ONLINE RETAIL

PROBLEM STATEMENT:

The transactions made by a UK-based, registered, non-store online retailer between December 1, 2010, and December 9, 2011, are all included in the transnational data set known as online retail. The company primarily offers one-of-a-kind gifts for every occasion. The company has a large number of wholesalers as clients.Company ObjectiveUsing the global online retail dataset, we will design a clustering model and select the ideal group of clients for the business to target.

KMeans cluster

In [30]:
```
import pandas as pd
import matplotlib.pyplot as plt
%matplotlib inline
```

In [2]:
```
df=pd.read_csv(r"C:\Users\yoshitha lakshmi\OneDrive\Desktop\python\Online retail.csv")
df
```

Out[2]:

	InvoiceNo	StockCode	Description	Quantity	InvoiceDate	UnitPrice	CustomerID	Country
0	536365	85123A	WHITE HANGING HEART T-LIGHT HOLDER	6	01-12-2010 08:26	2.55	17850.0	United Kingdom
1	536365	71053	WHITE METAL LANTERN	6	01-12-2010 08:26	3.39	17850.0	United Kingdom
2	536365	84406B	CREAM CUPID HEARTS COAT HANGER	8	01-12-2010 08:26	2.75	17850.0	United Kingdom
3	536365	84029G	KNITTED UNION FLAG HOT WATER BOTTLE	6	01-12-2010 08:26	3.39	17850.0	United Kingdom
4	536365	84029E	RED WOOLLY HOTTIE WHITE HEART.	6	01-12-2010 08:26	3.39	17850.0	United Kingdom
...	...	...	...	...	...	...	...	...
541904	581587	22613	PACK OF 20 SPACEBOY NAPKINS	12	09-12-2011 12:50	0.85	12680.0	France
541905	581587	22899	CHILDREN'S APRON DOLLY GIRL	6	09-12-2011 12:50	2.10	12680.0	France
541906	581587	23254	CHILDRENS CUTLERY DOLLY GIRL	4	09-12-2011 12:50	4.15	12680.0	France
541907	581587	23255	CHILDRENS CUTLERY CIRCUS PARADE	4	09-12-2011 12:50	4.15	12680.0	France
541908	581587	22138	BAKING SET 9 PIECE RETROSPOT	3	09-12-2011 12:50	4.95	12680.0	France

541909 rows × 8 columns

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

Out[3]:

	InvoiceNo	StockCode	Description	Quantity	InvoiceDate	UnitPrice	CustomerID	Country
0	536365	85123A	WHITE HANGING HEART T-LIGHT HOLDER	6	01-12-2010 08:26	2.55	17850.0	United Kingdom
1	536365	71053	WHITE METAL LANTERN	6	01-12-2010 08:26	3.39	17850.0	United Kingdom
2	536365	84406B	CREAM CUPID HEARTS COAT HANGER	8	01-12-2010 08:26	2.75	17850.0	United Kingdom
3	536365	84029G	KNITTED UNION FLAG HOT WATER BOTTLE	6	01-12-2010 08:26	3.39	17850.0	United Kingdom
4	536365	84029E	RED WOOLLY HOTTIE WHITE HEART.	6	01-12-2010 08:26	3.39	17850.0	United Kingdom

In [4]:
```
1 df.tail()
```

Out[4]:

	InvoiceNo	StockCode	Description	Quantity	InvoiceDate	UnitPrice	CustomerID	Country
541904	581587	22613	PACK OF 20 SPACEBOY NAPKINS	12	09-12-2011 12:50	0.85	12680.0	France
541905	581587	22899	CHILDREN'S APRON DOLLY GIRL	6	09-12-2011 12:50	2.10	12680.0	France
541906	581587	23254	CHILDRENS CUTLERY DOLLY GIRL	4	09-12-2011 12:50	4.15	12680.0	France
541907	581587	23255	CHILDRENS CUTLERY CIRCUS PARADE	4	09-12-2011 12:50	4.15	12680.0	France
541908	581587	22138	BAKING SET 9 PIECE RETROSPOT	3	09-12-2011 12:50	4.95	12680.0	France

In [5]:
```
1 df.describe()
```

Out[5]:

	Quantity	UnitPrice	CustomerID
count	541909.000000	541909.000000	406829.000000
mean	9.552250	4.611114	15287.690570
std	218.081158	96.759853	1713.600303
min	-80995.000000	-11062.060000	12346.000000
25%	1.000000	1.250000	13953.000000
50%	3.000000	2.080000	15152.000000
75%	10.000000	4.130000	16791.000000
max	80995.000000	38970.000000	18287.000000

In [6]:
```
1 df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 541909 entries, 0 to 541908
Data columns (total 8 columns):
 #   Column       Non-Null Count   Dtype  
---  ------       --------------   -----  
 0   InvoiceNo    541909 non-null  object 
 1   StockCode    541909 non-null  object 
 2   Description  540455 non-null  object 
 3   Quantity     541909 non-null  int64  
 4   InvoiceDate  541909 non-null  object 
 5   UnitPrice    541909 non-null  float64
 6   CustomerID   406829 non-null  float64
 7   Country      541909 non-null  object 
dtypes: float64(2), int64(1), object(5)
memory usage: 33.1+ MB
```

In [7]:
```
1 df['InvoiceNo'].isnull().sum
```

Out[7]:
```
<bound method NDFrame._add_numeric_operations.<locals>.sum of 0         False
1         False
2         False
3         False
4         False
          ...
541904    False
541905    False
541906    False
541907    False
541908    False
Name: InvoiceNo, Length: 541909, dtype: bool>
```

In [8]:
```
1 df['Quantity'].value_counts()
```

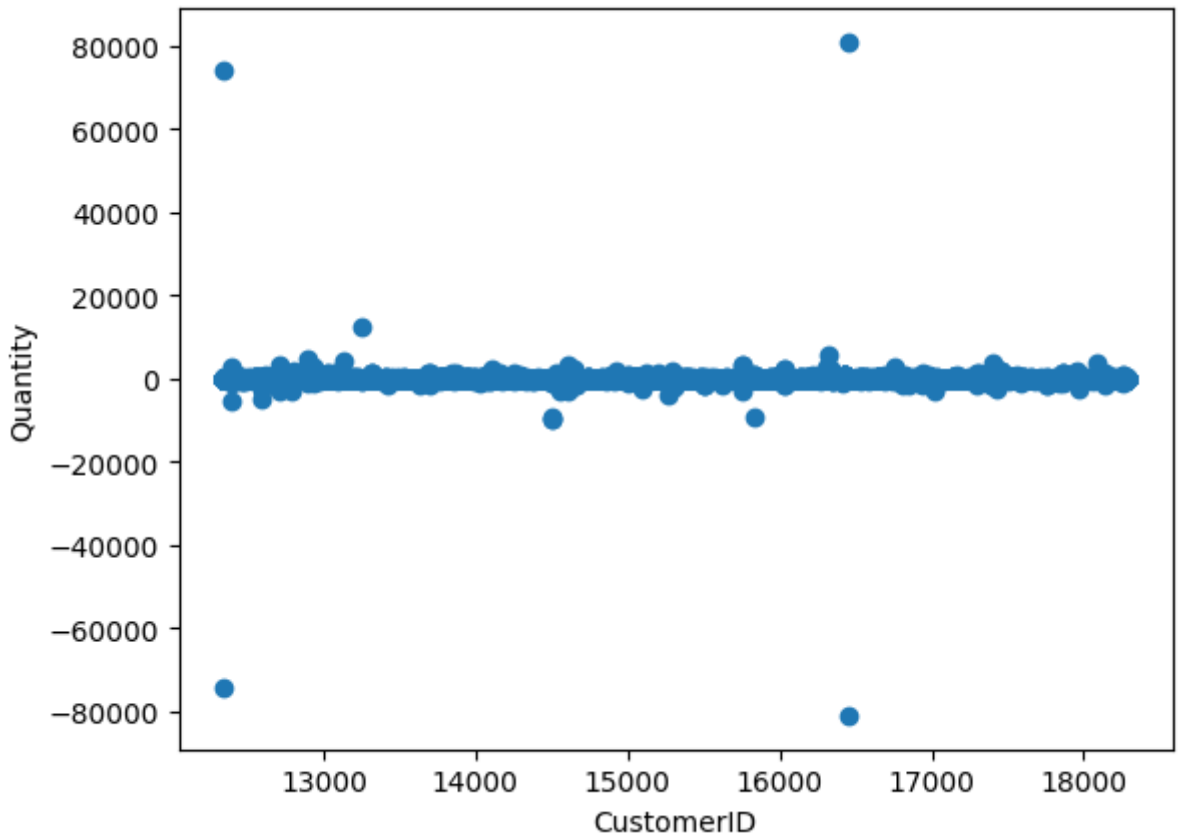
Out[8]:
```
Quantity
 1        148227
 2         81829
 12        61063
 6         40868
 4         38484
           ...
-472           1
-161           1
-1206          1
-272           1
-80995         1
Name: count, Length: 722, dtype: int64
```

In [9]:
```
1 df.fillna(method='ffill',inplace=True)
```

In [ ]:
```
1
```

In [10]:
```
plt.scatter(df["CustomerID"],df["Quantity"])
plt.xlabel("CustomerID")
plt.ylabel("Quantity")
```

Out[10]: Text(0, 0.5, 'Quantity')



In [11]:
```
from sklearn.cluster import KMeans
```

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

Out[12]:
```
KMeans()
```

In [14]:
```
y_predicted=km.fit_predict(df[["CustomerID","Quantity"]])
y_predicted
```

```
C:\Users\yoshitha lakshmi\AppData\Local\Programs\Python\Python310\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[14]:
```
array([4, 4, 4, ..., 3, 3, 3])
```

In [16]:
```
df["cluster"]=y_predicted
df.head()
```

Out[16]:

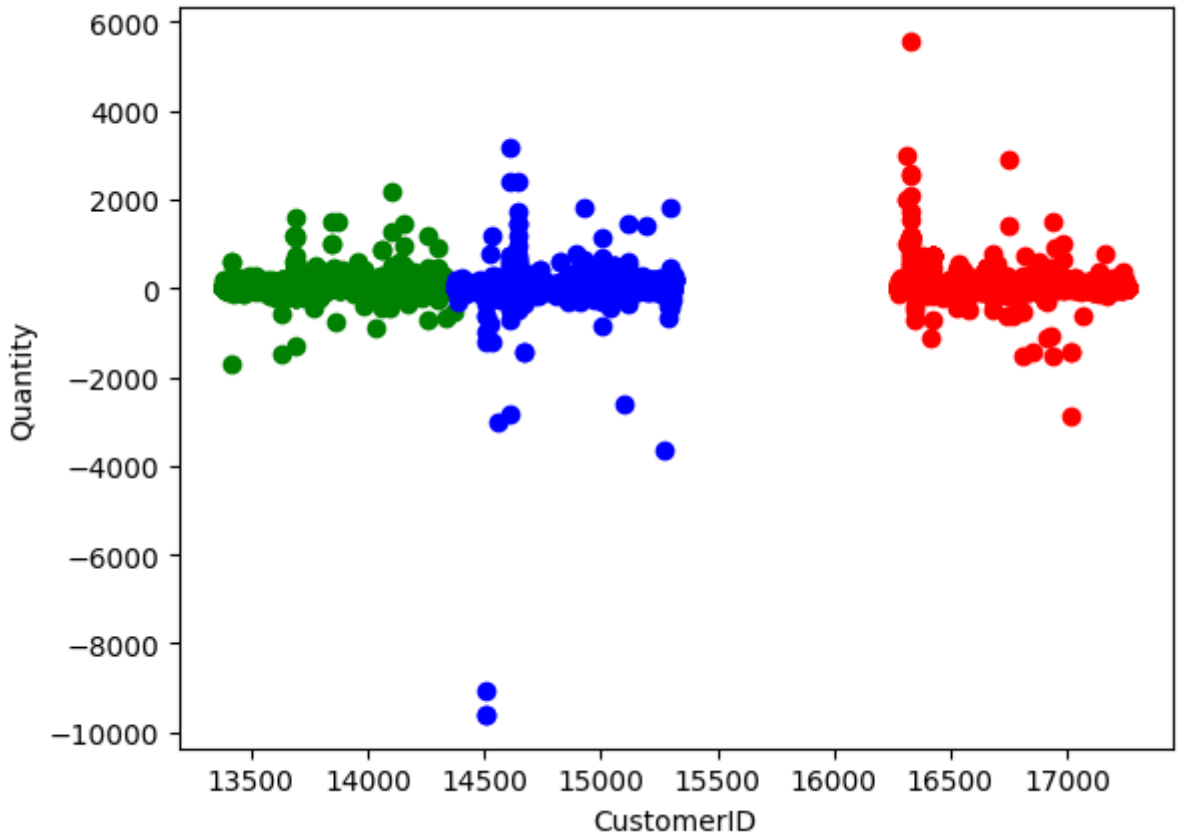
	InvoiceNo	StockCode	Description	Quantity	InvoiceDate	UnitPrice	CustomerID	Country	cluster
0	536365	85123A	WHITE HANGING HEART T-LIGHT HOLDER	6	01-12-2010 08:26	2.55	17850.0	United Kingdom	4
1	536365	71053	WHITE METAL LANTERN	6	01-12-2010 08:26	3.39	17850.0	United Kingdom	4
2	536365	84406B	CREAM CUPID HEARTS COAT HANGER	8	01-12-2010 08:26	2.75	17850.0	United Kingdom	4
3	536365	84029G	KNITTED UNION FLAG HOT WATER BOTTLE	6	01-12-2010 08:26	3.39	17850.0	United Kingdom	4
4	536365	84029E	RED WOOLLY HOTTIE WHITE HEART.	6	01-12-2010 08:26	3.39	17850.0	United Kingdom	4

In [17]:
```
df1=df[df.cluster==0]
df2=df[df.cluster==1]
df3=df[df.cluster==2]

plt.scatter(df1["CustomerID"],df1["Quantity"],color="red")
plt.scatter(df2["CustomerID"],df2["Quantity"],color="green")
plt.scatter(df3["CustomerID"],df3["Quantity"],color="blue")

plt.xlabel("CustomerID")
plt.ylabel("Quantity")
```

Out[17]: Text(0, 0.5, 'Quantity')



In [18]:
```
from sklearn.preprocessing import MinMaxScaler
```

In [19]:
```
scaler=MinMaxScaler()
```

In [20]:
```
scaler.fit(df[["Quantity"]])
df["Quantity"]=scaler.transform(df[["Quantity"]])
df.head()
```

Out[20]:

	InvoiceNo	StockCode	Description	Quantity	InvoiceDate	UnitPrice	CustomerID	Country	cluster
0	536365	85123A	WHITE HANGING HEART T-LIGHT HOLDER	0.500037	01-12-2010 08:26	2.55	17850.0	United Kingdom	4
1	536365	71053	WHITE METAL LANTERN	0.500037	01-12-2010 08:26	3.39	17850.0	United Kingdom	4
2	536365	84406B	CREAM CUPID HEARTS COAT HANGER	0.500049	01-12-2010 08:26	2.75	17850.0	United Kingdom	4
3	536365	84029G	KNITTED UNION FLAG HOT WATER BOTTLE	0.500037	01-12-2010 08:26	3.39	17850.0	United Kingdom	4
4	536365	84029E	RED WOOLLY HOTTIE WHITE HEART.	0.500037	01-12-2010 08:26	3.39	17850.0	United Kingdom	4

In [21]:
```
scaler.fit(df[["CustomerID"]])
df["CustomerID"]=scaler.transform(df[["CustomerID"]])
df.head()
```

Out[21]:

	InvoiceNo	StockCode	Description	Quantity	InvoiceDate	UnitPrice	CustomerID	Country	cluster
0	536365	85123A	WHITE HANGING HEART T-LIGHT HOLDER	0.500037	01-12-2010 08:26	2.55	0.926443	United Kingdom	4
1	536365	71053	WHITE METAL LANTERN	0.500037	01-12-2010 08:26	3.39	0.926443	United Kingdom	4
2	536365	84406B	CREAM CUPID HEARTS COAT HANGER	0.500049	01-12-2010 08:26	2.75	0.926443	United Kingdom	4
3	536365	84029G	KNITTED UNION FLAG HOT WATER BOTTLE	0.500037	01-12-2010 08:26	3.39	0.926443	United Kingdom	4
4	536365	84029E	RED WOOLLY HOTTIE WHITE HEART.	0.500037	01-12-2010 08:26	3.39	0.926443	United Kingdom	4

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

In [24]:
```
y_predicted=km.fit_predict(df[["CustomerID","Quantity"]])
y_predicted
```

```
C:\Users\yoshitha lakshmi\AppData\Local\Programs\Python\Python310\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` explic
itly to suppress the warning
  warnings.warn(
```

Out[24]:
```
array([1, 1, 1, ..., 6, 6, 6])
```

In [25]:
```
df["New cluster"]=y_predicted
df.head()
```

Out[25]:

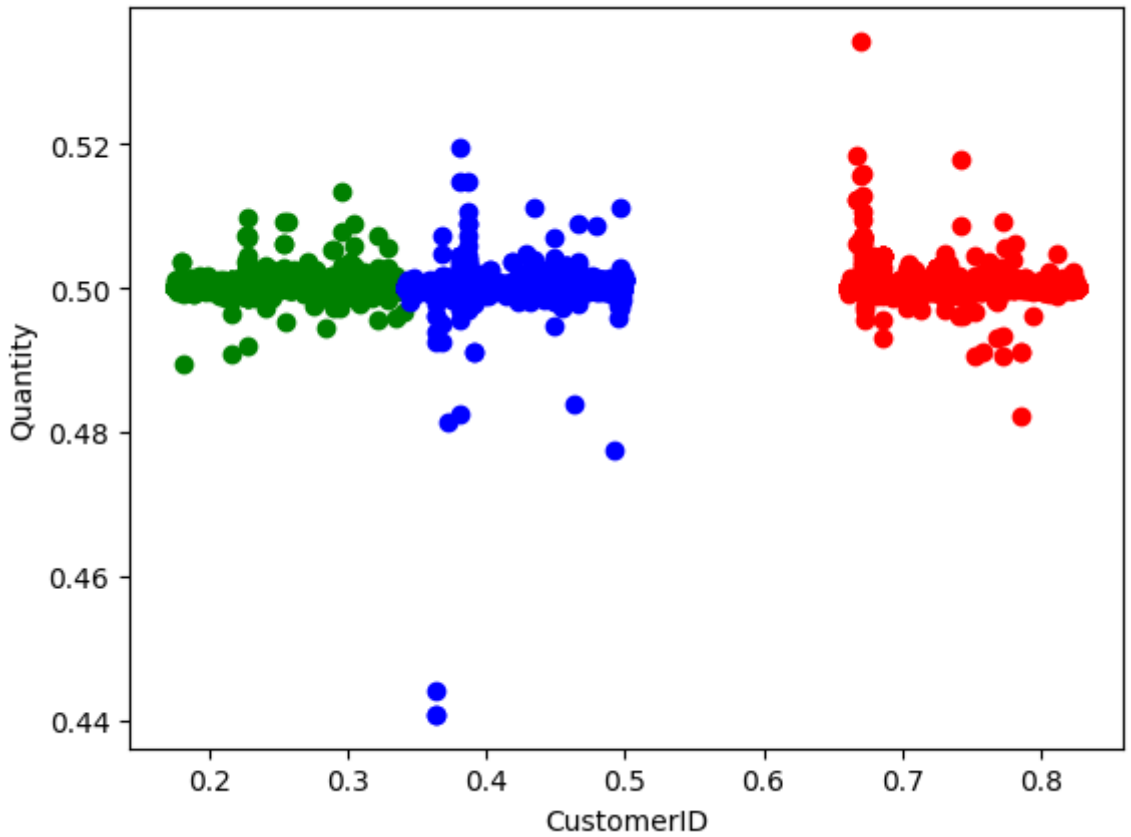
	InvoiceNo	StockCode	Description	Quantity	InvoiceDate	UnitPrice	CustomerID	Country	cluster	New cluster
0	536365	85123A	WHITE HANGING HEART T-LIGHT HOLDER	0.500037	01-12-2010 08:26	2.55	0.926443	United Kingdom	4	1
1	536365	71053	WHITE METAL LANTERN	0.500037	01-12-2010 08:26	3.39	0.926443	United Kingdom	4	1
2	536365	84406B	CREAM CUPID HEARTS COAT HANGER	0.500049	01-12-2010 08:26	2.75	0.926443	United Kingdom	4	1
3	536365	84029G	KNITTED UNION FLAG HOT WATER BOTTLE	0.500037	01-12-2010 08:26	3.39	0.926443	United Kingdom	4	1
4	536365	84029E	RED WOOLLY HOTTIE WHITE HEART.	0.500037	01-12-2010 08:26	3.39	0.926443	United Kingdom	4	1

In [26]:
```
df1=df[df.cluster==0]
df2=df[df.cluster==1]
df3=df[df.cluster==2]

plt.scatter(df1["CustomerID"],df1["Quantity"],color="red")
plt.scatter(df2["CustomerID"],df2["Quantity"],color="green")
plt.scatter(df3["CustomerID"],df3["Quantity"],color="blue")

plt.xlabel("CustomerID")
plt.ylabel("Quantity")
```

Out[26]: Text(0, 0.5, 'Quantity')

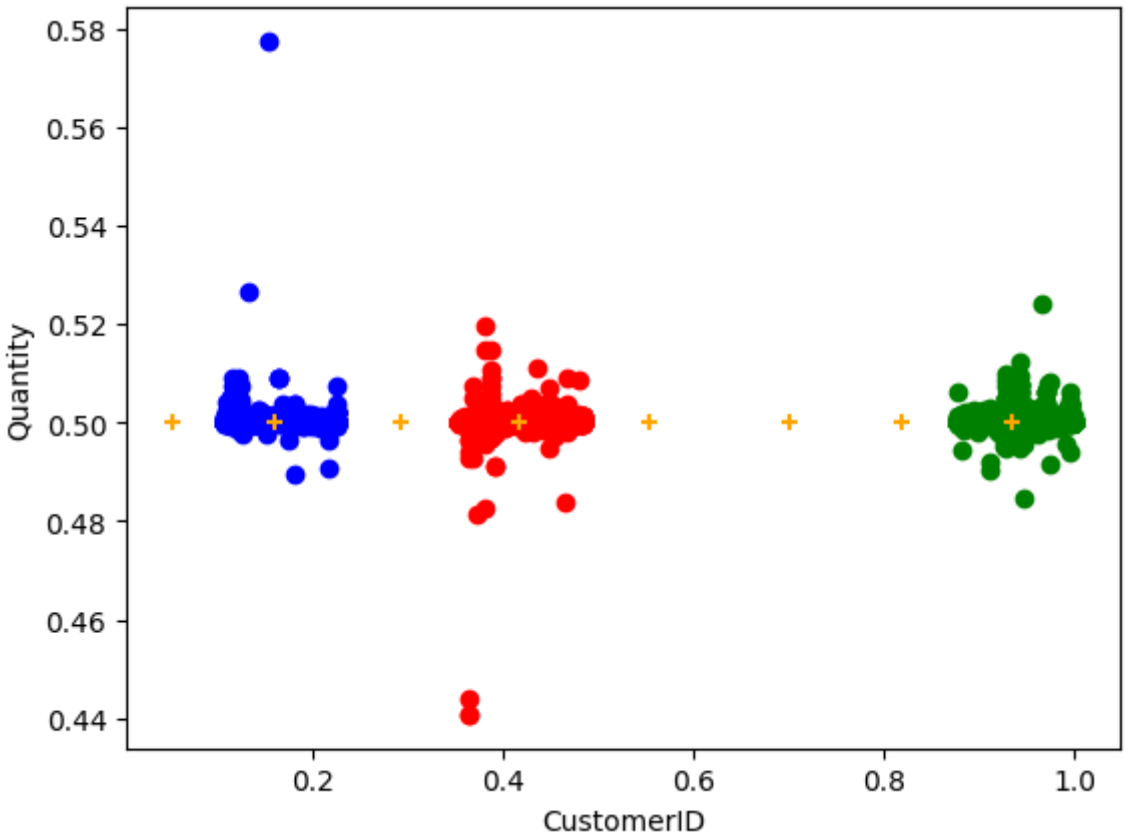


In [ ]:
```
1 km.cluster_centers_
```

In [27]:
```
df1=df[df["New cluster"]==0]
df2=df[df["New cluster"]==1]
df3=df[df["New cluster"]==2]

plt.scatter(df1["CustomerID"],df1["Quantity"],color="red")
plt.scatter(df2["CustomerID"],df2["Quantity"],color="green")
plt.scatter(df3["CustomerID"],df3["Quantity"],color="blue")
plt.scatter(km.cluster_centers_[:,0],km.cluster_centers_[:,1],color="orange",marker="+")
plt.xlabel("CustomerID")
plt.ylabel("Quantity")
```

Out[27]: Text(0, 0.5, 'Quantity')



In [28]:

```
k_rng=range(1,10)
sse=[]
for k in k_rng:
    km=KMeans(n_clusters=k)
    km.fit(df[["CustomerID","Quantity"]])
    sse.append(km.inertia_)
sse
```

```
C:\Users\yoshitha lakshmi\AppData\Local\Programs\Python\Python310\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` explic
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itly to suppress the warning
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C:\Users\yoshitha lakshmi\AppData\Local\Programs\Python\Python310\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` explic
itly to suppress the warning
  warnings.warn(
```
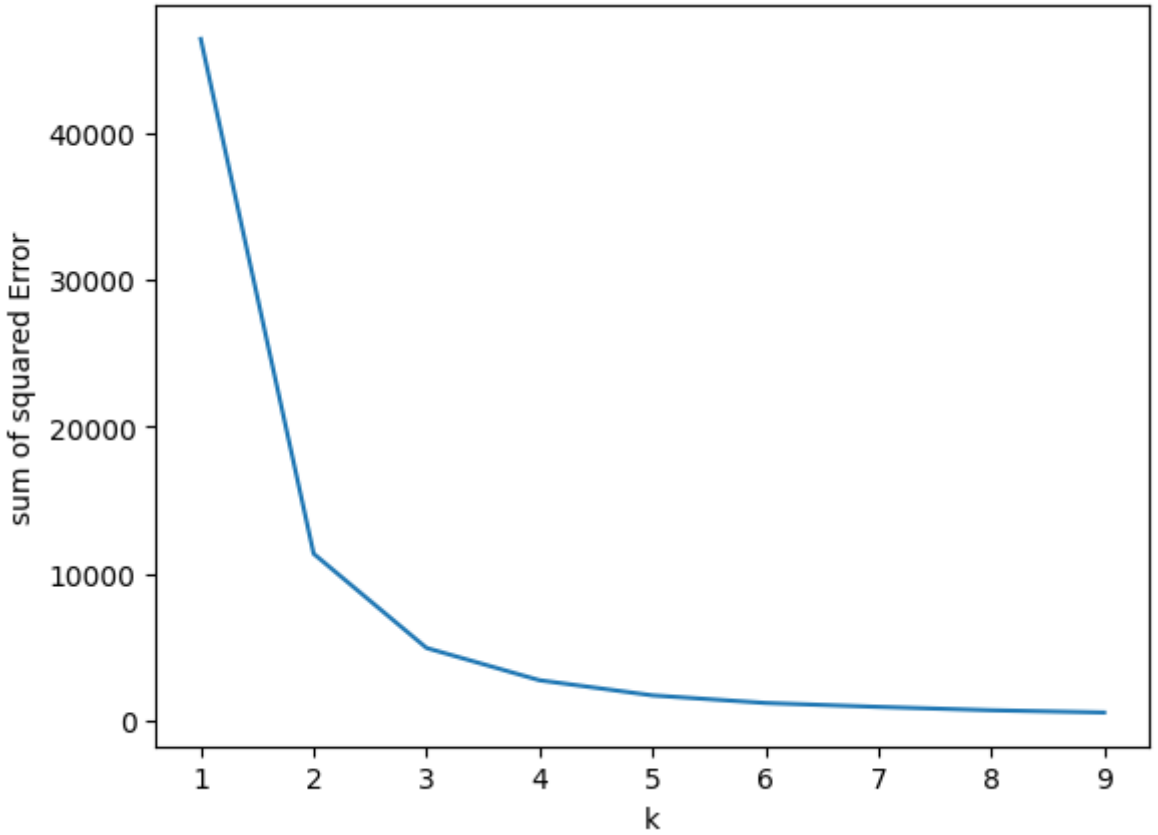

Out[28]:
```
[46374.84553398474,
 11336.0653054853,
 4921.025469201893,
 2723.512784391097,
 1695.4198408843572,
 1178.5970699567233,
 911.4001970967867,
 681.2684025522351,
 528.8809805034975]
```

In [29]:
```
plt.plot(k_rng,sse)
plt.xlabel("k")
plt.ylabel("sum of squared Error")
```

Out[29]: Text(0, 0.5, 'sum of squared Error')



Conclusion

Using K-Means Cluster we analysed the online retail data.