IMPORT LIBRARIES

In [51]:

```
import numpy as np
import pandas as pd
import datetime
import matplotlib.pyplot as plt
from scipy.stats import ttest_ind
```

TRANSACTION DATASET

In [49]:

```
# Transaction
df_transaction = pd.read_excel("QVI_transaction_data.xlsx")
df_transaction.head()
```

Out[49]:

	DATE	STORE_NBR	LYLTY_CARD_NBR	TXN_ID	PROD_NBR	PROD_NAME	PROD_C
0	43390	1	1000	1	5	Natural Chip Compny SeaSalt175g	
1	43599	1	1307	348	66	CCs Nacho Cheese 175g	
2	43605	1	1343	383	61	Smiths Crinkle Cut Chips Chicken 170g	
3	43329	2	2373	974	69	Smiths Chip Thinly S/Cream&Onion 175g	
4	43330	2	2426	1038	108	Kettle Tortilla ChpsHny&Jlpno Chili 150g	

CUSTOMER DATASET

In [52]:

```
# Customer
df_customer = pd.read_csv("QVI_purchase_behaviour.csv")
df_customer.head()
```

Out[52]:

	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

MERGE DATASETS

In [53]:

```
df = pd.merge(df_transaction, df_customer, on="LYLTY_CARD_NBR", how="left")
df.head()
```

Out[53]:

	DATE	STORE_NBR	LYLTY_CARD_NBR	TXN_ID	PROD_NBR	PROD_NAME	PROD_C
0	43390	1	1000	1	5	Natural Chip Compny SeaSalt175g	
1	43599	1	1307	348	66	CCs Nacho Cheese 175g	
2	43605	1	1343	383	61	Smiths Crinkle Cut Chips Chicken 170g	
3	43329	2	2373	974	69	Smiths Chip Thinly S/Cream&Onion 175g	
4	43330	2	2426	1038	108	Kettle Tortilla ChpsHny&Jlpno Chili 150g	

EXPLORATORY DATA ANALYSIS

In [54]:

```
# Rename columns to became meaningful
df = df.rename(columns={"LYLTY_CARD_NBR" : "Card No.",
                        "LIFESTAGE" : "Group",
                        "DATE" : "Date",
                        "PREMIUM_CUSTOMER" : "Subscription",
                        "STORE_NBR" : "Store Id",
                        "TXN_ID" : "Transaction Id",
                        "PROD_NBR" : "Product Id",
                        "PROD_NAME" : "Product",
                        "PROD_QTY" : "Quantity",
                        "TOT_SALES" : "Sales",
                        })
df.head()
```

Out[54]:

	Date	Store Id	Card No.	Transaction Id	Product Id	Product	Quantity	Sales	
0	43390	1	1000	1	5	Natural Chip Compny SeaSalt175g	2	6.0	SINGLES/
1	43599	1	1307	348	66	CCs Nacho Cheese 175g	3	6.3	SINGLES/
2	43605	1	1343	383	61	Smiths Crinkle Cut Chips Chicken 170g	2	2.9	SINGLES/
3	43329	2	2373	974	69	Smiths Chip Thinly S/Cream&Onion 175g	5	15.0	SINGLES/
4	43330	2	2426	1038	108	Kettle Tortilla ChpsHny&Jlpno Chili 150g	3	13.8	SINGLES/

EXAMINE DATATYPES

In [55]:

```
df.dtypes
```

Out[55]:

```
Date                int64
Store Id            int64
Card No.            int64
Transaction Id      int64
Product Id          int64
Product            object
Quantity            int64
Sales             float64
Group              object
Subscription       object
dtype: object
```

CONVERT DATA DATATYPE FROM (int to Date)

In [56]:

```
# 15 Dates
date_offsets = df["Date"].to_list()
base_date = pd.Timestamp("1899-12-30") # Start Date
df["Date"] = [base_date + pd.DateOffset(date_offset) for date_offset in date_off
df["Date"][0:15]
```

```
Out[56]: 0     2018-10-17
         1     2019-05-14
         2     2019-05-20
         3     2018-08-17
         4     2018-08-18
         5     2019-05-19
         6     2019-05-16
         7     2019-05-16
         8     2018-08-20
         9     2018-08-18
         10    2019-05-17
         11    2018-08-20
         12    2019-05-18
         13    2018-08-17
         14    2019-05-15
         Name: Date, dtype: datetime64[ns]
```

PRODUCTS SUMMARY

```
In [57]: # Examine Products
         df["Product"].unique()
```

```
Out[57]:  array(['Natural Chip        Compny SeaSalt175g',
                 'CCs Nacho Cheese    175g',
                 'Smiths Crinkle Cut  Chips Chicken 170g',
                 'Smiths Chip Thinly  S/Cream&Onion 175g',
                 'Kettle Tortilla ChpsHny&Jlpno Chili 150g',
                 'Old El Paso Salsa   Dip Tomato Mild 300g',
                 'Smiths Crinkle Chips Salt & Vinegar 330g',
                 'Grain Waves         Sweet Chilli 210g',
                 'Doritos Corn Chip Mexican Jalapeno 150g',
                 'Grain Waves Sour    Cream&Chives 210G',
                 'Kettle Sensations   Siracha Lime 150g',
                 'Twisties Cheese     270g', 'WW Crinkle Cut      Chicken 175g',
                 'Thins Chips Light&  Tangy 175g', 'CCs Original 175g',
                 'Burger Rings 220g', 'NCC Sour Cream &    Garden Chives 175g',
                 'Doritos Corn Chip Southern Chicken 150g',
                 'Cheezels Cheese Box 125g', 'Smiths Crinkle      Original 330g',
                 'Infzns Crn Crnchers Tangy Gcamole 110g',
                 'Kettle Sea Salt     And Vinegar 175g',
                 'Smiths Chip Thinly  Cut Original 175g', 'Kettle Original 175g',
                 'Red Rock Deli Thai  Chilli&Lime 150g',
                 'Pringles Sthrn FriedChicken 134g', 'Pringles Sweet&Spcy BBQ 134g',
                 'Red Rock Deli SR    Salsa & Mzzrlla 150g',
                 'Thins Chips         Originl saltd 175g',
                 'Red Rock Deli Sp    Salt & Truffle 150G',
                 'Smiths Thinly       Swt Chli&S/Cream175G', 'Kettle Chilli 175g',
                 'Doritos Mexicana    170g',
                 'Smiths Crinkle Cut  French OnionDip 150g',
                 'Natural ChipCo      Hony Soy Chckn175g',
                 'Dorito Corn Chp     Supreme 380g', 'Twisties Chicken270g',
                 'Smiths Thinly Cut   Roast Chicken 175g',
                 'Smiths Crinkle Cut  Tomato Salsa 150g',
                 'Kettle Mozzarella   Basil & Pesto 175g',
                 'Infuzions Thai SweetChili PotatoMix 110g',
                 'Kettle Sensations   Camembert & Fig 150g',
                 'Smith Crinkle Cut   Mac N Cheese 150g',
                 'Kettle Honey Soy    Chicken 175g',
                 'Thins Chips Seasonedchicken 175g',
                 'Smiths Crinkle Cut  Salt & Vinegar 170g',
                 'Infuzions BBQ Rib   Prawn Crackers 110g',
                 'GrnWves Plus Btroot & Chilli Jam 180g',
                 'Tyrrells Crisps     Lightly Salted 165g',
                 'Kettle Sweet Chilli And Sour Cream 175g',
                 'Doritos Salsa       Medium 300g', 'Kettle 135g Swt Pot Sea Salt',
                 'Pringles SourCream  Onion 134g',
                 'Doritos Corn Chips  Original 170g',
                 'Twisties Cheese     Burger 250g',
                 'Old El Paso Salsa   Dip Chnky Tom Ht300g',
                 'Cobs Popd Swt/Chlli &Sr/Cream Chips 110g',
                 'Woolworths Mild     Salsa 300g',
                 'Natural Chip Co     Tmato Hrb&Spce 175g',
                 'Smiths Crinkle Cut  Chips Original 170g',
                 'Cobs Popd Sea Salt  Chips 110g',
                 'Smiths Crinkle Cut  Chips Chs&Onion170g',
                 'French Fries Potato Chips 175g',
                 'Old El Paso Salsa   Dip Tomato Med 300g',
                 'Doritos Corn Chips  Cheese Supreme 170g',
                 'Pringles Original   Crisps 134g',
                 'RRD Chilli&         Coconut 150g',
                 'WW Original Corn    Chips 200g',
                 'Thins Potato Chips  Hot & Spicy 175g',
                 'Cobs Popd Sour Crm  &Chives Chips 110g',
                 'Smiths Crnkle Chip  Orgnl Big Bag 380g',
                 'Doritos Corn Chips  Nacho Cheese 170g',
                 'Kettle Sensations   BBQ&Maple 150g',
                 'WW D/Style Chip     Sea Salt 200g',
                 'Pringles Chicken    Salt Crips 134g',
                 'WW Original Stacked Chips 160g',
                 'Smiths Chip Thinly  CutSalt/Vinegr175g', 'Cheezels Cheese 330g',
                 'Tostitos Lightly    Salted 175g',
                 'Thins Chips Salt &  Vinegar 175g',
                 'Smiths Crinkle Cut  Chips Barbecue 170g', 'Cheetos Puffs 165g',
                 'RRD Sweet Chilli &  Sour Cream 165g',
                 'WW Crinkle Cut      Original 175g',
                 'Tostitos Splash Of  Lime 175g', 'Woolworths Medium   Salsa 300g',
                 'Kettle Tortilla ChpsBtroot&Ricotta 150g',
                 'CCs Tasty Cheese    175g', 'Woolworths Cheese   Rings 190g',
                 'Tostitos Smoked     Chipotle 175g', 'Pringles Barbeque   134g',
                 'WW Supreme Cheese   Corn Chips 200g',
                 'Pringles Mystery    Flavour 134g',
                 'Tyrrells Crisps     Ched & Chives 165g',
                 'Snbts Whlgrn Crisps Cheddr&Mstrd 90g',
                 'Cheetos Chs & Bacon Balls 190g', 'Pringles Slt Vingar 134g',
                 'Infuzions SourCream&Herbs Veg Strws 110g',
                 'Kettle Tortilla ChpsFeta&Garlic 150g',
                 'Infuzions Mango     Chutny Papadums 70g',
                 'RRD Steak &         Chimuchurri 150g',
                 'RRD Honey Soy       Chicken 165g',
                 'Sunbites Whlegrn    Crisps Frch/Onin 90g',
                 'RRD Salt & Vinegar  165g', 'Doritos Cheese      Supreme 330g',
                 'Smiths Crinkle Cut  Snag&Sauce 150g',
                 'WW Sour Cream &OnionStacked Chips 160g',
                 'RRD Lime & Pepper   165g',
                 'Natural ChipCo Sea  Salt & Vinegr 175g',
                 'Red Rock Deli Chikn&Garlic Aioli 150g',
                 'RRD SR Slow Rst     Pork Belly 150g', 'RRD Pc Sea Salt     165g',
                 'Smith Crinkle Cut   Bolognese 150g', 'Doritos Salsa Mild  300g'],
                dtype=object)
```

TEXT ANALYSIS ON PRODUCTS

In [69]:

```
# Remove numbers & special characters
split_prods = df["Product"].str.replace(r"([0-9]+[gG])", "").str.replace(r"[^\w]
split_prods
```

Out[69]:

```
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: Product, Length: 264836, dtype: object
```

FREQUENCY OF PRODUCTS

In [70]:
```
word_counts = {}
def count_words(line) :
    for word in line :
        if word not in word_counts :
            word_counts[word] = 1
        else :
            word_counts[word] += 1
split_prods.apply(lambda line : count_words(line))
print(pd.Series(word_counts).sort_values(ascending=False))
```

```
175g       60561
Chips      49770
150g       41633
Kettle     41288
&          35565
           ...  
Whlegrn     1432
Pc          1431
NCC         1419
Garden      1419
Fries       1418
Length: 220, dtype: int64
```

REMOVE SALSA PRODUCTS

In [71]:
```
df = df[~df["Product"].str.contains(r"[Ss]alsa")]
df.head()
```

Out[71]:

	Date	Store Id	Card No.	Transaction Id	Product Id	Product	Quantity	Sales	
0	2018-10-17	1	1000	1	5	Natural Chip Compny SeaSalt175g	2	6.0	SINGLES/
1	2019-05-14	1	1307	348	66	CCs Nacho Cheese 175g	3	6.3	SINGLES/
2	2019-05-20	1	1343	383	61	Smiths Crinkle Cut Chips Chicken 170g	2	2.9	SINGLES/
3	2018-08-17	2	2373	974	69	Smiths Chip Thinly S/Cream&Onion 175g	5	15.0	SINGLES/
4	2018-08-18	2	2426	1038	108	Kettle Tortilla ChpsHny&Jlpno Chili 150g	3	13.8	SINGLES/

CHECK NULL & OUTLIERS

In [72]:
```
df.describe()
```

Out[72]:

	Date	Store Id	Card No.	Transaction Id	Product Id	
count	246742	246742.000000	2.467420e+05	2.467420e+05	246742.000000	2
mean	2018-12-30 01:19:01.211467520	135.051098	1.355310e+05	1.351311e+05	56.351789	
min	2018-07-01 00:00:00	1.000000	1.000000e+03	1.000000e+00	1.000000	
25%	2018-09-30 00:00:00	70.000000	7.001500e+04	6.756925e+04	26.000000	
50%	2018-12-30 00:00:00	130.000000	1.303670e+05	1.351830e+05	53.000000	
75%	2019-03-31 00:00:00	203.000000	2.030840e+05	2.026538e+05	87.000000	
max	2019-06-30 00:00:00	272.000000	2.373711e+06	2.415841e+06	114.000000	
std	NaN	76.787096	8.071528e+04	7.814772e+04	33.695428	

VIEW OUTLIER CUSTOMER

In [74]:

```
df.sort_values(by = "Quantity", ascending = False).head()
```

Out[74]:

	Date	Store Id	Card No.	Transaction Id	Product Id	Product	Quantity	Sales	
69762	2018-08-19	226	226000	226201	4	Dorito Corn Chp Supreme 380g	200	650.0	OLD
69763	2019-05-20	226	226000	226210	4	Dorito Corn Chp Supreme 380g	200	650.0	OLD
32226	2018-08-19	62	62057	58117	51	Doritos Mexicana 170g	5	22.0	OLD
69541	2019-05-16	86	86089	84699	38	Infuzions Mango Chutny Papadums 70g	5	12.0	OLD
238227	2019-05-19	180	180111	181705	53	RRD Sweet Chilli & Sour Cream 165g	5	15.0	SINGL

SEE IF Card No. 226000 HAS OTHER TRANSACTIONS

In [76]:

```
len(df[df["Card No."] == 226000])
```

Out[76]:

```
2
```

IT LOOKS LIKE THIS CUSTOMER HAS ONLY HAD THE TWO TRANSACTIONS OVER THE YEAR AND IS NOT AN ORDINARY RETAIL CUSTOMER. THE CUSTOMER MIGHT BE BUYING CHIPS FOR COMMERCIAL PURPOSES INSTEAD. WE WILL REMOVE THIS LOYALTY CARD NUMBER FROM FURTHER ANALYSIS.

In [77]:

```
df = df[df["Quantity"] < 6]
df.head()
```

Out[77]:

	Date	Store Id	Card No.	Transaction Id	Product Id	Product	Quantity	Sales	
0	2018-10-17	1	1000	1	5	Natural Chip Compny SeaSalt175g	2	6.0	SINGLES/
1	2019-05-14	1	1307	348	66	CCs Nacho Cheese 175g	3	6.3	SINGLES/
2	2019-05-20	1	1343	383	61	Smiths Crinkle Cut Chips Chicken 170g	2	2.9	SINGLES/
3	2018-08-17	2	2373	974	69	Smiths Chip Thinly S/Cream&Onion 175g	5	15.0	SINGLES/
4	2018-08-18	2	2426	1038	108	Kettle Tortilla ChpsHny&Jlpno Chili 150g	3	13.8	SINGLES/

COUNT THE NUMBER OF TRANSACTIONS BY DATE

In [78]:

```
trans_by_date = df["Date"].value_counts()
trans_by_date
```

Out[78]:

```
Date
2018-12-24    865
2018-12-23    853
2018-12-22    840
2018-12-19    839
2018-12-20    808
             ...
2019-06-24    612
2018-10-18    611
2018-11-25    610
2018-09-22    609
2019-06-13    607
Name: count, Length: 364, dtype: int64
```

INSTEAD OF 365, THE DATE COLUMN ONLY HAS 364 UNIQUE VALUES. 1 IS MISSING.

In [80]:

```
pd.date_range(start=df["Date"].min(), end=df["Date"].max()).difference(df["Date"
```

Out[80]:

```
DatetimeIndex(['2018-12-25'], dtype='datetime64[ns]', freq='D')
```

INSERT MISSING VALUE

In [81]:

```
merge_value = pd.merge(pd.Series(pd.date_range(start=df["Date"].min(), end=df["D
merge_value.head()
```

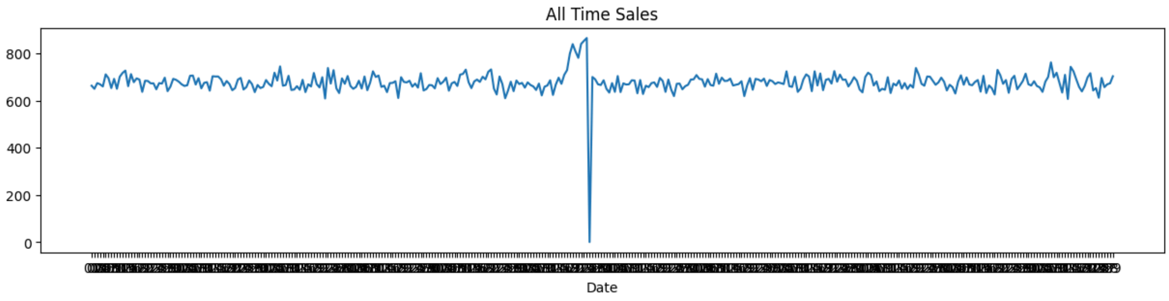
Out[81]:

	Date	Store Id	Card No.	Transaction Id	Product Id	Product	Quantity	Sales	
0	2018-07-01	47.0	47142.0	42540.0	14.0	Smiths Crnkle Chip Orgnl Big Bag 380g	2.0	11.8	SINGLES/C
1	2018-07-01	55.0	55073.0	48884.0	99.0	Pringles Sthrn FriedChicken 134g	2.0	7.4	SINGLES/C
2	2018-07-01	55.0	55073.0	48884.0	91.0	CCs Tasty Cheese 175g	2.0	4.2	SINGLES/C
3	2018-07-01	58.0	58351.0	54374.0	102.0	Kettle Mozzarella Basil & Pesto 175g	2.0	10.8	SINGLES/C
4	2018-07-01	68.0	68193.0	65598.0	44.0	Thins Chips Light& Tangy 175g	2.0	6.6	SINGLES/C

ALL TIME SALES GRAPH

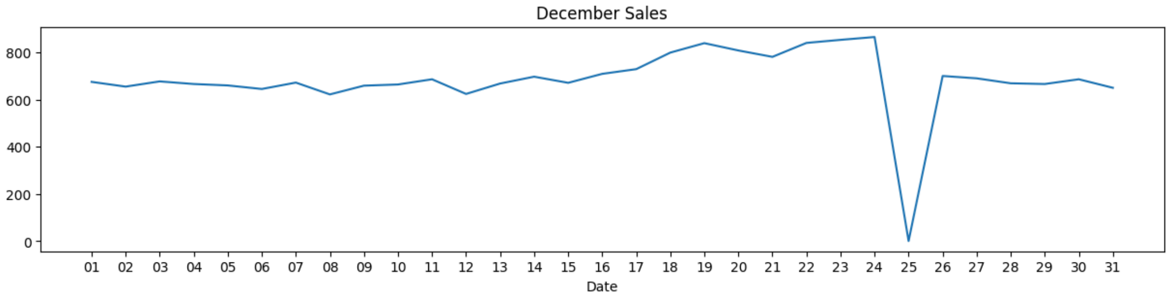
In [85]:

```
trans_by_date = merge_value["Date"].value_counts()
all_time = trans_by_date[(trans_by_date.index >= pd.Timestamp(2018,7,1)) & (tran
all_time.index = all_time.index.strftime('%d')
ax = all_time.plot(figsize=(15,3))
ax.set_xticks(np.arange(len(all_time)))
ax.set_xticklabels(all_time.index)
plt.title("All Time Sales")
plt.savefig("All Time Sales.png", bbox_inches="tight")
plt.show()
```



DECEMBER SALES GRAPH

```
In [86]:
trans_by_date = merge_value["Date"].value_counts()
dec = trans_by_date[(trans_by_date.index >= pd.Timestamp(2018,12,1)) & (trans_by
dec.index = dec.index.strftime('%d')
ax = dec.plot(figsize=(15,3))
ax.set_xticks(np.arange(len(dec)))
ax.set_xticklabels(dec.index)
plt.title("December Sales")
plt.savefig("December Sales.png", bbox_inches="tight")
plt.show()
```



EXPLORE PRODUCT PACK SIZE

```
In [ ]:
# Ensure no spaces between the number and "g"/"G" in the regex
df["Product"] = df["Product"].str.replace(r"(\d+)\s*[gG]", r"\1g", regex=True)
# Extract the numeric part before "g" or "G" and convert to float
pack_size = df["Product"].str.extract(r"(\d+)[gG]")[0].astype(float)
print(pack_size)
```

```
0         175.0
1         175.0
2         170.0
3         175.0
4         150.0
          ...
264831    175.0
264832    175.0
264833    170.0
264834    150.0
264835    175.0
Name: 0, Length: 246740, dtype: float64
```

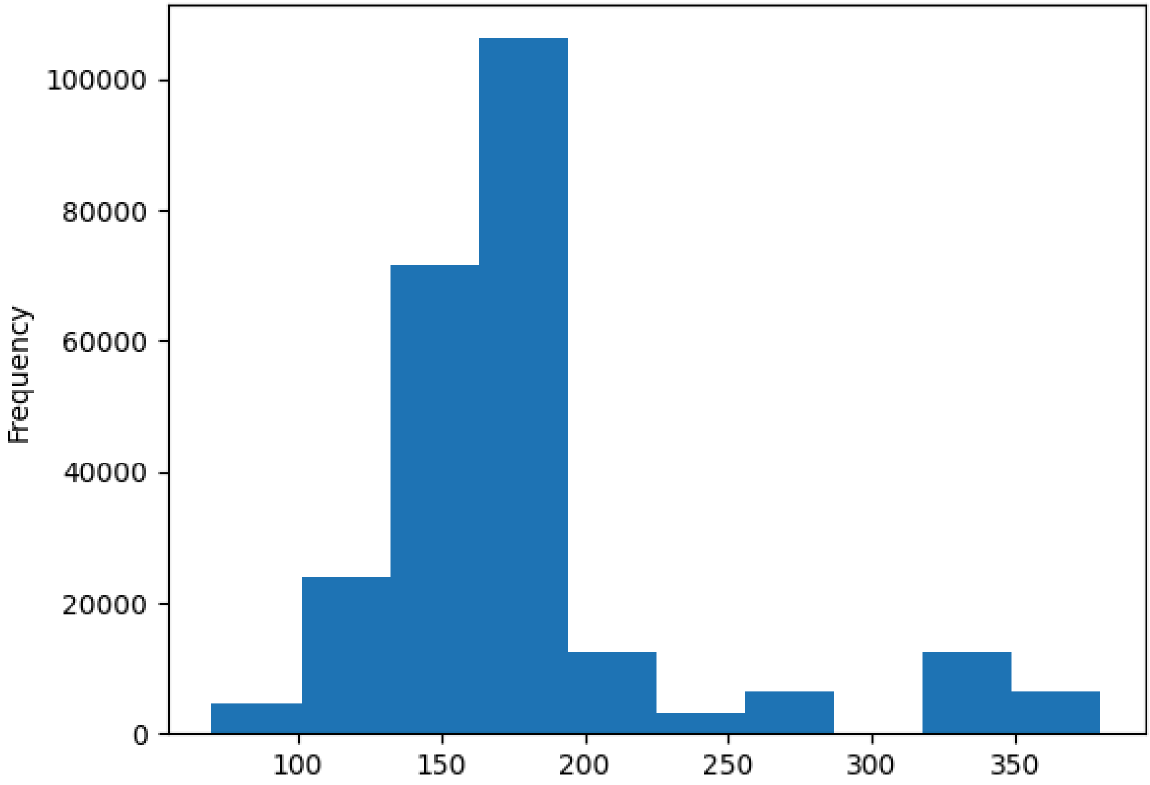
SUMMARY OF PACK SIZE

```
In [91]:
pack_size.describe()
```

```
Out[91]:
count    246740.000000
mean        175.583521
std          59.432118
min          70.000000
25%         150.000000
50%         170.000000
75%         175.000000
max         380.000000
Name: 0, dtype: float64
```

HISTOGRAM SHOWING TRANSACTION FREQUENCY OF PACK SIZE

In [94]:
```
pack_size.plot.hist()
plt.show()
```



FREQUENCY OF PRODUCT BRAND NAMES

In [96]:
```
df["Product"].str.split().str[0].value_counts()
```

Out[96]:
```
Product
Kettle        41288
Smiths        27390
Pringles      25102
Doritos       22041
Thins         14075
RRD           11894
Infuzions     11057
WW            10320
Cobs           9693
Tostitos       9471
Twisties       9454
Tyrrells       6442
Grain          6272
Natural        6050
Cheezels       4603
CCs            4551
Red            4427
Dorito         3183
Infzns         3144
Smith          2963
Cheetos        2927
Snbts          1576
Burger         1564
Woolworths     1516
GrnWves        1468
Sunbites       1432
NCC            1419
French         1418
Name: count, dtype: int64
```

INCLUDE BRAND NAME COLUMN

In [97]:
```python
df["Brand"] = df["Product"].str.split().str[0]
df.head()
```

Out[97]:

	Date	Store Id	Card No.	Transaction Id	Product Id	Product	Quantity	Sales	
0	2018-10-17	1	1000	1	5	Natural Chip Compny SeaSalt175g	2	6.0	SINGLES/
1	2019-05-14	1	1307	348	66	CCs Nacho Cheese 175g	3	6.3	SINGLES/
2	2019-05-20	1	1343	383	61	Smiths Crinkle Cut Chips Chicken 170g	2	2.9	SINGLES/
3	2018-08-17	2	2373	974	69	Smiths Chip Thinly S/Cream&Onion 175g	5	15.0	SINGLES/
4	2018-08-18	2	2426	1038	108	Kettle Tortilla ChpsHny&Jlpno Chili 150g	3	13.8	SINGLES/

COMBINE SAME BRANDS

In [98]:

```
def clear_brand_names(line) :
    brand = line["Brand"]
    if brand == "Dorito" :
        return "Doritos"
    elif brand == "GrnWves" or brand == "Grain" :
        return "Grain Waves"
    elif brand == "Infzns" :
        return "Infuzions"
    elif brand == "Natural" or brand == "NCC" :
        return "Natural Chip Co"
    elif brand == "Red" :
        return "RRD"
    elif brand == "Smith" :
        return "Smiths"
    elif brand == "Snbts" :
        return "Sunbites"
    elif brand == "WW" :
        return "Woolworths"
    else :
        return brand
```

CLEANED TRANSACTIONAL DATA

In [99]:

```
df["Brand"] = df.apply(lambda line : clear_brand_names(line), axis=1)
df.head()
```

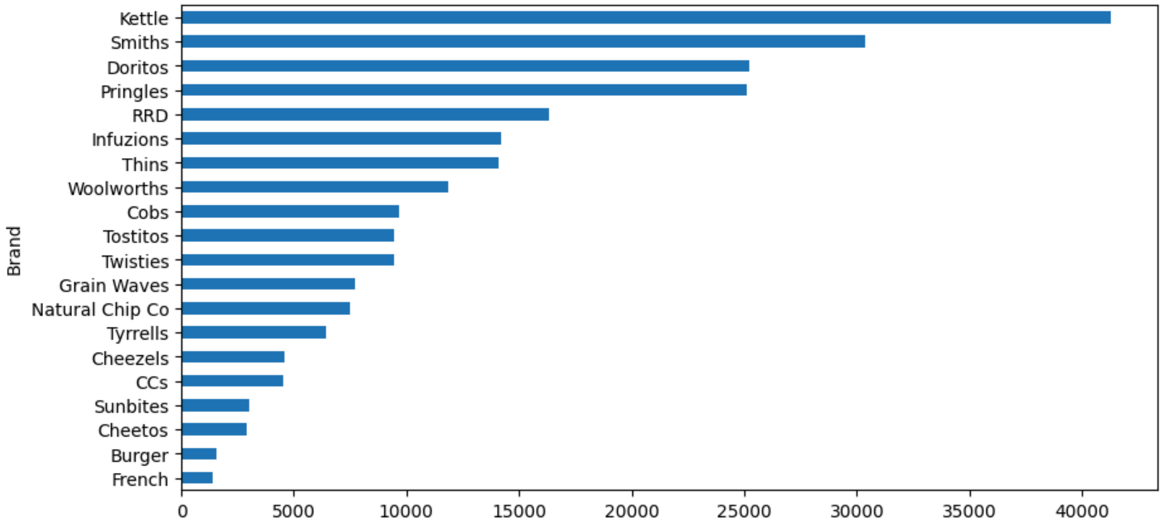
Out[99]:

	Date	Store Id	Card No.	Transaction Id	Product Id	Product	Quantity	Sales	
0	2018-10-17	1	1000	1	5	Natural Chip Compny SeaSalt175g	2	6.0	SINGLES/
1	2019-05-14	1	1307	348	66	CCs Nacho Cheese 175g	3	6.3	SINGLES/
2	2019-05-20	1	1343	383	61	Smiths Crinkle Cut Chips Chicken 170g	2	2.9	SINGLES/
3	2018-08-17	2	2373	974	69	Smiths Chip Thinly S/Cream&Onion 175g	5	15.0	SINGLES/
4	2018-08-18	2	2426	1038	108	Kettle Tortilla ChpsHny&Jlpno Chili 150g	3	13.8	SINGLES/

HISTOGRAM OF BRAND FREQUENCY

In [100…

```
df["Brand"].value_counts(ascending=True).plot.barh(figsize = (10, 5))
plt.show()
```



DATA ANALYSIS

---> 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 IS THE AVERAGE CHIPS PRICE BY CUSTOMER SEGMENT

In [ ]:

```
# 1/ WHO SPENDS THE MOST ON CHIPS (TOTAL SALES), DESCRIBING CUSTOMERS BY LIFESTA
most_shopping = df.groupby(["Group", "Subscription"])["Sales"].agg(["sum"]).sort
most_shopping
```

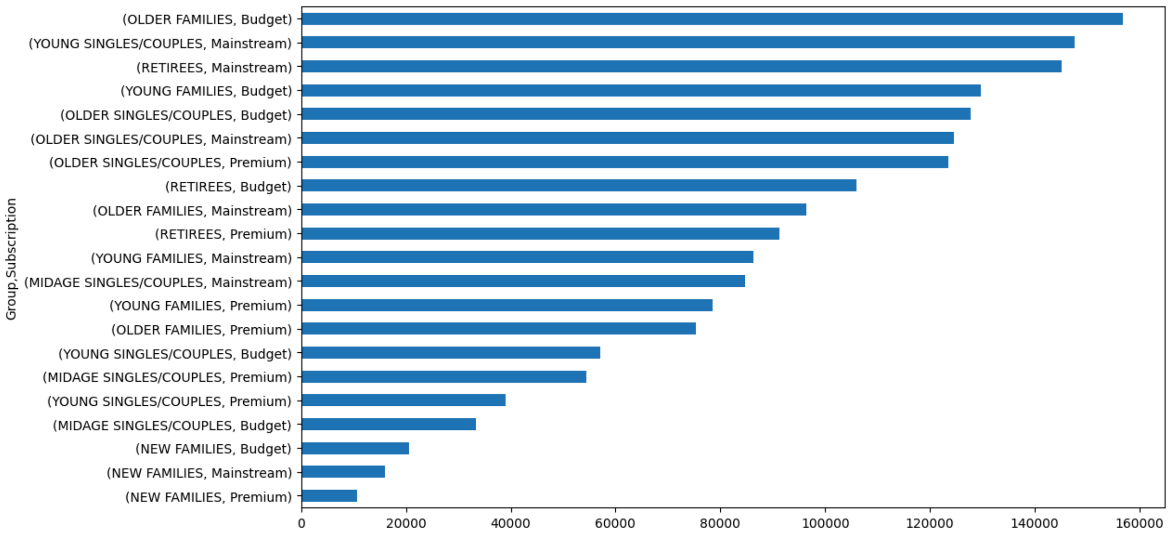
Out[ ]:

		sum
Group	**Subscription**	
OLDER FAMILIES	**Budget**	156863.75
YOUNG SINGLES/COUPLES	**Mainstream**	147582.20
RETIREES	**Mainstream**	145168.95
YOUNG FAMILIES	**Budget**	129717.95
OLDER SINGLES/COUPLES	**Budget**	127833.60
	Mainstream	124648.50
	Premium	123537.55
RETIREES	**Budget**	105916.30
OLDER FAMILIES	**Mainstream**	96413.55
RETIREES	**Premium**	91296.65
YOUNG FAMILIES	**Mainstream**	86338.25
MIDAGE SINGLES/COUPLES	**Mainstream**	84734.25
YOUNG FAMILIES	**Premium**	78571.70
OLDER FAMILIES	**Premium**	75242.60
YOUNG SINGLES/COUPLES	**Budget**	57122.10
MIDAGE SINGLES/COUPLES	**Premium**	54443.85
YOUNG SINGLES/COUPLES	**Premium**	39052.30
MIDAGE SINGLES/COUPLES	**Budget**	33345.70
NEW FAMILIES	**Budget**	20607.45
	Mainstream	15979.70
	Premium	10760.80

HISTOGRAM OF CUSTOMER SEGMENTS CONTRIBUTE TO CHIPS SALES

In [103…

```
most_shopping["sum"].sort_values().plot.barh(figsize = (12, 7))
plt.show()
```



TOP 3 TOTAL SALES CONTRIBUTOR SEGMENTS ARE - 1/ OLDER FAMILIES (BUDGET) $156863.752/YOUNGSINGLES/COUPLES(Mainstream)$147582.20 3/ RETIREES (Mainstream) $145168.95

TOP SHOPPING PER GROUP BY SUBSCRITION

In [109…

```
stage_agg_prem = df.groupby("Group")["Subscription"].agg(pd.Series.mode).sort_va
print("Top contributor per Group by Subscription")
print(stage_agg_prem)
```

```
Top contributor per Group by Subscription
Group
NEW FAMILIES                    Budget
OLDER FAMILIES                  Budget
OLDER SINGLES/COUPLES           Budget
YOUNG FAMILIES                  Budget
MIDAGE SINGLES/COUPLES      Mainstream
RETIREES                    Mainstream
YOUNG SINGLES/COUPLES       Mainstream
Name: Subscription, dtype: object
```

In [ ]:

```
# 2/ HOW MANY CUSTOMERS ARE IN EACH SEGMENT
cust_seg = df.groupby(["Group", "Subscription"])["Card No."].nunique().sort_valu
pd.DataFrame(cust_seg)
```

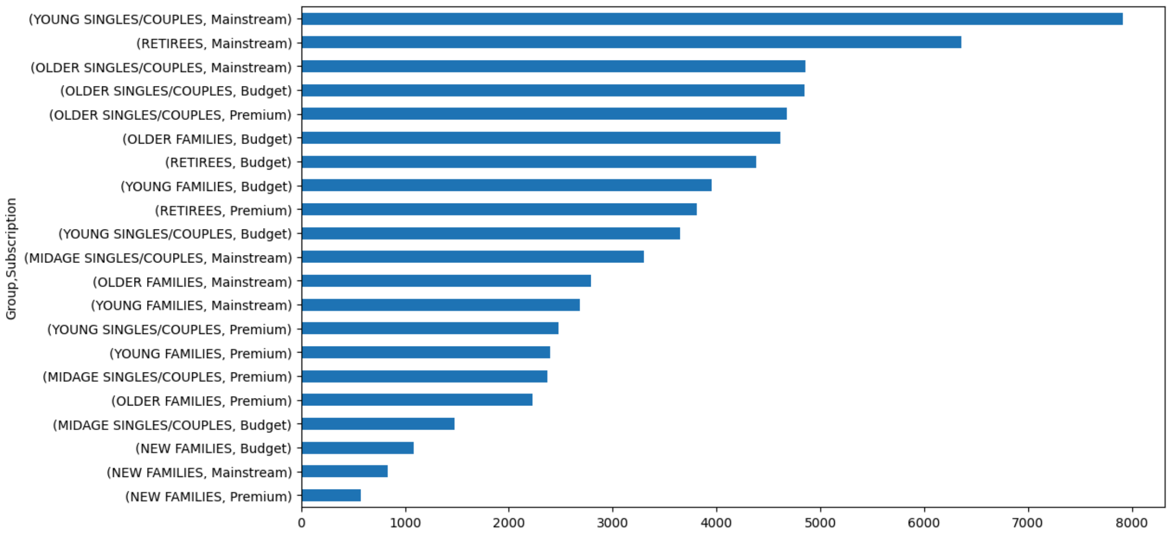
Out[ ]:

Group	Subscription	Card No.
YOUNG SINGLES/COUPLES	Mainstream	7917
RETIREES	Mainstream	6358
OLDER SINGLES/COUPLES	Mainstream	4858
	Budget	4849
	Premium	4682
OLDER FAMILIES	Budget	4611
RETIREES	Budget	4385
YOUNG FAMILIES	Budget	3953
RETIREES	Premium	3812
YOUNG SINGLES/COUPLES	Budget	3647
MIDAGE SINGLES/COUPLES	Mainstream	3298
OLDER FAMILIES	Mainstream	2788
YOUNG FAMILIES	Mainstream	2685
YOUNG SINGLES/COUPLES	Premium	2480
YOUNG FAMILIES	Premium	2398
MIDAGE SINGLES/COUPLES	Premium	2369
OLDER FAMILIES	Premium	2231
MIDAGE SINGLES/COUPLES	Budget	1474
NEW FAMILIES	Budget	1087
	Mainstream	830
	Premium	575

HISTOGRAM OF CUSTOMER SEGMENTS FREQUENCY

In [111…

```
cust_seg.sort_values().plot.barh(figsize = (12, 7))
plt.show()
```



YOUNG SINGLES/COUPLES (Mainstream) HAS THE HIGHEST POPULATION, FOLLOWED BY RETIREES (Mainstream). WHICH EXPLAIN THEIR HIGH TOTAL SALES.

In [ ]:

```
# 3/ HOW MANY CHIPS ARE BOUGHT PER CUSTOMER BY SEGMENT
# INDIVIDUAL CUSTOMER CHIPS SHOPPING BY DATE
chips_shop_per_segment = df.groupby(["Card No.", "Group", "Subscription"]).count
chips_shop_per_segment.to_frame()
```

Out[ ]:

			Date
Card No.	**Group**	**Subscription**	
1000	**YOUNG SINGLES/COUPLES**	**Premium**	1
1002	**YOUNG SINGLES/COUPLES**	**Mainstream**	1
1003	**YOUNG FAMILIES**	**Budget**	2
1004	**OLDER SINGLES/COUPLES**	**Mainstream**	1
1005	**MIDAGE SINGLES/COUPLES**	**Mainstream**	1
...	**...**	**...**	...
2370651	**MIDAGE SINGLES/COUPLES**	**Mainstream**	1
2370701	**YOUNG FAMILIES**	**Mainstream**	1
2370751	**YOUNG FAMILIES**	**Premium**	1
2370961	**OLDER FAMILIES**	**Budget**	1
2373711	**YOUNG SINGLES/COUPLES**	**Mainstream**	1

71287 rows × 1 columns

In [113…

```
# CHIPS SHOPPING FROM GROUPS BY INDIVIDUAL (AVG)
segment_shop_chips = chips_shop_per_segment.groupby(["Group", "Subscription"]).a
segment_shop_chips
```

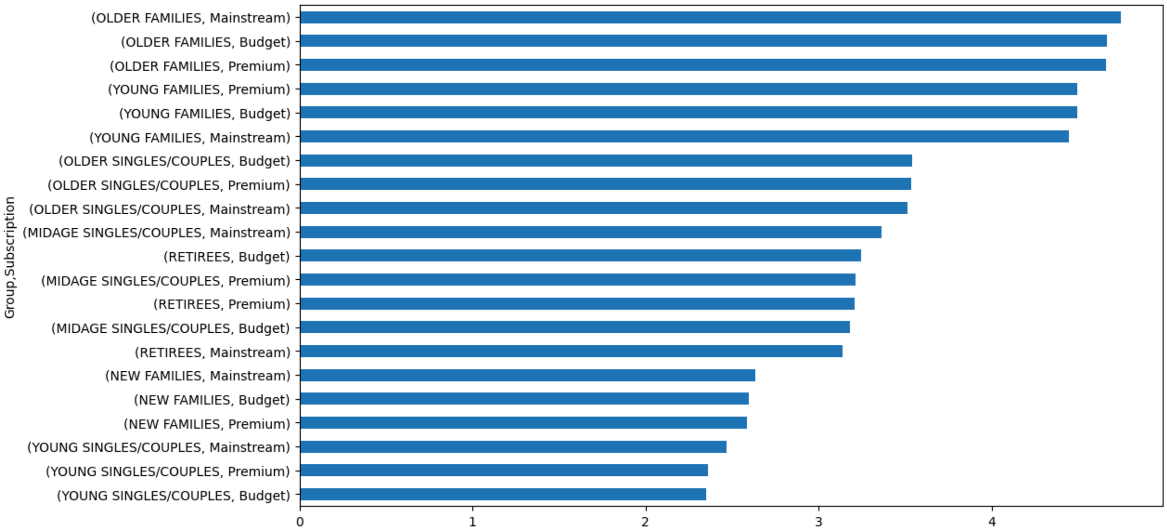
Out[113…

Group	Subscription	mean
OLDER FAMILIES	Mainstream	4.749283
	Budget	4.665799
	Premium	4.662931
YOUNG FAMILIES	Premium	4.497081
	Budget	4.493549
	Mainstream	4.449534
OLDER SINGLES/COUPLES	Budget	3.541349
	Premium	3.536950
	Mainstream	3.511939
MIDAGE SINGLES/COUPLES	Mainstream	3.364160
RETIREES	Budget	3.244014
MIDAGE SINGLES/COUPLES	Premium	3.213170
RETIREES	Premium	3.209864
MIDAGE SINGLES/COUPLES	Budget	3.182497
RETIREES	Mainstream	3.140925
NEW FAMILIES	Mainstream	2.632530
	Budget	2.597976
	Premium	2.587826
YOUNG SINGLES/COUPLES	Mainstream	2.468612
	Premium	2.359677
	Budget	2.350699

HISTOGRAM OF CHIPS SHOPPING BY SEGMENT

In [114…

```
segment_shop_chips["mean"].sort_values().plot.barh(figsize = (12, 7))
plt.show()
```



1/ DESPITE OLDER FAMILIES NOT HAVING THE HIGHEST POPULATION, THEY HAVE THE HIGHEST FREQUENCY OF PURCHASE, WHICH CONTRIBUTES TO THEIR HIGH TOTAL SALES. 2/ OLDER FAMILIES FOLLOWED BY YOUNG FAMILIES HAS THE HIGHEST AVERAGE QUANTITY OF CHIPS BOUGHT PER PURCHASE.

In [116…

```
# 4/ WHAT IS THE AVERAGE CHIPS PRICE BY CUSTOMER SEGMENT

avg_chips_price_cust_segment = df.groupby(["Group", "Subscription"])["Sales"].ag
avg_chips_price_cust_segment
```

Out[116…

		mean
Group	**Subscription**	
MIDAGE SINGLES/COUPLES	**Mainstream**	7.637156
YOUNG SINGLES/COUPLES	**Mainstream**	7.551279
RETIREES	**Premium**	7.461315
OLDER SINGLES/COUPLES	**Premium**	7.459997
RETIREES	**Budget**	7.445786
OLDER SINGLES/COUPLES	**Budget**	7.444305
NEW FAMILIES	**Mainstream**	7.313364
OLDER SINGLES/COUPLES	**Mainstream**	7.306049
YOUNG FAMILIES	**Budget**	7.302705
NEW FAMILIES	**Budget**	7.297256
OLDER FAMILIES	**Budget**	7.291241
YOUNG FAMILIES	**Premium**	7.285951
OLDER FAMILIES	**Mainstream**	7.281440
RETIREES	**Mainstream**	7.269352
OLDER FAMILIES	**Premium**	7.232779
NEW FAMILIES	**Premium**	7.231720
YOUNG FAMILIES	**Mainstream**	7.226772
MIDAGE SINGLES/COUPLES	**Premium**	7.152371
	Budget	7.108442
YOUNG SINGLES/COUPLES	**Premium**	6.673325
	Budget	6.663023

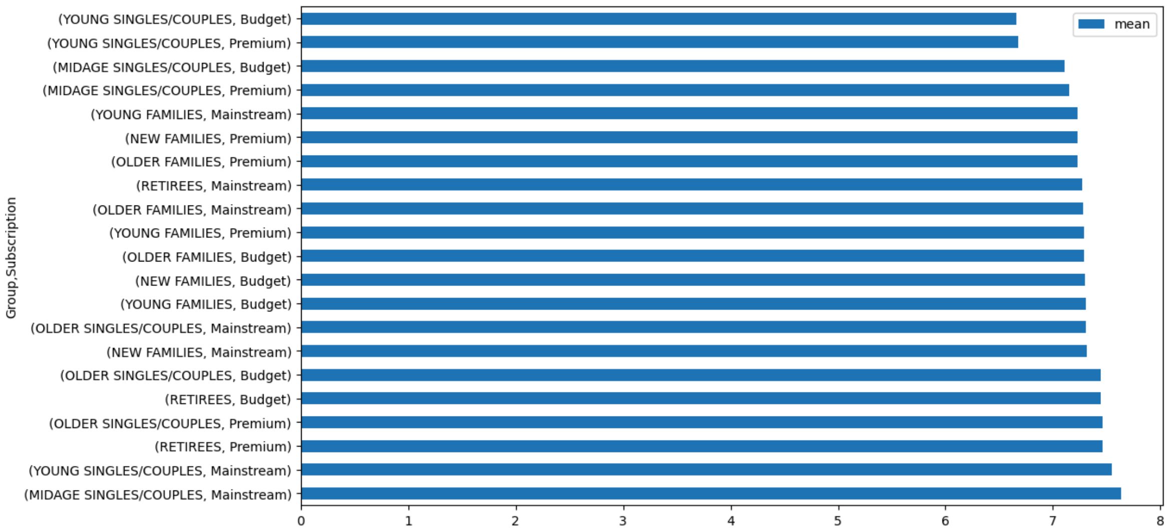
HISTOGRAM OF AVERAGE CHIPS PRICE BY CUSTOMER SEGMENT

In [117…

```
avg_chips_price_cust_segment.plot.barh(figsize = (12, 7))
```

Out[117…

```
<Axes: ylabel='Group,Subscription'>
```



THE Mainstream CATEGORY OF THE "YOUNG & MIDAGE SINGLES/COUPLES" HAVE THE HIGHEST SPENDING OF CHIPS PER PURCHASE. AND THE DIFFERENCE TO THE non-Mainstream "YOUNG & MIDAGE SINGLES/COUPLES" ARE STATISTICALLY SIGNIFICANT.

T-TEST

THE DIFFERENCE BETWEEN Mainstream & non-Mainstream GROUP MIGHT SEEM INSIGNIFICANT (7.6 Vs 6.6), BUT WE WILL FIND OUT BY EXAMINING IF THE DIFFERENCE IS STATISTICALLY SIGNIFICANT.

In [118…

```
mainstream = df["Subscription"] == "Mainstream"
budget_premium = (df["Subscription"] == "Budget") | (df["Subscription"] == "Prem
young_midage = (df["Group"] == "YOUNG SINGLES/COUPLES") | (df["Group"] == "MIDAG

a = df[young_midage & mainstream]["Sales"]
b = df[young_midage & budget_premium]["Sales"]

stat, pval = ttest_ind(a.values, b.values, equal_var=False)
print(pval)
pval < 0.0000001
```

```
1.834645908180742e-237
```

Out[118…

```
np.True_
```

P-VALUE IS CLOSE TO 0. THERE IS A STATISTICALLY SIGNIFICANT DIFFERENCE TO THE TOTAL SALES BETWEEN THE "Mainstream YOUNG MIDAGE" SEGMENT TO THE "Budget & Premium YOUNG MIDAGE" SEGMENT.

EXAMINE WHAT BRAND OF CHIPS THE TOP 3 SEGMENTS CONTRIBUTING TO TOTAL SALES ARE BUYING.

In [119…

```
df.groupby(["Group", "Subscription"])["Brand"].agg(pd.Series.mode).sort_values()
```

Out[119…

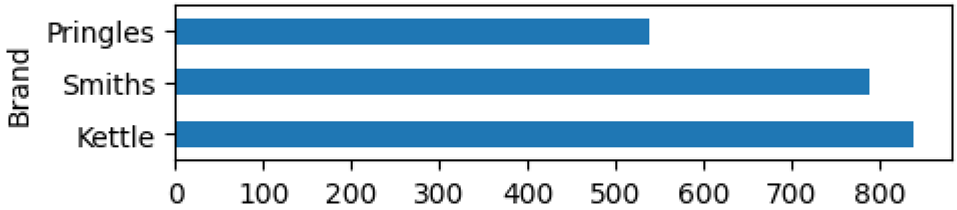
Group	Subscription	Brand
MIDAGE SINGLES/COUPLES	Budget	Kettle
YOUNG SINGLES/COUPLES	Budget	Kettle
YOUNG FAMILIES	Premium	Kettle
	Mainstream	Kettle
	Budget	Kettle
RETIREES	Premium	Kettle
	Mainstream	Kettle
	Budget	Kettle
OLDER SINGLES/COUPLES	Premium	Kettle
YOUNG SINGLES/COUPLES	Mainstream	Kettle
OLDER SINGLES/COUPLES	Mainstream	Kettle
OLDER FAMILIES	Premium	Kettle
	Mainstream	Kettle
	Budget	Kettle
NEW FAMILIES	Premium	Kettle
	Mainstream	Kettle
	Budget	Kettle
MIDAGE SINGLES/COUPLES	Premium	Kettle
	Mainstream	Kettle
OLDER SINGLES/COUPLES	Budget	Kettle
YOUNG SINGLES/COUPLES	Premium	Kettle

CHIPS BRAND "Kettle" IS DOMINATING EVERY SEGMENT AS THE MOST PURCHASED BRAND .

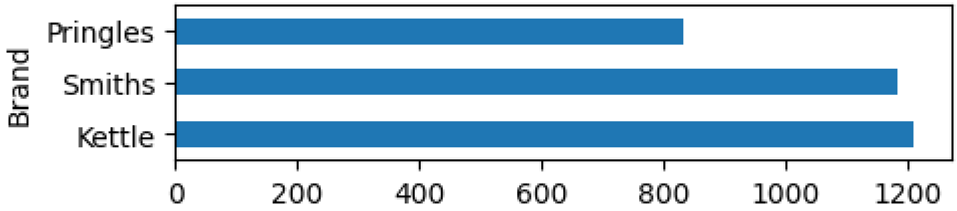
In [122…

```
for stage in df["Group"].unique() :
    for subs in df["Subscription"].unique() :
        print("==========", stage, "-", subs, "==========")
        summary = df[(df["Group"] == stage) & (df["Subscription"] == subs)]["Bra
        print(summary)
        plt.figure()
        summary.plot.barh(figsize = (5, 1))
        plt.show()
```

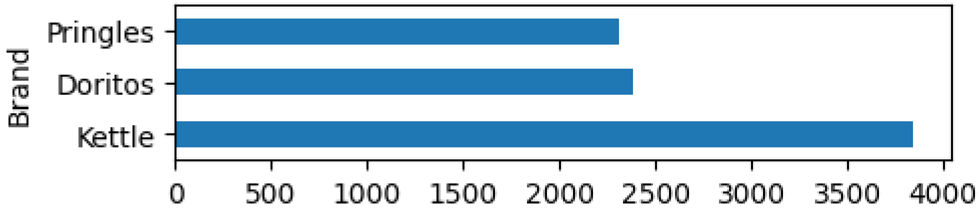
```
========== YOUNG SINGLES/COUPLES - Premium ==========
Brand
Kettle      838
Smiths      787
Pringles    537
Name: count, dtype: int64
```



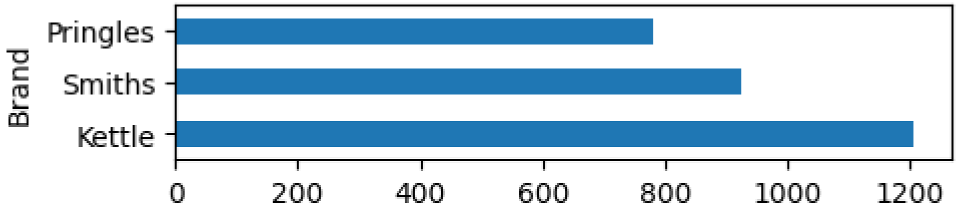
```
========== YOUNG SINGLES/COUPLES - Budget ==========
Brand
Kettle      1211
Smiths      1185
Pringles     832
Name: count, dtype: int64
```



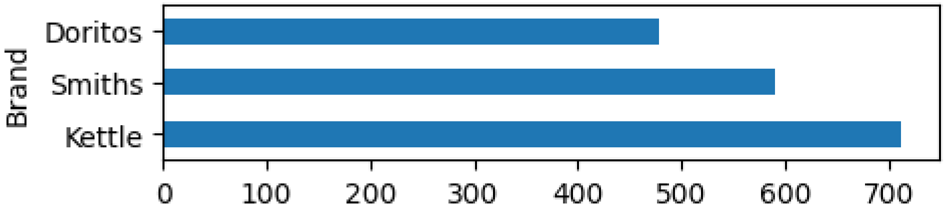
```
========== YOUNG SINGLES/COUPLES - Mainstream ==========
Brand
Kettle      3844
Doritos     2379
Pringles    2315
Name: count, dtype: int64
```



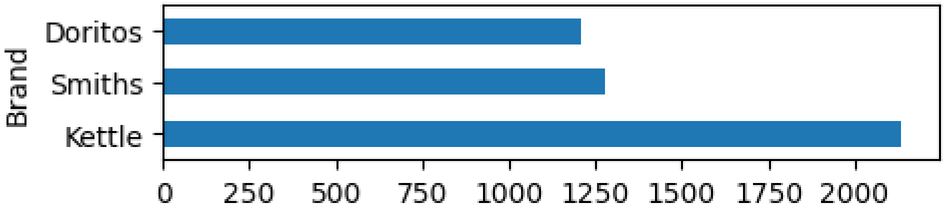
```
========== MIDAGE SINGLES/COUPLES - Premium ==========
Brand
Kettle      1206
Smiths       923
Pringles     781
Name: count, dtype: int64
```



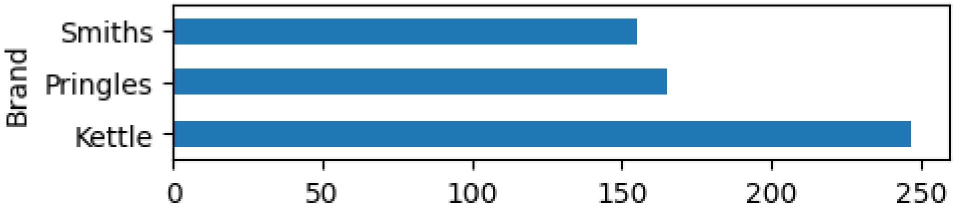
```
========== MIDAGE SINGLES/COUPLES - Budget ==========
Brand
Kettle     713
Smiths     591
Doritos    479
Name: count, dtype: int64
```



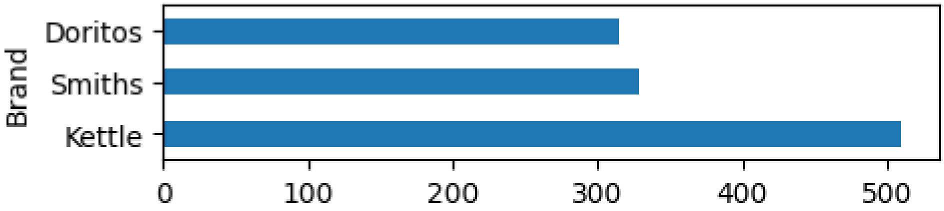
```
========== MIDAGE SINGLES/COUPLES - Mainstream ==========
Brand
Kettle     2136
Smiths     1276
Doritos    1210
Name: count, dtype: int64
```



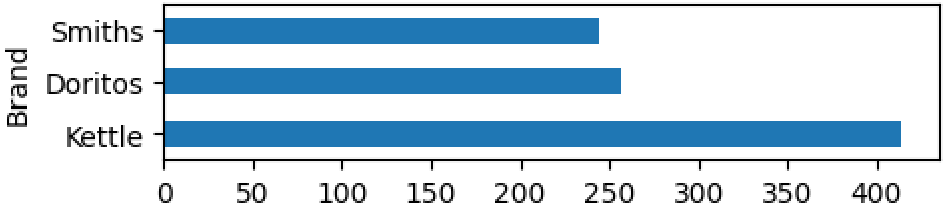
```
========== NEW FAMILIES - Premium ==========
Brand
Kettle      247
Pringles    165
Smiths      155
Name: count, dtype: int64
```



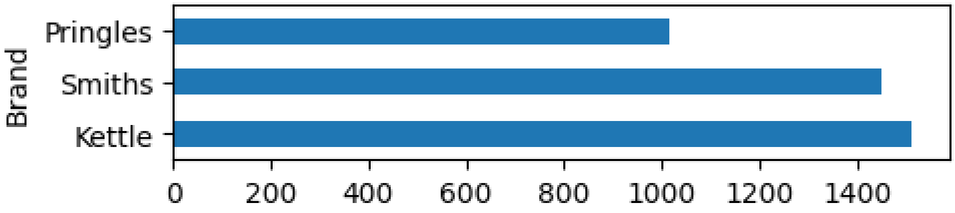
```
========== NEW FAMILIES - Budget ==========
Brand
Kettle     510
Smiths     328
Doritos    315
Name: count, dtype: int64
```



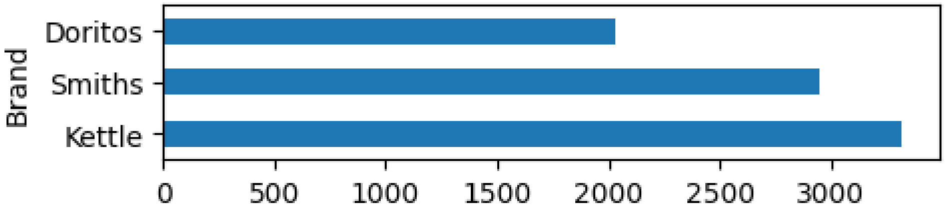
```
========== NEW FAMILIES - Mainstream ==========
Brand
Kettle     414
Doritos    257
Smiths     244
Name: count, dtype: int64
```



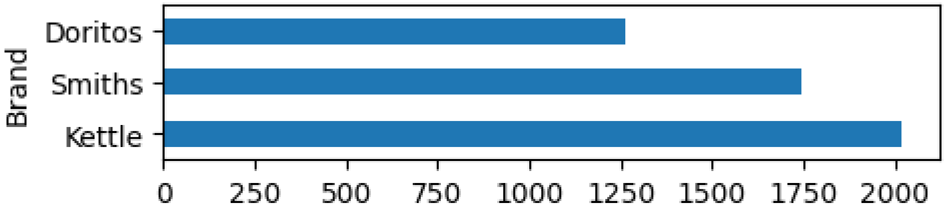
```
========== OLDER FAMILIES - Premium ==========
Brand
Kettle      1512
Smiths      1448
Pringles    1014
Name: count, dtype: int64
```



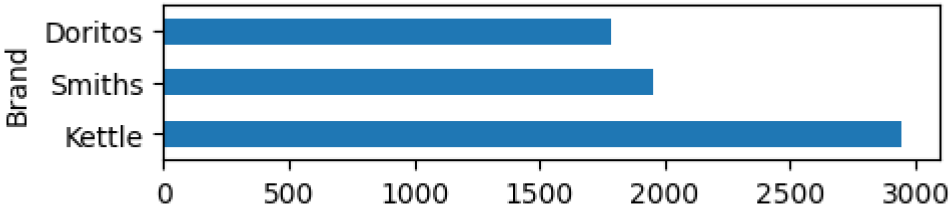
```
========== OLDER FAMILIES - Budget ==========
Brand
Kettle     3320
Smiths     2948
Doritos    2032
Name: count, dtype: int64
```



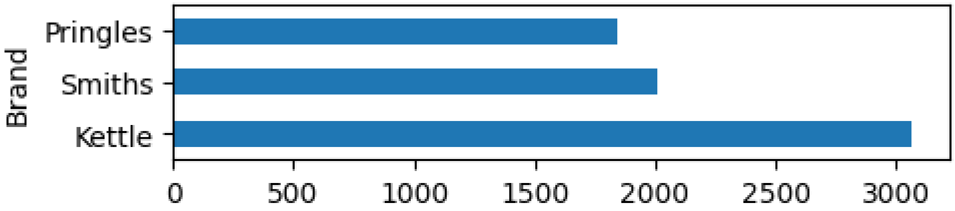
```
========== OLDER FAMILIES - Mainstream ==========
Brand
Kettle     2019
Smiths     1742
Doritos    1263
Name: count, dtype: int64
```



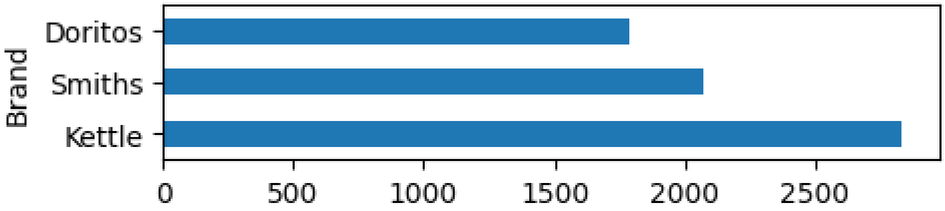
```
========== OLDER SINGLES/COUPLES - Premium ==========
Brand
Kettle     2947
Smiths     1952
Doritos    1784
Name: count, dtype: int64
```



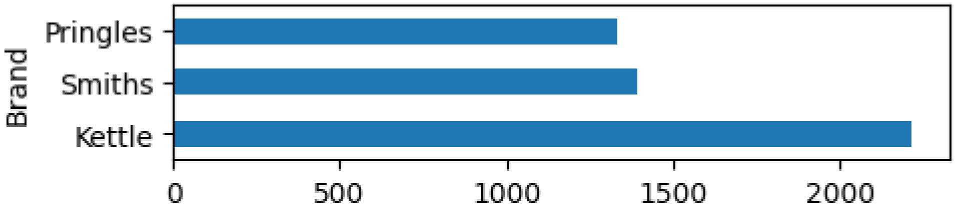
```
========== OLDER SINGLES/COUPLES - Budget ==========
Brand
Kettle      3065
Smiths      2010
Pringles    1843
Name: count, dtype: int64
```



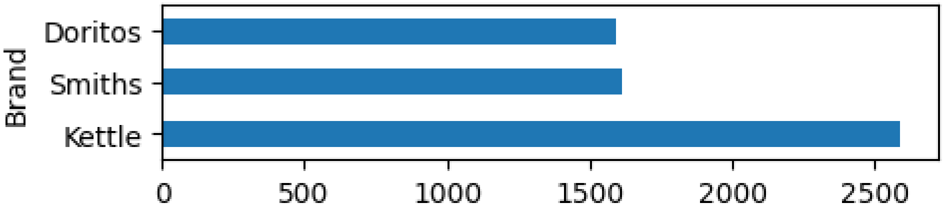
```
========== OLDER SINGLES/COUPLES - Mainstream ==========
Brand
Kettle     2835
Smiths     2070
Doritos    1791
Name: count, dtype: int64
```



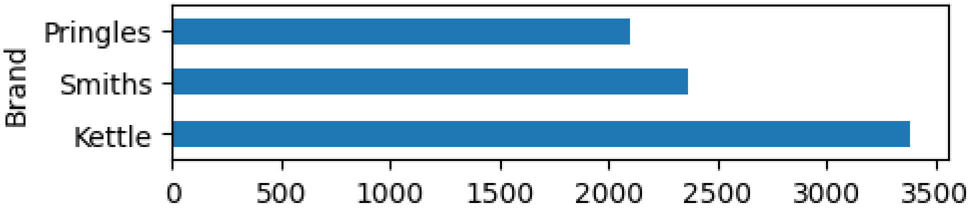
```
========== RETIREES - Premium ==========
Brand
Kettle      2216
Smiths      1395
Pringles    1331
Name: count, dtype: int64
```



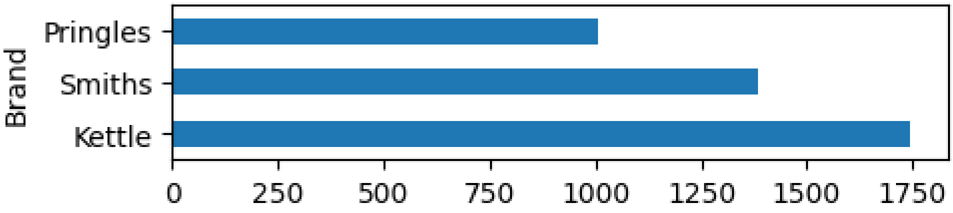
```
========== RETIREES - Budget ==========
Brand
Kettle     2592
Smiths     1612
Doritos    1592
Name: count, dtype: int64
```



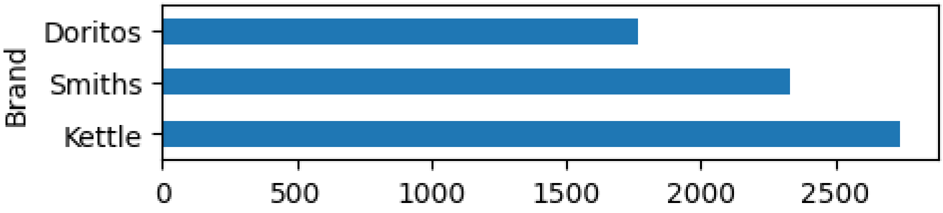
```
========== RETIREES - Mainstream ==========
Brand
Kettle      3386
Smiths      2367
Pringles    2103
Name: count, dtype: int64
```



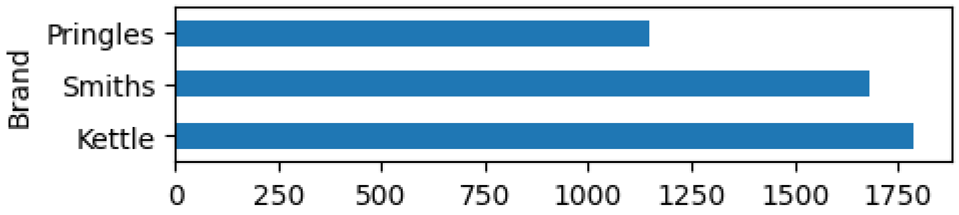
```
========== YOUNG FAMILIES - Premium ==========
Brand
Kettle      1745
Smiths      1384
Pringles    1007
Name: count, dtype: int64
```



```
========== YOUNG FAMILIES - Budget ==========
Brand
Kettle     2743
Smiths     2334
Doritos    1767
Name: count, dtype: int64
```



```
========== YOUNG FAMILIES - Mainstream ==========
Brand
Kettle      1789
Smiths      1681
Pringles    1148
Name: count, dtype: int64
```



EVERY SEGMENT HAD "Kettle" AS THE MOST PURCHASED BRAND. EVERY SEGMENT EXCEPT "YOUNG SINGLES/COUPLES Mainstream" HAD "Smiths" AS THEIR SECOND MOST PURCHASED BRAND. "YOUNG SINGLES/COUPLES Mainstream" HAD "Doritos" AS AS THEIR SECOND MOST PURCHASED BRAND.

EXAMINE IF OUR TARGET SEGMENT TENDS TO BUY LARGER PACKS OF CHIPS

In [123…

```
# MERGE DF WITH PACK SIZE
merged_pack = pd.concat([df, pack_size.rename("Size")], axis=1)
merged_pack.head()
```

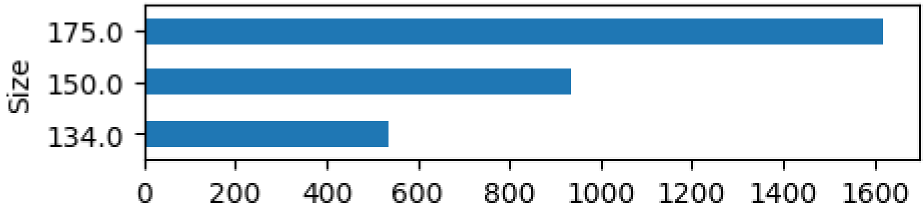
Out[123…

	Date	Store Id	Card No.	Transaction Id	Product Id	Product	Quantity	Sales	
0	2018-10-17	1	1000	1	5	Natural Chip Compny SeaSalt175g	2	6.0	SINGLES/
1	2019-05-14	1	1307	348	66	CCs Nacho Cheese 175g	3	6.3	SINGLES/
2	2019-05-20	1	1343	383	61	Smiths Crinkle Cut Chips Chicken 170g	2	2.9	SINGLES/
3	2018-08-17	2	2373	974	69	Smiths Chip Thinly S/Cream&Onion 175g	5	15.0	SINGLES/
4	2018-08-18	2	2426	1038	108	Kettle Tortilla ChpsHny&Jlpno Chili 150g	3	13.8	SINGLES/

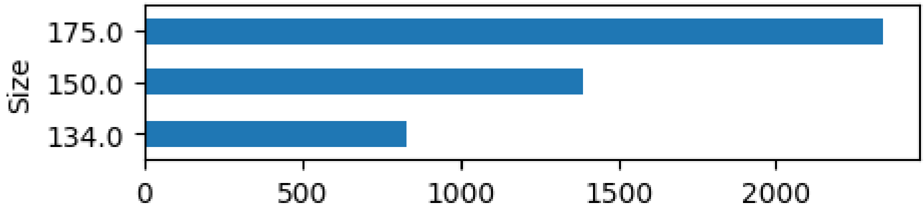
In [124…

```
for stage in merged_pack["Group"].unique() :
    for subs in merged_pack["Subscription"].unique() :
        print("==========", stage, "-", subs, "==========")
        summary = merged_pack[(merged_pack["Group"] == stage) & (merged_pack["Su
        print(summary)
        plt.figure()
        summary.plot.barh(figsize = (5, 1))
        plt.show()
```

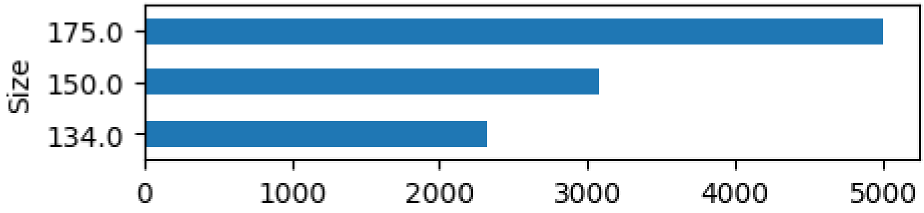
```
========== YOUNG SINGLES/COUPLES - Premium ==========
Size
134.0     537
150.0     933
175.0    1618
Name: count, dtype: int64
```



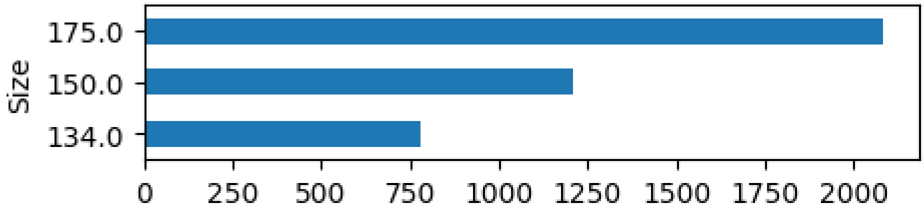
```
========== YOUNG SINGLES/COUPLES - Budget ==========
Size
134.0     832
150.0    1390
175.0    2338
Name: count, dtype: int64
```



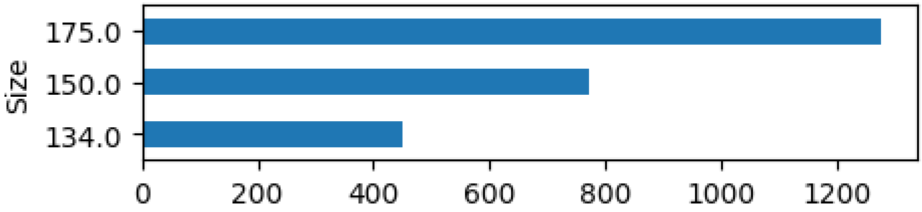
```
========== YOUNG SINGLES/COUPLES - Mainstream ==========
Size
134.0    2315
150.0    3080
175.0    4997
Name: count, dtype: int64
```



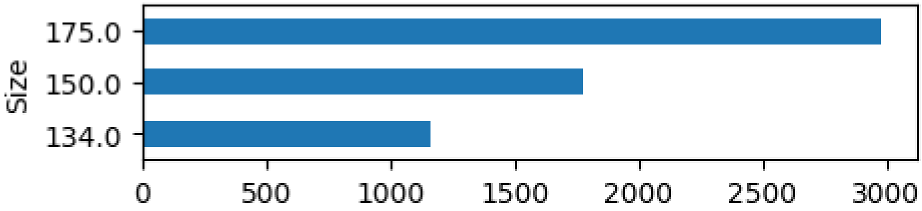
```
========== MIDAGE SINGLES/COUPLES - Premium ==========
Size
134.0     781
150.0    1207
175.0    2082
Name: count, dtype: int64
```



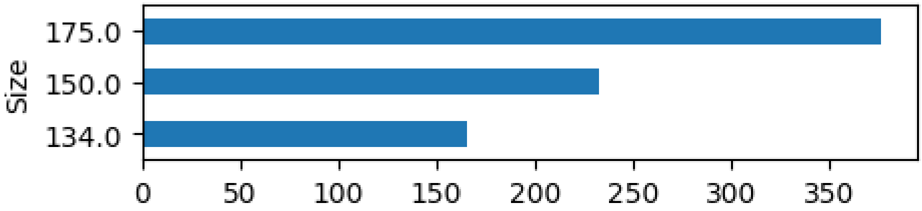
```
========== MIDAGE SINGLES/COUPLES - Budget ==========
Size
134.0     449
150.0     771
175.0    1277
Name: count, dtype: int64
```



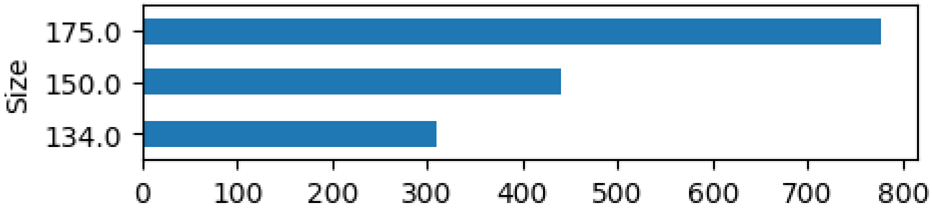
```
========== MIDAGE SINGLES/COUPLES - Mainstream ==========
Size
134.0    1159
150.0    1777
175.0    2975
Name: count, dtype: int64
```



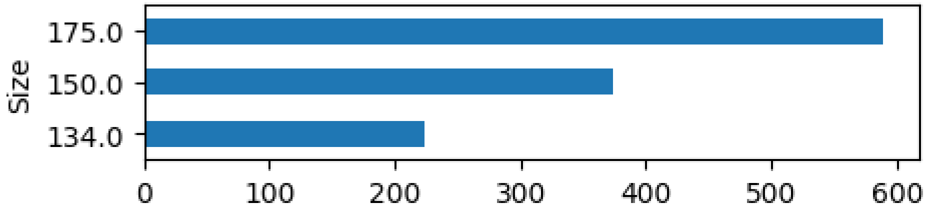
```
========== NEW FAMILIES - Premium ==========
Size
134.0    165
150.0    233
175.0    376
Name: count, dtype: int64
```



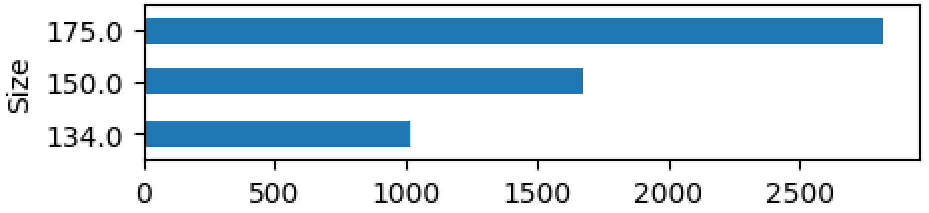
```
========== NEW FAMILIES - Budget ==========
Size
134.0    309
150.0    440
175.0    777
Name: count, dtype: int64
```



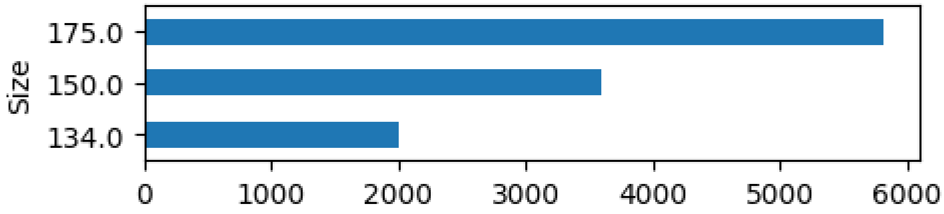
```
========== NEW FAMILIES - Mainstream ==========
Size
134.0    224
150.0    374
175.0    589
Name: count, dtype: int64
```



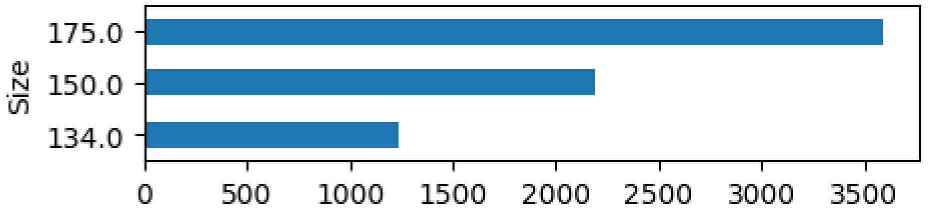
```
========== OLDER FAMILIES - Premium ==========
Size
134.0    1014
150.0    1673
175.0    2816
Name: count, dtype: int64
```



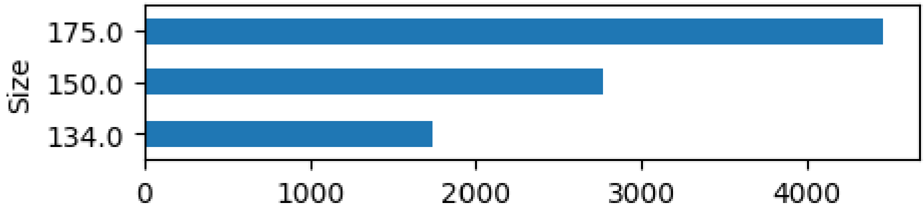
```
========== OLDER FAMILIES - Budget ==========
Size
134.0    1996
150.0    3588
175.0    5808
Name: count, dtype: int64
```



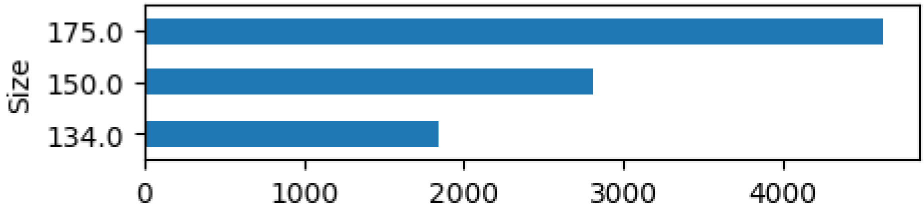
```
========== OLDER FAMILIES - Mainstream ==========
Size
134.0    1234
150.0    2189
175.0    3588
Name: count, dtype: int64
```



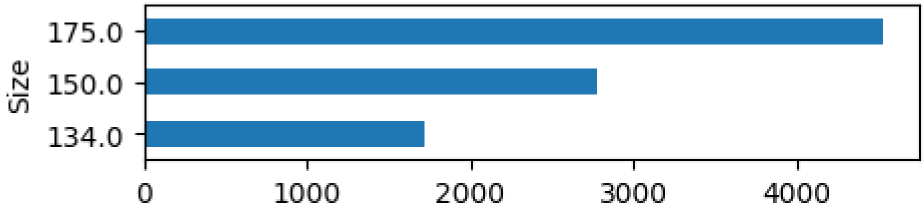
```
========== OLDER SINGLES/COUPLES - Premium ==========
Size
134.0    1744
150.0    2768
175.0    4458
Name: count, dtype: int64
```



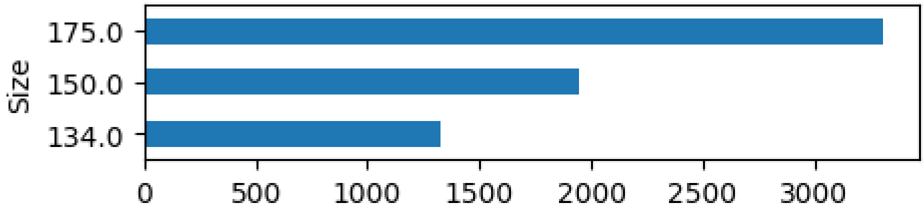
```
========== OLDER SINGLES/COUPLES - Budget ==========
Size
134.0    1843
150.0    2811
175.0    4625
Name: count, dtype: int64
```



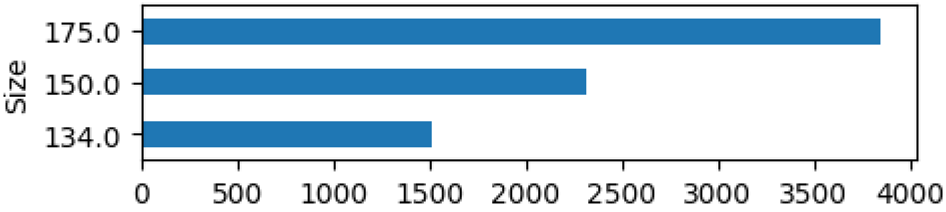
```
========== OLDER SINGLES/COUPLES - Mainstream ==========
Size
134.0    1720
150.0    2773
175.0    4525
Name: count, dtype: int64
```



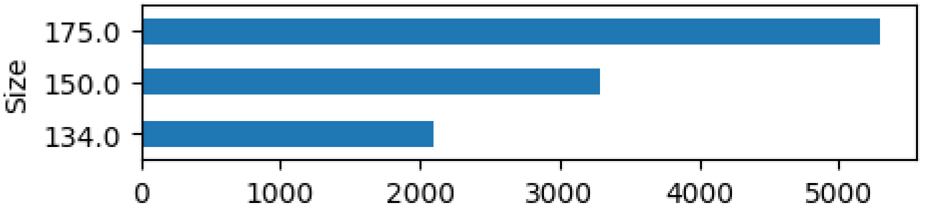
```
========== RETIREES - Premium ==========
Size
134.0    1331
150.0    1943
175.0    3306
Name: count, dtype: int64
```



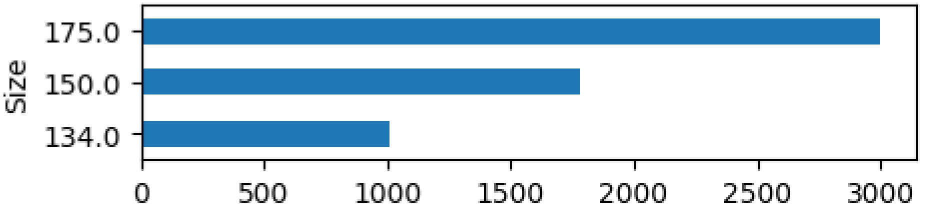
```
========== RETIREES - Budget ==========
Size
134.0    1517
150.0    2319
175.0    3847
Name: count, dtype: int64
```



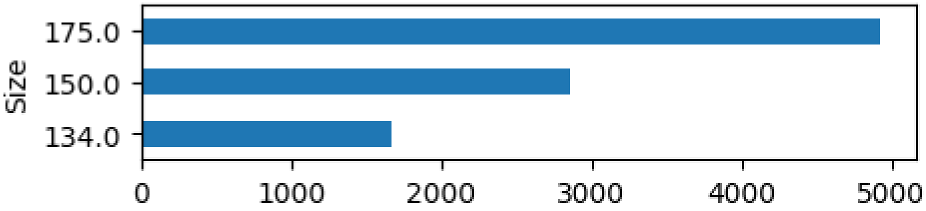
```
========== RETIREES - Mainstream ==========
Size
134.0    2103
150.0    3290
175.0    5295
Name: count, dtype: int64
```



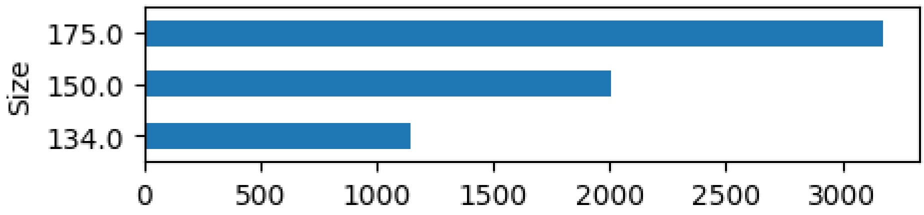
```
========== YOUNG FAMILIES - Premium ==========
Size
134.0    1007
150.0    1778
175.0    2998
Name: count, dtype: int64
```



```
========== YOUNG FAMILIES - Budget ==========
Size
134.0    1674
150.0    2862
175.0    4921
Name: count, dtype: int64
```



```
========== YOUNG FAMILIES - Mainstream ==========
Size
134.0    1148
150.0    2004
175.0    3174
Name: count, dtype: int64
```



MOST FREQUENT CHIPS SIZE PURCHASED IS 175g FOLLOWED BY THE 150g CHIPS SIZE FOR ALL SEGMENTS.

AVERAGE AMOUNT OF CHIPS BOUGHT PER CUSTOMER SEGMENT

```
In [125…
avg_chips = (df.groupby(["Group", "Subscription"])["Quantity"].sum() / df.groupb
avg_chips
```

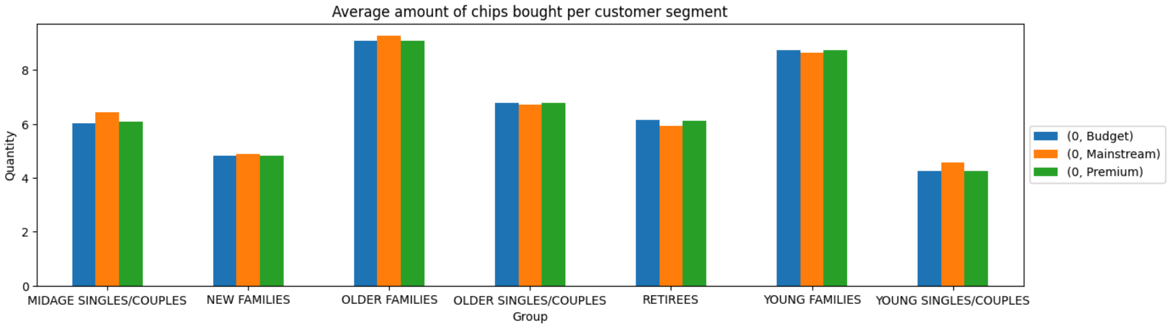
Out[125…

Group	Subscription	0
OLDER FAMILIES	Mainstream	9.255380
	Budget	9.076773
	Premium	9.071717
YOUNG FAMILIES	Budget	8.722995
	Premium	8.716013
	Mainstream	8.638361
OLDER SINGLES/COUPLES	Budget	6.781398
	Premium	6.769543
	Mainstream	6.712021
MIDAGE SINGLES/COUPLES	Mainstream	6.432080
RETIREES	Budget	6.141847
	Premium	6.103358
MIDAGE SINGLES/COUPLES	Premium	6.078514
	Budget	6.026459
RETIREES	Mainstream	5.925920
NEW FAMILIES	Mainstream	4.891566
	Budget	4.821527
	Premium	4.815652
YOUNG SINGLES/COUPLES	Mainstream	4.575597
	Premium	4.264113
	Budget	4.250069

HISTOGRAM OF AVERAGE AMOUNT OF CHIPS BOUGHT PER CUSTOMER SEGMENT

In [126…

```
avg_chips.unstack().plot.bar(figsize = (15, 4), rot = 0)
plt.title("Average amount of chips bought per customer segment")
plt.legend(loc = "center left", bbox_to_anchor = (1.0, 0.5))
plt.ylabel("Quantity")
plt.show()
```



AVERAGE CHIPS PRICE PER TRANSACTION BY SEGMENTS

In [ ]:

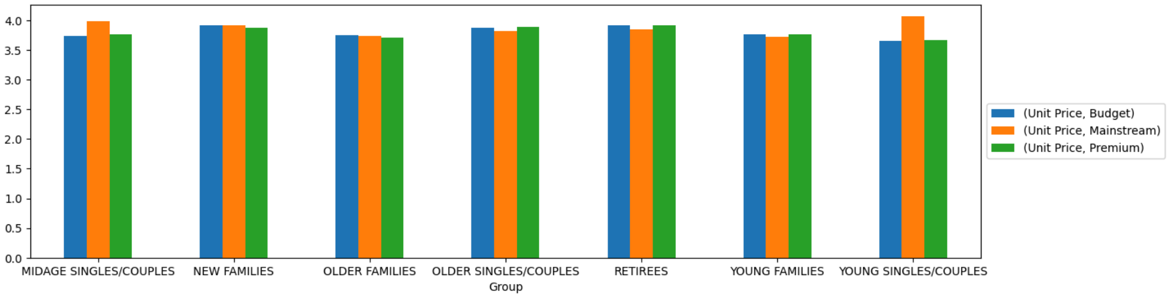
```
# Calculate "Unit Price" only where "Quantity" is non-zero and both columns are
df["Unit Price"] = df["Sales"] / df["Quantity"].replace(0, pd.NA)
# Group by "Group" and "Subscription" and calculate the mean of "Unit Price"
chips_segment = df.groupby(["Group", "Subscription"], dropna=False)["Unit Price"
# Display the resulting DataFrame
chips_segment
```

Out[ ]:

Group	Subscription	Unit Price
YOUNG SINGLES/COUPLES	**Mainstream**	4.065642
MIDAGE SINGLES/COUPLES	**Mainstream**	3.994241
RETIREES	**Budget**	3.924404
	Premium	3.920942
NEW FAMILIES	**Budget**	3.917688
	Mainstream	3.916133
OLDER SINGLES/COUPLES	**Premium**	3.893182
	Budget	3.882096
NEW FAMILIES	**Premium**	3.872110
RETIREES	**Mainstream**	3.844294
OLDER SINGLES/COUPLES	**Mainstream**	3.814665
MIDAGE SINGLES/COUPLES	**Premium**	3.770698
YOUNG FAMILIES	**Premium**	3.762150
	Budget	3.760737
OLDER FAMILIES	**Budget**	3.745340
MIDAGE SINGLES/COUPLES	**Budget**	3.743328
OLDER FAMILIES	**Mainstream**	3.737077
YOUNG FAMILIES	**Mainstream**	3.724533
OLDER FAMILIES	**Premium**	3.717000
YOUNG SINGLES/COUPLES	**Premium**	3.665414
	Budget	3.657366

In [129…

```
chips_segment.unstack().plot.bar(figsize = (15, 4), rot = 0)
plt.legend(loc = "center left", bbox_to_anchor = (1.0, 0.5))
plt.show()
```



RECOMMENDATIONS

1/ OLDER FAMILIES - Focus on the Budget Segment. - Strength: Frequent Purchase. We can give promotions that encourages more frequency of purchase. - Strength: High quantity of chips are purchased per visit. We can give promotions that encourage them to buy more quantity of chips per purchase.

2/ YOUNG SINGLES/COUPLES - Focus on the Mainstream Segment. - This segment is the only segment that had "Doritos" as their 2nd most purchased brand (after "Kettle"). 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. - Strength: Population quantity. We can spend more effort on making sure our promotions reach them, and it reaches them frequently.

3/ RETIREES - Focus on the Mainstream Segment. - Strength: Population quantity. Again, 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.

4/ GENERAL - All segments has "Kettle" as the most frequently purchased brand, and 175g (regardless of brand) followed by 150g as the preferred chips size. - When promoting chips in general to all segments it is good to take advantage of these two points.