importing pandas

```
import pandas as pd
```

```
df=pd.read_csv('Mall_Customers.csv')
```

printing the dataframe

```
df
```

	CustomerID	Genre	Age	Annual Income (k$)	Spending Score (1-100)
0	1	Male	19	15	39
1	2	Male	21	15	81
2	3	Female	20	16	6
3	4	Female	23	16	77
4	5	Female	31	17	40
...	...	...	...	...	...
195	196	Female	35	120	79
196	197	Female	45	126	28
197	198	Male	32	126	74
198	199	Male	32	137	18
199	200	Male	30	137	83

200 rows × 5 columns

Next steps: Generate code with df View recommended plots New interactive sheet

```
df.columns
```

```
Index(['CustomerID', 'Genre', 'Age', 'Annual Income (k$)',
       'Spending Score (1-100)'],
      dtype='object')
```

printing the data types

```
df.dtypes
```

	0
CustomerID	int64
Genre	object
Age	int64
Annual Income (k$)	int64
Spending Score (1-100)	int64

dtype: object

```
import numpy as np
```

```
import matplotlib.pyplot as plt
import seaborn as sns
```

```
print(df.isnull().sum())
```

```
CustomerID                0
Genre                     0
Age                       0
Annual Income (k$)        0
Spending Score (1-100)    0
dtype: int64
```

```
df.head()
```

	CustomerID	Genre	Age	Annual Income (k$)	Spending Score (1-100)
0	1	Male	19	15	39
1	2	Male	21	15	81
2	3	Female	20	16	6
3	4	Female	23	16	77
4	5	Female	31	17	40

Next steps: Generate code with df View recommended plots New interactive sheet

```
df.drop(['CustomerID'],axis=1,inplace=True)
```

```
df.head()
```

```
    Genre  Age  Annual Income (k$)  Spending Score (1-100)
0    Male   19                  15                      39
1    Male   21                  15                      81
2  Female   20                  16                       6
3  Female   23                  16                      77
4  Female   31                  17                      40
```

Next steps: Generate code with df | View recommended plots | New interactive sheet

preprocessing

```
from sklearn.preprocessing import LabelEncoder
```

```
from sklearn import metrics
```

```
le = LabelEncoder()
```

```
df["Genre"] = le.fit_transform(df["Genre"])
```

```
df.head()
```

```
   Genre  Age  Annual Income (k$)  Spending Score (1-100)
0      1   19                  15                      39
1      1   21                  15                      81
2      0   20                  16                       6
3      0   23                  16                      77
4      0   31                  17                      40
```

Next steps: Generate code with df | View recommended plots | New interactive sheet

```
data = df.copy()
x = data.iloc[:,[2,3]]
from sklearn.cluster import KMeans
```

```
data
```

	Genre	Age	Annual Income (k$)	Spending Score (1-100)
0	1	19	15	39
1	1	21	15	81
2	0	20	16	6
3	0	23	16	77
4	0	31	17	40
...	...	...	...	...
195	0	35	120	79
196	0	45	126	28
197	1	32	126	74
198	1	32	137	18
199	1	30	137	83

200 rows × 4 columns

Next steps: Generate code with `data` View recommended plots New interactive sheet

```
wcss = []
for i in range(1,11):
    kmeans = KMeans(n_clusters=i,init='k-means++',random_state=42)
    kmeans.fit(x)
    wcss.append(kmeans.inertia_)
    print('k:',i,"->wcss:",kmeans.inertia_)
```

```
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:1416: FutureWarning: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n
  super()._check_params_vs_input(X, default_n_init=10)
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:1416: FutureWarning: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n
  super()._check_params_vs_input(X, default_n_init=10)
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:1416: FutureWarning: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n
  super()._check_params_vs_input(X, default_n_init=10)
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:1416: FutureWarning: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n
  super()._check_params_vs_input(X, default_n_init=10)
k: 1 ->wcss: 269981.28000000014
k: 2 ->wcss: 181363.59595959607
k: 3 ->wcss: 106348.37306211119
k: 4 ->wcss: 73679.78903948837
k: 5 ->wcss: 44448.45544793369
```

```
k: 6 ->wcss: 37233.81451071002
k: 7 ->wcss: 30241.34361793659
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:1416: FutureWarning: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n
  super()._check_params_vs_input(X, default_n_init=10)
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:1416: FutureWarning: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n
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/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:1416: FutureWarning: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n
  super()._check_params_vs_input(X, default_n_init=10)
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:1416: FutureWarning: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n
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/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:1416: FutureWarning: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n
  super()._check_params_vs_input(X, default_n_init=10)
k: 8 ->wcss: 25036.417604033977
k: 9 ->wcss: 21916.79478984372
k: 10 ->wcss: 20072.070939404
```
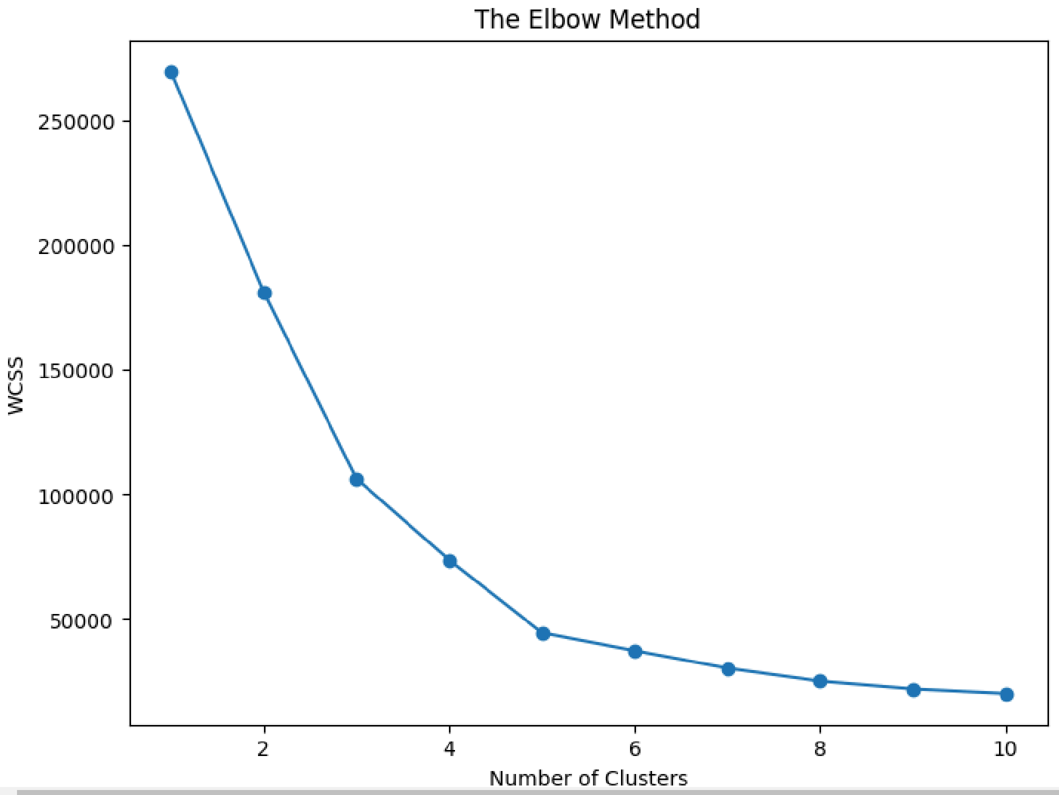

plotting the graph

```
plt.figure(figsize=(8, 6))
plt.plot(range(1,11),wcss,marker='o')
plt.title('The Elbow Method')
plt.xlabel('Number of Clusters')
plt.ylabel('WCSS')
plt.show()
```



fitting of data

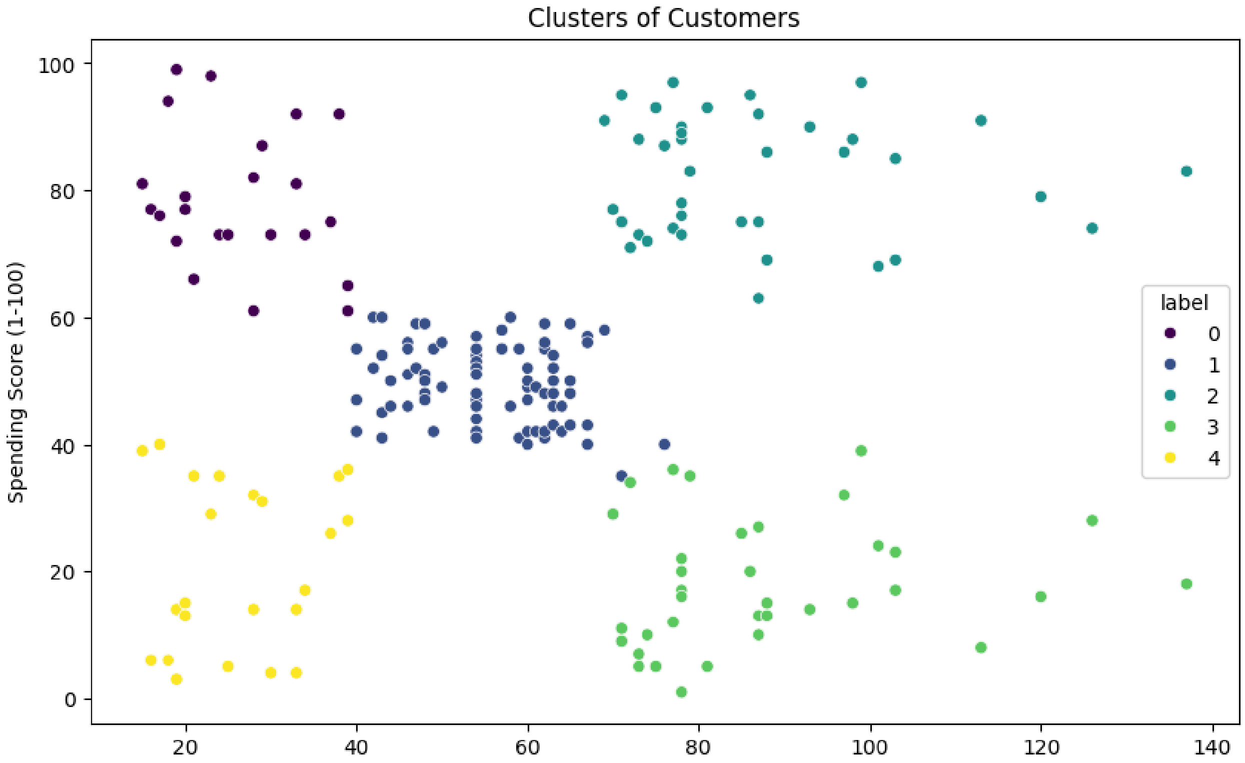
```
kmeans = KMeans(n_clusters=5)
kmeans.fit(data)
y=kmeans.predict(data)
data["label"] = y
```

```
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:1416: FutureWarning: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n
  super()._check_params_vs_input(X, default_n_init=10)
```

visualization of clusters

```
plt.close()
plt.figure(figsize=(10, 6))
```

```
sns.scatterplot(x='Annual Income (k$)', y='Spending Score (1-100)', hue='label', data=data, palette='viridis')
plt.title('Clusters of Customers')
plt.xlabel('Annual Income (k$)')
plt.ylabel('Spending Score (1-100)')
plt.show()
```


Clusters of Customers
Spending Score (1-100)
label