In [15]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

import warnings
warnings.filterwarnings('ignore')
```

In [2]:
```
df = pd.read_csv("./Mall_Customers.csv")
```

In [3]:
```
df.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]:
```
df.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
```

In [7]:
```
df.describe()
```

Out[7]:

	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

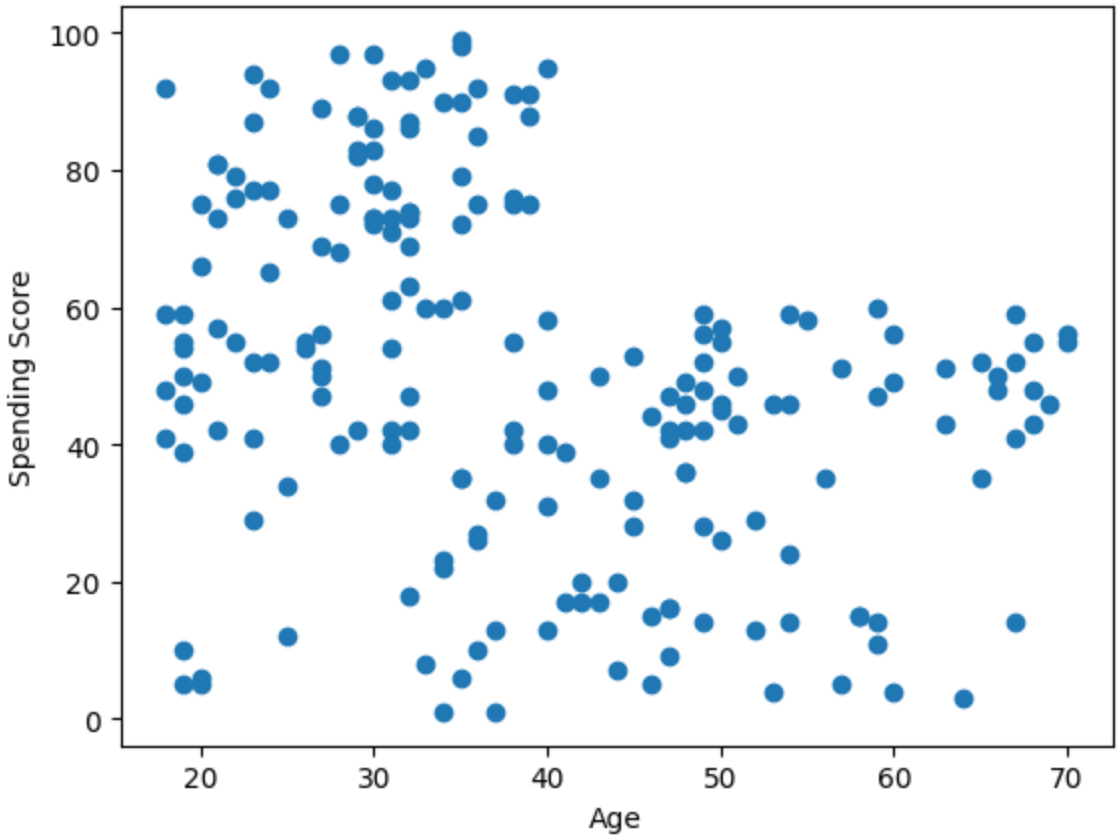
In [8]:
```
df.shape
```

Out[8]:
```
(200, 5)
```

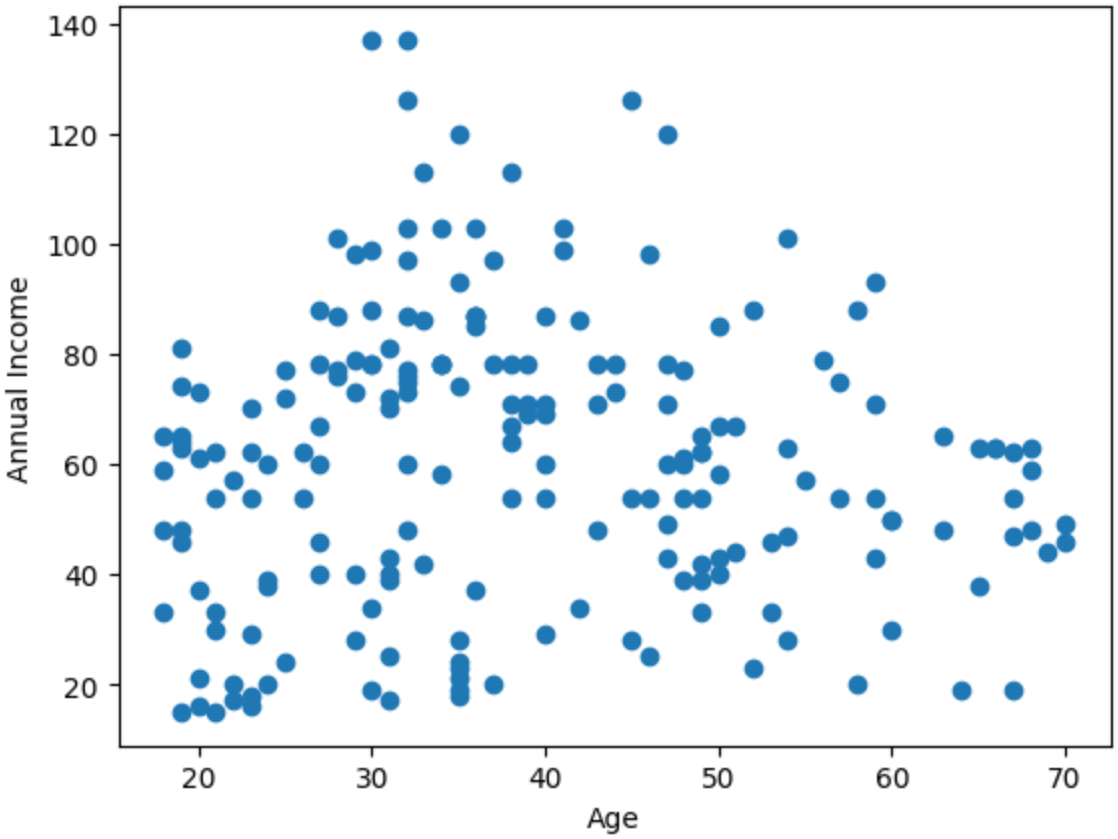
In [9]:
```
df.columns
```

Out[9]:
```
Index(['CustomerID', 'Gender', 'Age', 'Annual Income (k$)',
       'Spending Score (1-100)'],
      dtype='object')
```

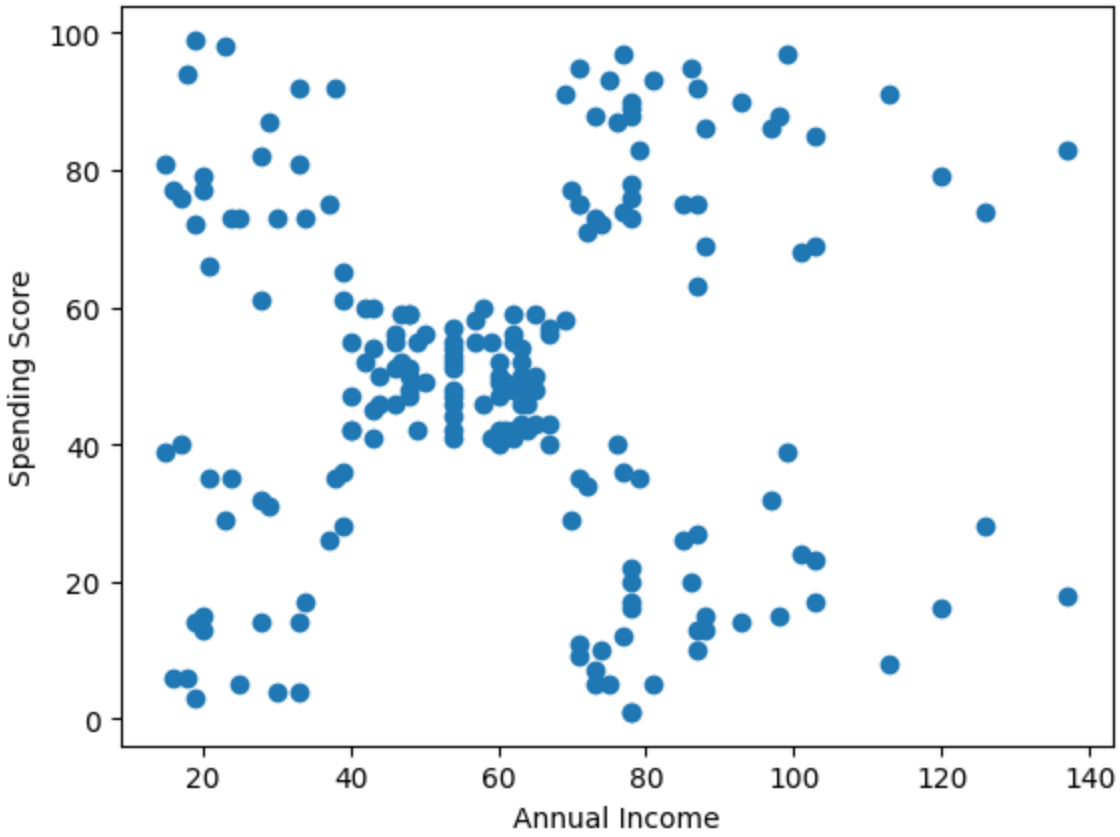
In [10]:
```
plt.scatter(df['Age'], df['Spending Score (1-100)'])
plt.xlabel('Age')
plt.ylabel('Spending Score')
plt.show()
```



In [11]:
```
plt.scatter(df['Age'], df['Annual Income (k$)'])
plt.xlabel('Age')
plt.ylabel('Annual Income')
plt.show()
```



In [12]:
```
plt.scatter(df['Annual Income (k$)'], df['Spending Score (1-100)'])
plt.xlabel('Annual Income')
plt.ylabel('Spending Score')
plt.show()
```



In [13]:
```
from sklearn.cluster import KMeans
```

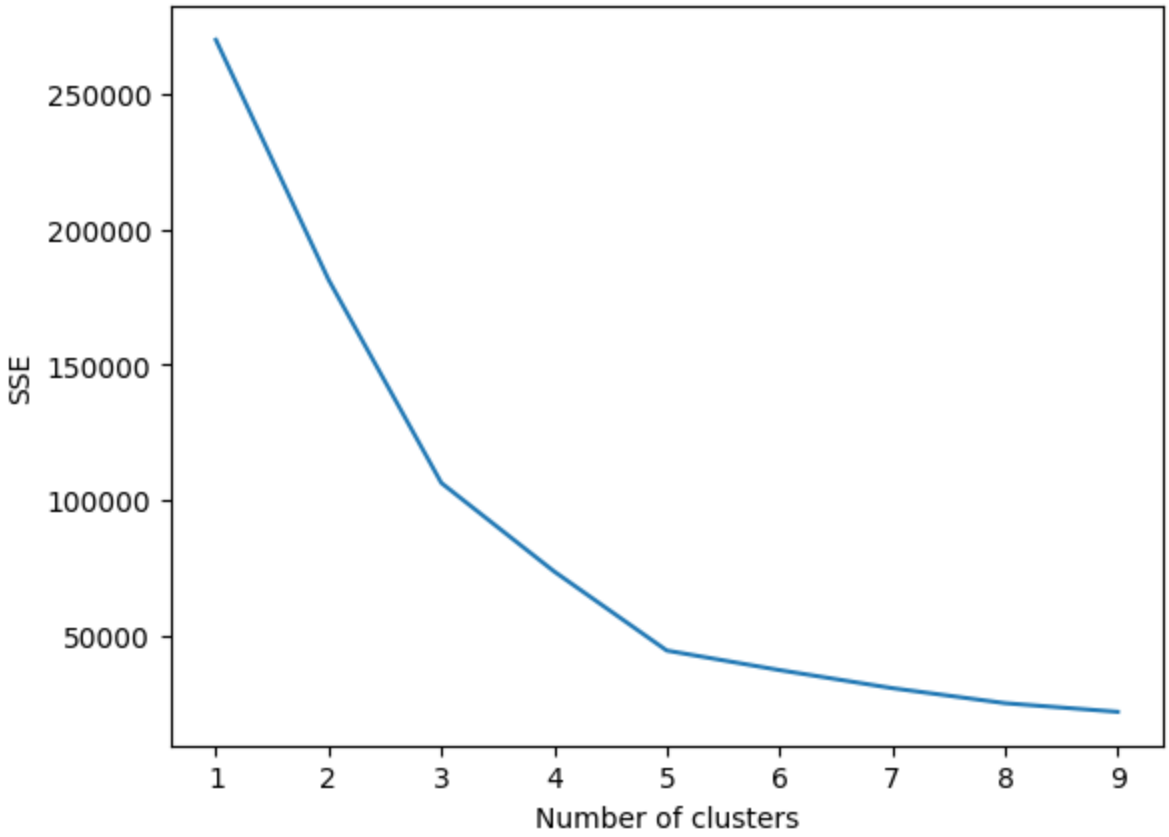
In [16]:
```
sse = []
for i in range(1, 10):
    km = KMeans(n_clusters =  i)
    km.fit(df[['Annual Income (k$)', 'Spending Score (1-100)']])
    sse.append(km.inertia_)
```

In [17]:
```
sse
```

Out[17]:
```
[269981.28,
 181363.59595959593,
 106348.37306211118,
 73679.78903948836,
 44448.45544793371,
 37233.81451071001,
 30566.45113025186,
 25018.781613414074,
 21818.11458845218]
```

In [18]:
```
plt.xlabel('Number of clusters')
plt.ylabel("SSE")
plt.plot(range(1,10), sse)
```

Out[18]:
```
[<matplotlib.lines.Line2D at 0x20679b02f10>]
```



In [19]:
```
km = KMeans(n_clusters = 5)
predicted = km.fit_predict(df[['Annual Income (k$)', 'Spending Score (1-100)']])
predicted
```

Out[19]:
```
array([2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4,
       2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 0,
       2, 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, 3, 1, 3, 0, 3, 1, 3, 1, 3,
       0, 3, 1, 3, 1, 3, 1, 3, 1, 3, 0, 3, 1, 3, 1, 3, 1, 3, 1, 3, 1, 3,
       1, 3, 1, 3, 1, 3, 1, 3, 1, 3, 1, 3, 1, 3, 1, 3, 1, 3, 1, 3, 1, 3,
       1, 3, 1, 3, 1, 3, 1, 3, 1, 3, 1, 3, 1, 3, 1, 3, 1, 3, 1, 3, 1, 3,
       1, 3])
```

In [20]:
```
df['Cluster'] = predicted
df
```

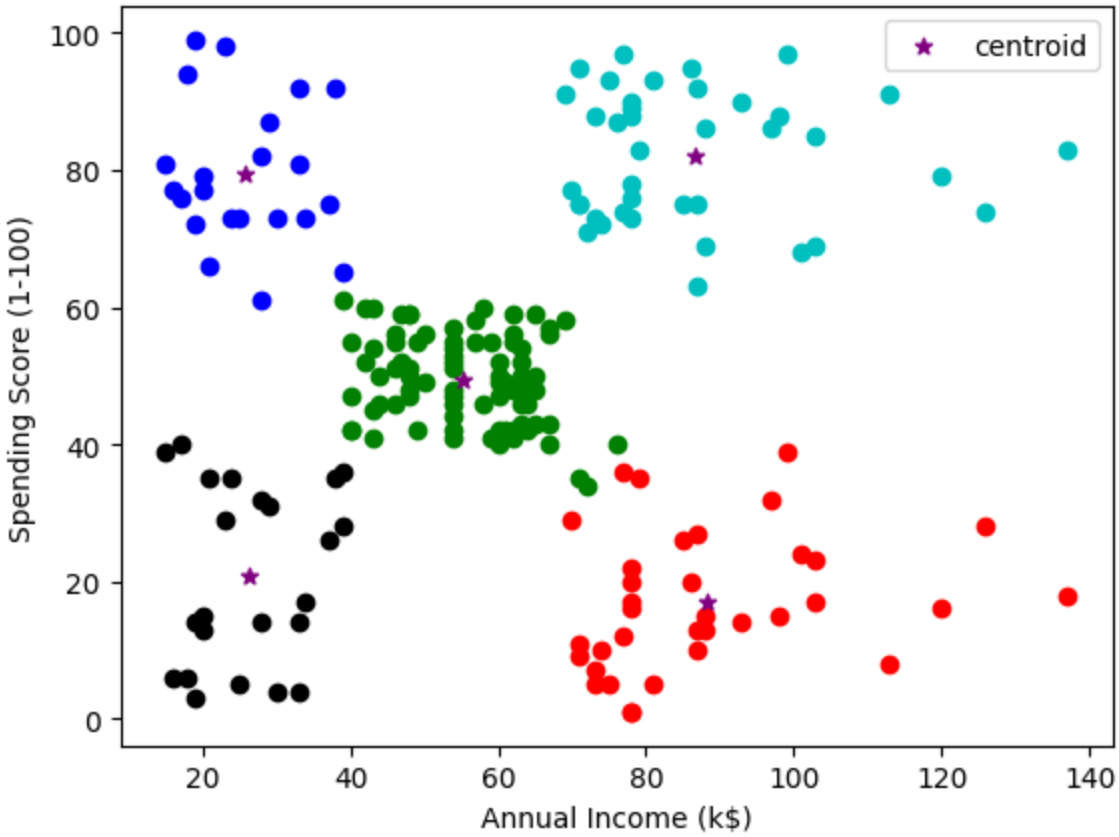
Out[20]:

	CustomerID	Gender	Age	Annual Income (k$)	Spending Score (1-100)	Cluster
0	1	Male	19	15	39	2
1	2	Male	21	15	81	4
2	3	Female	20	16	6	2
3	4	Female	23	16	77	4
4	5	Female	31	17	40	2
...	...	...	...	...	...	...
195	196	Female	35	120	79	3
196	197	Female	45	126	28	1
197	198	Male	32	126	74	3
198	199	Male	32	137	18	1
199	200	Male	30	137	83	3

200 rows × 6 columns

In [21]:
```
df1 = df[df.Cluster==0]
df2 = df[df.Cluster==1]
df3 = df[df.Cluster==2]
df4 = df[df.Cluster==3]
df5 = df[df.Cluster==4]
plt.scatter(df1['Annual Income (k$)'],df1['Spending Score (1-100)'],color='green')
plt.scatter(df2['Annual Income (k$)'],df2['Spending Score (1-100)'],color='red')
plt.scatter(df3['Annual Income (k$)'],df3['Spending Score (1-100)'],color='black')
plt.scatter(df4['Annual Income (k$)'],df4['Spending Score (1-100)'],color='c')
plt.scatter(df5['Annual Income (k$)'],df5['Spending Score (1-100)'],color='blue')
plt.scatter(km.cluster_centers_[:,0],km.cluster_centers_[:,1],color='purple',marker
plt.xlabel('Annual Income (k$)')
plt.ylabel('Spending Score (1-100)')
plt.legend()
```

Out[21]:
```
<matplotlib.legend.Legend at 0x2067c44e790>
```


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

In [ ]: