In [1]:
```
import pandas as pd
import numpy as np
```

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

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

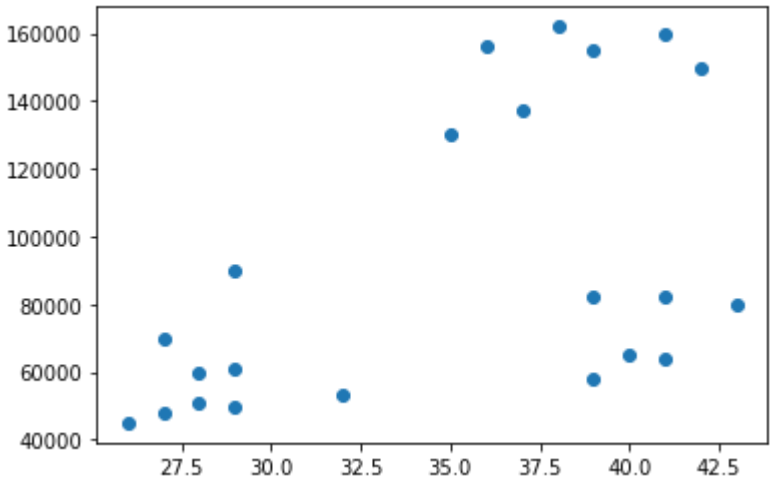
Out[3]:

	name	age	income
0	Hritik	27	70000
1	Arpit	29	90000
2	Manav	29	61000
3	Kirti	28	60000
4	Siddhi	42	150000
5	Riya	39	155000
6	Ankita	41	160000
7	Vikash	38	162000
8	Priyank	36	156000
9	Kranti	35	130000
10	Rohit	37	137000
11	Aakash	26	45000
12	Durgesh	27	48000
13	Varun	28	51000
14	Vicky	29	49500
15	Priyank	32	53000
16	Kranti	40	65000
17	Rohit	41	64000
18	Aakash	43	80000
19	Durgesh	39	82000
20	Varun	41	82000
21	Vicky	39	58000

In [4]:
```
from matplotlib import pyplot as plt
```

In [5]:
```
plt.scatter(df['age'],df['income'])
```

Out[5]:
```
<matplotlib.collections.PathCollection at 0x1efdcab31f0>
```



Apply K-means clustering

In [6]:
```
from sklearn.cluster import KMeans
```

In [7]:
```
kmean=KMeans(n_clusters=3)
```

In [8]:
```
kmean
```

Out[8]:
```
KMeans(n_clusters=3)
```

Assign the clusters to the data

In [9]:
```
y_predict=kmean.fit_predict(df[['age','income']])
```

In [10]:
```
y_predict
```

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

Revise the dataframe with cluster name

In [11]:
```
df['cluster']=y_predict
```

In [12]:
```
df
```

Out[12]:

	name	age	income	cluster
0	Hritik	27	70000	0
1	Arpit	29	90000	0
2	Manav	29	61000	2
3	Kirti	28	60000	2
4	Siddhi	42	150000	1
5	Riya	39	155000	1
6	Ankita	41	160000	1
7	Vikash	38	162000	1
8	Priyank	36	156000	1
9	Kranti	35	130000	1
10	Rohit	37	137000	1
11	Aakash	26	45000	2
12	Durgesh	27	48000	2
13	Varun	28	51000	2
14	Vicky	29	49500	2
15	Priyank	32	53000	2
16	Kranti	40	65000	2
17	Rohit	41	64000	2
18	Aakash	43	80000	0
19	Durgesh	39	82000	0
20	Varun	41	82000	0
21	Vicky	39	58000	2

predict the cluster of given data

name: ABC age:34 income:50000

In [13]:
```
kmean.predict([[34,500000]])
```

```
C:\Users\Hiray\anaconda3\lib\site-packages\sklearn\base.py:450: UserWarning:
X does not have valid feature names, but KMeans was fitted with feature name
s
  warnings.warn(
```

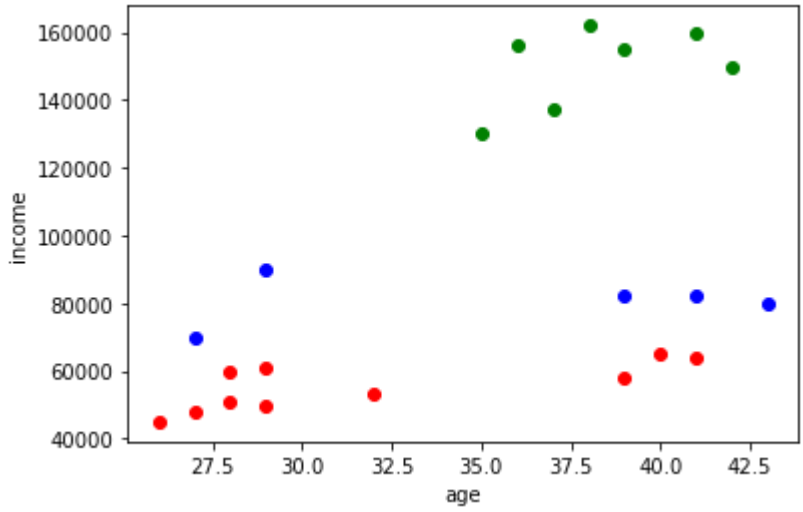
Out[13]:
```
array([1])
```

divide the dataframe according to the clusters

In [14]:
```
df1=df[df.cluster==0]
df2=df[df.cluster==1]
df3=df[df.cluster==2]
```

In [15]:
```
plt.scatter(df1.age,df1.income,color='blue')
plt.scatter(df2.age,df2.income,color='green')
plt.scatter(df3.age,df3.income,color='red')
plt.xlabel('age')
plt.ylabel('income')
```

Out[15]:
```
Text(0, 0.5, 'income')
```



Scale the attribute values from 0 to 1 by applying min-max scaler technique

In [16]:
```
from sklearn.preprocessing import MinMaxScaler
```

In [17]:
```
scaler=MinMaxScaler()
```

In [18]:
```
scaler.fit(df[['age']])
```

Out[18]:
```
MinMaxScaler()
```

In [19]:
```
df['AGE']=scaler.transform(df[['age']])
```

In [20]:
```
df
```

Out[20]:

	name	age	income	cluster	AGE
0	Hritik	27	70000	0	0.058824
1	Arpit	29	90000	0	0.176471
2	Manav	29	61000	2	0.176471
3	Kirti	28	60000	2	0.117647
4	Siddhi	42	150000	1	0.941176
5	Riya	39	155000	1	0.764706
6	Ankita	41	160000	1	0.882353
7	Vikash	38	162000	1	0.705882
8	Priyank	36	156000	1	0.588235
9	Kranti	35	130000	1	0.529412
10	Rohit	37	137000	1	0.647059
11	Aakash	26	45000	2	0.000000
12	Durgesh	27	48000	2	0.058824
13	Varun	28	51000	2	0.117647
14	Vicky	29	49500	2	0.176471
15	Priyank	32	53000	2	0.352941
16	Kranti	40	65000	2	0.823529
17	Rohit	41	64000	2	0.882353
18	Aakash	43	80000	0	1.000000
19	Durgesh	39	82000	0	0.764706
20	Varun	41	82000	0	0.882353
21	Vicky	39	58000	2	0.764706

In [21]:
```
scaler.fit(df[['income']])
```

Out[21]:
```
MinMaxScaler()
```

In [22]:
```
df['INCOME']=scaler.transform(df[['income']])
```

In [23]:
```
df
```

Out[23]:

	name	age	income	cluster	AGE	INCOME
0	Hritik	27	70000	0	0.058824	0.213675
1	Arpit	29	90000	0	0.176471	0.384615
2	Manav	29	61000	2	0.176471	0.136752
3	Kirti	28	60000	2	0.117647	0.128205
4	Siddhi	42	150000	1	0.941176	0.897436
5	Riya	39	155000	1	0.764706	0.940171
6	Ankita	41	160000	1	0.882353	0.982906
7	Vikash	38	162000	1	0.705882	1.000000
8	Priyank	36	156000	1	0.588235	0.948718
9	Kranti	35	130000	1	0.529412	0.726496
10	Rohit	37	137000	1	0.647059	0.786325
11	Aakash	26	45000	2	0.000000	0.000000
12	Durgesh	27	48000	2	0.058824	0.025641
13	Varun	28	51000	2	0.117647	0.051282
14	Vicky	29	49500	2	0.176471	0.038462
15	Priyank	32	53000	2	0.352941	0.068376
16	Kranti	40	65000	2	0.823529	0.170940
17	Rohit	41	64000	2	0.882353	0.162393
18	Aakash	43	80000	0	1.000000	0.299145
19	Durgesh	39	82000	0	0.764706	0.316239
20	Varun	41	82000	0	0.882353	0.316239
21	Vicky	39	58000	2	0.764706	0.111111

Again apply k-means clustering on the scaled attribute

In [24]:
```
km=KMeans(n_clusters=3)
y_predicted=km.fit_predict(df[['AGE','INCOME']])
```

In [25]:
```
y_predicted
```

Out[25]:
```
array([0, 0, 0, 0, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 2, 2, 2, 2, 2, 2])
```

In [26]:
```
df['cluster']=y_predicted
```

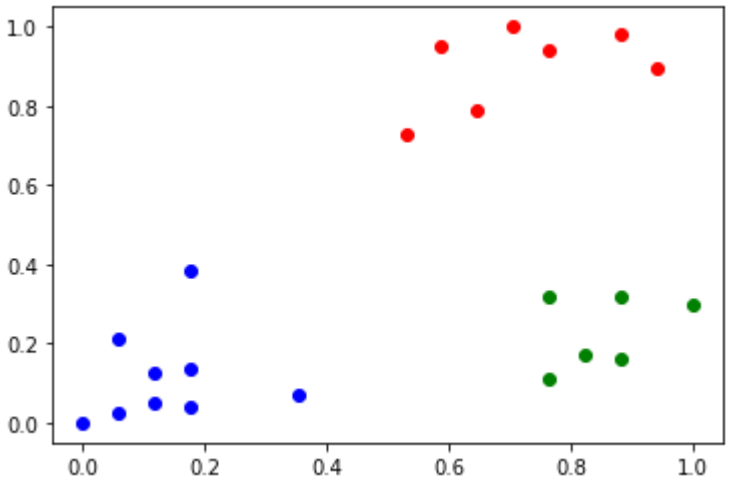
In [27]:
```
df
```

Out[27]:

	name	age	income	cluster	AGE	INCOME
0	Hritik	27	70000	0	0.058824	0.213675
1	Arpit	29	90000	0	0.176471	0.384615
2	Manav	29	61000	0	0.176471	0.136752
3	Kirti	28	60000	0	0.117647	0.128205
4	Siddhi	42	150000	1	0.941176	0.897436
5	Riya	39	155000	1	0.764706	0.940171
6	Ankita	41	160000	1	0.882353	0.982906
7	Vikash	38	162000	1	0.705882	1.000000
8	Priyank	36	156000	1	0.588235	0.948718
9	Kranti	35	130000	1	0.529412	0.726496
10	Rohit	37	137000	1	0.647059	0.786325
11	Aakash	26	45000	0	0.000000	0.000000
12	Durgesh	27	48000	0	0.058824	0.025641
13	Varun	28	51000	0	0.117647	0.051282
14	Vicky	29	49500	0	0.176471	0.038462
15	Priyank	32	53000	0	0.352941	0.068376
16	Kranti	40	65000	2	0.823529	0.170940
17	Rohit	41	64000	2	0.882353	0.162393
18	Aakash	43	80000	2	1.000000	0.299145
19	Durgesh	39	82000	2	0.764706	0.316239
20	Varun	41	82000	2	0.882353	0.316239
21	Vicky	39	58000	2	0.764706	0.111111

In [28]:
```
df1=df[df.cluster==0]
df2=df[df.cluster==1]
df3=df[df.cluster==2]
plt.scatter(df1.AGE,df1.INCOME,color='blue')
plt.scatter(df2.AGE,df2.INCOME,color='red')
plt.scatter(df3.AGE,df3.INCOME,color='green')
```

Out[28]:
```
<matplotlib.collections.PathCollection at 0x1efdf5b1250>
```



Display cluster means

In [29]:
```
km.cluster_centers_
```

Out[29]:
```
array([[0.1372549 , 0.11633428],
       [0.72268908, 0.8974359 ],
       [0.85294118, 0.22934473]])
```

Assignment

Implement K-means clustering on the following dataset

object	weight	PH
Medicine A	1	1
Medicine B	2	1
Medicine C	4	3
Medicine D	5	4

Elbow Method

In [30]:
```
k_range=range(1,10)
sse=[]
for k in k_range:
    km = KMeans(n_clusters=k)
    km.fit(df[['AGE','INCOME']])                    #fit is used for train the mo
    sse.append(km.inertia_)                            #inertia is
```

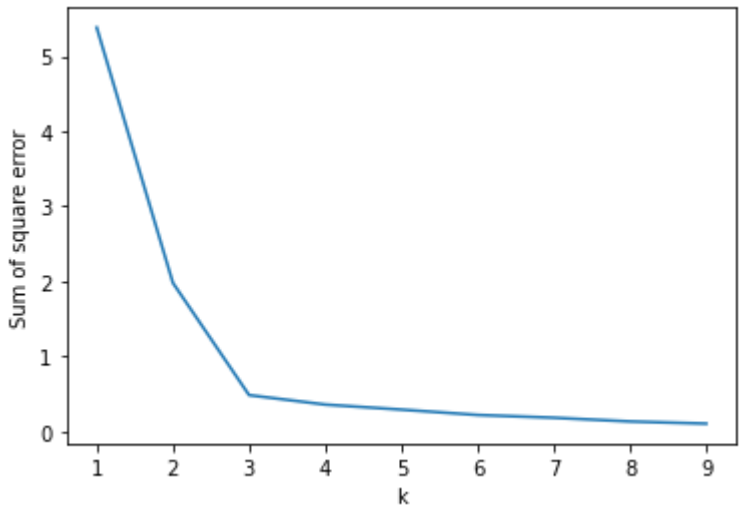
```
C:\Users\Hiray\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:1036:
UserWarning: KMeans is known to have a memory leak on Windows with MKL, when
there are less chunks than available threads. You can avoid it by setting th
e environment variable OMP_NUM_THREADS=1.
  warnings.warn(
```

In [31]:
```
sse
```

Out[31]:
```
[5.383034948191102,
 1.9781765163703693,
 0.48132424071658514,
 0.35535060030323207,
 0.2880938652978993,
 0.21680068081600046,
 0.1798018564144019,
 0.13008339301480998,
 0.10126672060839395]
```

In [32]:
```
plt.xlabel('k')
plt.ylabel("Sum of square error")
plt.plot(k_range, sse)
```

Out[32]:
```
[<matplotlib.lines.Line2D at 0x1efdf633580>]
```



In [33]:
```
iris = pd.read_csv("Iris.csv")
```

In [34]:
```
iris
```

Out[34]:

	Id	SepalLength	SepalWidth	PetalLength	PetalWidth	Species
0	1	5.1	3.5	1.4	0.2	Iris-setosa
1	2	4.9	3.0	1.4	0.2	Iris-setosa
2	3	4.7	3.2	1.3	0.2	Iris-setosa
3	4	4.6	3.1	1.5	0.2	Iris-setosa
4	5	5.0	3.6	1.4	0.2	Iris-setosa
...	...	...	...	...	...	...
145	146	6.7	3.0	5.2	2.3	Iris-virginica
146	147	6.3	2.5	5.0	1.9	Iris-virginica
147	148	6.5	3.0	5.2	2.0	Iris-virginica
148	149	6.2	3.4	5.4	2.3	Iris-virginica
149	150	5.9	3.0	5.1	1.8	Iris-virginica

150 rows × 6 columns

In [38]:
```
iris.shape
```

Out[38]:
```
(150, 6)
```

In [ ]:
```
kmi = KMeans(n_clusters=3)
y_predict = kmi.fit_predict(iris[['age','income']])
```