Basic Queries

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)
df.head()
```

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

2. Count the number of orders placed in 2017.

[4]:
```
query = """select count(order_id) from ecommerce.orders where year(order_purchase_timestamp) = 2017;"""
cur.execute(query)
data = cur.fetchall()
"Total orders placed in 2017 are", data[0][0]
```

[4]:
```
('Total orders placed in 2017 are', 45101)
```

3. Find the total sales per category.

[5]:
```
query = """select Upper(p.product_category), round(sum(py.payment_value), 2) as Sales
FROM ecommerce.products p
inner join ecommerce.order_item o on o.product_id = p.product_id
inner join ecommerce.payments py on py.order_id = o.order_id
group by p.product_category"""
cur.execute(query)
data = cur.fetchall()
df = pd.DataFrame(data, columns=["Category","Sales"])
df
```

[5]:

	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
...	...	...
69	CDS MUSIC DVDS	1199.43

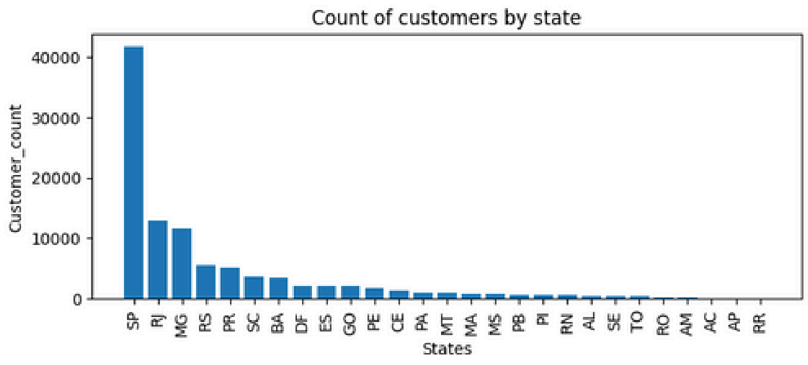
4. Calculate the percentage of orders that were paid in installments.

```
query = """SELECT (sum(case when payment_installments >=1 then 1 else 0 end)/count(*))*100
FROM ecommerce.payments;"""
cur.execute(query)
data = cur.fetchall()
"Percentage of orders that were paid in installments are", data[0][0]
```

```
('Percentage of orders that were paid in installments are', Decimal('99.9981'))
```

5. Count the number of customers from each state.

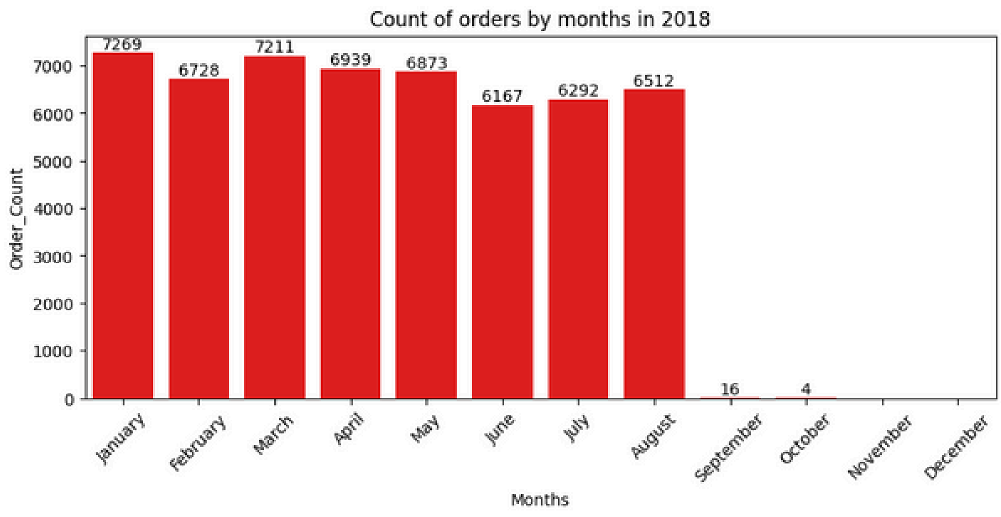
```
query = """SELECT customer_state, Count(customer_id) as Count FROM ecommerce.customers group by customer_state order by customer_state;"""
cur.execute(query)
data = cur.fetchall()
df = pd.DataFrame(data, columns=["State","Customer_Count"])
df = df.sort_values(by = "Customer_Count", ascending=False)

plt.figure(figsize = (8,3))
plt.bar(df["State"], df["Customer_Count"])
plt.xticks(rotation = 90)
plt.xlabel("States")
plt.ylabel("Customer_count")
plt.title("Count of customers by state")
plt.show()
```



Intermediate Queries ¶

1. Calculate the number of orders per month in 2018.

```
query = """SELECT monthname(order_purchase_timestamp) as Month, count(order_id) as Sales_Count FROM ecommerce.orders
where year(order_purchase_timestamp) = 2018 group by Month;"""
cur.execute(query)
data = cur.fetchall()
df=pd.DataFrame(data, columns=["Months","Order_Count"])
o=["January","February","March","April","May","June","July","August","September","October", "November","December"]

plt.figure(figsize=(10,4))
ax = sns.barplot(x=df["Months"], y=df["Order_Count"], data=df, order=o, color="Red")
plt.xticks(rotation=45)
ax.bar_label(ax.containers[0])
plt.title("Count of orders by months in 2018")
plt.show()
```



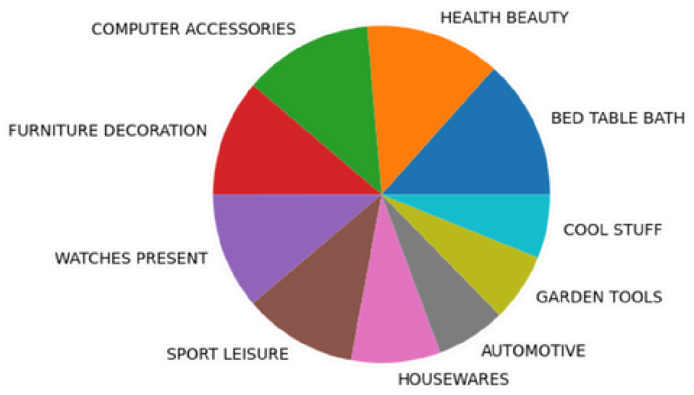
2. Find the average number of products per order, grouped by customer city.

```
query = """with count_per_order as(
SELECT o.order_id, o.customer_id, count(oi.order_id) as count
FROM ecommerce.orders o
inner join ecommerce.order_item oi on o.order_id = oi.order_id
group by o.order_id, o.customer_id)

select c.customer_city, round(avg(cp.count),2) as average
from ecommerce.customers c
inner join count_per_order cp on c.customer_id = cp.customer_id
group by c.customer_city order by average desc;"""
cur.execute(query)
data = cur.fetchall()
df=pd.DataFrame(data, columns=["customer_city", "Average_orders"])
df.head()
```

	customer_city	Average_orders
0	padre carvalho	7.00
1	celso ramos	6.50
2	datas	6.00
3	candido godoi	6.00
4	matias olimpio	5.00

3. Calculate the percentage of total revenue contributed by each product category.

```
query = """select Upper(p.product_category) as Category,
round((sum(py.payment_value)/(Select sum(payment_value) from ecommerce.payments)*100), 2) as Sales_Percentage
FROM ecommerce.products p
inner join ecommerce.order_item o on o.product_id = p.product_id inner join ecommerce.payments py on py.order_id = o.order_id
group by p.product_category order by Sales_Percentage desc"""
cur.execute(query)
data = cur.fetchall()
df = pd.DataFrame(data, columns=["Category","Percentage_Distribution"])
df=df.head(10)
df

plt.pie(df["Percentage_Distribution"], labels=df["Category"])
plt.show()    #Showing only 10 values
```



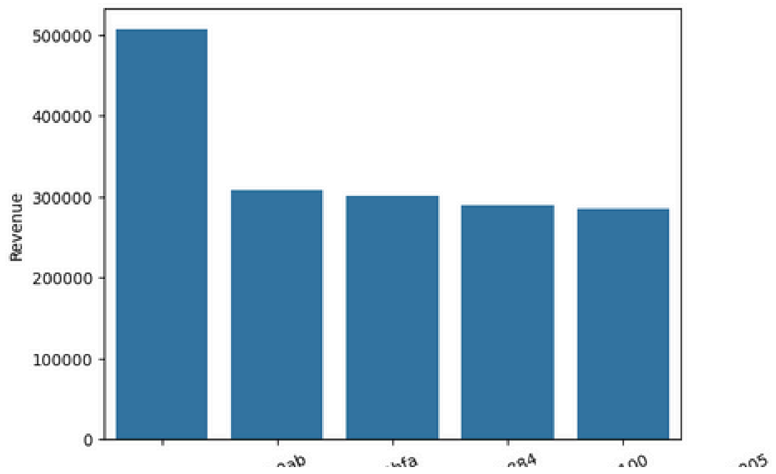
4. Identify the correlation between product price and the number of times a product has been purchased.

```
query = """select p.product_category, count(oi.Product_id) as Count, round(avg(oi.Price) , 2) as Price
from ecommerce.products p
inner join ecommerce.order_item oi on oi.product_id = p.product_id
group by p.product_category;"""
cur.execute(query)
data = cur.fetchall()
df = pd.DataFrame(data, columns=["Category","Order_Count","Price"])

arr1=df["Order_Count"]
arr2=df["Price"]
a = np.corrcoef([arr1, arr2])   #result is neutral
"correlation between product price and the number of times a product has been purchased is", a[0][1]
```

```
('correlation between product price and the number of times a product has been purchased is',
 -0.10631514167157562)
```

5. Calculate the total revenue generated by each seller, and rank them by revenue.

```
query = """select *, dense_rank() over(order by revenue desc) as Rankk from (
select oi.seller_id, sum(p.payment_value) as revenue
from ecommerce.sellers s
inner join ecommerce.order_item oi on oi.seller_id = s.seller_id
inner join ecommerce.payments p on p.order_id = oi.order_id
group by oi.seller_id) as a;"""
cur.execute(query)
data = cur.fetchall()
df = pd.DataFrame(data, columns=["seller_id","Revenue","Rank"])
df = df.head()

sns.barplot(x=df["seller_id"], y=df["Revenue"], data=df)
plt.xticks(rotation=25)
plt.show()
```



Advanced Queries

1. Calculate the moving average of order values for each customer over their order history.

```
[16]: query = """select o.customer_id, o.order_purchase_timestamp, p.payment_value, avg(p.payment_value)
      over(partition by o.customer_id order by o.order_purchase_timestamp
      rows between 2 preceding and current row) as moving_avg
      from ecommerce.orders o
      inner join ecommerce.payments p on p.order_id = o.order_id"""
      cur.execute(query)
      data = cur.fetchall()
      df = pd.DataFrame(data, columns=["Customer_id","Order_Purchase_Timestamp","Price","Moving_Average"])
      df
```

```
[16]:                          Customer_id  Order_Purchase_Timestamp   Price  Moving_Average
      0  00012a2ce6f8dcda20d059ce98491703       2017-11-14 16:08:26  114.74      114.739998
      1  000161a058600d5901f007fab4c27140       2017-07-16 09:40:32   67.41       67.410004
      2  0001fd6190edaaf884bcaf3d49edf079       2017-02-28 11:06:43  195.42      195.419998
      3  0002414f95344307404f0ace7a26f1d5       2017-08-16 13:09:20  179.35      179.350006
      4  000379cdec625522490c315e70c7a9fb       2018-04-02 13:42:17  107.01      107.010002
    ...                               ...                       ...     ...             ...
```

2. Calculate the cumulative sales per month for each year.

```
]: query = """select years, months, payment, sum(payment) over(order by years, months) from (
   select year(o.order_purchase_timestamp) as years, month(o.order_purchase_timestamp) as months,
   round(sum(p.payment_value), 2) as payment
   from ecommerce.orders o inner join ecommerce.payments p on o.order_id = p.order_id
   group by years, months order by years, months) as a;"""
   cur.execute(query)
   data = cur.fetchall()
   df = pd.DataFrame(data, columns=["Years","Months","Payment","Cummulative_Sum"])
   df
```

```
]:    Years  Months    Payment  Cummulative_Sum
   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
```

3. Calculate the year-over-year growth rate of total sales.

```
query = """with cte as(
select year(o.order_purchase_timestamp) as years, sum(p.payment_value) as payment
from ecommerce.orders o inner join ecommerce.payments p on o.order_id = p.order_id
group by years order by years)
select *, round(((cte.payment - lag(cte.payment, 1) over(order by years))/
(lag(cte.payment, 1) over(order by years)))*100,2) as YoY_Per_Growth from cte"""
cur.execute(query)
data = cur.fetchall()
df = pd.DataFrame(data, columns=["Years","Sales","YoY_Percentage_Growth"])
df
```

	Years	Sales	YoY_Percentage_Growth
0	2016	5.936234e+04	NaN
1	2017	7.249747e+06	12112.7
2	2018	8.699763e+06	20.0

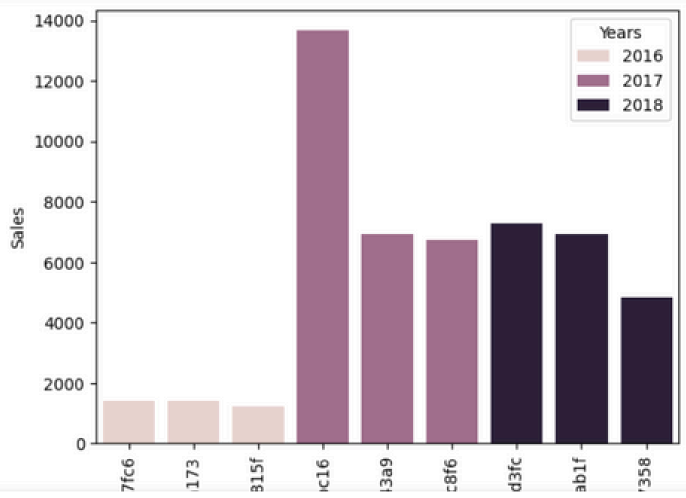
4. Calculate the retention rate of customers, defined as the percentage of customers who make another purchase within 6 months of their first purchase.

```
query = """with a as (select c.customer_id, min(o.order_purchase_timestamp) as First_Order
from ecommerce.customers c
inner join ecommerce.orders o on o.customer_id = c.customer_id
group by c.customer_id), b as(
select a.customer_id, count(distinct o.order_purchase_timestamp) as Next_Order
from a inner join ecommerce.orders o on o.customer_id = a.customer_id
and o.order_purchase_timestamp > a.first_order and
o.order_purchase_timestamp < date_add(first_order, interval 6 month)
group by a.customer_id)

select 100*(count(distinct a.customer_id)/count(distinct b.customer_id)) as Retention_Rate
from a left join b on a.customer_id = b.customer_id;"""

cur.execute(query)
data = cur.fetchall()
data    #None of the customer found
```

```
[(None,)]
```

5. Identify the top 3 customers who spent the most money in each year.

```
query = """select Year, customer_id, round(payment, 2) as Sales, d_rank from
(select year(o.order_purchase_timestamp) as Year, o.customer_id, sum(p.payment_value) as payment,
dense_rank() over(partition by year(o.order_purchase_timestamp) order by sum(p.payment_value) desc) as d_rank
from ecommerce.orders o inner join ecommerce.payments p on o.order_id = p.order_id
group by Year, o.order_id, o.customer_id) as a where d_rank <=3"""
cur.execute(query)
data = cur.fetchall()
df = pd.DataFrame(data, columns=["Years","customer_id","Sales","Rank"])

sns.barplot(x="customer_id", y="Sales", data=df, hue="Years")
plt.xticks(rotation=90)
plt.show()
```


Sales
Years
7fc6
815f
c16
3a9
c8f6
d3fc
ab1f