In [50]:
```
import pandas as pd
import numpy as np
import seaborn as sns
cus_data=pd.read_csv("D:\\intership\\Ignite Intern\\task2 customer segmentation\
cus_data
```

Out[50]:

	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

In [51]:
```
cus_data.isna()
```

Out[51]:

	CustomerID	Genre	Age	Annual Income (k$)	Spending Score (1-100)
0	False	False	False	False	False
1	False	False	False	False	False
2	False	False	False	False	False
3	False	False	False	False	False
4	False	False	False	False	False
...	...	...	...	...	...
195	False	False	False	False	False
196	False	False	False	False	False
197	False	False	False	False	False
198	False	False	False	False	False
199	False	False	False	False	False

200 rows × 5 columns

In [52]:
```
cus_data.isna().sum()
```

Out[52]:
```
CustomerID              0
Genre                   0
Age                     0
Annual Income (k$)      0
Spending Score (1-100)  0
dtype: int64
```

In [53]:
```
cus_data.tail()
```

Out[53]:

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

In [54]:
```
cus_data.shape
```

Out[54]:
```
(200, 5)
```

In [55]:
```
cus_data.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   Genre                   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
```

In [56]:
```
cus_data.describe()
```

Out[56]:

	CustomerID	Age	Annual Income (k$)	Spending Score (1-100)
count	200.000000	200.000000	200.000000	200.000000
mean	100.500000	38.850000	60.560000	50.200000
std	57.879185	13.969007	26.264721	25.823522
min	1.000000	18.000000	15.000000	1.000000
25%	50.750000	28.750000	41.500000	34.750000
50%	100.500000	36.000000	61.500000	50.000000
75%	150.250000	49.000000	78.000000	73.000000
max	200.000000	70.000000	137.000000	99.000000

In [57]:
```
cus_data.dtypes
```

Out[57]:
```
CustomerID                int64
Genre                    object
Age                       int64
Annual Income (k$)        int64
Spending Score (1-100)    int64
dtype: object
```

In [91]:
```
x=cus_data.iloc[:,[3,4]].values
x
```

Out[91]:
```
array([[ 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],
       [ 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],
       [ 43,  54],
       [ 43,  60],
       [ 43,  45],
       [ 43,  41],
       [ 44,  50],
       [ 44,  46],
       [ 46,  51],
       [ 46,  46],
```

```
       [ 46,  56],
       [ 46,  55],
       [ 47,  52],
       [ 47,  59],
       [ 48,  51],
       [ 48,  59],
       [ 48,  50],
       [ 48,  48],
       [ 48,  59],
       [ 48,  47],
       [ 49,  55],
       [ 49,  42],
       [ 50,  49],
       [ 50,  56],
       [ 54,  47],
       [ 54,  54],
       [ 54,  53],
       [ 54,  48],
       [ 54,  52],
       [ 54,  42],
       [ 54,  51],
       [ 54,  55],
       [ 54,  41],
       [ 54,  44],
       [ 54,  57],
       [ 54,  46],
       [ 57,  58],
       [ 57,  55],
       [ 58,  60],
       [ 58,  46],
       [ 59,  55],
       [ 59,  41],
       [ 60,  49],
       [ 60,  40],
       [ 60,  42],
       [ 60,  52],
       [ 60,  47],
       [ 60,  50],
       [ 61,  42],
       [ 61,  49],
       [ 62,  41],
       [ 62,  48],
       [ 62,  59],
       [ 62,  55],
       [ 62,  56],
       [ 62,  42],
       [ 63,  50],
       [ 63,  46],
       [ 63,  43],
       [ 63,  48],
       [ 63,  52],
       [ 63,  54],
       [ 64,  42],
       [ 64,  46],
       [ 65,  48],
       [ 65,  50],
       [ 65,  43],
       [ 65,  59],
       [ 67,  43],
       [ 67,  57],
```

```
[ 67,  56],
[ 67,  40],
[ 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],
[ 77,  97],
[ 77,  36],
[ 77,  74],
[ 78,  22],
[ 78,  90],
[ 78,  17],
[ 78,  88],
[ 78,  20],
[ 78,  76],
[ 78,  16],
[ 78,  89],
[ 78,   1],
[ 78,  78],
[ 78,   1],
[ 78,  73],
[ 79,  35],
[ 79,  83],
[ 81,   5],
[ 81,  93],
[ 85,  26],
[ 85,  75],
[ 86,  20],
[ 86,  95],
[ 87,  27],
[ 87,  63],
[ 87,  13],
[ 87,  75],
[ 87,  10],
[ 87,  92],
[ 88,  13],
[ 88,  86],
[ 88,  15],
[ 88,  69],
[ 93,  14],
[ 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]], dtype=int64)
```

In [72]:

```
import matplotlib.pyplot as plt
from sklearn.cluster import KMeans

wcss = []
for i in range(1, 11):
    kmeans = KMeans(n_clusters=i, init='k-means++', random_state=0)
    kmeans.fit(x)
    wcss.append(kmeans.inertia_)
```

```
C:\Users\Admin\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:870: Future
Warning: 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(
C:\Users\Admin\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:1382: UserW
arning: 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 v
ariable OMP_NUM_THREADS=1.
  warnings.warn(
C:\Users\Admin\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:870: Future
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  warnings.warn(
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  warnings.warn(
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  warnings.warn(
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Warning: 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(
C:\Users\Admin\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:1382: UserW
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```

```
less chunks than available threads. You can avoid it by setting the environment v
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  warnings.warn(
C:\Users\Admin\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:870: Future
Warning: 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(
C:\Users\Admin\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:1382: UserW
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less chunks than available threads. You can avoid it by setting the environment v
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  warnings.warn(
C:\Users\Admin\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:870: Future
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  warnings.warn(
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  warnings.warn(
C:\Users\Admin\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:870: Future
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  warnings.warn(
C:\Users\Admin\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:1382: UserW
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less chunks than available threads. You can avoid it by setting the environment v
ariable OMP_NUM_THREADS=1.
  warnings.warn(
```

In [68]:

```
kmeans
```

Out[68]:

```
▾ KMeans
KMeans(n_clusters=10, random_state=0)
```

In [69]:

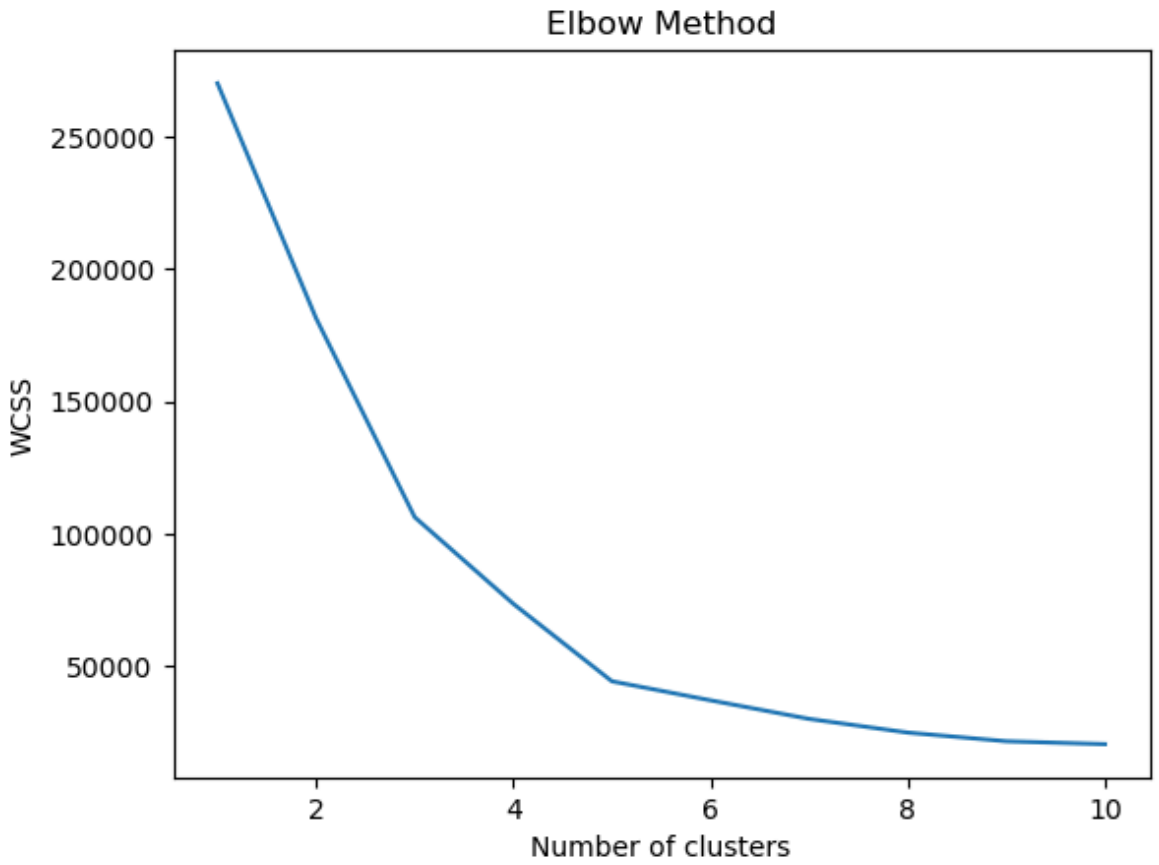
```
wcss
```

Out[69]:

```
[269981.28,
 181363.59595959593,
 106348.37306211118,
 73679.78903948836,
 44448.45544793371,
 37265.86520484347,
 30259.65720728547,
 25095.703209997548,
 21830.041978049438,
 20736.679938924124]
```

In [71]:

```
# Plotting the elbow curve
plt.plot(range(1, 11), wcss)
plt.title('Elbow Method')
plt.xlabel('Number of clusters')
plt.ylabel('WCSS')
plt.show()
```



In [74]:
```
kmodel=KMeans(n_clusters=5,init='k-means++', random_state=0)
kmodel
```

Out[74]:
```
KMeans(n_clusters=5, random_state=0)
```

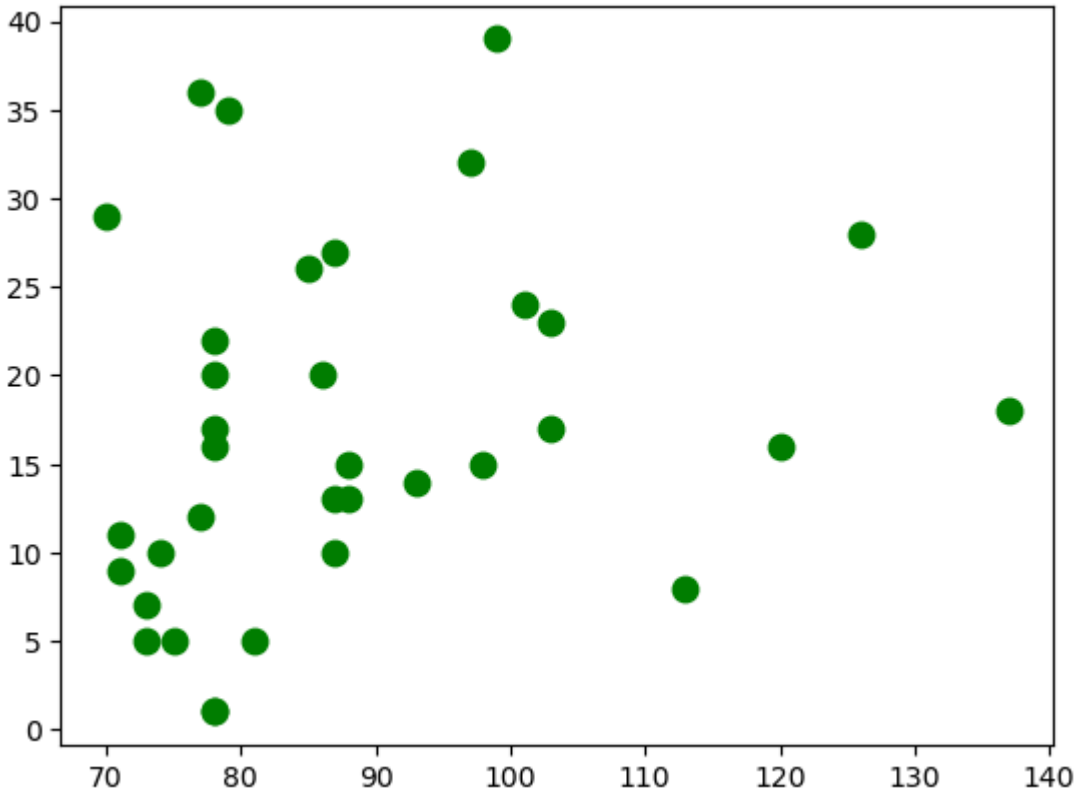
In [76]:
```
y_kmeans=kmodel.fit_predict(x)
y_kmeans
```

```
C:\Users\Admin\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:870: FutureWarning: 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(
C:\Users\Admin\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:1382: 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(
```

Out[76]:
```
array([4, 3, 4, 3, 4, 3, 4, 3, 4, 3, 4, 3, 4, 3, 4, 3, 4, 3, 4, 3, 4,
       4, 3, 4, 3, 4, 3, 4, 3, 4, 3, 4, 3, 4, 3, 4, 3, 4, 3, 4, 3, 4, 1,
       4, 3, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 2, 0, 2, 1, 2, 0, 2, 0, 2,
       1, 2, 0, 2, 0, 2, 0, 2, 0, 2, 1, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2,
       0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2,
       0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2,
       0, 2])
```

In [80]:
```
plt.scatter(x[y_kmeans==0,0],x[y_kmeans==0,1],s=80,c="green",label='cluster 1')
```

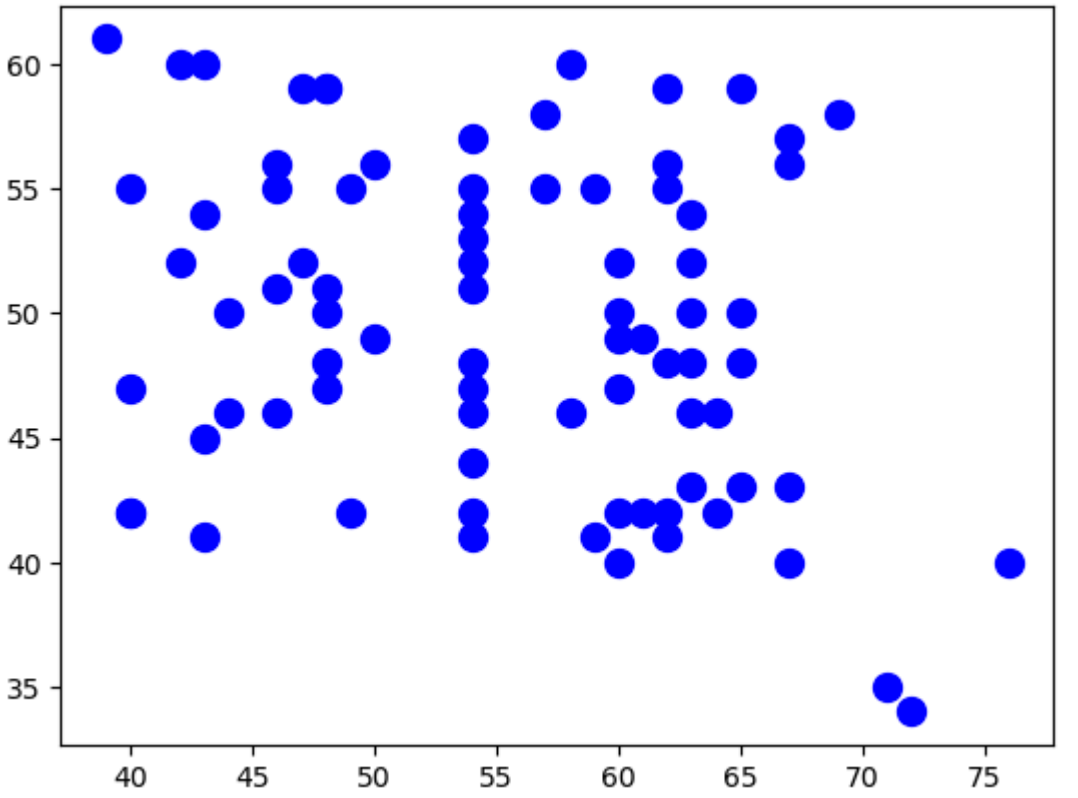
Out[80]: <matplotlib.collections.PathCollection at 0x182ef992a10>



In [ ]:

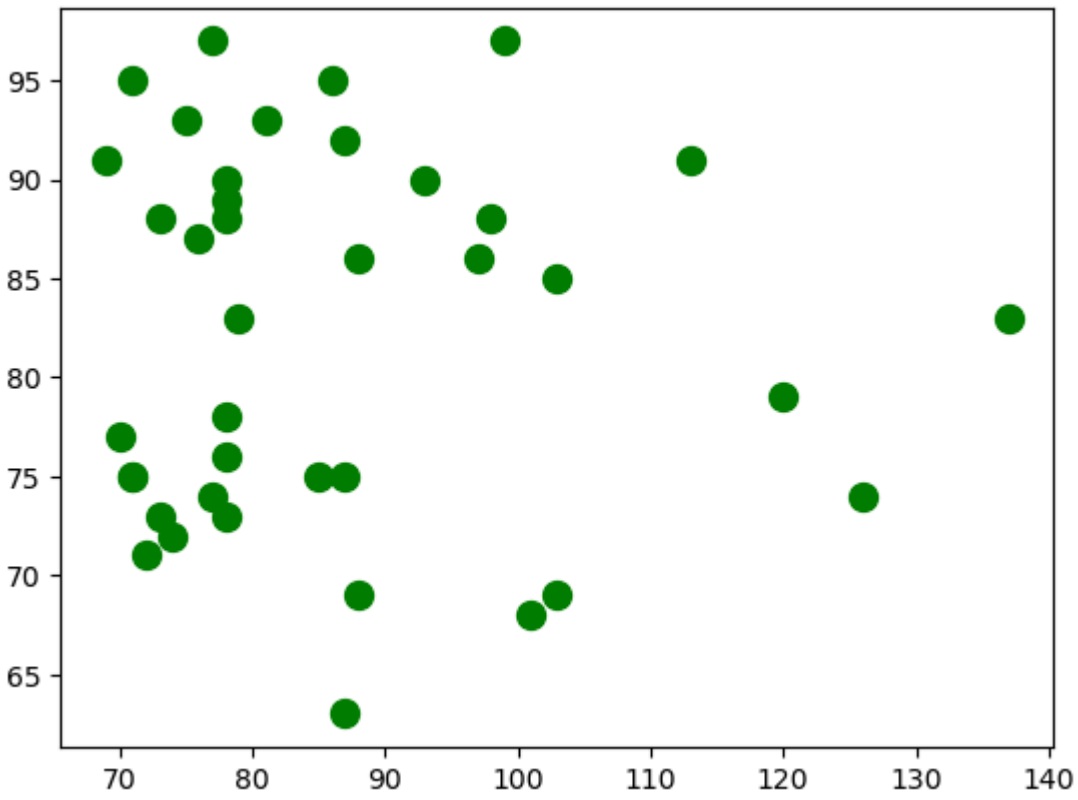
In [83]:
```
plt.scatter(x[y_kmeans==1, 0], x[y_kmeans==1, 1], s=100, c='blue', label ='Clust
```

Out[83]: <matplotlib.collections.PathCollection at 0x182ef8b6390>



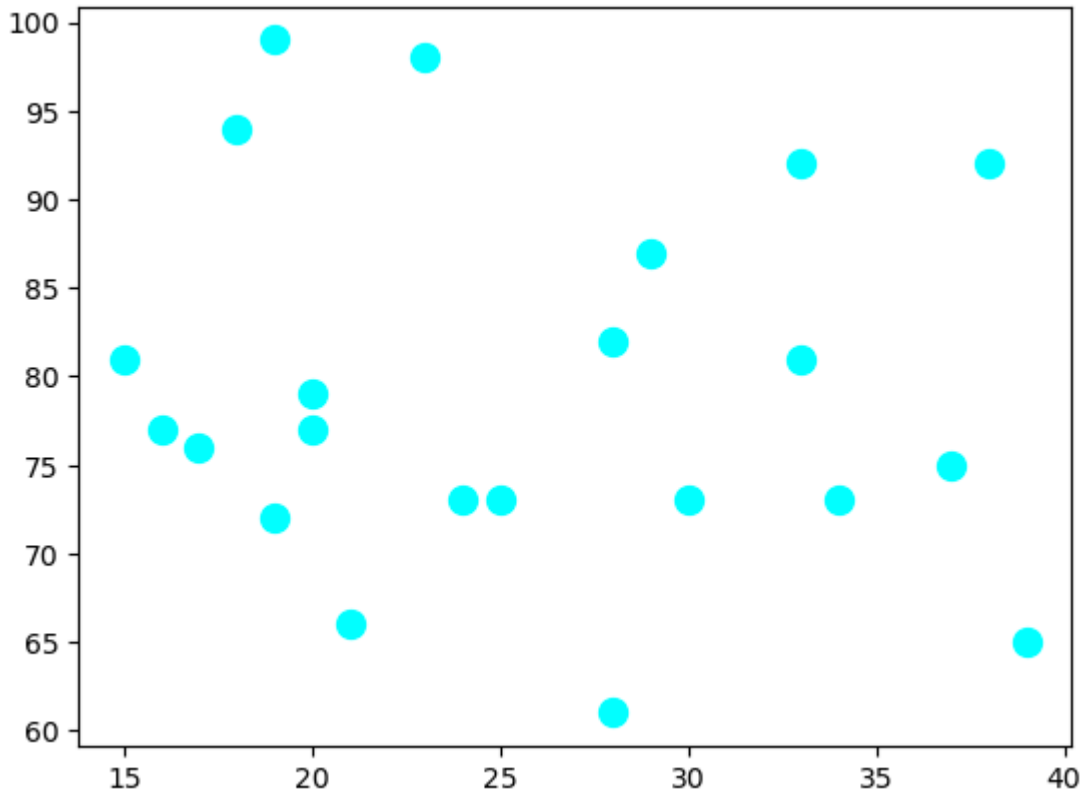
In [84]:
```
plt.scatter(x[y_kmeans==2, 0], x[y_kmeans==2, 1], s=100, c='green', label ='Clus
```

Out[84]: <matplotlib.collections.PathCollection at 0x182f0141890>



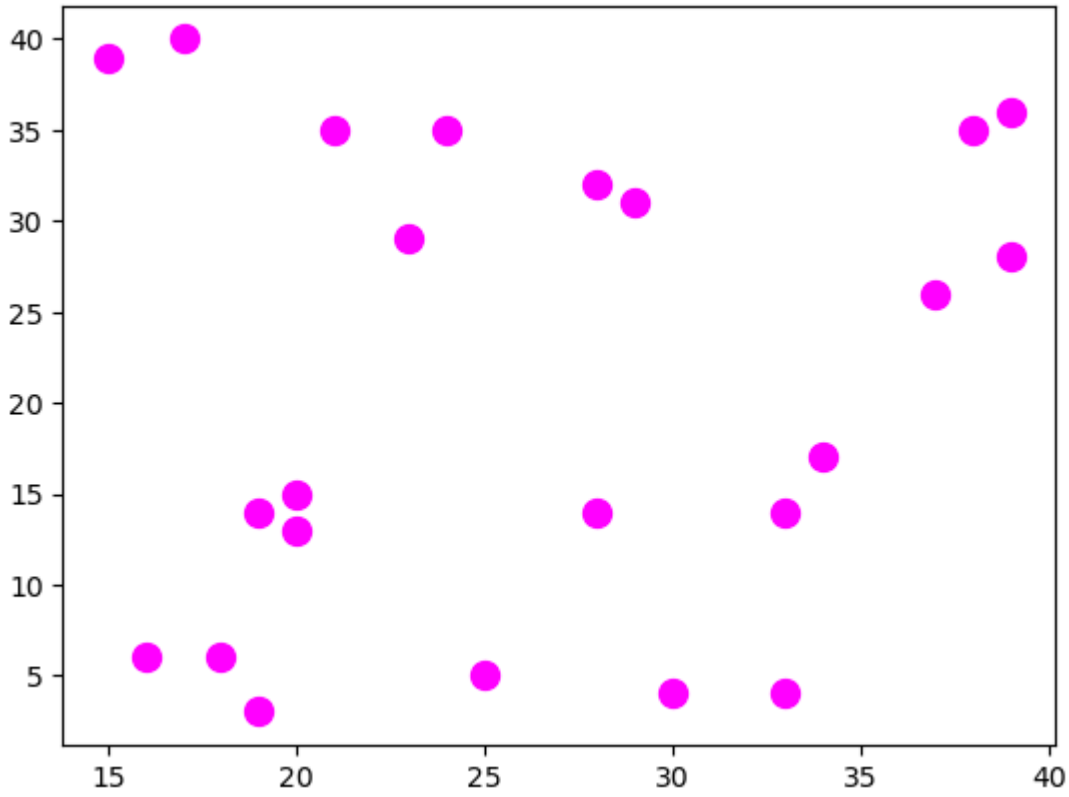
In [85]:
```
plt.scatter(x[y_kmeans==3, 0], x[y_kmeans==3, 1], s=100, c='cyan', label ='Clust
```

Out[85]: <matplotlib.collections.PathCollection at 0x182efff3590>



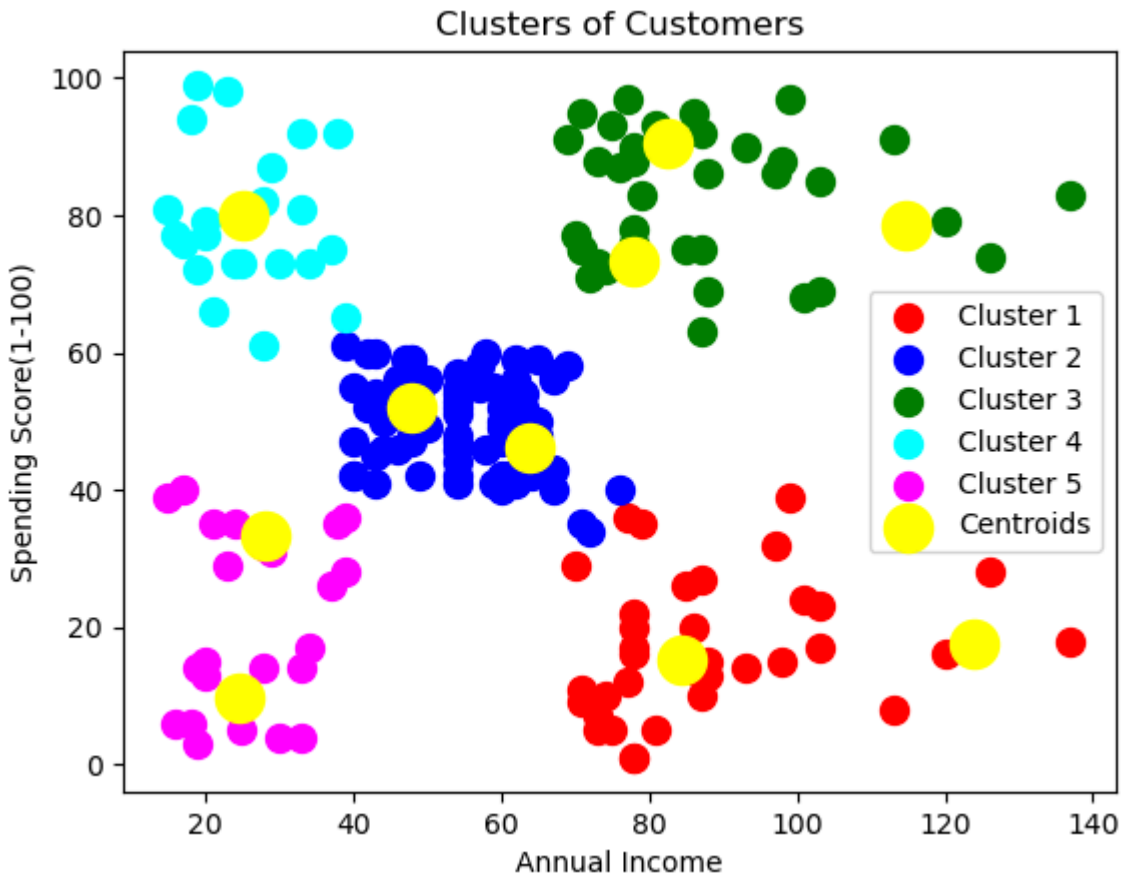
In [86]:
```
plt.scatter(x[y_kmeans==4, 0], x[y_kmeans==4, 1], s=100, c='magenta', label ='Cl
```

Out[86]: <matplotlib.collections.PathCollection at 0x182ef7ddfd0>



In [89]:
```
#6 Visualising the clusters
plt.scatter(x[y_kmeans==0, 0], x[y_kmeans==0, 1], s=100, c='red', label ='Cluste
plt.scatter(x[y_kmeans==1, 0], x[y_kmeans==1, 1], s=100, c='blue', label ='Clust
plt.scatter(x[y_kmeans==2, 0], x[y_kmeans==2, 1], s=100, c='green', label ='Clus
plt.scatter(x[y_kmeans==3, 0], x[y_kmeans==3, 1], s=100, c='cyan', label ='Clust
plt.scatter(x[y_kmeans==4, 0], x[y_kmeans==4, 1], s=100, c='magenta', label ='Cl

#Plot the centroid. This time we're going to use the cluster centres
#attribute that returns here the coordinates of the centroid.
plt.scatter(kmeans.cluster_centers_[:, 0], kmeans.cluster_centers_[:, 1], s=300,
plt.title('Clusters of Customers')
plt.xlabel('Annual Income')
plt.ylabel('Spending Score(1-100)')
plt.legend()
plt.show()
```


Clusters of Customers
Spending Score(1-100)
Annual Income
Cluster 1
Cluster 2
Cluster 3
Cluster 4
Cluster 5
Centroids
0
20
40
60
80
100
20
40
60
80
100
120
140

In [ ]: