

```
In [1]: import numpy as np
```

```
In [2]: np.__version__
```

```
Out[2]: '2.1.3'
```

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

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

```
In [4]: type(my_list)
```

```
Out[4]: list
```

```
In [5]: arr=np.array(my_list)
```

```
In [6]: arr
```

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

```
In [ ]:
```

```
In [7]: type(arr)
```

```
Out[7]: numpy.ndarray
```

```
In [8]: np.arange(10)
```

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

```
In [9]: np.arange(5.0)
```

```
Out[9]: array([0., 1., 2., 3., 4.])
```

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

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

```
In [11]: np.arange(0,5)
```

```
Out[11]: array([0, 1, 2, 3, 4])
```

```
In [12]: np.arange(10,20)
```

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

```
In [13]: np.arange(20,10)
```

```
Out[13]: array([], dtype=int64)
```

```
In [16]: np.arange(-16,10)
```

```
Out[16]: 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])
```

```
In [15]: np.arange(-20,10)
```

```
Out[15]: 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 [18]: ar=np.arange(-30,20)
ar
```

```
Out[18]: 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()

```
In [19]: np.arange()
```

**TypeError**

Traceback (most recent call last)

Cell In[19], line 1  
----> 1 np.arange()

**TypeError:** arange() requires stop to be specified.

```
In [20]: np.arange(10,30,5)
```

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

```
In [21]: np.arange(0,10,3)
```

```
Out[21]: array([0, 3, 6, 9])
```

```
In [22]: np.arange(10,30,5,8)
```

**TypeError**

Traceback (most recent call last)

Cell In[22], line 1  
----> 1 np.arange(10,30,5,8)

**TypeError:** Cannot interpret '8' as a data type

```
In [23]: np.zeros(10)
```

```
Out[23]: array([0., 0., 0., 0., 0., 0., 0., 0., 0., 0.])
```

```
In [24]: np.zeros(3,dtype=int)
```

Out[24]: array([0, 0, 0])

```
In [25]: np.zeros((2,2),dtype=int)
```

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

```
In [26]: zero=np.zeros([2,2])
          print(zero)
```

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

```
In [27]: print('####')
```

####

```
In [28]: print(type(zero))
```

```
<class 'numpy.ndarray'>
```

```
In [29]: np.zeros((2,10))
```

```
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.]])
```

```
In [30]: np.zeros((10,10),dtype=int)
```

```
In [31]: np.ones(3)
```

```
Out[31]: array([1., 1., 1.])
```

```
In [32]: np.ones(3, dtype=int)
```

Out[32]: array([1, 1, 1])

```
In [33]: np.ones((3,3))
```

```
Out[33]: array([[1., 1., 1.],  
                 [1., 1., 1.],  
                 [1., 1., 1.]])
```

```
In [34]: np.ones((2))
```

```
Out[34]: array([1., 1.])
```

```
In [35]: np.ones((2,3))
```

```
Out[35]: array([[1., 1., 1.],  
                 [1., 1., 1.]])
```

```
In [36]: rand(3,2)
```

```
NameError Traceback (most recent call last)  
Cell In[36], line 1  
----> 1 rand(3,2)  
  
NameError: name 'rand' is not defined
```

```
In [39]: np.random.rand(3)
```

```
Out[39]: array([0.31574201, 0.46832161, 0.26870979])
```

```
In [40]: np.random.rand(5)
```

```
Out[40]: array([0.80302142, 0.84921476, 0.47566107, 0.44426309, 0.021238 ])
```

```
In [41]: np.random.rand(3,5)
```

```
Out[41]: array([[0.46841858, 0.89893137, 0.95797464, 0.38713549, 0.66105091],  
                [0.2686061 , 0.35175017, 0.23310865, 0.90094875, 0.99681787],  
                [0.76822833, 0.23944089, 0.90670582, 0.3065056 , 0.27036721]])
```

```
In [44]: np.random.randint(4,6)
```

```
Out[44]: 4
```

```
In [45]: np.random.randint(2,20,4)
```

```
Out[45]: array([18, 8, 10, 5], dtype=int32)
```

```
In [46]: np.random.randint(3,15,4)
```

```
Out[46]: array([9, 9, 6, 5], dtype=int32)
```

```
In [47]: np.random.randint(30,20,10)
```

```
-----  
ValueError Traceback (most recent call last)  
Cell In[47], line 1  
----> 1 np.random.randint(30,20,10)  
  
File numpy\\random\\mtrand.pyx:796, in numpy.random.mtrand.RandomState.randint()  
  
File numpy\\random\\_bounded_integers.pyx:1425, in numpy.random._bounded_integers._rand_int32()  
  
ValueError: low >= high
```

```
In [48]: np.random.randint(-30,-20,5)
```

```
Out[48]: array([-21, -22, -30, -27, -26], dtype=int32)
```

```
In [49]: np.random.randint(2,20,4)  
np.random.randint(2,20,7,4)
```

```
-----  
TypeError                                                 Traceback (most recent call last)  
Cell In[49], line 1  
----> 1 np.random.randint(2,20,7,4)  
  
File numpy\random\mtrand.pyx:777, in numpy.random.mtrand.RandomState.randint()  
  
TypeError: Cannot interpret '4' as a data type
```

```
In [51]: np.random.randint(10,40,(10,10))
```

```
Out[51]: array([[18, 37, 28, 34, 36, 29, 16, 24, 20, 37],  
                 [35, 34, 35, 20, 35, 21, 18, 12, 18, 21],  
                 [37, 22, 23, 19, 27, 29, 25, 35, 19, 33],  
                 [29, 12, 16, 29, 19, 13, 15, 19, 27, 21],  
                 [28, 31, 27, 12, 18, 16, 29, 16, 15, 17],  
                 [31, 31, 23, 20, 27, 21, 34, 27, 35, 19],  
                 [24, 37, 17, 12, 26, 10, 15, 11, 15, 11],  
                 [37, 27, 22, 32, 19, 26, 25, 17, 21, 18],  
                 [13, 12, 34, 19, 20, 29, 15, 29, 37, 17],  
                 [22, 24, 13, 16, 14, 21, 25, 14, 13, 36]], dtype=int32)
```

```
In [52]: arr
```

```
Out[52]: array([0, 1, 2, 3, 4, 5])
```

```
In [53]: np.arange(1,13)
```

```
Out[53]: array([ 1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12])
```

```
In [54]: np.arange(1,13).reshape(3,4)
```

```
Out[54]: array([[ 1,  2,  3,  4],  
                 [ 5,  6,  7,  8],  
                 [ 9, 10, 11, 12]])
```

```
In [55]: np.arange(1,13).reshape(3,5)
```

```
-----  
ValueError                                                 Traceback (most recent call last)  
Cell In[55], line 1  
----> 1 np.arange(1,13).reshape(3,5)  
  
ValueError: cannot reshape array of size 12 into shape (3,5)
```

```
In [56]: np.arange(1,13).reshape(1,16)
```

```
-----  
ValueError                                Traceback (most recent call last)  
Cell In[56], line 1  
----> 1 np.arange(1,13).reshape(1,16)  
  
ValueError: cannot reshape array of size 12 into shape (1,16)
```

```
In [59]: np.arange(1,21).reshape(5,4)
```

```
Out[59]: array([[ 1,  2,  3,  4],  
                 [ 5,  6,  7,  8],  
                 [ 9, 10, 11, 12],  
                 [13, 14, 15, 16],  
                 [17, 18, 19, 20]])
```

```
In [60]: np.arange(1,13).reshape(6,2)
```

```
Out[60]: array([[ 1,  2],  
                 [ 3,  4],  
                 [ 5,  6],  
                 [ 7,  8],  
                 [ 9, 10],  
                 [11, 12]])
```

## slicing in matrix

```
In [63]: b=np.random.randint(10,20,(5,4))  
b
```

```
Out[63]: array([[13, 14, 17, 10],  
                 [17, 12, 19, 14],  
                 [12, 18, 17, 11],  
                 [10, 12, 16, 17],  
                 [16, 14, 14, 14]], dtype=int32)
```

```
In [64]: type(b)
```

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

```
In [65]: b
```

```
Out[65]: array([[13, 14, 17, 10],  
                 [17, 12, 19, 14],  
                 [12, 18, 17, 11],  
                 [10, 12, 16, 17],  
                 [16, 14, 14, 14]], dtype=int32)
```

```
In [66]: b[:]
```

```
Out[66]: array([[13, 14, 17, 10],  
                 [17, 12, 19, 14],  
                 [12, 18, 17, 11],  
                 [10, 12, 16, 17],  
                 [16, 14, 14, 14]], dtype=int32)
```

```
In [67]: b[1]
```

```
Out[67]: array([17, 12, 19, 14], dtype=int32)
```

```
In [68]: b[4]
```

```
Out[68]: array([16, 14, 14, 14], dtype=int32)
```

```
In [69]: b[0]
```

```
Out[69]: array([13, 14, 17, 10], dtype=int32)
```

```
In [70]: b[-5]
```

```
Out[70]: array([13, 14, 17, 10], dtype=int32)
```

```
In [71]: b[0:3]
```

```
Out[71]: array([[13, 14, 17, 10],  
                 [17, 12, 19, 14],  
                 [12, 18, 17, 11]], dtype=int32)
```

```
In [72]: b[0:5]
```

```
Out[72]: array([[13, 14, 17, 10],  
                 [17, 12, 19, 14],  
                 [12, 18, 17, 11],  
                 [10, 12, 16, 17],  
                 [16, 14, 14, 14]], dtype=int32)
```

```
In [1]: import numpy as np
```

```
In [6]: a=np.array([[1,2,3,4],[5,6,7,8],[10,11,12,13]])  
a
```

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

```
In [7]: print(a[0])
```

```
[1 2 3 4]
```

```
In [8]: np.zeros(a)
```

```
-----  
TypeError                                 Traceback (most recent call last)  
Cell In[8], line 1  
----> 1 np.zeros(a)
```

```
TypeError: only integer scalar arrays can be converted to a scalar index
```

```
In [9]: np.zeros(2)
```

```
Out[9]: array([0., 0.])
```

```
In [11]: np.zeros(8)
```

```
Out[11]: array([0., 0., 0., 0., 0., 0., 0., 0.])
```

```
In [12]: np.ones(6)
```

```
Out[12]: array([1., 1., 1., 1., 1., 1.])
```

```
In [13]: np.empty(2)
```

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

```
In [14]: np.empty(6)
```

```
Out[14]: array([1., 1., 1., 1., 1., 1.])
```

```
In [19]: a=np.arange(6)
```

```
In [20]: print(a)
```

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

```
In [21]: b=np.arange(0,10,2)
```

```
In [22]: print(b)
```

```
[0 2 4 6 8]
```

```
In [23]: a=np.linspace(0,10,num=5)
```

```
In [24]: a
```

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

```
In [ ]: arr=np.sort
```

```
In [ ]:
```

```
In [ ]:
```

```
In [ ]:
```

