

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.

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

Solution Query: There are two queries used here – first one to find total number of customers who place orders

```
-- Finding total count of customers
SELECT
    COUNT(DISTINCT customer_id) AS TOTAL_CUSTOMERS
FROM
    customer_t ;
```

```
--What is the distribution of the customers across states?
SELECT
    --displaying the name of states and rank based on the number of customers
    DENSE_RANK() OVER (ORDER BY COUNT(DISTINCT ORD.customer_id) DESC) AS Rank,
    CUST.state,
    --displaying the count of customers for each state
    COUNT(DISTINCT ORD.customer_id) AS COUNT_PER_STATE,
    --displaying the percentage of customer count for each state
    ROUND((COUNT(DISTINCT ORD.customer_id) * 100.0 /
    (SELECT COUNT(DISTINCT customer_id) FROM order_t WHERE quantity >= 0)), 2)
    || '%' AS DISTRIBUTION
FROM
    customer_t CUST
JOIN
    order_t ORD ON CUST.customer_id = ORD.customer_id
WHERE
    ORD.quantity > 0
GROUP BY
    CUST.state
ORDER BY
    DISTRIBUTION DESC;
```

Output: There are two queries and the corresponding results are given as below:

```

1 -- Finding total count of customers
2 SELECT
3     COUNT(DISTINCT customer_id) AS TOTAL_CUSTOMERS
4 FROM
5     customer_t ;
6
7 -- Finding distribution of customers among states
8 SELECT
9     --displaying the rank based on the number of customers and name of states,
10    DENSE_RANK() OVER (ORDER BY COUNT(DISTINCT ORD.customer_id) DESC) AS Rank,
11    CUST.state,
12    --displaying count of customers for each state
13    COUNT(DISTINCT ORD.customer_id) AS COUNT_PER_STATE,
14    -- displaying the percentage of customer count for each state
15    ROUND((COUNT(DISTINCT ORD.customer_id) * 100.0 / (SELECT COUNT(DISTINCT customer_id) FROM order_t WHERE quantity >= 0)), 2)
16    || '%' AS DISTRIBUTION
17 FROM
18     customer_t CUST
19 JOIN
20     order_t ORD ON CUST.customer_id = ORD.customer_id
21 WHERE
22     ORD.quantity >= 0
23 GROUP BY

```

Test Cases Run SQL

Result: Passed

Query 1

Query 2

Query:

```

SELECT
    COUNT(DISTINCT customer_id) AS TOTAL_CUSTOMERS
FROM
    customer_t

```

Output:

Showing 1 rows

TOTAL_CUSTOMERS
994

Test Cases Run SQL

Showing first 10 rows out of 49 rows

Rank	state	COUNT_PER_STATE	DISTRIBUTION
1	Texas	97	9.76%
1	California	97	9.76%
2	Florida	86	8.65%
3	New York	69	6.94%
4	District of Columbia	35	3.52%
5	Ohio	33	3.32%
5	Colorado	33	3.32%
6	Alabama	29	2.92%
7	Washington	28	2.82%
8	Arizona	26	2.62%

Observations:

- Total Number of Customers: 994
- Total States Analyzed: 49
 - Four states are having more than 50 customers (Texas, California, Florida, New York)- 35% of customers are from these 4 states. Highest customers count is 97 (Texas and California)
 - States with 10 to 50 customers: 24 states
 - States with 10 or fewer customers: 21 states – 12% of customers are from these states
 - Lowest number of customers (less than 5 count) : Maine, Vermont, Wyoming each with 1 customer, Mississippi, North Dakota with 2 customer each, New Hampshire and Montana with 3 customers

Insights:

- The majority of customers (87%) come from states with at least 10 customers.
 - Texas, California, Florida, and New York together account for 35% of all customers.
 - The 24 states with 10 to 50 customers contribute 52% of the total, suggesting potential for growth with more targeted efforts.
- A small portion (12%) of customers are from states with 10 or fewer customers, indicating minimal market penetration in those regions.

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

Solution Query:

```
SELECT
    -- displaying the vehicle maker, quantity sold and the average price per unit
    PROD.vehicle_maker AS VEHICLE_MAKER,
    SUM(ORD.quantity) AS QUANTITY_TOTAL_SOLD,
    round(AVG(PROD.vehicle_price),2) AS Avg_vehicle_Price
FROM
    product_t PROD JOIN order_t ORD
    ON PROD.product_id = ORD.product_id
GROUP BY
    PROD.vehicle_maker
ORDER BY
    QUANTITY_TOTAL_SOLD DESC
```

Output:

Test Cases

Run SQL

Query 4

Query:

```
SELECT
    PROD.vehicle_maker AS VEHICLE_MAKER,
    SUM(ORD.quantity) AS QUANTITY_TOTAL_SOLD,
    round(AVG(PROD.vehicle_price),2) AS Avg_vehicle_Price
FROM
    product_t PROD JOIN order_t ORD
    ON PROD.product_id = ORD.product_id
GROUP BY
    PROD.vehicle_maker
ORDER BY
    QUANTITY_TOTAL_SOLD DESC
```

Output:

Showing first 10 rows out of 54 rows

VEHICLE_MAKER	QUANTITY_TOTAL_SO...	Avg_vehicle_Price
Chevrolet	125	83530.15
Ford	97	83889.06
Toyota	78	81715.62
Pontiac	75	80877.52
Dodge	72	81556.01
Mercedes-Benz	67	82743.87
Mitsubishi	64	81638.68
Mazda	61	83665.13
GMC	59	82370.84
Buick	58	85454.71

Observations and Insights:

- Based on the number of vehicles sold by each vehicle maker, among the 54 vehicle makers, the top 5 that are preferred by the customers are Chevrolet, Ford, Toyota, Pontiac, Dodge.
 - These top5 companies account for the 29.56% of the total quantity sold
 - Chevrolet - 125
 - Ford - 97
 - Toyota - 78
 - Pontiac -75
 - Dodge - 64
 - On the other hand, following are the least preferred vehicle makers who has sold only 2 units – Rolls-Royce, Ram, Mini, MG, Daewoo, Citroen, Austin

Insights:

- Consistently high sales for Toyota, Ford, and Chevrolet show a strong preference and level of brand loyalty.
- Domestic automobiles are preferred, as seen by the dominance of American brands (Chevrolet, Ford, Pontiac, Dodge, GMC, and Buick).
- High sales for mid-priced vehicles (Chevrolet, Ford, Toyota) suggest customers prefer value-for-money options.
- Luxury brands like Mercedes-Benz and Buick sold 50 to 60 units. The average price of Benz being lower than Chevrolet indicate that some customers look for affordable luxury instead of going for the high end models.

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

Solution Query:

```
SELECT
    -- Adding row number for the output display
    ROW_NUMBER() OVER (ORDER BY COUNT(STATE) DESC) AS Row_Number,
    VEHICLE_MAKER,
    COUNT(STATE) AS State_count,
    GROUP_CONCAT(state, ', ') AS Preferred_States
FROM (
    SELECT
        CUST.state,
        PROD.vehicle_maker AS VEHICLE_MAKER,
        RANK() OVER (PARTITION BY CUST.state ORDER BY SUM(ORD.quantity) DESC) AS Ranking
    FROM
        order_t ORD
        JOIN product_t PROD ON PROD.product_id = ORD.product_id
        JOIN customer_t CUST ON ORD.customer_id = CUST.customer_id
    GROUP BY
        CUST.state, PROD.vehicle_maker
) AS subquery1
WHERE
    -- Only include the top-ranked vehicle maker for each state
    Ranking = 1
GROUP BY
    VEHICLE_MAKER
ORDER BY
    -- Order by the count of states
    COUNT(STATE) DESC;
```

Output:

```

1  -- Which is the most preferred vehicle maker state-wise
2  SELECT
3      -- Adding row number for the output display
4      ROW_NUMBER() OVER (ORDER BY COUNT(STATE) DESC) AS Row_Number,
5      VEHICLE_MAKER,
6      COUNT(STATE) AS State_count,
7      GROUP_CONCAT(state, ', ') AS Preferred_States
8  FROM (
9      SELECT
10         CUST.state,
11         PROD.vehicle_maker AS VEHICLE_MAKER,
12         RANK() OVER (PARTITION BY CUST.state ORDER BY SUM(ORD.quantity) DESC) AS Ranking
13     FROM
14         order_t ORD
15     JOIN product_t PROD ON PROD.product_id = ORD.product_id
16     JOIN customer_t CUST ON ORD.customer_id = CUST.customer_id
17     GROUP BY
18         CUST.state, PROD.vehicle_maker
19 ) AS subquery1
20 WHERE
21     -- Only include the top-ranked vehicle maker for each state
22     Ranking = 1
23 GROUP BY
24     VEHICLE_MAKER
25 ORDER BY
26     -- Order by the count of states
27     COUNT(STATE) DESC;

```

Test Cases
Run SQL

Showing first 10 rows out of 26 rows

Row_Number	VEHICLE_MAKER	State_count	Preferred_States
1	Chevrolet	15	Alaska, Colorado, Conn...
2	Ford	8	Illinois, Iowa, Kansas, L...
3	Toyota	7	Florida, Georgia, Missis...
4	Pontiac	6	Arizona, Arkansas, Nev...
5	Dodge	6	Alabama, California, Id...
6	Mercedes-Benz	5	Kansas, Kentucky, Mai...
7	Mazda	5	Indiana, South Carolina...
8	GMC	4	Hawaii, Illinois, Kansas,...
9	Volvo	3	Connecticut, Kentucky,...
10	Nissan	3	Kansas, Kentucky, Wis...

Test Cases
Run SQL

Result: Passed

Query 1

Observations and Insights:

- Chevrolet leads as the most preferred vehicle maker in multiple states by topping the sales chart in nearly 15 states, including Alaska, Colorado, Connecticut, Delaware, Massachusetts, Utah, Wisconsin, Ohio, and Texas, among others.
- Following Chevrolet, Ford is the top seller in 8 states, Toyota in 7 states, Pontiac in 6 states, and Dodge in 6 states.

Insights

- Chevrolet dominates with the highest preference in 15 states, showing broad appeal.
- Ford is strong in 8 states, including its home state, Michigan.
- Toyota leads in 7 states, with urban popularity in New York & Pennsylvania.
- Pontiac & Dodge each lead in 6 states, with Dodge strong in the West & South.
- Mercedes-Benz leads in 5 states, reflecting premium brand appeal.

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:

```
-- Selecting the quarter number and calculating the average rating per quarter
SELECT
    quarter_number AS QUARTER,
    ROUND(
        AVG(
            CASE
                -- Assigning rating numbers to customer feedback
                WHEN customer_feedback = "Very Bad" THEN 1
                WHEN customer_feedback = "Bad" THEN 2
                WHEN customer_feedback = "Okay" THEN 3
                WHEN customer_feedback = "Good" THEN 4
                WHEN customer_feedback = "Very Good" THEN 5
            END
        ), 2
    ) AS Average_Rating
FROM
    order_t
GROUP BY
    quarter_number
ORDER BY
    quarter_number ASC;
```


Output:

Test Cases
Run SQL

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
END),2) AS Average_Rating
FROM
order_t
GROUP BY quarter_number
ORDER BY quarter_number ASC

```

Output:

Showing 4 rows

QUARTER	Average_Rating
1	3.55
2	3.35
3	2.96
4	2.4

Observations and Insights:

- Customer satisfaction is declining as each quarter goes by.
- Q1 had the highest average rating (3.55), while in Q4 it dropped to 2.4.
- Significant drop between Q2 (3.35) and Q3 (2.96) is showing a turning point.

Insights

- Service or product quality issues may have worsened over time.
- Q3 and Q4 decline suggests a potential major incident or shift in operations.
- Q4's 2.4 rating indicates widespread dissatisfaction, needing urgent attention.

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

Solution Query:

```

SELECT
    quarter_number,
    -- Total feedback distribution per quarter
    (ROUND(
        COUNT(*) * 100.0 / (SELECT COUNT(*) FROM order_t),
        2) || '%' ) AS Feedback_distribution,
    -- Percentage of bad ratings per quarter (relative to total bad ratings across all quarters)
    (ROUND(
        SUM(CASE WHEN Rating < 3 THEN 1 ELSE 0 END) * 100.0 /
        (SELECT COUNT(*) FROM order_t WHERE
            customer_feedback IN ('Very Bad', 'Bad')),
        2) || '%') AS Bad_Feedback_distribution,
    --Percentage of 'Okay' ratings per quarter
    (ROUND(
        SUM(CASE WHEN Rating =3 THEN 1 ELSE 0 END) * 100.0 /
        (SELECT COUNT(*) FROM order_t WHERE
            customer_feedback IN ('Okay')),
        2) || '%') AS Okay_Feedback_distribution,
    -- Percentage of good ratings per quarter (relative to total good ratings across all quarters)
    (ROUND(
        SUM(CASE WHEN Rating > 3 THEN 1 ELSE 0 END) * 100.0 /
        (SELECT COUNT(*) FROM order_t WHERE
            customer_feedback IN ('Good', 'Very Good')),
        2) || '%') AS Good_Feedback_distribution
FROM
    ( SELECT
        quarter_number,
        customer_feedback,
        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
    FROM order_t
) subquery
GROUP BY quarter_number
ORDER BY quarter_number ASC;

```

Output:

```

1 SELECT
2   quarter_number,
3   -- Total feedback distribution per quarter
4   (ROUND(
5     COUNT(*) * 100.0 / (SELECT COUNT(*) FROM order_t),
6     2) || '%' ) AS Feedback_distribution,
7   -- Percentage of bad ratings per quarter (relative to total bad ratings across all quarters)
8   (ROUND(
9     SUM(CASE WHEN Rating < 3 THEN 1 ELSE 0 END) * 100.0 /
10    (SELECT COUNT(*) FROM order_t WHERE
11     customer_feedback IN ('Very Bad', 'Bad')),
12    2) || '%' ) AS Bad_Feedback_distribution,
13   -- Percentage of 'Okay' ratings per quarter
14   (ROUND(
15     SUM(CASE WHEN Rating = 3 THEN 1 ELSE 0 END) * 100.0 /
16     (SELECT COUNT(*) FROM order_t WHERE
17     customer_feedback IN ('Okay')),
18    2) || '%' ) AS Okay_Feedback_distribution,
19   -- Percentage of good ratings per quarter (relative to total good ratings across all quarters)
20   (ROUND(
21     SUM(CASE WHEN Rating > 3 THEN 1 ELSE 0 END) * 100.0 /
22     (SELECT COUNT(*) FROM order_t WHERE
23     customer_feedback IN ('Good', 'Very Good')),
24    2) || '%' ) AS Good_Feedback_distribution
25 FROM
26   ( SELECT

```

Test Cases Run SQL

Result: Passed

Query 1

Query:

Output:

Showing 4 rows

quarter_number	Feedback_distribution	Bad_Feedback_distrib...	Okay_Feedback_distri...	Good_Feedback_distri...
1	31.0%	19.33%	29.21%	41.27%
2	26.2%	21.29%	26.24%	30.16%
3	22.9%	26.05%	24.75%	19.5%
4	19.9%	33.33%	19.8%	9.07%

Observations and Insights:

- The above output for the quarterly customer feedback trend shows that the customers are dissatisfied over time
- Feedback distribution declines each quarter (Q1: 31% → Q4: 19.9%).
- Negative feedback is rising sharply (Q1: 19.33% → Q4: 33.33%).
- Positive feedback is drastically falling (Q1: 41.27% → Q4: 9.07%).
- Neutral feedback ("Okay") also declines but at a slower rate.

Insights

- Customer dissatisfaction with used vehicles is increasing, possibly due to pricing, delays, or quality issues.
- Q4 shows the worst performance, indicating a worsening reputation.
- Potential reasons could be late deliveries, poor after-sales service, lack of spare parts, or increased competition.

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

Solution Query:

```
SELECT
-- Checking the quarter wise count of orders
    quarter_number AS Quarter_Number,
    COUNT(order_id) AS Num_of_Orders,
    SUM(quantity) AS Total_Num_of_Vehicles_ordered
FROM
    order_t
GROUP BY
    quarter_number
ORDER BY
    quarter_number
```

Output:

```
1  --Q6.What is the trend of the number of orders by quarter?
2  SELECT
3  -- Checking the quarter wise count of orders
4      quarter_number AS Quarter_Number,
5      COUNT(order_id) AS Num_of_Orders,
6      SUM(quantity) AS Total_Num_of_Vehicles_ordered
7
8  FROM order_t
9  GROUP BY quarter_number
10 ORDER BY quarter_number
11
12
13
14
15
```

Run Test

Test Cases Run SQL

Result: Passed

Query 1

Output:

Showing 4 rows

Quarter_Number	Num_of_Orders	Total_Num_of_Vehicle...
1	310	464
2	262	400
3	229	342
4	199	306

Observations and Insights:

- There is an overall decline in the number of orders by quarter
- Order volume is declining across all quarters (Q1: 310 → Q4: 199).
- Total vehicles ordered also decreasing (Q1: 464 → Q4: 306).

Insights

- Demand is weakening over time, possibly due to economic conditions, seasonal trends, or changing customer preferences.
- Q4 shows the lowest orders, indicating potential end-of-year market slowdowns or lower customer confidence.

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

Solution Query:

Two queries are used here- First query to display total revenue and second query to see the quarter-over-quarter % change

```
SELECT
    '$' || round(SUM((quantity * vehicle_price)) / 1000000, 2) || 'M' AS NET_REVENUE
FROM
    order_t;
```

```
--Query2
SELECT
    -- Displaying all the columns in subqueries along with percentage change
    Quarter_number,
    '$' || round((Quarterly_revenue/1000000),3) || 'M' AS Current_Quarter_revenue,
    '$' || round((Previous_Quarter_Rev/1000000),3) || 'M' AS Previous_Quarter_revenue,
    round((Quarterly_revenue - Previous_Quarter_Rev)/1000000,3) || 'M$' AS Revenue_Difference,
    round((((Quarterly_revenue - Previous_Quarter_Rev)*100)/Previous_Quarter_Rev),2) || '%'
    AS Percentage_Change
FROM (
    -- Creating subquery to find the previous quarter revenue
    SELECT *,
        LAG(Quarterly_revenue,1,0) OVER (ORDER BY Quarter_number) AS Previous_Quarter_Rev
    FROM (
        -- Creating subquery to calculate quarterly revenue
        SELECT
            quarter_number As Quarter_number,
            SUM((quantity * vehicle_price)) AS Quarterly_revenue
        FROM
            order_t
        GROUP BY
            quarter_number
        ) AS Subquery1
    )AS Subquery2
ORDER BY
    Quarter_number;
```

Output: Please note that the revenue is represented in \$ and in Millions.

The output of two queries are given separately in the screenshots

```

1 --Q1: Calculate the net revenue generated by the company.
2 --What is the quarter-over-quarter % change in net revenue?
3 --Query1
4 SELECT
5     '$' || round(SUM((quantity * vehicle_price)) / 1000000, 2) || 'M' AS NET_REVENUE
6 FROM
7     order_t;
8 --Query2
9 SELECT
10    -- Displaying all the columns in subqueries along with percentage change

```

Test Cases Run SQL

Result: Passed

Query 1

Query:

```

SELECT
'$' || round(SUM((quantity * vehicle_price)) / 1000000, 2) || 'M' AS NET_REVENUE
FROM
order_t

```

Output:

Showing 1 rows

NET_REVENUE
\$125.48M

Test Cases Run SQL

Result: Passed

Query 1

Query 2

Query:

```

SELECT
Quarter_number,
'$' || round((Quarterly_revenue/1000000),3) || 'M' AS Current_Quarter_revenue,
'$' || round((Previous_Quarter_Rev/1000000),3) || 'M' AS Previous_Quarter_revenue,
round((Quarterly_revenue - Previous_Quarter_Rev)/1000000,3) || 'M' AS Revenue_Difference,
round(((Quarterly_revenue - Previous_Quarter_Rev)*100)/Previous_Quarter_Rev,2) || '%'
AS Percentage_Change

```

```

4 order_t;
5 --Query2
6 SELECT
7     -- Displaying all the columns in subqueries along with percentage change
8     Quarter_number,
9     '$' || round((Quarterly_revenue/1000000),3) || 'M' AS Current_Quarter_revenue,
10    '$' || round((Previous_Quarter_Rev/1000000),3) || 'M' AS Previous_Quarter_revenue,
11    round((Quarterly_revenue - Previous_Quarter_Rev)/1000000,3) || 'M' AS Revenue_Difference,
12    round(((Quarterly_revenue - Previous_Quarter_Rev)*100)/Previous_Quarter_Rev,2) || '%'
13    AS Percentage_Change
14 FROM ( -- Creating subquery to find the previous quarter revenue
15     SELECT *,
16     LAG(Quarterly_revenue,1,0) OVER (ORDER BY Quarter_number) AS Previous_Quarter_Rev
17 FROM ( -- Creating subquery to calculate quarterly revenue
18     SELECT quarter_number As Quarter_number,

```

Test Cases Run SQL

Showing 4 rows

Quarter_number	Current_Quarter_reve...	Previous_Quarter_reve...	Revenue_Difference	Percentage_Change
1	\$39.638M	\$0.0M	39.638M\$	
2	\$32.914M	\$39.638M	-6.724M\$	-16.96%
3	\$29.435M	\$32.914M	-3.478M\$	-10.57%
4	\$23.496M	\$29.435M	-5.939M\$	-20.18%

Observations and Insights:

- The net revenue earned by the company is \$125.48M over all the quarters
- The quarterly revenue is showing a declining trend from Q1 to Q4.
 - The highest most revenue is obtained in Q1 with almost \$39.64M and it declined by 16.96% in Q2 to \$32.9M.
 - From Q2 to Q3, there is another additional 10.5% decline in revenue making it \$29.4M.
 - The final quarter see the major drop in revenue by 20.18% to \$23.49M

Insights

- Reduced orders directly impact revenue, requiring demand-generation strategies.
- Customer dissatisfaction is affecting repeat business and referrals.
- Seasonal or external economic conditions may be influencing purchasing capability of customers.

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

Solution Query:

```
SELECT
    -- Displaying all the columns in subqueries along with percentage change
    Quarter_number,
    --Quarter wise Order Quantity trend
    Quarterly_Order_Qty AS Current_Order_Qty,
    Prev_Quarter_Order_Qty,
    round((((Quarterly_Order_Qty - Prev_Quarter_Order_Qty)*100/Prev_Quarter_Order_Qty),2) || '%'
    AS Percentage_Order_Qty_change,
    --Quarterly Revenue trend
    '$' || round((Quarterly_revenue/1000000),3) || 'M' AS Current_Quarter_Revenue,
    '$' || round((Prev_Quarter_Rev/1000000),3) || 'M' AS Prev_Quarter_Rev,
    round((((Quarterly_revenue - Prev_Quarter_Rev)*100)/Prev_Quarter_Rev),2) || '%'
    AS Percentage_Revenue_Change
FROM (
    -- Creating subquery to find the revenue and order quantity in previous quarter
    SELECT *,
        LAG(Quarterly_revenue,1,0) OVER (ORDER BY Quarter_number) AS Prev_Quarter_Rev,
        LAG(Quarterly_Order_Qty,1,0) OVER (ORDER BY Quarter_number)
        AS Prev_Quarter_Order_Qty
    FROM (
        -- Creating subquery to calculate revenue and order_quantity in current quarter
        SELECT
            quarter_number As Quarter_number,
            SUM((quantity * vehicle_price)) AS Quarterly_revenue,
            SUM(quantity) AS Quarterly_Order_Qty
        FROM
            order_t
        GROUP BY
            quarter_number
        ) AS Subquery1
    )AS Subquery2
ORDER BY
    Quarter_number;
```

Output:

```

1  --Q8. What is the trend of net revenue and orders by quarters?
2
3  SELECT
4      -- Displaying all the columns in subqueries along with percentage change
5      Quarter_number,
6      --Quarter wise Order Quantity trend
7      Quarterly_Order_Qty AS Current_Order_Qty,
8      Prev_Quarter_Order_Qty,
9      round((((Quarterly_Order_Qty - Prev_Quarter_Order_Qty)*100/Prev_Quarter_Order_Qty),2) || '%'
10     AS Percentage_Order_Qty_Change,
11     --Quarterly Revenue trend
12     '$' || round((Quarterly_revenue/1000000),3) || 'M' AS Current_Quarter_Revenue,
13     '$' || round((Prev_Quarter_Revenue/1000000),3) || 'M' AS Prev_Quarter_Revenue,
14     round((((Quarterly_revenue - Prev_Quarter_Revenue)*100/Prev_Quarter_Revenue),2) || '%'
15     AS Percentage_Revenue_Change
16 FROM ( -- Creating subquery to find the revenue and order quantity in previous quarter
17     SELECT *,
18     LAG(Quarterly_revenue,1,0) OVER (ORDER BY Quarter_number) AS Prev_Quarter_Revenue,
19     LAG(Quarterly_Order_Qty,1,0) OVER (ORDER BY Quarter_number) AS Prev_Quarter_Order_Qty
20 FROM ( -- Creating subquery to calculate revenue and order quantity in current quarter
21     SELECT quarter_number AS Quarter_number,
22     SUM((quantity * vehicle_price)) AS Quarterly_revenue,
23     SUM(quantity) AS Quarterly_Order_Qty
24 FROM order_t
25 GROUP BY quarter_number
26 ) AS Subquery1
27 ) AS Subquery2

```

Test Cases Run SQL

Result: Passed

Query 1

Test Cases Run SQL

AS Subquery2
ORDER BY Quarter_number

Output:

Showing 4 rows

Quarter_number	Current_Order_Qty	Prev_Quarter_Order_Qty	Percentage_Order_Qty...	Current_Quarter_Reve...	Prev_Quarter_Revenue	Percentage_Revenue...
1	464	0		\$39.638M	\$0.0M	
2	400	464	-13.0%	\$32.914M	\$39.638M	-16.96%
3	342	400	-14.0%	\$29.435M	\$32.914M	-10.57%
4	306	342	-10.0%	\$23.496M	\$29.435M	-20.18%

Observations and Insights:

- Orders are declining: From Q1 to Q4, there were fewer orders overall. There is a slow but discernible reduction in orders, with each quarter seeing fewer orders than the one before.
- Drop in revenue is reflecting the order decline. The net revenue pattern, which shows a steep drop from Q1 (\$39.638M) to Q4 (\$23.496M), corresponds with the decline in order quantity.
- The largest revenue drop is observed in Q4. Although the order quantity dropped by a comparatively smaller percentage (-10%), the income fell by the largest amount (-20.18%) in Q4. This suggests a decrease in sales of expensive cars or a rise in discounts.

Insights

- Revenue Declining Faster Than Orders – Suggests discounting, a shift to lower-priced vehicles, or customers opting for cheaper models.
- Customer Sentiment Impact – Poor feedback may be reducing repeat purchases and referrals.
- Seasonal or Economic Effects in Q4 – Decline may be due to seasonal demand shifts, supply issues, or economic factors.

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

Solution Query:

```
SELECT
    -- displaying the credit card type and the average discount
    CUST.credit_card_type AS Credit_Card_Type,
    ROUND(AVG(ORD.discount * 100), 2) || '%' AS Average_discount
FROM
    -- Joining the order_t and customer tables
    order_t ORD
    LEFT JOIN customer_t CUST ON ORD.customer_id = CUST.customer_id
GROUP BY
    -- Grouping the results by credit card
    Credit_Card_Type
ORDER BY
    Average_discount ASC;
```

Output:

```
1 --Q9. What is the average discount offered for different types of credit cards?
2
3 SELECT
4     -- displaying the credit card type and the average discount
5     CUST.credit_card_type AS Credit_Card_Type,
6     ROUND(AVG(ORD.discount * 100), 2) || '%' AS Average_discount
7 FROM
8     -- Joining the order_t and customer tables
9     order_t ORD
10    LEFT JOIN customer_t CUST ON ORD.customer_id = CUST.customer_id
11 GROUP BY
12     -- Grouping the results by credit card
13     Credit_Card_Type
14 ORDER BY
15     Average_discount ASC;
16
```

Test Cases Run SQL

Result: Passed

Query 1

Query:

```
SELECT
    CUST.credit_card_type AS Credit_Card_Type,
    ROUND(AVG(ORD.discount * 100), 2) || '%' AS Average_discount
```

Test Cases Run SQL

Output:

Showing first 10 rows out of 16 rows

Credit_Card_Type	Average_discount
diners-club-international	58.4%
solo	58.5%
diners-club-enroute	59.98%
visa	60.08%
jcb	60.74%
bankcard	60.95%
switch	61.02%
diners-club-carte-blanc	61.45%
diners-club-us-ca	61.46%
americanexpress	61.63%
instapayment	62.06%
china-unionpay	62.22%
visa-electron	62.35%
maestro	62.42%
mastercard	62.95%
laser	64.38%

Observations and Insights:

- Generally, the average discounts fall within a range of 58.4 to 64.38%, but certain credit cards offer noticeably higher discounts.
 - Highest discounts: Credit card types such as laser, MasterCard, Maestro offer large average discounts (about 64.38%).
 - Lowest discounts: Other card types, like "diners-club-international," have lower average discounts (around 58.4%). This might impact its attractiveness to customers

Insights

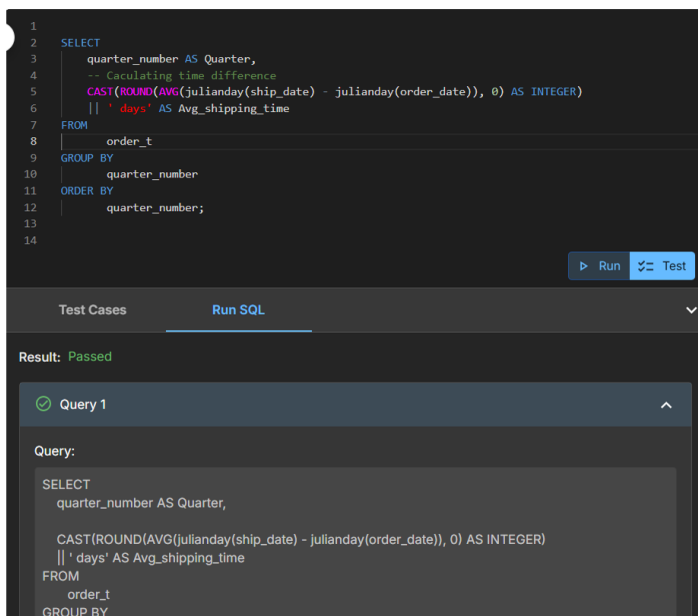
- Higher discounts may be used to encourage spending via specific credit card provider
- Customers may choose specific cards based on available discounts, influencing purchasing behavior

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

Solution Query:

```
SELECT
    quarter_number AS Quarter,
    -- Calculating time difference
    CAST(ROUND(AVG(julianday(ship_date) - julianday(order_date)), 0) AS INTEGER)
    || ' days' AS Avg_shipping_time
FROM
    order_t
GROUP BY
    quarter_number
ORDER BY
    quarter_number;
```

Output:



```
1 SELECT
2   quarter_number AS Quarter,
3   -- Calculating time difference
4   CAST(ROUND(AVG(julianday(ship_date) - julianday(order_date)), 0) AS INTEGER)
5   || ' days' AS Avg_shipping_time
6 FROM
7   order_t
8 GROUP BY
9   quarter_number
10 ORDER BY
11   quarter_number;
```

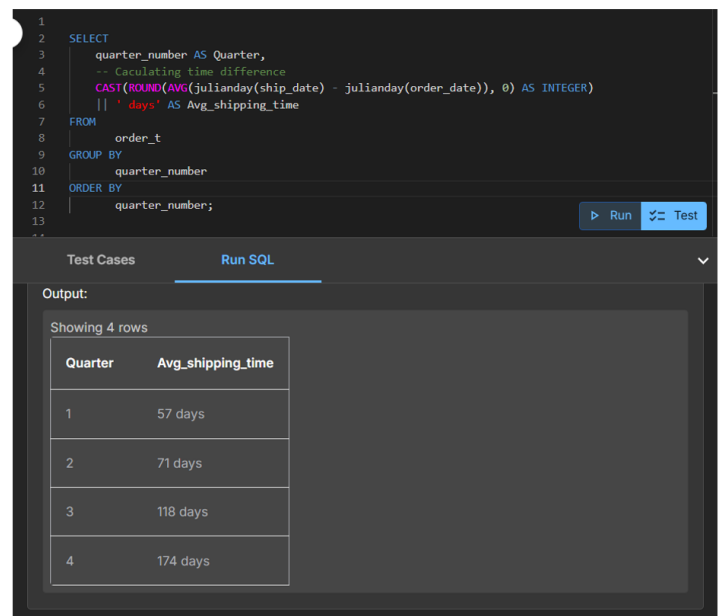
Test Cases Run SQL

Result: Passed

Query 1

Query:

```
SELECT
  quarter_number AS Quarter,
  CAST(ROUND(AVG(julianday(ship_date) - julianday(order_date)), 0) AS INTEGER)
  || ' days' AS Avg_shipping_time
FROM
  order_t
GROUP BY
```



```
1 SELECT
2   quarter_number AS Quarter,
3   -- Calculating time difference
4   CAST(ROUND(AVG(julianday(ship_date) - julianday(order_date)), 0) AS INTEGER)
5   || ' days' AS Avg_shipping_time
6 FROM
7   order_t
8 GROUP BY
9   quarter_number
10 ORDER BY
11   quarter_number;
```

Test Cases Run SQL

Output:

Showing 4 rows

Quarter	Avg_shipping_time
1	57 days
2	71 days
3	118 days
4	174 days

Observations and Insights:

- There is significant increase in the shipping time as the year progresses.
 - From Q1 to Q2, there is a moderate increase of 14 days.
 - From Q2 to Q3, the increase is more prominent, with 47 days.
 - From Q3 to Q4, the increase is the highest, with 56 days.

Insights

- The increase in shipping time is suggesting issue with the shipping process – may be supplier issues, shipping constraints, inventory shortages, economic changes or regulatory changes
- Increased shipping time or delay in delivery can lead to customer dissatisfaction and a major deciding factor in choosing the dealer in next purchase. Such delays can affect the reputation

Business Metrics Overview

Total Revenue	Total Orders	Total Customers	Average Rating
\$125.48M	1000	994	3.14
Last Quarter Revenue	Last quarter Orders	Average Days to Ship	% Good Feedback
\$2.4M	199	98	44.1%

Revenue decline in last quarter-

Indicate a slowdown in sales, last quarter's revenue was only \$2.4 million, a significant decrease from prior quarters.

Orders declining-

With 199 orders in last quarter out of 1000 total, there is a noticeable reduction in demand, which may be contributing to revenue loss.

Shipping Delays-

An average shipping time of 98 days is excessively high, likely leading to customer dissatisfaction and impacting repeat business.

Customer Feedback-

- Average Rating: 3.14, indicating dissatisfaction among customer
- % of Good Feedback: 44.1%, showing that negative experiences are outweighing positive ones.

Business Recommendations

- Based on the customer distribution across various states:
 - To further establish supremacy, concentrate on the high-value states (California, Florida, New York, and Texas).
 - Expand in mid-tier states (10-50 customers) through marketing and outreach.
 - Analyse states with low number of customers to see if investment is worth it or if resources should be allocated elsewhere.
- Based on the most preferred vehicle makers
 - Strengthen Chevrolet and Ford's market position: Offer targeted promotions, loyalty programs, and financing options to maintain and expand their leading position.
 - Focus on retaining existing customers by enhancing service quality.
- Based on regional analysis of most preferred vehicle makers of each state
 - Enhance the advertising, discounts of such brands in those specific area. For eg:
 - Chevrolet & Ford should maintain dominance via targeted promotions
 - Toyota should strengthen its urban presence with compact & hybrid models.
 - Even for the most popular brands, sales have declined over the course of the quarters, so the shipping time, after-sale support, and customer care need to be improved to attract consistent customer throughout quarters
- Based on the average rating
 - Investigate Q3-Q4 trends to find the root cause of the sharp decline in customer rating—delays, vehicle defects, pricing issues, or poor dealership experiences.
 - Gather detailed customer feedback to understand and address the most common concerns
 - Improve service quality & customer experience through training and process improvement.
 - Introduce loyalty incentives to rebuild trust and satisfaction.
 - Analyze competitor strategies to address why customers might be preferring other brands/importers.
- Based on the number of orders,
 - Examine past quarter-by-quarter counts to determine seasonal patterns in order volume. Also analyse additional elements like as competition, pricing, interest rates, and shifting customer preferences.
 - During quiet periods, consider providing flexible financing options to promote purchases.
 - Later quarters should see the introduction of discounts or promotional programs to increase sales.

- Based on revenue
 - Examine rivals' prices and products to stay competitive.
 - Adjust marketing and stocking strategies to better suit demand patterns.
- Based on both revenue and order count trends,
 - Consider promoting higher-value vehicle models or financing options to increase revenue per order, compensating for lower sales volume.
 - Examine whether price changes or discounts are having a disproportionate impact on revenue. A balanced approach to pricing may be able to stop excessive revenue loss.
- Based on credit card,
 - Further advertise the discount offers on most widely used credit cards such as JCB, Mastercard, Maestro. Assess if higher discounts on such cards are driving revenue growth or just reducing revenue
 - During customer feedback, get insights on how discounts influence customer preferences and purchasing decisions.
- Based on shipping time
 - Identify root cause for the shipping delays
 - Continuous tracking and more resources needed to be allotted to improve and maintain a not so high shipping time.
 - If delays are unavoidable, proactively inform customers and offer alternatives (e.g., partial shipments or discounts).