In [1]:

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

In [2]:

```
# Load data from CSV
data = pd.read_csv('Mall_Customers.csv')
```

In [3]:

```
# Select relevant features
X = data[['Annual Income (k$)', 'Spending Score (1-100)']]
```

In [4]:

```
# Determine the optimal number of clusters using the elbow method
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_)
```

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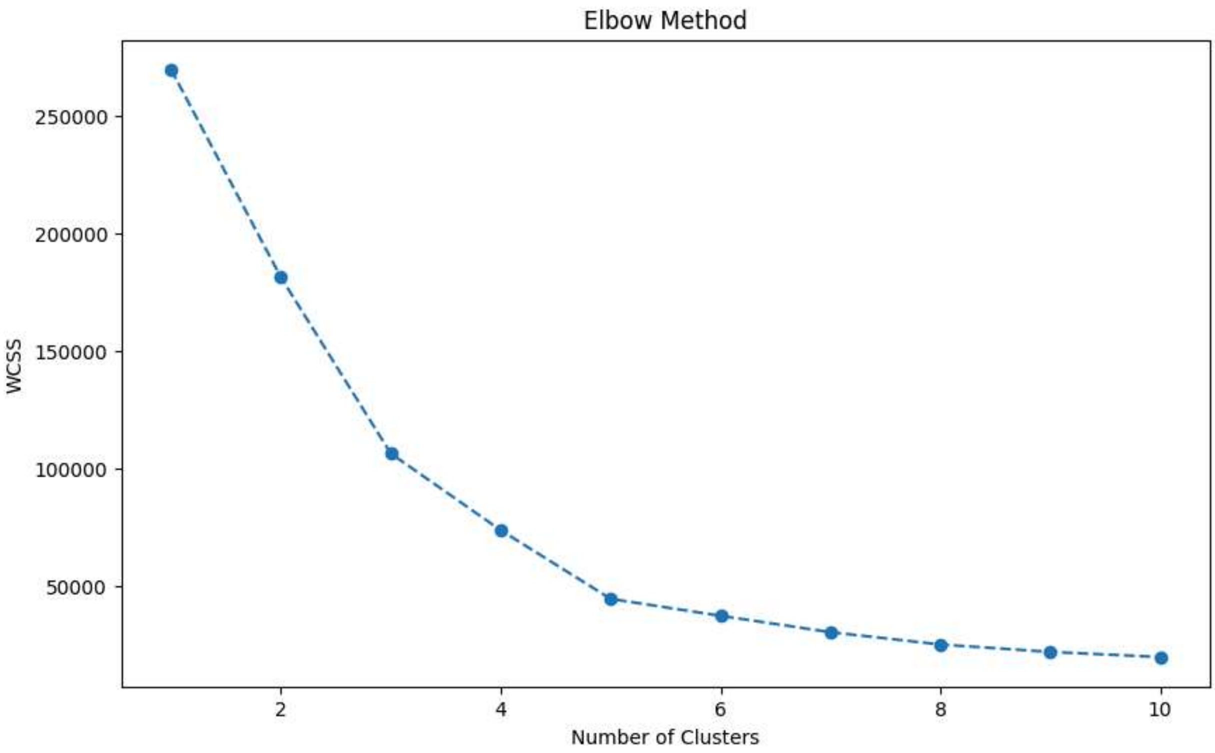

In [5]:

```
# Plot the elbow method graph
plt.figure(figsize=(10, 6))
plt.plot(range(1, 11), wcss, marker='o', linestyle='--')
plt.title('Elbow Method')
plt.xlabel('Number of Clusters')
plt.ylabel('WCSS')
plt.show()
```



In [6]:

```
# Based on the elbow method, let's choose 5 clusters and perform K-means clustering
kmeans = KMeans(n_clusters=5, init='k-means++', random_state=42)
kmeans.fit(X)
```

```
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g: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value
of `n_init` explicitly to suppress the warning
  warnings.warn(
```

Out[6]:

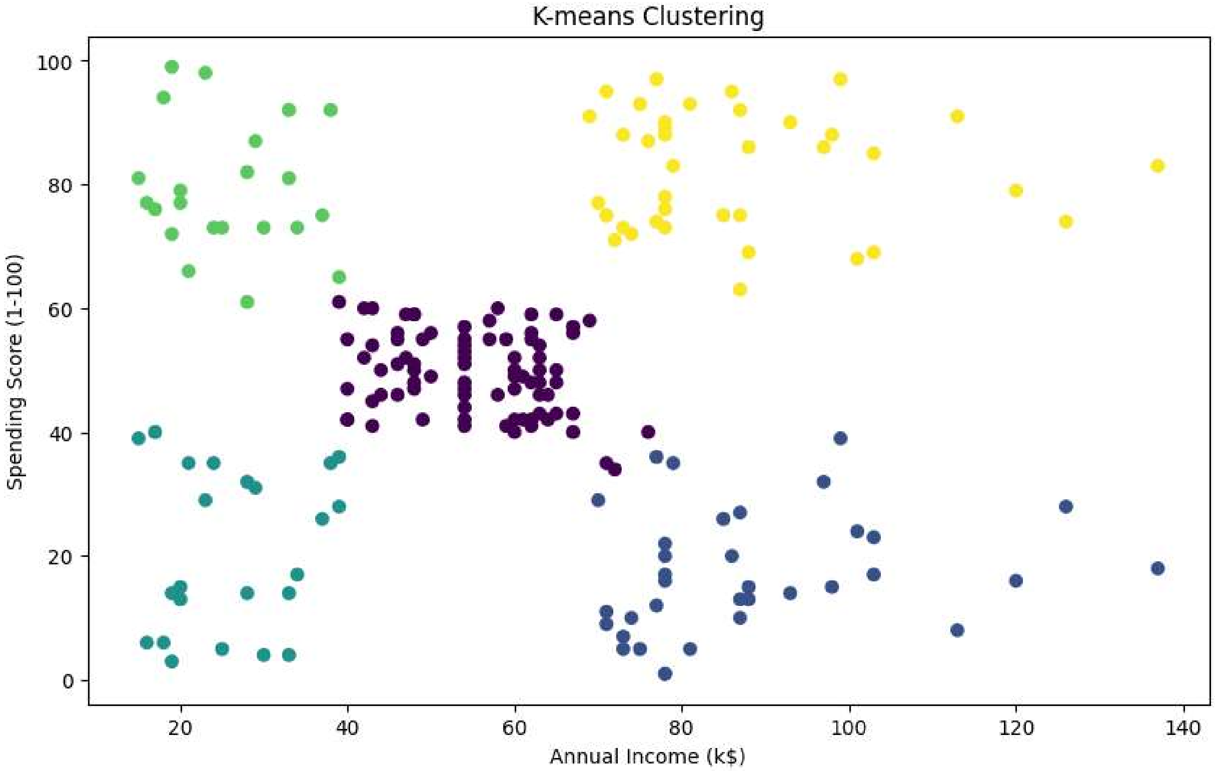
```
▾                KMeans
KMeans(n_clusters=5, random_state=42)
```

In [7]:

```
# Add cluster labels to the dataframe
data['Cluster'] = kmeans.labels_
```

In [8]:

```
# Plot the clusters
plt.figure(figsize=(10, 6))
plt.scatter(data['Annual Income (k$)'], data['Spending Score (1-100)'], c=data['Clus
plt.title('K-means Clustering')
plt.xlabel('Annual Income (k$)')
plt.ylabel('Spending Score (1-100)')
plt.show()
```


K-means Clustering
Spending Score (1-100)
0
20
40
60
80
100
Annual Income (k$)
20
40
60
80
100
120
140

```
In [ ]:
```

```
In [ ]:
```