New Wheels Project

Problem Statement

Business Context

A lot of people in the world share a common desire: to own a vehicle. A car or an automobile is seen as an object that gives the freedom of mobility. Many now prefer pre-owned vehicles because they come at an affordable cost, but at the same time, they are also concerned about whether the after-sales service provided by the resale vendors is as good as the care you may get from the actual manufacturers.

New-Wheels, a vehicle resale company, has launched an app with an end-to-end service from listing the vehicle on the platform to shipping it to the customer's location. This app also captures the overall after-sales feedback given by the customer.

Objective

New-Wheels sales have been dipping steadily in the past year, and due to the critical customer feedback and ratings online, there has been a drop in new customers every quarter, which is concerning to the business. The CEO of the company now wants a quarterly report with all the key metrics sent to him so he can assess the health of the business and make the necessary decisions.

As a data analyst, you see that there is an array of questions that are being asked at the leadership level that need to be answered using data. Import the dump file that contains various tables that are present in the database. Use the data to answer the questions posed and create a quarterly business report for the CEO

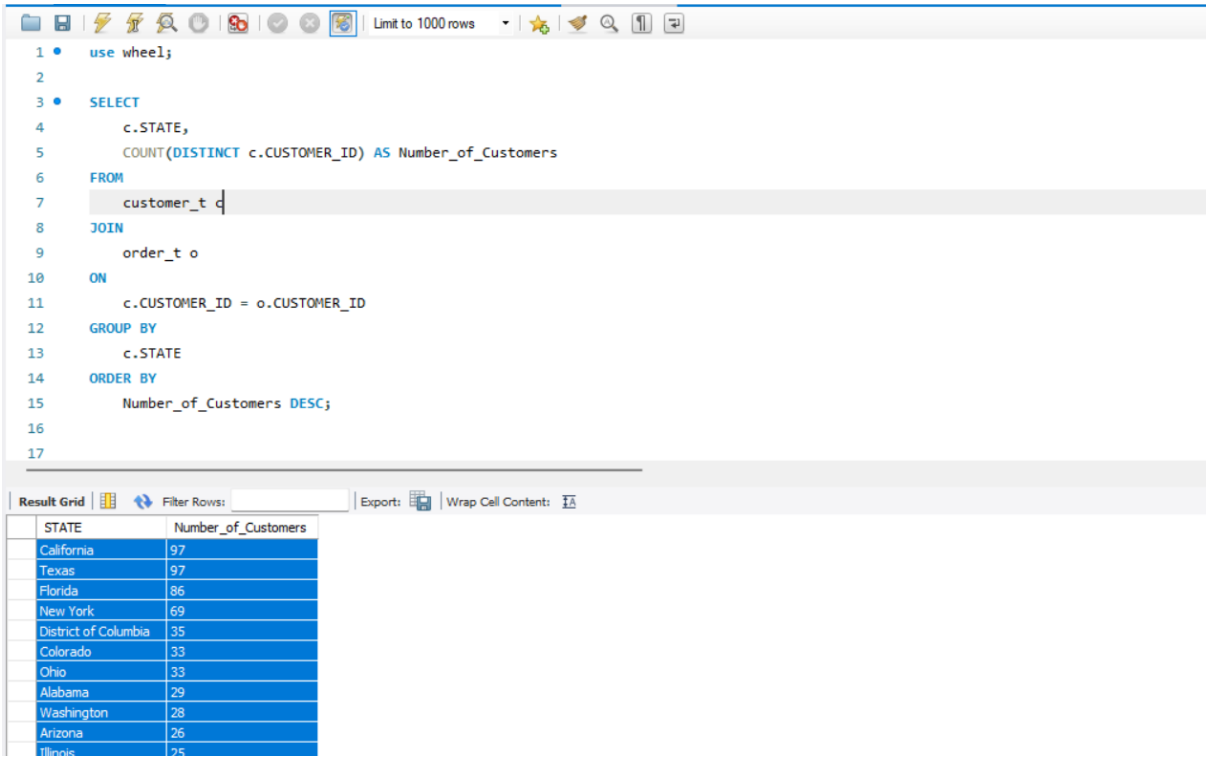
Question 1:

Find the total number of customers who have placed orders. What is the distribution of the customers across states? [4 marks]

Hint: For each state, count the number of customers

SOLUTION:

```
SELECT c.STATE,
   COUNT(DISTINCT c.CUSTOMER_ID) AS Number_of_Customers
FROM customer_t c
JOIN order_t o
ON c.CUSTOMER_ID = o.CUSTOMER_ID
GROUP BY c.STATE
ORDER BY  Number_of_Customers DESC;
```



```
use wheel;

SELECT
    c.STATE,
    COUNT(DISTINCT c.CUSTOMER_ID) AS Number_of_Customers
FROM
    customer_t c
JOIN
    order_t o
ON
    c.CUSTOMER_ID = o.CUSTOMER_ID
GROUP BY
    c.STATE
ORDER BY
    Number_of_Customers DESC;
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

STATE	Number_of_Customers
California	97
Texas	97
Florida	86
New York	69
District of Columbia	35
Colorado	33
Ohio	33
Alabama	29
Washington	28
Arizona	26
Illinois	25

Observation:

1. **Top Five states:**

- California : 95 customers
- Texas: 97 customers
- Florida: 86 customers
- New York: 69 customers
- District of Columbia: 35 customers

2. **Last Five States:**

- Vermont: 1 customer
- Wyoming: 1 customer
- Maine: 1 customer
- North Dakota: 2 customers
- Mississippi: 2 customers

3. **Uneven Distribution**:

- There is a significant disparity in the number of customers across states, with the top three states contributing to nearly 50% of all customers.

Insights:

1. **California and Texas:**
   These two states have the largest customer bases. Strategies targeting these regions could significantly increase revenue.

2. **Emerging Opportunities:**
   States with moderate customer bases, such as Colorado, Ohio, and Alabama, may represent growth opportunities with targeted marketing.
3. **Low Priority States:**
   States like Vermont and Wyoming might not warrant significant investment unless there's untapped potential due to low competition.

Recommendations:

1. **Strengthen Engagement in High-Performing States:**
   Focus on customer retention and loyalty programs in states like California, Texas, and Florida to maintain their market dominance.
   Use targeted marketing to upsell and cross-sell products in these regions.
2. **Develop Strategies for Low-Performing States:**
   Conduct market research to understand the reasons for low customer counts in states like Arizona and Washington.
   Launch localized campaigns or partnerships to improve awareness and reach in these regions.
3. **Address Uneven Distribution:**
   Allocate resources strategically based on the distribution of customers, prioritizing high-performing states while gradually increasing investments in underperforming ones.
4. **Evaluate Regional Dynamics:**
   Investigate whether operational factors (e.g., delivery availability, competition, or marketing reach) are contributing to the disparities in customer distribution.

Question 2:

Which are the top 5 vehicle makers preferred by the customers? [4 marks]

Hint: For each vehicle make what is the count of the customers.

SOLUTION:

```
SELECT
        vehicle_maker AS top_vehicle_makers,
        COUNT(customer_id) AS total_customers
FROM product_T JOIN customer_t
GROUP BY 1
ORDER BY 2 DESC
LIMIT 5;
```

```sql
use wheel;
SELECT
    vehicle_maker AS top_vehicle_makers,
    COUNT(customer_id) AS total_customers
FROM product_T JOIN customer_t
GROUP BY 1
ORDER BY 2 DESC
LIMIT 5;
```

Result Grid | Filter Rows: | Export:

top_vehicle_makers	total_customers
Chevrolet	82502
Ford	62622
Toyota	51688
Dodge	49700
Pontiac	49700

Observation:

1. **Top Vehicle Makers:**
    - Chevrolet is the most preferred vehicle maker with 82502 customers, significantly ahead of other brands.
    - Ford is the second most preferred with 62622 customers.
    - Toyota, Dodge, and Pontiac closely follow with 51688, 49700,49700 customers, respectively.
2. **Customer Distribution:**
    - Chevrolet alone accounts for the largest share among the top five, highlighting its dominance.
    - Dodge and Pontiac have an equal number of customers, indicating similar levels of preference among customers.
3. **Gap Between Makers:**
    - There is a noticeable gap between Chevrolet (82502) and the second-place Ford (62622).
    - Similarly, the gap between Ford and the remaining three brands is smaller, indicating closer competition among Toyota, Dodge, and Pontiac.

Insights:

1. **Chevrolet Leads:**
   Chevrolet is the most preferred vehicle maker with 83 unique customers, significantly ahead of the others.
2. **Tie Between Dodge and Pontiac:**
   Dodge and Pontiac are tied with 50 unique customers, making them equally competitive in the market.
3. **Ford and Toyota Are Competitive:**
   Ford and Toyota take the second and third spots, showing high customer preference.

Recommendation:

1. **Invest in Chevrolet Partnerships:**
   Focus on increasing stock, promotions, and collaborations with Chevrolet to leverage its strong customer base.
2. **Expand Promotions for Ford and Toyota:**
   Introduce competitive offers or loyalty programs to gain market share from Chevrolet.
3. **Understand Customer Preferences for Dodge and Pontiac:**
   Analyse customer feedback for Dodge and Pontiac to identify opportunities for growth.

Question 3:

Which is the most preferred vehicle maker in each state? [4 marks]

Hint: Use the window function RANK() to rank based on the count of customers for each state and vehicle maker.

After ranking, take the vehicle maker whose rank is 1.

SOLUTION:

```
SELECT *
FROM (
  SELECT
    state, vehicle_maker,
    COUNT(customer_id) AS total_customers,
    RANK() OVER (PARTITION BY state ORDER BY COUNT(customer_id) DESC) AS ranking
  FROM product_t
  JOIN order_t USING(product_id)
```

JOIN customer_t USING(customer_id)

GROUP BY state, vehicle_maker

) AS ranked_data

WHERE ranking = 1

ORDER BY total_customers DESC;

```sql
SELECT *
FROM (
    SELECT
        state, vehicle_maker,
        COUNT(customer_id) AS total_customers,
        RANK() OVER (PARTITION BY state ORDER BY COUNT(customer_id) DESC) AS ranking
    FROM product_t
    JOIN order_t USING(product_id)
    JOIN customer_t USING(customer_id)
    GROUP BY state, vehicle_maker
) AS ranked_data
WHERE ranking = 1
ORDER BY total_customers DESC;
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

state	vehicle_maker	total_customers	ranking
Texas	Chevrolet	9	1
Florida	Toyota	7	1
California	Ford	6	1
California	Dodge	6	1
California	Audi	6	1
California	Nissan	6	1
California	Chevrolet	6	1
Ohio	Chevrolet	6	1
Alabama	Dodge	5	1
Colorado	Chevrolet	5	1
Maryland	Ford	5	1
New York	Toyota	5	1

Observation:

1. **State-Wise Vehicle Preference:**

- The goal of the query was to identify the **most preferred vehicle maker in each state** based on the count of customers. This was achieved using the RANK() window function, which ranked vehicle makers within each state by customer count in descending order.
- Only the top-ranked vehicle maker for each state (rank = 1) was considered.

2. **Result Characteristics**:

- The output lists the **state**, the **most preferred vehicle maker**, the **total number of customers** for that vehicle maker, and the **ranking** (always 1).
- Some states (e.g., California) show multiple entries for the same rank due to ties in customer count (e.g., Dodge, Audi, and Chevrolet all have 6 customers).
- The results are sorted by the total customer count in descending order, with **Texas (Chevrolet)** and **Florida (Toyota)** having the highest numbers.

3. **Low Customer Counts:**
    - In many states, the number of customers per vehicle maker is relatively low, indicating either a small sample size or a fragmented market.
4. **Preference Ties:**
    - In states like Arizona, there are ties between vehicle makers for the top rank, suggesting similar popularity among customers.

Insights:

1. **Market Fragmentation**:
    - The distribution shows that no single vehicle maker dominates across multiple states. Preferences vary significantly by state.
2. **Emerging Preferences**:
    - In states with multiple vehicle makers tied for rank 1 (e.g., Arkansas), customer preferences are highly diverse and less consolidated.
3. **Dodge's Prominence**:
    - Dodge leads in Alabama, indicating it has a stronger market position in this state compared to others.

Recommendations:

1. **Target Marketing Campaigns:**
    - Chevrolet and Ford should focus their campaigns in their dominant states, such as Texas, California, and Virginia, to further solidify their market position.
    - Toyota should target Florida and New York with state-specific promotions to maintain its competitive edge.
2. **Expand in Fragmented Markets:**
    - In states like Arkansas, Hawaii, and Utah, where preferences are fragmented, brands should conduct market research to understand consumer needs better and develop strategies to capture market share.
3. **Leverage Regional Insights:**
    - Luxury brands like Ferrari and Maybach should focus on niche markets in Oklahoma and Utah, respectively, where they already have a foothold.
    - **Average rating in each quater**

Question 4:

Find the overall average rating given by the customers. What is the average rating in each quarter? [5 marks]

Consider the following mapping for ratings:

“Very Bad”: 1, “Bad”: 2, “Okay”: 3, “Good”: 4, “Very Good”: 5

Hint: Use subquery and assign numerical values to feedback categories using a CASE statement.

Then, calculate the average feedback count per quarter. Use a subquery to convert feedback

into numerical values and group by quarter_number to compute the average.

SOLUTION:

Average Rating foe each quarter

```
SELECT
   QUARTER(order_date) AS quarter_number,
   ROUND(AVG(
      CASE
         WHEN customer_feedback = 'very bad' THEN 1
         WHEN customer_feedback = 'bad' THEN 2
         WHEN customer_feedback = 'okay' THEN 3
         WHEN customer_feedback = 'good' THEN 4
         WHEN customer_feedback = 'very good' THEN 5
      END
   ), 2) AS average_rating
FROM
   order_t
GROUP BY
   QUARTER(order_date)
ORDER BY
   quarter_number ASC;
```

```sql
SELECT
    QUARTER(order_date) AS quarter_number,
    ROUND(AVG(
        CASE
            WHEN customer_feedback = 'very bad' THEN 1
            WHEN customer_feedback = 'bad' THEN 2
            WHEN customer_feedback = 'okay' THEN 3
            WHEN customer_feedback = 'good' THEN 4
            WHEN customer_feedback = 'very good' THEN 5
        END
    ), 2) AS average_rating
FROM
    order_t
GROUP BY
    QUARTER(order_date)
ORDER BY
    quarter_number ASC;
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

quarter_number	average_rating
1	3.55
2	3.35
3	2.96
4	2.40

Overall Rating by Customer:

```
SELECT
   ROUND(AVG(
      CASE
         WHEN customer_feedback = 'Very Bad' THEN 1
         WHEN customer_feedback = 'Bad' THEN 2
         WHEN customer_feedback = 'Okay' THEN 3
         WHEN customer_feedback = 'Good' THEN 4
         WHEN customer_feedback = 'Very Good' THEN 5
      END
   ), 2) AS overall_average_rating
```

FROM

order_t

WHERE

customer_feedback IS NOT NULL;

```
SELECT
    ROUND(AVG(
        CASE
            WHEN customer_feedback = 'Very Bad' THEN 1
            WHEN customer_feedback = 'Bad' THEN 2
            WHEN customer_feedback = 'Okay' THEN 3
            WHEN customer_feedback = 'Good' THEN 4
            WHEN customer_feedback = 'Very Good' THEN 5
        END
    ), 2) AS overall_average_rating
FROM
    order_t
WHERE
    customer_feedback IS NOT NULL;
```

overall_average_rating
3.14

Observation:

1. **Quarter 1 Performance:**
    - Quarter 1 has the highest average rating (3.5548), showing a strong start in customer satisfaction.
    - Customer satisfaction in this quarter may result from effective operations or improved service quality.
    - This sets a benchmark for understanding factors that contributed to high ratings.
2. **Declining Trend Over Quarters:**
    - Ratings decline steadily across Quarters 2 (3.3550), 3 (2.9563), and 4 (2.3970).
    - The lowest average rating in Quarter 4 suggests growing dissatisfaction towards the year-end.
    - Potential operational or seasonal factors may be contributing to the trend.
3. **Overall Feedback and Rollup Value:**
    - The overall average rating across all quarters is 3.1350, slightly above neutral satisfaction.

- Despite Quarter 1's high rating, the yearly average is pulled down due to poor performance in later quarters.
- This indicates inconsistent customer experience throughout the year.

Insights:

1. **Performance Decline:** The feedback ratings indicate a noticeable decline in customer satisfaction as the year progresses.
2. **Highest and Lowest Quarters:** Quarter 1 shows the highest average rating, while Quarter 4 has the lowest, suggesting specific issues or customer dissatisfaction in the latter part of the year.
3. **Overall Satisfaction:** The overall average rating (3.1350) indicates that customer feedback hovers slightly above neutral ("Okay"), which is not ideal.

Recommendation:

1. **Analyze Declining Satisfaction:**
   - Identify specific operational or service issues leading to dissatisfaction in Quarters 3 and 4.
   - Focus on customer complaints or delivery delays that may be more prevalent in these periods.
   - Conduct surveys or interviews to gather direct feedback from customers.
2. **Strengthen Quarter 4 Operations:**
   - Implement quality checks and optimize processes during Quarter 4 to address the significant dip in ratings.
   - Increase customer engagement through discounts or loyalty rewards to improve satisfaction levels.
   - Enhance staffing or support resources to handle potential holiday-season demand spikes.
3. **Set Goals for Improvement:**
   - Aim to maintain the high satisfaction levels seen in Quarter 1 throughout the year.
   - Establish key performance indicators (KPIs) like achieving a minimum average rating of 3.5 for every quarter.
   - Monitor feedback trends quarterly to address issues proactively rather than reactively.

Question 5:

Find the percentage distribution of feedback from the customers. Are customers getting more dissatisfied over time? [5 marks]

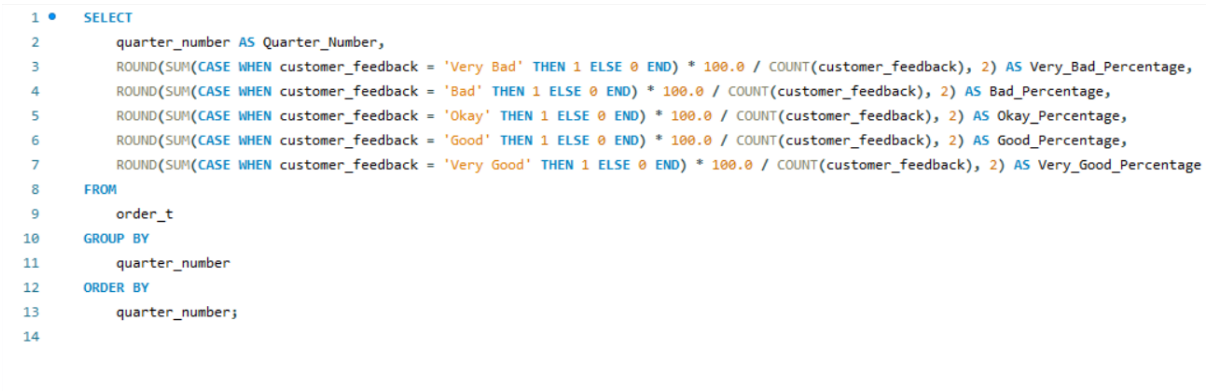
Hint: Calculate the percentage of each feedback type by using conditional aggregation.

For each feedback category, use a CASE statement to count the occurrences and then divide by the total count of feedback for the quarter, multiplied by 100 to get the percentage.

Finally, group by quarter_number and order the results to reflect the correct sequence.

SOLUTION:

```
SELECT
    quarter_number AS Quarter_Number,
    ROUND(SUM(CASE WHEN customer_feedback = 'Very Bad' THEN 1 ELSE 0 END) * 100.0 / COUNT(customer_feedback), 2) AS Very_Bad_Percentage,
    ROUND(SUM(CASE WHEN customer_feedback = 'Bad' THEN 1 ELSE 0 END) * 100.0 / COUNT(customer_feedback), 2) AS Bad_Percentage,
    ROUND(SUM(CASE WHEN customer_feedback = 'Okay' THEN 1 ELSE 0 END) * 100.0 / COUNT(customer_feedback), 2) AS Okay_Percentage,
    ROUND(SUM(CASE WHEN customer_feedback = 'Good' THEN 1 ELSE 0 END) * 100.0 / COUNT(customer_feedback), 2) AS Good_Percentage,
    ROUND(SUM(CASE WHEN customer_feedback = 'Very Good' THEN 1 ELSE 0 END) * 100.0 / COUNT(customer_feedback), 2) AS Very_Good_Percentage
FROM  order_t
GROUP BY quarter_number
ORDER BY quarter_number;
```



Quarter_Number	Very_Bad_Percentage	Bad_Percentage	Okay_Percentage	Good_Percentage	Very_Good_Percentage
1	10.97	11.29	19.03	28.71	30.00
2	14.89	14.12	20.23	22.14	28.63
3	17.90	22.71	21.83	20.96	16.59
4	30.65	29.15	20.10	10.05	10.05

Observation:

1. **Increase in Dissatisfaction (Very Bad and Bad Feedback)**:
    - **"Very Bad" feedback** steadily increases from **10.97% in Q1** to **30.65% in Q4**, indicating a significant rise in customer dissatisfaction.

- **"Bad" feedback** also increases from **11.29% in Q1** to **29.15% in Q4**, showing a consistent decline in service quality.

2. **Decline in Positive Feedback (Good and Very Good)**:
   - **"Good" feedback** decreases sharply from **28.71% in Q1** to **10.05% in Q4**, signifying reduced customer satisfaction.
   - **"Very Good" feedback** similarly drops from **30.00% in Q1** to **10.05% in Q4**, highlighting a failure to maintain high service standards.
3. **Shifts in Neutral Feedback (Okay)**:
   - **"Okay" feedback** remains relatively stable, increasing slightly from **19.03% in Q1** to **22.71% in Q3**, but dips slightly to **20.10% in Q4**.
   - This suggests that a portion of the dissatisfied customers might still find the service mediocre but not outright bad.

Insights:

- Worsening Customer Experience: The data highlights a clear trend of increasing dissatisfaction among customers as the year progresses.
- Positive Feedback Decline: A marked drop in "Very Good" ratings suggests that fewer customers are having exceptional experiences with the product or service.

Recommendations:

1. **Immediate Investigation:**
   - Analyse operational or service changes that occurred throughout the year, especially in Quarters 3 and 4.
   - Look for patterns in customer complaints or issues to pinpoint root causes.
2. **Customer Engagement:**
   - Reach out to customers who provided negative feedback to understand their concerns.
   - Implement a feedback loop to act on customer suggestions and improve satisfaction.
3. **Performance Improvement:**
   - Focus on training employees to deliver better service and maintain consistent standards.
   - Consider quality checks for products or services to ensure they meet customer expectations.
4. **Proactive Measures:**
   - Introduce promotions, loyalty programs, or incentives to encourage positive feedback.
   - Regularly monitor customer feedback percentages to address dissatisfaction before it escalates.
5. **Strategic Communication:**
   - Communicate changes or improvements based on customer feedback to rebuild trust and show that the organization values customer input.

Question 6:

What is the trend of the number of orders by quarter? [3 marks]

Hint: Count the number of orders for each quarter.

SOLUTION:

```
SELECT
   quarter_number AS Quarter_Number,
   COUNT(order_id) AS Total_Orders
FROM order_t
GROUP BY quarter_number
ORDER BY quarter_number;
```

```
1  SELECT
2      quarter_number AS Quarter_Number,
3      COUNT(order_id) AS Total_Orders
4  FROM
5      order_t
6  GROUP BY
7      quarter_number
8  ORDER BY
9      quarter_number;
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

Quarter_Number	Total_Orders
1	310
2	262
3	229
4	199

Observations:

1. **Order Count Trend:**

   The number of orders decreases progressively each quarter:
   - Quarter 1: 310 orders
   - Quarter 2: 262 orders
   - Quarter 3: 229 orders
   - Quarter 4: 199 orders

2. **Significant Decline:**

   - From Quarter 1 to Quarter 4, there is a 35.8% decrease in the total number of orders.

Insights:

1. **Declining Customer Engagement:**

- The consistent drop in order count indicates a possible reduction in customer interest or satisfaction over time.
- This decline aligns with the increasing dissatisfaction observed in customer feedback percentages (as seen in Question 5).

3. **Seasonality or Service Issues:**
    - The reduction in orders could be related to external factors such as seasonal demand changes, or internal issues such as declining service quality.

Recommendations:

1. **Analyze Causes of Decline:**
    - Investigate reasons for the decline in orders across quarters. Possible factors could include seasonality, customer satisfaction, or competitor activity.
2. **Customer Engagement:**
    - Enhance marketing efforts and promotions in Q3 and Q4 to boost sales, particularly during historically slower periods.
3. **Operational Optimization:**
    - Examine operational factors like product availability, delivery times, and discounts during Q3 and Q4 to understand if they influenced the downward trend.
4. **Feedback Analysis:**
    - Conduct surveys to gather customer feedback on why order volumes may have decreased over time. Address customer concerns promptly.

Question 7:

Calculate the net revenue generated by the company. What is the quarter-over-quarter % change in net revenue? [5 marks]

Hint: Net Revenue is the amount obtained by multiplying the number of units sold by the price after deducting the discounts applied.

Quarter over Quarter percentage change in revenue means what is the change in revenue from the subsequent quarter to the previous quarter in percentage.

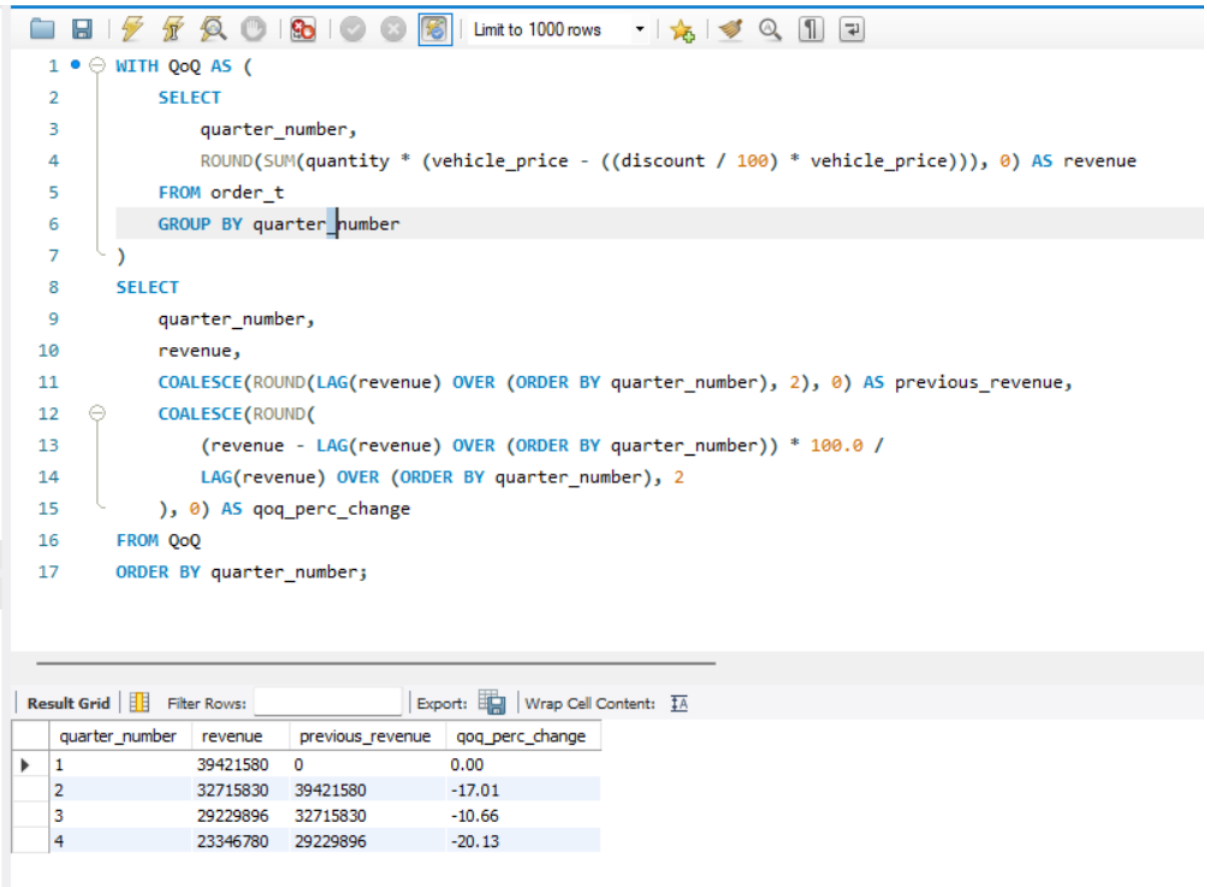
Calculate the revenue for each quarter by summing the quantity of product and the discounted vehicle price. Use the LAG function to get the revenue from the previous quarter, and then compute the quarter-over-quarter percentage change based on the current and previous revenue values.

Ensure the results are ordered by quarter_number to maintain the correct sequence.

SOLUTION:

```
WITH QoQ AS (
  SELECT
```

```
    quarter_number,
    ROUND(SUM(quantity * (vehicle_price - ((discount / 100) * vehicle_price))), 0) AS revenue
  FROM order_t
  GROUP BY quarter_number
)
SELECT
  quarter_number,
  revenue,
  COALESCE(ROUND(LAG(revenue) OVER (ORDER BY quarter_number), 2), 0) AS previous_revenue,
  COALESCE(ROUND(
    (revenue - LAG(revenue) OVER (ORDER BY quarter_number)) * 100.0 /
    LAG(revenue) OVER (ORDER BY quarter_number), 2
  ), 0) AS qoq_perc_change
FROM QoQ
ORDER BY quarter_number;
```



```
WITH QoQ AS (
    SELECT
        quarter_number,
        ROUND(SUM(quantity * (vehicle_price - ((discount / 100) * vehicle_price))), 0) AS revenue
    FROM order_t
    GROUP BY quarter_number
)
SELECT
    quarter_number,
    revenue,
    COALESCE(ROUND(LAG(revenue) OVER (ORDER BY quarter_number), 2), 0) AS previous_revenue,
    COALESCE(ROUND(
        (revenue - LAG(revenue) OVER (ORDER BY quarter_number)) * 100.0 /
        LAG(revenue) OVER (ORDER BY quarter_number), 2
    ), 0) AS qoq_perc_change
FROM QoQ
ORDER BY quarter_number;
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

quarter_number	revenue	previous_revenue	qoq_perc_change
1	39421580	0	0.00
2	32715830	39421580	-17.01
3	29229896	32715830	-10.66
4	23346780	29229896	-20.13

Observation:

1. **Net Revenue Trend:**
    - There is a significant decline in net revenue from Quarter 1 to Quarter 2.
    - The decline continues from Quarter 2 to Quarter 3, albeit at a slightly lower rate.
    - There is a further, albeit smaller, decrease in net revenue from Quarter 3 to Quarter 4.
2. **QoQ % Change:**
    - The QoQ % change from Quarter 1 to Quarter 2 is -17.01%, indicating a substantial drop in revenue.
    - The QoQ % change from Quarter 2 to Quarter 3 is -10.66%, showing a further decline in revenue compared to the previous quarter.
    - The QoQ % change from Quarter 3 to Quarter 4 is -20.13%, indicating a smaller decrease in revenue compared to the previous two quarters.

Insights:

1. **Net Revenue by Quarter:**
    - Quarter 1 has the highest revenue of approximately 39.4M.
    - There is a sharp decline in revenue in Quarter 2 (~32.7M) and Quarter 3 (~29.2M), followed by a smaller decline in Quarter 4 (~23.3M).
2. **Quarter-over-Quarter (QoQ) Change:**
    - Quarter 1 has no QoQ change since it is the starting point.
    - Revenue in Quarter 2 dropped by 17% compared to Quarter 1.
    - In Quarter 3, the revenue decline continues with a further 10.6% drop from Quarter 2.
    - Quarter 4 experienced a smaller decline of 20.3% compared to Quarter 3, which might indicate a potential stabilization of revenue.

Recommendations:

1. **Analyze Causes of Revenue Decline:**
    - Investigate factors leading to the sharp drop in Quarter 2 and Quarter 3, such as changes in demand, pricing strategy, or competitive landscape.
    - Check for seasonal patterns or external factors like market conditions that could explain these fluctuations.
2. **Focus on Retention and Growth:**
    - For Quarters 2 and 3, identify customer retention strategies and promotions to mitigate losses.
    - Explore upselling or cross-selling opportunities to increase revenue in future quarters.
3. **Discount Strategy Evaluation:**
    - The query accounts for the impact of discounts (1 - discount). Evaluate if the discounting strategy is sustainable or causing significant revenue loss.
4. **Improve Quarter 4 Stabilization:**
    - Leverage the smaller decline in Quarter 4 as a potential starting point for recovery. Consider strategies like targeted marketing or new product launches to further stabilize and increase revenue.

5. **Predictive Analysis for Upcoming Quarters:**
    - Use historical trends to build predictive models for revenue performance. This can guide proactive decision-making for Quarter 1 of the next year.

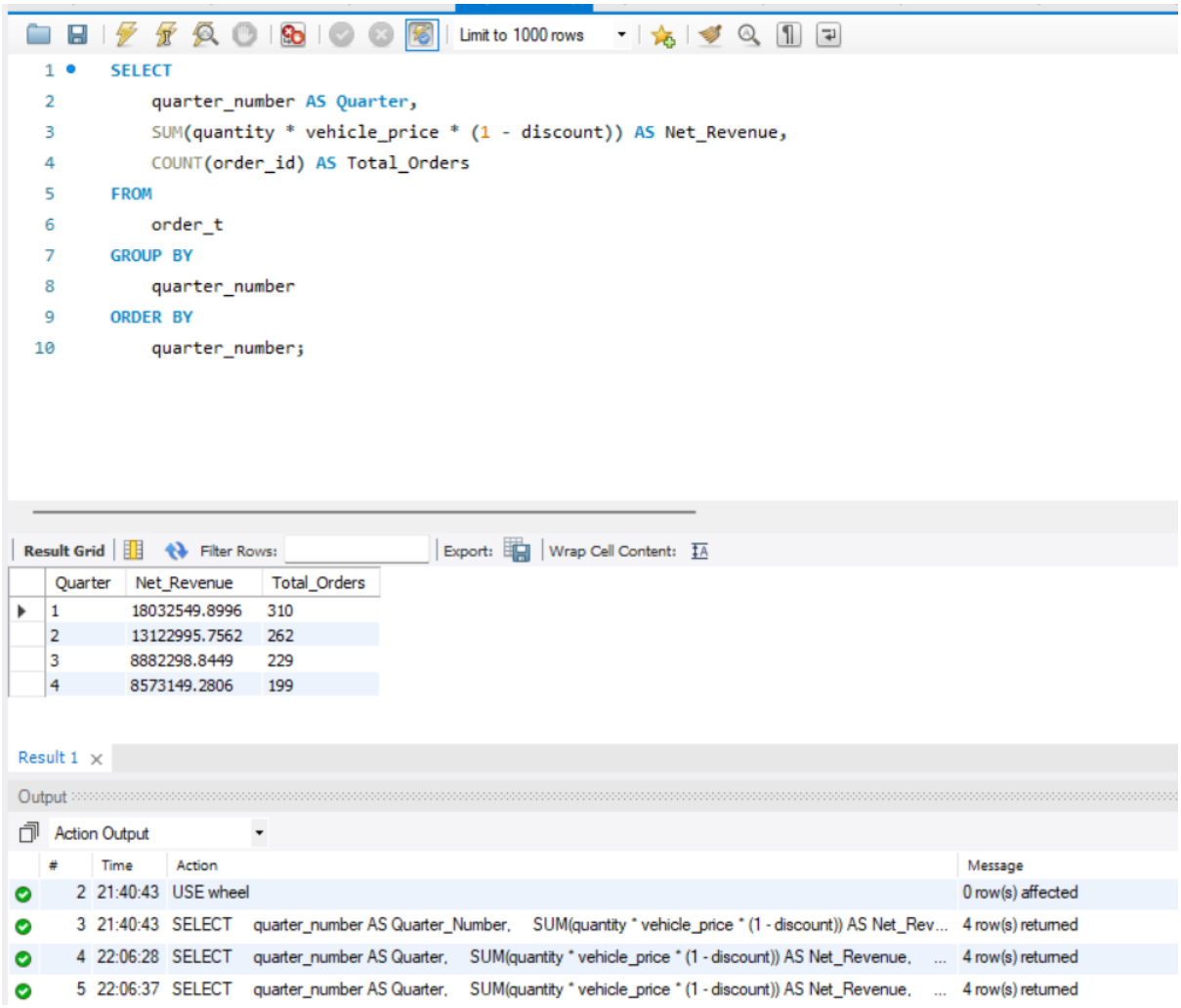
Question 8:

What is the trend of net revenue and orders by quarters? [4 marks]

Hint: Find out the sum of net revenue and count the number of orders for each quarter.

SOLUTION:

```
SELECT
   quarter_number AS Quarter,
   SUM(quantity * vehicle_price * (1 - discount)) AS Net_Revenue,
   COUNT(order_id) AS Total_Orders
FROM order_t
GROUP BY quarter_number
ORDER BY quarter_number;
```



```
SELECT
    quarter_number AS Quarter,
    SUM(quantity * vehicle_price * (1 - discount)) AS Net_Revenue,
    COUNT(order_id) AS Total_Orders
FROM
    order_t
GROUP BY
    quarter_number
ORDER BY
    quarter_number;
```

Result Grid

Quarter	Net_Revenue	Total_Orders
1	18032549.8996	310
2	13122995.7562	262
3	8882298.8449	229
4	8573149.2806	199

Result 1

Output

Action Output

#	Time	Action	Message
2	21:40:43	USE wheel	0 row(s) affected
3	21:40:43	SELECT quarter_number AS Quarter_Number, SUM(quantity * vehicle_price * (1 - discount)) AS Net_Rev...	4 row(s) returned
4	22:06:28	SELECT quarter_number AS Quarter, SUM(quantity * vehicle_price * (1 - discount)) AS Net_Revenue, ...	4 row(s) returned
5	22:06:37	SELECT quarter_number AS Quarter, SUM(quantity * vehicle_price * (1 - discount)) AS Net_Revenue, ...	4 row(s) returned

Observation:

1. Net Revenue Trend:

- **Quarter 1:** Highest net revenue (~18M).
- **Quarter 2:** Net revenue drops significantly to ~13.1M, a decrease of ~27% from Quarter 1.
- **Quarter 3:** Further decline to ~8.8M, a decrease of ~32% from Quarter 2.
- **Quarter 4:** Slight stabilization with net revenue at ~8.57M, a decline of only ~3% compared to Quarter 3.

2. Total Orders Trend:

- **Quarter 1:** Highest number of orders (310 orders).
- **Quarter 2:** Orders decrease to 262, a reduction of ~15% from Quarter 1.
- **Quarter 3:** Further reduction to 229 orders (~12.6% decline from Quarter 2).
- **Quarter 4:** Drops to 199 orders, a decline of ~13.1% from Quarter 3.

3. Correlation Between Net Revenue and Total Orders:

- Both net revenue and total orders show a consistent declining trend quarter-over-quarter, suggesting that the revenue decrease is partially driven by fewer orders.

Insights:

1. **Revenue and Orders are Correlated:**
    - The declining trend in both net revenue and the number of orders suggests a strong correlation between the two. A decrease in the number of orders directly impacts the overall revenue generated.
2. **Potential Sales and Marketing Issues:**
    - The consistent decline in both metrics indicates potential underlying issues with sales and marketing efforts.

    These could include:
    - **Decreased Customer Demand:** A decline in overall customer demand for the company's products or services.
    - **Ineffective Marketing Campaigns:** Ineffective marketing campaigns may not be reaching the target audience or generating sufficient interest.
    - **Pricing Issues:** The company's pricing strategy might not be competitive enough in the market.
    - **Sales Team Performance:** Issues with the sales team's performance, such as lack of training or motivation, could be contributing to the decline.

Recommendations:

1. **Customer Retention Strategies:**
   Focus on retaining existing customers by implementing loyalty programs, personalized offers, or exclusive discounts to boost order volume and stabilize revenue.
2. **Optimize Pricing and Promotions:**
   Review the current discounting strategy to ensure it is not eroding profitability. Introduce time-limited promotions or bundled deals to increase both order count and revenue.
3. **Targeted Marketing for Stabilization:**
   Build on the stabilization observed in Quarter 4 by launching targeted marketing campaigns to attract new customers and re-engage dormant ones.

Question 9:

What is the average discount offered for different types of credit cards? [3 marks]

Hint: Find out the average of discount for each credit card type.

SOLUTION:

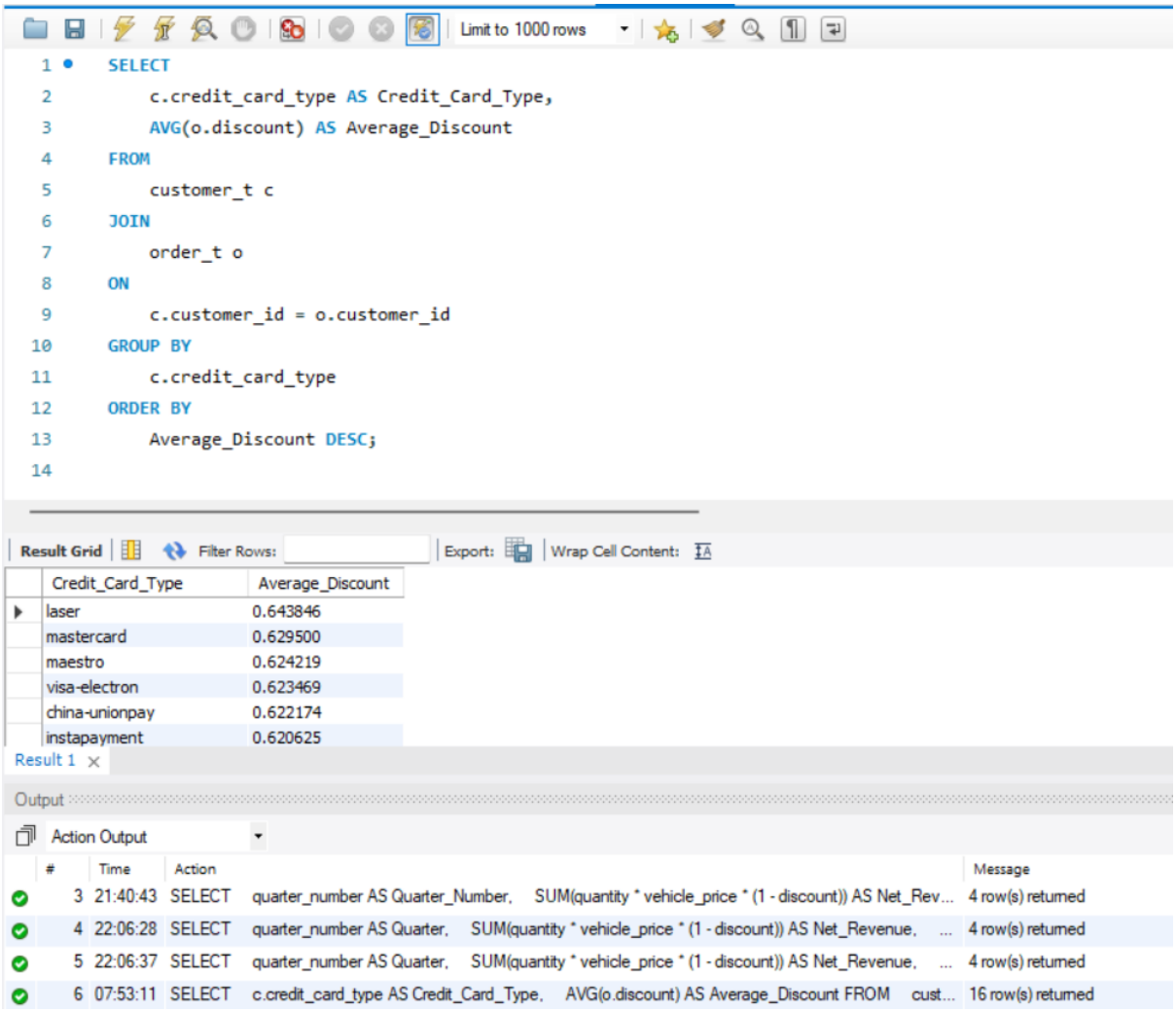
```
SELECT
   c.credit_card_type AS Credit_Card_Type,
   AVG(o.discount) AS Average_Discount
FROM customer_t c
```

JOIN order_t o

ON c.customer_id = o.customer_id

GROUP BY c.credit_card_type

ORDER BY Average_Discount DESC;



```
SELECT
    c.credit_card_type AS Credit_Card_Type,
    AVG(o.discount) AS Average_Discount
FROM
    customer_t c
JOIN
    order_t o
ON
    c.customer_id = o.customer_id
GROUP BY
    c.credit_card_type
ORDER BY
    Average_Discount DESC;
```

Result Grid

Credit_Card_Type	Average_Discount
laser	0.643846
mastercard	0.629500
maestro	0.624219
visa-electron	0.623469
china-unionpay	0.622174
instapayment	0.620625

Result 1

Output

Action Output

#	Time	Action	Message
3	21:40:43	SELECT quarter_number AS Quarter_Number, SUM(quantity * vehicle_price * (1 - discount)) AS Net_Rev...	4 row(s) returned
4	22:06:28	SELECT quarter_number AS Quarter, SUM(quantity * vehicle_price * (1 - discount)) AS Net_Revenue, ...	4 row(s) returned
5	22:06:37	SELECT quarter_number AS Quarter, SUM(quantity * vehicle_price * (1 - discount)) AS Net_Revenue, ...	4 row(s) returned
6	07:53:11	SELECT c.credit_card_type AS Credit_Card_Type, AVG(o.discount) AS Average_Discount FROM cust...	16 row(s) returned

Observation:

Average Discounts by Credit Card Type: The result grid shows the average discount offered for each credit card type.

Discount Variation: There is some variation in the average discount offered for different credit card types.

Laser Card: The "laser" credit card type has the highest average discount (0.643846).

China-Unionpay: The "china-unionpay" credit card type has the lowest average discount (0.620625).

Insights:

1. **Customer Segmentation:**
    - The variation in average discounts suggests that the company might be offering different discount levels to customers based on their credit card type.
    - This could be a strategic decision to attract customers using certain cards or to incentivize the use of specific payment methods.

2. **Potential for Optimization:**
    - The company could analyse these average discounts to identify any potential disparities or inconsistencies in its pricing and discount policies.

3. **Customer Loyalty:**
    - The company could potentially use this information to incentivize customers to use specific credit card types by offering more attractive discounts. This could help to build customer loyalty and encourage repeat business.

Recommendation:

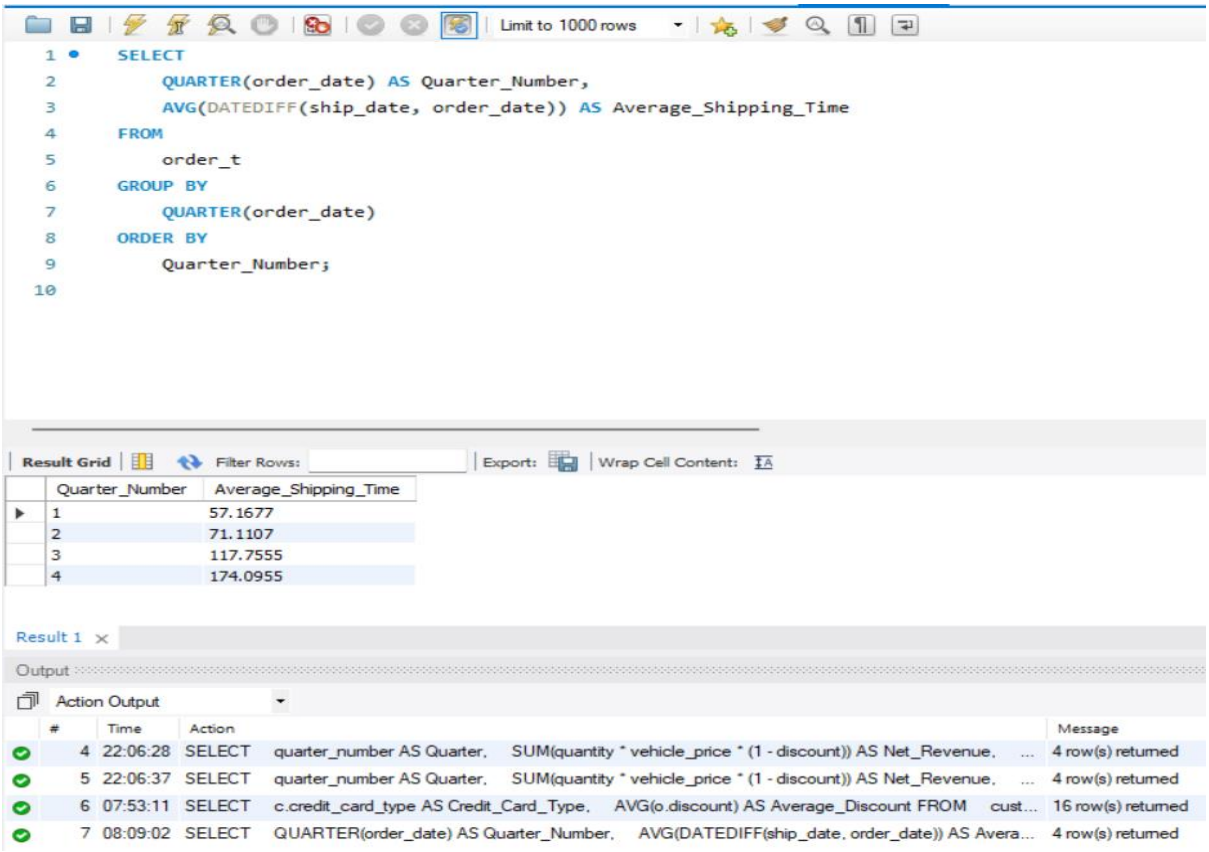
1. For card types like laser and mastercard, evaluate if these higher discounts are driving significant sales or attracting new customers. Consider replicating similar promotions for other card types.
2. **Optimize Discount Strategies:**
    - Analyze whether these discounts align with profitability goals. Reduce discounts for low-performing credit card types while maintaining competitiveness.
3. **Targeted Promotions:**
    - Collaborate with credit card providers offering higher discounts (e.g., laser, mastercard) for co-branded campaigns to maximize revenue and attract loyal users.

Question 10:

What is the average time taken to ship the placed orders for each quarter? [3 marks]

SOLUTION:

```
SELECT
   QUARTER(order_date) AS Quarter_Number,
   AVG(DATEDIFF(ship_date, order_date)) AS Average_Shipping_Time
FROM order_t
GROUP BY QUARTER(order_date)
ORDER BY Quarter_Number;
```



```
SELECT
    QUARTER(order_date) AS Quarter_Number,
    AVG(DATEDIFF(ship_date, order_date)) AS Average_Shipping_Time
FROM
    order_t
GROUP BY
    QUARTER(order_date)
ORDER BY
    Quarter_Number;
```

Quarter_Number	Average_Shipping_Time
1	57.1677
2	71.1107
3	117.7555
4	174.0955

#	Time	Action	Message
4	22:06:28	SELECT quarter_number AS Quarter, SUM(quantity * vehicle_price * (1 - discount)) AS Net_Revenue, ...	4 row(s) returned
5	22:06:37	SELECT quarter_number AS Quarter, SUM(quantity * vehicle_price * (1 - discount)) AS Net_Revenue, ...	4 row(s) returned
6	07:53:11	SELECT c.credit_card_type AS Credit_Card_Type, AVG(o.discount) AS Average_Discount FROM cust...	16 row(s) returned
7	08:09:02	SELECT QUARTER(order_date) AS Quarter_Number, AVG(DATEDIFF(ship_date, order_date)) AS Avera...	4 row(s) returned

Observation:

1. **Rising Shipping Times Over Quarters**:
   The **average shipping time** has shown a significant upward trend over the quarters:

   Q1: ~57.17 days

   Q2: ~71.11 days

   Q3: ~117.76 days

   Q4: ~174.10 days

   This indicates that shipping efficiency is deteriorating progressively across the year.
2. **Potential Operational Bottlenecks**:
   The steep increase in shipping times suggests possible bottlenecks in the supply chain, warehouse processing, or logistics, especially in Q3 and Q4.
3. **Impact on Customer Satisfaction**:
   Prolonged shipping times, particularly in Q4, may negatively affect customer satisfaction and repeat business.

Insights:

1. **Shipping Efficiency:**
   - The increasing trend in average shipping time suggests a potential decline in shipping efficiency over the quarters. This could be due to various factors such as increased order volume, supply chain disruptions, or changes in shipping logistics.
2. **Customer Satisfaction:**

- Longer shipping times can negatively impact customer satisfaction. If customers are waiting longer for their orders, it could lead to increased customer complaints and potentially drive them to competitors.

3. **Operational Issues:**
    - The increasing shipping times could indicate underlying operational issues within the company's supply chain or logistics department.

Recommendation:

1. **Investigate Logistics and Supply Chain Issues**:
    - Conduct a detailed review of supply chain operations to identify inefficiencies or capacity constraints causing delays, especially in Q3 and Q4.
2. **Implement a Scalable Shipping Strategy**:
    - Plan for seasonal demand surges and increase shipping capacity in peak periods. Collaborate with logistics partners to ensure faster fulfilment.
3. **Improve Customer Communication**:

    - Notify customers proactively about potential delays and offer real-time tracking. Providing estimated delivery dates can help manage expectations and maintain customer trust.

Business Metrics Overview

Total Revenue	Total Orders	Total Customers	Average Rating
124714086	1000	994	3.1350
Last Quarter Revenue	Last quarter Orders	Average Days to Ship	% Good Feedback
23346779	199	105	20.46

Business Recommendation:

1. Addressing Declining Revenue:

- Total revenue is $124,714,086, with $23,346,779 generated in the last quarter, accounting for only 18.72% of total revenue. This indicates a decline in performance in the last quarter.
- Investigate the reasons behind the significant revenue drop in the last quarter. Possible factors include seasonality, changes in demand, pricing strategies, or increased competition.

2.Optimize Pricing and Promotions:

- There are 994 unique customers with 1,000 total orders, suggesting most customers are one-time buyers.
- Review the current discounting strategy to ensure it is not eroding profitability.
- Introduce time-limited promotions or bundled deals to increase both order count and revenue.

3. Enhance Customer Retention:

- Implement customer retention strategies such as loyalty programs, personalized offers, or exclusive discounts to boost order volume and stabilize revenue. The average rating is 3.135, indicating moderate customer dissatisfaction.

4. Improve Customer Engagement:

- Enhance marketing efforts and promotions in Q3 and Q4 to boost sales, particularly during historically slower periods.

5. Optimize Shipping Processes:

- Investigate and address operational factors like product availability, delivery times, and discounts during Q3 and Q4 to understand their influence on the downward trend.
- Conduct a detailed review of supply chain operations to identify inefficiencies or capacity constraints causing delays, especially in Q3 and Q4.
- Implement a scalable shipping strategy to ensure timely fulfilment and manage seasonal demand surges.

6. Improve Customer Satisfaction:

- Only 20.46% of feedback is positive, reflecting a potential issue with customer experience or product/service quality.
- Conduct surveys to gather customer feedback on why order volumes may have decreased over time. Address customer concerns promptly.
- Improve customer communication by providing proactive updates and estimated delivery times.

7. Data-Driven Decision Making:

- Analyse customer feedback to understand the reasons for declining order volume and address customer concerns proactively.
- Use historical data to build predictive models and forecast future revenue performance.
- Leverage data analysis to identify trends, understand customer behaviour, and make informed decisions regarding marketing, sales, and operations.

8. Focus on Customer Experience:

- Address the low average rating and low % good feedback by implementing measures to improve customer service, address customer concerns, and gather feedback to identify areas for improvement.

9. Proactive Planning and Response:

- Leverage the smaller decline in Quarter 4 as a potential starting point for recovery. Consider strategies like targeted marketing or new product launches to further stabilize and increase revenue.

10. Shipping Time Optimization:

- Focus on significantly reducing the average shipping time (currently 105 days), which is a major concern impacting customer satisfaction and potentially driving away business.