In [3]:
```
import numpy as np
```

In [9]:
```
np.__version__
```

Out[9]:
```
'1.26.4'
```

In [13]:
```
my_list = [0,1,2,3,4,5]
```

In [15]:
```
my_list
```

Out[15]:
```
[0, 1, 2, 3, 4, 5]
```

In [17]:
```
type(my_list)
```

Out[17]:
```
list
```

In [26]:
```
empty_arr = np.empty(5)
```

In [28]:
```
empty_arr
```

Out[28]:
```
array([ 0. ,  2.5,  5. ,  7.5, 10. ])
```

In [24]:
```
np.linspace(0,10,5)
```

Out[24]:
```
array([ 0. ,  2.5,  5. ,  7.5, 10. ])
```

In [32]:
```
arr = np.array(my_list)
```

In [34]:
```
arr
```

Out[34]:
```
array([0, 1, 2, 3, 4, 5])
```

In [36]:
```
type(arr)
```

Out[36]:
```
numpy.ndarray
```

In [38]:
```
np.arange(15.2)
```

Out[38]:
```
array([ 0.,  1.,  2.,  3.,  4.,  5.,  6.,  7.,  8.,  9., 10., 11., 12.,
       13., 14., 15.])
```

In [40]:
```
np.arange(15)
```

Out[40]:
```
array([ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14])
```

In [42]:
```
np.arange(0,5)
```

Out[42]:
```
array([0, 1, 2, 3, 4])
```

In [44]:
```
np.arange(10,20)
```

Out[44]:
```
array([10, 11, 12, 13, 14, 15, 16, 17, 18, 19])
```

In [46]:
```
np.arange(20, 10)
```

Out[46]:
```
array([], dtype=int32)
```

In [48]:
```
np.arange(-20, 10)
```

Out[48]:
```
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 [52]:
```
ar = np.arange(-30,10)
ar
```

Out[52]:
```
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])
```

In [54]:
```
np.arange(10,10)
```

Out[54]:
```
array([], dtype=int32)
```

In [56]:
```
np.arange(10,30,5)
```

Out[56]:
```
array([10, 15, 20, 25])
```

In [58]:
```
np.zeros(3)
```

Out[58]:
```
array([0., 0., 0.])
```

In [60]:
```
np.zeros(5, dtype = int)
```

Out[60]:
```
array([0, 0, 0, 0, 0])
```

In [5]:
```
b = np.arange(3.0)
b
```

Out[5]:
```
array([0., 1., 2.])
```

In [7]:
```
np.arange(1, 101, 5)
```

Out[7]:
```
array([ 1,  6, 11, 16, 21, 26, 31, 36, 41, 46, 51, 56, 61, 66, 71, 76, 81,
       86, 91, 96])
```

In [9]:
```
np.arange(1,10,3)
```

Out[9]:
```
array([1, 4, 7])
```

In [11]:
```
np.zeros(0)
```

Out[11]:
```
array([], dtype=float64)
```

In [13]:
```
np.zeros(10)
```

Out[13]:
```
array([0., 0., 0., 0., 0., 0., 0., 0., 0., 0.])
```

In [15]:
```
np.zeros(10, dtype=int)
```

Out[15]:
```
array([0, 0, 0, 0, 0, 0, 0, 0, 0, 0])
```

In [17]:
```
np.zeros((10,5), dtype=int)
```

Out[17]:
```
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]])
```

In [19]:
```
np.zeros((10,5))
```

Out[19]:
```
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.]])
```

In [25]:
```
np.zeros((2,3))
```

Out[25]:
```
array([[0., 0., 0.],
       [0., 0., 0.]])
```

In [27]:
```
np.zeros((2 , 3), dtype=int)
```

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

In [29]:
```
np.zeros((10,10), dtype=int)
```

Out[29]:
```
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]:
```
n = (6,7)
n1 = (6,8)
print(np.zeros(n))
print(np.ones(n))
```

```
[[0. 0. 0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0. 0. 0.]]
[[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 [34]:
```
print(n1)
```

```
(6, 8)
```

In [40]:
```
print(np.zeros(n1, dtype=int))
print(np.ones(n1, dtype=int))
```

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

In [42]:
```
np.ones(2, dtype=int)
```

Out[42]:
```
array([1, 1])
```

In [44]:
```
np.ones((3,4), dtype=int)
```

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

In [46]:
```
np.zeros((10,5), dtype=int)
```

Out[46]:
```
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]])
```

In [48]:
```
range(15)
```

Out[48]:
```
range(0, 15)
```

In [52]:
```
r = range(4,15)
```

In [54]:
```
for i in enumerate(r):
    print(i)
```

```
(0, 4)
(1, 5)
(2, 6)
(3, 7)
(4, 8)
(5, 9)
(6, 10)
(7, 11)
(8, 12)
(9, 13)
(10, 14)
```

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

```
[range(4, 15)]
```

In [58]:
```
r = list(r)
```

In [60]:
```
type(r)
```

Out[60]:
```
list
```

In [62]:
```
np.random.randint(3,5,6)
```

Out[62]:
```
array([4, 4, 4, 4, 4, 4])
```

In [66]:
```
np.random.random_integers(3,7, 6)
```

```
C:\Users\azharalam\AppData\Local\Temp\ipykernel_9764\162953142.py:1: DeprecationW
arning: This function is deprecated. Please call randint(3, 7 + 1) instead
  np.random.random_integers(3,7, 6)
```

Out[66]:
```
array([6, 7, 3, 6, 4, 3])
```

In [68]:
```
np.random.randint(10,40,(10,10))
```

Out[68]:
```
array([[20, 31, 24, 38, 20, 15, 23, 27, 38, 29],
       [12, 39, 25, 22, 11, 22, 31, 20, 34, 15],
       [36, 24, 16, 21, 31, 13, 32, 33, 10, 19],
       [37, 31, 37, 12, 23, 11, 15, 28, 11, 13],
       [10, 39, 25, 27, 20, 19, 39, 20, 39, 29],
       [39, 30, 39, 10, 33, 38, 27, 16, 28, 35],
       [28, 23, 16, 23, 11, 30, 19, 18, 23, 30],
       [32, 28, 26, 19, 20, 22, 32, 32, 10, 16],
       [23, 14, 19, 19, 22, 18, 19, 11, 17, 28],
       [38, 37, 20, 23, 28, 26, 18, 34, 27, 20]])
```

In [70]:
```
np.random.randint(10,40,(15,15))
```

Out[70]:
```
array([[31, 14, 29, 23, 20, 32, 27, 16, 16, 27, 38, 24, 39, 21, 14],
       [29, 32, 11, 22, 37, 36, 39, 38, 32, 14, 27, 31, 34, 36, 32],
       [39, 25, 11, 33, 24, 19, 38, 25, 18, 12, 18, 39, 36, 11, 22],
       [35, 29, 39, 11, 17, 17, 15, 28, 15, 24, 26, 25, 15, 31, 38],
       [22, 35, 39, 27, 30, 29, 38, 13, 25, 23, 38, 17, 26, 15, 16],
       [29, 28, 24, 24, 17, 21, 23, 39, 18, 22, 29, 27, 22, 19, 13],
       [34, 30, 38, 16, 11, 27, 18, 25, 31, 19, 25, 13, 22, 29, 29],
       [21, 22, 34, 36, 11, 35, 22, 39, 39, 29, 23, 32, 14, 36, 21],
       [23, 36, 11, 25, 24, 27, 21, 19, 22, 34, 38, 27, 33, 35, 12],
       [10, 33, 11, 34, 19, 35, 15, 19, 27, 20, 23, 19, 12, 26, 37],
       [17, 11, 34, 36, 11, 33, 35, 33, 30, 28, 34, 16, 32, 15, 13],
       [30, 26, 25, 21, 35, 38, 24, 30, 12, 24, 11, 32, 18, 12, 33],
       [33, 31, 22, 15, 28, 16, 14, 21, 34, 30, 24, 35, 15, 20, 21],
       [28, 13, 18, 14, 27, 33, 18, 17, 12, 15, 29, 37, 33, 20, 38],
       [28, 16, 22, 12, 34, 17, 16, 29, 39, 13, 15, 26, 26, 29, 28]])
```

In [72]:
```
np.arange(1,50).reshape(7,7)
```

Out[72]:
```
array([[ 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]])
```

In [74]:
```
np.arange(1,100).reshape(33,3)
```

Out[74]:
```
array([[ 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]:
```
b = np.random.randint(1,20,(5,4))
```

In [81]:
```
b
```

Out[81]:
```
array([[15,  1, 16,  8],
       [ 5, 17,  5,  3],
       [ 5,  7, 13,  5],
       [ 1, 19,  9,  3],
       [ 3,  2, 14, 17]])
```

In [83]:
```
type(b)
```

Out[83]:
```
numpy.ndarray
```

In [85]:
```
b[:]
```

Out[85]:
```
array([[15,  1, 16,  8],
       [ 5, 17,  5,  3],
       [ 5,  7, 13,  5],
       [ 1, 19,  9,  3],
       [ 3,  2, 14, 17]])
```

In [87]:
```
b[1:]
```

Out[87]:
```
array([[ 5, 17,  5,  3],
       [ 5,  7, 13,  5],
       [ 1, 19,  9,  3],
       [ 3,  2, 14, 17]])
```

In [89]:
```
b[0:3]
```

Out[89]:
```
array([[15,  1, 16,  8],
       [ 5, 17,  5,  3],
       [ 5,  7, 13,  5]])
```

In [91]:
```
b[0:2]
```

Out[91]:
```
array([[15,  1, 16,  8],
       [ 5, 17,  5,  3]])
```

In [93]:
```
b[1:4]
```

Out[93]:
```
array([[ 5, 17,  5,  3],
       [ 5,  7, 13,  5],
       [ 1, 19,  9,  3]])
```

In [95]:
```
b
```

Out[95]:
```
array([[15,  1, 16,  8],
       [ 5, 17,  5,  3],
       [ 5,  7, 13,  5],
       [ 1, 19,  9,  3],
       [ 3,  2, 14, 17]])
```

In [97]:
```
b[0,1]
```

Out[97]:
```
1
```

In [99]:
```
b[0,3]
```

Out[99]:
```
8
```

In [101…
```
b[0,0]
```

Out[101…
```
15
```

In [103…
```
b[1,-1]
```

Out[103…
```
3
```

In [105…
```
b[1, -2]
```

Out[105…
```
5
```

In [107…
```
b[0, -2]
```

Out[107…
```
16
```

In [109…
```
b[-5, -3]
```

Out[109…
```
1
```

OPERATIONS

In [112…
```
b
```

Out[112…
```
array([[15,  1, 16,  8],
       [ 5, 17,  5,  3],
       [ 5,  7, 13,  5],
       [ 1, 19,  9,  3],
       [ 3,  2, 14, 17]])
```

In [116…
```
arr = np.array([0,1,2,3,4,5])
arr
```

Out[116…
```
array([0, 1, 2, 3, 4, 5])
```

In [118…
```
arr1 = np.random.randint(1, 100, (10,10))
arr1
```

Out[118…
```
array([[ 3, 26, 20, 88, 46, 64, 42, 76, 65, 88],
       [23, 78, 24, 37, 49, 48, 72, 87, 72, 10],
       [24, 55,  8, 21, 81, 70, 56,  6, 62,  8],
       [91, 24, 88, 44, 17, 51, 33, 91, 51, 32],
       [52, 56, 34, 41, 67, 44, 81, 30, 54, 78],
       [40,  6, 58, 79, 15, 60, 96, 86, 86, 62],
       [45, 33, 39, 54, 28, 85, 86, 69, 45, 21],
       [77, 99,  3, 55, 86, 26, 32, 79, 10, 18],
       [46, 17, 30, 11, 41, 95, 99, 48, 52, 29],
       [84, 99, 22, 91, 67, 67, 83, 69, 41, 58]])
```

In [120…
```
arr1.any()
```

Out[120…
```
True
```

In [122…
```
arr1.all()
```

Out[122…
```
True
```

In [124…
```
arr
```

Out[124…
```
array([0, 1, 2, 3, 4, 5])
```

In [131…
```
arr1[1:]
```

Out[131…
```
array([[23, 78, 24, 37, 49, 48, 72, 87, 72, 10],
       [24, 55,  8, 21, 81, 70, 56,  6, 62,  8],
       [91, 24, 88, 44, 17, 51, 33, 91, 51, 32],
       [52, 56, 34, 41, 67, 44, 81, 30, 54, 78],
       [40,  6, 58, 79, 15, 60, 96, 86, 86, 62],
       [45, 33, 39, 54, 28, 85, 86, 69, 45, 21],
       [77, 99,  3, 55, 86, 26, 32, 79, 10, 18],
       [46, 17, 30, 11, 41, 95, 99, 48, 52, 29],
       [84, 99, 22, 91, 67, 67, 83, 69, 41, 58]])
```

In [133…
```
arr1[::-4]
```

Out[133…
```
array([[84, 99, 22, 91, 67, 67, 83, 69, 41, 58],
       [40,  6, 58, 79, 15, 60, 96, 86, 86, 62],
       [23, 78, 24, 37, 49, 48, 72, 87, 72, 10]])
```

In [135…
```
arr1[:-2]
```

Out[135…
```
array([[ 3, 26, 20, 88, 46, 64, 42, 76, 65, 88],
       [23, 78, 24, 37, 49, 48, 72, 87, 72, 10],
       [24, 55,  8, 21, 81, 70, 56,  6, 62,  8],
       [91, 24, 88, 44, 17, 51, 33, 91, 51, 32],
       [52, 56, 34, 41, 67, 44, 81, 30, 54, 78],
       [40,  6, 58, 79, 15, 60, 96, 86, 86, 62],
       [45, 33, 39, 54, 28, 85, 86, 69, 45, 21],
       [77, 99,  3, 55, 86, 26, 32, 79, 10, 18]])
```

In [137…
```
arr1
```

Out[137…
```
array([[ 3, 26, 20, 88, 46, 64, 42, 76, 65, 88],
       [23, 78, 24, 37, 49, 48, 72, 87, 72, 10],
       [24, 55,  8, 21, 81, 70, 56,  6, 62,  8],
       [91, 24, 88, 44, 17, 51, 33, 91, 51, 32],
       [52, 56, 34, 41, 67, 44, 81, 30, 54, 78],
       [40,  6, 58, 79, 15, 60, 96, 86, 86, 62],
       [45, 33, 39, 54, 28, 85, 86, 69, 45, 21],
       [77, 99,  3, 55, 86, 26, 32, 79, 10, 18],
       [46, 17, 30, 11, 41, 95, 99, 48, 52, 29],
       [84, 99, 22, 91, 67, 67, 83, 69, 41, 58]])
```

In [139…
```
arr
```

Out[139…
```
array([0, 1, 2, 3, 4, 5])
```

In [141…
```
arr.max()
```

Out[141…
```
5
```

In [143…
```
arr1.max()
```

Out[143…
```
99
```

In [145…
```
arr.min()
```

Out[145…
```
0
```

In [147…
```
arr1.min()
```

Out[147…
```
3
```

In [149…
```
arr.mean()
```

Out[149…
```
2.5
```

In [151…
```
arr1.mean()
```

Out[151…
```
51.95
```

In [153…
```
from numpy import*
```

In [155…
```
arr
```

Out[155…
```
array([0, 1, 2, 3, 4, 5])
```

In [157…
```
median(arr1)
```

Out[157…
```
51.5
```

In [161…
```
median(arr)
```

Out[161…
```
2.5
```

In [167…
```
import random
def generate_otp(length = 4):
    "generates an otp of length"
    digits = '012380'
    otp = ''.join(random.choice(digits) for _ in range(length))
    return otp

otp_length = 4
otp = generate_otp(otp_length)
print('your otp is {}:'.format(otp) )
```

```
your otp is 0883:
```

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]: