Final Project

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"Sales Report Generation using SQL Server ROLLUP"

Introduction

In modern businesses, sales reporting is a crucial process for analyzing product performance, monitoring revenue trends, and supporting decision-making. Structured sales reports enable organizations to understand which product categories contribute the most to overall revenue, helping them plan better strategies for growth. This project focuses on creating a dynamic sales report using SQL Server's **ROLLUP** feature, which is an extension of the **GROUP BY** clause.
The objective of this project is to generate total sales for each product category along with a grand total of all sales. By leveraging the ROLLUP function, we can automate the computation of subtotals (category-level totals) and a final total without having to write multiple queries. This approach ensures better efficiency, scalability, and cleaner SQL code compared to manual aggregation techniques.
For demonstration purposes, a sample **Sales** table was created with different product categories such as Electronics, Clothing, and Furniture. The solution then applies SQL Server's ROLLUP function to produce a comprehensive sales report, where NULL values are replaced with the keyword "Total" for better readability.

Problem Statement

The task is to generate a comprehensive sales report that shows:

- Total sales for each product category, and
- An overall total of all sales.

The database contains a table named Sales with the following columns:

- **ProductCategory:** Category of the product sold.
- **ProductName:** Name of the product sold.
- **SaleAmount:** Amount of the sale.

The solution must use the **SQL Server ROLLUP** function along with the **GROUP BY** clause to compute both subtotals (for each category) and a grand total.

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Solution Approach

To solve the problem, the following steps, SQL procedures, and functions were implemented:

Table Creation

A table named Sales was created with the following columns:

- ProductCategory (VARCHAR) – stores the category of the product.
- ProductName (VARCHAR) – stores the name of the product.
- SaleAmount (DECIMAL) – stores the sales amount of each product.

```
CREATE TABLE Sales (
    ProductCategory VARCHAR(50),
    ProductName VARCHAR(50),
    SaleAmount DECIMAL(10,2)
);
```

Data Insertion

Sample data for Electronics, Clothing, and Furniture categories was inserted using the INSERT INTO statement:

```
INSERT INTO Sales (ProductCategory, ProductName, SaleAmount) VALUES
('Electronics', 'Laptop', 1000.00),
('Electronics', 'Phone', 800.00),
('Electronics', 'Tablet', 500.00),
('Clothing', 'Shirt', 300.00),
('Clothing', 'Pants', 400.00),
('Furniture', 'Sofa', 1200.00),
('Furniture', 'Bed', 900.00);
```

SQL Server ROLLUP

The ROLLUP operator was used with the GROUP BY clause to generate hierarchical totals:

- First, totals for each product category.
- Finally, the grand total across all categories.

IFNULL Function

IFNULL() was applied to replace NULL values generated by the ROLLUP function with the word "Total" for better readability.

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SELECT Statement

The query for generating the final report:

```sql
-- Sales Report Generation Using SQL Server ROLLUP
SELECT
    IFNULL(ProductCategory, 'Total') AS Category,
    IFNULL(ProductName, 'Total') AS Item,
    SUM(SaleAmount) AS TotalSales
FROM Sales
GROUP BY ProductCategory, ProductName WITH ROLLUP
ORDER BY
    (ProductCategory IS NULL),
    ProductCategory,
    (ProductName IS NULL),
    ProductName;
```

Clauses and Functions Used

- **GROUP BY:** For grouping records by product category and product name.
- **ROLLUP:** For generating subtotals and the overall total.
- **SUM():** For aggregating the SaleAmount.
- **ORDER BY:** To sort the result properly.
- **IFNULL():** To handle NULL values in the rollup results.

Sample Input

ProductCategory	ProductName	SaleAmount
Electronics	Laptop	1000.00
Electronics	Phone	800.00
Electronics	Tablet	500.00
Clothing	Shirt	300.00
Clothing	Pants	400.00
Furniture	Sofa	1200.00
Furniture	Bed	900.00

Expected Output

Category	Item	TotalSales
Clothing	Pants	400.00
Clothing	Shirt	300.00
Clothing	Total	700.00
Electronics	Laptop	1000.00
Electronics	Phone	800.00
Electronics	Tablet	500.00
Electronics	Total	2300.00
Furniture	Bed	900.00
Furniture	Sofa	1200.00
Furniture	Total	2100.00
Total	Total	5100.00

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Key Learnings / Conclusion

This project provided valuable insights into advanced SQL functionalities for generating structured and dynamic reports. By solving this problem, the following key learnings were achieved:

1. **Practical Use of ROLLUP**
   - Learned how the ROLLUP operator can automatically generate subtotals for grouped data and a grand total without requiring multiple queries or complex logic.
2. **Efficient Data Aggregation**
   - Understood how SUM() works with GROUP BY and ROLLUP to create a hierarchical report, which is essential for business analytics and real-world sales reporting.
3. **Handling NULL Values**
   - Learned the importance of replacing NULL values produced by ROLLUP with meaningful labels like "Total" using the IFNULL() function to improve readability.
4. **Optimizing Query Output**
   - Gained knowledge on using ORDER BY with logical conditions to display results in a clean and structured format.
5. **Understanding Real-World Applications**
   - Recognized how these SQL techniques can be applied in real business scenarios such as inventory management, financial summaries, or dashboard reports.
6. **Overall Learning Experience**
   - This project enhanced understanding of SQL Server's advanced features and how to write concise, efficient, and reusable queries to solve analytical problems.