'
WARNING: Skipping /opt/homebrew/lib/python3.11/site-packages/Pygments-
2.16.1.dist-info due to invalid metadata entry 'name'
WARNING: Skipping /opt/homebrew/lib/python3.11/site-packages/six-
1.16.0-py3.11.egg-info due to invalid metadata entry 'name'
WARNING: Skipping /opt/homebrew/lib/python3.11/site-packages/Pygments-
2.16.1.dist-info due to invalid metadata entry 'name'
WARNING: Skipping /opt/homebrew/lib/python3.11/site-packages/six-
1.16.0-py3.11.egg-info due to invalid metadata entry 'name'
WARNING: Skipping /opt/homebrew/lib/python3.11/site-packages/Pygments-
2.16.1.dist-info due to invalid metadata entry 'name'
Note: you may need to restart the kernel to use updated packages.

pip install numpy

WARNING: Skipping /opt/homebrew/lib/python3.11/site-packages/six-
1.16.0-py3.11.egg-info due to invalid metadata entry 'name'
WARNING: Skipping /opt/homebrew/lib/python3.11/site-packages/Pygments-
```

```
2.16.1.dist-info due to invalid metadata entry 'name'
Requirement already satisfied: numpy in
/opt/homebrew/lib/python3.11/site-packages (1.25.2)
WARNING: Skipping /opt/homebrew/lib/python3.11/site-packages/six-
1.16.0-py3.11.egg-info due to invalid metadata entry 'name'
WARNING: Skipping /opt/homebrew/lib/python3.11/site-packages/Pygments-
2.16.1.dist-info due to invalid metadata entry 'name'
WARNING: Skipping /opt/homebrew/lib/python3.11/site-packages/six-
1.16.0-py3.11.egg-info due to invalid metadata entry 'name'
WARNING: Skipping /opt/homebrew/lib/python3.11/site-packages/Pygments-
2.16.1.dist-info due to invalid metadata entry 'name'
WARNING: Skipping /opt/homebrew/lib/python3.11/site-packages/six-
1.16.0-py3.11.egg-info due to invalid metadata entry 'name'
WARNING: Skipping /opt/homebrew/lib/python3.11/site-packages/Pygments-
2.16.1.dist-info due to invalid metadata entry 'name'
Note: you may need to restart the kernel to use updated packages.

pip install pandas

WARNING: Skipping /opt/homebrew/lib/python3.11/site-packages/six-
1.16.0-py3.11.egg-info due to invalid metadata entry 'name'
WARNING: Skipping /opt/homebrew/lib/python3.11/site-packages/Pygments-
2.16.1.dist-info due to invalid metadata entry 'name'
Collecting pandas
  Obtaining dependency information for pandas from
https://files.pythonhosted.org/packages/8f/bb/aea1fbeed5b474cb86343647
18abe9030d7cc7a30bf51f40bd494bbc89a2/pandas-2.0.3-cp311-cp311-
macosx_11_0_arm64.whl.metadata
  Downloading pandas-2.0.3-cp311-cp311-macosx_11_0_arm64.whl.metadata
(18 kB)
Requirement already satisfied: python-dateutil>=2.8.2 in
/Users/pulkitbatra/Library/Python/3.11/lib/python/site-packages (from
pandas) (2.8.2)
Collecting pytz>=2020.1 (from pandas)
  Downloading pytz-2023.3-py2.py3-none-any.whl (502 kB)
━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 502.3/502.3 kB 196.7 kB/s eta
0:00:00a 0:00:01
 pandas)
  Downloading tzdata-2023.3-py2.py3-none-any.whl (341 kB)
━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 341.8/341.8 kB 381.1 kB/s eta
0:00:00a 0:00:01
ent already satisfied: numpy>=1.21.0 in
/opt/homebrew/lib/python3.11/site-packages (from pandas) (1.25.2)
Requirement already satisfied: six>=1.5 in
/Users/pulkitbatra/Library/Python/3.11/lib/python/site-packages (from
python-dateutil>=2.8.2->pandas) (1.16.0)
Downloading pandas-2.0.3-cp311-cp311-macosx_11_0_arm64.whl (10.7 MB)
━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 10.7/10.7 MB 3.0 MB/s eta
0:00:0000:0100:01m
WARNING: Skipping /opt/homebrew/lib/python3.11/site-packages/six-
```

```
1.16.0-py3.11.egg-info due to invalid metadata entry 'name'
WARNING: Skipping /opt/homebrew/lib/python3.11/site-packages/Pygments-
2.16.1.dist-info due to invalid metadata entry 'name'
Installing collected packages: pytz, tzdata, pandas
WARNING: Skipping /opt/homebrew/lib/python3.11/site-packages/six-
1.16.0-py3.11.egg-info due to invalid metadata entry 'name'
WARNING: Skipping /opt/homebrew/lib/python3.11/site-packages/Pygments-
2.16.1.dist-info due to invalid metadata entry 'name'
WARNING: Skipping /opt/homebrew/lib/python3.11/site-packages/six-
1.16.0-py3.11.egg-info due to invalid metadata entry 'name'
WARNING: Skipping /opt/homebrew/lib/python3.11/site-packages/six-
1.16.0-py3.11.egg-info due to invalid metadata entry 'name'
WARNING: Skipping /opt/homebrew/lib/python3.11/site-packages/Pygments-
2.16.1.dist-info due to invalid metadata entry 'name'
Successfully installed pandas-2.0.3 pytz-2023.3 tzdata-2023.3
WARNING: Skipping /opt/homebrew/lib/python3.11/site-packages/six-
1.16.0-py3.11.egg-info due to invalid metadata entry 'name'
WARNING: Skipping /opt/homebrew/lib/python3.11/site-packages/Pygments-
2.16.1.dist-info due to invalid metadata entry 'name'
WARNING: Skipping /opt/homebrew/lib/python3.11/site-packages/six-
1.16.0-py3.11.egg-info due to invalid metadata entry 'name'
WARNING: Skipping /opt/homebrew/lib/python3.11/site-packages/Pygments-
2.16.1.dist-info due to invalid metadata entry 'name'
Note: you may need to restart the kernel to use updated packages.

import numpy as np
import pandas as pd
```

Exersice 1

```python
x = np.array([[1,2,3],[4,5,6],[7,8,9]])

# gives rank of the array
print(x.ndim)

# gives dimentions of the array
print(x.shape)

# gives the size of the array
print(x.size)

2
(3, 3)
9

arr=[1,2,3,4,5,6]
sliced_array=arr[1:6]

sliced_array
```
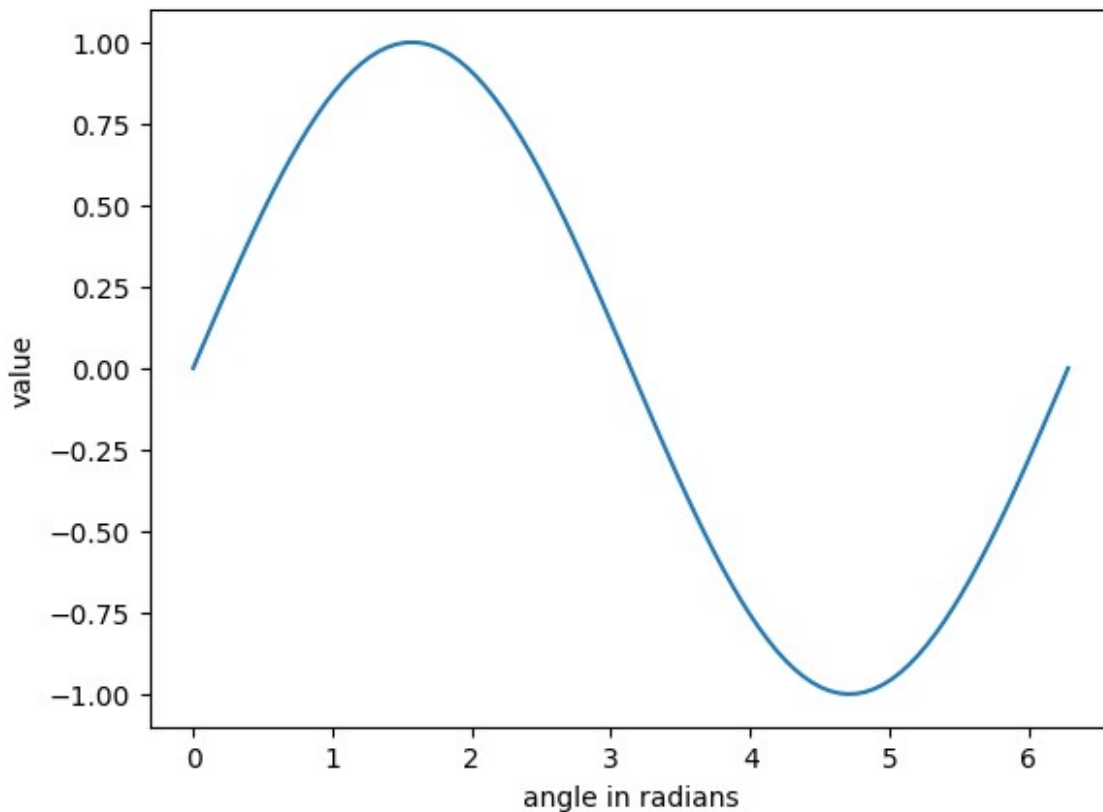
```
[2, 3, 4, 5, 6]
```

Exersice 2

```python
import matplotlib.pyplot as plt


x= np.linspace(0,2 * np.pi,100) #generate 0 to 100 evenly spaced
points by PI. i.e 3.14
y= np.sin(x)
plt.plot(x,y)

plt.xlabel("angle in radians")
plt.ylabel("value")

Text(0, 0.5, 'value')
```


Exersice 3

```python
# Generate random data (replace this with your actual data)
np.random.seed(42)  # For reproducibility
```
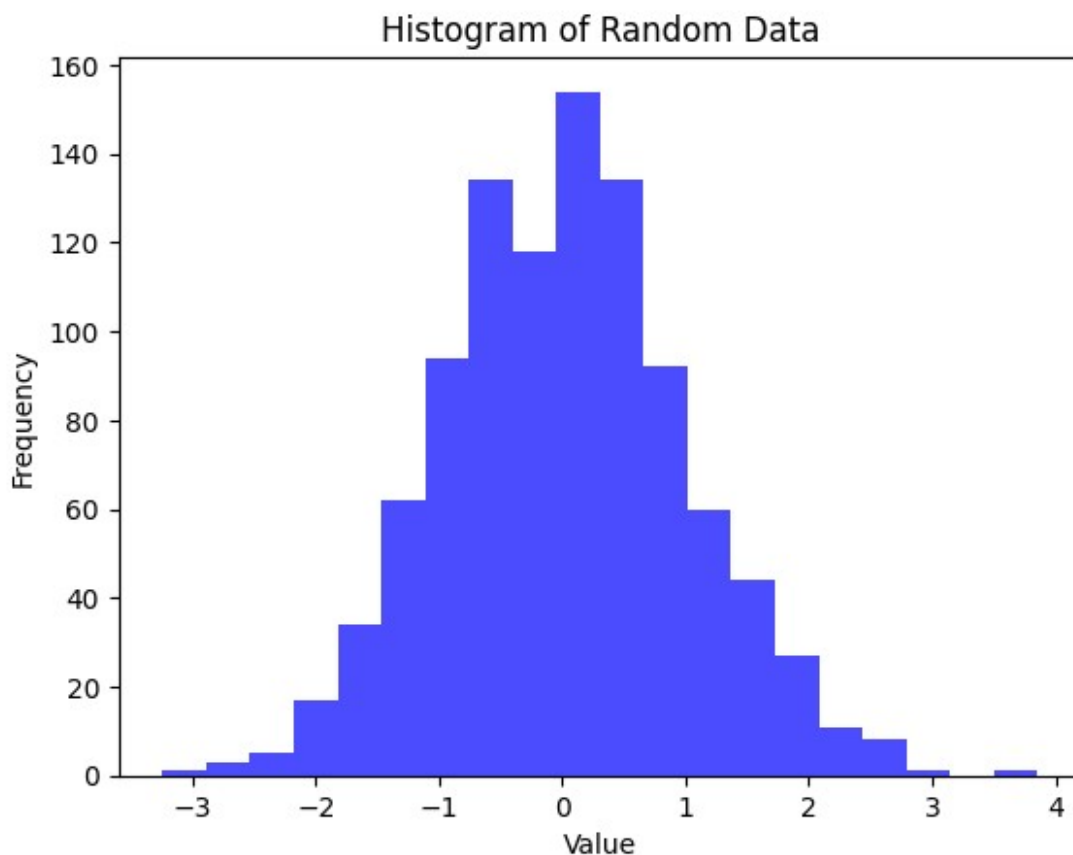
```python
x = np.random.normal(0, 1, 1000)  # Generating 1000 random data points

# Create a histogram plot
plt.hist(x, bins=20, color='blue', alpha=0.7)  # Using 20 bins

# Adding labels and title
plt.xlabel("Value")
plt.ylabel("Frequency")
plt.title("Histogram of Random Data")

# Display the plot
plt.show()
```



```python
import matplotlib.pyplot as plt

# Sample data for the pie chart
labels = ['Apples', 'Bananas', 'Oranges', 'Grapes']
sizes = [30, 25, 20, 15]  # Percentages that add up to 100
colors = ['red', 'yellow', 'orange', 'purple']
explode = (0.1, 0, 0, 0)  # Explode the 1st slice (Apples)

# Create a pie chart
plt.pie(sizes, explode=explode, labels=labels, colors=colors,
```
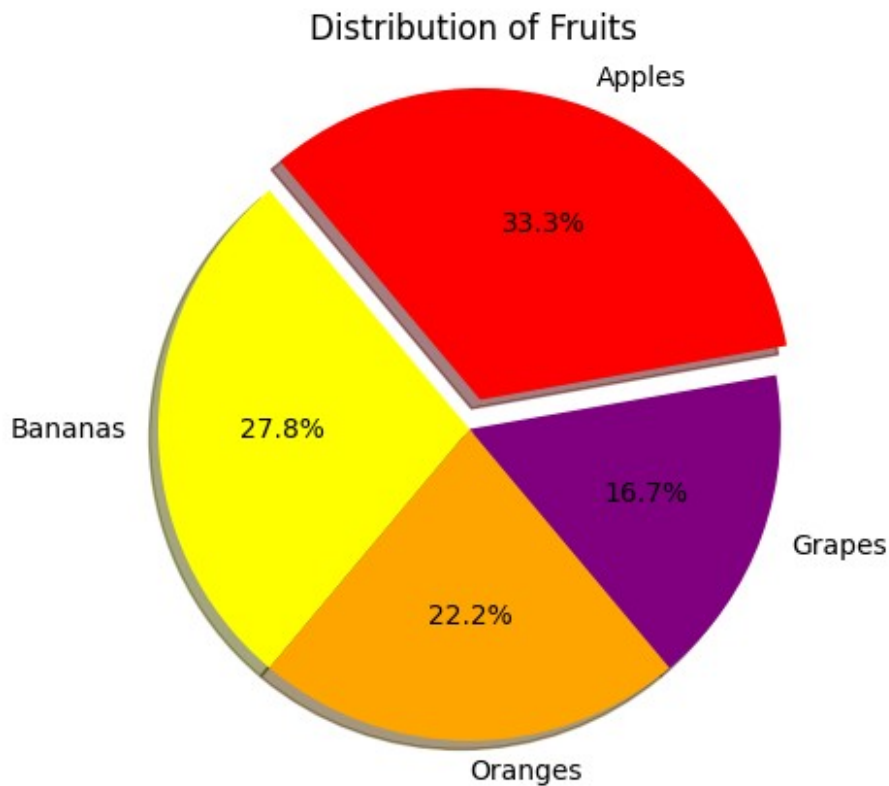
```
        autopct='%1.1f%%', shadow=True, startangle=10)

# Equal aspect ratio ensures that pie is drawn as a circle.
plt.axis('equal')


# Adding a title
plt.title("Distribution of Fruits")

# Display the pie chart
plt.show()
```


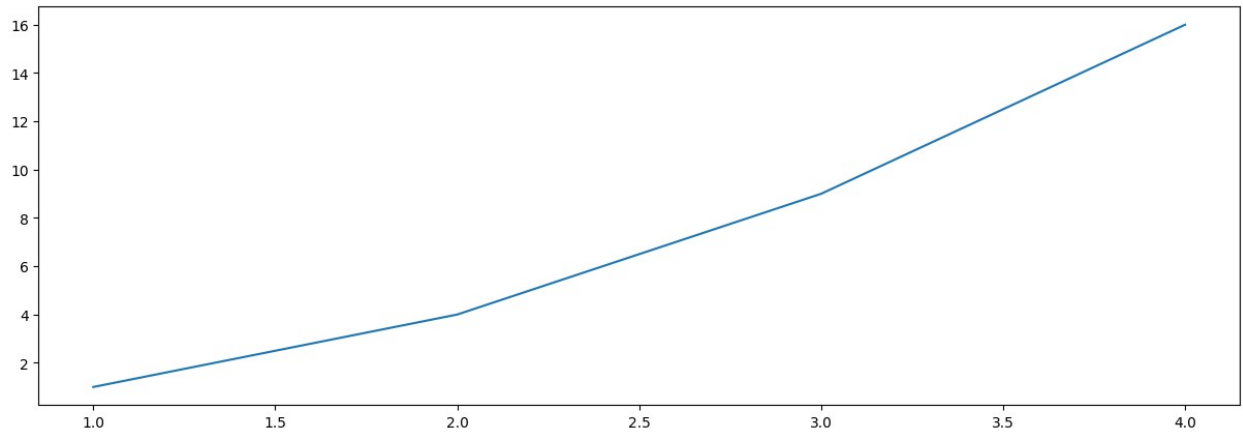Distribution of Fruits

```
plt.figure(figsize=(15,5))
plt.plot([1,2,3,4],[1,4,9,16])

[<matplotlib.lines.Line2D at 0x11a7aa8d0>]
```
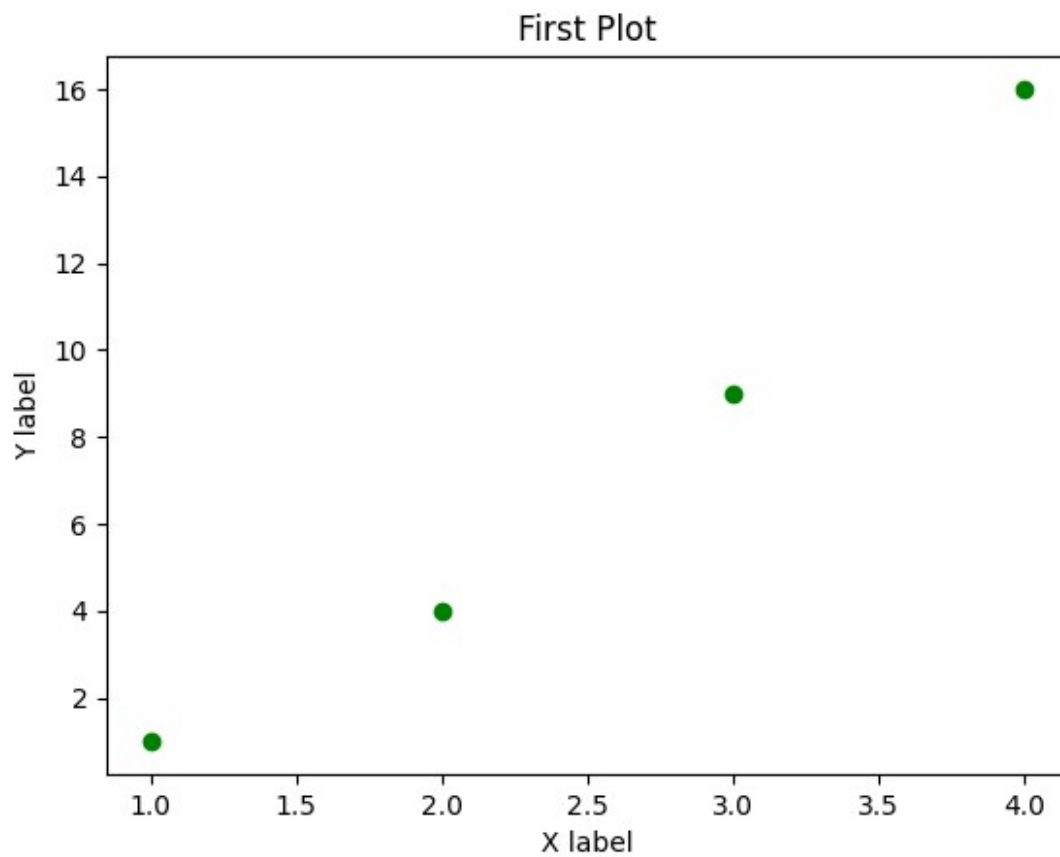
```
plt.plot([1,2,3,4],[1,4,9,16],"go")
plt.title('First Plot')
plt.xlabel("X label")
plt.ylabel("Y label")
plt.show()
```

SciPy

Practice

```python
from scipy import linalg
import numpy as np

array=np.array([[4,5],[3,2]])
linalg.det(array)
#returns determinant of the array

-7.0

# Find eigen value

eg_val,eg_vect=linalg.eig(array)
print(eg_val)

[ 7.+0.j -1.+0.j]
```