In [2]:

```
print('Hello')
```

```
Hello
```

In [3]:

```
import numpy as np
```

In [4]:

```
arr1=np.array([1,2,3,4,5])
arr1
```

Out[4]:

```
array([1, 2, 3, 4, 5])
```

In [5]:

```
type(arr1)
```

Out[5]:

```
numpy.ndarray
```

In [6]:

```
#create 2D matrix
```

In [7]:

```
arr2=np.array([[1,3,4,5],[5,6,7,8]])
arr2
```

Out[7]:

```
array([[1, 3, 4, 5],
       [5, 6, 7, 8]])
```

In [8]:

```
type(arr2)
```

Out[8]:

```
numpy.ndarray
```

In [9]:

```
#zeros
arr3=np.zeros((2,4))
arr3
```

Out[9]:

```
array([[0., 0., 0., 0.],
       [0., 0., 0., 0.]])
```

In [10]:

```
arr4=np.ones((2,4))
arr4
```

Out[10]:

```
array([[1., 1., 1., 1.],
       [1., 1., 1., 1.]])
```

In [11]:

```
arr5=np.identity(4)
arr5
```

Out[11]:

```
array([[1., 0., 0., 0.],
       [0., 1., 0., 0.],
       [0., 0., 1., 0.],
       [0., 0., 0., 1.]])
```

In [12]:

```
for i in range(0,10):
    print(i, end='')
```

```
0123456789
```

In [13]:

```
arr6=np.arange(10)
arr6
```

Out[13]:

```
array([0, 1, 2, 3, 4, 5, 6, 7, 8, 9])
```

In [14]:

```
arr7=np.linspace(1,10,11)
arr7
```

```
Out[14]: array([ 1. ,  1.9,  2.8,  3.7,  4.6,  5.5,  6.4,  7.3,  8.2,  9.1, 10. ])

In [15]: arr8=np.array([[1,2,3],[4,5,6],[7,8,9]])
         arr8

Out[15]: array([[1, 2, 3],
                [4, 5, 6],
                [7, 8, 9]])

In [16]: arr1.shape

Out[16]: (5,)

In [17]: arr2

Out[17]: array([[1, 3, 4, 5],
                [5, 6, 7, 8]])

In [18]: arr2.shape

Out[18]: (2, 4)

In [19]: arr3

Out[19]: array([[0., 0., 0., 0.],
                [0., 0., 0., 0.]])

In [20]: arr8

Out[20]: array([[1, 2, 3],
                [4, 5, 6],
                [7, 8, 9]])

In [21]: arr8.shape

Out[21]: (3, 3)

In [22]: arr1

Out[22]: array([1, 2, 3, 4, 5])

In [23]: arr1.ndim

Out[23]: 1

In [24]: arr2

Out[24]: array([[1, 3, 4, 5],
                [5, 6, 7, 8]])

In [25]: arr2.ndim

Out[25]: 2

In [26]: arr5

Out[26]: array([[1., 0., 0., 0.],
                [0., 1., 0., 0.],
                [0., 0., 1., 0.],
                [0., 0., 0., 1.]])

In [27]: arr5.ndim
```

Out[27]:

```
2
```

In [28]:

```
mat=np.identity(3)
mat
```

Out[28]:

```
array([[1., 0., 0.],
       [0., 1., 0.],
       [0., 0., 1.]])
```

In [29]:

```
mat.ndim
```

Out[29]:

```
2
```

In [30]:

```
rix=np.array([[1,2],[3,4],[5,6]])
rix
```

Out[30]:

```
array([[1, 2],
       [3, 4],
       [5, 6]])
```

In [31]:

```
rix.ndim
```

Out[31]:

```
2
```

In [32]:

```
rix.size
```

Out[32]:

```
6
```

In [33]:

```
rix.ndim
```

Out[33]:

```
2
```

In [34]:

```
rix2=np.array([[[1,2],[2,3],[4,5]],
              [[6,7],[8,9],[10,11]]])
rix2.ndim
```

Out[34]:

```
3
```

In [35]:

```
rix2
```

Out[35]:

```
array([[[ 1,  2],
        [ 2,  3],
        [ 4,  5]],

       [[ 6,  7],
        [ 8,  9],
        [10, 11]]])
```

In [36]:

```
rix2.shape
```

Out[36]:

```
(2, 3, 2)
```

In [37]:

```
rix2.itemsize
```

Out[37]:

```
4
```

In [38]:

```
trix=np.array([[1,2,3]])
trix
```

Out[38]:

```
array([[1, 2, 3]])
```

In [39]:

```
trix.ndim
```

Out[39]:

```
2
```

In [40]:

```
matrix=np.array([[[1,2,3],[4,5,6]],
                 [[7,8,9],[10,11,12]]])
matrix.shape
```

Out[40]:

```
(2, 2, 3)
```

In [41]:

```
matrix.ndim
```

Out[41]:

```
3
```

In [42]:

```
arr10=np.arange(25).reshape(5,5)
arr10
```

Out[42]:

```
array([[ 0,  1,  2,  3,  4],
       [ 5,  6,  7,  8,  9],
       [10, 11, 12, 13, 14],
       [15, 16, 17, 18, 19],
       [20, 21, 22, 23, 24]])
```

In [43]:

```
arr1
```

Out[43]:

```
array([1, 2, 3, 4, 5])
```

In [44]:

```
arr10[3]
```

Out[44]:

```
array([15, 16, 17, 18, 19])
```

In [45]:

```
arr10[:,2]
```

Out[45]:

```
array([ 2,  7, 12, 17, 22])
```

In [46]:

```
arr10[:,1:3]
```

Out[46]:

```
array([[ 1,  2],
       [ 6,  7],
       [11, 12],
       [16, 17],
       [21, 22]])
```

In [47]:

```
for i in arr10:
    print(i)
```

```
[0 1 2 3 4]
[5 6 7 8 9]
[10 11 12 13 14]
[15 16 17 18 19]
[20 21 22 23 24]
```

In [48]:

```
for i in np.nditer(arr10):
    print(i,end=' ')
```

```
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
```

In [49]:

```
mat1=np.array([1,2,3,4])
mat2=np.array([5,6,7,8])
result=mat1-mat2
result
```

Out[49]:
```
array([-4, -4, -4, -4])
```

In [51]:
```
result2=mat1*mat2
result2
```

Out[51]:
```
array([ 5, 12, 21, 32])
```

In [52]:
```
mat3=np.arange(6).reshape(3,2)
mat3
```

Out[52]:
```
array([[0, 1],
       [2, 3],
       [4, 5]])
```

In [53]:
```
mat4=np.arange(8).reshape(2,4)
mat4
```

Out[53]:
```
array([[0, 1, 2, 3],
       [4, 5, 6, 7]])
```

In [54]:
```
resultx=mat3.dot(mat4)
resultx
```

Out[54]:
```
array([[ 4,  5,  6,  7],
       [12, 17, 22, 27],
       [20, 29, 38, 47]])
```

In [55]:
```
resultx.std()
```

Out[55]:
```
13.238202294873727
```

In [56]:
```
np.sin(resultx)
```

Out[56]:
```
array([[-0.7568025 , -0.95892427, -0.2794155 ,  0.6569866 ],
       [-0.53657292, -0.96139749, -0.00885131,  0.95637593],
       [ 0.91294525, -0.66363388,  0.29636858,  0.12357312]])
```

Reshaping numpy array

In [57]:
```
arr10.ndim
```

Out[57]:
```
2
```

In [58]:
```
arr10.ravel()
```

Out[58]:
```
array([ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 16,
       17, 18, 19, 20, 21, 22, 23, 24])
```

In [59]:
```
arr10.transpose()
```

Out[59]:
```
array([[ 0,  5, 10, 15, 20],
       [ 1,  6, 11, 16, 21],
       [ 2,  7, 12, 17, 22],
       [ 3,  8, 13, 18, 23],
       [ 4,  9, 14, 19, 24]])
```

In [60]:
```
arr1
```

Out[60]:
```
array([1, 2, 3, 4, 5])
```

In [61]:

```
arr2
```

Out[61]:

```
array([[1, 3, 4, 5],
       [5, 6, 7, 8]])
```

In [62]:

```
arr1
```

Out[62]:

```
array([1, 2, 3, 4, 5])
```

In [63]:

```
arr3
```

Out[63]:

```
array([[0., 0., 0., 0.],
       [0., 0., 0., 0.]])
```

In [64]:

```
np.hstack((arr2,arr3))
```

Out[64]:

```
array([[1., 3., 4., 5., 0., 0., 0., 0.],
       [5., 6., 7., 8., 0., 0., 0., 0.]])
```

In [65]:

```
np.vstack((arr2,arr3))
```

Out[65]:

```
array([[1., 3., 4., 5.],
       [5., 6., 7., 8.],
       [0., 0., 0., 0.],
       [0., 0., 0., 0.]])
```

In [66]:

```
np.hsplit(arr2,2)
```

Out[66]:

```
[array([[1, 3],
        [5, 6]]),
 array([[4, 5],
        [7, 8]])]
```

In [68]:

```
np.vsplit(arr2,2)
```

Out[68]:

```
[array([[1, 3, 4, 5]]), array([[5, 6, 7, 8]])]
```

In [78]:

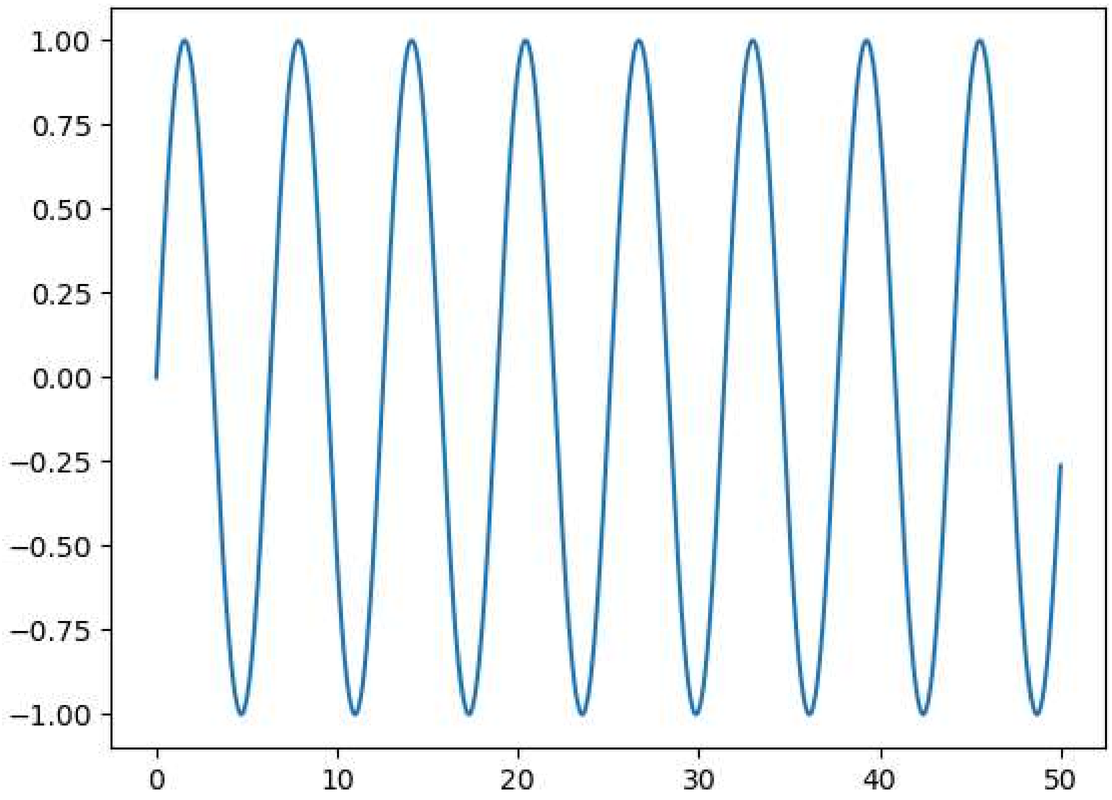
```
x=np.linspace(0,50,1000)
```

In [79]:

```
y=np.sin(x)
```

In [80]:

```
import matplotlib.pyplot as plt
%matplotlib inline
plt.plot(x,y)
plt.show()
```



Numpy exercise

In [82]:

```
np.random.random()
```

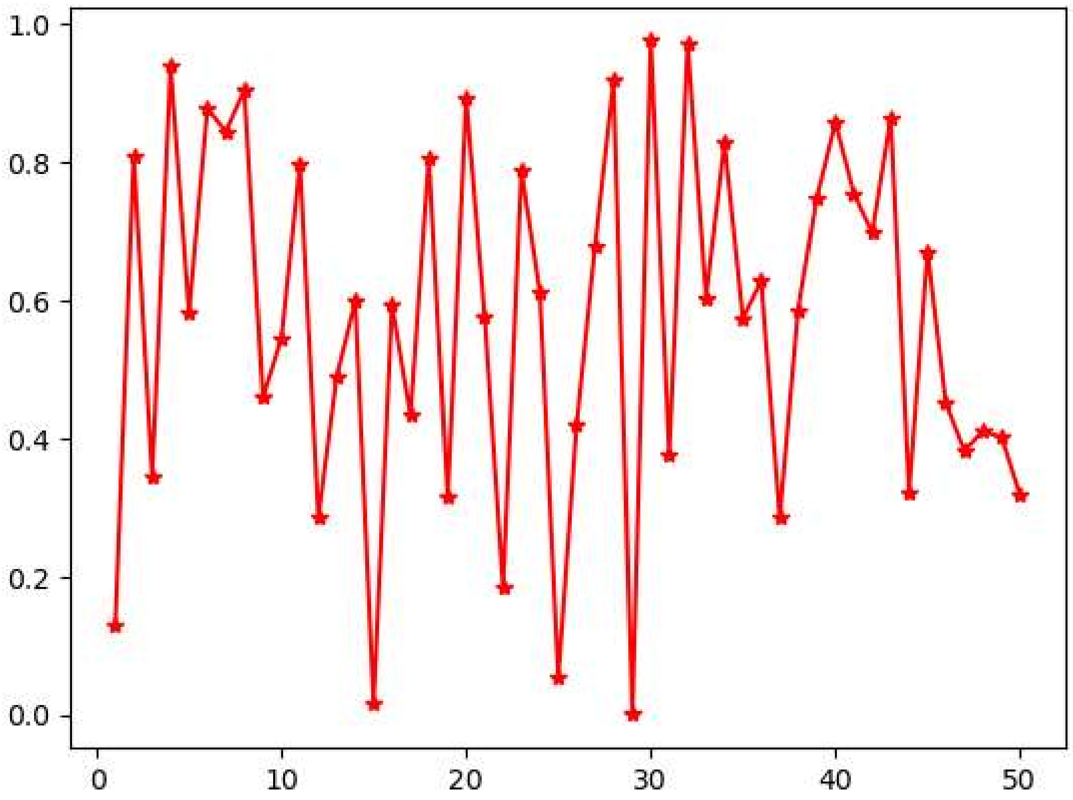
Out[82]:

```
0.5221847903663297
```

In [125…

```
y=[]
x=[]
i=0
def fill():
    global x,y,i
    i+=1
    x.append(i)
    a=np.random.random()
    y.append(a)

for k in range(0,50):
    fill()
plt.plot(x,y,color='Red',marker='*')
plt.show()
```



In [84]:
```
x
```

Out[84]:
```
[1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11]
```

In [85]:
```
y
```

Out[85]:
```
[0.23453349533631362,
 0.13814960457323067,
 0.6616444615074771,
 0.6469916719859959,
 0.8388383092207733,
 0.46649327159901277,
 0.7878670736737681,
 0.9293240961536702,
 0.785308053243389,
 0.039352135396470755,
 0.9730558385633682]
```

In [87]:
```
np.random.seed(1)
np.random.random()
```

Out[87]:
```
0.417022004702574
```

In [93]:
```
np.random.uniform(1,10)
```

Out[93]:
```
2.676341902399038
```

In [98]:
```
np.random.uniform(1,100,10).reshape(2,5)
```

Out[98]:
```
array([[30.06780069, 29.48975852, 13.87282864,  2.91732883, 68.20471776],
       [21.95118348, 27.28911928, 49.66574277,  6.28289197, 57.83764294]])
```

In [107…
```
np.random.randint(1,33)
```

Out[107]:
```
24
```

```
In [111…  np.random.randint(1,10,8).reshape(4,2)

Out[111]: array([[8, 9],
                 [5, 1],
                 [2, 9],
                 [3, 4]])

In [112…  arr1

Out[112]: array([1, 2, 3, 4, 5])

In [113…  np.argmax(arr1)

Out[113]: 4
```