Project 7

- Structured Query Language -

- (SQL Business Intelligence: KPI Analysis for Pre-Owned Vehicle Sales) -

1.Introduction

1.1.Problem Definition

1.1.1.Introduction:

Owning a vehicle is a significant milestone for many individuals, offering convenience, independence, and mobility. However, purchasing a brand-new vehicle can be expensive, leading many consumers to explore the pre-owned vehicle market. While pre-owned vehicles are cost-effective, customers often worry about the quality of after-sales service provided by resale vendors compared to original manufacturers.

New-Wheels, a vehicle resale company, aims to address these concerns by offering an end-to-end vehicle resale platform. The company has developed an app that streamlines the entire process, from listing and purchasing to shipping and after-sales support. Additionally, the app collects customer feedback, which can provide valuable insights into customer satisfaction and service quality.

1.1.2.Business Problem

New-Wheels is facing several key challenges that need to be addressed:

1. Declining Sales: The company has reported a steady drop in sales, which is impacting overall revenue and profitability.
2. Negative Customer Feedback: Poor after-sales service and customer dissatisfaction have led to lower ratings, discouraging new buyers.
3. Drop in New Customers: Due to declining trust and brand perception, fewer new customers are engaging with the platform.
4. Operational Inefficiencies: Potential delays in shipments or inadequate customer support may be contributing to customer dissatisfaction.
5. Need for Data-Driven Decision Making: The CEO requires a structured, data-backed report to assess performance and make strategic improvements.

1.1.3.Objective

Despite its innovative approach, New-Wheels has been experiencing a decline in sales over the past year. Negative customer feedback and low ratings have contributed to a drop in new customer acquisitions each quarter. To address these challenges, the CEO has requested a quarterly report with key business metrics. The goal is to analyze sales performance, customer feedback, and overall business health to make data-driven decisions for improvement.

1.2.Data Background and Contents

1.2.1.Dataset Overview:

New-Wheels' dataset consists of multiple tables containing detailed information about customers, orders, products, and shipping. This data will be used to analyze business performance, customer behavior, and key operational metrics. Below is an overview of the dataset and its structure.

1. Customer Information (customer_t)

This table contains details about customers, including personal information, location, and payment methods.

- customer_id: Unique identifier for each customer.
- customer_name: Name of the customer.
- gender: Gender of the customer.
- job_title: Occupation of the customer.
- phone_number: Contact number of the customer.
- email_address: Email ID of the customer.
- city, state, country: Residential details of the customer.
- customer_address: Full address of the customer.
- postal_code: Postal code of the customer's residence.
- credit_card_type: Type of credit card used for payment.
- credit_card_number: Credit card number (stored securely and anonymized).

2. Order and Shipment Details (order_t)

This table records all order transactions, including product purchases, shipping details, and customer feedback.

- order_id: Unique identifier for each order.
- customer_id: Links the order to a specific customer.
- shipper_id: Identifies the shipping provider.
- product_id: Identifies the vehicle purchased.
- quantity: Number of units ordered.
- vehicle_price: Price of the vehicle at the time of purchase.
- order_date: Date when the order was placed.
- ship_date: Date when the order was shipped.
- discount: Discount applied to the purchase.
- ship_mode: Shipping class (e.g., Standard, Express).
- shipping: Shipping method used for the order.
- customer_feedback: After-sales feedback from the customer.
- quarter_number: The quarter in which the transaction occurred, useful for quarterly reporting.

3. Vehicle Details (product_t)

This table contains information about the vehicles available for purchase, including manufacturer and specifications.

- product_id: Unique identifier for each vehicle.
- vehicle_maker: Name of the vehicle manufacturer.
- vehicle_model: Model name of the vehicle.
- vehicle_color: Color of the vehicle.
- vehicle_model_year: Year of manufacturing.
- vehicle_price: Selling price of the vehicle.

4. Shipper Details (shipper_t)

This table provides details of the shipping companies handling deliveries.

- shipper_id: Unique identifier for each shipping provider.
- shipper_name: Name of the shipping company.
- shipper_contact_details: Contact details of the shipper.

2. Addressing Key Business Questions

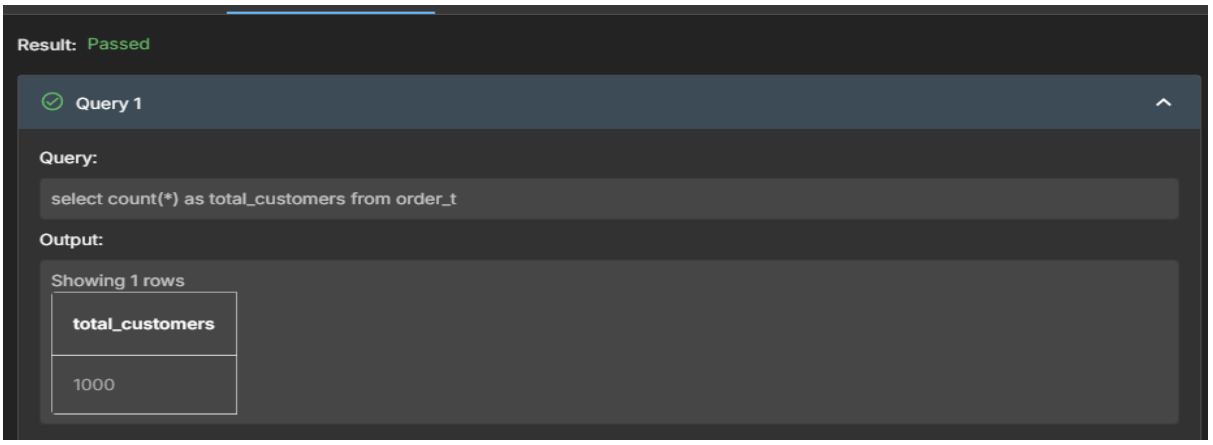
Question 1:

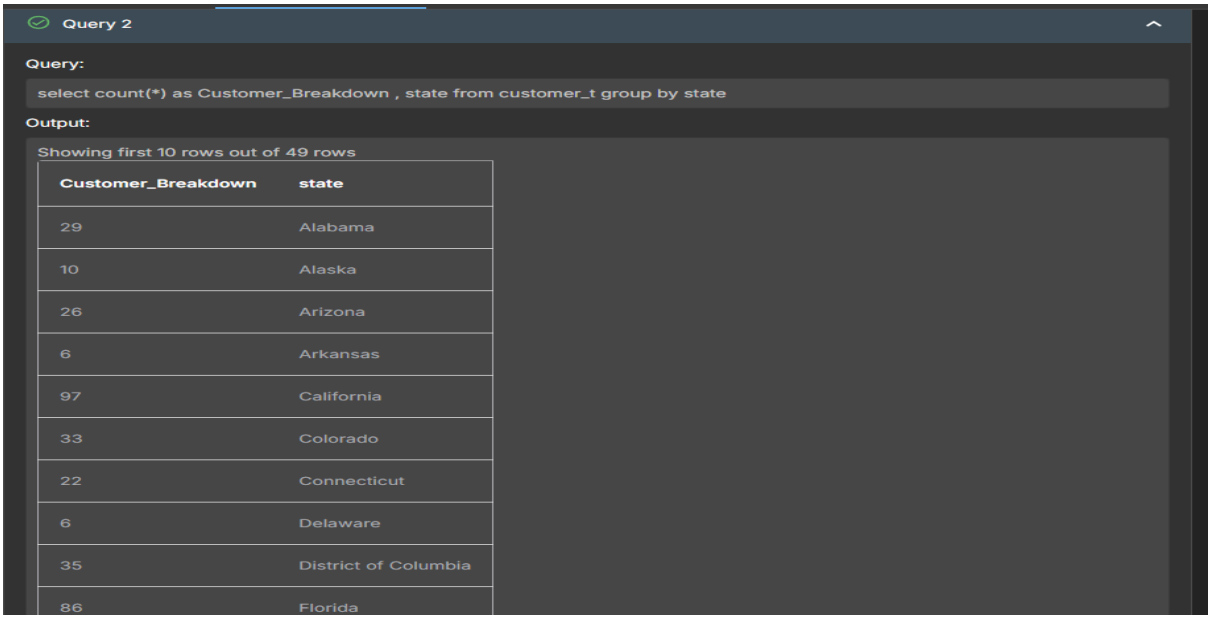
Find the total number of customers who have placed orders. What is the distribution of the customers across states?

Solution Query:

```
select count(*) as total_customers from order_t;

select count(*) as Customer_Breakdown , state from customer_t group by state
```

Output:





Observations of query 1 and 2 :

- A total of 1000 orders have been placed, but this does not indicate the number of unique customers, as some may have placed multiple orders.
- The number of customers varies across different states, with some having significantly higher customer counts while others have relatively fewer.
- The dataset includes 49 states, but only the first 10 rows are visible in the current output.

Insights of query 1 and 2 :

- Customer Concentration: Certain states have a higher number of customers, indicating strong demand in those regions. New-Wheels can focus on enhancing services, offers, and customer engagement in such areas.
- Potential Growth Areas: Some states show fewer customers, which may indicate lower awareness, limited market reach, or logistical constraints. The company can explore strategies to improve its presence in these areas.

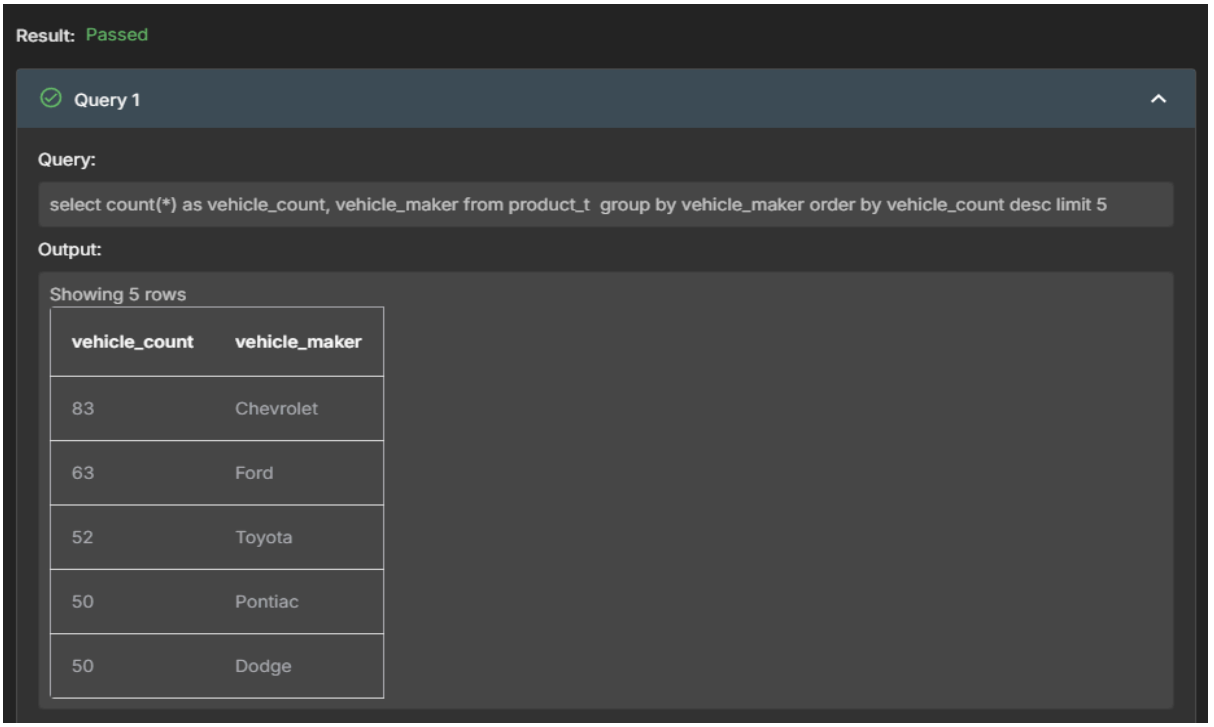
Question 2:

Which are the top 5 vehicle makers preferred by the customers?

Solution Query:

```
select count(*) as vehicle_count, vehicle_maker from product_t  group by
vehicle_maker order by vehicle_count desc limit 5
```

Output:



Observations:

- Chevrolet is the most preferred vehicle maker, with 83 vehicles sold, significantly higher than others.
- Ford follows with 63 vehicles sold, showing strong demand.
- Toyota remains a popular choice, with 52 vehicles sold, reinforcing its global reputation for reliability.
- Pontiac and Dodge have an equal count (50 each), indicating a balanced preference among customers.
- The distribution shows that American brands (Chevrolet, Ford, Pontiac, and Dodge) dominate the top 5, while Toyota is the only non-American brand in the list.

Insights:

- Chevrolet's Strong Demand: Since Chevrolet has the highest sales, New-Wheels should focus on maintaining stock levels, offering promotions, and analyzing what makes it so popular (e.g., affordability, reliability, or financing options).
- Ford’s Competitive Edge: Ford is another strong performer, suggesting potential for targeted marketing or bundling deals to further boost sales.
- Toyota's Global Appeal: Even with a strong preference for American brands, Toyota still ranks among the top 5, indicating that some customers prefer its reliability and fuel efficiency.
- Diversified Inventory Strategy: Since Pontiac and Dodge also have significant demand, New-Wheels should balance inventory across these brands to cater to varying customer preferences

Question 3:

Which is the most preferred vehicle maker in each state?

Solution Query:

```
WITH ranked_makers AS (
   SELECT
      c.state,
      p.vehicle_maker,
      COUNT(DISTINCT o.customer_id) AS customer_count,
      RANK() OVER (PARTITION BY c.state ORDER BY COUNT(DISTINCT
o.customer_id) DESC) AS rankk
   FROM order_t o
   JOIN product_t p ON o.product_id = p.product_id
   JOIN customer_t c ON o.customer_id = c.customer_id
   GROUP BY c.state, p.vehicle_maker
)
SELECT * FROM ranked_makers WHERE rankk = 1 ORDER BY state limit 10
```

Output:

Result: Passed

Query 1

Query:

```
WITH ranked_makers AS (
    SELECT
        c.state,
        p.vehicle_maker,
        COUNT(DISTINCT o.customer_id) AS customer_count,
        RANK() OVER (PARTITION BY c.state ORDER BY COUNT(DISTINCT o.customer_id) DESC) AS rankk
    FROM order_t o
    JOIN product_t p ON o.product_id = p.product_id
    JOIN customer_t c ON o.customer_id = c.customer_id
    GROUP BY c.state, p.vehicle_maker
)
SELECT * FROM ranked_makers WHERE rankk = 1 ORDER BY state limit 10
```

Output:

Query Executed Successfully

```
WITH ranked_makers AS (
    SELECT
        c.state,
        p.vehicle_maker,
        COUNT(DISTINCT o.customer_id) AS customer_count,
        RANK() OVER (PARTITION BY c.state ORDER BY COUNT(DISTINCT o.customer_id) DESC) AS rankk
    FROM order_t o
    JOIN product_t p ON o.product_id = p.product_id
    JOIN customer_t c ON o.customer_id = c.customer_id
    GROUP BY c.state, p.vehicle_maker
)
SELECT * FROM ranked_makers WHERE rankk = 1 ORDER BY state limit 10
```

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

state	vehicle_maker	customer_count	rankk
Alabama	Dodge	5	1
Alaska	Chevrolet	2	1
Arizona	Cadillac	3	1
Arizona	Pontiac	3	1
Arkansas	Chevrolet	1	1
Arkansas	GMC	1	1
Arkansas	Mitsubishi	1	1
Arkansas	Pontiac	1	1
Arkansas	Suzuki	1	1
Arkansas	Volkswagen	1	1

Result 39

Output

Action Output

#	Time	Action	Message	Duration / Fetch
350	18:14:02	WITH revenue_per_quarter AS (SELECT quarter_number, SUM(quantity * vehicle_price - discount)) AS net_revenue FROM order_t ...	4 row(s) returned	0.000 sec / 0.
351	21:31:15	WITH ranked_makers AS (SELECT c.state, p.vehicle_maker, COUNT(DISTINCT o.customer_id) AS customer_count, RANK(...	10 row(s) returned	0.047 sec / 0.

Observations:

- The most preferred vehicle maker varies across different states, indicating diverse customer preferences based on regional demand.
- Some states have multiple vehicle makers ranked at the top due to an equal number of customers preferring them, such as *Arizona* and *Arkansas*.
- Some states, like *Arkansas*, have a very low customer count for the top-ranked brands, which may indicate either low demand or a fragmented market.
- The presence of brands like Cadillac, Pontiac, Dodge, and Mitsubishi in the rankings suggests that preference is not limited to mainstream brands but includes niche choices as well.

Insights:

- Multiple top-ranked brands in states like Arizona suggest a highly competitive market with diverse customer preferences.
- The presence of low customer counts in states such as Arkansas may suggest less competition but also lower overall demand.
- Regional preferences play a significant role in vehicle choice, with different states showing varying leaders in terms of preferred vehicle makers.
- Niche brands like Cadillac and Mitsubishi still hold notable positions in some states, reflecting a preference for specific vehicle types or features.

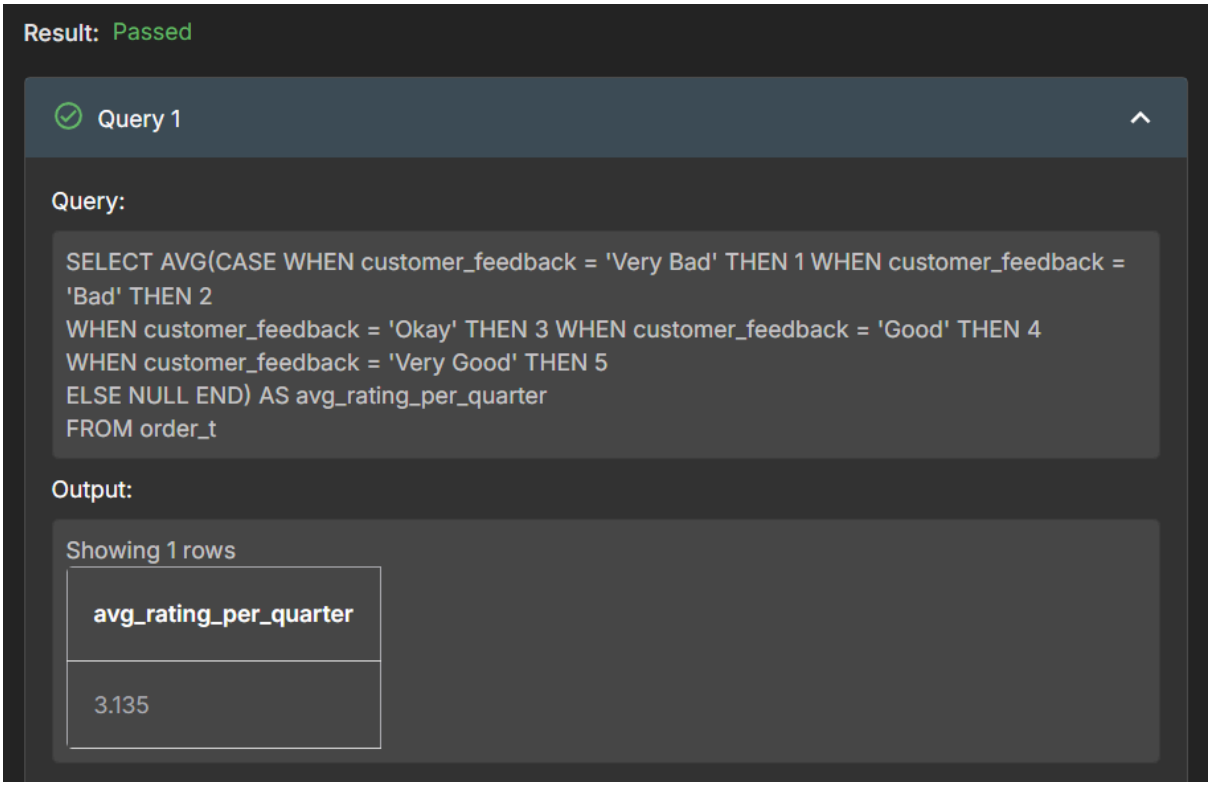
Question 4:

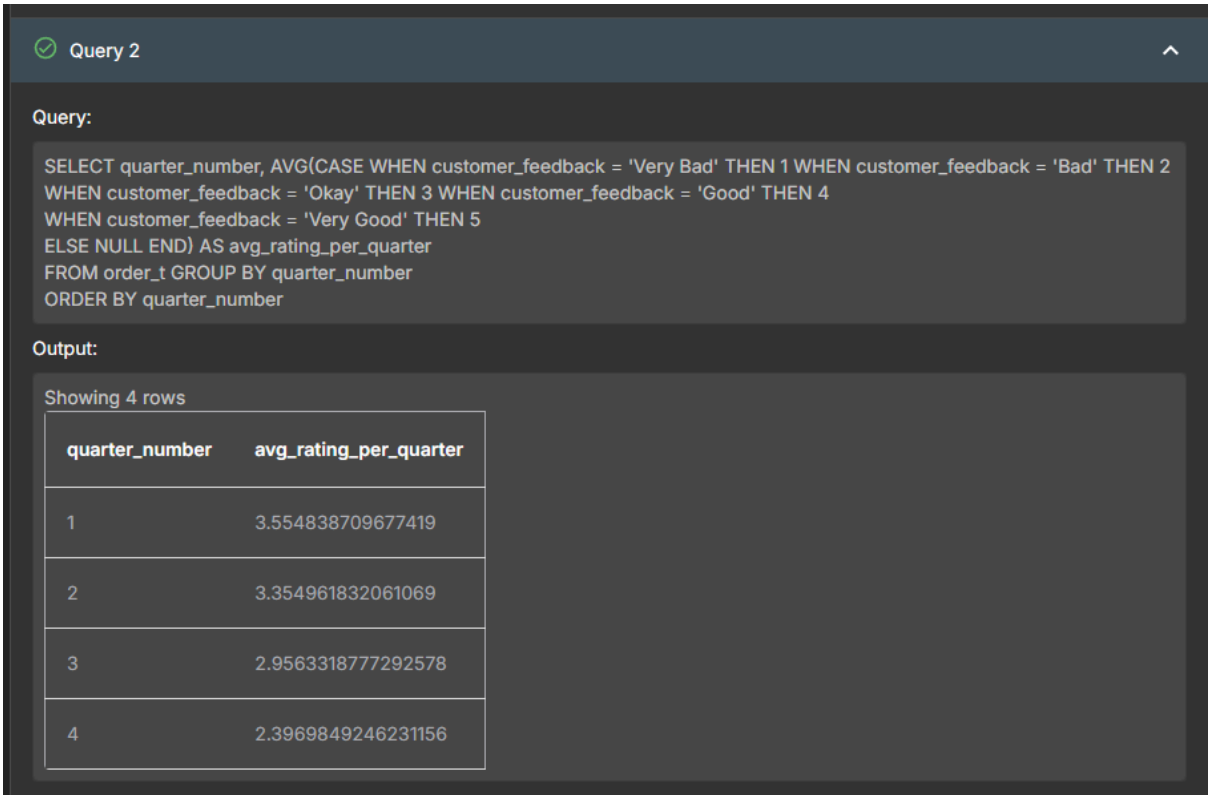
Find the overall average rating given by the customers. What is the average rating in each quarter?

Solution Query:

```
SELECT 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

ELSE NULL END) AS avg_rating_per_quarter

FROM order_t;

SELECT quarter_number, 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

ELSE NULL END) AS avg_rating_per_quarter

FROM order_t GROUP BY quarter_number

ORDER BY quarter_number;
```

Output:


Result: Passed
Query 1
Query:
SELECT 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
ELSE NULL END) AS avg_rating_per_quarter
FROM order_t
Output:
Showing 1 rows
avg_rating_per_quarter
3.135


Query 2
Query:
SELECT quarter_number, 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
ELSE NULL END) AS avg_rating_per_quarter
FROM order_t GROUP BY quarter_number
ORDER BY quarter_number
Output:
Showing 4 rows
quarter_number avg_rating_per_quarter
1 3.554838709677419
2 3.354961832061069
3 2.9563318777292578
4 2.3969849246231156

Observations:

- The overall average rating across all quarters is 3.135, which falls between “Okay” (3) and “Good” (4). This suggests that, on average, customers have a neutral to slightly positive experience.
- Quarter 1 has the highest average rating (3.55), indicating relatively better customer satisfaction during this period.
- Quarter 2 follows with an average rating of 3.35, still above the overall average but slightly lower than Quarter 1.
- Quarter 3 shows a decline (2.95), dropping below 3, meaning customer satisfaction started to decrease.
- Quarter 4 has the lowest rating (2.39), significantly below the overall average, suggesting a noticeable increase in dissatisfaction.

Insights:

- There is a downward trend in customer ratings from Quarter 1 to Quarter 4, indicating a potential issue that worsened over time.
- The decline in Quarter 3 and the sharp drop in Quarter 4 suggest possible service or product-related challenges that negatively impacted customer perception.
- The higher ratings in Quarter 1 and Quarter 2 suggest that the initial customer experience was better, but something changed in later quarters.

Question 5:

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

Solution Query:

```
SELECT
    quarter_number,
    COUNT(*) AS total_feedback,
    (SUM(CASE WHEN customer_feedback = 'Very Bad' THEN 1 ELSE 0 END) * 100.0 / COUNT(*)) AS very_bad_percentage,
    (SUM(CASE WHEN customer_feedback = 'Bad' THEN 1 ELSE 0 END) * 100.0 / COUNT(*)) AS bad_percentage,
    (SUM(CASE WHEN customer_feedback = 'Okay' THEN 1 ELSE 0 END) * 100.0 / COUNT(*)) AS okay_percentage,
    (SUM(CASE WHEN customer_feedback = 'Good' THEN 1 ELSE 0 END) * 100.0 / COUNT(*)) AS good_percentage,
    (SUM(CASE WHEN customer_feedback = 'Very Good' THEN 1 ELSE 0 END) * 100.0 / COUNT(*)) AS very_good_percentage
FROM order_t
GROUP BY quarter_number
ORDER BY quarter_number;
```

Output:

Result: Passed

Query 1

Query:

```
SELECT
    quarter_number,
    COUNT(*) AS total_feedback,
    (SUM(CASE WHEN customer_feedback = 'Very Bad' THEN 1 ELSE 0 END) * 100.0 / COUNT(*)) AS very_bad_percentage,
    (SUM(CASE WHEN customer_feedback = 'Bad' THEN 1 ELSE 0 END) * 100.0 / COUNT(*)) AS bad_percentage,
    (SUM(CASE WHEN customer_feedback = 'Okay' THEN 1 ELSE 0 END) * 100.0 / COUNT(*)) AS okay_percentage,
    (SUM(CASE WHEN customer_feedback = 'Good' THEN 1 ELSE 0 END) * 100.0 / COUNT(*)) AS good_percentage,
    (SUM(CASE WHEN customer_feedback = 'Very Good' THEN 1 ELSE 0 END) * 100.0 / COUNT(*)) AS very_good_percentage
FROM order_t
GROUP BY quarter_number
ORDER BY quarter_number
```

Output:

Showing 4 rows

quarter_number	total_feedback	very_bad_percentage	bad_percentage	okay_percentage	good_percentage	very_good_percentage
1	310	10.96774193548387	11.290322580645162	19.032258064516128	28.70967741935484	30
2	262	14.885496183206106	14.122137404580153	20.229007633587788	22.137404580152673	28.625954198473284
3	229	17.903930131004365	22.707423580786028	21.83406113537118	20.96069868995633	16.593886462882097
4	199	30.65326633165829	29.14572864321608	20.100502512562816	10.050251256281408	10.050251256281408

Observations:

- In Quarter 1, the highest percentage of feedback was "Very Good" (30%), followed by "Good" (28.71%). Negative feedback ("Very Bad" and "Bad") was relatively lower at 10.97% and 11.29% respectively.
- In Quarter 2, the "Very Good" feedback percentage slightly dropped to 28.63%, while negative feedback ("Very Bad" and "Bad") increased to 14.89% and 14.12% respectively.
- In Quarter 3, negative feedback saw a significant jump, with "Very Bad" increasing to 17.90% and "Bad" to 22.71%, while "Very Good" ratings declined sharply to 16.59%.
- By Quarter 4, dissatisfaction peaked, with "Very Bad" feedback reaching 30.65% and "Bad" at 29.15%, showing a continuous decline in customer satisfaction. Meanwhile, positive feedback ("Very Good" and "Good") drastically dropped to 10.05% each.

Insights:

- Customer dissatisfaction has been steadily increasing over time, as seen in the rise of "Very Bad" and "Bad" feedback percentages each quarter.
- The highest satisfaction was in Quarter 1, where over 58% of feedback was either "Good" or "Very Good".
- In Quarter 4, positive feedback saw a major drop, while negative feedback collectively accounted for nearly 60% of total feedback, indicating a severe decline in customer experience.
- The trend suggests a progressive decline in service quality, product experience, or support,

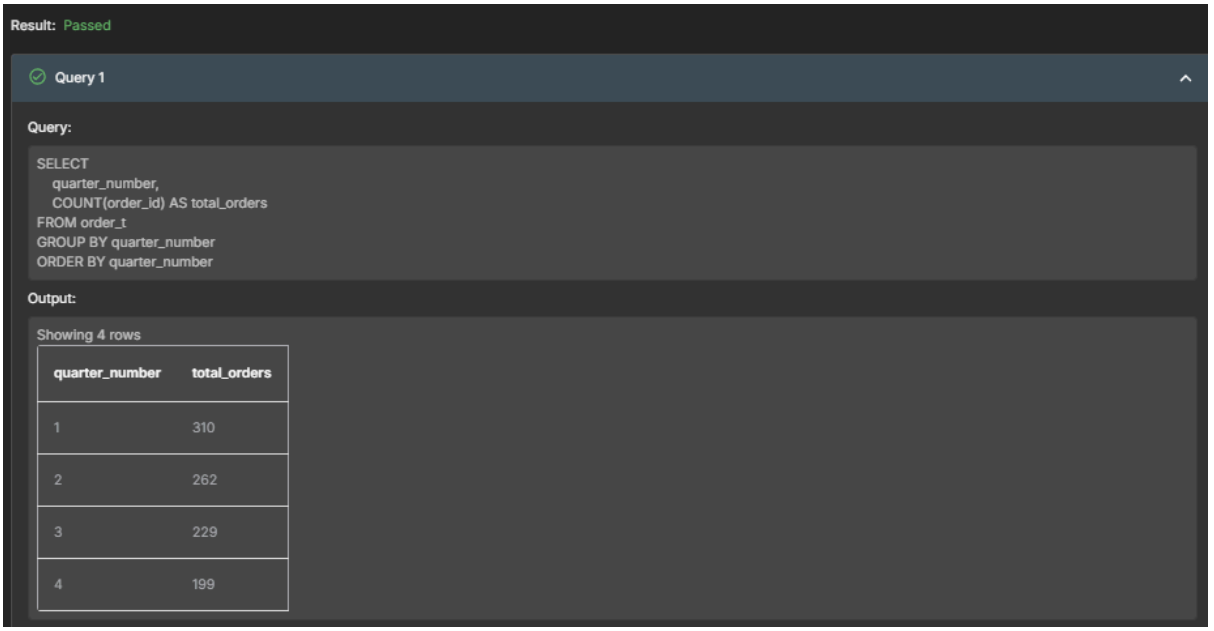
Question 6:

What is the trend of the number of orders by quarter?

Solution Query:

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

Output:



Observations:

- The number of orders has been declining across quarters.
- Q1 has the highest number of orders (310), indicating a strong start to the year.
- In Q2, the orders dropped to 262, showing a decrease compared to Q1.
- The decline continues in Q3 (229 orders) and Q4 (199 orders), suggesting a consistent downward trend.

Insights:

- The order volume shows a decreasing trend over the year, which could indicate seasonal fluctuations, declining customer interest, or external factors affecting demand.
- The most significant drop occurs between Q1 and Q4, suggesting a potential issue in customer retention, pricing, or market conditions.

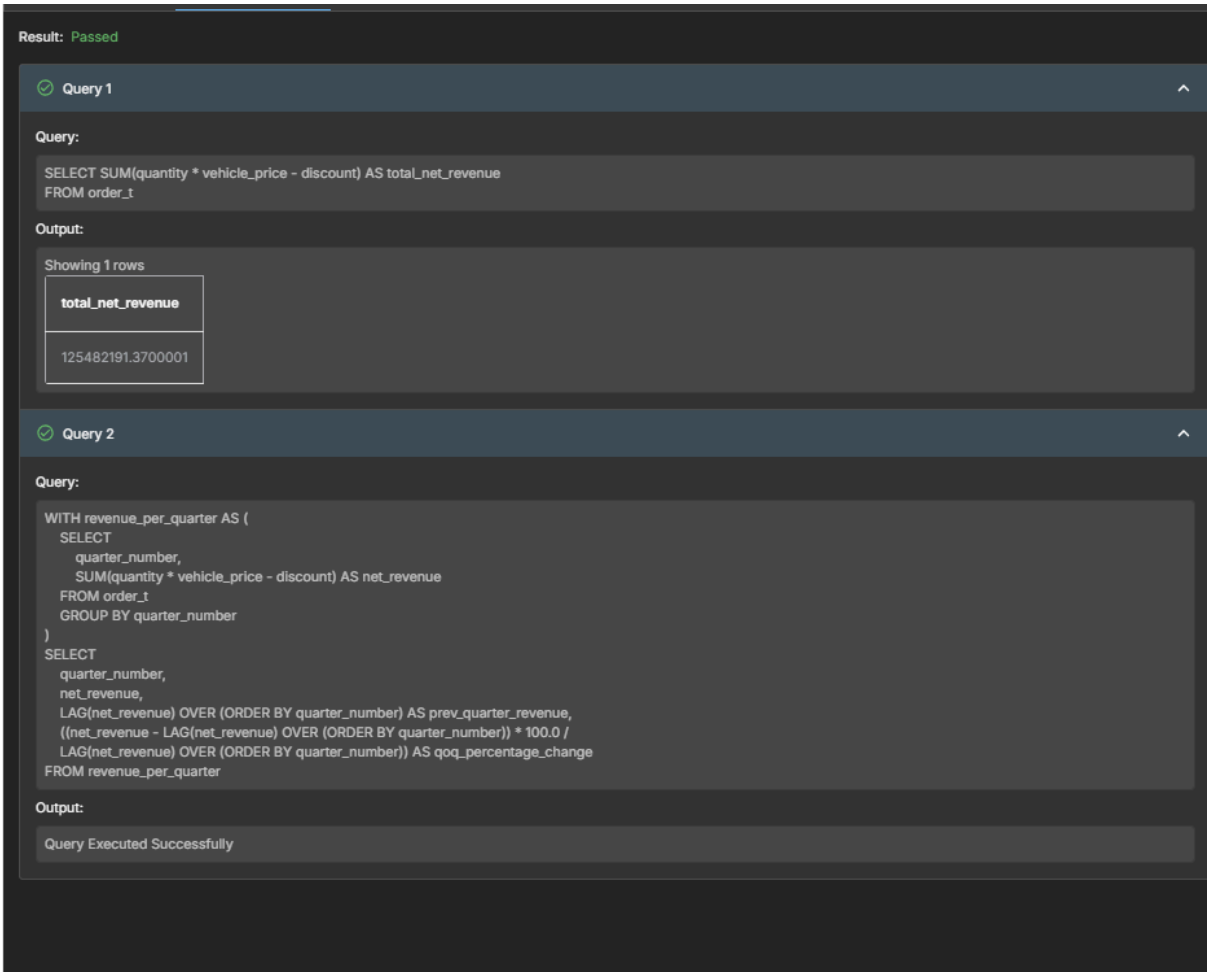
Question 7:

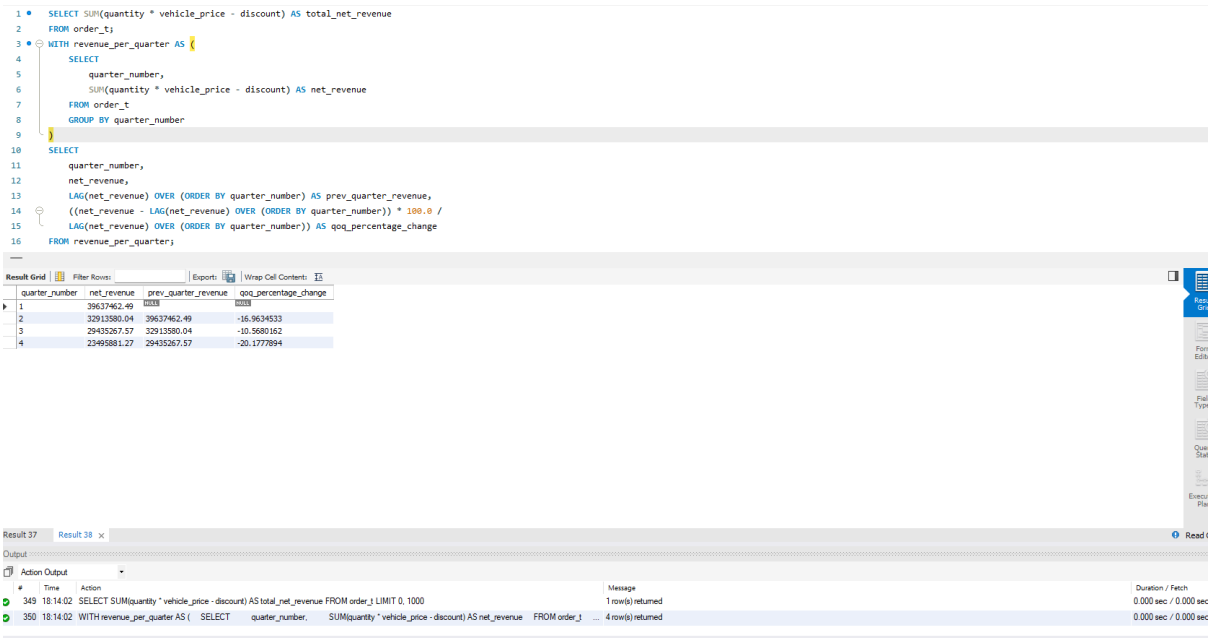
Calculate the net revenue generated by the company. What is the quarter-over-quarter % change in net revenue?

Solution Query:

```
SELECT SUM(quantity * vehicle_price - discount) AS total_net_revenue
FROM order_t;
WITH revenue_per_quarter AS (
    SELECT
        quarter_number,
        SUM(quantity * vehicle_price - discount) AS net_revenue
    FROM order_t
    GROUP BY quarter_number
)
SELECT
    quarter_number,
    net_revenue,
    LAG(net_revenue) OVER (ORDER BY quarter_number) AS prev_quarter_revenue,
    ((net_revenue - LAG(net_revenue) OVER (ORDER BY quarter_number)) * 100.0 /
    LAG(net_revenue) OVER (ORDER BY quarter_number)) AS qoq_percentage_change
FROM revenue_per_quarter;
```

Output:


Result: Passed
Query 1
Query:
SELECT SUM(quantity * vehicle_price - discount) AS total_net_revenue
FROM order_t
Output:
Showing 1 rows
total_net_revenue
125482191.3700001
Query 2
Query:
WITH revenue_per_quarter AS (
SELECT
quarter_number,
SUM(quantity * vehicle_price - discount) AS net_revenue
FROM order_t
GROUP BY quarter_number
)
SELECT
quarter_number,
net_revenue,
LAG(net_revenue) OVER (ORDER BY quarter_number) AS prev_quarter_revenue,
((net_revenue - LAG(net_revenue) OVER (ORDER BY quarter_number)) * 100.0 /
LAG(net_revenue) OVER (ORDER BY quarter_number)) AS qoq_percentage_change
FROM revenue_per_quarter
Output:
Query Executed Successfully


SELECT SUM(quantity * vehicle_price - discount) AS total_net_revenue
FROM order_t;
WITH revenue_per_quarter AS (
SELECT
quarter_number,
SUM(quantity * vehicle_price - discount) AS net_revenue
FROM order_t
GROUP BY quarter_number
)
SELECT
quarter_number,
net_revenue,
LAG(net_revenue) OVER (ORDER BY quarter_number) AS prev_quarter_revenue,
((net_revenue - LAG(net_revenue) OVER (ORDER BY quarter_number)) * 100.0 /
LAG(net_revenue) OVER (ORDER BY quarter_number)) AS qoq_percentage_change
FROM revenue_per_quarter;
Result Grid
quarter_number net_revenue prev_quarter_revenue qoq_percentage_change
1 39637462.49 NULL NULL
2 32913580.04 39637462.49 -16.9634533
3 29435267.57 32913580.04 -10.5680162
4 2349581.27 29435267.57 -20.1777894
Result 37
Result 38
Output
Action Output
Time Action Message Duration / Fetch
349 18:14:02 SELECT SUM(quantity * vehicle_price - discount) AS total_net_revenue FROM order_t LIMIT 0, 1000 1 row(s) returned 0.000 sec / 0.000 sec
350 18:14:02 WITH revenue_per_quarter AS (SELECT quarter_number, SUM(quantity * vehicle_price - discount) AS net_revenue FROM order_t ... 4 row(s) returned 0.000 sec / 0.000 sec

Observations:

- Total Net Revenue of the company is $125.48 million.
- Revenue is declining quarter-over-quarter:
    - Q2 saw a 16.96% decline from Q1.
    - Q3 saw a 10.57% decline from Q2.
    - Q4 saw a 20.18% decline from Q3.
- Q4 had the sharpest decline (-20.18%), Q3 showed the smallest decline (-10.57%), suggesting a relatively stable quarter compared to Q2 and Q4.

Insights

- The company is experiencing a steady decline in net revenue, which may indicate operational inefficiencies or reduced customer engagement.
- The sharp drop in Q4 suggests an urgent need to investigate the reasons—customer dissatisfaction, seasonal trends, or increased competition.
- The relatively smaller decline in Q3 suggests a better retention or demand in that quarter.

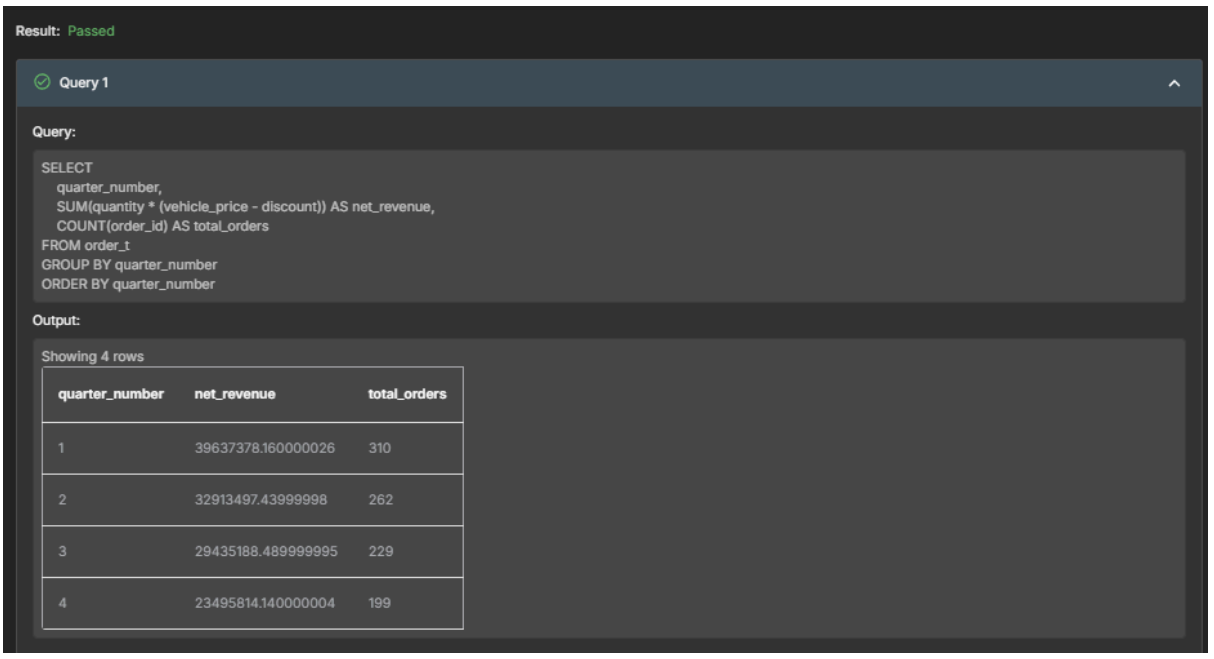
Question 8:

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

Solution Query:

```
SELECT
    quarter_number,
    SUM(quantity * (vehicle_price - discount)) AS net_revenue,
    COUNT(order_id) AS total_orders
FROM order_t
GROUP BY quarter_number
ORDER BY quarter_number;
```

Output:



Result: Passed

Query 1

Query:

```
SELECT
    quarter_number,
    SUM(quantity * (vehicle_price - discount)) AS net_revenue,
    COUNT(order_id) AS total_orders
FROM order_t
GROUP BY quarter_number
ORDER BY quarter_number
```

Output:

Showing 4 rows

quarter_number	net_revenue	total_orders
1	39637378.160000026	310
2	32913497.43999998	262
3	29435188.489999995	229
4	23495814.140000004	199

Observations:

- Net revenue is consistently decreasing from 39.64M in Q1 to 23.49M in Q4.
- Total orders are also declining, from 310 in Q1 to 199 in Q4.
- Both revenue and order volume follow a similar downward trend, suggesting a direct correlation.

Insights:

- The trend shows a consistent decline in both orders and revenue, suggesting that customer demand or business performance has been slowing down over time.
- The drop in orders strongly correlates with the drop in revenue, meaning fewer transactions are likely a key reason for revenue reduction.

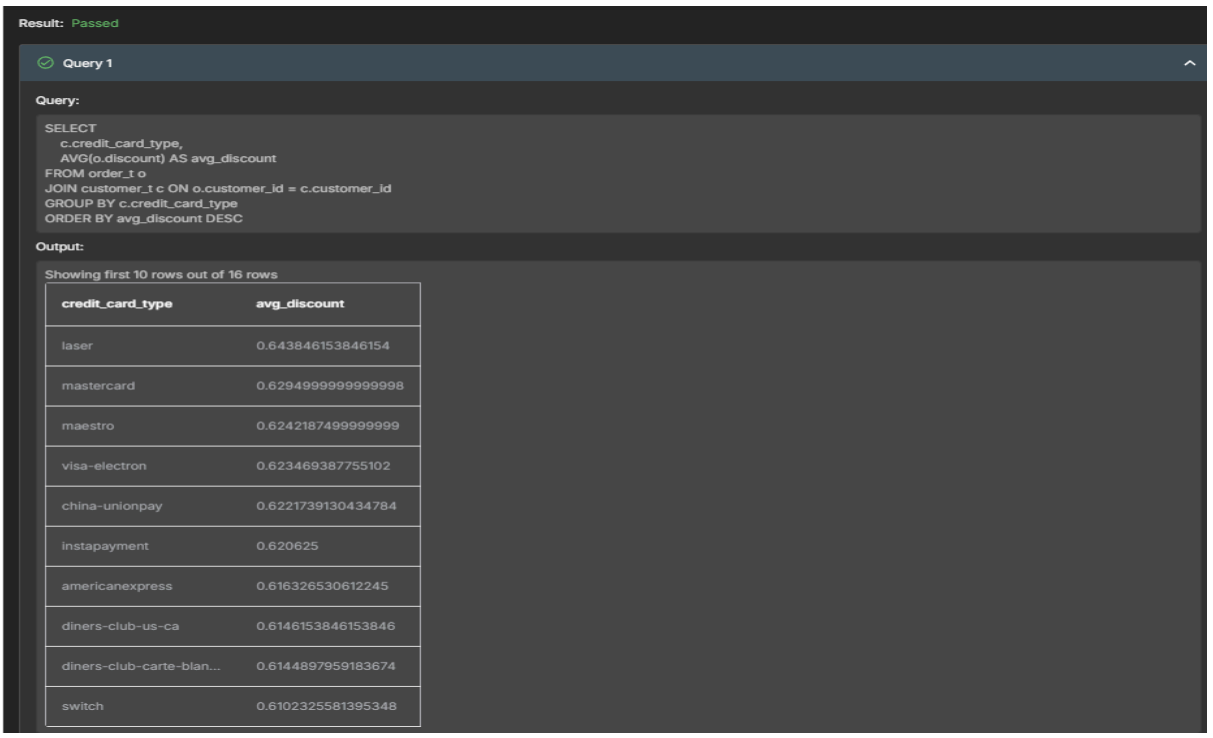
Question 9:

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

Solution Query:

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

Output:



Result: Passed

Query 1

Query:

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

Output:

Showing first 10 rows out of 16 rows

credit_card_type	avg_discount
laser	0.643846153846154
mastercard	0.6294999999999998
maestro	0.6242187499999999
visa-electron	0.623469387755102
china-unionpay	0.6221739130434784
instapayment	0.620625
americanexpress	0.616326530612245
diners-club-us-ca	0.6146153846153846
diners-club-carte-blan...	0.6144897959183674
switch	0.6102325581395348

Observations:

- Laser cards receive the highest average discount (0.6438), making them the most discounted credit card type.
- Mastercard (0.6295) and Maestro (0.6242) follow closely, showing competitive discount offers.
- Visa Electron (0.6234) and China UnionPay (0.6221) also receive significant discounts, suggesting broad acceptance and promotions.
- American Express (0.6163) and Diners Club variations (~0.6145) are slightly lower in discount ranking but still receive moderate reductions.

Insights:

- Laser and Mastercard holders receive the highest discounts, possibly due to bank partnerships or customer spending behavior.
- The variation in discounts is relatively small, indicating that no single card type is overwhelmingly favored.
- Premium credit cards like American Express receive competitive discounts, suggesting that high-value customers are still given moderate benefits.

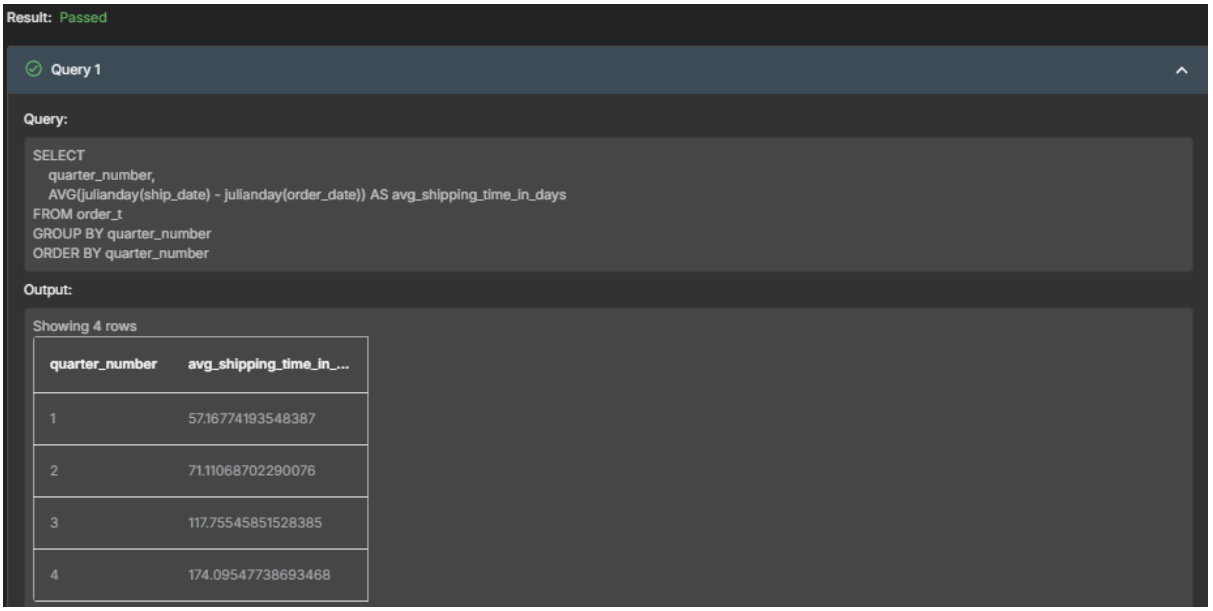
Question 10:

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

Solution Query:

```
SELECT
   quarter_number,
   AVG(julianday(ship_date) - julianday(order_date)) AS avg_shipping_time_in_days
FROM order_t
GROUP BY quarter_number
ORDER BY quarter_number;
```

Output:



Observations:

- The average shipping time has increased over the quarters, indicating possible delays in logistics.
- Q1 had the fastest shipping time (57.17 days), while Q4 had the slowest (174.10 days), showing a 3x increase.
- The highest jump occurred between Q2 (71.11 days) and Q3 (117.76 days), hinting at operational inefficiencies.

Insights:

- The shipping duration has worsened over time, which may indicate issues in supplier coordination, increased demand, or logistics inefficiencies.
- Q3 and Q4 show a critical increase, highlighting a possible operational bottleneck.

3.Business Metrics Overview:

Total Revenue	Total Orders	Total Customers	Average Rating
124714086.32	1000	994	3.135
Last Quarter Revenue	Last quarter Orders	Average Days to Ship	% Good Feedback
23346779.63	199	97.964	21.5

Table 1. Business Metrics Overview

Business Metrics Summary:

- The total revenue generated by the company is $125,482,191.37.
- A total of 1000 orders have been placed.
- There are 994 unique customers.
- The average customer rating across all orders is 3.135.
- The net revenue generated in the last quarter is $23,495,814.14.
- In the last quarter, 199 orders were placed.
- The overall average shipping time is 97.964 days.
- The overall percentage of "Good" feedback is 21.5%.

4.Business Recommendations :

1. Focus on Maintaining Popular Vehicle Stock:

- Top Vehicle Makers: Brands like Chevrolet, Ford, and Toyota dominate the sales, indicating a strong customer preference for these vehicles. New-Wheels should focus on ensuring that these brands are consistently in stock to meet customer demand, particularly during high-demand periods. Given that American brands are more popular, New-Wheels can prioritize stocking these vehicles and possibly develop strategic partnerships with these manufacturers.

2. Targeted Marketing and Customer Engagement:

- Customer Preferences: The trend analysis shows that customer satisfaction (as indicated by the Average Rating and Good Feedback percentage) has room for improvement, especially in the last quarter. This suggests potential dissatisfaction with service or product quality. New-Wheels should tailor marketing campaigns and customer engagement strategies to highlight the strengths of popular brands (like Chevrolet and Ford) while addressing any customer concerns. Customer retention programs and loyalty incentives should be prioritized to boost satisfaction and drive repeat purchases.

3. Monitor and Adjust Pricing Strategies:

- Discount Analysis: The average discount data reveals some variability across different credit card types. The Laser card seems to receive the highest discount on average. New-Wheels can refine its discount strategy by targeting specific customer segments with more personalized offers. Adjusting the discount offerings based on customer feedback and credit card preferences could enhance profitability without compromising on customer satisfaction.

4. Optimize Shipping Efficiency:

- Shipping Time Analysis: The average shipping time is increasing with each passing quarter. The delay in shipping could impact customer satisfaction and repeat business. New-Wheels should investigate ways to streamline its logistics and shipping processes. It might consider implementing better inventory management systems,

collaborating with reliable shipping partners, or even improving internal coordination to reduce delays and ensure timely deliveries.

5. Improve Customer Feedback Process:

- Feedback Trends: The percentage of "Good" feedback has seen a decline, especially in the later quarters. Although New-Wheels does have a healthy amount of "Very Good" feedback, the dip in "Good" ratings indicates dissatisfaction among certain segments. New-Wheels can enhance the customer feedback process by closely analyzing negative feedback and identifying the root causes of dissatisfaction. Additionally, the company can follow up on feedback to resolve issues proactively, which could lead to an overall improvement in customer satisfaction and more "Good" or "Very Good" ratings.

6. Revenue Monitoring and Forecasting:

- Quarterly Revenue Trends: The quarter-over-quarter revenue analysis reveals a steady decrease in net revenue, particularly in the last quarter. This downward trend could indicate either reduced sales volume or issues with discounting strategies.
  New-Wheels should focus on forecasting and improving sales strategies. This can involve adjusting the sales tactics, running promotions, or exploring new sales channels (online, for instance) to increase revenue. Further, investigating specific market conditions or operational bottlenecks that contributed to the decline in revenue could help address underlying issues.

7. Customer Retention and Satisfaction:

- Orders and Customers: The total orders and total customers show a decline in the latter quarters. Customer retention appears to be a critical challenge for New-Wheels.
  New-Wheels should enhance customer loyalty programs and increase post-purchase engagement. Strategies such as offering after-sales services, customer satisfaction surveys, or even exclusive deals to existing customers could help retain customers and encourage them to return for repeat purchases.

5.Conclusion :

This project aimed to provide New-Wheels with a detailed analysis of its business operations, focusing on key metrics such as customer satisfaction, sales performance, shipping efficiency, and feedback trends. By using SQL queries, we examined data on customer feedback, order trends, net revenue, discount practices, and more.

Through this analysis, we gained valuable insights into customer preferences, purchasing behavior, and potential areas of improvement. We found that popular vehicle brands like Chevrolet and Ford drive most of the sales, and that customer feedback trends indicate a need for improvement, particularly in shipping times and customer service.

Furthermore, the decline in quarterly revenues and the increase in shipping times highlight operational challenges that need to be addressed. By focusing on improving these areas—such as optimizing shipping processes, adjusting discount strategies, and enhancing customer retention efforts—New-Wheels can strengthen its competitive edge in the market.

In conclusion, leveraging the insights from this project can help New-Wheels refine its business strategies, improve customer satisfaction, and ultimately achieve sustainable growth. The recommendations provided are actionable and will guide New-Wheels in making data-driven decisions that align with both customer expectations and business objectives.