In [1]:
```python
my_list=[1,2,3]
my_list
```
Out[1]:
```
[1, 2, 3]
```
In [3]:
```python
type(my_list)
```
Out[3]:
```
list
```
In [5]:
```python
import numpy as np
```
In [9]:
```python
arr=np.array(my_list)
```
In [11]:
```python
arr
```
Out[11]:
```
array([1, 2, 3])
```
In [15]:
```python
type(arr)
```
Out[15]:
```
numpy.ndarray
```
In [20]:
```python
my_matrix=[[1,2,3],[4,5,6],[7,8,9]]
```
In [22]:
```python
my_matrix
```
Out[22]:
```
[[1, 2, 3], [4, 5, 6], [7, 8, 9]]
```
In [24]:
```python
np.array(my_matrix)
```
Out[24]:
```
array([[1, 2, 3],
       [4, 5, 6],
       [7, 8, 9]])
```
In [26]:
```python
np.arange(0,10)
```
Out[26]:
```
array([0, 1, 2, 3, 4, 5, 6, 7, 8, 9])
```
In [28]:
```python
np.arange(0,11,2)
```
Out[28]:
```
array([ 0,  2,  4,  6,  8, 10])
```
In [30]:
```python
np.zeros(3)
```
Out[30]:
```
array([0., 0., 0.])
```
In [32]:
```python
np.zeros((5,5))
```
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.]])
```
In [34]:
```python
np.ones(3)
```
Out[34]:
```
array([1., 1., 1.])
```
In [36]:
```python
np.ones((3,3))
```
Out[36]:
```
array([[1., 1., 1.],
       [1., 1., 1.],
       [1., 1., 1.]])
```
In [38]:
```python
np.linspace(0,10,3)
```
Out[38]:
```
array([ 0.,  5., 10.])
```
In [40]:
```python
np.arange(0,10,3)
```
Out[40]:
```
array([0, 3, 6, 9])
```
In [42]:
```python
np.linspace(0,10,50)
```
Out[42]:
```
array([ 0.        ,  0.20408163,  0.40816327,  0.6122449 ,  0.81632653,
        1.02040816,  1.2244898 ,  1.42857143,  1.63265306,  1.83673469,
        2.04081633,  2.24489796,  2.44897959,  2.65306122,  2.85714286,
        3.06122449,  3.26530612,  3.46938776,  3.67346939,  3.87755102,
        4.08163265,  4.28571429,  4.48979592,  4.69387755,  4.89795918,
        5.10204082,  5.30612245,  5.51020408,  5.71428571,  5.91836735,
        6.12244898,  6.32653061,  6.53061224,  6.73469388,  6.93877551,
        7.14285714,  7.34693878,  7.55102041,  7.75510204,  7.95918367,
        8.16326531,  8.36734694,  8.57142857,  8.7755102 ,  8.97959184,
        9.18367347,  9.3877551 ,  9.59183673,  9.79591837, 10.        ])
```
In [44]:
```python
np.eye(4)
```
Out[44]:
```
array([[1., 0., 0., 0.],
       [0., 1., 0., 0.],
       [0., 0., 1., 0.],
       [0., 0., 0., 1.]])
```
In [46]:
```python
np.random.rand(2)
```
Out[46]:
```
array([0.56936855, 0.35522565])
```
In [48]:
```python
np.random.rand(5,5)
```
Out[48]:
```
array([[0.68693766, 0.12559863, 0.13102579, 0.25761866, 0.42643089],
       [0.74939112, 0.88002173, 0.40492127, 0.96823059, 0.90345857],
       [0.27058619, 0.2143494 , 0.346096  , 0.2343224 , 0.49639788],
       [0.81996957, 0.99945489, 0.37623747, 0.51761009, 0.69999771],
       [0.11322503, 0.08754815, 0.08157233, 0.74579892, 0.68719684]])
```
In [50]:
```python
np.random.randn(2)
```
Out[50]:
```
array([-0.62012215, -0.3078892 ])
```
In [52]:
```python
np.random.randn(5,5)
```
Out[52]:
```
array([[ 0.21141887, -0.16282887,  0.55348288, -0.82437092, -1.75044172],
       [ 1.59567166,  0.77437996,  0.45954593,  0.1133306 , -0.36266497],
       [-0.62703452,  1.86663554,  0.36916175,  1.36098523,  0.57133226],
       [-0.879119  , -1.27550924,  0.23736808, -0.16383786, -0.78023104],
       [ 0.43439753, -0.7529198 ,  1.27022554, -0.27344599,  0.32482826]])
```
In [60]:
```python
np.random.randint(1,100)
```
Out[60]:
```
39
```
In [64]:
```python
np.random.randint(1,100,10)
```
Out[64]:
```
array([10, 88, 17,  9, 11, 95, 67,  1, 32,  9])
```
In [66]:
```python
arr=np.arange(25)
```
In [68]:
```python
arr
```
Out[68]:
```
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])
```
In [70]:
```python
ranarr=np.random.randint(0,50,10)
```
In [72]:
```python
ranarr
```
Out[72]:
```
array([17, 39, 21, 35,  6, 31,  5, 26, 45, 26])
```
In [74]:
```python
arr.reshape(5,5)
```
Out[74]:
```
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]])
```
In [76]:
```python
ranarr.max()
```
Out[76]:
```
45
```
In [78]:
```python
ranarr.min()
```
Out[78]:
```
5
```
In [82]:
```python
arr.shape
```
Out[82]:
```
(25,)
```
In [84]:
```python
arr.reshape(1,25)
```
Out[84]:
```
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]])
```
In [86]:
```python
arr.reshape(1,25).shape
```
Out[86]:
```
(1, 25)
```
In [88]:
```python
arr.reshape(25,1)
```
Out[88]:
```
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]])
```
In [90]:
```python
arr.reshape(25,1).shape
```
Out[90]:
```
(25, 1)
```
In [92]:
```python
arr.dtype
```
Out[92]:
```
dtype('int32')
```
In [94]:
```python
arr
```
Out[94]:
```
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])
```
In [96]:
```python
arr=np.arange(0,10)
```
In [98]:
```python
arr
```
Out[98]:
```
array([0, 1, 2, 3, 4, 5, 6, 7, 8, 9])
```
In [100…
```python
arr+arr
```
Out[100…
```
array([ 0,  2,  4,  6,  8, 10, 12, 14, 16, 18])
```
In [102…
```python
arr*arr
```
Out[102…
```
array([ 0,  1,  4,  9, 16, 25, 36, 49, 64, 81])
```
In [104…
```python
arr-arr
```
Out[104…
```
array([0, 0, 0, 0, 0, 0, 0, 0, 0, 0])
```
In [106…
```python
arr/arr
```
```
C:\Users\student\AppData\Local\Temp\ipykernel_9264\1862401812.py:1: RuntimeWarning: invalid value encountered in divide
  arr/arr
```
Out[106…
```
array([nan,  1.,  1.,  1.,  1.,  1.,  1.,  1.,  1.,  1.])
```
In [108…
```python
1/arr
```
```
C:\Users\student\AppData\Local\Temp\ipykernel_9264\255282349.py:1: RuntimeWarning: divide by zero encountered in divide
  1/arr
```
Out[108…
```
array([       inf, 1.        , 0.5       , 0.33333333, 0.25      ,
       0.2       , 0.16666667, 0.14285714, 0.125     , 0.11111111])
```
In [110…
```python
arr**3
```
Out[110…
```
array([  0,   1,   8,  27,  64, 125, 216, 343, 512, 729], dtype=int32)
```
In [112…
```python
np.sqrt(arr)
```
Out[112…
```
array([0.        , 1.        , 1.41421356, 1.73205081, 2.        ,
       2.23606798, 2.44948974, 2.64575131, 2.82842712, 3.        ])
```
In [114…
```python
np.exp(arr)
```
Out[114…
```
array([1.00000000e+00, 2.71828183e+00, 7.38905610e+00, 2.00855369e+01,
       5.45981500e+01, 1.48413159e+02, 4.03428793e+02, 1.09663316e+03,
       2.98095799e+03, 8.10308393e+03])
```
In [116…
```python
np.max(arr)
```
Out[116…
```
9
```
In [118…
```python
arr.max()
```
Out[118…
```
9
```
In [120…
```python
np.sin(arr)
```
Out[120…
```
array([ 0.        ,  0.84147098,  0.90929743,  0.14112001, -0.7568025 ,
       -0.95892427, -0.2794155 ,  0.6569866 ,  0.98935825,  0.41211849])
```
In [122…
```python
np.log(arr)
```
```
C:\Users\student\AppData\Local\Temp\ipykernel_9264\3120950136.py:1: RuntimeWarning: divide by zero encountered in log
  np.log(arr)
```
Out[122…
```
array([      -inf, 0.        , 0.69314718, 1.09861229, 1.38629436,
       1.60943791, 1.79175947, 1.94591015, 2.07944154, 2.19722458])
```
In [124…
```python
arr[8]
```
Out[124…
```
8
```
In [126…
```python
arr
```
Out[126…
```
array([0, 1, 2, 3, 4, 5, 6, 7, 8, 9])
```
In [128…
```python
arr[1:5]
```
Out[128…
```
array([1, 2, 3, 4])
```
In [130…
```python
arr[0:5]
```
Out[130…
```
array([0, 1, 2, 3, 4])
```
In [132…
```python
arr[0:5]=100
```
In [134…
```python
arr
```
Out[134…
```
array([100, 100, 100, 100, 100,   5,   6,   7,   8,   9])
```
In [140…
```python
arr[0:6]
```
Out[140…
```
array([100, 100, 100, 100, 100,   5])
```
In [142…
```python
s=arr[0:6]
```
In [144…
```python
s
```
Out[144…
```
array([100, 100, 100, 100, 100,   5])
```
In [146…
```python
s[:]=99
```
In [148…
```python
s
```
Out[148…
```
array([99, 99, 99, 99, 99, 99])
```
In [150…
```python
arr=np.arange(0,10)
```
In [152…
```python
arr
```
Out[152…
```
array([0, 1, 2, 3, 4, 5, 6, 7, 8, 9])
```
In [154…
```python
arr_copy=arr.copy()
```
In [156…
```python
arr_copy
```
Out[156…
```
array([0, 1, 2, 3, 4, 5, 6, 7, 8, 9])
```
In [158…
```python
arr_2d=np.array(([5,10,15],[20,25,30],[30,35,40]))
```
In [160…
```python
arr_2d
```
Out[160…
```
array([[ 5, 10, 15],
       [20, 25, 30],
       [30, 35, 40]])
```
In [162…
```python
arr_2d[1]
```
Out[162…
```
array([20, 25, 30])
```
In [164…
```python
arr_2d[2]
```
Out[164…
```
array([30, 35, 40])
```
In [166…
```python
arr_2d[1][0]
```
Out[166…
```
20
```
In [168…
```python
arr_2d[1,0]
```
Out[168…
```
20
```
In [170…
```python
arr_2d[:2,1:]
```
Out[170…
```
array([[10, 15],
       [25, 30]])
```
In [172…
```python
arr_2d[2,:]
```
Out[172…
```
array([30, 35, 40])
```
In [174…
```python
arr_2d=np.zeros((10,10))
```
In [176…
```python
arr_2d
```
Out[176…
```
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 [178…
```python
arr_length=arr_2d.shape[1]
```
In [180…
```python
arr_length
```
Out[180…
```
10
```
In [182…
```python
for i in range(arr_length):
    arr_2d[i]=i
```
In [184…
```python
arr_2d
```
Out[184…
```
array([[0., 0., 0., 0., 0., 0., 0., 0., 0., 0.],
       [1., 1., 1., 1., 1., 1., 1., 1., 1., 1.],
       [2., 2., 2., 2., 2., 2., 2., 2., 2., 2.],
       [3., 3., 3., 3., 3., 3., 3., 3., 3., 3.],
       [4., 4., 4., 4., 4., 4., 4., 4., 4., 4.],
       [5., 5., 5., 5., 5., 5., 5., 5., 5., 5.],
       [6., 6., 6., 6., 6., 6., 6., 6., 6., 6.],
       [7., 7., 7., 7., 7., 7., 7., 7., 7., 7.],
       [8., 8., 8., 8., 8., 8., 8., 8., 8., 8.],
       [9., 9., 9., 9., 9., 9., 9., 9., 9., 9.]])
```
In [186…
```python
arr_2d[[2,4,6,8]]
```
Out[186…
```
array([[2., 2., 2., 2., 2., 2., 2., 2., 2., 2.],
       [4., 4., 4., 4., 4., 4., 4., 4., 4., 4.],
       [6., 6., 6., 6., 6., 6., 6., 6., 6., 6.],
       [8., 8., 8., 8., 8., 8., 8., 8., 8., 8.]])
```
In [188…
```python
arr_2d[[6,4,2,7]]
```
Out[188…
```
array([[6., 6., 6., 6., 6., 6., 6., 6., 6., 6.],
       [4., 4., 4., 4., 4., 4., 4., 4., 4., 4.],
       [2., 2., 2., 2., 2., 2., 2., 2., 2., 2.],
       [7., 7., 7., 7., 7., 7., 7., 7., 7., 7.]])
```
In [190…
```python
arr
```
Out[190…
```
array([0, 1, 2, 3, 4, 5, 6, 7, 8, 9])
```
In [192…
```python
arr>4
```
Out[192…
```
array([False, False, False, False, False,  True,  True,  True,  True,
        True])
```
In [194…
```python
bool_arr=arr>4
```
In [196…
```python
bool_arr
```
Out[196…
```
array([False, False, False, False, False,  True,  True,  True,  True,
        True])
```
In [198…
```python
arr[bool_arr]
```
Out[198…
```
array([5, 6, 7, 8, 9])
```
In [200…
```python
arr[arr>2]
```
Out[200…
```
array([3, 4, 5, 6, 7, 8, 9])
```
In [202…
```python
x=2
arr[arr>x]
```

Out[202…

```
array([3, 4, 5, 6, 7, 8, 9])
```

In [ ]: