In [40]:
```
import numpy as np
```

In [41]:
```
import pandas as pp
```

In [57]:
```
#from numpy import linalg as la
```

Create 5 matrices with five different dimensions (1-D,2-D,...5-D)

In [53]:
```
a = np.array([1, 2, 3, 4, 5])
b = np.array([[1, 2, 3], [4, 5, 6], [7, 8, 9]])
c = np.array([[[1, 2], [3, 4]], [[5, 6], [7, 8]]])
d = np.array([[[[1, 2], [3, 4]], [[5, 6], [7, 8]]], [[[9, 10], [11, 12]], [[13, 14], [15, 16]]]])
e = np.array([[[[[1, 2], [3, 4]], [[5, 6], [7, 8]]], [[[9, 10], [11, 12]], [[13, 14], [15, 16]]]], [[[[17, 18]
print(a)
print(b)
print(c)
print(d)
print(e)
print(np.ndim(a))
print(np.ndim(b))
print(np.ndim(c))
print(np.ndim(d))
print(np.ndim(e))
print(np.linalg.det(b))
```

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

 [[5 6]
  [7 8]]]
[[[[ 1  2]
   [ 3  4]]

  [[ 5  6]
   [ 7  8]]]


 [[[ 9 10]
   [11 12]]

  [[13 14]
   [15 16]]]]
[[[[[ 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]]]]]
1
2
3
4
5
-9.51619735392994e-16
```

Find determinants of 5 matrices and display your output

In [58]:
```
print(np.linalg.det(b))
print(np.linalg.det(c))
print(np.linalg.det(d))
print(np.linalg.det(e))
```

```
-9.51619735392994e-16
[-2. -2.]
[[-2. -2.]
 [-2. -2.]]
[[[-2. -2.]
  [-2. -2.]]

 [[-2. -2.]
  [-2. -2.]]]
```

Find inverse of the above 5 matrices and display your output

In [63]:
```
print(np.linalg.inv(b))
print(np.linalg.inv(c))
print(np.linalg.inv(d))
print(np.linalg.inv(e))
```

```
[[ 3.15251974e+15 -6.30503948e+15  3.15251974e+15]
 [-6.30503948e+15  1.26100790e+16 -6.30503948e+15]
 [ 3.15251974e+15 -6.30503948e+15  3.15251974e+15]]
[[[-2.   1. ]
  [ 1.5 -0.5]]

 [[-4.   3. ]
  [ 3.5 -2.5]]]
[[[[-2.   1. ]
   [ 1.5 -0.5]]

  [[-4.   3. ]
   [ 3.5 -2.5]]]


 [[[-6.   5. ]
   [ 5.5 -4.5]]

  [[-8.   7. ]
   [ 7.5 -6.5]]]]
[[[[[ -2.    1. ]
    [  1.5  -0.5]]

   [[ -4.    3. ]
    [  3.5  -2.5]]]


  [[[ -6.    5. ]
    [  5.5  -4.5]]

   [[ -8.    7. ]
    [  7.5  -6.5]]]]



 [[[[-10.    9. ]
    [  9.5  -8.5]]

   [[-12.   11. ]
    [ 11.5 -10.5]]]


  [[[-14.   13. ]
```

```
 [ 13.5 -12.5]]

[[-16.   15. ]
 [ 15.5 -14.5]]]]]
```

Find the rank, diagonal and trace of the 5 matrices

In [71]:
```
print(la.matrix_rank(a))
print(la.matrix_rank(b))
print(la.matrix_rank(c))
print(la.matrix_rank(d))
print(la.matrix_rank(e))
print(np.trace(b))
print(np.trace(c))
print(np.trace(d))
print(np.trace(e))
print(np.diag(a))
print(np.diag(b))
```

```
1
2
[2 2]
[[2 2]
 [2 2]]
[[[2 2]
  [2 2]]

 [[2 2]
  [2 2]]]
15
[ 8 10]
[[14 16]
 [18 20]]
[[[26 28]
  [30 32]]

 [[34 36]
  [38 40]]]
[[1 0 0 0 0]
 [0 2 0 0 0]
 [0 0 3 0 0]
 [0 0 0 4 0]
 [0 0 0 0 5]]
[1 5 9]
```

5. Find Eigen value and eigen vector for 5 matrices

In [74]:
```
print(la.eig(b))
print(la.eig(c))
print(la.eig(d))
print(la.eig(e))
```

```
(array([ 1.61168440e+01, -1.11684397e+00, -3.38433605e-16]), array([[-0.23197069, -0.78583024,  0.40824829],
       [-0.52532209, -0.08675134, -0.81649658],
       [-0.8186735 ,  0.61232756,  0.40824829]]))
(array([[-0.37228132,  5.37228132],
       [-0.15206735, 13.15206735]]), array([[[-0.82456484, -0.41597356],
        [ 0.56576746, -0.90937671]],

       [[-0.75868086, -0.59276441],
        [ 0.65146248, -0.80537591]]]))
(array([[[-0.37228132,  5.37228132],
        [-0.15206735, 13.15206735]],

       [[-0.09481005, 21.09481005],
        [-0.06880228, 29.06880228]]]), array([[[[-0.82456484, -0.41597356],
         [ 0.56576746, -0.90937671]],

        [[-0.75868086, -0.59276441],
         [ 0.65146248, -0.80537591]]],


       [[[-0.73979641, -0.63720844],
         [ 0.67283079, -0.77069151]],

        [[-0.73099964, -0.65690325],
         [ 0.68237784, -0.75397488]]]]))
(array([[[[-3.72281323e-01,  5.37228132e+00],
         [-1.52067348e-01,  1.31520673e+01]],

        [[-9.48100502e-02,  2.10948101e+01],
         [-6.88022843e-02,  2.90688023e+01]]],


       [[[-5.39753153e-02,  3.70539753e+01],
         [-4.44006352e-02,  4.50444006e+01]],

        [[-3.77090194e-02,  5.30377090e+01],
         [-3.27692815e-02,  6.10327693e+01]]]]), array([[[[[-0.82456484, -0.41597356],
          [ 0.56576746, -0.90937671]],

         [[-0.75868086, -0.59276441],
          [ 0.65146248, -0.80537591]]],
```

```
 [[[-0.73979641, -0.63720844],
   [ 0.67283079, -0.77069151]],

  [[-0.73099964, -0.65690325],
   [ 0.68237784, -0.75397488]]],



[[[[-0.72592563, -0.66796817],
   [ 0.68777321, -0.74418984]],

  [[-0.72262672, -0.67504572],
   [ 0.69123847, -0.7377759 ]]],


 [[[-0.72031091, -0.67995921],
   [ 0.69365135, -0.73324994]],

  [[-0.71859602, -0.68356848],
   [ 0.69542775, -0.72988638]]]]))
```

In [76]:

```
x,y=la.eig(b)
print("root:",x)
print("matrix",y)
x,y=la.eig(c)
print("root:",x)
print("matrix",y)
x,y=la.eig(d)
print("root:",x)
print("matrix",y)
x,y=la.eig(e)
print("root:",x)
print("matrix",y)
```

```
root: [ 1.61168440e+01 -1.11684397e+00 -3.38433605e-16]
matrix [[-0.23197069 -0.78583024  0.40824829]
 [-0.52532209 -0.08675134 -0.81649658]
 [-0.8186735   0.61232756  0.40824829]]
root: [[-0.37228132  5.37228132]
 [-0.15206735 13.15206735]]
matrix [[[-0.82456484 -0.41597356]
  [ 0.56576746 -0.90937671]]

 [[-0.75868086 -0.59276441]
  [ 0.65146248 -0.80537591]]]
root: [[[-0.37228132  5.37228132]
  [-0.15206735 13.15206735]]

 [[-0.09481005 21.09481005]
  [-0.06880228 29.06880228]]]
matrix [[[[-0.82456484 -0.41597356]
   [ 0.56576746 -0.90937671]]

  [[-0.75868086 -0.59276441]
   [ 0.65146248 -0.80537591]]]


 [[[-0.73979641 -0.63720844]
   [ 0.67283079 -0.77069151]]

  [[-0.73099964 -0.65690325]
   [ 0.68237784 -0.75397488]]]]
root: [[[[-3.72281323e-01  5.37228132e+00]
   [-1.52067348e-01  1.31520673e+01]]

  [[-9.48100502e-02  2.10948101e+01]
   [-6.88022843e-02  2.90688023e+01]]]


 [[[-5.39753153e-02  3.70539753e+01]
   [-4.44006352e-02  4.50444006e+01]]

  [[-3.77090194e-02  5.30377090e+01]
   [-3.27692815e-02  6.10327693e+01]]]]
matrix [[[[[-0.82456484 -0.41597356]
    [ 0.56576746 -0.90937671]]
```

```
  [[-0.75868086 -0.59276441]
   [ 0.65146248 -0.80537591]]]


 [[[-0.73979641 -0.63720844]
   [ 0.67283079 -0.77069151]]

  [[-0.73099964 -0.65690325]
   [ 0.68237784 -0.75397488]]]]



[[[[-0.72592563 -0.66796817]
   [ 0.68777321 -0.74418984]]

  [[-0.72262672 -0.67504572]
   [ 0.69123847 -0.7377759 ]]]


 [[[-0.72031091 -0.67995921]
   [ 0.69365135 -0.73324994]]

  [[-0.71859602 -0.68356848]
   [ 0.69542775 -0.72988638]]]]]
```