High Impact Skills Development Program
in Artificial Intelligence, Data Science, and Blockchain

Project Title: Online Retail Segmentation. **Module 06:** Data Mining

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github link : https://github.com/Aslam009/ORS-Data-mining

Beginner Queries:

1- Define meta data in mysql workbench

1. InvoiceNo:
   - Data Type: VARCHAR
2. StockCode:
   - Data Type: VARCHAR (to store alphanumeric stock codes)
   - Constraints: PRIMARY KEY (StockCode is unique)

3. Description:
   - Data Type: TEXT
   - Constraints: None

4. Quantity:
   - Data Type: INT
   - Constraints: (constraint to ensure positive values)

5. InvoiceDate:

   - Data Type: DATETIME or TIMESTAMP
   - Constraints: None (not null)

6. UnitPrice:

   - Data Type: DECIMAL
   - Constraints: None (non-negative values)

7. CustomerID:

   - Data Type: INT (assuming customer IDs are represented as integers)

- Constraints: FOREIGN KEY (if linked to a Customers table) or None

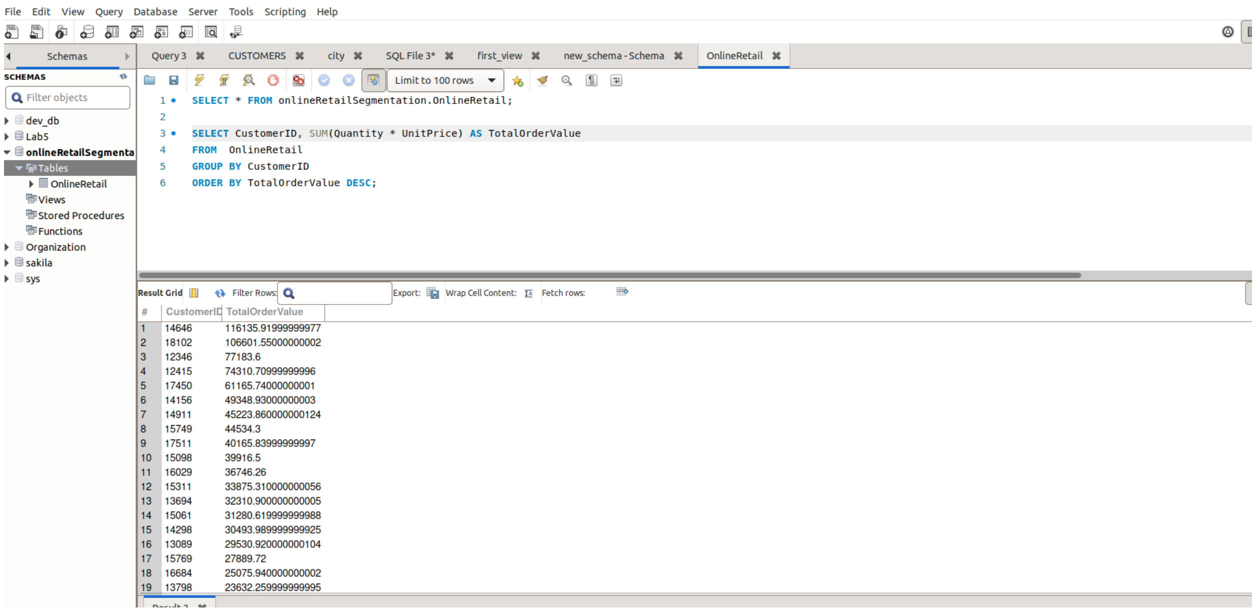
8. Country:

   - Data Type: VARCHAR

- Constraints: None

2:**What is the distribution of order values across all customers in the dataset?**

```
SELECT CustomerID, SUM(Quantity * UnitPrice) AS TotalOrderValue
FROM  OnlineRetail
GROUP BY CustomerID
ORDER BY TotalOrderValue DESC;
```



```
SELECT * FROM onlineRetailSegmentation.OnlineRetail;

SELECT CustomerID, SUM(Quantity * UnitPrice) AS TotalOrderValue
FROM  OnlineRetail
GROUP BY CustomerID
ORDER BY TotalOrderValue DESC;
```

#	CustomerID	TotalOrderValue
1	14646	116135.91999999977
2	18102	106601.55000000002
3	12346	77183.6
4	12415	74310.70999999996
5	17450	61165.74000000001
6	14156	49348.93000000003
7	14911	45223.860000000124
8	15749	44534.3
9	17511	40165.83999999997
10	15098	39916.5
11	16029	36746.26
12	15311	33875.310000000056
13	13694	32310.900000000005
14	15061	31280.619999999988
15	14298	30493.989999999925
16	13089	29530.920000000104
17	15769	27889.72
18	16684	25075.940000000002
19	13798	23632.259999999995

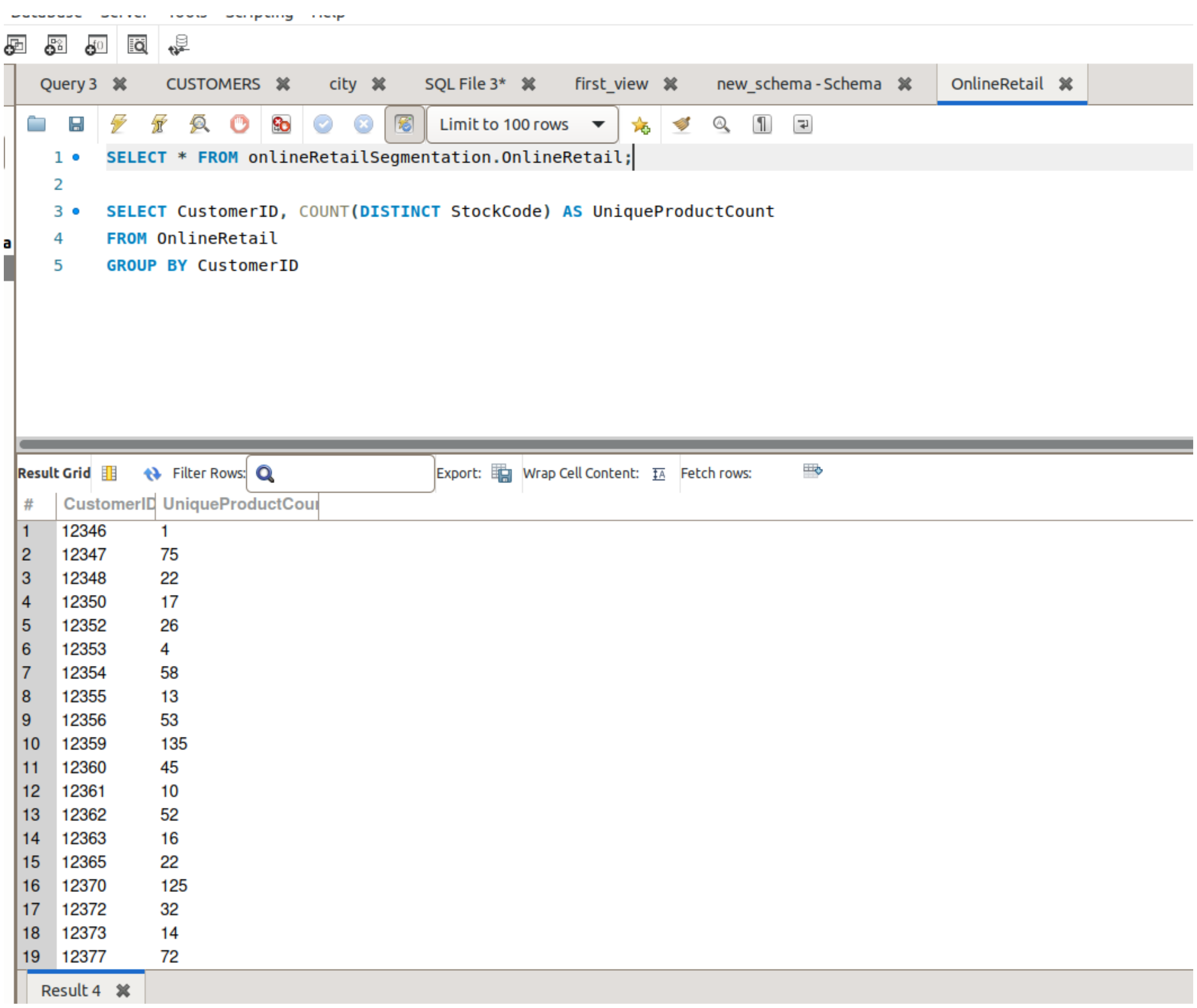
This SQL query get information from customers' total order values from the "OnlineRetail" table. The query calculates the sum of the product of quantity and unit price for each customer's transactions. The results are then grouped by customer and ordered in descending order based on the total order value.

3:How many unique products has each customer purchased?

SELECT CustomerID, COUNT(DISTINCT StockCode) AS UniqueProductCount

FROM OnlineRetail

GROUP BY CustomerID



```
SELECT * FROM onlineRetailSegmentation.OnlineRetail;

SELECT CustomerID, COUNT(DISTINCT StockCode) AS UniqueProductCount
FROM OnlineRetail
GROUP BY CustomerID
```

#	CustomerID	UniqueProductCou
1	12346	1
2	12347	75
3	12348	22
4	12350	17
5	12352	26
6	12353	4
7	12354	58
8	12355	13
9	12356	53
10	12359	135
11	12360	45
12	12361	10
13	12362	52
14	12363	16
15	12365	22
16	12370	125
17	12372	32
18	12373	14
19	12377	72

This SQL query retrieves information about the count of unique products that each customer has purchased from the "OnlineRetail" table. The query calculates the number of distinct product codes (StockCodes) associated with each customer's transactions. The results are grouped by customer.

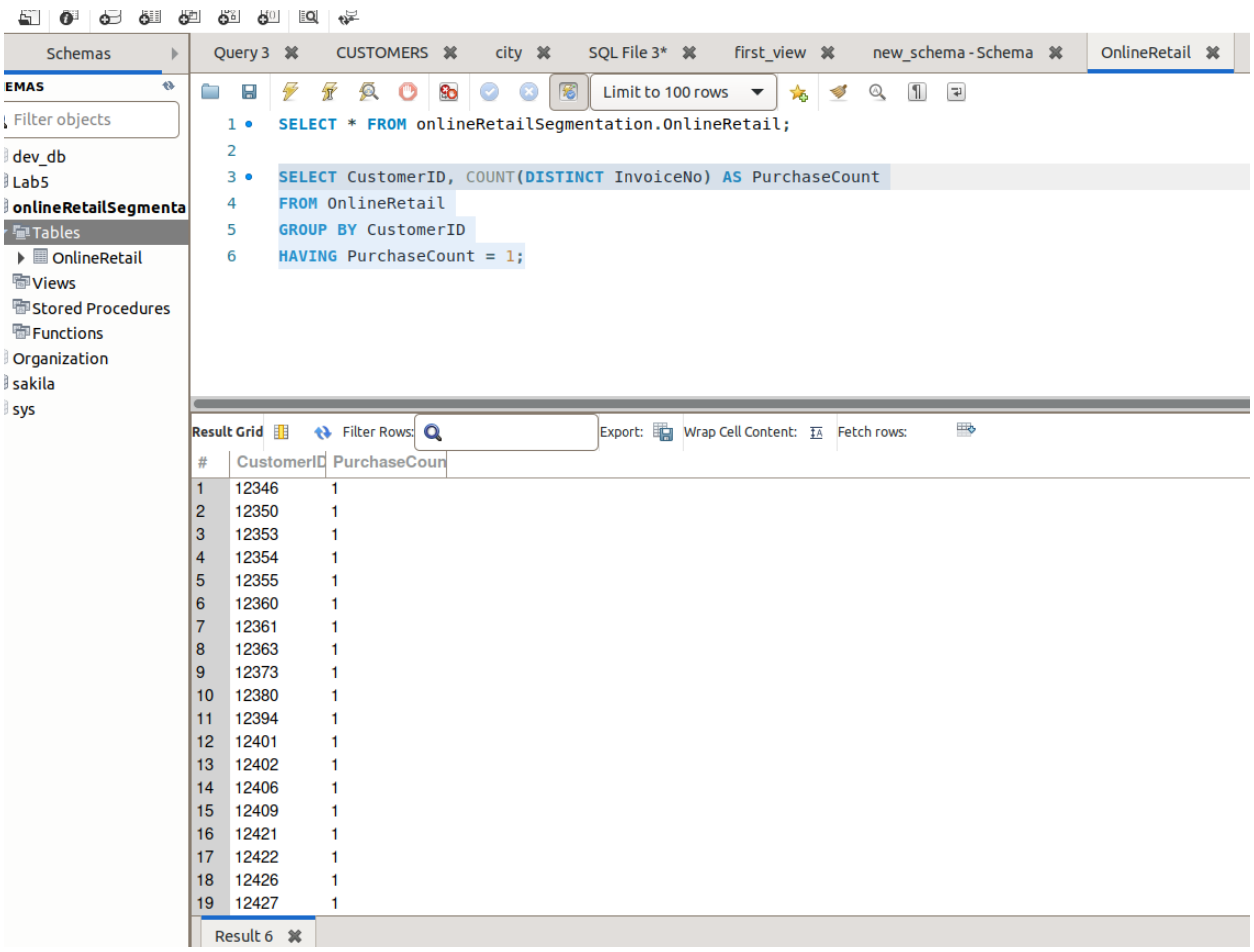
4:Which customers have only made a single purchase from the company?

SELECT CustomerID, COUNT(DISTINCT InvoiceNo) AS PurchaseCount

FROM OnlineRetail

GROUP BY CustomerID

HAVING PurchaseCount = 1;



```
SELECT * FROM onlineRetailSegmentation.OnlineRetail;

SELECT CustomerID, COUNT(DISTINCT InvoiceNo) AS PurchaseCount
FROM OnlineRetail
GROUP BY CustomerID
HAVING PurchaseCount = 1;
```

#	CustomerID	PurchaseCoun
1	12346	1
2	12350	1
3	12353	1
4	12354	1
5	12355	1
6	12360	1
7	12361	1
8	12363	1
9	12373	1
10	12380	1
11	12394	1
12	12401	1
13	12402	1
14	12406	1
15	12409	1
16	12421	1
17	12422	1
18	12426	1
19	12427	1

This SQL query get information from customers who have a single purchase from the "OnlineRetail" table. The query calculates the count of distinct invoice numbers (InvoiceNos) associated with each customer's transactions and filters the results to include only customers with a purchase count of 1.

5:Which products are most commonly purchased together by customers in the dataset?

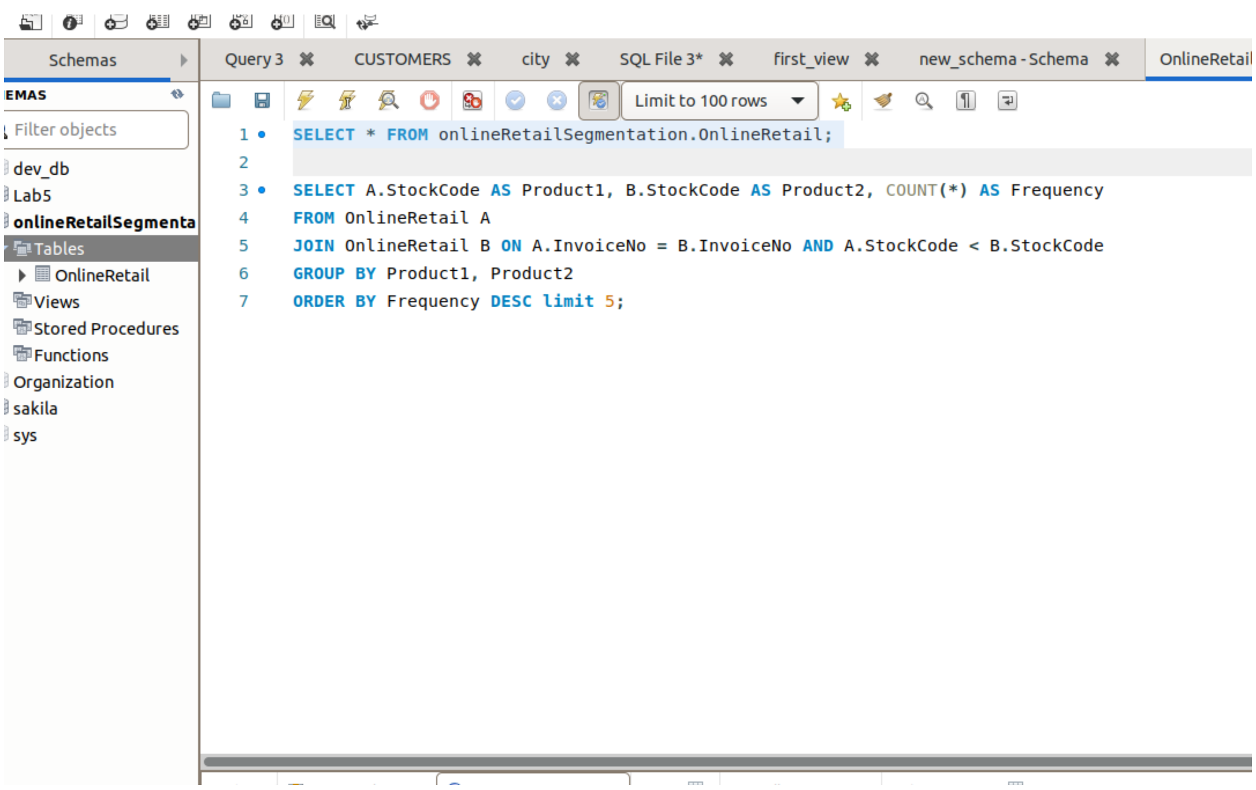
SELECT A.StockCode AS Product1, B.StockCode AS Product2, COUNT(*) AS Frequency

FROM OnlineRetail A

JOIN OnlineRetail B ON A.InvoiceNo = B.InvoiceNo AND A.StockCode < B.StockCode

GROUP BY Product1, Product2

ORDER BY Frequency DESC limit 5;



```
SELECT * FROM onlineRetailSegmentation.OnlineRetail;

SELECT A.StockCode AS Product1, B.StockCode AS Product2, COUNT(*) AS Frequency
FROM OnlineRetail A
JOIN OnlineRetail B ON A.InvoiceNo = B.InvoiceNo AND A.StockCode < B.StockCode
GROUP BY Product1, Product2
ORDER BY Frequency DESC limit 5;
```

This SQL query is to find out the frequency of pairs of products that are commonly purchased together in the "OnlineRetail" table. The query performs a self-join on the "OnlineRetail" table to compare different products within the same invoices.

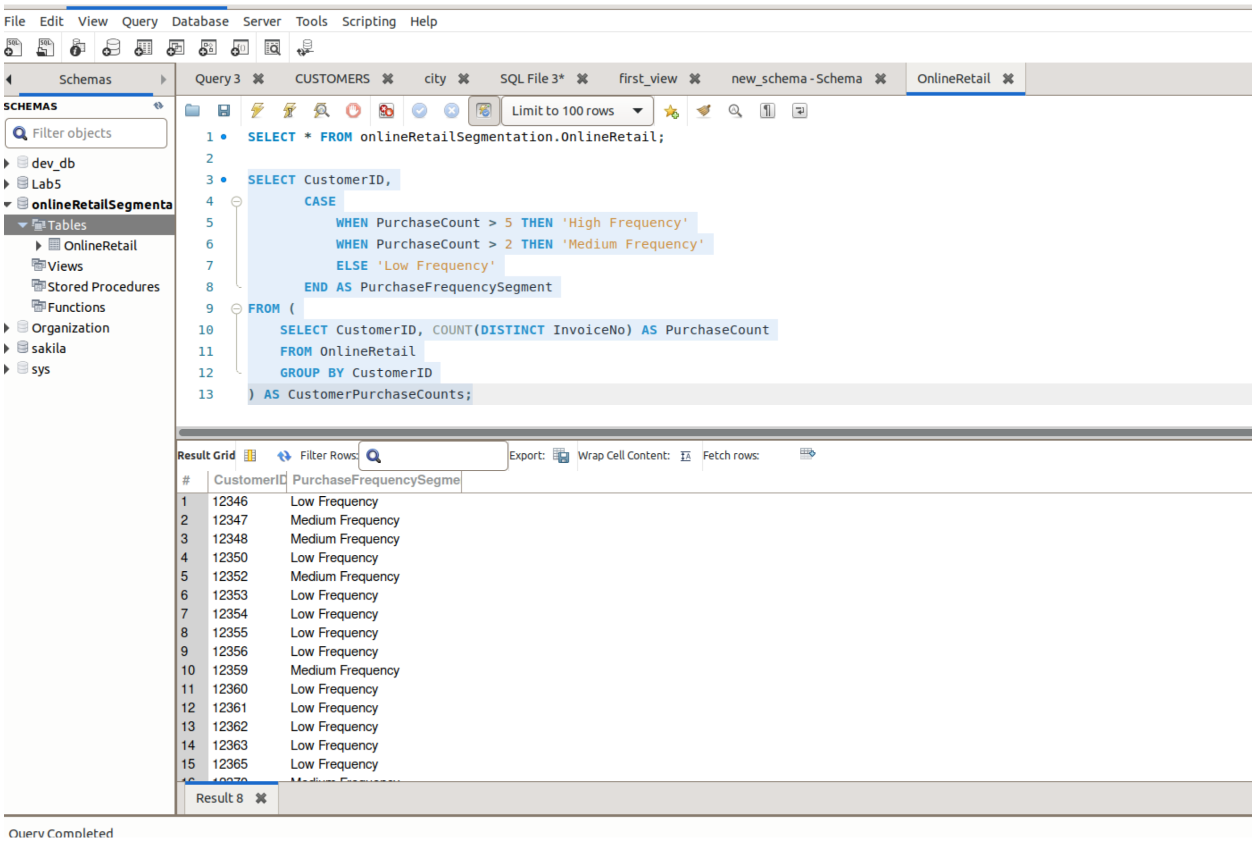
Advance Queries :

1: Customer Segmentation by Purchase Frequency

```
SELECT CustomerID,
       CASE
           WHEN PurchaseCount > 5 THEN 'High Frequency'
           WHEN PurchaseCount > 2 THEN 'Medium Frequency'
           ELSE 'Low Frequency'
       END AS PurchaseFrequencySegment
FROM (
    SELECT CustomerID, COUNT(DISTINCT InvoiceNo) AS PurchaseCount
    FROM OnlineRetail
```

    GROUP BY CustomerID

) AS CustomerPurchaseCounts;



```
SELECT * FROM onlineRetailSegmentation.OnlineRetail;

SELECT CustomerID,
       CASE
           WHEN PurchaseCount > 5 THEN 'High Frequency'
           WHEN PurchaseCount > 2 THEN 'Medium Frequency'
           ELSE 'Low Frequency'
       END AS PurchaseFrequencySegment
FROM (
    SELECT CustomerID, COUNT(DISTINCT InvoiceNo) AS PurchaseCount
    FROM OnlineRetail
    GROUP BY CustomerID
) AS CustomerPurchaseCounts;
```

```
#   CustomerID  PurchaseFrequencySegme
1   12346       Low Frequency
2   12347       Medium Frequency
3   12348       Medium Frequency
4   12350       Low Frequency
5   12352       Medium Frequency
6   12353       Low Frequency
7   12354       Low Frequency
8   12355       Low Frequency
9   12356       Low Frequency
10  12359       Medium Frequency
11  12360       Low Frequency
12  12361       Low Frequency
13  12362       Low Frequency
14  12363       Low Frequency
15  12365       Low Frequency
```

This query selects data from the subquery and applies a CASE statement to categorize customers based on their purchase frequency.

2:Average Order Value by Country

SELECT Country, AVG(TotalOrderValue) AS AverageOrderValue

FROM (

    SELECT Country, InvoiceNo, SUM(Quantity * UnitPrice) AS TotalOrderValue

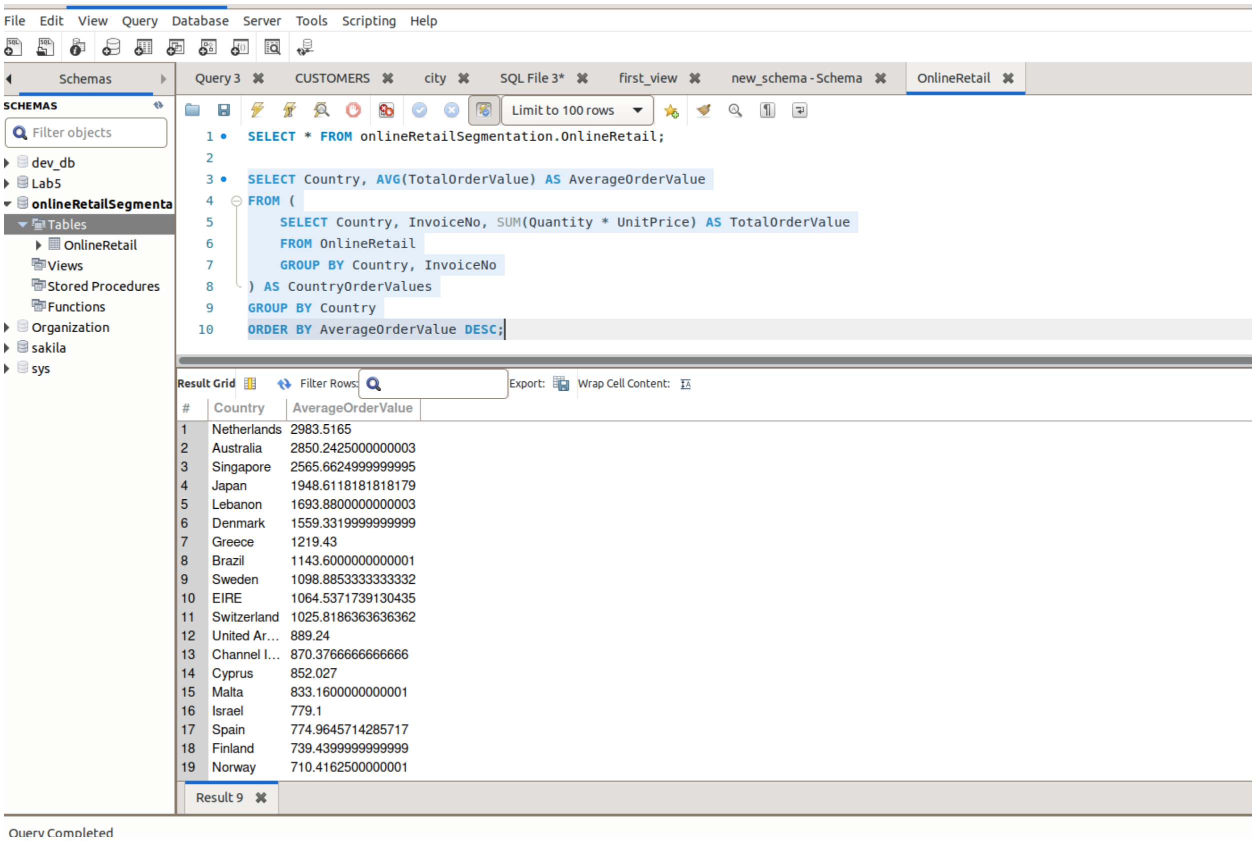
    FROM OnlineRetail

    GROUP BY Country, InvoiceNo

) AS CountryOrderValues

GROUP BY Country

ORDER BY AverageOrderValue DESC;



```sql
SELECT * FROM onlineRetailSegmentation.OnlineRetail;

SELECT Country, AVG(TotalOrderValue) AS AverageOrderValue
FROM (
    SELECT Country, InvoiceNo, SUM(Quantity * UnitPrice) AS TotalOrderValue
    FROM OnlineRetail
    GROUP BY Country, InvoiceNo
) AS CountryOrderValues
GROUP BY Country
ORDER BY AverageOrderValue DESC;
```

#	Country	AverageOrderValue
1	Netherlands	2983.5165
2	Australia	2850.2425000000003
3	Singapore	2565.6624999999995
4	Japan	1948.6118181818179
5	Lebanon	1693.8800000000003
6	Denmark	1559.3319999999999
7	Greece	1219.43
8	Brazil	1143.6000000000001
9	Sweden	1098.8853333333332
10	EIRE	1064.5371739130435
11	Switzerland	1025.8186363636362
12	United Ar...	889.24
13	Channel I...	870.3766666666666
14	Cyprus	852.027
15	Malta	833.1600000000001
16	Israel	779.1
17	Spain	774.9645714285717
18	Finland	739.4399999999999
19	Norway	710.4162500000001

Query Completed

This SQL query calculates the average order value for each country in the "OnlineRetail" dataset. It involves nested subqueries to first calculate the total order value for each invoice within each country, and then it calculates the average order value for each country.

3:Customer Churn Analysis

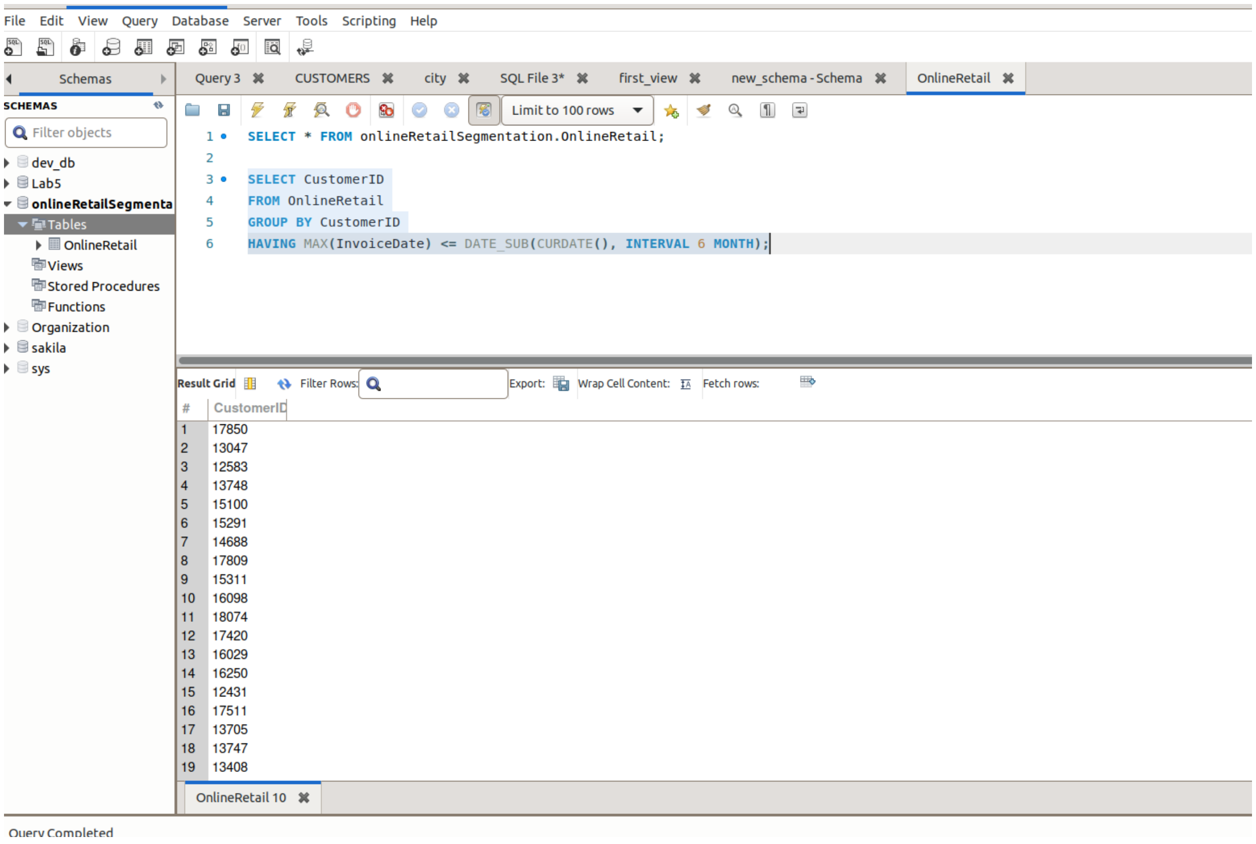
Identify customers who haven't made a purchase in a specific period (e.g., last 6 months) to assess churn.

SELECT CustomerID

FROM OnlineRetail

GROUP BY CustomerID

HAVING MAX(InvoiceDate) <= DATE_SUB(CURDATE(), INTERVAL 6 MONTH);



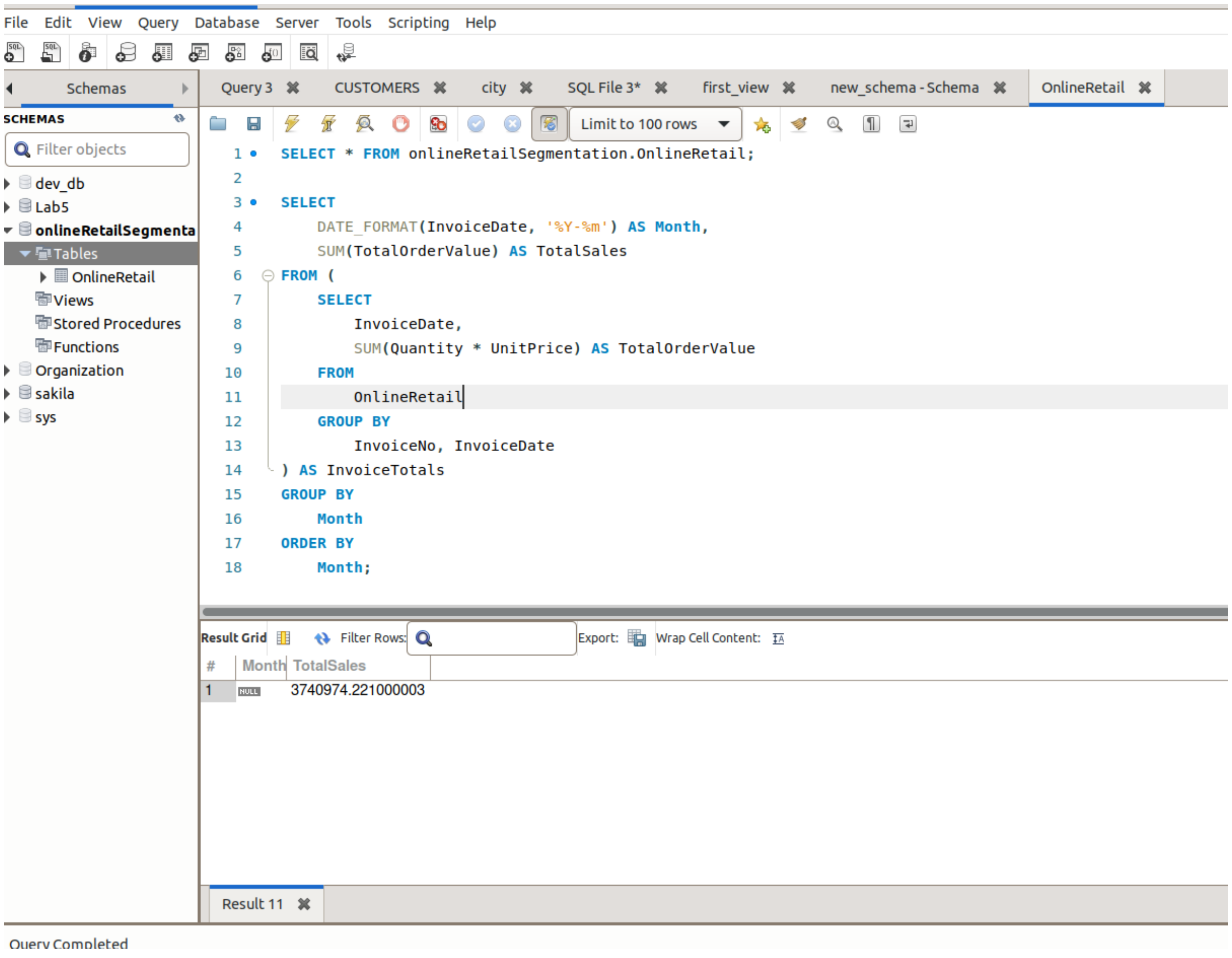
```
SELECT * FROM onlineRetailSegmentation.OnlineRetail;

SELECT CustomerID
FROM OnlineRetail
GROUP BY CustomerID
HAVING MAX(InvoiceDate) <= DATE_SUB(CURDATE(), INTERVAL 6 MONTH);
```

```
#   CustomerID
1   17850
2   13047
3   12583
4   13748
5   15100
6   15291
7   14688
8   17809
9   15311
10  16098
11  18074
12  17420
13  16029
14  16250
15  12431
16  17511
17  13705
18  13747
19  13408
```

4:**Product Affinity Analysis**

Determine which products are often purchased together by calculating the correlation between product purchases.

```
SELECT
    DATE_FORMAT(InvoiceDate, '%Y-%m') AS Month,
    SUM(TotalOrderValue) AS TotalSales
FROM (
    SELECT
        InvoiceDate,
        SUM(Quantity * UnitPrice) AS TotalOrderValue
    FROM
        OnlineRetail
    GROUP BY
        InvoiceNo, InvoiceDate
) AS InvoiceTotals
GROUP BY
    Month
ORDER BY
    Month;
```



```
SELECT * FROM onlineRetailSegmentation.OnlineRetail;

SELECT
    DATE_FORMAT(InvoiceDate, '%Y-%m') AS Month,
    SUM(TotalOrderValue) AS TotalSales
FROM (
    SELECT
        InvoiceDate,
        SUM(Quantity * UnitPrice) AS TotalOrderValue
    FROM
        OnlineRetail
    GROUP BY
        InvoiceNo, InvoiceDate
) AS InvoiceTotals
GROUP BY
    Month
ORDER BY
    Month;
```

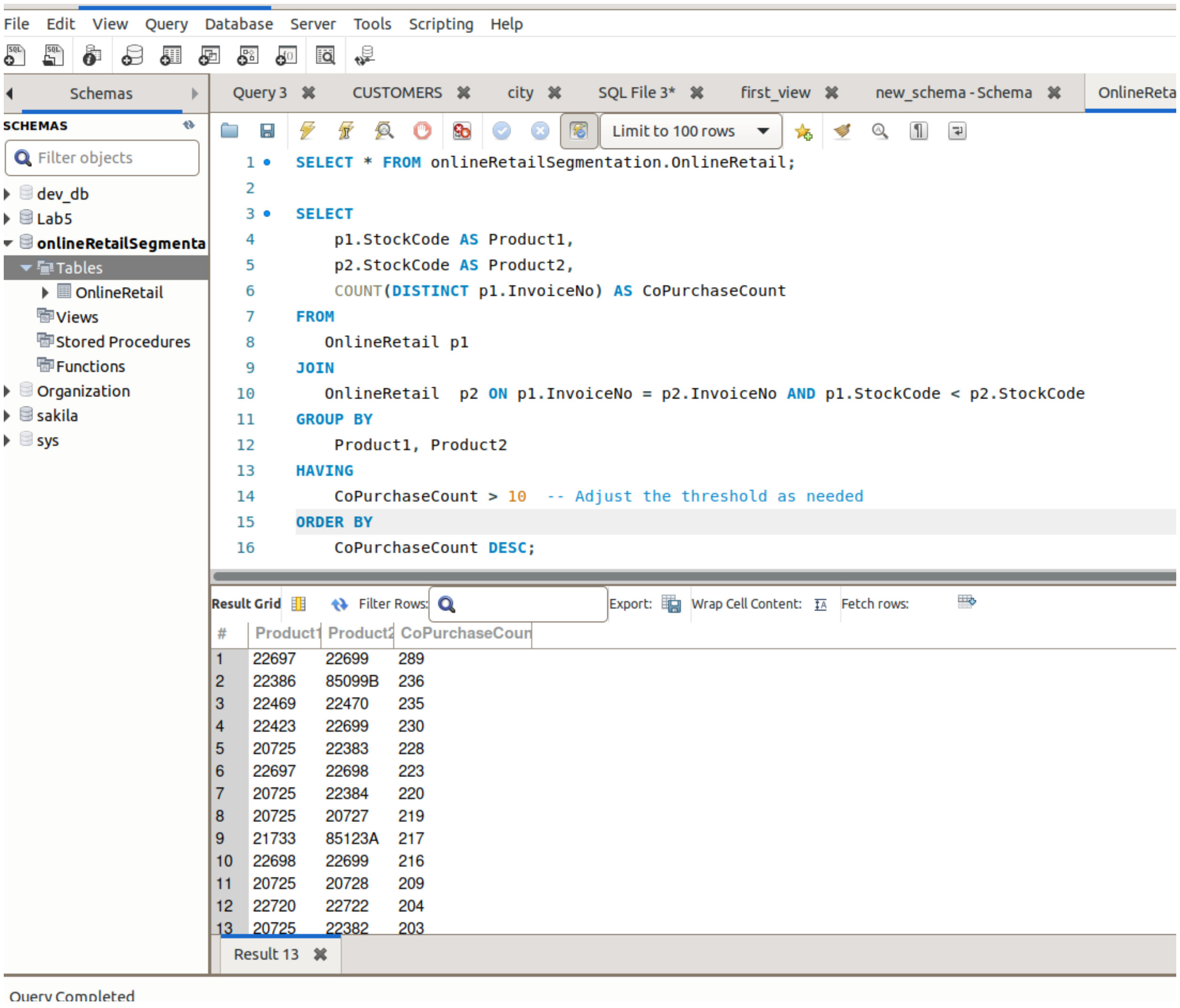
#	Month	TotalSales
1	NULL	3740974.221000003

This SQL query is used to summarize the total sales for each month in the "OnlineRetail" table. The query involves nested subqueries to first calculate the total order value for each invoice and then aggregates those values on a monthly basis. Here's a breakdown of each part of the query:

5:**Time-based Analysis**

Explore trends in customer behavior over time, such as monthly or quarterly sales patterns.

```
SELECT
    p1.StockCode AS Product1,
    p2.StockCode AS Product2,
    COUNT(DISTINCT p1.InvoiceNo) AS CoPurchaseCount
FROM
   OnlineRetail p1
JOIN
   OnlineRetail  p2 ON p1.InvoiceNo = p2.InvoiceNo AND p1.StockCode <
p2.StockCode
GROUP BY
    Product1, Product2
HAVING
    CoPurchaseCount > 10  -- Adjust the threshold as needed
ORDER BY
    CoPurchaseCount DESC
```



```sql
SELECT * FROM onlineRetailSegmentation.OnlineRetail;

SELECT
    p1.StockCode AS Product1,
    p2.StockCode AS Product2,
    COUNT(DISTINCT p1.InvoiceNo) AS CoPurchaseCount
FROM
   OnlineRetail p1
JOIN
   OnlineRetail  p2 ON p1.InvoiceNo = p2.InvoiceNo AND p1.StockCode < p2.StockCode
GROUP BY
    Product1, Product2
HAVING
    CoPurchaseCount > 10  -- Adjust the threshold as needed
ORDER BY
    CoPurchaseCount DESC;
```

#	Product1	Product2	CoPurchaseCoun
1	22697	22699	289
2	22386	85099B	236
3	22469	22470	235
4	22423	22699	230
5	20725	22383	228
6	22697	22698	223
7	20725	22384	220
8	20725	20727	219
9	21733	85123A	217
10	22698	22699	216
11	20725	20728	209
12	22720	22722	204
13	20725	22382	203

This SQL query is used to identify pairs of products that are commonly purchased together in the "OnlineRetail" table. The query performs a self-join on the "OnlineRetail" table to compare different products within the same invoices and calculates the count of distinct invoices where each pair of products was co-purchased.

The End