Common Table Expressions (CTEs) in T-SQL

What is a Common Table Expression (CTE)?

A Common Table Expression (CTE) is a temporary result set that is defined within the execution scope of a single SELECT, INSERT, UPDATE, or DELETE statement.

It simplifies complex queries, improves readability, and supports recursive operations.

Key Features

1. Temporary Scope: CTEs exist only during the execution of the query.

2. Improved Readability: CTEs make complex queries easier to understand and maintain.

3. Recursive Queries: Useful for hierarchical or recursive data operations.

Syntax

```
WITH CTE_Name (Column1, Column2, ...)
AS
(
    -- CTE query definition
    SELECT ...
)
-- Query using the CTE
SELECT * FROM CTE_Name;
```

Use Cases of CTEs

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1. Simplifying Complex Queries: CTEs replace subqueries or derived tables, making queries more readable and maintainable.

2. Recursive Queries: CTEs are used for hierarchical data, such as employee-manager relationships or organizational structures.

3. Reusable Result Sets: Define a result set once and use it multiple times within a query.

Examples

Example 1: Simplifying a Complex Query

```
WITH AveragePriceCTE AS
(
    SELECT AVG(Price) AS AvgPrice
    FROM Products
)
SELECT ProductID, ProductName, Price
FROM Products, AveragePriceCTE
WHERE Price > AvgPrice;
```

Example 2: Recursive Query

```
WITH EmployeeHierarchy AS
(
    SELECT EmployeeID, ManagerID, EmployeeName, 1 AS Level
    FROM Employees
    WHERE ManagerID IS NULL
```

```
    UNION ALL

    SELECT e.EmployeeID, e.ManagerID, e.EmployeeName, eh.Level + 1
    FROM Employees e
    INNER JOIN EmployeeHierarchy eh ON e.ManagerID = eh.EmployeeID
)
SELECT * FROM EmployeeHierarchy;
```

Example 3: Reusable Result Set

```
WITH RankedProducts AS
(
    SELECT
        ProductID,
        CategoryID,
        ProductName,
        Price,
        RANK() OVER (PARTITION BY CategoryID ORDER BY Price DESC) AS Rank
    FROM Products
)
SELECT ProductID, CategoryID, ProductName, Price
FROM RankedProducts
WHERE Rank <= 3;
```

Practice Tasks

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1. Calculate Total Sales for Each Product: Create a CTE to calculate the total sales (Quantity * Price) for each product and list only those with total sales above $10,000.

2. Find Departments with More Than 10 Employees: Use a CTE to group employees by department and find departments with more than 10 employees.

3. Recursive Query for Parent-Child Relationships: Write a CTE to retrieve a folder structure hierarchy for a given root folder ID.

4. Identify High-Selling Categories: Create a CTE to identify product categories with average product prices above $50.