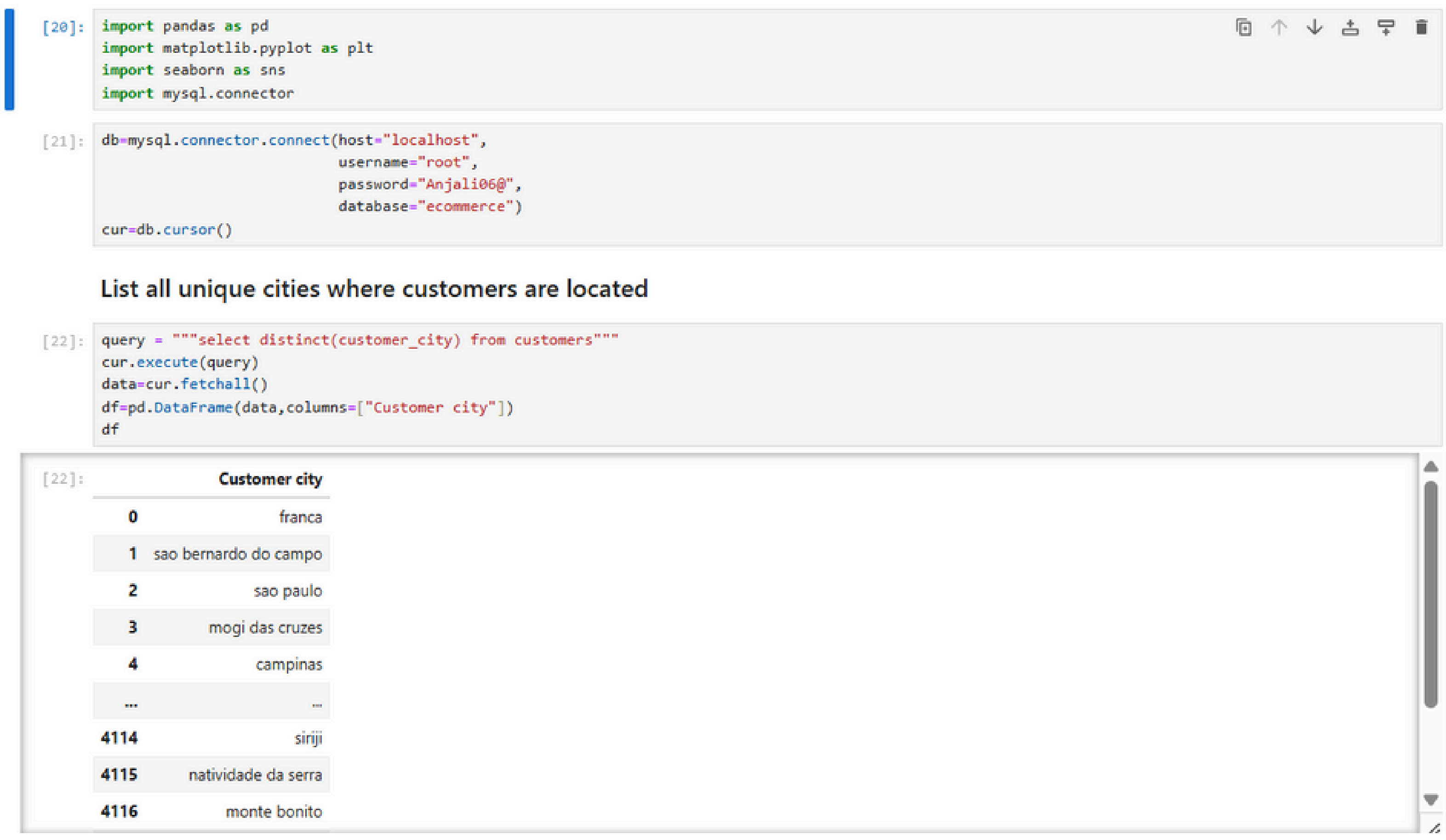


[20]:
```python
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import mysql.connector
```

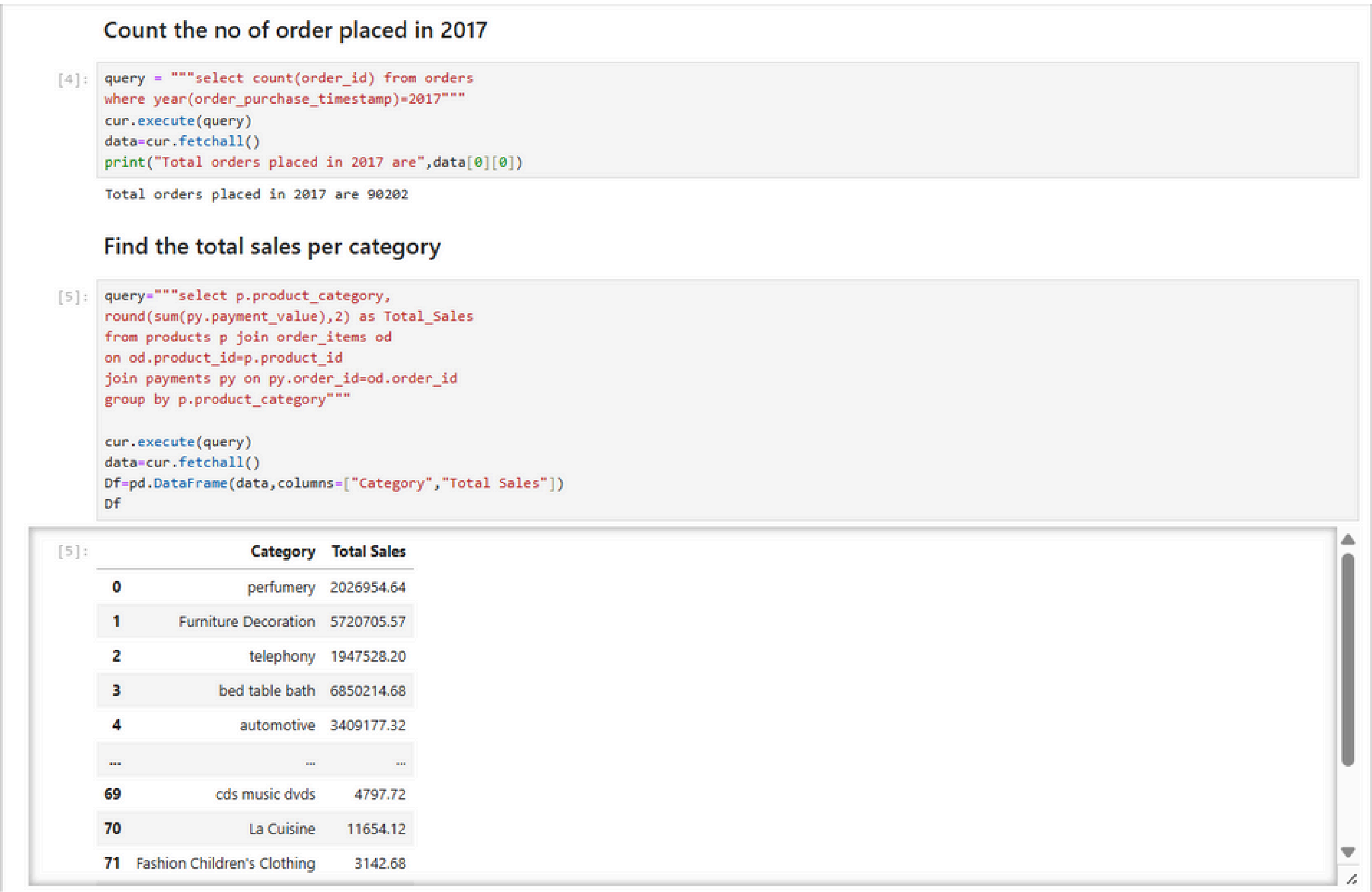
[21]:
```python
db=mysql.connector.connect(host="localhost",
                           username="root",
                           password="Anjali06@",
                           database="ecommerce")
cur=db.cursor()
```

List all unique cities where customers are located

[22]:
```python
query = """select distinct(customer_city) from customers"""
cur.execute(query)
data=cur.fetchall()
df=pd.DataFrame(data,columns=["Customer city"])
df
```

[22]:

	Customer city
0	franca
1	sao bernardo do campo
2	sao paulo
3	mogi das cruzes
4	campinas
...	...
4114	siriji
4115	natividade da serra
4116	monte bonito



Count the no of order placed in 2017

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

```
Total orders placed in 2017 are 90202
```

Find the total sales per category

[5]:
```python
query="""select p.product_category,
round(sum(py.payment_value),2) as Total_Sales
from products p join order_items od
on od.product_id=p.product_id
join payments py on py.order_id=od.order_id
group by p.product_category"""

cur.execute(query)
data=cur.fetchall()
Df=pd.DataFrame(data,columns=["Category","Total Sales"])
Df
```

[5]:

	Category	Total Sales
0	perfumery	2026954.64
1	Furniture Decoration	5720705.57
2	telephony	1947528.20
3	bed table bath	6850214.68
4	automotive	3409177.32
...	...	...
69	cds music dvds	4797.72
70	La Cuisine	11654.12
71	Fashion Children's Clothing	3142.68

Calculate the percentage of orders that were paid in installments

```
[6]: query = """select
     (sum(case when payment_installments >= 1 then 1 else 0 end) )/count(*) * 100
     as Percentage_orders
     from payments"""
     cur.execute(query)
     data=cur.fetchall()
     print("the percentage of orders that were paid in installments is:",data[0][0])
```

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

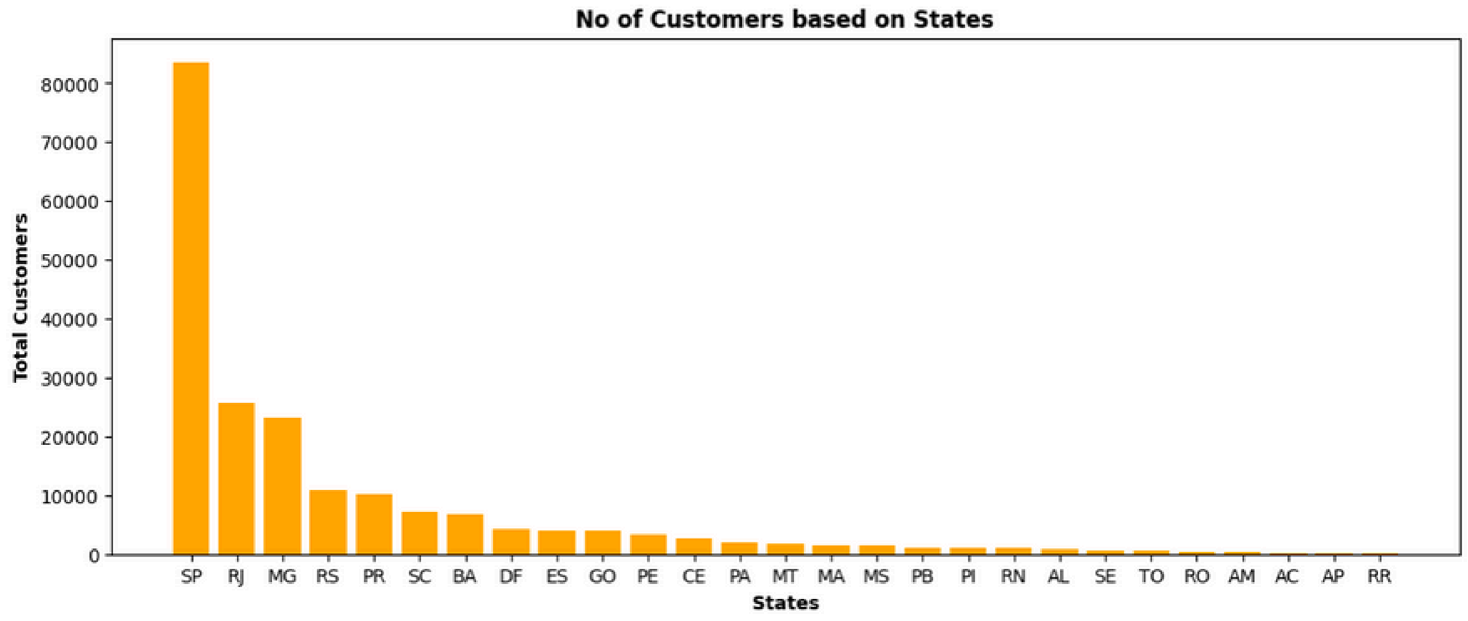
Count the no of customers from each state.

```
[7]: query = """select customer_state ,count(customer_id) as No_of_customers from customers
      group by customer_state"""
     cur.execute(query)
     data=cur.fetchall()
     Df=pd.DataFrame(data,columns=["State","Total Customers"])
     Df=Df.sort_values(by="Total Customers",ascending=False)
     Df
```

[7]:

	State	Total Customers
0	SP	83492
4	RJ	25704
2	MG	23270
5	RS	10932
3	PR	10090
1	SC	7274
9	BA	6760
13	DF	4280
8	ES	4066

```
[8]: plt.figure(figsize=(13,5))
     plt.bar(Df["State"],Df["Total Customers"],color="orange")
     plt.xlabel("States",fontweight="bold")
     plt.ylabel("Total Customers",fontweight="bold")
     plt.title("No of Customers based on States",fontweight="bold")
     plt.show()
```



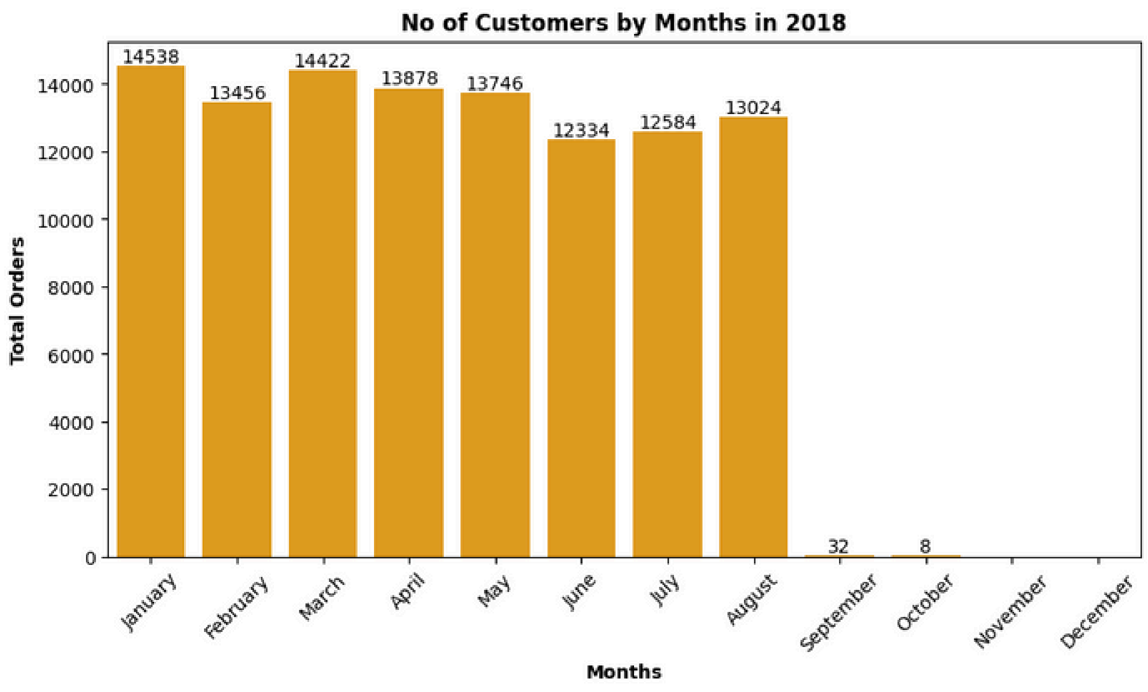
Calculate the no of orders per month in 2018

[9]:
```
query = """ select monthname(order_purchase_timestamp) as Months,
count(order_id) as Order_count from orders
where year(order_purchase_timestamp)=2018 group by Months """
cur.execute(query)
data=cur.fetchall()
Df=pd.DataFrame(data,columns=["Months","Total Orders"])
Df=Df.sort_values(by="Total Orders",ascending=False)
Df
```

[9]:

	Months	Total Orders
5	January	14538
4	March	14422
7	April	13878
6	May	13746
2	February	13456
1	August	13024
0	July	12584
3	June	12334
8	September	32
9	October	8

[10]:
```
o=["January","February","March","April","May","June","July","August","September","October","November","December"]
plt.figure(figsize=(10,5))
ax=sns.barplot(x="Months",y="Total Orders",data=Df,color="orange",order=o)
plt.xlabel("Months",fontweight="bold")
plt.ylabel("Total Orders",fontweight="bold")
plt.title("No of Customers by Months in 2018",fontweight="bold")
ax.bar_label(ax.containers[0])
plt.xticks(rotation=45)
plt.show()
```



Find the average no of products per order,grouped by customer city.

```
[11]: query = """ with Count_per_order as(select o.order_id,o.customer_id,count(od.order_id) as oc from orders o join
order_items od on o.order_id=od.order_id
group by o.order_id,o.customer_id)

select c.customer_city,round(avg(Count_per_order.oc),2) As Average_orders
from customers c join Count_per_order on
c.customer_id=Count_per_order.customer_id
group by c.customer_city """

cur.execute(query)
data=cur.fetchall()
Df=pd.DataFrame(data,columns=["City","Average Products Per Orders"])
Df=Df.sort_values(by="Average Products Per Orders",ascending=False)
Df
```

[11]:

	City	Average Products Per Orders
2812	padre carvalho	14.00
1930	celso ramos	13.00
2397	datas	12.00
3936	candido godoi	12.00
3991	matias olimpio	10.00
...	...	...
2078	inhuma	2.00
2079	porto dos gauchos	2.00
2080	sao joao do sul	2.00
2081	pimenta bueno	2.00
4109	japaratuba	2.00

4110 rows × 2 columns

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

```
[12]: query = """ select upper(p.product_category),
round((sum(py.payment_value)/(select sum(payment_value) from payments))*100,2) as Percent_sales
from products p join order_items od
on od.product_id=p.product_id
join payments py on py.order_id=od.order_id
group by p.product_category order by Percent_sales desc """
cur.execute(query)
data=cur.fetchall()
Df=pd.DataFrame(data,columns=["Category","Sales Percentage"])
Df
```

[12]:

	Category	Sales Percentage
0	BED TABLE BATH	21.40
1	HEALTH BEAUTY	20.71
2	COMPUTER ACCESSORIES	19.81
3	FURNITURE DECORATION	17.87
4	WATCHES PRESENT	17.86
...	...	...
69	PC GAMER	0.03
70	HOUSE COMFORT 2	0.02
71	CDS MUSIC DVDS	0.01
72	FASHION CHILDREN'S CLOTHING	0.01
73	INSURANCE AND SERVICES	0.00

74 rows × 2 columns

Identify the coorelation b/w product price and the no of times a product has been purchased.

[13]:
```
query = """ select p.product_category,count(od.product_id) as Count_Product,
 round(avg(od.price),2) as Avg_price
 from products p join order_items od on
 p.product_id=od.product_id
 group by p.product_category """
cur.execute(query)
data=cur.fetchall()
Df=pd.DataFrame(data,columns=["Category","Count_Product","Average_Price"])
Df
```

[13]:

	Category	Count_Product	Average_Price
0	HEALTH BEAUTY	19340	130.16
1	sport leisure	17282	114.34
2	Cool Stuff	7592	167.36
3	computer accessories	15654	116.51
4	Watches present	11982	201.14
...	...	...	...
69	flowers	66	33.64
70	Kitchen portable and food coach	30	264.57
71	CITTE AND UPHACK FURNITURE	76	114.95
72	House Comfort 2	60	25.34
73	cds music dvds	28	52.14

74 rows × 3 columns

[14]:
```
import numpy as np
```

[15]:
```
arr1 = Df["Count_Product"]
arr2=Df["Average_Price"]
a=np.corrcoef([arr1,arr2])
print("The corelation between price and no of times a product has been purchased is",a[0][-1])
```

```
The corelation between price and no of times a product has been purchased is -0.10631514167157562
```

Calculate the total revenue generated by each seller and rank them by revenue

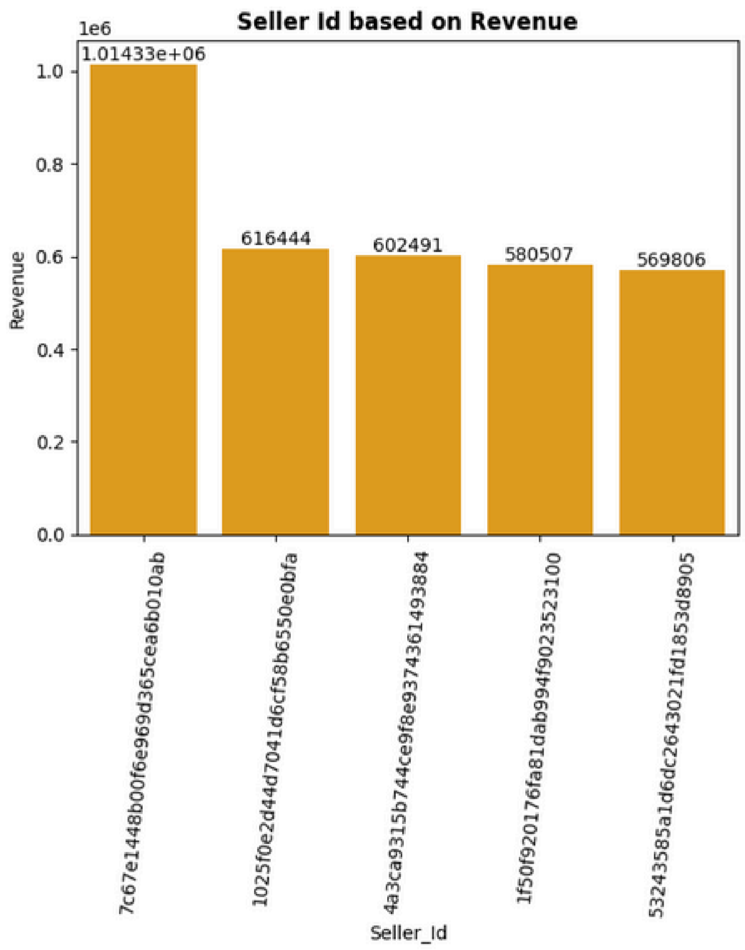
[16]:
```
query = """ select * ,dense_rank() over(order by Total_Revenue desc)  as Ranks from
(select od.seller_id,round(sum(py.payment_value),2) as Total_Revenue
from order_items od join payments py on od.order_id=py.order_id
group by od.seller_id) as A """
cur.execute(query)
data=cur.fetchall()
Df=pd.DataFrame(data,columns=["Seller_Id","Revenue","Rank"])
Df
```

[16]:

	Seller_Id	Revenue	Rank
0	7c67e1448b00f6e969d365cea6b010ab	1014333.81	1
1	1025f0e2d44d7041d6cf58b6550e0bfa	616444.08	2
2	4a3ca9315b744ce9f8e9374361493884	602490.54	3
3	1f50f920176fa81dab994f9023523100	580506.84	4
4	53243585a1d6dc2643021fd1853d8905	569806.16	5
...	...	...	...
3090	ad14615bdd492b01b0d97922e87cb87f	38.42	3076
3091	702835e4b785b67a084280efca355756	37.12	3077
3092	4965a7002cca77301c82d3f91b82e1a9	32.72	3078
3093	77128dec4bec4878c37ab7d6169d6f26	30.44	3079
3094	cf6f6bc4df3999b9c6440f124fb2f687	24.44	3080

```
[17]: Top5=Df.head()
```

```
[18]: ax=sns.barplot(x="Seller_Id",y="Revenue",data=Top5,color="orange")
      plt.xticks(rotation=85)
      ax.bar_label(ax.containers[0])
      plt.title("Seller Id based on Revenue",fontweight="bold")
      plt.show()
```



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

[23]:
```
query = """ select customer_id,order_purchase_timestamp,payment,
avg(payment) over(partition by customer_id order by order_purchase_timestamp
rows between 2 preceding and current row) as Moving_Avg
from
(select o.customer_id,o.order_purchase_timestamp,
py.payment_value as payment
from orders o join payments py on o.order_id=py.order_id) as A """
cur.execute(query)
data=cur.fetchall()
Df=pd.DataFrame(data,columns=["Customer_id","Order_Date/Time","Payment","Moving_Avg"])
Df
```

[23]:

	Customer_id	Order_Date/Time	Payment	Moving_Avg
0	00012a2ce6f8dcda20d059ce98491703	2017-11-14 16:08:26	114.74	114.739998
1	00012a2ce6f8dcda20d059ce98491703	2017-11-14 16:08:26	114.74	114.739998
2	00012a2ce6f8dcda20d059ce98491703	2017-11-14 16:08:26	114.74	114.739998
3	00012a2ce6f8dcda20d059ce98491703	2017-11-14 16:08:26	114.74	114.739998
4	000161a058600d5901f007fab4c27140	2017-07-16 09:40:32	67.41	67.410004
...	...	...	...	...
415539	ffffa3172527f765de70084a7e53aae8	2017-09-02 11:53:32	45.50	45.500000
415540	ffffe8b65bbe3087b653a978c870db99	2017-09-29 14:07:03	18.37	18.370001
415541	ffffe8b65bbe3087b653a978c870db99	2017-09-29 14:07:03	18.37	18.370001
415542	ffffe8b65bbe3087b653a978c870db99	2017-09-29 14:07:03	18.37	18.370001
415543	ffffe8b65bbe3087b653a978c870db99	2017-09-29 14:07:03	18.37	18.370001

415544 rows × 4 columns

Calculate the cumulative sales per month for each year. ¶

[24]:
```
query = """ select years,months,payment,sum(payment) over (order by years,months)
as cumulative_sales from
(select year(o.order_purchase_timestamp) as years,month(o.order_purchase_timestamp)
as months,round(sum(py.payment_value),2) as payment from  orders o join payments py on o.order_id=py.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","Cumulative Sales"])
Df
```

[24]:

	Years	Months	Payment	Cumulative Sales
0	2016	9	1008.96	1008.96
1	2016	10	236361.92	237370.88
2	2016	12	78.48	237449.36
3	2017	1	553952.16	791401.52
4	2017	2	1167632.04	1959033.56
5	2017	3	1799454.40	3758487.96
6	2017	4	1671152.12	5429640.08
7	2017	5	2371675.28	7801315.36
8	2017	6	2045105.52	9846420.88

Calculate the year over year growth rate to total sales

[48]:
```
query = """ with a as (select year(o.order_purchase_timestamp) as years,
round(sum(py.payment_value),2) as payment from  orders o
join payments py on o.order_id=py.order_id
group by years order by years)

select years,
((payment-lag(payment,1) over (order by years))/
lag(payment,1) over (order by years)) * 100
as Year_over_year_percentage_growth from a """
cur.execute(query)
data=cur.fetchall()
Df=pd.DataFrame(data,columns=["Years","YOY % Growth"])
Df
```

[48]:

	Years	YOY % Growth
0	2016	NaN
1	2017	12112.703757
2	2018	20.000924

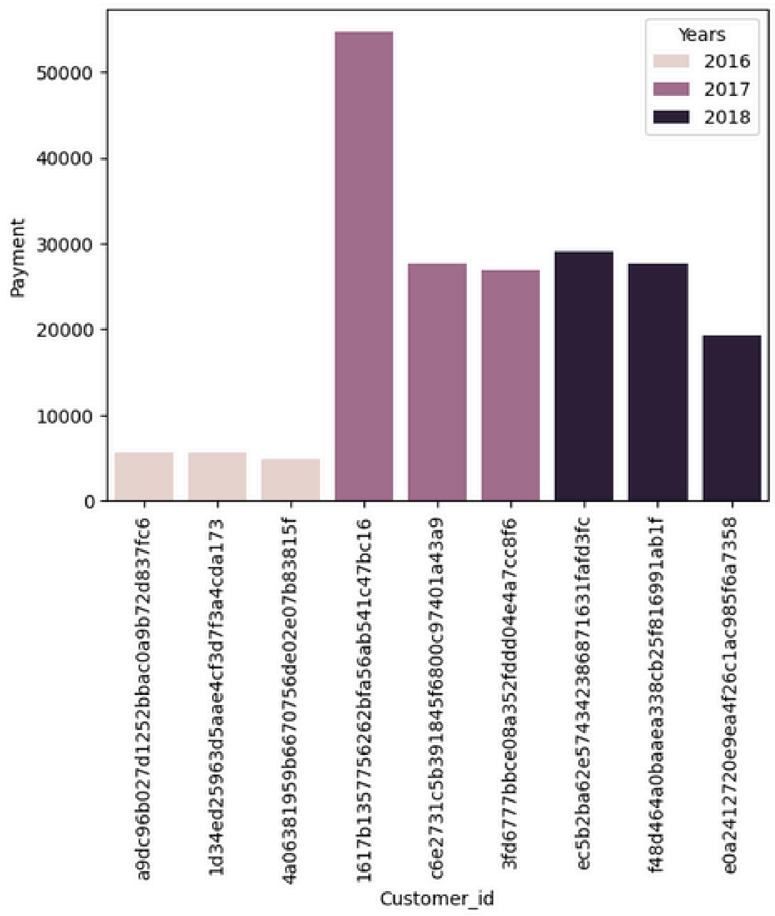
IDentify the top3 customers who spent most money in each year.

[49]:
```
query = """ select years,customer_id,payment,D_rank
from
(select o.customer_id,
year(o.order_purchase_timestamp) as years,
sum(py.payment_value) as payment,
dense_rank() over(partition by year(o.order_purchase_timestamp)
order by sum(py.payment_value) desc) as D_rank
from orders o join payments as py
on py.order_id=o.order_id
group by years,o.customer_id) as a
where D_rank <= 3 """
cur.execute(query)
data=cur.fetchall()
Df=pd.DataFrame(data,columns=["Years","Customer_id","Payment","Rank"])
Df
```

[49]:

	Years	Customer_id	Payment	Rank
0	2016	a9dc96b027d1252bbac0a9b72d837fc6	5694.200195	1
1	2016	1d34ed25963d5aae4cf3d7f3a4cda173	5602.959961	2
2	2016	4a06381959b6670756de02e07b83815f	4911.120117	3
3	2017	1617b1357756262bfa56ab541c47bc16	54656.320312	1
4	2017	c6e2731c5b391845f6800c97401a43a9	27717.240234	2
5	2017	3fd6777bbce08a352fddd04e4a7cc8f6	26906.640625	3
6	2018	ec5b2ba62e574342386871631fafd3fc	29099.519531	1
7	2018	f48d464a0baaea338cb25f816991ab1f	27688.839844	2
8	2018	e0a2412720e9ea4f26c1ac985f6a7358	19237.759766	3

[55]:
```
sns.barplot(x="Customer_id",y="Payment",data=Df,hue="Years")
plt.xticks(rotation=90)
plt.show()
```


Years
Payment
a9dc96b027d1252bbac0a9b72d837fc6
1d34ed25963d5aae4cf3d7f3a4cda173
4a06381959b6670756de02e07b83815f
1617b1357756262bfa56ab541c47bc16
c6e2731c5b391845f6800c97401a43a9
3fd6777bbce08a352fddd04e4a7cc8f6
ec5b2ba62e574342386871631fafd3fc
f48d464a0baaea338cb25f816991ab1f
e0a2412720e9ea4f26c1ac985f6a7358
Customer_id