DATA VISUALIZATION USING PYPLOT

- Visualization basically refers to the graphical or visual representation of information and data using visual element like chart,graph and maps.
- Data visualization unveils patterns,trends,outliers,correlation etc.

USING PYPLOT OF MATPLOTLIB LIBRARY

- For data visualization in python the matplotlib librarys pyplot interface is used.
- Pyplot is a collection of methods within matplotlib library (of python) which allow user to construct 2D plots easily and interactively.
- The matplotlib is a python library that provides many interface and functionality for 2D graphics similar to MATLAB.

NUMPY:

- Numpy stands for numerical python
- Numpy is the core library for scientific computing in python
- It provides a high performance multidimensional array object and tools for working these arrays.

Using numpy developer can perform the following operations.

I. Mathematical and logical operations on arrays.
II. Fourier transforms and routines for shape manipulations.
III. Operations related to linear algebra,Numpy has in-built functions for linear algebra and random number generations.

To install numpy type in cmd.

```
C:\pip install numpy
```

INSTALLING MATPLOTLIB:

Before we start plotting graphs in matplotlib.it needs to be installed first.for installation of matplotlib follow the steps listed below.

Step-1

Open cmd(command prompt) and run command prompt as on Adminstrator.

Step-2

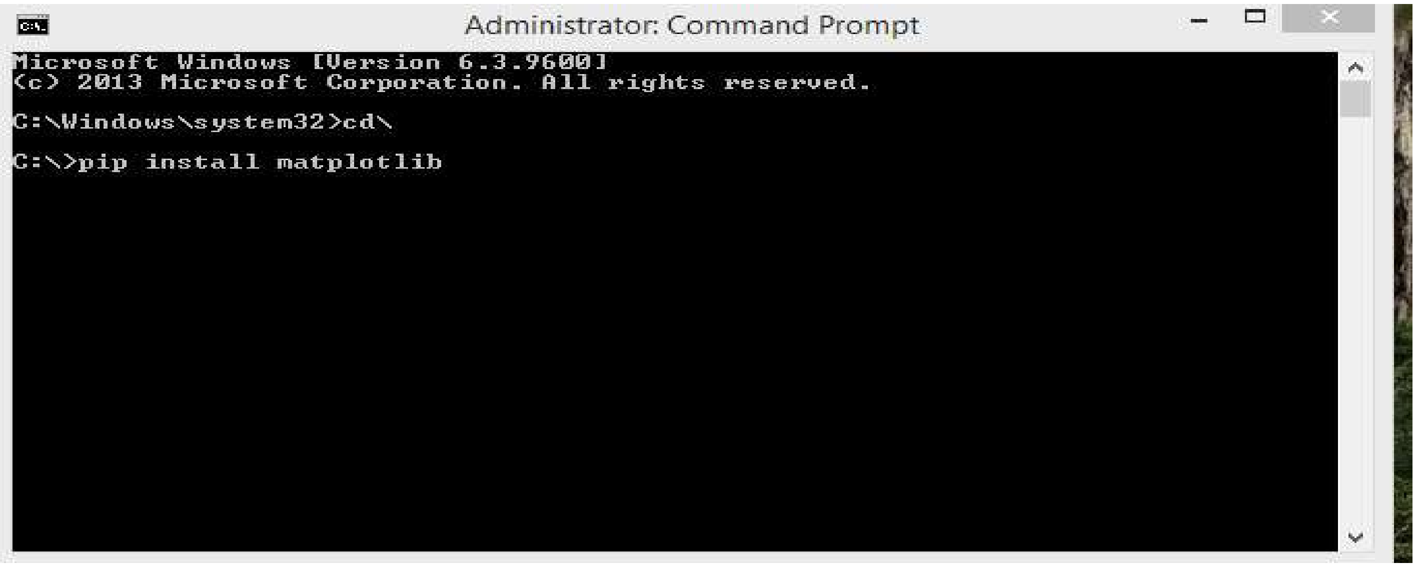
Type cd\ to move to the root directory.

Step-3

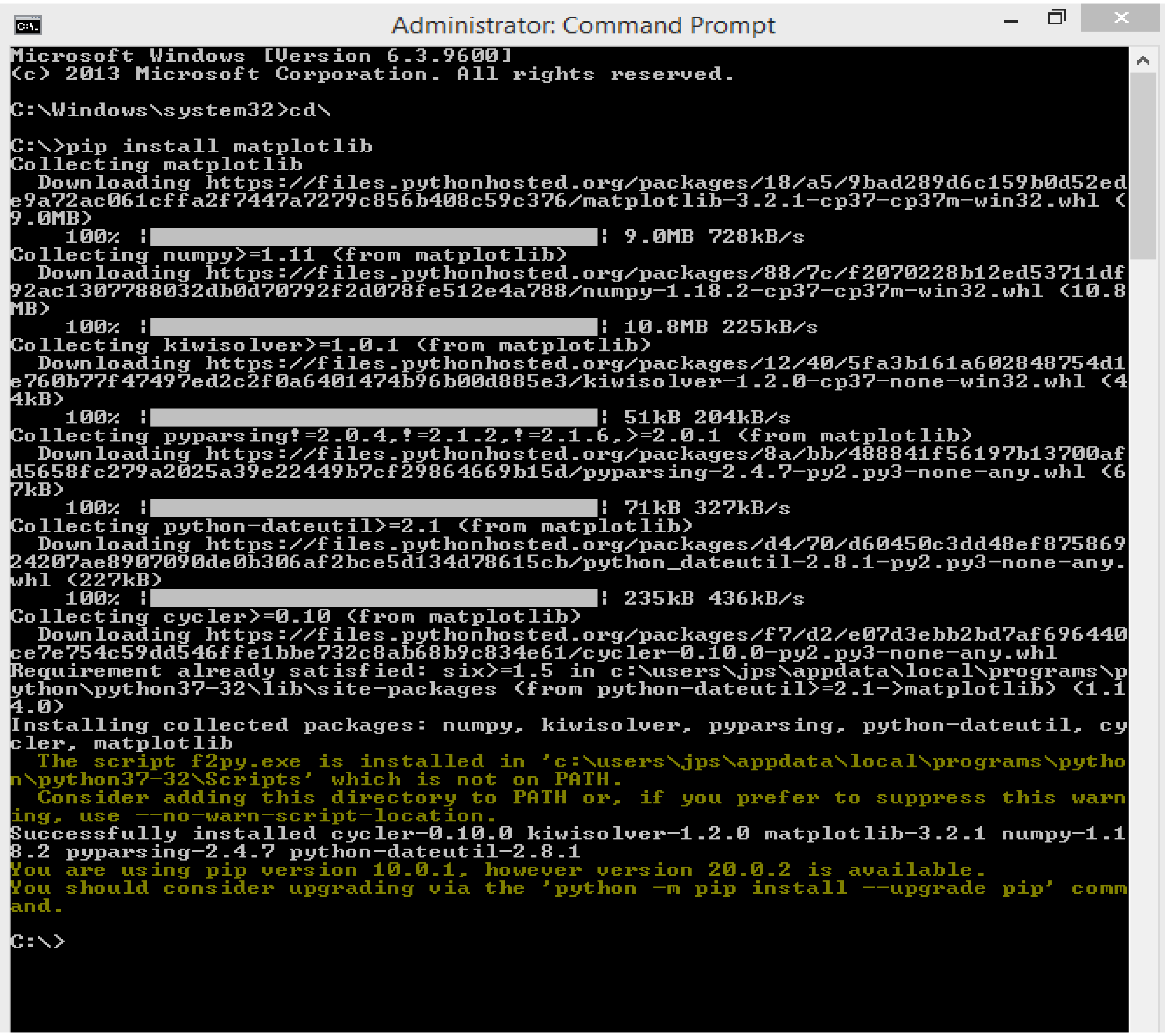
Type :pip install matplotlib(with internet connection)

Step4

Installation of matplot will start.



```
Microsoft Windows [Version 6.3.9600]
(c) 2013 Microsoft Corporation. All rights reserved.

C:\Windows\system32>cd\

C:\>pip install matplotlib
```



```
Microsoft Windows [Version 6.3.9600]
(c) 2013 Microsoft Corporation. All rights reserved.

C:\Windows\system32>cd\

C:\>pip install matplotlib
Collecting matplotlib
  Downloading https://files.pythonhosted.org/packages/18/a5/9bad289d6c159b0d52ed
e9a72ac061cffa2f7447a7279c856b408c59c376/matplotlib-3.2.1-cp37-cp37m-win32.whl (
9.0MB)
    100% |████████████████████████████████| 9.0MB 728kB/s
Collecting numpy>=1.11 (from matplotlib)
  Downloading https://files.pythonhosted.org/packages/88/7c/f2070228b12ed53711df
92ac1307788032db0d70792f2d078fe512e4a788/numpy-1.18.2-cp37-cp37m-win32.whl (10.8
MB)
    100% |████████████████████████████████| 10.8MB 225kB/s
Collecting kiwisolver>=1.0.1 (from matplotlib)
  Downloading https://files.pythonhosted.org/packages/12/40/5fa3b161a602848754d1
e760b77f47497ed2c2f0a6401474b96b00d885e3/kiwisolver-1.2.0-cp37-none-win32.whl (4
4kB)
    100% |████████████████████████████████| 51kB 204kB/s
Collecting pyparsing!=2.0.4,!=2.1.2,!=2.1.6,>=2.0.1 (from matplotlib)
  Downloading https://files.pythonhosted.org/packages/8a/bb/488841f56197b13700af
d5658fc279a2025a39e22449b7cf29864669b15d/pyparsing-2.4.7-py2.py3-none-any.whl (6
7kB)
    100% |████████████████████████████████| 71kB 327kB/s
Collecting python-dateutil>=2.1 (from matplotlib)
  Downloading https://files.pythonhosted.org/packages/d4/70/d60450c3dd48ef875869
24207ae8907090de0b306af2bce5d134d78615cb/python_dateutil-2.8.1-py2.py3-none-any.
whl (227kB)
    100% |████████████████████████████████| 235kB 436kB/s
Collecting cycler>=0.10 (from matplotlib)
  Downloading https://files.pythonhosted.org/packages/f7/d2/e07d3ebb2bd7af696440
ce7e754c59dd546ffe1bbe732c8ab68b9c834e61/cycler-0.10.0-py2.py3-none-any.whl
Requirement already satisfied: six>=1.5 in c:\users\jps\appdata\local\programs\p
ython\python37-32\lib\site-packages (from python-dateutil>=2.1->matplotlib) (1.1
4.0)
Installing collected packages: numpy, kiwisolver, pyparsing, python-dateutil, cy
cler, matplotlib
  The script f2py.exe is installed in 'c:\users\jps\appdata\local\programs\pytho
n\python37-32\Scripts' which is not on PATH.
  Consider adding this directory to PATH or, if you prefer to suppress this warn
ing, use --no-warn-script-location.
Successfully installed cycler-0.10.0 kiwisolver-1.2.0 matplotlib-3.2.1 numpy-1.1
8.2 pyparsing-2.4.7 python-dateutil-2.8.1
You are using pip version 10.0.1, however version 20.0.2 is available.
You should consider upgrading via the 'python -m pip install --upgrade pip' comm
and.

C:\>
```

After the installation is successfully done on the system an appropriate message shall be displayed.

IMPORTING PYPLOT:

In order to use pyplot on your computers for data visualization.we need to first import in your python environment by issuing one of the following command.

import matplotlib.python -> this would requires to refer to every command of pyplot as matplotlib.pyplot<command>

import matplotlib.pyplot as pl ->with this,we can refer to every command of pyplot as pl.<command> as we have given an alias name to matplotlib pyplot as pl.

With the first command, we will need to issue every pyplot command as per the following syntax:

Matplotlib.pyplot<command>

USING NUMPY ARRAYS:

Numpy (numerical python or pronounced as num pie)is an open source module of python that offers functions and routines for fast mathematical computation an arrays and matrices.

import numpy as np

- Array is general refer to a named group of homogeneous(of same type) elements.

BASIC VISUALIZATION RULES:

- The first step is to choose an appropriate plot type.if there are various options,we should compare them and choose first one.
- Second,when we choose the type of plot,one of the most important things is to label the axis.
- Third we can add a little to make our plot more information.
- Fourth add labels for different categories when needed.
- Fifth we can add a text or an arrow at interesting data point.
- Sixth,we can use some sizes and columns of the data to make the plot more informative.

LINE PLOT/CHART

- **LINE plot**/chart is a type of plot which displays information as a series of data points called 'markers' connected by straight line.
- This type of plot is often used to visualization a trend in data over intervals of time –a time series.
- A line chart or line graph can be created using the plot() function available in pyplot library.

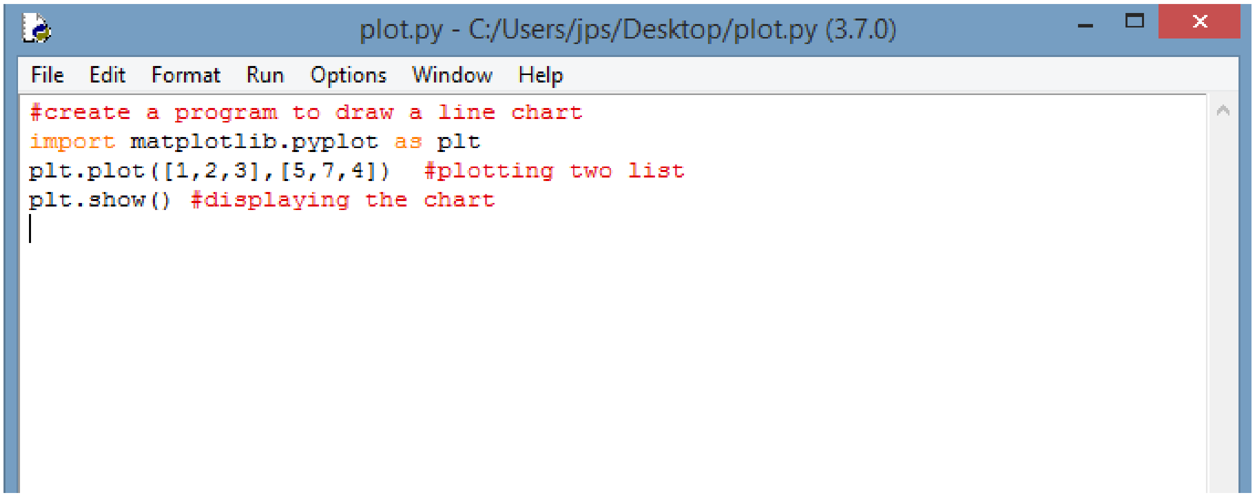
In order to draw a line plot, the steps to be followed are as under

Steps in:

- **Importing matplotlib**
- **Plt.plot(x,y,color,others) plot y versus x as lines and or/marker**

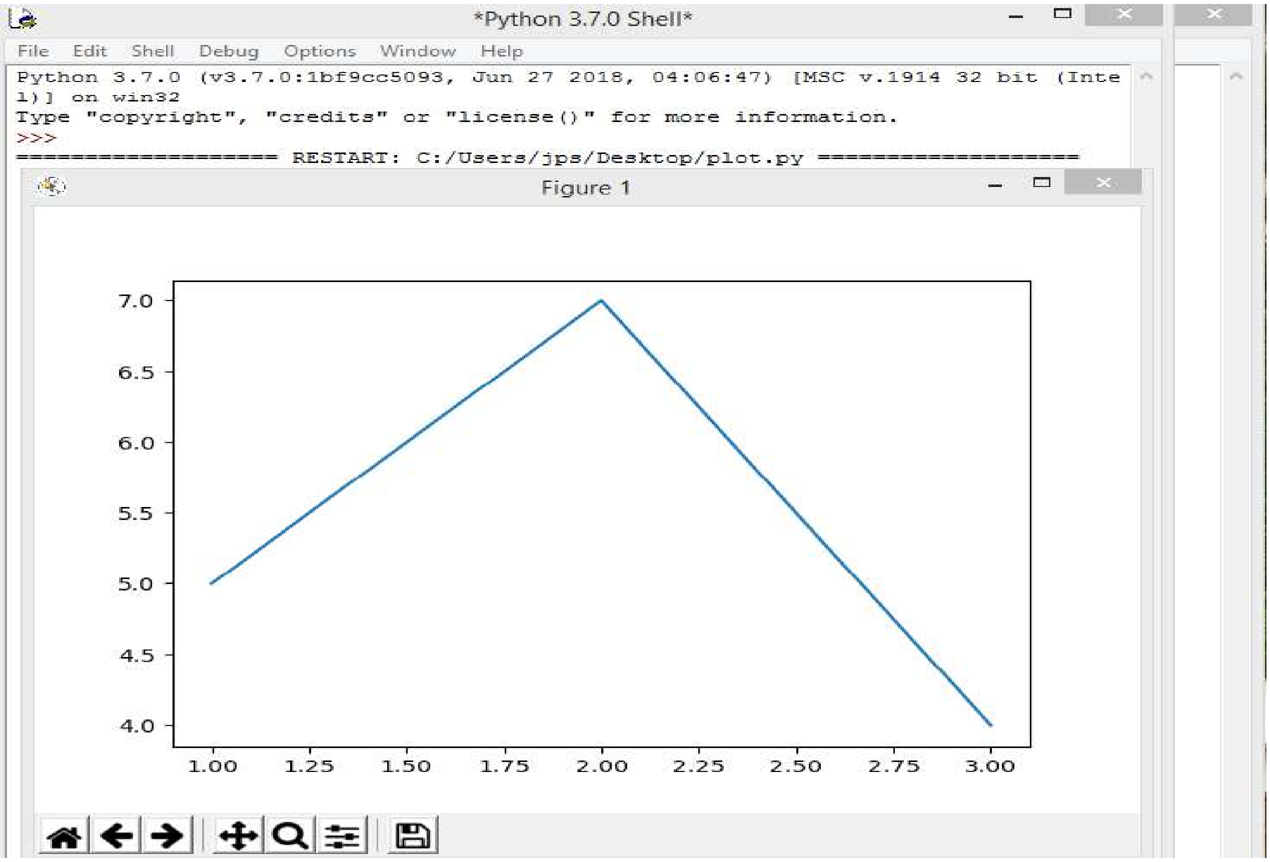
- **Plt.xlabel("your text")**
- **Plot.ylabel("your text")**
- **Plt.set_title("your titile")**
- **Plt.show() //display a figure**

# CREATE A PROGRAMME TO DRAW A LINE CHART


plot.py - C:/Users/jps/Desktop/plot.py (3.7.0)
File Edit Format Run Options Window Help

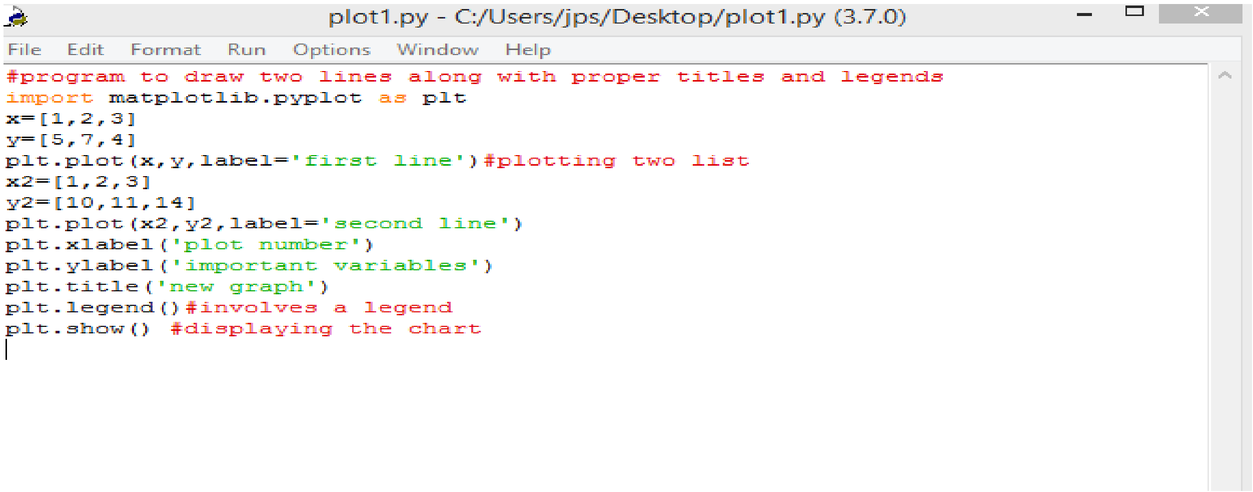
```
#create a program to draw a line chart
import matplotlib.pyplot as plt
plt.plot([1,2,3],[5,7,4])  #plotting two list
plt.show() #displaying the chart
```

OUTPUT//

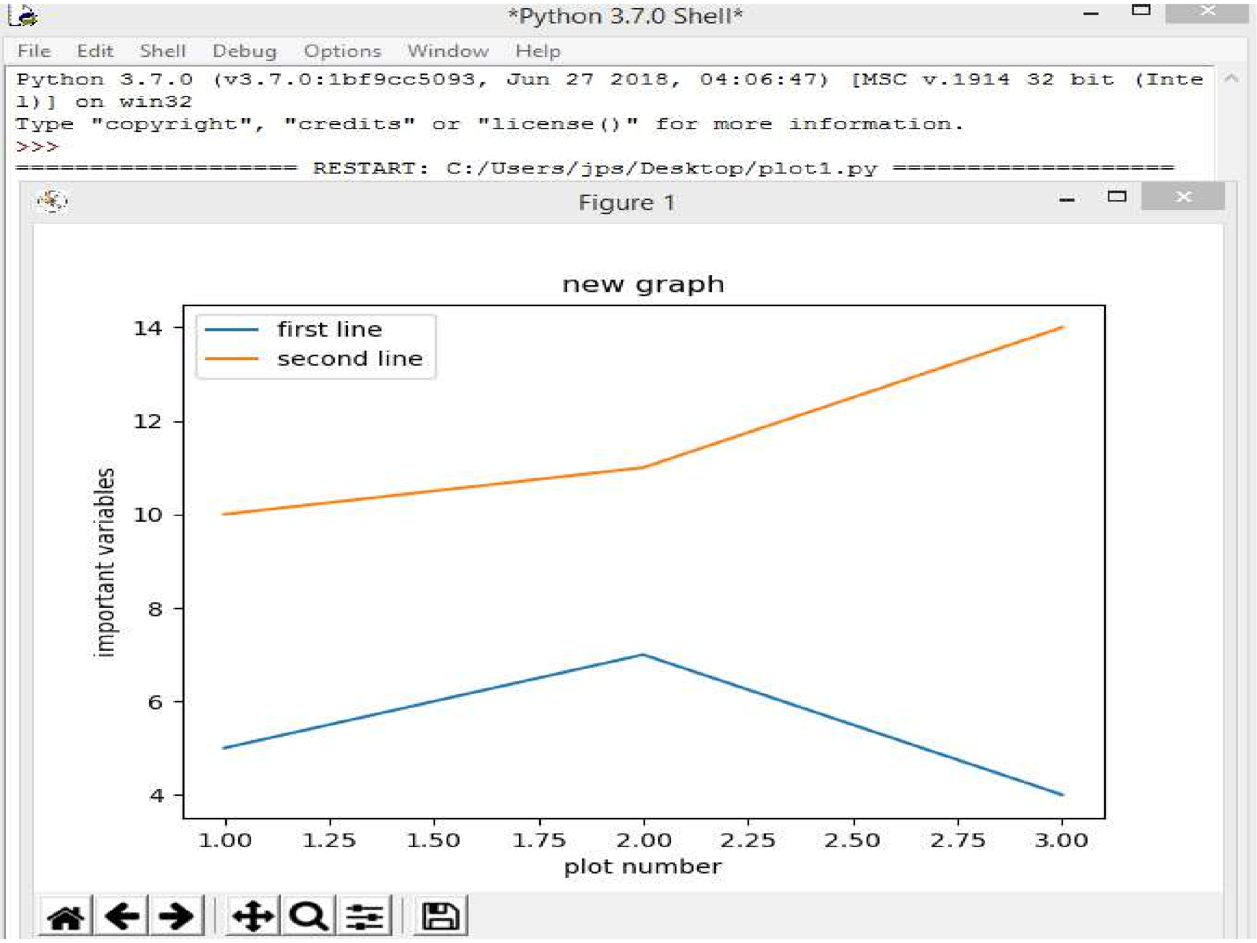


```
Python 3.7.0 (v3.7.0:1bf9cc5093, Jun 27 2018, 04:06:47) [MSC v.1914 32 bit (Inte
l)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
=================== RESTART: C:/Users/jps/Desktop/plot.py ===================
```

# CREATE A PROGRAMME TO DRAW TWO LINES ALONG WITH PROPER TITLES AND LEGENDS:


plot1.py - C:/Users/jps/Desktop/plot1.py (3.7.0)
File Edit Format Run Options Window Help

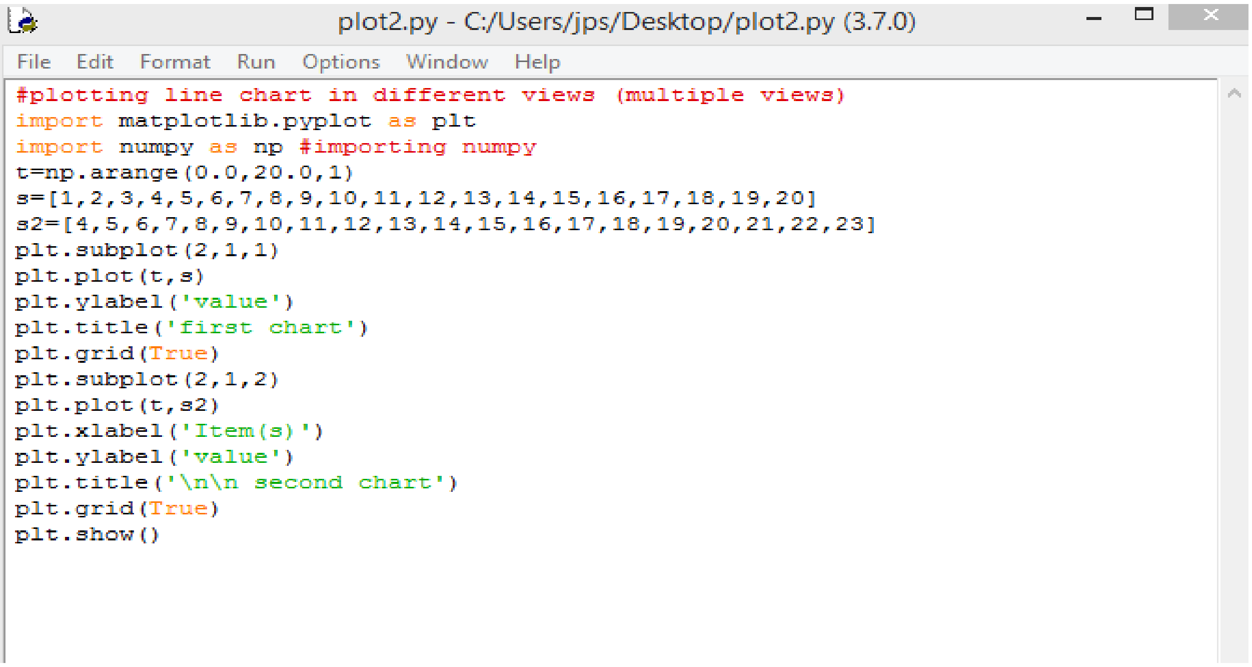
```
#program to draw two lines along with proper titles and legends
import matplotlib.pyplot as plt
x=[1,2,3]
y=[5,7,4]
plt.plot(x,y,label='first line')#plotting two list
x2=[1,2,3]
y2=[10,11,14]
plt.plot(x2,y2,label='second line')
plt.xlabel('plot number')
plt.ylabel('important variables')
plt.title('new graph')
plt.legend()#involves a legend
plt.show() #displaying the chart
```



```
Python 3.7.0 (v3.7.0:1bf9cc5093, Jun 27 2018, 04:06:47) [MSC v.1914 32 bit (Inte
l)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
=================== RESTART: C:/Users/jps/Desktop/plot1.py ===================
```

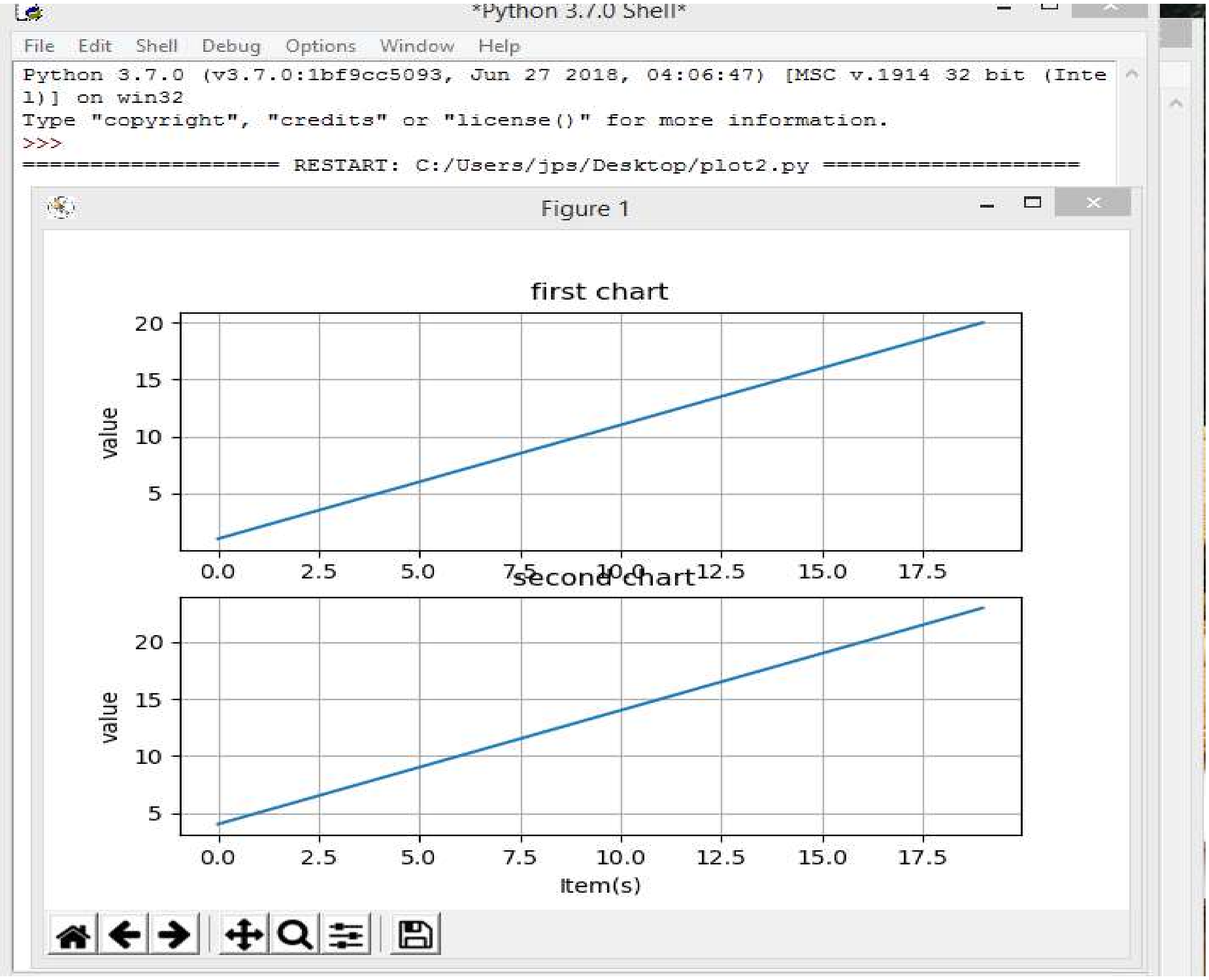
CREATED BY J P KHUNTIA @8763930387

#PLOTTING LINE CHART IN DIFFERENT VIEWS(MULTIPLE VIEWS)


plot2.py - C:/Users/jps/Desktop/plot2.py (3.7.0)
File Edit Format Run Options Window Help

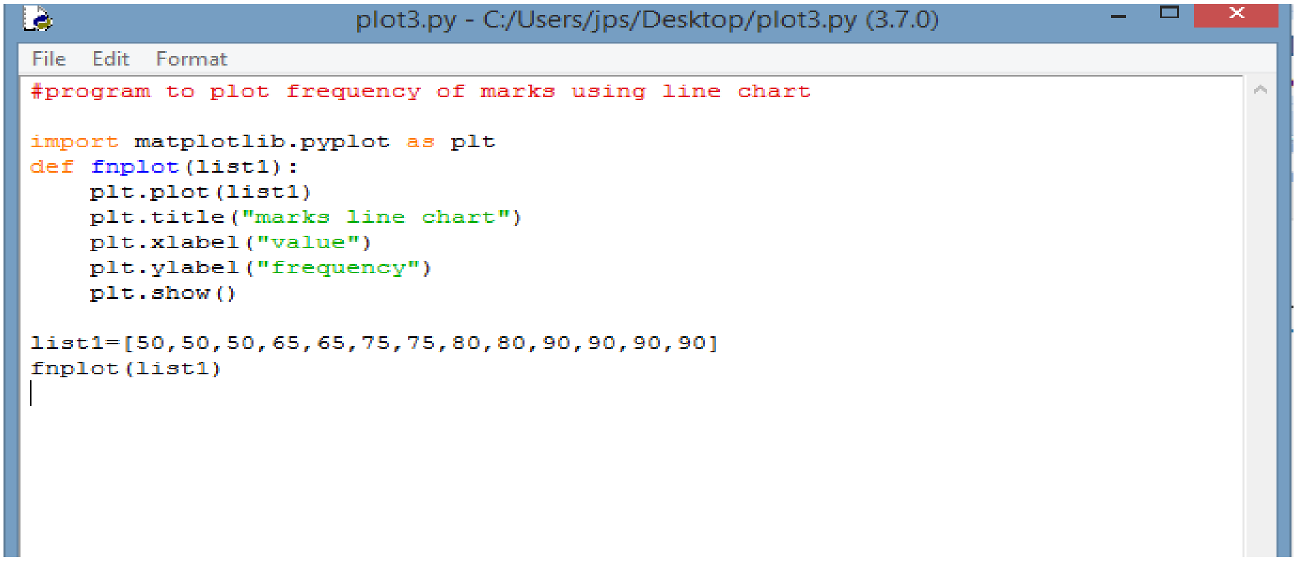
```
#plotting line chart in different views (multiple views)
import matplotlib.pyplot as plt
import numpy as np #importing numpy
t=np.arange(0.0,20.0,1)
s=[1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20]
s2=[4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23]
plt.subplot(2,1,1)
plt.plot(t,s)
plt.ylabel('value')
plt.title('first chart')
plt.grid(True)
plt.subplot(2,1,2)
plt.plot(t,s2)
plt.xlabel('Item(s)')
plt.ylabel('value')
plt.title('\n\n second chart')
plt.grid(True)
plt.show()
```

OUTPUT//



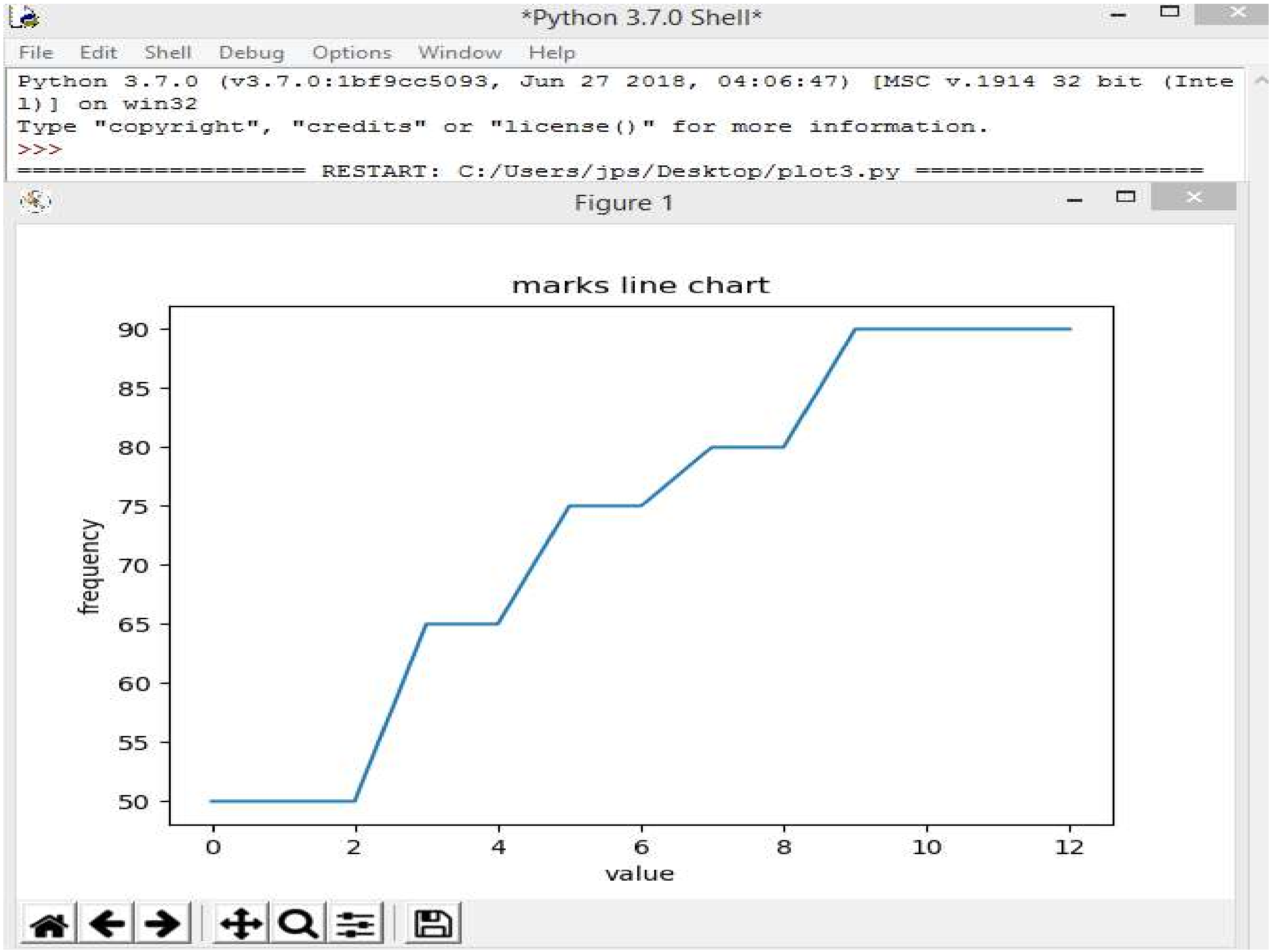
```
Python 3.7.0 (v3.7.0:1bf9cc5093, Jun 27 2018, 04:06:47) [MSC v.1914 32 bit (Inte
l)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
=================== RESTART: C:/Users/jps/Desktop/plot2.py ===================
```

# CREATE A PROGRAMME TO PLOT FREQUENCY OF MARKS USING LINE CHART



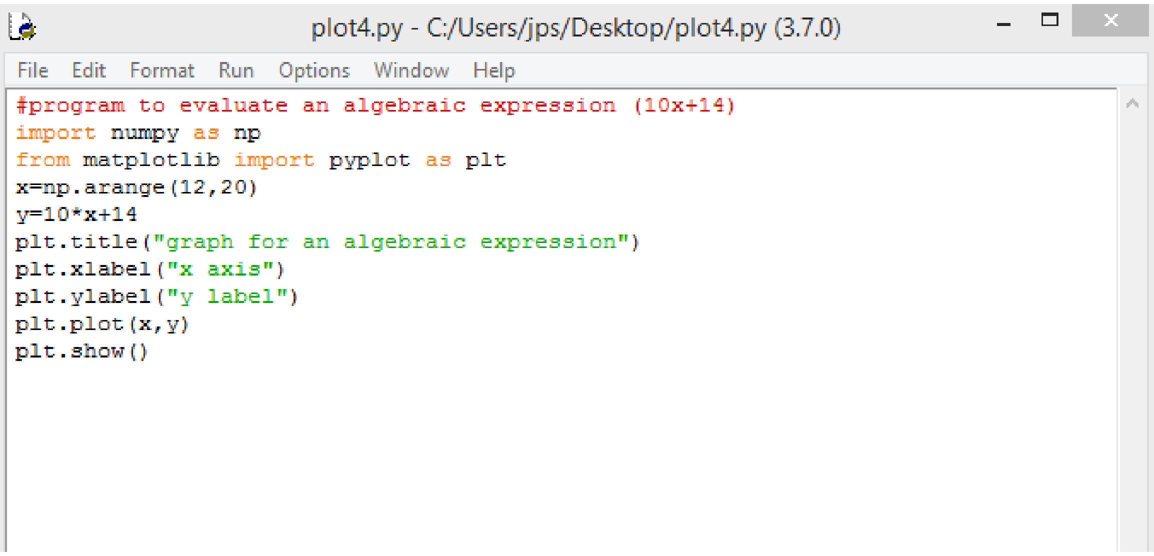
```
#program to plot frequency of marks using line chart

import matplotlib.pyplot as plt
def fnplot(list1):
    plt.plot(list1)
    plt.title("marks line chart")
    plt.xlabel("value")
    plt.ylabel("frequency")
    plt.show()

list1=[50,50,50,65,65,75,75,80,80,90,90,90,90]
fnplot(list1)
```

OUTPUT//



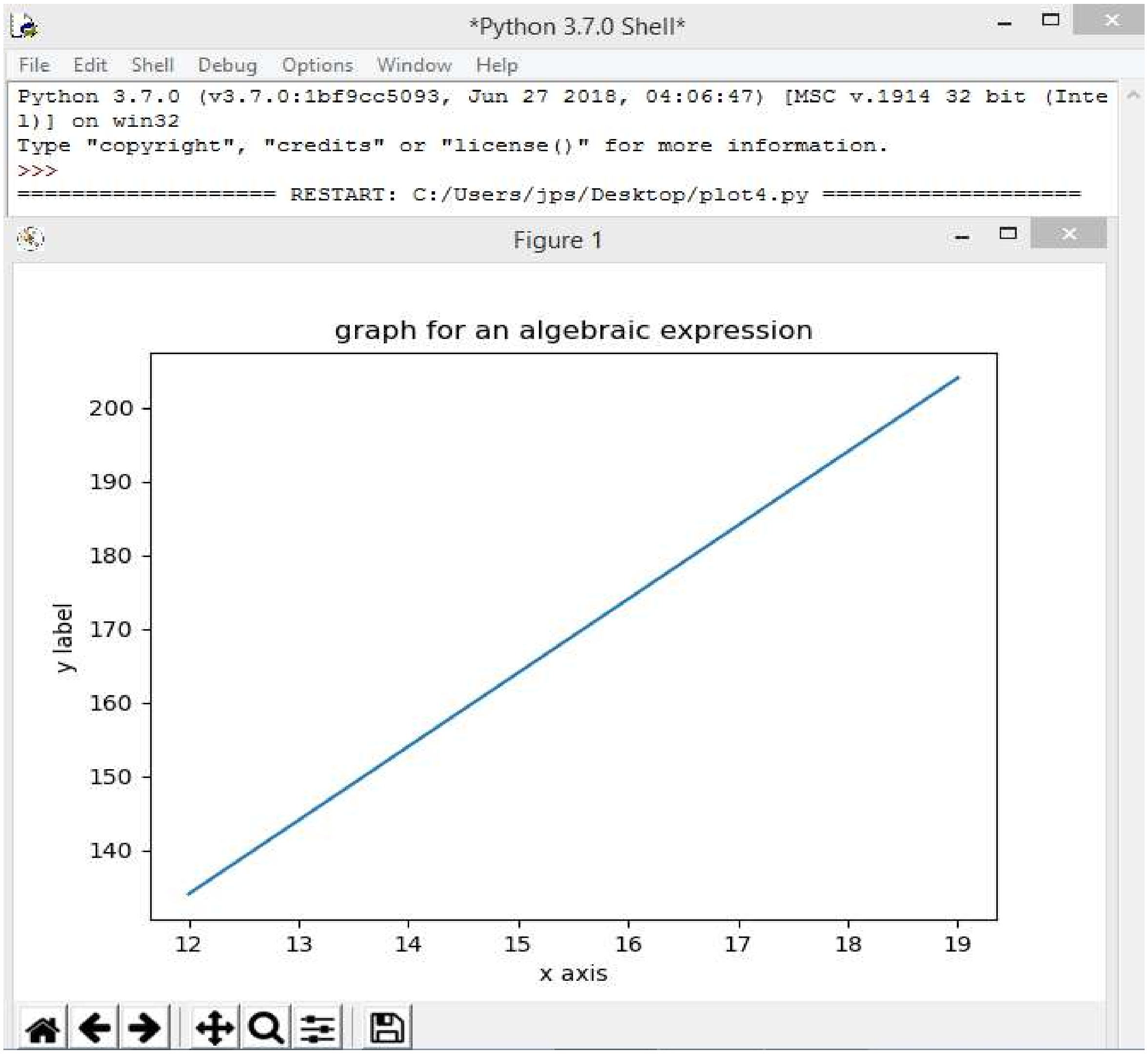
```
Python 3.7.0 (v3.7.0:1bf9cc5093, Jun 27 2018, 04:06:47) [MSC v.1914 32 bit (Inte
l)] on win32
Type "copyright", "credits" or "license()" for more information.
>>> 
=================== RESTART: C:/Users/jps/Desktop/plot3.py ===================
```

# CREATE A PROGRAMME TO EVALUATE AN ALGEBRAIC EXPRESSION (10X+14)


plot4.py - C:/Users/jps/Desktop/plot4.py (3.7.0)
File Edit Format Run Options Window Help

```
#program to evaluate an algebraic expression (10x+14)
import numpy as np
from matplotlib import pyplot as plt
x=np.arange(12,20)
y=10*x+14
plt.title("graph for an algebraic expression")
plt.xlabel("x axis")
plt.ylabel("y label")
plt.plot(x,y)
plt.show()
```

OUTPUT///

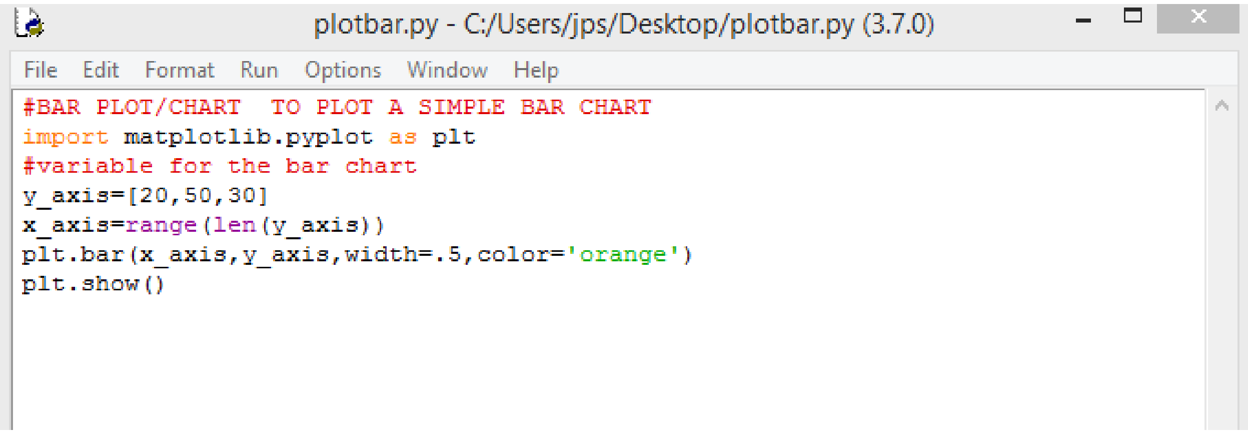


```
Python 3.7.0 (v3.7.0:1bf9cc5093, Jun 27 2018, 04:06:47) [MSC v.1914 32 bit (Inte
l)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
=================== RESTART: C:/Users/jps/Desktop/plot4.py ===================
```

BAR PLOT/CHART:

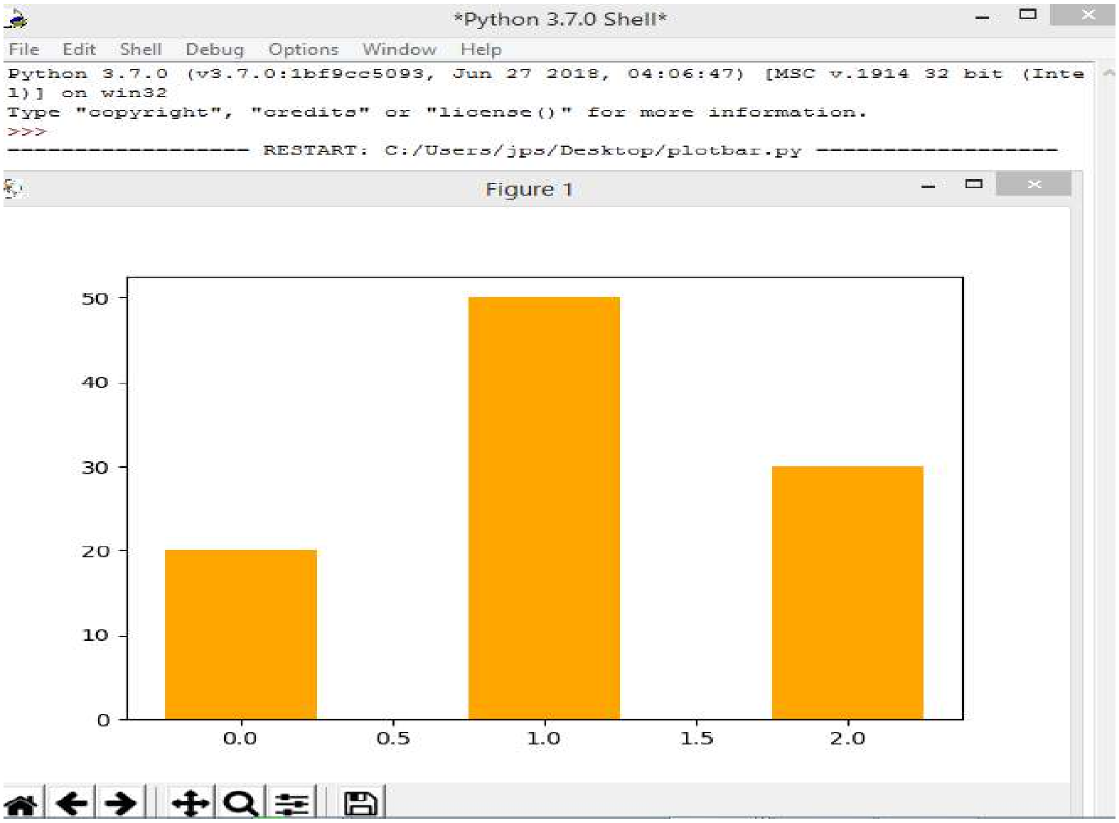
- A bar chart represents categorical data with rectangular bars each bar has a height which corresponds to the value it represents.
- It can also be used with two data series.The bars can be plotted vertically or horizontally.
- A bar chart/bar graph is a very commonly used-two dimensional data visualization made up of rectangular bars.

# TO PLOT A SIMPLE BAR CHART


plotbar.py - C:/Users/jps/Desktop/plotbar.py (3.7.0)
File Edit Format Run Options Window Help

```
#BAR PLOT/CHART  TO PLOT A SIMPLE BAR CHART
import matplotlib.pyplot as plt
#variable for the bar chart
y_axis=[20,50,30]
x_axis=range(len(y_axis))
plt.bar(x_axis,y_axis,width=.5,color='orange')
plt.show()
```

OUTPUT//

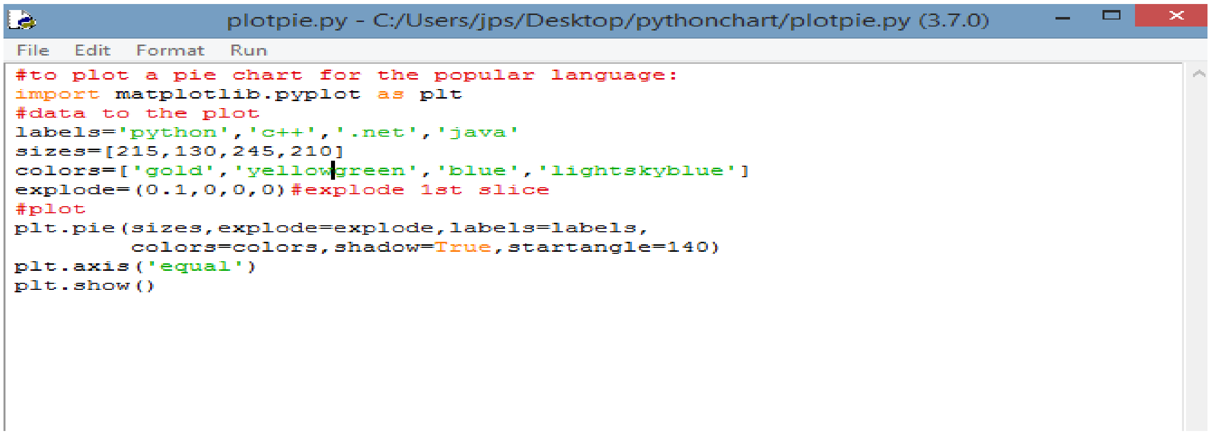


```
Python 3.7.0 (v3.7.0:1bf9cc5093, Jun 27 2018, 04:06:47) [MSC v.1914 32 bit (Inte
l)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
------------------ RESTART: C:/Users/jps/Desktop/plotbar.py ------------------
```

PIE PLOT/CHART:

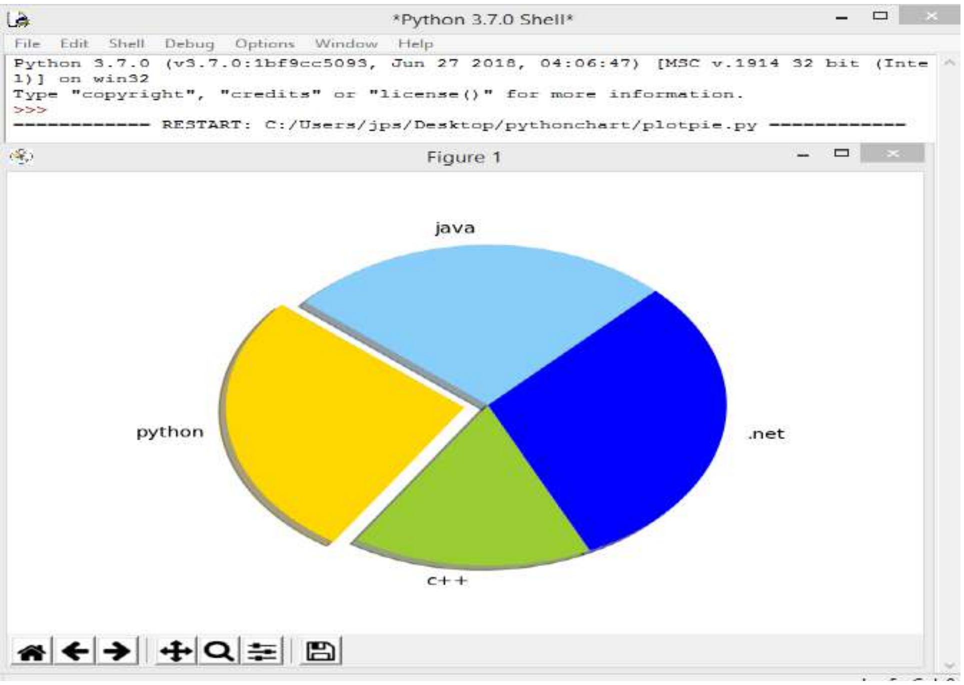
- A pie plot is a circular plot,divided into slices to show numerical proportion.
- Pie plots are widely used in the business world.
- To make a pie chart with matplotlib,we can use the plt.pie() function.
- A pie graph/pie chart is a specialized graph used in statistics
- Pie charts show proportions and percentages between categories by dividing a circle into proportional segments/parts.

#TO PLOT A PIE CHART FOR THE POPULAR LANGUAGE


plotpie.py - C:/Users/jps/Desktop/pythonchart/plotpie.py (3.7.0)
File Edit Format Run

```
#to plot a pie chart for the popular language:
import matplotlib.pyplot as plt
#data to the plot
labels='python','c++','.net','java'
sizes=[215,130,245,210]
colors=['gold','yellowgreen','blue','lightskyblue']
explode=(0.1,0,0,0)#explode 1st slice
#plot
plt.pie(sizes,explode=explode,labels=labels,
        colors=colors,shadow=True,startangle=140)
plt.axis('equal')
plt.show()
```

OUTPUT//



```
Python 3.7.0 (v3.7.0:1bf9cc5093, Jun 27 2018, 04:06:47) [MSC v.1914 32 bit (Inte
l)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
============ RESTART: C:/Users/jps/Desktop/pythonchart/plotpie.py ============
```

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