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?

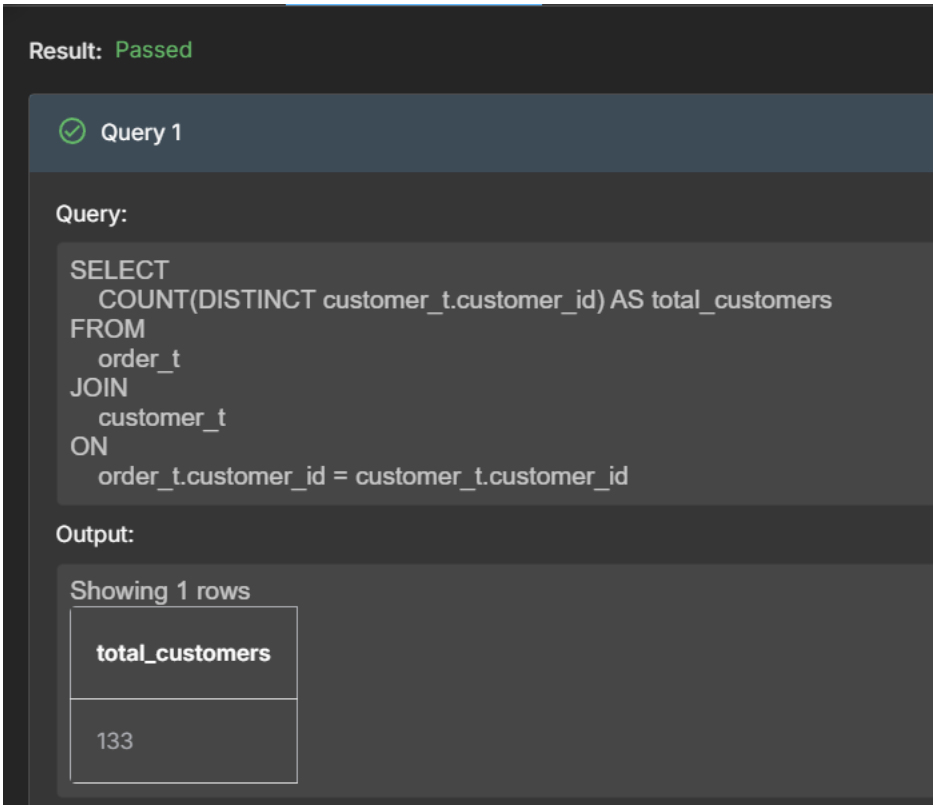
Solution Query:

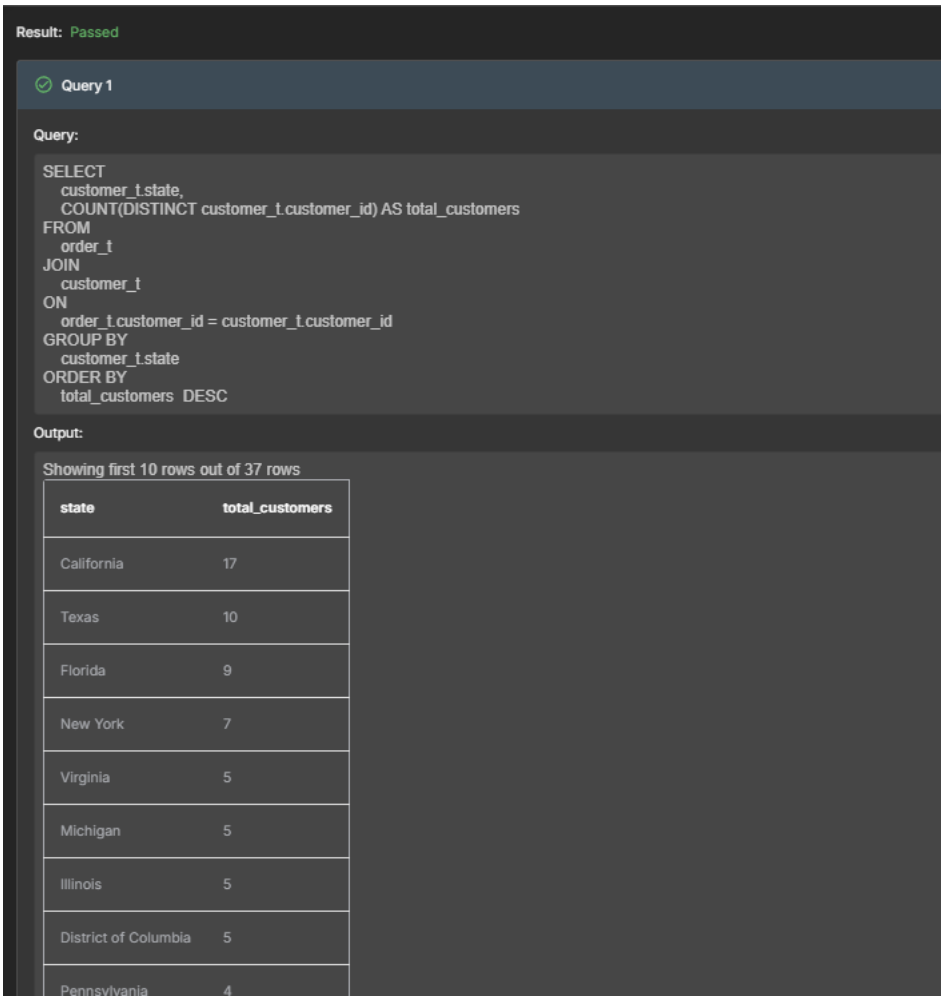
```
-- Number of customers placed orders
SELECT
    COUNT(DISTINCT customer_t.customer_id) AS total_customers
FROM
    order_t
JOIN
    customer_t
ON
    order_t.customer_id = customer_t.customer_id;
-- Distribution of customers across states
SELECT
    customer_t.state,
    COUNT(DISTINCT customer_t.customer_id) AS total_customers
FROM
    order_t
JOIN
    customer_t
ON
    order_t.customer_id = customer_t.customer_id
GROUP BY
    customer_t.state
```

ORDER BY

total_customers DESC;

Output:





Observations and Insights:

- The total number of unique customers who have placed orders is 133.
- The top 5 states in terms of customers placing orders are from California with 17 customers, Texas with 10 customers, Florida with 9 customers, New York with 7 customers and Virigina with 5 customers.

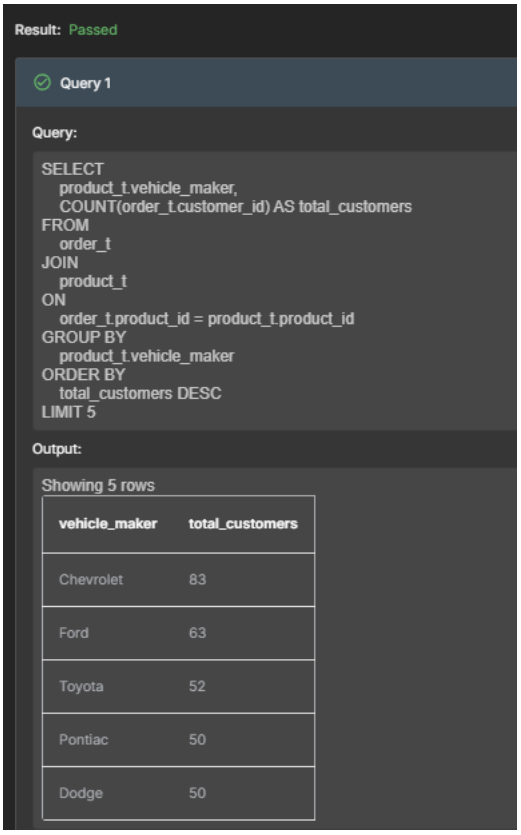
Question 2: Which are the top 5 vehicle makers preferred by the customers?

Solution Query:

```
SELECT
    product_t.vehicle_maker,
    COUNT(order_t.customer_id) AS total_customers
FROM
    order_t
```

```
JOIN
    product_t
ON
    order_t.product_id = product_t.product_id
GROUP BY
    product_t.vehicle_maker
ORDER BY
    total_customers DESC
LIMIT 5;
```

Output:



Observations and Insights:

- The top 5 vehicle makers preferred by the customers are Chevrolet with 83 orders, Ford with 63 orders, Toyota with 52 orders, Pontiac with 50 orders and Dodge with 50 orders.

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

Solution Query:

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

Output:

Result: Passed

Query 1

Query:

```
SELECT *
FROM
   (
      SELECT
         state,
         vehicle_maker,
         COUNT(customer_id) AS Count_of_Customers,
         RANK() OVER(PARTITION BY state ORDER BY COUNT(customer_id) DESC) AS Rank_of_State
      FROM product_t
      JOIN order_t USING(product_id)
      JOIN customer_t USING(customer_id)
      GROUP BY
         state,
         vehicle_maker
   ) AS Preferred_Vehicle
WHERE
Rank_of_State = 1
ORDER BY
   Count_of_Customers DESC
```

Output:

Showing first 10 rows out of 101 rows

state	vehicle_maker	Count_of_Customers	Rank_of_State
California	Pontiac	2	1
California	Nissan	2	1
California	Ford	2	1
California	Chevrolet	2	1
Florida	Volvo	2	1
Florida	Ford	2	1

Observations and Insights:

- There are ties for multiple vehicle makers in different states since most of them have the same count of customers.
- This also suggest that there is no single brand dominance which is no monopoly of brands in states like California and Florida since multiple brands has the same number of customers. This also shows that there is more customer engagement in these areas.
- However, there are states like Indiana and Texas where the brand preference is Mazda and Nissan respectively signifying a stronger brand domination in such areas.

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 as Quarter,
   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
           ELSE NULL
           END
        ),
      2)
      as Average_Rating
FROM
   order_t
GROUP BY
   Quarter
```

Output:

Result: Passed

Query 1

Query:

```
SELECT
   quarter_number as Quarter,
   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
            ELSE NULL
            END
             ),
       2)
       as Average_Rating
FROM
   order_t
GROUP BY
   Quarter
```

Output:

Showing 4 rows

Quarter	Average_Rating
1	3.55
2	3.35
3	2.96
4	2.4

Observations and Insights:

- The average rating for quarter 1, 2, 3 and 4 is 3.55, 3.55, 2.96 and 2.40 respectively.
- We can see that there is a declining trend in the average rating provided by the customer in the quarters.
- The rating has been okay on an average in quarter 1 and 2 whereas it has dropped to bad on an average for quarter 3 and 4.
- This shows that there requires immediate attention in the matter and should be investigated thoroughly since it affects the business.

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

Solution Query:

```
SELECT
    quarter_number,
    ROUND(SUM(CASE WHEN customer_feedback = 'Very Good' THEN 1 ELSE 0 END) * 100.0 / COUNT(order_id),2) AS percentage_very_good,
    ROUND(SUM(CASE WHEN customer_feedback = 'Good' THEN 1 ELSE 0 END) * 100.0 / COUNT(order_id),2) AS percentage_good,
    ROUND(SUM(CASE WHEN customer_feedback = 'Okay' THEN 1 ELSE 0 END) * 100.0 / COUNT(order_id),2) AS percentage_okay,
    ROUND(SUM(CASE WHEN customer_feedback = 'Bad' THEN 1 ELSE 0 END) * 100.0 / COUNT(order_id),2) AS percentage_bad,
    ROUND(SUM(CASE WHEN customer_feedback = 'Very Bad' THEN 1 ELSE 0 END) * 100.0 / COUNT(order_id),2) AS percentage_very_bad
FROM
    order_t
GROUP BY
    quarter_number
ORDER BY
    quarter_number;
```

Output:

Result: Passed

Query 1

Query:

```
SELECT
    quarter_number,
    ROUND(SUM(CASE WHEN customer_feedback = 'Very Good' THEN 1 ELSE 0 END) * 100.0 / COUNT(order_id),2) AS percentage_very_good,
    ROUND(SUM(CASE WHEN customer_feedback = 'Good' THEN 1 ELSE 0 END) * 100.0 / COUNT(order_id),2) AS percentage_good,
    ROUND(SUM(CASE WHEN customer_feedback = 'Okay' THEN 1 ELSE 0 END) * 100.0 / COUNT(order_id),2) AS percentage_okay,
    ROUND(SUM(CASE WHEN customer_feedback = 'Bad' THEN 1 ELSE 0 END) * 100.0 / COUNT(order_id),2) AS percentage_bad,
    ROUND(SUM(CASE WHEN customer_feedback = 'Very Bad' THEN 1 ELSE 0 END) * 100.0 / COUNT(order_id),2) AS percentage_very_bad
FROM
    order_t
GROUP BY
    quarter_number
ORDER BY
    quarter_number
```

Output:

Showing 4 rows

quarter_number	percentage_very_good	percentage_good	percentage_okay	percentage_bad	percentage_very_bad
1	30	28.71	19.03	11.29	10.97
2	28.63	22.14	20.23	14.12	14.89
3	16.59	20.96	21.83	22.71	17.9
4	10.05	10.05	20.1	29.15	30.65

Observations and Insights:

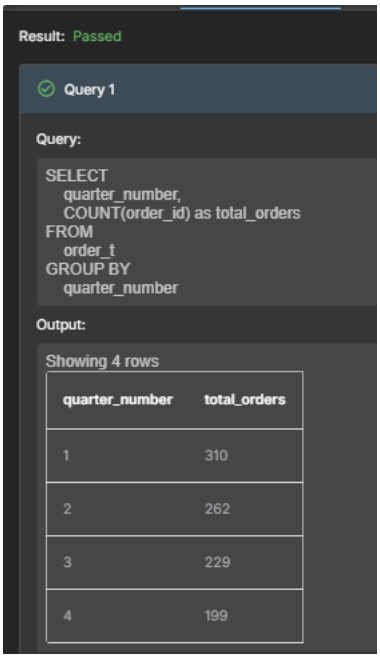
- There is a declining in positive feedback such as for Very good rating it has fallen from 30% to 10.05% and Good rating has fallen from 28.71% to 10.05% from Quarter 1 to Quarter 4.
- Very Bad and Bad rating has increased from 10.97% to 30.05% and 11.29% to 29.15% respectively from Quarter 1 to Quarter 4.
- There is a stable trend shown in the rating of Okay which is ranging between 19% to 21%.
- There is a peak dissatisfaction in Quarter 4 since the Very bad rating and bad rating is at the highest with 29.15% and 30.655 respectively.

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;
```

Output:



Observations and Insights:

- The total orders are 310, 262, 229 and 199 respectively from quarter 1 to quarter 4.
- We can see that there is a declining trend of orders placed throughout the quarter. We should also factor in the seasonality factor where the economy might be facing inflation and customers might be reluctant to invest on a big spending.

- This also correlates to the negative customer feedback new wheels is receiving since the higher the negative feedback, lower the number of orders are being placed.

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

Solution Query:

```
-- Net revenue generated by new wheels

SELECT

   ROUND(SUM(quantity * vehicle_price * (1 - discount/100)),2) as net_revenue

FROM

   order_t;

-- Quarter over Quarter

SELECT *,

   Round(100*((total_revenue - LAG(total_revenue) OVER(ORDER BY
quarter_number)))/(LAG(total_revenue)OVER(ORDER BY quarter_number)),2) AS perc_qoq

FROM(

SELECT

   quarter_number,

   ROUND(SUM(quantity * vehicle_price * (1 - discount/100)),2) as total_revenue


FROM

   order_t

GROUP BY

   quarter_number

);
```

Output:

Result: Passed

Query 1

Query:

```
SELECT
    ROUND(SUM(quantity * vehicle_price * (1 - discount/100)),2) as net_revenue
FROM
    order_t
```

Output:

Showing 1 rows

net_revenue
124714086.32

Result: Passed

Query 1

Query 2

Query:

```
SELECT *,
    Round(100*((total_revenue - LAG(total_revenue) OVER(ORDER BY quarter_number)))/(LAG(total_revenue)OVER(ORDER BY quarter_number)),2) AS perc_qoq
FROM(
SELECT
    quarter_number,
    ROUND(SUM(quantity * vehicle_price * (1 - discount/100)),2) as total_revenue

FROM
    order_t
GROUP BY
    quarter_number
)
```

Output:

Showing 4 rows

quarter_number	total_revenue	perc_qoq
1	39421580.16	
2	32715830.34	-17.01
3	29229896.19	-10.66
4	23346779.63	-20.13

Observations and Insights:

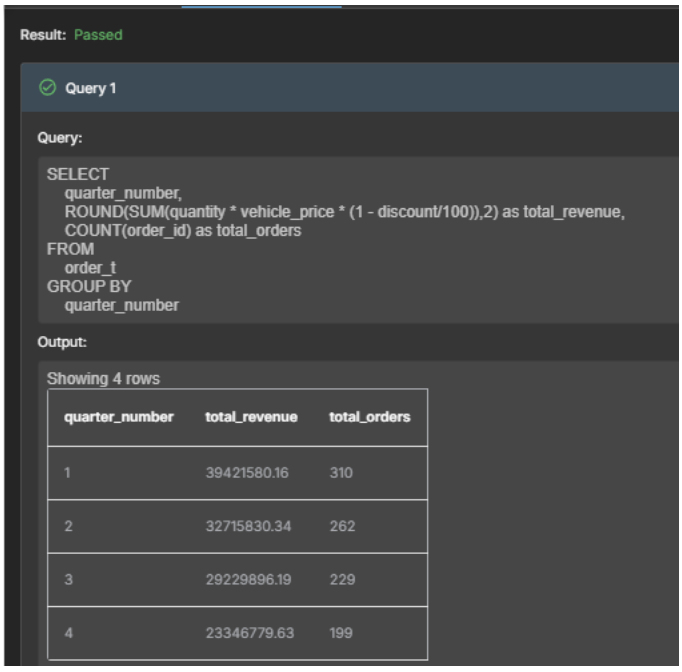
- The net revenue generated by the new wheels company is $ 124,714,086.32
- The net revenue generated in each quarter is $ 39,421,580.16, $ 32,715,830.34, $ 29,229,896.19, $ 23,346,779.63 respectively.
- We can see that the net revenue is declining in each quarter from 17% to 10% and 10 to 20%. The customer feedback is also bad in quarter 4 and we can see that there is a positive correlation between customer feedback and net revenue generated since the declining percentage is more in quarter 4.

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

Solution Query:

```
SELECT
    quarter_number,
    ROUND(SUM(quantity * vehicle_price * (1 - discount/100)),2) as total_revenue,
    COUNT(order_id) as total_orders
FROM
    order_t
GROUP BY
    quarter_number;
```

Output:



Observations and Insights:

- We can see that there is a declining trend in both the net revenue generated and the total orders being placed throughout the quarters.
- The total orders are 310, 262, 229 and 199 throughout the quarters respectively.

- The net revenue generated in each quarter is $ 39,421,580.16, $ 32,715,830.34, $ 29,229,896.19, $ 23,346,779.63 respectively.
- The revenue has dropped to nearly 41% (From $ 39,421,580.16 to$ 23,346,779.63) from Quarter 1 to Quarter 4 and the total orders has fallen to 36% (From 310 to 199).
- While the total order has declined to 36%, the net revenue dropped to 41%. This might because the customers might be preferring a low budget vehicle or else an economic slow down.
- This can also be tied to the bad customer feedback received which has led to the decrease of the revenue and orders placed throughout the quarters.

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

Solution Query:

```
SELECT
   DISTINCT customer_t.credit_card_type AS Credit_Card_Type,
   ROUND(AVG(order_t.discount),2) AS Average_Discount
FROM
   customer_t
JOIN
   order_t
USING(customer_id)
GROUP BY
   Credit_Card_Type
ORDER BY
   Average_Discount DESC;
```

Output:

Result: Passed

Query 1

Query:

```
SELECT
    DISTINCT customer_t.credit_card_type AS Credit_Card_Type,
    ROUND(AVG(order_t.discount),2) AS Average_Discount
FROM
    customer_t
JOIN
    order_t
USING(customer_id)
GROUP BY
    Credit_Card_Type
ORDER BY
    Average_Discount DESC
```

Output:

Showing first 10 rows out of 16 rows

Credit_Card_Type	Average_Discount
instapayment	0.77
solo	0.7
americanexpress	0.68
diners-club-enroute	0.67
mastercard	0.65
diners-club-carte-blan...	0.65
visa-electron	0.64
maestro	0.64
laser	0.62

Observations and Insights:

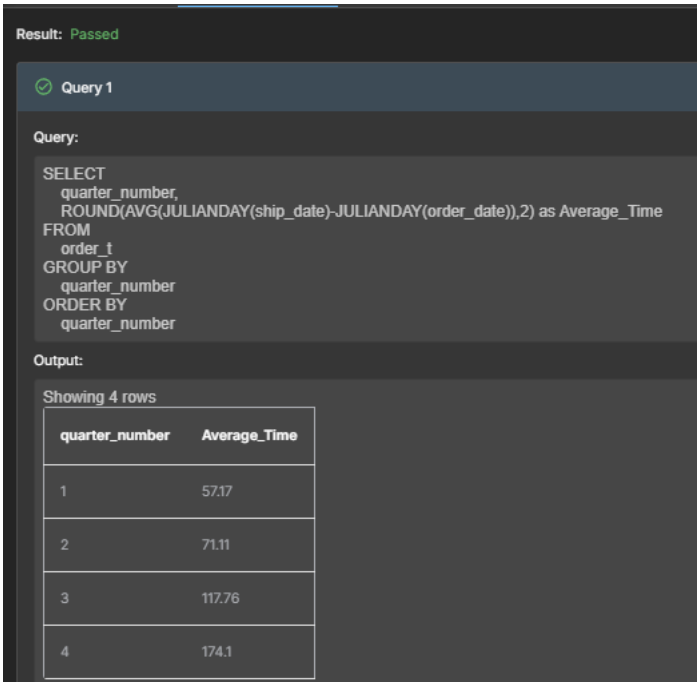
- The maximum amount of discount given is by instapayment which is at 0.77% followed by solo and american express providing discount at 0.70% and 0.68% respectively.
- There are 16 credit card providers in the whole data set.
- There is no much differentiation of discount percentage with most of the cards and hence tie ups can be made in order to increase the sale of vehicles.

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

Solution Query:

```
SELECT
   quarter_number,
   ROUND(AVG(JULIANDAY(ship_date)-JULIANDAY(order_date)),2) as Average_Time
FROM
   order_t
GROUP BY
   quarter_number
ORDER BY
   quarter_number;
```

Output:



Observations and Insights:

- The average time between the order placed date and shipped date is increasing throughout the quarters which are 57 days, 71 days, 118 days and 174 days respectively.

- The increase in the shipping time maybe a factor which is correlated to the negative customer feedback.
- A thorough investigation should be conducted on increasing delivery time and should take remediation steps to decrease the average time.

Business Metrics Overview

Total Revenue	Total Orders	Total Customers	Average Rating
$ 124,714,086.32	1000 orders	133 customers	3.14 (Okay)
Last Quarter Revenue	**Last quarter Orders**	**Average Days to Ship**	**% Good Feedback**
$ 23,346,779.63	199 orders	97.96 days	21.5%

Business Recommendations

- **Improve Delivery and Shipping Times**
  The average shipping time has increased from 57 days to 174 days from quarter 1 to quarter 4. This will lead to more waiting time and hence leading to negative customer feedback. Conduct an internal review of supply chain and investigate the challenges faced and address the issues.
- **Focus on Brand Loyalty and Customer Engagement**
  There are states where the brand dominance is at high such as Mazda and Nissan being preferred in Indiana and Texas respectively. In such states, develop targeted marketing and offer exclusive discounts or benefits or additional services.
- **Enhance Customer Experience and Feedback Systems**
  The customer ratings are declining and has signified a huge dissatisfaction among the customers from quarter 1 to quarter 4. Introduce faster query systems, loyalty programs and keep in check on the inventory availability and the shipping time of the product. Ensure there is a transparency between the customer and new wheels by keeping them informed on necessary information about their product.
- **Collaborate with Credit Card Providers for Better Discounts**
  Discounts are uniform or nearly related within all credit cards with minimal differentiation. It will be a better idea to have strategic tie ups with credit card banks since it might boost new wheel revenue and will be a win for the credit card bank since they get a customer too.
- **Address Seasonal Trends and Economic Factors**
  Sales and revenue is declining consistently over the quarters. This can be due to economic slow down or seasonality. In both the cases, initiatives shall be made such as flexible pricing or else promotional discounts to drive the sales. Introduce EMI options to accommodate budget conscious customers.

Conclusion

New Wheels is experiencing a multi-faceted decline in performance, driven by increasing shipping delays, declining customer satisfaction, and reduced order volumes. The analysis shows a direct correlation between poor customer feedback and declining revenue, underlining the urgent need for intervention.

By focusing on operational efficiency, customer engagement, and strategic partnerships, New Wheels can reverse the declining trends and regain customer trust. Addressing core issues like delivery times and feedback dissatisfaction will not only improve ratings but also positively impact sales and revenue in the coming quarters.

Proactive measures, coupled with tailored marketing strategies and operational improvements, will position New Wheels to better adapt to market challenges, stabilize revenue, and enhance customer satisfaction.