

Task-7 Sales_Dataset

Objective:

The main goal of this project is to connect Python with a SQLite database, extract sales data using SQL queries, and then summarize and visualize the results.

You will calculate:

- Total quantity sold per product
- Total revenue per product
and display them in both text form and as a simple bar chart.

◆ Tools & Libraries:

- Python (main programming language)
- sqlite3 (to connect with the SQLite database)
- pandas (to manage and manipulate data easily)
- matplotlib (to create bar charts)

◆ Dataset:

- You'll create a small SQLite database file named sales_data.db
- Inside it, you'll have one table: sales
- The table contains columns like:
 - product
 - quantity
 - price

In [9]:

```

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'),
    ('sellers.csv', 'sellers'),
    ('products.csv', 'products'),
    ('geolocation.csv', 'geolocation'),
    ('payments.csv', 'payments'),
    ('order_items.csv', 'order_items') # Added payments.csv for specific handling
]

# Connect to the MySQL database
conn = mysql.connector.connect(
    host='localhost',
    user='root',
    password='Krima@123',
    database='ecommerce'
)
cursor = conn.cursor()

# Folder containing the CSV files
folder_path = 'C:/Users/kkjeg/OneDrive/Desktop/E-commerce_Projects'

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 col in df.columns]

    # Generate the CREATE TABLE statement with appropriate data types
    columns = ', '.join([f'{col} {get_sql_type(df[col].dtype)}' for col in df.columns])
    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 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
```

```
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
```

In []:

```
In [10]: 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="Krima@123",
                           database="ecommerce")
cur=db.cursor()
```

List all unique cities where customers are located.

```
In [11]: query = """select distinct customer_city from customers """
cur.execute(query)
data = cur.fetchall()
data
```

```
Out[11]: [('franca',),  
          ('sao bernardo do campo',),  
          ('sao paulo',),  
          ('mogi das cruzes',),  
          ('campinas',),  
          ('jaragua do sul',),  
          ('timoteo',),  
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('cristalandia',),
('castelo do piaui',),
('ibipora',),
('presidente dutra',),
('vera cruz',),
('paulo frontin',),
...]
```

Count the number of orders placed in 2017.

```
In [15]: query = """select count(order_id) from orders where year(order_purchase_timestamp)
cur.execute(query)
data = cur.fetchall()
"total orders placed in 2017 are",data[0][0]
```

Out[15]: ('total orders placed in 2017 are', 45101)

Find the total sales per category.

```
In [23]: query = """select upper(products.product_category) category,
round(sum(payments.payment_value),2) sales
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 category"""
cur.execute(query)
data = cur.fetchall()
df = pd.DataFrame(data,columns=[ "Category","Sales"])
df
```

Out[23]:

	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
70	LA CUISINE	2913.53
71	FASHION CHILDREN'S CLOTHING	785.67
72	PC GAMER	2174.43
73	INSURANCE AND SERVICES	324.51

74 rows × 2 columns

Calculate the percentage of orders that were paid in installments.

```
In [32]: query = """select (sum(case when payment_installments >=1 then 1
else 0 end))/count(*)* 100 from payments"""
cur.execute(query)
data = cur.fetchall()
"the percentage of orders that were paid in installments is",data[0][0]
```

```
Out[32]: ('the percentage of orders that were paid in installments is',
Decimal('99.9981'))
```

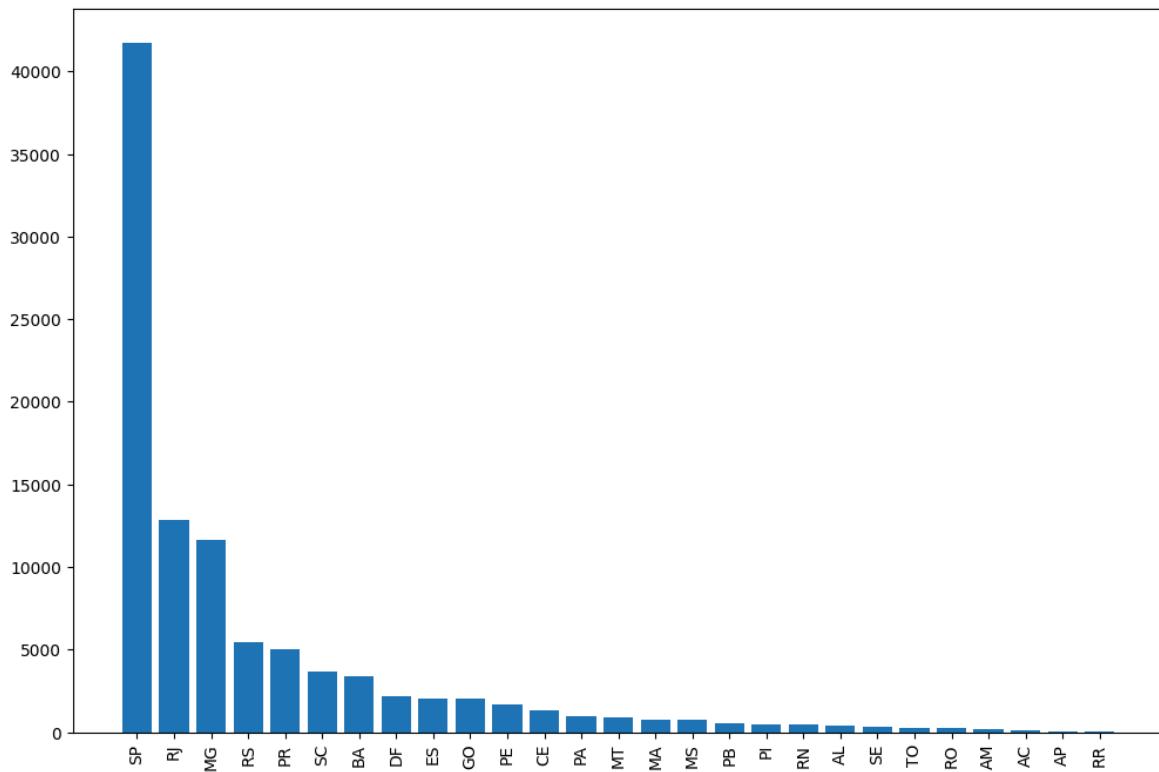
Count the number of customers from each state.

```
In [41]: query = """select customer_state,count(customer_id) from customers group by cust
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 = (12,8))
plt.bar(df["state"],df["customer_count"])
plt.xticks(rotation = 90)
plt.show()

```



Calculate the number of orders per month in 2018.

In [7]:

```

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="Krima@123",
                           database="ecommerce")
cur=db.cursor()

```

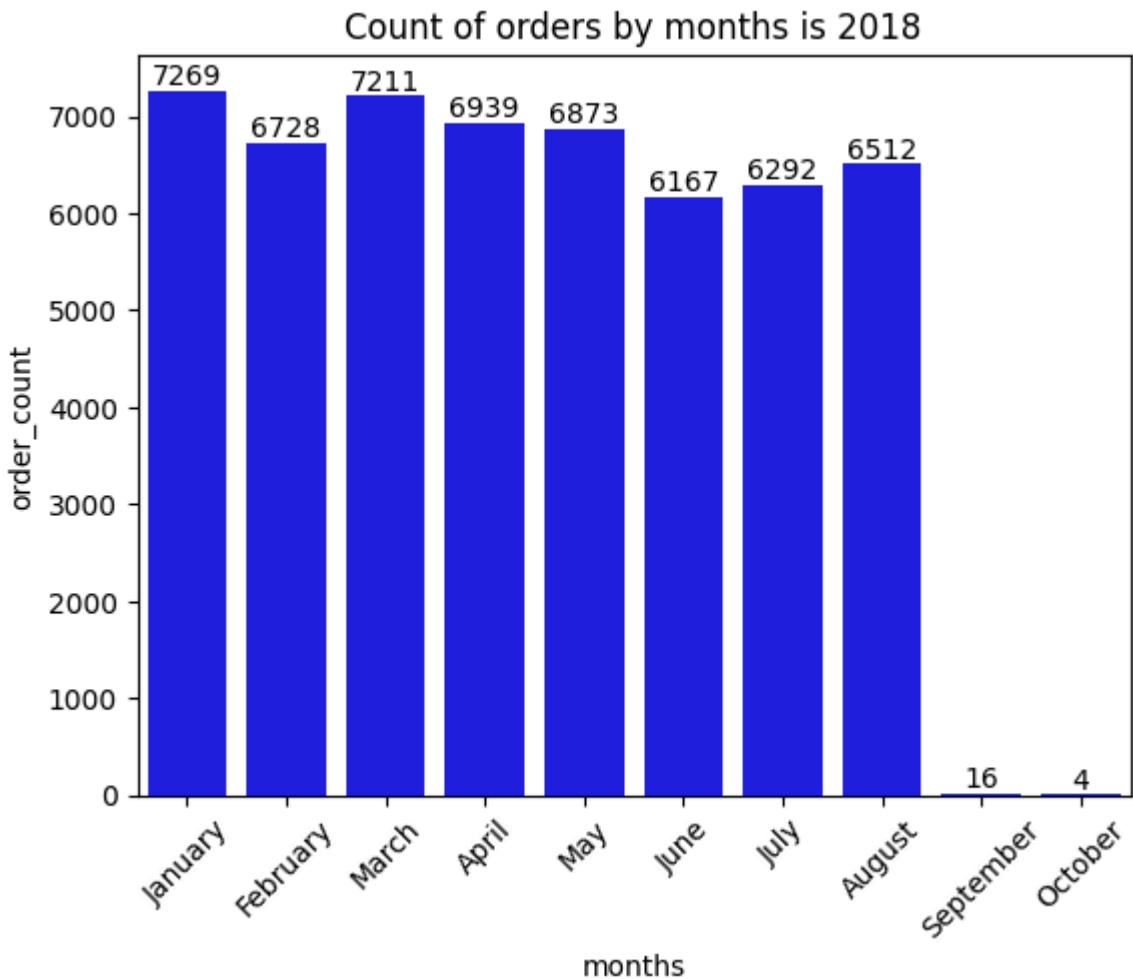
In [24]:

```

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"])
o = ["January", "February", "March", "April", "May", "June", "July", "August", "September", "October", "November", "December"]
ax = sns.barplot(x = df["months"], y = df["order_count"], data = df, order = o, color="#4CAF50")
plt.xticks(rotation = 45)
ax.bar_label(ax.containers[0])

```

```
plt.title ("Count of orders by months is 2018")
plt.show()
```



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

```
In [37]: query = """with count_per_order as
(select orders.order_id, orders.customer_id, count(order_items.order_id) as oc
from orders join order_items
on orders.order_id = order_items.order_id
group by orders.order_id, orders.customer_id)

select customers.customer_city, round(avg(count_per_order.oc),2) average_orders
from customers join count_per_order
on customers.customer_id = count_per_order.customer_id
group by customers.customer_city order by average_orders desc
"""

cur.execute(query)

data = cur.fetchall()
df = pd.DataFrame(data,columns = ["customer city", "average products/order"])
df.head(10)
```

Out[37]:

	customer city	average products/order
0	padre carvalho	7.00
1	celso ramos	6.50
2	datas	6.00
3	candido godoi	6.00
4	matias olimpio	5.00
5	cidelandia	4.00
6	picarra	4.00
7	morro de sao paulo	4.00
8	teixeira soares	4.00
9	curralinho	4.00

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

In [45]:

```
query = """select upper(products.product_category) category,
round((sum(payments.payment_value)/(select sum(payment_value) from payments))*10
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 category order by sales desc"""

cur.execute(query)
data = cur.fetchall()
df= pd.DataFrame(data,columns = ["Category","percentage distribution"])
df.head(5)
```

Out[45]:

	Category	percentage distribution
0	BED TABLE BATH	10.70
1	HEALTH BEAUTY	10.35
2	COMPUTER ACCESSORIES	9.90
3	FURNITURE DECORATION	8.93
4	WATCHES PRESENT	8.93

In [12]:

```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import numpy as np
import mysql.connector

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

```
        password="Krima@123",
        database="ecommerce")
cur=db.cursor()
```

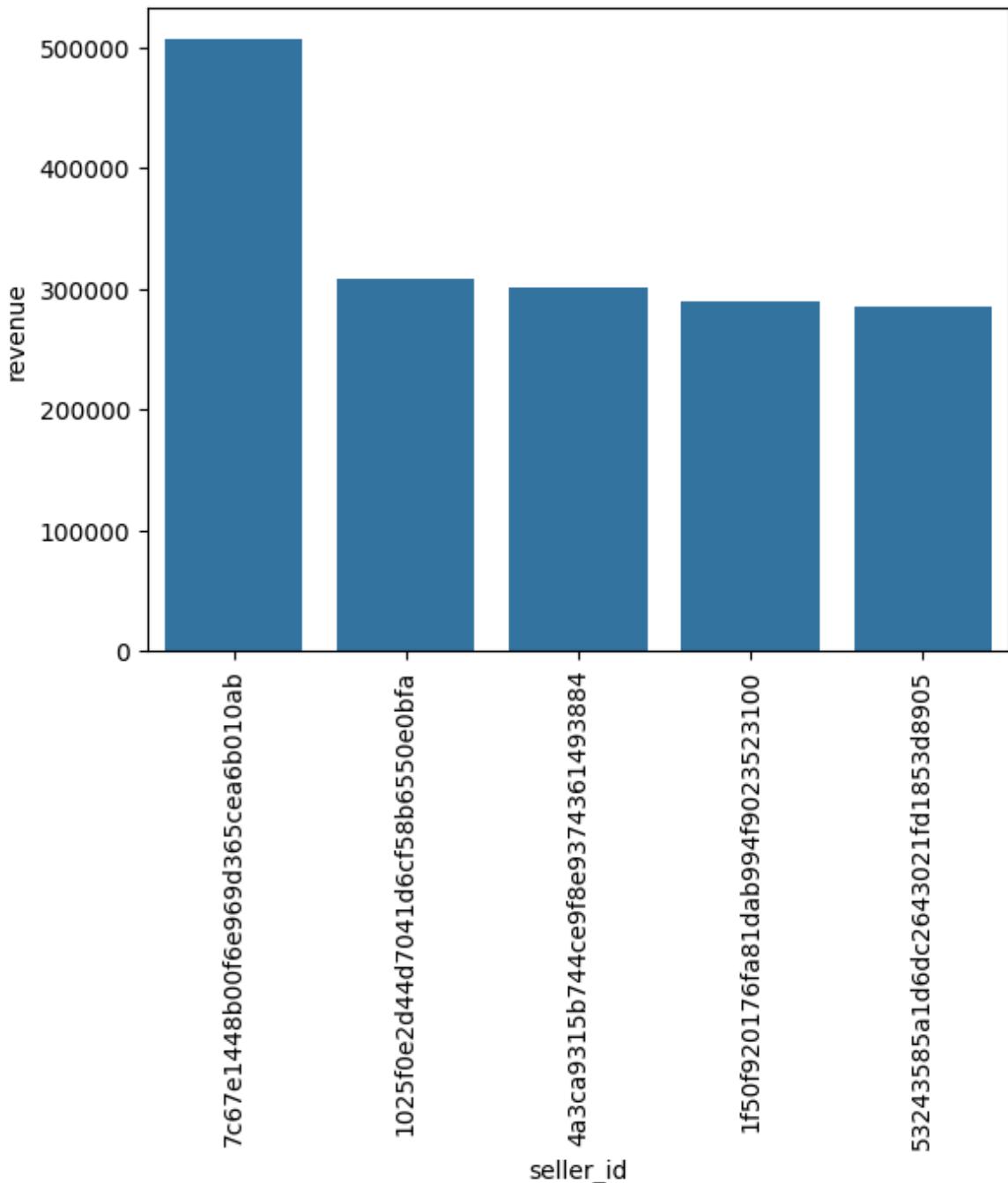
Identify the correlation between product price and the number of times a product has been purchased

```
In [18]: query = """select products.product_category,count(order_items.product_id),
round(avg(order_items.price),2)
from products join order_items
on products.product_id = order_items.product_id
group by products.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])
print(a[0][-1])
```

-0.10631514167157562

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

```
In [27]: query = """select *, dense_rank() over(order by revenue desc) as rn from
(select order_items.seller_id,sum(payments.payment_value)
revenue from order_items join payments
on order_items.order_id = payments.order_id
group by order_items.seller_id) as a"""
cur.execute(query)
data = cur.fetchall()
df=pd.DataFrame(data,columns = ["seller_id","revenue","rank"])
df=df.head(5)
sns.barplot(x="seller_id",y="revenue", data = df)
plt.xticks(rotation=90)
plt.show()
```



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

```
In [34]: 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 mov_avg from (select orders.customer_id, orders.order_purchase_timestamp,payments.payment_val from payments join orders on payments.order_id = orders.order_id) as a"""
cur.execute(query)
data = cur.fetchall()
df=pd.DataFrame(data)
df
```

Out[34]:

	0	1	2	3
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	0001fd6190edaaf884bcf3d49edf079	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
...
103881	fffecc9f79fd8c764f843e9951b11341	2018-03-29 16:59:26	71.23	27.120001
103882	ffffeda5b6d849fdbd39689bb92087f431	2018-05-22 13:36:02	63.13	63.130001
103883	fffff42319e9b2d713724ae527742af25	2018-06-13 16:57:05	214.13	214.130005
103884	fffffa3172527f765de70084a7e53aae8	2017-09-02 11:53:32	45.50	45.500000
103885	fffffe8b65bbe3087b653a978c870db99	2017-09-29 14:07:03	18.37	18.370001

103886 rows × 4 columns

Calculate the cumulative sales per month for each year.

In [42]:

```
query = """select years,months,payment,sum(payment)
over(order by years,months) cumulative_sales from
(select year(orders.order_purchase_timestamp) as years,
month(orders.order_purchase_timestamp) as months,
round(sum(payments.payment_value),2) as payment from orders join payments
on orders.order_id = payments.order_id
group by years,months order by years, months) as a"""
cur.execute(query)
data = cur.fetchall()
df= pd.DataFrame(data)
```

Out[42]:

	0	1	2	3
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

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

In [52]:

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

select years,((payment-lag(payment,1) over(order by years))/lag(payment,1) over(
cur.execute(query))
```

```
data = cur.fetchall()
df= pd.DataFrame(data,columns=[ "years","yo % growth"])
df
```

Out[52]:

	years	yo % growth
0	2016	NaN
1	2017	12112.703761
2	2018	20.000924

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

In [56]:

```
query = """with a as (select customers.customer_id,
min(orders.order_purchase_timestamp) first_order
from customers join orders
on customers.customer_id = orders.customer_id
group by customers.customer_id),

b as (select a.customer_id, count(distinct orders.order_purchase_timestamp) next
from a join orders
on orders.customer_id = a.customer_id
and orders.order_purchase_timestamp > first_order
and orders.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))
from a left join b
on a.customer_id = b.customer_id ;"""

cur.execute(query)
data = cur.fetchall()

data
```

Out[56]:

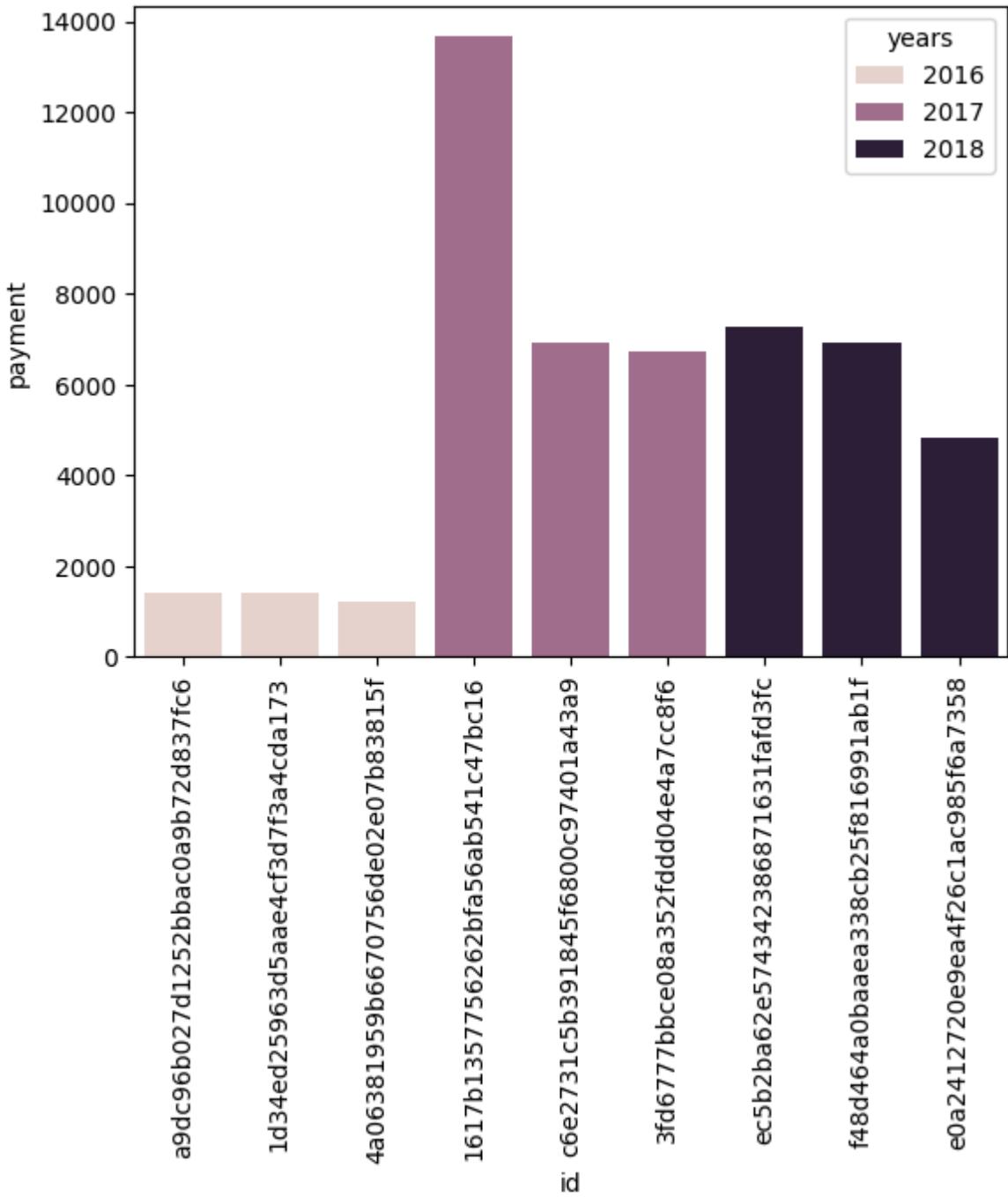
Identify the top 3 customers who spent the most money in each year.

In [57]:

```
query = """select years, customer_id, payment, d_rank
from
(select year(orders.order_purchase_timestamp) years,
orders.customer_id,
sum(payments.payment_value) payment,
dense_rank() over(partition by year(orders.order_purchase_timestamp)
order by sum(payments.payment_value) desc) d_rank
```

```
from orders join payments
on payments.order_id = orders.order_id
group by year(orders.order_purchase_timestamp),
orders.customer_id) as a
where d_rank <= 3 ;"""

cur.execute(query)
data = cur.fetchall()
df = pd.DataFrame(data, columns = ["years","id","payment","rank"])
sns.barplot(x = "id", y = "payment", data = df, hue = "years")
plt.xticks(rotation = 90)
plt.show()
```



In [1]: pip install pandas

```
Requirement already satisfied: pandas in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (2.3.0)
Requirement already satisfied: numpy>=1.26.0 in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (from pandas) (2.3.1)
Requirement already satisfied: python-dateutil>=2.8.2 in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (from pandas) (2.9.0.post0)
Requirement already satisfied: pytz>=2020.1 in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (from pandas) (2025.2)
Requirement already satisfied: tzdata>=2022.7 in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (from pandas) (2025.2)
Requirement already satisfied: six>=1.5 in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (from python-dateutil>=2.8.2->pandas) (1.17.0)
Note: you may need to restart the kernel to use updated packages.
```

```
In [2]: pip install numpy
```

```
Requirement already satisfied: numpy in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (2.3.1)
Note: you may need to restart the kernel to use updated packages.
```

```
In [4]: pip install mysql-connector-python
```

```
Requirement already satisfied: mysql-connector-python in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (9.3.0)
Note: you may need to restart the kernel to use updated packages.
```

```
In [5]: pip install seaborn
```

```
Requirement already satisfied: seaborn in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (0.13.2)
Requirement already satisfied: numpy!=1.24.0,>=1.20 in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (from seaborn) (2.3.1)
Requirement already satisfied: pandas>=1.2 in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (from seaborn) (2.3.0)
Requirement already satisfied: matplotlib!=3.6.1,>=3.4 in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (from seaborn) (3.10.3)
Requirement already satisfied: contourpy>=1.0.1 in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (from matplotlib!=3.6.1,>=3.4->seaborn) (1.3.2)
Requirement already satisfied: cycler>=0.10 in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (from matplotlib!=3.6.1,>=3.4->seaborn) (0.12.1)
Requirement already satisfied: fonttools>=4.22.0 in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (from matplotlib!=3.6.1,>=3.4->seaborn) (4.58.5)
Requirement already satisfied: kiwisolver>=1.3.1 in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (from matplotlib!=3.6.1,>=3.4->seaborn) (1.4.8)
Requirement already satisfied: packaging>=20.0 in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (from matplotlib!=3.6.1,>=3.4->seaborn) (25.0)
Requirement already satisfied: pillow>=8 in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (from matplotlib!=3.6.1,>=3.4->seaborn) (11.3.0)
Requirement already satisfied: pyparsing>=2.3.1 in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (from matplotlib!=3.6.1,>=3.4->seaborn) (3.2.3)
Requirement already satisfied: python-dateutil>=2.7 in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (from matplotlib!=3.6.1,>=3.4->seaborn) (2.9.0.post0)
Requirement already satisfied: pytz>=2020.1 in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (from pandas>=1.2->seaborn) (2025.2)
Requirement already satisfied: tzdata>=2022.7 in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (from pandas>=1.2->seaborn) (2025.2)
Requirement already satisfied: six>=1.5 in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (from python-dateutil>=2.7->matplotlib!=3.6.1,>=3.4->seaborn) (1.17.0)
Note: you may need to restart the kernel to use updated packages.
```

In [6]: pip install matplotlib

```
Requirement already satisfied: matplotlib in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (3.10.3)
Requirement already satisfied: contourpy>=1.0.1 in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (from matplotlib) (1.3.2)
Requirement already satisfied: cycler>=0.10 in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (from matplotlib) (0.12.1)
Requirement already satisfied: fonttools>=4.22.0 in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (from matplotlib) (4.58.5)
Requirement already satisfied: kiwisolver>=1.3.1 in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (from matplotlib) (1.4.8)
Requirement already satisfied: numpy>=1.23 in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (from matplotlib) (2.3.1)
Requirement already satisfied: packaging>=20.0 in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (from matplotlib) (25.0)
Requirement already satisfied: pillow>=8 in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (from matplotlib) (11.3.0)
Requirement already satisfied: pyparsing>=2.3.1 in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (from matplotlib) (3.2.3)
Requirement already satisfied: python-dateutil>=2.7 in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (from matplotlib) (2.9.0.post0)
Requirement already satisfied: six>=1.5 in c:\users\kkjeg\appdata\local\programs\python\python313\lib\site-packages (from python-dateutil>=2.7->matplotlib) (1.17.0)
```

Note: you may need to restart the kernel to use updated packages.