```
In [2]:    1  pip install numpy
```

```
Requirement already satisfied: numpy in c:\programdata\anaconda3\lib\site-packages (1.16.4)
Note: you may need to restart the kernel to use updated packages.
```

```
In [10]:   1  import numpy as np
```

```
In [7]:    1  D1  = np.array([1,2,3])
           2  D1
```

Out[7]: array([1, 2, 3])

```
In [11]:   1  print(np.ndim(D1))
           2  1
```

1

Out[11]: 1

```
In [12]:   1  D2 = np.array([[1,2],[3,4]])
           2  D2
```

Out[12]: array([[1, 2],
                [3, 4]])

```
In [13]:   1  D3 = np.array([[[19,65,43],[7,8,9],[11,12,13]]])
           2  D3
```

Out[13]: array([[[19, 65, 43],
                 [7, 8, 9],
                 [11, 12, 13]]])

```
In [15]:   1  print(np.ndim(D3))
           2  3
```

3

Out[15]: 3

```
In [16]:   1  D4 = np.array([[[[1,2,3,4],[4,5,6,7],[6,7,8,9],[4,8,9,5]]]])
           2  D4
```

Out[16]: array([[[[1, 2, 3, 4],
                  [4, 5, 6, 7],
                  [6, 7, 8, 9],
                  [4, 8, 9, 5]]]])

```
In [17]:   1  print(np.ndim(D4))
```

4

```
In [18]:   1  D5 = np.array([[[[[1,2,3,4,15],[2,23,44,5,16],[32,14,51,6,7],[1,2,3,7,8],[11,12,13,14,15]]]]])
           2  D5
```

Out[18]: array([[[[[1, 2, 3, 4, 15],
                   [2, 23, 44, 5, 16],
                   [32, 14, 51, 6, 7],
                   [1, 2, 3, 7, 8],
                   [11, 12, 13, 14, 15]]]]])

In [19]:
```
1  print(np.ndim(D5))
```

5

In [21]:
```
1  import numpy as np
2  from  numpy import linalg as la
```

In [22]:
```
1  #det1 = la.det(D1) #  gives is a error
2  det2 = la.det(D2)
3  det2
```

Out[22]: -2.0000000000000004

In [23]:
```
1  det3 = la.det(D3)
2  det3
3
```

Out[23]: array([272.])

In [25]:
```
1  det4 = la.det(D4)
2  det4
```

Out[25]: array([[9.36750677e-15]])

In [26]:
```
1  det5 = la.det(D5)
2  det5
```

Out[26]: array([[[-724350.]]])

In [27]:
```
1  print(D1.T)
```

[1 2 3]

In [28]:
```
1  print(D2.T)
```

[[1 3]
 [2 4]]

In [29]:
```
1  print(D3.T)
```

[[[19]
  [7]
  [11]]

 [[65]
  [8]
  [12]]

 [[43]
  [9]
  [13]]]

In [30]:
```
print(D4.T)
```

```
[[[[1]]

  [[4]]

  [[6]]

  [[4]]]


 [[[2]]

  [[5]]

  [[7]]

  [[8]]]


 [[[3]]

  [[6]]

  [[8]]

  [[9]]]


 [[[4]]

  [[7]]

  [[9]]

  [[5]]]]]
```

```
In [31]:    1  print(D5.T)
```

```
[[[[ 1]]]]

[[[ 2]]]

[[[32]]]

[[[ 1]]]

[[[11]]]]


[[[[ 2]]]

[[[23]]]

[[[14]]]

[[[ 2]]]

[[[12]]]]


[[[[ 3]]]

[[[44]]]

[[[51]]]

[[[ 3]]]

[[[13]]]]


[[[[ 4]]]

[[[ 5]]]

[[[ 6]]]

[[[ 7]]]

[[[14]]]]
```

```
      [[[[15]]]


       [[[16]]]


       [[[ 7]]]


       [[[ 8]]]


       [[[15]]]]]
```

In [32]:   1 # print(la.inv(D1))
            2 print(la.inv(D2))

```
      [[-2.   1. ]
       [ 1.5 -0.5]]
```

In [33]:   1 print(la.inv(D3))

```
      [[[-0.01470588 -1.20955882  0.88602941]
        [ 0.02941176 -0.83088235  0.47794118]
        [-0.01470588  1.79044118 -1.11397059]]]
```

In [34]:   1 print(la.inv(D4))

```
      [[[[ 1.06751991e+15 -2.66879978e+15  1.60127987e+15 -1.11111111e-01]
         [-2.77555177e+15  6.93887943e+15 -4.16332766e+15  8.88888889e-02]
         [ 2.34854381e+15 -5.87135951e+15  3.52281571e+15  1.55555556e-01]
         [-6.40511947e+14  1.60127987e+15 -9.60767921e+14 -1.33333333e-01]]]]
```

In [35]:   1 print(la.inv(D5))

```
      [[[[[ 3.48339891e-02 -3.06205564e-02  1.81818182e-02 -1.15441430e-01
           5.09118520e-02]
          [-9.15165321e-03  2.17574377e-02 -3.63636364e-02 -2.25457307e-01
           1.23157313e-01]
          [-2.03672258e-02  1.41782288e-02  1.81818182e-02  1.13867605e-01
           -6.39704563e-02]
          [-1.05315110e-01 -5.31511010e-03 -4.51807308e-19  2.27031131e-01
           -1.00987092e-02]
          [ 9.77220957e-02 -2.27790433e-03  4.19232880e-19 -4.55580866e-02
           -4.32801822e-03]]]]]
```

In [36]:
```python
#print (np.trace(D1))
print(np.trace(D2))
print(np.trace(D3))
print(np.trace(D4))
print(np.trace(D5))
```

```
5
[19 65 43]
[[1 2 3 4]
 [4 5 6 7]
 [6 7 8 9]
 [4 8 9 5]]
[[[ 1  2  3  4 15]
  [ 2 23 44  5 16]
  [32 14 51  6  7]
  [ 1  2  3  7  8]
  [11 12 13 14 15]]]
```

In [37]:
```python
print(la.matrix_rank(D1))
print(la.matrix_rank(D2))
print(la.matrix_rank(D3))
print(la.matrix_rank(D4))
print(la.matrix_rank(D5))
```

```
1
2
[3]
[[3]]
[[[5]]]
```

In [40]:
```python
print(np.diag(D1))
print(np.diag(D2))
 #print(np.diag(D3))
#print(np.diag(D4))
#print(np.diag(D5)) it gives error for D3 and  more dimensions
```

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

In [42]:
```python
#print(la.eigvals (D1)) #error
print(la.eigvals (D2))
print(la.eigvals (D3))
print(la.eigvals (D4))
 print(la.eigvals (D5))
```

```
[-0.37228132  5.37228132]
[[ 50.63285827 -10.1010308   -0.53182747]]
[[[ 2.33876857e+01 -2.63558006e+00 -1.75210566e+00 -4.88361356e-16]]]
[[[[ 74.94297768+0.j         14.26053623+7.67083299j
    14.26053623-7.67083299j -10.11009509+0.j
     3.64604495+0.j        ]]]]
```

In [43]:
```python
#x,y = la.eig(D1)
#print("values:",x)
#print("vectors :",y)
```

In [47]:
```
1
```

Eigen values: [-0.37228132 5.37228132]
Eigen vectors: [[-0.82456484 -0.41597356]
 [0.56576746 -0.90937671]]

In [53]:
```
1  x,y  = la.eig(D3)
2  print("Eigen values:",x)
3  print("Eigen vectors:",y)
```

Eigen values: [[50.63285827 -10.1010308   -0.53182747]]
Eigen vectors: [[[-0.9146971 -0.92111118 -0.57007616]
 [-0.22154136 0.18623201 -0.32723971]
 [-0.33800686 0.34186522 0.75360954]]]

In [52]:
```
1  x,y  = la.eig(D4)
2  print("Eigen values:",x)
3  print("Eigen vectors:",y)
```

Eigen values: [[[2.33876857e+01 -2.63558006e+00 -1.75210566e+00 -4.88361356e-16]]]
Eigen vectors: [[[[0.22854499 -0.56583976 -0.78880879 0.27777778]
 [0.4726279 -0.3007259 -0.23060725 -0.72222222]
 [0.63534983 -0.12398332 0.1415271   0.61111111]
 [0.56632204 0.75763938 0.55187958 -0.16666667]]]]

In [56]:
```
1  x,y  = la.eig(D5)
2  print("Eigen values:",x)
3  print("Eigen vectors:",y)
```

Eigen values: [[[[74.94297768+0.j   14.26053623+7.67083299j
    14.26053623-7.67083299j -10.11009509+0.j
     3.64604495+0.j   ]]]]
Eigen vectors: [[[[0.11394133+0.j   -0.26240853-0.24524872j
  -0.26240853+0.24524872j -0.49353443+0.j
    0.22592903+0.j   ]
 [0.66776149+0.j   0.75539088+0.j
   0.75539088-0.j   -0.64553819+0.j
   0.67033752+0.j   ]
 [0.65762217+0.j   -0.06460707+0.29425416j
  -0.06460707-0.29425416j 0.37377786+0.j
  -0.29855655+0.j   ]
 [0.08777968+0.j   -0.16970224-0.14259799j
  -0.16970224+0.14259799j -0.15701881+0.j
  -0.61643561+0.j   ]
 [0.31771021+0.j   -0.14910449-0.37182614j
  -0.14910449+0.37182614j 0.4187355 +0.j
   0.17457036+0.j   ]]]]]

In [54]:
```
1  import pandas  as pd
2
```

In [55]:
```
1  df = {'Name':pd.Series(['Rahul','nandhu', 'sai','Harshini','rushmika','satya','asha','anjali']),
2        'Age':pd.Series([10,16,15,18,23,25,30,35]),
3        'Weight':pd.Series([10,35,35,38,40,50,55,60])
4       }
```

In [58]:
```python
1  df = pd.DataFrame(df)
2  df
```

Out[58]:

	Name	Age	Weight
0	Rahul	10	10
1	nandhu	16	35
2	sai	15	35
3	Harshini	18	38
4	rushmika	23	40
5	satya	25	50
6	asha	30	55
7	anjali	35	60

In [59]:
```python
1  print(df.sum())
```

```
Name      RahulnandhusaiHarshinirushmikasatyaashaanjali
Age                                                  172
Weight                                               323
dtype: object
```

In [60]:
```python
1  print(df.cumsum())
```

```
                                          Name  Age  Weight
0                                        Rahul   10      10
1                                   Rahulnandhu   26      45
2                                Rahulnandhusai   41      80
3                        RahulnandhusaiHarshini   59     118
4                RahulnandhusaiHarshinirushmika   82     158
5           RahulnandhusaiHarshinirushmikasatya  107     208
6       RahulnandhusaiHarshinirushmikasatyaasha  137     263
7  RahulnandhusaiHarshinirushmikasatyaashaanjali  172     323
```

In [61]:
```python
1  df1 ={
2         'Age':pd.Series([10,16,15,18,23,25,30,35]),
3         'Weight':pd.Series([10,35,35,38,40,50,55,60])
4       }
5  df1 = pd.DataFrame(df1)
6  df1
```

Out[61]:

	Age	Weight
0	10	10
1	16	35
2	15	35
3	18	38
4	23	40
5	25	50
6	30	55
7	35	60

In [62]:
```python
print(df1.mean())
```

```
Age       21.500
Weight    40.375
dtype: float64
```

In [63]:
```python
print(df1.median())
```

```
Age       20.5
Weight    39.0
dtype: float64
```

In [64]:
```python
print(df1.mode())
```

```
   Age  Weight
0   10    35.0
1   15     NaN
2   16     NaN
3   18     NaN
4   23     NaN
5   25     NaN
6   30     NaN
7   35     NaN
```

In [65]:
```python
print(df1.describe())
```

```
             Age      Weight
count   8.000000    8.000000
mean   21.500000   40.375000
std     8.332381   15.482133
min    10.000000   10.000000
25%    15.750000   35.000000
50%    20.500000   39.000000
75%    26.250000   51.250000
max    35.000000   60.000000
```

In [66]:
```python
print(df1.max())
```

```
Age       35
Weight    60
dtype: int64
```

In [67]:
```python
print(df1.min())
```

```
Age       10
Weight    10
dtype: int64
```

In [68]:
```python
print(df1.count())
```

```
Age       8
Weight    8
dtype: int64
```

In [73]:
```python
#--------Finding convariance and correlation-----------
```

In [74]:
```python
pip install scipy
```

```
Requirement already satisfied: scipy in c:\programdata\anaconda3\lib\site-packages (1.2.1)
Note: you may need to restart the kernel to use updated packages.
```

```
In [71]:   1  from numpy import cov
           2  data1 =[1,2,3,4,5,6,7,8,9,10]
           3  data2 =[11,22,33,44,55,66,77,88,99,19]
           4  covariance = cov(data1,data2)
           5  print(covariance)
```

```
[[  9.16666667  55.33333333]
 [ 55.33333333 936.26666667]]
```

```
In [75]:   1  from scipy.stats import pearsonr
           2  data1 = [1,2,3,4,5,6,7,8,9,10]
```

```
In [76]:   1  #--------Finding convariance and correlation-----------
```

```
In [77]:   1  pip install scipy
```

```
Requirement already satisfied: scipy in c:\programdata\anaconda3\lib\site-packages (1.2.1)
Note: you may need to restart the kernel to use updated packages.
```

```
In [78]:   1  from numpy import cov
           2  data1 =[1,2,3,4,5,6,7,8,9,10]
           3  data2 =[11,22,33,44,55,66,77,88,99,19]
           4  covariance = cov(data1,data2)
           5  print(covariance)
```

```
[[  9.16666667  55.33333333]
 [ 55.33333333 936.26666667]]
```

```
In [79]:   1  from scipy.stats import pearsonr
           2  data1 = [1,2,3,4,5,6,7,8,9,10]
           3  data2 =[11,22,33,44,55,66,77,88,99,19]
           4  corr = pearsonr(data1,data2)
           5  print(corr)
```

```
(0.5972846214175459, 0.06825702065969001)
```

```
In [ ]:    1
```