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

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

Out[2]:
```
'2.1.3'
```

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]:
```
#list to array
```

In [7]:
```
arr=np.array(my_list)
arr
```

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

In [8]:
```
print(type(arr))
```

```
<class 'numpy.ndarray'>
```

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

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

In [11]:
```
np.arange(10,20)
```

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

In [13]:
```
np.arange(10,20,5)
```

Out[13]:
```
array([10, 15])
```

In [14]:
```
np.arange(10,50,5)
```

Out[14]:
```
array([10, 15, 20, 25, 30, 35, 40, 45])
```

In [15]:
```
np.arange(20,10) # first arg is always less then 2nd arg
```

Out[15]:
```
array([], dtype=int64)
```

In [17]:
```
np.arange(-20,10)
```

Out[17]:
```
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 [18]:
```
np.zeros(5)  # id array #parameter tnning
```

Out[18]:
```
array([0., 0., 0., 0., 0.])
```

In [19]:
```
np.zeros(5,dtype=int) #hyper parameter tunning
```

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

In [20]:
```
np.zeros([2,2]) #2d array
```

Out[20]:
```
array([[0., 0.],
       [0., 0.]])
```

In [21]:
```
np.zeros([5,4]) #nd array
```

Out[21]:
```
array([[0., 0., 0., 0.],
       [0., 0., 0., 0.],
       [0., 0., 0., 0.],
       [0., 0., 0., 0.],
       [0., 0., 0., 0.]])
```

In [23]:
```
np.zeros([10,10],dtype=int)
```

Out[23]:
```
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 [24]:
```
np.ones(2,dtype=int)
```

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

In [25]:
```
np.ones([4,5])
```

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

In [26]:
```
np.ones([6,2])
```

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

In [27]:
```
rand(3,2)
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
Cell In[27], line 1
----> 1 rand(3,2)

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

In [28]:
```
random.rand(3,3)
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
Cell In[28], line 1
----> 1 random.rand(3,3)

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

In [31]:
```
np.random.rand(3,4) # always the oput will be changed.
```

Out[31]:
```
array([[0.98048923, 0.78490564, 0.77216887, 0.32275605],
       [0.25555655, 0.05434837, 0.45377169, 0.42937538],
       [0.15302649, 0.14812311, 0.77644397, 0.19813232]])
```

In [32]:
```
np.random.rand(3,4)
```

Out[32]:
```
array([[0.48530953, 0.58284674, 0.5266915 , 0.05217703],
       [0.09270892, 0.75449654, 0.89309175, 0.20764051],
       [0.3431067 , 0.42895497, 0.58812828, 0.58100565]])
```

In [34]:
```
np.random.rand(3)
```

Out[34]:
```
array([0.07502315, 0.6959442 , 0.50031352])
```

In [35]:
```
np.random.rand(3)
```

Out[35]:
```
array([0.09094553, 0.11282708, 0.71364648])
```

In [38]:
```
np.random.randint(4,6)
```

Out[38]:
```
5
```

In [40]:
```
np.random.randint(4,6)
```

Out[40]:
```
4
```

In [41]:
```
np.random.randint(0,10)
```

Out[41]:
```
7
```

In [43]:
```
np.random.randint(0,10,4)
```

Out[43]:
```
array([3, 3, 5, 0], dtype=int32)
```

In [44]:
```
np.random.randint(0,10,5)
```

Out[44]:
```
array([0, 0, 3, 5, 9], dtype=int32)
```

In [47]:
```
n=np.random.randint(10,40,(10,10))
n
```

Out[47]:
```
array([[23, 30, 17, 30, 16, 29, 25, 26, 36, 17],
       [23, 13, 12, 27, 22, 13, 36, 22, 28, 15],
       [14, 12, 24, 10, 30, 24, 11, 33, 20, 35],
       [19, 18, 13, 24, 26, 10, 34, 16, 29, 28],
       [33, 15, 16, 25, 10, 27, 21, 15, 18, 10],
       [18, 17, 15, 27, 18, 21, 24, 15, 37, 31],
       [17, 28, 10, 28, 13, 21, 13, 12, 37, 37],
       [23, 33, 35, 12, 27, 20, 33, 17, 26, 29],
       [17, 35, 17, 35, 11, 23, 10, 24, 29, 23],
       [21, 28, 18, 32, 25, 29, 38, 32, 18, 16]], dtype=int32)
```

In [48]:
```
n=np.random.randint(10,40,(8,10))
n
```

Out[48]:
```
array([[38, 39, 28, 33, 39, 10, 28, 14, 31, 23],
       [25, 39, 13, 34, 26, 30, 29, 37, 29, 18],
       [21, 34, 27, 17, 13, 23, 23, 16, 16, 33],
       [24, 29, 10, 14, 38, 39, 14, 29, 14, 11],
       [21, 37, 16, 32, 18, 24, 14, 38, 20, 26],
       [16, 38, 12, 37, 18, 22, 24, 28, 13, 38],
       [23, 21, 36, 23, 19, 23, 28, 34, 29, 15],
       [21, 28, 26, 26, 22, 20, 21, 28, 13, 14]], dtype=int32)
```

In [49]:
```
n[0] # prints row
```

Out[49]:
```
array([38, 39, 28, 33, 39, 10, 28, 14, 31, 23], dtype=int32)
```

In [50]:
```
n[5]
```

Out[50]:
```
array([16, 38, 12, 37, 18, 22, 24, 28, 13, 38], dtype=int32)
```

In [51]:
```
n[0:6]
```

Out[51]:
```
array([[38, 39, 28, 33, 39, 10, 28, 14, 31, 23],
       [25, 39, 13, 34, 26, 30, 29, 37, 29, 18],
       [21, 34, 27, 17, 13, 23, 23, 16, 16, 33],
       [24, 29, 10, 14, 38, 39, 14, 29, 14, 11],
       [21, 37, 16, 32, 18, 24, 14, 38, 20, 26],
       [16, 38, 12, 37, 18, 22, 24, 28, 13, 38]], dtype=int32)
```

In [52]:
```
n[::-1]
```

Out[52]:
```
array([[21, 28, 26, 26, 22, 20, 21, 28, 13, 14],
       [23, 21, 36, 23, 19, 23, 28, 34, 29, 15],
       [16, 38, 12, 37, 18, 22, 24, 28, 13, 38],
       [21, 37, 16, 32, 18, 24, 14, 38, 20, 26],
       [24, 29, 10, 14, 38, 39, 14, 29, 14, 11],
       [21, 34, 27, 17, 13, 23, 23, 16, 16, 33],
       [25, 39, 13, 34, 26, 30, 29, 37, 29, 18],
       [38, 39, 28, 33, 39, 10, 28, 14, 31, 23]], dtype=int32)
```

In [53]:
```
n
```

Out[53]:
```
array([[38, 39, 28, 33, 39, 10, 28, 14, 31, 23],
       [25, 39, 13, 34, 26, 30, 29, 37, 29, 18],
       [21, 34, 27, 17, 13, 23, 23, 16, 16, 33],
       [24, 29, 10, 14, 38, 39, 14, 29, 14, 11],
       [21, 37, 16, 32, 18, 24, 14, 38, 20, 26],
       [16, 38, 12, 37, 18, 22, 24, 28, 13, 38],
       [23, 21, 36, 23, 19, 23, 28, 34, 29, 15],
       [21, 28, 26, 26, 22, 20, 21, 28, 13, 14]], dtype=int32)
```

In [55]:
```
n[0::2]
```

Out[55]:
```
array([[38, 39, 28, 33, 39, 10, 28, 14, 31, 23],
       [21, 34, 27, 17, 13, 23, 23, 16, 16, 33],
       [21, 37, 16, 32, 18, 24, 14, 38, 20, 26],
       [23, 21, 36, 23, 19, 23, 28, 34, 29, 15]], dtype=int32)
```

In [56]:
```
n[0]
```

Out[56]:
```
array([38, 39, 28, 33, 39, 10, 28, 14, 31, 23], dtype=int32)
```

In [57]:
```
n
```

Out[57]:
```
array([[38, 39, 28, 33, 39, 10, 28, 14, 31, 23],
       [25, 39, 13, 34, 26, 30, 29, 37, 29, 18],
       [21, 34, 27, 17, 13, 23, 23, 16, 16, 33],
       [24, 29, 10, 14, 38, 39, 14, 29, 14, 11],
       [21, 37, 16, 32, 18, 24, 14, 38, 20, 26],
       [16, 38, 12, 37, 18, 22, 24, 28, 13, 38],
       [23, 21, 36, 23, 19, 23, 28, 34, 29, 15],
       [21, 28, 26, 26, 22, 20, 21, 28, 13, 14]], dtype=int32)
```

In [58]:
```
n[0,5]
```

Out[58]:
```
np.int32(10)
```

In [62]:
```
n[5,-3]
```

Out[62]:
```
np.int32(28)
```

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

In [63]:
```
np.arange(1,13).reshape(3,4)
```

Out[63]:
```
array([[ 1,  2,  3,  4],
       [ 5,  6,  7,  8],
       [ 9, 10, 11, 12]])
```

In [64]:
```
np.arange(1,13).reshape(5,5)
```

```
---------------------------------------------------------------------------
ValueError                                Traceback (most recent call last)
Cell In[64], line 1
----> 1 np.arange(1,13).reshape(5,5)

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

In [65]:
```
np.arange(1,13).reshape(4,4)
```

```
---------------------------------------------------------------------------
ValueError                                Traceback (most recent call last)
Cell In[65], line 1
----> 1 np.arange(1,13).reshape(4,4)

ValueError: cannot reshape array of size 12 into shape (4,4)
```

In [66]:
```
np.arange(1,13).reshape(4,3)
```

Out[66]:
```
array([[ 1,  2,  3],
       [ 4,  5,  6],
       [ 7,  8,  9],
       [10, 11, 12]])
```

In [67]:
```
np.arange(1,13).reshape(6,2)
```

Out[67]:
```
array([[ 1,  2],
       [ 3,  4],
       [ 5,  6],
       [ 7,  8],
       [ 9, 10],
       [11, 12]])
```

In [68]:
```
np.arange(1,13).reshape(1,12)
```

Out[68]:
```
array([[ 1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12]])
```

In [69]:
```
np.arange(1,13).reshape(12,1)
```

Out[69]:
```
array([[ 1],
       [ 2],
       [ 3],
       [ 4],
       [ 5],
       [ 6],
       [ 7],
       [ 8],
       [ 9],
       [10],
       [11],
       [12]])
```