Numpy

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

In [2]:
```
np.__version__
```

Out[2]:
```
'1.26.4'
```

Creating Arrays

In [3]:
```
my_list = [0,1,2,3,4,5]
my_list
```

Out[3]:
```
[0, 1, 2, 3, 4, 5]
```

In [4]:
```
type(my_list)
```

Out[4]:
```
list
```

In [5]:
```
arr=np.array(my_list) #to convert list to array
```

In [6]:
```
arr
```

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

In [7]:
```
type(arr)
```

Out[7]:
```
numpy.ndarray
```

In [8]:
```
type(my_list)
```

Out[8]:
```
list
```

In [10]:
```
np.arange(15) #end index is n-1
```

Out[10]:
```
array([ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14])
```

In [11]:
```
np.arange(3.0)
```

Out[11]:
```
array([0., 1., 2.])
```

In [12]:
```
np.arange(10)
```

Out[12]:
```
array([0, 1, 2, 3, 4, 5, 6, 7, 8, 9])
```

In [13]:
```
np.arange(0,5)
```

Out[13]:
```
array([0, 1, 2, 3, 4])
```

In [14]:
```
np.arange(10,20)
```

Out[14]:
```
array([10, 11, 12, 13, 14, 15, 16, 17, 18, 19])
```

In [15]:
```
np.arange(20,10) #1st arg< 2nd arg
```

Out[15]:
```
array([], dtype=int32)
```

In [16]:
```
np.arange(-20,10)
```

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

In [17]:
```
np.arange(-16,10)
```

Out[17]:
```
array([-16, -15, -14, -13, -12, -11, -10,  -9,  -8,  -7,  -6,  -5,  -4,
        -3,  -2,  -1,   0,   1,   2,   3,   4,   5,   6,   7,   8,   9])
```

In [18]:
```
np.arange(-20,-10)
```

Out[18]:
```
array([-20, -19, -18, -17, -16, -15, -14, -13, -12, -11])
```

In [23]:
```
ar=np.arange(-30,20)
ar
```

Out[23]:
```
array([-30, -29, -28, -27, -26, -25, -24, -23, -22, -21, -20, -19, -18,
       -17, -16, -15, -14, -13, -12, -11, -10,  -9,  -8,  -7,  -6,  -5,
        -4,  -3,  -2,  -1,   0,   1,   2,   3,   4,   5,   6,   7,   8,
         9,  10,  11,  12,  13,  14,  15,  16,  17,  18,  19])
```

In [22]:
```
np.arange(10,10)
```

Out[22]:
```
array([], dtype=int32)
```

In [24]:
```
np.arange(10,30,5)
```

Out[24]:
```
array([10, 15, 20, 25])
```

In [26]:
```
np.arange(50,100,5)
```

Out[26]:
```
array([50, 55, 60, 65, 70, 75, 80, 85, 90, 95])
```

In [27]:
```
np.zeros(5) # parameter tunning
```

Out[27]:
```
array([0., 0., 0., 0., 0.])
```

In [28]:
```
np.zeros(5, dtype=int) #hyperparameter tuinning
```

Out[28]:
```
array([0, 0, 0, 0, 0])
```

In [33]:
```
np.zeros((10,10)) #parameter
```

Out[33]:
```
array([[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.],
       [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.],
       [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.],
       [0., 0., 0., 0., 0., 0., 0., 0., 0., 0.]])
```

In [32]:
```
np.zeros((10,10),dtype=int) #hyperparameter
```

Out[32]:
```
array([[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],
       [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],
       [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],
       [0, 0, 0, 0, 0, 0, 0, 0, 0, 0]])
```

In [37]:
```
np.zeros((2,2,1),dtype=int)
```

Out[37]:
```
array([[[0],
        [0]],

       [[0],
        [0]]])
```

In [42]:
```
zero=np.zeros([2,2])
type(zero)
```

Out[42]:
```
numpy.ndarray
```

In [44]:
```
np.zeros((2,20))
```

Out[44]:
```
array([[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., 0., 0., 0., 0.,
        0., 0., 0., 0.]])
```

In [47]:
```
n=(6,7)
n1=(6,8)
print(np.zeros(n)) #parameter tunning
print(np.zeros(n1))
```

```
[[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. 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. 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]:
```
print(np.zeros(n1,dtype=int)) #hyperparameter tunning
```

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

In [53]:
```
np.ones(4)
```

Out[53]:
```
array([1., 1., 1., 1.])
```

In [56]:
```
np.ones(n) #6rows and 7 columns
```

Out[56]:
```
array([[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., 1., 1.],
       [1., 1., 1., 1., 1., 1., 1.]])
```

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

Out[4]:
```
'1.26.4'
```

In [5]:
```
np.ones((5,6),dtype=int)
```

Out[5]:
```
array([[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]])
```

In [6]:
```
range(5)
```

Out[6]:
```
range(0, 5)
```

In [7]:
```
r= range(5)
r
```

Out[7]:
```
range(0, 5)
```

In [8]:
```
for i in r:
    print(i)
```

```
0
1
2
3
4
```

In [9]:
```
list(range(5))
```

Out[9]:
```
[0, 1, 2, 3, 4]
```

In [10]:
```
range(1,10)
```

Out[10]:
```
range(1, 10)
```

In [11]:
```
list(range(1,10))
```

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

In [12]:
```
list(range(1,10,3))
```

Out[12]:
```
[1, 4, 7]
```

In [14]:
```
y= list(range(12))
y
```

Out[14]:
```
[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11]
```

In [15]:
```
rand(3,2)
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
Cell In[15], line 1
----> 1 rand(3,2)

NameError: name 'rand' is not defined
```

In [16]:
```
ran(3,2)
random.rand(3,2)
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
Cell In[16], line 1
----> 1 ran(3,2)
      2 random.rand(3,2)

NameError: name 'ran' is not defined
```

In [17]:
```
np.random.rand(4) # np is package , random is module, rand is function
```

Out[17]:
```
array([0.97017169, 0.4750047 , 0.26226571, 0.01472414])
```

In [18]:
```
np.random.rand(5)
```

Out[18]:
```
array([0.90913951, 0.16317088, 0.49263811, 0.75428087, 0.64970797])
```

In [19]:
```
np.random.rand(2,4)
```

Out[19]:
```
array([[0.66271714, 0.50918557, 0.31048259, 0.49013555],
       [0.26714101, 0.57733095, 0.64961576, 0.40404945]])
```

In [20]:
```
np.random.randint(2,4) # any value btn 2 and 4 means 2 or 3
```

Out[20]:
```
3
```

In [21]:
```
np.random.randint(2,4)
```

Out[21]:
```
2
```

In [22]:
```
np.random.randint(0,1)
```

Out[22]:
```
0
```

In [23]:
```
np.random.randint(1,2,3) # generate 3 numbers btn 1 and 2
```

Out[23]:
```
array([1, 1, 1])
```

In [24]:
```
np.random.randint(1,3,4)
```

Out[24]:
```
array([1, 2, 1, 1])
```

In [25]:
```
np.random.randint(1,3,4)
```

Out[25]:
```
array([2, 1, 2, 1])
```

In [27]:
```
np.arange(1,11).reshape(5,2) #converted 2 rowa and 5 columns
```

Out[27]:
```
array([[ 1,  2],
       [ 3,  4],
       [ 5,  6],
       [ 7,  8],
       [ 9, 10]])
```

In [28]:
```
np.random.randint(10,40,(10,10)) #generate the element 10 to 30 with 4*4 matrix
```

Out[28]:
```
array([[33, 25, 27, 11, 16, 38, 26, 11, 26, 30],
       [27, 11, 38, 24, 21, 21, 14, 29, 12, 33],
       [36, 26, 21, 19, 35, 30, 34, 31, 30, 24],
       [35, 18, 36, 25, 34, 33, 13, 11, 20, 12],
       [20, 20, 37, 35, 35, 14, 29, 18, 14, 29],
       [20, 11, 22, 34, 36, 35, 36, 25, 39, 35],
       [37, 38, 27, 38, 17, 11, 29, 17, 19, 21],
       [15, 13, 14, 21, 28, 12, 16, 39, 15, 32],
       [18, 22, 35, 20, 13, 11, 30, 31, 12, 23],
       [34, 31, 26, 37, 16, 14, 14, 27, 15, 10]])
```

In [32]:
```
b= np.random.randint(10,20,(5,4))
b
```

Out[32]:
```
array([[13, 18, 14, 15],
       [18, 19, 17, 16],
       [16, 10, 17, 19],
       [14, 12, 14, 10],
       [15, 11, 19, 14]])
```

In [30]:
```
type(b)
```

Out[30]:
```
numpy.ndarray
```

In [33]:
```
b
```

Out[33]:
```
array([[13, 18, 14, 15],
       [18, 19, 17, 16],
       [16, 10, 17, 19],
       [14, 12, 14, 10],
       [15, 11, 19, 14]])
```

In [34]:
```
b= np.random.randint(10,20,(5,4))
b
```

Out[34]:
```
array([[16, 12, 12, 11],
       [16, 19, 13, 14],
       [10, 17, 10, 11],
       [14, 17, 19, 16],
       [11, 10, 18, 19]])
```

In [35]:
```
b[1:3]
```

Out[35]:
```
array([[16, 19, 13, 14],
       [10, 17, 10, 11]])
```

In [36]:
```
b
```

Out[36]:
```
array([[16, 12, 12, 11],
       [16, 19, 13, 14],
       [10, 17, 10, 11],
       [14, 17, 19, 16],
       [11, 10, 18, 19]])
```

In [37]:
```
b[1,3]
```

Out[37]:
```
14
```

In [38]:
```
b[2:3]
```

Out[38]:
```
array([[10, 17, 10, 11]])
```

In [39]:
```
b
```

Out[39]:
```
array([[16, 12, 12, 11],
       [16, 19, 13, 14],
       [10, 17, 10, 11],
       [14, 17, 19, 16],
       [11, 10, 18, 19]])
```

In [41]:
```
b[0:-1]
```

Out[41]:
```
array([[16, 12, 12, 11],
       [16, 19, 13, 14],
       [10, 17, 10, 11],
       [14, 17, 19, 16]])
```

In [42]:
```
b[0,2]
```

Out[42]:
```
12
```

In [43]:
```
b
```

Out[43]:
```
array([[16, 12, 12, 11],
       [16, 19, 13, 14],
       [10, 17, 10, 11],
       [14, 17, 19, 16],
       [11, 10, 18, 19]])
```

In [44]:
```
b[-5,-3]
```

Out[44]:
```
12
```

In [45]:
```
b[-4:2]
```

Out[45]:
```
array([[16, 19, 13, 14]])
```

In [46]:
```
a=np.random.randint(10,20,5)
```

In [48]:
```
a
```

Out[48]:
```
array([19, 18, 11, 16, 19])
```

In [53]:
```
arr
array([0,1,2,3,4,5])
arr2=np.random.randint(0,100,(10,10))
arr2
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
Cell In[53], line 1
----> 1 arr
      2 array([0,1,2,3,4,5])
      3 arr2=np.random.randint(0,100,(10,10))

NameError: name 'arr' is not defined
```

In [54]:
```
array([0,1,2,3,4,5])
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
Cell In[54], line 1
----> 1 array([0,1,2,3,4,5])

NameError: name 'array' is not defined
```

In [ ]:
```

```

In [57]:
```
arr
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
Cell In[57], line 1
----> 1 arr

NameError: name 'arr' is not defined
```

In [56]:
```
array([0,1,2,3,4,5])
arr.reshape(2,3)
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
Cell In[56], line 1
----> 1 array([0,1,2,3,4,5])
      2 arr.reshape(2,3)

NameError: name 'array' is not defined
```

In [ ]:

In [62]:
```
mat=np.arange(0,100).reshape(10,10)
```

In [63]:
```
mat
```

Out[63]:
```
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, 25, 26, 27, 28, 29],
       [30, 31, 32, 33, 34, 35, 36, 37, 38, 39],
       [40, 41, 42, 43, 44, 45, 46, 47, 48, 49],
       [50, 51, 52, 53, 54, 55, 56, 57, 58, 59],
       [60, 61, 62, 63, 64, 65, 66, 67, 68, 69],
       [70, 71, 72, 73, 74, 75, 76, 77, 78, 79],
       [80, 81, 82, 83, 84, 85, 86, 87, 88, 89],
       [90, 91, 92, 93, 94, 95, 96, 97, 98, 99]])
```

In [64]:
```
row=4
col=5
```

In [65]:
```
row
```

Out[65]:
```
4
```

In [66]:
```
col
```

Out[66]:
```
5
```

In [67]:
```
mat
```

Out[67]:
```
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, 25, 26, 27, 28, 29],
       [30, 31, 32, 33, 34, 35, 36, 37, 38, 39],
       [40, 41, 42, 43, 44, 45, 46, 47, 48, 49],
       [50, 51, 52, 53, 54, 55, 56, 57, 58, 59],
       [60, 61, 62, 63, 64, 65, 66, 67, 68, 69],
       [70, 71, 72, 73, 74, 75, 76, 77, 78, 79],
       [80, 81, 82, 83, 84, 85, 86, 87, 88, 89],
       [90, 91, 92, 93, 94, 95, 96, 97, 98, 99]])
```

In [68]:
```
mat[row,col]
```

Out[68]:
```
45
```

In [69]:
```
mat[4,5]
```

Out[69]:
```
45
```

In [70]:
```
col=6
```

In [71]:
```
mat[6]
```

Out[71]:
```
array([60, 61, 62, 63, 64, 65, 66, 67, 68, 69])
```

In [72]:
```
mat[:,col] #with slices how to print columns
```

Out[72]:
```
array([ 6, 16, 26, 36, 46, 56, 66, 76, 86, 96])
```

In [73]:
```
mat
```

Out[73]:
```
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, 25, 26, 27, 28, 29],
       [30, 31, 32, 33, 34, 35, 36, 37, 38, 39],
       [40, 41, 42, 43, 44, 45, 46, 47, 48, 49],
       [50, 51, 52, 53, 54, 55, 56, 57, 58, 59],
       [60, 61, 62, 63, 64, 65, 66, 67, 68, 69],
       [70, 71, 72, 73, 74, 75, 76, 77, 78, 79],
       [80, 81, 82, 83, 84, 85, 86, 87, 88, 89],
       [90, 91, 92, 93, 94, 95, 96, 97, 98, 99]])
```

In [74]:
```
mat[row,:]
```

Out[74]:
```
array([40, 41, 42, 43, 44, 45, 46, 47, 48, 49])
```

In [75]:
```
mat[:,col]
```

Out[75]:
```
array([ 6, 16, 26, 36, 46, 56, 66, 76, 86, 96])
```

In [76]:
```
mat[:,-1]
```

Out[76]:
```
array([ 9, 19, 29, 39, 49, 59, 69, 79, 89, 99])
```

In [77]:
```
mat[0:10]
```

Out[77]:
```
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, 25, 26, 27, 28, 29],
       [30, 31, 32, 33, 34, 35, 36, 37, 38, 39],
       [40, 41, 42, 43, 44, 45, 46, 47, 48, 49],
       [50, 51, 52, 53, 54, 55, 56, 57, 58, 59],
       [60, 61, 62, 63, 64, 65, 66, 67, 68, 69],
       [70, 71, 72, 73, 74, 75, 76, 77, 78, 79],
       [80, 81, 82, 83, 84, 85, 86, 87, 88, 89],
       [90, 91, 92, 93, 94, 95, 96, 97, 98, 99]])
```

In [79]:
```
mat[0:10:3]
```

Out[79]:
```
array([[ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9],
       [30, 31, 32, 33, 34, 35, 36, 37, 38, 39],
       [60, 61, 62, 63, 64, 65, 66, 67, 68, 69],
       [90, 91, 92, 93, 94, 95, 96, 97, 98, 99]])
```

In [81]:
```
mat[2:6,2:4]
```

Out[81]:
```
array([[22, 23],
       [32, 33],
       [42, 43],
       [52, 53]])
```

In [82]:
```
mat[1:2,2:4]
```

Out[82]:
```
array([[12, 13]])
```

In [83]:
```
mat
```

Out[83]:
```
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, 25, 26, 27, 28, 29],
       [30, 31, 32, 33, 34, 35, 36, 37, 38, 39],
       [40, 41, 42, 43, 44, 45, 46, 47, 48, 49],
       [50, 51, 52, 53, 54, 55, 56, 57, 58, 59],
       [60, 61, 62, 63, 64, 65, 66, 67, 68, 69],
       [70, 71, 72, 73, 74, 75, 76, 77, 78, 79],
       [80, 81, 82, 83, 84, 85, 86, 87, 88, 89],
       [90, 91, 92, 93, 94, 95, 96, 97, 98, 99]])
```

In [84]:
```
mat[2:3,2:3]
```

Out[84]:
```
array([[22]])
```

In [85]:
```
id(mat)
```

Out[85]:
```
1499484947920
```

In [86]:
```
mat
```

Out[86]:
```
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, 25, 26, 27, 28, 29],
       [30, 31, 32, 33, 34, 35, 36, 37, 38, 39],
       [40, 41, 42, 43, 44, 45, 46, 47, 48, 49],
       [50, 51, 52, 53, 54, 55, 56, 57, 58, 59],
       [60, 61, 62, 63, 64, 65, 66, 67, 68, 69],
       [70, 71, 72, 73, 74, 75, 76, 77, 78, 79],
       [80, 81, 82, 83, 84, 85, 86, 87, 88, 89],
       [90, 91, 92, 93, 94, 95, 96, 97, 98, 99]])
```

mat

In [87]:
```
mat
```

Out[87]:
```
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, 25, 26, 27, 28, 29],
       [30, 31, 32, 33, 34, 35, 36, 37, 38, 39],
       [40, 41, 42, 43, 44, 45, 46, 47, 48, 49],
       [50, 51, 52, 53, 54, 55, 56, 57, 58, 59],
       [60, 61, 62, 63, 64, 65, 66, 67, 68, 69],
       [70, 71, 72, 73, 74, 75, 76, 77, 78, 79],
       [80, 81, 82, 83, 84, 85, 86, 87, 88, 89],
       [90, 91, 92, 93, 94, 95, 96, 97, 98, 99]])
```

In [88]:
```
mat < 50
```

Out[88]:
```
array([[ True,  True,  True,  True,  True,  True,  True,  True,  True,
         True],
       [ True,  True,  True,  True,  True,  True,  True,  True,  True,
         True],
       [ True,  True,  True,  True,  True,  True,  True,  True,  True,
         True],
       [ True,  True,  True,  True,  True,  True,  True,  True,  True,
         True],
       [ True,  True,  True,  True,  True,  True,  True,  True,  True,
         True],
       [False, False, False, False, False, False, False, False, False,
        False],
       [False, False, False, False, False, False, False, False, False,
        False],
       [False, False, False, False, False, False, False, False, False,
        False],
       [False, False, False, False, False, False, False, False, False,
        False],
       [False, False, False, False, False, False, False, False, False,
        False]])
```

In [89]:
```
mat[mat>50]
```

Out[89]:
```
array([51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67,
       68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84,
       85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99])
```

In [90]:
```
mat==50
```

Out[90]:
```
array([[False, False, False, False, False, False, False, False, False,
        False],
       [False, False, False, False, False, False, False, False, False,
        False],
       [False, False, False, False, False, False, False, False, False,
        False],
       [False, False, False, False, False, False, False, False, False,
        False],
       [False, False, False, False, False, False, False, False, False,
        False],
       [ True, False, False, False, False, False, False, False, False,
        False],
       [False, False, False, False, False, False, False, False, False,
        False],
       [False, False, False, False, False, False, False, False, False,
        False],
       [False, False, False, False, False, False, False, False, False,
        False],
       [False, False, False, False, False, False, False, False, False,
        False]])
```

In [91]:
```
mat
```

Out[91]:
```
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, 25, 26, 27, 28, 29],
       [30, 31, 32, 33, 34, 35, 36, 37, 38, 39],
       [40, 41, 42, 43, 44, 45, 46, 47, 48, 49],
       [50, 51, 52, 53, 54, 55, 56, 57, 58, 59],
       [60, 61, 62, 63, 64, 65, 66, 67, 68, 69],
       [70, 71, 72, 73, 74, 75, 76, 77, 78, 79],
       [80, 81, 82, 83, 84, 85, 86, 87, 88, 89],
       [90, 91, 92, 93, 94, 95, 96, 97, 98, 99]])
```

Identity

In [2]:
```
import numpy as np
```

In [3]:
```
np.identity(3)
```

Out[3]:
```
array([[1., 0., 0.],
       [0., 1., 0.],
       [0., 0., 1.]])
```

In [5]:
```
np.identity(6)
```

Out[5]:
```
array([[1., 0., 0., 0., 0., 0.],
       [0., 1., 0., 0., 0., 0.],
       [0., 0., 1., 0., 0., 0.],
       [0., 0., 0., 1., 0., 0.],
       [0., 0., 0., 0., 1., 0.],
       [0., 0., 0., 0., 0., 1.]])
```

Array Attributes

In [8]:
```
a1=np.arange(10) #1D
a1
```

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

In [9]:
```
a2=np.arange(12,dtype=float).reshape(3,4) #matrix
a2
```

Out[9]:
```
array([[ 0.,  1.,  2.,  3.],
       [ 4.,  5.,  6.,  7.],
       [ 8.,  9., 10., 11.]])
```

In [13]:
```
a3=np.arange(8).reshape(2,2,2) #3D ----> Tensor
a3
```

Out[13]:
```
array([[[0, 1],
        [2, 3]],

       [[4, 5],
        [6, 7]]])
```

In [ ]:
```

```

ndim

In [ ]:
```
# To findout given arrays number of dimensions
```

In [14]:
```
a1.ndim
```

Out[14]: 1

In [15]:
```
a2.ndim
```

Out[15]: 2

In [16]:
```
a3.ndim
```

Out[16]: 3

Shape

In [17]:
```
a1.shape # 1D array has 10 elements
```

Out[17]: (10,)

In [18]:
```
a2.shape # 3 rows and 4 columns
```

Out[18]: (3, 4)

In [19]:
```
a3.shape #first, 2 says it consists 2d arrays 2,2 gives no. of rows and columns
```

Out[19]: (2, 2, 2)

Size

In [ ]:
```
#givess number of items
```

In [20]:
```
a3
```

Out[20]:
```
array([[[0, 1],
        [2, 3]],

       [[4, 5],
        [6, 7]]])
```

In [21]:
```
a3.size # it has 8 items like shape 2,2,2=8
```

Out[21]: 8

In [22]:
```
a2
```

Out[22]:
```
array([[ 0.,  1.,  2.,  3.],
       [ 4.,  5.,  6.,  7.],
       [ 8.,  9., 10., 11.]])
```

In [23]:
```
a2.size
```

Out[23]:
```
12
```

Item size

In [ ]:
```
# memory occupied by item
```

In [24]:
```
a1
```

Out[24]:
```
array([0, 1, 2, 3, 4, 5, 6, 7, 8, 9])
```

In [25]:
```
a1.itemsize #bytes
```

Out[25]:
```
4
```

In [26]:
```
a2.itemsize # integer 64 gives =8bytes
```

Out[26]:
```
8
```

In [27]:
```
a3.itemsize
```

Out[27]:
```
4
```

In [28]:
```
a3
```

Out[28]:
```
array([[[0, 1],
        [2, 3]],

       [[4, 5],
        [6, 7]]])
```

dtype

In [ ]:
```
#gives the data type of the item
```

In [29]:
```
print(a1.dtype)
print(a2.dtype)
print(a3.dtype)
```

```
int32
float64
int32
```

Changing data Type

In [31]:
```
#astype
x=np.array([33,22,2.5])
```

In [ ]:
```
x
```

Out[31]:
```
array([33. , 22. ,  2.5])
```

In [32]:
```
x.astype(int)
```

Out[32]:
```
array([33, 22,  2])
```

Array operations

In [35]:
```
z1=np.arange(12).reshape(3,4)
z2= np.arange(12,24).reshape(3,4)
```

In [36]:
```
z1
```

Out[36]:
```
array([[ 0,  1,  2,  3],
       [ 4,  5,  6,  7],
       [ 8,  9, 10, 11]])
```

In [37]:
```
z2
```

Out[37]:
```
array([[12, 13, 14, 15],
       [16, 17, 18, 19],
       [20, 21, 22, 23]])
```

In [ ]:

In [ ]: