```
print("Welcome to Numpy-4")
```

```
Welcome to Numpy-4
```

```
import numpy as np
```

```
#vectorise

np.vectorise
```

```
a=np.arange(1,11)
import math
func=np.vectorize(math.log)
print(a)
func(a)
```

```
[ 1  2  3  4  5  6  7  8  9 10]
array([0.        , 0.69314718, 1.09861229, 1.38629436, 1.60943791,
       1.79175947, 1.94591015, 2.07944154, 2.19722458, 2.30258509])
```

```
def complicated(s):
    return 2**s

func1=np.vectorize(complicated)
func1(a)
```

```
array([   2,    4,    8,   16,   32,   64,  128,  256,  512, 1024])
```

```
np.power
```

```
a=np.arange(4)
a
```

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

```
b=a.reshape((2,2))
b
```

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

```
a[0]=100
```

```
a
```

```
array([100,   1,   2,   3])
```

```
b
```

```
array([[100,   1],
       [  2,   3]])
```

```
b.shape
```

```
(2, 2)
```

```
b[0,1]=22
b
```

```
array([[100,  22],
       [  2,   3]])
```

```
a
```

```
array([100,  22,   2,   3])
```

```
c=a+1
c
```

```
array([101,  23,   3,   4])
```

```
c[2]=99
```

```
c
```

```
array([101,  23,  99,   4])
```

```
a
```

```
array([100,  22,   2,   3])
```

```
a=np.arange(4)
a
```

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

```
d=a*1
d
```

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

```
d[0]=100
```

```
d
```

```
array([100,   1,   2,   3])
```

```
a
```

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

```
array([[100,  22],
       [  2,   3]])
```

```
a=np.arange(4)
a
```

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

```
b=a+0
b
```

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

```
b[1]=100
```

```
b
```

```
array([  0, 100,   2,   3])
```

```
a
```

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

```
np.shares_memory(a,b)
```

```
False
```

```
a=np.arange(4)
b=a.reshape((2,2))
print(a)
print(b)
```

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

```
a[0]=100
a
```

```
array([100,   1,   2,   3])
```

```
b
```

```
array([[100,   1],
       [  2,   3]])
```

```
np.shares_memory(a,b)
```

```
True
```

```
b[1,0]=89
```

```
b
```

```
array([[100,   1],
       [ 89,   3]])
```

```
a
```

```
array([100,   1,  89,   3])
```

```
a is b
```

```
False
```

```
a=np.arange(1,13).reshape((3,4))
```

```
b=a.reshape((6,2))
print(a)
print(b)
```

```
[[ 1  2  3  4]
 [ 5  6  7  8]
 [ 9 10 11 12]]
[[ 1  2]
 [ 3  4]
 [ 5  6]
 [ 7  8]
 [ 9 10]
 [11 12]]
```

```
np.shares_memory(a,b)
```

```
True
```

```
print(a.shape)
```

```
(3, 4)
```

```
print(b.shape)
```

```
(6, 2)
```

```
print(a.ndim)
print(b.ndim)
```

```
2
2
```

```
b[1,1]=99
b
```

```
array([[ 1,  2],
       [ 3, 99],
       [ 5,  6],
       [ 7,  8],
       [ 9, 10],
       [11, 12]])
```

```
a
```

```
array([[ 1,  2,  3, 99],
       [ 5,  6,  7,  8],
       [ 9, 10, 11, 12]])
```

```
c=b*2
c
```

```
array([[  2,   4],
```

```
            [  6, 198],
            [ 10,  12],
            [ 14,  16],
            [ 18,  20],
            [ 22,  24]])
```

```
print(b)
```

```
     [[ 1  2]
      [ 3 99]
      [ 5  6]
      [ 7  8]
      [ 9 10]
      [11 12]]
```

```
a
```

```
     array([[ 1,  2,  3, 99],
            [ 5,  6,  7,  8],
            [ 9, 10, 11, 12]])
```

```
np.shares_memory(b,c)
```

```
     False
```

```
a=np.arange(1,13)
a
```

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

```
b=a
```

```
b
```

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

```
c=a.copy()
```

```
c
```

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

```
c[0]=100000
```

```
c
```

```
     array([100000,      1,      2,      3,      4,      5,      6,      7,
```

```
                  8,      9])
```

```
a
```

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

```
np.shares_memory(a,c)
```

```
     False
```

```
id(a)
```

```
     140687436489424
```

```
id(b)
```

```
     140687436489424
```

```
b=b.reshape(((3,4)))
```

```
b
```

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

```
a
```

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

```
id(a)
```

```
     140687436489424
```

```
id(b)
```

```
140687436491536
```

```
b.shape
```

```
(3, 4)
```

```
a[0]=100
```

```
a
```

```
array([100,   2,   3,   4,   5,   6,   7,   8,   9,  10,  11,  12])
```

```
b
```

```
array([[100,   2,   3,   4],
       [  5,   6,   7,   8],
       [  9,  10,  11,  12]])
```

```
d=a.view()
```

```
d
```

```
array([100,   2,   3,   4,   5,   6,   7,   8,   9,  10,  11,  12])
```

```
a=np.arange(1,13).reshape((3,4))
b=a.T
print(a)
print(a.shape)
print(b)
print(b.shape)
```

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

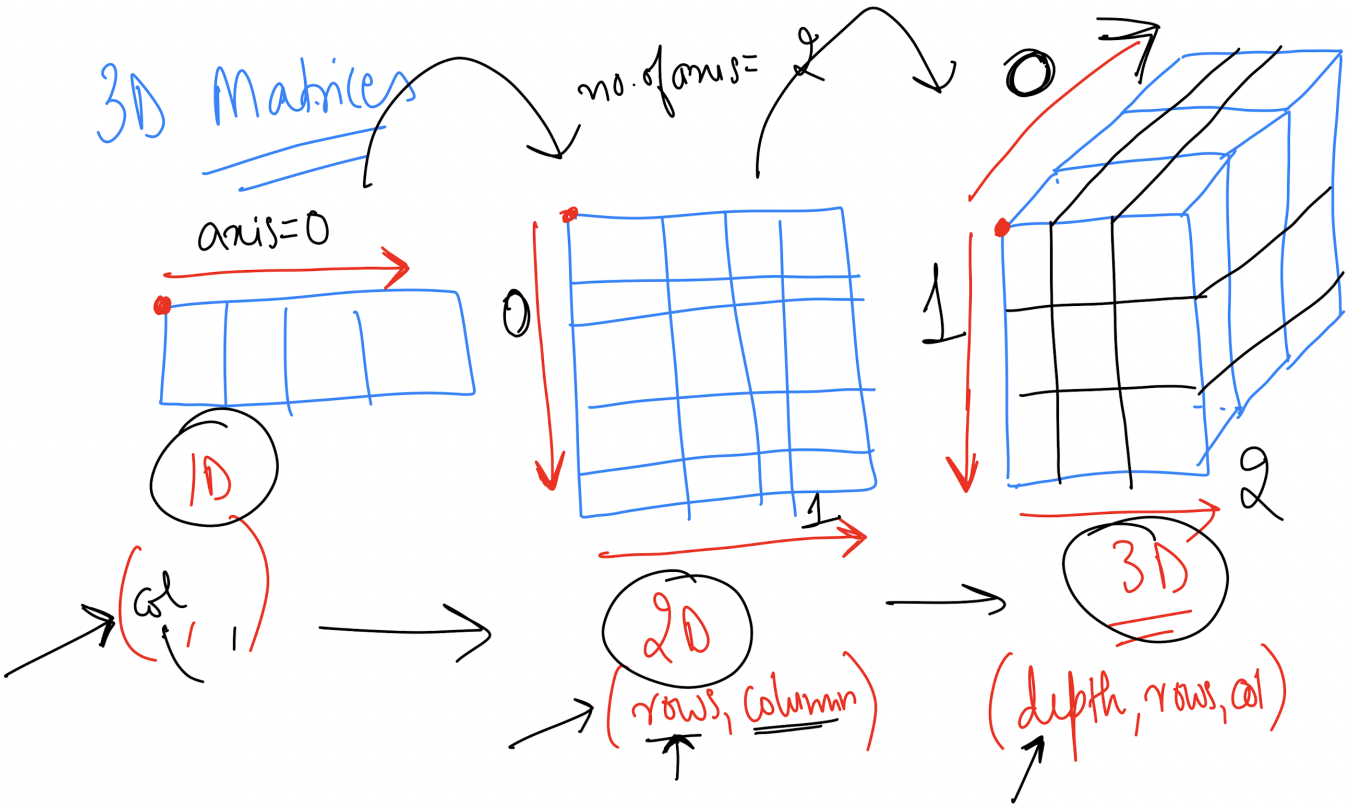
```
a.flatten()
```

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

```
b.flatten()
```

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

```
#3d arrays
```




```
a=np.arange(1,25).reshape(2,3,4)
a
```

```
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]]])
```

```
np.sum(a,axis=0)
```

```
array([[14, 16, 18, 20],
       [22, 24, 26, 28],
       [30, 32, 34, 36]])
```

```
np.sum(a,axis=1)
```

```
array([[15, 18, 21, 24],
       [51, 54, 57, 60]])
```

```
np.sum(a,axis=2)
```

```
array([[10, 26, 42],
       [58, 74, 90]])
```

```
a[0,:,:]
```

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

```
a[0]
```

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

```
a[:,:,0]
```

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

```
a[:,:,::2]
```

```
array([[[ 1,  3],
        [ 5,  7],
        [ 9, 11]],

       [[13, 15],
        [17, 19],
        [21, 23]]])
```

```
#Splitting
```

```
d=np.arange(1,13)
d
```

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

```
np.split(d,3)
```

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

```
np.split(d,2)
```

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

```
np.split(d,4)
```

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

```
np.split(d,6)
```

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

```
np.split(d,12)
```

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

```
d
```

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

```
np.split(d,[3,5,7])
```

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

```
np.split(d,[3,5,7,14,18])
```

```
[array([1, 2, 3]),
 array([4, 5]),
 array([6, 7]),
 array([ 8,  9, 10, 11, 12]),
 array([], dtype=int64),
 array([], dtype=int64)]
```

```
np.split?
```

```
np.split(d,[3,5,7,11,14,18])
```

```
[array([1, 2, 3]),
 array([4, 5]),
 array([6, 7]),
 array([ 8,  9, 10, 11]),
 array([12]),
 array([], dtype=int64),
 array([], dtype=int64)]
```

```
np.split(d,[3,3,5])
```

```
[array([1, 2, 3]),
 array([], dtype=int64),
 array([4, 5]),
 array([ 6,  7,  8,  9, 10, 11, 12])]
```

```
d=np.arange(1,13).reshape((3,4))
d
```

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

```
np.split(d,2,axis=1)
```

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

```
np.split(d,4,axis=1)
```

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

```
d
```

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

```
            [ 5,  6,  7,  8],
            [ 9, 10, 11, 12]])
```

```
# np.split(d,3,axis=1)
```

```
np.split(d,[1,2],axis=1)
```

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

```
d
```

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

```
np.split(d,3,axis=0)
```

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

```
np.split(d,[1],axis=0)
```

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

```
d=np.arange(1,13).reshape((3,4))
d
```

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

```
d[::-1,:]
```

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

```
arr1=np.array(['Ram','Astha','Brahat'])
arr2=np.array(['Shyam','Kalyan','Naveen'])
arr1>arr2
```

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

```
d
```

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

```
d[::-1,:]
```

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