```
import numpy as np
np.__version__
```

```
'2.0.2'
```

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

```
[0, 1, 2, 3, 4, 5]
```

```
type(my_list)
```

```
list
```

```
arr = np.array(my_list)
arr
```

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

```
type(arr)
```

```
numpy.ndarray
```

```
np.arange(5)
```

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

```
np.arange(0,5)
```

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

```
np.arange(10,20)
```

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

```
np.arange(-20,10)
```

```
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])
```

```
np.arange(-16,10)
```

```
array([-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])
```

```
np.arange(-20,-10)
```

```
array([-20, -19, -18, -17, -16, -15, -14, -13, -12, -11])
```

```
b = np.arange(-30,20)
b
```

```
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])
```

```
np.arange(0,10,3)
```

```
array([0, 3, 6, 9])
```

```
b1 = np.zeros(2) #parameter tunning
b1
```

```
array([0., 0.])
```

```
zero = np.zeros((2,2))
zero
```

```
array([[0., 0.],
       [0., 0.]])
```

```
np.zeros(5,dtype=int) #hyperparameter tunning
```

```
array([0, 0, 0, 0, 0])
```

```
np.zeros((10,10))
```

```
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.]])
```

```
np.zeros((2,10))
```

```
array([[0., 0., 0., 0., 0., 0., 0., 0., 0., 0.],
       [0., 0., 0., 0., 0., 0., 0., 0., 0., 0.]])
```

```
np.arange(10,30,5,1)
```

```
---------------------------------------------------------------------------
TypeError                                 Traceback (most recent call last)
<ipython-input-108-3cd8b0a42dd5> in <cell line: 0>()
----> 1 np.arange(10,30,5,1)

TypeError: Cannot interpret '1' as a data type
```

Next steps: Explain error

```
n = (5,7)
n1 = (6,8)
print(np.zeros(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.]]
```

```
print(np.zeros(n1))
```

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

```
np.arange(10,30,5)
```

```
array([10, 15, 20, 25])
```

```
np.ones(4,dtype=int)
```

```
array([1, 1, 1, 1])
```

```
np.ones(4)
```

```
array([1., 1., 1., 1.])
```

```
np.ones(n)
```

```
array([[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.]])
```

```
np.ones((5,4),dtype=int)
```

```
array([[1, 1, 1, 1],
       [1, 1, 1, 1],
       [1, 1, 1, 1],
       [1, 1, 1, 1],
       [1, 1, 1, 1]])
```

```
import numpy as np
```

```
np.random.rand(4)
```

```
array([0.74454025, 0.04062263, 0.22850805, 0.40267018])
```

```
np.rand(4)
```

```
---------------------------------------------------------------------------
AttributeError                            Traceback (most recent call last)
<ipython-input-3-23e17fba0190> in <cell line: 0>()
----> 1 np.rand(4)

/usr/local/lib/python3.11/dist-packages/numpy/__init__.py in __getattr__(attr)
    408             return char.chararray
    409
--> 410         raise AttributeError("module {!r} has no attribute "
    411                              "{!r}".format(__name__, attr))
    412

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

Next steps: Explain error

```
np.random.rand(2,4)
```

```
array([[0.04156437, 0.66532894, 0.27696698, 0.43939862],
       [0.01372274, 0.33427645, 0.96272729, 0.048633  ]])
```

```
np.random.randint(2,20) # 2nd argument is exlusive
```

```
18
```

```
np.random.randint(0,2)
```

```
1
```

Start coding or generate with AI.

```
np.random.randint(1,10,4)
```

```
array([4, 3, 2, 8])
```

```
np.random.randint(5,9)  #GET THE VALUE <=1 & >=5
```

```
8
```

```
np.random.randint(10,40,(10,10))
```

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

```
b = np.random.randint(10,20,(5,4))
b
```

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

```
b[:]
```

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

```
b[0:2]
```

```
array([[11, 15, 18, 10],
       [16, 14, 10, 10]])
```

```
b[0:-1]
```

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

```
b[0,2]
```

```
np.int64(18)
```

```
np.random.randint(10,20,(4,4))
```

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

```
a = np.random.randint(10,20,5)
```

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

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

```
arr2 = np.random.randint(0,100,(10,10))
```

```
arr2
```

```
array([[70, 89, 86, 75, 86, 72, 56, 10, 45, 45],
       [85, 36,  0, 80, 45, 24, 78,  0, 95, 31],
       [96, 23, 95, 60, 52, 56, 84, 68,  4, 80],
       [87,  3, 15,  6, 63, 33, 58, 84, 15, 73],
       [17, 16, 12, 33, 74,  3, 44,  3,  0, 92],
       [42, 51,  4, 68, 86, 20, 87,  9, 88,  3],
       [42,  2, 74, 11,  6,  4, 90, 67, 57, 25],
       [13,  1, 42, 70, 55, 67, 89, 32, 56, 42],
       [99, 90,  2, 40, 78,  9, 11, 20, 21,  7],
       [98, 23, 34, 85, 71, 15,  5, 82, 73, 37]])
```

```
arr
```

```
[0, 1, 2, 3, 4, 5]
```

```
arr[:]
```

```
[0, 1, 2, 3, 4, 5]
```

```
arr[:4]
```

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

```
arr2[:]
```

```
array([[70, 89, 86, 75, 86, 72, 56, 10, 45, 45],
       [85, 36,  0, 80, 45, 24, 78,  0, 95, 31],
       [96, 23, 95, 60, 52, 56, 84, 68,  4, 80],
       [87,  3, 15,  6, 63, 33, 58, 84, 15, 73],
       [17, 16, 12, 33, 74,  3, 44,  3,  0, 92],
       [42, 51,  4, 68, 86, 20, 87,  9, 88,  3],
       [42,  2, 74, 11,  6,  4, 90, 67, 57, 25],
       [13,  1, 42, 70, 55, 67, 89, 32, 56, 42],
       [99, 90,  2, 40, 78,  9, 11, 20, 21,  7],
       [98, 23, 34, 85, 71, 15,  5, 82, 73, 37]])
```

```
arr2[0:5]
```

```
array([[70, 89, 86, 75, 86, 72, 56, 10, 45, 45],
       [85, 36,  0, 80, 45, 24, 78,  0, 95, 31],
       [96, 23, 95, 60, 52, 56, 84, 68,  4, 80],
       [87,  3, 15,  6, 63, 33, 58, 84, 15, 73],
       [17, 16, 12, 33, 74,  3, 44,  3,  0, 92]])
```

```
arr2[1,5]
```

```
np.int64(24)
```

```
arr2[-5,-5]
```

```
np.int64(20)
```

```
arr2[-1,-2]
```

```
np.int64(73)
```

```
arr2
```

```
array([[70, 89, 86, 75, 86, 72, 56, 10, 45, 45],
       [85, 36,  0, 80, 45, 24, 78,  0, 95, 31],
       [96, 23, 95, 60, 52, 56, 84, 68,  4, 80],
       [87,  3, 15,  6, 63, 33, 58, 84, 15, 73],
       [17, 16, 12, 33, 74,  3, 44,  3,  0, 92],
       [42, 51,  4, 68, 86, 20, 87,  9, 88,  3],
```

```
           [42,  2, 74, 11,  6,  4, 90, 67, 57, 25],
           [13,  1, 42, 70, 55, 67, 89, 32, 56, 42],
           [99, 90,  2, 40, 78,  9, 11, 20, 21,  7],
           [98, 23, 34, 85, 71, 15,  5, 82, 73, 37]])
```

```
arr2[::-2]
```

```
array([[98, 23, 34, 85, 71, 15,  5, 82, 73, 37],
       [13,  1, 42, 70, 55, 67, 89, 32, 56, 42],
       [42, 51,  4, 68, 86, 20, 87,  9, 88,  3],
       [87,  3, 15,  6, 63, 33, 58, 84, 15, 73],
       [85, 36,  0, 80, 45, 24, 78,  0, 95, 31]])
```

```
arr2[::-3]
```

```
array([[98, 23, 34, 85, 71, 15,  5, 82, 73, 37],
       [42,  2, 74, 11,  6,  4, 90, 67, 57, 25],
       [87,  3, 15,  6, 63, 33, 58, 84, 15, 73],
       [70, 89, 86, 75, 86, 72, 56, 10, 45, 45]])
```

```
arr
```

```
[0, 1, 2, 3, 4, 5]
```

```
from numpy import *
arr.max()
```

```
np.int64(5)
```

```
arr.min()
```

```
np.int64(0)
```

```
arr.mean()
```

```
np.float64(2.5)
```

```
arr.median()
```

```
---------------------------------------------------------------------------
AttributeError                            Traceback (most recent call last)
<ipython-input-44-e8f6ca672427> in <cell line: 0>()
----> 1 arr.median()

AttributeError: 'numpy.ndarray' object has no attribute 'median'
```

Next steps: Explain error

```
from numpy import *
>>> a = array([1,2,3,4,9])
>>> median(a)
```

```
np.float64(3.0)
```

```
arr.reshape(2,3)
```

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

```
arr.reshape(6,1)
```

```
array([[0],
       [1],
       [2],
       [3],
```

```
           [4],
           [5]])
```

```
arr.reshape(3,2)
```

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

INDEXING

```
mat = np.arange(0,100).reshape(10,10)
mat
```

```
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]])
```

```
row = 4
col = 5
```

```
mat[row,col]
```

```
np.int64(45)
```

```
mat[4,5]
```

```
np.int64(45)
```

```
mat[:]
```

```
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]])
```

```
col = 6
mat
```

```
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]])
```

```
mat[:,col]
```

```
array([ 6, 16, 26, 36, 46, 56, 66, 76, 86, 96])
```

```
mat[row,:]
```

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

```
mat[:col]
```

```
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]])
```

```
mat[:,-1]
```

```
array([ 9, 19, 29, 39, 49, 59, 69, 79, 89, 99])
```

```
mat[1,4]
```

```
np.int64(14)
```

```
mat[3:-3]
```

```
array([[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]])
```

```
mat[0]
```

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

```
mat[6]
```

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

```
mat
```

```
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]])
```

```
mat[5:7]
```

```
array([[50, 51, 52, 53, 54, 55, 56, 57, 58, 59],
       [60, 61, 62, 63, 64, 65, 66, 67, 68, 69]])
```

```
mat[0:10]
```

```
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]])
```

```
mat[0:10:3]
```

```
array([[ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9],
       [30, 31, 32, 33, 34, 35, 36, 37, 38, 39],
       [60, 61, 62, 63, 64, 65, 66, 67, 68, 69],
       [90, 91, 92, 93, 94, 95, 96, 97, 98, 99]])
```

```
mat[:4]
```

```
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]])
```

```
mat[::-1]
```

```
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]])
```

```
mat[::-2]
```

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

```
mat[::-3]
```

```
array([[90, 91, 92, 93, 94, 95, 96, 97, 98, 99],
       [60, 61, 62, 63, 64, 65, 66, 67, 68, 69],
       [30, 31, 32, 33, 34, 35, 36, 37, 38, 39],
       [ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9]])
```

```
mat[::-5]
```

```
array([[90, 91, 92, 93, 94, 95, 96, 97, 98, 99],
       [40, 41, 42, 43, 44, 45, 46, 47, 48, 49]])
```

```
mat
```

```
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]])
```

```
mat[2:6,2:4]
```

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

```
mat[:6]
```

```
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]])
```

```
mat[3:5]
```

```
array([[30, 31, 32, 33, 34, 35, 36, 37, 38, 39],
       [40, 41, 42, 43, 44, 45, 46, 47, 48, 49]])
```

```
mat[3,5]
```

```
np.int64(35)
```

```
mat[1:2,2:4]
```

```
array([[12, 13]])
```

```
mat[3:5,2:4,]
```

```
array([[32, 33],
       [42, 43]])
```

```
mat<50
```

```
array([[ True,  True,  True,  True,  True,  True,  True,  True,  True,
         True],
       [ True,  True,  True,  True,  True,  True,  True,  True,  True,
         True],
       [ True,  True,  True,  True,  True,  True,  True,  True,  True,
         True],
       [ True,  True,  True,  True,  True,  True,  True,  True,  True,
         True],
       [ True,  True,  True,  True,  True,  True,  True,  True,  True,
         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,
        False]])
```

```
mat>50
```

```
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],
       [False,  True,  True,  True,  True,  True,  True,  True,  True,
         True],
       [ True,  True,  True,  True,  True,  True,  True,  True,  True,
         True],
       [ True,  True,  True,  True,  True,  True,  True,  True,  True,
         True],
       [ True,  True,  True,  True,  True,  True,  True,  True,  True,
         True],
       [ True,  True,  True,  True,  True,  True,  True,  True,  True,
         True]])
```

```
mat==50
```

```
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]])
```

```
a1 = mat[mat<50]
a1
```

```
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])
```

```
a2 = mat[mat>50]
a2
```

```
array([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])
```

```
a3 = mat[mat>=50]
a3
```

```
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])
```

```
a4 = mat[mat==50]
a4
```