In [1]:
```
#Ayush Sharma 209303312
#Python code to implement Decision tree classifier.
from sklearn.cluster import KMeans
import pandas as pd
from sklearn.preprocessing import MinMaxScaler
from matplotlib import pyplot as plt
```

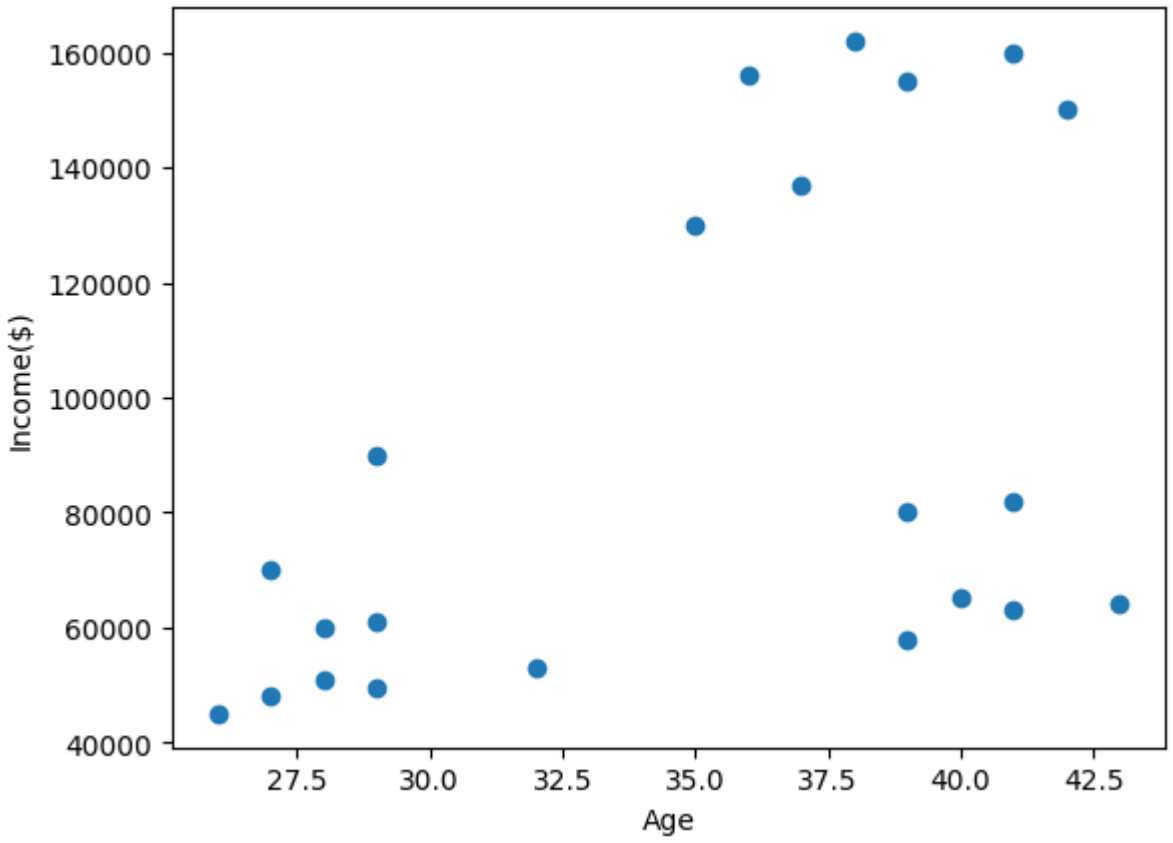
In [2]:
```
url=("https://raw.githubusercontent.com/codebasics/py/master/ML/13_kmeans/income.cs
df = pd.read_csv(url)
df.head()
```

Out[2]:

	Name	Age	Income($)
0	Rob	27	70000
1	Michael	29	90000
2	Mohan	29	61000
3	Ismail	28	60000
4	Kory	42	150000

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

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



In [4]:
```
km = KMeans(n_clusters=3)
y_predicted = km.fit_predict(df[['Age','Income($)']])
y_predicted
df['cluster']=y_predicted
df.head()
```

Out[4]:

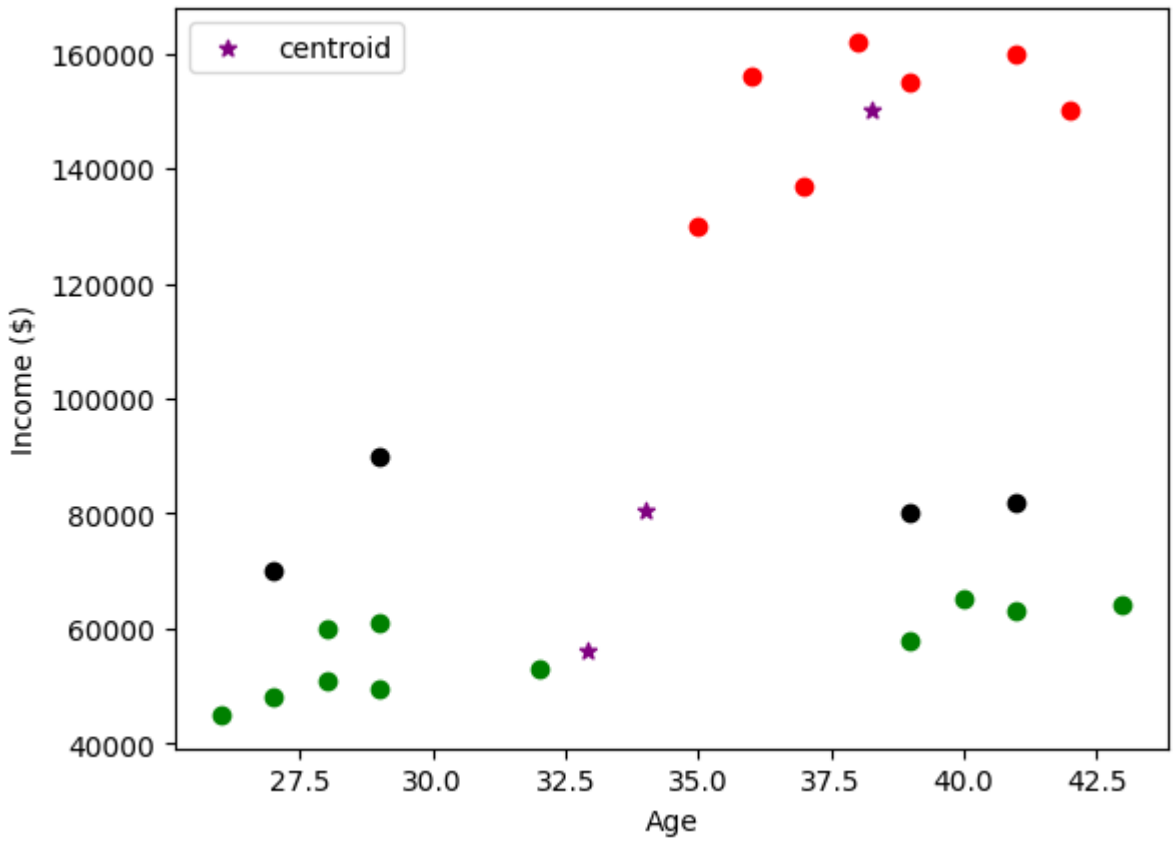
	Name	Age	Income($)	cluster
0	Rob	27	70000	2
1	Michael	29	90000	2
2	Mohan	29	61000	0
3	Ismail	28	60000	0
4	Kory	42	150000	1

In [5]:
```
km.cluster_centers_
```

Out[5]:
```
array([[3.29090909e+01, 5.61363636e+04],
       [3.82857143e+01, 1.50000000e+05],
       [3.40000000e+01, 8.05000000e+04]])
```

In [6]:
```
df1 = df[df.cluster==0]
df2 = df[df.cluster==1]
df3 = df[df.cluster==2]
plt.scatter(df1.Age,df1['Income($)'],color='green')
plt.scatter(df2.Age,df2['Income($)'],color='red')
plt.scatter(df3.Age,df3['Income($)'],color='black')
plt.scatter(km.cluster_centers_[:,0],km.cluster_centers_[:,1],color='purple',marker
plt.xlabel('Age')
plt.ylabel('Income ($)')
plt.legend()
```

Out[6]:
```
<matplotlib.legend.Legend at 0x217067b75b0>
```



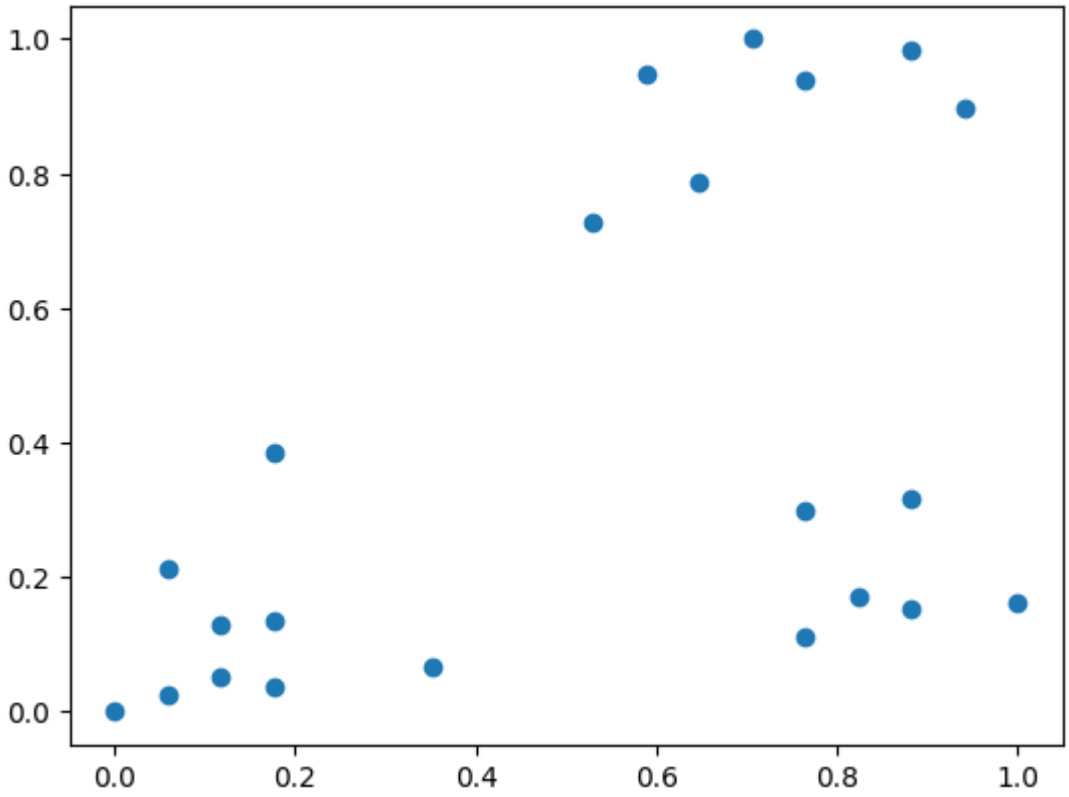
In [7]:
```
scaler = MinMaxScaler()
scaler.fit(df[['Income($)']])
df['Income($)'] = scaler.transform(df[['Income($)']])
scaler.fit(df[['Age']])
df['Age'] = scaler.transform(df[['Age']])
df.head()
```

Out[7]:

	Name	Age	Income($)	cluster
0	Rob	0.058824	0.213675	2
1	Michael	0.176471	0.384615	2
2	Mohan	0.176471	0.136752	0
3	Ismail	0.117647	0.128205	0
4	Kory	0.941176	0.897436	1

In [9]:
```
plt.scatter(df.Age,df['Income($)'])
```

Out[9]:
```
<matplotlib.collections.PathCollection at 0x21708b29030>
```



In [10]:
```
km = KMeans(n_clusters=3)
y_predicted = km.fit_predict(df[['Age','Income($)']])
y_predicted
```

Out[10]:
```
array([1, 1, 1, 1, 2, 2, 2, 2, 2, 2, 2, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0])
```

In [11]:
```
km.cluster_centers_
```

Out[11]:
```
array([[0.85294118, 0.2022792 ],
       [0.1372549 , 0.11633428],
       [0.72268908, 0.8974359 ]])
```

In [12]:
```
df['cluster']=y_predicted
df.head()
```

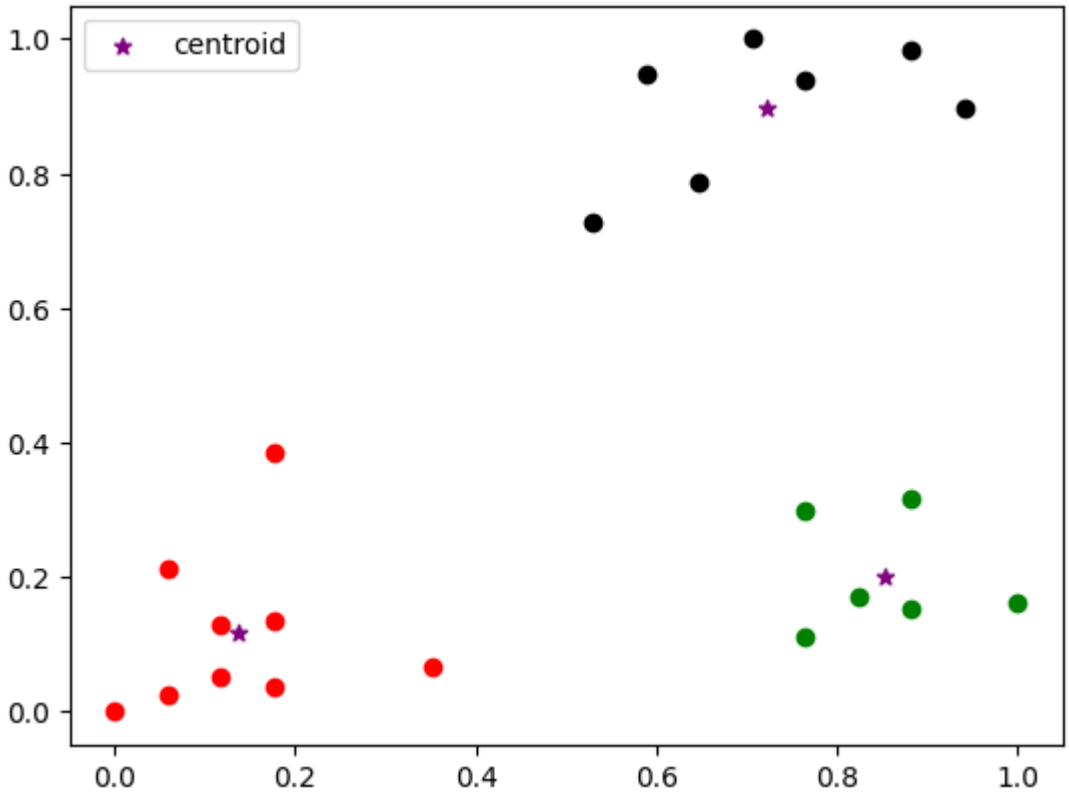
Out[12]:

	Name	Age	Income($)	cluster
0	Rob	0.058824	0.213675	1
1	Michael	0.176471	0.384615	1
2	Mohan	0.176471	0.136752	1
3	Ismail	0.117647	0.128205	1
4	Kory	0.941176	0.897436	2

In [13]:
```
df1 = df[df.cluster==0]
df2 = df[df.cluster==1]
df3 = df[df.cluster==2]
plt.scatter(df1.Age,df1['Income($)'],color='green')
```

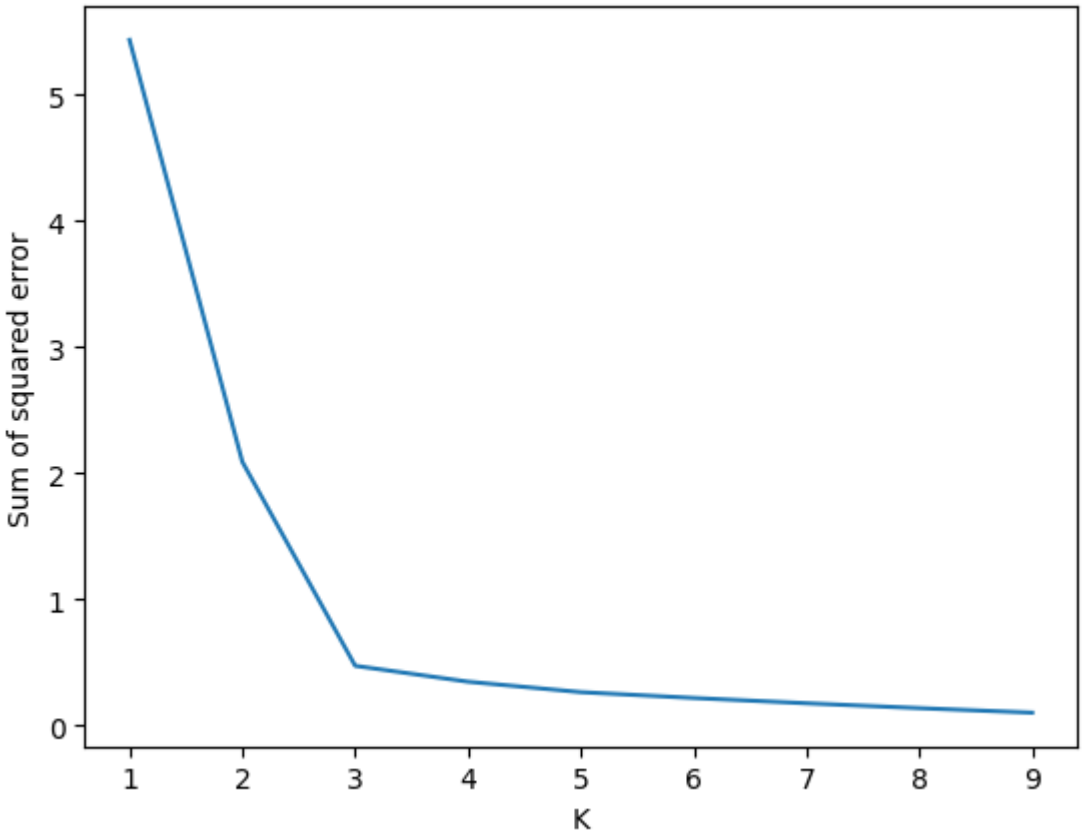
```
plt.scatter(df2.Age,df2['Income($)'],color='red')
plt.scatter(df3.Age,df3['Income($)'],color='black')
plt.scatter(km.cluster_centers_[:,0],km.cluster_centers_[:,1],color='purple',marker
plt.legend()
```

Out[13]: <matplotlib.legend.Legend at 0x217067e35b0>



In [14]:
```
sse = []
k_rng = range(1,10)
for k in k_rng:
 km = KMeans(n_clusters=k)
 km.fit(df[['Age','Income($)']])
 sse.append(km.inertia_)
plt.xlabel('K')
plt.ylabel('Sum of squared error')
plt.plot(k_rng,sse)
```

Out[14]: [<matplotlib.lines.Line2D at 0x217089d9ea0>]


Sum of squared error
0
1
2
3
4
5
1
2
3
4
5
6
7
8
9
K