In [3]:
```
import pandas as pd
import mysql.connector
import os

# List of CSV files and their corresponding table names
csv_files = [
    ('customers.csv', 'customers'),
    ('orders.csv', 'orders'),
    ('order_items.csv', 'order_items'),
    ('sellers.csv', 'sellers'),
    ('products.csv', 'products'),
    ('geolocation.csv', 'geolocation'),
    ('payments.csv', 'payments')  # Added payments.csv for specific handling
]

# Connect to the MySQL database
conn = mysql.connector.connect(
    host='localhost',
    user='root',
    password='Yash@2002',
    database='ecommerce'
)
cursor = conn.cursor()

# Folder containing the CSV files
folder_path = 'D:/OneDrive/Desktop/Ecommerce/archive (2)'

def get_sql_type(dtype):
    if pd.api.types.is_integer_dtype(dtype):
        return 'INT'
    elif pd.api.types.is_float_dtype(dtype):
        return 'FLOAT'
    elif pd.api.types.is_bool_dtype(dtype):
        return 'BOOLEAN'
    elif pd.api.types.is_datetime64_any_dtype(dtype):
        return 'DATETIME'
    else:
        return 'TEXT'

for csv_file, table_name in csv_files:
    file_path = os.path.join(folder_path, csv_file)

    # Read the CSV file into a pandas DataFrame
    df = pd.read_csv(file_path)

    # Replace NaN with None to handle SQL NULL
    df = df.where(pd.notnull(df), None)

    # Debugging: Check for NaN values
    print(f"Processing {csv_file}")
    print(f"NaN values before replacement:\n{df.isnull().sum()}\n")

    # Clean column names
    df.columns = [col.replace(' ', '_').replace('-', '_').replace('.', '_') for

    # Generate the CREATE TABLE statement with appropriate data types
    columns = ', '.join([f'`{col}` {get_sql_type(df[col].dtype)}' for col in df.
    create_table_query = f'CREATE TABLE IF NOT EXISTS `{table_name}` ({columns})
```

```
    cursor.execute(create_table_query)

    # Insert DataFrame data into the MySQL table
    for _, row in df.iterrows():
        # Convert row to tuple and handle NaN/None explicitly
        values = tuple(None if pd.isna(x) else x for x in row)
        sql = f"INSERT INTO `{table_name}` ({', '.join(['`' + col + '`' for col
        cursor.execute(sql, values)

    # Commit the transaction for the current CSV file
    conn.commit()

# Close the connection
conn.close()
```

```
Processing customers.csv
NaN values before replacement:
customer_id                 0
customer_unique_id          0
customer_zip_code_prefix    0
customer_city               0
customer_state              0
dtype: int64

Processing orders.csv
NaN values before replacement:
order_id                            0
customer_id                         0
order_status                        0
order_purchase_timestamp            0
order_approved_at                 160
order_delivered_carrier_date     1783
order_delivered_customer_date    2965
order_estimated_delivery_date       0
dtype: int64

Processing order_items.csv
NaN values before replacement:
order_id               0
order_item_id          0
product_id             0
seller_id              0
shipping_limit_date    0
price                  0
freight_value          0
dtype: int64

Processing sellers.csv
NaN values before replacement:
seller_id                 0
seller_zip_code_prefix    0
seller_city               0
seller_state              0
dtype: int64

Processing products.csv
NaN values before replacement:
product_id                      0
product category              610
product_name_length           610
product_description_length    610
product_photos_qty            610
product_weight_g                2
product_length_cm               2
product_height_cm               2
product_width_cm                2
dtype: int64

Processing geolocation.csv
NaN values before replacement:
geolocation_zip_code_prefix    0
geolocation_lat                0
geolocation_lng                0
geolocation_city               0
geolocation_state              0
```

```
dtype: int64

Processing payments.csv
NaN values before replacement:
order_id                0
payment_sequential      0
payment_type            0
payment_installments    0
payment_value           0
dtype: int64
```

In [1]:
```
pip install mysql-connector-python
```

```
Collecting mysql-connector-python
  Downloading mysql_connector_python-9.0.0-cp311-cp311-win_amd64.whl.metadata (2.
0 kB)
Downloading mysql_connector_python-9.0.0-cp311-cp311-win_amd64.whl (14.3 MB)
   ---------------------------------------- 0.0/14.3 MB ? eta -:--:--
   ---------------------------------------- 0.0/14.3 MB ? eta -:--:--
   ---------------------------------------- 0.0/14.3 MB ? eta -:--:--
   ---------------------------------------- 0.0/14.3 MB 326.8 kB/s eta 0:00:44
   ---------------------------------------- 0.2/14.3 MB 1.1 MB/s eta 0:00:14
   -- ------------------------------------- 0.8/14.3 MB 4.3 MB/s eta 0:00:04
   --- ------------------------------------ 1.4/14.3 MB 5.9 MB/s eta 0:00:03
   ----- ---------------------------------- 2.0/14.3 MB 7.0 MB/s eta 0:00:02
   ------- -------------------------------- 2.7/14.3 MB 8.1 MB/s eta 0:00:02
   -------- ------------------------------- 3.2/14.3 MB 8.4 MB/s eta 0:00:02
   --------- ------------------------------ 3.5/14.3 MB 9.0 MB/s eta 0:00:02
   ------------ --------------------------- 4.4/14.3 MB 9.6 MB/s eta 0:00:02
   -------------- ------------------------- 5.2/14.3 MB 10.0 MB/s eta 0:00:01
   ---------------- ----------------------- 6.1/14.3 MB 11.1 MB/s eta 0:00:01
   ------------------ --------------------- 6.9/14.3 MB 11.6 MB/s eta 0:00:01
   -------------------- ------------------- 7.3/14.3 MB 11.4 MB/s eta 0:00:01
   ---------------------- ----------------- 7.8/14.3 MB 11.3 MB/s eta 0:00:01
   ---------------------- ----------------- 8.1/14.3 MB 11.2 MB/s eta 0:00:01
   ---------------------- ----------------- 8.1/14.3 MB 11.2 MB/s eta 0:00:01
   ---------------------- ----------------- 8.4/14.3 MB 10.2 MB/s eta 0:00:01
   ------------------------- -------------- 10.0/14.3 MB 11.4 MB/s eta 0:00:01
   ------------------------- -------------- 10.5/14.3 MB 13.1 MB/s eta 0:00:01
   ---------------------------- ---------- 11.0/14.3 MB 12.8 MB/s eta 0:00:01
   ---------------------------- ---------- 11.6/14.3 MB 13.1 MB/s eta 0:00:01
   ------------------------------- ------- 12.2/14.3 MB 13.1 MB/s eta 0:00:01
   ------------------------------- ------- 12.8/14.3 MB 12.8 MB/s eta 0:00:01
   ---------------------------------- ---- 13.4/14.3 MB 13.1 MB/s eta 0:00:01
   ---------------------------------- ---- 13.8/14.3 MB 13.1 MB/s eta 0:00:01
   ----------------------------------- ---  14.2/14.3 MB 12.8 MB/s eta 0:00:01
   ----------------------------------- ---  14.3/14.3 MB 12.4 MB/s eta 0:00:01
   ---------------------------------------- 14.3/14.3 MB 11.7 MB/s eta 0:00:00
Installing collected packages: mysql-connector-python
Successfully installed mysql-connector-python-9.0.0
Note: you may need to restart the kernel to use updated packages.
```

In [1]:
```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import mysql.connector

db = mysql.connector.connect(host = "localhost",
                             username = "root",
```

```
                            password = "Yash@2002",
                            database = "ecommerce"
                            )

cur = db.cursor()
```

Basic Queries

In [2]:
```
# 1. List all unique cities where customers are located.

query = """select distinct(customer_city) from customers"""

cur.execute(query)

data = cur.fetchall()
df = pd.DataFrame(data,columns=["unique_cities"])
df.head()
```

Out[2]:

	unique_cities
0	franca
1	sao bernardo do campo
2	sao paulo
3	mogi das cruzes
4	campinas

In [3]:
```
# 2. Count the number of orders placed in 2017.

query = """select count(order_id) from orders where year(order_purchase_timestam

cur.execute(query)

data = cur.fetchall()
print("Total orders placed in 2017 are:", data[0][0])
```

```
Total orders placed in 2017 are: 45101
```

In [4]:
```
# 3. Find the total sales per category.

query = """select products.product_category category, round(sum(payments.payment
from products join order_items
on products.product_id = order_items.product_id
join payments
on payments.order_id = order_items.order_id
group by product_category"""

cur.execute(query)

data = cur.fetchall()
df = pd.DataFrame(data, columns = ["category","sales"])
df.head()
```

Out[4]:

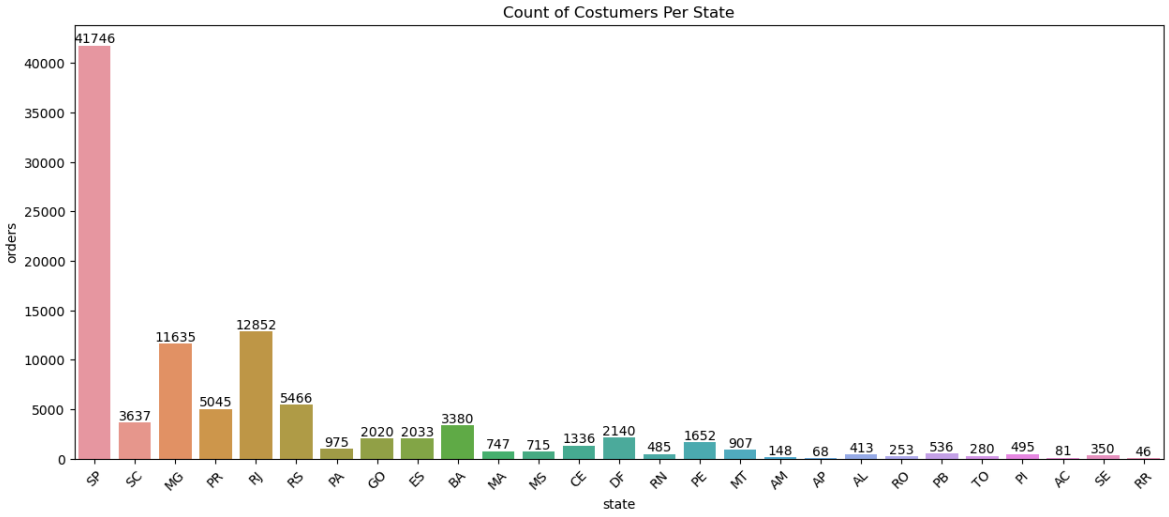
	category	sales
0	perfumery	506738.66
1	Furniture Decoration	1430176.39
2	telephony	486882.05
3	bed table bath	1712553.67
4	automotive	852294.33

In [20]:
```
# 4. Calculate the percentage of orders that were paid in installments.

query = """select (sum(case when payment_installments >= 1 then 1 else 0 end))/c

cur.execute(query)

data = cur.fetchall()
print("the percentage of orders that were paid in installments:",data[0][0])
```

```
the percentage of orders that were paid in installments: 99.9981
```

In [21]:
```
# 5. Count the number of customers from each state.

query = """select customer_state, count(customer_id) from customers group by cus

cur.execute(query)

data = cur.fetchall()
df = pd.DataFrame(data, columns=["state","orders"])
print(df)


plt.figure(figsize=(15,6))
ax = sns.barplot(x=df['state'],y=df['orders'])
ax.bar_label(ax.containers[0])
plt.xticks(rotation=45)
plt.title("Count of Costumers Per State")
plt.show()
```

	state	orders
0	SP	41746
1	SC	3637
2	MG	11635
3	PR	5045
4	RJ	12852
5	RS	5466
6	PA	975
7	GO	2020
8	ES	2033
9	BA	3380
10	MA	747
11	MS	715
12	CE	1336
13	DF	2140
14	RN	485
15	PE	1652
16	MT	907
17	AM	148
18	AP	68
19	AL	413
20	RO	253
21	PB	536
22	TO	280
23	PI	495
24	AC	81
25	SE	350
26	RR	46

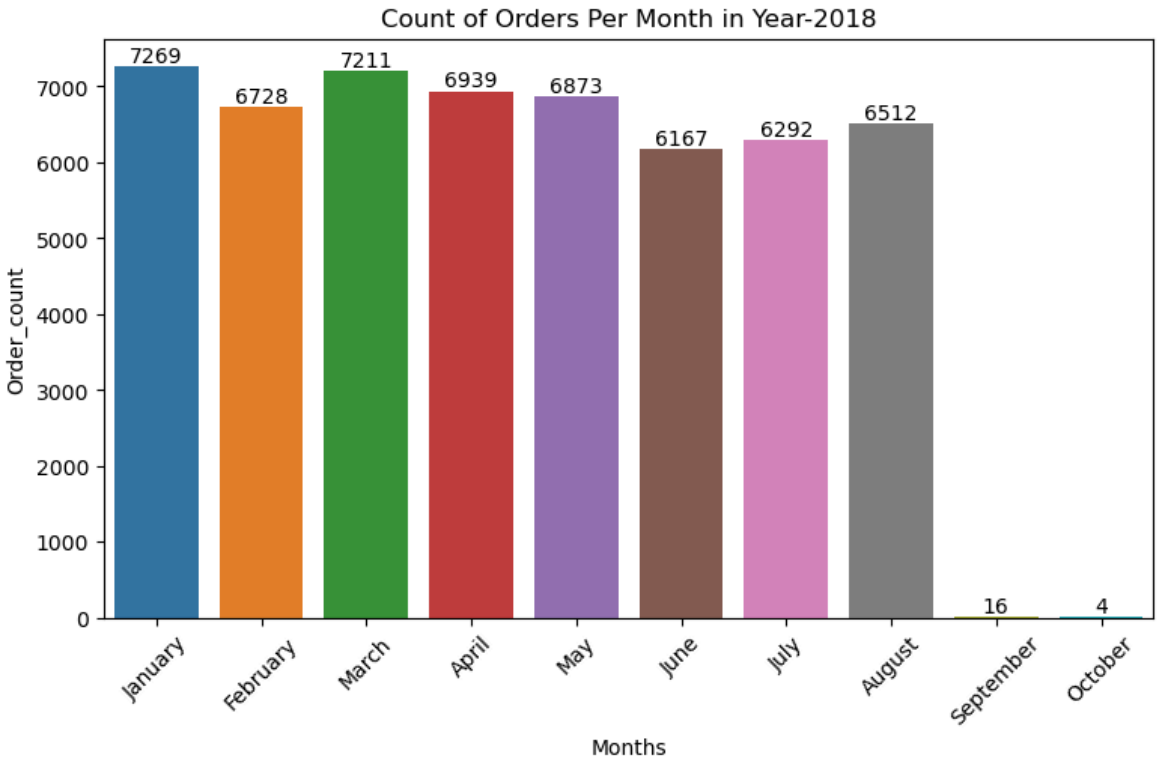


Intermediate Queries

In [26]:
```
# 1. Calculate the number of orders per month in 2018.

query = """select monthname(order_purchase_timestamp) months,count(order_id) ord
from orders where year(order_purchase_timestamp)=2018
group by months"""

cur.execute(query)

data = cur.fetchall()
df = pd.DataFrame(data,columns=["Months","Order_count"])
print(df)
```

```
o = ["January","February","March","April","May","June","July","August","Septembe
plt.figure(figsize=(9,5))
ax = sns.barplot(x=df['Months'],y=df['Order_count'],order=o)
ax.bar_label(ax.containers[0])
plt.xticks(rotation=45)
plt.title('Count of Orders Per Month in Year-2018')
plt.show()
```

	Months	Order_count
0	July	6292
1	August	6512
2	February	6728
3	June	6167
4	March	7211
5	January	7269
6	May	6873
7	April	6939
8	September	16
9	October	4



In [4]:
```
# 3. Calculate the percentage of total revenue contributed by each product categ

query = """select products.product_category category,
round(sum(payments.payment_value)/(select sum(payment_value) from payments)*100,
from products join order_items
on products.product_id = order_items.product_id
join payments
on payments.order_id = order_items.order_id
group by product_category"""

cur.execute(query)

data = cur.fetchall()
df = pd.DataFrame(data, columns = ["category","sales_percentage"])
df.head()
```

Out[4]:

	category	sales_percentage
0	perfumery	3.17
1	Furniture Decoration	8.93
2	telephony	3.04
3	bed table bath	10.70
4	automotive	5.32

In [15]:
```
# 4. Identify the correlation between product price and the number of times a pr
import numpy as np
query = """select products.product_category, count(order_items.product_id), avg(
from order_items join products
on order_items.product_id = products.product_id
group by products.product_category"""

cur.execute(query)

data = cur.fetchall()
df = pd.DataFrame(data, columns=["Category","Number of Products Purchased","Pric

arr1 = df["Number of Products Purchased"]
arr2 = df["Price"]

a = np.corrcoef([arr1,arr2])
print("The correlation between the product price and the number of times product
```

```
The correlation between the product price and the number of times product has bee
n purchased:  -0.10631552237549534
```

In [24]:
```
# 5. Calculate the total revenue generated by each seller, and rank them by reve

query = """select *, dense_rank() over(order by rev desc) as rn from
(select sellers.seller_id,
round(sum(payments.payment_value),2) rev
from sellers join order_items
on sellers.seller_id = order_items.seller_id
join payments
on payments.order_id = order_items.order_id
group by sellers.seller_id) as a"""

cur.execute(query)

data = cur.fetchall()
df = pd.DataFrame(data, columns = ["Seller_id","Sellers_Revenue","Rank"])
df.head()
```

Out[24]:

	Seller_id	Sellers_Revenue	Rank
0	7c67e1448b00f6e969d365cea6b010ab	507166.91	1
1	1025f0e2d44d7041d6cf58b6550e0bfa	308222.04	2
2	4a3ca9315b744ce9f8e9374361493884	301245.27	3
3	1f50f920176fa81dab994f9023523100	290253.42	4
4	53243585a1d6dc2643021fd1853d8905	284903.08	5

Advanced Queries

In [28]:
```
# 1. Calculate the moving average of order values for each customer over their o

query = """select *,round(avg(payment)
over(partition by customer_id order by
order_purchase_timestamp
rows between 2 preceding and current row),2)
as mov_avg from
(select orders.customer_id,
orders.order_purchase_timestamp,
payments.payment_value as payment
from orders join payments
on orders.order_id = payments.order_id) as a"""

cur.execute(query)

data = cur.fetchall()
df = pd.DataFrame(data, columns = ["Customer_id","Order_Purchase_Timestamp","Pay
df.tail(10)
```

Out[28]:

	Customer_id	Order_Purchase_Timestamp	Payment_value
103876	fffb97495f78be80e2759335275df2aa	2018-01-16 14:51:35	61.01
103877	fffc22669ca576ae3f654ea64c8f36be	2017-06-30 11:21:11	101.56
103878	fffcb937e9dd47a13f05ecb8290f4d3e	2018-03-17 00:55:27	91.91
103879	fffecc9f79fd8c764f843e9951b11341	2018-03-29 16:59:26	0.64
103880	fffecc9f79fd8c764f843e9951b11341	2018-03-29 16:59:26	9.49
103881	fffecc9f79fd8c764f843e9951b11341	2018-03-29 16:59:26	71.23
103882	fffeda5b6d849fbd39689bb92087f431	2018-05-22 13:36:02	63.13
103883	ffff42319e9b2d713724ae527742af25	2018-06-13 16:57:05	214.13
103884	ffffa3172527f765de70084a7e53aae8	2017-09-02 11:53:32	45.50
103885	ffffe8b65bbe3087b653a978c870db99	2017-09-29 14:07:03	18.37

In [4]:
```
# 2. Calculate the cumulative sales per month for each year.

query = """select *, round(sum(payment) over(order by years,months),2) as cumula
```

```
(select year(orders.order_purchase_timestamp) as years,
month(orders.order_purchase_timestamp) as months,
round(sum(payments.payment_value),2) as payment from payments join orders
on payments.order_id = orders.order_id
group by years,months order by years,months) as a;"""

cur.execute(query)

data = cur.fetchall()
df = pd.DataFrame(data, columns = ["Year","Month","Payment","Cumulative_sale"])
df
```

Out[4]:

	Year	Month	Payment	Cumulative_sale
0	2016	9	252.24	252.24
1	2016	10	59090.48	59342.72
2	2016	12	19.62	59362.34
3	2017	1	138488.04	197850.38
4	2017	2	291908.01	489758.39
5	2017	3	449863.60	939621.99
6	2017	4	417788.03	1357410.02
7	2017	5	592918.82	1950328.84
8	2017	6	511276.38	2461605.22
9	2017	7	592382.92	3053988.14
10	2017	8	674396.32	3728384.46
11	2017	9	727762.45	4456146.91
12	2017	10	779677.88	5235824.79
13	2017	11	1194882.80	6430707.59
14	2017	12	878401.48	7309109.07
15	2018	1	1115004.18	8424113.25
16	2018	2	992463.34	9416576.59
17	2018	3	1159652.12	10576228.71
18	2018	4	1160785.48	11737014.19
19	2018	5	1153982.15	12890996.34
20	2018	6	1023880.50	13914876.84
21	2018	7	1066540.75	14981417.59
22	2018	8	1022425.32	16003842.91
23	2018	9	4439.54	16008282.45
24	2018	10	589.67	16008872.12

In [19]:
```
# 3. Calculate the year-over-year growth rate of total sales.

query = """select years,payment,
((payment - lag(payment,1) over(order by years))/lag(payment,1) over(order by ye
from (select year(orders.order_purchase_timestamp) as years,
round(sum(payments.payment_value),2) as payment from payments join orders
on payments.order_id = orders.order_id
group by years order by years) as a"""

cur.execute(query)

data = cur.fetchall()
df = pd.DataFrame(data, columns=['Year','Total_sale','growth_rate_%'])
df
```

Out[19]:

	Year	Total_sale	growth_rate_%
0	2016	59362.34	NaN
1	2017	7249746.73	12112.703761
2	2018	8699763.05	20.000924

In [21]:
```
# 5. Identify the top 3 customers who spent the most money in each year.

query = """select customer_id,years,payment,Ranking from
(select orders.customer_id, year(orders.order_purchase_timestamp) years,
sum(payments.payment_value) as payment,
dense_rank() over(partition by year(orders.order_purchase_timestamp) order by su
from orders join payments on payments.order_id = orders.order_id
group by years,orders.customer_id) as a
where ranking <= 3;"""

cur.execute(query)

data = cur.fetchall()
df = pd.DataFrame(data, columns=['customer_id','Year','Total_payment','Rank'])
df
```

Out[21]:

	customer_id	Year	Total_payment	Rank
0	a9dc96b027d1252bbac0a9b72d837fc6	2016	1423.550049	1
1	1d34ed25963d5aae4cf3d7f3a4cda173	2016	1400.739990	2
2	4a06381959b6670756de02e07b83815f	2016	1227.780029	3
3	1617b1357756262bfa56ab541c47bc16	2017	13664.080078	1
4	c6e2731c5b391845f6800c97401a43a9	2017	6929.310059	2
5	3fd6777bbce08a352fddd04e4a7cc8f6	2017	6726.660156	3
6	ec5b2ba62e574342386871631fafd3fc	2018	7274.879883	1
7	f48d464a0baaea338cb25f816991ab1f	2018	6922.209961	2
8	e0a2412720e9ea4f26c1ac985f6a7358	2018	4809.439941	3

In [ ]: