NUMPY

First, install Numpy using pip. Then, import it into your code.

Use this code **"!pip install numpy"** to install the Numpy module.

After installing the module, import the Numpy library.

In [1]:
```
import numpy as np
```

checking the Version

In [2]:
```
print(np.__version__)
```

```
1.24.3
```

Zero-dimensional Array

In [3]:
```
a = np.array(10)
```

In [4]:
```
print(a)
```

```
10
```

In [5]:
```
a.ndim
```

Out[5]:
```
0
```

One-dimensional Array

In [6]:
```
b = np.array([10,20,30])
```

In [7]:
```
print(b)
```

```
[10 20 30]
```

In [8]:
```
b.ndim
```

Out[8]:
```
1
```

In [9]:
```
b[0]
```

Out[9]:
```
10
```

Two-dimensional Array

In [10]:
```
c = np.array([[10,20,30],[40,50,60]])
```

In [11]:
```
print(c)
```

```
[[10 20 30]
 [40 50 60]]
```

In [12]:
```
c.ndim
```

Out[12]:
```
2
```

In [13]:
```
c[0]
```

Out[13]:
```
array([10, 20, 30])
```

In [14]:
```
c[0][2]
```

Out[14]:
```
30
```

Three-dimensional Array

In [15]:
```
d = np.array([[[10,20,30],[40,50,60]],[[70,80,90],[90,100,110]]])
```

In [16]:
```
print(d)
```

```
[[[ 10  20  30]
  [ 40  50  60]]

 [[ 70  80  90]
  [ 90 100 110]]]
```

In [17]:
```
d.ndim
```

Out[17]:
```
3
```

In [18]:
```
d[0]
```

Out[18]:
```
array([[10, 20, 30],
       [40, 50, 60]])
```

In [19]:
```
d[0][0]
```

Out[19]:
```
array([10, 20, 30])
```

In [20]:
```
d[0][0][0]
```

Out[20]:
```
10
```

In [21]:
```
e = [10,20,30]
f = np.asarray(e,dtype=float)
```

In [22]:
```
print(f)
```

```
[10. 20. 30.]
```

In [23]:
```
f.dtype
```

Out[23]:
```
dtype('float64')
```

In [24]:
```
g = [[10,20,30],[40,50,60]]
f = np.asarray(g,dtype=int)
```

In [25]:
```
print(f)
```

```
[[10 20 30]
 [40 50 60]]
```

In [26]:
```
f.dtype
```

Out[26]:
```
dtype('int32')
```

NumPy arrays with order="C" store rows contiguously, emphasizing row-major order.

In [27]:
```
h = [[10,20,30],[40,50,60]]
i = np.asarray(h,order="C")
```

In [28]:
```
print(i)
```

```
[[10 20 30]
 [40 50 60]]
```

In [29]:
```
for i in np.nditer(i):
    print(i)
```

```
10
20
30
40
50
60
```

With order="F", arrays are column-major: columns are stored contiguously, prioritizing vertical traversal.

In [30]:
```
j = [[10,20,30],[40,50,60]]
k = np.asarray(j,order="F")
```

In [31]:
```
print(k)
```

```
[[10 20 30]
 [40 50 60]]
```

In [32]:
```
for i in np.nditer(k):
    print(i)
```

```
10
40
20
50
30
60
```

Uing the string or Categorical

In [33]:
```
Text = b"welcome to numpy Serires"
```

In [34]:
```
np.frombuffer(Text,dtype="S1")
```

Out[34]:
```
array([b'w', b'e', b'l', b'c', b'o', b'm', b'e', b' ', b't', b'o', b' ',
       b'n', b'u', b'm', b'p', b'y', b' ', b'S', b'e', b'r', b'i', b'r',
       b'e', b's'], dtype='|S1')
```

In [35]:
```
text=np.frombuffer(Text,dtype="S1",offset=9)
```

In [36]:
```
print(text)
```

```
[b'o' b' ' b'n' b'u' b'm' b'p' b'y' b' ' b'S' b'e' b'r' b'i' b'r' b'e'
 b's']
```

Using the numerical

In [37]:
```
num = [10,20,30,40,50]
```

In [38]:
```
num=np.fromiter(num,dtype="int",count=3)
```

In [39]:
```
print(num)
```

```
[10 20 30]
```

In [40]:
```
str_num=np.fromiter(num,dtype="S1",count=3)
```

In [41]:
```
print(str_num)
```

```
[b'1' b'2' b'3']
```

Initializing Array

zero()

In [42]:
```
zero = np.zeros(3)
```

In [43]:
```
zero
```

Out[43]:
```
array([0., 0., 0.])
```

In [44]:
```
zero.dtype
```

Out[44]:
```
dtype('float64')
```

In [45]:
```
a = np.zeros([2,4])
```

In [46]:
```
print(a)
```

```
[[0. 0. 0. 0.]
 [0. 0. 0. 0.]]
```

In [47]:
```
b = np.zeros([2,3,5]) #array,rows,colums
```

In [48]:
```
print(b)
```

```
[[[0. 0. 0. 0. 0.]
  [0. 0. 0. 0. 0.]
  [0. 0. 0. 0. 0.]]

 [[0. 0. 0. 0. 0.]
  [0. 0. 0. 0. 0.]
  [0. 0. 0. 0. 0.]]]
```

In [49]:
```
b[0][0][0]
```

Out[49]:
```
0.0
```

In [50]:
```
c = np.zeros([2,3,5], dtype=np.int64)
```

In [51]:
```
print(c)
```

```
[[[0 0 0 0 0]
  [0 0 0 0 0]
  [0 0 0 0 0]]

 [[0 0 0 0 0]
  [0 0 0 0 0]
  [0 0 0 0 0]]]
```

In [52]:
```
c.dtype
```

Out[52]:
```
dtype('int64')
```

Full()

In [53]:
```
a = np.full([2,3],1)
```

In [54]:
```
print(a)
```

```
[[1 1 1]
 [1 1 1]]
```

In [55]:
```
b = np.full([2,4,4],10)
```

In [56]:
```
print(b)
```

```
[[[10 10 10 10]
  [10 10 10 10]
  [10 10 10 10]
  [10 10 10 10]]

 [[10 10 10 10]
  [10 10 10 10]
  [10 10 10 10]
  [10 10 10 10]]]
```

Random

In [57]:
```
rand = np.random.rand(4,3)
```

In [58]:
```
print(rand)
```

```
[[0.26158662 0.87245819 0.63527379]
 [0.67728095 0.18302769 0.73143657]
 [0.46301195 0.70420001 0.74309628]
 [0.05255059 0.50728496 0.82666815]]
```

In [59]:
```
rand_1 = np.random.rand(3,4,3)
```

In [60]:
```
print(rand_1)
```

```
[[[0.85566938 0.91526319 0.55549545]
  [0.14566089 0.73413513 0.37391688]
  [0.20041378 0.79832866 0.61871579]
  [0.62738053 0.46286702 0.17871891]]

 [[0.79938109 0.93763722 0.87219899]
  [0.74370832 0.60291256 0.39711369]
  [0.24985218 0.69384836 0.99226142]
  [0.58442088 0.31274512 0.68397466]]

 [[0.65083987 0.68789874 0.57673037]
  [0.15826955 0.4194457  0.47909886]
  [0.57845707 0.39496601 0.14942133]
  [0.6158821  0.9871429  0.22461476]]]
```

ones

In [61]:
```
one = np.ones([2,4])
```

In [62]:
```
print(one)
```

```
[[1. 1. 1. 1.]
 [1. 1. 1. 1.]]
```

In [63]:
```
one_1 = np.ones([2,4,4])
```

In [64]:
```
print(one_1)
```

```
[[[1. 1. 1. 1.]
  [1. 1. 1. 1.]
  [1. 1. 1. 1.]
  [1. 1. 1. 1.]]

 [[1. 1. 1. 1.]
  [1. 1. 1. 1.]
  [1. 1. 1. 1.]
  [1. 1. 1. 1.]]]
```

eye

In [65]:
```
eye = np.eye(2)
```

In [66]:
```
print(eye)
```

```
[[1. 0.]
 [0. 1.]]
```

In [67]:
```
eye_1 = np.eye(4)
```

In [68]:
```
print(eye_1)
```

```
[[1. 0. 0. 0.]
 [0. 1. 0. 0.]
 [0. 0. 1. 0.]
 [0. 0. 0. 1.]]
```

In [69]:
```
print(eye.dtype,"-----",eye_1.dtype)
```

```
float64 ----- float64
```

In [70]:
```
eye_2 = np.eye(4, dtype=int)
```

In [71]:
```
print(eye_2)
```

```
[[1 0 0 0]
 [0 1 0 0]
 [0 0 1 0]
 [0 0 0 1]]
```

range()

In [72]:
```
num_int = np.arange(10,100,10)
```

In [73]:
```
print(num_int)
```

```
[10 20 30 40 50 60 70 80 90]
```

In [74]:
```
num_float = np.arange(10,100,10,dtype=float)
```

In [75]:
```
print(num_float)
```

```
[10. 20. 30. 40. 50. 60. 70. 80. 90.]
```

reshape

In [76]:
```
a = num_int.reshape(3,3)
```

In [77]:
```
print(a)
```

```
[[10 20 30]
 [40 50 60]
 [70 80 90]]
```

In [78]:
```
b = num_int.reshape(1,9)
```

In [79]:
```
print(b)
```

```
[[10 20 30 40 50 60 70 80 90]]
```

Linespace

In [80]:
```
line_space = np.linspace(10,100,10)
```

In [81]:
```
print(line_space)
```

```
[ 10.  20.  30.  40.  50.  60.  70.  80.  90. 100.]
```

In [82]:
```
line_space_1 = np.linspace(10,100,10,endpoint=False)
```

In [83]:
```
print(line_space_1)
```

```
[10. 19. 28. 37. 46. 55. 64. 73. 82. 91.]
```

In [84]:
```
line_space_2 = np.linspace(10,100,10,endpoint=True)
```

In [85]:
```
print(line_space_2)
```

```
[ 10.  20.  30.  40.  50.  60.  70.  80.  90. 100.]
```

In [86]:
```
line_space_3 = np.linspace(10,100,10,endpoint=True,dtype=int,retstep=False)
```

In [87]:
```
print(line_space_3)
```

```
[ 10  20  30  40  50  60  70  80  90 100]
```

In [88]:
```
line_space_4 = np.linspace(0,100,20,endpoint=False,retstep=True)
```

In [89]:
```
print(line_space_4)
```

```
(array([ 0.,  5., 10., 15., 20., 25., 30., 35., 40., 45., 50., 55., 60.,
       65., 70., 75., 80., 85., 90., 95.]), 5.0)
```

Logspace

In [90]:
```
log_space = np.logspace(0,10,10)
```

In [91]:
```
print(log_space)
```

```
[1.00000000e+00 1.29154967e+01 1.66810054e+02 2.15443469e+03
 2.78255940e+04 3.59381366e+05 4.64158883e+06 5.99484250e+07
 7.74263683e+08 1.00000000e+10]
```

In [92]:
```
log_space_1 = np.logspace(0,10,10,base=2)
```

In [93]:
```
print(log_space_1)
```

```
[1.00000000e+00 2.16011948e+00 4.66611616e+00 1.00793684e+01
 2.17726400e+01 4.70315038e+01 1.01593667e+02 2.19454460e+02
 4.74047853e+02 1.02400000e+03]
```

Array Properties

Size,Shape,Dtype

In [94]:
```
a = np.arange(10,100,10)
```

In [95]:
```
print(a)
```

```
[10 20 30 40 50 60 70 80 90]
```

In [96]:
```
a=a.reshape(3,3)
```

In [97]:
```
np.size(a)
```

Out[97]:
```
9
```

In [98]:
```
np.shape(a)
```

Out[98]:
```
(3, 3)
```

In [99]:
```
a.dtype
```

Out[99]:
```
dtype('int32')
```

In [100…
```
c = np.array([10,20,30],dtype=float)
```

In [101…
```
print(c)
```

```
[10. 20. 30.]
```

In [102…
```
c.dtype
```

Out[102]:
```
dtype('float64')
```

Array Operations

In [103…
```
a = np.array([[10,20,30],[40,50,60]])
```

In [104…
```
print(a)
```

```
[[10 20 30]
 [40 50 60]]
```

In [105…
```
a[0]
```

Out[105]:
```
array([10, 20, 30])
```

In [106…
```
a[1]
```

Out[106]:
```
array([40, 50, 60])
```

In [107…
```
a[0][1]
```

Out[107]:
```
20
```

In [108…
```
s = np.arange(10,100,10)
```

In [109…
```
print(s)
```

```
[10 20 30 40 50 60 70 80 90]
```

In [110…
```
s[::]
```

Out[110]:
```
array([10, 20, 30, 40, 50, 60, 70, 80, 90])
```

In [111…
```
s[2:5]
```

Out[111]:
```
array([30, 40, 50])
```

Copy()

In [112…
```
b = np.copy(a)
```

In [113…
```
print(b)
```

```
[[10 20 30]
 [40 50 60]]
```

In [114…
```
a,b
```

Out[114]:
```
(array([[10, 20, 30],
        [40, 50, 60]]),
 array([[10, 20, 30],
        [40, 50, 60]]))
```

In [115…
```
c = b.view()
```

In [116…
```
c
```

Out[116]:
```
array([[10, 20, 30],
       [40, 50, 60]])
```

In [117…
```
print("a =",a)
print("b =",b)
print("c =",c)
```

```
a = [[10 20 30]
 [40 50 60]]
b = [[10 20 30]
 [40 50 60]]
c = [[10 20 30]
 [40 50 60]]
```

In [118…
```
a
```

Out[118]:
```
array([[10, 20, 30],
       [40, 50, 60]])
```

In [119…
```
b
```

Out[119]:
```
array([[10, 20, 30],
       [40, 50, 60]])
```

In [120…
```
c
```

Out[120]:
```
array([[10, 20, 30],
       [40, 50, 60]])
```

In [121…
```
a[0][2]=100
```

In [122…
```
a
```

Out[122]:
```
array([[ 10,  20, 100],
       [ 40,  50,  60]])
```

In [123…
```
b
```

Out[123]:
```
array([[10, 20, 30],
       [40, 50, 60]])
```

In [124…
```
b[0][1]=300
```

In [125…
```
b
```

Out[125]:
```
array([[ 10, 300,  30],
       [ 40,  50,  60]])
```

In [126…
```
c
```

Out[126]:
```
array([[ 10, 300,  30],
       [ 40,  50,  60]])
```

In [127…
```
num = np.array([10,40,90,100,30,20])
```

In [128…
```
np.sort(num)
```

Out[128]:
```
array([ 10,  20,  30,  40,  90, 100])
```

In [129…
```
num.reshape(2,3)
```

Out[129]:
```
array([[ 10,  40,  90],
       [100,  30,  20]])
```

In [130…
```
a = np.array([[40,30,20],[10,50,5]])
```

In [131…
```
a
```

Out[131]:
```
array([[40, 30, 20],
       [10, 50,  5]])
```

In [132…
```
np.sort(a)
```

Out[132]:
```
array([[20, 30, 40],
       [ 5, 10, 50]])
```

In [133…
```
np.sort(a,axis=0)
```

Out[133]:
```
array([[10, 30,  5],
       [40, 50, 20]])
```

In [134…
```
np.sort(a,axis=1)
```

Out[134]:
```
array([[20, 30, 40],
       [ 5, 10, 50]])
```

In [135…
```
d = np.dtype([("Name", "S1"), ("perc", float)])
```

In [136…
```
mark = np.array([("Rama",78.0),("Gopala",77.0),("Krishna",98.0)],dtype=d)
```

In [137…
```
mark
```

Out[137]:
```
array([(b'R', 78.), (b'G', 77.), (b'K', 98.)],
      dtype=[('Name', 'S1'), ('perc', '<f8')])
```

In [138…
```
np.sort(mark,order="Name")
```

Out[138]:
```
array([(b'G', 77.), (b'K', 98.), (b'R', 78.)],
      dtype=[('Name', 'S1'), ('perc', '<f8')])
```

In [139…
```
np.sort(mark,order="perc")
```

Out[139]:
```
array([(b'G', 77.), (b'R', 78.), (b'K', 98.)],
      dtype=[('Name', 'S1'), ('perc', '<f8')])
```

In [140…
```
a = np.arange(10,110,10)
```

In [141…
```
print(a)
```

```
[ 10  20  30  40  50  60  70  80  90 100]
```

In [142…
```
a.reshape(2,5)
```

Out[142]:
```
array([[ 10,  20,  30,  40,  50],
       [ 60,  70,  80,  90, 100]])
```

In [143…
```
c=np.arange(10,130,10)
```

In [144…
```
c.reshape(4,3)
```

Out[144]:
```
array([[ 10,  20,  30],
       [ 40,  50,  60],
       [ 70,  80,  90],
       [100, 110, 120]])
```

In [145…
```
a = np.array([10,20,30])
```

In [146…
```
b = np.array([40,50,60])
```

In [147…
```
np.append(a,b)
```

Out[147]:
```
array([10, 20, 30, 40, 50, 60])
```

In [148…
```
a = ([[10,20,30],[40,50,60]])
```

In [149…
```
b = ([[70,80,90],[100,110,120]])
```

In [150…
```
np.append(a,b).reshape(4,3)
```

Out[150]:
```
array([[ 10,  20,  30],
       [ 40,  50,  60],
       [ 70,  80,  90],
       [100, 110, 120]])
```

In [151…
```
np.insert(a,2,[5,15]).reshape(4,2)
```

Out[151]:
```
array([[10, 20],
       [ 5, 15],
       [30, 40],
       [50, 60]])
```

In [152…
```
np.delete(a,2)
```

Out[152]:
```
array([10, 20, 40, 50, 60])
```

In [153…
```
a
```

Out[153]:
```
[[10, 20, 30], [40, 50, 60]]
```

In [154…
```
a = np.array([[10,20],[30,40]])
```

In [155…
```
b = np.array([[50,60],[70,80]])
```

In [156…
```
a
```

Out[156]:
```
array([[10, 20],
       [30, 40]])
```

In [157…
```
b
```

Out[157]:
```
array([[50, 60],
       [70, 80]])
```

In [158…
```
np.concatenate((a,b))
```

Out[158]:
```
array([[10, 20],
       [30, 40],
       [50, 60],
       [70, 80]])
```

In [159…
```
np.concatenate((a,b),axis=0)
```

Out[159]:
```
array([[10, 20],
       [30, 40],
       [50, 60],
       [70, 80]])
```

In [160…
```
np.concatenate((a,b),axis=1)
```

Out[160]:
```
array([[10, 20, 50, 60],
       [30, 40, 70, 80]])
```

In [161…
```
res = np.stack((a,b))
```

In [162…
```
res
```

Out[162]:
```
array([[[10, 20],
        [30, 40]],

       [[50, 60],
        [70, 80]]])
```

In [163…
```
res_1 = np.stack((a,b),axis=1)
```

In [164…
```
print(res_1)
```

```
[[[10 20]
  [50 60]]

 [[30 40]
  [70 80]]]
```

In [165…
```
a
```

Out[165]:
```
array([[10, 20],
       [30, 40]])
```

In [166…
```
b
```

Out[166]:
```
array([[50, 60],
       [70, 80]])
```

In [167…
```
res_2 = np.vstack((a,b))
```

In [168…
```
print(res_2)
```

```
[[10 20]
 [30 40]
 [50 60]
 [70 80]]
```

In [169…
```
res_3 = np.hstack((a,b))
```

In [170…
```
res_3
```

Out[170]:
```
array([[10, 20, 50, 60],
       [30, 40, 70, 80]])
```

In [171…
```
res_4 = np.dstack((a,b))
```

In [172…
```
res_4
```

Out[172]:
```
array([[[10, 50],
        [20, 60]],

       [[30, 70],
        [40, 80]]])
```

In [173…
```
x = np.arange(10,110,10)
```

In [174…
```
x
```

Out[174]:
```
array([ 10,  20,  30,  40,  50,  60,  70,  80,  90, 100])
```

In [175…
```
np.split(x,2)
```

Out[175]:
```
[array([10, 20, 30, 40, 50]), array([ 60,  70,  80,  90, 100])]
```

In [176…
```
np.split(x,10)
```

Out[176]:
```
[array([10]),
 array([20]),
 array([30]),
 array([40]),
 array([50]),
 array([60]),
 array([70]),
 array([80]),
 array([90]),
 array([100])]
```

In [177…
```
z = np.arange(10,110,10)
```

In [178…
```
y = np.split(z,5)
```

In [179…
```
print(y)
```

```
[array([10, 20]), array([30, 40]), array([50, 60]), array([70, 80]), array([ 90, 100])]
```

In [180…
```
s1,s2,s3,s4,s5 = np.split(z,5)
```

In [181…
```
s1
```

Out[181]:
```
array([10, 20])
```

In [182…
```
s2
```

Out[182]:
```
array([30, 40])
```

In [183…
```
s3
```

Out[183]:
```
array([50, 60])
```

In [184…
```
s4
```

Out[184]:
```
array([70, 80])
```

In [185…
```
s5
```

Out[185]:
```
array([ 90, 100])
```

In [186…
```
x = np.arange(10,130,10)
```

In [187…
```
print(x)
```

```
[ 10  20  30  40  50  60  70  80  90 100 110 120]
```

In [188…
```
np.split(x,(2,6))
```

Out[188]:
```
[array([10, 20]),
 array([30, 40, 50, 60]),
 array([ 70,  80,  90, 100, 110, 120])]
```

In [189…
```
y
```

Out[189]:
```
[array([10, 20]),
 array([30, 40]),
 array([50, 60]),
 array([70, 80]),
 array([ 90, 100])]
```

In [190…
```
a = np.arange(10,130,10).reshape(4,3)
```

In [191…
```
a
```

Out[191]:
```
array([[ 10,  20,  30],
       [ 40,  50,  60],
       [ 70,  80,  90],
       [100, 110, 120]])
```

In [192…
```
np.where(a==80)
```

Out[192]:
```
(array([2], dtype=int64), array([1], dtype=int64))
```

In [193…
```
x = np.arange(10,100,10)
```

In [194…
```
x.reshape(3,3)
```

Out[194]:
```
array([[10, 20, 30],
       [40, 50, 60],
       [70, 80, 90]])
```

In [195…
```
np.where(x==50)
```

Out[195]:
```
(array([4], dtype=int64),)
```

In [196…
```
a = np.arange(10,110,10)
```

In [197…
```
a.reshape(2,5)
```

Out[197]:
```
array([[ 10,  20,  30,  40,  50],
       [ 60,  70,  80,  90, 100]])
```

In [198…
```
np.where(a%20==0)
```

Out[198]:
```
(array([1, 3, 5, 7, 9], dtype=int64),)
```

In [199…
```
b = np.arange(10,130,10)
```

In [200…
```
b.reshape(4,3)
```

Out[200]:
```
array([[ 10,  20,  30],
       [ 40,  50,  60],
       [ 70,  80,  90],
       [100, 110, 120]])
```

In [201…
```
np.where(b%20==0)
```

Out[201]:
```
(array([ 1,  3,  5,  7,  9, 11], dtype=int64),)
```

In [202…
```
a = np.array([10,20,30,40,50,60])
```

In [203…
```
np.searchsorted(a,10)
```

Out[203]:
```
0
```

In [204…
```
np.searchsorted(a,[60,50])
```
Out[204]:
```
array([5, 4], dtype=int64)
```

Arithamatic Operations

In [205…
```
a = np.array([[10,20,30,],[40,50,60]])
```

In [206…
```
b = np.array([[1,2,3,],[4,5,6]])
```

In [207…
```
a
```
Out[207]:
```
array([[10, 20, 30],
       [40, 50, 60]])
```

In [208…
```
b
```
Out[208]:
```
array([[1, 2, 3],
       [4, 5, 6]])
```

In [209…
```
np.add(a,b)
```
Out[209]:
```
array([[11, 22, 33],
       [44, 55, 66]])
```

In [210…
```
np.subtract(a,b)
```
Out[210]:
```
array([[ 9, 18, 27],
       [36, 45, 54]])
```

In [211…
```
np.multiply(a,b)
```
Out[211]:
```
array([[ 10,  40,  90],
       [160, 250, 360]])
```

In [212…
```
np.divide(a,b)
```
Out[212]:
```
array([[10., 10., 10.],
       [10., 10., 10.]])
```

In [213…
```
np.mod(a,b)
```
Out[213]:
```
array([[0, 0, 0],
       [0, 0, 0]])
```

In [214…
```
np.exp(a)
```
Out[214]:
```
array([[2.20264658e+04, 4.85165195e+08, 1.06864746e+13],
       [2.35385267e+17, 5.18470553e+21, 1.14200739e+26]])
```

In [215…
```
np.exp(b)
```
Out[215]:
```
array([[  2.71828183,   7.3890561 ,  20.08553692],
       [ 54.59815003, 148.4131591 , 403.42879349]])
```

In [216…
```
np.sqrt(a)
```
Out[216]:
```
array([[3.16227766, 4.47213595, 5.47722558],
       [6.32455532, 7.07106781, 7.74596669]])
```

In [217…
```
np.sqrt(b)
```
Out[217]:
```
array([[1.        , 1.41421356, 1.73205081],
       [2.        , 2.23606798, 2.44948974]])
```

In [218…
```
a
```
Out[218]:
```
array([[10, 20, 30],
       [40, 50, 60]])
```

In [219…
```
b
```
Out[219]:
```
array([[1, 2, 3],
       [4, 5, 6]])
```

In [220…
```
b[1][0]=40
b[1][1]=30
b[1][2]=40
```

In [221…
```
a
```
Out[221]:
```
array([[10, 20, 30],
       [40, 50, 60]])
```

In [222…
```
np.array_equal(a,b)
```

Out[222]:
```
False
```

In [223…
```
a==b
```

Out[223]:
```
array([[False, False, False],
       [ True, False, False]])
```

Array Functions

In [224…
```
a = np.array([[10,20],[30,40],[50,60]])
```

In [225…
```
a
```

Out[225]:
```
array([[10, 20],
       [30, 40],
       [50, 60]])
```

In [226…
```
np.min(a)
```

Out[226]:
```
10
```

In [227…
```
np.min(a,axis=1)
```

Out[227]:
```
array([10, 30, 50])
```

In [228…
```
np.min(a,axis=0)
```

Out[228]:
```
array([10, 20])
```

In [229…
```
np.max(a)
```

Out[229]:
```
60
```

In [230…
```
a
```

Out[230]:
```
array([[10, 20],
       [30, 40],
       [50, 60]])
```

In [231…
```
np.max(a,axis=1)
```

Out[231]:
```
array([20, 40, 60])
```

In [232…
```
np.max(a,axis=0)
```

Out[232]:
```
array([50, 60])
```

In [233…
```
a
```

Out[233]:
```
array([[10, 20],
       [30, 40],
       [50, 60]])
```

In [234…
```
np.sum(a)
```

Out[234]:
```
210
```

In [235…
```
np.sum(a,axis=0)
```

Out[235]:
```
array([ 90, 120])
```

In [236…
```
np.sum(a,axis=1)
```

Out[236]:
```
array([ 30,  70, 110])
```

In [237…
```
a
```

Out[237]:
```
array([[10, 20],
       [30, 40],
       [50, 60]])
```

In [238…
```
np.median(a)
```

Out[238]:
```
35.0
```

In [239…
```
np.median(a,axis=1)
```

Out[239]:
```
array([15., 35., 55.])
```

In [240…
```
np.median(a,axis=0)
```

Out[240]:
```
array([30., 40.])
```

In [241…
```
a
```

Out[241]:
```
array([[10, 20],
       [30, 40],
       [50, 60]])
```

In [242…
```
np.var(a)
```

Out[242]:
```
291.6666666666667
```

In [243…
```
np.var(a,axis=0)
```

Out[243]:
```
array([266.66666667, 266.66666667])
```

In [244…
```
np.var(a,axis=1)
```

Out[244]:
```
array([25., 25., 25.])
```

In [245…
```
a
```

Out[245]:
```
array([[10, 20],
       [30, 40],
       [50, 60]])
```

In [246…
```
np.std(a)
```

Out[246]:
```
17.07825127659933
```

In [247…
```
np.std(a,axis=0)
```

Out[247]:
```
array([16.32993162, 16.32993162])
```

In [248…
```
np.std(a,axis=1)
```

Out[248]:
```
array([5., 5., 5.])
```

M.Rama Gopala Krishna