```
import pandas as pd

df=pd.read_csv("sales_data_sample.csv",encoding = 'Latin-1')
## if we don't add "",encoding = 'Latin-1'"" then we get error

df.head()

   ORDERNUMBER  QUANTITYORDERED  PRICEEACH  ORDERLINENUMBER
SALES  \
0        10107               30      95.70                2  2871.00

1        10121               34      81.35                5  2765.90

2        10134               41      94.74                2  3884.34

3        10145               45      83.26                6  3746.70

4        10159               49     100.00               14  5205.27


         ORDERDATE   STATUS  QTR_ID  MONTH_ID  YEAR_ID  ...  \
0   2/24/2003 0:00  Shipped       1         2     2003  ...
1    5/7/2003 0:00  Shipped       2         5     2003  ...
2    7/1/2003 0:00  Shipped       3         7     2003  ...
3   8/25/2003 0:00  Shipped       3         8     2003  ...
4  10/10/2003 0:00  Shipped       4        10     2003  ...

                    ADDRESSLINE1  ADDRESSLINE2           CITY STATE  \
0        897 Long Airport Avenue           NaN            NYC    NY
1             59 rue de l'Abbaye           NaN          Reims   NaN
2  27 rue du Colonel Pierre Avia           NaN          Paris   NaN
3             78934 Hillside Dr.           NaN       Pasadena    CA
4                7734 Strong St.           NaN  San Francisco    CA

  POSTALCODE COUNTRY TERRITORY CONTACTLASTNAME CONTACTFIRSTNAME
DEALSIZE
0      10022     USA       NaN              Yu             Kwai
Small
1      51100  France      EMEA         Henriot             Paul
Small
2      75508  France      EMEA        Da Cunha           Daniel
Medium
3      90003     USA       NaN           Young            Julie
Medium
4        NaN     USA       NaN           Brown            Julie
Medium

[5 rows x 25 columns]

df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2823 entries, 0 to 2822
Data columns (total 25 columns):
 #   Column            Non-Null Count  Dtype  
---  ------            --------------  -----  
 0   ORDERNUMBER       2823 non-null   int64  
 1   QUANTITYORDERED   2823 non-null   int64  
 2   PRICEEACH         2823 non-null   float64
 3   ORDERLINENUMBER   2823 non-null   int64  
 4   SALES             2823 non-null   float64
 5   ORDERDATE         2823 non-null   object 
 6   STATUS            2823 non-null   object 
 7   QTR_ID            2823 non-null   int64  
 8   MONTH_ID          2823 non-null   int64  
 9   YEAR_ID           2823 non-null   int64  
 10  PRODUCTLINE       2823 non-null   object 
 11  MSRP              2823 non-null   int64  
 12  PRODUCTCODE       2823 non-null   object 
 13  CUSTOMERNAME      2823 non-null   object 
 14  PHONE             2823 non-null   object 
 15  ADDRESSLINE1      2823 non-null   object 
 16  ADDRESSLINE2      302 non-null    object 
 17  CITY              2823 non-null   object 
 18  STATE             1337 non-null   object 
 19  POSTALCODE        2747 non-null   object 
 20  COUNTRY           2823 non-null   object 
 21  TERRITORY         1749 non-null   object 
 22  CONTACTLASTNAME   2823 non-null   object 
 23  CONTACTFIRSTNAME  2823 non-null   object 
 24  DEALSIZE          2823 non-null   object 
dtypes: float64(2), int64(7), object(16)
memory usage: 551.5+ KB
```

```
df.isnull().sum()
```

```
ORDERNUMBER           0
QUANTITYORDERED       0
PRICEEACH             0
ORDERLINENUMBER       0
SALES                 0
ORDERDATE             0
STATUS                0
QTR_ID                0
MONTH_ID              0
YEAR_ID               0
PRODUCTLINE           0
MSRP                  0
PRODUCTCODE           0
CUSTOMERNAME          0
PHONE                 0
```

```
ADDRESSLINE1            0
ADDRESSLINE2         2521
CITY                    0
STATE                1486
POSTALCODE             76
COUNTRY                 0
TERRITORY            1074
CONTACTLASTNAME         0
CONTACTFIRSTNAME        0
DEALSIZE                0
dtype: int64

## so only two columns are important of the dataset i.e.
QuantityOrdered and PriceEach other are irrelevant
data=df[['QUANTITYORDERED','PRICEEACH']]

data.head(4)

   QUANTITYORDERED  PRICEEACH
0               30      95.70
1               34      81.35
2               41      94.74
3               45      83.26

## Do normalization of the data
from sklearn.preprocessing import StandardScaler
# make object of it
scaler=StandardScaler()
normalized_data=scaler.fit_transform(data)
print(normalized_data)

[[-0.52289086  0.5969775 ]
 [-0.11220131 -0.11445035]
 [ 0.60650538  0.54938372]
 ...
 [ 0.81185016  0.81015797]
 [-0.11220131 -1.06186404]
 [ 1.2225397  -0.89925195]]

## Using elbow method , determine the best value of k
# wcss= within cluster sum of squares . It's a measure of how close
data points are to the centroid of their cluster

from sklearn.cluster import KMeans

wcss=[]
for i in range(1,16):
    k_means=KMeans(n_clusters=i,init='k-means+
+',max_iter=300,n_init=10,random_state=10)
    # Here
    # n_clusters specifies the number of clusters you want the
```

```
algorithm to find in your data.
    # init determines the method for initializing the positions of the 
cluster centers (centroids). 'k-means++'is the default and recommended
method.
    # max_iter=300 Sets the maximum number of iterations the algorithm
will run for a single initialization.
    # n_init=10 Specifies the number of times the KMeans algorithm
will run with different centroid seeds.
    k_means.fit(normalized_data)
    wcss.append(k_means.inertia_)
```

```
C:\Users\Ashvini Mahajan\Anaconda\Lib\site-packages\sklearn\cluster\
_kmeans.py:1382: 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 the environment variable
OMP_NUM_THREADS=12.
  warnings.warn(
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```
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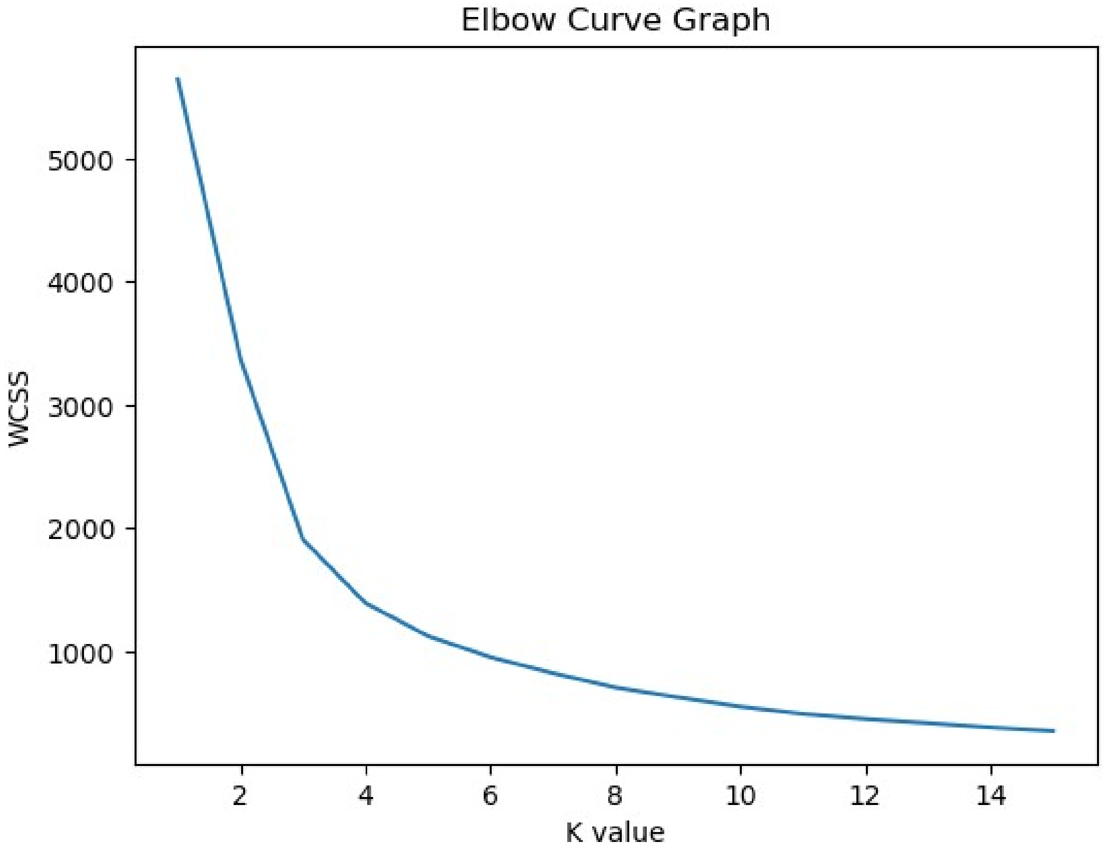
  warnings.warn(
```

```
## Elbow Graph
import matplotlib.pyplot as plt
plt.plot(range(1,16),wcss)
plt.xlabel("K value")
plt.ylabel("WCSS")
plt.title("Elbow Curve Graph")
```

```
Text(0.5, 1.0, 'Elbow Curve Graph')
```



```
# from graph we can see that for k=4 is the optimal value , so train the model
k_means=KMeans(n_clusters=4,init='k-means++',max_iter=300,n_init=10,random_state=10)
clusters=k_means.fit_predict(normalized_data)
# The fit_predict method combines the operations of fitting the model and predicting
```

```
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```

```
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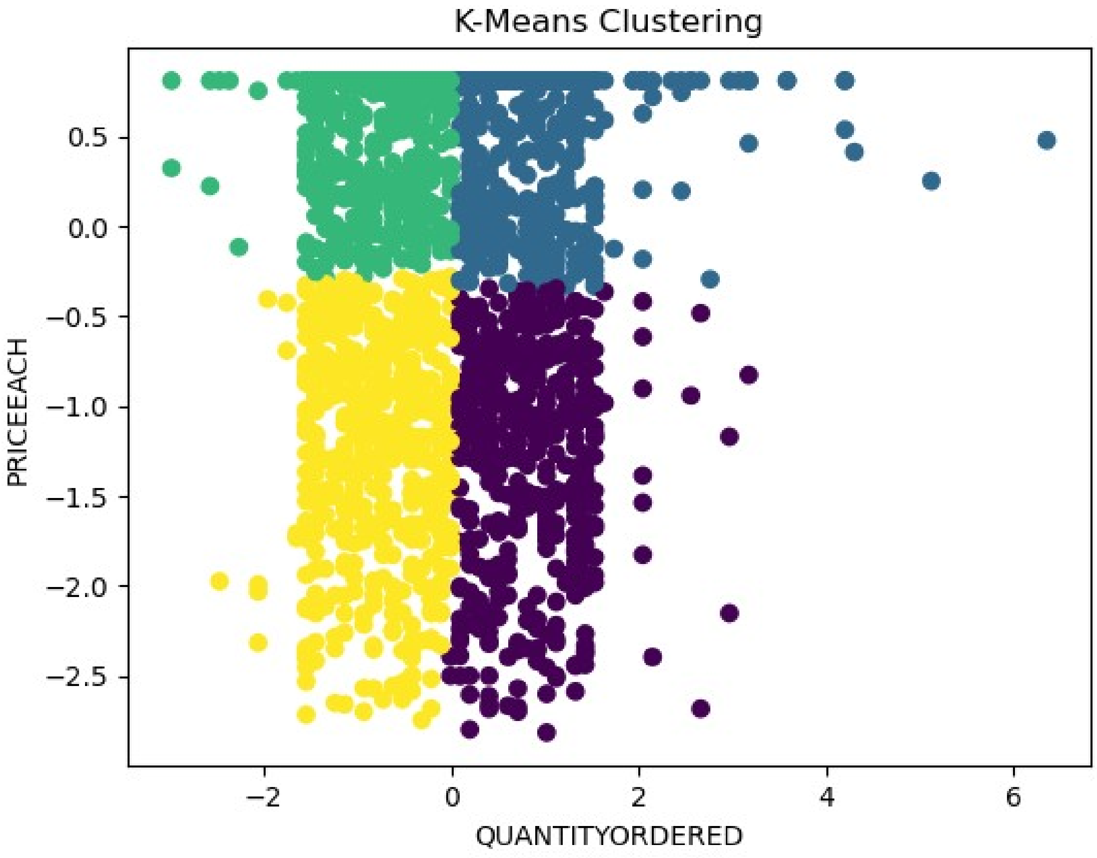
  warnings.warn(

## Visualization of the clusters
plt.scatter(normalized_data[:, 0], normalized_data[:, 1], c=clusters,
cmap='viridis')
# x aixs numbers =normalized_data[:, 0]
# y aixs numbers =normalized_data[:, 1]
# The c parameter specifies the color of the markers (data points) in
the scatter plot
# The cmap parameter stands for "colormap." It defines the colormap
used to map numerical data to colors.
plt.xlabel('QUANTITYORDERED')
plt.ylabel('PRICEEACH')
plt.title('K-Means Clustering')
plt.show()
```


K-Means Clustering
PRICEEACH
QUANTITYORDERED