```
In [*]: a = [2,3,4,5,7,]
        type(a)
```

```
In [*]: b = [1,2,4,5,True,(1,2),"Mahi",{2,3}]
        type(b)
```

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

```
In [*]: #np -> standard
        #natplotlib.pyplot  as plt mt
        import numpy as np
        np.__version__
```

```
In [*]: arr0 = np.array(5)
```

```
In [*]: print(arr0)
```

```
In [*]: type(arr0)
```

```
In [*]: #ndim -> no of dimension
        arr0.ndim
```

```
In [*]: arr1 = np.array([5,5,2,3,4.5])
        print(arr1)
```

```
In [*]: type(arr1)
```

```
In [*]: arr1.ndim
```

```
In [*]: a1 = np.array([3,6,4,1,""])
        print(a1)
        type(a1)
        print(type(a1))
        print(a1.ndim)
```

```
In [*]: a3 = np.array([7,9,5,8,4,3,5])
        print(a3)
```

```
In [*]: arr2 = np.array([
            [5,6,4],
            [2,4,7]
        ])
        arr2.ndim
```

```
In [*]: arr3 = np.array(
        [
            [9,8]
        ])
        arr3.ndim
```

```
In [*]: arr4 = np.array(
            [
                [
                    [6,4,5],[4,5,2],[5,5,2],
                ]
            ]
        )
        arr4.ndim
```

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


        a = np.array(7)
        print(a)
        print(type(a))
        print(a.ndim)
```

```
In [*]: b = np.array([5,4,6,8])
        print(b)
        print(type(b))
        print(b.ndim)
```

```
In [*]: my_list = []
        c = np.array(my_list)
        print(type(my_list))
        print(type(c))
```

```
In [*]: for i in range(1,5):
            x = int(input('elements:'))
            my_list.append(x)
        d = np.array(my_list)
        print(d)
```

```
In [*]: type(d)
```

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

```
In [*]: e = np.zeros(4)
        print(e)
```

```
In [*]: f = np.ones(5)
        print(f)
```

```
In [*]: g = np.arange(10)
        print(g)
```

```
In [*]: #np.arange(start,stop,steps,dtype)
        h = np.arrange(5,10)
        h
```

```
In [*]: #steps
        i = np.arange(0,10,2)
        i
```

```
In [*]: j = np.arange(0,30,3)
        j
```

```
In [*]: #spacial
        #linespace
        j = np.linspace(0,10, num= 5)
        j
```

```
In [*]: #variance -> IQR (25%),(50%),(75%),(100%)
```

```
In [*]: k = np.random.rand(4) #(0-4)
        k
```

```
In [*]: #(-1 -> +1)
        l = np.random.randn(7)
        l
```

```
In [*]: m = np.random.ranf(6)
        m
```

```
In [*]: #(start,stop,count)# 6 start , 20 stop , 7 count
        n = np.random.randint(6,20,7)
        n
```

```
In [*]: o = np.linspace(100,1000,num=5)
        o
```

```
In [*]: print(o.dtype)
```

```
In [*]: print(d.dtype)
```

```
In [*]: p = np.array(['Manisha','Seema','Mahi','Saini'])
        p.dtype
```

```
In [*]: q = np.array(['K'])
        q.dtype
```

```
In [*]: r = np.array([True])
        r.dtype
```

```
In [*]: s = np.array([1])
        s.dtype
```

```
In [*]: t = np.array([0+1j])
        t.dtype
```

```
In [*]: u = np.array(['a','s','w','x',5,4,2,3,True])#is case me U11 hi mile ga.
        u.dtype
```

```
In [*]: v = np.array([2,5,7,8], dtype = np.int_)
        print(v)
        print(v.dtype)
```

```
In [*]: w = np.array([4,5,6,7], dtype = np.float_)
        print(w)
        print(w.dtype)
```

```
In [*]: x = np.array([5,6,3,4])
        print(x)
        print(x.dtype)
```

```
In [*]: z = np.longfloat(y)
        print(z)
        print(z.dtype)
```

```
In [*]: #list & Arrays -> Datatype
        a = []
        type(a)
```

```
In [*]: b = [i**2 for i in range(1,10)]
        b
```

```
In [*]: %timeit [ i**2 for i in  range(1,15)]
```

```python
import numpy as np
%timeit np.arange(1,15)**2
```

```python
%timeit [x**3 for x in range(1,20)]
```

```python
import numpy as np
```

```python
%timeit np.arange(1,20)**3
```

```python
np.arange(1,15)**2
```

```python
a = np.array([
    [6,7],[4,5],[6,9]
])
a.ndim
```

```python
b = np.array([[[]]])
b.ndim
```

```python
c =[[5,6,7,8,'Mahi']]
c
```

```python
d = [[[[5,6,8],['a','m','k']]]]
```

```python
d[0][0][1][0]
```

```python
e = np.array([[[8,6,4]]])
e.ndim
```

```python
f = np.array([[[[[[[[[[4,6,8]]]]]]]]]])
f.ndim
```

```python
g = np.arange(3,3)
g
g.ndim
```

```python
h = np.zeros((3,4))
h
```

```python
i = np.ones((3,3))
i
```

```python
j = np.eye(3)
j
```

```
In [*]: k = np.eye(4,6)
        k
```

```
In [*]: k = np.eye(4,6)
        print(k)
        k.ndim
```

```
In [*]: l = np.random.rand(3,4)
        l
```

m = np.random.randint((2,10),(4,5)) m

```
In [*]: m = np.random.randint((2,4,6,8,3))
        m
```

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```
In [*]: #shape #4 element 2 rows
        import numpy
        a = numpy.array([[2,3,5,6],[3,5,8,7]])
        a.shape
```

```
In [*]: b = numpy.array([[[[4,5,2,7,8]]]])
        b.shape
```

```
In [*]: c = numpy.array([[3,5,6],[5,7,9],[3,5,8],[3,5,8]])
        c.shape
```

```
In [*]: c = numpy.array([[3,5,6],[5,7,9],[3,5,8]])
        c.shape
```

```
In [*]: d = numpy.array([[3,4,6,7],[7,8,9,8]])
        d.shape
        d.ndim
```

```
In [*]: e = numpy.array([
            [
                [3,4,5],
                [3,5,7],
                [2,8,9],
                [9,6,4],
            ]
        ])
        e.shape
```

```
In [*]: e.ndim
```

```python
In [*]: f = numpy.array([3,4,6,5,8])
        f[1]
        # 0 1 2 3 4
        # -4 -3 -2 -1
```

```python
In [*]: f[-2]
```

```python
In [*]: g = numpy.array([
            [7,5,4],
            [4,5,7]
        ])
        g[1,2]
```

```python
In [*]: g[-1,-2]
```

```python
In [*]: h = numpy.array([[[5,6,3,7],[2,5,1,8]]])
        #h.ndim
        h[0]
```

```python
In [*]: h[0]
```

```python
In [*]: #matrix addition
        a = numpy.array([4,3,5,6])
        b = numpy.array([3,2,5,6])
        a+b
```

```python
In [*]: #matrix subtraction
        a = numpy.array([4,3,5,6])
        b = numpy.array([3,2,5,6])
        a-b
```

```python
In [*]: #matrix multiplication
        a = numpy.array([4,3,5,6])
        b = numpy.array([3,2,5,6])
        a*b
```

```python
In [*]: #matrix divison
        a = numpy.array([4,3,5,6])
        b = numpy.array([3,2,5,6])
        a/b
```

```python
In [*]: #matrix addition
        a = numpy.array([[4,3,5,6],[2,3,4,6]])
        b = numpy.array([[3,2,5,6],[2,1,3,4]])
        a+b
```

```python
In [*]: a-b
```

```
In [*]: a*b
```

```
In [*]: z = numpy.array([1,2,4,5])
        numpy.reciprocal(z)
```

```
In [*]: 1/z
```

```
In [*]: numpy.max(z)
```

```
In [*]: numpy.min(z)
```

```
In [*]: numpy.sqrt(z)
```

```
In [*]: numpy.sin(z)
```

```
In [*]: print(numpy.max(z)) # 5 maximum  3 index position
        print(numpy.argmax(z))
```

```
In [*]: print(numpy.min(z))
        print(numpy.argmin(z))
```

```
In [*]: print(z) #cumsum is the sum of numbers.
        print()
        print(numpy.cumsum(z))
```

```
In [*]: import numpy
        b = numpy.array([23,13,45,67])
        b.nbytes
```

```
In [*]: c = numpy.array([[2,3],[4,5]])
        c.nbytes
```

```
In [*]: b = numpy.array([2,4,6,8])
        b.ndim
```

```
In [*]: d = b.reshape(2,2)
        d
```

```
In [*]: e = numpy.array([1,2,3,4,5,6,7,8,9,1,2,3])
        f = e.reshape(4,2,2)
        f
```

```
In [*]: g = numpy.array([3,4,5,7,8,9])
```

```
In [*]: h = g.reshape(2,3)
        h
```

```
In [*]: h.ndim
```

```
In [*]: g.reshape(1,2,3)
```

```
In [*]: h = g.reshape(2,1,3)
        h
```

```
In [*]: h.ndim
```

```
In [*]: h[1]
```

```
In [*]: h[1,0]
```

```
In [*]: #Broadcasting
```

```
In [*]: a = numpy.array([2,3,5,6,7])
        b = numpy.array([5])
        a+b
```

```
In [*]: a = numpy.array([[2,3],[4,5]])
        a.shape
```