In [50]:
```
pip install numpy
```

```
Requirement already satisfied: numpy in c:\users\arabinda\anaconda3\lib\site-package
s (1.26.4)
Note: you may need to restart the kernel to use updated packages.
```

In [51]:
```
import numpy as np
```

In [52]:
```
a1=(np.arange(6))
a2=a1[np.newaxis,:]
a2.shape
```

Out[52]:
```
(1, 6)
```

In [53]:
```
np.__version__
```

Out[53]:
```
'1.26.4'
```

In [54]:
```
np.arange(8)
```

Out[54]:
```
array([0, 1, 2, 3, 4, 5, 6, 7])
```

In [55]:
```
np.arange(0,8)
```

Out[55]:
```
array([0, 1, 2, 3, 4, 5, 6, 7])
```

In [56]:
```
np.arange(-5,8)
```

Out[56]:
```
array([-5, -4, -3, -2, -1,  0,  1,  2,  3,  4,  5,  6,  7])
```

In [57]:
```
np.arange(30,20)#starting index must be lessthen with ending index
```

Out[57]:
```
array([], dtype=int32)
```

In [58]:
```
np.arange(10,10)
```

Out[58]:
```
array([], dtype=int32)
```

In [59]:
```
np.arange(1,25,4)#1 is the starting index,25 is the ending index(n-1),4 is the step
```

Out[59]:
```
array([ 1,  5,  9, 13, 17, 21])
```

In [60]:
```
np.zeros(5)#zeros function arrange all zero
```

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

In [61]:
```
np.zeros([3,3])
```

Out[61]:
```
array([[0., 0., 0.],
       [0., 0., 0.],
       [0., 0., 0.]])
```

In [62]:
```
np.ones(5)#ones function arrange all one
```

Out[62]:
```
array([1., 1., 1., 1., 1.])
```

In [63]:
```
np.ones([3,3])
```

Out[63]:
```
array([[1., 1., 1.],
       [1., 1., 1.],
       [1., 1., 1.]])
```

In [64]:
```
zero=np.zeros([2,2])
print(zero)
type(zero)
```

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

Out[64]:
```
numpy.ndarray
```

In [65]:
```
n=(6,7)
n1=(3,3)
print(np.zeros(n))#parameter 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.]]
```

In [66]:
```
print(np.zeros(n,dtype=int))#hyperparameter tunning because we alter the value of a
```

```
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 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 [67]:
```
import numpy as np1
```

In [68]:
```
np1=np.zeros(n,dtype=int)
```

In [69]:
```
print(np1)
```

```
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 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 [70]:
```
n
```

Out[70]:
```
(6, 7)
```

In [71]:
```
range(5)
```

Out[71]:
```
range(0, 5)
```

In [72]:
```
ran=range(5)
ran
```

Out[72]:
```
range(0, 5)
```

In [73]:
```
for i in ran:
    print(i)
```

```
0
1
2
3
4
```

In [74]:
```
print(list(ran))
```

```
[0, 1, 2, 3, 4]
```

In [75]:
```
np.random.rand(3)#it gives three random values form 0-1
```

Out[75]:
```
array([0.67548667, 0.97824858, 0.81095527])
```

In [84]:
```
np.random.randint(3,10,10)#it gives 3-9 every 10 random number
```

Out[84]:
```
array([9, 6, 5, 3, 8, 6, 3, 6, 4, 8])
```

In [91]:
```
np.random.randint(1)#it gives only 0
```

Out[91]:
```
0
```

In [103…
```
np.random.randint(3,10,(10,10))#it gives 10*10 matrix random number
```

Out[103…
```
array([[4, 3, 4, 6, 4, 3, 4, 9, 4, 5],
       [5, 8, 8, 6, 5, 8, 4, 8, 6, 8],
       [7, 6, 6, 8, 6, 6, 6, 7, 5, 7],
       [7, 4, 4, 8, 3, 5, 5, 7, 4, 3],
       [9, 5, 9, 5, 5, 5, 5, 6, 9, 8],
       [3, 8, 4, 3, 6, 6, 8, 3, 9, 7],
       [9, 9, 8, 6, 8, 5, 8, 6, 7, 4],
       [7, 8, 8, 5, 9, 9, 6, 8, 3, 9],
       [6, 4, 7, 4, 8, 4, 9, 8, 7, 7],
       [6, 7, 7, 3, 7, 7, 4, 4, 8, 8]])
```

In [108…
```
np.arange(1,10).reshape(3,3)#(3,3) this is row and column
```

Out[108…
```
array([[1, 2, 3],
       [4, 5, 6],
       [7, 8, 9]])
```

In [110…
```
b=np.random.randint(1,10,(3,3))
b
```

Out[110…
```
array([[9, 5, 8],
       [1, 7, 4],
       [6, 5, 6]])
```

In [112…
```
type(b)
```

Out[112…
```
numpy.ndarray
```

In [114…
```
b[:]
```

Out[114…
```
array([[9, 5, 8],
       [1, 7, 4],
       [6, 5, 6]])
```

In [116…
```
b[1:3]
```

Out[116…
```
array([[1, 7, 4],
       [6, 5, 6]])
```

In [118…
```
b[1,1]
```

Out[118…
```
7
```

In [120…
```
b[2,2]
```

Out[120…
```
6
```

In [122…
```
c=np.arange(0,20)
c
```

Out[122…
```
array([ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 16,
       17, 18, 19])
```

In [124…
```
del c
```

In [126…
```
c
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
Cell In[126], line 1
----> 1 c

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

In [128…
```
matrix1=np.random.randint(0,19,(4,5))
matrix1
```

Out[128…
```
array([[10,  6, 16, 12, 10],
       [10, 12,  9,  6,  0],
       [ 7,  5, 14,  6, 11],
       [17, 12, 10, 13, 16]])
```

In [130…
```
matrix1[1:4]#fron 1 rows it return upto (4-1) its call slicing
```

Out[130…
```
array([[10, 12,  9,  6,  0],
       [ 7,  5, 14,  6, 11],
       [17, 12, 10, 13, 16]])
```

In [132…
```
matrix1[0:-1]
```

Out[132…
```
array([[10,  6, 16, 12, 10],
       [10, 12,  9,  6,  0],
       [ 7,  5, 14,  6, 11]])
```

In [134…
```
matrix1[-2,-4]
```

Out[134…
```
5
```

In [136…
```
matrix1[:]
```

Out[136…
```
array([[10,  6, 16, 12, 10],
       [10, 12,  9,  6,  0],
       [ 7,  5, 14,  6, 11],
       [17, 12, 10, 13, 16]])
```

In [138…
```
matrix1[::-1]
```

Out[138…
```
array([[17, 12, 10, 13, 16],
       [ 7,  5, 14,  6, 11],
       [10, 12,  9,  6,  0],
       [10,  6, 16, 12, 10]])
```

In [140…
```
matrix1[0:4]
```

Out[140…
```
array([[10,  6, 16, 12, 10],
       [10, 12,  9,  6,  0],
       [ 7,  5, 14,  6, 11],
       [17, 12, 10, 13, 16]])
```

In [142…
```
len(matrix1)
```

Out[142…
```
4
```

In [144…
```
matrix1.max()#it return max value of an matrix
```

Out[144…
```
17
```

In [146…
```
matrix1.min()#it returns the minimum value
```

Out[146…
```
0
```

In [148…
```
matrix1.mean()#Average
```

Out[148…
```
10.1
```

In [150…
```
from numpy import *
a = array([1,2,77,6,5,6,9,8])
median(a)
```

Out[150…
```
6.0
```

In [152…
```
matrix1
```

Out[152…
```
array([[10,  6, 16, 12, 10],
       [10, 12,  9,  6,  0],
       [ 7,  5, 14,  6, 11],
       [17, 12, 10, 13, 16]])
```

In [154…
```
matrix1.reshape(2,10)# we can resize our matrix
```

Out[154…
```
array([[10,  6, 16, 12, 10, 10, 12,  9,  6,  0],
       [ 7,  5, 14,  6, 11, 17, 12, 10, 13, 16]])
```

In [156…
```
matrix1.reshape(2,10,order='C')
```

Out[156…
```
array([[10,  6, 16, 12, 10, 10, 12,  9,  6,  0],
       [ 7,  5, 14,  6, 11, 17, 12, 10, 13, 16]])
```

In [158…
```
matrix1.reshape(2,10,order='F')
```

Out[158…
```
array([[10,  7,  6,  5, 16, 14, 12,  6, 10, 11],
       [10, 17, 12, 12,  9, 10,  6, 13,  0, 16]])
```

In [160…
```
matrix1.reshape(2,10,order='A')
```

Out[160…
```
array([[10,  6, 16, 12, 10, 10, 12,  9,  6,  0],
       [ 7,  5, 14,  6, 11, 17, 12, 10, 13, 16]])
```

In [162…
```
mat = np.arange(0,100).reshape(10,10)
mat
```

Out[162…
```
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 [164…
```
row=4
col=5
mat[row,col]
```

Out[164…
```
45
```

In [166…
```
mat[6]
```

Out[166… array([60, 61, 62, 63, 64, 65, 66, 67, 68, 69])

In [168…
```
mat[:]
```

Out[168…
```
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 [170…
```
mat[:,col]
```

Out[170… array([5, 15, 25, 35, 45, 55, 65, 75, 85, 95])

In [172…
```
mat[:,8]
```

Out[172… array([8, 18, 28, 38, 48, 58, 68, 78, 88, 98])

In [174…
```
mat[row]
```

Out[174… array([40, 41, 42, 43, 44, 45, 46, 47, 48, 49])

In [176…
```
mat[col]
```

Out[176… array([50, 51, 52, 53, 54, 55, 56, 57, 58, 59])

In [178…
```
mat[:col]
```

Out[178…
```
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]])
```

In [180…
```
mat[::-1]
```

Out[180…
```
array([[90, 91, 92, 93, 94, 95, 96, 97, 98, 99],
       [80, 81, 82, 83, 84, 85, 86, 87, 88, 89],
       [70, 71, 72, 73, 74, 75, 76, 77, 78, 79],
       [60, 61, 62, 63, 64, 65, 66, 67, 68, 69],
       [50, 51, 52, 53, 54, 55, 56, 57, 58, 59],
       [40, 41, 42, 43, 44, 45, 46, 47, 48, 49],
       [30, 31, 32, 33, 34, 35, 36, 37, 38, 39],
       [20, 21, 22, 23, 24, 25, 26, 27, 28, 29],
       [10, 11, 12, 13, 14, 15, 16, 17, 18, 19],
       [ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9]])
```

In [182…
```
mat[1:10:2]
```

Out[182…
```
array([[10, 11, 12, 13, 14, 15, 16, 17, 18, 19],
       [30, 31, 32, 33, 34, 35, 36, 37, 38, 39],
       [50, 51, 52, 53, 54, 55, 56, 57, 58, 59],
       [70, 71, 72, 73, 74, 75, 76, 77, 78, 79],
       [90, 91, 92, 93, 94, 95, 96, 97, 98, 99]])
```

In [184…
```
mat
```

Out[184…
```
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 [186…
```
mat[2:6,2:4]
```

Out[186…
```
array([[22, 23],
       [32, 33],
       [42, 43],
       [52, 53]])
```

In [188…
```
mat
```

Out[188…
```
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 [192…
```
id(mat)
```

Out[192…
```
2079819089648
```

In [194…
```
mat[mat<50]
```

Out[194…
```
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])
```

In [196…
```
mat[mat<=50]
```

Out[196…
```
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])
```

In [198…
```
mat[mat==50]
```

Out[198…
```
array([50])
```

In [204…
```
mat==50
```

Out[204…
```
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 [206…
```
a = np.arange(10,110)
```

In [212…
```
a = a.reshape(10,10)
```

In [214…
```
a
```

Out[214…
```
array([[ 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],
       [100, 101, 102, 103, 104, 105, 106, 107, 108, 109]])
```

In [220…
```
a[a>=50]
```

Out[220…
```
array([ 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, 100, 101,
       102, 103, 104, 105, 106, 107, 108, 109])
```

In [226…
```
mat[mat == 50]
```

Out[226… array([50])

In [228…
```
mat
```

Out[228…
```
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 [236…
```
temp = np.arange(0,8).reshape(2,2,2)
```

In [240…
```
temp.ndim#finding the diamonsnal matrix
```

Out[240… 3

In [242…
```
mat.ndim
```

Out[242… 2

In [244…
```
mat
```

Out[244…
```
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 [246…
```
temp
```

Out[246…
```
array([[[0, 1],
        [2, 3]],

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

In [248…
```
np.arange(0,16).reshape(2,2,2,2)
```

Out[248…
```
array([[[[ 0,  1],
         [ 2,  3]],

        [[ 4,  5],
         [ 6,  7]]],


       [[[ 8,  9],
         [10, 11]],

        [[12, 13],
         [14, 15]]]])
```

In [256…
```
a = 0.3
b = 0.2
```

In [258…
```
a-b == 0.1
```

Out[258…
```
False
```

In [266…
```
a=[1,2,3]
b=a
c
b.append(4)#1234
print(a)
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
Cell In[266], line 3
      1 a=[1,2,3]
      2 b=a
----> 3 c
      4 b.append(4)#1234
      5 print(a)

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

In [262…
```
id(a)
```

Out[262…
```
2079822342400
```

In [264…
```
id(b)
```

Out[264…
```
2079822342400
```

In [ ]: