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

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

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
...	...	...	...
195	Female	35	120
196	Female	45	126
197	Male	32	126
198	Male	32	137
199	Male	30	137

200 rows × 3 columns

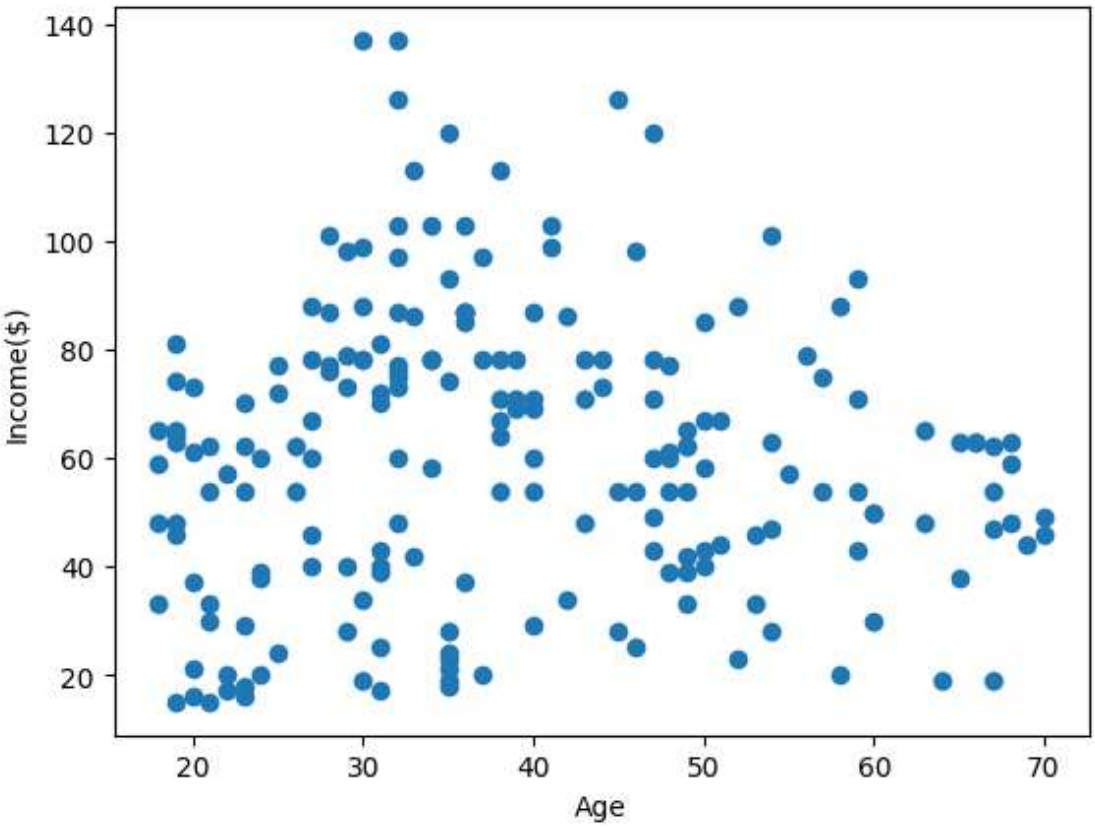
In [3]:
```
df.head()
```

Out[3]:

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

In [4]:
```
plt.scatter(df["Age"],df["Income($)"])
plt.xlabel("Age")
plt.ylabel("Income($)")
```

Out[4]:
```
Text(0, 0.5, 'Income($)')
```



In [5]:
```
from sklearn.cluster import KMeans
km=KMeans()
km
```

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

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

```
C:\Users\Ajay Reddy\AppData\Local\Programs\Python\Python311\Lib\site-pac
kages\sklearn\cluster\_kmeans.py:870: FutureWarning: The default value o
f `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_ini
t` explicitly to suppress the warning
  warnings.warn(
```

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

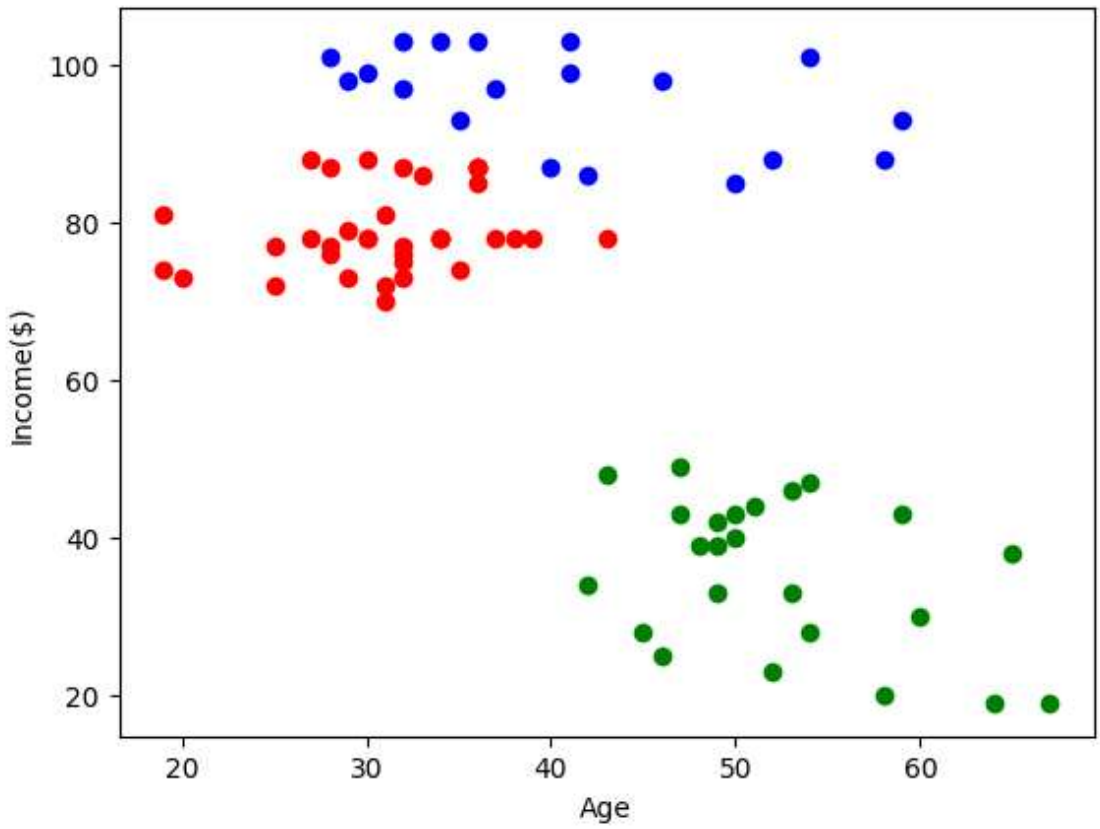
In [7]:
```
df["cluster"]=y_predicted
df.head()
```

Out[7]:

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

In [8]:
```
df1=df[df.cluster==0]
df2=df[df.cluster==1]
df3=df[df.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[8]:
```
Text(0, 0.5, 'Income($)')
```



In [9]:
```
from sklearn.preprocessing import MinMaxScaler
scaler=MinMaxScaler()
scaler.fit(df[["Income($)"]])
df["Income($)"]=scaler.transform(df[["Income($)"]])
df.head()
```

Out[9]:

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

In [10]:
```
scaler.fit(df[["Age"]])
df["Age"]=scaler.transform(df[["Age"]])
df.head()
```

Out[10]:

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

In [12]:
```
km=KMeans()
```

In [13]:
```
y_predicted=km.fit_predict(df[["Age","Income($)"]])
y_predicted
```

```
C:\Users\Ajay Reddy\AppData\Local\Programs\Python\Python311\Lib\site-pac
kages\sklearn\cluster\_kmeans.py:870: FutureWarning: The default value o
f `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_ini
t` explicitly to suppress the warning
  warnings.warn(
```

Out[13]:
```
array([7, 7, 7, 7, 3, 7, 3, 7, 0, 3, 0, 3, 0, 7, 3, 7, 3, 7, 2, 3, 3, 7,
       2, 3, 2, 3, 2, 3, 3, 7, 0, 7, 2, 7, 2, 7, 2, 3, 3, 7, 0, 7, 2, 3,
       2, 7, 2, 3, 3, 3, 2, 3, 3, 0, 2, 2, 2, 0, 5, 2, 0, 5, 0, 2, 0, 5,
       2, 0, 5, 3, 0, 2, 0, 0, 0, 5, 2, 2, 5, 2, 0, 1, 0, 2, 5, 2, 2, 5,
       1, 2, 0, 5, 2, 1, 1, 5, 2, 5, 2, 5, 5, 2, 0, 5, 2, 5, 0, 6, 0, 0,
       0, 5, 1, 5, 5, 5, 0, 6, 6, 6, 5, 1, 1, 1, 5, 1, 6, 1, 6, 1, 6, 1,
       5, 1, 5, 1, 6, 1, 5, 1, 6, 1, 1, 1, 5, 1, 6, 1, 1, 1, 6, 1, 6, 1,
       6, 1, 1, 1, 1, 1, 6, 1, 5, 1, 6, 1, 6, 1, 1, 1, 1, 1, 1, 1, 6, 1,
       6, 1, 6, 1, 4, 4, 6, 4, 4, 4, 6, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4,
       4, 4])
```

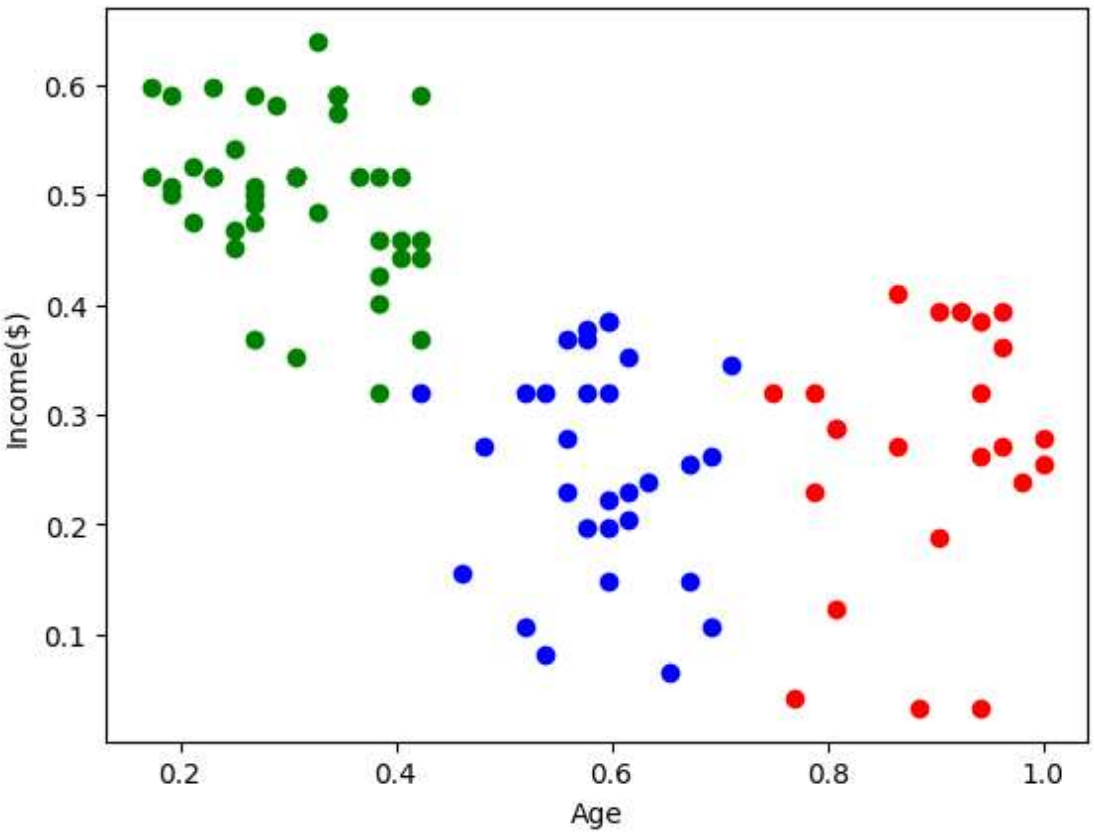
In [14]:
```
df["New Cluster"]=y_predicted
df.head()
```

Out[14]:

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

In [15]:
```
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[15]:
```
Text(0, 0.5, 'Income($)')
```



In [16]:
```
km.cluster_centers_
```

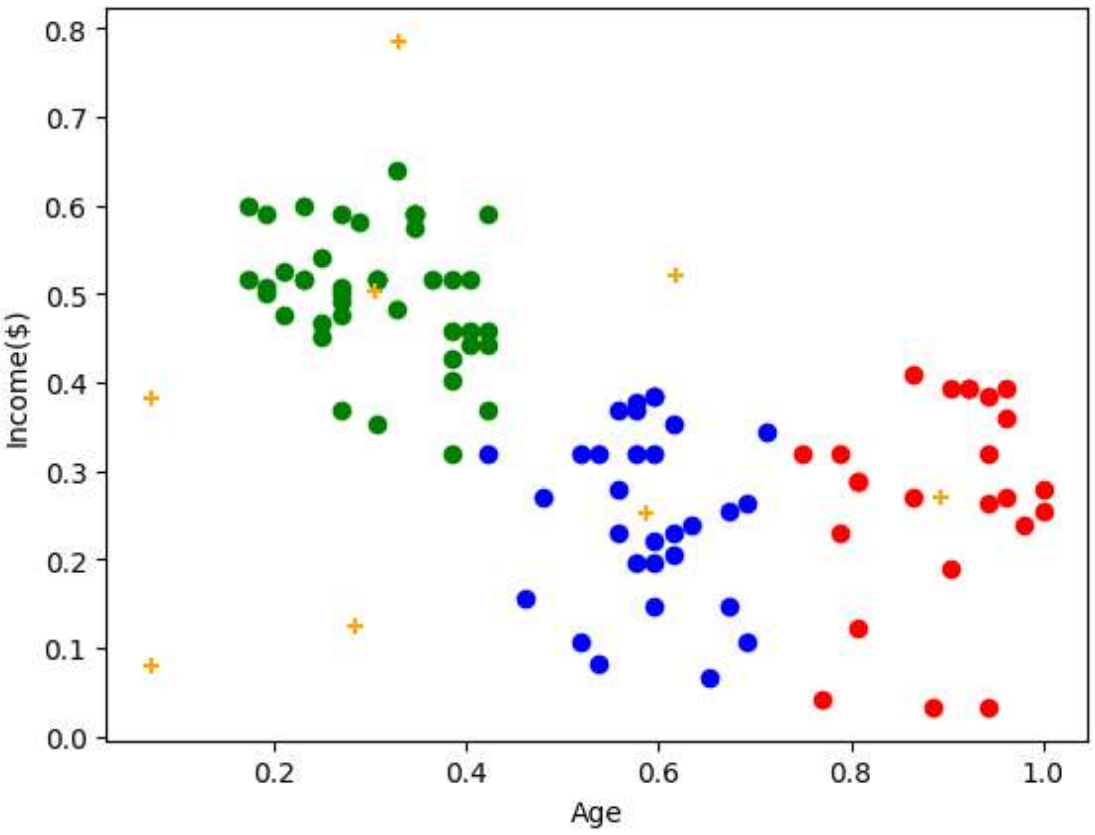
Out[16]:
```
array([[0.89262821, 0.27015027],
       [0.3059034 , 0.50247808],
       [0.58717949, 0.25245902],
       [0.28388278, 0.1245121 ],
       [0.32905983, 0.78551913],
       [0.07322485, 0.38272383],
       [0.61813187, 0.52185792],
       [0.07239819, 0.08003857]])
```

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

Out[17]:
```
array([[0.89262821, 0.27015027],
       [0.3059034 , 0.50247808],
       [0.58717949, 0.25245902],
       [0.28388278, 0.1245121 ],
       [0.32905983, 0.78551913],
       [0.07322485, 0.38272383],
       [0.61813187, 0.52185792],
       [0.07239819, 0.08003857]])
```

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($)"],color="blue")
plt.scatter(km.cluster_centers_[:,0],km.cluster_centers_[:,1],color="orang
plt.xlabel("Age")
plt.ylabel("Income($)")
```

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



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

In [21]:

```
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 error
print(sse)
plt.plot(k_rng,sse)
plt.xlabel("K")
plt.ylabel("Sum of Squared Error")
```

```
C:\Users\Ajay Reddy\AppData\Local\Programs\Python\Python311\Lib\site-pac
kages\sklearn\cluster\_kmeans.py:870: FutureWarning: The default value o
f `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_ini
t` explicitly to suppress the warning
  warnings.warn(
C:\Users\Ajay Reddy\AppData\Local\Programs\Python\Python311\Lib\site-pac
kages\sklearn\cluster\_kmeans.py:870: FutureWarning: The default value o
f `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_ini
t` explicitly to suppress the warning
  warnings.warn(
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kages\sklearn\cluster\_kmeans.py:870: FutureWarning: The default value o
f `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_ini
t` explicitly to suppress the warning
  warnings.warn(
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kages\sklearn\cluster\_kmeans.py:870: FutureWarning: The default value o
f `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_ini
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kages\sklearn\cluster\_kmeans.py:870: FutureWarning: The default value o
f `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_ini
t` explicitly to suppress the warning
  warnings.warn(
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kages\sklearn\cluster\_kmeans.py:870: FutureWarning: The default value o
f `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_ini
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C:\Users\Ajay Reddy\AppData\Local\Programs\Python\Python311\Lib\site-pac
kages\sklearn\cluster\_kmeans.py:870: FutureWarning: The default value o
f `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_ini
t` explicitly to suppress the warning
  warnings.warn(

[23.583906150363607, 13.028938428018286, 7.492113413237458, 6.0583724533
53154, 4.738918324790584, 3.863114332829242, 3.0547174363693586, 2.64821
68727909814, 2.3301075323423235]
```
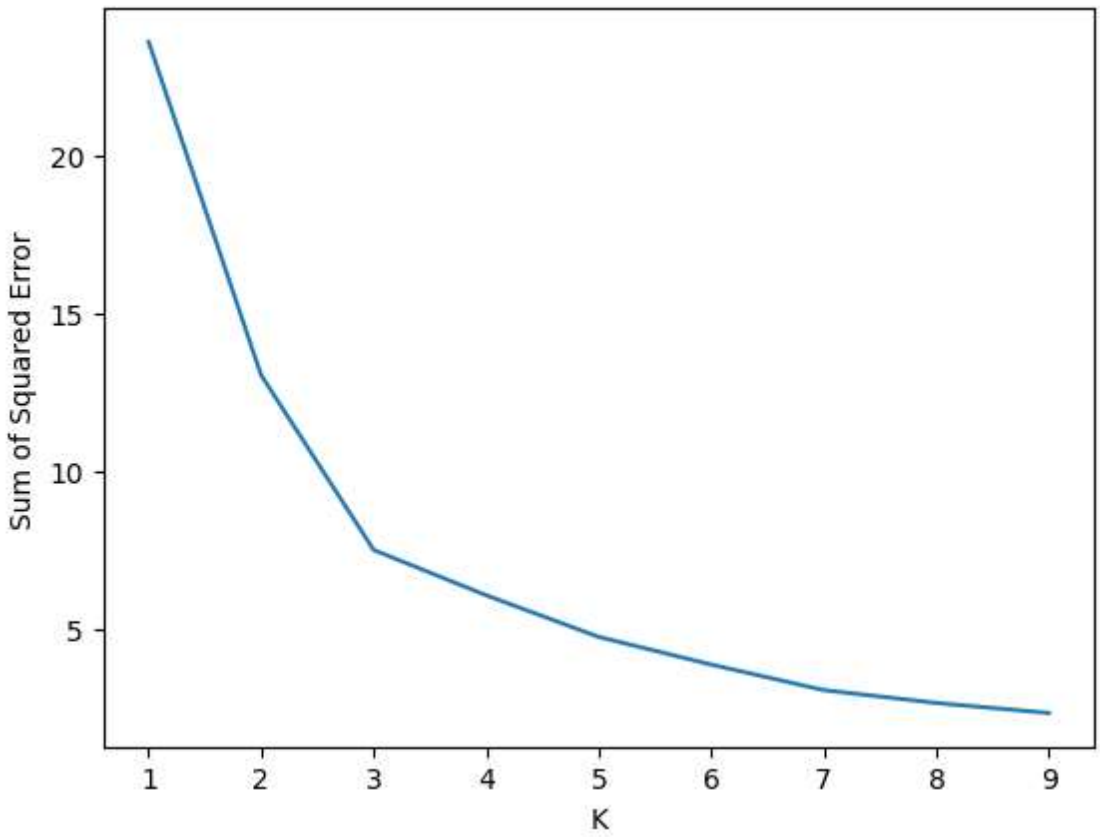

```
C:\Users\Ajay Reddy\AppData\Local\Programs\Python\Python311\Lib\site-pac
kages\sklearn\cluster\_kmeans.py:870: FutureWarning: The default value o
f `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_ini
t` explicitly to suppress the warning
  warnings.warn(
C:\Users\Ajay Reddy\AppData\Local\Programs\Python\Python311\Lib\site-pac
kages\sklearn\cluster\_kmeans.py:870: FutureWarning: The default value o
f `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_ini
t` explicitly to suppress the warning
  warnings.warn(
```

Out[21]: Text(0, 0.5, 'Sum of Squared Error')



In [ ]: