

Module 11

Using Table Expressions

Module Overview

- Using Views
- Using Inline TVFs
- Using Derived Tables
- Using CTEs

Lesson 1: Using Views

- Writing Queries That Return Results from Views
- Creating Simple Views
- Demonstration: Using Views

Writing Queries That Return Results from Views

- Views may be referenced in a SELECT statement just like a table
- Views are named table expressions with definitions stored in a database
- Like derived tables and CTEs, queries that use views can provide encapsulation and simplification
- From an administrative perspective, views can provide a security layer to a database

```
SELECT      <select_list>  
FROM        <view_name>  
ORDER BY    <sort_list>;
```

Creating Simple Views

- Views are saved queries created in a database by administrators and developers
- Views are defined with a single SELECT statement
- ORDER BY is not permitted in a view definition without the use of TOP, OFFSET/FETCH, or FOR XML
- To sort the output, use ORDER BY in the outer query
- View creation supports additional options beyond the scope of this class

```
CREATE VIEW HR.EmpPhoneList  
AS  
SELECT empid, lastname, firstname, phone  
FROM HR.Employees;
```

Demonstration: Using Views

In this demonstration, you will see how to:

- Create views
- Demonstration A

Lesson 2: Using Inline TVFs

- Writing Queries That Use Inline TVFs
- Creating Simple Inline TVFs
- Retrieving from Inline TVFs
- Demonstration: Inline TVFs

Writing Queries That Use Inline TVFs

- TVFs are named table expressions with definitions stored in a database
- TVFs return a virtual table to the calling query
- SQL Server provides two types of TVFs:
 - Inline, based on a single SELECT statement
 - Multi-statement, which creates and loads a table variable
- Unlike views, TVFs support input parameters
- Inline TVFs may be thought of as parameterized views

Creating Simple Inline TVFs

- TVFs are created by administrators and developers
- Create and name function and optional parameters with CREATE FUNCTION
- Declare return type as TABLE
- Define inline SELECT statement following RETURN

```
CREATE FUNCTION Sales.fn_LineTotal (@orderid INT)
RETURNS TABLE
AS
RETURN
    SELECT orderid,
           CAST((qty * unitprice * (1 - discount)) AS
              DECIMAL(8, 2)) AS line_total
    FROM   Sales.OrderDetails
    WHERE  orderid = @orderid ;
```

Retrieving from Inline TVFs

- SELECT from function
- Use two-part name
- Pass in parameters

```
SELECT orderid, line_total  
FROM Sales.fn_LineTotal(10252) AS LT;
```

orderid	line_total
10252	2462.40
10252	47.50
10252	1088.00

Demonstration: Inline TVFs

In this demonstration, you will see how to:

- Create inline TVFs

Demo B

Lesson 3: Using Derived Tables

- Writing Queries with Derived Tables
- Guidelines for Derived Tables
- Using Aliases for Column Names in Derived Tables
- Passing Arguments to Derived Tables
- Nesting and Reusing Derived Tables
- Demonstration: Using Derived Tables

Writing Queries with Derived Tables

- Derived tables are named query expressions created within an outer SELECT statement
- Not stored in database—represents a virtual relational table
- When processed, unpacked into query against underlying referenced objects
- Allow you to write more modular queries

```
SELECT <column_list>  
FROM (  
    <derived_table_definition>  
) AS <derived_table_alias>;
```

- Scope of a derived table is the query in which it is defined

Guidelines for Derived Tables

Derived Tables Must

- Have an alias
- Have names for all columns
- Have unique names for all columns
- Not use an ORDER BY clause (without TOP or OFFSET/FETCH)
- Not be referred to multiple times in the same query

Derived Tables May

- Use internal or external aliases for columns
- Refer to parameters and/or variables
- Be nested within other derived tables

Using Aliases for Column Names in Derived Tables

- Column aliases may be defined inline:

```
SELECT orderyear, COUNT(DISTINCT custid) AS cust_count
FROM (
    SELECT YEAR(orderdate) AS orderyear, custid
    FROM Sales.Orders) AS derived_year
GROUP BY orderyear;
```

- Column aliases may be defined externally:

```
SELECT orderyear, COUNT(DISTINCT custid) AS cust_count
FROM (
    SELECT YEAR(orderdate), custid
    FROM Sales.Orders) AS
    derived_year(orderyear, custid)
GROUP BY orderyear;
```

Passing Arguments to Derived Tables

- Derived tables may refer to arguments
- Arguments might be:
 - Variables declared in the same batch as the SELECT statement
 - Parameters passed into a table-valued function or stored procedure

```
DECLARE @emp_id INT = 9;  
SELECT orderyear, COUNT(DISTINCT custid) AS cust_count  
FROM (  
    SELECT YEAR(orderdate) AS orderyear, custid  
    FROM Sales.Orders  
    WHERE empid=@emp_id  
) AS derived_year  
GROUP BY orderyear;
```


Nesting and Reusing Derived Tables

- Derived tables may be nested, though not recommended:

```
SELECT orderyear, cust_count
FROM (SELECT orderyear,
             COUNT(DISTINCT custid) AS cust_count
       FROM (SELECT YEAR(orderdate) AS orderyear,
                    custid
              FROM Sales.Orders) AS derived_table_1
          GROUP BY orderyear) AS derived_table_2
WHERE cust_count > 80;
```

- Derived tables may not be referred to multiple times in the same query
 - Each reference must be separately defined

Demonstration: Using Derived Tables

In this demonstration, you will see how to:

- Write queries that create derived tables
- Demonstration 

Lesson 4: Using CTEs

- Writing Queries with CTEs
- Creating Queries with Common Table Expressions
- Demonstration: Using CTEs

Writing Queries with CTEs

- CTEs are named table expressions defined in a query
- CTEs are similar to derived tables in scope and naming requirements
- Unlike derived tables, CTEs support multiple definitions, multiple references, and recursion

```
WITH <CTE_name>  
AS (  
    <CTE_definition>  
)  
<outer query referencing CTE>;
```

Creating Queries with Common Table Expressions

- To create a CTE:
 - Define the table expression in a WITH clause
 - Assign column aliases (inline or external)
 - Pass arguments if desired
 - Reference the CTE in the outer query

```
WITH CTE_year AS
(
    SELECT YEAR(orderdate) AS orderyear, custid
    FROM Sales.Orders
)
SELECT orderyear, COUNT(DISTINCT custid) AS cust_count
FROM CTE_year
GROUP BY orderyear;
```

Demonstration: Using CTEs

In this demonstration, you will see how to:

- Write queries that create CTEs
- Demonstration 🖐️📄

Module Review and Takeaways

- Review Question(s)
- **Question**
- When would you use a CTE rather than a derived table for a query?
- **Question**
- Which table expressions allow variables to be passed in as parameters to the expression?