

Quantium Virtual Internship - Task 1

Analyse the data to understand the current purchasing trends and behaviours. The client is particularly interested in customer segments and their chip purchasing behaviour. Consider what metrics would help describe the customers' purchasing behaviour.

importing required modules for the task1

```
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
import datetime
import seaborn as sns
import plotly
import plotly.express as px
import plotly.graph_objects as go
```

1.1 Dataset loading and cleaning - Transaction

reading excel file (Transaction data) and showing first 5 rows to have a glance on data

```
df = pd.read_excel('Data/QVI_transaction_data.xlsx')
df.head()
```

	DATE	STORE_NBR	LYLTY_CARD_NBR	TXN_ID	PROD_NBR	\
0	43390	1	1000	1	5	
1	43599	1	1307	348	66	
2	43605	1	1343	383	61	
3	43329	2	2373	974	69	
4	43330	2	2426	1038	108	

	PROD_NAME	PROD_QTY	TOT_SALES
0	Natural Chip Compny SeaSalt175g	2	6.0
1	CCs Nacho Cheese 175g	3	6.3
2	Smiths Crinkle Cut Chips Chicken 170g	2	2.9
3	Smiths Chip Thinly S/Cream&Onion 175g	5	15.0
4	Kettle Tortilla ChpsHny&Jlpno Chili 150g	3	13.8

Checking the size of the dataset

```
df.shape
```

```
(264836, 8)
```

''' checking information of the dataset that contains the number of columns, column labels, column data types, etc. '''

```
df.info()
```

```

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 264836 entries, 0 to 264835
Data columns (total 8 columns):
 #   Column                Non-Null Count  Dtype
---  -
 0   DATE                  264836 non-null int64
 1   STORE_NBR             264836 non-null int64
 2   LYLTY_CARD_NBR       264836 non-null int64
 3   TXN_ID                264836 non-null int64
 4   PROD_NBR              264836 non-null int64
 5   PROD_NAME             264836 non-null object
 6   PROD_QTY              264836 non-null int64
 7   TOT_SALES             264836 non-null float64
dtypes: float64(1), int64(6), object(1)
memory usage: 16.2+ MB

```

We can see that column DATE is not in right format, so calling datetime module to change the datatype of DATE column into dates

changing DATE column datatype to date, as it is USA date so the format of the date should be yyyy-mm-dd

```

df['DATE'] =
pd.to_datetime(df['DATE'],errors='coerce',unit='d',origin='1900-01-01')

```

showing first 5 rows to check the changed format of DATE column

```
df.head()
```

	DATE	STORE_NBR	LYLTY_CARD_NBR	TXN_ID	PROD_NBR	\
0	2018-10-19	1	1000	1	5	
1	2019-05-16	1	1307	348	66	
2	2019-05-22	1	1343	383	61	
3	2018-08-19	2	2373	974	69	
4	2018-08-20	2	2426	1038	108	

	PROD_NAME	PROD_QTY	TOT_SALES
0	Natural Chip Compny SeaSalt175g	2	6.0
1	CCs Nacho Cheese 175g	3	6.3
2	Smiths Crinkle Cut Chips Chicken 170g	2	2.9
3	Smiths Chip Thinly S/Cream&Onion 175g	5	15.0
4	Kettle Tortilla ChpsHny&Jlpno Chili 150g	3	13.8

checking if the dataset has any missing value

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

```

DATE                0
STORE_NBR           0
LYLTY_CARD_NBR      0

```

```
TXN_ID          0
PROD_NBR        0
PROD_NAME       0
PROD_QTY        0
TOT_SALES       0
dtype: int64
```

checking each column unique values for any inconsistant data

```
df['DATE'].value_counts()
```

```
2018-12-26    939
2018-12-25    917
2018-12-24    915
2018-12-21    906
2018-12-20    862
```

```
...
2018-12-14    664
2019-06-26    662
2019-06-15    659
2018-10-20    658
2018-11-27    648
```

```
Name: DATE, Length: 364, dtype: int64
```

```
df['STORE_NBR'].value_counts()
```

```
226    2022
88      1873
93      1832
165     1819
237     1785
```

```
...
11         2
31         2
206        2
76         1
92         1
```

```
Name: STORE_NBR, Length: 272, dtype: int64
```

```
df['LYLTY_CARD_NBR'].value_counts()
```

```
172032    18
162039    18
13138     17
230078    17
128178    17
```

```
..
20408     1
6194      1
14263     1
16310     1
```

```
2049      1
Name: LYLT_CARD_NBR, Length: 72637, dtype: int64
```

```
df['TXN_ID'].value_counts()
```

```
102237      3
228741      3
108462      3
230356      3
222775      3
```

```
..
109471      1
107422      1
113565      1
111516      1
2049        1
```

```
Name: TXN_ID, Length: 263127, dtype: int64
```

```
df['PROD_NBR'].value_counts()
```

```
102      3304
108      3296
33       3269
112      3268
75       3265
```

```
...
11       1431
76       1430
98       1419
29       1418
72       1410
```

```
Name: PROD_NBR, Length: 114, dtype: int64
```

```
df['PROD_NAME'].value_counts()
```

```
Kettle Mozzarella Basil & Pesto 175g      3304
Kettle Tortilla ChpsHny&Jlpno Chili 150g    3296
Cobs Popd Swt/Chlli &Sr/Cream Chips 110g     3269
Tyrrells Crisps      Ched & Chives 165g     3268
Cobs Popd Sea Salt   Chips 110g              3265
```

```
...
RRD Pc Sea Salt      165g                    1431
Woolworths Medium    Salsa 300g              1430
NCC Sour Cream &     Garden Chives 175g      1419
French Fries Potato  Chips 175g              1418
WW Crinkle Cut        Original 175g           1410
```

```
Name: PROD_NAME, Length: 114, dtype: int64
```

After checking on google, Woolworths Medium Salsa is a bottled salsa, rest are just different flavoured chips. That's why we have to remove salsa from the dataset

```
updated_df= df[df['PROD_NAME'] != 'Woolworths Medium Salsa 300g']
updated_df.head()
```

	DATE	STORE_NBR	LYLTY_CARD_NBR	TXN_ID	PROD_NBR	\
0	2018-10-19	1	1000	1	5	
1	2019-05-16	1	1307	348	66	
2	2019-05-22	1	1343	383	61	
3	2018-08-19	2	2373	974	69	
4	2018-08-20	2	2426	1038	108	

	PROD_NAME	PROD_QTY	TOT_SALES
0	Natural Chip Compny SeaSalt175g	2	6.0
1	CCs Nacho Cheese 175g	3	6.3
2	Smiths Crinkle Cut Chips Chicken 170g	2	2.9
3	Smiths Chip Thinly S/Cream&Onion 175g	5	15.0
4	Kettle Tortilla ChpsHny&Jlpno Chili 150g	3	13.8

```
updated_df['PROD_NAME']
```

```
0      Natural Chip      Compny SeaSalt175g
1      CCs Nacho Cheese      175g
2      Smiths Crinkle Cut Chips Chicken 170g
3      Smiths Chip Thinly S/Cream&Onion 175g
4      Kettle Tortilla ChpsHny&Jlpno Chili 150g
...
264831      Kettle Sweet Chilli And Sour Cream 175g
264832      Tostitos Splash Of Lime 175g
264833      Doritos Mexicana      170g
264834      Doritos Corn Chip Mexican Jalapeno 150g
264835      Tostitos Splash Of Lime 175g
Name: PROD_NAME, Length: 264836, dtype: object
```

```
updated_df['PROD_QTY'].value_counts()
```

```
2      236039
1      27518
5       450
3       430
4       397
200       2
Name: PROD_QTY, dtype: int64
```

```
updated_df['TOT_SALES'].value_counts()
```

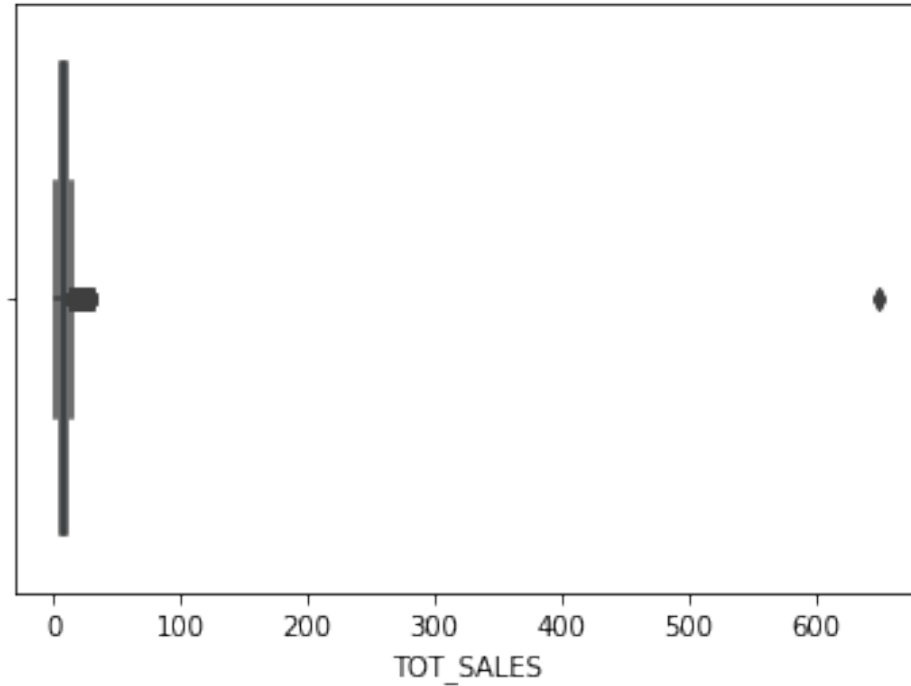
```
9.2      22821
7.4      22513
6.0      20798
7.6      20212
8.8      19900
...
9.3       3
6.9       3
```

```
11.2          2
650.0         2
12.4          2
Name: TOT_SALES, Length: 112, dtype: int64
```

1.2 Checking outliers and removing them from dataset

```
sns.boxplot(updated_df.TOT_SALES)
```

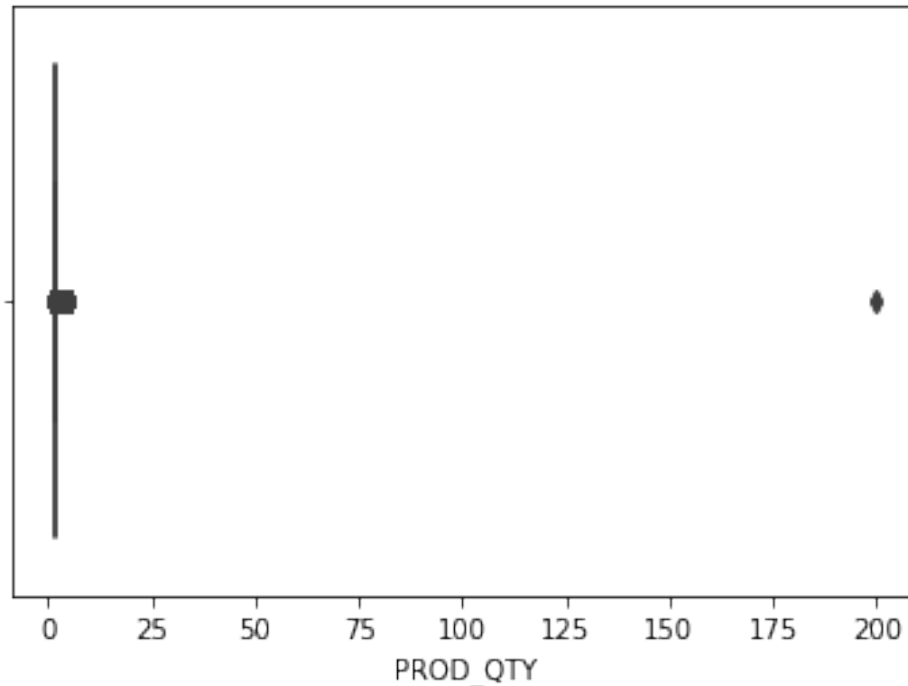
```
<matplotlib.axes._subplots.AxesSubplot at 0x149362b7348>
```



There is an outlier stands above 600 in total sales

```
sns.boxplot(updated_df.PROD_QTY)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x14933b0f148>
```



There is also an outlier in product quantity that stands no. 200

rechecking outlier in dataset

```
updated_df[updated_df['PROD_QTY'] == 200]
```

	DATE	STORE_NBR	LYLTY_CARD_NBR	TXN_ID	PROD_NBR	\
69762	2018-08-21	226	226000	226201	4	
69763	2019-05-22	226	226000	226210	4	

	PROD_NAME	PROD_QTY	TOT_SALES
69762	Dorito Corn Chp Supreme 380g	200	650.0
69763	Dorito Corn Chp Supreme 380g	200	650.0

we can see that product quantity and total sales outliers stands in same row, so we'll create a new dataframe without the outliers

```
trans_df = updated_df[updated_df['PROD_QTY'] != 200]
trans_df.head()
```

	DATE	STORE_NBR	LYLTY_CARD_NBR	TXN_ID	PROD_NBR	\
0	2018-10-19	1	1000	1	5	
1	2019-05-16	1	1307	348	66	
2	2019-05-22	1	1343	383	61	
3	2018-08-19	2	2373	974	69	
4	2018-08-20	2	2426	1038	108	

	PROD_NAME	PROD_QTY	TOT_SALES
0	Natural Chip Compny SeaSalt175g	2	6.0

1	CCs Nacho Cheese	175g	3	6.3
2	Smiths Crinkle Cut Chips Chicken	170g	2	2.9
3	Smiths Chip Thinly S/Cream&Onion	175g	5	15.0
4	Kettle Tortilla ChpsHny&Jlpno Chili	150g	3	13.8

```
trans_df['PROD_QTY'].value_counts()
```

```
2    236039
1     27518
5       450
3       430
4       397
```

```
Name: PROD_QTY, dtype: int64
```

```
trans_df['TOT_SALES'].value_counts()
```

```
9.2    22821
7.4    22513
6.0    20798
7.6    20212
8.8    19900
```

```
...
9.3         3
15.5        3
6.9         3
11.2        2
12.4        2
```

```
Name: TOT_SALES, Length: 111, dtype: int64
```

1.3 Adding columns

```
trans_df['YEAR'] = pd.DatetimeIndex(trans_df['DATE']).year
```

```
trans_df['MONTH'] = pd.DatetimeIndex(trans_df['DATE']).month
```

```
C:\ProgramData\Anaconda3\lib\site-packages\ipykernel_launcher.py:1:
```

```
SettingWithCopyWarning:
```

```
A value is trying to be set on a copy of a slice from a DataFrame.
```

```
Try using .loc[row_indexer,col_indexer] = value instead
```

```
See the caveats in the documentation:
```

```
https://pandas.pydata.org/pandas-docs/stable/user\_guide/indexing.html#
returning-a-view-versus-a-copy
```

```
"""Entry point for launching an IPython kernel.
```

```
C:\ProgramData\Anaconda3\lib\site-packages\ipykernel_launcher.py:2:
```

```
SettingWithCopyWarning:
```

```
A value is trying to be set on a copy of a slice from a DataFrame.
```

```
Try using .loc[row_indexer,col_indexer] = value instead
```

```
See the caveats in the documentation:
```

```
https://pandas.pydata.org/pandas-docs/stable/user\_guide/indexing.html#
returning-a-view-versus-a-copy
```



```
# Brand Column
```

```
trans_df['BRAND'] = trans_df['PROD_NAME'].apply(lambda x :  
x.strip().split()[0])  
trans_df['BRAND'].value_counts()
```

C:\ProgramData\Anaconda3\lib\site-packages\ipykernel_launcher.py:2:

SettingWithCopyWarning:

A value is trying to be set on a copy of a slice from a DataFrame.

Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation:

https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy

Kettle	41288
Smiths	28860
Pringles	25102
Doritos	24962
Thins	14075
RRD	11894
Infuzions	11057
WW	10320
Cobs	9693
Tostitos	9471
Twisties	9454
Old	9324
Tyrrells	6442
Grain	6272
Natural	6050
Red	5885
Cheezels	4603
CCs	4551
Woolworths	4437
Dorito	3183
Infzns	3144
Smith	2963
Cheetos	2927
Snbts	1576
Burger	1564
GrnWves	1468
Sunbites	1432
NCC	1419
French	1418

Name: BRAND, dtype: int64

we can see there is inconsistency in the brand names, for example, (Doritos and Dorito),(Infuzions and Infzns) and more

```
brands =
```

```
{'Dorito': 'Doritos', 'Infzns': 'Infuzions', 'Snbts': 'Sunbites', 'Grain': 'G
```

```
rain Wave',
      'Red': 'RRD', 'Smith': 'Smiths', 'GrnWves': 'Grain
Wave', 'ww': 'Woolworths', 'NCC': 'Natural'}
```

```
trans_df['BRAND'] = trans_df['BRAND'].replace(brands)
```

C:\ProgramData\Anaconda3\lib\site-packages\ipykernel_launcher.py:4:
SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation:
[https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#](https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
returning-a-view-versus-a-copy
after removing the cwd from sys.path.

```
trans_df['BRAND'].value_counts()
```

```
Kettle      41288
Smiths      31823
Doritos     28145
Pringles    25102
RRD         17779
Infuzions   14201
Thins       14075
WW          10320
Cobs        9693
Tostitos    9471
Twisties    9454
Old         9324
Grain Wave  7740
Natural     7469
Tyrrells    6442
Cheezels    4603
CCs         4551
Woolworths  4437
Sunbites    3008
Cheetos     2927
Burger      1564
French      1418
Name: BRAND, dtype: int64
```

To extract packet size

```
def get_size(packet):
    size=[]
    for item in packet:
        if item.isdigit():
            size.append(item)
    return int("".join(size))
```

```
trans_df['PACKET_SIZE'] = trans_df['PROD_NAME'].apply(lambda a :
get_size(a))
```

C:\ProgramData\Anaconda3\lib\site-packages\ipykernel_launcher.py:1:

SettingWithCopyWarning:

A value is trying to be set on a copy of a slice from a DataFrame.

Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation:

https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy

"""Entry point for launching an IPython kernel.

calculating unit price of each product

```
trans_df['PROD_UNIT_PRICE'] =
trans_df['TOT_SALES']/trans_df['PROD_QTY']
```

C:\ProgramData\Anaconda3\lib\site-packages\ipykernel_launcher.py:3:

SettingWithCopyWarning:

A value is trying to be set on a copy of a slice from a DataFrame.

Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation:

https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy

This is separate from the ipykernel package so we can avoid doing imports until

trans_df

	DATE	STORE_NBR	LYLTY_CARD_NBR	TXN_ID	PROD_NBR	\
0	2018-10-19	1	1000	1	5	
1	2019-05-16	1	1307	348	66	
2	2019-05-22	1	1343	383	61	
3	2018-08-19	2	2373	974	69	
4	2018-08-20	2	2426	1038	108	
...	
264831	2019-03-11	272	272319	270088	89	
264832	2018-08-15	272	272358	270154	74	
264833	2018-11-08	272	272379	270187	51	
264834	2018-12-29	272	272379	270188	42	
264835	2018-09-24	272	272380	270189	74	

YEAR	\	PROD_NAME	PROD_QTY	TOT_SALES	
0		Natural Chip	Compny SeaSalt175g	2	6.0
2018					
1		CCs Nacho Cheese	175g	3	6.3
2019					
2		Smiths Crinkle Cut	Chips Chicken 170g	2	2.9

2019					
3	Smiths	Chip Thinly	S/Cream&Onion	175g	5 15.0
2018					
4	Kettle	Tortilla	ChpsHny&Jlpno	Chili 150g	3 13.8
2018					
...					...
...					...
264831	Kettle	Sweet Chilli	And Sour Cream	175g	2 10.8
2019					
264832		Tostitos	Splash Of	Lime 175g	1 4.4
2018					
264833		Doritos	Mexicana	170g	2 8.8
2018					
264834	Doritos	Corn Chip	Mexican Jalapeno	150g	2 7.8
2018					
264835		Tostitos	Splash Of	Lime 175g	2 8.8
2018					

	MONTH	BRAND	PACKET_SIZE	PROD_UNIT_PRICE
0	10	Natural	175	3.00
1	5	CCs	175	2.10
2	5	Smiths	170	1.45
3	8	Smiths	175	3.00
4	8	Kettle	150	4.60
...
264831	3	Kettle	175	5.40
264832	8	Tostitos	175	4.40
264833	11	Doritos	170	4.40
264834	12	Doritos	150	3.90
264835	9	Tostitos	175	4.40

[264834 rows x 13 columns]

saving updated new transaction dataset in csv format

trans_df.to_csv('Data/QVI_transaction_data_updated.csv')

2.1 Loading and cleaning dataset - Purchase behaviour

```
df_pur = pd.read_csv('Data/QVI_purchase_behaviour.csv')
df_pur.head()
```

	LYLTY_CARD_NBR		LIFESTAGE	PREMIUM_CUSTOMER
0	1000	YOUNG	SINGLES/COUPLES	Premium
1	1002	YOUNG	SINGLES/COUPLES	Mainstream
2	1003		YOUNG FAMILIES	Budget
3	1004	OLDER	SINGLES/COUPLES	Mainstream
4	1005	MIDAGE	SINGLES/COUPLES	Mainstream

df_pur.isnull().sum()

```

LYLTY_CARD_NBR      0
LIFESTAGE           0
PREMIUM_CUSTOMER    0
dtype: int64

```

```
df_pur.info()
```

```

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 72637 entries, 0 to 72636
Data columns (total 3 columns):
 #   Column                Non-Null Count  Dtype
---  -
 0   LYLTY_CARD_NBR        72637 non-null  int64
 1   LIFESTAGE             72637 non-null  object
 2   PREMIUM_CUSTOMER      72637 non-null  object
dtypes: int64(1), object(2)
memory usage: 1.7+ MB

```

```
df_pur['LIFESTAGE'].value_counts()
```

```

RETIREES           14805
OLDER SINGLES/COUPLES 14609
YOUNG SINGLES/COUPLES 14441
OLDER FAMILIES      9780
YOUNG FAMILIES      9178
MIDAGE SINGLES/COUPLES 7275
NEW FAMILIES        2549
Name: LIFESTAGE, dtype: int64

```

```
df_pur['PREMIUM_CUSTOMER'].value_counts()
```

```

Mainstream      29245
Budget          24470
Premium         18922
Name: PREMIUM_CUSTOMER, dtype: int64

```

3. Merging Datasets into one dataframe

```

pur_trans = trans_df.merge(df_pur, on='LYLTY_CARD_NBR')
pur_trans.head()

```

	DATE	STORE_NBR	LYLTY_CARD_NBR	TXN_ID	PROD_NBR	\
0	2018-10-19	1	1000	1	5	
1	2019-05-16	1	1307	348	66	
2	2018-11-12	1	1307	346	96	
3	2019-03-11	1	1307	347	54	
4	2019-05-22	1	1343	383	61	

	MONTH	\	PROD_NAME	PROD_QTY	TOT_SALES	YEAR
0	Natural	Chip	Compny SeaSalt175g	2	6.0	2018
10						
1			CCs Nacho Cheese 175g	3	6.3	2019

```

5
2          WW Original Stacked Chips 160g          2          3.8  2018
11
3          CCs Original 175g          1          2.1  2019
3
4 Smiths Crinkle Cut Chips Chicken 170g          2          2.9  2019
5

```

```

      BRAND  PACKET_SIZE  PROD_UNIT_PRICE  LIFESTAGE \
0  Natural          175          3.00  YOUNG SINGLES/COUPLES
1    CCs          175          2.10  MIDAGE SINGLES/COUPLES
2    WW          160          1.90  MIDAGE SINGLES/COUPLES
3    CCs          175          2.10  MIDAGE SINGLES/COUPLES
4  Smiths          170          1.45  MIDAGE SINGLES/COUPLES

```

```

      PREMIUM_CUSTOMER
0          Premium
1          Budget
2          Budget
3          Budget
4          Budget

```

```
pur_trans.info()
```

```

<class 'pandas.core.frame.DataFrame'>
Int64Index: 264834 entries, 0 to 264833
Data columns (total 15 columns):
#   Column                Non-Null Count  Dtype
---  -
0   DATE                  264834 non-null  datetime64[ns]
1   STORE_NBR             264834 non-null  int64
2   LYLTY_CARD_NBR        264834 non-null  int64
3   TXN_ID                264834 non-null  int64
4   PROD_NBR              264834 non-null  int64
5   PROD_NAME             264834 non-null  object
6   PROD_QTY              264834 non-null  int64
7   TOT_SALES             264834 non-null  float64
8   YEAR                  264834 non-null  int64
9   MONTH                 264834 non-null  int64
10  BRAND                 264834 non-null  object
11  PACKET_SIZE           264834 non-null  int64
12  PROD_UNIT_PRICE       264834 non-null  float64
13  LIFESTAGE              264834 non-null  object
14  PREMIUM_CUSTOMER      264834 non-null  object
dtypes: datetime64[ns](1), float64(2), int64(8), object(4)
memory usage: 32.3+ MB

```

```
pur_trans.corr()
```

```

          STORE_NBR  LYLTY_CARD_NBR  TXN_ID  PROD_NBR
PROD_QTY  \

```

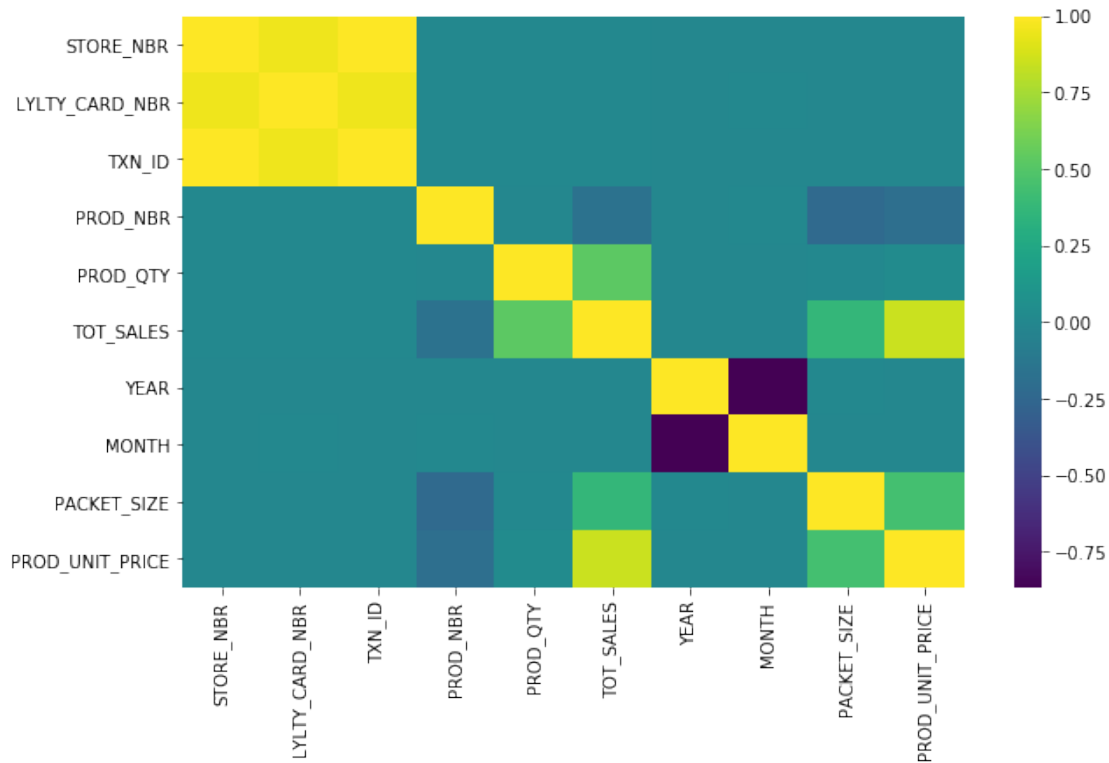
STORE_NBR	1.000000	0.950868	0.997593	0.002324	
0.004766					
LYLTY_CARD_NBR	0.950868	1.000000	0.954919	0.001769	
0.002296					
TXN_ID	0.997593	0.954919	1.000000	0.002558	
0.004937					
PROD_NBR	0.002324	0.001769	0.002558	1.000000	-
0.002043					
PROD_QTY	0.004766	0.002296	0.004937	-0.002043	
1.000000					
TOT_SALES	0.001672	0.001392	0.001994	-0.160224	
0.527788					
YEAR	0.000669	-0.001604	0.000426	-0.004149	-
0.001382					
MONTH	0.000021	0.002668	0.000293	0.003091	
0.000933					
PACKET_SIZE	0.000259	0.000713	0.000235	-0.230428	
0.001761					
PROD_UNIT_PRICE	-0.001056	0.000145	-0.000754	-0.190054	
0.027083					

	TOT_SALES	YEAR	MONTH	PACKET_SIZE	
PROD_UNIT_PRICE					
STORE_NBR	0.001672	0.000669	0.000021	0.000259	-
0.001056					
LYLTY_CARD_NBR	0.001392	-0.001604	0.002668	0.000713	
0.000145					
TXN_ID	0.001994	0.000426	0.000293	0.000235	-
0.000754					
PROD_NBR	-0.160224	-0.004149	0.003091	-0.230428	-
0.190054					
PROD_QTY	0.527788	-0.001382	0.000933	0.001761	
0.027083					
TOT_SALES	1.000000	-0.001088	0.000378	0.369834	
0.849723					
YEAR	-0.001088	1.000000	-0.866461	0.001764	-
0.000323					
MONTH	0.000378	-0.866461	1.000000	-0.001758	-
0.000103					
PACKET_SIZE	0.369834	0.001764	-0.001758	1.000000	
0.438764					
PROD_UNIT_PRICE	0.849723	-0.000323	-0.000103	0.438764	
1.000000					

#correlation heatmap

```
plt.figure(figsize=(10,6))
sns.heatmap(pur_trans.corr(),cmap='viridis')
```

<matplotlib.axes._subplots.AxesSubplot at 0x1492e9b2a48>



```
pur_trans.describe()
```

	STORE_NBR	LYLTY_CARD_NBR	TXN_ID	PROD_NBR \
count	264834.000000	2.648340e+05	2.648340e+05	264834.000000
mean	135.079423	1.355488e+05	1.351576e+05	56.583554
std	76.784063	8.057990e+04	7.813292e+04	32.826444
min	1.000000	1.000000e+03	1.000000e+00	1.000000
25%	70.000000	7.002100e+04	6.760050e+04	28.000000
50%	130.000000	1.303570e+05	1.351365e+05	56.000000
75%	203.000000	2.030940e+05	2.026998e+05	85.000000
max	272.000000	2.373711e+06	2.415841e+06	114.000000

	PROD_QTY	TOT_SALES	YEAR	MONTH \
count	264834.000000	264834.000000	264834.000000	264834.000000
mean	1.905813	7.299346	2018.500687	6.535943
std	0.343436	2.527241	0.500000	3.448682
min	1.000000	1.500000	2018.000000	1.000000
25%	2.000000	5.400000	2018.000000	4.000000
50%	2.000000	7.400000	2019.000000	7.000000
75%	2.000000	9.200000	2019.000000	10.000000
max	5.000000	29.500000	2019.000000	12.000000

	PACKET_SIZE	PROD_UNIT_PRICE
count	264834.000000	264834.000000
mean	182.425512	3.824629
std	64.325148	1.109526
min	70.000000	1.320000

25%	150.000000	3.000000
50%	170.000000	3.800000
75%	175.000000	4.600000
max	380.000000	6.500000

saving merged file as csv file

```
pur_trans.to_csv('Data/Merged_dataset_QVI_customer.csv')
```

```
pur_trans['TXN_ID'].nunique()
```

263125

In each row transaction ID is not unique that means a customer can buy multiple brands of chips and multiple packets in a single transaction.

'''looking for transaction id duplicates to check in one transaction how many chips has been purchased and how big was th size of the packet'''

```
pur_trans[pur_trans.duplicated(['TXN_ID'])].head()
```

	DATE	STORE_NBR	LYLTY_CARD_NBR	TXN_ID	PROD_NBR	\
49	2018-08-05	19	19272	16683	31	
155	2019-05-22	55	55073	48887	113	
157	2018-07-03	55	55073	48884	91	
770	2018-08-31	236	236247	240053	60	
1044	2019-01-12	7	7364	7739	20	

	PROD_NAME	PROD_QTY	TOT_SALES
YEAR \			
49	Infzns Crn Crnchers Tangy Gcamole 110g	2	7.6
2018			
155	Twisties Chicken270g	1	4.6
2019			
157	CCs Tasty Cheese 175g	2	4.2
2018			
770	Kettle Tortilla ChpsFeta&Garlic 150g	2	9.2
2018			
1044	Doritos Cheese Supreme 330g	2	11.4
2019			

	MONTH	BRAND	PACKET_SIZE	PROD_UNIT_PRICE
LIFESTAGE \				
49	8	Infuzions	110	3.8 MIDAGE
SINGLES/COUPLES				
155	5	Twisties	270	4.6 MIDAGE
SINGLES/COUPLES				
157	7	CCs	175	2.1 MIDAGE
SINGLES/COUPLES				
770	8	Kettle	150	4.6 MIDAGE

SINGLES/COUPLES
 1044 1 Doritos 330 5.7 MIDAGE
 SINGLES/COUPLES

PREMIUM_CUSTOMER
 49 Budget
 155 Budget
 157 Budget
 770 Budget
 1044 Budget

we found 5 transactions with same transaction ID, let's check what and how much they bought

pur_trans.loc[pur_trans['TXN_ID']==16683,:]

	DATE	STORE_NBR	LYLTY_CARD_NBR	TXN_ID	PROD_NBR	\
48	2018-08-05	19	19272	16683	7	
49	2018-08-05	19	19272	16683	31	

	PROD_NAME	PROD_QTY	TOT_SALES	YEAR
MONTH \				
48	Smiths Crinkle Original 330g	2	11.4	2018
8				
49	Infzns Crn Crnchers Tangy Gcamole 110g	2	7.6	2018
8				

	BRAND	PACKET_SIZE	PROD_UNIT_PRICE	LIFESTAGE	\
48	Smiths	330	5.7	MIDAGE	SINGLES/COUPLES
49	Infuzions	110	3.8	MIDAGE	SINGLES/COUPLES

PREMIUM_CUSTOMER
 48 Budget
 49 Budget

pur_trans.loc[pur_trans['TXN_ID']==48887,:]

	DATE	STORE_NBR	LYLTY_CARD_NBR	TXN_ID	PROD_NBR	\
154	2019-05-22	55	55073	48887	4	
155	2019-05-22	55	55073	48887	113	

	PROD_NAME	PROD_QTY	TOT_SALES	YEAR
MONTH \				
154	Dorito Corn Chp Supreme 380g	1	3.25	2019
5				
155	Twisties Chicken270g	1	4.60	2019
5				

	BRAND	PACKET_SIZE	PROD_UNIT_PRICE	LIFESTAGE	\
154	Doritos	380	3.25	MIDAGE	SINGLES/COUPLES
155	Twisties	270	4.60	MIDAGE	SINGLES/COUPLES

PREMIUM_CUSTOMER
154 Budget
155 Budget

pur_trans.loc[pur_trans['TXN_ID']==48884,:]

	DATE	STORE_NBR	LYLTY_CARD_NBR	TXN_ID	PROD_NBR	\
156	2018-07-03	55	55073	48884	99	
157	2018-07-03	55	55073	48884	91	

		PROD_NAME	PROD_QTY	TOT_SALES	YEAR
MONTH	\				
156	Pringles	Sthrn FriedChicken 134g	2	7.4	2018
7					
157	CCs	Tasty Cheese 175g	2	4.2	2018
7					

	BRAND	PACKET_SIZE	PROD_UNIT_PRICE		LIFESTAGE	\
156	Pringles	134	3.7	MIDAGE	SINGLES/COUPLES	
157	CCs	175	2.1	MIDAGE	SINGLES/COUPLES	

PREMIUM_CUSTOMER
156 Budget
157 Budget

pur_trans.loc[pur_trans['TXN_ID']==240053,:]

	DATE	STORE_NBR	LYLTY_CARD_NBR	TXN_ID	PROD_NBR	\
769	2018-08-31	236	236247	240053	94	
770	2018-08-31	236	236247	240053	60	

		PROD_NAME	PROD_QTY	TOT_SALES	YEAR
MONTH	\				
769		Burger Rings 220g	2	4.6	2018
8					
770	Kettle	Tortilla ChpsFeta&Garlic 150g	2	9.2	2018
8					

	BRAND	PACKET_SIZE	PROD_UNIT_PRICE		LIFESTAGE	\
769	Burger	220	2.3	MIDAGE	SINGLES/COUPLES	
770	Kettle	150	4.6	MIDAGE	SINGLES/COUPLES	

PREMIUM_CUSTOMER
769 Budget
770 Budget

pur_trans.loc[pur_trans['TXN_ID']==7739,:]

	DATE	STORE_NBR	LYLTY_CARD_NBR	TXN_ID	PROD_NBR	\
1043	2019-01-12	7	7364	7739	50	

1044	2019-01-12	7	7364	7739	20
------	------------	---	------	------	----

MONTH \	PROD_NAME	PROD_QTY	TOT_SALES	YEAR
1043	Tostitos Lightly Salted 175g	2	8.8	2019
1044	Doritos Cheese Supreme 330g	2	11.4	2019

LIFESTAGE \	BRAND	PACKET_SIZE	PROD_UNIT_PRICE	
1043	Tostitos	175	4.4	MIDAGE SINGLES/COUPLES
1044	Doritos	330	5.7	MIDAGE SINGLES/COUPLES

	PREMIUM_CUSTOMER
1043	Budget
1044	Budget

Midage singles/ couples bought multiple brands in single transactions and these were also budget customers.

4. Analyzing and Visualizing merged dataset

Point to analyze and visualize

- Who spends the most on chips (total sales), describing customers by lifestage and how premium their general purchasing behaviour is
- How many customers are in each segment
- How many chips are bought per customer by segment
- What's the average chip price by customer segment
- In which time of the year chips are high on sale

Top 10 who spend most on chips

```
sales = pur_trans.groupby(["LIFESTAGE", "PREMIUM_CUSTOMER"])
["TOT_SALES"].sum().sort_values(ascending=False).reset_index(name='total_sale')
sales
```

	LIFESTAGE	PREMIUM_CUSTOMER	total_sale
0	OLDER FAMILIES	Budget	168363.25
1	YOUNG SINGLES/COUPLES	Mainstream	157621.60
2	RETIREES	Mainstream	155677.05
3	YOUNG FAMILIES	Budget	139345.85
4	OLDER SINGLES/COUPLES	Budget	136769.80
5	OLDER SINGLES/COUPLES	Mainstream	133393.80
6	OLDER SINGLES/COUPLES	Premium	132263.15
7	RETIREES	Budget	113147.80
8	OLDER FAMILIES	Mainstream	103445.55

9	RETIREES	Premium	97646.05
10	YOUNG FAMILIES	Mainstream	92788.75
11	MIDAGE SINGLES/COUPLES	Mainstream	90803.85
12	YOUNG FAMILIES	Premium	84025.50
13	OLDER FAMILIES	Premium	80658.40
14	YOUNG SINGLES/COUPLES	Budget	61141.60
15	MIDAGE SINGLES/COUPLES	Premium	58432.65
16	YOUNG SINGLES/COUPLES	Premium	41642.10
17	MIDAGE SINGLES/COUPLES	Budget	35514.80
18	NEW FAMILIES	Budget	21928.45
19	NEW FAMILIES	Mainstream	17013.90
20	NEW FAMILIES	Premium	11491.10

shwoing result in bar chart

```
fig =
px.bar(sales,x='LIFESTAGE',y='total_sale',color='PREMIUM_CUSTOMER',tit
le='Total sale by different lifestages')
```

```
fig.show()
```

```
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```

The top 3 total sales contributor segment are (in order):

- Older singles/couples
- Retirees
- Older families

```
cust = pur_trans.groupby(["LIFESTAGE", "PREMIUM_CUSTOMER"])
["LYLTY_CARD_NBR"].nunique().sort_values(ascending=False).reset_index(
name='Total_customer')
cust
```

	LIFESTAGE	PREMIUM_CUSTOMER	Total_customer
0	YOUNG SINGLES/COUPLES	Mainstream	8088
1	RETIREES	Mainstream	6479
2	OLDER SINGLES/COUPLES	Mainstream	4930
3	OLDER SINGLES/COUPLES	Budget	4929
4	OLDER SINGLES/COUPLES	Premium	4750
5	OLDER FAMILIES	Budget	4675
6	RETIREES	Budget	4454
7	YOUNG FAMILIES	Budget	4017
8	RETIREES	Premium	3872
9	YOUNG SINGLES/COUPLES	Budget	3779
10	MIDAGE SINGLES/COUPLES	Mainstream	3340
11	OLDER FAMILIES	Mainstream	2831

12	YOUNG FAMILIES	Mainstream	2728
13	YOUNG SINGLES/COUPLES	Premium	2574
14	YOUNG FAMILIES	Premium	2433
15	MIDAGE SINGLES/COUPLES	Premium	2431
16	OLDER FAMILIES	Premium	2273
17	MIDAGE SINGLES/COUPLES	Budget	1504
18	NEW FAMILIES	Budget	1112
19	NEW FAMILIES	Mainstream	849
20	NEW FAMILIES	Premium	588

shwoing result in bar chart

```
fig =
px.bar(cust,x='LIFESTAGE',y='Total_customer',color='PREMIUM_CUSTOMER',
title='Total sale by different lifestages')
```

```
fig.show()
```

```
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```

Retirees, young singles/couple and older singles/couples are buying different brands though older families are generating more profit by sales but young singles/couples are buying multi brand chips.

```
time = pur_trans.groupby(['YEAR', 'MONTH'])
['TOT_SALES'].sum().reset_index(name='total_sale')
time
```

	YEAR	MONTH	total_sale
0	2018	7	154357.10
1	2018	8	158632.85
2	2018	9	159876.70
3	2018	10	164979.70
4	2018	11	159839.50
5	2018	12	167907.40
6	2019	1	162737.10
7	2019	2	150630.50
8	2019	3	166521.80
9	2019	4	159625.00
10	2019	5	156798.95
11	2019	6	160287.40
12	2019	7	10921.00

shwoing result in bar chart

```
fig = px.bar(time, x='MONTH', y='total_sale', color='YEAR', title='Monthly sale in year 2018 - 2019')
```

```
fig.show()
```

```

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```

In 2018 from october and december sale was on its peak though in 2019 march and july was on highest

```

brand = pur_trans.groupby(['BRAND', 'PACKET_SIZE'])
['TOT_SALES'].sum().reset_index(name='total_sale')
brand

```

	BRAND	PACKET_SIZE	total_sale
0	Burger	220	6831.0
1	CCs	175	18078.9
2	Cheetos	165	7641.2
3	Cheetos	190	9243.3
4	Cheezels	125	5733.0
5	Cheezels	330	34296.9
6	Cobs	110	70569.8
7	Doritos	150	47622.9
8	Doritos	170	106264.4
9	Doritos	300	14261.0
10	Doritos	330	33390.6
11	Doritos	380	39052.0
12	French	175	7929.0
13	Grain Wave	180	8568.4
14	Grain Wave	210	43048.8
15	Infuzions	70	6852.0
16	Infuzions	110	92195.6
17	Kettle	135	26090.4
18	Kettle	150	167481.4
19	Kettle	175	196668.0
20	Natural	175	42318.0
21	Old	300	90785.1
22	Pringles	134	177655.5
23	RRD	150	52974.0
24	RRD	165	42072.0
25	Smiths	150	36210.2
26	Smiths	170	40408.6
27	Smiths	175	42567.0
28	Smiths	330	69106.8
29	Smiths	380	36367.6
30	Sunbites	90	9676.4
31	Thins	175	88852.5
32	Tostitos	175	79789.6
33	Twisties	250	26096.7
34	Twisties	270	55425.4
35	Tyrrells	165	51647.4
36	WW	160	10647.6
37	WW	175	9234.4
38	WW	200	16007.5
39	Woolworths	190	5169.6
40	Woolworths	300	8284.5

shwoing result in bar chart

```
fig =
px.bar(brand,x='BRAND',y='total_sale',color='PACKET_SIZE',title='Total
sale on brands')
```

```
fig.show()
```



```

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```

Kettle, Doritos and Smiths are the most profit generating brands. 170g and above packet size is more popular and in demand Only in Pringles 134g size is popular

```
trans =
pur_trans.groupby(['LYLTY_CARD_NBR', 'PREMIUM_CUSTOMER', 'PACKET_SIZE'])
.agg({'TOT_SALES': 'sum', 'PROD_QTY': 'sum'}).sort_values(by='TOT_SALES',
ascending=False)[:50]
trans.reset_index(inplace=True)
```

```
# shwoing result in bar chart
```

```
fig =
px.bar(trans,y='TOT_SALES',x='PREMIUM_CUSTOMER',color='PACKET_SIZE',ti
tle='Total sale on the base of packet size and premium customers')
```

```
fig.show()
```

```
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```

175 g pack is most popular among these three most profit generating customer segments

As seen earlier as well that budget customers are choosing to buy multi brand packets in one transaction as well and also generating most profit

shwoing result in bar chart

```
fig =
px.bar(trans,y='TOT_SALES',x='PROD_QTY',color='PREMIUM_CUSTOMER',title
='Total sale on the base of premium customers segment and total no. of
product purchase')
```

```
fig.show()
```

```
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```

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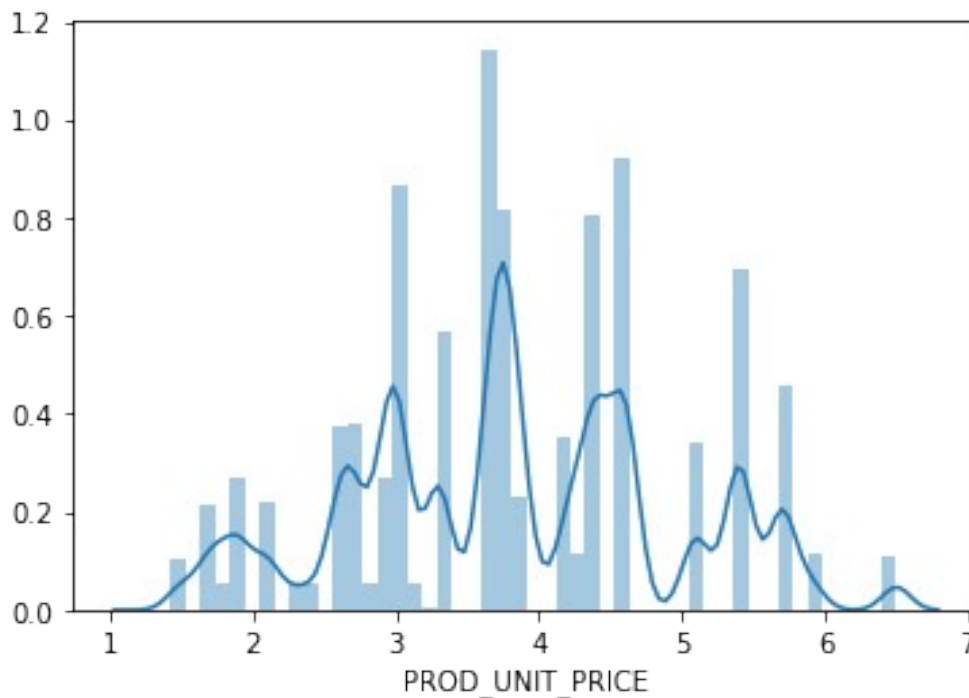
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```
# showing unit price sales on distplot
```

```
sns.distplot(pur_trans['PROD_UNIT_PRICE'])
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x1493e524848>
```



We can see that maximum transactions are for the price range between 3 to 4.5

```
# checking total sale in the year followed by dates
```

```
date_sale =  
pur_trans.groupby('DATE').agg({'TOT_SALES': 'sum'}).reset_index()  
date_sale
```

	DATE	TOT_SALES
0	2018-07-03	5372.2
1	2018-07-04	5315.4
2	2018-07-05	5321.8
3	2018-07-06	5309.9
4	2018-07-07	5080.9
...
359	2019-06-28	5305.0
360	2019-06-29	5202.8
361	2019-06-30	5299.6
362	2019-07-01	5497.6
363	2019-07-02	5423.4

```
[364 rows x 2 columns]
```

```
# Shwoing total sales with the dates
```

```
fig=px.line(date_sale,x='DATE',y='TOT_SALES',title='Total sale through  
year 2018-2019')  
fig.show()
```

```
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Transactions have been more or less same across different months, only in august and may it was down and in december it was on it's peak. May be because of christmas

Conclusion

- Kettle brand has the highest number of transactions.
- Packet Size of 175 has the highest transactions.
- Price Range between - 3-4.5 has the highest transactions.
- Sales have mainly been due to Budget - older families, Mainstream - young singles/couples, and Mainstream retirees shoppers.
- We found that the high spend in chips for mainstream young singles/couples and retirees with multi brand.

Recommendations:

Older Families:

- Focus on the Budget segment.
 - Strength: Frequent purchase. High quantity of chips purchased per visit.
 - Opportunity: We can give promotions that encourage them to buy more quantity of chips per purchase. **Young Singles/Couples:**
 - Focus on the Mainstream segment.
 - Strength: This segment is the only segment that had Doritos as their 2nd most purchased brand (after Kettle).
 - Opportunity: To specifically target this segment it might be a good idea to collaborate with Doritos merchant to do some branding promotion catered to "Young Singles/Couples - Mainstream" segment. **Retirees:**
 - Focus on the Mainstream segment.
 - Strength: They are more in quantity.
 - **Challenge: Since their population quantity is the contributor to the high total sales, we should spend more effort on making sure our promotions reaches as many of them as possible and frequent.**
- When promoting chips in general to all segments it is good to take advantage of preferred packet size and brand.**