Matplotlib-Overview, Setup, Basic plots, Customizing plots, Subplots, 3D plots.

Data Processing with Pandas

Pandas – Overview, Setup, Data Structures, Indexing & Selecting Data, groupby Operations, Reshaping data.

UPES
UNIVERSITY WITH A PURPOSE

Matplotlib

Introduction

- Matplotlib is an open source plotting library for Python developed by John D. Hunter.
- Package is imported into the Python script by adding the following statement: import matplotlib
- Its version can be checked by: print(matplotlib.__version__)
- Most of the Matplotlib utilities lies under the pyplot submodule, and are usually imported under the plt alias:

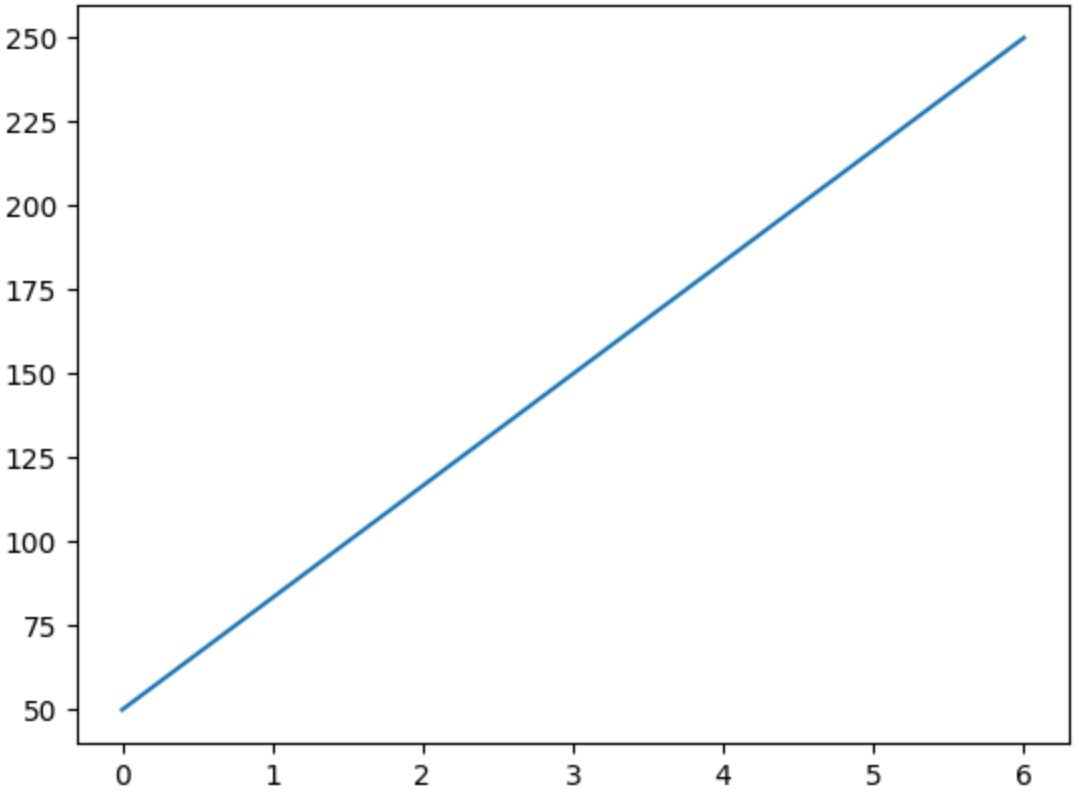
```
import matplotlib.pyplot as plt
```

Introduction

- Draw a line diagram:
- import matplotlib.pyplot as plt
  import numpy as np

  xpoints = np.array([0, 6])
  ypoints = np.array([50, 250])

  plt.plot(xpoints, ypoints)
  plt.show()
-



UPES
UNIVERSITY WITH A PURPOSE

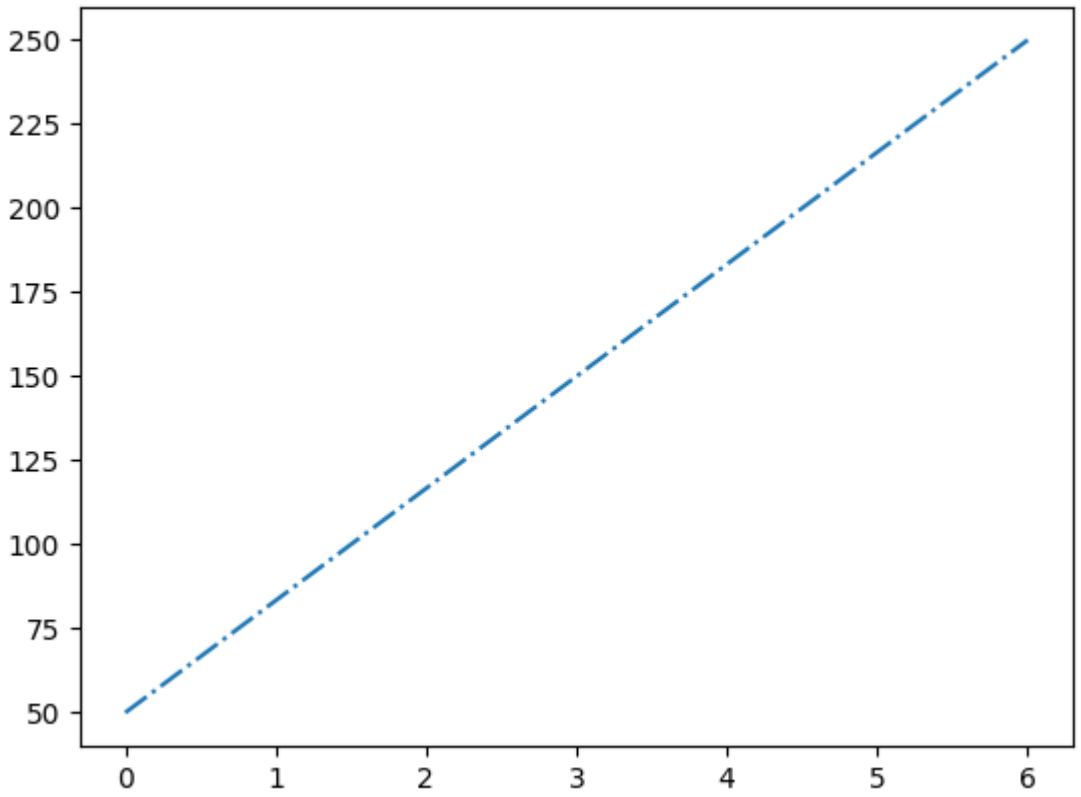
Marker Reference

Marker	Description
'o'	Circle
'*'	Star
'.'	Point
','	Pixel
'x'	X
'X'	X (filled)
'+'	Plus
'P'	Plus (filled)
's'	Square
'D'	Diamond
'd'	Diamond (thin)
'p'	Pentagon
'H'	Hexagon
'h'	Hexagon
'v'	Triangle Down
'^'	Triangle Up

Line Reference

Line Syntax	Description
'-'	Solid line
':'	Dotted line
'--'	Dashed line
'-.'	Dashed/dotted line

plt.plot(xpoints, ypoints,'-.')



Color Reference

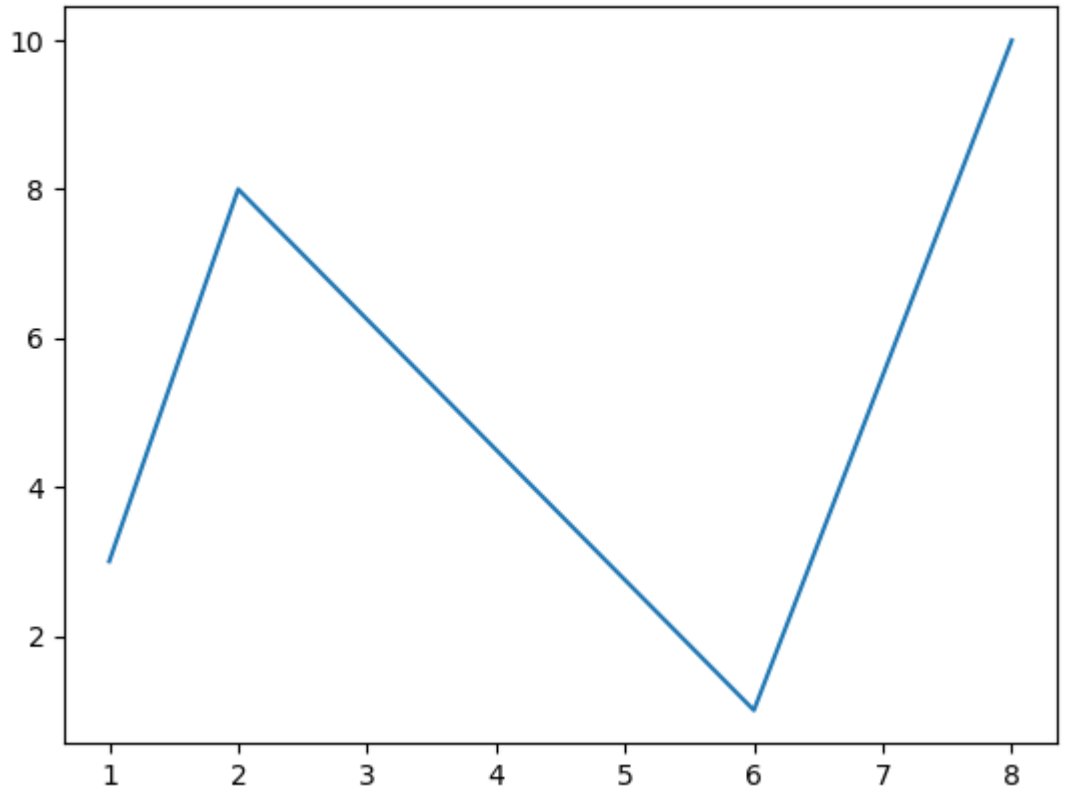
Color Syntax	Description
'r'	Red
'g'	Green
'b'	Blue
'c'	Cyan
'm'	Magenta
'y'	Yellow
'k'	Black
'w'	White

UPES
UNIVERSITY WITH A PURPOSE

- import matplotlib.pyplot as plt
  import numpy as np

  xpoints = np.array([1, 2, 6, 8])
  ypoints = np.array([3, 8, 1, 10])

  plt.plot(xpoints, ypoints)
  plt.show()



UPES
UNIVERSITY WITH A PURPOSE

Basic Functions for Chart Creation

- Use plot() function of matplotlib.pyplot to plot the graph. This function is used to draw the graph. It takes x value, y value, format string(line style and color) as an argument.
- Use show() function of matplotlib.pyplot to show the graph window. This function is used to display the graph. It does not take any argument.
- Use title() function of matplotlib.pyplot to give title to graph. It takes string to be displayed as title as argument. You can use the loc parameter in title() to position the title. Legal values are: 'left', 'right', and 'center'. Default value is 'center'.

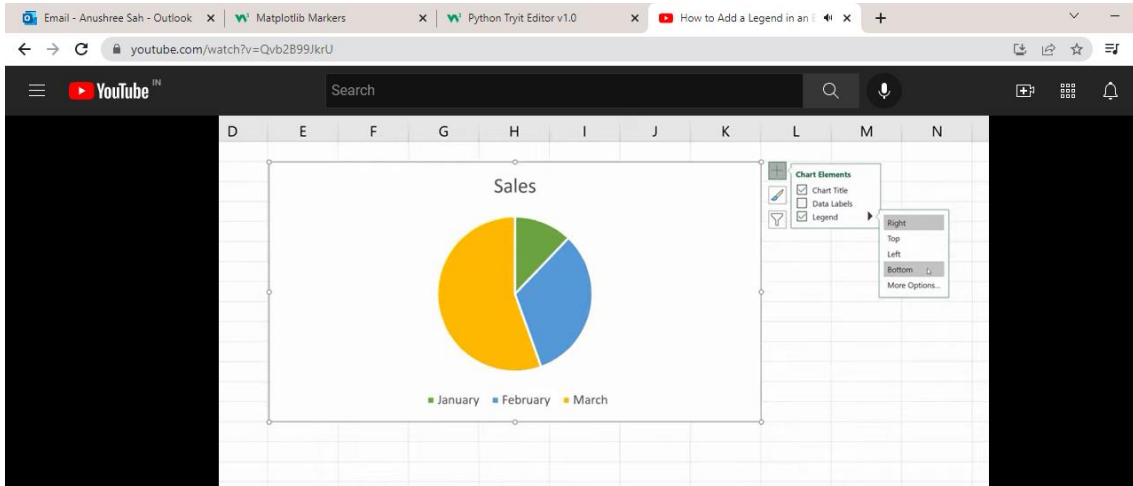
UPES
UNIVERSITY WITH A PURPOSE

Basic Functions for Chart Creation

- Use xlabel() function of matplotlib.pyplot to give label to x-axis. It takes string to be displayed as label of x-axis as argument.
- Use ylabel() function of matplotlib.pyplot to give label to y-axis. It takes string to be displayed as label of y-axis as argument.

Basic Functions for Chart Creation

- Use savefig() function of matplotlib.pyplot to save the result in a file.
- Use legend() function of matplotlib.pyplot to apply legend in the chart.
- The subplot() function allows you to plot multiple plots in the same figure. Its first argument specify row, second specify the column and third argument specify the index of active subplot. You can add a title to the entire figure with the subtitle() function

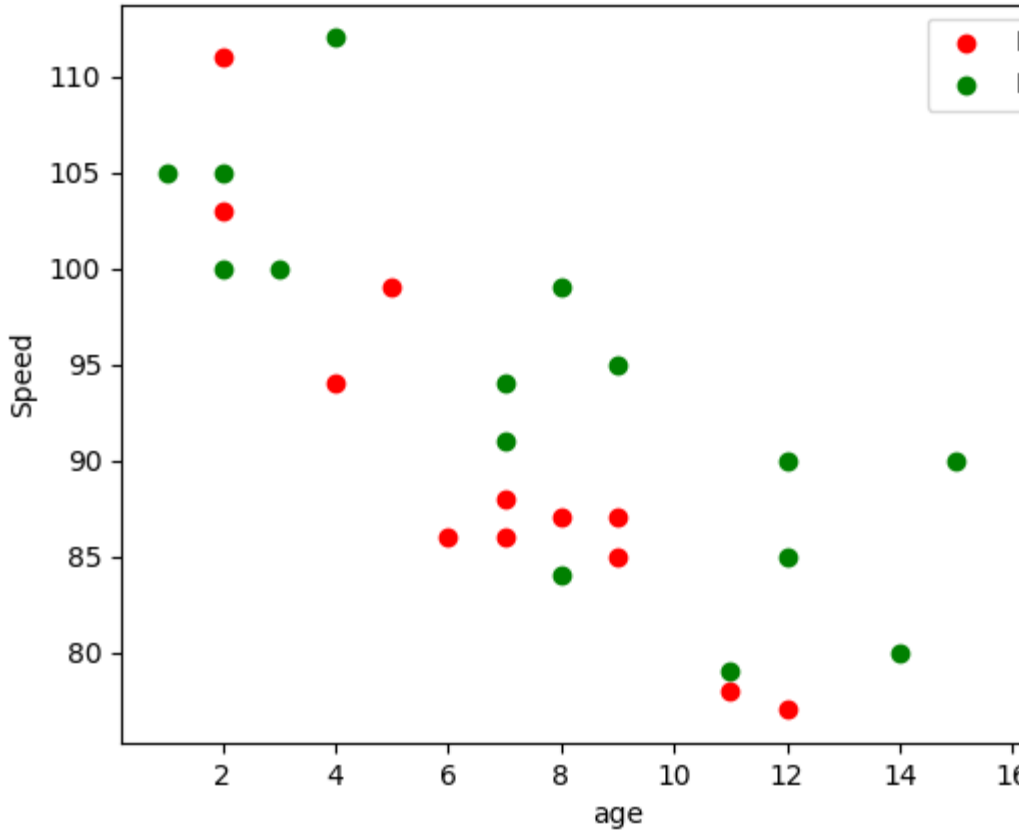


Scatter Chart

- We use scatter() function to draw a scatter plot.
- The scatter() function plots one dot for each observation. It needs two arrays of the same length, one for the values of the x-axis, and one for values on the y-axis:

Scatter Chart

```
import matplotlib.pyplot as plt
import numpy as np
x = np.array([5,7,8,7,2,17,2,9,4,11,12,9,6])
y = np.array([99,86,87,88,111,86,103,87,94,78,7
plt.scatter(x, y,color='red')
x = np.array([2,2,8,1,15,8,12,9,7,3,11,4,7,14,12]
y = np.array([100,105,84,105,90,99,90,95,94,10
plt.scatter(x, y,color='green')
plt.xlabel("age")
plt.ylabel('Speed')
plt.legend(['Day1','Day2'])
plt.show()
```

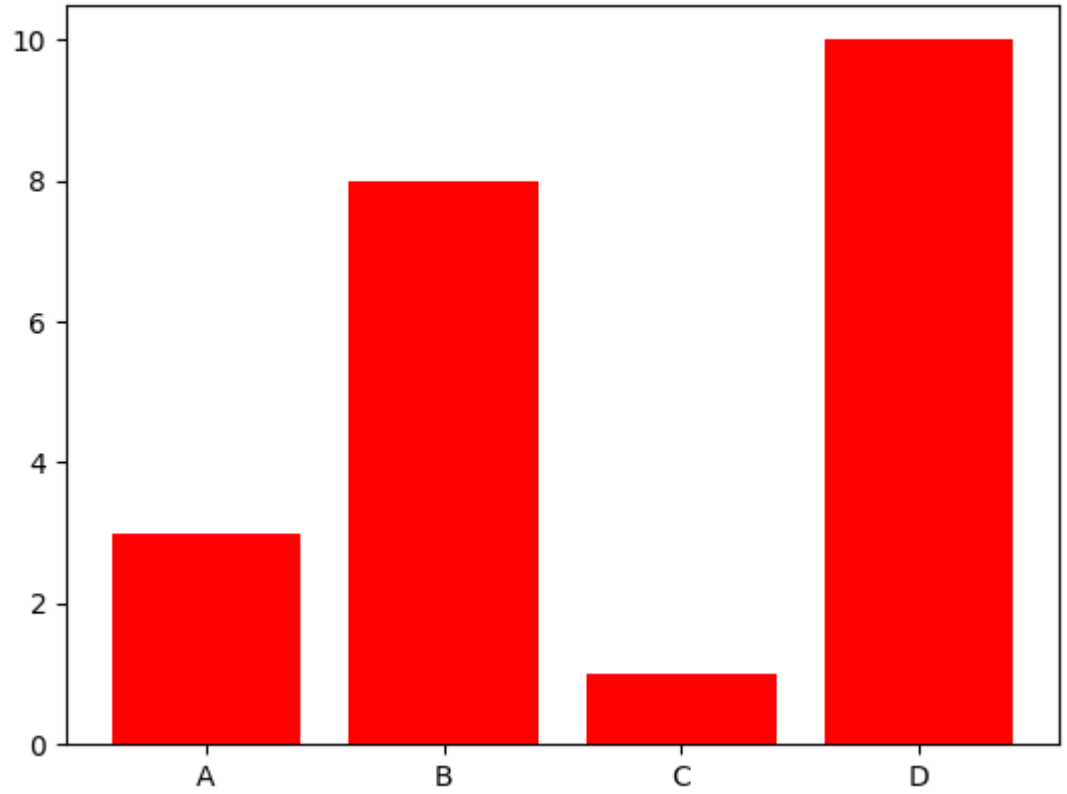


UPES
UNIVERSITY WITH A PURPOSE

Bar Chart

- We use the bar() function to draw bar graphs:

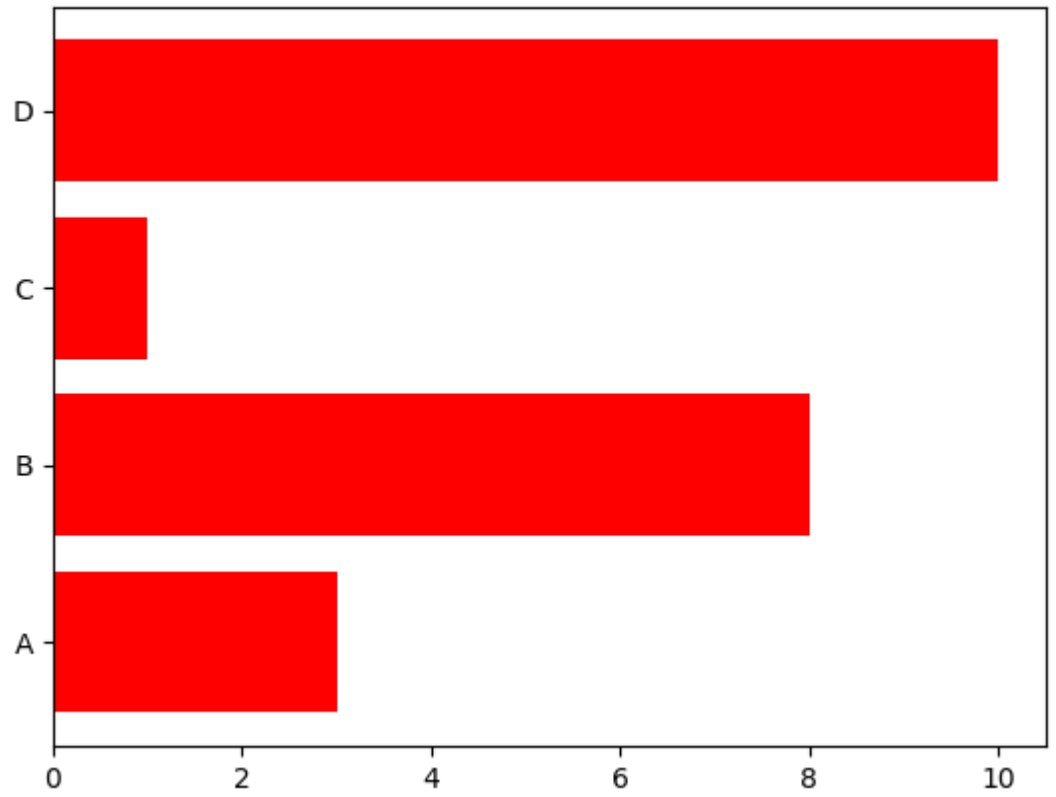
```
import matplotlib.pyplot as plt
import numpy as np

x = np.array(["A", "B", "C", "D"])
y = np.array([3, 8, 1, 10])

plt.bar(x,y, color='red')
plt.show()
```



Bar Chart

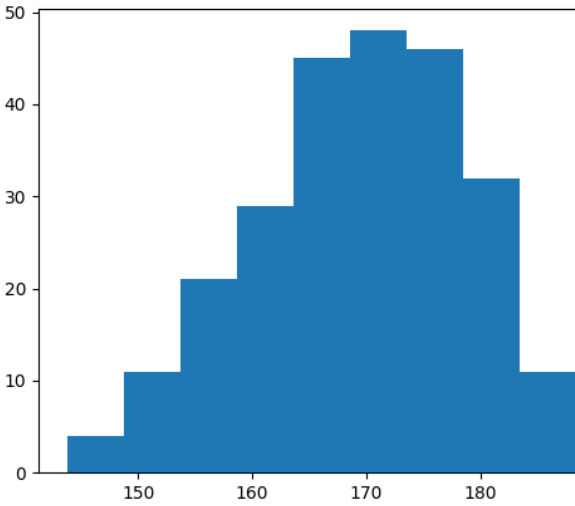
- If you want the bars to be displayed horizontally instead of vertically, use the barh() function:

```
import matplotlib.pyplot as plt
import numpy as np
x = np.array(["A","B","C","D"])
y = np.array([3,8,1,10])
plt.barh(x, y, color='red')
plt.show()
```



Histograms Chart

- A histogram is a graph showing *frequency* distributions. It is a graph showing the number of observations within each given interval.
- We use the hist() function to create histograms.




```
import matplotlib.pyplot as plt
import numpy as np

x = np.random.normal(170, 10, 250)
# It randomly generate an array with 250 values, where the values will concentrate around 170, and the standard deviation is 10.
plt.hist(x)
plt.show()
```

UPES
UNIVERSITY WITH A PURPOSE

Pie Chart

- We can use the pie() function to draw pie charts.
- By default the plotting of the first piece starts from the x-axis and move *counterclockwise*:
- The size of each wedge is determined by x/sum(x)
- The explode parameter, if specified, and not None, must be an array with one value for each piece.

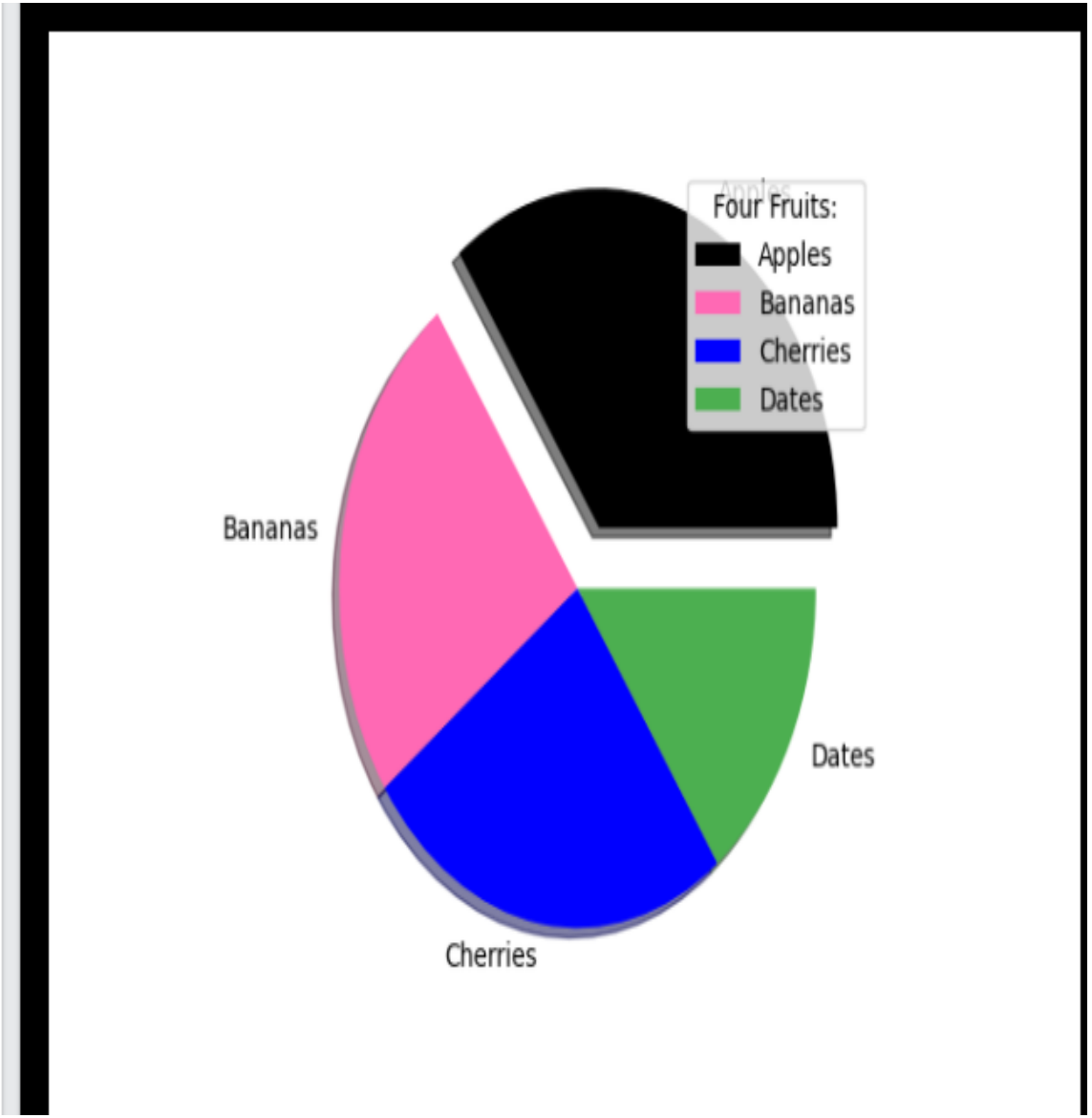
```
import matplotlib.pyplot as plt
import numpy as np

y = np.array([35, 25, 25, 15])

plt.pie(y)
plt.show()
```

Pie Chart

```
import matplotlib.pyplot as plt
import numpy as np
y = np.array([35, 25, 25, 15])
mylabels = ["Apples", "Bananas", "Cherries", "Dates"]

myexplode = [0.2, 0, 0, 0]
mycolors = ["black", "hotpink", "b", "#4CAF50"]

plt.pie(y, labels = mylabels, explode = myexplode, shadow = True, colors = mycolors)
plt.legend(title = "Four Fruits:")
plt.show()
```

UPES
UNIVERSITY WITH A PURPOSE

```
#Three lines to make our compiler able to draw:
import sys
import matplotlib.pyplot as plt
import numpy as np

y = np.array([35,25,25,15])
mylabels = ["Apples","Bananas", "Cherries", "Dates"]

myexplode = [0.2, 0, 0, 0]
mycolors = ["black", "hotpink", "b", "#4CAF50"]

plt.pie(y, labels = mylabels, explode = myexplode, shadow = True,
colors = mycolors)
plt.legend(title = "Four Fruits:")


#Two  lines to make our compiler able to draw:
plt.savefig(sys.stdout.buffer)
sys.stdout.flush()
```



UPES
UNIVERSITY WITH A PURPOSE