09shqjowy

January 5, 2025

```
[ ]: import numpy as np
     import pandas as pd
     import seaborn as sns
     import matplotlib.pyplot as plt
     import plotly.express as px
```

```
[ ]: from google.colab import drive
     drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

```
[ ]: data = '/content/drive/MyDrive/008 - My Projects/Big Basket Mini/BigBasket␣
       ↪Products.csv'
     df = pd.read_csv(data)
```

```
[ ]: df
```

```
[ ]:        index                                            product  \
     0          1             Garlic Oil - Vegetarian Capsule 500 mg
     1          2                              Water Bottle - Orange
     2          3                     Brass Angle Deep - Plain, No.2
     3          4  Cereal Flip Lid Container/Storage Jar - Assort…
     4          5                     Creme Soft Soap - For Hands & Body
     …        …                                                  …
     27550  27551           Wottagirl! Perfume Spray - Heaven, Classic
     27551  27552                                           Rosemary
     27552  27553                        Peri-Peri Sweet Potato Chips
     27553  27554                           Green Tea - Pure Original
     27554  27555                       United Dreams Go Far Deodorant

                         category              sub_category  \
     0           Beauty & Hygiene                 Hair Care
     1       Kitchen, Garden & Pets    Storage & Accessories
     2         Cleaning & Household              Pooja Needs
     3         Cleaning & Household       Bins & Bathroom Ware
     4           Beauty & Hygiene            Bath & Hand Wash
     …                        …                        …
```

```
27550        Beauty & Hygiene         Fragrances & Deos
27551    Gourmet & World Food    Cooking & Baking Needs
27552    Gourmet & World Food  Snacks, Dry Fruits, Nuts
27553               Beverages                       Tea
27554        Beauty & Hygiene            Men's Grooming

                            brand  sale_price  market_price  \
0               Sri Sri Ayurveda       220.00         220.0
1                      Mastercook      180.00         180.0
2                             Trm      119.00         250.0
3                          Nakoda      149.00         176.0
4                           Nivea      162.00         162.0
…                           …         …           …
27550                      Layerr      199.20         249.0
27551                    Puramate       67.50          75.0
27552                      FabBox      200.00         200.0
27553                      Tetley      396.00         495.0
27554  United Colors Of Benetton       214.53         390.0

                           type  rating  \
0              Hair Oil & Serum     4.1
1        Water & Fridge Bottles     2.3
2               Lamp & Lamp Oil     3.4
3      Laundry, Storage Baskets     3.7
4          Bathing Bars & Soaps     4.4
…                         …     …
27550                   Perfume     3.9
27551  Herbs, Seasonings & Rubs     4.0
27552            Nachos & Chips     3.8
27553                  Tea Bags     4.2
27554          Men's Deodorants     4.5

                                             description
0      This Product contains Garlic Oil that is known…
1      Each product is microwave safe (without lid), …
2      A perfect gift for all occasions, be it your m…
3      Multipurpose container with an attractive desi…
4      Nivea Creme Soft Soap gives your skin the best…
…                                                  …
27550  Layerr brings you Wottagirl Classic fragrant b…
27551  Puramate rosemary is enough to transform a dis…
27552  We have taken the richness of Sweet Potatoes (…
27553  Tetley Green Tea with its refreshing pure, ori…
27554  The new mens fragrance from the United Dreams …

[27555 rows x 10 columns]
```

[ ]:

```
'''Beginning by exploring the dataset'''
'''Understanding the structure of data, the Dtypes of variables available, and␣
 ↪the general patterns'''

df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 27555 entries, 0 to 27554
Data columns (total 10 columns):
 #   Column        Non-Null Count  Dtype
---  ------        --------------  -----
 0   index         27555 non-null  int64
 1   product       27554 non-null  object
 2   category      27555 non-null  object
 3   sub_category  27555 non-null  object
 4   brand         27554 non-null  object
 5   sale_price    27549 non-null  float64
 6   market_price  27555 non-null  float64
 7   type          27555 non-null  object
 8   rating        18919 non-null  float64
 9   description   27440 non-null  object
dtypes: float64(3), int64(1), object(6)
memory usage: 2.1+ MB
```

[ ]:

```
'''Descriptive Statistics about our dataset'''

df.describe()
```

[ ]:

```
             index     sale_price  market_price        rating
count  27555.00000   27549.000000  27555.000000  18919.000000
mean   13778.00000     334.648391    382.056664      3.943295
std     7954.58767    1202.102113    581.730717      0.739217
min        1.00000       2.450000      3.000000      1.000000
25%     6889.50000      95.000000    100.000000      3.700000
50%    13778.00000     190.320000    220.000000      4.100000
75%    20666.50000     359.000000    425.000000      4.300000
max    27555.00000  112475.000000  12500.000000      5.000000
```

[ ]:

```
#As soon as we perform Exploratory and Descriptive analysis, we can now begin␣
 ↪Data Cleaning.
```

[ ]:

```
'''Let's drop any duplicate entries and check the shape of our dataset'''

df.drop_duplicates()
df.shape
```

[ ]:

```
(27555, 10)
```

[ ]:

```
'''Let's find Null/Missing values in our dataset(Column-wise)'''

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

[ ]:

```
index              0
product            1
category           0
sub_category       0
brand              1
sale_price         6
market_price       0
type               0
rating          8636
description      115
dtype: int64
```

[ ]:

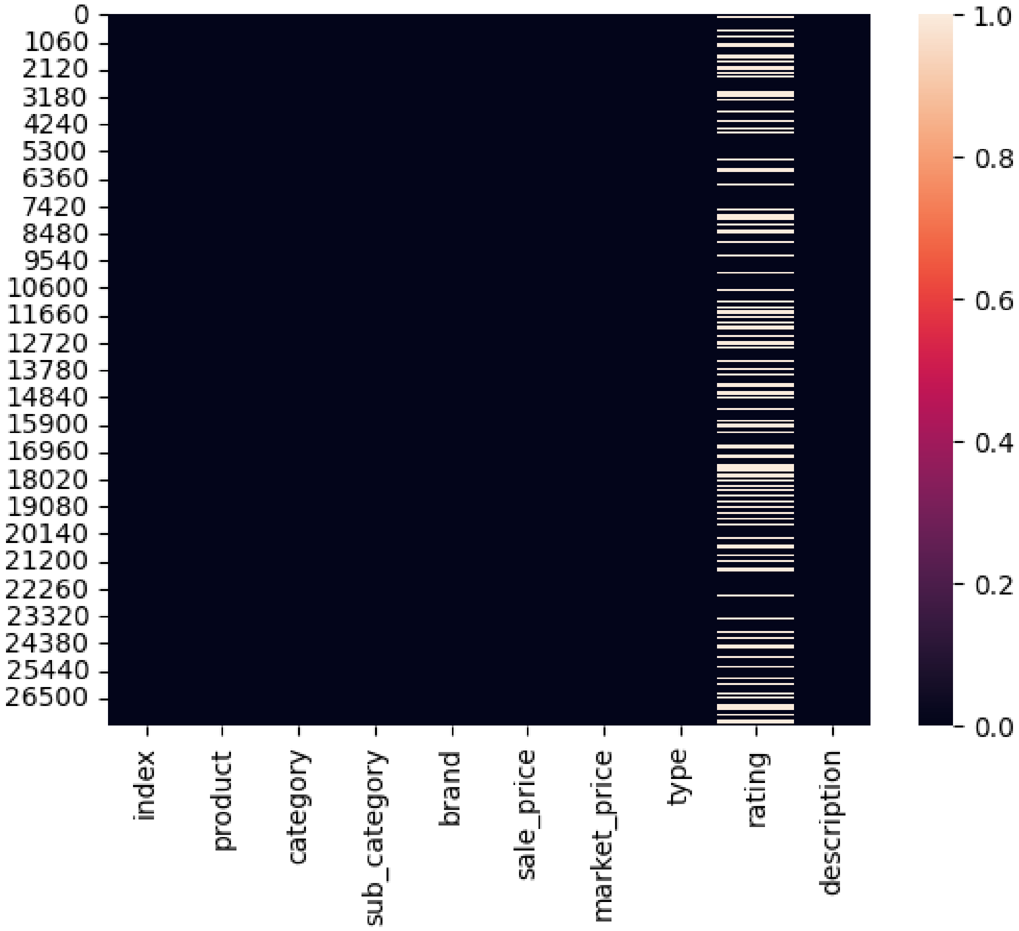
```
'''Total Number of Null values in our dataset'''

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

[ ]:

```
8759
```

[ ]:

```
'''Heatmap of Null values'''

sns.heatmap(df.isnull())
plt.show()
```



```
[ ]: '''We need to fill these missing values with the appropriate values, which␣
      ↪enables us analyse better insights from our dataset'''
     '''The reason to fill Null/Missing values is that we can't analyse the data␣
      ↪without it'''

     #For Categorical features like

     # Filling null values in 'brand' with 'No brand provided'.
     df['brand'].fillna('No brand provided', inplace=True)

     # Filling null values in 'product' with 'Product is not specified'.
     df['product'].fillna('Product is not specified', inplace=True)

     # Dropping 'description' as it is a string which isn't adding any value to our␣
      ↪analysis.
     df.drop('description', axis=1, inplace=True)
```

[ ]:

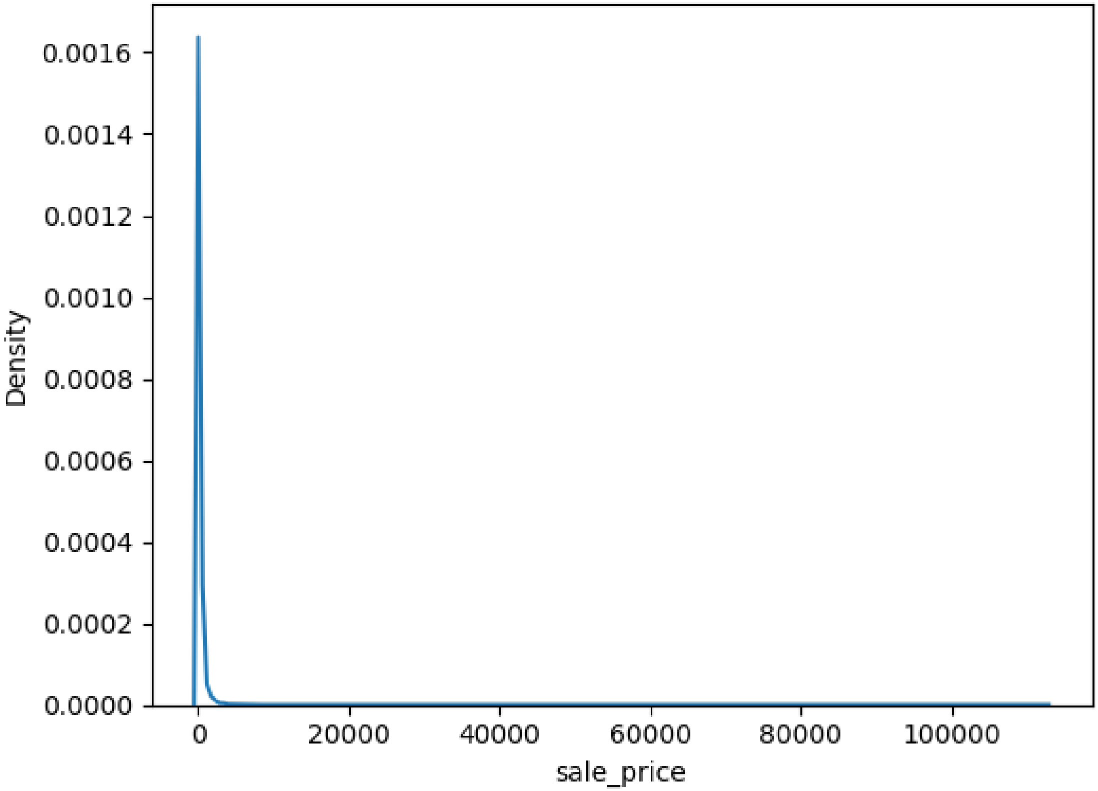
```
#For Numerical features like

'''sale_price'''
'''rating'''

#First calculate the percentage of Null values specifically column-wise.
df.isnull().sum()/df.shape[0]*100
```

[ ]:

```
index            0.000000
product          0.000000
category         0.000000
sub_category     0.000000
brand            0.000000
sale_price       0.021775
market_price     0.000000
type             0.000000
rating          31.340954
dtype: float64
```

[ ]:

```
'''Feature - sale_price'''

# Checking the distribution of feature 'sale_price'

sns.kdeplot(df['sale_price'])
plt.show()
```



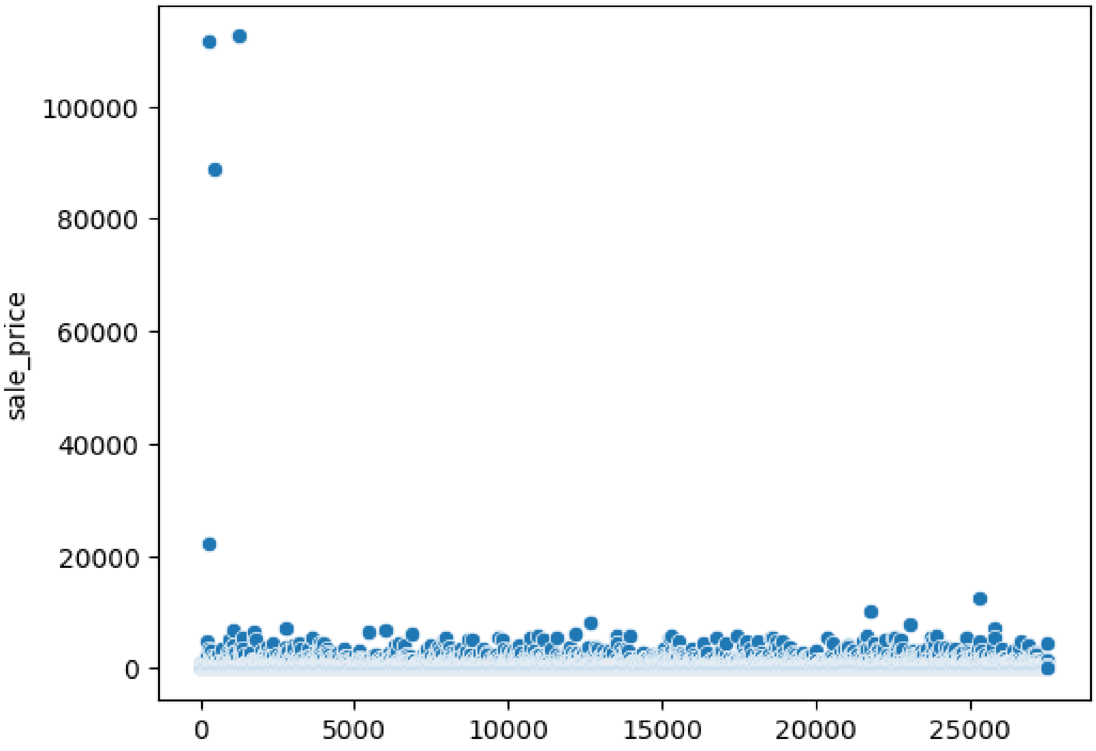
[ ]:
```
# The feature 'sale_price' is positively skewed.

median_value = df['sale_price'].median()
median_value
```

[ ]:
```
190.32
```

[ ]:
```
# So Filling the Null values in this feature by Median.

df['sale_price'] = df['sale_price'].fillna(median_value).astype(float)
```

[ ]:
```
'''Outliers handling in feature 'sale_price' by IQR Method.'''
```

[ ]:
```
sns.scatterplot(df['sale_price'])
plt.show()
```



[ ]:
```python
# Calculating IQR for Feature 'sale_price'.

Q1 = df['sale_price'].quantile(0.25)
print(f"Q1 is {Q1}")

Q3 = df['sale_price'].quantile(0.75)
print(f"Q3 is {Q3}")
```

```
Q1 is 95.0
Q3 is 359.0
```

[ ]:
```python
IQR = Q3 - Q1
print(f"IQR is {IQR}")
```

```
IQR is 264.0
```

[ ]:
```python
# Defining the outlier boundaries.

lower_bound = Q1 - 1.5 * IQR
print(lower_bound)

upper_bound = Q3 + 1.5 * IQR
print(upper_bound)
```

```
-301.0
755.0
```

[ ]:

```
# Identifying outliers.

# Our feature 'sale_price' lies between -301.0 and 755.0 as per IQR Method,␣
 ↪therefore any value below -301.0 and beyond 755.0 is considered as outliers.

outliers = df[(df['sale_price'] < lower_bound) | (df['sale_price'] >␣
 ↪upper_bound)]
outliers
```

[ ]:

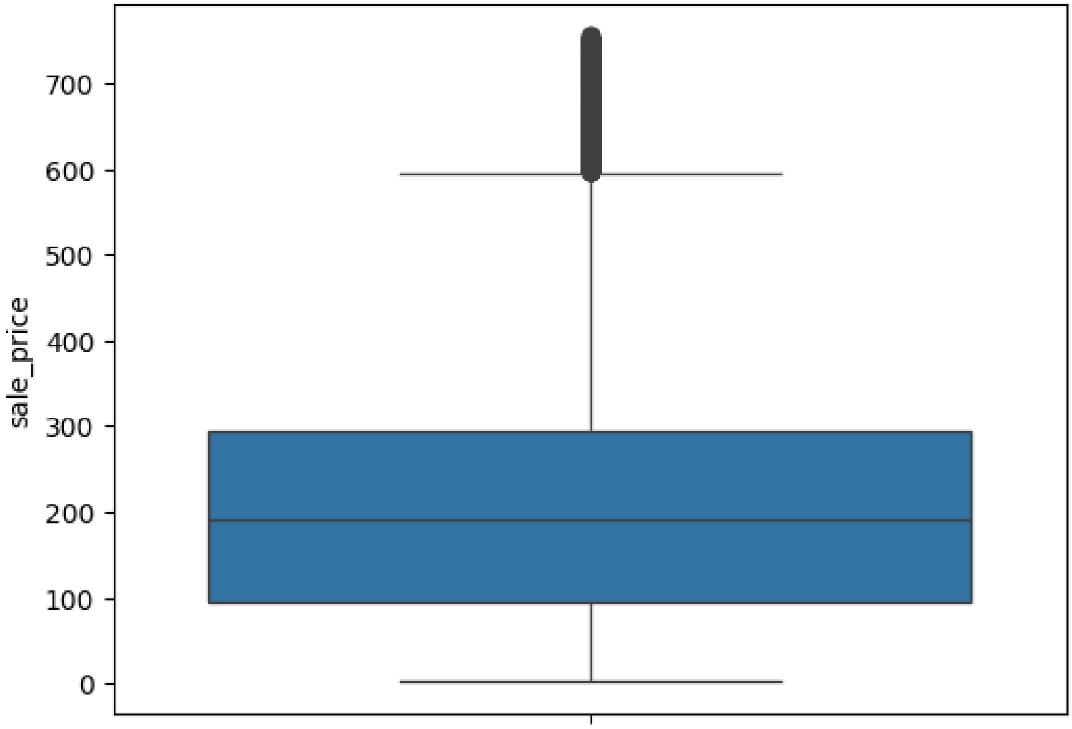
```
       index                                            product  \
8          9  Biotin & Collagen Volumizing Hair Shampoo + Bi…
47        48                                Colour Catcher Sheets
51        52                                         Peach Syrup
69        70                   Padded Harness - 3/4 inch, Grey Colour
91        92         Hard Anodised Ezee-Pour Saucepan With Lid - L88
…          …                                                  …
27498  27499                   Juicer - Fruit & Vegetable, Light Green
27505  27506                                    Virgin Coconut Oil
27514  27515                           Verge & Sheer Perfume For Pair
27538  27539  Quista Pro Advanced Whey Protein Formula forti…
27542  27543                           Embellish Skin Lightening Serum

                     category              sub_category            brand  \
8           Beauty & Hygiene                  Hair Care       StBotanica
47       Cleaning & Household      All Purpose Cleaners            Dylon
51        Gourmet & World Food       Drinks & Beverages           Pekers
69        Kitchen, Garden & Pets  Pet Food & Accessories          Glenand
91        Kitchen, Garden & Pets    Cookware & Non Stick    Hawkins Futura
…                         …                         …                …
27498     Kitchen, Garden & Pets     Kitchen Accessories           Ganesh
27505  Foodgrains, Oil & Masala       Edible Oils & Ghee          Merkera
27514           Beauty & Hygiene       Fragrances & Deos    Skinn by Titan
27538           Beauty & Hygiene       Health & Medicine          Himalaya
27542           Beauty & Hygiene               Skin Care  Organic Harvest

       sale_price  market_price                             type  rating
8         1098.00        1098.0          Shampoo & Conditioner     3.5
47         799.00         799.0              Imported Cleaners     4.0
51         850.00         850.0         Gourmet Juices & Drinks     4.2
69         840.00         840.0           Pet Collars & Leashes     NaN
91         864.50         910.0                Tawa & Sauce Pan     4.6
…            …              …                                …      …
27498     1071.00        1071.0  Kitchen Tools & Other Accessories     2.0
27505      875.00         875.0               Other Edible Oils     NaN
```

```
27514     1615.50        1795.0                           Perfume      NaN
27538     4500.00        4500.0            Supplements & Proteins      4.0
27542     1525.75        1795.0                         Face Care      4.2

[2205 rows x 9 columns]
```

[ ]:
```
# Replacing Outliers with Median.

df['sale_price'] = np.where((df['sale_price'] < lower_bound) |␣
 ↪(df['sale_price'] > upper_bound), median_value, df['sale_price'])
print(df['sale_price'])
```

```
0        220.00
1        180.00
2        119.00
3        149.00
4        162.00
          …
27550    199.20
27551     67.50
27552    200.00
27553    396.00
27554    214.53
Name: sale_price, Length: 27555, dtype: float64
```

[ ]:
```
# We see that there are still a few outliers exists.

sns.boxplot(df['sale_price'])
plt.show()
```



[ ]:
```
# Calculating IQR for 'sale_price' again after the previous transformations.

Q1 = df['sale_price'].quantile(0.25)
print(f"Q1 is {Q1}")

Q3 = df['sale_price'].quantile(0.75)
print(f"Q3 is {Q3}")
```

```
Q1 is 95.0
Q3 is 295.0
```

[ ]:
```
IQR = Q3 - Q1
print(f"IQR is {IQR}")
```

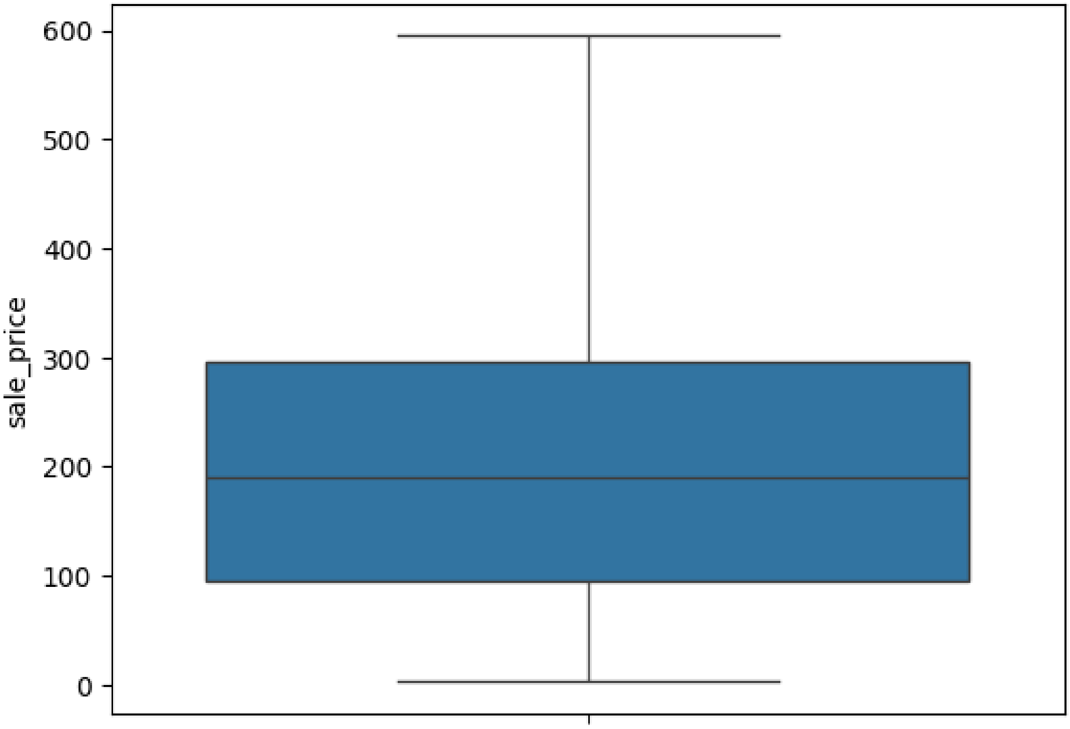
```
IQR is 200.0
```

[ ]:
```
# Defining new outlier boundaries.

lower_bound = Q1 - 1.5 * IQR
print(lower_bound)

upper_bound = Q3 + 1.5 * IQR
print(upper_bound)
```

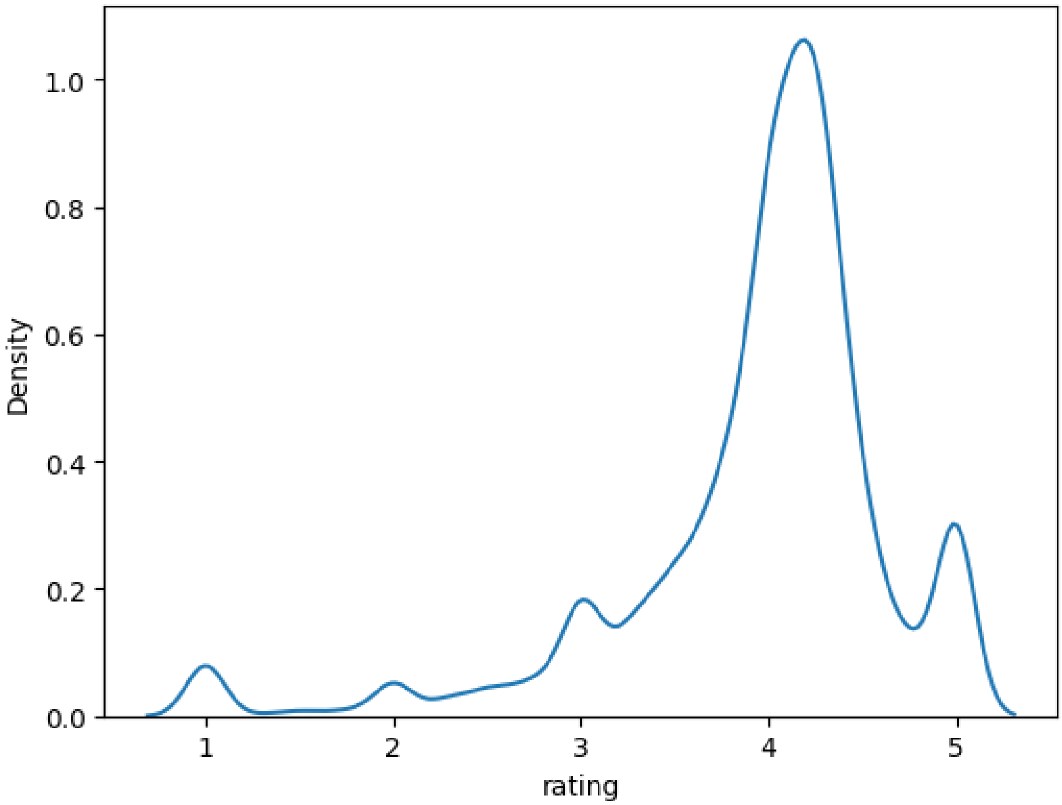
```
-205.0
595.0
```

[ ]:
```
# Now, instead of replacing with Median, Capping the outliers to boundary␣
↪values.

df['sale_price'] = np.where(df['sale_price'] < lower_bound, lower_bound,␣
↪df['sale_price'])
df['sale_price'] = np.where(df['sale_price'] > upper_bound, upper_bound,␣
↪df['sale_price'])
```

[ ]:
```
# Checking our Distribution again.

sns.boxplot(df['sale_price'])
plt.show()
```



[ ]:
```
'''Feature - rating'''

# Checking the distribution of feature 'rating'

sns.kdeplot(df['rating'])
plt.show()
```

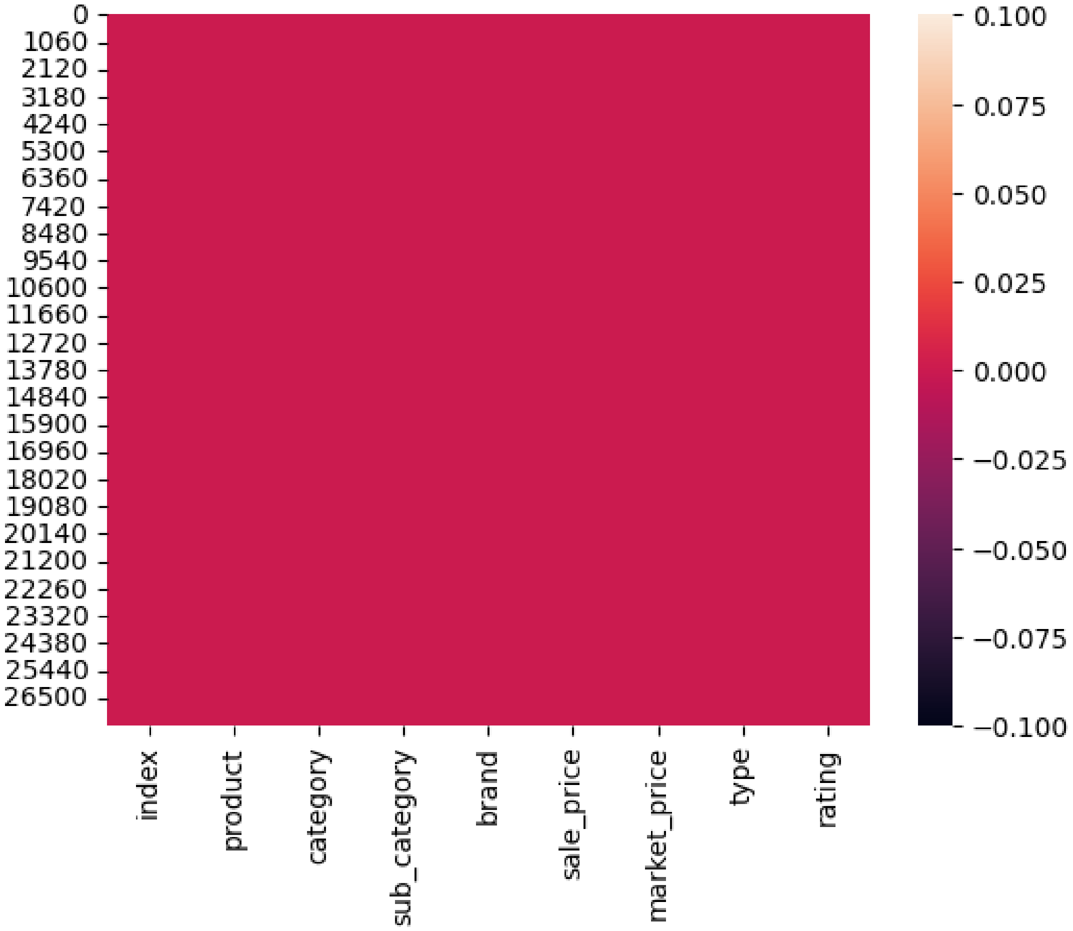


```
[ ]: # 'Rating' is from 1 to 5 and there isn't any outlier exist in this feature but␣
      ↪we see that 'rating' is negatively skewed.

     median_rating = df['rating'].median()
     median_rating
```

```
[ ]: 4.1
```

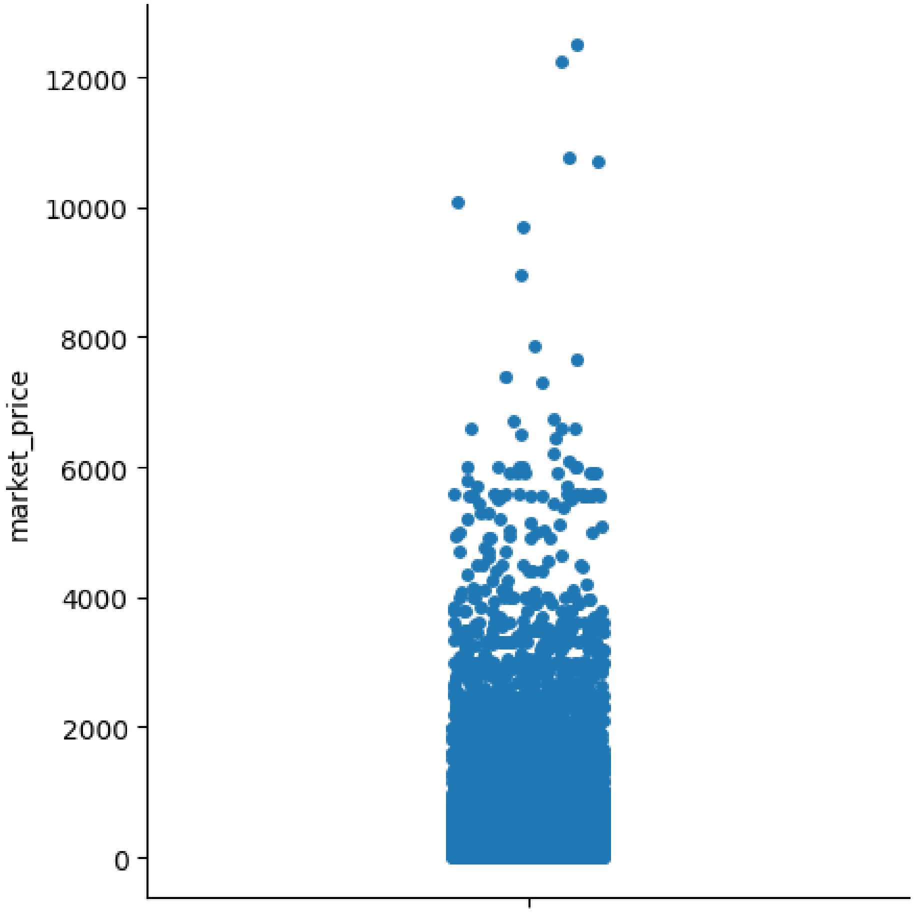
```
[ ]: # So Filling the Null values in this feature by Median.

     df['rating'] = df['rating'].fillna(median_rating).astype(float)
```

```
[ ]: '''Let's draw a HEATMAP to ensure all Null values has been handled'''
     sns.heatmap(df.isnull())
     plt.show()
```



[ ]:
```
# NOTE

# As all the Outliers and Null values in above features has been handled, We␣
↪still have one Numerical features left to check at least for Outliers.
# The feature is 'market_price'.
```

[ ]:
```
'''Feature - market_price'''

# Drawing a catplot of feature 'market_price' for checking if there's any␣
↪outliers exist

sns.catplot(df['market_price'])
plt.show()
```



[ ]:
```
'''Outliers handling in feature 'market_price' by IQR Method.'''
```

[ ]:
```
# Calculating IQR for 'market_price'.

Q1 = df['market_price'].quantile(0.25)
print(f"Q1 is {Q1}")

Q3 = df['market_price'].quantile(0.75)
print(f"Q3 is {Q3}")
```

```
Q1 is 100.0
Q3 is 425.0
```

[ ]:
```
IQR = Q3 - Q1
print(f"IQR is {IQR}")
```

```
IQR is 325.0
```

[ ]:

```
# Defining the outlier boundaries.

lower_bound = Q1 - 1.5 * IQR
print(lower_bound)

upper_bound = Q3 + 1.5 * IQR
print(upper_bound)
```

```
-387.5
912.5
```

[ ]:

```
# Identifying outliers.

# Our feature 'market_price' lies between -387.5 and 912.5 as per IQR Method,␣
 ↪therefore any value below -387.5 and beyond 912.5 is considered as an␣
 ↪outlier.

outliers = df[(df['market_price'] < lower_bound) | (df['market_price'] >␣
 ↪upper_bound)]
outliers
```

[ ]:

```
       index                                            product  \
8          9  Biotin & Collagen Volumizing Hair Shampoo + Bi…
34        35               Pet Solitaire Container Set - Silver
96        97                    Hair Remover Spray - Foam Lemon
99       100         Wonder Diaper Pants - Xtra Large, 12-17 Kg
118      119           Adult Dry Cat Food - +1 Year, Ocean Fish
…      …                                                 …
27488  27489                          Cranberry - Dried, Sliced
27498  27499            Juicer - Fruit & Vegetable, Light Green
27514  27515                     Verge & Sheer Perfume For Pair
27538  27539  Quista Pro Advanced Whey Protein Formula forti…
27542  27543                    Embellish Skin Lightening Serum

                     category              sub_category            brand  \
8            Beauty & Hygiene                 Hair Care       StBotanica
34     Kitchen, Garden & Pets     Storage & Accessories           Steelo
96           Beauty & Hygiene          Feminine Hygiene          Dimples
99                  Baby Care           Diapers & Wipes          Huggies
118    Kitchen, Garden & Pets    Pet Food & Accessories     Maxi Persian
…                       …                       …              …
27488    Gourmet & World Food  Snacks, Dry Fruits, Nuts           Rostaa
27498  Kitchen, Garden & Pets       Kitchen Accessories           Ganesh
27514        Beauty & Hygiene         Fragrances & Deos   Skinn by Titan
27538        Beauty & Hygiene         Health & Medicine         Himalaya
27542        Beauty & Hygiene                 Skin Care  Organic Harvest
```

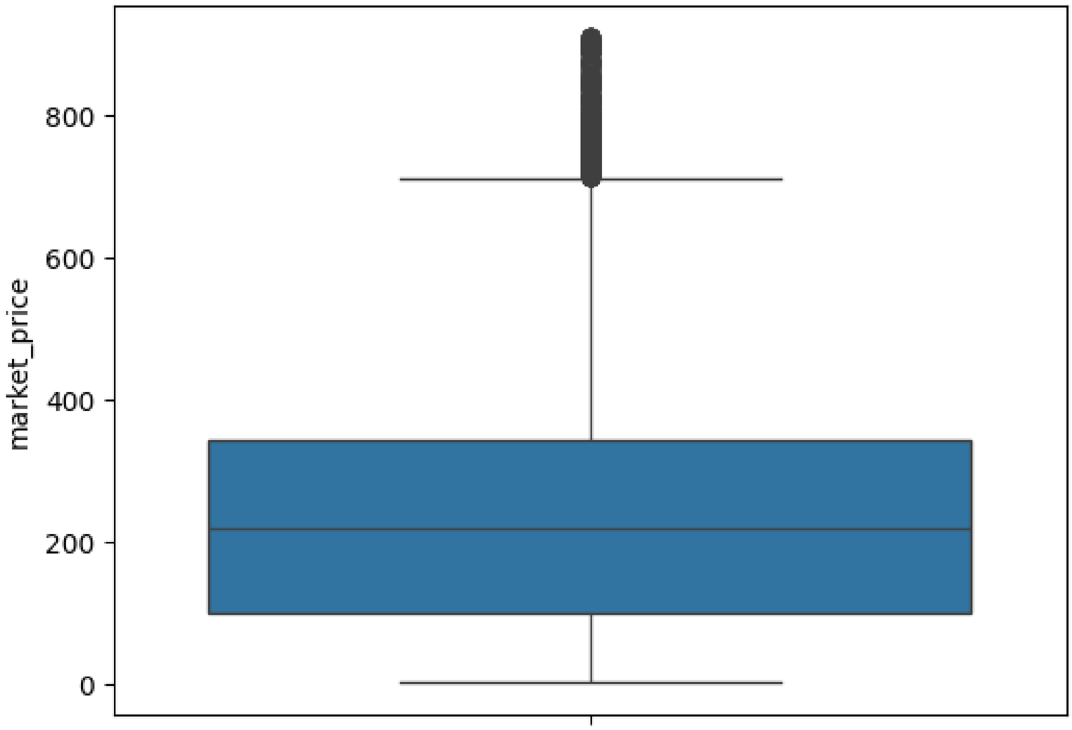
```
       sale_price  market_price                        type  rating
8          190.32        1098.0      Shampoo & Conditioner     3.5
34         499.00         969.0             Containers Sets    3.9
96         190.32        1200.0                Hair Removal    4.1
99         190.32        1398.0                     Diapers    4.0
118        190.32         999.0          Pet Meals & Treats    4.1
…             …            …                           …    …
27488      190.32         980.0       Dry Fruits & Berries    4.1
27498      190.32        1071.0  Kitchen Tools & Other Accessories  2.0
27514      190.32        1795.0                     Perfume    4.1
27538      190.32        4500.0     Supplements & Proteins     4.0
27542      190.32        1795.0                   Face Care    4.2

[2147 rows x 9 columns]
```

```
[ ]: # Checking Median.

     median_market_price = df['market_price'].median()
     median_market_price
```

```
[ ]: 220.0
```

```
[ ]: # Replacing Outliers in 'market_price' with Median

     df['market_price'] = np.where((df['market_price'] < lower_bound) |␣
      ↪(df['market_price'] > upper_bound), median_market_price, df['market_price'])
```

```
[ ]: # We see that there are still a few outliers exists.

     sns.boxplot(df['market_price'])
     plt.show()
```



```
[ ]: # Calculate the IQR for 'market_price' again after the previous transformations.

     Q1 = df['market_price'].quantile(0.25)
     print(f"Q1 is {Q1}")

     Q3 = df['market_price'].quantile(0.75)
     print(f"Q3 is {Q3}")
```

```
Q1 is 100.0
Q3 is 345.0
```

```
[ ]: IQR = Q3 - Q1
     print(f"IQR is {IQR}")
```

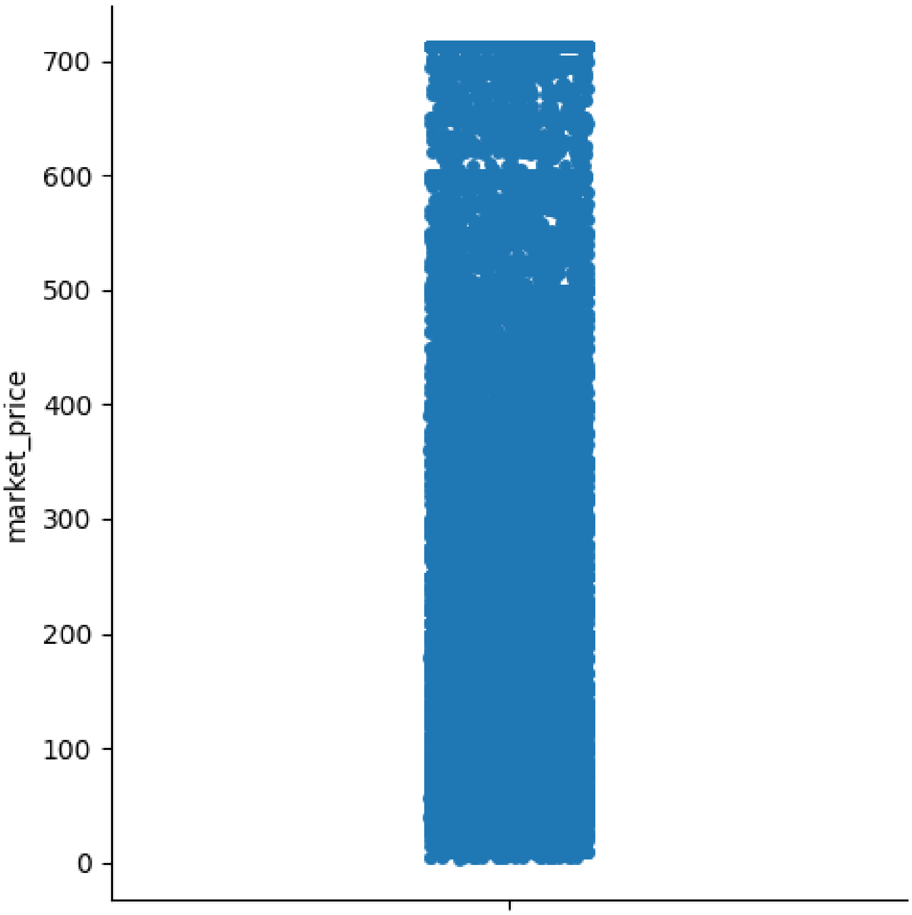
```
IQR is 245.0
```

```
[ ]: # Defining new outlier boundaries.

     lower_bound = Q1 - 1.5 * IQR
     print(lower_bound)

     upper_bound = Q3 + 1.5 * IQR
     print(upper_bound)
```

```
-267.5
712.5
```

[ ]:
```
# Now, instead of replacing with Median, Capping the outliers to boundary␣
↪values.

df['market_price'] = np.where(df['market_price'] < lower_bound, lower_bound,␣
↪df['market_price'])
df['market_price'] = np.where(df['market_price'] > upper_bound, upper_bound,␣
↪df['market_price'])
```

[ ]:
```
# Checking our Distribution again.

sns.catplot(df['market_price'])
plt.show()
```



[ ]:
```
df.describe()
```

```
[ ]:              index   sale_price  market_price        rating
     count  27555.00000  27555.000000  27555.000000  27555.000000
     mean   13778.00000    212.990196    249.555412      3.992408
     std     7954.58767    152.020223    183.080616      0.616814
     min        1.00000      2.450000      3.000000      1.000000
     25%     6889.50000     95.000000    100.000000      4.000000
     50%    13778.00000    190.320000    220.000000      4.100000
     75%    20666.50000    295.000000    345.000000      4.200000
     max    27555.00000    595.000000    712.500000      5.000000
```

```
[ ]: '''Question 1 - Use head function to look for first 12 rows.'''

     df.head(12)
```

```
[ ]:     index                                            product  \
     0       1            Garlic Oil - Vegetarian Capsule 500 mg
     1       2                            Water Bottle - Orange
     2       3                   Brass Angle Deep - Plain, No.2
     3       4  Cereal Flip Lid Container/Storage Jar - Assort…
     4       5               Creme Soft Soap - For Hands & Body
     5       6              Germ - Removal Multipurpose Wipes
     6       7                                     Multani Mati
     7       8               Hand Sanitizer - 70% Alcohol Base
     8       9  Biotin & Collagen Volumizing Hair Shampoo + Bi…
     9      10             Scrub Pad - Anti- Bacterial, Regular
     10     11                        Wheat Grass Powder - Raw
     11     12                    Butter Cookies Gold Collection

                       category           sub_category               brand  \
     0         Beauty & Hygiene              Hair Care  Sri Sri Ayurveda
     1    Kitchen, Garden & Pets   Storage & Accessories          Mastercook
     2     Cleaning & Household            Pooja Needs                 Trm
     3     Cleaning & Household    Bins & Bathroom Ware              Nakoda
     4         Beauty & Hygiene        Bath & Hand Wash               Nivea
     5     Cleaning & Household    All Purpose Cleaners      Nature Protect
     6         Beauty & Hygiene              Skin Care           Satinance
     7         Beauty & Hygiene        Bath & Hand Wash             Bionova
     8         Beauty & Hygiene              Hair Care          StBotanica
     9     Cleaning & Household  Mops, Brushes & Scrubs        Scotch brite
     10    Gourmet & World Food  Cooking & Baking Needs           NUTRASHIL
     11    Gourmet & World Food   Chocolates & Biscuits            Sapphire

         sale_price  market_price                      type  rating
     0       220.00         220.0         Hair Oil & Serum     4.1
     1       180.00         180.0      Water & Fridge Bottles    2.3
     2       119.00         250.0            Lamp & Lamp Oil     3.4
     3       149.00         176.0    Laundry, Storage Baskets    3.7
```

```
4       162.00       162.0         Bathing Bars & Soaps     4.4
5       169.00       199.0  Disinfectant Spray & Cleaners     3.3
6        58.00        58.0                     Face Care     3.6
7       250.00       250.0          Hand Wash & Sanitizers     4.0
8       190.32       220.0           Shampoo & Conditioner     3.5
9        20.00        20.0        Utensil Scrub-Pad, Glove     4.3
10      261.00       290.0              Flours & Pre-Mixes     4.0
11      595.00       600.0        Luxury Chocolates, Gifts     2.2
```

[ ]:

```
'''Question 2 - Get Description of the data in the DataFrame.'''

df.describe()
```

[ ]:

```
             index     sale_price   market_price        rating
count  27555.00000  27555.000000  27555.000000  27555.000000
mean   13778.00000    212.990196    249.555412      3.992408
std     7954.58767    152.020223    183.080616      0.616814
min        1.00000      2.450000      3.000000      1.000000
25%     6889.50000     95.000000    100.000000      4.000000
50%    13778.00000    190.320000    220.000000      4.100000
75%    20666.50000    295.000000    345.000000      4.200000
max    27555.00000    595.000000    712.500000      5.000000
```

[ ]:

```
'''Question 3 - : Find Information about the DataFrame.'''

df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 27555 entries, 0 to 27554
Data columns (total 9 columns):
 #   Column        Non-Null Count  Dtype
---  ------        --------------  -----
 0   index         27555 non-null  int64
 1   product       27555 non-null  object
 2   category      27555 non-null  object
 3   sub_category  27555 non-null  object
 4   brand         27555 non-null  object
 5   sale_price    27555 non-null  float64
 6   market_price  27555 non-null  float64
 7   type          27555 non-null  object
 8   rating        27555 non-null  float64
dtypes: float64(3), int64(1), object(5)
memory usage: 1.9+ MB
```

[ ]:

```
'''Question 4 - Find out Top and least sold products (at least 5).'''

# Top 5 sold products are as follows:
```

```
df['product'].value_counts().reset_index().head(5)
```

[ ]:

```
                               product  count
0        Turmeric Powder/Arisina Pudi     26
1              Extra Virgin Olive Oil     15
2                      Cow Ghee/Tuppa     14
3                          Soft Drink     12
4  Colorsilk Hair Colour With Keratin     12
```

[ ]:

```
# Bottom 5 least sold products are as follows:

df['product'].value_counts().reset_index().tail(5)
```

[ ]:

```
                                             product  count
23536                 Sauteed Onion & Garlic Pasta Sauce      1
23537                       Pepper & Herb Salami Chicken      1
23538                                     Nutmeg Powder      1
23539  Disney Mickey Mouse Plastic Kids Sipper Bottle…      1
23540                           Green Tea - Pure Original      1
```

[ ]:

```
'''Question 5 - Measuring discount on a certain item.'''

# Let's create a function for the same.
# It can calculate discount of any item in our dataset.
# We need to enter the index number of concerned article.

def calculate_discount(market_price, sale_price):

  """Calculates the discount percentage for an item.
  Args:
    market_price: The original price of the item.
    sale_price: The discounted price of the item.
  Returns:
    The discount percentage as a float."""

  discount = (market_price - sale_price) / market_price * 100
  return discount
```

[ ]:

```
# Let's calculate the discount on 'Ceramic Barrel Brush', which is at 20th␣
 ↪index.

market_price = df['market_price'][20]
sale_price = df['sale_price'][20]

# putting the values in our user-defined function.
```

```
discount = calculate_discount(market_price, sale_price)

print(f"The discount on the item is {discount:.2f}%")
```

```
The discount on the item is 25.00%
```

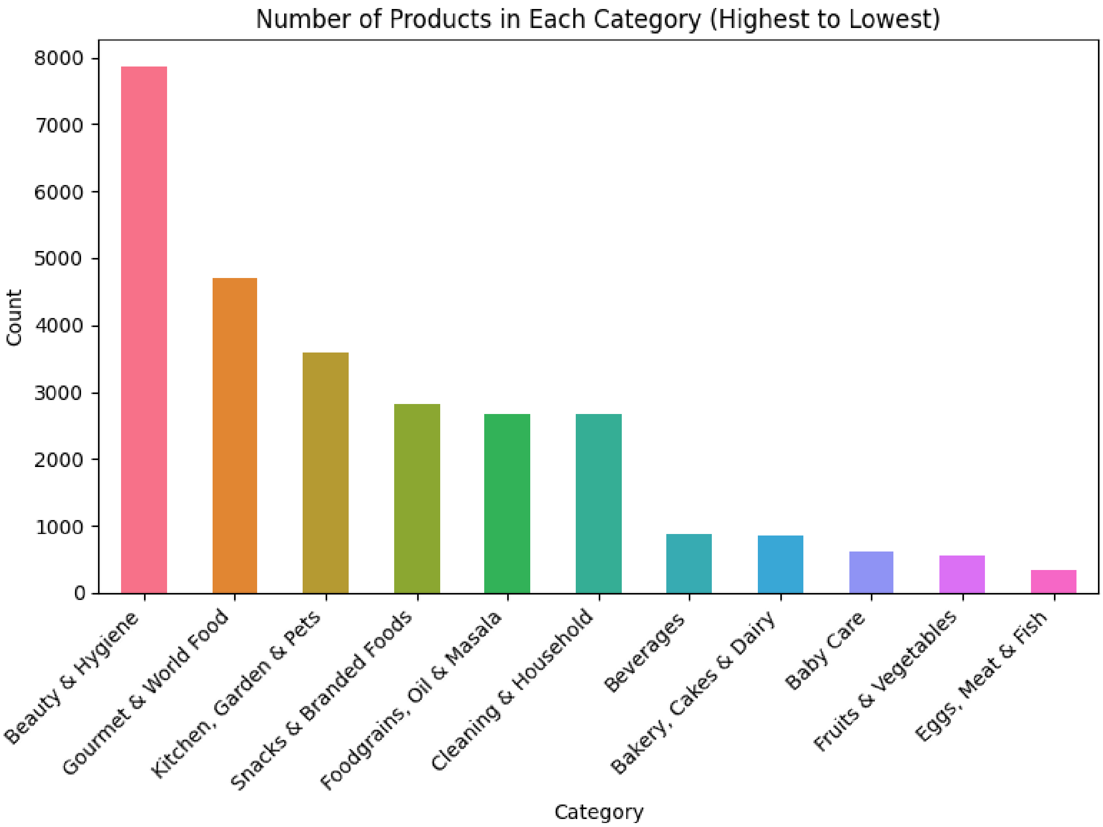
[ ]:

```
# Again calculate the discount on 'Woman - Pure Body Mist', which is at 14,988␣
  ↪index.

market_price = df['market_price'][14988]
sale_price = df['sale_price'][14988]

# putting the values in our user-defined function.

discount = calculate_discount(market_price, sale_price)

print(f"The discount on the item is {discount:.2f}%")
```

```
The discount on the item is 20.00%
```

[ ]:

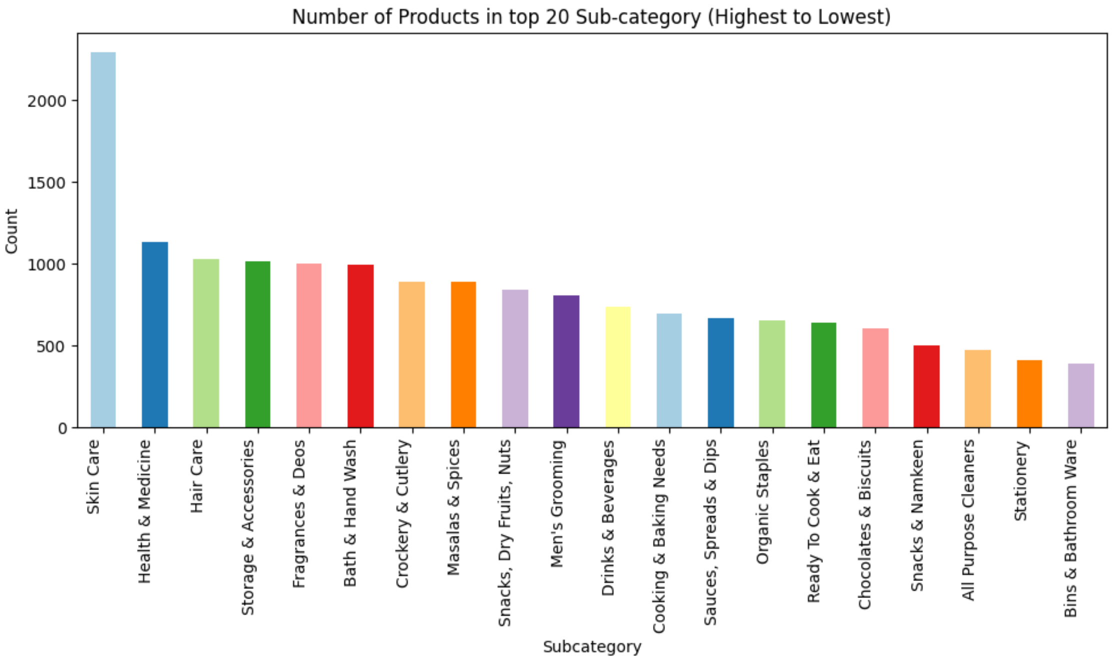
```
'''Question 6 - Create Plots and Visualizations-'''

'''BAR CHART: Plot the distribution of number of products in each Category.'''

category_counts = df['category'].value_counts()
plt.figure(figsize=(8, 6))

# Set the color palette
colors = sns.color_palette('husl', len(category_counts))

# Create a bar chart
category_counts.plot(kind='bar', color = colors)
plt.title('Number of Products in Each Category (Highest to Lowest)')
plt.xlabel('Category')
plt.ylabel('Count')
plt.xticks(rotation=45, ha='right')
plt.tight_layout()
plt.show()
```



```
[ ]: '''Meaningful insights from above plot'''

     # The category "Beauty & Hygiene" has the highest number of products. This␣
      ↪suggests that Big Basket has a strong focus on this category followed by␣
      ↪"Gourmet & World Food".

     # The categories "Snacks & Branded Foods" and "Foodgrains, Oil & Masala" also␣
      ↪have a significant number of products.
     # These are essential categories that are likely to be in high demand.

     # The categories "Fruits & Vegetables" and "Eggs, Meat & Fish" have a␣
      ↪relatively smaller number of products.
     # Big Basket may want to consider expanding their offerings in these categories␣
      ↪to cater to a wider range of customer needs.

     # Overall, the distribution of products across categories provides insights␣
      ↪into Big Basket's focus areas and potential areas for growth.
```

```
[ ]: '''Question 6 - Create Plots and Visualizations-'''
```

```
'''BAR CHART: Plot the distribution of number of products in Top 20␣
 ↪Sub-category.'''

subcategory_counts = df['sub_category'].value_counts().head(20)
plt.figure(figsize=(10, 6))

# Set the color palette
colors = sns.color_palette('Paired', len(category_counts))

# Create a bar chart
subcategory_counts.plot(kind='bar', color=colors)
plt.title('Number of Products in top 20 Sub-category (Highest to Lowest)')
plt.xlabel('Subcategory')
plt.ylabel('Count')
plt.xticks(rotation=90, ha='right')
plt.tight_layout()
plt.show()
```



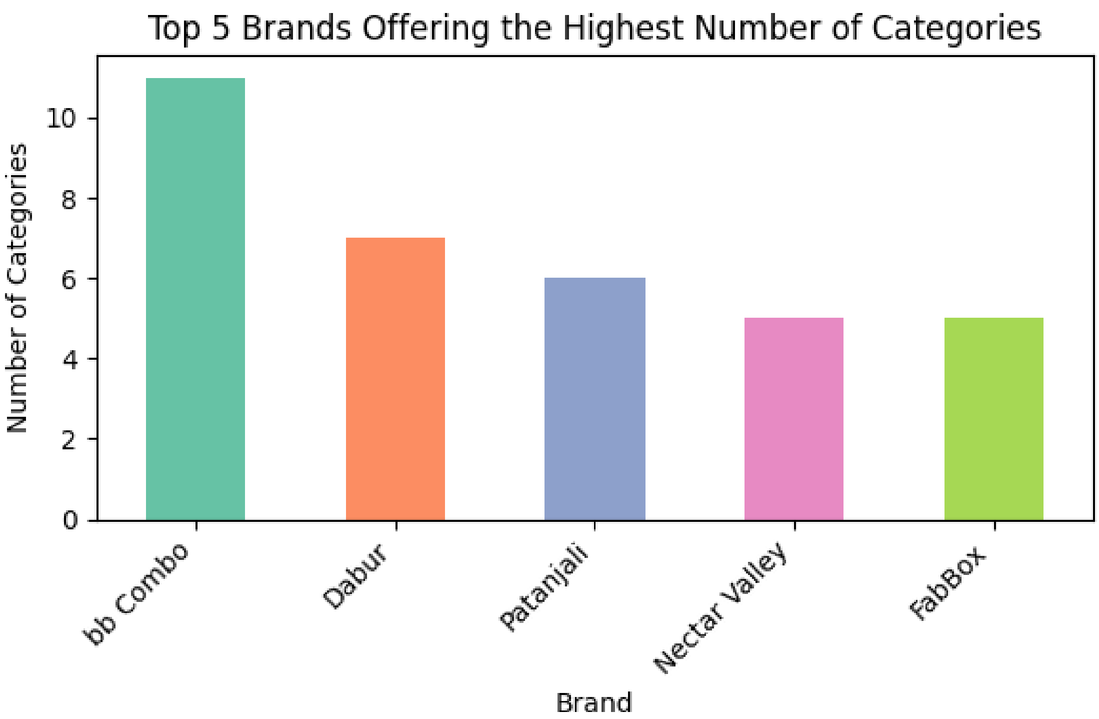
[ ]:

```
'''Meaningful insights from above plot'''

# "Skin Care" is the leading sub-category with the highest number of products.␣
 ↪"Health & Medicine" follows closely behind "Skin Care" in terms of product␣
 ↪count.
```

```
# There's a significant drop in product count after the top 3 categories␣
↪("Skincare", "Health & Medicine", and "Hair Care").

# It should be noted that all top 3 Sub-categories belongs to category "Beauty␣
↪& Hygiene" estamitaing that Big Basket focus more on these categories.

# The remaining sub-categories have relatively similar product counts, with␣
↪some fluctuations.
```

[ ]:

```
'''Question 6 - Create Plots and Visualizations-'''

'''BAR CHART: Draw a visualization of Top 5 brands with most number of␣
↪Categories.'''

brand_category_counts = df.groupby('brand')['category'].nunique().
↪sort_values(ascending=False)
plt.figure(figsize=(6, 4))

# Set the color palette
colors = sns.color_palette('Set2', len(category_counts))

# Create a bar chart
brand_category_counts.head(5).plot(kind='bar', color = colors)
plt.title('Top 5 Brands Offering the Highest Number of Categories')
plt.xlabel('Brand')
plt.ylabel('Number of Categories')
plt.xticks(rotation=45, ha='right')
plt.tight_layout()
plt.show()
```



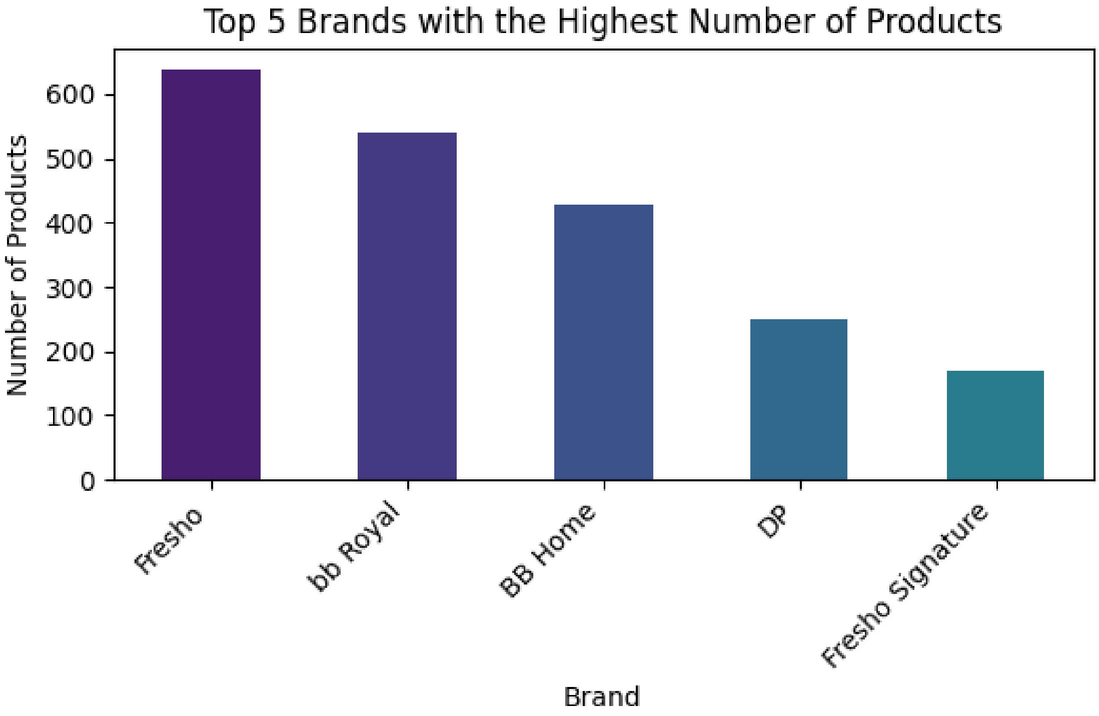
[ ]:

```
'''Meaningful insights from above plot'''

# "bb Combo" is the clear leader in terms of the number of categories offered␣
↪with offering products in all 11 categories.
# To increase sales, BigBasket should prioritize support for these brands.

# There's a significant drop in the number of categories offered by the␣
↪subsequent brands ("Dabur", "Patanjali", "Nectar Valley", and "FabBox").

# The remaining four brands have a relatively similar number of categories,␣
↪with slight variations.
```

[ ]:

```
'''Question 6 - Create Plots and Visualizations-'''

'''BAR CHART: Draw a visualization of Top 5 brands offering highest number of␣
↪products.'''

top_5_brands = df['brand'].value_counts().nlargest(5)
plt.figure(figsize=(6, 4))

# Set the color palette
colors = sns.color_palette('viridis', len(category_counts))
```

```
# Create a bar chart
top_5_brands.plot(kind='bar', color = colors)
plt.title('Top 5 Brands with the Highest Number of Products')
plt.xlabel('Brand')
plt.ylabel('Number of Products')
plt.xticks(rotation=45, ha='right')
plt.tight_layout()
plt.show()
```



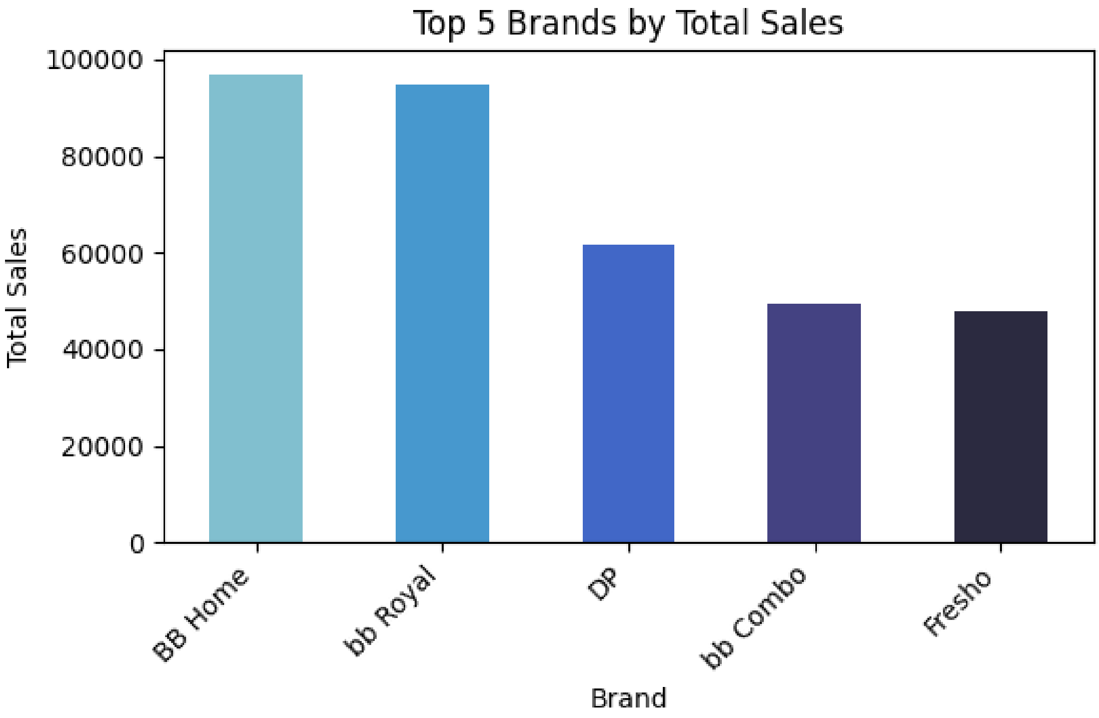
[ ]:

```
'''Meaningful insights from above plot'''

# "Fresho" is the dominant brand with the highest number of products offered on␣
 ↪Big Basket, followed by "bb Royal", "BB Home".

# Note that top 3 brands of this graph are selling Groceries, which are either␣
 ↪fresh fruits/vegetables, Rice/Flour or Cutlery/Cookware.

# Which makes clear sense as Big Basket is all about online supermarket selling␣
 ↪Groceries of various type.
```

[ ]:

```
'''Question 6 - Create Plots and Visualizations-'''

'''BAR CHART: Draw a visualization of Top 5 brands by Total Sales.'''
```

```
top_brands_by_sales = df.groupby('brand')['sale_price'].sum().nlargest(5)
plt.figure(figsize=(6, 4))

# Set the color palette
colors = sns.color_palette('icefire', len(category_counts))

# Create a bar chart
top_brands_by_sales.plot(kind='bar', color = colors)
plt.title('Top 5 Brands by Total Sales')
plt.xlabel('Brand')
plt.ylabel('Total Sales')
plt.xticks(rotation=45, ha='right')
plt.tight_layout()
plt.show()
```



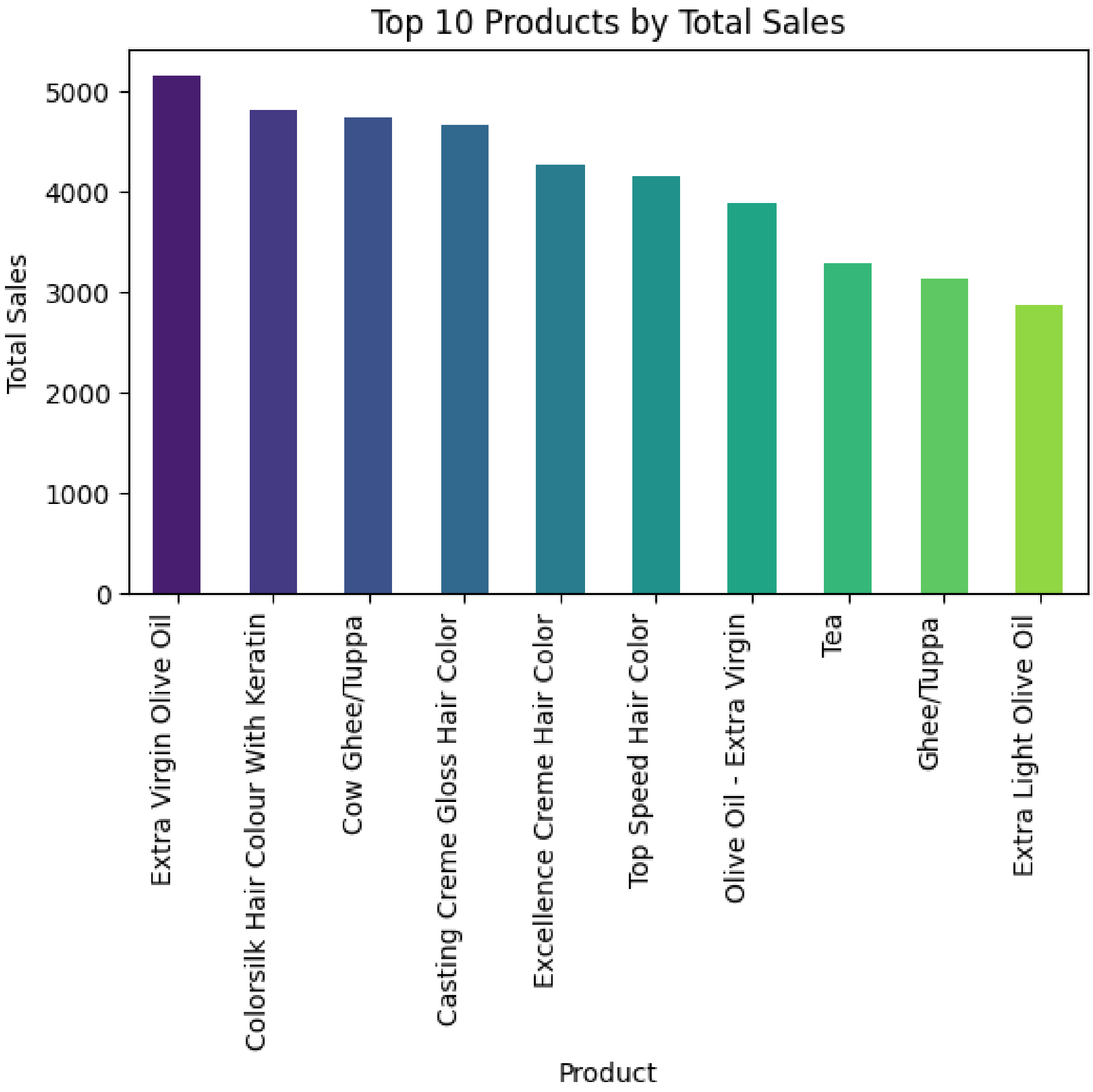
[ ]:

```
'''Meaningful insights from above plot'''

# "BB Home" and "bb Royal" is the clear leader in terms of total sales,␣
 ↪indicating their popularity and strong customer preference among Big Basket␣
 ↪users.
```

```
# This suggests that "BB Home" and "bb Royal" holds a dominant position in the market and is a key contributor to Big Basket's revenue.

# It also seems that brands with the prefix "BB" are affiliated companies of a single larger corporation, similar to Reliance Fresh.

# The remaining brands, "bb Combo" & "Fresho", have significantly lower total sales compared to Top 3 performers.

# Big Basket could consider strategies to further leverage the popularity of all "BB" Brands while also focusing on promoting other brands to diversify its sales and potentially capture a larger market share.
```

[ ]:

```
'''Question 6 - Create Plots and Visualizations-'''

'''BAR CHART: Draw a visualization of Top 10 products by Total Sales.'''

top_products_by_sales = df.groupby('product')['sale_price'].sum().nlargest(10)
plt.figure(figsize=(6, 6))

# Set the color palette
colors = sns.color_palette('viridis', len(category_counts))

# Create a bar chart
top_products_by_sales.plot(kind='bar', color = colors)
plt.title('Top 10 Products by Total Sales')
plt.xlabel('Product')
plt.ylabel('Total Sales')
plt.xticks(rotation=90, ha='right')
plt.tight_layout()
plt.show()
```

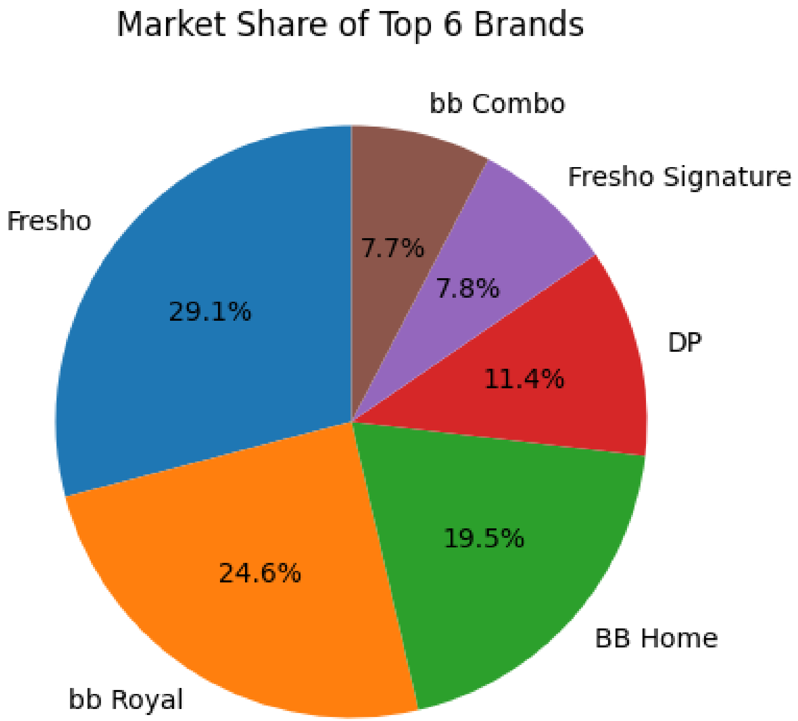


```
[ ]: '''Meaningful insights from above plot'''

     # "Extra Virgin Olive Oil" is the top-selling product, with sales significantly␣
      ↪higher than the other products.

     # "Colorsilk Hair Colour With Keratin" is the second best-selling product,␣
      ↪followed closely by "Cow Ghee/Tuppa" and "Casting Creme Gloss Hair Color".

     # The following three products, "Excellence Creme Hair Color", "Top Speed Hair␣
      ↪Color", and "Olive Oil - Extra Virgin" have relatively similar sales␣
      ↪figures, with "Excellence Creme Hair Color" being slightly ahead.
```

```
# Note that Top 10 products list is significantly dominated with "Beauty" (4␣
↪Products) and "Foodgrains/Gourmet" related items (5 Products). This finding␣
↪aligns with our previous analysis in Question 6 (Part 1).
```

[ ]:

```
'''Question 6 - Create Plots and Visualizations-'''

'''Brand Analysis'''
'''PIE CHART: Draw a visualization of Top 6 Brands to show their Market Share.
↪'''

top_6_brands = df['brand'].value_counts().nlargest(6)
plt.figure(figsize=(5, 5))

# Set the color palette
colors = sns.color_palette('pastel')

# Create a pie chart
plt.pie(top_6_brands, labels=top_6_brands.index, autopct='%1.1f%%',␣
↪startangle=90)
plt.title('Market Share of Top 6 Brands')
plt.show()
```

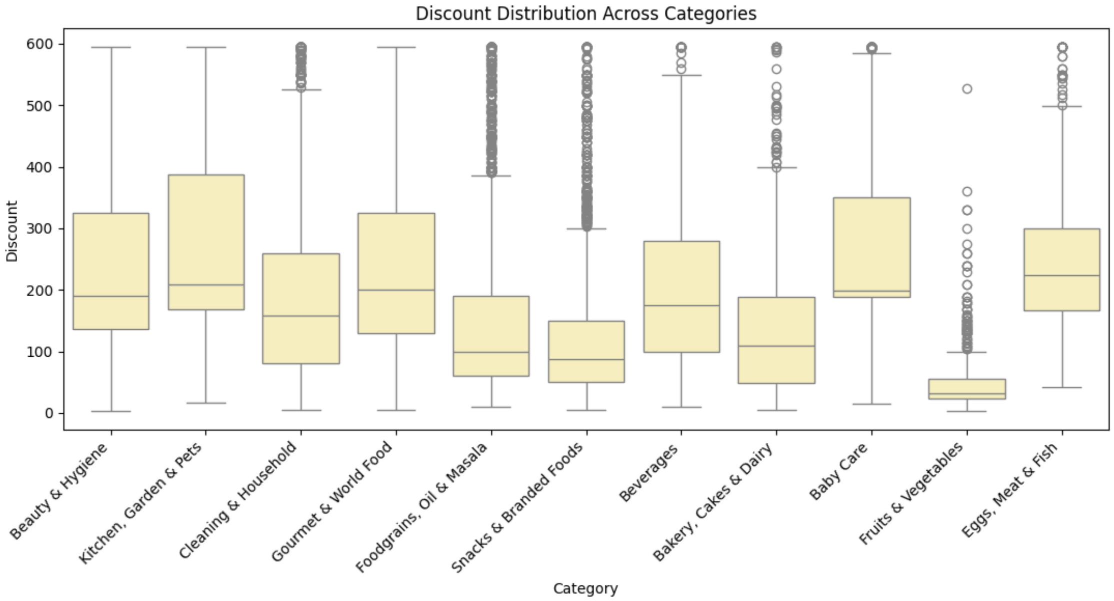


[ ]:

```
'''Meaningful insights from above plot'''

# "Fresho" commands the largest market share with 29.1% among the top 6 brands,␣
 ↪indicating its strong presence and popularity on Big Basket.

# "bb Royal" and "BB Home" also hold significant market shares with 24.6% and␣
 ↪19.5%, suggesting their strong brand recognition and customer loyalty.

# The chart reveals that Big Basket offers a diverse product range,␣
 ↪encompassing categories like Baby care ("bb Combo"), Cleaning & Household␣
 ↪("DP"), Garden & Pets ("BB Home").

# BigBasket could consider strategies to further strengthen the market position␣
 ↪of "Fresho", "bb Royal", and "BB Home" while also exploring ways to increase␣
 ↪the market share of other brands.
```

[ ]:

```
'''Question 6 - Create Plots and Visualizations-'''

'''Discount Analysis'''
'''BOXPLOT: Draw a visualization to compare Discount Distributions across␣
 ↪Categories'''

plt.figure(figsize=(11, 6))

# Set the color palette
colors = sns.color_palette('YlOrBr')

# Create a boxplot
sns.boxplot(x='category', y='sale_price', color=colors[0], data=df)
plt.title('Discount Distribution Across Categories')
plt.xlabel('Category')
plt.ylabel('Discount')
plt.xticks(rotation=45, ha='right')
plt.tight_layout()
plt.show()
```



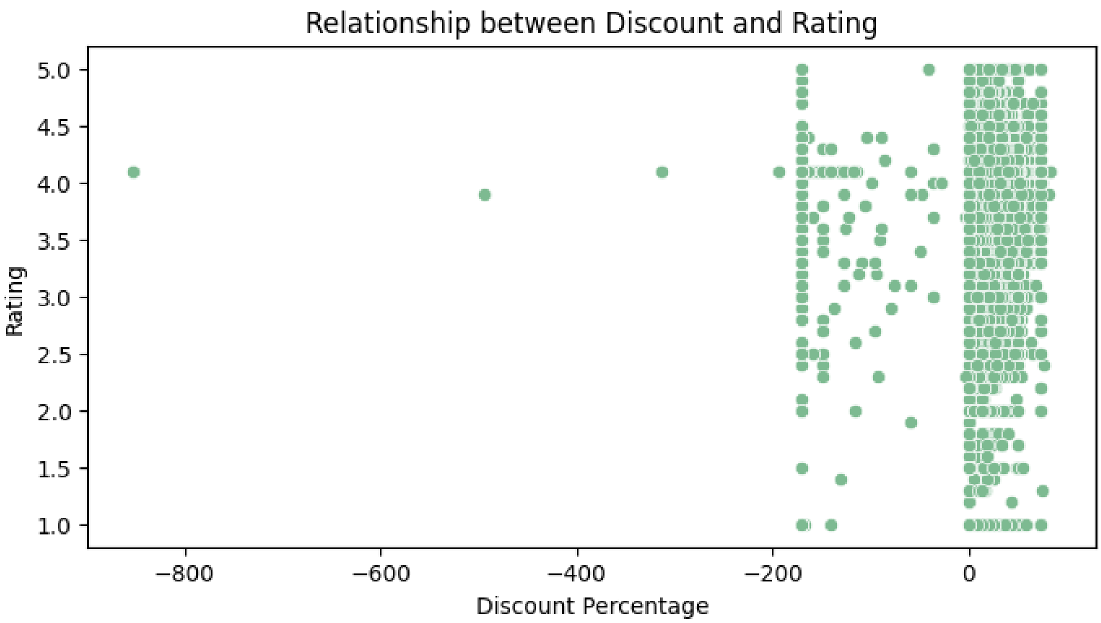
[ ]:

```
'''Meaningful insights from above plot'''

# **Price Variability:** The box plot reveals the spread of prices within each␣
 ↪category.
# Categories with longer boxes indicate a wider range of prices for products␣
 ↪within that category.

# **Median Prices:** The horizontal line within each box represents the median␣
 ↪price.
# This allows you to quickly compare the typical price point of products across␣
 ↪different categories.

# **Outliers:** The dots outside the whiskers of the box plot represent outlier␣
 ↪prices.
# These are products that are significantly more expensive or cheaper than the␣
 ↪majority of products within their category.

# **Category Comparisons:** By comparing the positions and sizes of the boxes,␣
 ↪you can identify categories with higher or lower overall prices
# and those with greater or lesser price variability.

'''**Potential Business Implications**'''

# **Pricing Strategy:** This visualization can inform pricing decisions for new␣
 ↪products or adjustments to existing pricing.
```

```
# Like if you see a category with a high median price and low variability, you␣
 ↪might consider introducing a lower-priced product to capture a different␣
 ↪market segment.

# **Inventory Management:** Understanding price distributions can help with␣
 ↪inventory management.
# Categories with a wide range of prices might require a more diverse inventory␣
 ↪strategy compared to categories with a narrow price range.

# **Marketing and Promotions:**  The insights from this plot can be used to␣
 ↪tailor marketing and promotional efforts.
# For instance, you might focus discounts on categories with higher median␣
 ↪prices to attract price-sensitive customers.
```

[ ]:

```
'''Question 6 - Create Plots and Visualizations-'''

'''Discount Analysis'''
'''SCATTER PLOT: Draw a visualization to see if there's any relationship␣
 ↪between Discount and Rating.'''

# Calculate discount percentage

df['discount_percentage'] = (df['market_price'] - df['sale_price']) /␣
 ↪df['market_price'] * 100

# Set the color palette
colors = sns.color_palette('crest')

# Create scatter plot
plt.figure(figsize=(8, 4))
sns.scatterplot(x='discount_percentage', y='rating', color=colors[0], data=df)
plt.title('Relationship between Discount and Rating')
plt.xlabel('Discount Percentage')
plt.ylabel('Rating')
plt.show()
```



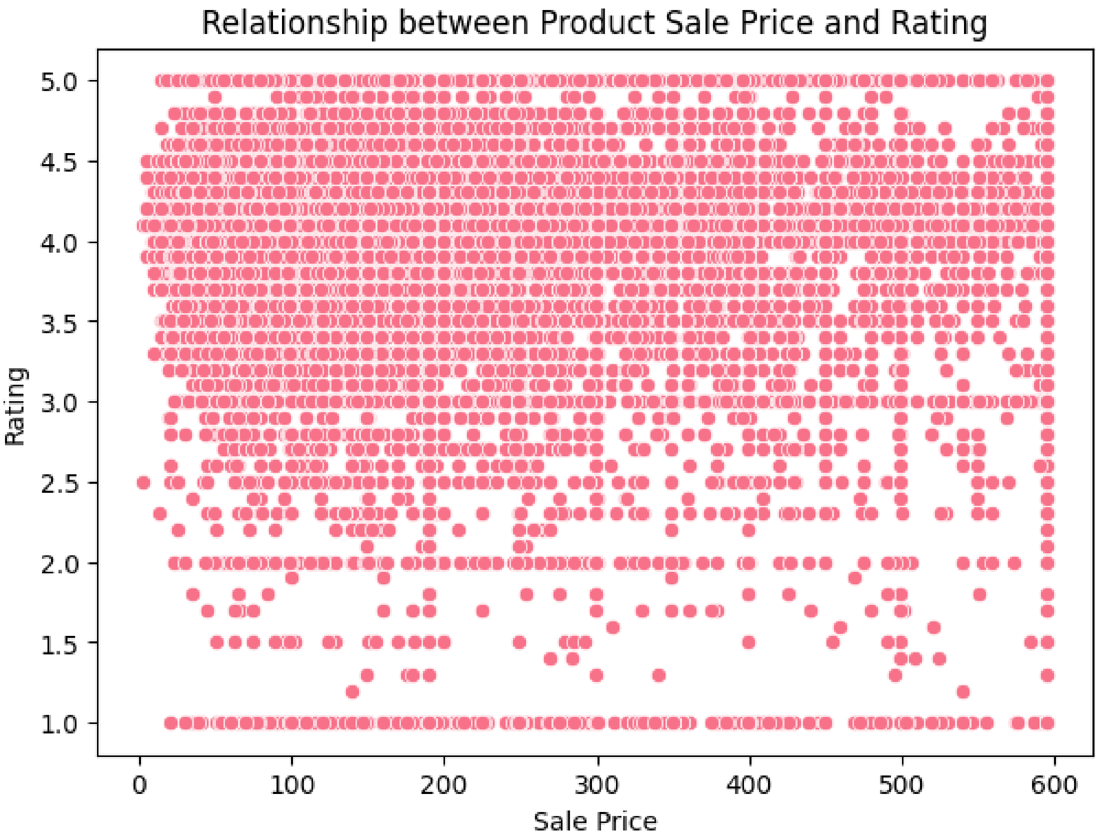
[ ]:

```
'''Meaningful insights from above plot'''

# **No Clear Correlation:** The scatter plot does not show a strong linear␣
 ↪relationship between "Discount" percentage and "Rating".
# This suggests that offering a higher discount does not necessarily lead to a␣
 ↪higher product rating.

# **Potential Factors:** Other factors, such as product quality, brand␣
 ↪reputation, and customer expectations, likely play a more significant role␣
 ↪in determining product ratings.

'''**Business Implications**'''

# **Discount Strategy:** While discounts can attract customers, they may not be␣
 ↪the primary driver of positive product ratings.
# Focus on overall product quality and customer experience to improve ratings.

# **Targeted Promotions:** Consider offering targeted discounts based on␣
 ↪customer preferences and product categories, rather than relying on blanket␣
 ↪discounts.
```

[ ]:

```
'''Question 6 - Create Plots and Visualizations-'''

'''SCATTER PLOT: Draw a visualization to explore the relationship between␣
 ↪Product Sale Price and Rating.'''
```

```
plt.figure(figsize=(7, 5))

# Set the color palette
colors = sns.color_palette('husl')

# Create scatter plot
sns.scatterplot(x='sale_price', y='rating', color=colors[0], data=df)
plt.title('Relationship between Product Sale Price and Rating')
plt.xlabel('Sale Price')
plt.ylabel('Rating')
plt.show()
```



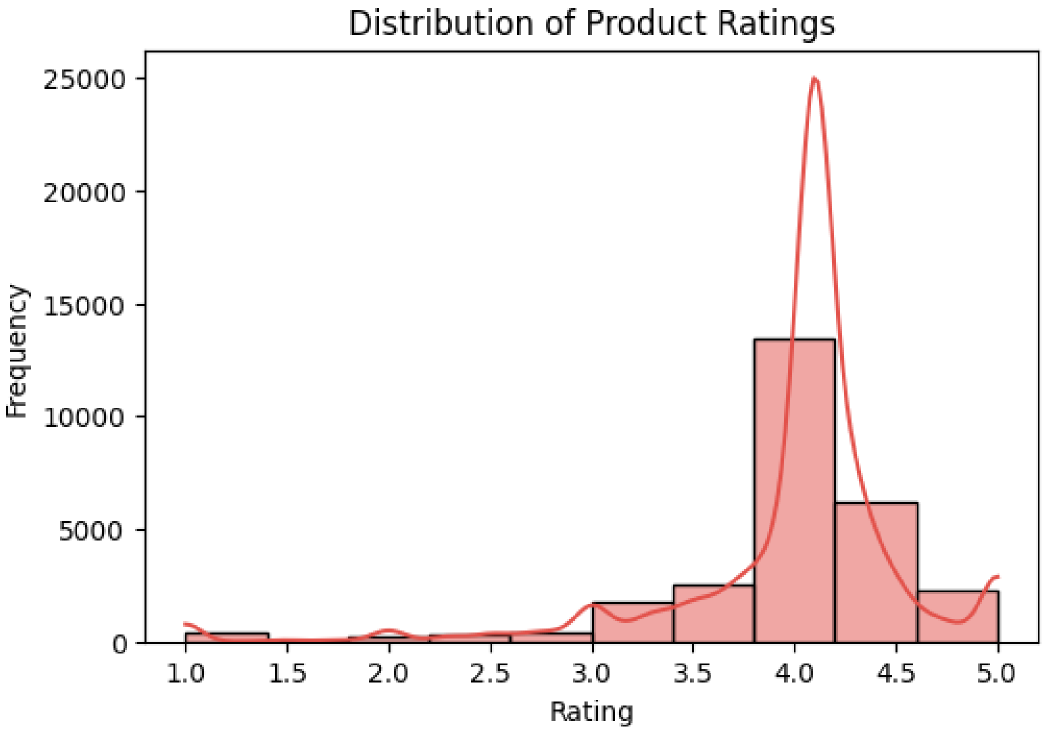
[ ]:

```
'''Meaningful insights from above plot'''

# **No clear correlation:** There doesn't seem to be a strong linear␣
 ↪relationship between product "Sale Price" and "Rating".
# This suggests that customers don't necessarily rate higher-priced products␣
 ↪more favorably.
```

```
# **Concentration of products:** Most products are concentrated in the lower␣
 ↪price range, regardless of their rating.
# This indicates that the majority of products offered are budget-friendly.

# **Potential outliers:** There are a few products with high prices and low␣
 ↪ratings, which could be worth investigating further to understand why they␣
 ↪didn't receive favorable reviews despite their cost.
```

[ ]:

```
'''Question 6 - Create Plots and Visualizations-'''

'''HISTOGRAM: Draw a visualization to show the Distribution of Product ratings.
 ↪'''

plt.figure(figsize=(6, 4))

# Set the color palette
colors = sns.color_palette('Spectral')

# Histogram to show the distribution of product ratings.

sns.histplot(df['rating'], bins=10, kde=True, color=colors[0])
plt.title('Distribution of Product Ratings')
plt.xlabel('Rating')
plt.ylabel('Frequency')
plt.show()
```



```
[ ]: '''Meaningful insights from above plot'''

     # The distribution of product "Ratings" is heavily skewed towards higher␣
      ↪ratings, with the majority of products receiving ratings of 4 or above.
     # This suggests that customers are generally satisfied with the products being␣
      ↪sold on the platform.

     # I strongly believe that this is a significant finding as prioritizing␣
      ↪customer satisfaction is a fundamental key to growth for service-oriented␣
      ↪businesses.
```

```
[ ]: '''FINAL WORDINGS - Summarize the key findings, draw conclusions, and provide␣
      ↪recommendations based on the insights gained from the analysis'''

     '''
     Key Findings:

     1. Product and Category Analysis:

       - "Beauty & Hygiene" is the most dominant category, followed by "Gourmet &␣
      ↪World Food".
       - "Skin Care" is the leading sub-category.
       - "Fresho" is the most popular brand with the highest number of products.
       - "BB Home" and "bb Royal" generate the highest total sales.

     2. Discount Analysis:

       - No strong correlation between Discount percentage and product rating.
       - Product Sale price does not have a clear relationship with rating..
       - Discounts do not appear to strongly influence product ratings.

     3. Rating Analysis:

       - Product ratings are heavily skewed towards higher ratings (4 or above).␣
      ↪Which is a clear sign of customer satisfaction.
       - Customers usually gave higher ratings to products, indicating that the␣
      ↪price, whether low or high, isn't a major concern for them. They are␣
      ↪satisfied with the quality they receive.

     General Summary of Key findings:-
```

```
- Product Distribution: The distribution of Products across Categories and Sub-categories was visualized, revealing the most and least popular Products types. Certain product categories and sub-categories are more popular than others.
- Brand Analysis: Top Brands were identified based on the number of Categories, Number of products, and Total Sales. Market share was visualized using a pie chart.
- Discount and Rating: The relationship between Discount and Rating was explored using a scatter plot, indicating no strong correlation.
- Price and Rating: Similarly, the relationship between Product Sale price and Rating was visualized, suggesting no clear trend.
- Rating Distribution: The distribution of product ratings was visualized using a histogram, showing a concentration around higher ratings.



Conclusions:

  - Big Basket's focus is on "Beauty & Hygiene" and "Gourmet & World Food" categories, with a strong emphasis on "Skin Care".
  - "Fresho" is a key brand for Big Basket, while "BB Home" and "bb Royal" are major revenue drivers.
  - These Top brands dominate the market in terms of product variety, sales, and market share.
  - Discounts don't necessarily guarantee higher ratings; product quality and customer experience are crucial.
  - Customers are mostly pleased with the products offered by Big Basket, and their overall experience is positive.

Recommendations:

  - Firstly, Big Basket should typically concentrate on promoting products in popular categories and sub-categories, as these are significant revenue generators for the brand.
  - Big Basket must expand product offerings in categories like "Fruits & Vegetables" and "Eggs, Meat & Fish" to cater to a wider audience.
  - Big Basket is supposed to leverage the popularity of "Fresho", "BB Home", and "bb Royal" for further growth.
  - It would be wise for Big Basket to identify and partner with brands to boost profits, focusing on marketing through YouTube ads and TV commercials to leverage their market presence.
  - Prioritize product quality and customer experience to maintain high ratings.
  - Big Basket is expected to consider strategies to improve ratings for products with lower ratings too.
  - Consider targeted discounts based on customer preferences and product categories.
  - Big Basket ought to continue monitoring customer satisfaction and address␣
↪any potential issues promptly.

'''
```

[ ]:

```
#'''THANK YOU FOR YOUR VALUABLE TIME'''#
```