In [1]:
```
from numpy import*
```

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

In [9]:
```
a=array([0,1,2,3,45])
```

In [11]:
```
type(a)
```

Out[11]:
```
numpy.ndarray
```

In [337…
```
arr=np.array([0,1,2,3,4,5])
```

In [339…
```
print(arr)
```

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

In [341…
```
arr[:]
```

Out[341…
```
array([0, 1, 2, 3, 4, 5])
```

In [343…
```
arr[2]
```

Out[343…
```
2
```

In [345…
```
type(arr)
```

Out[345…
```
numpy.ndarray
```

In [347…
```
np.arange(0,4)
```

Out[347…
```
array([0, 1, 2, 3])
```

In [349…
```
np.arange(15)
```

Out[349…
```
array([ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14])
```

In [351…
```
np.arange(1,101,5)
```

Out[351…
```
array([ 1,  6, 11, 16, 21, 26, 31, 36, 41, 46, 51, 56, 61, 66, 71, 76, 81,
       86, 91, 96])
```

In [353…
```
b=np.arange(3.0)
```

In [354…
```
np.arange(20,10)#always 1st argument should be < 2nd argument
```

Out[354…
```
array([], dtype=int32)
```

In [355…
```
np.arange(10,20)
```

Out[355…
```
array([10, 11, 12, 13, 14, 15, 16, 17, 18, 19])
```

In [356…
```
np.arange(-10,20).reshape(3,10)
```

Out[356…
```
array([[-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]])
```

In [357…
```
np.arange(-10,20)
```

Out[357…
```
array([-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])
```

In [358…
```
np.arange(0,10,3)
```

Out[358…
```
array([0, 3, 6, 9])
```

In [359…
```
np.arange(1,24,5,4)
```

```
---------------------------------------------------------------------------
TypeError                                 Traceback (most recent call last)
Cell In[359], line 1
----> 1 np.arange(1,24,5,4)

TypeError: Cannot interpret '4' as a data type
```

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

In [360…
```
np.zeros(10)#it by default takes as float
```

Out[360…
```
array([0., 0., 0., 0., 0., 0., 0., 0., 0., 0.])
```

In [361…
```
np.zeros((10),dtype=int)#here the dtype is defined for type of it
```

Out[361…
```
array([0, 0, 0, 0, 0, 0, 0, 0, 0, 0])
```

In [362…
```
np.zeros((10,5),dtype=int)
```

Out[362…
```
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 [363…
```
np.zeros((10,5))
```

Out[363…
```
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 [364…
```
np.zeros(2,3)#should specify with "(())"
```

```
---------------------------------------------------------------------------
TypeError                                 Traceback (most recent call last)
Cell In[364], line 1
----> 1 np.zeros(2,3)

TypeError: Cannot interpret '3' as a data type
```

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

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

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

In [ ]:
```
print(n1)
```

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

In [365…
```
np.twos(2,3)#module 'numpy' has no attribute 'twos'
```

```
---------------------------------------------------------------------------
AttributeError                            Traceback (most recent call last)
Cell In[365], line 1
----> 1 np.twos(2,3)

File ~\anaconda3\Lib\site-packages\numpy\__init__.py:333, in __getattr__(attr)
    330     "Removed in NumPy 1.25.0"
    331     raise RuntimeError("Tester was removed in NumPy 1.25.")
--> 333 raise AttributeError("module {!r} has no attribute "
    334                        "{!r}".format(__name__, attr))

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

In [ ]:
```
np.three(3,4)#module 'numpy' has no attribute 'three'
```

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

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

In [366…
```
np.zeros((10,5),dtype=int)
```

Out[366…
```
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 [367…
```
range(15)
```

Out[367…
```
range(0, 15)
```

In [368…
```
r=range(4,15)
```

In [369…
```
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 [370…
```
print([r])
```

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

In [371…
```
r=list(r)
```

In [372…
```
type(r)
```

Out[372…
```
list
```

In [373…
```
np.random.randint(3,5,6)
```

Out[373…
```
array([4, 3, 4, 3, 3, 3])
```

In [374…
```
np.random.random_integers(3,7,5)
```

```
C:\Users\nandh\AppData\Local\Temp\ipykernel_22012\1436299205.py:1: DeprecationWarnin
g: This function is deprecated. Please call randint(3, 7 + 1) instead
  np.random.random_integers(3,7,5)
```

Out[374… array([5, 6, 6, 3, 4])

In [375…
```
np.random.randint(30,10,4)  #ValueError: low >= high
```

```
---------------------------------------------------------------------------
ValueError                                Traceback (most recent call last)
Cell In[375], line 1
----> 1 np.random.randint(30,10,4)

File numpy\\random\\mtrand.pyx:780, in numpy.random.mtrand.RandomState.randint()

File numpy\\random\\_bounded_integers.pyx:1425, in numpy.random._bounded_integers._r
and_int32()

ValueError: low >= high
```

In [ ]:
```
np.random.randint(10,40,(10,10))# generates a 10*10 matrix numbers from 10-39
```

In [376…
```
np.random.randint(10,40,(15,15))
```

Out[376…
```
array([[16, 25, 22, 34, 16, 27, 12, 17, 21, 16, 35, 38, 15, 19, 31],
       [28, 38, 35, 34, 11, 19, 11, 20, 19, 10, 38, 19, 39, 14, 36],
       [17, 24, 20, 18, 37, 19, 25, 11, 10, 19, 30, 33, 24, 35, 18],
       [18, 30, 39, 33, 17, 33, 33, 25, 25, 31, 12, 28, 37, 24, 23],
       [24, 21, 39, 13, 16, 12, 10, 36, 36, 36, 24, 24, 35, 38, 34],
       [32, 24, 23, 29, 24, 27, 34, 17, 20, 23, 31, 36, 34, 22, 32],
       [36, 23, 12, 16, 29, 12, 23, 22, 35, 31, 33, 27, 31, 26, 30],
       [10, 11, 37, 28, 20, 23, 13, 14, 12, 34, 38, 13, 34, 23, 23],
       [17, 20, 27, 25, 21, 34, 35, 39, 24, 19, 24, 24, 36, 32, 38],
       [22, 23, 25, 26, 21, 28, 25, 20, 25, 22, 29, 22, 12, 36, 14],
       [10, 31, 32, 14, 14, 17, 31, 32, 37, 14, 23, 31, 18, 22, 27],
       [35, 37, 25, 19, 27, 36, 17, 22, 14, 16, 20, 35, 31, 31, 24],
       [27, 25, 36, 39, 36, 25, 31, 35, 13, 24, 18, 22, 18, 30, 30],
       [31, 16, 12, 33, 11, 29, 24, 26, 31, 18, 35, 38, 29, 11, 11],
       [37, 10, 13, 34, 13, 24, 39, 33, 28, 29, 27, 34, 32, 13, 22]])
```

In [377…
```
np.arange(1,50).reshape(7,7)
```

Out[377…
```
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 [378…
```
np.arange(1,100).reshape(33,3)
```

Out[378…
```
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]])
```

slicing and indexing in numpy matrix or array

In [380…
```
#let b be an array
b=np.random.randint(10,20,(5,4))
```

In [381…
```
print(b)
print(type(b))
```

```
[[11 19 12 15]
 [10 11 19 15]
 [16 16 18 11]
 [15 19 13 19]
 [19 11 12 12]]
<class 'numpy.ndarray'>
```

In [382…
```
b[:]
```

Out[382…
```
array([[11, 19, 12, 15],
       [10, 11, 19, 15],
       [16, 16, 18, 11],
       [15, 19, 13, 19],
       [19, 11, 12, 12]])
```

In [383…
```
b[1:]
```

Out[383…
```
array([[10, 11, 19, 15],
       [16, 16, 18, 11],
       [15, 19, 13, 19],
       [19, 11, 12, 12]])
```

In [384…
```
b[0:3]
```

Out[384…
```
array([[11, 19, 12, 15],
       [10, 11, 19, 15],
       [16, 16, 18, 11]])
```

In [385…
```
b[1:4]
```

Out[385…
```
array([[10, 11, 19, 15],
       [16, 16, 18, 11],
       [15, 19, 13, 19]])
```

In [386…
```
b
```

Out[386…
```
array([[11, 19, 12, 15],
       [10, 11, 19, 15],
       [16, 16, 18, 11],
       [15, 19, 13, 19],
       [19, 11, 12, 12]])
```

In [387…
```
b[0,1]
```

Out[387…
```
19
```

In [388…
```
b[0,0]
```

Out[388…
```
11
```

In [389…
```
b[1,-1]
```

Out[389…
```
15
```

In [390…
```
b
```

Out[390…
```
array([[11, 19, 12, 15],
       [10, 11, 19, 15],
       [16, 16, 18, 11],
       [15, 19, 13, 19],
       [19, 11, 12, 12]])
```

In [391…
```
b[0:-2]
```

Out[391…
```
array([[11, 19, 12, 15],
       [10, 11, 19, 15],
       [16, 16, 18, 11]])
```

In [440…
```
b
```

Out[440…
```
array([[11, 19, 12, 15],
       [10, 11, 19, 15],
       [16, 16, 18, 11],
       [15, 19, 13, 19],
       [19, 11, 12, 12]])
```

In [441…
```
b[-5,-3]
```

Out[441…
```
19
```

OPERATIONS

In [443…
```
b
```

Out[443…
```
array([[11, 19, 12, 15],
       [10, 11, 19, 15],
       [16, 16, 18, 11],
       [15, 19, 13, 19],
       [19, 11, 12, 12]])
```

In [444…
```
arr
```

Out[444…
```
array([0, 1, 2, 3, 4, 5])
```

In [445…
```
arr1=np.random.randint(0,100,(10,10))
arr
```

Out[445…
```
array([0, 1, 2, 3, 4, 5])
```

In [446…
```
arr1.any()
```

Out[446…
```
True
```

In [449…
```
arr1.all()
```

Out[449…
```
False
```

In [455…
```
arr
```

Out[455…
```
array([0, 1, 2, 3, 4, 5])
```

In [466…
```
print(arr1[1:])
```

```
[[33 62 59  7 98 94 62 54 58 58]
 [24 40 73 93 16 22 61 48 97 86]
 [21 10 89 51  8 36 24 61 71  3]
 [32 65 31  0  7 67 76 10 91 60]
 [82 56 31 37 66 24 63 29 18 61]
 [65 64 41 36 39 15 79 73 19 37]
 [20 51 45 26 61 55 62 79 79 54]
 [93 20 92 80 19 13 85 32 69 35]
 [36  0 51 17 84 36 59 91 89 12]]
```

In [468…
```
arr1
```

Out[468…
```
array([[34, 18, 38, 54, 62, 43, 44, 81, 14, 57],
       [33, 62, 59,  7, 98, 94, 62, 54, 58, 58],
       [24, 40, 73, 93, 16, 22, 61, 48, 97, 86],
       [21, 10, 89, 51,  8, 36, 24, 61, 71,  3],
       [32, 65, 31,  0,  7, 67, 76, 10, 91, 60],
       [82, 56, 31, 37, 66, 24, 63, 29, 18, 61],
       [65, 64, 41, 36, 39, 15, 79, 73, 19, 37],
       [20, 51, 45, 26, 61, 55, 62, 79, 79, 54],
       [93, 20, 92, 80, 19, 13, 85, 32, 69, 35],
       [36,  0, 51, 17, 84, 36, 59, 91, 89, 12]])
```

In [470…
```
arr1[::-1]
```

Out[470…
```
array([[36,  0, 51, 17, 84, 36, 59, 91, 89, 12],
       [93, 20, 92, 80, 19, 13, 85, 32, 69, 35],
       [20, 51, 45, 26, 61, 55, 62, 79, 79, 54],
       [65, 64, 41, 36, 39, 15, 79, 73, 19, 37],
       [82, 56, 31, 37, 66, 24, 63, 29, 18, 61],
       [32, 65, 31,  0,  7, 67, 76, 10, 91, 60],
       [21, 10, 89, 51,  8, 36, 24, 61, 71,  3],
       [24, 40, 73, 93, 16, 22, 61, 48, 97, 86],
       [33, 62, 59,  7, 98, 94, 62, 54, 58, 58],
       [34, 18, 38, 54, 62, 43, 44, 81, 14, 57]])
```

In [476…
```
arr1[::-4]
```

Out[476…
```
array([[36,  0, 51, 17, 84, 36, 59, 91, 89, 12],
       [82, 56, 31, 37, 66, 24, 63, 29, 18, 61],
       [33, 62, 59,  7, 98, 94, 62, 54, 58, 58]])
```

In [480…
```
arr1[:-2]
```

Out[480…
```
array([[34, 18, 38, 54, 62, 43, 44, 81, 14, 57],
       [33, 62, 59,  7, 98, 94, 62, 54, 58, 58],
       [24, 40, 73, 93, 16, 22, 61, 48, 97, 86],
       [21, 10, 89, 51,  8, 36, 24, 61, 71,  3],
       [32, 65, 31,  0,  7, 67, 76, 10, 91, 60],
       [82, 56, 31, 37, 66, 24, 63, 29, 18, 61],
       [65, 64, 41, 36, 39, 15, 79, 73, 19, 37],
       [20, 51, 45, 26, 61, 55, 62, 79, 79, 54]])
```

In [482…
```
arr1
```

Out[482…
```
array([[34, 18, 38, 54, 62, 43, 44, 81, 14, 57],
       [33, 62, 59,  7, 98, 94, 62, 54, 58, 58],
       [24, 40, 73, 93, 16, 22, 61, 48, 97, 86],
       [21, 10, 89, 51,  8, 36, 24, 61, 71,  3],
       [32, 65, 31,  0,  7, 67, 76, 10, 91, 60],
       [82, 56, 31, 37, 66, 24, 63, 29, 18, 61],
       [65, 64, 41, 36, 39, 15, 79, 73, 19, 37],
       [20, 51, 45, 26, 61, 55, 62, 79, 79, 54],
       [93, 20, 92, 80, 19, 13, 85, 32, 69, 35],
       [36,  0, 51, 17, 84, 36, 59, 91, 89, 12]])
```

In [484…
```
arr
```

Out[484…
```
array([0, 1, 2, 3, 4, 5])
```

In [486…
```
arr.max()
```

Out[486…
```
5
```

In [488…
```
arr1.max()
```

Out[488…
```
98
```

In [490…
```
arr.min()
```

Out[490…
```
0
```

In [492…
```
arr1.min()
```

Out[492…
```
0
```

In [494…
```
arr.mean()
```

Out[494…
```
2.5
```

In [496…
```
arr1.mean()
```

Out[496…
```
48.83
```

In [498…
```
arr.median()
```

```
---------------------------------------------------------------------------
AttributeError                            Traceback (most recent call last)
Cell In[498], line 1
----> 1 arr.median()

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

In [512…
```
from numpy import*
```

In [514…
```
arr
```

Out[514…
```
array([0, 1, 2, 3, 4, 5])
```

In [516…
```
median(arr1)
```

Out[516… 51.0

In [520…
```
median(arr)
```

Out[520… 2.5

In [533…
```
#mode(arr)
```

PYTHON PROGRAM TO GENERATE OTP

In [586…
```
import random
def generate_otp(length=4):
    "generates a otp of length"
    digits='01238'
    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:1383
```

In [ ]: