Import Library

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

Load Dataset From Local Directory

```
from google.colab import files
uploaded = files.upload()
```

```
Choose Files Inc_Exp_Data.csv
• Inc_Exp_Data.csv(text/csv) - 2081 bytes, last modified: 4/11/2023 - 100% done
Saving Inc_Exp_Data.csv to Inc_Exp_Data (1).csv
```

Load Dataset

```
dataset = pd.read_csv('Inc_Exp_Data.csv')
```

Summarize Dataset

```
print(dataset.shape)
print(dataset.describe())
print(dataset.head(5))
```

```
(50, 7)
       Mthly_HH_Income  Mthly_HH_Expense  No_of_Fly_Members  Emi_or_Rent_Amt  \
count        50.000000         50.000000          50.000000        50.000000
mean      41558.000000      18818.000000           4.060000      3060.000000
std       26097.908979      12090.216824           1.517382      6241.434948
min        5000.000000       2000.000000           1.000000         0.000000
25%       23550.000000      10000.000000           3.000000         0.000000
50%       35000.000000      15500.000000           4.000000         0.000000
75%       50375.000000      25000.000000           5.000000      3500.000000
max      100000.000000      50000.000000           7.000000     35000.000000

       Annual_HH_Income  No_of_Earning_Members
count      5.000000e+01              50.000000
mean       4.900190e+05               1.460000
std        3.201358e+05               0.734291
min        6.420000e+04               1.000000
25%        2.587500e+05               1.000000
50%        4.474200e+05               1.000000
75%        5.947200e+05               2.000000
max        1.404000e+06               4.000000
   Mthly_HH_Income  Mthly_HH_Expense  No_of_Fly_Members  Emi_or_Rent_Amt  \
0             5000              8000                  3             2000
1             6000              7000                  2             3000
2            10000              4500                  2                0
3            10000              2000                  1                0
4            12500             12000                  2             3000

   Annual_HH_Income Highest_Qualified_Member  No_of_Earning_Members
0             64200           Under-Graduate                     1
1             79920              Illiterate                      1
2            112800           Under-Graduate                     1
3             97200              Illiterate                      1
4            147000                Graduate                      1
```

Segregate & Zipping Dataset

```
Income = dataset['Mthly_HH_Income'].values
Spend = dataset['Mthly_HH_Expense'].values
X = np.array(list(zip(Income, Spend)))
X
```

```
array([[  5000,   8000],
       [  6000,   7000],
       [ 10000,   4500],
       [ 10000,   2000],
       [ 12500,  12000],
       [ 14000,   8000],
       [ 15000,  16000],
       [ 18000,  20000],
       [ 19000,   9000],
       [ 20000,   9000],
       [ 20000,  18000],
       [ 22000,  25000],
       [ 23400,   5000],
       [ 24000,  10500],
       [ 24000,  10000],
       [ 25000,  12300],
       [ 25000,  20000],
       [ 25000,  10000],
       [ 29000,   6600],
       [ 30000,  13000],
       [ 30500,  25000],
       [ 32000,  15000],
       [ 34000,  19000],
       [ 34000,  25000],
       [ 35000,  12000],
       [ 35000,  25000],
       [ 39000,   8000],
       [ 40000,  10000],
       [ 42000,  15000],
       [ 43000,  12000],
       [ 45000,  25000],
       [ 45000,  40000],
       [ 45000,  10000],
       [ 45000,  22000],
       [ 46000,  25000],
```

```
       [ 47000,  15000],
       [ 50000,  20000],
       [ 50500,  20000],
       [ 55000,  45000],
       [ 60000,  10000],
       [ 60000,  50000],
       [ 65000,  20000],
       [ 70000,   9000],
       [ 80000,  20000],
       [ 85000,  25000],
       [ 90000,  48000],
       [ 98000,  25000],
       [100000,  30000],
       [100000,  50000],
       [100000,  40000]])
```

Finding the optimized K Value

```
from sklearn.cluster import KMeans
wcss = []
for i in range(1, 11):
  km = KMeans(n_clusters=1, random_state=0)
  km.fit(X)
  wcss.append(km.inertia_)
plt.plot(range(1, 11), wcss, color='red', marker='8')
plt.title('Optimal K Value')
plt.xlabel('Number of clusters')
plt.ylabel('WCSS')
plt.show()
```

```
/usr/local/lib/python3.9/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning: The default value of `n_init` will
  warnings.warn(
/usr/local/lib/python3.9/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning: The default value of `n_init` will
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/usr/local/lib/python3.9/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning: The default value of `n_init` will
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  warnings.warn(
/usr/local/lib/python3.9/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning: The default value of `n_init` will
  warnings.warn(
```
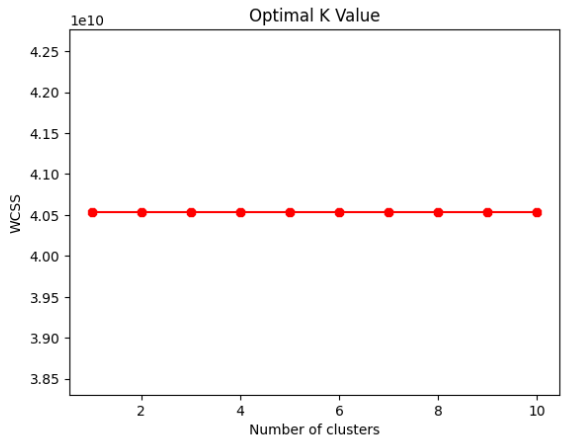



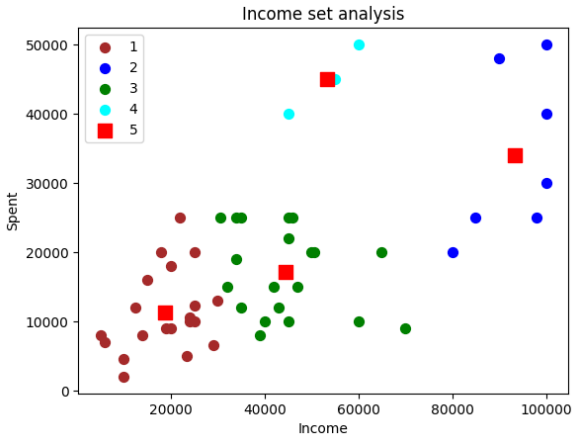
Finding the K-means to the dataset with k=4

```
model = KMeans(n_clusters=4, random_state=0)
y_means = model.fit_predict(X)
```

```
/usr/local/lib/python3.9/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` explic
  warnings.warn(
```

Visualizig the clusters for K=4

```
plt.scatter(X[y_means==0,0],X[y_means==0,1],s=50, c='brown', label='1')
plt.scatter(X[y_means==1,0],X[y_means==1,1],s=50, c='blue', label='2')
plt.scatter(X[y_means==2,0],X[y_means==2,1],s=50, c='green', label='3')
plt.scatter(X[y_means==3,0],X[y_means==3,1],s=50, c='cyan', label='4')
plt.scatter(model.cluster_centers_[:,0],model.cluster_centers_[:,1],s=100, marker='s', c='red', label='5')
plt.title('Income set analysis')
plt.xlabel('Income')
plt.ylabel('Spent')
plt.legend()
plt.show()
```



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