In [18]:
```
import numpy as np
```

In [19]:
```
np.__version__
```

Out[19]:
```
'2.1.3'
```

In [20]:
```
# creating a list
my_list=[0,1,2,3,4,5]
my_list
```

Out[20]:
```
[0, 1, 2, 3, 4, 5]
```

In [21]:
```
type(my_list)
```

Out[21]:
```
list
```

In [22]:
```
#code  converting list to array
```

In [23]:
```
arr=np.array(my_list)    #----------
arr
```

Out[23]:
```
array([0, 1, 2, 3, 4, 5])
```

In [24]:
```
type(arr)
```

Out[24]:
```
numpy.ndarray
```

In [25]:
```
np.arange(10)
```

Out[25]:
```
array([0, 1, 2, 3, 4, 5, 6, 7, 8, 9])
```

In [26]:
```
np.arange(20)
```

Out[26]:
```
array([ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 1
6,
       17, 18, 19])
```

In [27]:
```
np.arange(5.0)
```

Out[27]:
```
array([0., 1., 2., 3., 4.])
```

In [28]:
```
np.arange(0,5)
```

Out[28]:
```
array([0, 1, 2, 3, 4])
```

In [29]:
```
np.arange(10,20)
```

Out[29]:
```
array([10, 11, 12, 13, 14, 15, 16, 17, 18, 19])
```

In [30]:
```
np.arange(20,10)
```

Out[30]:
```
array([], dtype=int64)
```

In [31]:
```
np.arange(-20,10)
```

Out[31]:
```
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 [32]:
```
np.arange(0,20,2)
```

Out[32]:
```
array([ 0,  2,  4,  6,  8, 10, 12, 14, 16, 18])
```

In [33]:
```
# create variable
ar=np.arange(-30,20)
ar
```

Out[33]:
```
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 [34]:
```
np.arange()
```

```
---------------------------------------------------------------------------
TypeError                                 Traceback (most recent call last)
Cell In[34], line 1
----> 1 np.arange()

TypeError: arange() requires stop to be specified.
```

In [35]:
```
np.arange(10,30,5) # step count 5
```

Out[35]:
```
array([10, 15, 20, 25])
```

In [36]:
```
np.arange(10,30,5,8)
```

```
---------------------------------------------------------------------------
TypeError                                 Traceback (most recent call last)
Cell In[36], line 1
----> 1 np.arange(10,30,5,8)

TypeError: Cannot interpret '8' as a data type
```

In [37]:
```
np.zeros(10)   #parameter tuning
```

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

In [38]:
```
np.zeros(10,dtype=int)   # hyperparameter
```

Out[38]:
```
array([0, 0, 0, 0, 0, 0, 0, 0, 0, 0])
```

In [39]:
```
np.zeros((2,2),dtype=int)
```

Out[39]:
```
array([[0, 0],
       [0, 0]])
```

In [40]:
```
zero=np.zeros([2,2])
print(zero)
print('###')
print(type(zero))
```

```
[[0. 0.]
 [0. 0.]]
###
<class 'numpy.ndarray'>
```

In [41]:
```
np.zeros((2,10))
```

Out[41]:
```
array([[0., 0., 0., 0., 0., 0., 0., 0., 0., 0.],
       [0., 0., 0., 0., 0., 0., 0., 0., 0., 0.]])
```

In [42]:
```
np.zeros((10,10),dtype=int)
```

Out[42]:
```
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 [43]:
```
np.ones(3,dtype=int)
```

Out[43]:
```
array([1, 1, 1])
```

In [44]:
```
np.ones((3,3),dtype=int)
```

Out[44]:
```
array([[1, 1, 1],
       [1, 1, 1],
       [1, 1, 1]])
```

In [45]:
```
np.two((2,3))
```

```
---------------------------------------------------------------------------
AttributeError                            Traceback (most recent call last)
Cell In[45], line 1
----> 1 np.two((2,3))

File /opt/anaconda3/lib/python3.13/site-packages/numpy/__init__.py:414, in __getattr__(attr)
    411     import numpy.char as char
    412     return char.chararray
--> 414 raise AttributeError("module {!r} has no attribute "
    415                        "{!r}".format(__name__, attr))

AttributeError: module 'numpy' has no attribute 'two'
```

In [46]:
```
# random (how otp are generated
```

In [47]:
```
rand(3,2)
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
Cell In[47], line 1
----> 1 rand(3,2)

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

In [48]:
```
random.rand(2,3)
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
Cell In[48], line 1
----> 1 random.rand(2,3)

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

In [49]:
```
np.random.rand(3)
```

Out[49]:
```
array([0.25643098, 0.16148818, 0.62167362])
```

In [50]:
```
np.random.rand(5)
```

Out[50]:
```
array([0.2885106 , 0.34192779, 0.13481916, 0.78879895, 0.71190638])
```

In [51]:
```
np.random.rand(3,4)
```

Out[51]:
```
array([[0.40861477, 0.41647115, 0.18830357, 0.48983052],
       [0.03517144, 0.43646936, 0.51265584, 0.4316413 ],
       [0.85134617, 0.65024463, 0.62675271, 0.63457271]])
```

In [52]:
```
np.random.randint(4,6)
```

Out[52]:
```
5
```

In [53]:
```
np.random.randint(2,20,4)
```

Out[53]:
```
array([14, 16,  2,  8])
```

In [54]:
```
np.random.randint(30,20,10)
```

```
---------------------------------------------------------------------------
ValueError                                Traceback (most recent call last)
Cell In[54], line 1
----> 1 np.random.randint(30,20,10)

File numpy/random/mtrand.pyx:798, in numpy.random.mtrand.RandomState.randint()

File numpy/random/_bounded_integers.pyx:1334, in numpy.random._bounded_integers._rand_int64()

ValueError: low >= high
```

In [55]:
```
np.random.randint(-30,-20,10)
```

Out[55]:
```
array([-26, -22, -28, -26, -29, -27, -30, -27, -30, -26])
```

In [56]:
```
np.random.randint(3,9,1,3)
```

```
---------------------------------------------------------------------------
TypeError                                 Traceback (most recent call last)
Cell In[56], line 1
----> 1 np.random.randint(3,9,1,3)

File numpy/random/mtrand.pyx:777, in numpy.random.mtrand.RandomState.randint()

TypeError: Cannot interpret '3' as a data type
```

In [57]:
```
np.random.randint(10,40,(10,10))
```

Out[57]:
```
array([[33, 28, 34, 11, 17, 26, 31, 21, 12, 37],
       [22, 29, 13, 34, 34, 10, 30, 18, 15, 30],
       [17, 24, 14, 21, 34, 17, 37, 37, 23, 33],
       [29, 35, 18, 14, 14, 25, 36, 31, 33, 28],
       [15, 25, 13, 17, 26, 12, 36, 22, 24, 34],
       [13, 24, 31, 32, 34, 17, 28, 16, 37, 25],
       [38, 18, 25, 16, 25, 28, 30, 36, 21, 31],
       [20, 33, 29, 39, 17, 23, 37, 31, 32, 23],
       [16, 26, 31, 23, 28, 37, 12, 38, 14, 33],
       [24, 13, 30, 33, 33, 37, 29, 26, 12, 28]])
```

In [58]:
```
# arange reshape
```

In [59]:
```
np.arange(1,13).reshape(3,4)
```

Out[59]:
```
array([[ 1,  2,  3,  4],
       [ 5,  6,  7,  8],
       [ 9, 10, 11, 12]])
```

In [60]:
```
np.arange(1,13).reshape(3,5)
```

```
---------------------------------------------------------------------------
ValueError                                Traceback (most recent call last)
Cell In[60], line 1
----> 1 np.arange(1,13).reshape(3,5)

ValueError: cannot reshape array of size 12 into shape (3,5)
```

In [61]:
```
np.arange(1,21).reshape(5,4)
```

Out[61]:
```
array([[ 1,  2,  3,  4],
       [ 5,  6,  7,  8],
       [ 9, 10, 11, 12],
       [13, 14, 15, 16],
       [17, 18, 19, 20]])
```

In [62]:
```
np.arange(1,13).reshape(6,2)
```

Out[62]:
```
array([[ 1,  2],
       [ 3,  4],
       [ 5,  6],
       [ 7,  8],
       [ 9, 10],
       [11, 12]])
```

In [63]:
```
#slicing in matrix
```

slicing in matrix

In [64]:
```
b=np.random.randint(10,20,(5,4))
```

In [65]:
```
b
```

Out[65]:
```
array([[14, 13, 18, 12],
       [12, 17, 15, 10],
       [15, 17, 14, 13],
       [16, 13, 16, 18],
       [15, 16, 17, 16]])
```

In [66]:
```
type(b)
```

Out[66]:
```
numpy.ndarray
```

In [67]:
```
b[:]
```

Out[67]:
```
array([[14, 13, 18, 12],
       [12, 17, 15, 10],
       [15, 17, 14, 13],
       [16, 13, 16, 18],
       [15, 16, 17, 16]])
```

In [68]:
```
b[1:3]
```

Out[68]:
```
array([[12, 17, 15, 10],
       [15, 17, 14, 13]])
```

In [69]:
```
b[2]
```

Out[69]:
```
array([15, 17, 14, 13])
```

In [70]:
```
b[-4]
```

Out[70]:
```
array([12, 17, 15, 10])
```

In [71]:
```
b[1,0]
```

Out[71]:
```
np.int64(12)
```

In [72]:
```
b[-3,3]
```

Out[72]:
```
np.int64(13)
```

In [73]:
```
b.max()
```

Out[73]:
```
np.int64(18)
```

In [74]:
```
b.min()
```

Out[74]:
```
np.int64(10)
```

In [75]:
```
b.mean()
```

Out[75]: np.float64(14.85)

In [ ]: