MatplotLib Tutorial ¶

Matplotlib is a plotting library for the Python programming language and its numerical mathematics extension NumPy. It provides an object-oriented API for embedding plots into application using general-purpose GUI toolkits like Tkinter, wxPython,Qt, or GTK+.

some of major pros of MatplotLib are:

. Generally easy to get started for simple plots

. support for custom labels and texts

. Great control of every element in figure

. High quality output in many formats

. very customizable in general

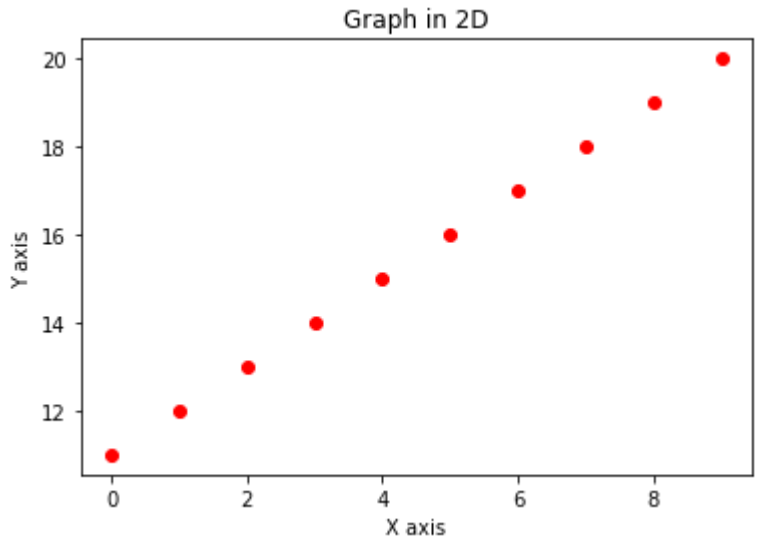
In [3]:
```
import matplotlib.pyplot as plt
%matplotlib inline
```

In [4]:
```
import numpy as np
```

In [5]:
```
## simple Examples
x=np.arange(0,10)
y=np.arange(11,21)
```

In [6]:
```
a=np.arange(40,50)
b=np.arange(50,60)
```

In [17]:
```
##plotting using matplotlib
## plt scatter
plt.scatter(x,y,c='r')   ## c used for colors of scatter point r=red g = green
plt.xlabel('X axis')
plt.ylabel('Y axis')
plt.title('Graph in 2D')  ## plt.show() does not require to plot graph because
plt.savefig('Test.png')
```

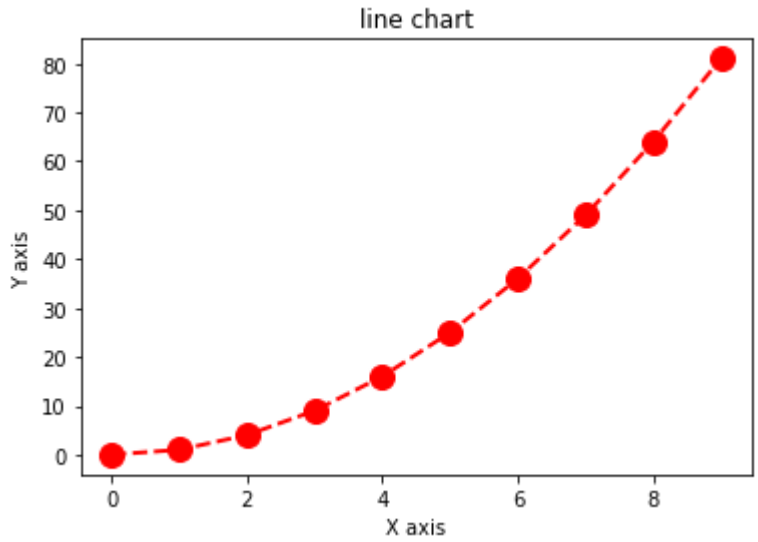


In [18]:
```
y=x*x   ## now y value is x square that why garph not come straight line
```

In [40]:
```
## plt plot
plt.plot(x,y,"ro--",linestyle='dashed',linewidth=2,markersize=12)
plt.title("line chart")
plt.xlabel('X axis')
plt.ylabel('Y axis')
```

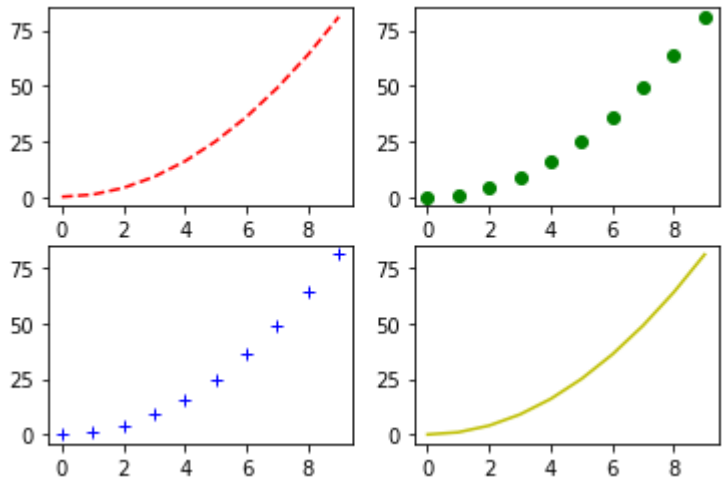
```
C:\Users\Desh Deepak Verma\AppData\Local\Temp\ipykernel_12016\4089266584.py:
2: UserWarning: linestyle is redundantly defined by the 'linestyle' keyword a
rgument and the fmt string "ro--" (-> linestyle='--'). The keyword argument w
ill take precedence.
  plt.plot(x,y,"ro--",linestyle='dashed',linewidth=2,markersize=12)
```

Out[40]:
```
Text(0, 0.5, 'Y axis')
```

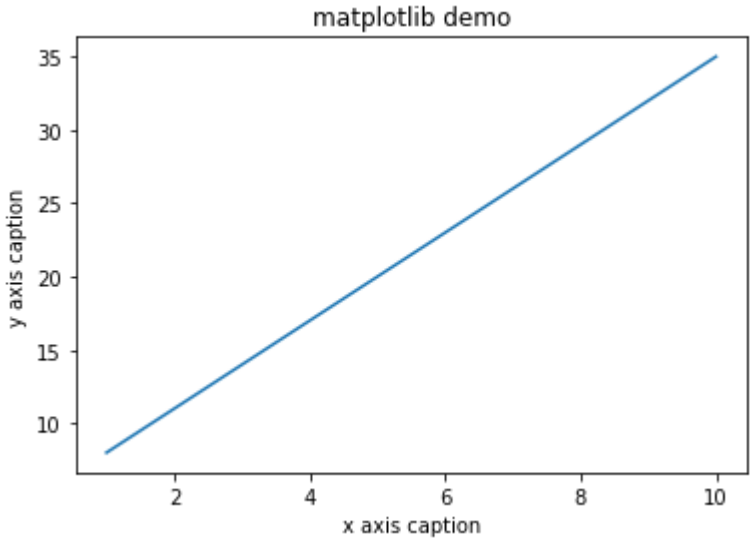


In [61]:
```
## creating subplots
plt.subplot(2,2,1)   ## (2,2,1) postion of curve at one place. 2,2 indicating 
plt.plot(x,y,'r--')
plt.subplot(2,2,2)
plt.plot(x,y,'go')
plt.subplot(2,2,3)
plt.plot(x,y,'b+')
plt.subplot(2,2,4)
plt.plot(x,y,'y-')
```

Out[61]:
```
[<matplotlib.lines.Line2D at 0x1f29d185fd0>]
```



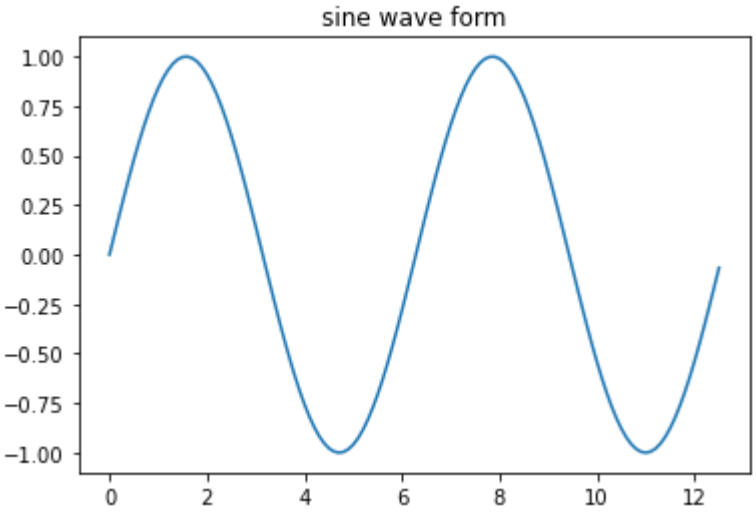
In [68]:
```
x= np.arange(1,11)
y= 3*x+5
plt.title('matplotlib demo')
plt.xlabel('x axis caption')
plt.ylabel('y axis caption')
plt.plot(x,y)
plt.show()
```



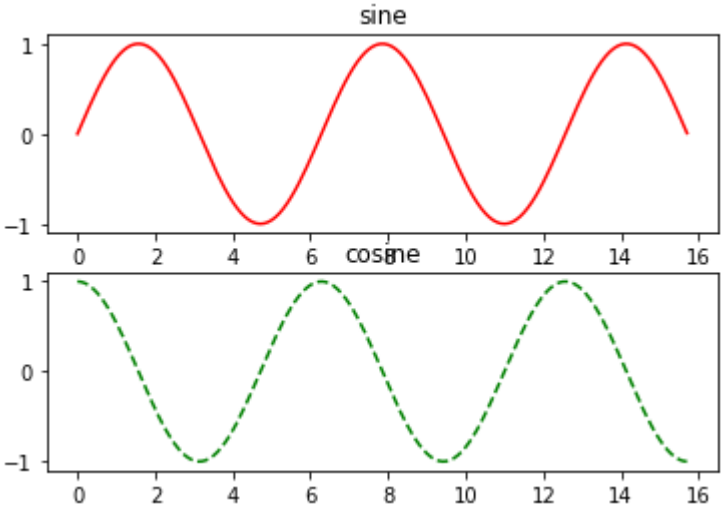
In [69]:
```
np.pi
```

Out[69]:
```
3.141592653589793
```

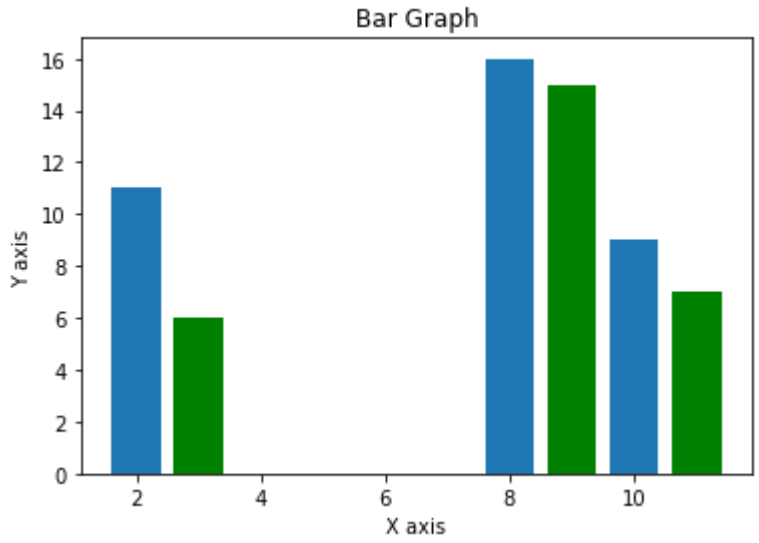
In [70]:
```
# compute the x and y coordinates for points on a sine curve
x=np.arange(0,4*np.pi,0.1)
y=np.sin(x)
plt.title('sine wave form')

# plot the points using matplotlib
plt.plot(x,y)
plt.show()
```



In [74]:
```
# subplot
# compute the x and y coordinate for points on sine and cosine curves
x=np.arange(0,5*np.pi,0.1)
y_sin=np.sin(x)
y_cos=np.cos(x)

# set up a subplot grid that has height 2 and width 1,
# and set the first such subplot as active
plt.subplot(2,1,1)

# make the first plot
plt.plot(x,y_sin,'r-')
plt.title('sine')

#set the second subplot as active, and make the second plot.
plt.subplot(2,1,2)
plt.plot(x,y_cos,'g--')
plt.title('cosine')

#show the figure.
plt.show()
```

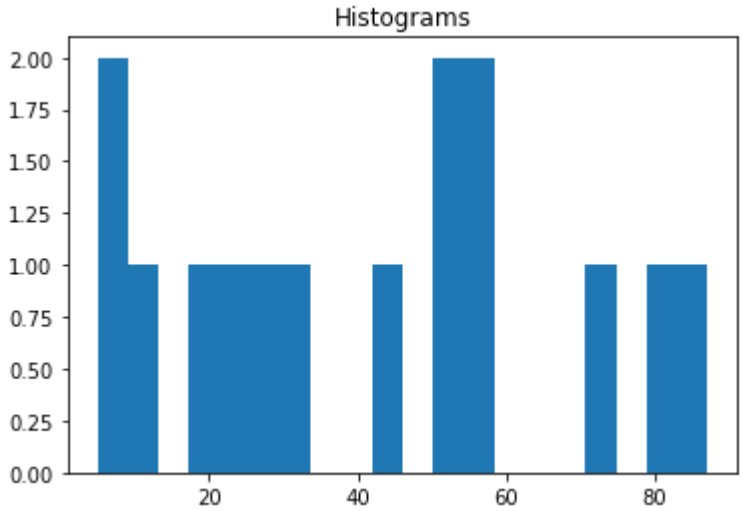


In [77]:
```
## Bar plot

x=[2,8,10]
y=[11,16,9]

x2=[3,9,11]
y2=[6,15,7]
plt.bar(x,y)
plt.bar(x2,y2,color='g')
plt.title('Bar Graph')
plt.ylabel('Y axis')
plt.xlabel('X axis')


plt.show()
```



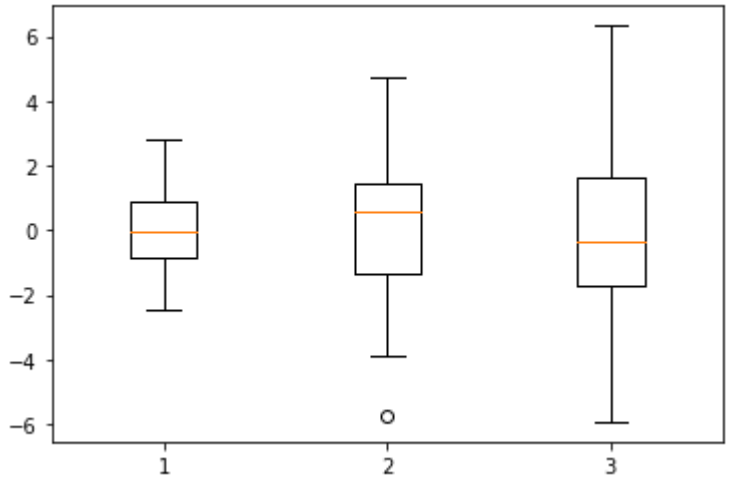
Histograms

In [80]:
```
a= np.array([22,87,5,43,56,73,55,54,11,20,51,5,79,31,27])
plt.hist(a,bins=20)       ## bins fuction you should understand
plt.title('Histograms')
plt.show()
```



Box plot using Matplotlib

In [88]:
```
data=[np.random.normal(0,std,100) for std in range(1,4)]

# rectanglur box plot
plt.boxplot(data,vert=True,patch_artist=False);  ##artist for color, vert= tru
```



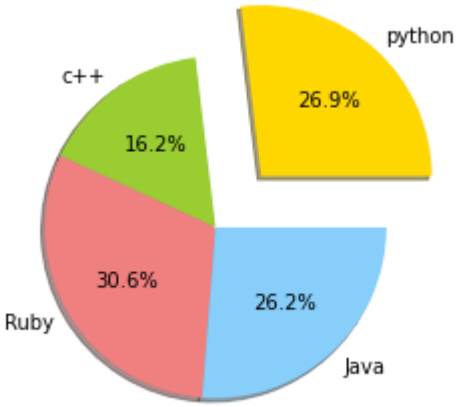
In [82]:
```
data
```

Out[82]:
```
[array([-0.34168131,  0.1393032 , -0.70139842, -0.70827135, -0.35938711,
        -1.24294356,  0.07816271,  0.38520978,  0.08241476,  0.16018735,
         0.49262454,  0.66062628,  0.58941195,  0.97097567, -0.98396982,
         2.07758646,  1.5961588 ,  0.96537008, -0.4735482 ,  0.20360365,
         0.89293302, -1.84597543, -1.05151511,  0.33724878,  0.16375221,
         0.96714345,  0.69106572, -0.58424167,  0.23317161, -0.7215846 ,
        -1.42469985,  1.02736677, -0.07953644,  1.86557947,  0.02587791,
         0.38139381, -0.4372021 ,  0.68565412,  0.51983929, -0.88425881,
        -1.77534094, -0.00801927,  0.2437222 , -0.67697229,  1.46050345,
        -0.14313378, -0.33432186, -0.47895721, -1.02036128, -0.53131572,
         0.39379347, -0.80139346,  0.33914195,  0.23115556, -0.21567808,
         1.88756293,  0.08203092, -0.0892112 ,  0.99086109,  0.7733315 ,
         0.23313288,  0.04232508,  2.54856552, -0.66950405,  2.11228517,
        -0.72738684,  0.56624818,  0.56464962,  0.28622755,  0.44164181,
         0.92388756, -0.10408415, -0.70876693, -0.29298164,  1.48711619,
        -1.81540352, -1.10446085, -0.25670169,  2.64920025,  0.13988544,
        -0.03773123,  0.14773661,  1.46310109, -0.06401194,  0.03393119,
         0.93296879,  0.7442084 , -0.25546247, -0.37239217,  2.15462013,
         1.92607409, -1.86938982, -0.30995319, -0.92998565, -0.64632955,
        -0.67906268, -1.27121293, -0.95322607,  0.05552215, -2.18881383]),
 array([-1.19939734e+00, -1.61809216e+00, -1.76865692e+00, -1.32404845e+00,
        -1.85965837e+00,  6.96657983e-02, -9.72382947e-01, -3.13476150e-01,
         1.88313309e+00, -1.53860335e+00,  1.56881984e+00, -1.35292143e+00,
        -1.01939064e+00,  4.87562010e+00,  3.31000180e+00, -1.85388505e+00,
        -3.97844914e+00, -1.45315173e-01, -1.43210259e+00,  5.75639784e+00,
         4.06339303e+00,  2.02167795e+00, -2.12870980e+00, -5.37596005e-03,
         3.75948065e-01, -1.33626919e+00, -1.04886341e+00, -1.52989155e+00,
         1.83718609e+00,  1.67049030e+00, -7.68915498e-01,  2.98549053e+00,
         2.03726095e+00,  3.94755779e+00, -1.09501172e+00,  3.46249579e+00,
        -8.76543590e-01,  4.77379599e-01, -3.34085725e+00, -4.83100421e-02,
        -1.60658452e+00, -9.62355482e-01,  4.46913955e-01,  2.39690280e-01,
        -4.70962695e-01,  3.34226107e+00, -1.24386699e+00, -1.02645695e+00,
         1.28915214e+00,  2.96953630e+00, -7.49565170e-01, -1.03035518e+00,
         2.58486941e+00,  3.67004507e+00,  8.45971699e-01,  1.53627439e+00,
        -3.14809777e-01, -2.56870112e+00,  7.39836706e-01, -9.01191345e-01,
         1.96358217e+00,  2.63948155e+00,  1.62708537e+00, -4.07075165e-01,
         1.61969352e+00, -8.86195892e-01,  2.26004766e+00, -3.26547557e+00,
         4.55549151e-01, -1.81391107e+00, -1.22733851e+00,  1.37847647e+00,
        -1.39051633e+00, -3.37838066e-01,  4.35697225e-01, -2.97075461e+00,
        -1.53755530e+00,  1.22125163e+00, -1.28965238e+00,  3.87657843e-01,
         2.53970219e+00, -3.02020596e-01, -4.00934450e+00, -3.59600884e+00,
        -7.73989230e-01,  1.45453825e+00,  4.99746230e-01,  3.85229837e+00,
         2.98772225e+00,  2.54752587e+00, -1.79061283e+00,  2.46264686e-01,
        -3.49599800e+00,  2.45074006e+00, -1.03281320e+00,  1.10286519e+00,
        -6.17367967e-01, -1.86218425e-01, -2.23811498e+00, -4.93856364e-01]),
 array([ 2.92711   , -3.43641621,  4.44233485,  0.45327185,  1.37201601,
         1.25290128, -0.868401  ,  1.16658258, -1.18786484,  2.85289479,
         1.04557233, -3.47415654,  0.93177972,  1.29540022, -0.74050142,
        -1.44420312,  4.81060928, -0.48039631,  4.88562156, -1.49266063,
        -2.79704419, -1.87690636, -2.18048052, -2.14641894, -3.70535523,
         0.98794013,  2.57825357,  1.027294  , -1.20841174,  3.0323873 ,
         1.08853888,  4.07243454, -0.17802086, -2.73237773, -1.67796018,
        -0.80980878, -2.71521839, -0.01392324, -1.22362315, -1.65714226,
        -0.18881775,  0.91517357,  3.64454402,  1.45380882, -4.11655132,
        -3.10468039, -0.49191364, -4.85154956, -0.39583827,  3.08276276,
        -3.74400573, -3.16673741,  4.70588665,  2.91880073, -1.43150237,
         2.14146614, -0.85539431,  0.83698602, -0.56194606, -1.77106089,
```

```
-2.23185166,  0.89839188, -0.68000936, -4.42115213,  1.89661563,
 1.74420031, -1.41808421, -2.3964221 ,  0.23472261,  2.0545045 ,
 0.07816812, -5.13161135, -0.81460367, -2.34281555, -1.73640293,
 4.41788072,  0.31518972, -0.59197246,  0.38358908, -5.68161548,
 9.76520288,  3.29319178,  0.79046291, -0.74588057,  1.68530292,
-3.54233937,  0.1803705 , -3.16361792,  1.91935081, -3.76196164,
 2.6976133 ,  0.61151551,  0.71365386, -0.25460161,  2.15117641,
-3.38495703,  1.38196437, -4.33982824, -0.36709347,  0.18282335])]
```

Pie chart

In [100]:
```
## Data to plot
labels = 'python','c++','Ruby','Java'
sizes=[215,130,245,210]
colors=['gold','yellowgreen','lightcoral','lightskyblue']
explode=(0.4,0,0,0)   # explode 1st slice

#plot
plt.pie(sizes, explode=explode, labels=labels, colors=colors,autopct='%1.1f%%'

plt.axis('equal')
plt.show()
```



In [ ]:
```

```