```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.cluster import KMeans

csd=pd.read_excel('/content/Mall_Customers.xlsx')

csd.head()
```


```
{"summary":"{\n  \"name\": \"csd\",\n  \"rows\": 200,\n  \"fields\":
[\n    {\n      \"column\": \"CustomerID\",\n      \"properties\": {\n
\"dtype\": \"number\",\n        \"std\": 57,\n        \"min\": 1,\n
\"max\": 200,\n        \"num_unique_values\": 200,\n
\"samples\": [\n          96,\n          16,\n          31\
n        ],\n        \"semantic_type\": \"\",\n
\"description\": \"\"\n      }\n    },\n    {\n      \"column\":
\"Gender\",\n      \"properties\": {\n        \"dtype\":
\"category\",\n        \"num_unique_values\": 2,\n        \"samples\":
[\n          \"Female\",\n          \"Male\"\n        ],\n
\"semantic_type\": \"\",\n        \"description\": \"\"\n      }\
n    },\n    {\n      \"column\": \"Age\",\n      \"properties\": {\n
\"dtype\": \"number\",\n        \"std\": 13,\n        \"min\": 18,\n
\"max\": 70,\n        \"num_unique_values\": 51,\n        \"samples\":
[\n          55,\n          26\n        ],\n        \"semantic_type\":
\"\",\n        \"description\": \"\"\n      }\n    },\n    {\n
\"column\": \"Annual Income (k$)\",\n      \"properties\": {\n
\"dtype\": \"number\",\n        \"std\": 26,\n        \"min\": 15,\n
\"max\": 137,\n        \"num_unique_values\": 64,\n
\"samples\": [\n          87,\n          101\n        ],\n
\"semantic_type\": \"\",\n        \"description\": \"\"\n      }\
n    },\n    {\n      \"column\": \"Spending Score (1-100)\",\n
\"properties\": {\n        \"dtype\": \"number\",\n        \"std\":
25,\n        \"min\": 1,\n        \"max\": 99,\n
\"num_unique_values\": 84,\n        \"samples\": [\n          83,\n
39\n        ],\n        \"semantic_type\": \"\",\n
\"description\": \"\"\n      }\n    }\n  ]\
n}","type":"dataframe","variable_name":"csd"}
```


```
csd.isnull().sum()
```

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

```
csd.shape
```

```
(200, 5)
```

```
csd.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 200 entries, 0 to 199
Data columns (total 5 columns):
 #   Column                  Non-Null Count  Dtype  
---  ------                  --------------  -----  
 0   CustomerID              200 non-null    int64  
 1   Gender                  200 non-null    object 
 2   Age                     200 non-null    int64  
 3   Annual Income (k$)      200 non-null    int64  
 4   Spending Score (1-100)  200 non-null    int64  
dtypes: int64(4), object(1)
memory usage: 7.9+ KB
```

```
x=csd.iloc[:,[3,4]].values
```

```
print(x)
```

```
[[ 15  39]
 [ 15  81]
 [ 16   6]
 [ 16  77]
 [ 17  40]
 [ 17  76]
 [ 18   6]
 [ 18  94]
 [ 19   3]
 [ 19  72]
 [ 19  14]
 [ 19  99]
 [ 20  15]
 [ 20  77]
 [ 20  13]
 [ 20  79]
 [ 21  35]
 [ 21  66]
 [ 23  29]
 [ 23  98]
 [ 24  35]
 [ 24  73]
 [ 25   5]
 [ 25  73]
 [ 28  14]
 [ 28  82]
 [ 28  32]
 [ 28  61]
 [ 29  31]
 [ 29  87]
 [ 30   4]
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[ 30  73]
[ 33   4]
[ 33  92]
[ 33  14]
[ 33  81]
[ 34  17]
[ 34  73]
[ 37  26]
[ 37  75]
[ 38  35]
[ 38  92]
[ 39  36]
[ 39  61]
[ 39  28]
[ 39  65]
[ 40  55]
[ 40  47]
[ 40  42]
[ 40  42]
[ 42  52]
[ 42  60]
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[ 43  60]
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[ 54  42]
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[ 67  56]
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[ 69  58]
[ 69  91]
[ 70  29]
[ 70  77]
[ 71  35]
[ 71  95]
[ 71  11]
```

```
[ 71  75]
[ 71   9]
[ 71  75]
[ 72  34]
[ 72  71]
[ 73   5]
[ 73  88]
[ 73   7]
[ 73  73]
[ 74  10]
[ 74  72]
[ 75   5]
[ 75  93]
[ 76  40]
[ 76  87]
[ 77  12]
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[ 78  88]
[ 78  20]
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[ 87  10]
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[ 88  86]
[ 88  15]
[ 88  69]
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 [ 93  90]
 [ 97  32]
 [ 97  86]
 [ 98  15]
 [ 98  88]
 [ 99  39]
 [ 99  97]
 [101  24]
 [101  68]
 [103  17]
 [103  85]
 [103  23]
 [103  69]
 [113   8]
 [113  91]
 [120  16]
 [120  79]
 [126  28]
 [126  74]
 [137  18]
 [137  83]]
```
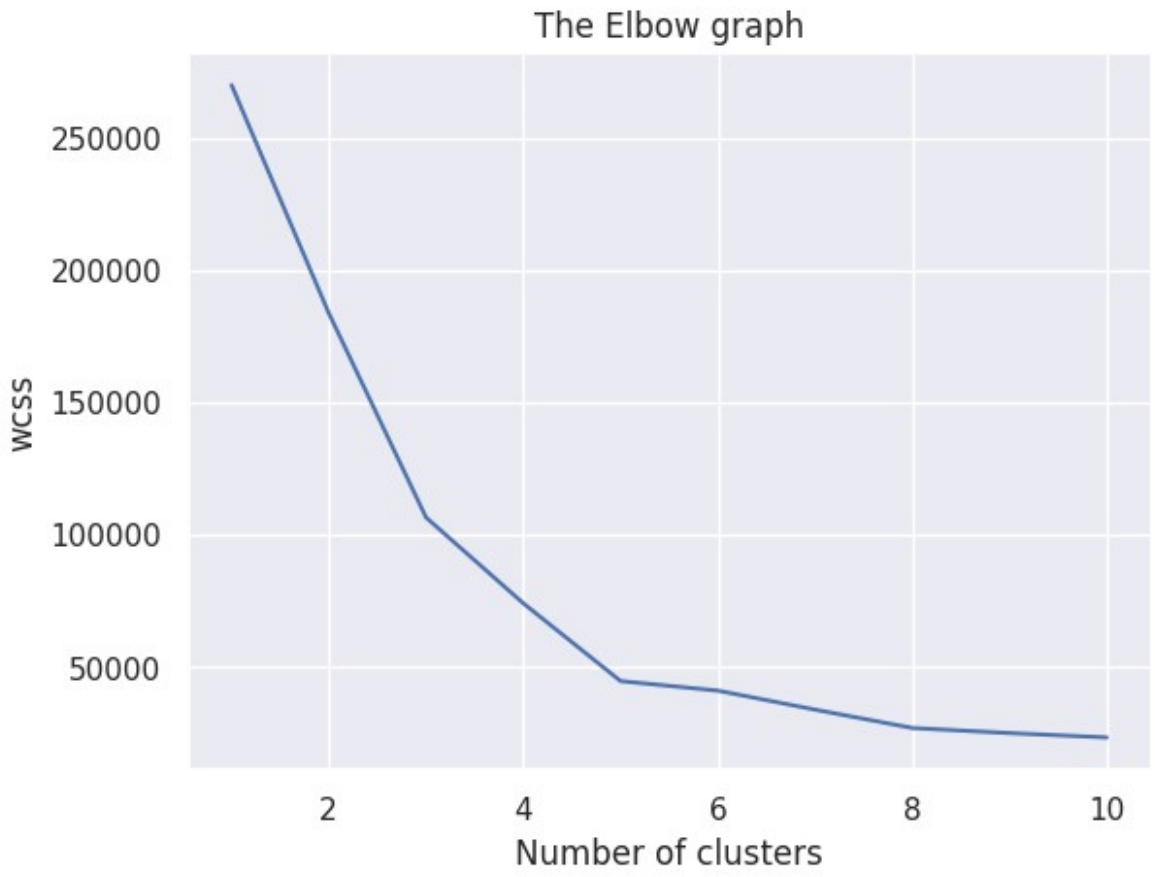

```
wcss = []

for i in range(1,11):
  Kmeans = KMeans(n_clusters = i, init = 'k-means++',random_state=42)
  Kmeans.fit(x)

  wcss.append(Kmeans.inertia_)

sns.set()
plt.plot(range(1,11),wcss)
plt.title('The Elbow graph')
plt.xlabel('Number of clusters')
plt.ylabel('wcss')
plt.show()
```




```
K=KMeans(n_clusters=5,init='k-means++',random_state=0)
y=K.fit_predict(x)

print(y)
```

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

```
plt.figure(figsize=(8,8))
plt.scatter(x[y==0,0],x[y==0,1],s=50,c='green',label='cluster1')
plt.scatter(x[y==1,0],x[y==1,1],s=50,c='red',label='cluster2')
plt.scatter(x[y==2,0],x[y==2,1],s=50,c='yellow',label='cluster3')
plt.scatter(x[y==3,0],x[y==3,1],s=50,c='blue',label='cluster4')
plt.scatter(x[y==4,0],x[y==4,1],s=50,c='black',label='cluster5')
```

```
plt.scatter(K.cluster_centers_[:,0],K.cluster_centers_[:,1],s=300,c='c
yan',label='centroids')
plt.title('Clusters of customers')
plt.show()
```