Matplotlib:

It is a plotting library used for 2D graphics in python programming language. It can be used in python scripts, shell, web application servers and other graphical user interface toolkits.

What is matplotlib used for?

Matploitlib is a Python Library used for plotting, this python library provides and objected-oriented APIs for integrating plots into applications.

Types of plots:

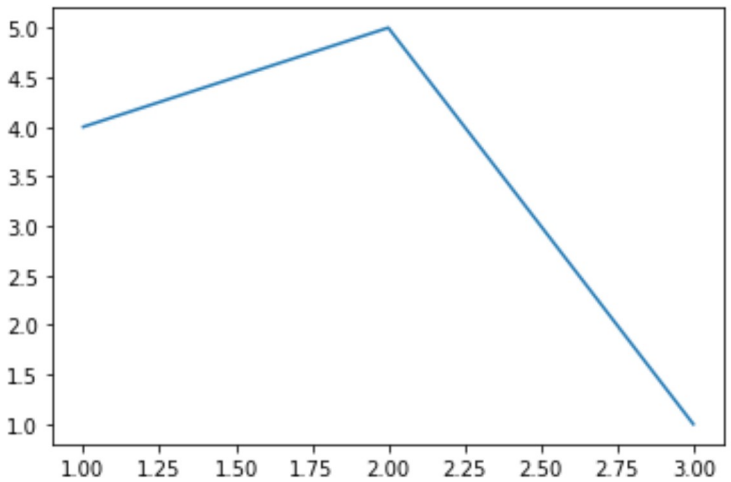
*Bar graph

*Histogram

*Scatter plot

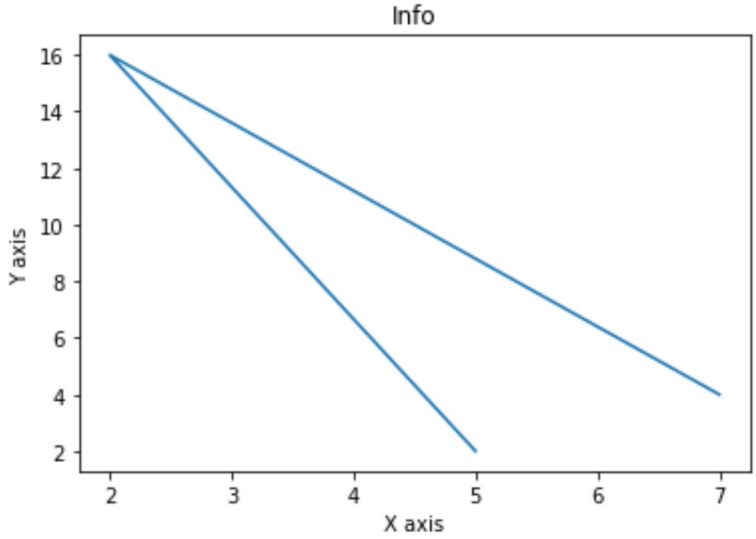
*Area plot Pie plot

In [1]:
```
#basic codes examples in python matplotlib in order to generate a simple gr
from matplotlib import pyplot as plt

#Plotting to our canvas

plt.plot([1,2,3],[4,5,1])

#Showing what we plotted

plt.show()
```



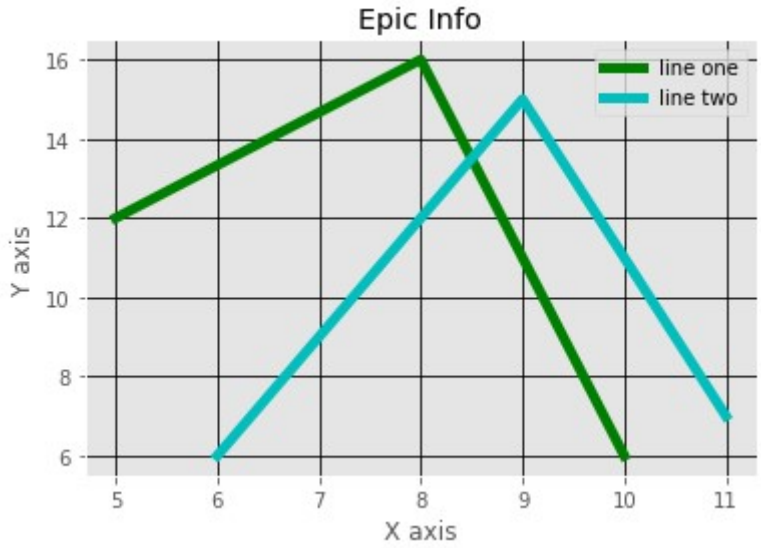
In [2]:

```
#  programming example to add title, labels to our graph created by python
from matplotlib import pyplot as plt

x = [5,2,7]
y = [2,16,4]
plt.plot(x,y)
plt.title('Info')
plt.ylabel('Y axis')
plt.xlabel('X axis')
plt.show()
```



In [3]:

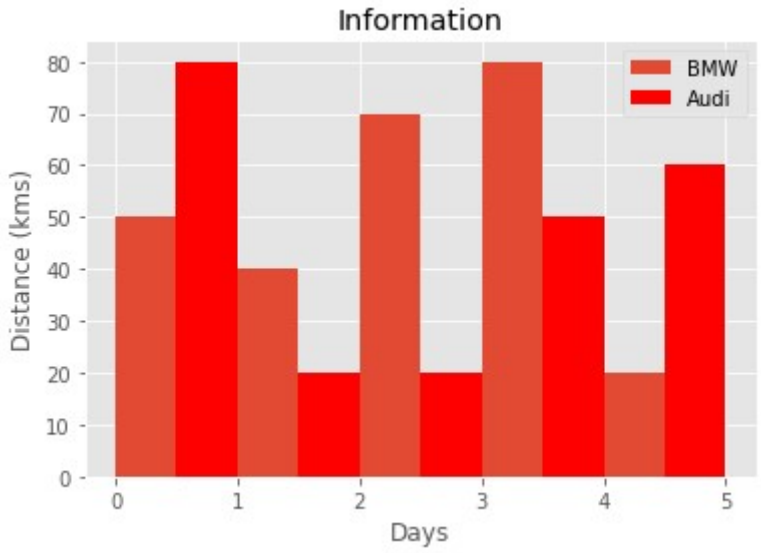
```
#programming example to add style to a graph using python matplotlib. First
from matplotlib import pyplot as plt
from matplotlib import style

style.use('ggplot')
x = [5,8,10]
y = [12,16,6]
x2 = [6,9,11]
y2 = [6,15,7]
plt.plot(x,y,'g',label='line one', linewidth=5)
plt.plot(x2,y2,'c',label='line two',linewidth=5)
plt.title('Epic Info')
plt.ylabel('Y axis')
plt.xlabel('X axis')
plt.legend()
plt.grid(True,color='k')
plt.show()
```



Python Matplotlib: Bar Graph

A bar graph uses bars to compare data among different categories. It is well suited when you want to measure the changes over a period of time. It can be represented horizontally or vertically. Also, the important thing to keep in mind is that longer the bar, greater is the value.

In [4]:
```
#programming example for bar graph
from matplotlib import pyplot as plt

plt.bar([0.25,1.25,2.25,3.25,4.25],[50,40,70,80,20],
label="BMW",width=.5)
plt.bar([.75,1.75,2.75,3.75,4.75],[80,20,20,50,60],
label="Audi", color='r',width=.5)
plt.legend()
plt.xlabel('Days')
plt.ylabel('Distance (kms)')
plt.title('Information')
plt.show()
```

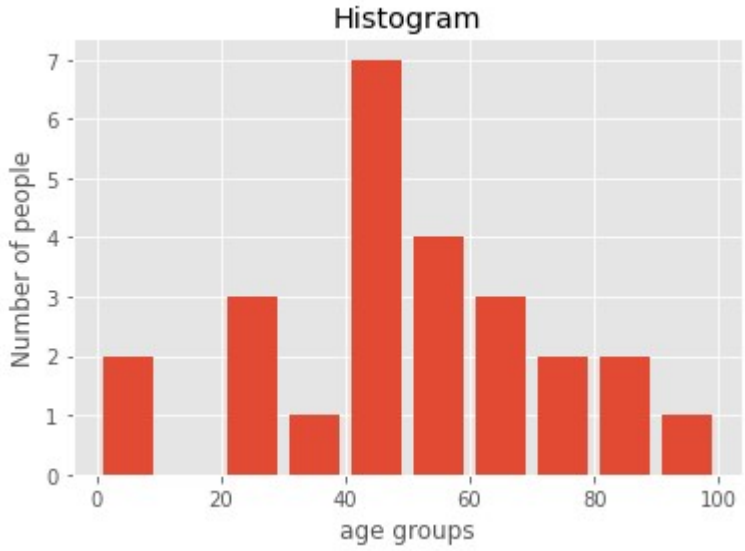


In the above plot, I have displayed the comparison between the distance covered by two cars BMW and Audi over a period of 5 days.

Python Matplotlib – Histogram

the difference between a bar graph and a histogram. Histograms are used to show a distribution whereas a bar chart is used to compare different entities. Histograms are useful when you have arrays or a very long list. Let's consider an example where I have to plot the age of population with respect to bin. Now, bin refers to the range of values that are divided into series of intervals. Bins are usually created of the same size. In the below code, I have created the bins in the interval of 10 which means the first bin contains elements from 0 to 9, then 10 to 19 and so on.

In [5]:
```
#programming example for histogram
import matplotlib.pyplot as plt
population_age = [22,55,62,45,21,22,34,42,42,4,2,102,95,85,55,110,120,70,65
bins = [0,10,20,30,40,50,60,70,80,90,100]
plt.hist(population_age, bins, histtype='bar', rwidth=0.8)
plt.xlabel('age groups')
plt.ylabel('Number of people')
plt.title('Histogram')
plt.show()
```



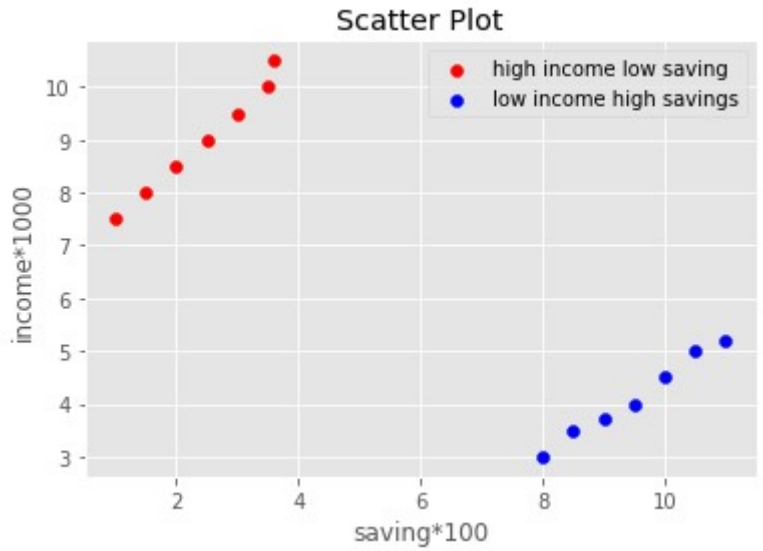
As you can see in the above plot, we got age groups with respect to the bins. Our biggest age group is between 40 and 50.

Python Matplotlib : Scatter Plot

Usually we need scatter plots in order to compare variables, for example, how much one variable is affected by another variable to build a relation out of it. The data is displayed as a collection of points, each having the value of one variable which determines the position on the horizontal axis and the value of other variable determines the position on the vertical axis.

In [6]:

```
#programming example for scatter plot
import matplotlib.pyplot as plt
x = [1,1.5,2,2.5,3,3.5,3.6]
y = [7.5,8,8.5,9,9.5,10,10.5]

x1=[8,8.5,9,9.5,10,10.5,11]
y1=[3,3.5,3.7,4,4.5,5,5.2]

plt.scatter(x,y, label='high income low saving',color='r')
plt.scatter(x1,y1,label='low income high savings',color='b')
plt.xlabel('saving*100')
plt.ylabel('income*1000')
plt.title('Scatter Plot')
plt.legend()
plt.show()
```



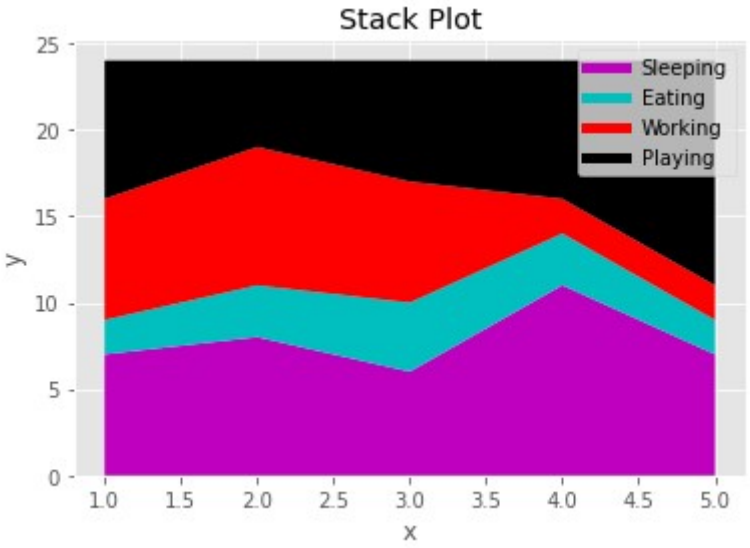
As you can see in the above graph, I have plotted two scatter plots based on the inputs specified in the above code. The data is displayed as a collection of points having 'high income low salary' and 'low income high salary'.

Python Matplotlib : Area Plot

Area plots are pretty much similar to the line plot. They are also known as stack plots. These plots can be used to track changes over time for two or more related groups that make up one whole category. For example, let's compile the work done during a day into categories, say sleeping, eating, working and playing.

In [8]:

```
#programming example for area plot
import matplotlib.pyplot as plt
days = [1,2,3,4,5]

sleeping =[7,8,6,11,7]
eating = [2,3,4,3,2]
working =[7,8,7,2,2]
playing = [8,5,7,8,13]

plt.plot([],[],color='m', label='Sleeping', linewidth=5)
plt.plot([],[],color='c', label='Eating', linewidth=5)
plt.plot([],[],color='r', label='Working', linewidth=5)
plt.plot([],[],color='k', label='Playing', linewidth=5)

plt.stackplot(days, sleeping,eating,working,playing, colors=['m','c','r','k

plt.xlabel('x')
plt.ylabel('y')
plt.title('Stack Plot')
plt.legend()
plt.show()
```



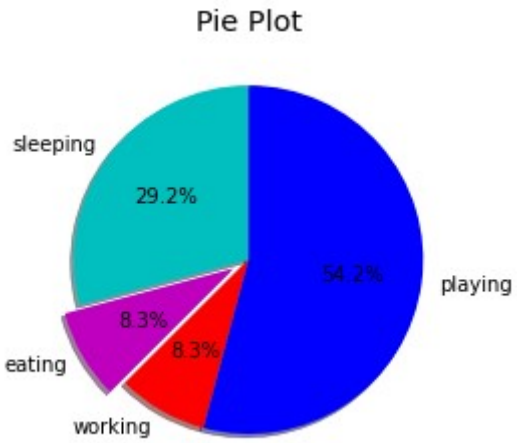
As we can see in the above image, we have time spent based on the categories. Therefore, area plot or stack plot is used to show trends over time, among different attributes.

Python Matplotlib : Pie Chart

A pie chart refers to a circular graph which is broken down into segments i.e. slices of pie. It is basically used to show the percentage or proportional data where each slice of pie represents a category.

In [9]:

```
#programming example for pie chart
import matplotlib.pyplot as plt

days = [1,2,3,4,5]

sleeping =[7,8,6,11,7]
eating = [2,3,4,3,2]
working =[7,8,7,2,2]
playing = [8,5,7,8,13]
slices = [7,2,2,13]
activities = ['sleeping','eating','working','playing']
cols = ['c','m','r','b']

plt.pie(slices,
  labels=activities,
  colors=cols,
  startangle=90,
  shadow= True,
  explode=(0,0.1,0,0),
  autopct='%1.1f%%')

plt.title('Pie Plot')
plt.show()
```

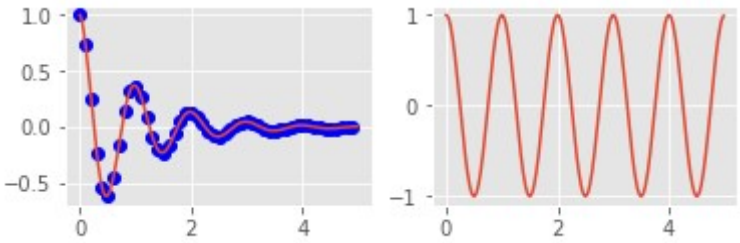


In the above pie chart, I have divided the circle into 4 sectors or slices which represents the respective category (playing, sleeping, eating and working) along with the percentage they hold. Now, if you have noticed these slices adds up to 24 hrs, but the calculation of pie slices is done automatically for you. In this way, pie charts are really useful as you don't have to be the one who calculates the percentage or the slice of the pie.

Python Matplotlib : Working With Multiple Plots

I have discussed about multiple types of plots in python matplotlib such as bar plot, scatter plot, pie plot, area plot etc. Now, let me show you how to handle multiple plots.

In [10]:
```
import numpy as np
import matplotlib.pyplot as plt

def f(t):
    return np.exp(-t) * np.cos(2*np.pi*t)
t1 = np.arange(0.0, 5.0, 0.1)
t2 = np.arange(0.0, 5.0, 0.02)
plt.subplot(221)
plt.plot(t1, f(t1), 'bo', t2, f(t2))
plt.subplot(222)
plt.plot(t2, np.cos(2*np.pi*t2))
plt.show()
```



The code is pretty much similar to the previous examples that you have seen but there is one new concept here i.e. subplot. The subplot() command specifies numrow, numcol, fignum which ranges from 1 to numrows*numcols. The commas in this command are optional if* numrowsnumcols<10. So subplot (221) is identical to subplot (2,2,1). Therefore, subplots helps us to plot multiple graphs in which you can define it by aligning vertically or horizontally. In the above example, I have aligned it horizontally.

Disadvantages of matplotlib:

*They are heavily reliant on other packages, such as NumPy.

*It only works for python, so it is hard or impossible to be used in languages other than python.

In [ ]:
```
```