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

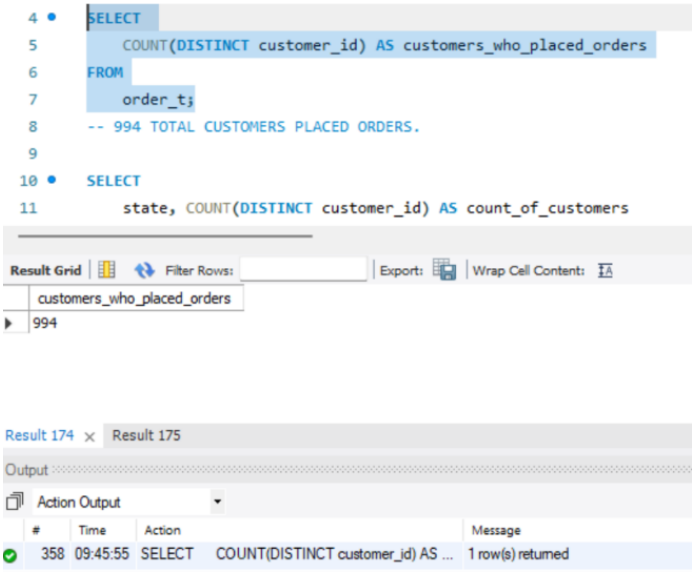
Question 1: Find the total number of customers who have placed orders. What is the distribution of the customers across states?

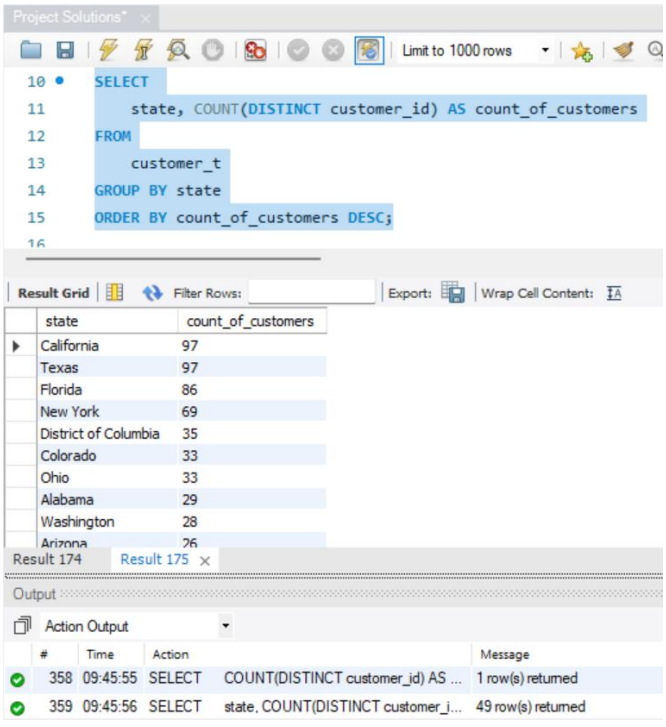
Solution Query:

```
SELECT
   COUNT(DISTINCT customer_id) AS customers_who_placed_orders
FROM
   order_t;
-- 994 TOTAL CUSTOMERS PLACED ORDERS.

SELECT
   state, COUNT(DISTINCT customer_id) AS count_of_customers
FROM
   customer_t
GROUP BY state
ORDER BY count_of_customers DESC;
```

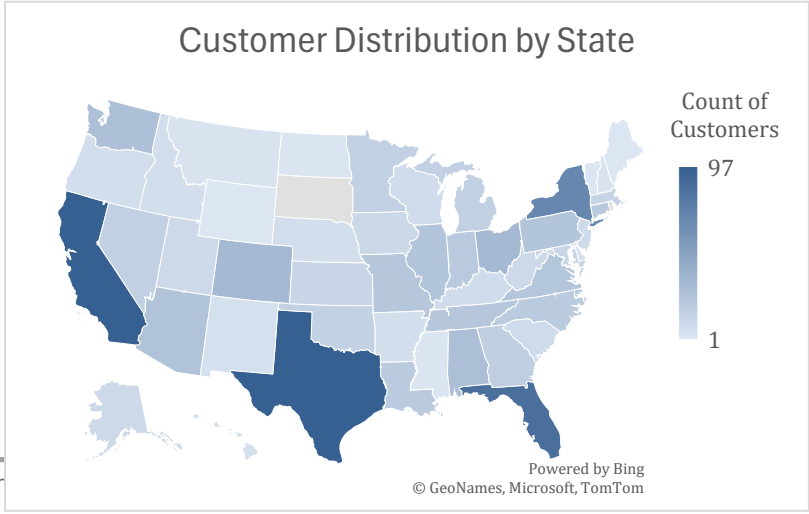
Output:





Observations and Insights:

- 994 total customers placed orders.
- Most of the customers come from California, Texas, Florida, and New York with a total of 69-97 customers per state.
- Followed by DC, CO, OH, AL, WA, AZ, IL, PN, VA, MI, TN, CN, IN, NC, and LA all having 20+ customers.



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

Solution Query:

```
SELECT
   p.vehicle_maker, COUNT(o.customer_id) AS count_of_customers
FROM
   order_t AS o
      JOIN
   product_t AS p ON o.product_id = p.product_id
GROUP BY p.vehicle_maker
ORDER BY COUNT(o.customer_id) DESC
LIMIT 5;
```

Output:

```
21 •  SELECT
22        p.vehicle_maker, COUNT(o.customer_id) AS count_of_customers
23    FROM
24        order_t AS o
25            JOIN
26        product_t AS p ON o.product_id = p.product_id
27    GROUP BY p.vehicle_maker
28    ORDER BY COUNT(o.customer_id) DESC
29    LIMIT 5;
30    -- TOP 5 VEHICLE MAKERS ARE CHEVROLET, FORD, TOYOTA, PONTIAC, AND DODGE.
31
```

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

vehicle_maker	count_of_customers
Chevrolet	83
Ford	63
Toyota	52
Pontiac	50
Dodge	50

Result 180

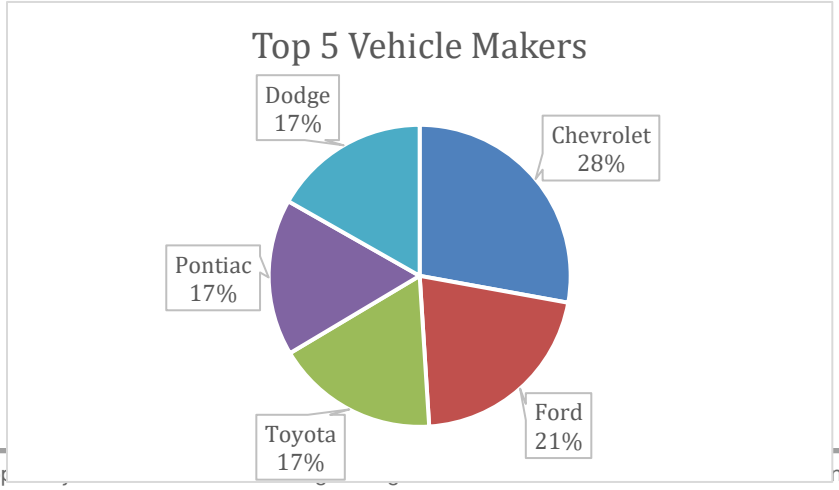
Output

Action Output

#	Time	Action	Message
363	10:10:11	SELECT p.vehicle_maker, COUNT(o.customer...	5 row(s) returned

Observations and Insights:

- The top 5 vehicle makers preferred by the customers are Chevrolet, Ford, Toyota, Pontiac, and Dodge.

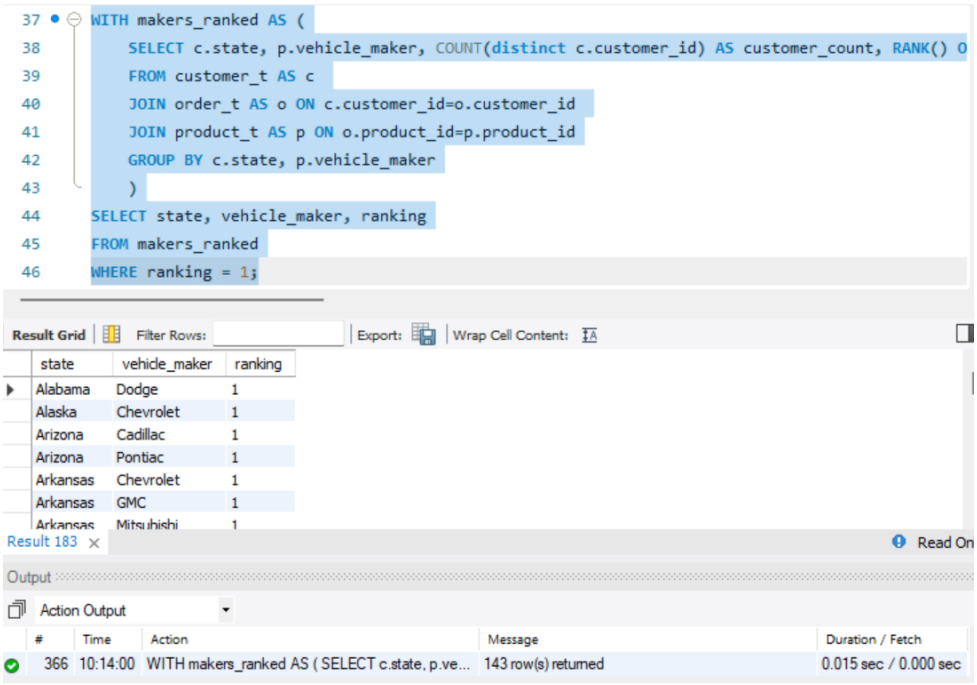


Question 3: Which is the most preferred vehicle maker in each state?

Solution Query:

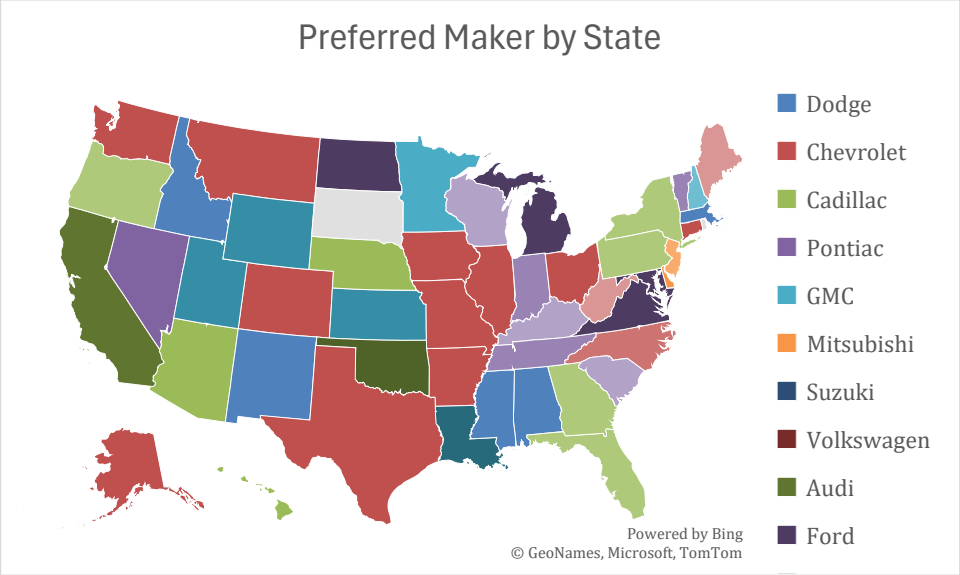
```
WITH makers_ranked AS (
        SELECT c.state, p.vehicle_maker, COUNT(distinct c.customer_id) AS customer_count, RANK() OVER
(PARTITION BY c.state ORDER BY COUNT(distinct c.customer_id) DESC) AS ranking
        FROM customer_t AS c
        JOIN order_t AS o ON c.customer_id=o.customer_id
        JOIN product_t AS p ON o.product_id=p.product_id
        GROUP BY c.state, p.vehicle_maker
   )
SELECT state, vehicle_maker, ranking
FROM makers_ranked
WHERE ranking = 1;
```

Output:



Observations and Insights:

The chart below demonstrates preferred vehicle maker by state:



There are states, however, where the preferred maker ranked #1 with another. These are listed below:

Arizona- Cadillac, Pontiac

Arkansas- Chevrolet, GMC, Mitsubishi, Pontiac, Suzuki, Volkswagen

California- Audi, Chevrolet, Dodge, Ford, Nissan

Connecticut- Chevrolet, Maserati, Mercury, Volvo

Hawaii- Cadillac, Ford, GMC, Nissan, Pontiac, Toyota

Illinois- Chevrolet, GMC, Ford; **Iowa**- Chevrolet, Chrysler, Dodge, Ford, Hyundai, Isuzu, Jeep, Mazda, Pontiac, Porsche, Subaru

Kansas- Buick, Dodge, Ford, GMC, Honda, Lexus, Maserati, Mazda, Mercedes-Benz, Nissan, Saab, Suzuki, Volkswagen

Kentucky- Acura, Audi, Mercedes-Benz, Mercury, Nissan, Pontiac, Ram, Volvo

Louisiana- Nissan, BMW, Ford, Pontiac, Kia

Massachusetts- Dodge, Chevrolet, Dodge, Toyota

Montana- Chevrolet, Dodge, Mitsubishi

Nebraska- Cadillac, Chevrolet, Mercedes-Benz, Nissan, Pontiac, Toyota, Volkswagen

New Hampshire- Chrysler, Lexus, Lincoln

New Jersey- Hyundai, Mercedes-Benz

New York- Toyota, Pontiac

North Dakota- Ford, Hyundai

Oklahoma- Ferrari, Mazda, Toyota

South Carolina- Acura, BMW, Buick, Dodge, Isuzu, Jaguar, Kia, Mazda, Mitsubishi

Utah- Buick, Chevrolet, Dodge, Isuzu, Lincoln, Maybach, Oldsmobile, Pontiac, Subaru, Volkswagen

Wisconsin- Acura, Cadillac, Chevrolet, Dodge, Honda, Mazda, Nissan, Pontiac

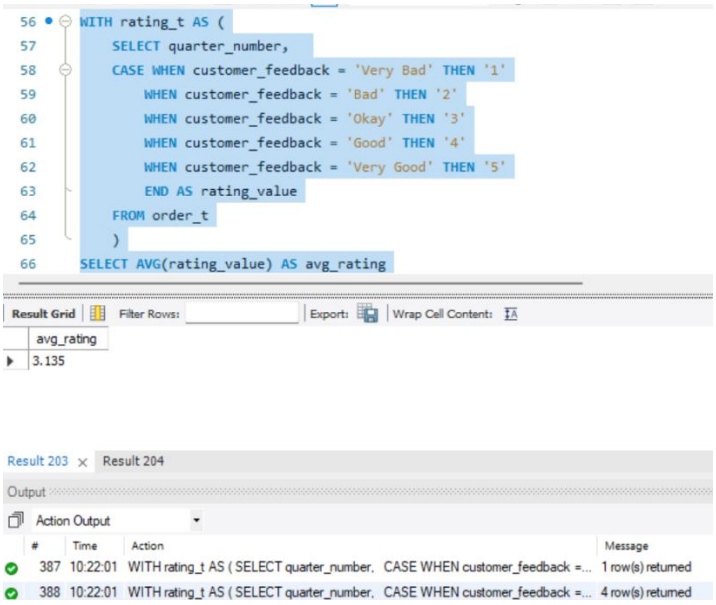
Question 4: Find the overall average rating given by the customers. What is the average rating in each quarter?
Consider the following mapping for ratings: "Very Bad": 1, "Bad": 2, "Okay": 3, "Good": 4, "Very Good": 5

Solution Query:

```
WITH rating_t AS (
        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 rating_value
        FROM order_t
   )
SELECT AVG(rating_value) AS avg_rating
FROM rating_t
;
-- Average rating overall: 3.135

WITH rating_t AS (
        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 rating_value
        FROM order_t
   )
SELECT quarter_number, AVG(rating_value) AS avg_rating
FROM rating_t
GROUP BY quarter_number
ORDER BY quarter_number ASC;
```

Output:



```
WITH rating_t AS (
    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 rating_value
    FROM order_t
    )
SELECT AVG(rating_value) AS avg_rating
```

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

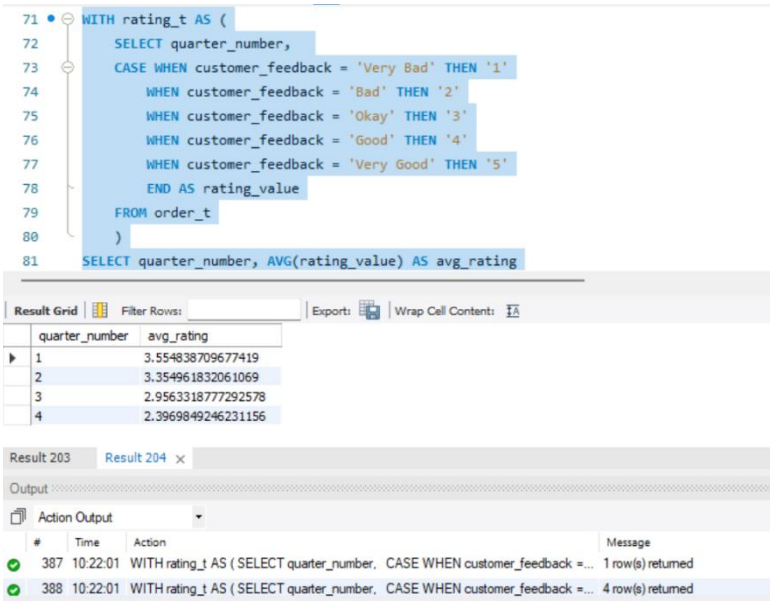
avg_rating
3.135

Result 203 | Result 204

Output

Action Output

#	Time	Action	Message
387	10:22:01	WITH rating_t AS (SELECT quarter_number, CASE WHEN customer_feedback =...	1 row(s) returned
388	10:22:01	WITH rating_t AS (SELECT quarter_number, CASE WHEN customer_feedback =...	4 row(s) returned



```
WITH rating_t AS (
    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 rating_value
    FROM order_t
    )
SELECT quarter_number, AVG(rating_value) AS avg_rating
```

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

quarter_number	avg_rating
1	3.554838709677419
2	3.354961832061069
3	2.956331877729258
4	2.396984924623116

Result 203 | Result 204

Output

Action Output

#	Time	Action	Message
387	10:22:01	WITH rating_t AS (SELECT quarter_number, CASE WHEN customer_feedback =...	1 row(s) returned
388	10:22:01	WITH rating_t AS (SELECT quarter_number, CASE WHEN customer_feedback =...	4 row(s) returned

Observations and Insights:

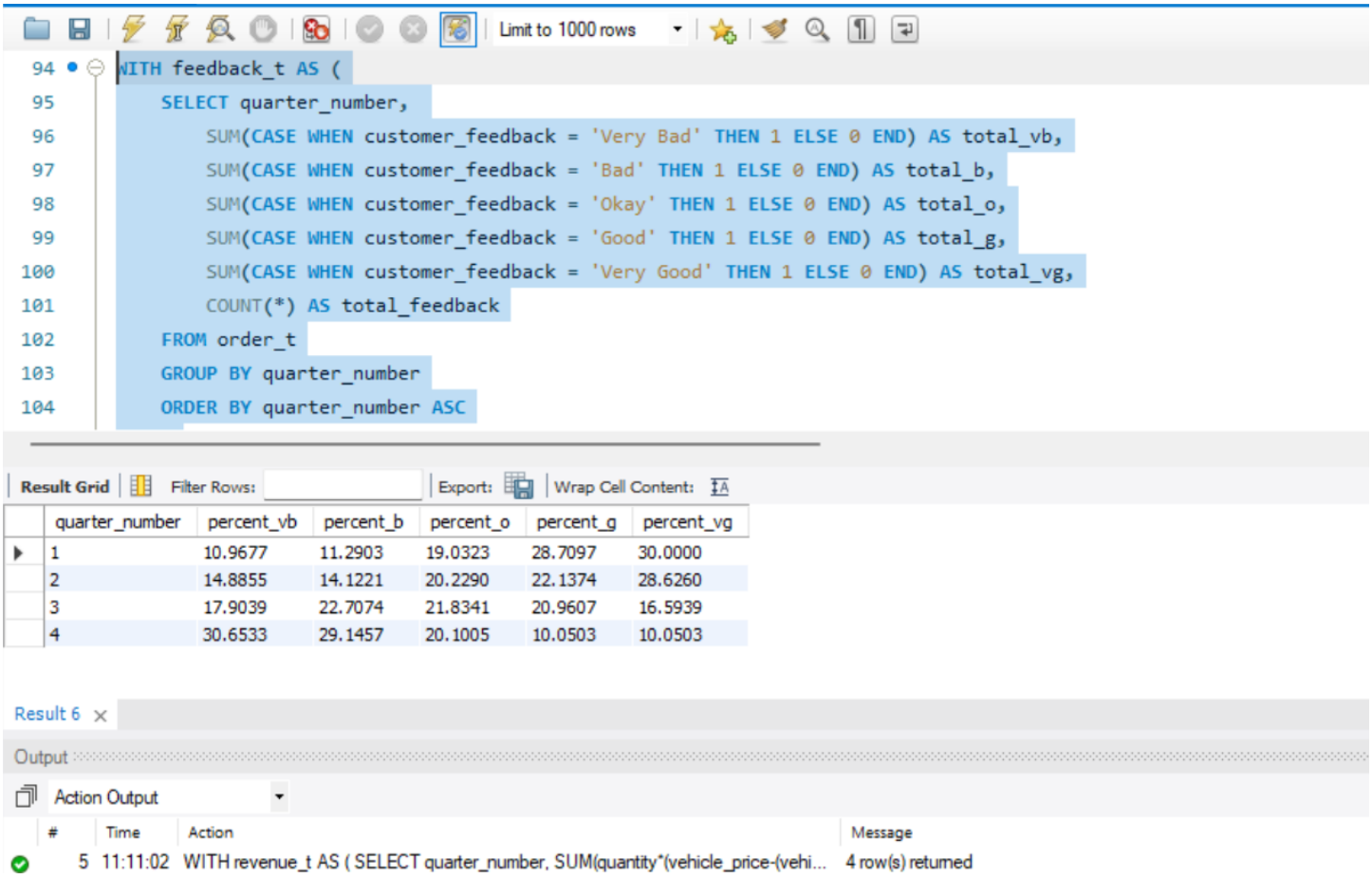
- The overall rating given by the customers for the year is 3.135 out of 5.
- The average rating per quarter is as follows: Quarter 1: 3.555, Quarter 2: 3.355, Quarter 3: 2.956 Quarter 4: 2.397
- The average rating fell from Q1 to Q2 by 0.2 out of 5, Q2 to Q3 fell 0.399 out of 5, and Q3 to Q4 fell by 0.559 out of 5, meaning the rate of declining customer ratings is falling faster over time.

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

Solution Query:

```
WITH feedback_t AS (
        SELECT quarter_number,
                SUM(CASE WHEN customer_feedback = 'Very Bad' THEN 1 ELSE 0 END) AS total_vb,
                SUM(CASE WHEN customer_feedback = 'Bad' THEN 1 ELSE 0 END) AS total_b,
                SUM(CASE WHEN customer_feedback = 'Okay' THEN 1 ELSE 0 END) AS total_o,
                SUM(CASE WHEN customer_feedback = 'Good' THEN 1 ELSE 0 END) AS total_g,
                SUM(CASE WHEN customer_feedback = 'Very Good' THEN 1 ELSE 0 END) AS total_vg,
                COUNT(*) AS total_feedback
        FROM order_t
        GROUP BY quarter_number
        ORDER BY quarter_number ASC
        )
SELECT quarter_number, (total_vb/total_feedback)*100 AS percent_vb, (total_b/total_feedback)*100 AS percent_b, (total_o/total_feedback)*100 AS percent_o, (total_g/total_feedback)*100 AS percent_g, (total_vg/total_feedback)*100 AS percent_vg
FROM feedback_t;
```

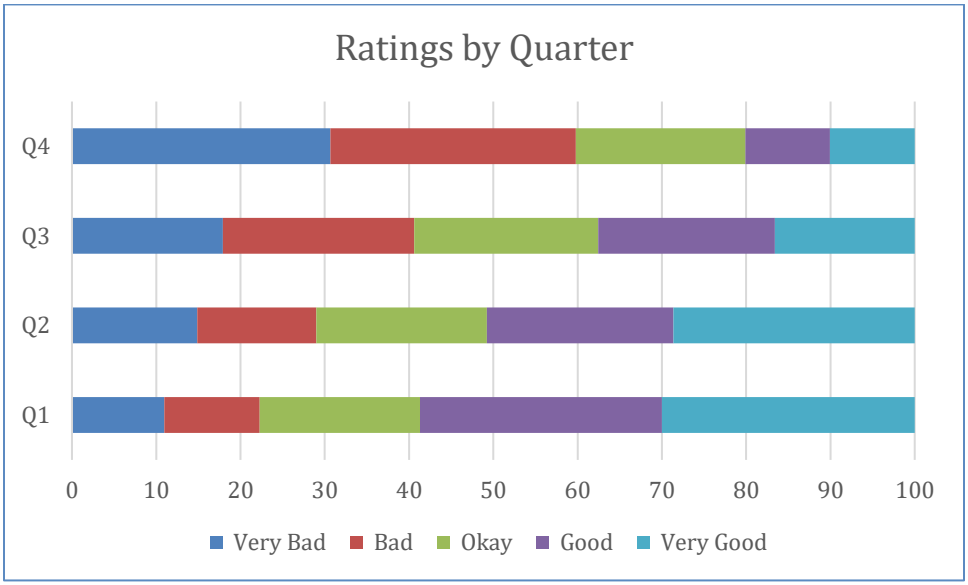
Output:



Observations and Insights:

- Yes, customers are getting more dissatisfied over time.

- In the first quarter, 30% of customers rated Very Good and only 10% rated Very Bad. By the fourth quarter it flipped, and only 10% of customers rated Very Good while 30% rated Very Bad.

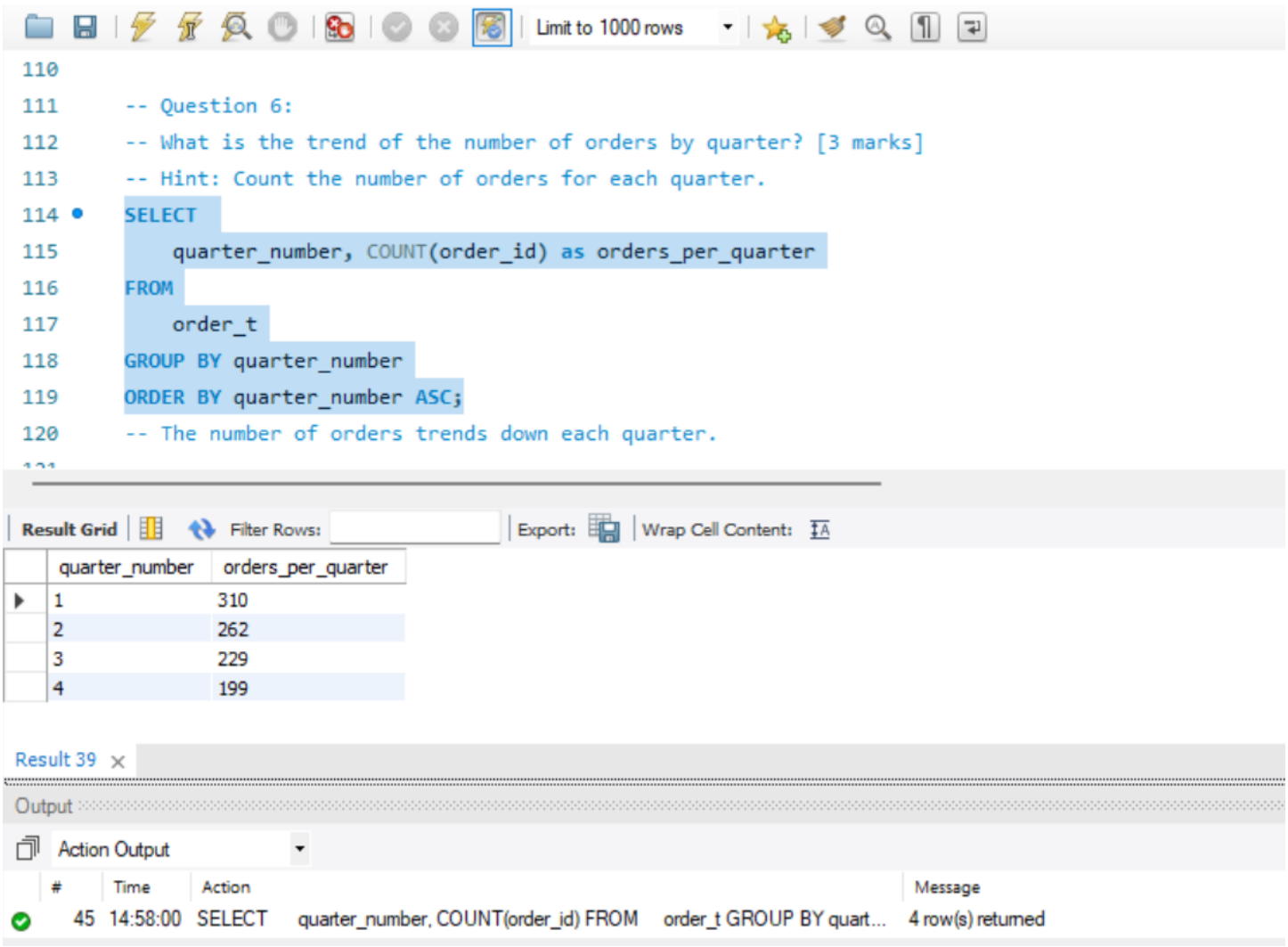


Question 6: What is the trend of the number of orders by quarter?

Solution Query:

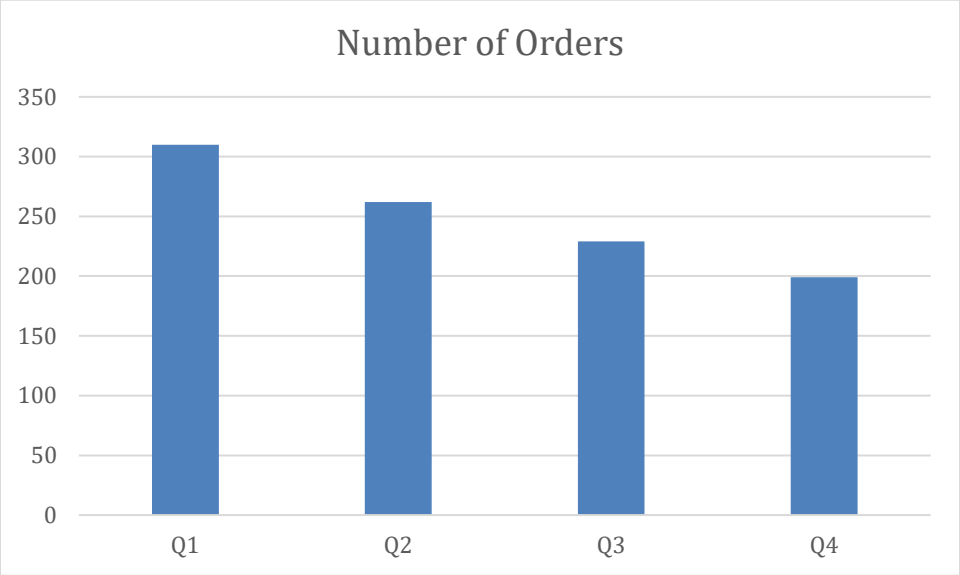
```
SELECT
   quarter_number, COUNT(order_id) as orders_per_quarter
FROM
   order_t
GROUP BY quarter_number
ORDER BY quarter_number ASC;
```

Output:



Observations and Insights:

- The number of orders trends down each quarter.
- The number of orders from Q1 to Q2 dropped by 48, Q2 to Q3 dropped by 33, and Q3 to Q4 dropped by 30.
- This means that though the orders are trending downwards, they are not accelerating in the drop.



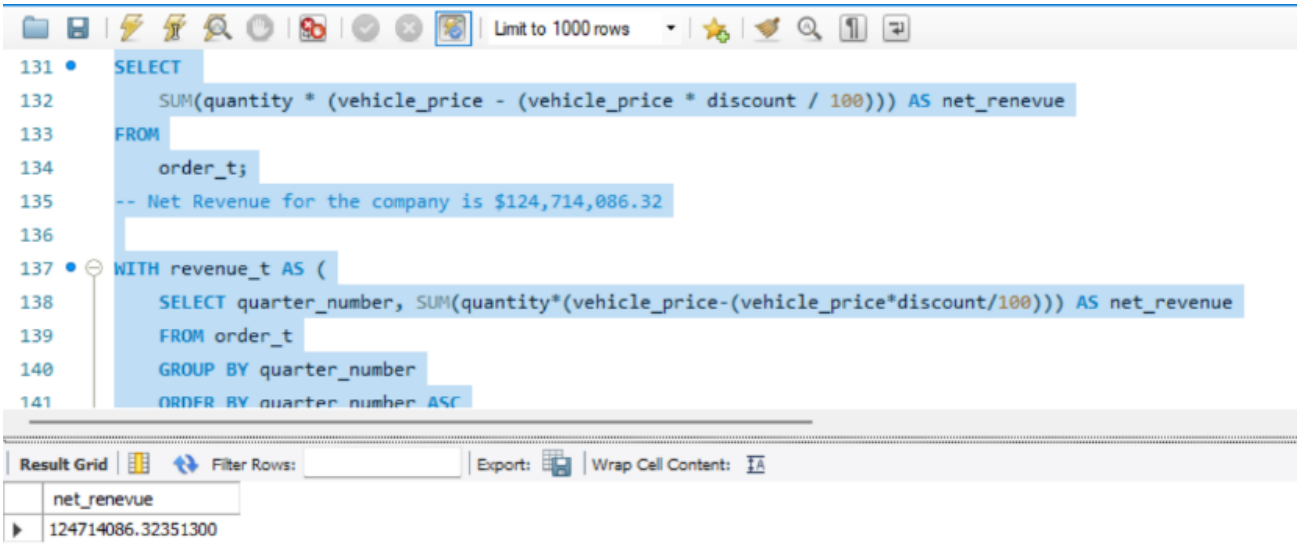
Question 7: Calculate the net revenue generated by the company. What is the quarter-over-quarter % change in net revenue?

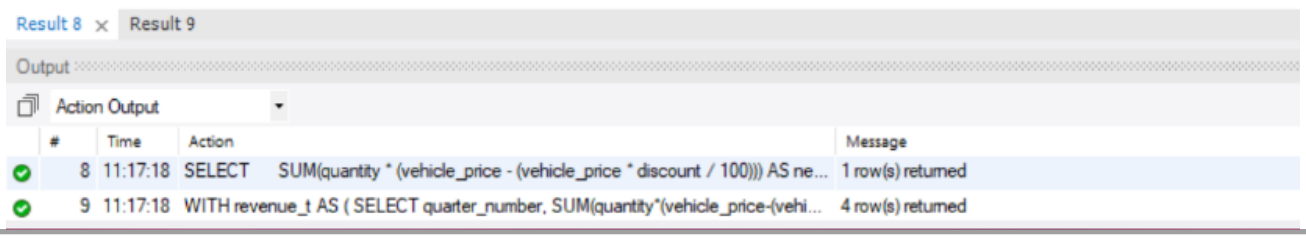
Solution Query:

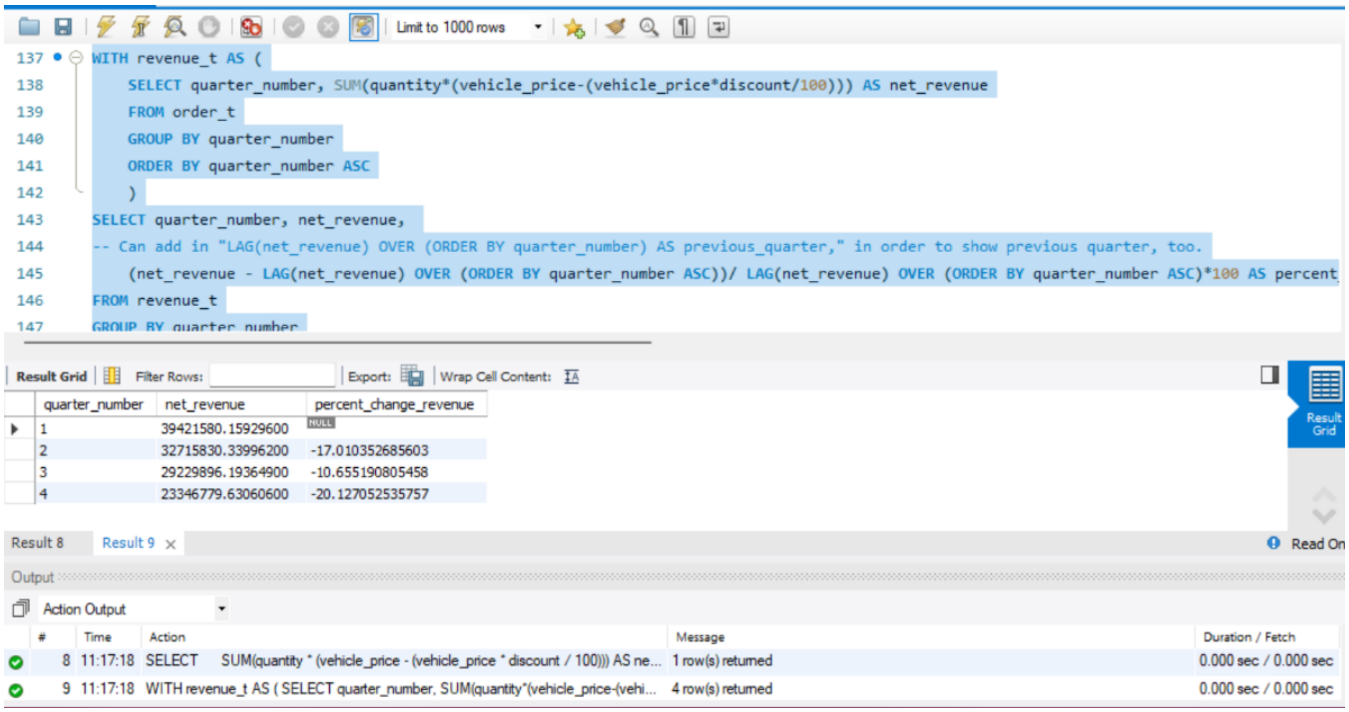
```
SELECT
   SUM(quantity * (vehicle_price - (vehicle_price * discount / 100))) AS net_renevue
FROM
   order_t;
-- Net Revenue for the company is $124,714,086.32

WITH revenue_t AS (
        SELECT quarter_number, SUM(quantity*(vehicle_price-(vehicle_price*discount/100))) AS net_revenue
   FROM order_t
   GROUP BY quarter_number
   ORDER BY quarter_number ASC
   )
SELECT quarter_number, net_revenue,
-- Can add in "LAG(net_revenue) OVER (ORDER BY quarter_number) AS previous_quarter," in order to show previous quarter, too.
        (net_revenue - LAG(net_revenue) OVER (ORDER BY quarter_number ASC))/ LAG(net_revenue) OVER (ORDER BY quarter_number ASC)*100 AS percent_change_revenue
FROM revenue_t
GROUP BY quarter_number
ORDER BY quarter_number ASC;
```

Output:







```
WITH revenue_t AS (
    SELECT quarter_number, SUM(quantity*(vehicle_price-(vehicle_price*discount/100))) AS net_revenue
    FROM order_t
    GROUP BY quarter_number
    ORDER BY quarter_number ASC
    )
SELECT quarter_number, net_revenue,
-- Can add in "LAG(net_revenue) OVER (ORDER BY quarter_number) AS previous_quarter," in order to show previous quarter, too.
    (net_revenue - LAG(net_revenue) OVER (ORDER BY quarter_number ASC))/ LAG(net_revenue) OVER (ORDER BY quarter_number ASC)*100 AS percent
FROM revenue_t
GROUP BY quarter_number
```

Result Grid

quarter_number	net_revenue	percent_change_revenue
1	39421580.15929600	NULL
2	32715830.33996200	-17.010352685603
3	29229896.19364900	-10.655190805458
4	23346779.63060600	-20.127052535757

Result 8 | Result 9

Output

Action Output

#	Time	Action	Message	Duration / Fetch
8	11:17:18	SELECT SUM(quantity * (vehicle_price - (vehicle_price * discount / 100))) AS ne...	1 row(s) returned	0.000 sec / 0.000 sec
9	11:17:18	WITH revenue_t AS (SELECT quarter_number, SUM(quantity*(vehicle_price-(vehi...	4 row(s) returned	0.000 sec / 0.000 sec

Observations and Insights:

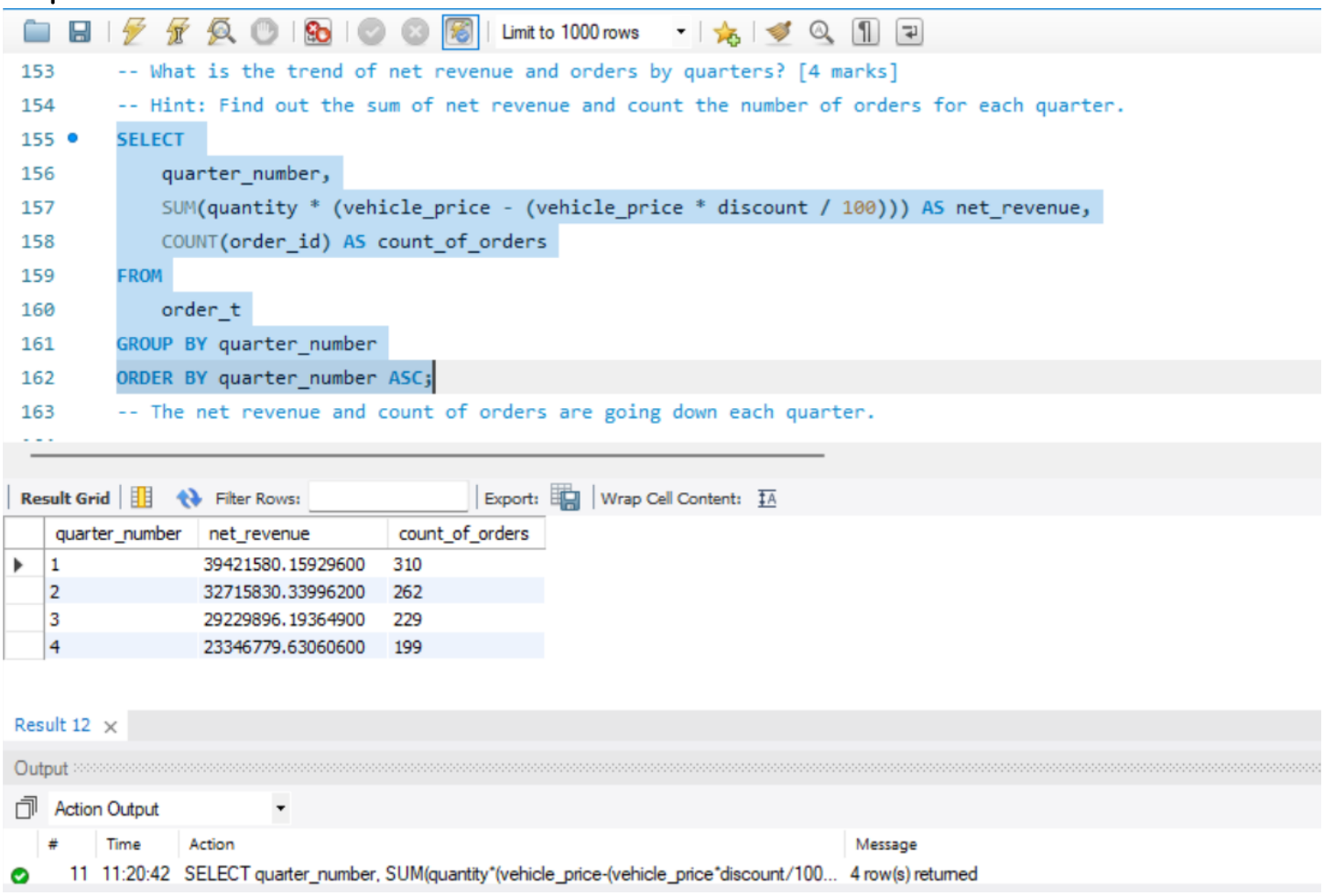
- The net revenue for the company for the year is $124,714,086.32
- The quarter-over-quarter change in net revenue from Q1 to Q2 went down 17.01%, Q2 to Q3 went down 10.66%, and Q3 to Q4 went down 20.13%.

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

Solution Query:

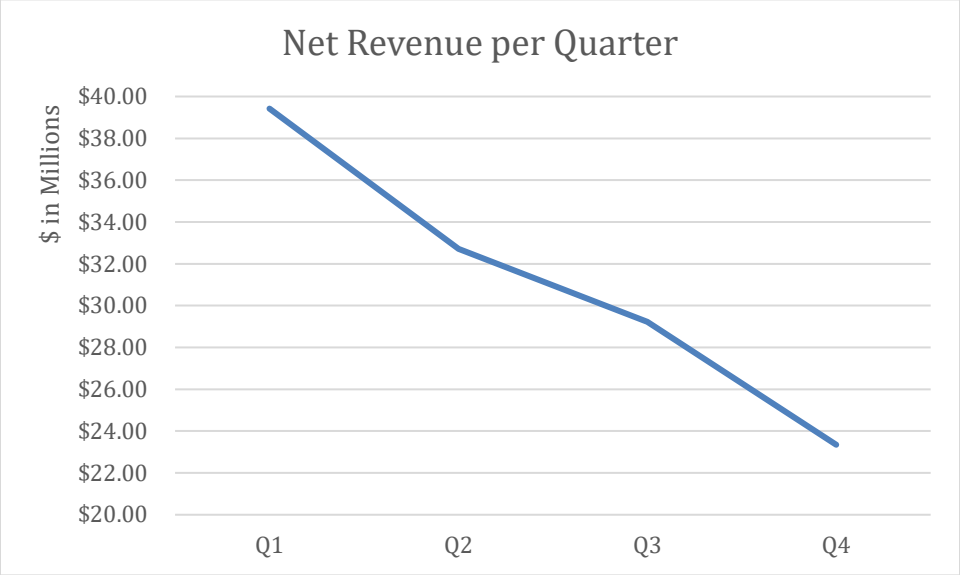
```
SELECT
   quarter_number,
   SUM(quantity * (vehicle_price - (vehicle_price * discount / 100))) AS net_revenue,
   COUNT(order_id) AS count_of_orders
FROM
   order_t
GROUP BY quarter_number
ORDER BY quarter_number ASC;
```

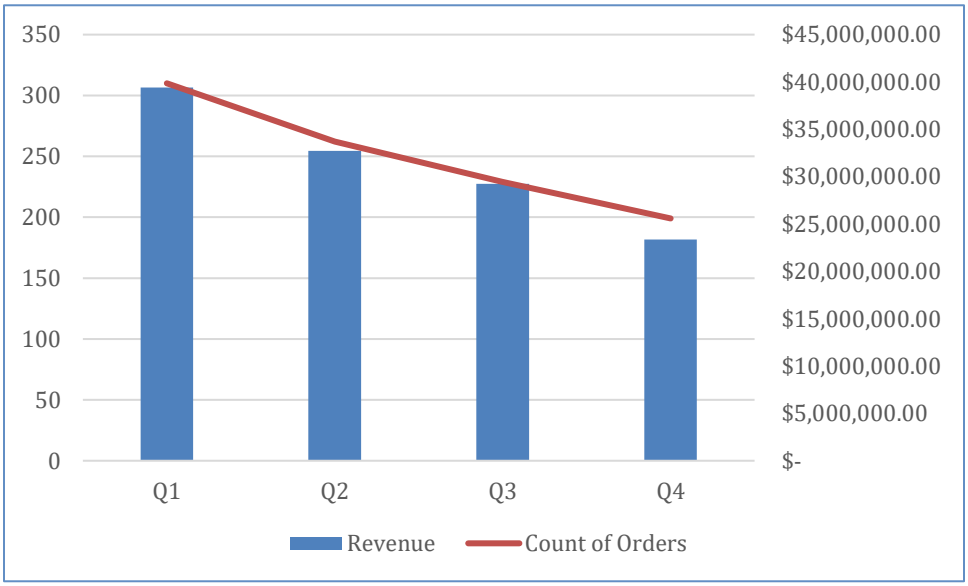
Output:



Observations and Insights:

- The net revenue and count of orders per quarter are trending downwards.
- Due to the lower number of orders per quarter, the net revenue also is lowered as reflected in the graphs below.



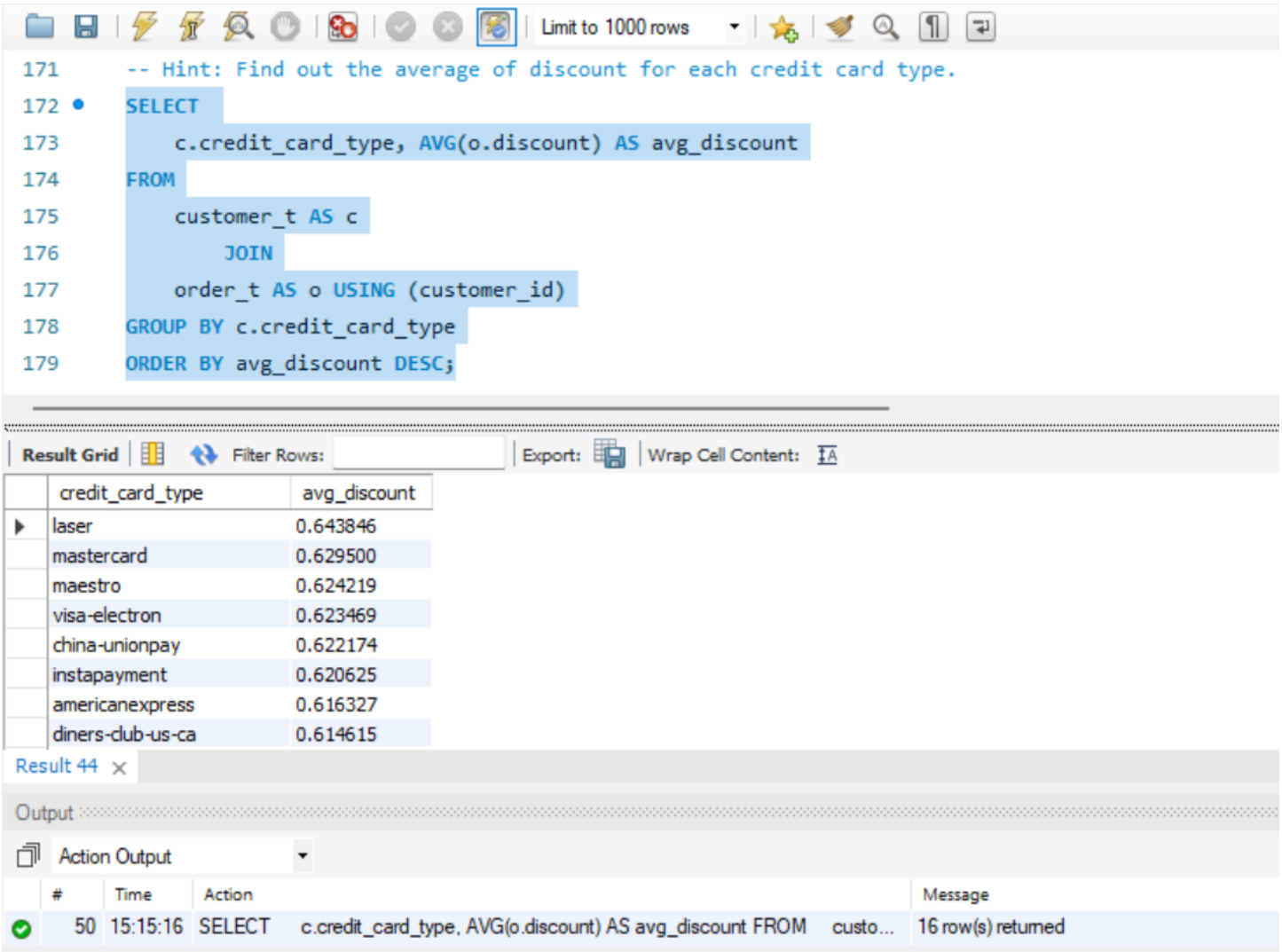


Question 9: What is the average discount offered for different types of credit cards?

Solution Query:

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

Output:



Observations and Insights:

- The average discounts per credit card are as follows:

Laser	0.643846
Mastercard	0.629500
Maestro	0.624219
Visa-electron	0.623469
China-unionpay	0.622174
InstaPayment	0.620625
AmericanExpress	0.616327
Diners Club -us-ca	0.614615
Diners Club-carte blanche	0.614490
Switch	0.610233
Bankcard	0.609545
JCB	0.607382
Visa	0.600833
Diners Club -enroute	0.599792
Solo	0.585000
Diners Club -international	0.584000

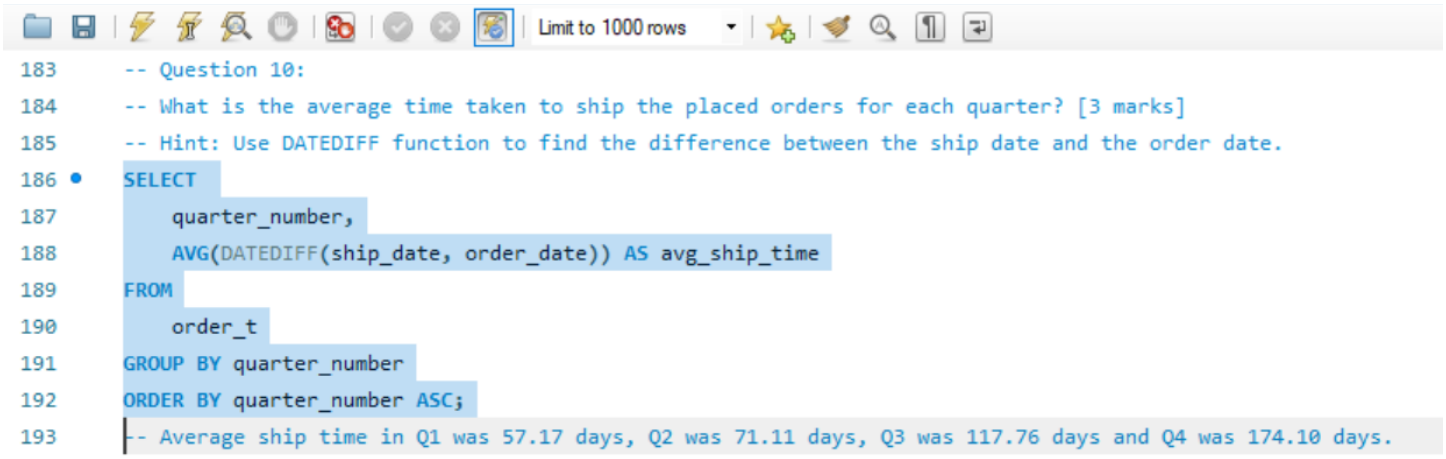
- The difference between the highest and lowest credit card type discount (between Laser and Diners Club-International) is only 0.059846%, resulting in an average vehicle discount price difference of $49.74.
- This suggests that the difference in credit card discounts is not impacting the downward trend of sales for New Wheels.

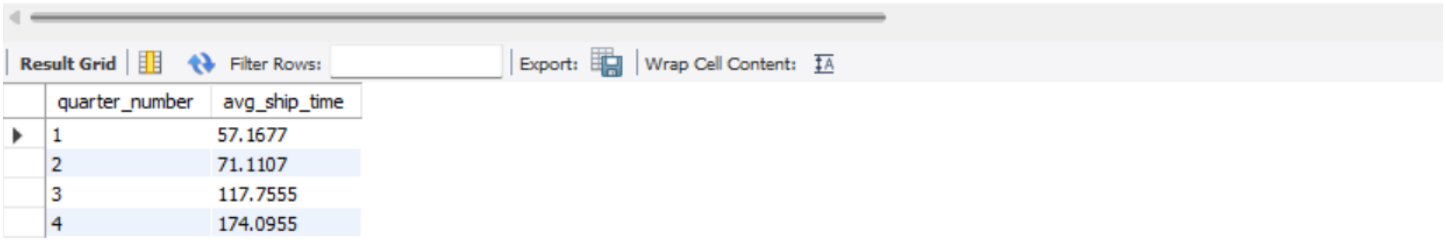
Question 10: What is the average time taken to ship the placed orders for each quarter?

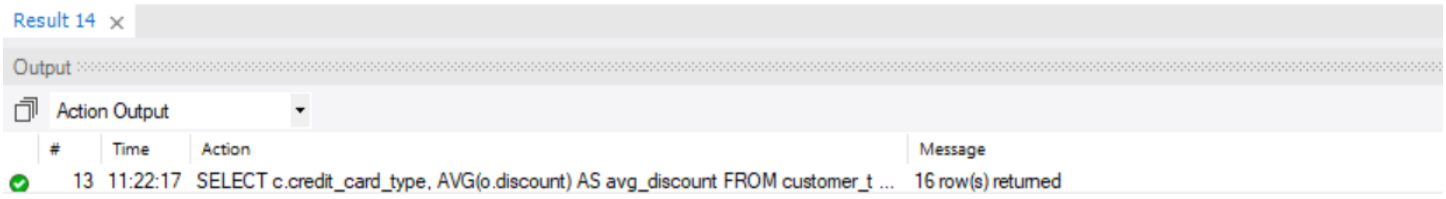
Solution Query:

```
SELECT
   quarter_number,
   AVG(DATEDIFF(ship_date, order_date)) AS avg_ship_time
FROM
   order_t
GROUP BY quarter_number
ORDER BY quarter_number ASC;
```

Output:







Observations and Insights:

- The average time it took to ship orders placed in Q1 was 57.17 days, Q2 was 71.11 days, Q3 was 117.76 days and Q4 was 174.10 days.
- This is a change of nearly 14 days from Q1 to Q2, 46.65 days from Q2 to Q3, and 56.34 days (nearly 2 months) from Q3 to Q4.
- This data suggests that the increased delay in shipping time plays a large factor in the decrease in customer satisfaction quarter to quarter.

Business Metrics Overview

Total Revenue	Total Orders	Total Customers	Average Rating
$124,714,086.32	1,000	994	3.066
Last Quarter Revenue	**Last quarter Orders**	**Average Days to Ship**	**% Good Feedback**
$23,346,779.63	199	105	20.46%

Business Recommendations

- The biggest impact on customer satisfaction is the time it takes to ship the vehicle after it's been ordered. Customer satisfaction was at its highest in quarter 1 when the average shipping time was 57 days. I recommend going back to lowering your average shipping time, as from quarter 1 to quarter 4 the shipping time increased by an average of 117 days.

- 349 out of 994 of your customer base (35%) comes from California, Texas, Florida, and New York. I recommend offering a sale to draw in more customers from those four states.
    - The most popular vehicle makers in each of those states were Audi in California, Chevrolet in Texas, and Toyota in New York and Florida, therefore a sale on those makers would likely bring in a larger client base during the promotion.

- New Wheels received only "Very Bad" or "Bad" feedback when shipping orders through shippers Realcube, Meembee, Livefish, Shuffletag, Myworks, Cogibox, Buzzdog, Jatri, Aibox, Gigaclub, Mita, Fliptune, Dynava, Dynazzy, Jaxbean, Shufflebeat, Vitz, Babblestorm, Fivechat, Flipstorm, Blogpad, Skinder, Twitterbridge, Flashset, Bluezoom, Tanoodle, Browsezoom, Fatz, Topiclounge, Aimbo, Ntags, Skyndu, Meedoo, Tavu, Rhybox, Npath, Tambee, Meemm, Dabjam, Jabbertype, Tekfly, Mudo, Demivee, Voolith, Yoveo, and Demimbu. Therefore, when possible, try to avoid shipping with these shipper names.