In [24]:
```
import numpy as nm
import matplotlib.pyplot as mtp
import pandas as pd
```

In [25]:
```
file_path = 'Mall_Customers.csv'

# Read the CSV file
dataset = pd.read_csv(file_path)
# Display the first few rows of the DataFrame
print(dataset.head(20))

```

```
    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
5            6  Female   22                  17                      76
6            7  Female   35                  18                       6
7            8  Female   23                  18                      94
8            9    Male   64                  19                       3
9           10  Female   30                  19                      72
10          11    Male   67                  19                      14
11          12  Female   35                  19                      99
12          13  Female   58                  20                      15
13          14  Female   24                  20                      77
14          15    Male   37                  20                      13
15          16    Male   22                  20                      79
16          17  Female   35                  21                      35
17          18    Male   20                  21                      66
18          19    Male   52                  23                      29
19          20  Female   35                  23                      98
```

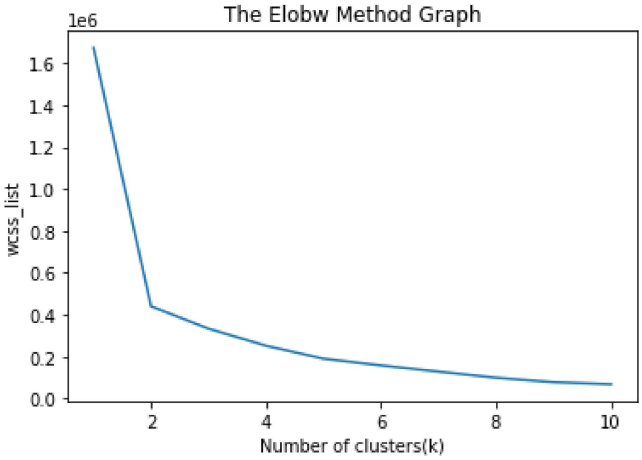
In [26]:
```
x = dataset.iloc[:, [3, 4]].values
```

the elbow method uses the WCSS concept to draw the plot by plotting WCSS values on the Y-axis and the number of clusters on the X-axis. So we are going to calculate the value for WCSS for different k values ranging from 1 to 10.

In [27]:
```
#finding optimal number of clusters using the elbow method
from sklearn.cluster import KMeans
wcss_list= []  #Initializing the list for the values of WCSS

#Using for loop for iterations from 1 to 10.
for i in range(1, 11):
    kmeans = KMeans(n_clusters=i, init='k-means++', random_state= 42)
    kmeans.fit(x)
    wcss_list.append(kmeans.inertia_)
mtp.plot(range(1, 11), wcss_list)
mtp.title('The Elobw Method Graph')
mtp.xlabel('Number of clusters(k)')
mtp.ylabel('wcss_list')
mtp.show()
```

```
C:\Users\91955\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 [28]:
```
from kneed import KneeLocator
```

In [29]:
```
kl = KneeLocator(range(1, 11), wcss_list, curve="convex", direction="decreasing")
kl.elbow
```

Out[29]: 2

Here elbow point is at 2. So number of clusters will be 2.

In [30]:
```
#training the K-means model on a dataset
kmeans = KMeans(n_clusters=2, init='k-means++', random_state= 42)
y_predict= kmeans.fit_predict(x)
```

In [32]:

```
#visulaizing the clusters
mtp.scatter(x[y_predict == 0, 0], x[y_predict == 0, 1], s = 100, c = 'blue', label = 'Clus
mtp.scatter(x[y_predict == 1, 0], x[y_predict == 1, 1], s = 100, c = 'green', label = 'Clu

mtp.scatter(kmeans.cluster_centers_[:, 0], kmeans.cluster_centers_[:, 1], s = 300, c = 'ye
mtp.title('Clusters of customers')
mtp.xlabel('Annual Income (k$)')
mtp.ylabel('Spending Score (1-100)')
mtp.legend()
mtp.show()
```