New Wheels Project

Introduction to SQL

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.

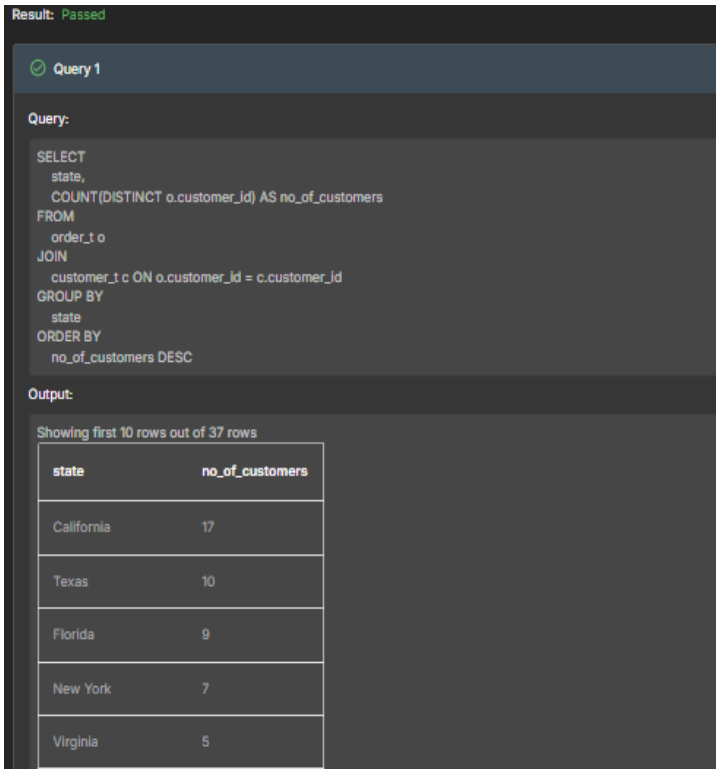
Business Questions

Question 1: Find the total number of customers who have placed orders. What is the distribution of the customers across states?

Solution Query:

```
SELECT
    state,
    COUNT(DISTINCT o.customer_id) AS no_of_customers
FROM
    order_t o
JOIN
    customer_t c ON o.customer_id = c.customer_id
GROUP BY
    state
ORDER BY
    no_of_customers DESC;
```

Output:



Observations and Insights:

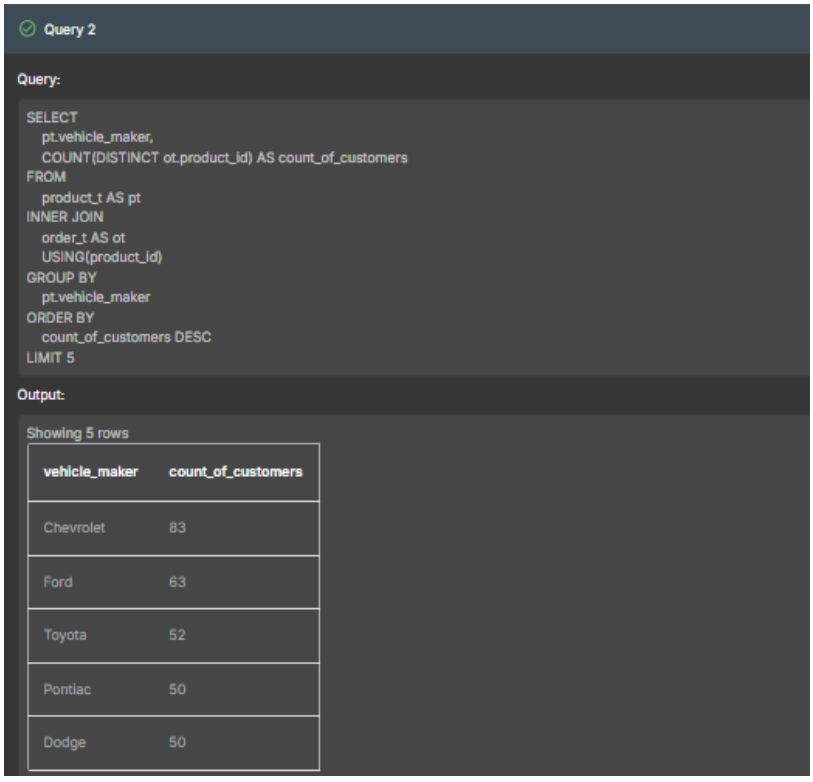
- **Customer Base**: The analysis identifies the total unique customers and their distribution across states, revealing New-Wheels' market penetration.
- **Regional Trends**: High-performing states indicate a strong market presence while low-performing states highlight potential growth or improvement areas.
- **Strategic Focus**: Insights can guide resource allocation, replicate successful strategies in strong markets, and address gaps in underperforming regions.

Question 2: Which are the top 5 vehicle makers preferred by the customers?

Solution Query:

```
SELECT
    pt.vehicle_maker,
    COUNT(DISTINCT ot.product_id) AS count_of_customers
FROM
    product_t AS pt
INNER JOIN
    order_t AS ot
    USING(product_id)
GROUP BY
    pt.vehicle_maker
ORDER BY
    count_of_customers DESC
LIMIT 5;
```

Output:



Observations and Insights:

- **Top Choices**: The query highlights the top 5 vehicle makers favoured by customers, representing brands with the highest demand and popularity.
- **Customer Alignment**: These vehicle makers likely meet customer expectations for affordability, quality, and brand reputation, strongly influencing purchase decisions.
- **Strategic Opportunities**: The findings suggest focusing on partnerships with top-performing brands, optimizing their listings, and tailoring marketing efforts to align with customer preferences.

Question 3: Which is the most preferred vehicle maker in each state?

Solution Query:

```
SELECT
    state,
    vehicle_maker,
    rank_no
FROM (
    SELECT
        C.state,
        P.vehicle_maker,
        COUNT(C.customer_id) AS rank_no,
        RANK() OVER (PARTITION BY C.state ORDER BY COUNT(C.customer_id)
DESC) AS rank
    FROM
        customer_t C
    INNER JOIN
        order_t O
        ON C.customer_id = O.customer_id
    INNER JOIN
        product_t P
        ON O.product_id = P.product_id
    GROUP BY
        C.state,
        P.vehicle_maker
) AS ranked_vehicles
WHERE
    rank = 1;
```

Output:

Query 3

Query:

```
SELECT
  state,
  vehicle_maker,
  rank_no
FROM (
  SELECT
    C.state,
    P.vehicle_maker,
    COUNT(C.customer_id) AS rank_no,
    RANK() OVER (PARTITION BY C.state ORDER BY COUNT(C.customer_id) DESC) AS rank
  FROM
    customer_t C
  INNER JOIN
    order_t O
    ON C.customer_id = O.customer_id
  INNER JOIN
    product_t P
    ON O.product_id = P.product_id
  GROUP BY
    C.state,
    P.vehicle_maker
) AS ranked_vehicles
WHERE
  rank = 1
```

Output:

Showing first 10 rows out of 101 rows

state	vehicle_maker	rank_no
Alabama	Lincoln	1
Alabama	Lexus	1
Alabama	Chevrolet	1
Arizona	Chevrolet	1
Arkansas	Pontiac	1

Observations and Insights:

- **Regional Preferences**: The query determines the top vehicle maker in each state by customer count, showcasing differences in brand popularity across regions.
- **Local Market Insights**: The findings highlight the dominant vehicle makers in specific states, providing a clear view of localized customer preferences and demand patterns.
- **Strategic Alignment**: These insights can help tailor marketing efforts, strengthen collaborations with leading brands, and optimize inventory to meet state-specific customer needs.

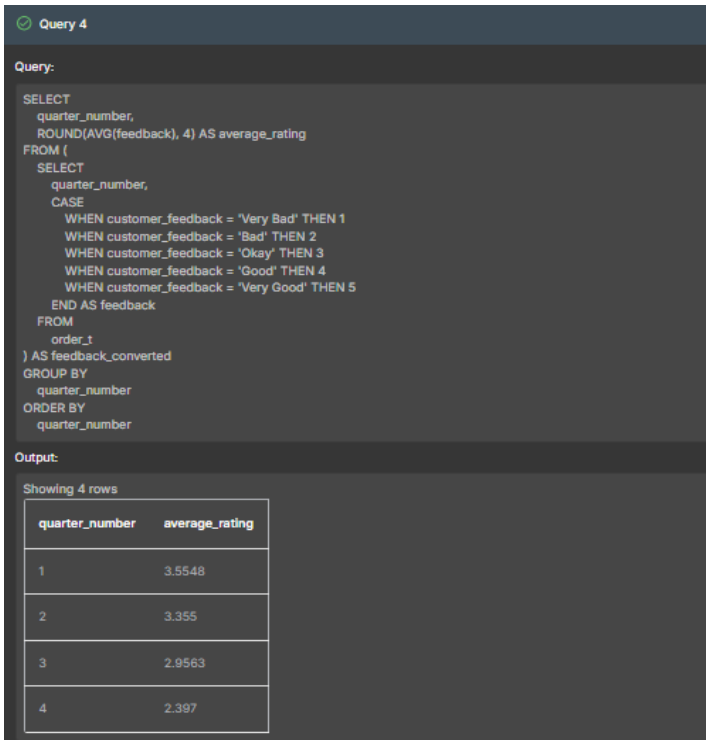
Question 4: Find the overall average rating given by the customers. What is the average rating in each quarter?

Consider the following mapping for ratings: “Very Bad”: 1, “Bad”: 2, “Okay”: 3, “Good”: 4, “Very Good”: 5

Solution Query:

```
SELECT
    quarter_number,
    ROUND(AVG(feedback), 4) AS average_rating
FROM (
    SELECT
        quarter_number,
        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 AS feedback
    FROM
        order_t
) AS feedback_converted
GROUP BY
    quarter_number
ORDER BY
    quarter_number;
```

Output:



Observations and Insights:

- **Average Rating Analysis**: The query computes the average customer rating for each quarter by converting feedback into numerical values, offering a clear view of customer satisfaction trends over time.
- **Quarterly Satisfaction Patterns**: Grouping ratings by quarter highlights variations in customer sentiment, helping to determine if satisfaction levels are improving or declining in specific periods.
- **Informed Decision-Making**: The results provide valuable insights for the business to monitor performance, assess the impact of changes, and make data-driven decisions to enhance customer satisfaction in future quarters.

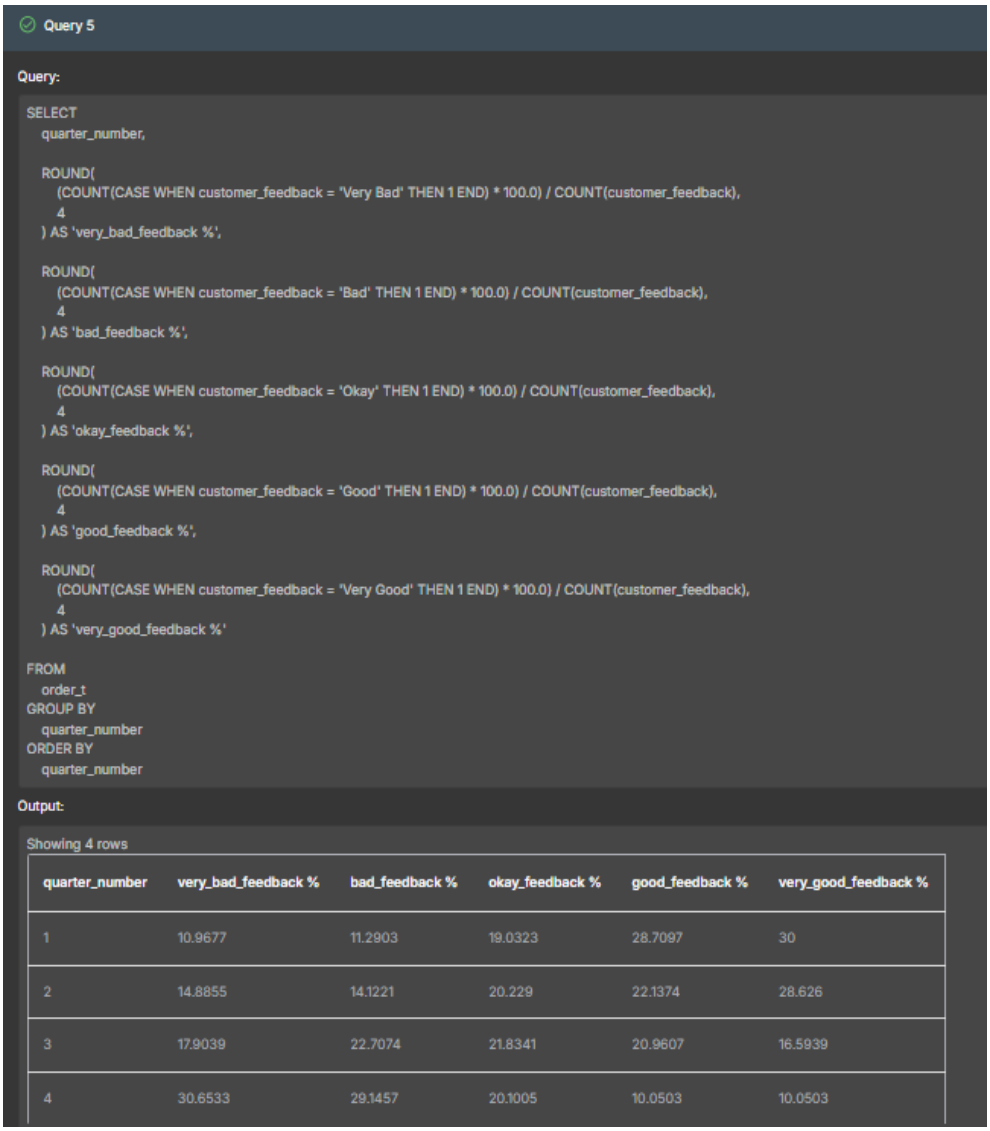
Question 5: Find the percentage distribution of feedback from the customers. Are customers getting more dissatisfied over time?

Solution Query:

```
SELECT
    quarter_number,

    ROUND(
        (COUNT(CASE WHEN customer_feedback = 'Very Bad' THEN 1 END) * 100.0)
/ COUNT(customer_feedback),
        4
    ) AS 'very_bad_feedback %',

    ROUND(
        (COUNT(CASE WHEN customer_feedback = 'Bad' THEN 1 END) * 100.0) /
COUNT(customer_feedback),
        4
    ) AS 'bad_feedback %',

    ROUND(
        (COUNT(CASE WHEN customer_feedback = 'Okay' THEN 1 END) * 100.0) /
COUNT(customer_feedback),
        4
    ) AS 'okay_feedback %',

    ROUND(
        (COUNT(CASE WHEN customer_feedback = 'Good' THEN 1 END) * 100.0) /
COUNT(customer_feedback),
        4
    ) AS 'good_feedback %',

    ROUND(
        (COUNT(CASE WHEN customer_feedback = 'Very Good' THEN 1 END) *
100.0) / COUNT(customer_feedback),
        4
    ) AS 'very_good_feedback %'

FROM
    order_t
```

```
GROUP BY
    quarter_number
ORDER BY
    quarter_number;
```

Output:



Query 5

Query:

```
SELECT
  quarter_number,

  ROUND(
    (COUNT(CASE WHEN customer_feedback = 'Very Bad' THEN 1 END) * 100.0) / COUNT(customer_feedback),
    4
  ) AS 'very_bad_feedback %',

  ROUND(
    (COUNT(CASE WHEN customer_feedback = 'Bad' THEN 1 END) * 100.0) / COUNT(customer_feedback),
    4
  ) AS 'bad_feedback %',

  ROUND(
    (COUNT(CASE WHEN customer_feedback = 'Okay' THEN 1 END) * 100.0) / COUNT(customer_feedback),
    4
  ) AS 'okay_feedback %',

  ROUND(
    (COUNT(CASE WHEN customer_feedback = 'Good' THEN 1 END) * 100.0) / COUNT(customer_feedback),
    4
  ) AS 'good_feedback %',

  ROUND(
    (COUNT(CASE WHEN customer_feedback = 'Very Good' THEN 1 END) * 100.0) / COUNT(customer_feedback),
    4
  ) AS 'very_good_feedback %'

FROM
  order_t
GROUP BY
  quarter_number
ORDER BY
  quarter_number
```

Output:

Showing 4 rows

quarter_number	very_bad_feedback %	bad_feedback %	okay_feedback %	good_feedback %	very_good_feedback %
1	10.9677	11.2903	19.0323	28.7097	30
2	14.8855	14.1221	20.229	22.1374	28.626
3	17.9039	22.7074	21.8341	20.9607	16.5939
4	30.6533	29.1457	20.1005	10.0503	10.0503

Observations and Insights:

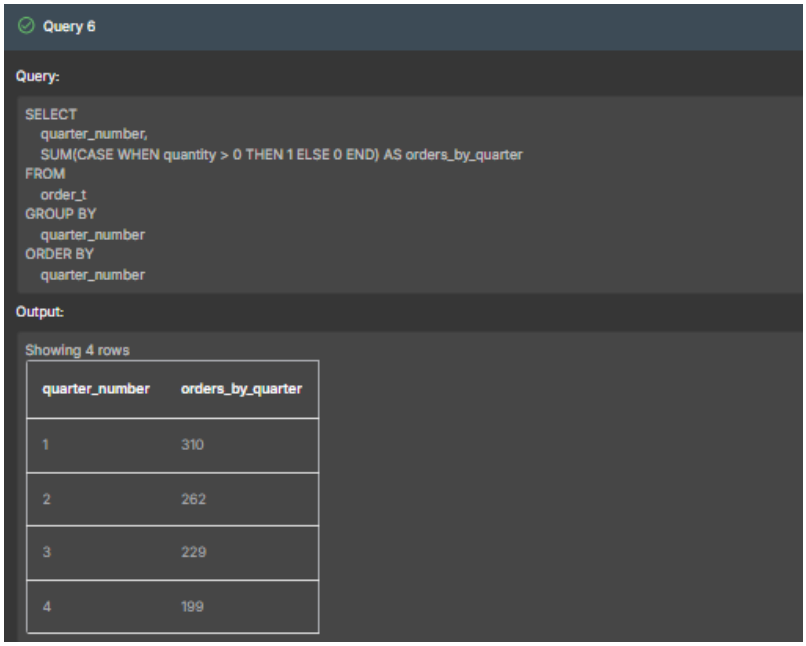
- **Feedback Distribution**: The query calculates the percentage of each feedback type across quarters, highlighting trends in customer satisfaction and identifying shifts in sentiment.
- **Dissatisfaction Monitoring**: By tracking "Very Bad" and "Bad" feedback percentages, the query reveals whether dissatisfaction is rising, signalling areas for improvement.
- **Quarterly Trends**: The query shows how satisfaction fluctuates by quarter, helping the company evaluate the impact of changes and refine strategies for improvement.

Question 6: What is the trend of the number of orders by quarter?

Solution Query:

```
SELECT
    quarter_number,
    SUM(CASE WHEN quantity > 0 THEN 1 ELSE 0 END) AS orders_by_quarter
FROM
    order_t
GROUP BY
    quarter_number
ORDER BY
    quarter_number;
```

Output:



Observations and Insights:

- **Order Volume by Quarter**: The query calculates the total number of orders per quarter, helping to identify fluctuations in customer demand and overall sales activity.
- **Trend Identification**: By grouping the orders by quarter, the query highlights trends in order volume, allowing the business to track growth, stability, or decline in demand over time.
- **Strategic Planning**: The results provide valuable insights into order patterns, enabling the business to adjust marketing, inventory, and sales strategies based on seasonal or quarterly demand changes.

Question 7: Calculate the net revenue generated by the company. What is the quarter-over-quarter % change in net revenue?

Solution Query:

```
SELECT
    quarter_number,
    net_revenue,
    ((net_revenue - LAG(net_revenue) OVER (ORDER BY quarter_number)) /
     LAG(net_revenue) OVER (ORDER BY quarter_number)) * 100 AS
'quarter_over_quarter %'
FROM (
    SELECT
        quarter_number,
        ROUND(SUM(quantity * (vehicle_price - (discount / 100 *
vehicle_price))), 2) AS net_revenue
    FROM
        order_t
    GROUP BY
        quarter_number
) AS revenue_data
ORDER BY
    quarter_number;
```

Output:

Query 7

Query:

```
SELECT
  quarter_number,
  net_revenue,
  ((net_revenue - LAG(net_revenue) OVER (ORDER BY quarter_number)) /
   LAG(net_revenue) OVER (ORDER BY quarter_number)) * 100 AS 'quarter_over_quarter %'
FROM (
  SELECT
    quarter_number,
    ROUND(SUM(quantity * (vehicle_price - (discount / 100 * vehicle_price))), 2) AS net_revenue
  FROM
    order_t
  GROUP BY
    quarter_number
) AS revenue_data
ORDER BY
  quarter_number
```

Output:

Showing 4 rows

quarter_number	net_revenue	quarter_over_quarter %
1	39421580.16	
2	32715830.34	-17.01035268698878
3	29229896.19	-10.655190816715791
4	23346779.63	-20.127052527859156

Observations and Insights:

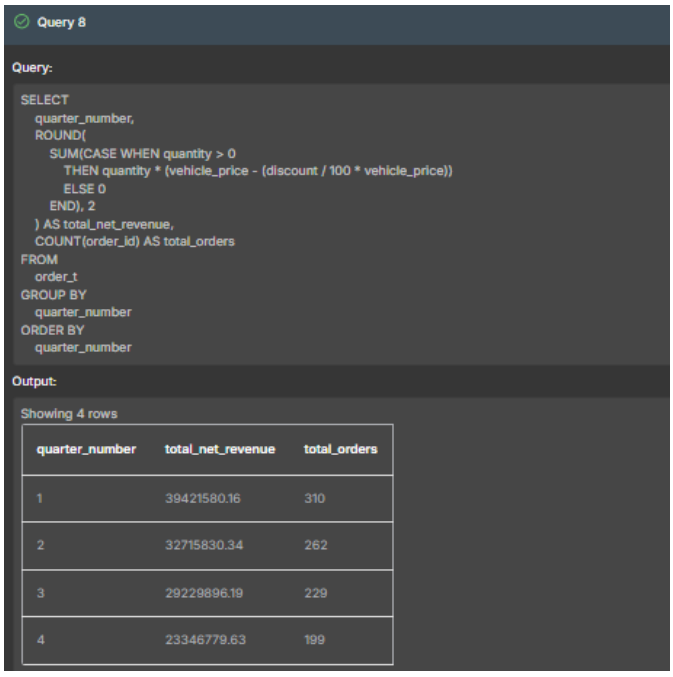
- **Net Revenue Calculation**: The query computes quarterly net revenue by considering product quantity, vehicle price, and discounts, offering insights into financial performance.
- **Quarter-over-Quarter Change**: Using the LAG function, the query calculates the percentage change in net revenue between quarters, indicating growth or decline.
- **Revenue Trend Insights**: The quarter-over-quarter percentage change reveals revenue patterns, helping assess the impact of market conditions, pricing, and promotions on overall sales.

Question 8: What is the trend of net revenue and orders by quarters?

Solution Query:

```
SELECT
    quarter_number,
    ROUND(
        SUM(CASE WHEN quantity > 0
            THEN quantity * (vehicle_price - (discount / 100 *
vehicle_price))
            ELSE 0
        END), 2
    ) AS total_net_revenue,
    COUNT(order_id) AS total_orders
FROM
    order_t
GROUP BY
    quarter_number
ORDER BY
    quarter_number;
```

Output:



Observations and Insights:

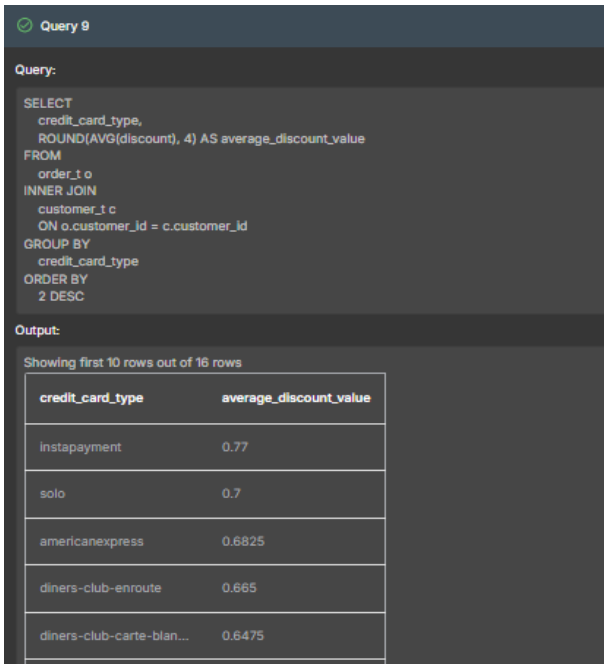
- **Sales Performance Insights**: The query calculates total net revenue and order volume per quarter, offering a clear view of sales performance.
- **Trend Monitoring**: By analysing quarterly revenue and order data, the query highlights growth, stability, or decline, helping track key business trends.
- **Informed Strategy**: Understanding revenue and order volume trends aids in making data-driven decisions on inventory, marketing, and resource allocation to drive future growth.

Question 9: What is the average discount offered for different types of credit cards?

Solution Query:

```
SELECT
    credit_card_type,
    ROUND(AVG(discount), 4) AS average_discount_value
FROM
    order_t o
INNER JOIN
    customer_t c
    ON o.customer_id = c.customer_id
GROUP BY
    credit_card_type
ORDER BY
    2 DESC;
```

Output:



Observations and Insights:

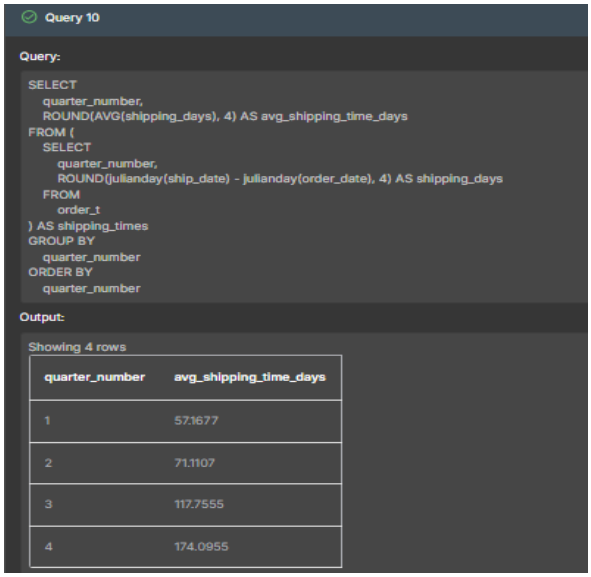
- **Discounts by Credit Card Type**: The query calculates the average discount per credit card type, highlighting variations in discount distribution based on payment methods.
- **Credit Card Influence**: By analyzing average discounts, the query shows how specific card types might be linked to higher or lower discounts, suggesting potential targeted promotions or partnerships.
- **Pricing Strategy Optimization**: The insights help businesses understand the impact of credit card types on discount strategies, allowing for tailored promotions or pricing adjustments to boost sales.

Question 10: What is the average time taken to ship the placed orders for each quarter?

Solution Query:

```
SELECT
    quarter_number,
    ROUND(AVG(shipping_days), 4) AS avg_shipping_time_days
FROM (
    SELECT
        quarter_number,
        ROUND(julianday(ship_date) - julianday(order_date), 4) AS
shipping_days
    FROM
        order_t
) AS shipping_times
GROUP BY
    quarter_number
ORDER BY
    quarter_number;
```

Output:



Observations and Insights:

- **Quarterly Shipping Efficiency:** The query calculates the average shipping time for each quarter, revealing trends in order fulfillment speed.
- **Trend Analysis:** By tracking shipping time over quarters, the query highlights changes in shipping efficiency, helping to identify potential delays or improvements.
- **Operational Optimization**: These insights enable the business to assess shipping performance and take corrective actions to improve delivery times in future quarters.

Based on the queries and results, let's **Overview of given Business Metrics** (each metric) and extract the required data:

Data Extraction:

Total Revenue: This can be calculated by summing the net revenue for all quarters from the revenue_data table.

= 39,421,580.16 (Q1) + 32,715,830.34 (Q2) + 29,229,896.19 (Q3) + 23,346,779.63(Q4)
= 124,714,086.32
Total Revenue = $124,714,086.32

Total Orders: The total number of orders across all quarters can be summed up from the number_of_orders query.

Total Orders = 310 (Q1) + 262 (Q2) + 229 (Q3) + 199 (Q4)
Total Orders = 1000 orders

Total Customers: The total number of distinct customers can be calculated by counting the distinct customer_id from the order_t table.
Total Customers = 994

Average Rating: The average rating for each quarter can be derived from the average_rating query.
Average Rating (across all quarters) = 3.55 (Q1) +3.35 (Q2) +2.95 (Q3) +2.39 (Q4)
Average Rating = 3.065

Last Quarter Revenue: The revenue for the last quarter (Q4) from the revenue_data table is already given.
Last Quarter Revenue = $23,346,779.63

Last Quarter Orders: From the number_of_orders query, the orders in Q4 are provided.
Last Quarter Orders = 199

Average Days to Ship: The average shipping days across all quarters are
Average ship days (across all quarters) = 57.1677(Q1) +71.1107(Q2) +117.7555 (Q3) +174.0955 (Q4)
= 4420.1294 / 4
Average Days to Ship = 105.03

% Good Feedback: The percentage of Good feedback across all quarters is
= 28.70 (Q1) + 22.13 (Q2) + 20.96 (Q3) + 10.05 (Q4)
= 81.85 / 4
% Good Feedback = 20.46%

Business Metrics Overview

Total Revenue	Total Orders	Total Customers	Average Rating
$124,714,086.32	1000	994	3.065
Last Quarter Revenue	**Last quarter Orders**	**Average Days to Ship**	**% Good Feedback**
$23,346,779.63	199	105 days	20.46 %

Business Recommendations

Based on the data analysis from New-Wheels, the following business strategies are recommended to counter declining sales, enhance customer satisfaction, and increase profitability:

1. Enhance After-Sales Support

- **Improve Customer Feedback Management:** The data highlights lower customer satisfaction, particularly with negative feedback such as "Very Bad" and "Bad." To address this, New-Wheels should implement a proactive approach in handling negative reviews and enhance after-sales support. Assigning a dedicated team to resolve complaints swiftly can help increase positive feedback.
- **Ongoing Customer Service Training:** Regular training should be provided to customer service representatives to improve their ability to manage inquiries, complaints, and issues effectively, which could contribute to reducing the number of negative ratings.

2. Strengthen Customer Retention

- **Loyalty Programs:** Implement loyalty initiatives or reward systems for repeat customers, such as offering discounts on future purchases or exclusive services to encourage continued use of New-Wheels.
- **Personalized Offers:** Utilize customer data to offer tailored discounts and promotions based on past purchases, preferences, or location, creating a more customized experience for each customer.

3. Enhance Product Offering and Quality

- **Broaden Vehicle Selection:** It's essential to evaluate which vehicle types are in demand and expand options in those areas. For example, focusing on popular models such as electric vehicles or specific brands like "Volkswagen" could help attract more customers.
- **Introduce Vehicle Certification:** To mitigate concerns about pre-owned vehicles, New-Wheels can introduce a certification process to assure customers of the vehicles' quality, fostering greater trust and potentially boosting sales.

4. Boost Visibility and Marketing

- **Targeted Marketing Campaigns:** Use customer demographic insights (e.g., age, location, occupation) to create tailored marketing campaigns. Promotions could be customized according to popular vehicle models or regions with higher customer interest.
- **Leverage Customer Reviews:** Highlight positive customer reviews and encourage satisfied customers to leave detailed feedback. This will enhance the company's online reputation and attract new clients.
- **Collaborate with Influencers and Partners:** Form partnerships with automotive influencers or established brands in the industry to amplify brand awareness and reach a larger audience.

5. Optimize Operations and Delivery

- **Improve Shipping Efficiency:** Shipping times are an area for potential improvement. By partnering with more reliable shipping companies or offering expedited delivery options, New-Wheels can enhance customer satisfaction.
- **Provide Transparent Order Tracking:** Offering real-time tracking of orders will increase customer trust. A live tracking system to show the vehicle's location during delivery could significantly improve the customer experience.

6. Financial and Revenue Management

- **Review Discount Strategy:** The variability in discounts provided to customers should be analyzed to assess its impact on both sales and profitability. Adjusting discounts based on customer demographics or market conditions can optimize revenue without compromising profit margins.
- **Monitor Quarterly Revenue Trends:** Tracking revenue on a quarterly basis will help New-Wheels adapt to seasonal trends, ensuring profitability during peak periods and allowing adjustments for slower months.

7. Monitor Customer Satisfaction Continuously

- **Regular Surveys and Feedback Collection:** Periodic surveys should be implemented to continuously capture customer satisfaction and gather suggestions for improvement. This will help refine the customer experience over time.

- **Track Customer Ratings Over Time:** Monitoring customer ratings every quarter allows New-Wheels to identify patterns of dissatisfaction and respond swiftly with corrective actions.

8. Customer Segmentation and Targeting

- **Segment Customers by Feedback:** Customers should be categorized according to their feedback (e.g., "Very Good," "Good," "Bad"), allowing the company to personalize communication. Offering personalized incentives or follow-up calls to dissatisfied customers could help improve their experience.
- **Focus on High-Demand Regions:** Direct marketing efforts toward states or areas with the highest customer base. Concentrating resources in these regions can yield a higher return on investment and foster better growth.

By implementing these recommendations, New-Wheels can enhance operational efficiency, boost customer satisfaction, and ultimately increase sales and revenue in the coming quarters.