Task - 2

Quantium client has asked us to evaluate the performance of a store trial which was performed in stores 77, 86 and 88. This can be broken down by:

- total sales revenue
- total number of customers
- average number of transactions per customer

```
#import essential libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import scipy.stats as stats
```

```
#import data file
from google.colab import files
data=files.upload()
```

Browse... No files selected. Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to enable.

```
Saving QVI_data.csv to QVI_data.csv
```

```
chips=pd.read_csv('QVI_data.csv')
#ds = dataset

chips
```

```
#creating month and year column
chips['DATE']=pd.to_datetime(chips['DATE'])
chips['MONTH_YEAR']=chips['DATE'].dt.strftime('%m/%Y')
chips['MONTH_YEAR']
```

```
0         10/2018
1         09/2018
2         03/2019
3         03/2019
4         11/2018
           ...
264829    12/2018
264830    10/2018
264831    10/2018
264832    10/2018
264833    12/2018
Name: MONTH_YEAR, Length: 264834, dtype: object
```

```
#to find comparison stores
chips['MONTH_YEAR']=pd.to_datetime(chips['MONTH_YEAR'])
chips_before=chips[(chips['MONTH_YEAR']>='07/2018')&(chips['MONTH_YEAR']<='01/2019')]
chips_before['MONTH_YEAR'].value_counts()
```

```
2018-12-01    22835
2018-07-01    22562
2018-08-01    22410
2018-10-01    22288
2019-01-01    22161
2018-11-01    21852
2018-09-01    21743
Name: MONTH_YEAR, dtype: int64
```

```
#grouping by store number and month year
chips_grp_before=chips_before.groupby(['STORE_NBR','MONTH_YEAR'])
total_grp=chips_grp_before['TOT_SALES'].sum()
total_grp
```

```
STORE_NBR  MONTH_YEAR
1          2018-07-01    206.9
           2018-08-01    176.1
           2018-09-01    278.8
           2018-10-01    188.1
           2018-11-01    192.6
                         ...
272        2018-09-01    304.7
           2018-10-01    430.6
           2018-11-01    376.2
           2018-12-01    403.9
           2019-01-01    423.0
Name: TOT_SALES, Length: 1848, dtype: float64
```

```
#total sales by store number
chips_grp_sales=chips_before.groupby(['STORE_NBR'])
total_sales=chips_grp_sales['TOT_SALES'].sum()
total_sales
```

```
STORE_NBR
1      1386.90
2      1128.50
3      7526.15
4      9127.00
5      5739.70
         ...
268    1549.05
269    6664.50
270    6697.95
271    5765.10
272    2744.35
Name: TOT_SALES, Length: 271, dtype: float64
```

```
#total sales in trial stores
trial_store=total_sales[76:88]
trial_store
```

```
     STORE_NBR
     77    1699.00
     78    5466.40
     79    7143.15
     80    6953.40
     81    8260.30
     82    2289.90
     83    5739.80
     84    3238.50
     85      13.90
     86    6119.85
     87    2385.50
     88    9383.60
     Name: TOT_SALES, dtype: float64
```

Total sales for trail stores between july 2018 to january 2019:

- store 77:1699.00
- store 86:6119.85
- store 88:9383.60

```
#sorting stores by total sales
#searching for matching store of store 77
total_sorted=total_sales.sort_values(ascending=True)
total_sorted.iloc[63:73]
```

```
     STORE_NBR
     53     1611.1
     6      1618.8
     255    1636.6
     233    1659.8
     188    1683.5
     77     1699.0
     187    1702.2
     90     1736.4
     46     1758.0
     220    1788.6
     Name: TOT_SALES, dtype: float64
```

```
stores_control_one=[6,46,53,77,90,187,188,220,233,255]
control_one=pd.DataFrame({'Value':total_grp[stores_control_one]})
print(control_one)
```

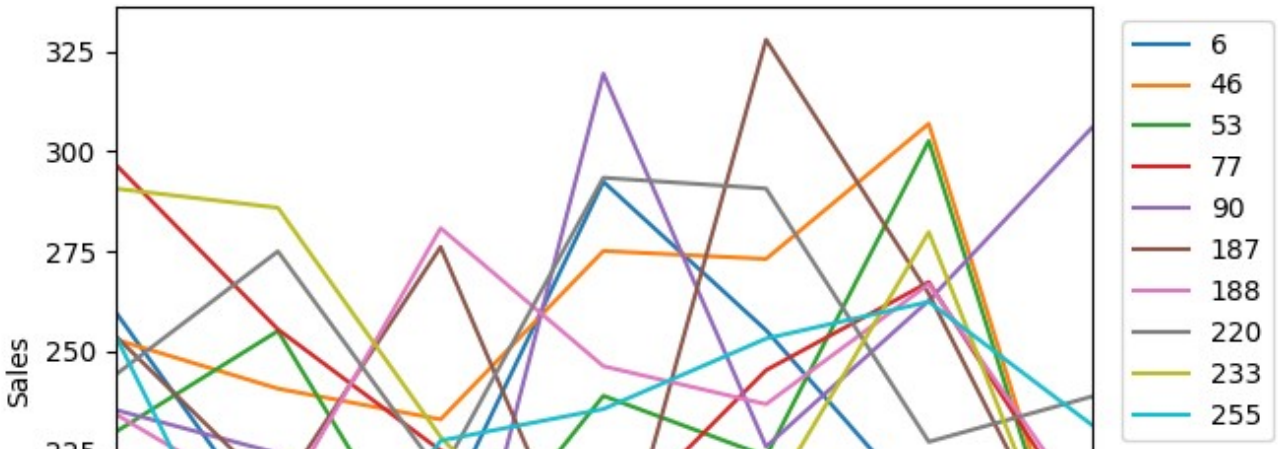
```
                            Value
```

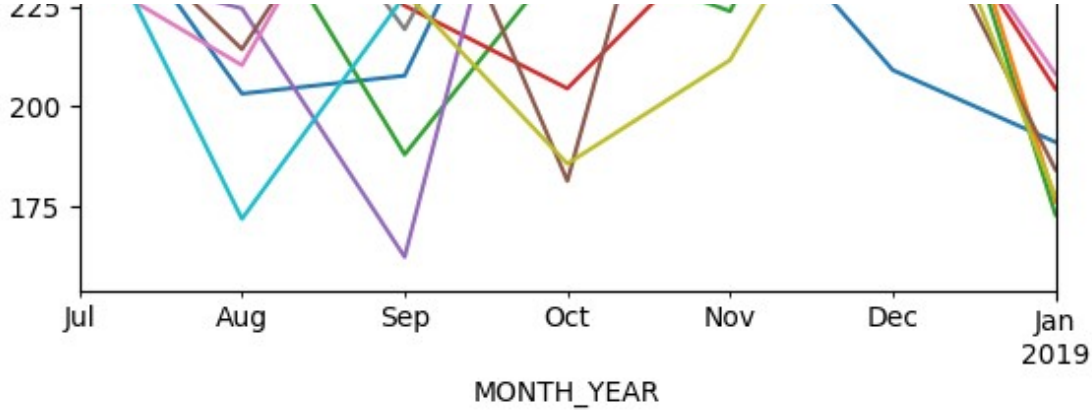
```
                      value
STORE_NBR MONTH_YEAR
6         2018-07-01  260.0
          2018-08-01  203.2
          2018-09-01  207.7
          2018-10-01  292.4
          2018-11-01  255.3
...                     ...
255       2018-09-01  227.7
          2018-10-01  235.6
          2018-11-01  253.2
          2018-12-01  262.4
          2019-01-01  231.7

[70 rows x 1 columns]
```

```
pivot_chips1=control_one.pivot_table(index='MONTH_YEAR',columns='STORE_NBR',values='Value
pivot_chips1
```

STORE_NBR	6	46	53	77	90	187	188	220	233	255
MONTH_YEAR										
2018-07-01	260.0	253.0	229.8	296.8	235.4	253.9	234.4	244.1	290.7	254.1
2018-08-01	203.2	240.7	255.1	255.5	224.5	214.3	210.3	275.0	285.9	171.9
2018-09-01	207.7	233.0	188.0	225.2	162.4	276.1	280.8	219.3	228.6	227.7
2018-10-01	292.4	275.1	238.9	204.5	319.4	181.4	246.3	293.4	185.7	235.6
2018-11-01	255.3	273.1	223.8	245.3	226.2	327.9	236.8	290.7	211.6	253.2
2018-12-01	209.1	306.9	302.6	267.3	262.7	264.4	266.8	227.4	279.8	262.4
2019-01-01	191.1	176.2	172.9	204.4	305.8	184.2	208.1	238.7	177.5	231.7

```
pivot_chips1.plot()
plt.legend(loc='upper right',bbox_to_anchor=(1.20,1))
plt.ylabel('Sales')
plt.show()
```






```
#correlation
pivot_chips1.corr(method='pearson')
```

STORE_NBR	6	46	53	77	90	187	188	
STORE_NBR								
6	1.000000	0.484580	0.139538	0.042490	0.288923	0.041493	0.115455	0.64
46	0.484580	1.000000	0.838008	0.435650	-0.038130	0.433520	0.527886	0.23
53	0.139538	0.838008	1.000000	0.532764	0.112228	0.125959	0.199495	0.13
77	0.042490	0.435650	0.532764	1.000000	-0.377649	0.460669	0.042708	-0.18
90	0.288923	-0.038130	0.112228	-0.377649	1.000000	-0.681605	-0.422287	0.34
187	0.041493	0.433520	0.125959	0.460669	-0.681605	1.000000	0.457048	-0.08
188	0.115455	0.527886	0.199495	0.042708	-0.422287	0.457048	1.000000	-0.42
220	0.641903	0.239256	0.133959	-0.183091	0.341478	-0.086637	-0.422733	1.00
233	-0.176677	0.401329	0.625439	0.903774	-0.453268	0.280566	0.090490	-0.27
255	0.363013	0.402832	0.101587	0.191091	0.177864	0.421864	0.461834	-0.22

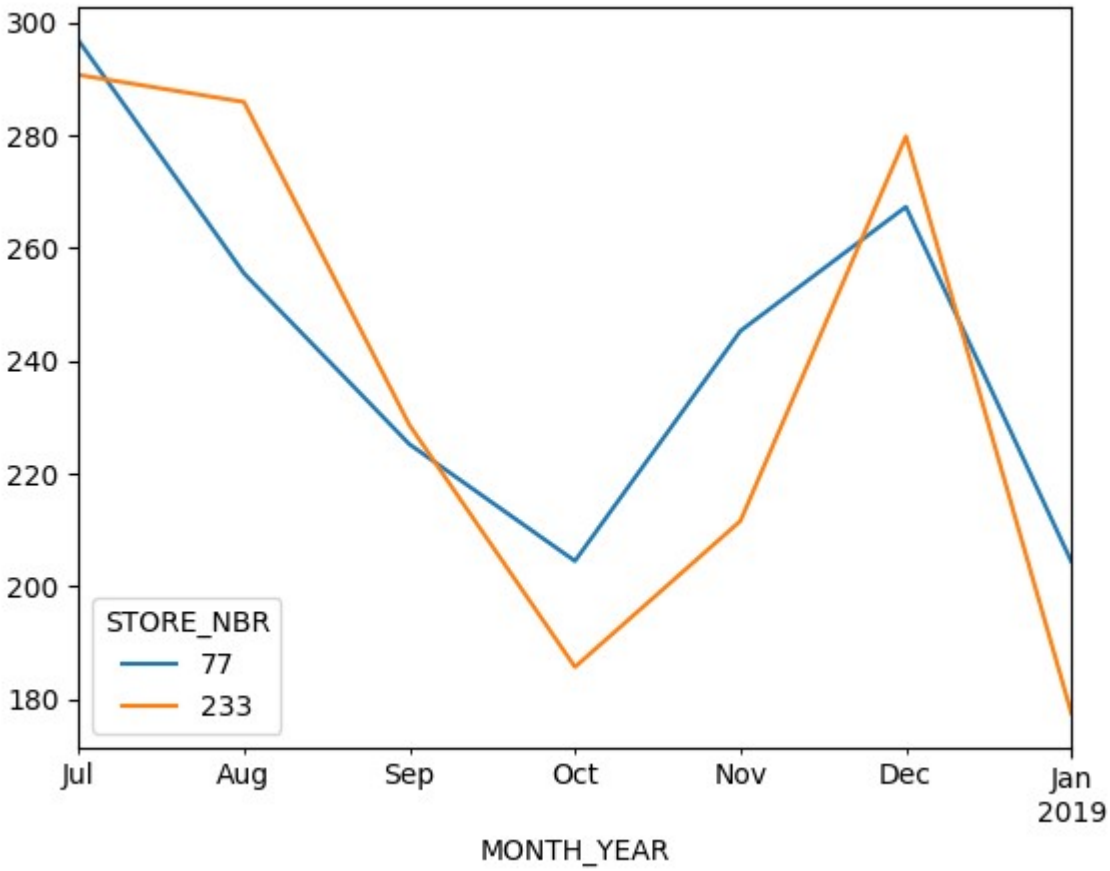
```
#here we can observe store 233 has the strongest correlation at .90
#it's graphical view is as follows
chips1_graph=pivot_chips1[[77,233]]
chips1_graph.plot()
plt.show
```

matplotlib.pyplot.show
def show(*args, **kwargs)

Display all open figures.

Parameters
---
block : bool, optional

```
    Whether to wait for all figures to be closed before returning.
```



The stores 77 and 233 have .90 correlation and having 40 dollars difference.

- Store 77: Total sales=1699.00; Control Store: 233; Total sales(233)=1659.80
- Store 86: Total sales=6119.85; Control Store: ?
- Store 88: Total sales=9383.60; Control Store: ?

```
#searching for matching store of store 86
total_sorted.iloc[176:186]
```

```
    STORE_NBR
    23     6098.90
    48     6112.30
    172    6113.40
    13     6114.70
    86     6119.85
    196    6126.30
    57     6147.40
    30     6194.60
    236    6197.40
    105    6206.20
    Name: TOT_SALES, dtype: float64
```

```
stores_control_two=[13,23,30,48,57,86,105,172,196,236]
control_two=pd.DataFrame({'Value':total_grp[stores_control_two]})
```

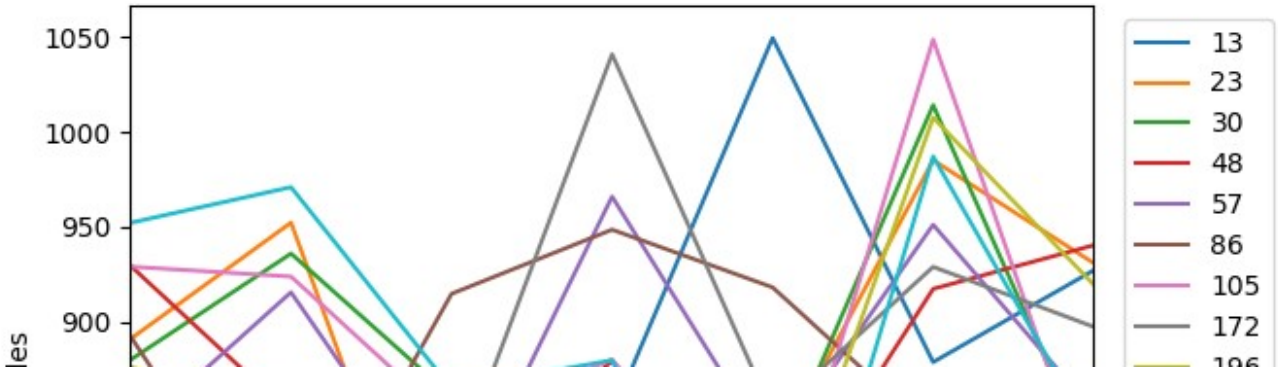
```
print(control_two)
```

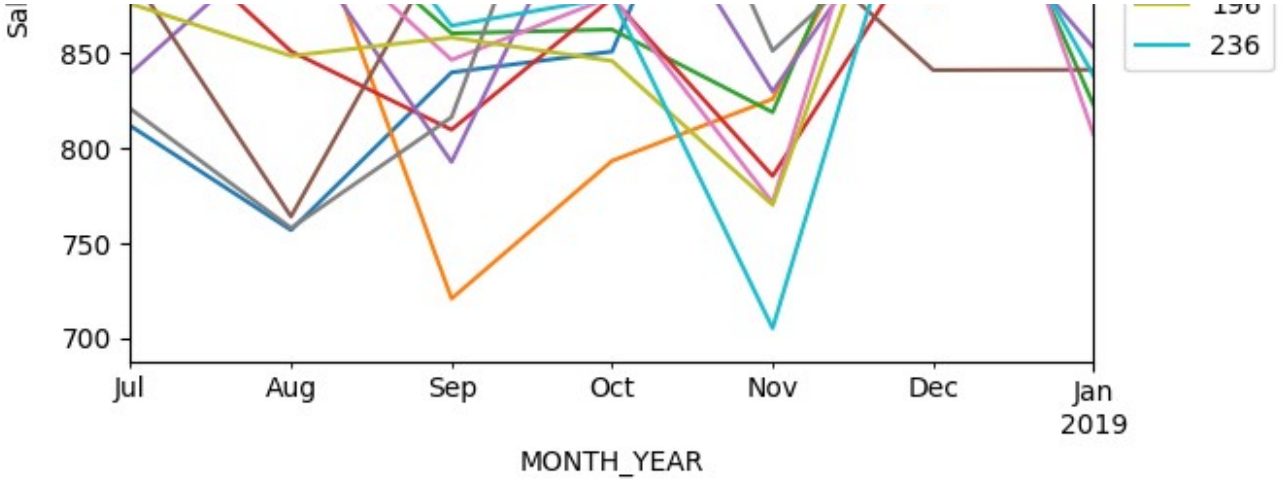
```
                        Value
     STORE_NBR MONTH_YEAR
     13        2018-07-01   811.8
               2018-08-01   756.9
               2018-09-01   840.0
               2018-10-01   851.0
               2018-11-01  1049.4
     ...                      ...
     236       2018-09-01   864.6
               2018-10-01   879.6
               2018-11-01   705.2
               2018-12-01   987.0
               2019-01-01   838.2

     [70 rows x 1 columns]
```

```
pivot_chips2=control_two.pivot_table(index='MONTH_YEAR',columns='STORE_NBR',values='Value
pivot_chips2
```

STORE_NBR	13	23	30	48	57	86	105	172	196	236
MONTH_YEAR										
2018-07-01	811.8	890.8	879.8	929.4	839.6	892.20	928.9	820.8	876.2	952.0
2018-08-01	756.9	952.1	935.8	851.1	915.4	764.05	923.7	758.0	848.7	970.8
2018-09-01	840.0	720.8	860.6	809.8	792.8	914.60	846.6	816.4	858.4	864.6
2018-10-01	851.0	793.4	862.6	879.2	965.8	948.40	880.0	1040.8	846.0	879.6
2018-11-01	1049.4	826.0	819.0	785.4	830.0	918.00	771.4	851.4	770.2	705.2
2018-12-01	878.6	985.0	1014.0	917.2	951.0	841.20	1048.6	928.8	1007.4	987.0
2019-01-01	927.0	930.8	822.8	940.2	852.8	841.40	807.0	897.2	919.4	838.2

```
pivot_chips2.plot()
plt.legend(loc='upper right',bbox_to_anchor=(1.20,1))
plt.ylabel('Sales')
plt.show()
```






```
pivot_chips2.corr(method='pearson')
```

STORE_NBR	13	23	30	48	57	86	105	
STORE_NBR								
13	1.000000	-0.150189	-0.477595	-0.310142	-0.283500	0.409610	-0.563172	0.2
23	-0.150189	1.000000	0.594336	0.620930	0.458281	-0.784698	0.558633	-0.1
30	-0.477595	0.594336	1.000000	0.292305	0.599159	-0.516913	0.952586	-0.0
48	-0.310142	0.620930	0.292305	1.000000	0.363605	-0.271147	0.479948	0.3
57	-0.283500	0.458281	0.599159	0.363605	1.000000	-0.218110	0.603628	0.5
86	0.409610	-0.784698	-0.516913	-0.271147	-0.218110	1.000000	-0.381464	0.5
105	-0.563172	0.558633	0.952586	0.479948	0.603628	-0.381464	1.000000	0.0
172	0.240211	-0.115548	-0.021631	0.303527	0.593520	0.524475	0.083882	1.0
196	-0.270657	0.600215	0.689615	0.735414	0.393114	-0.373196	0.739672	0.2
236	-0.853592	0.515399	0.805425	0.573430	0.495600	-0.520981	0.888408	-0.0

```
#correlation is .52 with 172 store
total_sorted.iloc[180:195]
```

```
STORE_NBR
86     6119.85
196    6126.30
57     6147.40
30     6194.60
236    6197.40
105    6206.20
91     6230.00
109    6238.30
97     6264.95
180    6265.70
```

```
102    6286.00
164    6289.40
155    6308.70
184    6309.00
160    6311.60
Name: TOT_SALES, dtype: float64
```

```
stores_control_three=[86,91,97,102,109,155,160,164,180,184]
control_three=pd.DataFrame({'Value':total_grp[stores_control_three]})
print(control_three)
```

```
                          Value
STORE_NBR MONTH_YEAR
86        2018-07-01  892.20
          2018-08-01  764.05
          2018-09-01  914.60
          2018-10-01  948.40
          2018-11-01  918.00
...                      ...
184       2018-09-01  873.00
          2018-10-01  895.20
          2018-11-01  869.20
          2018-12-01  900.00
          2019-01-01  913.40

[70 rows x 1 columns]
```

```
pivot_chips3=control_three.pivot_table(index='MONTH_YEAR',columns='STORE_NBR',values='Val
pivot_chips3
```

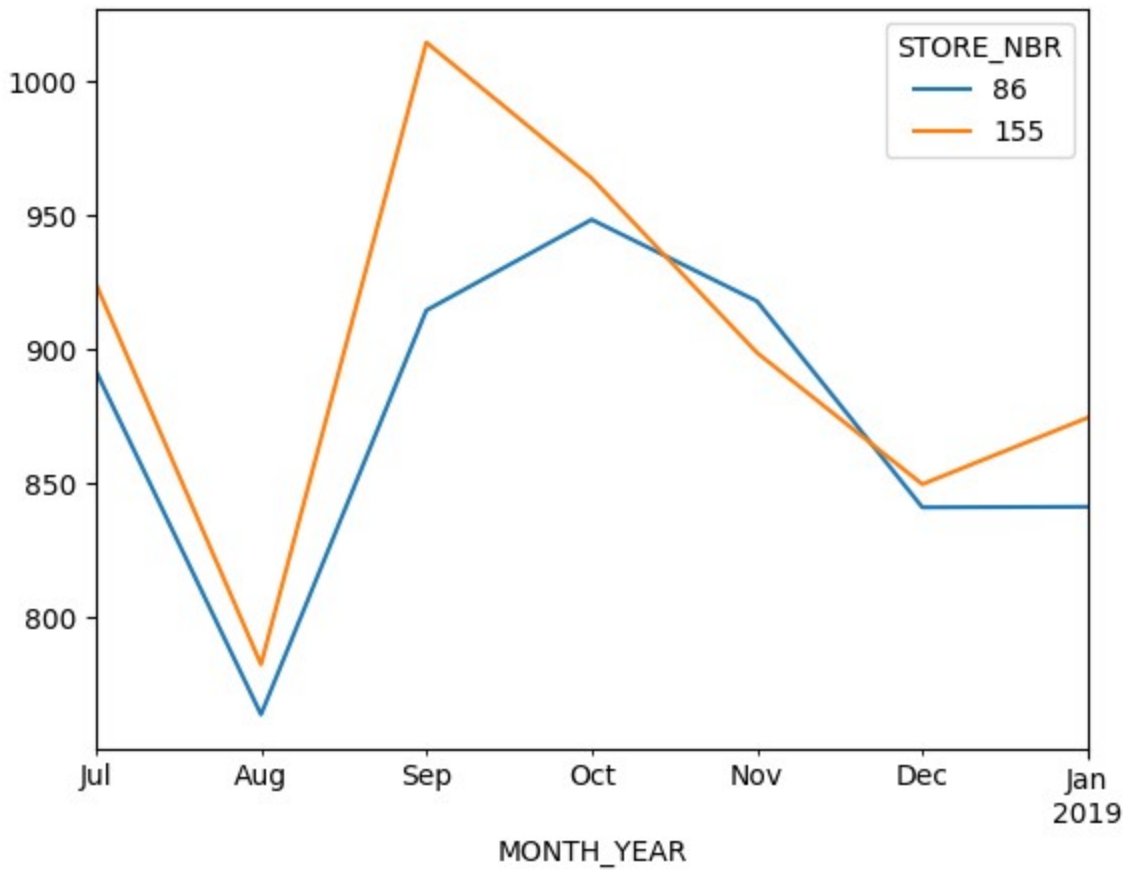
STORE_NBR	86	91	97	102	109	155	160	164	180	184
MONTH_YEAR										
2018-07-01	892.20	827.7	848.20	782.4	884.0	924.6	894.8	853.2	816.6	983.8
2018-08-01	764.05	916.1	917.35	986.4	828.3	782.7	756.2	920.2	788.5	874.4
2018-09-01	914.60	1000.1	908.80	970.4	871.4	1014.4	915.2	841.4	911.4	873.0
2018-10-01	948.40	851.8	993.20	902.2	957.6	963.8	887.4	863.2	871.4	895.2
2018-11-01	918.00	911.2	853.40	930.0	929.6	898.8	936.0	829.6	793.4	869.2
2018-12-01	841.20	866.8	899.40	816.6	908.8	849.8	1018.4	1031.6	995.0	900.0
2019-01-01	841.40	856.3	844.60	898.0	858.6	874.6	903.6	950.2	1089.4	913.4

```
pivot_chips3.corr(method='pearson')
```

STORE_NBR	86	91	97	102	109	155	160
STORE_NBR							

86	1.000000	0.019027	0.211778	-0.158172	0.788300	0.877882	0.441970	-0.6
91	0.019027	1.000000	0.107347	0.756611	-0.286609	0.285142	-0.124414	-0.3
97	0.211778	0.107347	1.000000	0.296909	0.378689	0.214531	-0.208412	-0.0
102	-0.158172	0.756611	0.296909	1.000000	-0.305346	-0.017878	-0.554953	-0.3
109	0.788300	-0.286609	0.378689	-0.305346	1.000000	0.451168	0.548266	-0.2
155	0.877882	0.285142	0.214531	-0.017878	0.451168	1.000000	0.325977	-0.6
160	0.441970	-0.124414	-0.208412	-0.554953	0.548266	0.325977	1.000000	0.2
164	-0.624613	-0.307085	-0.034539	-0.307030	-0.219011	-0.609502	0.296822	1.0
180	-0.115073	-0.157871	-0.165523	-0.208742	-0.104106	0.021320	0.476804	0.6
184	0.072641	-0.703307	-0.373501	-0.826582	-0.037604	0.074457	0.097636	0.0

```
store_86_155=pivot_chips3[[86,155]]
store_86_155.plot()
plt.show()
```



The store number have correlation .87

```
#correlation of entire table
```

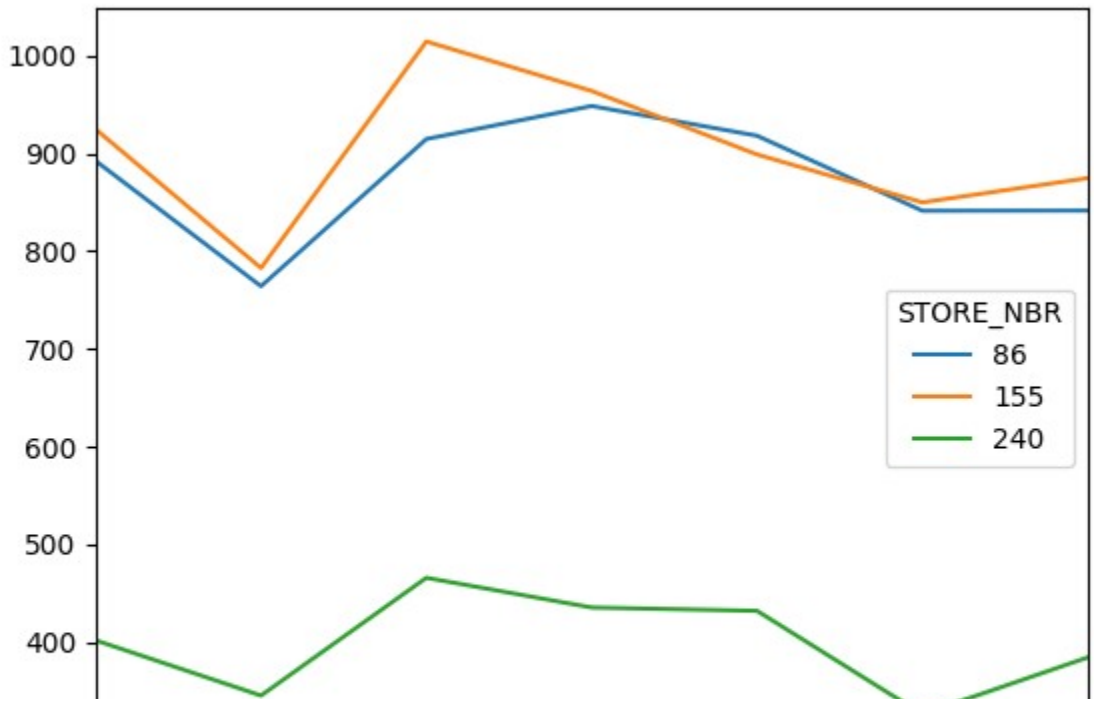
```
total_grp_df=pd.DataFrame(total_grp)
total_grp_pivot=total_grp_df.pivot_table(index='MONTH_YEAR',columns='STORE_NBR',values='T
total_grp_pivot_table=total_grp_pivot.corr(method='pearson')
total_grp_pivot_table[86].sort_values(ascending=False).head(10)
```

```
STORE_NBR
31     1.000000
86     1.000000
155    0.877882
132    0.846517
240    0.825066
222    0.795075
109    0.788300
138    0.759864
198    0.748794
114    0.734415
Name: 86, dtype: float64
```

```
total_sorted.iloc[[31,240,132,155]]
```

```
STORE_NBR
14      283.2
65     7602.4
242    3423.2
5      5739.7
Name: TOT_SALES, dtype: float64
```

```
#since store 132 sales are too low to use. So use 240,155,86 from total group
three=total_grp[[86,155,240]]
three_df=pd.DataFrame(three)
three_pivot=three_df.pivot_table(index='MONTH_YEAR',columns='STORE_NBR',values='TOT_SALES
three_pivot.plot()
plt.show()
```



Even though store 240 has good correlation, I choose 155 store as a much better fit.

- Store 77: Total sales=1699.00; Control Store: 233; Total sales(233)=1659.80
- Store 86: Total sales=6119.85; Control Store: 155; Total sales(155)=6308.70
- Store 88: Total sales=9383.60; Control Store: ?

```
#now the last trial store 88
total_grp_pivot_table[88].sort_values(ascending=False).head(10)
```

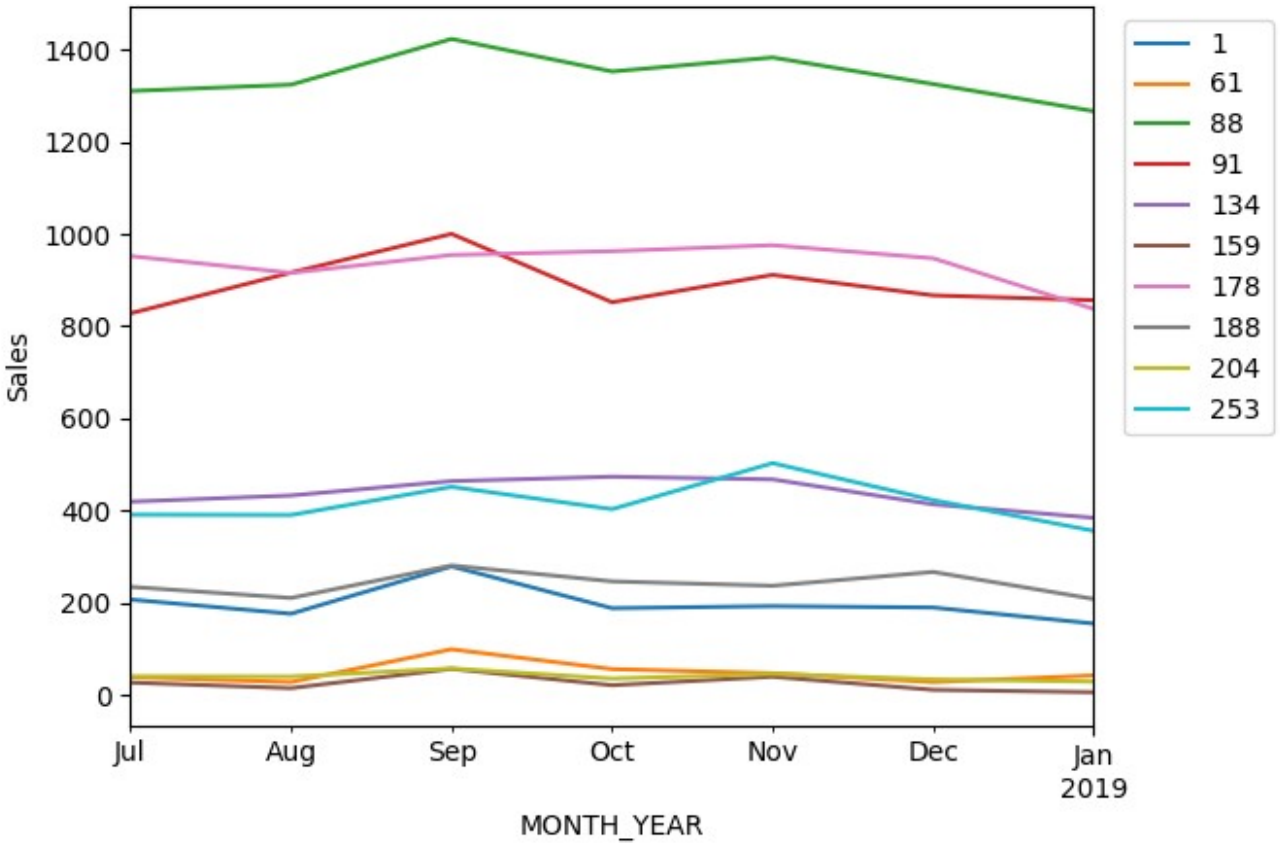
```
STORE_NBR
88     1.000000
159    0.903186
204    0.885774
134    0.864293
1      0.813636
253    0.811838
91     0.776688
61     0.748929
178    0.731857
188    0.716752
Name: 88, dtype: float64
```

```
total_sorted.iloc[260:]
```

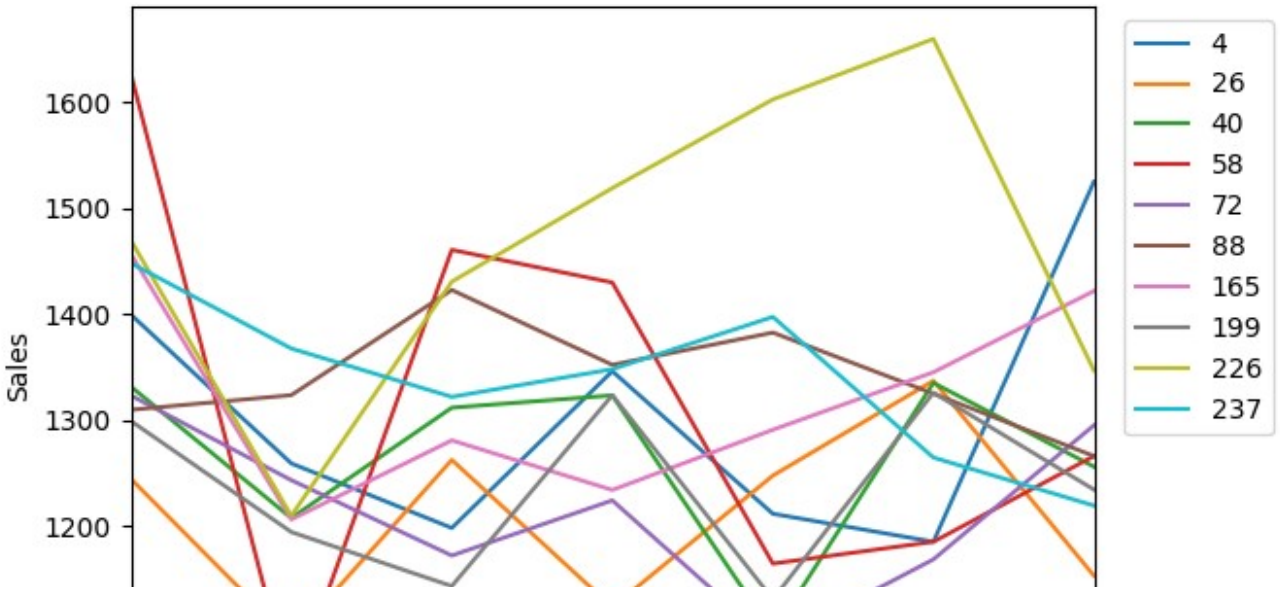
```
STORE_NBR
26      8463.40
72      8518.50
199     8654.40
40      8866.80
203     8943.70
4       9127.00
58      9178.75
165     9237.80
237     9369.00
88      9383.60
226    10239.15
Name: TOT_SALES, dtype: float64
```

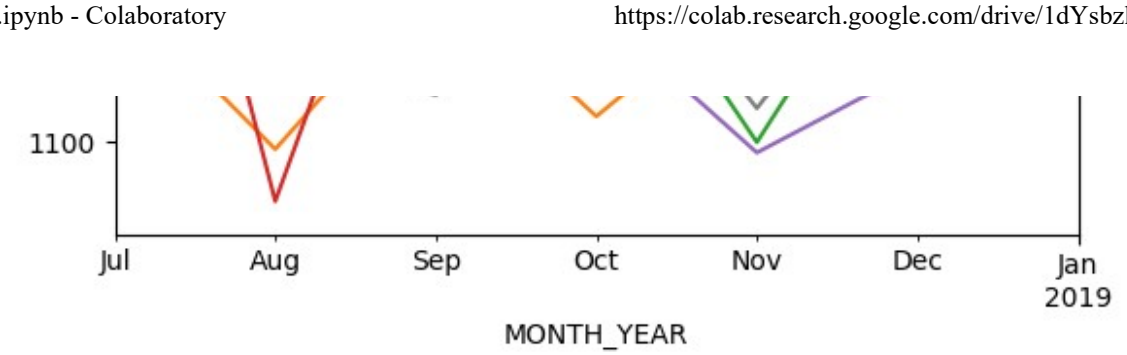
```
#here none of the stores colse to sales amount but these are matching with the pattern
chips_four=total_grp[[1,61,88,91,134,159,178,188,204,253]]
chips_four_df=pd.DataFrame(chips_four)
chips_four_pivot=chips_four_df.pivot_table(index='MONTH_YEAR',columns='STORE_NBR',values=
chips_four_pivot.plot()
plt.ylabel('Sales')
plt.legend(loc='upper right', bbox_to_anchor=(1.20, 1))
```

```
plt.legend(loc='upper right',bbox_to_anchor=(1.20,1))
plt.show()
```

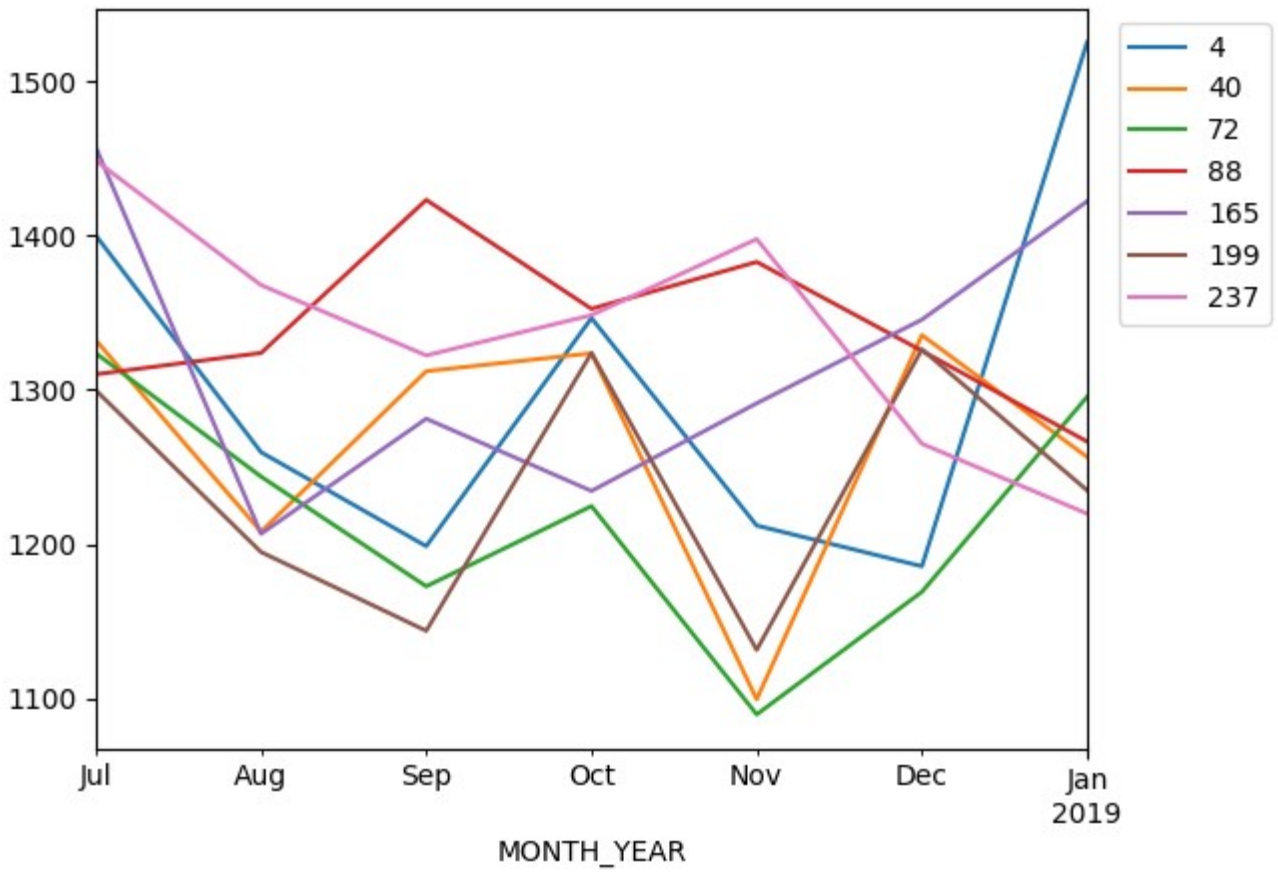



```
chips_five=total_grp[[4,26,40,58,72,88,165,199,226,237]]
chips_five_df=pd.DataFrame(chips_five)
chips_five_pivot=chips_five_df.pivot_table(index='MONTH_YEAR',columns='STORE_NBR',values=
chips_five_pivot.plot()
plt.ylabel('Sales')
plt.legend(loc='upper right',bbox_to_anchor=(1.20,1))
plt.show()
```

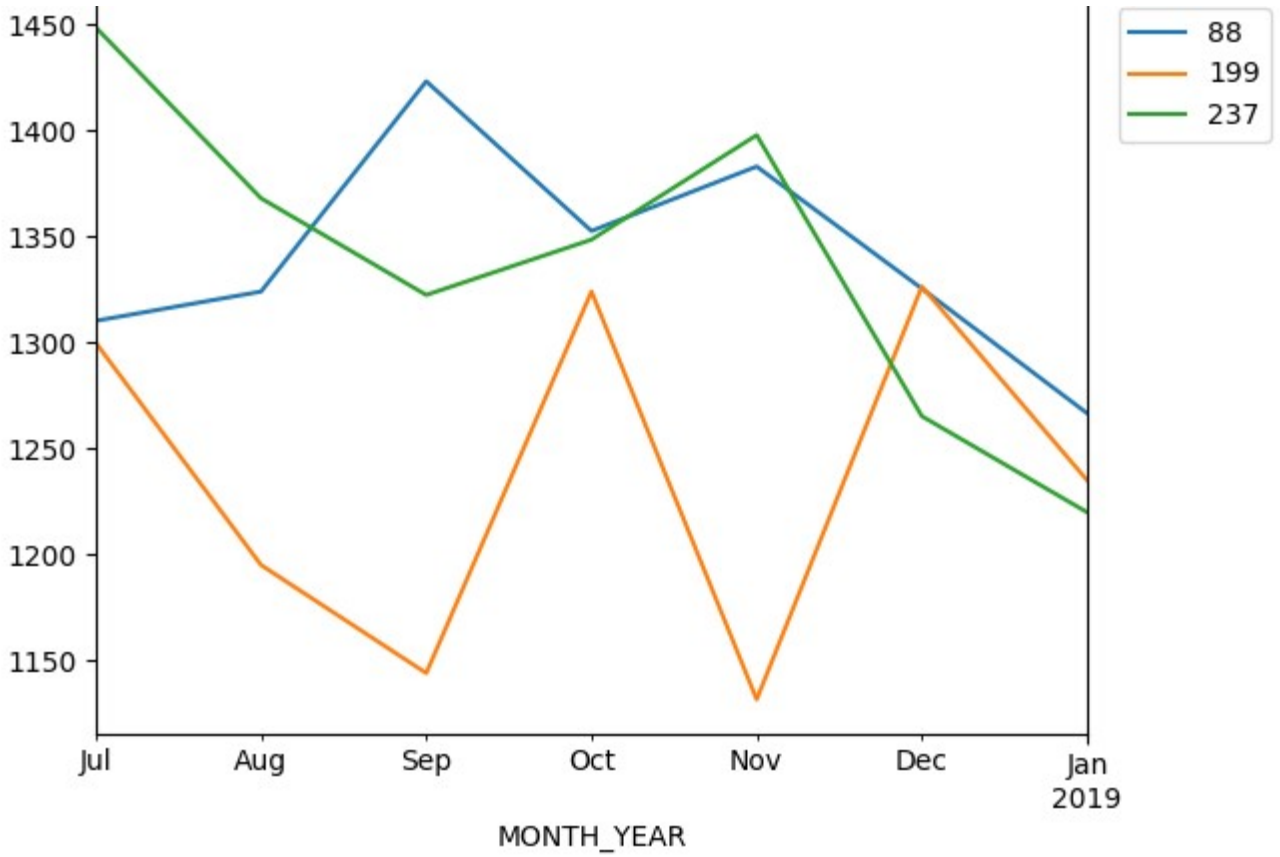





```
#we remove 3 stores
chips_five=total_grp[[4,40,72,88,165,199,237]]
chips_five_df=pd.DataFrame(chips_five)
chips_five_pivot=chips_five_df.pivot_table(index='MONTH_YEAR',columns='STORE_NBR',values=
chips_five_pivot.plot()
plt.legend(loc='upper right',bbox_to_anchor=(1.20,1))
plt.show()
```




```
#now by removing 2 stores
chips_five=total_grp[[88,199,237]]
chips_five_df=pd.DataFrame(chips_five)
chips_five_pivot=chips_five_df.pivot_table(index='MONTH_YEAR',columns='STORE_NBR',values=
chips_five_pivot.plot()
plt.legend(loc='upper right',bbox_to_anchor=(1.20,1))
plt.show()
```




```
#since store 237 is close to the pattern of store 88
sorted_88=total_grp_pivot_table[88].sort_values(ascending=False)
sorted_88[237]
```

```
0.3084792217319044
```

Here the correlation is very low at .30, this store makes most by total sales.

- Store 77: Total sales=1699.00; Control Store: 233; Total sales(233)=1659.80
- Store 86: Total sales=6119.85; Control Store: 155; Total sales(155)=6308.70
- Store 88: Total sales=9383.60; Control Store: 237; Total sales(237)=9369.00

Comparing trial stores and control stores.

```
chips_trial=chips[(chips['MONTH_YEAR']>='02/2019')&(chips['MONTH_YEAR']<='04/2019')]
chips_trial['MONTH_YEAR'].value_counts()
```

```
2019-03-01    22592
2019-04-01    21766
2019-02-01    20405
Name: MONTH_YEAR, dtype: int64
```

```
totore_77_chips_trial[chips_trial['STORE_NBR']==77]
```

```
tstore_77=chips_trial[chips_trial['STORE_NBR']==77]
cstore_233=chips_trial[chips_trial['STORE_NBR']==233]
tstore_86=chips_trial[chips_trial['STORE_NBR']==86]
cstore_155=chips_trial[chips_trial['STORE_NBR']==155]
tstore_88=chips_trial[chips_trial['STORE_NBR']==88]
cstore_237=chips_trial[chips_trial['STORE_NBR']==237]
```

```
tstore_77
```

	LYLTY_CARD_NBR	DATE	STORE_NBR	TXN_ID	PROD_NBR	PROD_NAME	PROD_QTY
73365	77000	2019-03-28	77	74911	18	Cheetos Chs & Bacon Balls 190g	1
73366	77000	2019-04-13	77	74912	69	Smiths Chip Thinly S/ Cream&Onion 175g	1
73368	77001	2019-02-27	77	74913	7	Smiths Crinkle Original 330g	2
73372	77003	2019-03-18	77	74917	80	Natural ChipCo Sea Salt & Vinegr 175g	1
73377	77007	2019-03-20	77	74923	3	Kettle Sensations Camembert & Fig 150g	2
...	...	...	...	...	...	...	...
73890	77482	2019-03-24	77	75445	102	Kettle Mozzarella Basil & Pesto 175g	1
73894	77488	2019-02-17	77	75450	94	Burger Rings 220g	2
73902	77496	2019-03-06	77	75459	50	Tostitos Lightly Salted 175g	1
73904	77500	2019-03-12	77	75461	81	Pringles Original Crisps 134g	1
73907	77502	2019-02-20	77	75464	69	Smiths Chip Thinly S/ Cream&Onion 175g	2

Store 77 and 233

```
tstore_77[['TOT_SALES','PROD_QTY']].sum()
```

```
TOT_SALES    777.0
PROD_QTY     234.0
dtype: float64
```

```
cstore_233[['TOT_SALES','PROD_QTY']].sum()
```

```
TOT_SALES    601.7
PROD_QTY     175.0
dtype: float64
```

```
tstore_77['LYLTY_CARD_NBR'].value_counts()
```

```
77000    2
77338    2
77115    2
77207    2
77350    2
        ..
77151    1
77147    1
77144    1
77142    1
77502    1
Name: LYLTY_CARD_NBR, Length: 124, dtype: int64
```

```
tstore_77[['LYLTY_CARD_NBR']].count()
```

```
LYLTY_CARD_NBR    148
dtype: int64
```

```
cstore_233[['LYLTY_CARD_NBR']].count()
```

```
LYLTY_CARD_NBR    121
dtype: int64
```

```
cstore_233['LYLTY_CARD_NBR'].value_counts()
```

```
233227    2
233449    2
233327    2
233111    2
233398    2
         ..
233139    1
233138    1
233136    1
233135    1
233491    1
Name: LYLTY_CARD_NBR, Length: 113, dtype: int64
```

```
Name: LYLTY_CARD_NBR, Length: 112, dtype: int64
```

```
#repeated coustomers
repeat_customers=tstore_77['LYLTY_CARD_NBR'].value_counts()
print(repeat_customers.head(24))
repeats_total=24
```

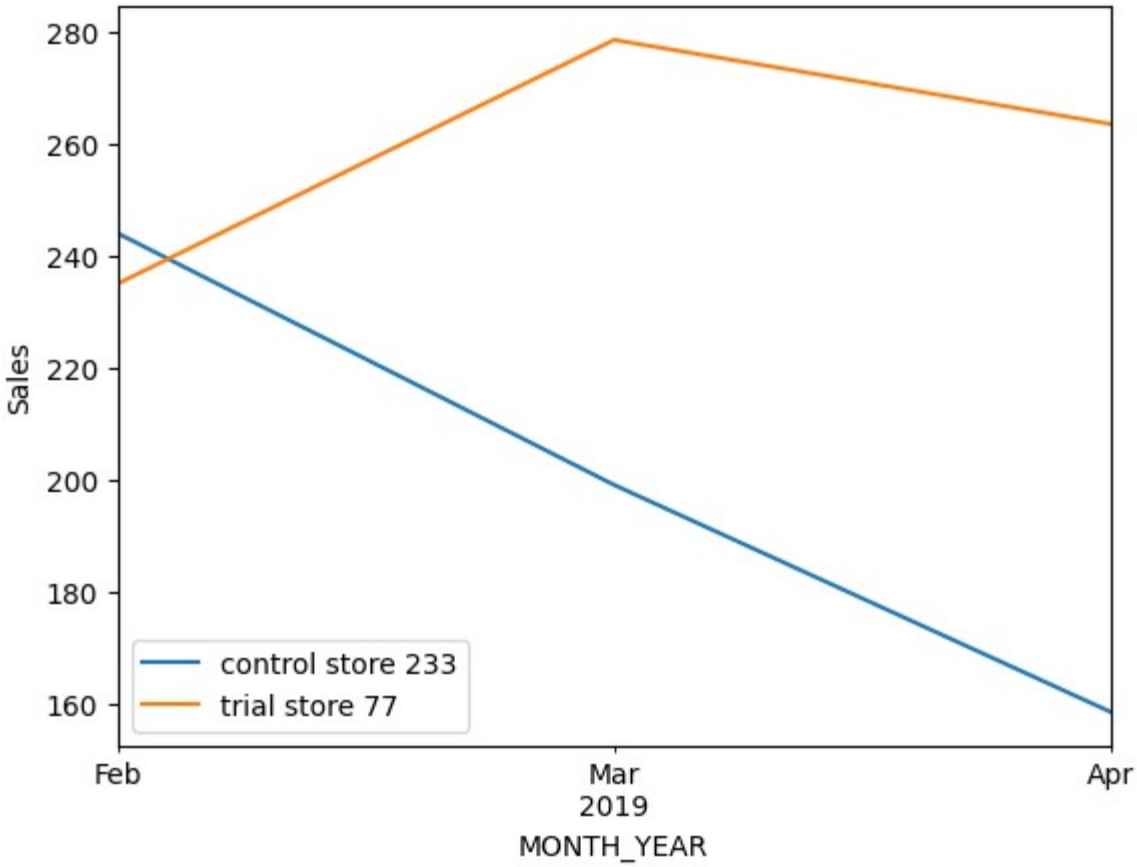
```
77000    2
77338    2
77115    2
77207    2
77350    2
77123    2
77420    2
77424    2
77402    2
77450    2
77077    2
77341    2
77454    2
77069    2
77462    2
77466    2
77359    2
77045    2
77139    2
77482    2
77389    2
77009    2
77007    2
77206    2
Name: LYLTY_CARD_NBR, dtype: int64
```

```
repeat_customers2=cstore_233['LYLTY_CARD_NBR'].value_counts()
print(repeat_customers2.head(9))
repeats_total2=0
```

```
233227    2
233449    2
233327    2
233111    2
233398    2
233071    2
233284    2
233341    2
233186    2
Name: LYLTY_CARD_NBR, dtype: int64
```

```
#grouping
group77=tstore_77.groupby('MONTH_YEAR')
group233=cstore_233.groupby('MONTH_YEAR')

group233=cstore_233.groupby('MONTH_YEAR')
```

```
group233['TOT_SALES'].sum().plot(label='control store 233')
group77['TOT_SALES'].sum().plot(label='trial store 77')
plt.ylabel('Sales')
plt.legend()
plt.show()
```



- Store 77:
  - TOT_SALES=777.0
  - PROD_QTY=234.0
  - REPEAT CST=24
  - TOTAL CST=145
- Store 233:
  - TOT_SALES=601.70
  - PROD_QTY=175.0
  - REPEAT CST=9
  - TOTAL CST=121

Store 86 and 155

```
tstore_86[['TOT_SALES','PROD_QTY']].sum()
```

```
tstore_86[['TOT_SALES','PROD_QTY']].sum()
```

```
TOT_SALES    2788.2
PROD_QTY      815.0
dtype: float64
```

```
cstore_155[['TOT_SALES','PROD_QTY']].sum()
```

```
TOT_SALES    2540.2
PROD_QTY      736.0
dtype: float64
```

```
tstore_86['LYLTY_CARD_NBR'].value_counts()
```

```
86112     6
86230     5
86075     5
86116     5
86172     5
          ..
86120     1
86117     1
86110     1
86103     1
155311    1
Name: LYLTY_CARD_NBR, Length: 215, dtype: int64
```

```
tstore_86[['LYLTY_CARD_NBR']].count()
```

```
LYLTY_CARD_NBR    408
dtype: int64
```

```
cstore_155[['LYLTY_CARD_NBR']].count()
```

```
LYLTY_CARD_NBR    368
dtype: int64
```

```
cstore_155['LYLTY_CARD_NBR'].value_counts()
```

```
155048    5
155010    5
155082    5
155153    5
155158    4
          ..
155188    1
155187    1
155152    1
155183    1
155140    1
Name: LYLTY_CARD_NBR, Length: 190, dtype: int64
```

```
#repeated coustomers
```

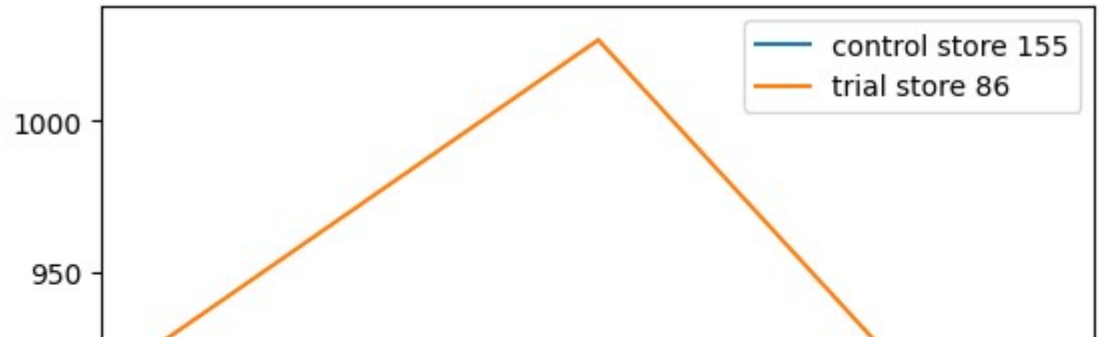
```
repeat_customers_86=tstore_86['LYLTY_CARD_NBR'].value_counts()
print(repeat_customers.head(123))
repeats_total=123
```

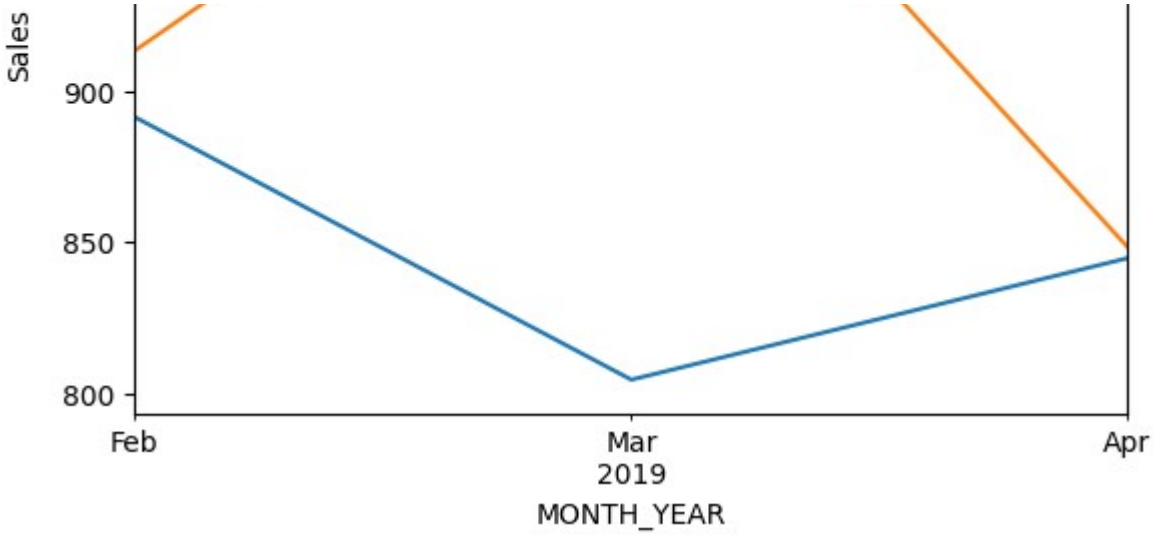
```
77000    2
77338    2
77115    2
77207    2
77350    2
        ..
77155    1
77151    1
77147    1
77144    1
77142    1
Name: LYLTY_CARD_NBR, Length: 123, dtype: int64
```

```
#repeated coustomers
repeat_customers_155=cstore_155['LYLTY_CARD_NBR'].value_counts()
repeat_customers_155.iloc[:155]
```

```
155048    5
155010    5
155082    5
155153    5
155158    4
         ..
155084    1
155107    1
155176    1
155174    1
155173    1
Name: LYLTY_CARD_NBR, Length: 155, dtype: int64
```

```
#grouping
group86=tstore_86.groupby('MONTH_YEAR')
group155=cstore_155.groupby('MONTH_YEAR')

group155['TOT_SALES'].sum().plot(label='control store 155')
group86['TOT_SALES'].sum().plot(label='trial store 86')
plt.ylabel('Sales')
plt.legend()
plt.show()
```





- Store 86:
  - TOT_SALES=2788.2
  - PROD_QTY=815.0
  - REPEAT CST=123
  - TOTAL CST=215
- Store 155:
  - TOT_SALES=2540.2
  - PROD_QTY=736.0
  - REPEAT CST=111
  - TOTAL CST=190

Store 88 and 237

```
tstore_88[['TOT_SALES','PROD_QTY']].sum()
```

```
TOT_SALES    4286.8
PROD_QTY      972.0
dtype: float64
```

```
cstore_237['LYLTY_CARD_NBR'].value_counts()
```

```
237366    6
237325    5
237182    5
237038    5
237217    4
         ..
237177    1
237178    1
237179    1
```

```
237179    1
237180    1
237384    1
Name: LYLTY_CARD_NBR, Length: 262, dtype: int64
```

```
tstore_88['LYLTY_CARD_NBR'].value_counts()
```

```
88313    6
88231    5
88257    4
88212    4
88358    4
        ..
88164    1
88170    1
88178    1
88186    1
88190    1
Name: LYLTY_CARD_NBR, Length: 261, dtype: int64
```

```
cstore_237['LYLTY_CARD_NBR'].value_counts()
```

```
237366    6
237325    5
237182    5
237038    5
237217    4
         ..
237177    1
237178    1
237179    1
237180    1
237384    1
Name: LYLTY_CARD_NBR, Length: 262, dtype: int64
```

```
tstore_88[['LYLTY_CARD_NBR']].count()
```

```
LYLTY_CARD_NBR    486
dtype: int64
```

```
cstore_237[['LYLTY_CARD_NBR']].count()
```

```
LYLTY_CARD_NBR    430
dtype: int64
```

```
#repeated coustomers
repeat_customers_88=tstore_88['LYLTY_CARD_NBR'].value_counts()
print(repeat_customers.head(145))
repeats_total=145
```

```
77000    2
77338    2
77115    2
77207    2
```

```
77207    2
77350    2
        ..
77151    1
77147    1
77144    1
77142    1
77502    1
Name: LYLTY_CARD_NBR, Length: 124, dtype: int64
```

```
#repeated coustomers
repeat_customers_237=cstore_237['LYLTY_CARD_NBR'].value_counts()
repeat_customers_237.iloc[:235]
```

```
237366    6
237325    5
237182    5
237038    5
237217    4
         ..
237222    1
237224    1
237225    1
237226    1
237229    1
Name: LYLTY_CARD_NBR, Length: 235, dtype: int64
```

```
#grouping
group88=tstore_88.groupby('MONTH_YEAR')
group237=cstore_237.groupby('MONTH_YEAR')

group237['TOT_SALES'].sum().plot(label='control store 237')
group88['TOT_SALES'].sum().plot(label='trial store 88')
plt.ylabel('Sales')
plt.legend()
plt.show()
```

- TOT_SALES=4286.8
- PROD_QTY=972
- REPEAT CST=145
- TOTAL CST=261

Stores stack up with average transactions per customer

```
group88['LYLTY_CARD_NBR'].value_counts().mean()
```

```
1.2590673575129534
```

```
group237['LYLTY_CARD_NBR'].value_counts().mean()
```

```
1.178082191780822
```

```
group86['LYLTY_CARD_NBR'].value_counts().mean()
```

```
1.2477064220183487
```

```
group155['LYLTY_CARD_NBR'].value_counts().mean()
```

```
1.2777777777777777
```

```
group77['LYLTY_CARD_NBR'].value_counts().mean()
```

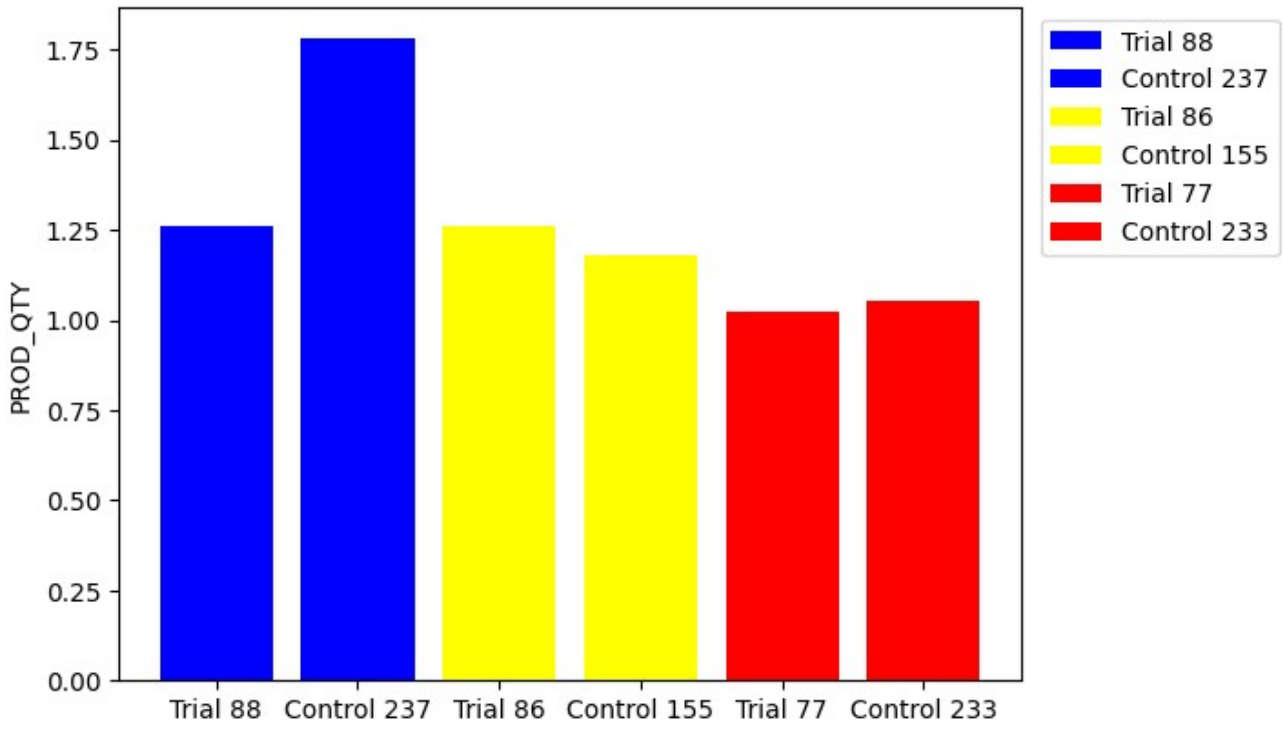
```
1.0422535211267605
```

```
group233['LYLTY_CARD_NBR'].value_counts().mean()
```

```
1.0521739130434782
```

```
group1=['Trial 88','Control 237']
group2=['Trial 86','Control 155']
group3=['Trial 77','Control 233']
values_grp1=[1.259,1.78]
values_grp2=[1.259,1.178]
values_grp3=[1.024,1.052]
plt.bar(group1,values_grp1,label=group1,color='blue')
```

```
plt.bar(group2,values_grp2,label=group2,color='yellow')
plt.bar(group3,values_grp3,label=group3,color='red')
plt.ylabel('PROD_QTY')
plt.legend(loc='upper right',bbox_to_anchor=(1.3,1))
plt.show()
```



Here we can observe that average transactions are higher for 2 of the 3 trial stores

```
# Total sales revenue
ts=sum(chips['TOT_SALES'])
#ts=total sum i.e., total sales revenue
print(ts)
```

```
1933114.9999996515
```

```
#Since there is no coustomer column, I am using TX_ID, as it is unique for every individu
chips.describe()
```

```
# Total number of customers
tc=241584
#tc= total number of customers
# Average number of transactions per customer
chips.shape
```

```
(264834, 13)
```

```
avg_trans=tc/264834
print(avg_trans)
```

```
0.9122091574344684
```

CONCLUSION:

Comparing to the trial stores and control stores; sales,products sold, amount of repeated customers and average transactions per customer all shows signs that the trial stores are performing the control stores during this period. If we increase the amount of trial stores and run another analysis to see if the increased sales stay true and stablized at a higher point.