# Phase-2

# Data Pre-processing

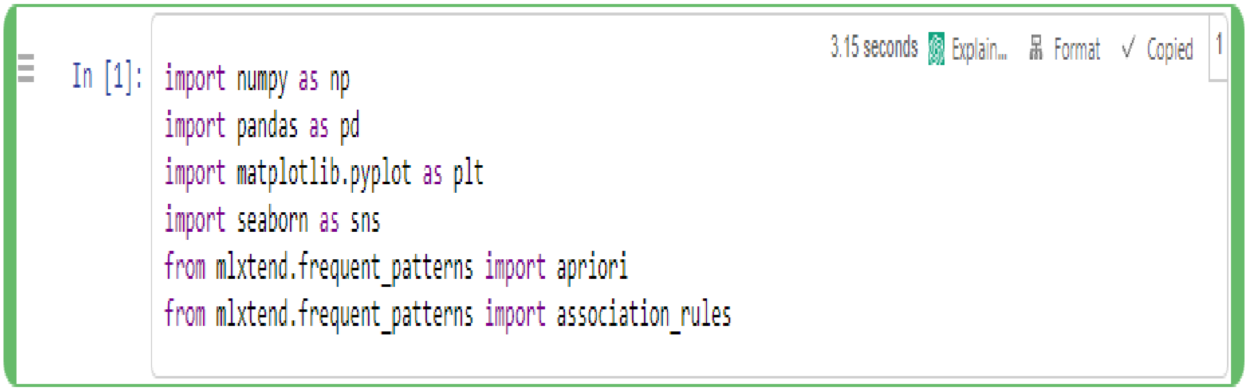
| | |
|---|---|
| Date | 8 October 2023 |
| Team ID | proj-212168-Team-2 |
| Project Name | Market Basket Insights |
| Maximum marks | |

Data pre-processing refers to the process of cleaning, transforming, and organizing raw data into a format that is suitable for machine learning algorithms and models. Data pre-processing aims to make the data more understandable and valuable for the AI model by addressing issues such as noise, missing values, outliers, and inconsistencies. It is an important step in the data mining process.

**Program:**

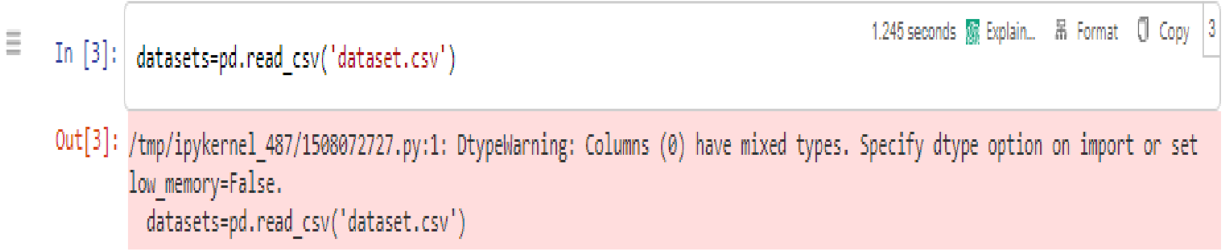
#import packages:

- Numpy :(import numpy as np) a library for mathematical operations and handling arrays.
- Pandas :(import pandas as pd) a library for data manipulation and analysis.
- matplotlib.pyplot: (import as plt) a library for creating visualization.
- Seaborn :as a library for creating additional data visualization.
- mlxtend.frequent_patterns: a module for performing frequent itemset mining and association rule learning.



```
In [1]: import numpy as np
        import pandas as pd
        import matplotlib.pyplot as plt
        import seaborn as sns
        from mlxtend.frequent_patterns import apriori
        from mlxtend.frequent_patterns import association_rules
```

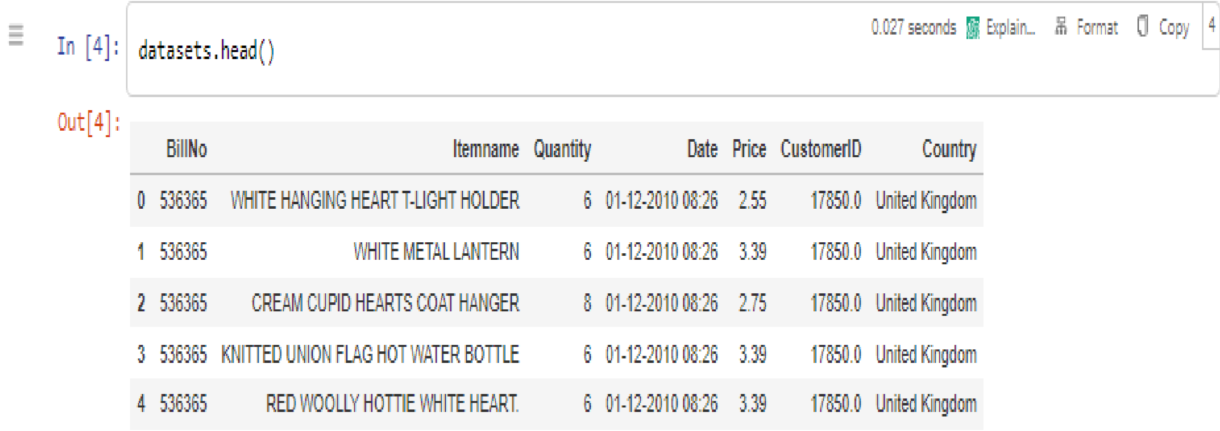
#Load the dataset:



```
In [3]: datasets=pd.read_csv('dataset.csv')

Out[3]: /tmp/ipykernel_487/1508072727.py:1: DtypeWarning: Columns (0) have mixed types. Specify dtype option on import or set
        low_memory=False.
          datasets=pd.read_csv('dataset.csv')
```

This code reads contents of a csv file called "dataset.csv" and saves it a variable called "datasets".



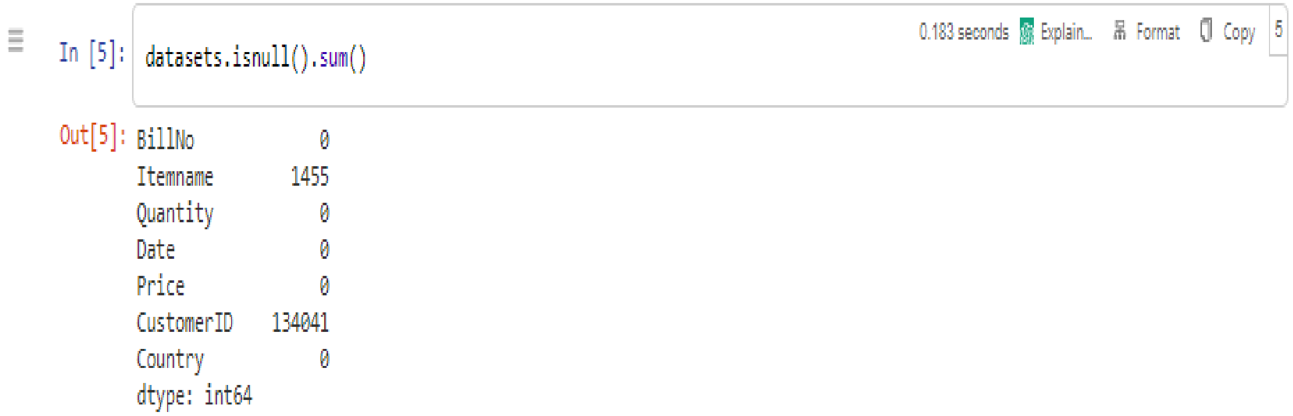
```
In [4]: datasets.head()
```

Out[4]:

| | BillNo | Itemname | Quantity | Date | Price | CustomerID | Country |
|---|---|---|---|---|---|---|---|
| 0 | 536365 | WHITE HANGING HEART T-LIGHT HOLDER | 6 | 01-12-2010 08:26 | 2.55 | 17850.0 | United Kingdom |
| 1 | 536365 | WHITE METAL LANTERN | 6 | 01-12-2010 08:26 | 3.39 | 17850.0 | United Kingdom |
| 2 | 536365 | CREAM CUPID HEARTS COAT HANGER | 8 | 01-12-2010 08:26 | 2.75 | 17850.0 | United Kingdom |
| 3 | 536365 | KNITTED UNION FLAG HOT WATER BOTTLE | 6 | 01-12-2010 08:26 | 3.39 | 17850.0 | United Kingdom |
| 4 | 536365 | RED WOOLLY HOTTIE WHITE HEART. | 6 | 01-12-2010 08:26 | 3.39 | 17850.0 | United Kingdom |

The code datasets.head() is calling the head() function on the dataset

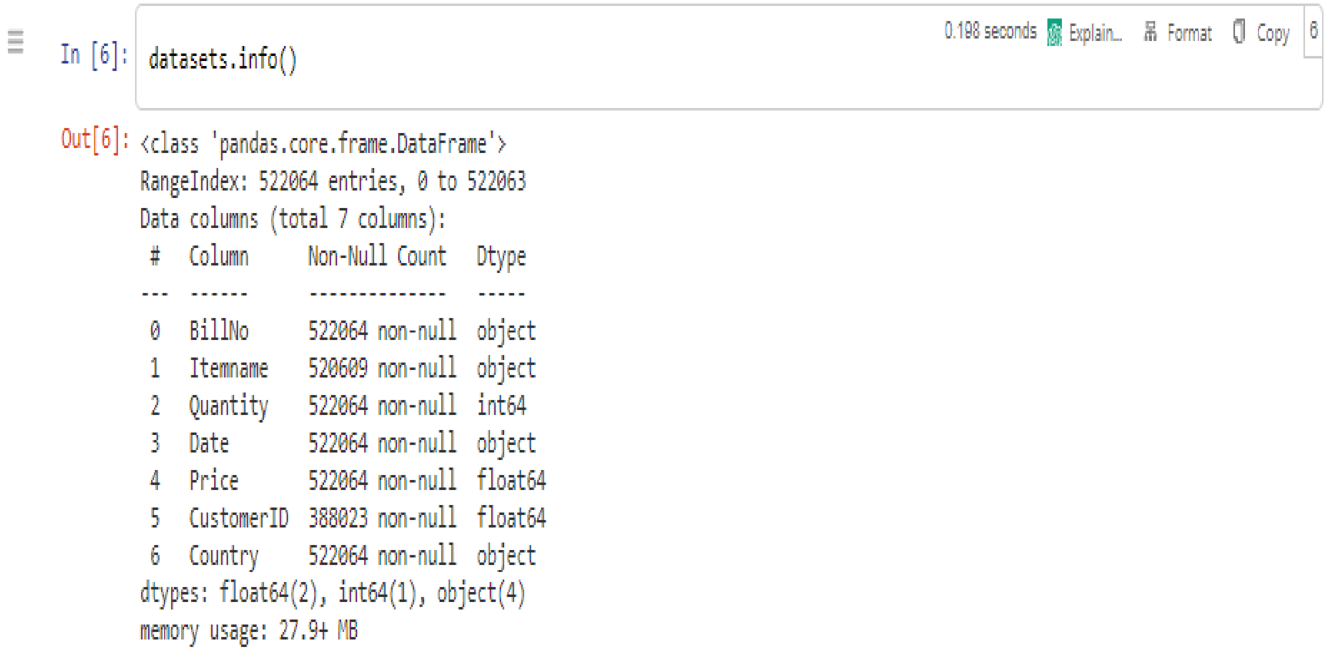
is used display first few rows of a data set.



```
In [5]: datasets.isnull().sum()
```

```
Out[5]: BillNo           0
        Itemname      1455
        Quantity         0
        Date             0
        Price            0
        CustomerID  134041
        Country          0
        dtype: int64
```

The isnull() function is used to find the number of missing values in column of a dataset. The sum() function is count the number of missing values.

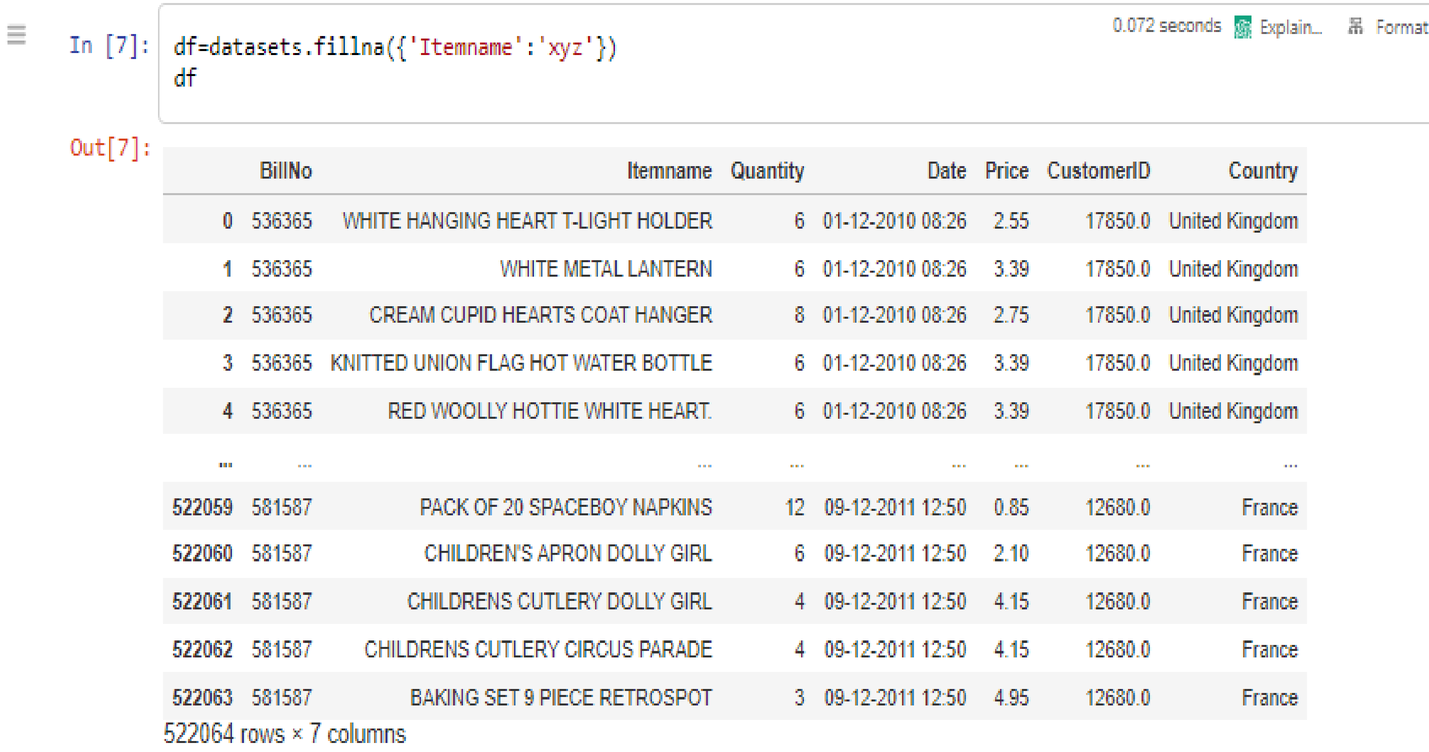


```
In [6]: datasets.info()
```

```
Out[6]: <class 'pandas.core.frame.DataFrame'>
        RangeIndex: 522064 entries, 0 to 522063
        Data columns (total 7 columns):
         #   Column      Non-Null Count   Dtype  
        ---  ------      --------------   -----  
         0   BillNo      522064 non-null  object 
         1   Itemname    520609 non-null  object 
         2   Quantity    522064 non-null  int64  
         3   Date        522064 non-null  object 
         4   Price       522064 non-null  float64
         5   CustomerID  388023 non-null  float64
         6   Country     522064 non-null  object 
        dtypes: float64(2), int64(1), object(4)
        memory usage: 27.9+ MB
```

The code datasets.info() is a method call in python to display the

information about dataset. The info() method provides such as number of columns and rows datatypes of columns and memory usage of the dataset.



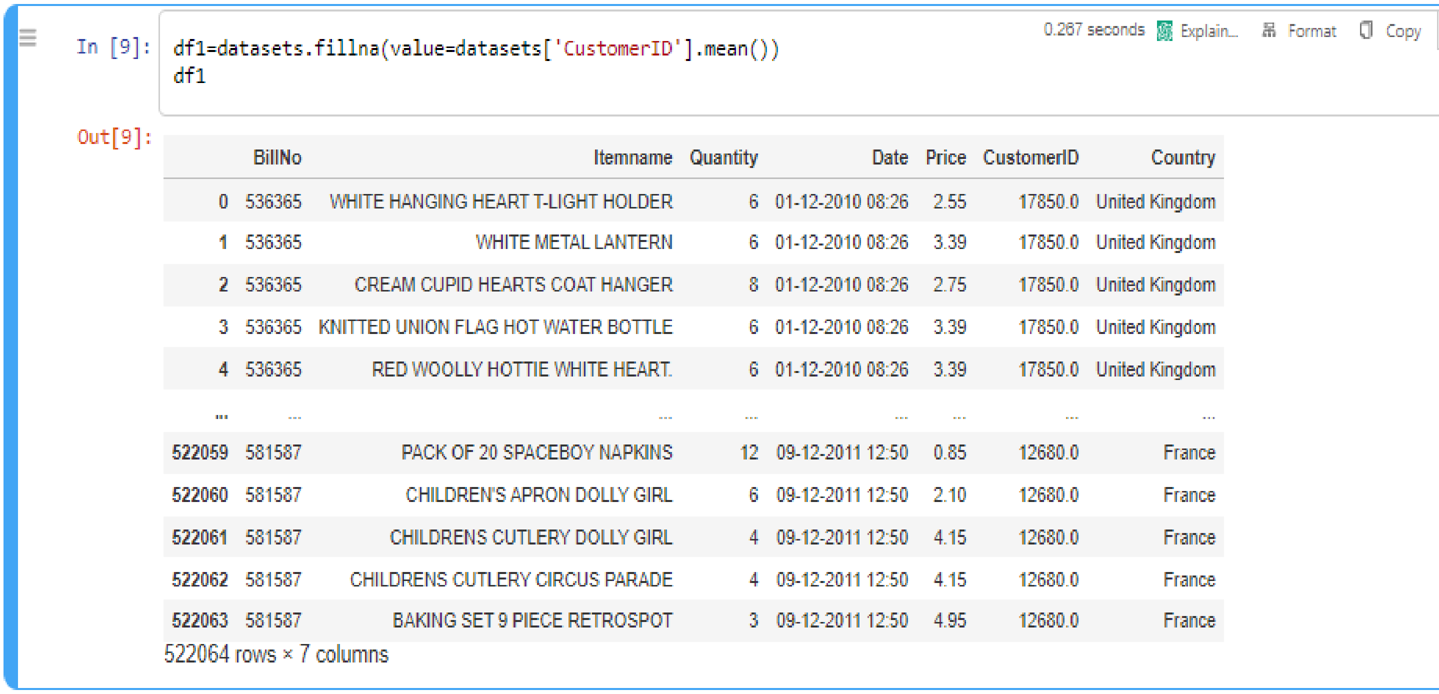
```
In [7]: df=datasets.fillna({'Itemname':'xyz'})
        df
```

Out[7]:

| | BillNo | Itemname | Quantity | Date | Price | CustomerID | Country |
|---|---|---|---|---|---|---|---|
| 0 | 536365 | WHITE HANGING HEART T-LIGHT HOLDER | 6 | 01-12-2010 08:26 | 2.55 | 17850.0 | United Kingdom |
| 1 | 536365 | WHITE METAL LANTERN | 6 | 01-12-2010 08:26 | 3.39 | 17850.0 | United Kingdom |
| 2 | 536365 | CREAM CUPID HEARTS COAT HANGER | 8 | 01-12-2010 08:26 | 2.75 | 17850.0 | United Kingdom |
| 3 | 536365 | KNITTED UNION FLAG HOT WATER BOTTLE | 6 | 01-12-2010 08:26 | 3.39 | 17850.0 | United Kingdom |
| 4 | 536365 | RED WOOLLY HOTTIE WHITE HEART. | 6 | 01-12-2010 08:26 | 3.39 | 17850.0 | United Kingdom |
| ... | ... | ... | ... | ... | ... | ... | ... |
| 522059 | 581587 | PACK OF 20 SPACEBOY NAPKINS | 12 | 09-12-2011 12:50 | 0.85 | 12680.0 | France |
| 522060 | 581587 | CHILDREN'S APRON DOLLY GIRL | 6 | 09-12-2011 12:50 | 2.10 | 12680.0 | France |
| 522061 | 581587 | CHILDRENS CUTLERY DOLLY GIRL | 4 | 09-12-2011 12:50 | 4.15 | 12680.0 | France |
| 522062 | 581587 | CHILDRENS CUTLERY CIRCUS PARADE | 4 | 09-12-2011 12:50 | 4.15 | 12680.0 | France |
| 522063 | 581587 | BAKING SET 9 PIECE RETROSPOT | 3 | 09-12-2011 12:50 | 4.95 | 12680.0 | France |

522064 rows × 7 columns

The fillna() is used to filling the missing values in the columns "Itemname" of the data frame "datasets" with the value "xyz". The filled data frame is then displayed.



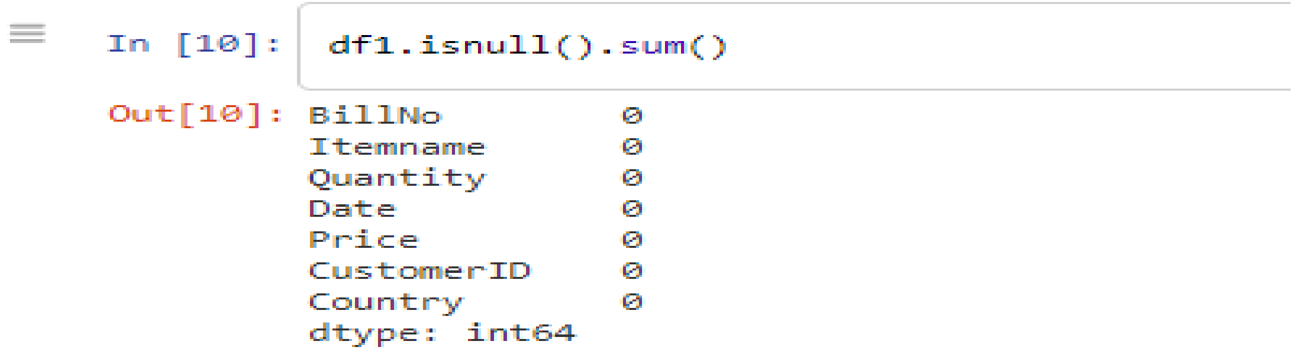
In [9]:
```
df1=datasets.fillna(value=datasets['CustomerID'].mean())
df1
```

Out[9]:

| | BillNo | Itemname | Quantity | Date | Price | CustomerID | Country |
|---|---|---|---|---|---|---|---|
| 0 | 536365 | WHITE HANGING HEART T-LIGHT HOLDER | 6 | 01-12-2010 08:26 | 2.55 | 17850.0 | United Kingdom |
| 1 | 536365 | WHITE METAL LANTERN | 6 | 01-12-2010 08:26 | 3.39 | 17850.0 | United Kingdom |
| 2 | 536365 | CREAM CUPID HEARTS COAT HANGER | 8 | 01-12-2010 08:26 | 2.75 | 17850.0 | United Kingdom |
| 3 | 536365 | KNITTED UNION FLAG HOT WATER BOTTLE | 6 | 01-12-2010 08:26 | 3.39 | 17850.0 | United Kingdom |
| 4 | 536365 | RED WOOLLY HOTTIE WHITE HEART. | 6 | 01-12-2010 08:26 | 3.39 | 17850.0 | United Kingdom |
| ... | ... | ... | ... | ... | ... | ... | ... |
| 522059 | 581587 | PACK OF 20 SPACEBOY NAPKINS | 12 | 09-12-2011 12:50 | 0.85 | 12680.0 | France |
| 522060 | 581587 | CHILDREN'S APRON DOLLY GIRL | 6 | 09-12-2011 12:50 | 2.10 | 12680.0 | France |
| 522061 | 581587 | CHILDRENS CUTLERY DOLLY GIRL | 4 | 09-12-2011 12:50 | 4.15 | 12680.0 | France |
| 522062 | 581587 | CHILDRENS CUTLERY CIRCUS PARADE | 4 | 09-12-2011 12:50 | 4.15 | 12680.0 | France |
| 522063 | 581587 | BAKING SET 9 PIECE RETROSPOT | 3 | 09-12-2011 12:50 | 4.95 | 12680.0 | France |

522064 rows × 7 columns

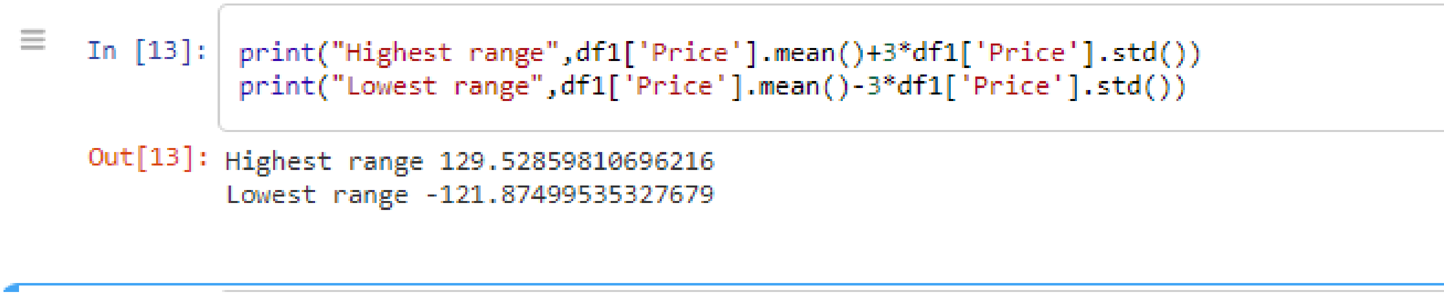
This code is fills the missing values in a data frame called dataset, using the mean of the "CustomerID" column. The filled data frame than assigned variable df1and displayed.



In [10]:
```
df1.isnull().sum()
```

Out[10]:
```
BillNo        0
Itemname      0
Quantity      0
Date          0
Price         0
CustomerID    0
Country       0
dtype: int64
```

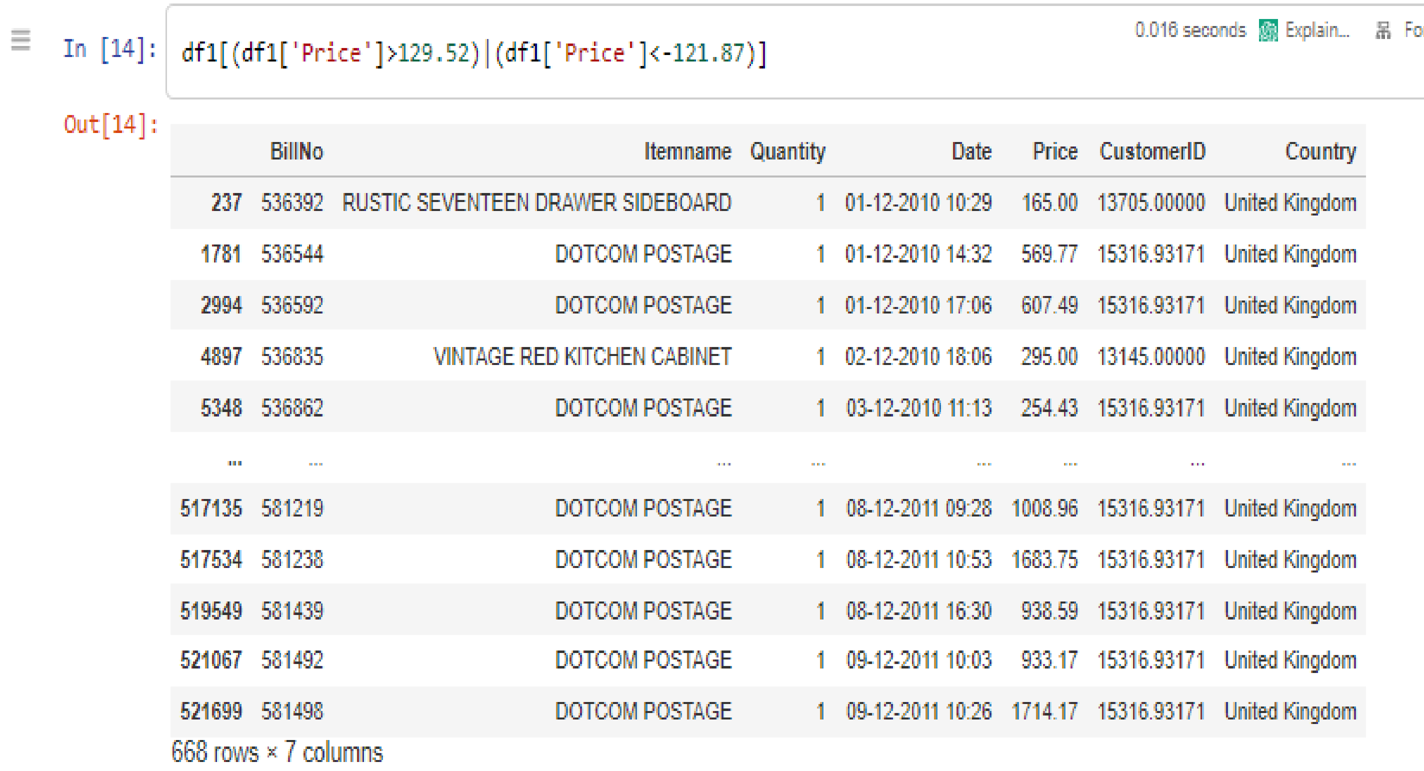
The isnull() function is used to find the number of missing values in column of a dataset. The sum() function is count the number of missing values.



```
In [13]: print("Highest range",df1['Price'].mean()+3*df1['Price'].std())
         print("Lowest range",df1['Price'].mean()-3*df1['Price'].std())

Out[13]: Highest range 129.52859810696216
         Lowest range -121.87499535327679
```

This code is printing the highest and lowest range based on statistical calculation. It calculates the mean and standard deviation of column called "Price" in data frame called df1.



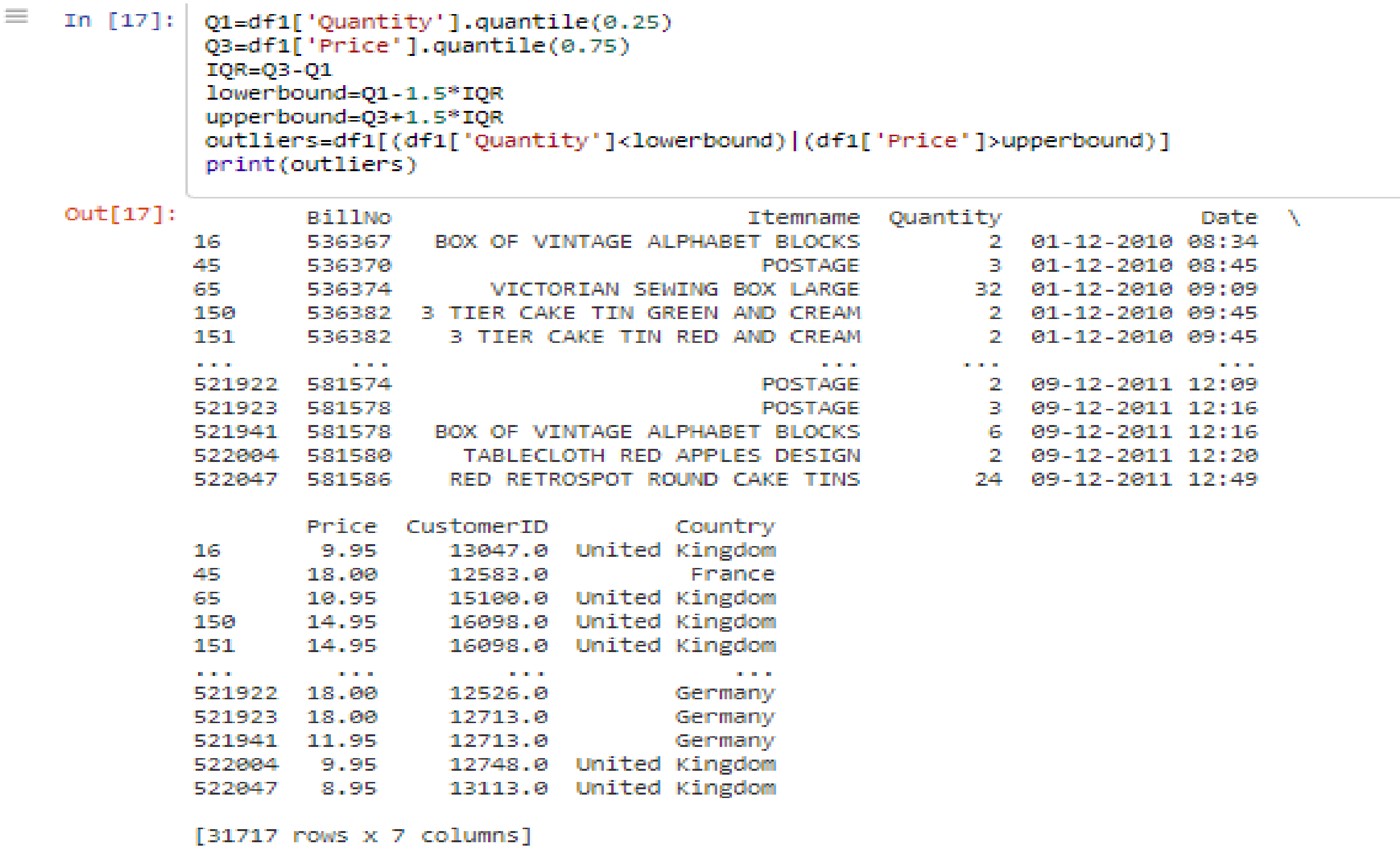
```
In [14]: df1[(df1['Price']>129.52)|(df1['Price']<-121.87)]
```

Out[14]:

| | BillNo | Itemname | Quantity | Date | Price | CustomerID | Country |
|---|---|---|---|---|---|---|---|
| 237 | 536392 | RUSTIC SEVENTEEN DRAWER SIDEBOARD | 1 | 01-12-2010 10:29 | 165.00 | 13705.00000 | United Kingdom |
| 1781 | 536544 | DOTCOM POSTAGE | 1 | 01-12-2010 14:32 | 569.77 | 15316.93171 | United Kingdom |
| 2994 | 536592 | DOTCOM POSTAGE | 1 | 01-12-2010 17:06 | 607.49 | 15316.93171 | United Kingdom |
| 4897 | 536835 | VINTAGE RED KITCHEN CABINET | 1 | 02-12-2010 18:06 | 295.00 | 13145.00000 | United Kingdom |
| 5348 | 536862 | DOTCOM POSTAGE | 1 | 03-12-2010 11:13 | 254.43 | 15316.93171 | United Kingdom |
| ... | ... | ... | ... | ... | ... | ... | ... |
| 517135 | 581219 | DOTCOM POSTAGE | 1 | 08-12-2011 09:28 | 1008.96 | 15316.93171 | United Kingdom |
| 517534 | 581238 | DOTCOM POSTAGE | 1 | 08-12-2011 10:53 | 1683.75 | 15316.93171 | United Kingdom |
| 519549 | 581439 | DOTCOM POSTAGE | 1 | 08-12-2011 16:30 | 938.59 | 15316.93171 | United Kingdom |
| 521067 | 581492 | DOTCOM POSTAGE | 1 | 09-12-2011 10:03 | 933.17 | 15316.93171 | United Kingdom |
| 521699 | 581498 | DOTCOM POSTAGE | 1 | 09-12-2011 10:26 | 1714.17 | 15316.93171 | United Kingdom |

668 rows × 7 columns

This code is used to filtering the data frame df1 based on the given condition.



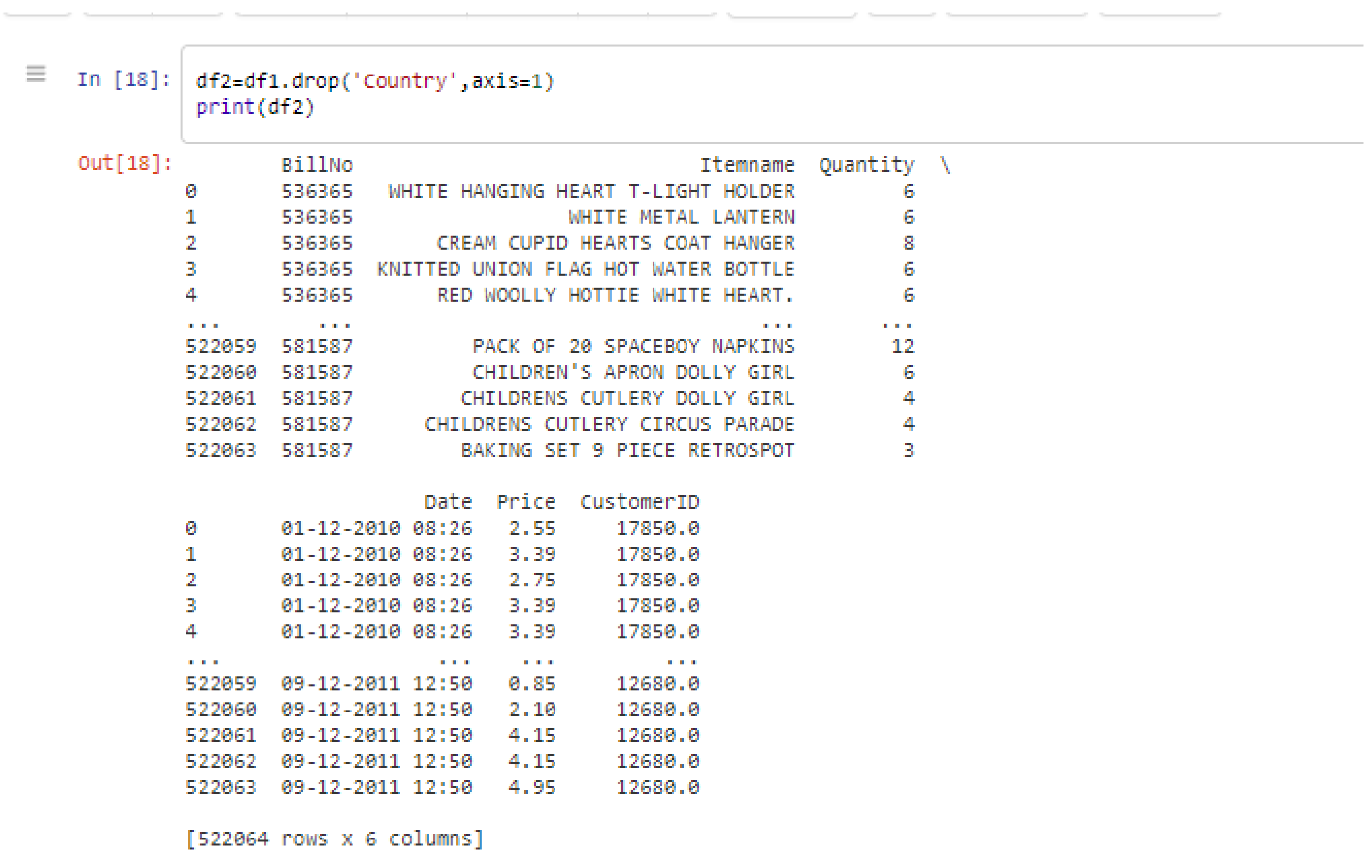
```
In [17]: Q1=df1['Quantity'].quantile(0.25)
         Q3=df1['Price'].quantile(0.75)
         IQR=Q3-Q1
         lowerbound=Q1-1.5*IQR
         upperbound=Q3+1.5*IQR
         outliers=df1[(df1['Quantity']<lowerbound)|(df1['Price']>upperbound)]
         print(outliers)
```

```
Out[17]:       BillNo                          Itemname  Quantity              Date  \
         16      536367   BOX OF VINTAGE ALPHABET BLOCKS         2  01-12-2010 08:34
         45      536370                          POSTAGE         3  01-12-2010 08:45
         65      536374        VICTORIAN SEWING BOX LARGE        32  01-12-2010 09:09
         150     536382  3 TIER CAKE TIN GREEN AND CREAM         2  01-12-2010 09:45
         151     536382    3 TIER CAKE TIN RED AND CREAM         2  01-12-2010 09:45
         ...        ...                              ...       ...               ...
         521922  581574                          POSTAGE         2  09-12-2011 12:09
         521923  581578                          POSTAGE         3  09-12-2011 12:16
         521941  581578   BOX OF VINTAGE ALPHABET BLOCKS         6  09-12-2011 12:16
         522004  581580     TABLECLOTH RED APPLES DESIGN         2  09-12-2011 12:20
         522047  581586    RED RETROSPOT ROUND CAKE TINS        24  09-12-2011 12:49

                 Price  CustomerID         Country
         16       9.95     13047.0  United Kingdom
         45      18.00     12583.0          France
         65      10.95     15100.0  United Kingdom
         150     14.95     16098.0  United Kingdom
         151     14.95     16098.0  United Kingdom
         ...       ...         ...             ...
         521922  18.00     12526.0         Germany
         521923  18.00     12713.0         Germany
         521941  11.95     12713.0         Germany
         522004   9.95     12748.0  United Kingdom
         522047   8.95     13113.0  United Kingdom

         [31717 rows x 7 columns]
```

- Q1 and Q3 are the first and third quartiles of the 'Quantity' and 'Price' columns, respectively.
- IQR is the interquartile range, calculated as the difference between Q3 and Q1.
- lowerbound and upperbound are the lower and upper bounds, respectively, for identifying outliers. They are calculated as Q1 - 1.5 * IQR and Q3 + 1.5 * IQR.
- Outliers is a Data Frame containing the rows from df1 where either the 'Quantity' is less than lowerbound or the 'Price' is greater than upperbound.
- Finally, the code prints out the outliers Data Frame.



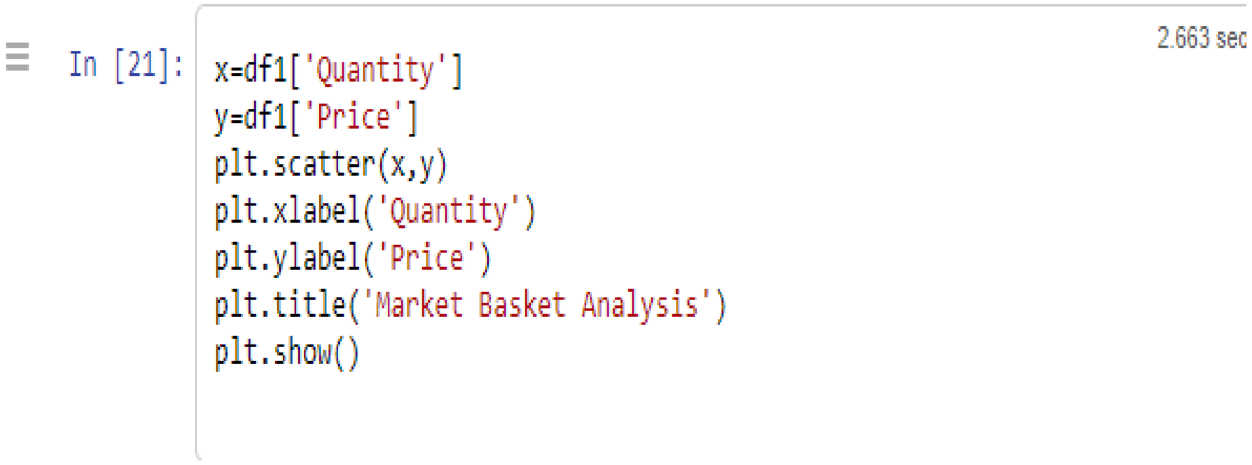
In [18]:
```
df2=df1.drop('Country',axis=1)
print(df2)
```

Out[18]:
```
        BillNo                            Itemname  Quantity  \
0       536365   WHITE HANGING HEART T-LIGHT HOLDER         6
1       536365                  WHITE METAL LANTERN         6
2       536365       CREAM CUPID HEARTS COAT HANGER         8
3       536365  KNITTED UNION FLAG HOT WATER BOTTLE         6
4       536365       RED WOOLLY HOTTIE WHITE HEART.         6
...        ...                                 ...       ...
522059  581587          PACK OF 20 SPACEBOY NAPKINS        12
522060  581587         CHILDREN'S APRON DOLLY GIRL          6
522061  581587         CHILDRENS CUTLERY DOLLY GIRL         4
522062  581587      CHILDRENS CUTLERY CIRCUS PARADE         4
522063  581587        BAKING SET 9 PIECE RETROSPOT          3

                    Date  Price  CustomerID
0       01-12-2010 08:26   2.55     17850.0
1       01-12-2010 08:26   3.39     17850.0
2       01-12-2010 08:26   2.75     17850.0
3       01-12-2010 08:26   3.39     17850.0
4       01-12-2010 08:26   3.39     17850.0
...                  ...    ...         ...
522059  09-12-2011 12:50   0.85     12680.0
522060  09-12-2011 12:50   2.10     12680.0
522061  09-12-2011 12:50   4.15     12680.0
522062  09-12-2011 12:50   4.15     12680.0
522063  09-12-2011 12:50   4.95     12680.0

[522064 rows x 6 columns]
```

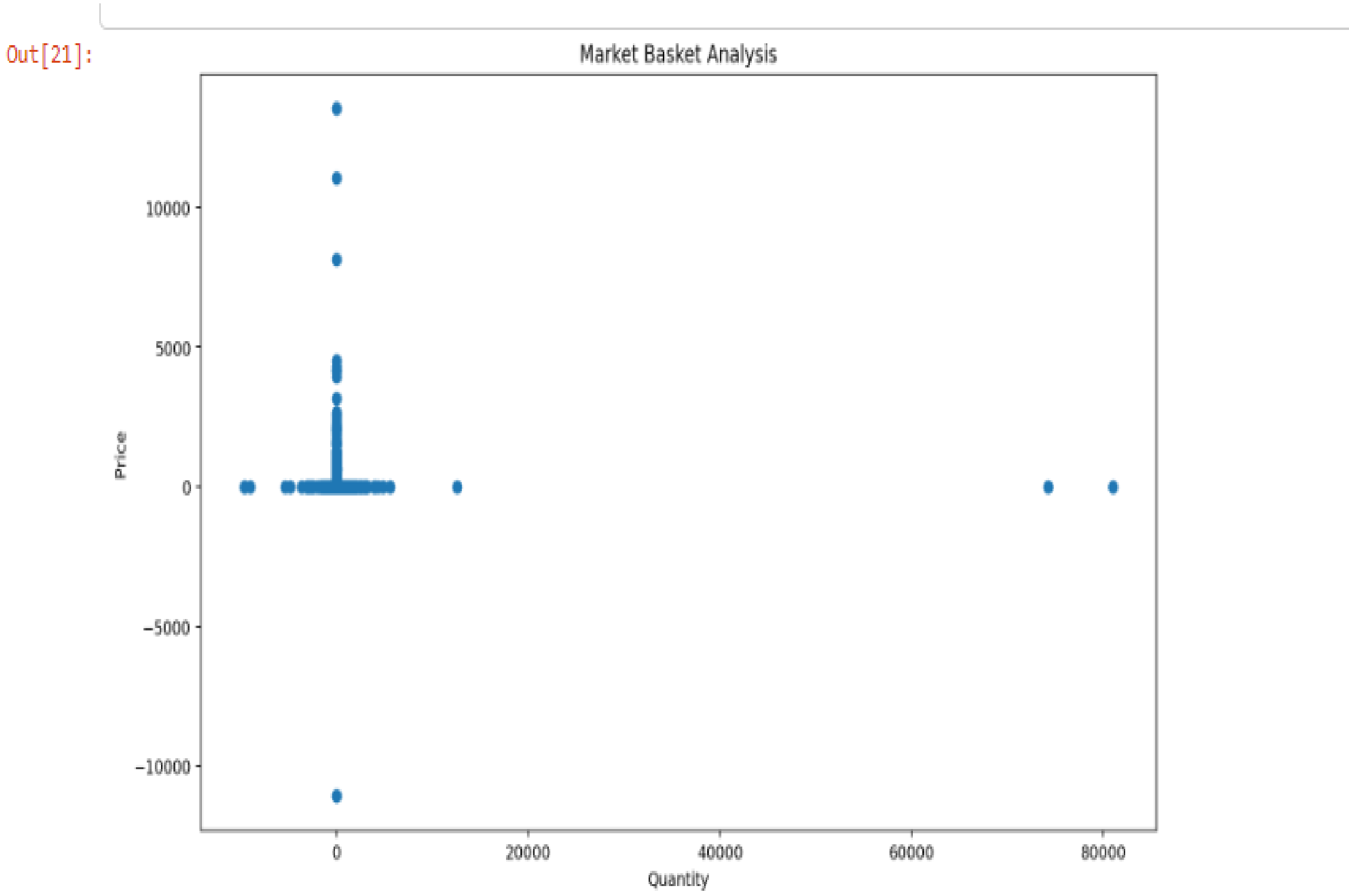
This code using the pandas library in Python to drop the 'Country' column from a Data Frame called df1. The 'axis=1' parameter specifies that the column is being dropped.



In [21]:

2.663 sec

```
x=df1['Quantity']
y=df1['Price']
plt.scatter(x,y)
plt.xlabel('Quantity')
plt.ylabel('Price')
plt.title('Market Basket Analysis')
plt.show()
```



Out[21]:

This code takes two column values from a data frame and assign them to the variables x and y, plots them as a scatterplot using the scatter() function from the pyplot module of the matplotlib library, adds labels to the x-axis using the xlabel() and y-axis using the ylabel(), sets a title to the plot using the title() and displays the plot using the show() .