In [1]:
```
import pandas as pd
from matplotlib import pyplot as plt
%matplotlib inline
```

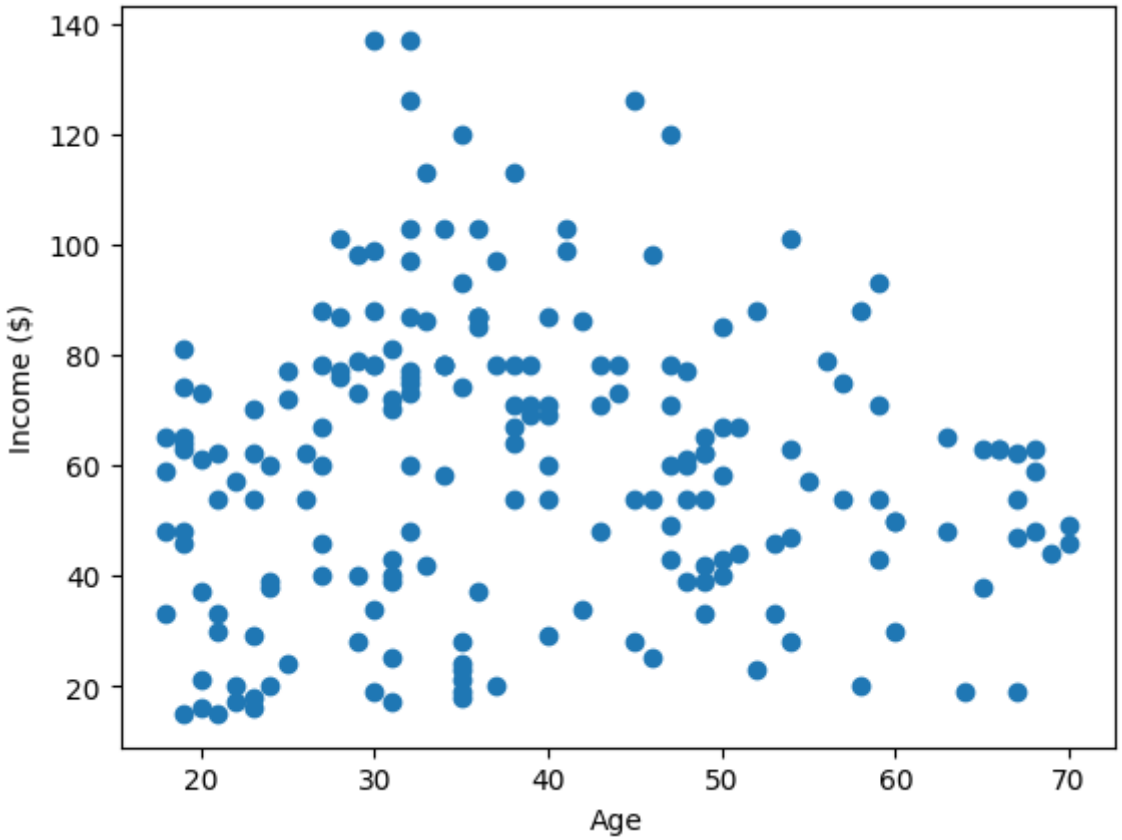
In [2]:
```
df=pd.read_csv(r"C:\Users\LENOVO\Downloads\Income.csv")
df.head()
```

Out[2]:

	Gender	Age	Income($)
0	Male	19	15
1	Male	21	15
2	Female	20	16
3	Female	23	16
4	Female	31	17

In [3]:
```
plt.scatter(df["Age"],df["Income($)"])
plt.xlabel("Age")
plt.ylabel("Income ($)")
```

Out[3]:
```
Text(0, 0.5, 'Income ($)')
```



In [4]:
```
from sklearn.cluster import KMeans
```

In [5]:
```
km=KMeans()
km
```

Out[5]:
```
KMeans()
```

In [6]:
```
y_predicted=km.fit_predict(df[["Age","Income($)"]])
y_predicted
```

```
C:\Users\LENOVO\AppData\Local\Programs\Python\Python311\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(
```

Out[6]:
```
array([3, 3, 3, 3, 3, 3, 3, 3, 0, 3, 0, 3, 0, 3, 3, 3, 3, 3, 0, 3, 3, 3,
       0, 3, 0, 3, 0, 3, 0, 3, 0, 3, 0, 7, 0, 7, 0, 7, 7, 7, 0, 7, 0, 7,
       0, 7, 0, 7, 7, 7, 0, 7, 7, 0, 0, 0, 0, 6, 7, 0, 6, 7, 6, 0, 6, 7,
       0, 6, 7, 7, 6, 0, 6, 6, 6, 7, 5, 5, 7, 5, 6, 5, 6, 5, 7, 5, 6, 2,
       5, 5, 6, 2, 5, 5, 2, 2, 5, 2, 5, 2, 2, 5, 6, 2, 5, 2, 6, 5, 6, 6,
       6, 2, 5, 2, 2, 2, 6, 5, 5, 5, 2, 5, 5, 5, 2, 2, 5, 5, 5, 5, 5, 5,
       2, 2, 2, 2, 5, 2, 2, 2, 5, 2, 2, 2, 2, 2, 5, 2, 2, 2, 5, 5, 5, 2,
       5, 2, 2, 2, 2, 2, 5, 2, 2, 2, 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, 4, 4, 4, 4, 4, 4,
       4, 4])
```

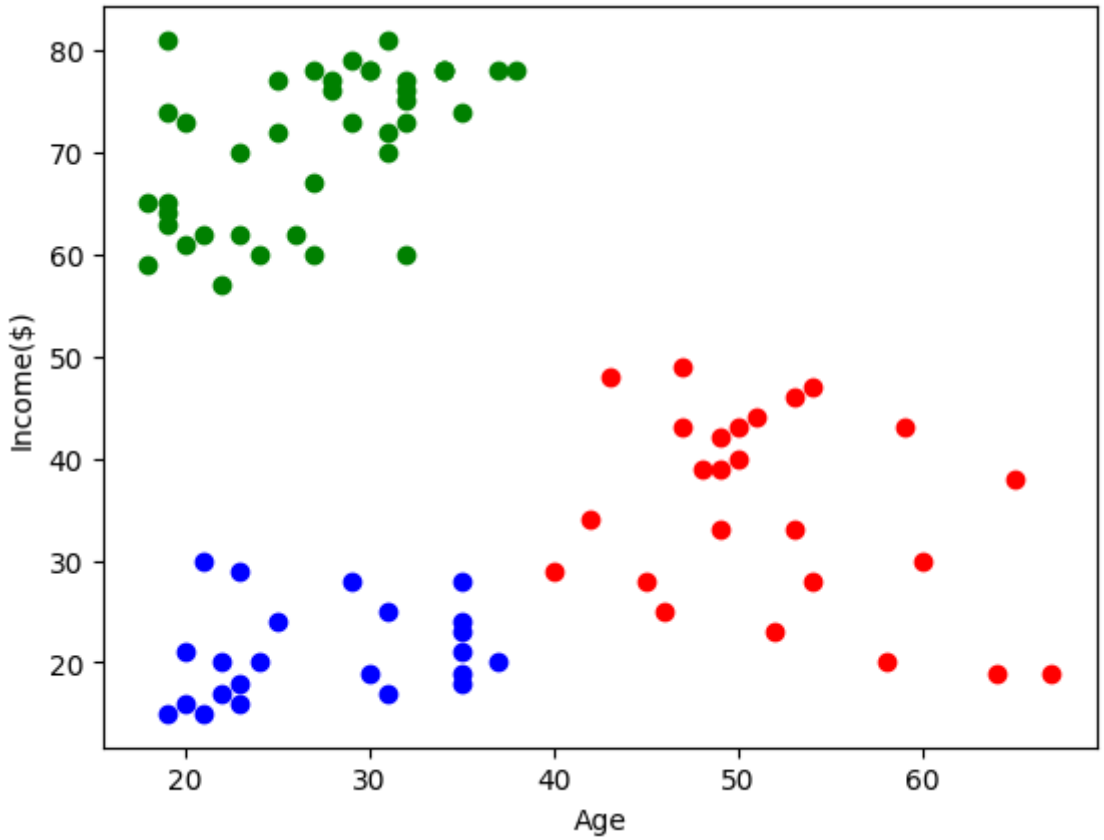
In [7]:
```
df["Cluster"]=y_predicted
df.head()
```

Out[7]:

	Gender	Age	Income($)	Cluster
0	Male	19	15	3
1	Male	21	15	3
2	Female	20	16	3
3	Female	23	16	3
4	Female	31	17	3

In [8]:
```
df1=df[df.Cluster==0]
df2=df[df.Cluster==2]
df3=df[df.Cluster==3]
plt.scatter(df1["Age"],df1["Income($)"],color="red")
plt.scatter(df2["Age"],df2["Income($)"],color="green")
plt.scatter(df3["Age"],df3["Income($)"],color="blue")
plt.xlabel("Age")
plt.ylabel("Income($)")
```

Out[8]:
```
Text(0, 0.5, 'Income($)')
```



In [9]:
```
from sklearn.preprocessing import MinMaxScaler
```

In [10]:
```
scaler=MinMaxScaler()
```

In [11]:
```
scaler.fit(df[["Income($)"]])
df["Income($)"]=scaler.transform(df[["Income($)"]])
df.head()
```

Out[11]:

	Gender	Age	Income($)	Cluster
0	Male	19	0.000000	3
1	Male	21	0.000000	3
2	Female	20	0.008197	3
3	Female	23	0.008197	3
4	Female	31	0.016393	3

In [12]:
```
scaler.fit(df[["Age"]])
df["Age"]=scaler.transform(df[["Age"]])
df.head()
```

Out[12]:

	Gender	Age	Income($)	Cluster
0	Male	0.019231	0.000000	3
1	Male	0.057692	0.000000	3
2	Female	0.038462	0.008197	3
3	Female	0.096154	0.008197	3
4	Female	0.250000	0.016393	3

In [13]:
```
km=KMeans()
```

In [14]:
```
y_predicted=km.fit_predict(df[["Age","Income($)"]])
y_predicted
```

```
C:\Users\LENOVO\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\cluster\_kmeans.py:870: FutureWarni
ng: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to suppr
ess the warning
  warnings.warn(
```

Out[14]:
```
array([3, 3, 3, 3, 7, 3, 7, 3, 4, 7, 4, 7, 0, 3, 7, 3, 7, 3, 0, 7, 7, 3,
       0, 7, 0, 7, 0, 7, 7, 3, 4, 3, 0, 3, 0, 3, 0, 7, 7, 3, 4, 3, 0, 7,
       0, 3, 0, 7, 7, 7, 0, 7, 7, 4, 0, 0, 0, 4, 7, 0, 4, 6, 4, 0, 4, 6,
       0, 4, 6, 7, 4, 0, 4, 4, 4, 6, 0, 0, 6, 0, 4, 1, 4, 0, 6, 0, 2, 6,
       1, 2, 4, 6, 2, 1, 1, 6, 2, 6, 2, 6, 6, 2, 4, 6, 2, 6, 4, 2, 4, 4,
       4, 6, 1, 6, 6, 6, 4, 2, 2, 2, 6, 1, 1, 1, 6, 1, 2, 1, 2, 1, 2, 1,
       6, 1, 6, 1, 2, 1, 6, 1, 2, 1, 1, 1, 6, 1, 2, 1, 1, 1, 2, 1, 2, 1,
       2, 1, 1, 1, 1, 1, 2, 1, 6, 1, 2, 1, 1, 1, 1, 1, 1, 1, 1, 2, 1,
       2, 1, 2, 1, 5, 5, 5, 5, 5, 5, 2, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5,
       5, 5])
```

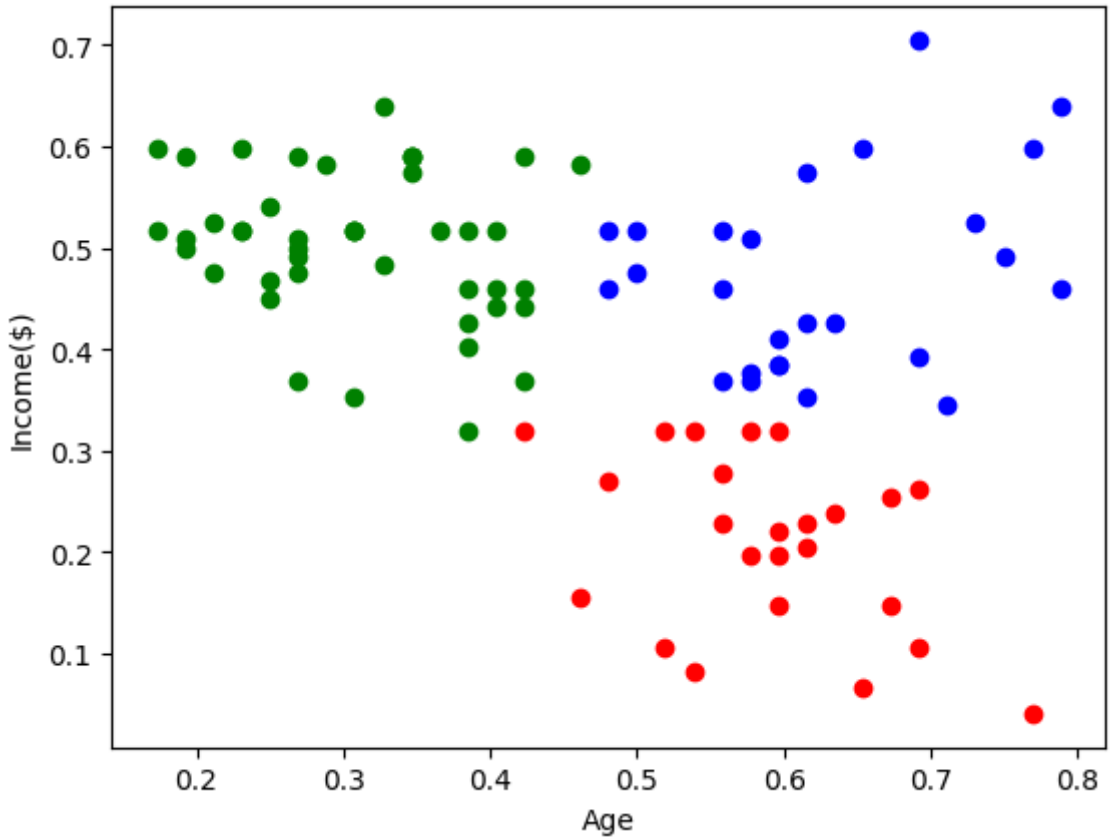
In [15]:
```
df["New Cluster"]=y_predicted
df.head()
```

Out[15]:

	Gender	Age	Income($)	Cluster	New Cluster
0	Male	0.019231	0.000000	3	3
1	Male	0.057692	0.000000	3	3
2	Female	0.038462	0.008197	3	3
3	Female	0.096154	0.008197	3	3
4	Female	0.250000	0.016393	3	7

In [16]:
```
df1=df[df["New Cluster"]==0]
df2=df[df["New Cluster"]==1]
df3=df[df["New Cluster"]==2]
plt.scatter(df1["Age"],df1["Income($)"],color="red")
plt.scatter(df2["Age"],df2["Income($)"],color="green")
plt.scatter(df3["Age"],df3["Income($)"],color="blue")
plt.xlabel("Age")
plt.ylabel("Income($)")
```

Out[16]:
```
Text(0, 0.5, 'Income($)')
```

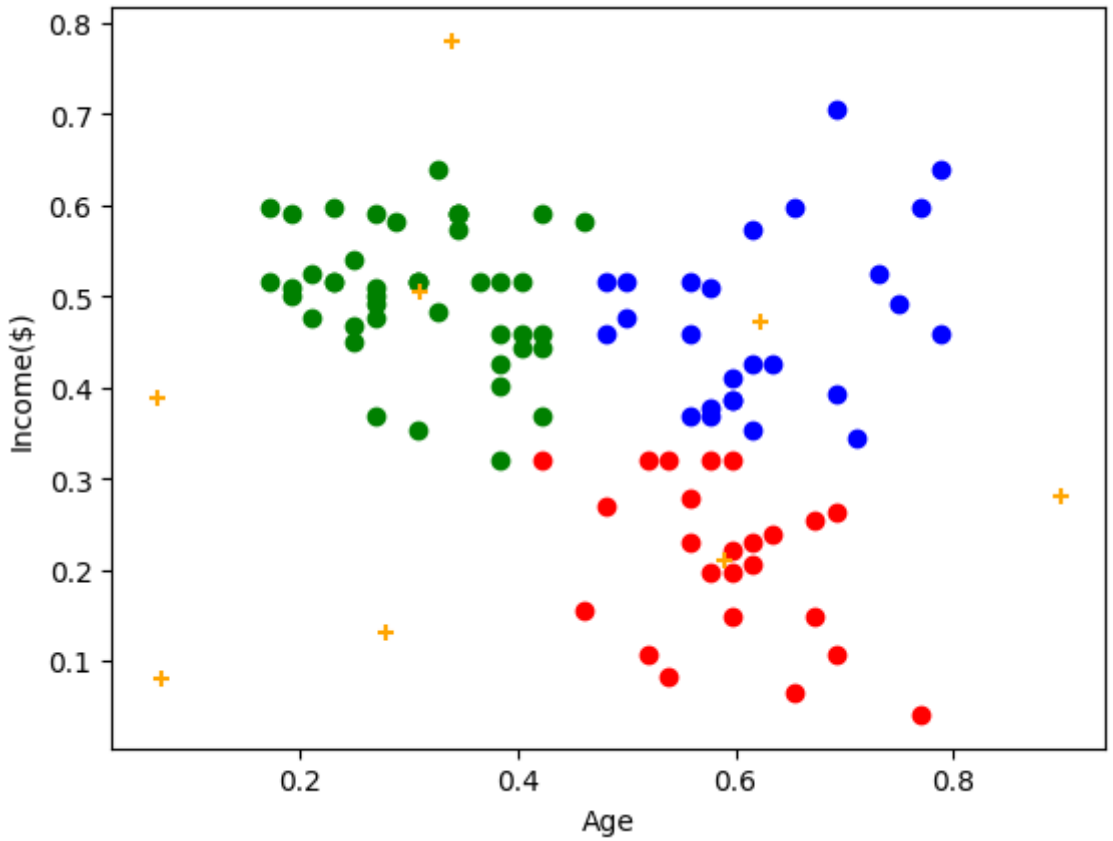


In [17]:
```
km.cluster_centers_
```

Out[17]:
```
array([[0.58974359, 0.20969945],
       [0.30944056, 0.50428465],
       [0.62352071, 0.47225725],
       [0.07239819, 0.08003857],
       [0.89799331, 0.28011404],
       [0.34008097, 0.77998274],
       [0.06923077, 0.38786885],
       [0.27884615, 0.13040238]])
```

In [18]:
```
df1=df[df["New Cluster"]==0]
df2=df[df["New Cluster"]==1]
df3=df[df["New Cluster"]==2]
plt.scatter(df1["Age"],df1["Income($)"],color="red")
plt.scatter(df2["Age"],df2["Income($)"],color="green")
plt.scatter(df3["Age"],df3["Income($)"],color="blue")
plt.scatter(km.cluster_centers_[:,0],km.cluster_centers_[:,1],color="orange",marker="+")
plt.xlabel("Age")
plt.ylabel("Income($)")
```

Out[18]:
```
Text(0, 0.5, 'Income($)')
```



In [19]:
```
k_rng=range(1,10)
sse=[]
```

In [20]:
```
for k in k_rng:
 km=KMeans(n_clusters=k)
 km.fit(df[["Age","Income($)"]])
 sse.append(km.inertia_)
#km.inertia_ will give you the value of sum of square errorprint(sse)
plt.plot(k_rng,sse)
plt.xlabel("K")
plt.ylabel("Sum of Squared Error")
```

```
C:\Users\LENOVO\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\cluster\_kmeans.py:870: FutureWarni
ng: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to suppr
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  warnings.warn(
C:\Users\LENOVO\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\cluster\_kmeans.py:870: FutureWarni
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C:\Users\LENOVO\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\cluster\_kmeans.py:870: FutureWarni
ng: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to suppr
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  warnings.warn(
C:\Users\LENOVO\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\cluster\_kmeans.py:870: FutureWarni
ng: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to suppr
ess the warning
  warnings.warn(
```
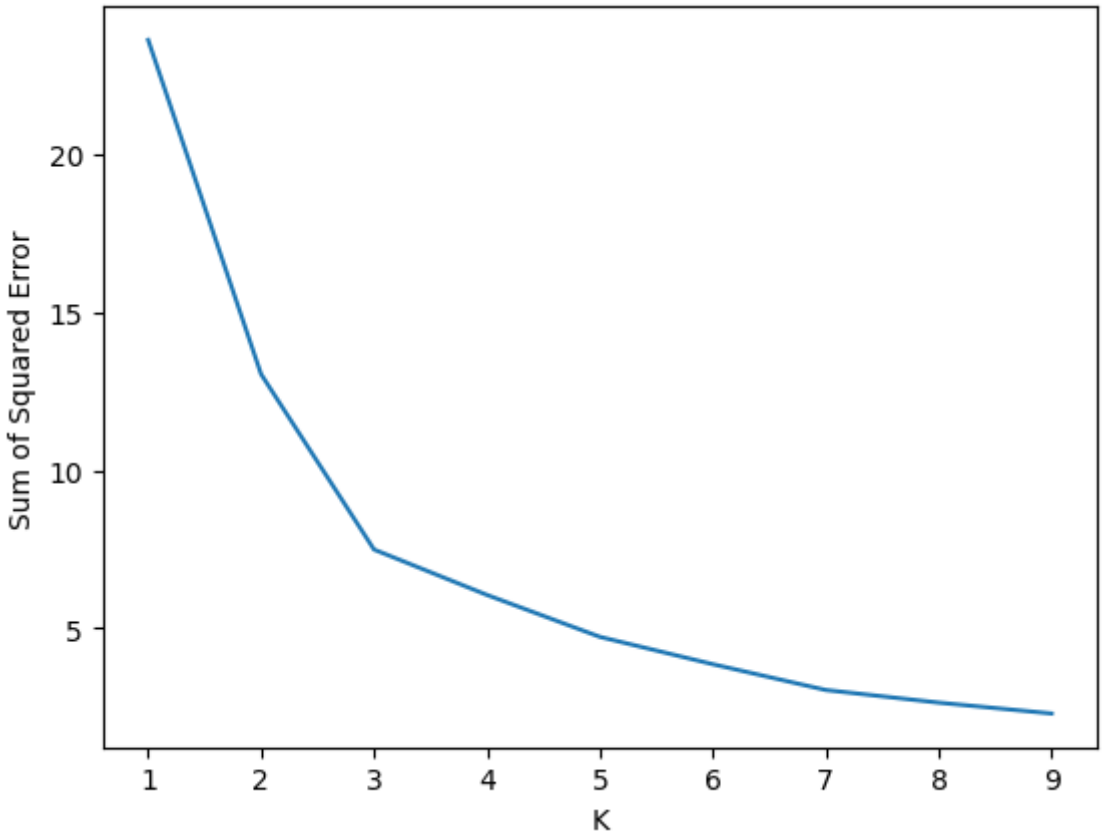

Out[20]:
```
Text(0, 0.5, 'Sum of Squared Error')
```



In [ ]: