

Marketing Analytics for E-Commerce Market Place Company

May 9, 2023

Business Context:

Measuring, Managing and Analysing the performance of business.

Importing libraries

```
import numpy as np
import pandas as pd
import datetime as dt
import matplotlib.pyplot as plt
import seaborn as sns
import scipy.stats as stats #for the statistical tests
from scipy import stats as stats
```

```
# set the graphs to show in the jupyter notebook
%matplotlib inline
```

```
# set seabor graphs to a better style
sns.set(style="ticks")
sns.set_context('talk')
```

```
pd.set_option('display.max_columns', None)
```

```
# for better visualization
plt.style.use('ggplot')
```

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

Dataset

Customers: Customers information

Sellers: Sellers information

Products: Product information

Orders: Orders info like ordered, product id, status, order dates etc..

Order_Items: Order level information

Order_Payments: Order payment information

Order_Review_Ratings: Customer ratings at order level

Geo-Location: Location details

Reading the Dataset

CUSTOMERS

```
input_file_path = "C:\\\\Projects\\EDA\\data\\input_files\\"
input_file_name = "CUSTOMERS.csv"
input_file_path + input_file_name
CUSTOMERS = pd.read_csv(input_file_path + input_file_name )
```

SELLERS

```
input_file_path = "C:\\\\Projects\\EDA\\data\\input_files\\"
input_file_name = "SELLERS.csv"
input_file_path + input_file_name
SELLERS = pd.read_csv(input_file_path + input_file_name )
```

PRODUCTS

```
input_file_path = "C:\\\\Projects\\EDA\\data\\input_files\\"
input_file_name = "PRODUCTS.csv"
input_file_path + input_file_name
PRODUCTS = pd.read_csv(input_file_path + input_file_name )
```

ORDERS

```
input_file_path = "C:\\\\Projects\\EDA\\data\\input_files\\"
input_file_name = "ORDERS.csv"
input_file_path + input_file_name
ORDERS = pd.read_csv(input_file_path + input_file_name )
```

ORDER_ITEMS

```
input_file_path = "C:\\\\Projects\\EDA\\data\\input_files\\"
input_file_name = "ORDER_ITEMS.csv"
input_file_path + input_file_name
ORDER_ITEMS = pd.read_csv(input_file_path + input_file_name )
```

ORDER_PAYMENTS

```
input_file_path = "C:\\\\Projects\\EDA\\data\\input_files\\"
input_file_name = "ORDER_PAYMENTS.csv"
input_file_path + input_file_name
ORDER_PAYMENTS= pd.read_csv(input_file_path + input_file_name )
```

ORDER_REVIEW_RATINGS

```
input_file_path = "C:\\\\Projects\\EDA\\data\\input_files\\"
input_file_name = "ORDER_REVIEW_RATINGS.csv"
input_file_path + input_file_name
ORDER_REVIEW_RATINGS = pd.read_csv(input_file_path + input_file_name )
```

GEO_LOCATION

```
input_file_path = "C:\\\\Projects\\EDA\\data\\input_files\\"
input_file_name = "GEO_LOCATION.csv"
input_file_path + input_file_name
GEO_LOCATION= pd.read_csv(input_file_path + input_file_name )
```

Joining tables(Data 360)

```
ORDER_PAYMENT_VALUE =  
ORDER_PAYMENTS.groupby("order_id").payment_value.sum().reset_index()  
ORDER_REVIEW_RATING_AVG =  
ORDER_REVIEW_RATINGS.groupby("order_id").review_score.mean().reset_index()  
data_360 = ORDERS.merge(ORDER_PAYMENT_VALUE, on = 'order_id')  
data_360 = data_360.merge(CUSTOMERS, on = 'customer_id')  
data_360 = data_360.merge(ORDER_ITEMS, on = 'order_id')  
data_360 = data_360.merge(PRODUCTS, on = 'product_id')  
data_360 = data_360.merge(SELLERS, on = 'seller_id')  
data_360 = data_360.merge(ORDER_REVIEW_RATING_AVG, on = 'order_id')
```

Handling Null Values

```
data_360  
=data_360.drop(columns=['order_approved_at', 'order_delivered_carrier_date', 'order_estimated_delivery_date', 'order_delivered_customer_date', 'shipping_limit_date', 'product_name_lenght', 'product_description_lenght', 'product_photos_qty', 'product_weight_g', 'product_length_cm', 'product_height_cm', 'product_height_cm', 'product_width_cm', 'seller_city', 'seller_state', 'seller_zip_code_prefix'])  
data_360.head()
```

	order_id	customer_id
0	e481f51cbdc54678b7cc49136f2d6af7	9ef432eb6251297304e76186b10a928d
1	128e10d95713541c87cd1a2e48201934	a20e8105f23924cd00833fd87daa0831
2	0e7e841ddf8f8f2de2bad69267ecfbcf	26c7ac168e1433912a51b924fbd34d34
3	bfc39df4f36c3693ff3b63fcbea9e90a	53904ddbea91e1e92b2b3f1d09a7af86
4	8736140c61ea584cb4250074756d8f3b	ab8844663ae049fda8baf15fc928f47f

	order_status	order_purchase_timestamp	payment_value
0	delivered	10/2/2017 10:56	38.71
1	delivered	8/15/2017 18:29	37.77
2	delivered	8/2/2017 18:24	37.77
3	delivered	10/23/2017 23:26	44.09
4	delivered	8/10/2017 13:35	83.69

	customer_unique_id	customer_zip_code_prefix
0	7c396fd4830fd04220f754e42b4e5bff	3149
1	3a51803cc0d012c3b5dc8b7528cb05f7	3366
2	ef0996a1a279c26e7ecbd737be23d235	2290

Akkarampalle	
3 e781fdcc107d13d865fc7698711cc572	88032
Bhadrachalam	
4 02c9e0c05a817d4562ec0e8c90f29dba	8577
Vijayawada	

	customer_state	order_item_id	product_id \
0	Andhra Pradesh	1	87285b34884572647811a353c7ac498a
1	Andhra Pradesh	1	87285b34884572647811a353c7ac498a
2	Andhra Pradesh	1	87285b34884572647811a353c7ac498a
3	Andhra Pradesh	1	87285b34884572647811a353c7ac498a
4	Andhra Pradesh	1	b00a32a0b42fd65efb58a5822009f629

	seller_id	price	freight_value \
0	3504c0cb71d7fa48d967e0e4c94d59d9	29.99	8.72
1	3504c0cb71d7fa48d967e0e4c94d59d9	29.99	7.78
2	3504c0cb71d7fa48d967e0e4c94d59d9	29.99	7.78
3	3504c0cb71d7fa48d967e0e4c94d59d9	29.99	14.10
4	3504c0cb71d7fa48d967e0e4c94d59d9	75.90	7.79

	product_category_name	review_score
0	Housewares	4.0
1	Housewares	4.0
2	Housewares	5.0
3	Housewares	3.0
4	Baby	5.0

Checking data types

data_360.dtypes

order_id	object
customer_id	object
order_status	object
order_purchase_timestamp	object
payment_value	float64
customer_unique_id	object
customer_zip_code_prefix	int64
customer_city	object
customer_state	object
order_item_id	int64
product_id	object
seller_id	object
price	float64
freight_value	float64
product_category_name	object
review_score	float64
dtype:	object

```
data_360.order_purchase_timestamp=pd.to_datetime(data_360.order_purchase_timestamp)
```

```

data_360['year']=data_360.order_purchase_timestamp.dt.year
data_360['month']=data_360.order_purchase_timestamp.dt.month_name()
data_360['week']=data_360.order_purchase_timestamp.dt.weekofyear
data_360['time']=data_360.order_purchase_timestamp.dt.time
data_360['day']=data_360.order_purchase_timestamp.dt.date
data_360['month_year']=data_360.order_purchase_timestamp.dt.date.astype(str).str[0:7]
data_360['price_to_pay']=data_360['price']+data_360['freight_value']

```

Checking duplicates

```

data_360.duplicated(['order_id','product_id','order_item_id']).sum()

0

```

Exploratory Data Analysis

Calculating and Defining high level metrics(General KPIs) like

Total Revenue

```

ORDER_ITEMS['price_to_pay']= ORDER_ITEMS['price'] +
ORDER_ITEMS['freight_value']
ORDER_ITEMS.head(3)

```

	order_id	order_item_id	\
0	00010242fe8c5a6d1ba2dd792cb16214	1	
1	00018f77f2f0320c557190d7a144bdd3	1	
2	000229ec398224ef6ca0657da4fc703e	1	

	product_id	seller_id
\		
0	4244733e06e7ecb4970a6e2683c13e61	48436dade18ac8b2bce089ec2a041202
1	e5f2d52b802189ee658865ca93d83a8f	dd7ddc04e1b6c2c614352b383efe2d36
2	c777355d18b72b67abbeef9df44fd0fd	5b51032eddd242adc84c38acab88f23d

	shipping_limit_date	price	freight_value	price_to_pay
0	9/19/2017 9:45	58.9	13.29	72.19
1	5/3/2017 11:05	239.9	19.93	259.83
2	1/18/2018 14:48	199.0	17.87	216.87

```

ORDER_ITEMS.price_to_pay.sum()

```

15843553.24

Total Quantity

```

ORDER_ITEMS.order_item_id.count()

```

112650

Total Products

```
PRODUCTS['product_id'].nunique()
```

32951

Total categories

```
PRODUCTS['product_category_name'].nunique()
```

71

Total sellers

```
SELLERS['seller_id'].count()
```

3095

Total locations

```
CUSTOMERS['customer_zip_code_prefix'].nunique()
```

14994

Total Payment methods

```
ORDER_PAYMENTS['payment_type'].value_counts()
```

```
credit_card    76795
```

```
UPI            19784
```

```
voucher        5775
```

```
debit_card     1529
```

```
not_defined      3
```

```
Name: payment_type, dtype: int64
```

```
len(ORDER_PAYMENTS['payment_type'].value_counts())
```

5

Understanding how many new customers acquired every month

```
data_360.groupby(['order_id', 'customer_id']).last()
```

```
order_status \
```

```
order_id      customer_id
```

```
00010242fe8c5a6d1ba2dd792cb16214 3ce436f183e68e07877b285a838db11a  
delivered
```

```
00018f77f2f0320c557190d7a144bdd3 f6dd3ec061db4e3987629fe6b26e5cce  
delivered
```

```
000229ec398224ef6ca0657da4fc703e 6489ae5e4333f3693df5ad4372dab6d3  
delivered
```

```
00024acbcdcf0a6daa1e931b038114c75 d4eb9395c8c0431ee92fce09860c5a06  
delivered
```

```
00042b26cf59d7ce69dfabb4e55b4fd9 58dbd0b2d70206bf40e62cd34e84d795  
delivered
```

```
...
```

```

...
fffc94f6ce00a00581880bf54a75a037 b51593916b4b8e0d6f66f2ae24f2673d
delivered
fffc46ef2263f404302a634eb57f7eb 84c5d4fbaf120aae381fad077416eaa0
delivered
fffce4705a9662cd70adb13d4a31832d 29309aa813182aaddc9b259e31b870e6
delivered
fffe18544ffabc95dfada21779c9644f b5e6afd5a41800fdf401e0272ca74655
delivered
fffe41c64501cc87c801fd61db3f6244 96d649da0cc4ff33bb408b199d4c7dcf
delivered

```

```

order_purchase_timestamp \
order_id                  customer_id

00010242fe8c5a6d1ba2dd792cb16214 3ce436f183e68e07877b285a838db11a
2017-09-13 08:59:00
00018f77f2f0320c557190d7a144bdd3 f6dd3ec061db4e3987629fe6b26e5cce
2017-04-26 10:53:00
000229ec398224ef6ca0657da4fc703e 6489ae5e4333f3693df5ad4372dab6d3
2018-01-14 14:33:00
00024acbcdcf0a6daa1e931b038114c75 d4eb9395c8c0431ee92fce09860c5a06
2018-08-08 10:00:00
00042b26cf59d7ce69dfabb4e55b4fd9 58dbd0b2d70206bf40e62cd34e84d795
2017-02-04 13:57:00

```

```

...
fffc94f6ce00a00581880bf54a75a037 b51593916b4b8e0d6f66f2ae24f2673d
2018-04-23 13:57:00
fffc46ef2263f404302a634eb57f7eb 84c5d4fbaf120aae381fad077416eaa0
2018-07-14 10:26:00
fffce4705a9662cd70adb13d4a31832d 29309aa813182aaddc9b259e31b870e6
2017-10-23 17:07:00
fffe18544ffabc95dfada21779c9644f b5e6afd5a41800fdf401e0272ca74655
2017-08-14 23:02:00
fffe41c64501cc87c801fd61db3f6244 96d649da0cc4ff33bb408b199d4c7dcf
2018-06-09 17:00:00

```

```

payment_value \
order_id                  customer_id

00010242fe8c5a6d1ba2dd792cb16214 3ce436f183e68e07877b285a838db11a
72.19
00018f77f2f0320c557190d7a144bdd3 f6dd3ec061db4e3987629fe6b26e5cce
259.83
000229ec398224ef6ca0657da4fc703e 6489ae5e4333f3693df5ad4372dab6d3
216.87
00024acbcdcf0a6daa1e931b038114c75 d4eb9395c8c0431ee92fce09860c5a06

```

25.78	
00042b26cf59d7ce69dfabb4e55b4fd9	58dbd0b2d70206bf40e62cd34e84d795
218.04	
...	
...	
fff94f6ce00a00581880bf54a75a037	b51593916b4b8e0d6f66f2ae24f2673d
343.40	
fffcd46ef2263f404302a634eb57f7eb	84c5d4fbaf120aae381fad077416eaa0
386.53	
fffce4705a9662cd70adb13d4a31832d	29309aa813182aaddc9b259e31b870e6
116.85	
fffe18544ffabc95dfada21779c9644f	b5e6afd5a41800fdf401e0272ca74655
64.71	
fffe41c64501cc87c801fd61db3f6244	96d649da0cc4ff33bb408b199d4c7dcf
55.79	

customer_unique_id \ order_id	customer_id
00010242fe8c5a6d1ba2dd792cb16214	3ce436f183e68e07877b285a838db11a
871766c5855e863f6eccc05f988b23cb	
00018f77f2f0320c557190d7a144bdd3	f6dd3ec061db4e3987629fe6b26e5cce
eb28e67c4c0b83846050ddfb8a35d051	
000229ec398224ef6ca0657da4fc703e	6489ae5e4333f3693df5ad4372dab6d3
3818d81c6709e39d06b2738a8d3a2474	
00024acbcd0a6daa1e931b038114c75	d4eb9395c8c0431ee92fce09860c5a06
af861d436cfc08b2c2ddefd0ba074622	
00042b26cf59d7ce69dfabb4e55b4fd9	58dbd0b2d70206bf40e62cd34e84d795
64b576fb70d441e8f1b2d7d446e483c5	
...	
...	
fff94f6ce00a00581880bf54a75a037	b51593916b4b8e0d6f66f2ae24f2673d
0c9aeda10a71f369396d0c04dce13a64	
fffcd46ef2263f404302a634eb57f7eb	84c5d4fbaf120aae381fad077416eaa0
0da9fe112eae0c74d3ba1fe16de0988b	
fffce4705a9662cd70adb13d4a31832d	29309aa813182aaddc9b259e31b870e6
cd79b407828f02fdbba457111c38e4c4	
fffe18544ffabc95dfada21779c9644f	b5e6afd5a41800fdf401e0272ca74655
eb803377c9315b564bde672039306	
fffe41c64501cc87c801fd61db3f6244	96d649da0cc4ff33bb408b199d4c7dcf
cd76a00d8e3ca5e6ab9ed9ecb6667ac4	

customer_zip_code_prefix \ order_id	customer_id
00010242fe8c5a6d1ba2dd792cb16214	3ce436f183e68e07877b285a838db11a
28013	
00018f77f2f0320c557190d7a144bdd3	f6dd3ec061db4e3987629fe6b26e5cce

15775
 000229ec398224ef6ca0657da4fc703e 6489ae5e4333f3693df5ad4372dab6d3
 35661
 00024acbcd0a6daa1e931b038114c75 d4eb9395c8c0431ee92fce09860c5a06
 12952
 00042b26cf59d7ce69dfabb4e55b4fd9 58dbd0b2d70206bf40e62cd34e84d795
 13226
 ...
 ...
 fffc94f6ce00a00581880bf54a75a037 b51593916b4b8e0d6f66f2ae24f2673d
 65077
 fffcd46ef2263f404302a634eb57f7eb 84c5d4fbaf120aae381fad077416eaa0
 81690
 fffce4705a9662cd70adb13d4a31832d 29309aa813182aaddc9b259e31b870e6
 4039
 fffe18544ffabc95dfada21779c9644f b5e6afd5a41800fdf401e0272ca74655
 13289
 fffe41c64501cc87c801fd61db3f6244 96d649da0cc4ff33bb408b199d4c7dcf
 18605

customer_city \ order_id	customer_id
00010242fe8c5a6d1ba2dd792cb16214 Guntakal	3ce436f183e68e07877b285a838db11a
00018f77f2f0320c557190d7a144bdd3 Kirandul	f6dd3ec061db4e3987629fe6b26e5cce
000229ec398224ef6ca0657da4fc703e Kanker	6489ae5e4333f3693df5ad4372dab6d3
00024acbcd0a6daa1e931b038114c75 Patancheru	d4eb9395c8c0431ee92fce09860c5a06
00042b26cf59d7ce69dfabb4e55b4fd9 Changanassery	58dbd0b2d70206bf40e62cd34e84d795
...	
...	
fffc94f6ce00a00581880bf54a75a037 Chilakaluripet	b51593916b4b8e0d6f66f2ae24f2673d
fffc46ef2263f404302a634eb57f7eb Anakapalle	84c5d4fbaf120aae381fad077416eaa0
fffc4705a9662cd70adb13d4a31832d Akkarampalle	29309aa813182aaddc9b259e31b870e6
fffe18544ffabc95dfada21779c9644f Repalle	b5e6afd5a41800fdf401e0272ca74655
fffe41c64501cc87c801fd61db3f6244 Chalala	96d649da0cc4ff33bb408b199d4c7dcf

customer_state \ order_id	customer_id
------------------------------	-------------

```

00010242fe8c5a6d1ba2dd792cb16214 3ce436f183e68e07877b285a838db11a
Andhra Pradesh
00018f77f2f0320c557190d7a144bdd3 f6dd3ec061db4e3987629fe6b26e5cce
Chhattisgarh
000229ec398224ef6ca0657da4fc703e 6489ae5e4333f3693df5ad4372dab6d3
Chhattisgarh
00024acbcd0a6daa1e931b038114c75 d4eb9395c8c0431ee92fce09860c5a06
Andhra Pradesh
00042b26cf59d7ce69dfabb4e55b4fd9 58dbd0b2d70206bf40e62cd34e84d795
Kerala
...
...
fffc94f6ce00a00581880bf54a75a037 b51593916b4b8e0d6f66f2ae24f2673d
Andhra Pradesh
fffc46ef2263f404302a634eb57f7eb 84c5d4fbaf120aae381fad077416eaa0
Andhra Pradesh
fffc4705a9662cd70adb13d4a31832d 29309aa813182aaddc9b259e31b870e6
Andhra Pradesh
fffe18544ffabc95dfada21779c9644f b5e6afd5a41800fdf401e0272ca74655
Andhra Pradesh
fffe41c64501cc87c801fd61db3f6244 96d649da0cc4ff33bb408b199d4c7dcf
Gujarat

```

```

order_item_id \
order_id

```

```

customer_id

```

```

00010242fe8c5a6d1ba2dd792cb16214 3ce436f183e68e07877b285a838db11a
1
00018f77f2f0320c557190d7a144bdd3 f6dd3ec061db4e3987629fe6b26e5cce
1
000229ec398224ef6ca0657da4fc703e 6489ae5e4333f3693df5ad4372dab6d3
1
00024acbcd0a6daa1e931b038114c75 d4eb9395c8c0431ee92fce09860c5a06
1
00042b26cf59d7ce69dfabb4e55b4fd9 58dbd0b2d70206bf40e62cd34e84d795
1
...
...
fffc94f6ce00a00581880bf54a75a037 b51593916b4b8e0d6f66f2ae24f2673d
1
fffc46ef2263f404302a634eb57f7eb 84c5d4fbaf120aae381fad077416eaa0
1
fffc4705a9662cd70adb13d4a31832d 29309aa813182aaddc9b259e31b870e6
1
fffe18544ffabc95dfada21779c9644f b5e6afd5a41800fdf401e0272ca74655
1
fffe41c64501cc87c801fd61db3f6244 96d649da0cc4ff33bb408b199d4c7dcf
1

```

product_id \ order_id	customer_id
00010242fe8c5a6d1ba2dd792cb16214	3ce436f183e68e07877b285a838db11a
4244733e06e7ecb4970a6e2683c13e61	
00018f77f2f0320c557190d7a144bdd3	f6dd3ec061db4e3987629fe6b26e5cce
e5f2d52b802189ee658865ca93d83a8f	
000229ec398224ef6ca0657da4fc703e	6489ae5e4333f3693df5ad4372dab6d3
c777355d18b72b67abbef9df44fd0fd	
00024acbcd0a6daa1e931b038114c75	d4eb9395c8c0431ee92fce09860c5a06
7634da152a4610f1595efa32f14722fc	
00042b26cf59d7ce69dfabb4e55b4fd9	58dbd0b2d70206bf40e62cd34e84d795
ac6c3623068f30de03045865e4e10089	
...	
...	
fffc94f6ce00a00581880bf54a75a037	b51593916b4b8e0d6f66f2ae24f2673d
4aa6014eceb682077f9dc4bffe05b0	
fffc46ef2263f404302a634eb57f7eb	84c5d4fbaf120aae381fad077416eaa0
32e07fd915822b0765e448c4dd74c828	
fffce4705a9662cd70adb13d4a31832d	29309aa813182aaddc9b259e31b870e6
72a30483855e2eafc67aee5dc2560482	
fffe18544ffabc95dfada21779c9644f	b5e6afd5a41800fdf401e0272ca74655
9c422a519119dcad7575db5af1ba540e	
fffe41c64501cc87c801fd61db3f6244	96d649da0cc4ff33bb408b199d4c7dcf
350688d9dc1e75ff97be326363655e01	

seller_id \ order_id	customer_id
00010242fe8c5a6d1ba2dd792cb16214	3ce436f183e68e07877b285a838db11a
48436dade18ac8b2bce089ec2a041202	
00018f77f2f0320c557190d7a144bdd3	f6dd3ec061db4e3987629fe6b26e5cce
dd7ddc04e1b6c2c614352b383efe2d36	
000229ec398224ef6ca0657da4fc703e	6489ae5e4333f3693df5ad4372dab6d3
5b51032eddd242adc84c38acab88f23d	
00024acbcd0a6daa1e931b038114c75	d4eb9395c8c0431ee92fce09860c5a06
9d7a1d34a5052409006425275ba1c2b4	
00042b26cf59d7ce69dfabb4e55b4fd9	58dbd0b2d70206bf40e62cd34e84d795
df560393f3a51e74553ab94004ba5c87	
...	
...	
fffc94f6ce00a00581880bf54a75a037	b51593916b4b8e0d6f66f2ae24f2673d
b8bc237ba3788b23da09c0f1f3a3288c	
fffc46ef2263f404302a634eb57f7eb	84c5d4fbaf120aae381fad077416eaa0
f3c38ab652836d21de61fb8314b69182	
fffce4705a9662cd70adb13d4a31832d	29309aa813182aaddc9b259e31b870e6
c3cfdc648177fdbbbb35635a37472c53	

fffe18544ffabc95dfada21779c9644f b5e6afd5a41800fdf401e0272ca74655
2b3e4a2a3ea8e01938cabda2a3e5cc79
fffe41c64501cc87c801fd61db3f6244 96d649da0cc4ff33bb408b199d4c7dcf
f7ccf836d21b2fb1de37564105216cc1

price \
order_id

customer_id

00010242fe8c5a6d1ba2dd792cb16214 3ce436f183e68e07877b285a838db11a
58.90
00018f77f2f0320c557190d7a144bdd3 f6dd3ec061db4e3987629fe6b26e5cce
239.90
000229ec398224ef6ca0657da4fc703e 6489ae5e4333f3693df5ad4372dab6d3
199.00
00024acbcd0a6daa1e931b038114c75 d4eb9395c8c0431ee92fce09860c5a06
12.99
00042b26cf59d7ce69dfabb4e55b4fd9 58dbd0b2d70206bf40e62cd34e84d795
199.90
...
...
fffc94f6ce00a00581880bf54a75a037 b51593916b4b8e0d6f66f2ae24f2673d
299.99
fffc46ef2263f404302a634eb57f7eb 84c5d4fbaf120aae381fad077416eaa0
350.00
fffce4705a9662cd70adb13d4a31832d 29309aa813182aaddc9b259e31b870e6
99.90
fffe18544ffabc95dfada21779c9644f b5e6afd5a41800fdf401e0272ca74655
55.99
fffe41c64501cc87c801fd61db3f6244 96d649da0cc4ff33bb408b199d4c7dcf
43.00

freight_value \
order_id

customer_id

00010242fe8c5a6d1ba2dd792cb16214 3ce436f183e68e07877b285a838db11a
13.29
00018f77f2f0320c557190d7a144bdd3 f6dd3ec061db4e3987629fe6b26e5cce
19.93
000229ec398224ef6ca0657da4fc703e 6489ae5e4333f3693df5ad4372dab6d3
17.87
00024acbcd0a6daa1e931b038114c75 d4eb9395c8c0431ee92fce09860c5a06
12.79
00042b26cf59d7ce69dfabb4e55b4fd9 58dbd0b2d70206bf40e62cd34e84d795
18.14
...
...
fffc94f6ce00a00581880bf54a75a037 b51593916b4b8e0d6f66f2ae24f2673d
43.41

ffffcd46ef2263f404302a634eb57f7eb	84c5d4fbaf120aae381fad077416eaa0
36.53	
fffce4705a9662cd70adb13d4a31832d	29309aa813182aaddc9b259e31b870e6
16.95	
fffe18544ffabc95dfada21779c9644f	b5e6afd5a41800fdf401e0272ca74655
8.72	
fffe41c64501cc87c801fd61db3f6244	96d649da0cc4ff33bb408b199d4c7dcf
12.79	

product_category_name \

order_id	customer_id
----------	-------------

00010242fe8c5a6d1ba2dd792cb16214	3ce436f183e68e07877b285a838db11a
Cool_Stuff	
00018f77f2f0320c557190d7a144bdd3	f6dd3ec061db4e3987629fe6b26e5cce
Pet_Shop	
000229ec398224ef6ca0657da4fc703e	6489ae5e4333f3693df5ad4372dab6d3
Furniture_Decor	
00024acbcd0a6daa1e931b038114c75	d4eb9395c8c0431ee92fce09860c5a06
Perfumery	
00042b26cf59d7ce69dfabb4e55b4fd9	58dbd0b2d70206bf40e62cd34e84d795
Garden_Tools	
...	
...	
ffffc94f6ce00a00581880bf54a75a037	b51593916b4b8e0d6f66f2ae24f2673d
Housewares	
ffffcd46ef2263f404302a634eb57f7eb	84c5d4fbaf120aae381fad077416eaa0
Computers_Accessories	
fffce4705a9662cd70adb13d4a31832d	29309aa813182aaddc9b259e31b870e6
Sports_Leisure	
fffe18544ffabc95dfada21779c9644f	b5e6afd5a41800fdf401e0272ca74655
Computers_Accessories	
fffe41c64501cc87c801fd61db3f6244	96d649da0cc4ff33bb408b199d4c7dcf
Bed_Bath_Table	

review_score \

order_id	customer_id
----------	-------------

00010242fe8c5a6d1ba2dd792cb16214	3ce436f183e68e07877b285a838db11a
5.0	
00018f77f2f0320c557190d7a144bdd3	f6dd3ec061db4e3987629fe6b26e5cce
4.0	
000229ec398224ef6ca0657da4fc703e	6489ae5e4333f3693df5ad4372dab6d3
5.0	
00024acbcd0a6daa1e931b038114c75	d4eb9395c8c0431ee92fce09860c5a06
4.0	
00042b26cf59d7ce69dfabb4e55b4fd9	58dbd0b2d70206bf40e62cd34e84d795
5.0	

```

...
...
fffc94f6ce00a00581880bf54a75a037 b51593916b4b8e0d6f66f2ae24f2673d
5.0
fffc46ef2263f404302a634eb57f7eb 84c5d4fbaf120aae381fad077416eaa0
5.0
fffce4705a9662cd70adb13d4a31832d 29309aa813182aaddc9b259e31b870e6
5.0
fffe18544ffabc95dfada21779c9644f b5e6afd5a41800fdf401e0272ca74655
5.0
fffe41c64501cc87c801fd61db3f6244 96d649da0cc4ff33bb408b199d4c7dcf
5.0

```

```

year \
order_id                                customer_id

00010242fe8c5a6d1ba2dd792cb16214 3ce436f183e68e07877b285a838db11a
2017
00018f77f2f0320c557190d7a144bdd3 f6dd3ec061db4e3987629fe6b26e5cce
2017
000229ec398224ef6ca0657da4fc703e 6489ae5e4333f3693df5ad4372dab6d3
2018
00024acbcd0a6daa1e931b038114c75 d4eb9395c8c0431ee92fce09860c5a06
2018
00042b26cf59d7ce69dfabb4e55b4fd9 58dbd0b2d70206bf40e62cd34e84d795
2017
...

```

```

.
fffc94f6ce00a00581880bf54a75a037 b51593916b4b8e0d6f66f2ae24f2673d
2018
fffc46ef2263f404302a634eb57f7eb 84c5d4fbaf120aae381fad077416eaa0
2018
fffce4705a9662cd70adb13d4a31832d 29309aa813182aaddc9b259e31b870e6
2017
fffe18544ffabc95dfada21779c9644f b5e6afd5a41800fdf401e0272ca74655
2017
fffe41c64501cc87c801fd61db3f6244 96d649da0cc4ff33bb408b199d4c7dcf
2018

```

```

month \
order_id                                customer_id

00010242fe8c5a6d1ba2dd792cb16214 3ce436f183e68e07877b285a838db11a
September
00018f77f2f0320c557190d7a144bdd3 f6dd3ec061db4e3987629fe6b26e5cce
April
000229ec398224ef6ca0657da4fc703e 6489ae5e4333f3693df5ad4372dab6d3
January

```

00024acbcd0a6daa1e931b038114c75 d4eb9395c8c0431ee92fce09860c5a06
August
00042b26cf59d7ce69dfabb4e55b4fd9 58dbd0b2d70206bf40e62cd34e84d795
February
...
...
fffc94f6ce00a00581880bf54a75a037 b51593916b4b8e0d6f66f2ae24f2673d
April
fffc46ef2263f404302a634eb57f7eb 84c5d4fbaf120aae381fad077416eaa0
July
fffce4705a9662cd70adb13d4a31832d 29309aa813182aaddc9b259e31b870e6
October
fffe18544ffabc95dfada21779c9644f b5e6afd5a41800fdf401e0272ca74655
August
fffe41c64501cc87c801fd61db3f6244 96d649da0cc4ff33bb408b199d4c7dcf
June

week \ order_id	customer_id
00010242fe8c5a6d1ba2dd792cb16214 37	3ce436f183e68e07877b285a838db11a
00018f77f2f0320c557190d7a144bdd3 17	f6dd3ec061db4e3987629fe6b26e5cce
000229ec398224ef6ca0657da4fc703e 2	6489ae5e4333f3693df5ad4372dab6d3
00024acbcd0a6daa1e931b038114c75 32	d4eb9395c8c0431ee92fce09860c5a06
00042b26cf59d7ce69dfabb4e55b4fd9 5	58dbd0b2d70206bf40e62cd34e84d795
...	..
...	.
fffc94f6ce00a00581880bf54a75a037 17	b51593916b4b8e0d6f66f2ae24f2673d
fffc46ef2263f404302a634eb57f7eb 28	84c5d4fbaf120aae381fad077416eaa0
fffce4705a9662cd70adb13d4a31832d 43	29309aa813182aaddc9b259e31b870e6
fffe18544ffabc95dfada21779c9644f 33	b5e6afd5a41800fdf401e0272ca74655
fffe41c64501cc87c801fd61db3f6244 23	96d649da0cc4ff33bb408b199d4c7dcf

time \ order_id	customer_id
00010242fe8c5a6d1ba2dd792cb16214 08:59:00	3ce436f183e68e07877b285a838db11a

```

00018f77f2f0320c557190d7a144bdd3 f6dd3ec061db4e3987629fe6b26e5cce
10:53:00
000229ec398224ef6ca0657da4fc703e 6489ae5e4333f3693df5ad4372dab6d3
14:33:00
00024acbcdcf0a6daa1e931b038114c75 d4eb9395c8c0431ee92fce09860c5a06
10:00:00
00042b26cf59d7ce69dfabb4e55b4fd9 58dbd0b2d70206bf40e62cd34e84d795
13:57:00
...
...
fffc94f6ce00a00581880bf54a75a037 b51593916b4b8e0d6f66f2ae24f2673d
13:57:00
fffc46ef2263f404302a634eb57f7eb 84c5d4fbaf120aae381fad077416eaa0
10:26:00
fffce4705a9662cd70adb13d4a31832d 29309aa813182aaddc9b259e31b870e6
17:07:00
fffe18544ffabc95dfada21779c9644f b5e6afd5a41800fdf401e0272ca74655
23:02:00
fffe41c64501cc87c801fd61db3f6244 96d649da0cc4ff33bb408b199d4c7dcf
17:00:00

```

```

day \
order_id                                customer_id

00010242fe8c5a6d1ba2dd792cb16214 3ce436f183e68e07877b285a838db11a
2017-09-13
00018f77f2f0320c557190d7a144bdd3 f6dd3ec061db4e3987629fe6b26e5cce
2017-04-26
000229ec398224ef6ca0657da4fc703e 6489ae5e4333f3693df5ad4372dab6d3
2018-01-14
00024acbcdcf0a6daa1e931b038114c75 d4eb9395c8c0431ee92fce09860c5a06
2018-08-08
00042b26cf59d7ce69dfabb4e55b4fd9 58dbd0b2d70206bf40e62cd34e84d795
2017-02-04
...
...
fffc94f6ce00a00581880bf54a75a037 b51593916b4b8e0d6f66f2ae24f2673d
2018-04-23
fffc46ef2263f404302a634eb57f7eb 84c5d4fbaf120aae381fad077416eaa0
2018-07-14
fffce4705a9662cd70adb13d4a31832d 29309aa813182aaddc9b259e31b870e6
2017-10-23
fffe18544ffabc95dfada21779c9644f b5e6afd5a41800fdf401e0272ca74655
2017-08-14
fffe41c64501cc87c801fd61db3f6244 96d649da0cc4ff33bb408b199d4c7dcf
2018-06-09

```

```

month_year \

```


order_id	customer_id
00010242fe8c5a6d1ba2dd792cb16214 2017-09	3ce436f183e68e07877b285a838db11a
00018f77f2f0320c557190d7a144bdd3 2017-04	f6dd3ec061db4e3987629fe6b26e5cce
000229ec398224ef6ca0657da4fc703e 2018-01	6489ae5e4333f3693df5ad4372dab6d3
00024acbcdcf0a6daa1e931b038114c75 2018-08	d4eb9395c8c0431ee92fce09860c5a06
00042b26cf59d7ce69dfabb4e55b4fd9 2017-02	58dbd0b2d70206bf40e62cd34e84d795
...	
...	
fffc94f6ce00a00581880bf54a75a037 2018-04	b51593916b4b8e0d6f66f2ae24f2673d
fffc46ef2263f404302a634eb57f7eb 2018-07	84c5d4fbaf120aae381fad077416eaa0
fffce4705a9662cd70adb13d4a31832d 2017-10	29309aa813182aaddc9b259e31b870e6
fffe18544ffabc95dfada21779c9644f 2017-08	b5e6afd5a41800fdf401e0272ca74655
fffe41c64501cc87c801fd61db3f6244 2018-06	96d649da0cc4ff33bb408b199d4c7dcf

price_to_pay	customer_id
order_id	
00010242fe8c5a6d1ba2dd792cb16214 72.19	3ce436f183e68e07877b285a838db11a
00018f77f2f0320c557190d7a144bdd3 259.83	f6dd3ec061db4e3987629fe6b26e5cce
000229ec398224ef6ca0657da4fc703e 216.87	6489ae5e4333f3693df5ad4372dab6d3
00024acbcdcf0a6daa1e931b038114c75 25.78	d4eb9395c8c0431ee92fce09860c5a06
00042b26cf59d7ce69dfabb4e55b4fd9 218.04	58dbd0b2d70206bf40e62cd34e84d795
...	
...	
fffc94f6ce00a00581880bf54a75a037 343.40	b51593916b4b8e0d6f66f2ae24f2673d
fffc46ef2263f404302a634eb57f7eb 386.53	84c5d4fbaf120aae381fad077416eaa0
fffce4705a9662cd70adb13d4a31832d 116.85	29309aa813182aaddc9b259e31b870e6
fffe18544ffabc95dfada21779c9644f 64.71	b5e6afd5a41800fdf401e0272ca74655
fffe41c64501cc87c801fd61db3f6244	96d649da0cc4ff33bb408b199d4c7dcf

55.79

[98665 rows x 21 columns]

```
# sorting data by customer level
```

```
C = data_360.groupby(['order_id', 'customer_id']).last().reset_index()
customer_count_per_month=C.groupby(['month_year',C.customer_id.rename(
'customer')]).customer_id.count().reset_index()
customer_firstpurchase=C.groupby('customer_id').month_year.min().reset_index().rename(columns={'customer_id':'customer','month_year':'first_purchase_month'})
C_final=customer_count_per_month.merge(customer_firstpurchase,on='customer')
C_final.customer_id=np.where(C_final.month_year==C_final.first_purchase_month,'New','Old')
C_final.head(15)
```

	month_year	customer	customer_id	\
0	2016-09	08c5351a6acalc1589a38f244edeee9d	New	
1	2016-09	683c54fc24d40ee9f8a6fc179fd9856c	New	
2	2016-10	00474d2582fd72663036795b7ab8cfc1	New	
3	2016-10	01415cfeb907d8ce0e17075b4c097fe9	New	
4	2016-10	01be2c0c2d55c597b5ec011e26e4b0d1	New	
5	2016-10	01f7b7a4e25cda9ce48c0f7263f7452d	New	
6	2016-10	01fc05160cf790b9ed54ec795ff07688	New	
7	2016-10	021833e9737a1145b5a6e3053f0f4329	New	
8	2016-10	02cb3a8ef6e13d37560379559e2f533d	New	
9	2016-10	031f08a1ebdcfb5e706831bf64de3860	New	
10	2016-10	04356ca5b944f7a92d6b103bdb44268a	New	
11	2016-10	04a043776b45158df5f274435321c199	New	
12	2016-10	053716fea805d6b29d6f8b6113fefe4d	New	
13	2016-10	06a70917afd2dcd59396eleac836c646	New	
14	2016-10	070db51ef1d6a1bd858c21b03de83e66	New	

	first_purchase_month
0	2016-09
1	2016-09
2	2016-10
3	2016-10
4	2016-10
5	2016-10
6	2016-10
7	2016-10
8	2016-10
9	2016-10
10	2016-10
11	2016-10
12	2016-10
13	2016-10
14	2016-10

```
C_final.query('customer_id=="New"').groupby('month_year').customer_id.  
count()
```

```
month_year
```

```
2016-09      2  
2016-10     308  
2016-12      1  
2017-01     789  
2017-02    1733  
2017-03    2641  
2017-04    2391  
2017-05    3660  
2017-06    3217  
2017-07    3969  
2017-08    4293  
2017-09    4243  
2017-10    4568  
2017-11    7451  
2017-12    5624  
2018-01    7220  
2018-02    6694  
2018-03    7188  
2018-04    6934  
2018-05    6853  
2018-06    6160  
2018-07    6273  
2018-08    6452  
2018-09      1
```

```
Name: customer_id, dtype: int64
```

Understand the retention of customers on month on month basis

```
C_final.customer_id.value_counts()
```

```
New      98665
```

```
Name: customer_id, dtype: int64
```

```
data_360.customer_id.nunique()
```

```
98665
```

```
data_360.order_id.nunique()
```

```
98665
```

How the revenues from existing/new customers on month on month basis

```
d = data_360.drop_duplicates('customer_id')
```

```
D=d.groupby('month_year').payment_value.sum().reset_index()
```

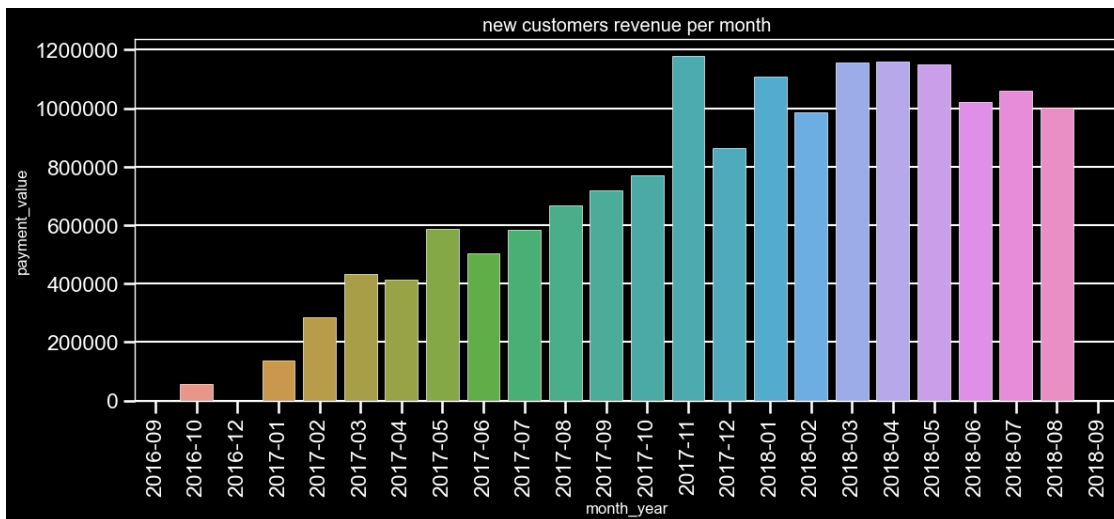
```
plt.style.use('dark_background')
```

```
plt.rcParams.update({'text.color': 'white'})
```

```
plt.figure(figsize=(13.5,5))
```

```
sns.barplot(D.month_year,D.payment_value)
```

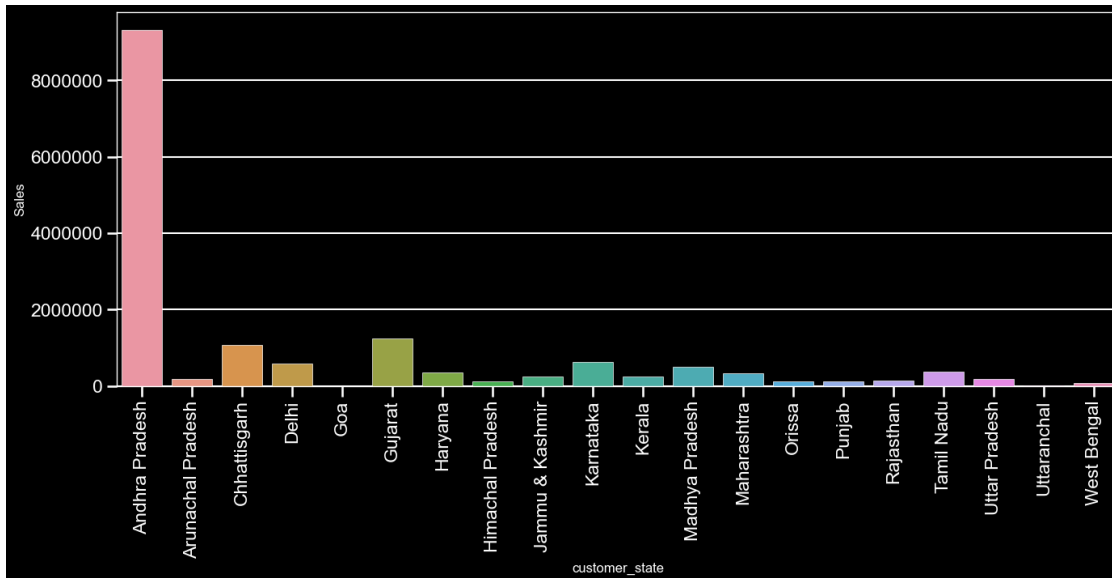
```
plt.xticks(rotation=90)
plt.ticklabel_format(style='plain',axis='y')
plt.title('new customers revenue per month')
plt.show()
```



Understand the trends/seasonality of sales, quantity by category, location, month, week, day, time, channel, payment method etc...

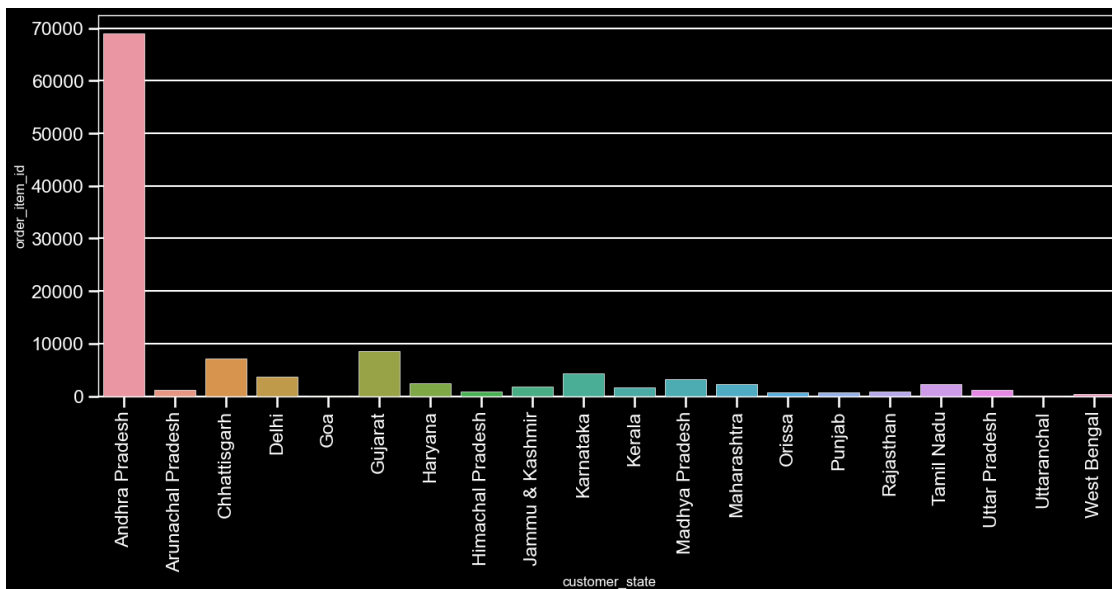
Sales by State

```
S_state=data_360.groupby('customer_state').price_to_pay.sum().reset_index()
plt.style.use('dark_background')
plt.rcParams.update({'text.color': 'white'})
plt.figure(figsize=(16,6))
sns.barplot(S_state.customer_state,S_state.price_to_pay)
plt.ticklabel_format(style='plain',axis='y')
plt.ylabel('Sales')
plt.xticks(rotation=90)
plt.show()
```



Quantity by state

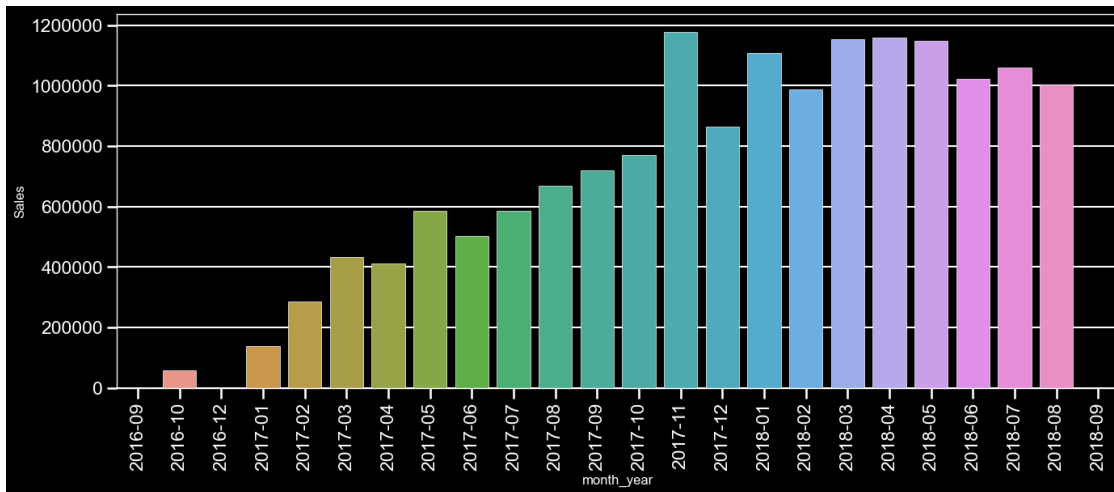
```
Q_state=data_360.groupby('customer_state').order_item_id.count().reset_index()
plt.style.use('dark_background')
plt.rcParams.update({'text.color': 'white'})
plt.figure(figsize=(16,6))
sns.barplot(Q_state.customer_state,Q_state.order_item_id)
plt.ticklabel_format(style='plain',axis='y')
plt.xticks(rotation=90)
plt.show()
```



Sales by Month

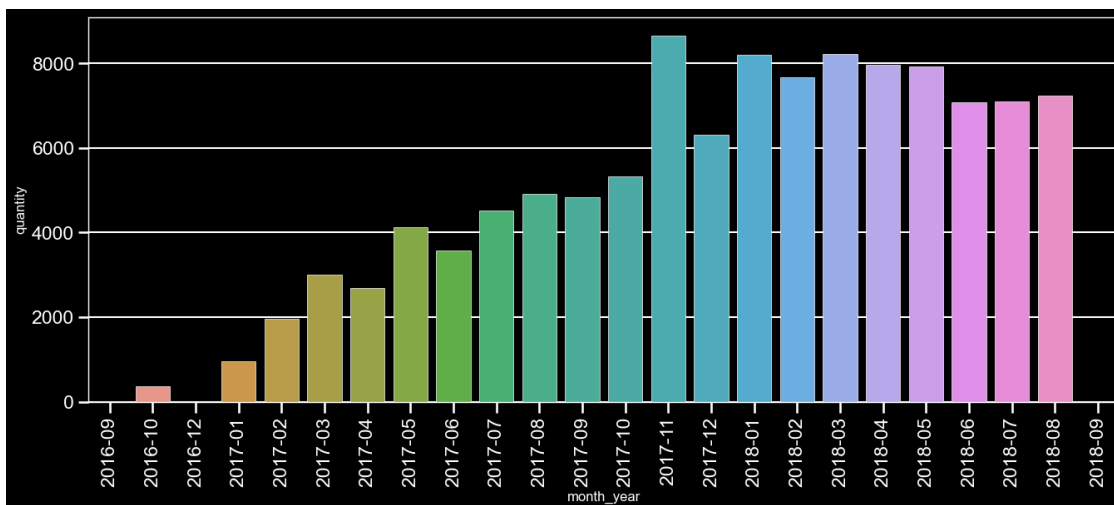
```
S_month=data_360.groupby('month_year').price_to_pay.sum().reset_index()
```

```
plt.figure(figsize=(16,6))
sns.barplot(S_month.month_year,S_month.price_to_pay)
plt.ticklabel_format(style='plain',axis='y')
plt.ylabel('Sales')
plt.xticks(rotation=90)
plt.show()
```



Quantity by month

```
Q_month=data_360.groupby('month_year').order_item_id.count().reset_index()
plt.figure(figsize=(16,6))
sns.barplot(Q_month.month_year,Q_month.order_item_id)
plt.ticklabel_format(style='plain',axis='y')
plt.ylabel('quantity')
plt.xticks(rotation=90)
plt.show()
```



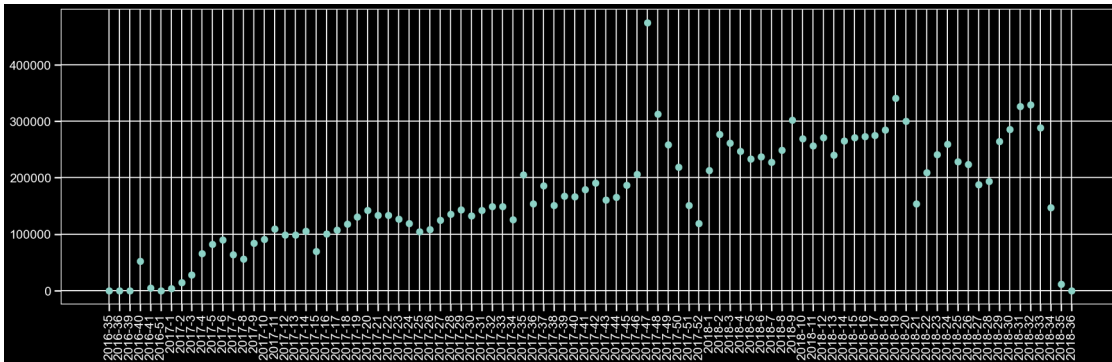
Sales by weeks

```
S_week=data_360.groupby(['year','week']).price_to_pay.sum().reset_index()
```

```

S_week['year_week']=S_week.year.astype(str)
+'-' +S_week.week.astype(str)
plt.figure(figsize=(25,7))
plt.scatter(S_week.year_week,S_week.price_to_pay)
plt.ticklabel_format(style='plain',axis='y')
plt.xticks(rotation=90)
plt.show()

```

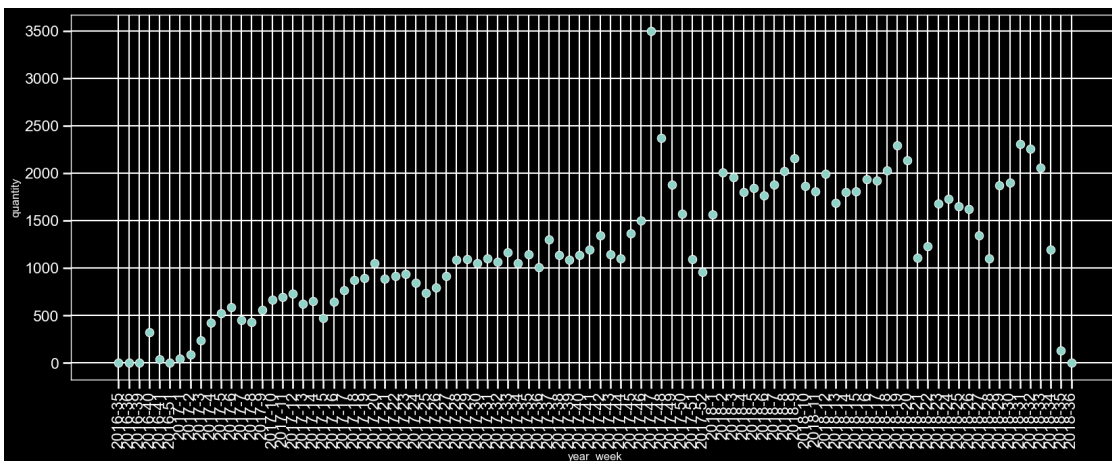


Quantity by weeks

```

Q_week=data_360.groupby(['year','week']).order_item_id.count().reset_index()
Q_week['year_week']=Q_week.year.astype(str)
+'-' +Q_week.week.astype(str)
plt.figure(figsize=(20,7))
sns.scatterplot(Q_week.year_week,Q_week.order_item_id)
plt.ticklabel_format(style='plain',axis='y')
plt.ylabel('quantity')
plt.xticks(rotation=90)
plt.show()

```



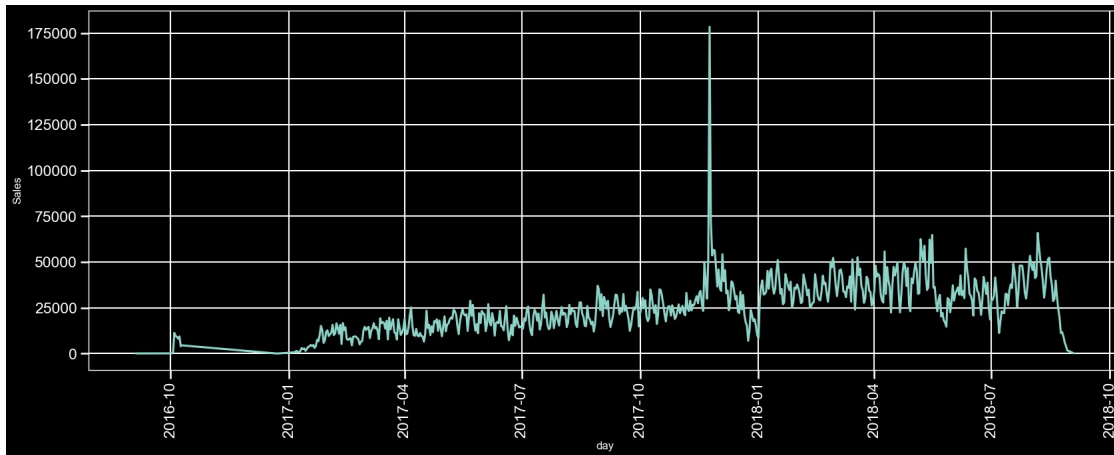
Sales by days

```

S_day=data_360.groupby('day').price_to_pay.sum().reset_index()
plt.figure(figsize=(20,7))
sns.lineplot(x='day',y='price_to_pay',data=S_day)
plt.ticklabel_format(style='plain',axis='y')

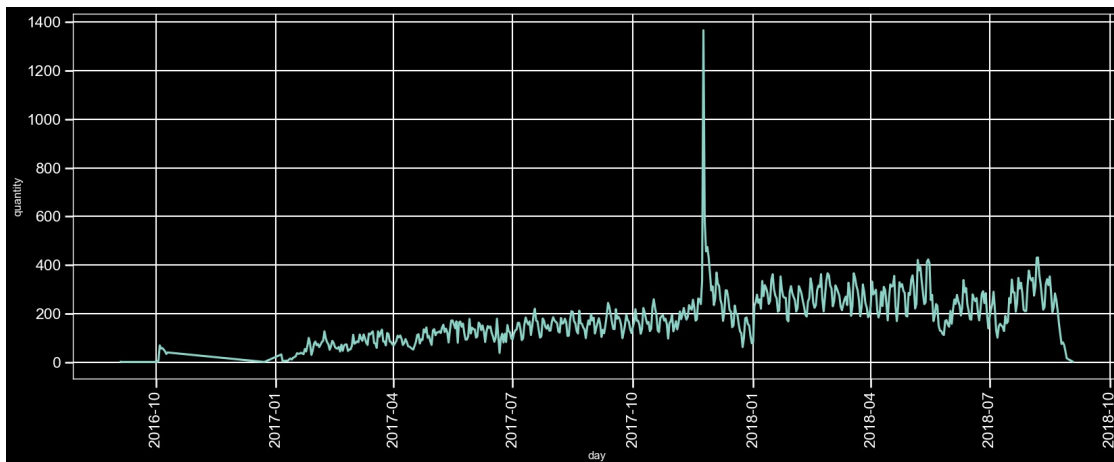
```

```
plt.ylabel('Sales')
plt.xticks(rotation=90)
plt.show()
```



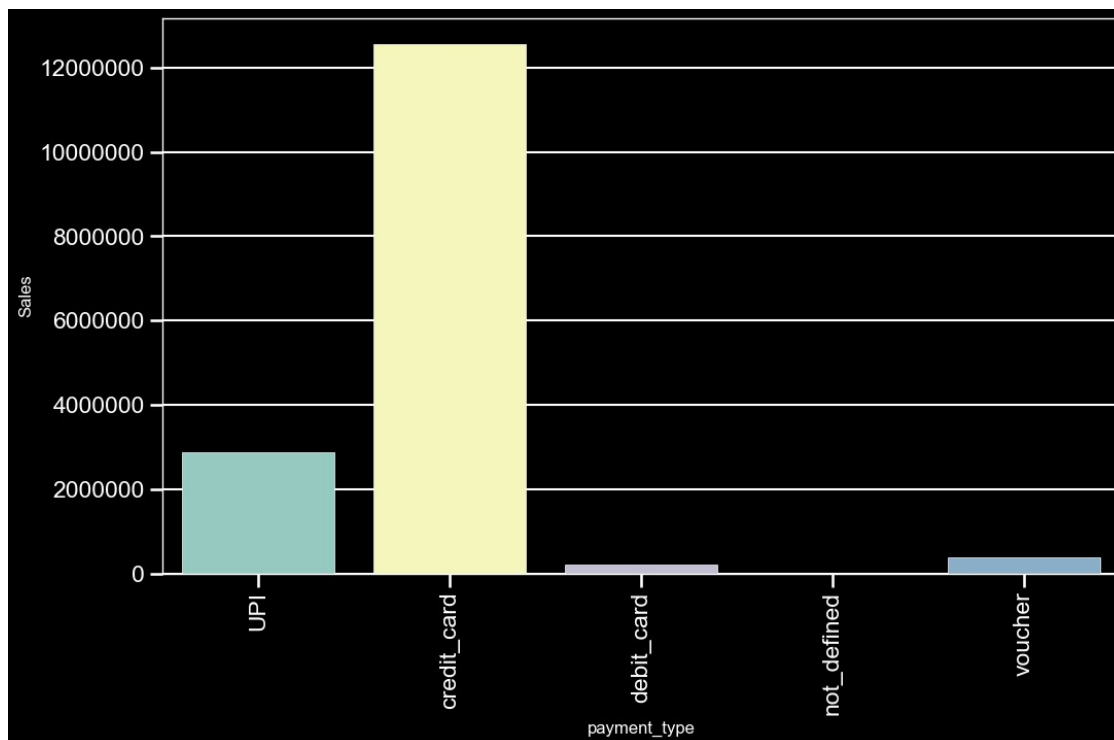
Quantity by days

```
Q_day=data_360.groupby('day').order_item_id.count().reset_index()
plt.figure(figsize=(20,7))
sns.lineplot(x='day',y='order_item_id',data=Q_day)
plt.ticklabel_format(style='plain',axis='y')
plt.ylabel('quantity')
plt.xticks(rotation=90)
plt.show()
```



Payment method

```
pay=ORDER_PAYMENTS.groupby('payment_type').payment_value.sum().reset_index()
plt.figure(figsize=(12,7))
sns.barplot(pay.payment_type,pay.payment_value)
plt.ticklabel_format(style='plain',axis='y')
plt.ylabel('Sales')
plt.xticks(rotation=90)
plt.show()
```

Popular Products by month, seller, state, category.

```
POP_month=data_360.groupby(['month_year',data_360.product_id.rename('product')]).product_id.count().reset_index().sort_values(by=['month_year','product_id'],ascending=[True,False])
POP_month=POP_month.groupby('month_year').head(5).reset_index(drop=True)
POP_month[['month_year','product']]
```

	month_year	product
0	2016-09	c1488892604e4ba5cff5b4eb4d595400
1	2016-09	f293394c72c9b5fafd7023301fc21fc2
2	2016-09	f3c2d01a84c947b078e32bbef0718962
3	2016-10	eba7488e1c67729f045ab43fac426f2e
4	2016-10	d9894482fba41f536a273ba2276d951f
...
105	2018-08	73326828aa5efe1ba096223de496f596
106	2018-08	19c91ef95d509ea33eda93495c4d3481
107	2018-08	3fbc0ef745950c7932d5f2a446189725
108	2018-08	a92930c327948861c015c919a0bcb4a8
109	2018-09	b98992ea80b467987a7fbb88e7f2076a

[110 rows x 2 columns]

```
POP_seller=data_360.groupby(['seller_id',data_360.product_id.rename('product')]).product_id.count().reset_index().sort_values(by=['seller_id','product_id'],ascending=[True,False])
POP_seller=POP_seller.groupby('seller_id').head(5).reset_index(drop=True)
```

```

ue)
POP_seller[['seller_id','product']]

            seller_id
product
0      0015a82c2db000af6aaaf3ae2ecb0532
a2ff5a97bf95719e38ea2e3b4105bce8
1      001cca7ae9ae17fb1caed9dfb1094831
08574b074924071f4e201e151b152b4e
2      001cca7ae9ae17fb1caed9dfb1094831
e251ebd2858belaa7d9b2087a6992580
3      001cca7ae9ae17fb1caed9dfb1094831
98a8c2fa16d7239c606640f5555768e4
4      001cca7ae9ae17fb1caed9dfb1094831
0da9ffd92214425d880de3f94e74ce39
...
...
10367  ffff564a4f9085cd26170f4732393726
8f7a3322e1abfed89ac080b0f7364779
10368  ffff564a4f9085cd26170f4732393726
96aca2f53bcaed6f466449f7fb18ae75
10369  ffff564a4f9085cd26170f4732393726
c4b925e40f11289063a854c47aaef129
10370  ffff564a4f9085cd26170f4732393726
c5897f6f2d995196dbb40542439da9b9
10371  ffff564a4f9085cd26170f4732393726
dbd024d4182504993ad1e3cd2ee9d9e9

```

[10372 rows x 2 columns]

```

POP_state=data_360.groupby(['customer_state',data_360.product_id.renam
e('product')]).product_id.count().reset_index().sort_values(by=['custo
mer_state','product_id'],ascending=[True,False])
POP_state=POP_state.groupby('customer_state').head(5).reset_index(drop
=True)
POP_state[['customer_state','product']]

```

	customer_state	product
0	Andhra Pradesh	aca2eb7d00ea1a7b8ebd4e68314663af
1	Andhra Pradesh	99a4788cb24856965c36a24e339b6058
2	Andhra Pradesh	422879e10f46682990de24d770e7f83d
3	Andhra Pradesh	53b36df67ebb7c41585e8d54d6772e08
4	Andhra Pradesh	389d119b48cf3043d311335e499d9c6b
..
95	West Bengal	99a4788cb24856965c36a24e339b6058
96	West Bengal	30ac6df06dc59ad72cf2f158fc2d904c
97	West Bengal	389d119b48cf3043d311335e499d9c6b
98	West Bengal	ffaf0af7eebb57c7f262b51ebb05dfd6
99	West Bengal	1ba4e3fe92f16fd5a8942f7b7d804b52

[100 rows x 2 columns]

```
POP_category=data_360.groupby(['product_category_name',data_360.product_id.rename('product')]).product_id.count().reset_index().sort_values(by=['product_category_name','product_id'],ascending=[True,False])
POP_category=POP_category.groupby('product_category_name').head(5).reset_index(drop=True)
POP_category[['product_category_name','product']]
```

	product_category_name	product
0	Agro_Industry_And_Commerce	11250b0d4b709fee92441c5f34122aed
1	Agro_Industry_And_Commerce	423a6644f0aa529e8828ff1f91003690
2	Agro_Industry_And_Commerce	672e757f331900b9deea127a2a7b79fd
3	Agro_Industry_And_Commerce	3bebad3cf2c8d1a8d3ce97174643e054
4	Agro_Industry_And_Commerce	a0fe1efb855f3e786f0650268cd77f44
...
343	Watches_Gifts	53b36df67ebb7c41585e8d54d6772e08
344	Watches_Gifts	a62e25e09e05e6faf31d90c6ec1aa3d1
345	Watches_Gifts	e0d64dcfaa3b6db5c54ca298ae101d05
346	Watches_Gifts	a92930c327948861c015c919a0bcb4a8
347	Watches_Gifts	461f43be3bdf8844e65b62d9ac2c7a5a

[348 rows x 2 columns]

Popular categories by state, month

```
CAT_state=data_360.groupby(['customer_state',data_360.product_category_name.rename('category')]).product_category_name.count().reset_index().sort_values(by=['customer_state','product_category_name'],ascending=[True,False])
CAT_state=
CAT_state.groupby('customer_state').head(5).reset_index(drop=True)
CAT_state[['customer_state','category']]
```

	customer_state	category
0	Andhra Pradesh	Bed_Bath_Table
1	Andhra Pradesh	Health_Beauty
2	Andhra Pradesh	Sports_Leisure
3	Andhra Pradesh	Furniture_Decor
4	Andhra Pradesh	Computers_Accessories
...
95	West Bengal	Health_Beauty
96	West Bengal	Telephony
97	West Bengal	Computers_Accessories
98	West Bengal	Bed_Bath_Table
99	West Bengal	Sports_Leisure

[100 rows x 2 columns]

```
CAT_month=data_360.groupby(['month_year',data_360.product_category_name.rename('category')]).product_category_name.count().reset_index().sort_values(by=['month_year','product_category_name'],ascending=[True,False])
CAT_month=CAT_month.groupby('month_year').head(5).reset_index(drop=True)
```

```
e)
CAT_month[['month_year', 'category']]

   month_year      category
0    2016-09  Furniture_Decor
1    2016-09      Telephony
2    2016-10  Furniture_Decor
3    2016-10   Health_Beauty
4    2016-10    Perfumery
...
104   2018-08      Bed_Bath_Table
105   2018-08      Housewares
106   2018-08   Sports_Leisure
107   2018-08  Furniture_Decor
108   2018-09 Kitchen_Dining_Laundry_Garden_Furniture

[109 rows x 2 columns]
```

List top 10 most expensive products sorted by price

```
Expensive_prod = data_360.groupby(['product_id'])['price'].mean()
Expensive_prod.sort_values(ascending =
False).head(10).reset_index().product_id
```

```
0    489ae2aa008f021502940f251d4cce7f
1    69c590f7ffc7bf8db97190b6cb6ed62e
2    1bdf5e6731585cf01aa8169c7028d6ad
3    a6492cc69376c469ab6f61d8f44de961
4    c3ed642d592594bb648ff4a04cee2747
5    259037a6a41845e455183f89c5035f18
6    a1beef8f3992dbd4cd8726796aa69c53
7    6cdf8fc1d741c76586d8b6b15e9eef30
8    6902c1962dd19d540807d0ab8fade5c6
9    4ca7b91a31637bd24fb8e559d5e015e4
Name: product_id, dtype: object
```

2. Performing Customers/sellers Segmentation

Divide the customers into groups based on the revenue generated

```
cust_divd=data_360.groupby('customer_id').price_to_pay.sum().reset_index()
cust_divd['Group_number']=pd.qcut(cust_divd['price_to_pay'],10,labels=False)
cust_divd[['customer_id', 'Group_number']]
```

```
   customer_id  Group_number
0    00012a2ce6f8dcda20d059ce98491703      5
1    000161a058600d5901f007fab4c27140      2
2    0001fd6190edaaf884bc3d49edf079      7
3    0002414f95344307404f0ace7a26f1d5      7
4    000379cdec625522490c315e70c7a9fb      5
...          ...          ...
```

98660	fffc937e9dd47a13f05ecb8290f4d3e	4
98661	fffecc9f79fd8c764f843e9951b11341	3
98662	fffed5b6d849fbd39689bb92087f431	2
98663	ffff42319e9b2d713724ae527742af25	8
98664	ffffa3172527f765de70084a7e53aae8	1

[98665 rows x 2 columns]

Divide the sellers into groups based on the revenue generated

```
seller_divd=data_360.groupby('seller_id').price_to_pay.sum().reset_index()
seller_divd['Group_number']=pd.qcut(seller_divd['price_to_pay'],10,labels=False)
seller_divd[['seller_id','Group_number']]
```

	seller_id	Group_number
0	0015a82c2db000af6aaaf3ae2ecb0532	6
1	001cca7ae9ae17fb1caed9dfb1094831	9
2	001e6ad469a905060d959994f1b41e4f	2
3	002100f778ceb8431b7a1020ff7ab48f	6
4	003554e2dce176b5555353e4f3555ac8	1
...
3090	ffcfefa19b08742c5d315f2791395ee5	0
3091	ffdd9f82b9a447f6f8d4b91554cc7dd3	6
3092	ffeee66ac5d5a62fe688b9d26f83f534	6
3093	fffd5413c0700ac820c7069d66d98c89	9
3094	ffff564a4f9085cd26170f4732393726	6

[3095 rows x 2 columns]

3. Cross-Selling (Which products are selling together)

Hint: We need to find which of the top 10 combinations of products are selling together in each transaction. (combination of 2 or 3 buying together)

```
cs=data_360.groupby(['order_id','product_id']).order_item_id.count().reset_index()
cs=pd.crosstab(data_360.order_id,data_360.product_category_name)
function=lambda x: True if x>0 else False
for i in cs.columns:
    cs[i]=cs[i].apply(function)
cs.head(15)
```

product_category_name	Agro_Industry_And_Commerce	\
order_id		
00010242fe8c5a6d1ba2dd792cb16214		False
00018f77f2f0320c557190d7a144bdd3		False
000229ec398224ef6ca0657da4fc703e		False
00024acbcdff0a6daa1e931b038114c75		False
00042b26cf59d7ce69dfabb4e55b4fd9		False
00048cc3ae777c65dbb7d2a0634bc1ea		False

00054e8431b9d7675808bcb819fb4a32	False
000576fe39319847cbb9d288c5617fa6	False
0005a1a1728c9d785b8e2b08b904576c	False
0005f50442cb953dcd1d21e1fb923495	False
00061f2a7bc09da83e415a52dc8a4af1	False
00063b381e2406b52ad429470734ebd5	False
0006ec9db01a64e59a68b2c340bf65a7	False
0008288aa423d2a3f00fcb17cd7d8719	False
0009792311464db532ff765bf7b182ae	False

product_category_name	Air_Conditioning	Art \
order_id		
00010242fe8c5a6d1ba2dd792cb16214	False	False
00018f77f2f0320c557190d7a144bdd3	False	False
000229ec398224ef6ca0657da4fc703e	False	False
00024acbcd0a6daa1e931b038114c75	False	False
00042b26cf59d7ce69dfabb4e55b4fd9	False	False
00048cc3ae777c65dbb7d2a0634bc1ea	False	False
00054e8431b9d7675808bcb819fb4a32	False	False
000576fe39319847cbb9d288c5617fa6	False	False
0005a1a1728c9d785b8e2b08b904576c	False	False
0005f50442cb953dcd1d21e1fb923495	False	False
00061f2a7bc09da83e415a52dc8a4af1	False	False
00063b381e2406b52ad429470734ebd5	False	False
0006ec9db01a64e59a68b2c340bf65a7	False	False
0008288aa423d2a3f00fcb17cd7d8719	False	False
0009792311464db532ff765bf7b182ae	False	False

product_category_name	Arts_And_Craftmanship	Audio	Auto
Baby \			
order_id			
00010242fe8c5a6d1ba2dd792cb16214	False	False	False
False			
00018f77f2f0320c557190d7a144bdd3	False	False	False
False			
000229ec398224ef6ca0657da4fc703e	False	False	False
False			
00024acbcd0a6daa1e931b038114c75	False	False	False
False			
00042b26cf59d7ce69dfabb4e55b4fd9	False	False	False
False			
00048cc3ae777c65dbb7d2a0634bc1ea	False	False	False
False			
00054e8431b9d7675808bcb819fb4a32	False	False	False
False			
000576fe39319847cbb9d288c5617fa6	False	False	False
False			
0005a1a1728c9d785b8e2b08b904576c	False	False	False
False			

0005f50442cb953dcd1d21e1fb923495 False	False	False	False
00061f2a7bc09da83e415a52dc8a4af1 False	False	False	False
00063b381e2406b52ad429470734ebd5 False	False	False	False
0006ec9db01a64e59a68b2c340bf65a7 False	False	False	False
0008288aa423d2a3f00fcb17cd7d8719 False	False	False	False
0009792311464db532ff765bf7b182ae False	False	False	False

product_category_name	Bed_Bath_Table
Books_General_Interest \	
order_id	

00010242fe8c5a6d1ba2dd792cb16214 False	False
00018f77f2f0320c557190d7a144bdd3 False	False
000229ec398224ef6ca0657da4fc703e False	False
00024acbcd0a6daa1e931b038114c75 False	False
00042b26cf59d7ce69dfabb4e55b4fd9 False	False
00048cc3ae777c65dbb7d2a0634bc1ea False	False
00054e8431b9d7675808bcb819fb4a32 False	False
000576fe39319847cbb9d288c5617fa6 False	False
0005a1a1728c9d785b8e2b08b904576c False	False
0005f50442cb953dcd1d21e1fb923495 False	False
00061f2a7bc09da83e415a52dc8a4af1 False	False
00063b381e2406b52ad429470734ebd5 False	False
0006ec9db01a64e59a68b2c340bf65a7 False	True
0008288aa423d2a3f00fcb17cd7d8719 False	False
0009792311464db532ff765bf7b182ae False	False

product_category_name	Books_Imported	Books_Technical \
order_id		

00010242fe8c5a6d1ba2dd792cb16214	False	False
00018f77f2f0320c557190d7a144bdd3	False	False
000229ec398224ef6ca0657da4fc703e	False	False
00024acbcd0a6daa1e931b038114c75	False	False
00042b26cf59d7ce69dfabb4e55b4fd9	False	False
00048cc3ae777c65dbb7d2a0634bc1ea	False	False
00054e8431b9d7675808bcb819fb4a32	False	False
000576fe39319847cbb9d288c5617fa6	False	False
0005a1a1728c9d785b8e2b08b904576c	False	False
0005f50442cb953dcd1d21e1fb923495	False	True
00061f2a7bc09da83e415a52dc8a4af1	False	False
00063b381e2406b52ad429470734ebd5	False	False
0006ec9db01a64e59a68b2c340bf65a7	False	False
0008288aa423d2a3f00fcb17cd7d8719	False	False
0009792311464db532ff765bf7b182ae	False	False

product_category_name	Cds_Dvds_Musicals
Christmas_Supplies \	
order_id	

00010242fe8c5a6d1ba2dd792cb16214	False
False	
00018f77f2f0320c557190d7a144bdd3	False
False	
000229ec398224ef6ca0657da4fc703e	False
False	
00024acbcd0a6daa1e931b038114c75	False
False	
00042b26cf59d7ce69dfabb4e55b4fd9	False
False	
00048cc3ae777c65dbb7d2a0634bc1ea	False
False	
00054e8431b9d7675808bcb819fb4a32	False
False	
000576fe39319847cbb9d288c5617fa6	False
False	
0005a1a1728c9d785b8e2b08b904576c	False
False	
0005f50442cb953dcd1d21e1fb923495	False
False	
00061f2a7bc09da83e415a52dc8a4af1	False
False	
00063b381e2406b52ad429470734ebd5	False
False	
0006ec9db01a64e59a68b2c340bf65a7	False
False	
0008288aa423d2a3f00fcb17cd7d8719	False
False	
0009792311464db532ff765bf7b182ae	False
False	

product_category_name order_id	Cine_Photo	Computers \
00010242fe8c5a6d1ba2dd792cb16214	False	False
00018f77f2f0320c557190d7a144bdd3	False	False
000229ec398224ef6ca0657da4fc703e	False	False
00024acbcd0a6daa1e931b038114c75	False	False
00042b26cf59d7ce69dfabb4e55b4fd9	False	False
00048cc3ae777c65dbb7d2a0634bc1ea	False	False
00054e8431b9d7675808bcb819fb4a32	False	False
000576fe39319847cbb9d288c5617fa6	False	False
0005a1a1728c9d785b8e2b08b904576c	False	False
0005f50442cb953dcd1d21e1fb923495	False	False
00061f2a7bc09da83e415a52dc8a4af1	False	False
00063b381e2406b52ad429470734ebd5	False	False
0006ec9db01a64e59a68b2c340bf65a7	False	False
0008288aa423d2a3f00fcb17cd7d8719	False	False
0009792311464db532ff765bf7b182ae	False	False

product_category_name Consoles_Games \	Computers_Accessories
order_id	
00010242fe8c5a6d1ba2dd792cb16214	False
False	
00018f77f2f0320c557190d7a144bdd3	False
False	
000229ec398224ef6ca0657da4fc703e	False
False	
00024acbcd0a6daa1e931b038114c75	False
False	
00042b26cf59d7ce69dfabb4e55b4fd9	False
False	
00048cc3ae777c65dbb7d2a0634bc1ea	False
False	
00054e8431b9d7675808bcb819fb4a32	False
False	
000576fe39319847cbb9d288c5617fa6	False
False	
0005a1a1728c9d785b8e2b08b904576c	False
False	
0005f50442cb953dcd1d21e1fb923495	False
False	
00061f2a7bc09da83e415a52dc8a4af1	False
False	
00063b381e2406b52ad429470734ebd5	False
False	
0006ec9db01a64e59a68b2c340bf65a7	False
False	
0008288aa423d2a3f00fcb17cd7d8719	False

False
0009792311464db532ff765bf7b182ae
False

False

product_category_name	Construction_Tools_Construction	\
order_id		
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000229ec398224ef6ca0657da4fc703e	False	
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00042b26cf59d7ce69dfabb4e55b4fd9	False	
00048cc3ae777c65dbb7d2a0634bc1ea	False	
00054e8431b9d7675808bcb819fb4a32	False	
000576fe39319847cbb9d288c5617fa6	False	
0005a1a1728c9d785b8e2b08b904576c	False	
0005f50442cb953dcd1d21e1fb923495	False	
00061f2a7bc09da83e415a52dc8a4af1	False	
00063b381e2406b52ad429470734ebd5	False	
0006ec9db01a64e59a68b2c340bf65a7	False	
0008288aa423d2a3f00fcb17cd7d8719	False	
0009792311464db532ff765bf7b182ae	False	

product_category_name	Construction_Tools_Lights	\
order_id		
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00018f77f2f0320c557190d7a144bdd3	False	
000229ec398224ef6ca0657da4fc703e	False	
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00042b26cf59d7ce69dfabb4e55b4fd9	False	
00048cc3ae777c65dbb7d2a0634bc1ea	False	
00054e8431b9d7675808bcb819fb4a32	False	
000576fe39319847cbb9d288c5617fa6	False	
0005a1a1728c9d785b8e2b08b904576c	False	
0005f50442cb953dcd1d21e1fb923495	False	
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0008288aa423d2a3f00fcb17cd7d8719	False	
0009792311464db532ff765bf7b182ae	False	

product_category_name	Construction_Tools_Safety
Cool_Stuff \	
order_id	
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True	
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False	
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False	

00024acbcd0a6daa1e931b038114c75	False
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00042b26cf59d7ce69dfabb4e55b4fd9	False
False	
00048cc3ae777c65dbb7d2a0634bc1ea	False
False	
00054e8431b9d7675808bcb819fb4a32	False
False	
000576fe39319847cbb9d288c5617fa6	False
False	
0005a1a1728c9d785b8e2b08b904576c	False
False	
0005f50442cb953dcd1d21e1fb923495	False
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00061f2a7bc09da83e415a52dc8a4af1	False
False	
00063b381e2406b52ad429470734ebd5	False
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0006ec9db01a64e59a68b2c340bf65a7	False
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0008288aa423d2a3f00fcb17cd7d8719	False
False	
0009792311464db532ff765bf7b182ae	False
False	

product_category_name	Costruction_Tools_Garden	\
order_id		
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00018f77f2f0320c557190d7a144bdd3	False	
000229ec398224ef6ca0657da4fc703e	False	
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0008288aa423d2a3f00fcb17cd7d8719	False	
0009792311464db532ff765bf7b182ae	False	

product_category_name	Costruction_Tools_Tools	\
order_id		
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00024acbcd0a6daa1e931b038114c75	False	
00042b26cf59d7ce69dfabb4e55b4fd9	False	

00048cc3ae777c65dbb7d2a0634bc1ea	False
00054e8431b9d7675808bcb819fb4a32	False
000576fe39319847cbb9d288c5617fa6	False
0005a1a1728c9d785b8e2b08b904576c	False
0005f50442cb953dcd1d21e1fb923495	False
00061f2a7bc09da83e415a52dc8a4af1	False
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0006ec9db01a64e59a68b2c340bf65a7	False
0008288aa423d2a3f00fcb17cd7d8719	False
0009792311464db532ff765bf7b182ae	False

product_category_name Dvds_Blu_Ray \	Diapers_And_Hygiene	Drinks
order_id		

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00024acbcd0a6daa1e931b038114c75	False	False
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False		
000576fe39319847cbb9d288c5617fa6	False	False
False		
0005a1a1728c9d785b8e2b08b904576c	False	False
False		
0005f50442cb953dcd1d21e1fb923495	False	False
False		
00061f2a7bc09da83e415a52dc8a4af1	False	False
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00063b381e2406b52ad429470734ebd5	False	False
False		
0006ec9db01a64e59a68b2c340bf65a7	False	False
False		
0008288aa423d2a3f00fcb17cd7d8719	False	False
False		
0009792311464db532ff765bf7b182ae	False	False
False		

product_category_name	Electronics	Fashio_Female_Clothing
\		
order_id		

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00054e8431b9d7675808bcb819fb4a32	False	False
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0005a1a1728c9d785b8e2b08b904576c	False	False
0005f50442cb953dcd1d21e1fb923495	False	False
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0008288aa423d2a3f00fcb17cd7d8719	False	False
0009792311464db532ff765bf7b182ae	False	False

product_category_name	Fashion_Bags_Accessories	\
order_id		
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0008288aa423d2a3f00fcb17cd7d8719	False	
0009792311464db532ff765bf7b182ae	False	

product_category_name	Fashion_Childrens_Clothes	\
order_id		
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00018f77f2f0320c557190d7a144bdd3	False	
000229ec398224ef6ca0657da4fc703e	False	
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0008288aa423d2a3f00fcb17cd7d8719	False	
0009792311464db532ff765bf7b182ae	False	

product_category_name	Fashion_Male_Clothing	Fashion_Shoes
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order_id		
00010242fe8c5a6d1ba2dd792cb16214	False	False
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000229ec398224ef6ca0657da4fc703e	False	False
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00061f2a7bc09da83e415a52dc8a4af1	False	False
00063b381e2406b52ad429470734ebd5	False	False
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0008288aa423d2a3f00fcb17cd7d8719	False	False
0009792311464db532ff765bf7b182ae	False	False

product_category_name Fashion_Underwear_Beach \	Fashion_Sport
order_id	

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False	
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False	
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False	
0008288aa423d2a3f00fcb17cd7d8719	False
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0009792311464db532ff765bf7b182ae	False
False	

product_category_name Food_Drink \	Fixed_Telephony	Flowers	Food
order_id			

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False			
00018f77f2f0320c557190d7a144bdd3	False	False	False
False			
000229ec398224ef6ca0657da4fc703e	False	False	False
False			

00024acbcd0a6daa1e931b038114c75 False	False	False	False
00042b26cf59d7ce69dfabb4e55b4fd9 False	False	False	False
00048cc3ae777c65dbb7d2a0634bc1ea False	False	False	False
00054e8431b9d7675808bcb819fb4a32 False	False	False	False
000576fe39319847cbb9d288c5617fa6 False	False	False	False
0005a1a1728c9d785b8e2b08b904576c False	False	False	False
0005f50442cb953dcd1d21e1fb923495 False	False	False	False
00061f2a7bc09da83e415a52dc8a4af1 False	False	False	False
00063b381e2406b52ad429470734ebd5 False	False	False	False
0006ec9db01a64e59a68b2c340bf65a7 False	False	False	False
0008288aa423d2a3f00fcb17cd7d8719 False	False	False	False
0009792311464db532ff765bf7b182ae False	False	False	False

product_category_name Furniture_Decor \	Furniture_Bedroom
order_id	

00010242fe8c5a6d1ba2dd792cb16214	False	False
00018f77f2f0320c557190d7a144bdd3	False	False
000229ec398224ef6ca0657da4fc703e	False	True
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0008288aa423d2a3f00fcb17cd7d8719	False	False
0009792311464db532ff765bf7b182ae	False	False

product_category_name	Furniture_Living_Room	\
order_id		
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000229ec398224ef6ca0657da4fc703e	False	
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0009792311464db532ff765bf7b182ae	False	

product_category_name	Furniture_Mattress_And_Upholstery	\
order_id		
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00018f77f2f0320c557190d7a144bdd3	False	
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0008288aa423d2a3f00fcb17cd7d8719	False	
0009792311464db532ff765bf7b182ae	False	

product_category_name	Garden_Tools	Health_Beauty	\
order_id			

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0006ec9db01a64e59a68b2c340bf65a7	False	False
0008288aa423d2a3f00fcb17cd7d8719	True	False
0009792311464db532ff765bf7b182ae	False	False

product_category_name	Home_Appliances
Home_Appliances_2 \	
order_id	

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0008288aa423d2a3f00fcb17cd7d8719	False	False
0009792311464db532ff765bf7b182ae	False	False

product_category_name order_id	Home_Comfort_2	Home_Confort	\
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0008288aa423d2a3f00fcb17cd7d8719	False	False	
0009792311464db532ff765bf7b182ae	False	False	

product_category_name order_id	Home_Construction	Housewares	\
00010242fe8c5a6d1ba2dd792cb16214	False	False	
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000576fe39319847cbb9d288c5617fa6	False	False	
0005a1a1728c9d785b8e2b08b904576c	False	False	
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0009792311464db532ff765bf7b182ae	False	False	

product_category_name order_id	Industry_Commerce_And_Business	\
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00061f2a7bc09da83e415a52dc8a4af1	False
00063b381e2406b52ad429470734ebd5	False
0006ec9db01a64e59a68b2c340bf65a7	False
0008288aa423d2a3f00fcb17cd7d8719	False
0009792311464db532ff765bf7b182ae	False

product_category_name
Kitchen_Dining_Laundry_Garden_Furniture \

order_id

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False
0008288aa423d2a3f00fcb17cd7d8719
False
0009792311464db532ff765bf7b182ae
False

product_category_name order_id	La_Cuisine	Luggage_Accessories \
00010242fe8c5a6d1ba2dd792cb16214	False	False
00018f77f2f0320c557190d7a144bdd3	False	False
000229ec398224ef6ca0657da4fc703e	False	False
00024acbcd0a6daa1e931b038114c75	False	False
00042b26cf59d7ce69dfabb4e55b4fd9	False	False
00048cc3ae777c65dbb7d2a0634bc1ea	False	False
00054e8431b9d7675808bcb819fb4a32	False	False

000576fe39319847cbb9d288c5617fa6	False	False
0005a1a1728c9d785b8e2b08b904576c	False	False
0005f50442cb953dcd1d21e1fb923495	False	False
00061f2a7bc09da83e415a52dc8a4af1	False	False
00063b381e2406b52ad429470734ebd5	False	False
0006ec9db01a64e59a68b2c340bf65a7	False	False
0008288aa423d2a3f00fcb17cd7d8719	False	False
0009792311464db532ff765bf7b182ae	False	False

product_category_name	Market_Place	Music
Musical_Instruments \		
order_id		

00010242fe8c5a6d1ba2dd792cb16214	False	False
False		
00018f77f2f0320c557190d7a144bdd3	False	False
False		
000229ec398224ef6ca0657da4fc703e	False	False
False		
00024acbcd0a6daa1e931b038114c75	False	False
False		
00042b26cf59d7ce69dfabb4e55b4fd9	False	False
False		
00048cc3ae777c65dbb7d2a0634bc1ea	False	False
False		
00054e8431b9d7675808bcb819fb4a32	False	False
False		
000576fe39319847cbb9d288c5617fa6	False	False
False		
0005a1a1728c9d785b8e2b08b904576c	False	False
False		
0005f50442cb953dcd1d21e1fb923495	False	False
False		
00061f2a7bc09da83e415a52dc8a4af1	False	False
False		
00063b381e2406b52ad429470734ebd5	False	False
False		
0006ec9db01a64e59a68b2c340bf65a7	False	False
False		
0008288aa423d2a3f00fcb17cd7d8719	False	False
False		
0009792311464db532ff765bf7b182ae	False	False
False		

product_category_name	Office_Furniture	Party_Supplies
Perfumery \		
order_id		

00010242fe8c5a6d1ba2dd792cb16214	False	False
False		

00018f77f2f0320c557190d7a144bdd3 False	False	False
000229ec398224ef6ca0657da4fc703e False	False	False
00024acbcd0a6daa1e931b038114c75 True	False	False
00042b26cf59d7ce69dfabb4e55b4fd9 False	False	False
00048cc3ae777c65dbb7d2a0634bc1ea False	False	False
00054e8431b9d7675808bcb819fb4a32 False	False	False
000576fe39319847cbb9d288c5617fa6 False	False	False
0005a1a1728c9d785b8e2b08b904576c False	False	False
0005f50442cb953dcd1d21e1fb923495 False	False	False
00061f2a7bc09da83e415a52dc8a4af1 False	False	False
00063b381e2406b52ad429470734ebd5 False	False	False
0006ec9db01a64e59a68b2c340bf65a7 False	False	False
0008288aa423d2a3f00fcb17cd7d8719 False	False	False
0009792311464db532ff765bf7b182ae False	False	False

product_category_name order_id	Pet_Shop	Security_And_Services \
00010242fe8c5a6d1ba2dd792cb16214	False	False
00018f77f2f0320c557190d7a144bdd3	True	False
000229ec398224ef6ca0657da4fc703e	False	False
00024acbcd0a6daa1e931b038114c75	False	False
00042b26cf59d7ce69dfabb4e55b4fd9	False	False
00048cc3ae777c65dbb7d2a0634bc1ea	False	False
00054e8431b9d7675808bcb819fb4a32	False	False
000576fe39319847cbb9d288c5617fa6	False	False
0005a1a1728c9d785b8e2b08b904576c	False	False
0005f50442cb953dcd1d21e1fb923495	False	False
00061f2a7bc09da83e415a52dc8a4af1	False	False
00063b381e2406b52ad429470734ebd5	False	False
0006ec9db01a64e59a68b2c340bf65a7	False	False
0008288aa423d2a3f00fcb17cd7d8719	False	False
0009792311464db532ff765bf7b182ae	False	False

product_category_name Small_Appliances \	Signaling_And_Security
order_id	

00010242fe8c5a6d1ba2dd792cb16214	False
False	
00018f77f2f0320c557190d7a144bdd3	False
False	
000229ec398224ef6ca0657da4fc703e	False
False	
00024acbcd0a6daa1e931b038114c75	False
False	
00042b26cf59d7ce69dfabb4e55b4fd9	False
False	
00048cc3ae777c65dbb7d2a0634bc1ea	False
False	
00054e8431b9d7675808bcb819fb4a32	False
False	
000576fe39319847cbb9d288c5617fa6	False
False	
0005a1a1728c9d785b8e2b08b904576c	False
False	
0005f50442cb953dcd1d21e1fb923495	False
False	
00061f2a7bc09da83e415a52dc8a4af1	False
False	
00063b381e2406b52ad429470734ebd5	False
False	
0006ec9db01a64e59a68b2c340bf65a7	False
False	
0008288aa423d2a3f00fcb17cd7d8719	False
False	
0009792311464db532ff765bf7b182ae	False
False	

product_category_name
Small_Appliances_Home_Oven_And_Coffee \
order_id

00010242fe8c5a6d1ba2dd792cb16214
False
00018f77f2f0320c557190d7a144bdd3
False
000229ec398224ef6ca0657da4fc703e
False
00024acbcd0a6daa1e931b038114c75
False
00042b26cf59d7ce69dfabb4e55b4fd9
False
00048cc3ae777c65dbb7d2a0634bc1ea
False
00054e8431b9d7675808bcb819fb4a32
False

000576fe39319847cbb9d288c5617fa6
 False
 0005a1a1728c9d785b8e2b08b904576c
 False
 0005f50442cb953dcd1d21e1fb923495
 False
 00061f2a7bc09da83e415a52dc8a4af1
 False
 00063b381e2406b52ad429470734ebd5
 False
 0006ec9db01a64e59a68b2c340bf65a7
 False
 0008288aa423d2a3f00fcb17cd7d8719
 False
 0009792311464db532ff765bf7b182ae
 False

product_category_name order_id	Sports_Leisure	Stationery \
00010242fe8c5a6d1ba2dd792cb16214	False	False
00018f77f2f0320c557190d7a144bdd3	False	False
000229ec398224ef6ca0657da4fc703e	False	False
00024acbcd0a6daa1e931b038114c75	False	False
00042b26cf59d7ce69dfabb4e55b4fd9	False	False
00048cc3ae777c65dbb7d2a0634bc1ea	False	False
00054e8431b9d7675808bcb819fb4a32	False	False
000576fe39319847cbb9d288c5617fa6	False	False
0005a1a1728c9d785b8e2b08b904576c	False	False
0005f50442cb953dcd1d21e1fb923495	False	False
00061f2a7bc09da83e415a52dc8a4af1	False	False
00063b381e2406b52ad429470734ebd5	False	False
0006ec9db01a64e59a68b2c340bf65a7	False	False
0008288aa423d2a3f00fcb17cd7d8719	False	False
0009792311464db532ff765bf7b182ae	True	False

product_category_name Toys \	Tablets_Printing_Image	Telephony
order_id		
00010242fe8c5a6d1ba2dd792cb16214		False
False		False
00018f77f2f0320c557190d7a144bdd3		False
False		False
000229ec398224ef6ca0657da4fc703e		False
False		False
00024acbcd0a6daa1e931b038114c75		False
False		False
00042b26cf59d7ce69dfabb4e55b4fd9		False
False		False
00048cc3ae777c65dbb7d2a0634bc1ea		False

False		
00054e8431b9d7675808bcb819fb4a32	False	True
False		
000576fe39319847cbb9d288c5617fa6	False	False
False		
0005a1a1728c9d785b8e2b08b904576c	False	False
False		
0005f50442cb953dcd1d21e1fb923495	False	False
False		
00061f2a7bc09da83e415a52dc8a4af1	False	False
False		
00063b381e2406b52ad429470734ebd5	False	False
False		
0006ec9db01a64e59a68b2c340bf65a7	False	False
False		
0008288aa423d2a3f00fcb17cd7d8719	False	False
False		
0009792311464db532ff765bf7b182ae	False	False
False		

product_category_name	Watches_Gifts
order_id	
00010242fe8c5a6d1ba2dd792cb16214	False
00018f77f2f0320c557190d7a144bdd3	False
000229ec398224ef6ca0657da4fc703e	False
00024acbcdcf0a6daa1e931b038114c75	False
00042b26cf59d7ce69dfabb4e55b4fd9	False
00048cc3ae777c65dbb7d2a0634bc1ea	False
00054e8431b9d7675808bcb819fb4a32	False
000576fe39319847cbb9d288c5617fa6	False
0005a1a1728c9d785b8e2b08b904576c	False
0005f50442cb953dcd1d21e1fb923495	False
00061f2a7bc09da83e415a52dc8a4af1	False
00063b381e2406b52ad429470734ebd5	False
0006ec9db01a64e59a68b2c340bf65a7	False
0008288aa423d2a3f00fcb17cd7d8719	False
0009792311464db532ff765bf7b182ae	False

4. Payment Behaviour

How customers are paying?

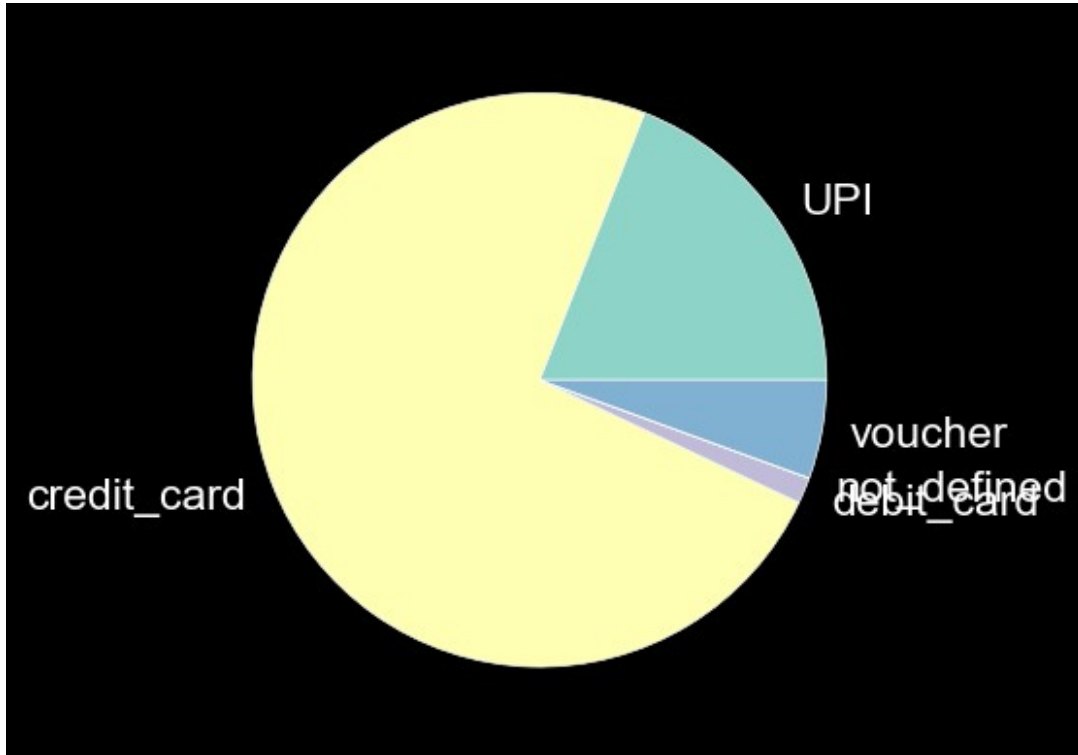
```
ORDER_PAYMENTS['payment_type'].value_counts()
```

```
credit_card    76795
UPI            19784
voucher        5775
debit_card     1529
not_defined      3
Name: payment_type, dtype: int64
```

```

payment_behaviour=ORDER_PAYMENTS.merge(ORDERS,on='order_id')
a=payment_behaviour.groupby('payment_type').customer_id.count().reset_index()
plt.pie(a.customer_id,labels=a.payment_type)
plt.show()

```



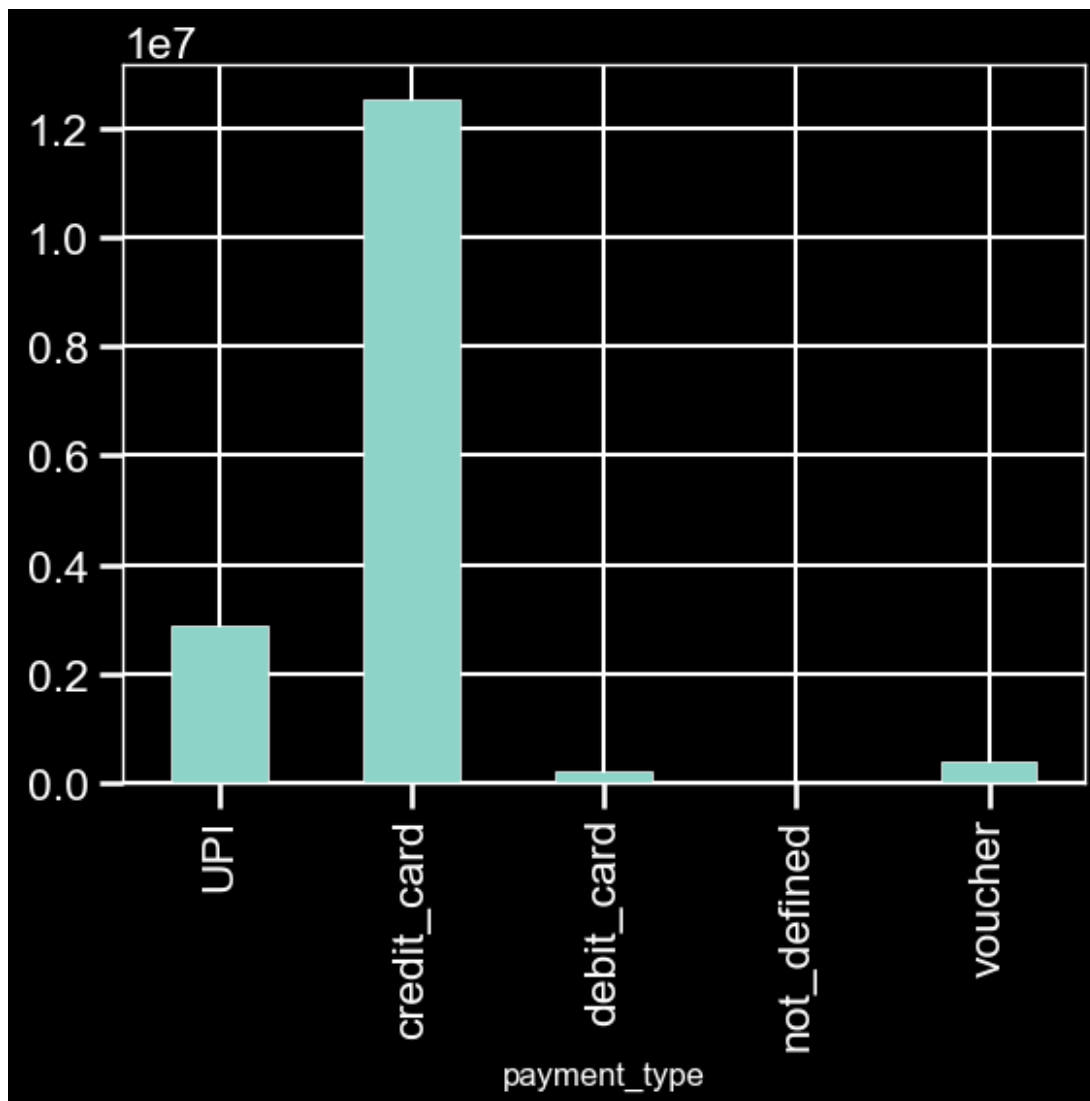
Which payment channels are used by most customers?

```

ORDER_PAYMENTS.groupby('payment_type').payment_value.sum().plot.bar()

```

<AxesSubplot:xlabel='payment_type'>



5.Customer satisfaction towards category & product

Which categories (top 10) are maximum rated & minimum rated?

```
category_ratings=data_360.groupby('product_category_name').review_score.mean().reset_index().sort_values(by='review_score')
```

top 10 min rated

```
category_ratings.head(10)
```

	product_category_name	review_score
61	Security_And_Services	2.500000
23	Diapers_And_Hygiene	3.256410
46	Home_Comfort_2	3.366667
57	Office_Furniture	3.480189
30	Fashion_Male_Clothing	3.621212
34	Fixed_Telephony	3.670455
58	Party_Supplies	3.767442
27	Fashio_Female_Clothing	3.781250

```

52          La_Cuisine      3.785714
4          Audio           3.814560

```

```

# top 10 max rated
category_ratings.tail(10)

```

```

          product_category_name  review_score
32          Fashion_Sport        4.233333
37          Food_Drink           4.300360
64  Small_Appliances_Home_Oven_And_Coffee  4.302632
53          Luggage_Accessories  4.309524
10          Books_Technical       4.333333
22  Costruction_Tools_Tools       4.359223
9          Books_Imported        4.400000
8          Books_General_Interest  4.439421
29  Fashion_Childrens_Clothes     4.500000
11          Cds_Dvds_Musicals     4.642857

```

Which products (top10) are maximum rated & minimum rated?

```

prod = category_ratings.groupby(['product_category_name'])
[['review_score']].count().sort_values(by='review_score',ascending=False)
prod.head()

```

```

          review_score
product_category_name
Agro_Industry_And_Commerce      1
Home_Appliances_2              1
Kitchen_Dining_Laundry_Garden_Furniture  1
Industry_Commerce_And_Business  1
Housewares                    1

```

```

prod.tail()

```

```

          review_score
product_category_name
Diapers_And_Hygiene      1
Costruction_Tools_Tools  1
Costruction_Tools_Garden  1
Cool_Stuff               1
Watches_Gifts            1

```

Average rating by location, seller, product, category, month etc.

Average rating by location

data at customer level

```

avg_loc=data_360.groupby(['order_id','customer_id']).last().reset_index()
avg_loc.groupby('customer_state').review_score.mean().reset_index()

```

```

          customer_state  review_score
0      Andhra Pradesh      4.070959

```

1	Arunachal Pradesh	4.131413
2	Chhattisgarh	4.108265
3	Delhi	4.073934
4	Goa	4.800000
5	Gujarat	4.102550
6	Haryana	4.181336
7	Himachal Pradesh	4.040136
8	Jammu & Kashmir	4.096405
9	Karnataka	4.089914
10	Kerala	4.162821
11	Madhya Pradesh	4.112350
12	Maharashtra	4.147739
13	Orissa	4.149518
14	Punjab	4.219259
15	Rajasthan	4.197516
16	Tamil Nadu	4.178368
17	Uttar Pradesh	4.173659
18	Uttaranchal	3.917526
19	West Bengal	4.063014

Average rating by seller

data at product and seller level:

```
avg_sell=data_360.groupby(['order_id','product_id','seller_id']).last(
).reset_index()
avg_sell.groupby('seller_id').review_score.mean().reset_index()
```

	seller_id	review_score
0	0015a82c2db000af6aaaf3ae2ecb0532	3.666667
1	001cca7ae9ae17fb1caed9dfb1094831	3.935323
2	001e6ad469a905060d959994f1b41e4f	1.000000
3	002100f778ceb8431b7a1020ff7ab48f	3.981818
4	003554e2dce176b5555353e4f3555ac8	5.000000
...
3090	ffcfefaf19b08742c5d315f2791395ee5	1.000000
3091	ffdd9f82b9a447f6f8d4b91554cc7dd3	4.333333
3092	ffeee66ac5d5a62fe688b9d26f83f534	4.214286
3093	fffd5413c0700ac820c7069d66d98c89	3.866667
3094	ffff564a4f9085cd26170f4732393726	2.100000

[3095 rows x 2 columns]

Average rating by product

data at product level:

```
avg_prod=data_360.groupby(['order_id','product_id']).last().reset_index()
avg_prod.groupby('product_id').review_score.mean().reset_index()
```

	product_id	review_score
0	00066f42aeeb9f3007548bb9d3f33c38	5.0
1	00088930e925c41fd95ebfe695fd2655	4.0
2	0009406fd7479715e4bef61dd91f2462	1.0

```

3      000b8f95fcb9e0096488278317764d19      5.0
4      000d9be29b5207b54e86aa1b1ac54872      5.0
...
32946  fff6177642830a9a94a0f2cba5e476d1      4.5
32947  fff81cc3158d2725c0655ab9ba0f712c      4.0
32948  fff9553ac224cec9d15d49f5a263411f      5.0
32949  fffdb2d0ec8d6a61f0a0a0db3f25b441      5.0
32950  fffe9eef12fcbd74a2f2b007dde0c58      4.0

```

[32951 rows x 2 columns]

Average rating by location

data at product level:

```

avg_cat=data_360.groupby(['order_id','product_id']).last().reset_index
()
avg_cat.groupby('product_category_name').review_score.mean().reset_index()

```

	product_category_name	review_score
0	Agro_Industry_And_Commerce	4.027322
1	Air_Conditioning	3.984252
2	Art	4.004950
3	Arts_And_Craftmanship	4.125000
4	Audio	3.818571
..
66	Stationery	4.218606
67	Tablets_Printing_Image	4.075949
68	Telephony	3.971075
69	Toys	4.160719
70	Watches_Gifts	4.028453

[71 rows x 2 columns]

Average rating by month

data at product level:

```

avg_mon=data_360.groupby(['order_id','product_id']).last().reset_index
()
avg_mon.groupby('month_year').review_score.mean().reset_index()

```

	month_year	review_score
0	2016-09	1.000000
1	2016-10	3.600917
2	2016-12	5.000000
3	2017-01	4.061286
4	2017-02	4.054657
5	2017-03	4.082937
6	2017-04	4.033658
7	2017-05	4.139364
8	2017-06	4.128078
9	2017-07	4.164812
10	2017-08	4.228271

11	2017-09	4.168147
12	2017-10	4.094929
13	2017-11	3.887368
14	2017-12	3.991585
15	2018-01	3.997871
16	2018-02	3.799263
17	2018-03	3.713631
18	2018-04	4.109459
19	2018-05	4.160672
20	2018-06	4.246096
21	2018-07	4.236214
22	2018-08	4.225996
23	2018-09	1.000000