E-Commerce Management System

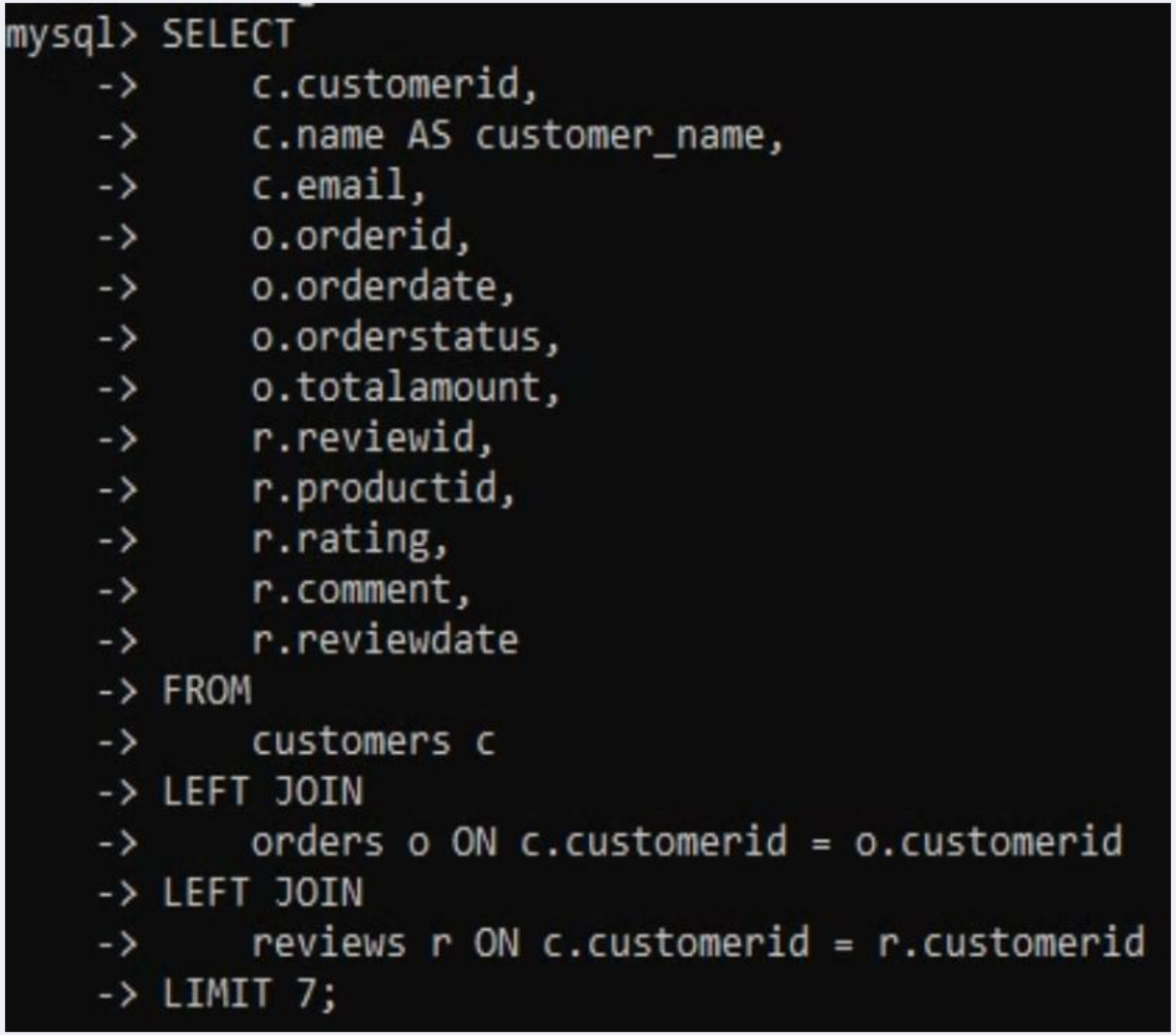
Objectives

The objective of this project is to design and implement a comprehensive database system for an e-commerce platform. The system aims to efficiently manage customer information, product details, orders, reviews, and supplier relationships. Additionally, the project includes the creation of complex SQL queries and Power BI dashboards to analyze key business metrics such as customer order history, top-selling products, stock levels, and supplier performance. This will provide valuable insights for improving sales strategies, customer satisfaction, inventory management, and supplier collaboration.

Methodology

1. **Database Design**:
    - Created eight tables: `customers`, `products`, `categories`, `orders`, `orderitems`, `reviews`, `suppliers`, and `productsuppliers`.
    - Ensured that all necessary columns were included for managing data related to customers, products, orders, reviews, and suppliers without using auto-increment or foreign key constraints.
2. **SQL Query Development**:
    - Developed SQL queries to retrieve a customer's complete order history and reviews.
    - Identified top-selling products along with their categories.
    - Generated reports for total sales and average order value for the last quarter.
    - Identified products with low stock levels and their associated suppliers.
    - Created more complex queries for generating monthly sales reports and supplier performance evaluations.
3. **Data Analysis and Reporting**:
    - Generated dashboards in Power BI to visualize top-selling products, customer reviews, and sales trends.
    - Provided insights into supplier performance, including delivery times and cost trends.

Query 1: Retrieve a customer's complete order history and reviews.



```
mysql> SELECT
    ->     c.customerid,
    ->     c.name AS customer_name,
    ->     c.email,
    ->     o.orderid,
    ->     o.orderdate,
    ->     o.orderstatus,
    ->     o.totalamount,
    ->     r.reviewid,
    ->     r.productid,
    ->     r.rating,
    ->     r.comment,
    ->     r.reviewdate
    -> FROM
    ->     customers c
    -> LEFT JOIN
    ->     orders o ON c.customerid = o.customerid
    -> LEFT JOIN
    ->     reviews r ON c.customerid = r.customerid
    -> LIMIT 7;
```

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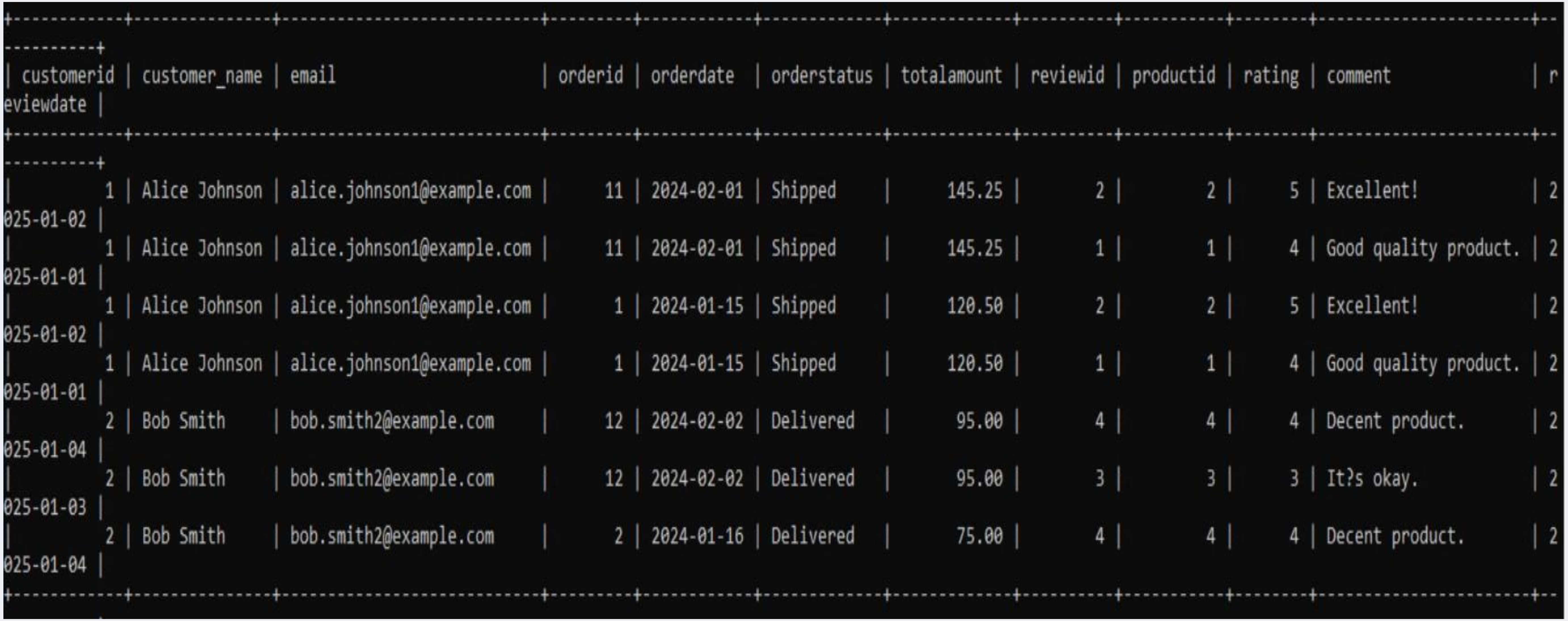
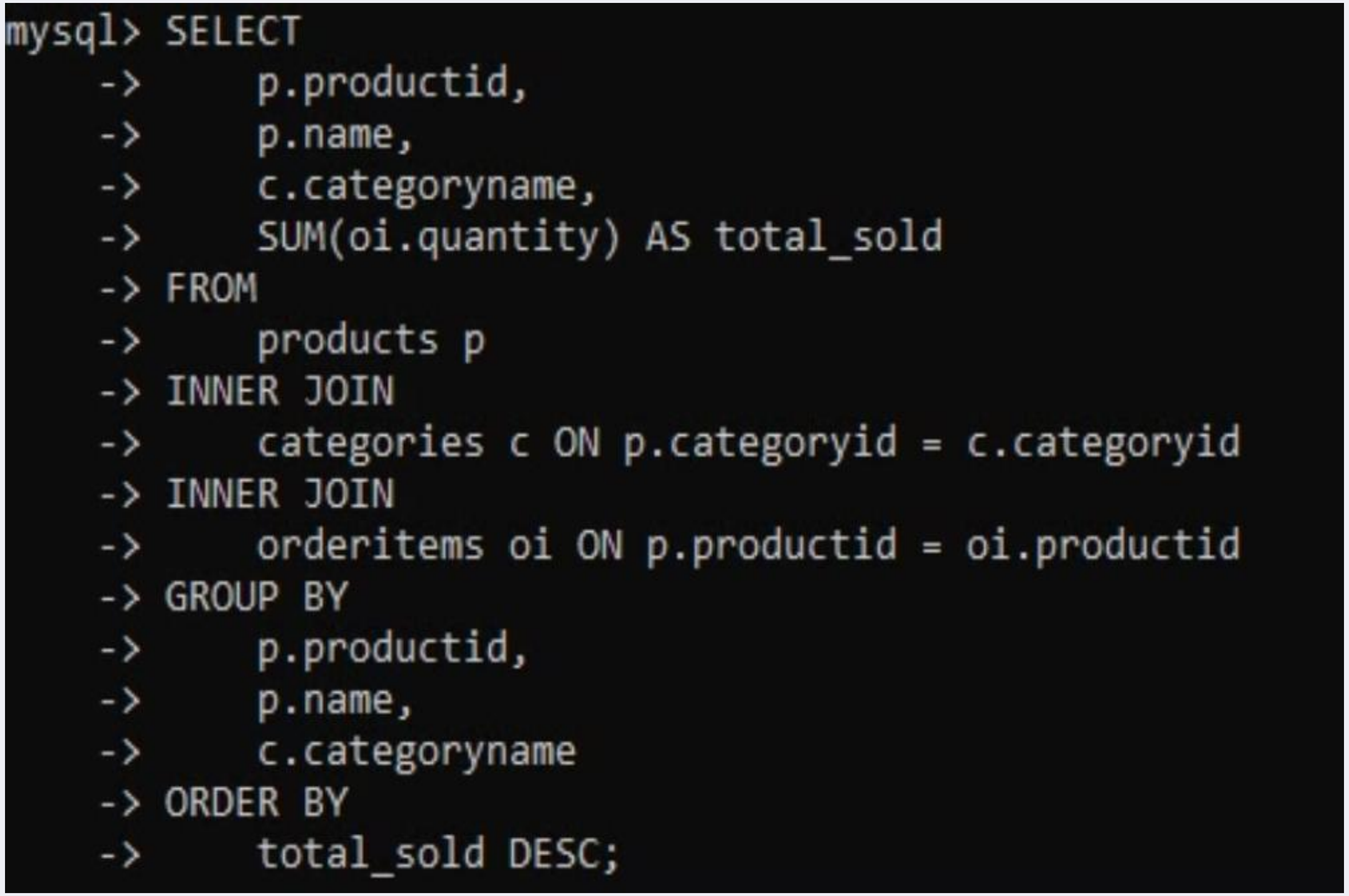
Output for Query 1:



```
+------------+---------------+----------------------------+---------+------------+-------------+-------------+----------+-----------+--------+-----------------------+--
----------+
| customerid | customer_name | email                      | orderid | orderdate  | orderstatus | totalamount | reviewid | productid | rating | comment               | r
eviewdate |
+------------+---------------+----------------------------+---------+------------+-------------+-------------+----------+-----------+--------+-----------------------+--
----------+
|          1 | Alice Johnson | alice.johnson1@example.com |      11 | 2024-02-01 | Shipped     |      145.25 |        2 |         2 |      5 | Excellent!            | 2
025-01-02 |
|          1 | Alice Johnson | alice.johnson1@example.com |      11 | 2024-02-01 | Shipped     |      145.25 |        1 |         1 |      4 | Good quality product. | 2
025-01-01 |
|          1 | Alice Johnson | alice.johnson1@example.com |       1 | 2024-01-15 | Shipped     |      120.50 |        2 |         2 |      5 | Excellent!            | 2
025-01-02 |
|          1 | Alice Johnson | alice.johnson1@example.com |       1 | 2024-01-15 | Shipped     |      120.50 |        1 |         1 |      4 | Good quality product. | 2
025-01-01 |
|          2 | Bob Smith     | bob.smith2@example.com     |      12 | 2024-02-02 | Delivered   |       95.00 |        4 |         4 |      4 | Decent product.       | 2
025-01-04 |
|          2 | Bob Smith     | bob.smith2@example.com     |      12 | 2024-02-02 | Delivered   |       95.00 |        3 |         3 |      3 | It?s okay.            | 2
025-01-03 |
|          2 | Bob Smith     | bob.smith2@example.com     |       2 | 2024-01-16 | Delivered   |       75.00 |        4 |         4 |      4 | Decent product.       | 2
025-01-04 |
+------------+---------------+----------------------------+---------+------------+-------------+-------------+----------+-----------+--------+-----------------------+--
```

Query 2: Find top selling products and the categories they belong to.



```
mysql> SELECT
    ->     p.productid,
    ->     p.name,
    ->     c.categoryname,
    ->     SUM(oi.quantity) AS total_sold
    -> FROM
    ->     products p
    -> INNER JOIN
    ->     categories c ON p.categoryid = c.categoryid
    -> INNER JOIN
    ->     orderitems oi ON p.productid = oi.productid
    -> GROUP BY
    ->     p.productid,
    ->     p.name,
    ->     c.categoryname
    -> ORDER BY
    ->     total_sold DESC;
```

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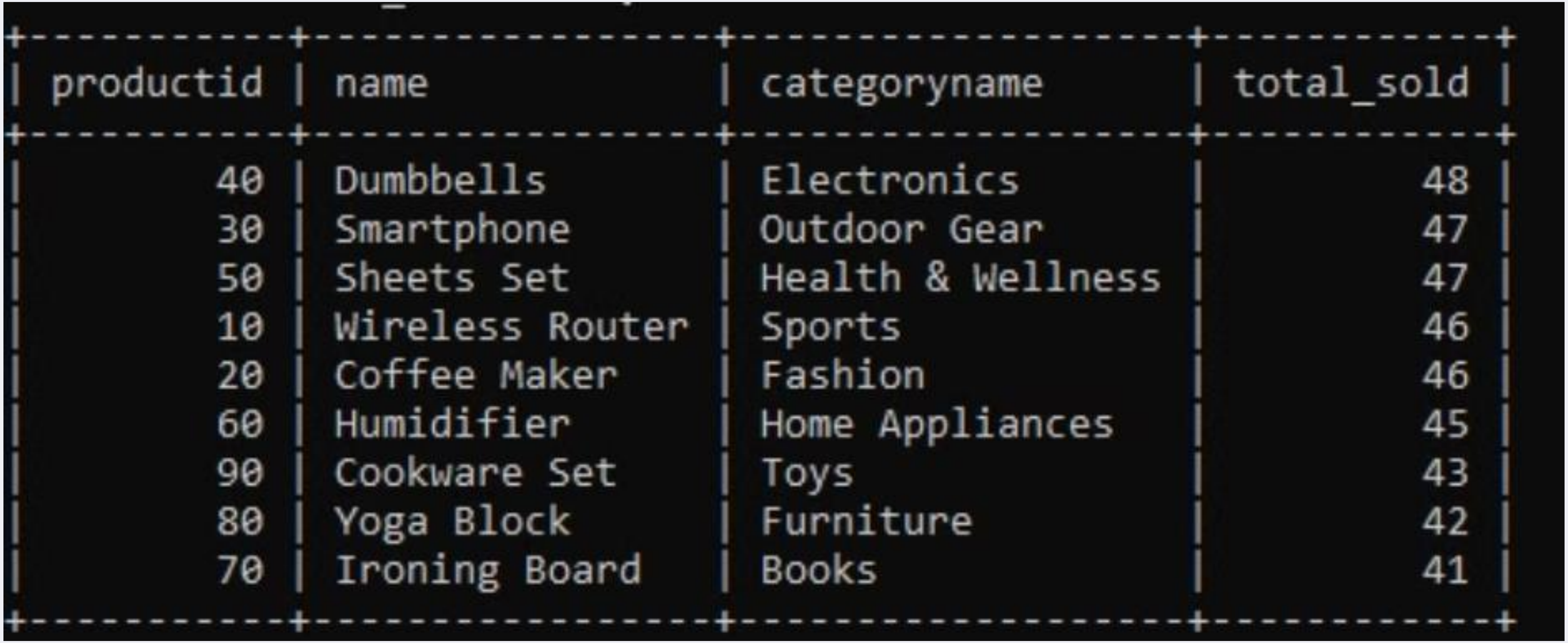
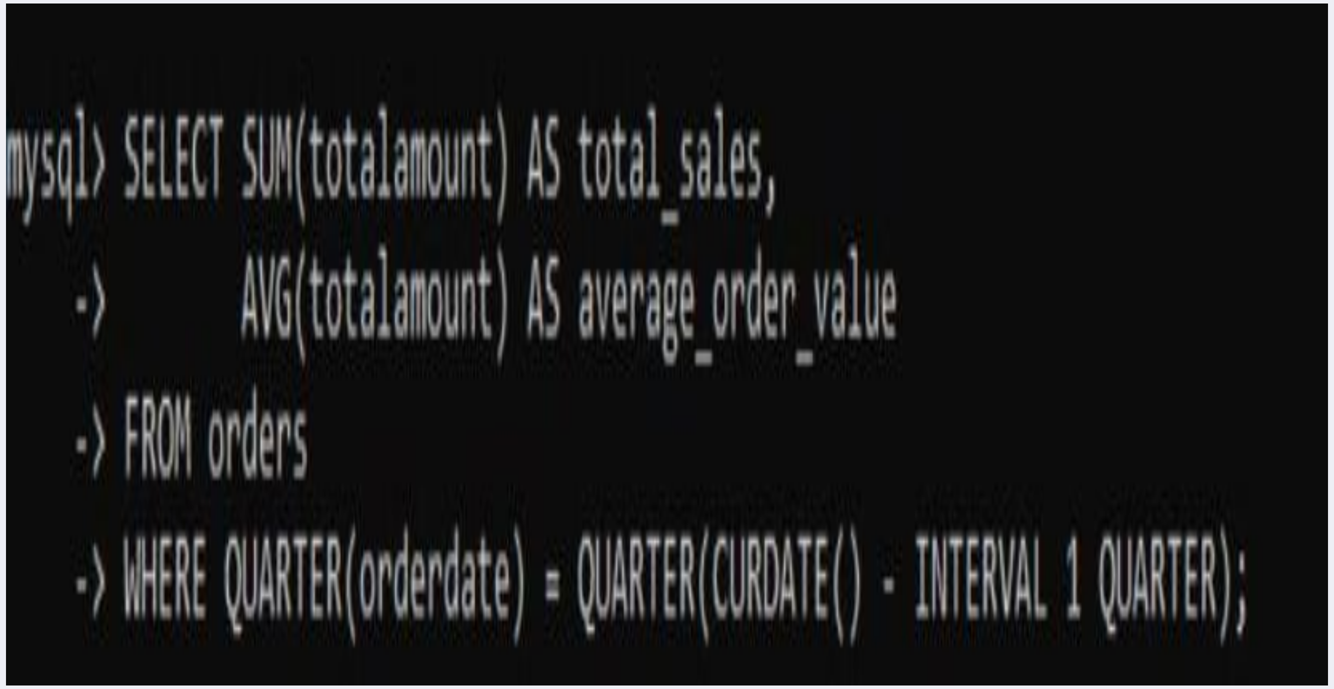
Reporty and Analytis witer ting insfuite

Output for Query 2:



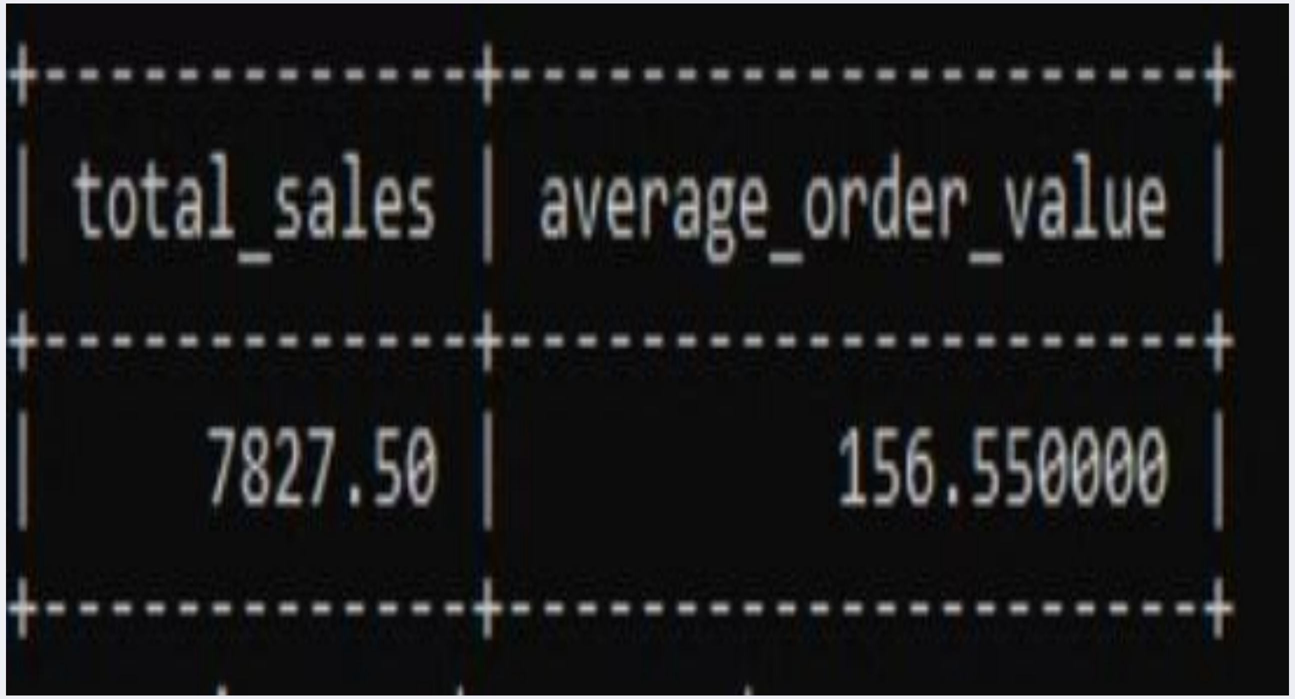
```
+-----------+-----------------+-------------------+------------+
| productid | name            | categoryname      | total_sold |
+-----------+-----------------+-------------------+------------+
|        40 | Dumbbells       | Electronics       |         48 |
|        30 | Smartphone      | Outdoor Gear      |         47 |
|        50 | Sheets Set      | Health & Wellness |         47 |
|        10 | Wireless Router | Sports            |         46 |
|        20 | Coffee Maker    | Fashion           |         46 |
|        60 | Humidifier      | Home Appliances   |         45 |
|        90 | Cookware Set    | Toys              |         43 |
|        80 | Yoga Block      | Furniture         |         42 |
|        70 | Ironing Board   | Books             |         41 |
+-----------+-----------------+-------------------+------------+
```

Query 3: Generate a report of total sales and average order value for the last quarter.



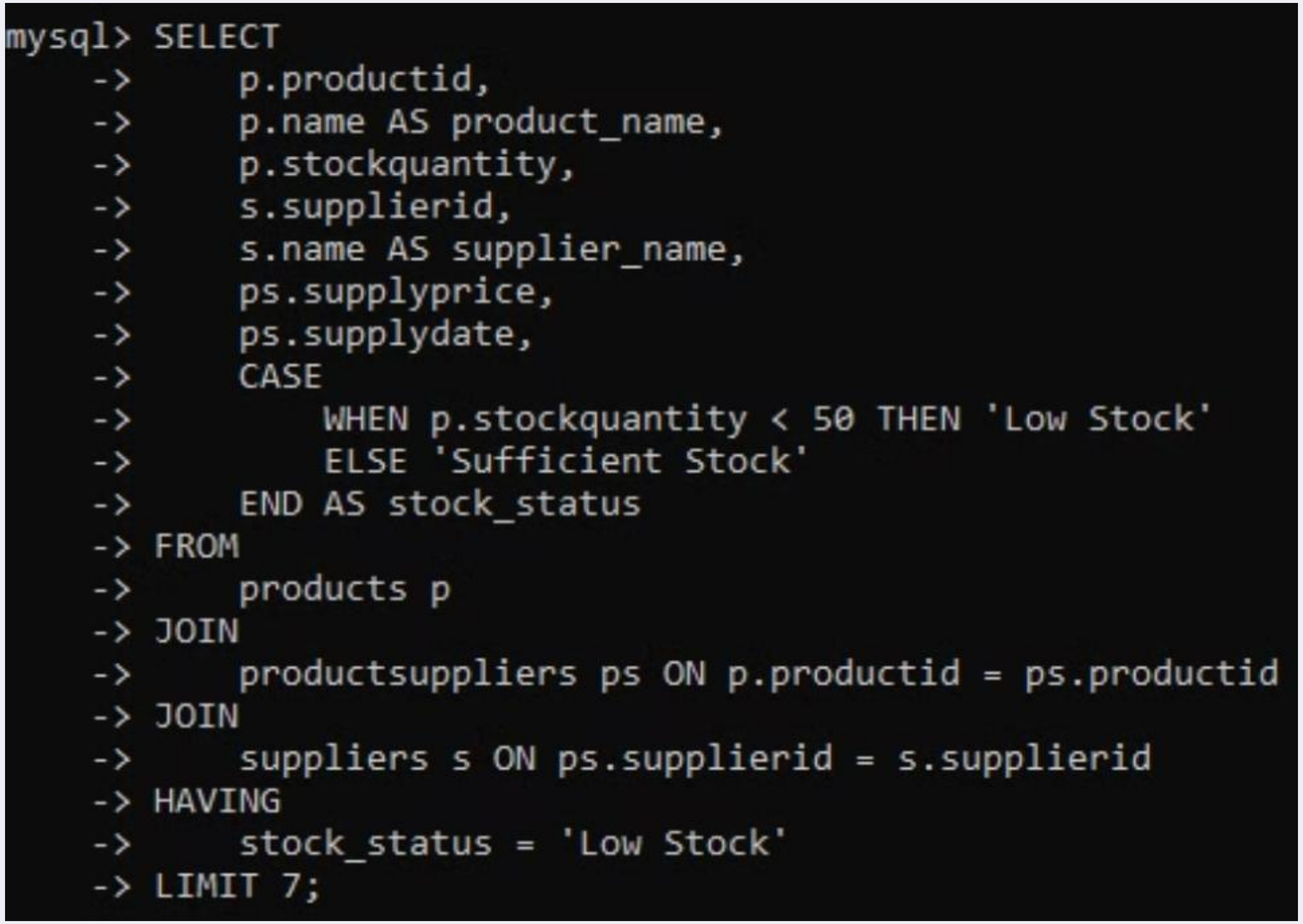
```
mysql> SELECT SUM(totalamount) AS total_sales,
    ->        AVG(totalamount) AS average_order_value
    -> FROM orders
    -> WHERE QUARTER(orderdate) = QUARTER(CURDATE() - INTERVAL 1 QUARTER);
```

Output for Query 3:



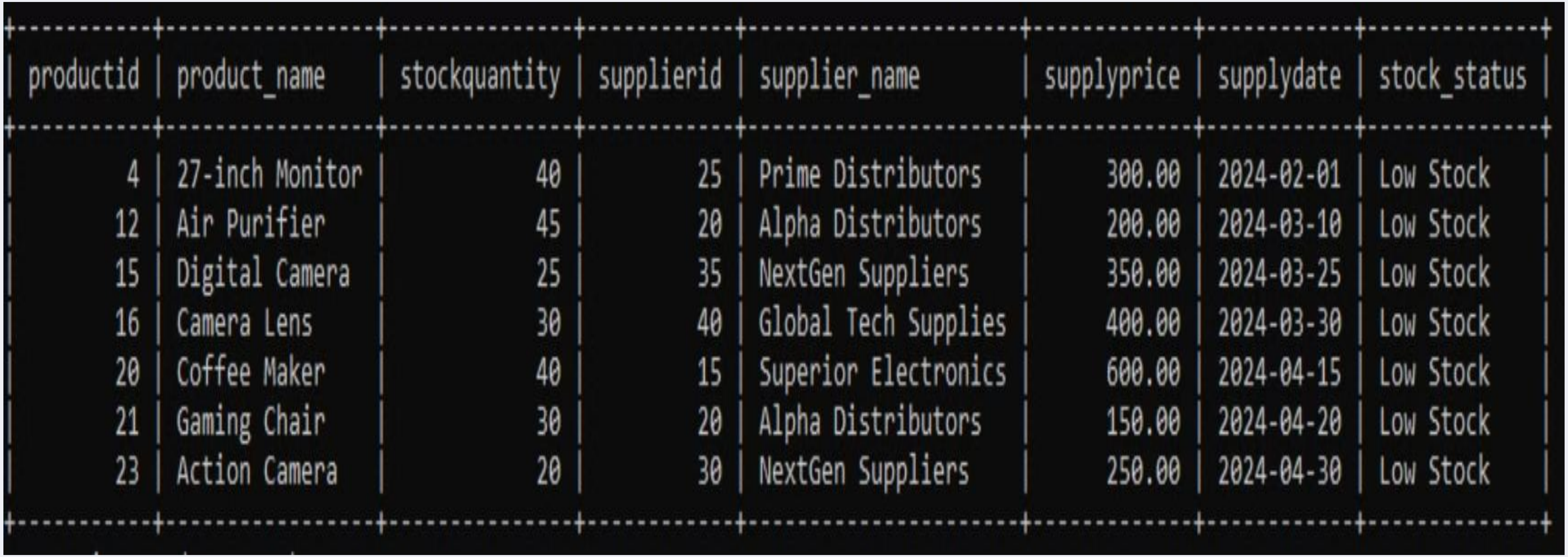
```
+-------------+---------------------+
| total_sales | average_order_value |
+-------------+---------------------+
|     7827.50 |          156.550000 |
+-------------+---------------------+
```

Query 4: Identify products with low stock levels and their suppliers.



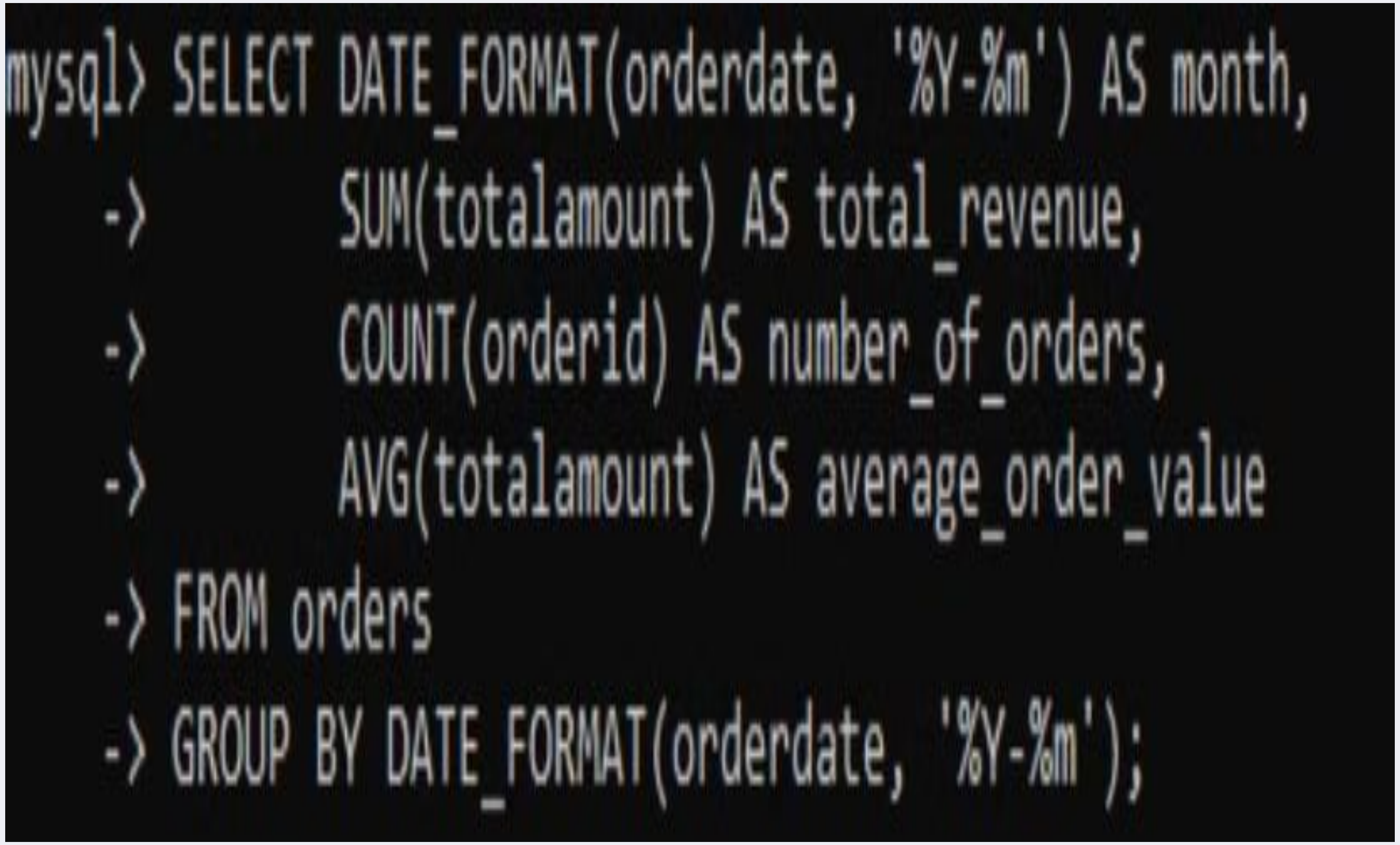
```
mysql> SELECT
    ->     p.productid,
    ->     p.name AS product_name,
    ->     p.stockquantity,
    ->     s.supplierid,
    ->     s.name AS supplier_name,
    ->     ps.supplyprice,
    ->     ps.supplydate,
    ->     CASE
    ->         WHEN p.stockquantity < 50 THEN 'Low Stock'
    ->         ELSE 'Sufficient Stock'
    ->     END AS stock_status
    -> FROM
    ->     products p
    -> JOIN
    ->     productsuppliers ps ON p.productid = ps.productid
    -> JOIN
    ->     suppliers s ON ps.supplierid = s.supplierid
    -> HAVING
    ->     stock_status = 'Low Stock'
    -> LIMIT 7;
```

Output for Query 4:

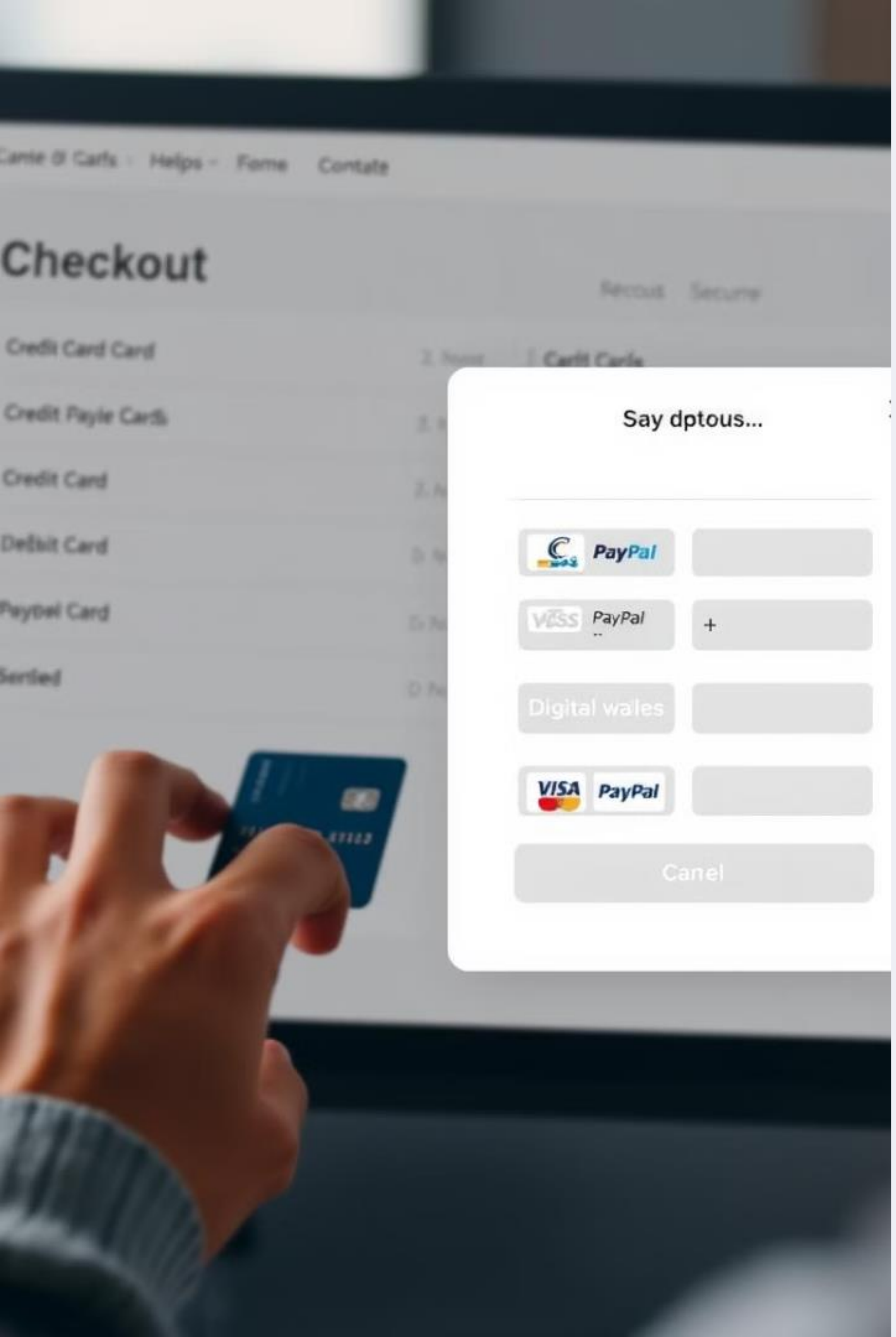


```
+-----------+-----------------+---------------+------------+----------------------+-------------+------------+--------------+
| productid | product_name    | stockquantity | supplierid | supplier_name        | supplyprice | supplydate | stock_status |
+-----------+-----------------+---------------+------------+----------------------+-------------+------------+--------------+
|         4 | 27-inch Monitor |            40 |         25 | Prime Distributors   |      300.00 | 2024-02-01 | Low Stock    |
|        12 | Air Purifier    |            45 |         20 | Alpha Distributors   |      200.00 | 2024-03-10 | Low Stock    |
|        15 | Digital Camera  |            25 |         35 | NextGen Suppliers    |      350.00 | 2024-03-25 | Low Stock    |
|        16 | Camera Lens     |            30 |         40 | Global Tech Supplies |      400.00 | 2024-03-30 | Low Stock    |
|        20 | Coffee Maker    |            40 |         15 | Superior Electronics |      600.00 | 2024-04-15 | Low Stock    |
|        21 | Gaming Chair    |            30 |         20 | Alpha Distributors   |      150.00 | 2024-04-20 | Low Stock    |
|        23 | Action Camera   |            20 |         30 | NextGen Suppliers    |      250.00 | 2024-04-30 | Low Stock    |
+-----------+-----------------+---------------+------------+----------------------+-------------+------------+--------------+
```

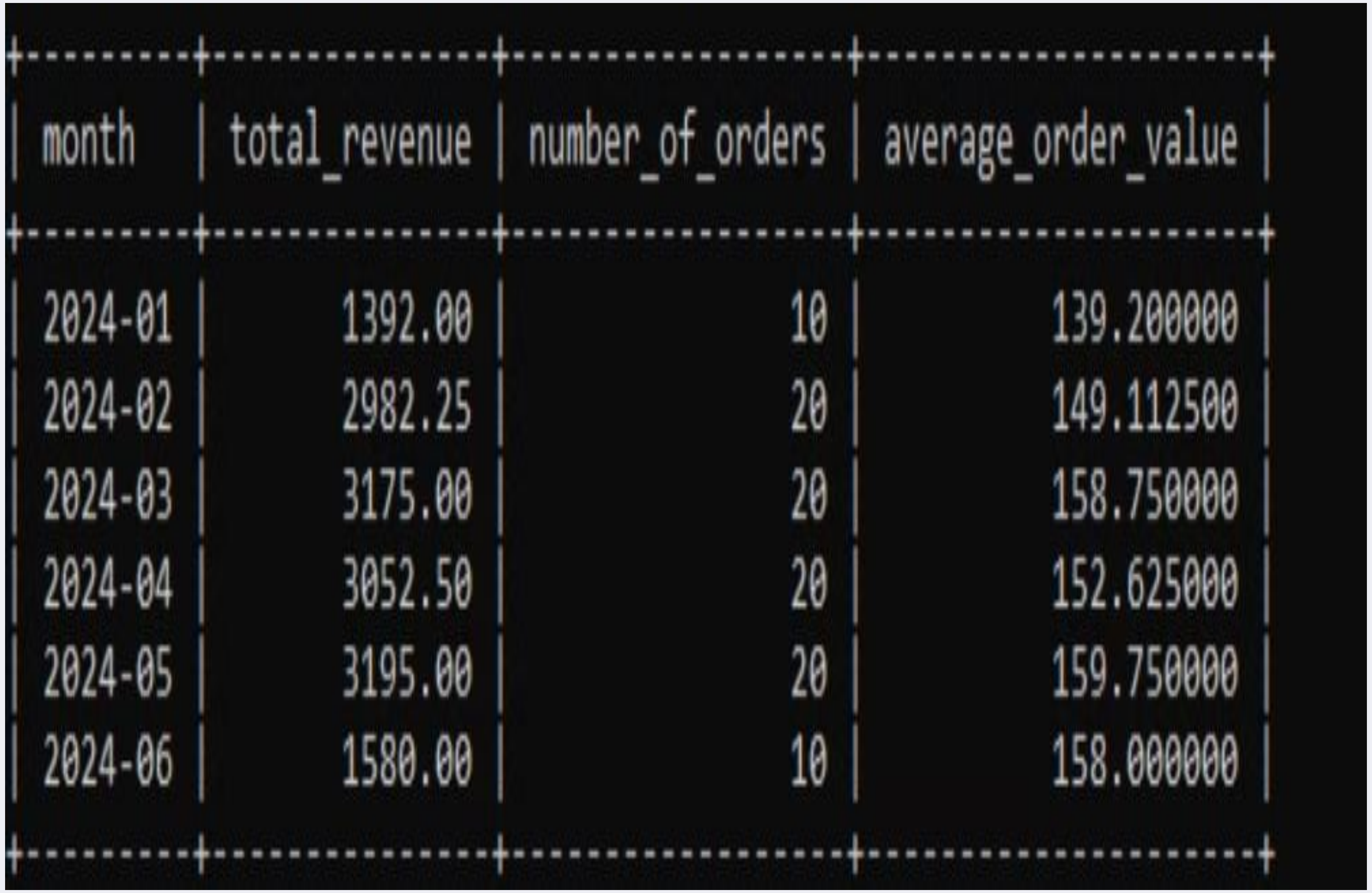
Query 5: Create a monthly sales report showing total revenue, number of orders, and average order value.



```
mysql> SELECT DATE_FORMAT(orderdate, '%Y-%m') AS month,
    ->        SUM(totalamount) AS total_revenue,
    ->        COUNT(orderid) AS number_of_orders,
    ->        AVG(totalamount) AS average_order_value
    -> FROM orders
    -> GROUP BY DATE_FORMAT(orderdate, '%Y-%m');
```

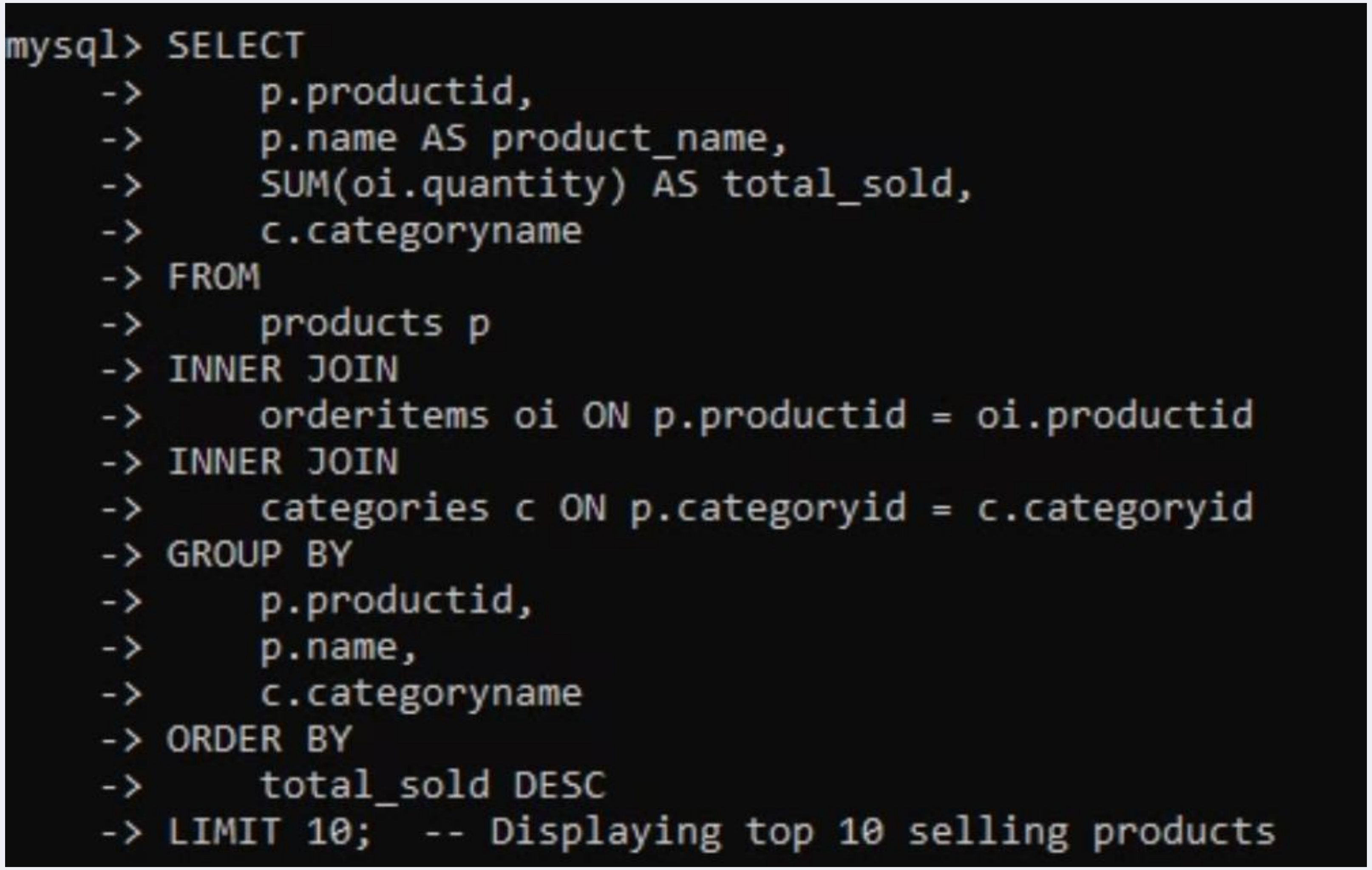


Output for Query 5:



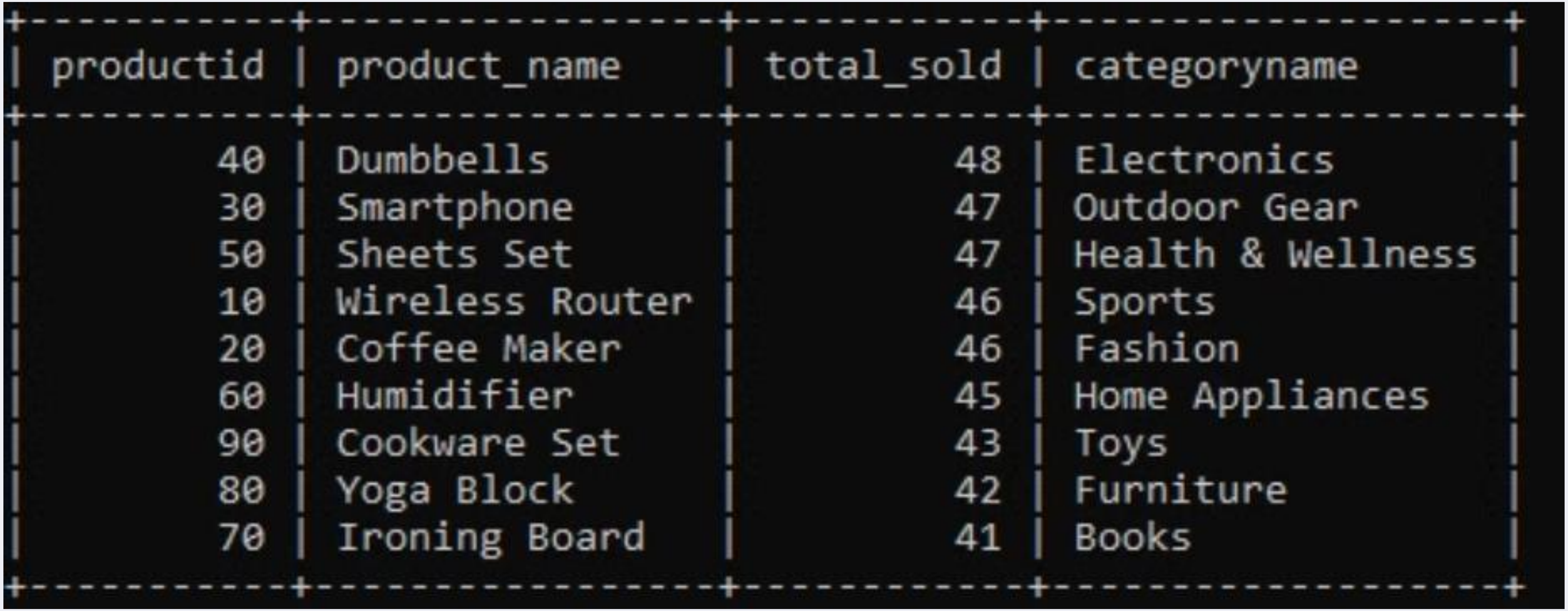
```
+---------+---------------+-----------------+--------------------+
| month   | total_revenue | number_of_orders | average_order_value |
+---------+---------------+-----------------+--------------------+
| 2024-01 |       1392.00 |              10 |          139.200000 |
| 2024-02 |       2982.25 |              20 |          149.112500 |
| 2024-03 |       3175.00 |              20 |          158.750000 |
| 2024-04 |       3052.50 |              20 |          152.625000 |
| 2024-05 |       3195.00 |              20 |          159.750000 |
| 2024-06 |       1580.00 |              10 |          158.000000 |
+---------+---------------+-----------------+--------------------+
```

Query 6: Generate a dashboard displaying top-selling products, customer reviews, and sales trends.

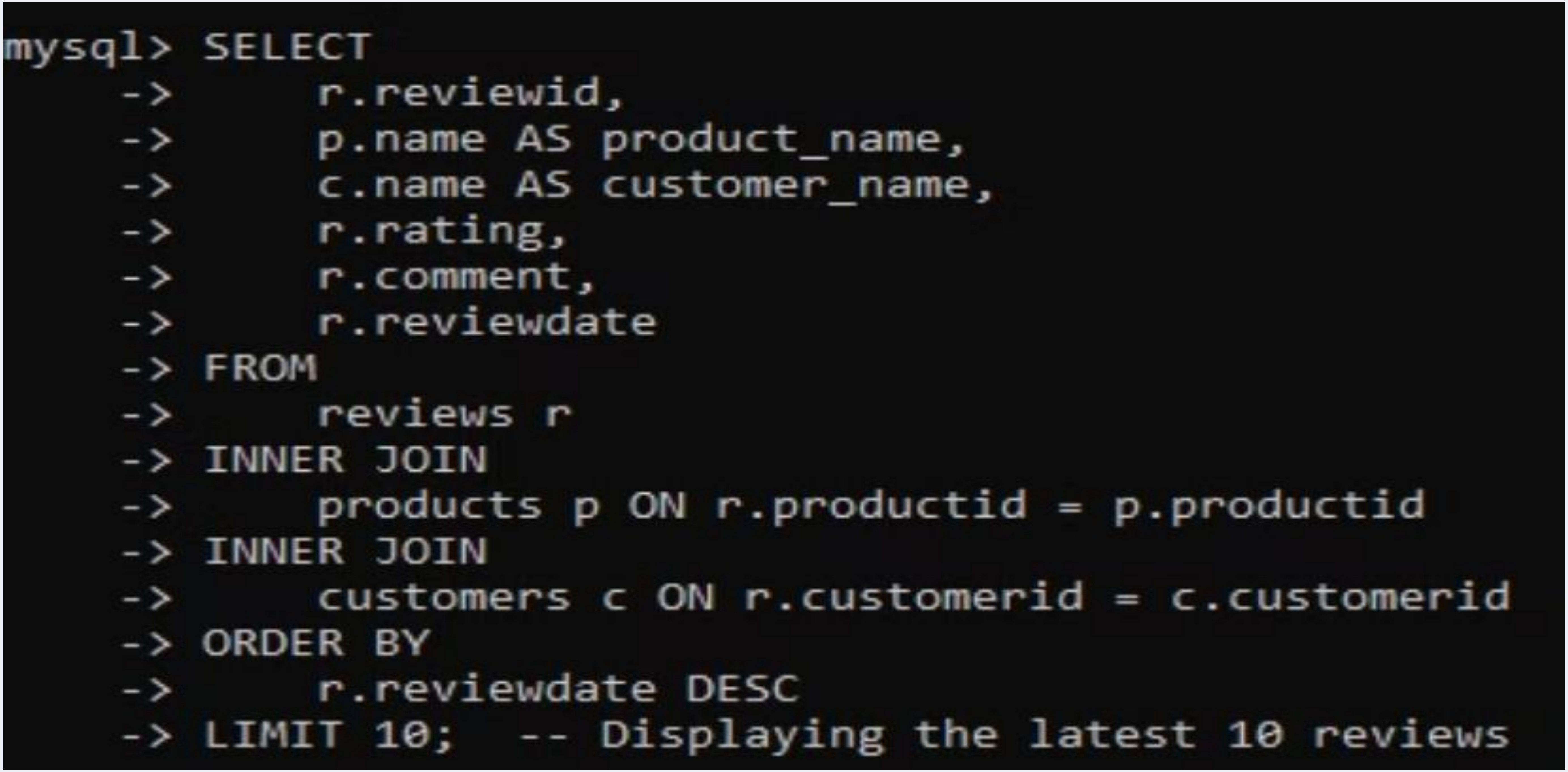


```
mysql> SELECT
    ->     p.productid,
    ->     p.name AS product_name,
    ->     SUM(oi.quantity) AS total_sold,
    ->     c.categoryname
    -> FROM
    ->     products p
    -> INNER JOIN
    ->     orderitems oi ON p.productid = oi.productid
    -> INNER JOIN
    ->     categories c ON p.categoryid = c.categoryid
    -> GROUP BY
    ->     p.productid,
    ->     p.name,
    ->     c.categoryname
    -> ORDER BY
    ->     total_sold DESC
    -> LIMIT 10;  -- Displaying top 10 selling products
```

Output for Query 6(i):

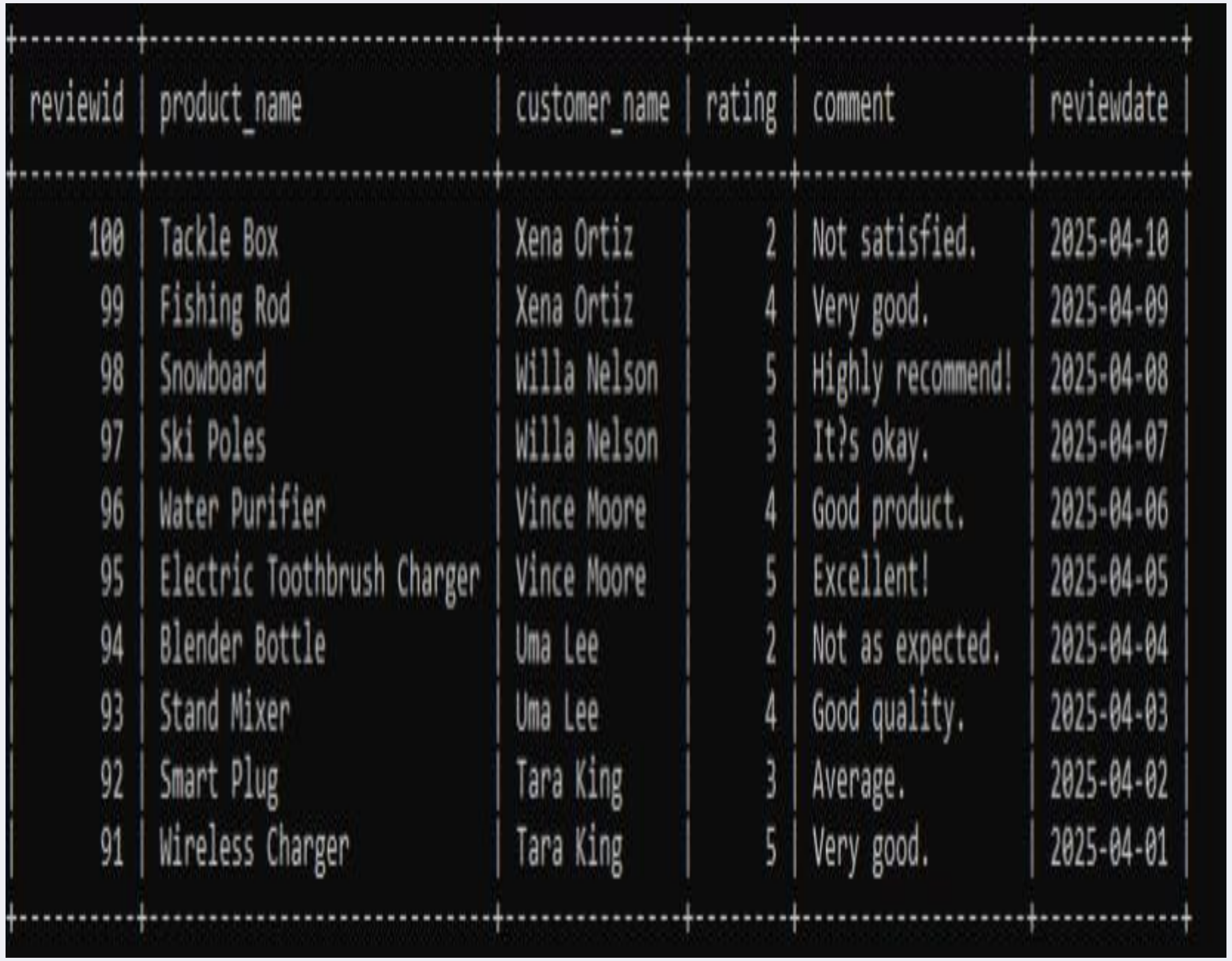


```
+-----------+-----------------+------------+-------------------+
| productid | product_name    | total_sold | categoryname      |
+-----------+-----------------+------------+-------------------+
|        40 | Dumbbells       |         48 | Electronics       |
|        30 | Smartphone      |         47 | Outdoor Gear      |
|        50 | Sheets Set      |         47 | Health & Wellness |
|        10 | Wireless Router |         46 | Sports            |
|        20 | Coffee Maker    |         46 | Fashion           |
|        60 | Humidifier      |         45 | Home Appliances   |
|        90 | Cookware Set    |         43 | Toys              |
|        80 | Yoga Block      |         42 | Furniture         |
|        70 | Ironing Board   |         41 | Books             |
+-----------+-----------------+------------+-------------------+
```

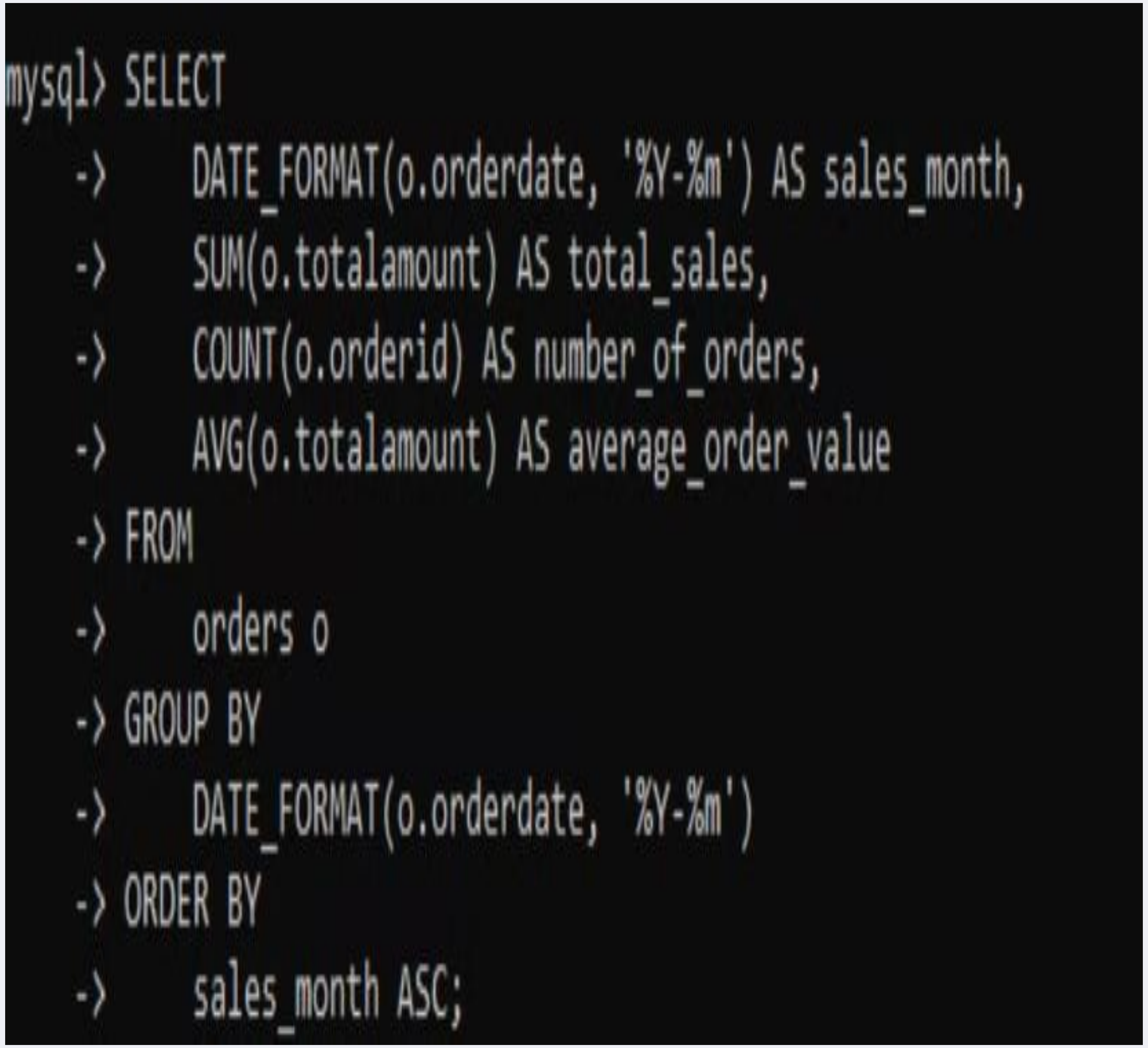


```
mysql> SELECT
    ->     r.reviewid,
    ->     p.name AS product_name,
    ->     c.name AS customer_name,
    ->     r.rating,
    ->     r.comment,
    ->     r.reviewdate
    -> FROM
    ->     reviews r
    -> INNER JOIN
    ->     products p ON r.productid = p.productid
    -> INNER JOIN
    ->     customers c ON r.customerid = c.customerid
    -> ORDER BY
    ->     r.reviewdate DESC
    -> LIMIT 10;  -- Displaying the latest 10 reviews
```

Output for Query 6(ii):

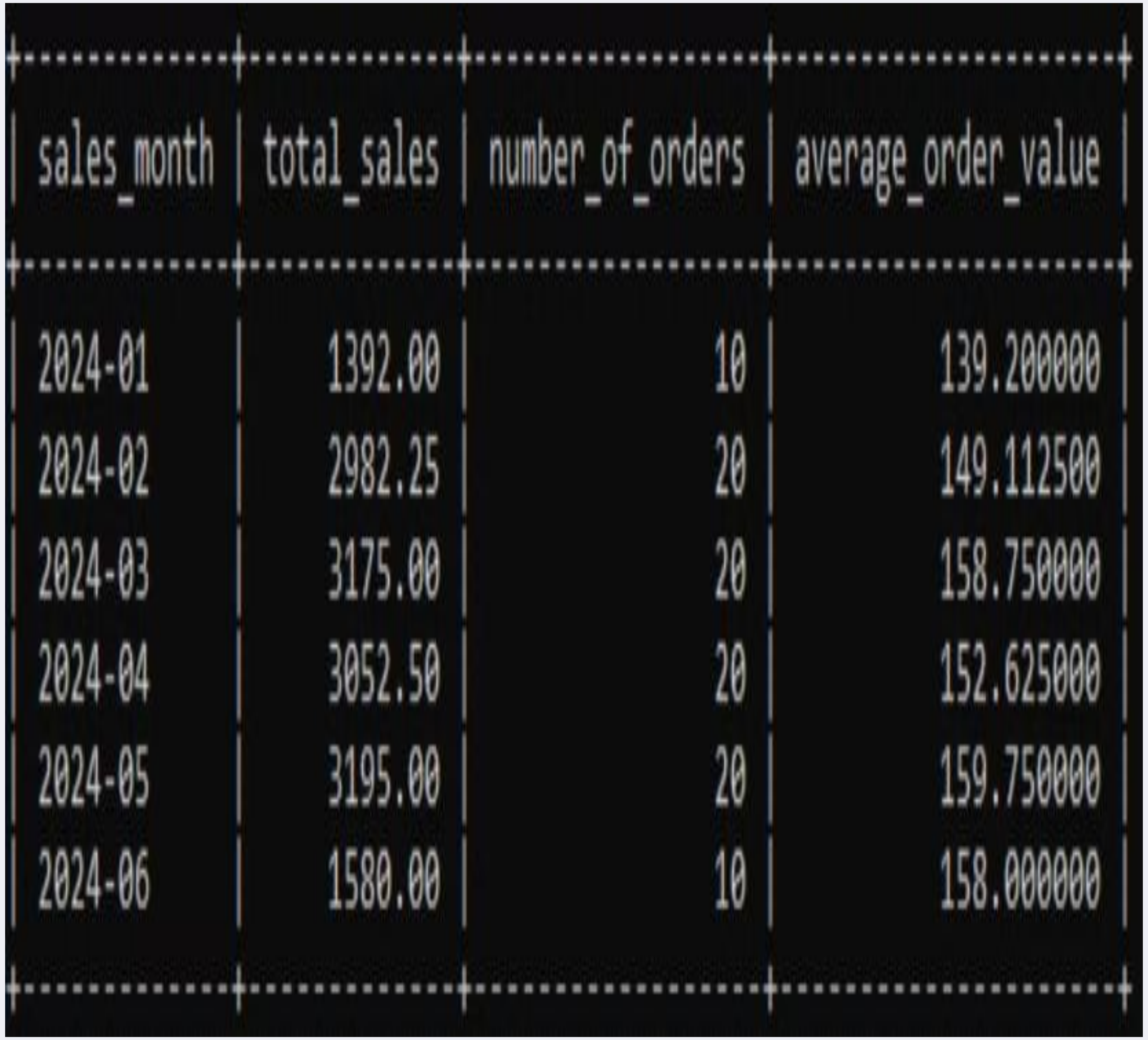


```
+----------+-----------------------------+---------------+--------+-------------------+------------+
| reviewid | product_name                | customer_name | rating | comment           | reviewdate |
+----------+-----------------------------+---------------+--------+-------------------+------------+
|      100 | Tackle Box                  | Xena Ortiz    |      2 | Not satisfied.    | 2025-04-10 |
|       99 | Fishing Rod                 | Xena Ortiz    |      4 | Very good.        | 2025-04-09 |
|       98 | Snowboard                   | Willa Nelson  |      5 | Highly recommend! | 2025-04-08 |
|       97 | Ski Poles                   | Willa Nelson  |      3 | It?s okay.        | 2025-04-07 |
|       96 | Water Purifier              | Vince Moore   |      4 | Good product.     | 2025-04-06 |
|       95 | Electric Toothbrush Charger | Vince Moore   |      5 | Excellent!        | 2025-04-05 |
|       94 | Blender Bottle              | Uma Lee       |      2 | Not as expected.  | 2025-04-04 |
|       93 | Stand Mixer                 | Uma Lee       |      4 | Good quality.     | 2025-04-03 |
|       92 | Smart Plug                  | Tara King     |      3 | Average.          | 2025-04-02 |
|       91 | Wireless Charger            | Tara King     |      5 | Very good.        | 2025-04-01 |
+----------+-----------------------------+---------------+--------+-------------------+------------+
```



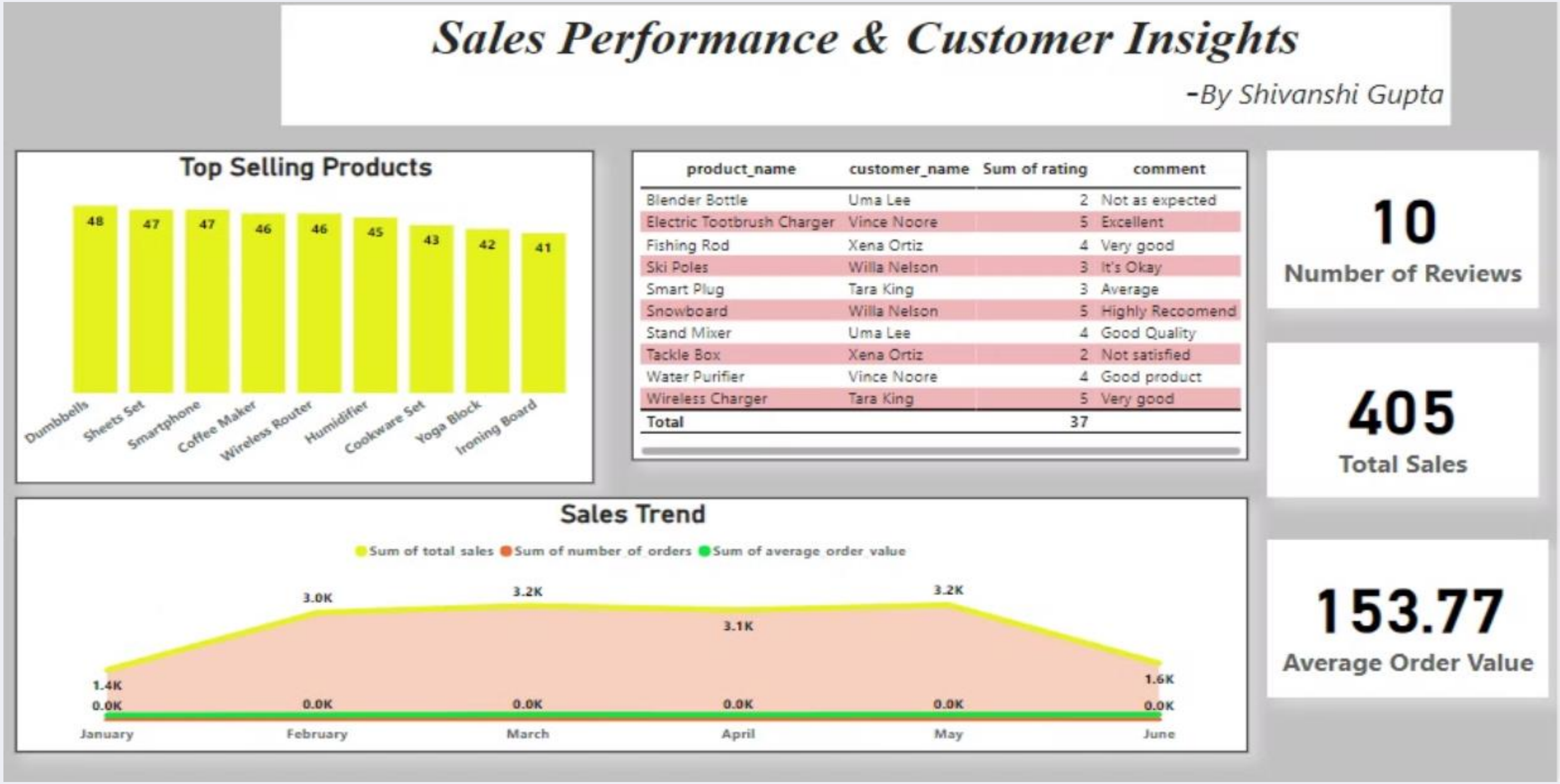
```
mysql> SELECT
    ->     DATE_FORMAT(o.orderdate, '%Y-%m') AS sales_month,
    ->     SUM(o.totalamount) AS total_sales,
    ->     COUNT(o.orderid) AS number_of_orders,
    ->     AVG(o.totalamount) AS average_order_value
    -> FROM
    ->     orders o
    -> GROUP BY
    ->     DATE_FORMAT(o.orderdate, '%Y-%m')
    -> ORDER BY
    ->     sales_month ASC;
```

Output for Query 6(iii):



```
+-------------+-------------+------------------+---------------------+
| sales_month | total_sales | number_of_orders | average_order_value |
+-------------+-------------+------------------+---------------------+
| 2024-01     |     1392.00 |               10 |          139.200000 |
| 2024-02     |     2982.25 |               20 |          149.112500 |
| 2024-03     |     3175.00 |               20 |          158.750000 |
| 2024-04     |     3052.50 |               20 |          152.625000 |
| 2024-05     |     3195.00 |               20 |          159.750000 |
| 2024-06     |     1580.00 |               10 |          158.000000 |
+-------------+-------------+------------------+---------------------+
```

Final Dashboard



Sales Performance & Customer Insights

-By Shivanshi Gupta

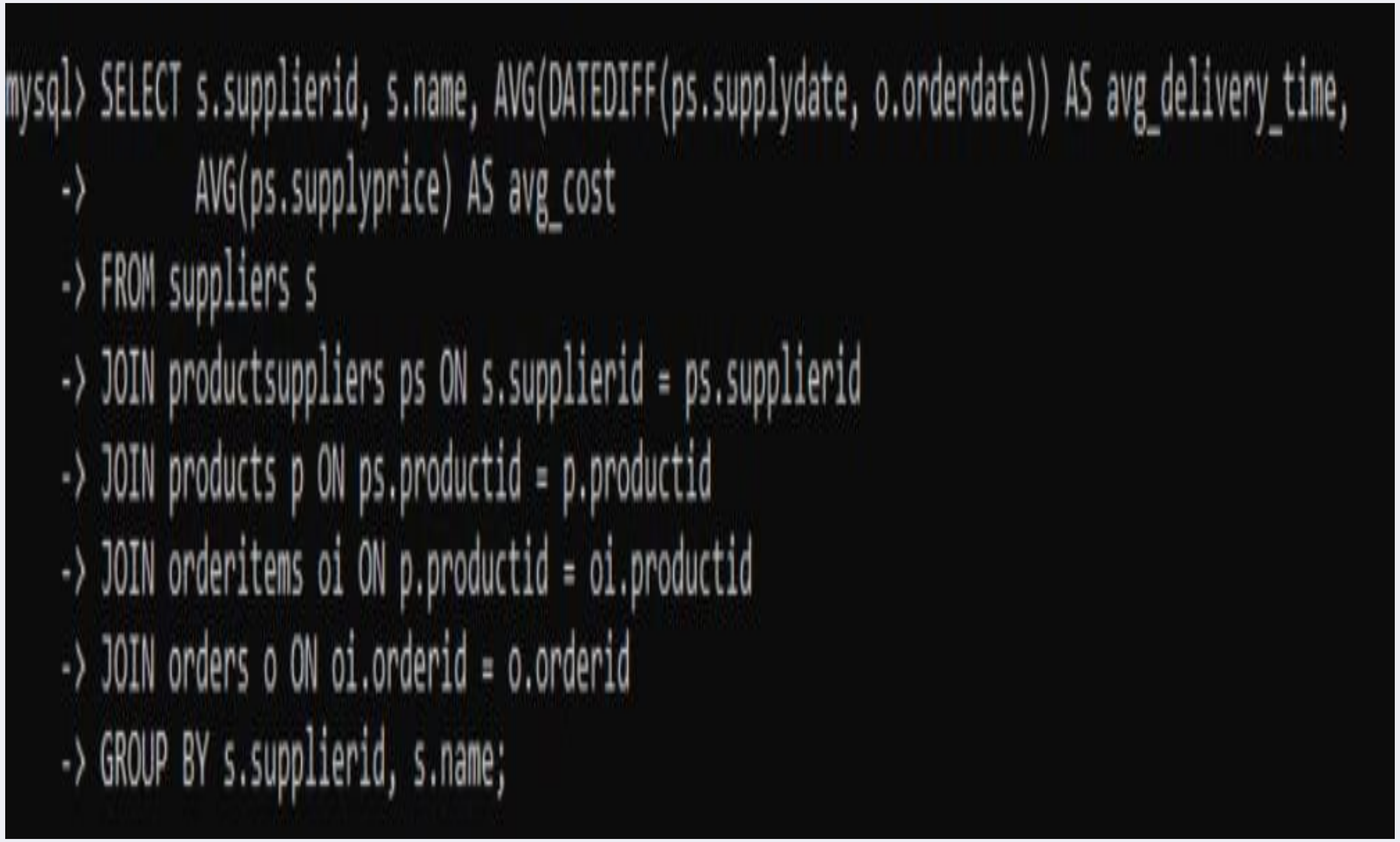
product_name	customer_name	Sum of rating	comment
Blender Bottle	Uma Lee	2	Not as expected
Electric Tootbrush Charger	Vince Noore	5	Excellent
Fishing Rod	Xena Ortiz	4	Very good
Ski Poles	Willa Nelson	3	It's Okay
Smart Plug	Tara King	3	Average
Snowboard	Willa Nelson	5	Highly Recoomend
Stand Mixer	Uma Lee	4	Good Quality
Tackle Box	Xena Ortiz	2	Not satisfied
Water Purifier	Vince Noore	4	Good product
Wireless Charger	Tara King	5	Very good
Total		37	

10
Number of Reviews

405
Total Sales

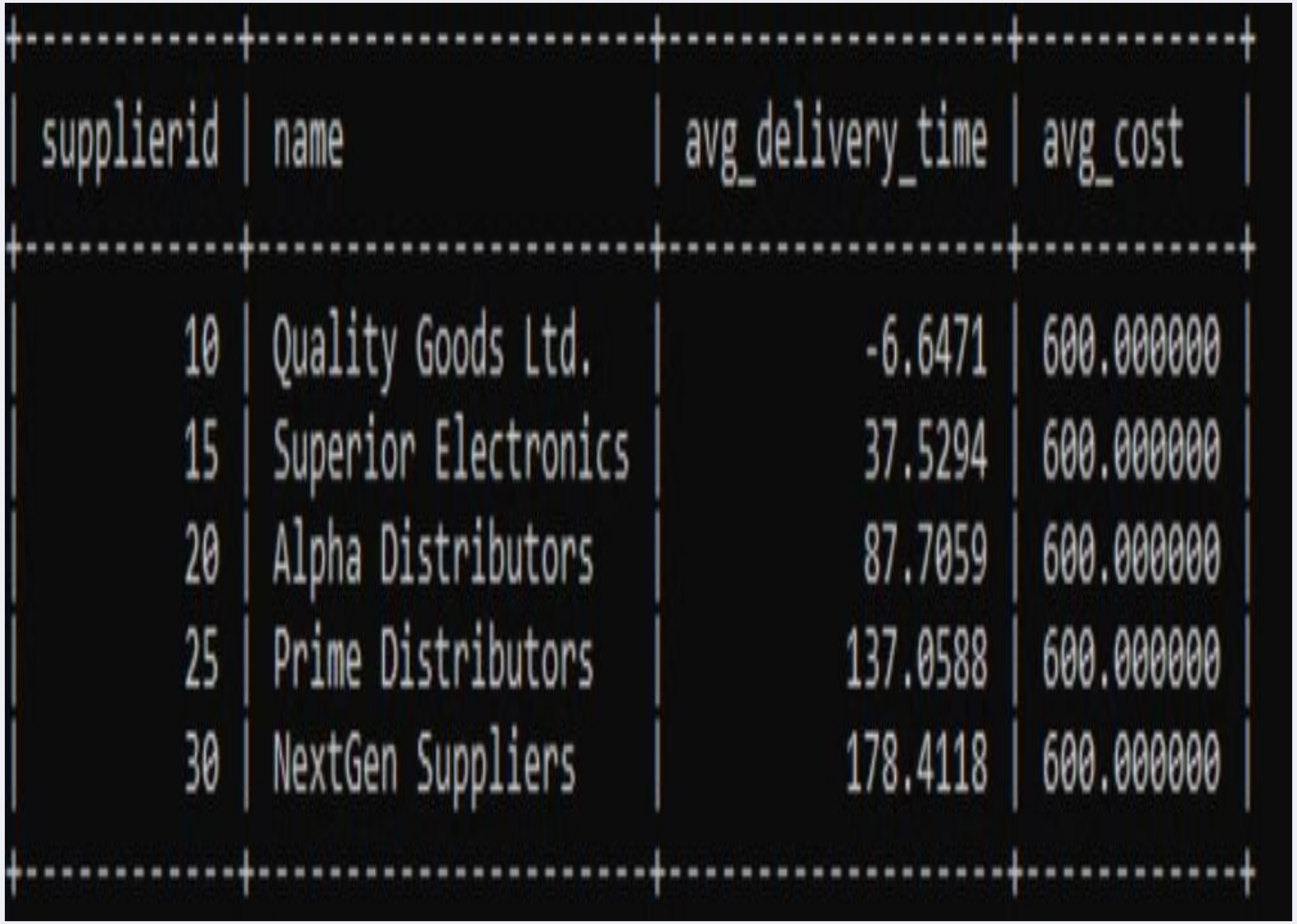
153.77
Average Order Value

Query 7: Develop a report on supplier performance, including delivery times and cost trends.



```
mysql> SELECT s.supplierid, s.name, AVG(DATEDIFF(ps.supplydate, o.orderdate)) AS avg_delivery_time,
    ->        AVG(ps.supplyprice) AS avg_cost
    -> FROM suppliers s
    -> JOIN productsuppliers ps ON s.supplierid = ps.supplierid
    -> JOIN products p ON ps.productid = p.productid
    -> JOIN orderitems oi ON p.productid = oi.productid
    -> JOIN orders o ON oi.orderid = o.orderid
    -> GROUP BY s.supplierid, s.name;
```

Output for Query 7:



```
+------------+-------------------------+------------------+------------+
| supplierid | name                    | avg_delivery_time | avg_cost   |
+------------+-------------------------+------------------+------------+
|         10 | Quality Goods Ltd.      |          -6.6471 | 600.000000 |
|         15 | Superior Electronics    |          37.5294 | 600.000000 |
|         20 | Alpha Distributors      |          87.7059 | 600.000000 |
|         25 | Prime Distributors      |         137.0588 | 600.000000 |
|         30 | NextGen Suppliers       |         178.4118 | 600.000000 |
+------------+-------------------------+------------------+------------+
```

Insights

The analysis of the e-commerce data has provided several key insights that can help in making informed business decisions.

1. **Customer Behavior**: By examining the complete order history and reviews of customers, we gained a better understanding of their purchasing patterns and preferences. This information is valuable for personalizing marketing strategies, improving customer satisfaction, and increasing repeat purchases.
2. **Top-Selling Products**: The product "Dumbbells" in the "Electronics" category emerged as the top-selling item. This insight highlights the importance of this product in driving sales and suggests a focus on maintaining its availability, offering promotions, or expanding similar product lines to boost revenue.
3. **Sales Performance**: The report on total sales and average order value for the last quarter provides a snapshot of the company's financial performance. This data helps in assessing the effectiveness of sales strategies and identifying areas for improvement to increase revenue and customer spending.
4. **Inventory Management**: The identification of products with low stock levels, along with their associated suppliers, is crucial for maintaining a balanced inventory. Ensuring that high-demand products are adequately stocked can prevent lost sales and improve customer satisfaction.
5. **Monthly Sales Trends**: The monthly sales report, which includes total revenue, number of orders, and average order value, offers a detailed view of sales trends over time. This information is essential for understanding seasonal demand fluctuations and planning inventory and marketing activities accordingly.
6. **Supplier Performance**: Evaluating supplier performance in terms of delivery times and cost trends helps in identifying reliable suppliers and negotiating better terms. This can lead to cost savings and more efficient supply chain management.
7. **Comprehensive Dashboard**: The creation of a dashboard displaying top-selling products, customer reviews, and sales trends