In [1]:
```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline
```

In [2]:
```
data=pd.read_csv('Mall_Customers.csv')
```

In [3]:
```
data.head()

```

Out[3]:

	CustomerID	Gender	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

In [4]:
```
data.rename(columns = {'Annual Income (k$)' : 'Income', 'Spending Score (1-100)' : 'Spending_Score'}, inplace=True)
data_short=data[['Spending_Score', 'Income']]
```

In [5]:
```
import sklearn.cluster as cluster
K=range(1,12)
wss=[]
for k in K:
    kmeans=cluster.KMeans(n_clusters=k,init="k-means++")
    kmeans=kmeans.fit(data_short)
    wss_iter=kmeans.inertia_
    wss.append(wss_iter)
```

```
C:\Users\morri\Anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:1036: UserWarning: KMeans is known to have a memory leak on Windows with MKL, when there
are less chunks than available threads. You can avoid it by setting the environment variable OMP_NUM_THREADS=1.
  warnings.warn(
```

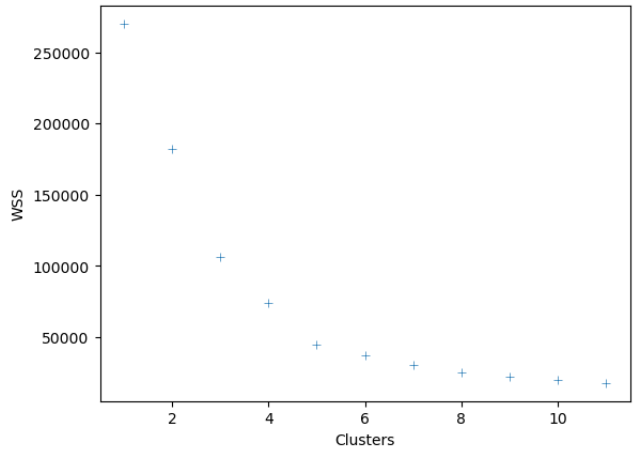
In [6]:
```
mycenters = pd.DataFrame({'Clusters':K, 'WSS':wss})
mycenters
```

Out[6]:

	Clusters	WSS
0	1	269981.280000
1	2	181665.823129
2	3	106348.373062
3	4	73679.789039
4	5	44448.455448
5	6	37233.814511
6	7	30241.343618
7	8	24990.434310
8	9	21838.863693
9	10	19657.783609
10	11	17595.288881

In [7]:
```
sns.scatterplot(x='Clusters', y='WSS', data=mycenters, marker="+")
```

Out[7]:
```
<AxesSubplot:xlabel='Clusters', ylabel='WSS'>
```



In [8]:
```
learn.metrics as metrics
range (3,13):
s=cluster.KMeans(n_clusters=i,init='k-means++', random_state=200).fit(data_short).labels_
("Silhoutte score for k(clusters) = "+str(i)+" is " +str(metrics.silhouette_score(data_short,labels, metric="euclidean", sample_size=1000, random_state=200)))
```

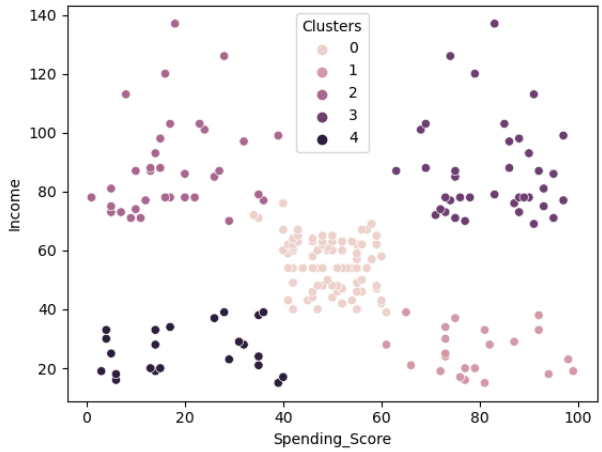
```
Silhoutte score for k(clusters) = 3 is 0.46761358158775423
Silhoutte score for k(clusters) = 4 is 0.4931963109249047
Silhoutte score for k(clusters) = 5 is 0.553931997444648
Silhoutte score for k(clusters) = 6 is 0.5379675585622219
Silhoutte score for k(clusters) = 7 is 0.5367379891273258
Silhoutte score for k(clusters) = 8 is 0.4592958445675391
Silhoutte score for k(clusters) = 9 is 0.45770857148861777
Silhoutte score for k(clusters) = 10 is 0.446735677440187
Silhoutte score for k(clusters) = 11 is 0.4472950813160941
Silhoutte score for k(clusters) = 12 is 0.4257901147260263
```

In [9]:
```
kmeans=cluster.KMeans(n_clusters=5,init="k-means++")
kmeans=kmeans.fit(data[['Spending_Score', 'Income']])
```

In [10]:
```
data['Clusters'] = kmeans.labels_
```

In [11]:
```
sns.scatterplot(x="Spending_Score", y="Income", hue="Clusters", data=data)
```

Out[11]: <AxesSubplot:xlabel='Spending_Score', ylabel='Income'>



In [ ]:
```

```