TASK 1: Data Preparation and Customer Analytics

Conduct analysis on your client's transaction dataset and identify customer purchasing behaviours to generate insights and provide commercial recommendations.

Background information for the task

You are part of Quantium’s retail analytics team and have been approached by your client, the Category Manager for Chips, who wants to better understand the types of customers who purchase Chips and their purchasing behaviour within the region.

The insights from your analysis will feed into the supermarket’s strategic plan for the chip category in the next half year.

Here is your task

We need to present a strategic recommendation to Julia that is supported by data which she can then use for the upcoming category review however to do so we need to 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.

To get started, download the resource csv data files below and begin performing high level data checks such as:

- Creating and interpreting high level summaries of the data
- Finding outliers and removing these (if applicable)
- Checking data formats and correcting (if applicable)

You will also want to derive extra features such as pack size and brand name from the data and define metrics of interest to enable you to draw insights on who spends on chips and what drives spends for each customer segment. Remember our end goal is to form a strategy based on the findings to provide a clear recommendation to Julia the Category Manager so make sure your insights can have a commercial application

```python
#Importing the necessary libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import datetime
import xlrd         #used for reading data and formatting information from excel file

import warnings
warnings.filterwarnings('ignore')
```

Transaction Data

```
#Reading the Excel File
transaction_data= pd.read_excel("S:\Downloads\QVI_transaction_data
(1).xlsx")
transaction_data
```

```
         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
...       ...        ...             ...     ...       ...
264831  43533        272          272319  270088        89
264832  43325        272          272358  270154        74
264833  43410        272          272379  270187        51
264834  43461        272          272379  270188        42
264835  43365        272          272380  270189        74

                                       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

...                                          ...       ...        ...

264831   Kettle Sweet Chilli And Sour Cream 175g         2       10.8

264832             Tostitos Splash Of  Lime 175g         1        4.4

264833                  Doritos Mexicana    170g         2        8.8

264834   Doritos Corn Chip Mexican Jalapeno 150g         2        7.8

264835             Tostitos Splash Of  Lime 175g         2        8.8


[264836 rows x 8 columns]
```

```
#Getting concise summary
transaction_data.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
```

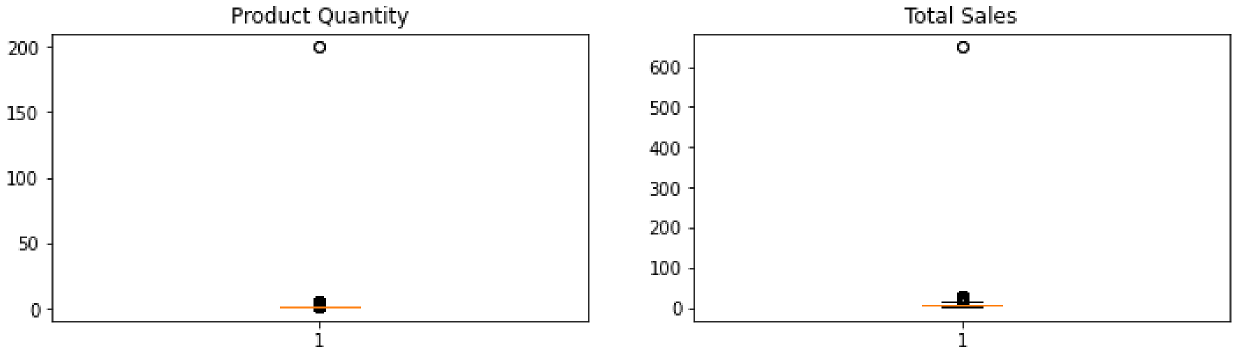
```
#Statistical Description
transaction_data.describe()
```

```
                DATE     STORE_NBR  LYLTY_CARD_NBR        TXN_ID  \
count  264836.000000  264836.00000    2.648360e+05  2.648360e+05   
mean    43464.036260     135.08011    1.355495e+05  1.351583e+05   
std       105.389282      76.78418    8.057998e+04  7.813303e+04   
min     43282.000000       1.00000    1.000000e+03  1.000000e+00   
25%     43373.000000      70.00000    7.002100e+04  6.760150e+04   
50%     43464.000000     130.00000    1.303575e+05  1.351375e+05   
75%     43555.000000     203.00000    2.030942e+05  2.027012e+05   
max     43646.000000     272.00000    2.373711e+06  2.415841e+06   

            PROD_NBR       PROD_QTY      TOT_SALES  
count  264836.000000  264836.000000  264836.000000  
mean       56.583157       1.907309       7.304200  
std        32.826638       0.643654       3.083226  
min         1.000000       1.000000       1.500000  
25%        28.000000       2.000000       5.400000  
50%        56.000000       2.000000       7.400000  
75%        85.000000       2.000000       9.200000  
max       114.000000     200.000000     650.000000  
```

```
#Checking for null values
transaction_data.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 Outliers using Boxplot

figure,axis=  plt.subplots(1,2,figsize=(12,3))
#subplot of order (1 X 2 )
axis[0].boxplot(transaction_data['PROD_QTY'])
axis[1].boxplot(transaction_data['TOT_SALES'])
axis[0].set_title('Product Quantity')
axis[1].set_title('Total Sales')

plt.show()
```



```
#Removing Outliers
transaction_data= transaction_data[transaction_data['PROD_QTY']<50 ]
transacction_data= transaction_data[transaction_data['TOT_SALES']<100]
transaction_data
```

```
         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
...       ...        ...             ...     ...       ...
264831  43533        272          272319  270088        89
264832  43325        272          272358  270154        74
264833  43410        272          272379  270187        51
264834  43461        272          272379  270188        42
264835  43365        272          272380  270189        74

                                       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
...                                          ...        ...         ...
264831   Kettle Sweet Chilli And Sour Cream 175g          2        10.8
264832            Tostitos Splash Of  Lime 175g           1         4.4
264833                 Doritos Mexicana    170g           2         8.8
264834   Doritos Corn Chip Mexican Jalapeno 150g          2         7.8
264835            Tostitos Splash Of  Lime 175g           2         8.8

[264834 rows x 8 columns]
```

As we can see, removing the outliers decreased the transaction data by two rows. Ofcourse, this isn't a significant differnce, but removing these outliers may allow us to get slightly more accurate results.

```
#Converting Excel serial date format to the datetime format:-

date= transaction_data['DATE'].tolist()                     #storing the
data column as a list

for i in range(len(date)):
    date[i]= xlrd.xldate_as_datetime(date[i],0)

transaction_data['DATE']= date
transaction_data

             DATE  STORE_NBR  LYLTY_CARD_NBR  TXN_ID  PROD_NBR  \
0      2018-10-17          1            1000       1         5
1      2019-05-14          1            1307     348        66
2      2019-05-20          1            1343     383        61
3      2018-08-17          2            2373     974        69
4      2018-08-18          2            2426    1038       108
...           ...        ...             ...     ...       ...
264831 2019-03-09        272          272319  270088        89
264832 2018-08-13        272          272358  270154        74
264833 2018-11-06        272          272379  270187        51
264834 2018-12-27        272          272379  270188        42
264835 2018-09-22        272          272380  270189        74

                                        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
...                                          ...       ...         ...
264831   Kettle Sweet Chilli And Sour Cream 175g         2        10.8
264832             Tostitos Splash Of  Lime 175g         1         4.4
264833                  Doritos Mexicana    170g         2         8.8
264834   Doritos Corn Chip Mexican Jalapeno 150g         2         7.8
264835             Tostitos Splash Of  Lime 175g         2         8.8

[264834 rows x 8 columns]
```

Customer Data

```
#Reading the CSV File
customer_data= pd.read_csv("S:\Downloads\QVI_purchase_behaviour
(1).csv")
customer_data
```

```
       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
...               ...                     ...              ...
72632         2370651  MIDAGE SINGLES/COUPLES       Mainstream
72633         2370701          YOUNG FAMILIES       Mainstream
72634         2370751          YOUNG FAMILIES          Premium
72635         2370961           OLDER FAMILIES           Budget
72636         2373711   YOUNG SINGLES/COUPLES       Mainstream

[72637 rows x 3 columns]
```

```
#Getting Summary
customer_data.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

#Statistical Description
customer_data.describe(include='object')

       LIFESTAGE PREMIUM_CUSTOMER
count      72637            72637
unique         7                3
top     RETIREES       Mainstream
freq       14805            29245

#Check Null Values
customer_data.isnull().sum()

LYLTY_CARD_NBR      0
LIFESTAGE           0
PREMIUM_CUSTOMER    0
dtype: int64
```

Merging

```
#Merging two dataframe
df= pd.merge(transaction_data,customer_data, on='LYLTY_CARD_NBR' )
df

             DATE  STORE_NBR  LYLTY_CARD_NBR  TXN_ID  PROD_NBR  \
0      2018-10-17          1            1000       1         5   
1      2019-05-14          1            1307     348        66   
2      2018-11-10          1            1307     346        96   
3      2019-03-09          1            1307     347        54   
4      2019-05-20          1            1343     383        61   
...           ...        ...             ...     ...       ...   
264829 2019-03-09        272          272319  270088        89   
264830 2018-08-13        272          272358  270154        74   
264831 2018-11-06        272          272379  270187        51   
264832 2018-12-27        272          272379  270188        42   
264833 2018-09-22        272          272380  270189        74   

                                      PROD_NAME  PROD_QTY  
TOT_SALES  \
0        Natural Chip        Compny SeaSalt175g         2        6.0   

1                      CCs Nacho Cheese    175g         3        6.3   
```

```
2                    WW Original Stacked Chips 160g          2          3.8
3                                 CCs Original 175g          1          2.1
4           Smiths Crinkle Cut  Chips Chicken 170g           2          2.9
...                                            ...         ...          ...
264829   Kettle Sweet Chilli And Sour Cream 175g            2         10.8
264830                 Tostitos Splash Of  Lime 175g         1          4.4
264831                      Doritos Mexicana    170g         2          8.8
264832   Doritos Corn Chip Mexican Jalapeno 150g            2          7.8
264833                 Tostitos Splash Of  Lime 175g         2          8.8

                     LIFESTAGE PREMIUM_CUSTOMER
0         YOUNG SINGLES/COUPLES          Premium
1        MIDAGE SINGLES/COUPLES           Budget
2        MIDAGE SINGLES/COUPLES           Budget
3        MIDAGE SINGLES/COUPLES           Budget
4        MIDAGE SINGLES/COUPLES           Budget
...                         ...              ...
264829    YOUNG SINGLES/COUPLES          Premium
264830    YOUNG SINGLES/COUPLES          Premium
264831    YOUNG SINGLES/COUPLES          Premium
264832    YOUNG SINGLES/COUPLES          Premium
264833    YOUNG SINGLES/COUPLES          Premium

[264834 rows x 10 columns]
```

In PROD_NAME we have combination of Brand Name, Product Name, Product Name but we need to split it for better analysis.

```
df['BRAND_NAME']= df['PROD_NAME'].str.split().str[0]
#str.split(): splits by the white space , .str[0]: selects a first
word from splitted string

df['PROD_SIZE']= df['PROD_NAME'].str.extract('(\d+)')
# (/d): to extract digit , '+'' : to extract whole  number

df['PRODUCT_NAME']= df['PROD_NAME'].str.replace('\d+g'," ")
# g: attach with number

df= df.loc[: , [
'DATE','PROD_NBR','PRODUCT_NAME','BRAND_NAME','PROD_SIZE','PROD_QTY','
TOT_SALES','LIFESTAGE','PREMIUM_CUSTOMER','STORE_NBR','LYLTY_CARD_NBR'
,'TXN_ID']]
# loc: Used to access rows and columns.   ; Rearranging the column
with all rows selected
df
```

```
             DATE  PROD_NBR                          PRODUCT_NAME
BRAND_NAME  \
0      2018-10-17         5   Natural Chip        Compny SeaSalt
Natural
1      2019-05-14        66                 CCs Nacho Cheese
CCs
2      2018-11-10        96           WW Original Stacked Chips
WW
3      2019-03-09        54                        CCs Original
CCs
4      2019-05-20        61   Smiths Crinkle Cut  Chips Chicken
Smiths
...           ...       ...                                   ...
...
264829 2019-03-09        89  Kettle Sweet Chilli And Sour Cream
Kettle
264830 2018-08-13        74            Tostitos Splash Of  Lime
Tostitos
264831 2018-11-06        51                 Doritos Mexicana
Doritos
264832 2018-12-27        42  Doritos Corn Chip Mexican Jalapeno
Doritos
264833 2018-09-22        74            Tostitos Splash Of  Lime
Tostitos

       PROD_SIZE  PROD_QTY  TOT_SALES               LIFESTAGE  \
0            175         2        6.0   YOUNG SINGLES/COUPLES
1            175         3        6.3  MIDAGE SINGLES/COUPLES
2            160         2        3.8  MIDAGE SINGLES/COUPLES
3            175         1        2.1  MIDAGE SINGLES/COUPLES
4            170         2        2.9  MIDAGE SINGLES/COUPLES
...          ...       ...        ...                     ...
264829       175         2       10.8   YOUNG SINGLES/COUPLES
264830       175         1        4.4   YOUNG SINGLES/COUPLES
264831       170         2        8.8   YOUNG SINGLES/COUPLES
264832       150         2        7.8   YOUNG SINGLES/COUPLES
264833       175         2        8.8   YOUNG SINGLES/COUPLES

       PREMIUM_CUSTOMER  STORE_NBR  LYLTY_CARD_NBR  TXN_ID
0               Premium          1            1000       1
1                Budget          1            1307     348
2                Budget          1            1307     346
3                Budget          1            1307     347
4                Budget          1            1343     383
...                 ...        ...             ...     ...
```

```
264829          Premium        272             272319  270088
264830          Premium        272             272358  270154
264831          Premium        272             272379  270187
264832          Premium        272             272379  270188
264833          Premium        272             272380  270189

[264834 rows x 12 columns]

#Checking for Null Values
df.isnull().sum()

DATE                0
PROD_NBR            0
PRODUCT_NAME        0
BRAND_NAME          0
PROD_SIZE           0
PROD_QTY            0
TOT_SALES           0
LIFESTAGE           0
PREMIUM_CUSTOMER    0
STORE_NBR           0
LYLTY_CARD_NBR      0
TXN_ID              0
dtype: int64

#Sort by date
df=df.sort_values(by='DATE')
df

             DATE  PROD_NBR                           PRODUCT_NAME
BRAND_NAME  \
139041 2018-07-01        70   Tyrrells Crisps     Lightly Salted
Tyrrells
199667 2018-07-01       103      RRD Steak &         Chimuchurri
RRD
228014 2018-07-01        24     Grain Waves         Sweet Chilli
Grain
59848  2018-07-01       114     Kettle Sensations   Siracha Lime
Kettle
3958   2018-07-01        23                      Cheezels Cheese
Cheezels
...           ...       ...                                  ...
...
106477 2019-06-30        57   Old El Paso Salsa   Dip Tomato Mild
Old
64030  2019-06-30        44            Thins Chips Light&  Tangy
Thins
206707 2019-06-30        83          WW D/Style Chip     Sea Salt
WW
122945 2019-06-30        91                    CCs Tasty Cheese
```

```
CCs
31644  2019-06-30        42   Doritos Corn Chip Mexican Jalapeno
Doritos

       PROD_SIZE  PROD_QTY  TOT_SALES               LIFESTAGE  \
139041       165         2        8.4                RETIREES
199667       150         2        5.4          YOUNG FAMILIES
228014       210         2        7.2          YOUNG FAMILIES
59848        150         2        9.2          OLDER FAMILIES
3958         330         2       11.4  MIDAGE SINGLES/COUPLES
...          ...       ...        ...                     ...
106477       300         2       10.2   OLDER SINGLES/COUPLES
64030        175         2        6.6          OLDER FAMILIES
206707       200         2        3.8          YOUNG FAMILIES
122945       175         2        4.2   OLDER SINGLES/COUPLES
31644        150         2        7.8            NEW FAMILIES

       PREMIUM_CUSTOMER  STORE_NBR  LYLTY_CARD_NBR  TXN_ID
139041           Budget         27           27181   24218
199667           Budget        191          191099  192367
228014          Premium        257          257010  255769
59848        Mainstream         48           48129   43842
3958             Budget        203          203013  202339
...                 ...        ...             ...     ...
106477       Mainstream         67           67129   64592
64030        Mainstream        133          133121  136776
206707       Mainstream        257          257195  256935
122945          Premium         45           45057   40739
31644           Premium        199          199122  198088

[264834 rows x 12 columns]
```

```
pd.date_range(start='2018-07-01',end= '2019-06-
30').difference(df['DATE'])
# (range of dates - our actual dates) = missing dates
```

```
DatetimeIndex(['2018-12-25'], dtype='datetime64[ns]', freq=None)
```

As suspected, there is one unrecorded date and thats of Christmas Day, since most stores are closed during that time.

```
# Filling entry for missing data
df=df.append({'DATE': pd.to_datetime('2018-12-
25'),'PROD_NBR':0,'PRODUCT_NAME':'None','BRAND_NAME':'None','PROD_SIZE
':0,'PROD_QTY':0,'TOT_SALES':0,'LIFESTAGE':'None','PREMIUM_CUSTOMER':'
None','STORE_NBR':0,'LYLTY_CARD_NBR':0,'TXN_ID':0},ignore_index=True)
# Only append a dict if ignore_index=True

df=df.sort_values(by='DATE')
df
```

```
             DATE  PROD_NBR                           PRODUCT_NAME
BRAND_NAME  \
0      2018-07-01        70  Tyrrells Crisps     Lightly Salted
Tyrrells
478    2018-07-01        46                     Kettle Original
Kettle
479    2018-07-01        56                 Cheezels Cheese Box
Cheezels
480    2018-07-01        24    Grain Waves         Sweet Chilli
Grain
481    2018-07-01        80   Natural ChipCo Sea  Salt & Vinegr
Natural
...           ...       ...                                   ...
...
264340 2019-06-30        77    Doritos Corn Chips  Nacho Cheese
Doritos
264341 2019-06-30        12  Natural Chip Co     Tmato Hrb&Spce
Natural
264342 2019-06-30        47        Doritos Corn Chips  Original
Doritos
264333 2019-06-30        42  Doritos Corn Chip Mexican Jalapeno
Doritos
264276 2019-06-30        25           Pringles SourCream  Onion
Pringles

       PROD_SIZE  PROD_QTY  TOT_SALES              LIFESTAGE  \
0            165         2        8.4               RETIREES
478          175         2       10.8               RETIREES
479          125         2        4.2         OLDER FAMILIES
480          210         2        7.2               RETIREES
481          175         1        3.0  MIDAGE SINGLES/COUPLES
...          ...       ...        ...                    ...
264340       170         2        8.8   YOUNG SINGLES/COUPLES
264341       175         2        6.0   YOUNG SINGLES/COUPLES
264342       170         2        8.8   YOUNG SINGLES/COUPLES
264333       150         2        7.8  MIDAGE SINGLES/COUPLES
264276       134         2        7.4   YOUNG SINGLES/COUPLES

       PREMIUM_CUSTOMER  STORE_NBR  LYLTY_CARD_NBR  TXN_ID
0                Budget         27           27181   24218
478             Premium        180          180179  182143
479             Premium        164          164069  164212
480             Premium        179          179216  180709
481             Premium         18           18221   15451
...                 ...        ...             ...     ...
264340       Mainstream        230          230022  232028
264341       Mainstream        101          101071  100462
264342       Mainstream        141          141226  142472
264333       Mainstream        162          162118  162544
264276           Budget         27           27288   24377
```

```
[264835 rows x 12 columns]
```

```
df.loc[df['DATE']=='2018-12-25']
```

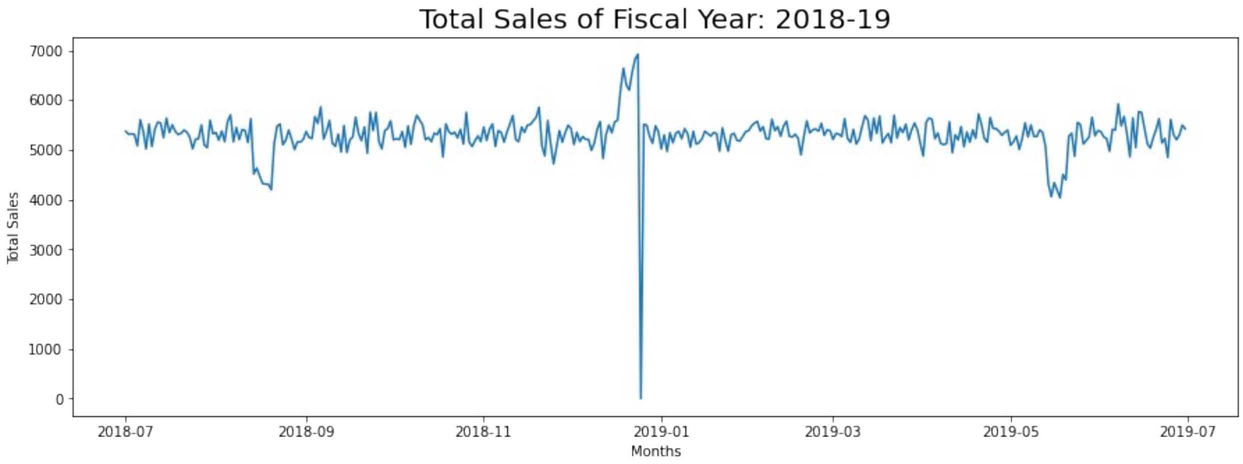
```
             DATE  PROD_NBR PRODUCT_NAME BRAND_NAME PROD_SIZE  
PROD_QTY  \
264834 2018-12-25         0         None       None         0   
0   

        TOT_SALES LIFESTAGE PREMIUM_CUSTOMER  STORE_NBR  
LYLTY_CARD_NBR  \
264834        0.0      None             None          0   
0   

        TXN_ID  
264834       0  
```

Analysis and Visualization

```
date_sales= df.groupby('DATE')['TOT_SALES'].sum().reset_index()
date_sales
```

```
          DATE  TOT_SALES
0   2018-07-01     5372.2
1   2018-07-02     5315.4
2   2018-07-03     5321.8
3   2018-07-04     5309.9
4   2018-07-05     5080.9
..         ...        ...
360 2019-06-26     5305.0
361 2019-06-27     5202.8
362 2019-06-28     5299.6
363 2019-06-29     5497.6
364 2019-06-30     5423.4

[365 rows x 2 columns]
```

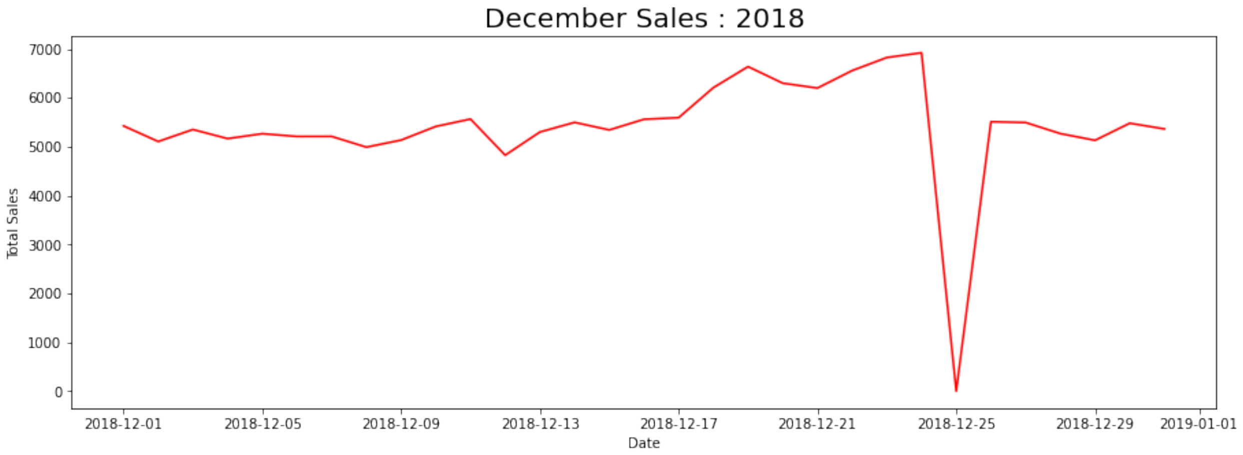
```
#Plotting a line graph of the totalsales for each date over the entire 
recorded duration
plt.figure(figsize=(15,5))
plt.plot(date_sales['DATE'], date_sales['TOT_SALES'])
plt.title('Total Sales of Fiscal Year: 2018-19',size=20)
plt.xlabel('Months')
plt.ylabel('Total Sales')
plt.show()
```



As we can see from the line graph, the sales drop to zero on a certain date, which is 25th December(Christmas), which we manually set zero. However, the sales also reached an all-time high right before that, so we would need to analyze the transaction data from Decemeber 2018 to find out more about the sales

HOLIDAY SEASON

```
plt.figure(figsize=(15,5))
plt.plot( date_sales['DATE'][date_sales['DATE'].dt.month==12] ,
date_sales['TOT_SALES'][date_sales['DATE'].dt.month==12],color='r' )
plt.title('December Sales : 2018',size=20)
plt.xlabel('Date')
plt.ylabel('Total Sales')
plt.show()
```



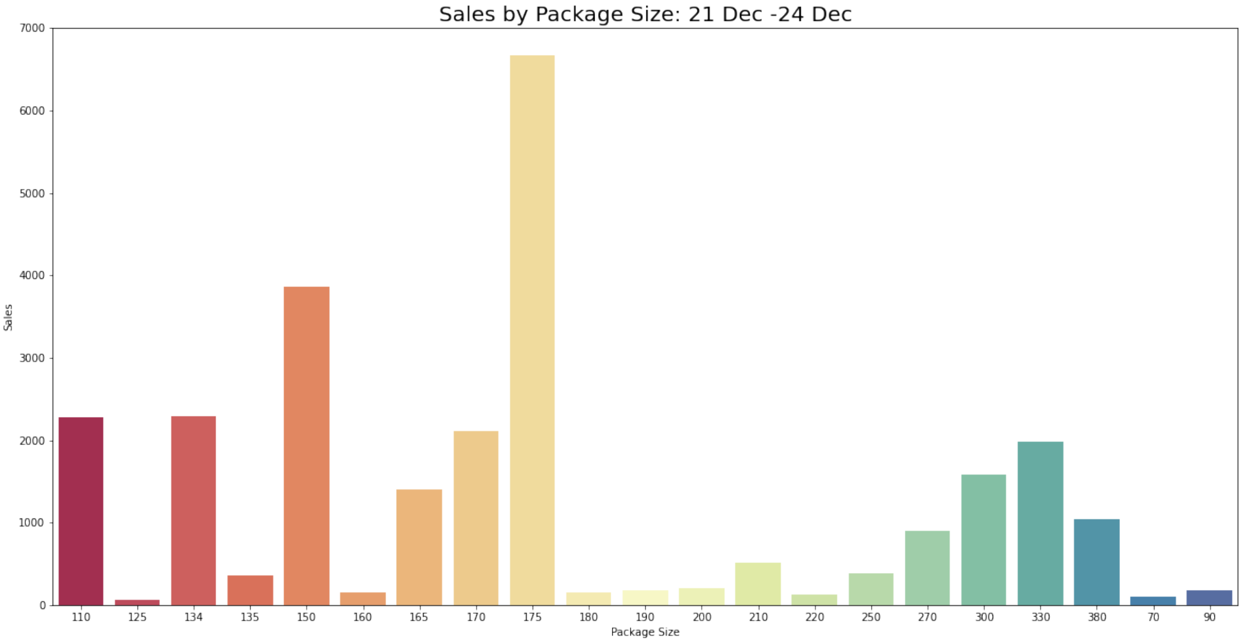
As suspected, the sales reached an all time high the day before Christmas Day, which makes sense because people tend to purchase food items more when approaching holiday season. We can also see a consistent rise in the line graph between 21st December and 24th December, which means that these are the dates the store could target with promotions and discounts to increase the sales even more

We also want to know which package sizes sell the most to create promotions and discounts around them

```
holiday_sales= df[ (df['DATE']>= '2018-12-21') & (df['DATE']<= '2018-
12-25')]
holiday_sales

             DATE  PROD_NBR                           PRODUCT_NAME
BRAND_NAME  \
126267 2018-12-21       112    Tyrrells Crisps     Ched & Chives
Tyrrells
126268 2018-12-21        57  Old El Paso Salsa   Dip Tomato Mild
Old
126269 2018-12-21        57  Old El Paso Salsa   Dip Tomato Mild
Old
126270 2018-12-21        80    Natural ChipCo Sea  Salt & Vinegr
Natural
126271 2018-12-21        39     Smiths Crinkle Cut  Tomato Salsa
Smiths
...           ...       ...                                    ...
...
128703 2018-12-24        32      Kettle Sea Salt     And Vinegar
Kettle
128704 2018-12-24        63              Kettle   Swt Pot Sea Salt
Kettle
128692 2018-12-24         1   Smiths Crinkle Cut  Chips Barbecue
Smiths
129323 2018-12-24       107  Smiths Crinkle Cut  French OnionDip
Smiths
264834 2018-12-25         0                                   None
None

       PROD_SIZE  PROD_QTY  TOT_SALES              LIFESTAGE  \
126267       165         2        8.4  MIDAGE SINGLES/COUPLES
126268       300         1        5.1                RETIREES
126269       300         2       10.2                RETIREES
126270       175         2        6.0                RETIREES
126271       150         2        5.2            NEW FAMILIES
...          ...       ...        ...                     ...
128703       175         2       10.8          OLDER FAMILIES
128704       135         2        8.4   OLDER SINGLES/COUPLES
128692       170         2        5.8                RETIREES
129323       150         2        5.2          OLDER FAMILIES
264834         0         0        0.0                    None

       PREMIUM_CUSTOMER  STORE_NBR  LYLTY_CARD_NBR  TXN_ID
126267           Budget         75           75029   73499
126268       Mainstream        120          120346  123864
126269          Premium         40           40314   37546
126270       Mainstream         50           50452   46618
```

```
126271       Mainstream        114          114085  117409
...                 ...        ...             ...     ...
128703           Budget         26           26186   23091
128704       Mainstream        171          171242  172523
128692          Premium        178          178026  177722
129323           Budget        101          101001  100045
264834             None          0               0       0

[3614 rows x 12 columns]
```

```
# Plotting a bar graph of the total sales for each package size
between 21st Dec and 24th Dec
holiday_sizes=holiday_sales.groupby('PROD_SIZE')
['TOT_SALES'].sum().reset_index()
holiday_sizes= holiday_sizes[holiday_sizes['PROD_SIZE']!=0]

plt.figure(figsize=(20,10))
sns.barplot(x='PROD_SIZE',y= 'TOT_SALES', data=
holiday_sizes,palette='Spectral')
plt.title('Sales by Package Size: 21 Dec -24 Dec',size=20)
plt.xlabel('Package Size')
plt.ylabel('Sales')
plt.show()
```



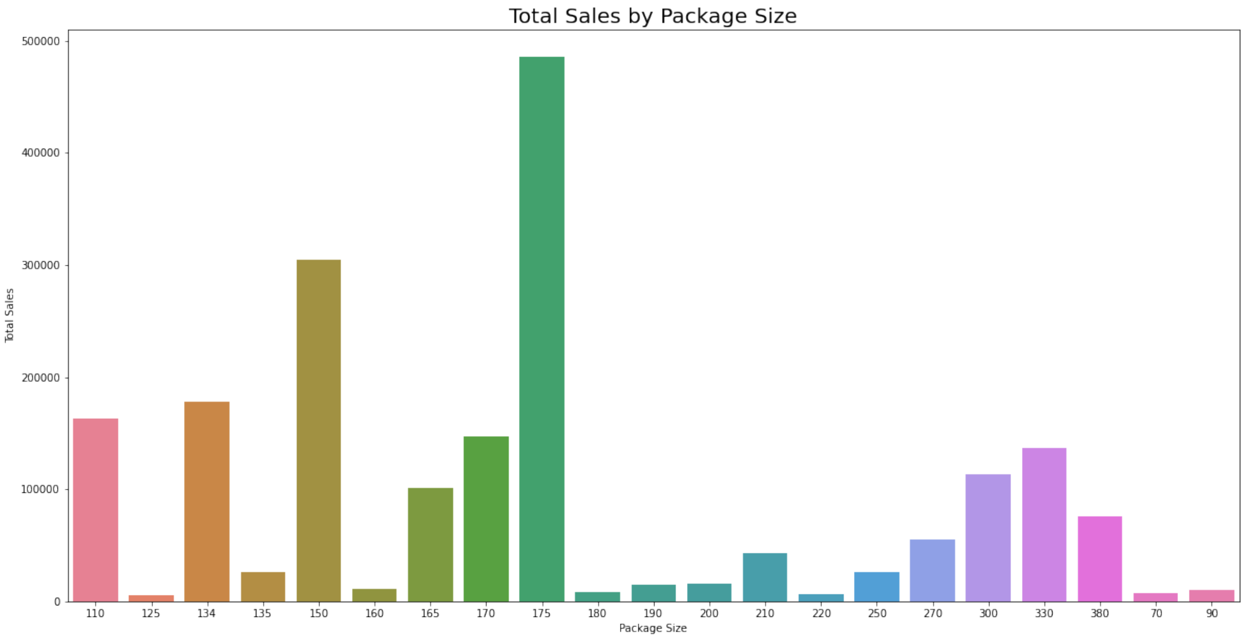
```
holiday_brands=holiday_sales.groupby('BRAND_NAME')
['TOT_SALES'].sum().reset_index().sort_values(by='TOT_SALES',ascending
=False)
holiday_brands.head()
```

```
   BRAND_NAME  TOT_SALES
12     Kettle     4940.0
6     Doritos     2948.5
21     Smiths     2914.5
17   Pringles     2290.3
24      Thins     1343.1
```

We can see that KETTLE was the highest-selling brand during the holiday season, so it will be wise to surround promotions and discouts around it to drive sales even more. And need to focus on 175 grams packet more

Lets see the holiday season statistics match with the ones during the entire duration of the recorded sales:-

```
package_size= df.groupby('PROD_SIZE')['TOT_SALES'].sum().reset_index()
package_size= package_size[package_size['PROD_SIZE']!=0]

plt.figure(figsize=(20,10))
sns.barplot(x='PROD_SIZE',y='TOT_SALES',data=package_size,palette='hus
l')
plt.title('Total Sales by Package Size',size=20)
plt.xlabel('Package Size')
plt.ylabel('Total Sales')
plt.show()
```



Seems like 175 grams and 150 grams have higgest sale in whole fiscal year too.

```
brand_sales=df.groupby('BRAND_NAME')
['TOT_SALES'].sum().reset_index().sort_values(by='TOT_SALES',ascending
=False)
brand_sales.head()
```

```
   BRAND_NAME  TOT_SALES
12     Kettle   390239.8
21     Smiths   210076.8
6     Doritos   201538.9
17   Pringles   177655.5
16        Old    90785.1
```

Just like holiday season sales, KETTLE remained the highest-selling brand during the entire duration of the recorded sales

Now let's move onto the Customer Analysis

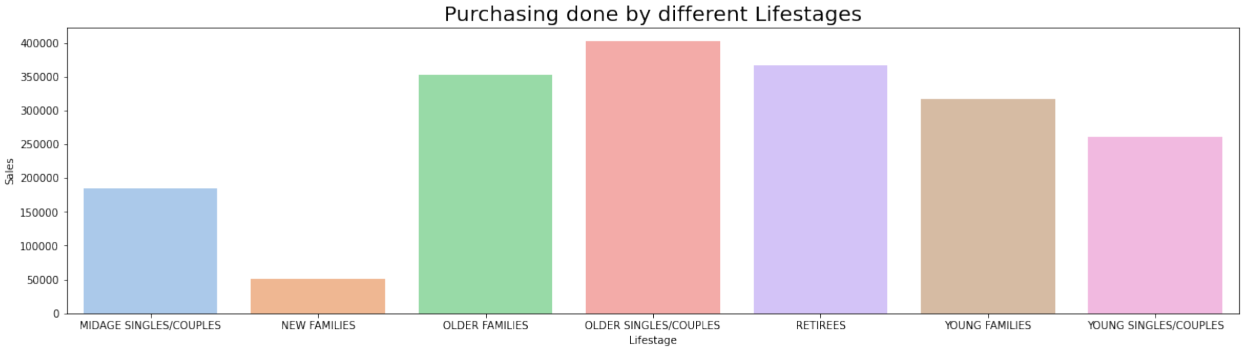
```
df['LIFESTAGE'].value_counts()
```

```
OLDER SINGLES/COUPLES     54479
RETIREES                  49763
OLDER FAMILIES            48594
YOUNG FAMILIES            43592
YOUNG SINGLES/COUPLES     36377
MIDAGE SINGLES/COUPLES    25110
NEW FAMILIES               6919
None                          1
Name: LIFESTAGE, dtype: int64
```

```
customer_purchase= df.groupby('LIFESTAGE')
['TOT_SALES'].sum().reset_index()
customer_purchase= customer_purchase[customer_purchase['LIFESTAGE']!
='None']
customer_purchase
```

```
                LIFESTAGE  TOT_SALES
0  MIDAGE SINGLES/COUPLES  184751.30
1            NEW FAMILIES   50433.45
3          OLDER FAMILIES  352467.20
4   OLDER SINGLES/COUPLES  402426.75
5                RETIREES  366470.90
6          YOUNG FAMILIES  316160.10
7   YOUNG SINGLES/COUPLES  260405.30
```

```
plt.figure(figsize=(20,5))
sns.barplot(x='LIFESTAGE',y='TOT_SALES',data=customer_purchase,palette
='pastel')
plt.title('Purchasing done by different Lifestages',size=20)
plt.xlabel('Lifestage')
plt.ylabel('Sales')
plt.show()
```



It seems like OLDER SINGLES/COUPLES are the most loyal customers of the store and NEW FAMILIES are the least. Intrestingly, we can see a decreasing trend of purchasing according to age.

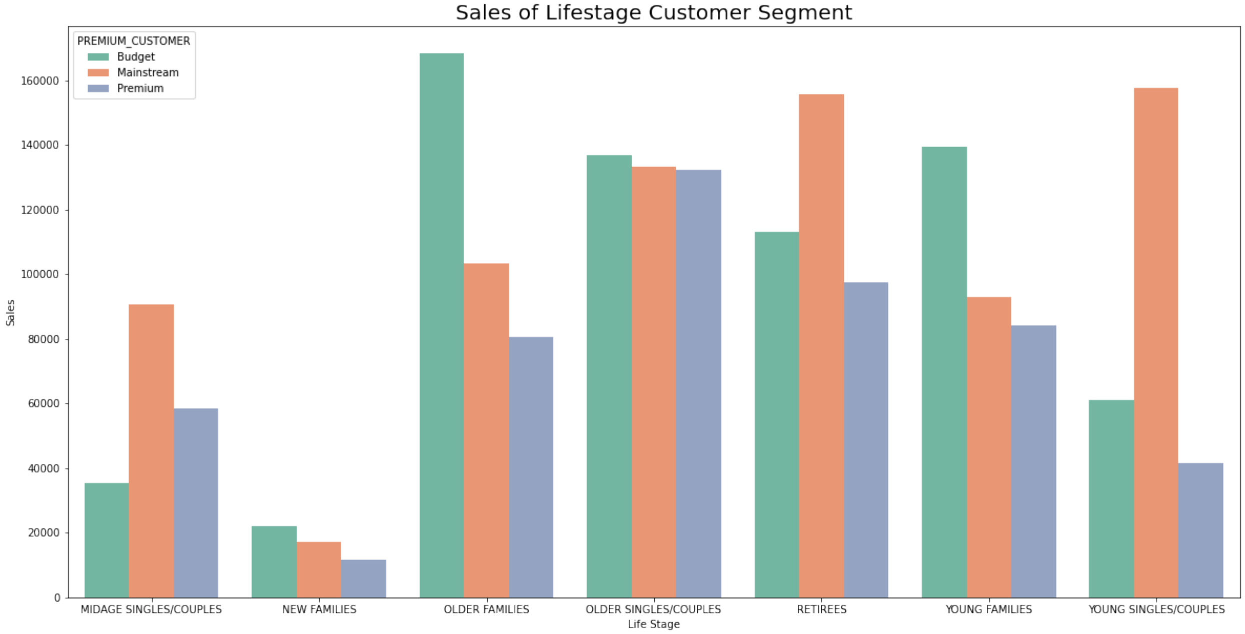
Lets see what sort of purchasing behaviour each age demographic has

```
lifestage_segment= df.groupby(['LIFESTAGE','PREMIUM_CUSTOMER'])
['TOT_SALES'].sum().reset_index().sort_values(by=['LIFESTAGE','PREMIUM
_CUSTOMER'])
lifestage_segment= lifestage_segment[lifestage_segment['LIFESTAGE']!
='None']
lifestage_segment
```

```
                 LIFESTAGE PREMIUM_CUSTOMER  TOT_SALES
0   MIDAGE SINGLES/COUPLES           Budget   35514.80
1   MIDAGE SINGLES/COUPLES       Mainstream   90803.85
2   MIDAGE SINGLES/COUPLES          Premium   58432.65
3             NEW FAMILIES           Budget   21928.45
4             NEW FAMILIES       Mainstream   17013.90
5             NEW FAMILIES          Premium   11491.10
7           OLDER FAMILIES           Budget  168363.25
8           OLDER FAMILIES       Mainstream  103445.55
9           OLDER FAMILIES          Premium   80658.40
10   OLDER SINGLES/COUPLES           Budget  136769.80
11   OLDER SINGLES/COUPLES       Mainstream  133393.80
12   OLDER SINGLES/COUPLES          Premium  132263.15
13                RETIREES           Budget  113147.80
14                RETIREES       Mainstream  155677.05
15                RETIREES          Premium   97646.05
16          YOUNG FAMILIES           Budget  139345.85
17          YOUNG FAMILIES       Mainstream   92788.75
18          YOUNG FAMILIES          Premium   84025.50
19   YOUNG SINGLES/COUPLES           Budget   61141.60
20   YOUNG SINGLES/COUPLES       Mainstream  157621.60
21   YOUNG SINGLES/COUPLES          Premium   41642.10
```

```
#Plotting a bar graph for total sales of each age demographic with
customer segmnent
```

```
plt.figure(figsize=(20,10))
sns.barplot(x='LIFESTAGE',y='TOT_SALES',data=lifestage_segment,hue='PREMIUM_CUSTOMER',palette='Set2')
plt.title('Sales of Lifestage Customer Segment',size=20)
plt.xlabel('Life Stage')
plt.ylabel('Sales')
plt.show()
```



OLDER FAMILIES are highest Budget customers, RETIREES are highest Mainstream customer while OLDER SINGLES/COUPLES are highest Premium customer, these are the age demographic to target for payment plans and promotions to drive sales even more since they are more likely to pay more per packet of chips than others

Conclusion:

- Generally, sales gradually increase during the holiday season and are the highest the day before Christmas Day, but suddenly decrease right after, so this would be the ideal time for any promotional campaigns or discount.
- The 175 gramme package size is the highest-selling package size during the holiday season with KETTLE® being the highest-selling brand.
- KETTLE® is the also the highest-selling brand during the entire year, also the 175 grams package size is the highest-selling package size, on average, with a difference of nearly 37% from the second highest-selling package size.
- OLDER SINGLES/COUPLES are the most loyal customers of the store and NEW FAMILIES are the least.
- Highest Customer:- Premium: OLDER SINGLES/COUPLES , Mainstream: RETIREES , Budget: OLDER FAMILIES