```
Name :: Gayatri Manikchand Deshmukh
Class :: BE A
Roll No.:: 38
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Problem Statement

Implement K-Means clustering/ hierarchical clustering on sales_data_sample.csv dataset. Determine the number of clusters using the elbow method. Dataset link : [https://www.kaggle.com/datasets/kyanyoga/sample-sales-data (https://www.kaggle.com/datasets/kyanyoga/sample-sales-data)](https://www.kaggle.com/datasets/kyanyoga/sample-sales-data)

In [1]:

```
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
import seaborn as sns
```

In [4]:

```
df = pd.read_csv('sales_data_sample.csv', encoding='Latin-1')
```

In [5]:

```
df.head()
```

Out[5]:

	ORDERNUMBER	QUANTITYORDERED	PRICEEACH	ORDERLINENUMBER	SALES	ORDERDA
0	10107	30	95.70	2	2871.00	2/24/2 (
1	10121	34	81.35	5	2765.90	5/7/2003 (
2	10134	41	94.74	2	3884.34	7/1/2003 (
3	10145	45	83.26	6	3746.70	8/25/2 (
4	10159	49	100.00	14	5205.27	10/10/2 (

5 rows × 25 columns

In [6]:

```
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
```

In [7]:

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

Out[7]:

```
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
```

In [8]:

```
df.columns
```

Out[8]:

```
Index(['ORDERNUMBER', 'QUANTITYORDERED', 'PRICEEACH', 'ORDERLINENUMBER',
       'SALES', 'ORDERDATE', 'STATUS', 'QTR_ID', 'MONTH_ID', 'YEAR_ID',
       'PRODUCTLINE', 'MSRP', 'PRODUCTCODE', 'CUSTOMERNAME', 'PHONE',
       'ADDRESSLINE1', 'ADDRESSLINE2', 'CITY', 'STATE', 'POSTALCODE',
       'COUNTRY', 'TERRITORY', 'CONTACTLASTNAME', 'CONTACTFIRSTNAME',
       'DEALSIZE'],
      dtype='object')
```

In [10]:

```
x = df.iloc[:, [1, 2]].values
```

In [11]:

```
print(x)
```

```
[[ 30.    95.7 ]
 [ 34.    81.35]
 [ 41.    94.74]
 ...
 [ 43.   100.  ]
 [ 34.    62.24]
 [ 47.    65.52]]
```

In [12]:

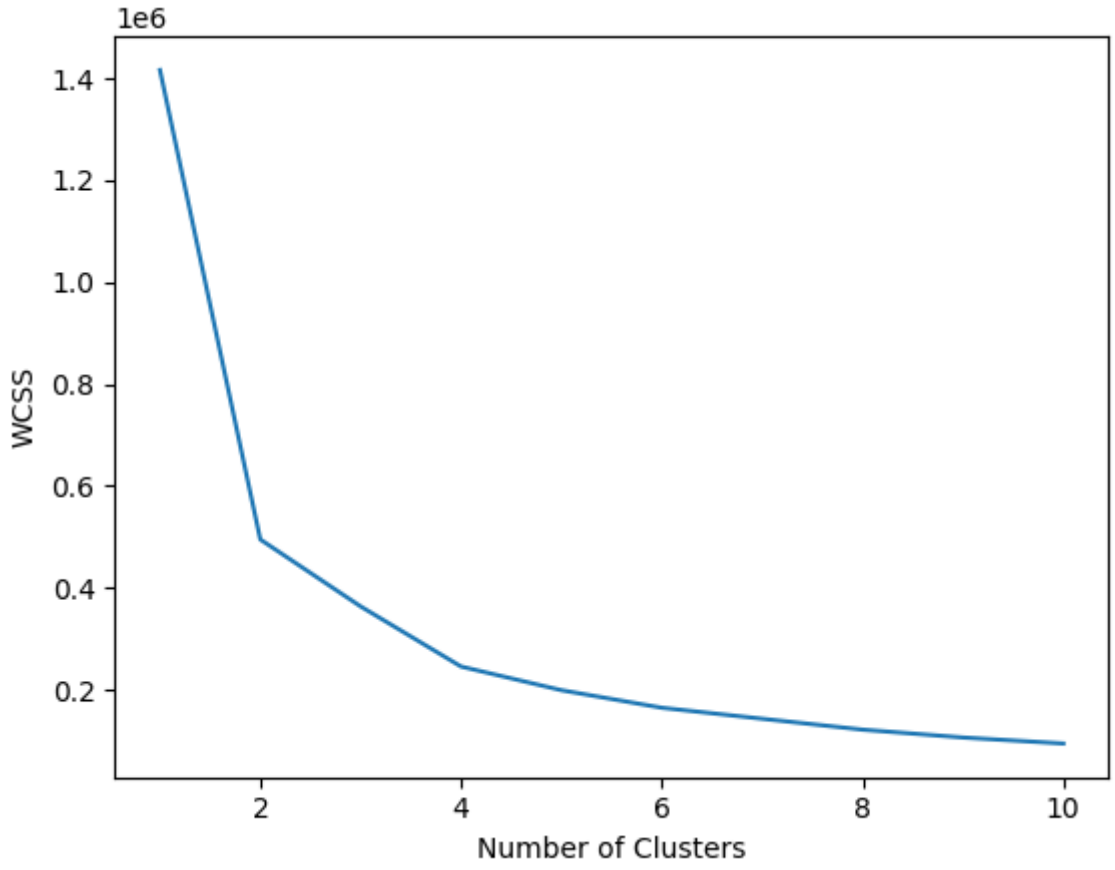
```
from sklearn.cluster import KMeans
```

In [15]:

```
wcss = []
for i in range(1, 11):
    kmeans = KMeans(n_clusters = i, init = 'k-means++', random_state = 42)
    kmeans.fit(x)
    wcss.append(kmeans.inertia_)
```

In [17]:

```
plt.plot(range(1,11), wcss)
plt.xlabel("Number of Clusters")
plt.ylabel("WCSS")
plt.show()
```



In [19]:

```
kmeans = KMeans(n_clusters = 5, init = "k-means++", random_state = 42)
y_kmeans = kmeans.fit_predict(x)
```

In [20]:

```
y_kmeans
```

Out[20]:

```
array([3, 1, 0, ..., 0, 2, 1])
```

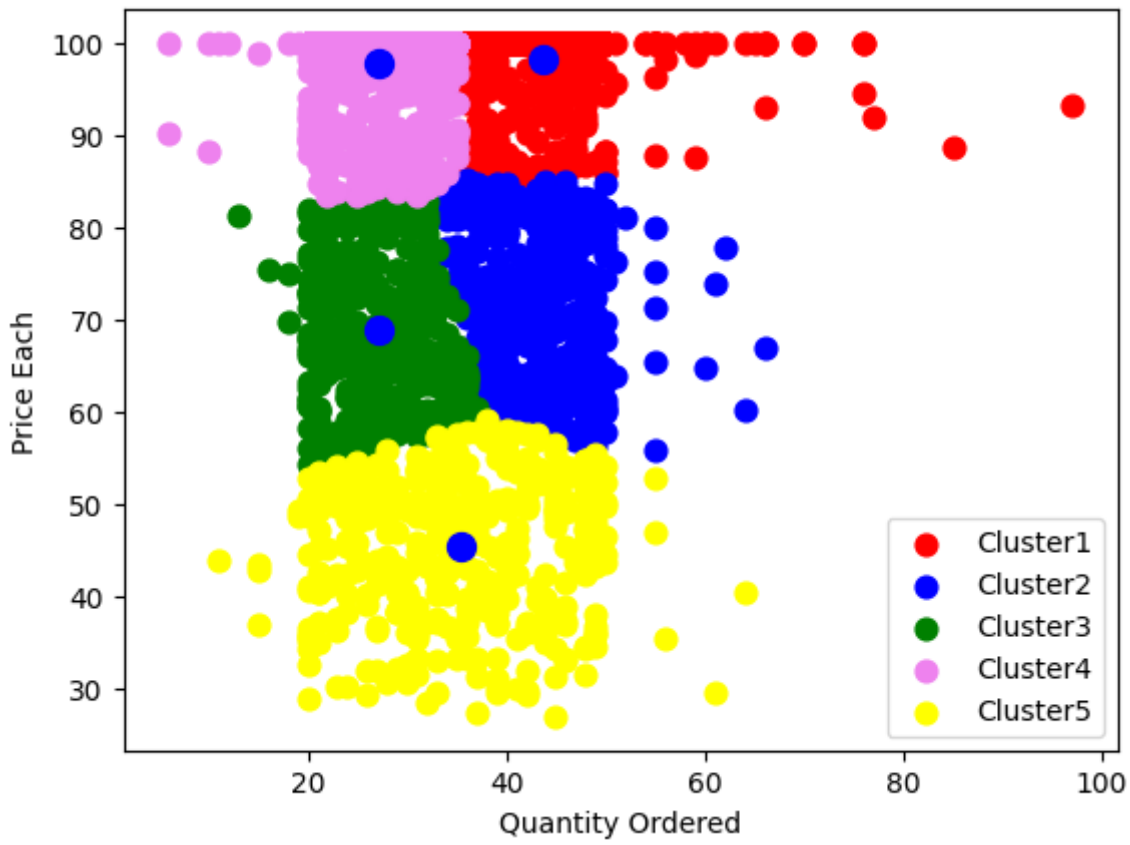
In [27]:

```
plt.scatter(x[y_kmeans==0,0],x[y_kmeans==0,1],s=60,c='red', label = 'Cluster1')
plt.scatter(x[y_kmeans==1,0],x[y_kmeans==1,1],s=60,c='blue', label = 'Cluster2')
plt.scatter(x[y_kmeans==2,0],x[y_kmeans==2,1],s=60,c='green', label = 'Cluster3')
plt.scatter(x[y_kmeans==3,0],x[y_kmeans==3,1],s=60,c='violet', label = 'Cluster4')
plt.scatter(x[y_kmeans==4,0],x[y_kmeans==4,1],s=60,c='yellow', label = 'Cluster5')

plt.scatter(kmeans.cluster_centers_[:, 0], kmeans.cluster_centers_[:, 1], s = 100, c = 'blu
plt.xlabel('Quantity Ordered')
plt.ylabel('Price Each')
plt.legend()
```

Out[27]:

```
<matplotlib.legend.Legend at 0x25cc87f47c0>
```



In [ ]:

```
```