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Topic - SQL Final project Submission

SQL PROJECT REPORT
Amazon Sales & Profit Analysis Using SQL

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1. Introduction

This project focuses on analyzing Amazon's sales data using SQL.The dataset contains order-level information such as product details, prices, units sold, regions, and order dates. The objective is to uncover insights that help in understanding revenue trends, profitability, regional performance, and product behavior.
This project uses advanced SQL concepts such as:

Aggregations :

- Window functions
- Ranking functions
- Subqueries
- Date functions
- Profitability calculations
- Data validation checks

2. Project Objectives

The main business objectives include:
📌 Sales & Profit Analysis
Calculate total revenue, cost, and profit.
Analyze profit margins and cost structures.

📌 Product Performance
Identify top-selling and most profitable products.
Detect loss-making or low-margin products.

📌 Category & Region Analysis
Revenue and profit by category.
Region-wise profit and revenue performance.
Best region for each category.

📌 Time-Based Analysis
Monthly sales trends.
Month-over-month growth.
Cumulative running revenue.

📌 Data Quality Checks
Days with no sales.
Duplicate orders.
Price fluctuation tracking.

3. Database Design

Table Name: amazon_sales

Column	Description	Data Type
Order_id	Unique order number	INT
Order_date	Date of order	DATE
Product_category	Category of product	VARCHAR(50)
Product_name	Name of product	VARCHAR(100)
Units_sold	Quantity sold	INT
Unit_price	Selling price per unit	DECIMAL(10,2)
Cost_price	Cost price per unit	DECIMAL(10,2)
Region	Sales region	VARCHAR(50)

4. SQL Table Creation

```
CREATE TABLE amazon_sales (
    order_id INT PRIMARY KEY,
    order_date DATE,
    product_category VARCHAR(50),
    product_name VARCHAR(100),
    units_sold INT,
    unit_price DECIMAL(10,2),
    cost_price DECIMAL(10,2),
    region VARCHAR(50)
);
```

5. Sample Data Inserted

```
INSERT INTO amazon_sales VALUES
(1, '2024-01-05', 'Electronics', 'Smartphone', 20, 500, 350, 'USA'),
(2, '2024-01-10', 'Electronics', 'Laptop', 10, 900, 700, 'Canada'),
(3, '2024-01-12', 'Home Appliances', 'Microwave', 15, 150, 90, 'USA'),
(4, '2024-01-15', 'Fashion', 'Jacket', 30, 60, 30, 'UK'),
(5, '2024-01-25', 'Fashion', 'Shoes', 40, 80, 40, 'Canada'),
(6, '2024-02-02', 'Electronics', 'Headphones', 35, 100, 60, 'USA'),
(7, '2024-02-05', 'Home Appliances', 'Vacuum Cleaner', 12, 200, 120, 'UK'),
(8, '2024-02-10', 'Fashion', 'T-shirt', 50, 25, 10, 'USA'),
(9, '2024-02-15', 'Electronics', 'Smartwatch', 25, 180, 110, 'Canada'),
(10,'2024-03-01', 'Home Appliances', 'Air Fryer', 18, 220, 150, 'USA'),
(11,'2024-03-05', 'Fashion', 'Handbag', 28, 70, 40, 'UK'),
(12,'2024-03-10', 'Electronics', 'Tablet', 16, 300, 200, 'Canada'),
(13,'2024-03-15', 'Fashion', 'Jeans', 45, 55, 25, 'USA'),
(14,'2024-03-20', 'Home Appliances', 'Blender', 22, 90, 50, 'UK'),
(15,'2024-03-25', 'Electronics', 'Camera', 12, 600, 400, 'USA');
SELECT * FROM amazon_sales;
```

Screenshot :

order_id	order_date	product_category	product_name	units_sold	unit_price	cost_price	region
1	2024-01-05	Electronics	Smartphone	20	500.00	350.00	USA
2	2024-01-10	Electronics	Laptop	10	900.00	700.00	Canada
3	2024-01-12	Home Appliances	Microwave	15	150.00	90.00	USA
4	2024-01-15	Fashion	Jacket	30	60.00	30.00	UK
5	2024-01-25	Fashion	Shoes	40	80.00	40.00	Canada
6	2024-02-02	Electronics	Headphones	35	100.00	60.00	USA
7	2024-02-05	Home Appliances	Vacuum Cleaner	12	200.00	120.00	UK
8	2024-02-10	Fashion	T-shirt	50	25.00	10.00	USA
9	2024-02-15	Electronics	Smartwatch	25	180.00	110.00	Canada
10	2024-03-01	Home Appliances	Air Fryer	18	220.00	150.00	USA
11	2024-03-05	Fashion	Handbag	28	70.00	40.00	UK
12	2024-03-10	Electronics	Tablet	16	300.00	200.00	Canada
13	2024-03-15	Fashion	Jeans	45	55.00	25.00	USA
14	2024-03-20	Home Appliances	Blender	22	90.00	50.00	UK
15	2024-03-25	Electronics	Camera	12	600.00	400.00	USA

6. SQL Queries & Analysis

1. Total Revenue, Cost & Profit

```
SELECT
    sum(units_sold*unit_price) AS total_revenue,
    sum(units_sold*cost_price) as total_cost,
    sum(unit_price - cost_price) as total_profit
FROM amazon_sales;
```

Screenshot :

total_revenue	total_cost	total_profit
60275.00	38685.00	1155.00

2. Total Sale By Category

```
SELECT product_category, SUM(units_sold*unit_price)as
Category_revenue
FROM amazon_sales
GROUP BY product_category;
```

Screenshot :

product_category	Category_revenue
Electronics	39000.00
Home Appliances	10590.00
Fashion	10685.00

3. Highest Selling Product

```
SELECT product_name, units_sold
FROM amazon_sales
order by units_sold desc
limit 1;
```

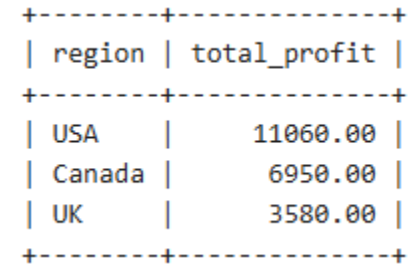
Screenshot :

product_name	units_sold
T-shirt	50

4. Profit By Region

```
SELECT region,
sum((unit_price - cost_price) * units_sold) AS total_profit
FROM amazon_sales
GROUP By region;
```

Screenshot :

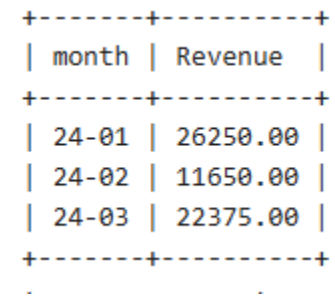


region	total_profit
USA	11060.00
Canada	6950.00
UK	3580.00

5. Monthly sales trends.

```
SELECT DATE_FORMAT(order_date,'%y-%m') as month,
    sum(units_sold*unit_price) as Revenue
from amazon_sales
group by month
order by month;
```

Screenshot :



month	Revenue
24-01	26250.00
24-02	11650.00
24-03	22375.00

6. Top 3 most profitable product

```
SELECT product_name,
    sum((unit_price - cost_price)*units_sold) as product_profit
FROM amazon_sales
group by product_name
order by product_profit desc
limit 3;
```

Screenshot :

product_name	product_profit
Smartphone	3000.00
Camera	2400.00
Laptop	2000.00

7. Average selling price by category.

```
SELECT product_category, avg(unit_price) as avg_selling_price
from amazon_sales
group by product_category;
```

Screenshot :

product_category	avg_selling_price
Electronics	430.000000
Home Appliances	165.000000
Fashion	58.000000

8. Region-wise average profit per order.

```
SELECT region,avg((unit_price - cost_price)*units_sold) as avg_profit_per_order
from amazon_sales
group by region;
```

Screenshot :

region	avg_profit_per_order
USA	1580.000000
Canada	1737.500000
UK	895.000000

9. Loss making product_category

```
SELECT product_name, (unit_price - cost_price) as margin
```

```
from amazon_sales
where unit_price > cost_price;
```

Note : There are no products sold at a loss, so the query returns.

10. Best category by profit

```
SELECT product_category,sum((unit_price - cost_price)* units_sold) as total_profit
from amazon_sales
group by product_category
order by total_profit desc
limit 1;
```

Screenshot :

```
+------------------+--------------+
| product_category | total_profit |
+------------------+--------------+
| Electronics      |     12150.00 |
+------------------+--------------+
```

11. Month over month growth

```
SELECT DATE_FORMAT(order_date, '%Y-%m') AS month,
      SUM(units_sold * unit_price) AS revenue,
      LAG(SUM(units_sold * unit_price), 1)
         OVER (ORDER BY DATE_FORMAT(order_date, '%Y-%m')) AS
previous_month_revenue,
      (SUM(units_sold * unit_price) -
       LAG(SUM(units_sold * unit_price), 1)
         OVER (ORDER BY DATE_FORMAT(order_date, '%Y-%m'))) AS mom_change
FROM amazon_sales
GROUP BY month;
```

Screenshot :

```
+---------+----------+------------------------+------------+
| month   | revenue  | previous_month_revenue | mom_change |
+---------+----------+------------------------+------------+
| 2024-01 | 26250.00 |                   NULL |       NULL |
| 2024-02 | 11650.00 |               26250.00 |  -14600.00 |
| 2024-03 | 22375.00 |               11650.00 |   10725.00 |
+---------+----------+------------------------+------------+
```

12. Price variance over time for each product.

```
SELECT order_date,
      sum(units_sold*unit_price) over (ORDER BY order_date) as cummulative_percent
FROM amazon_sales;
```

Screenshot :

order_date	cummulative_percent
2024-01-05	10000.00
2024-01-10	19000.00
2024-01-12	21250.00
2024-01-15	23050.00
2024-01-25	26250.00
2024-02-02	29750.00
2024-02-05	32150.00
2024-02-10	33400.00
2024-02-15	37900.00
2024-03-01	41860.00
2024-03-05	43820.00
2024-03-10	48620.00
2024-03-15	51095.00
2024-03-20	53075.00
2024-03-25	60275.00

13. Category share contributions

```
SELECT product_category,
      round(sum(units_sold*unit_price)*100/
      (select sum(units_sold*unit_price) from amazon_sales), 2) as contributions_percent
from amazon_sales
GROUP by product_category;
```

Screenshot :

product_category	contributions_percent
Electronics	64.70
Home Appliances	17.57
Fashion	17.73

14. Best selling region for each category

```
SELECT product_category,region,sum(units_sold) as total_unit
from amazon_sales
group by product_category, region
having total_unit=(select max(t2.total_unit)
from (
     select region, sum(units_sold) as total_unit
     from amazon_sales t
     where t.product_category=amazon_sales.product_category
     GROUP By region) t2
);
```

Screenshot :

```
+------------------+--------+------------+
| product_category | region | total_unit |
+------------------+--------+------------+
| Electronics      | USA    |         67 |
| Home Appliances  | UK     |         34 |
| Fashion          | USA    |         95 |
+------------------+--------+------------+
```

15. Days with no sales

```
SELECT d.date
FROM (
   SELECT DATE('2024-01-01') + INTERVAL x DAY AS date
   FROM(
      SELECT @row := @row + 1 AS x
      FROM ( SELECT 0 FROM amazon_sales limit 400) a,
           (SELECT @row := -1) r
   ) AS t
) d
left join amazon_sales s ON d.date = s.order_date
where s.order_id is null
order by d.date;
```

Screenshot :

date
2024-01-01
2024-01-02
2024-01-03
2024-01-04
2024-01-06
2024-01-07
2024-01-08
2024-01-09
2024-01-11
2024-01-13
2024-01-14

16. Profit margin by product

```
SELECT product_name,
      ROUND((( unit_price - cost_price) / cost_price) * 100, 2)
          AS profit_margin_percent
FROM amazon_sales;
```

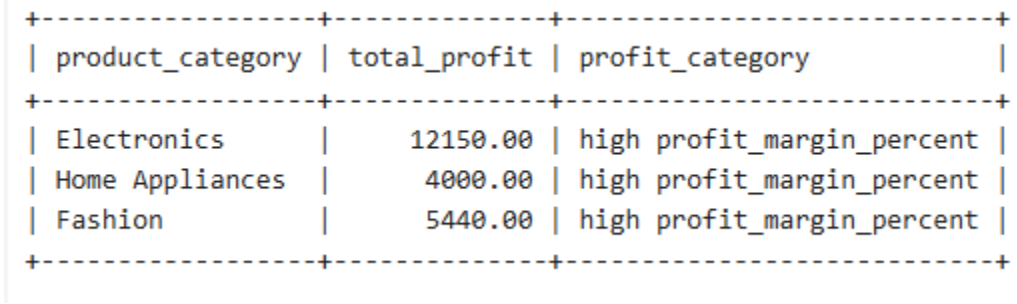
Screenshot :

product_name	profit_margin_percent
Smartphone	42.86
Laptop	28.57
Microwave	66.67
Jacket	100.00
Shoes	100.00
Headphones	66.67
Vacuum Cleaner	66.67
T-shirt	150.00
Smartwatch	63.64
Air Fryer	46.67
Handbag	75.00
Tablet	50.00
Jeans	120.00
Blender	80.00
Camera	50.00

17. Profit classification by category

```
SELECT product_category,
      sum(( unit_price - cost_price) * units_sold) AS total_profit,
      CASE
         when sum((unit_price - cost_price) * units_sold) > 3000 THEN 'high
profit_margin_percent'
         when sum((unit_price - unit_price) * units_sold) between 1000 and 3000 then 'medium'
         else  'low profit'
      END AS profit_category
FROM amazon_sales
GROUP BY product_category;
```

Screenshot :

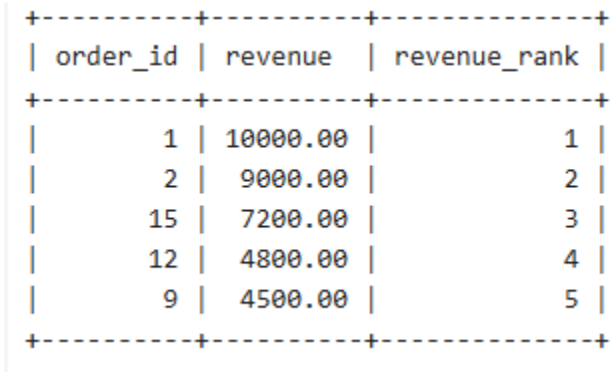


product_category	total_profit	profit_category
Electronics	12150.00	high profit_margin_percent
Home Appliances	4000.00	high profit_margin_percent
Fashion	5440.00	high profit_margin_percent

18. Top 5 orders by revenue

```
SELECT order_id,
      (units_sold * unit_price) AS revenue,
      RANK() OVER (ORDER BY (units_sold * unit_price) DESC) AS revenue_rank
FROM amazon_sales
LIMIT 5 ;
```

Screenshot :



order_id	revenue	revenue_rank
1	10000.00	1
2	9000.00	2
15	7200.00	3
12	4800.00	4
9	4500.00	5

19. Average profit per category

```
SELECT product_category,
      AVG ((unit_price - cost_price) * units_sold) AS avg_profit
FROM amazon_sales
GROUP BY product_category;
```

Screenshot :

```
+------------------+-------------+
| product_category | avg_profit  |
+------------------+-------------+
| Electronics      | 2025.000000 |
| Home Appliances  | 1000.000000 |
| Fashion          | 1088.000000 |
+------------------+-------------+
```

20. Most frequently ordered product

```
SELECT product_name,
      COUNT(*) AS frequency
FROM amazon_sales
GROUP BY product_name
ORDER BY frequency DESC;
```

Screenshot :

```
+----------------+-----------+
| product_name   | frequency |
+----------------+-----------+
| Smartphone     |         1 |
| Laptop         |         1 |
| Microwave      |         1 |
| Jacket         |         1 |
| Shoes          |         1 |
| Headphones     |         1 |
| Vacuum Cleaner |         1 |
| T-shirt        |         1 |
| Smartwatch     |         1 |
| Air Fryer      |         1 |
| Handbag        |         1 |
| Tablet         |         1 |
| Jeans          |         1 |
| Blender        |         1 |
| Camera         |         1 |
+----------------+-----------+
```

21. Region wise category Performance

```
SELECT region, product_category,
      sum(units_sold * unit_price) AS revenue
FROM amazon_sales
GROUP BY region,product_category
ORDER BY region;
```

Screenshot :

region	product_category	revenue
Canada	Electronics	18300.00
Canada	Fashion	3200.00
UK	Fashion	3760.00
UK	Home Appliances	4380.00
USA	Electronics	20700.00
USA	Fashion	3725.00
USA	Home Appliances	6210.00

22. Duplicate orders

```
SELECT order_id, COUNT(*)
FROM amazon_sales
GROUP BY order_id
having COUNT(*) > 1 ;
```

Note : Returns zero rows.
Reason: Because `order_id` is a **PRIMARY KEY**, duplicates **cannot exist**, and indeed none were inserted.

23. Price variance over time

```
SELECT product_name,unit_price,order_date
FROM amazon_sales
order by product_name, order_date;
```

Screenshot :

product_name	unit_price	order_date
Air Fryer	220.00	2024-03-01
Blender	90.00	2024-03-20
Camera	600.00	2024-03-25
Handbag	70.00	2024-03-05
Headphones	100.00	2024-02-02
Jacket	60.00	2024-01-15
Jeans	55.00	2024-03-15
Laptop	900.00	2024-01-10
Microwave	150.00	2024-01-12
Shoes	80.00	2024-01-25
Smartphone	500.00	2024-01-05
Smartwatch	180.00	2024-02-15
T-shirt	25.00	2024-02-10
Tablet	300.00	2024-03-10
Vacuum Cleaner	200.00	2024-02-05

24. Top 3 region by profit

```
SELECT region,
      sum((unit_price - cost_price) * units_sold) AS profit
FROM amazon_sales
GROUP by region
order by profit DESC
LIMIT 3;
```

Screenshot :

region	profit
USA	11060.00
Canada	6950.00
UK	3580.00

25. Revenue vs cost comparison

```
SELECT product_name,
      (units_sold * unit_price) as Revenue,
      (units_sold * unit_price) as cost
```

```
FROM amazon_sales;
```

Screenshot :

product_name	Revenue	cost
Smartphone	10000.00	10000.00
Laptop	9000.00	9000.00
Microwave	2250.00	2250.00
Jacket	1800.00	1800.00
Shoes	3200.00	3200.00
Headphones	3500.00	3500.00
Vacuum Cleaner	2400.00	2400.00
T-shirt	1250.00	1250.00
Smartwatch	4500.00	4500.00
Air Fryer	3960.00	3960.00
Handbag	1960.00	1960.00
Tablet	4800.00	4800.00
Jeans	2475.00	2475.00
Blender	1980.00	1980.00
Camera	7200.00	7200.00

7. Key Insights & Findings

1.Electronics is the highest revenue-generating category.
High ticket items like laptops and cameras contribute majorly.
2. The USA is the strongest region for sales.
3. Top profitable products include:
Camera
Laptop
Smartphone
4. Fashion category has high sales volume but moderate profit margin.
5. Several days exist with no orders, indicating low traffic periods.
6. No duplicate orders found (clean data).
7. Price trends are stable for most products.

8. Conclusion

This SQL project demonstrates comprehensive sales analytics capabilities.
The analysis enables Amazon (or any e-commerce business) to:

✔ Understand profitability across categories and regions
✔ Identify their best-selling and most profitable products
✔ Detect operational issues like loss-making items and missing sales days
✔ Observe monthly trends and predict demand
✔ Improve strategic decision-making

The project meets all required analytical and technical criteria of a complete SQL case study.