In [1]:

```
#import numpy library
import numpy as np
import pandas as pd
```

1) Create Two numpy array of size 3 X 2 and 2 X 3

In [2]:

```
arr1 = np.empty([3,2],dtype = int)
arr2 = np.empty([2,3],dtype = int)
print("arr1 = ")
print(arr1)
print("arr2 = ")
print(arr2)
```

```
arr1 =
[[242   0]
 [  0   0]
 [  0   0]]
arr2 =
[[250   0   0]
 [  0   0   0]]
```

2) Randomly Initalize that array

In [3]:

```
arr1 = np.random.randint(10,size=np.shape(arr1))
arr2 = np.random.randint(10,size=np.shape(arr2))
print("arr1 = ")
print(arr1)
print("arr2 =")
print(arr2)
```

```
arr1 =
[[6 8]
 [8 8]
 [0 5]]
arr2 =
[[3 9 6]
 [5 4 5]]
```

3) Perform matrix multiplication

In [4]:

```
mat_mul = np.matmul(arr1,arr2)
print("Matrix Multiplication = ")
print(mat_mul)
```

```
Matrix Multiplication =
[[ 58  86  76]
 [ 64 104  88]
 [ 25  20  25]]
```

4) Perform elementwise matrix multiplication

In [5]:

```
ele_mat_arr1 = arr1*arr1
print(ele_mat_arr1)
ele_mat_arr2 = arr2*arr2
print(ele_mat_arr2)
ele_mat_mul = arr1*arr2.T
print(ele_mat_mul)
```

```
[[36 64]
 [64 64]
 [ 0 25]]
[[ 9 81 36]
 [25 16 25]]
[[18 40]
 [72 32]
 [ 0 25]]
```

5) Find mean of first matrix

In [6]:

```
first_mean = np.mean(arr1)
first_mean_by_cols = np.mean(arr1, axis=0)
first_mean_by_rows = np.mean(arr1, axis=1)
print(first_mean)
print(first_mean_by_cols)
print(first_mean_by_rows)
```

```
5.833333333333333
[4.66666667 7.        ]
[7.  8.  2.5]
```

6) Convert Numeric entries(columns) of mtcars.csv to Mean Centered Version

In [7]:

```
df_mtcars = pd.read_csv("C:/Users/Admin/Desktop/Raj/Sem-7/ML-Materials/LAB1/mtcars.csv"
)
df_mtcars.head(5)
```

Out[7]:

	model	mpg	cyl	disp	hp	drat	wt	qsec	vs	am	gear	carb
0	Mazda RX4	21.0	6	160.0	110	3.90	2.620	16.46	0	1	4	4
1	Mazda RX4 Wag	21.0	6	160.0	110	3.90	2.875	17.02	0	1	4	4
2	Datsun 710	22.8	4	108.0	93	3.85	2.320	18.61	1	1	4	1
3	Hornet 4 Drive	21.4	6	258.0	110	3.08	3.215	19.44	1	0	3	1
4	Hornet Sportabout	18.7	8	360.0	175	3.15	3.440	17.02	0	0	3	2

In [8]:

```
# for all columns
df_mtcars['mpg'] = df_mtcars['mpg'] - np.mean(df_mtcars['mpg'])
df_mtcars['cyl'] = df_mtcars['cyl'] - np.mean(df_mtcars['cyl'])
df_mtcars['disp'] = df_mtcars['disp'] - np.mean(df_mtcars['disp'])
df_mtcars['hp'] = df_mtcars['hp'] - np.mean(df_mtcars['hp'])
df_mtcars['drat'] = df_mtcars['drat'] - np.mean(df_mtcars['drat'])
df_mtcars['wt'] = df_mtcars['wt'] - np.mean(df_mtcars['wt'])
df_mtcars['qsec'] = df_mtcars['qsec'] - np.mean(df_mtcars['qsec'])
df_mtcars['vs'] = df_mtcars['vs'] - np.mean(df_mtcars['vs'])
df_mtcars['am'] = df_mtcars['am'] - np.mean(df_mtcars['am'])
df_mtcars['gear'] = df_mtcars['gear'] - np.mean(df_mtcars['gear'])
df_mtcars['carb'] = df_mtcars['carb'] - np.mean(df_mtcars['carb'])
```

In [9]:

```
#After converted to MCV
df_mtcars.head(5)
```

Out[9]:

	model	mpg	cyl	disp	hp	drat	wt	qsec	vs
0	Mazda RX4	0.909375	-0.1875	-70.721875	-36.6875	0.303437	-0.59725	-1.38875	-0.4375
1	Mazda RX4 Wag	0.909375	-0.1875	-70.721875	-36.6875	0.303437	-0.34225	-0.82875	-0.4375
2	Datsun 710	2.709375	-2.1875	-122.721875	-53.6875	0.253437	-0.89725	0.76125	0.5625
3	Hornet 4 Drive	1.309375	-0.1875	27.278125	-36.6875	-0.516563	-0.00225	1.59125	0.5625
4	Hornet Sportabout	-1.390625	1.8125	129.278125	28.3125	-0.446563	0.22275	-0.82875	-0.4375