<https://mva.microsoft.com/en-US/training-courses/querying-microsoft-sql-server-2012-databases-jump-start-8241>

--ddl or data definition language: create alter drop

--dml or data manipulation language: select insert update delete (CRUD operations)

--dcl or data control language: grant revoke deny

**T-SQL enforces operator precedence**

|  |  |
| --- | --- |
| **Elements:** | **Predicates and Operators:** |
| Predicates | IN, BETWEEN, LIKE |
| Comparison Operators | =, >, <, >=, <=, <>, !=, !>, !< |
| Logical Operators | AND, OR, NOT |
| Arithmetic Operators | +, -, \*, /, % |
| Concatenation | + |

**T-SQL functions**:

String functions: SUBSTRING,LEFT, RIGHT,LEN,DATALENGTH, REPLACE,REPLICATE,UPPER, LOWER,RTRIM, LTRIM

Date and time functions: GETDATE,SYSTDATETIME,GETUTCDATE,DATEADD,DATEDIFF,YEAR,MONTH,DAY

Aggregate functions: SUM,MIN,MAX,AVG,COUNT

**T-SQL variables**:

Local variables in T-SQL temporarily store a value of a specific data type

Name begins with single @ sign

@@ reserved for system functions

Assigned a data type

Must be declared and used within the same batch

In SQL Server 2008 and later, can declare and initialize in the same statement

**DECLARE @MyVar int = 30;**

**T-SQL expressions**:

Combination of identifiers, values, and operators evaluated to obtain a single result

Can be used in SELECT statements

SELECT clause

WHERE clause

Can be single constant, single-valued function, or variable

Can be combined if expressions have same the data type

**SELECT YEAR(OrderDate) + 1 ...**

**SELECT OrderQty \* UnitPrice ...**

**T-SQL batch separators**:

Batches are sets of commands sent to SQL Server as a unit

Batches determine variable scope, name resolution

To separate statements into batches, use a separator:

SQL Server tools use the GO keyword

GO is not a SQL Server T-SQL command

**T-SQL flow control, errors and transactions**:

Used in programmatic code objects such as stored procedures, triggers, statement blocks

Flow control: IF...ELSE,WHILE,BREAK,CONTINUE,BEGIN...END

Error handling: TRY…CATCH

Transaction control: BEGIN TRANSACTION,COMMIT TRANSACTION,ROLLBACK TRANSACTION

The order in which a query is written is not the order in which it is evaluated by the server. The order is:

5: SELECT <select list>

1: FROM <table source>

2: WHERE <search condition>

3: GROUP BY <group by list>

4: HAVING <search condition>

6: ORDER BY <order by list>

USE AdventureWorks2014;

SELECT SalesPersonID, YEAR(OrderDate) AS OrderYear

FROM Sales.SalesOrderHeader

WHERE CustomerID = 29974

GROUP BY SalesPersonID, YEAR(OrderDate)

HAVING COUNT(\*) > 1

ORDER BY SalesPersonID, OrderYear;

When performance tuning, using SELECT 1 gives you stats for just speaking to sql server on network(rather than what happens inside the database engine)

**Advanced SELECT clauses (DISTINCT, aliases, CASE, and scalar functions)**

Distinct: Specifies that only unique rows can appear in the result set

Removes duplicates based on column list results, not source table

Provides uniqueness across set of selected columns

Removes rows already operated on by WHERE, HAVING, and GROUP BY clauses

Some queries may improve performance by filtering out duplicates prior to execution of SELECT clause

SELECT DISTINCT <column list>

FROM <table or view>

**SELECT DISTINCT StoreID**

**FROM Sales.Customer;**

Using aliases to refer to columns: only ‘AS’ is the standard. Rest are here for legacy reasons

**SELECT SalesOrderID, UnitPrice, OrderQty AS Quantity**

**FROM Sales.SalesOrderDetail;**

**SELECT SalesOrderID, UnitPrice, Quantity =** **OrderQty**

**FROM Sales.SalesOrderDetail;**

**SELECT SalesOrderID, UnitPrice** **Quantity**

**FROM Sales.SalesOrderDetail;**

Using aliases to refer to tables: using alias makes name shorter and also then u can use same table multiple times(with different aliases) in joins

**SELECT SalesOrderID, ProductID FROM Sales.SalesOrderDetail AS SalesOrders;**

**SELECT SalesOrderID, ProductID FROM Sales.SalesOrderDetail SalesOrders;**

**SELECT SalesOrders.SalesOrderID, SalesOrders.ProductID FROM Sales.SalesOrderDetail AS SalesOrders;**

**T-SQL case expressions**:

Simple CASE

Compares one value to a list of possible values and returns first match

If no match, returns value found in optional ELSE clause

If no match and no ELSE, returns NULL

Searched CASE

Evaluates a set of predicates, or logical expressions

Returns value found in THEN clause matching first expression that evaluates to TRUE

T-SQL CASE expressions return a single (scalar) value

CASE expressions may be used in:

SELECT column list (behaves as calculated column requiring an alias)

WHERE or HAVING clauses

ORDER BY clause

**SELECT ProductID, Name, ProductSubCategoryID,**

**CASE ProductSubCategoryID**

**WHEN 1 THEN 'Beverages'**

**ELSE 'Unknown Category'**

**END**

**FROM Production.Product**

**Joins**:

|  |  |
| --- | --- |
| **Join Type** | **Description** |
| Cross | Combines all rows in both tables (creates Cartesian product). |
| Inner(the default join) | Starts with Cartesian product; applies filter to match rows between tables based on predicate. |
| Outer | Starts with Cartesian product; all rows from designated table preserved, matching rows from other table retrieved. Additional NULLs inserted as placeholders. |

Inner Join: As it is the default join, just specify join for inner join

Returns only rows where a match is found in both tables

Matches rows based on attributes supplied in predicate

ON clause in SQL-92 syntax

Why filter in ON clause?

Logical separation between filtering for purposes of JOIN and filtering results in WHERE

‘on’ filter is applied before the ‘where’ filter

Typically no difference to query optimizer

If JOIN predicate operator is =, also known as equi-join

**SELECT SOH.SalesOrderID, SOH.OrderDate, SOD.ProductID, SOD.UnitPrice, SOD.OrderQty**

**FROM Sales.SalesOrderHeader AS SOH**

**JOIN Sales.SalesOrderDetail AS SOD**

**ON SOH.SalesOrderID = SOD.SalesOrderID;**

Outer Join:

Returns all rows from one table and any matching rows from second table

One table’s rows are “preserved”

Designated with LEFT, RIGHT, FULL keyword

All rows from preserved table output to result set

Matches from other table retrieved

Additional rows added to results for non-matched rows

NULLs added in place where attributes do not match

Example: Return all customers and for those who have placed orders, return order information. Customers without matching orders will display NULL for order details.

Customers that did not place orders

SELECT CUST.CustomerID, CUST.StoreID, ORD.SalesOrderID, ORD.OrderDate

FROM Sales.Customer AS CUST

LEFT OUTER JOIN Sales.SalesOrderHeader AS ORD

ON CUST.CustomerID = ORD.CustomerID

WHERE ORD.SalesOrderID IS NULL;

Cross join:

Combine each row from first table with each row from second table

All possible combinations are displayed

Logical foundation for inner and outer joins

INNER JOIN starts with Cartesian product, adds filter

OUTER JOIN takes Cartesian output, filtered, adds back non-matching rows (with NULL placeholders)

Due to Cartesian product output, not typically a desired form of JOIN

Some useful exceptions:

Generating a table of numbers for testing

Example:

Create test data by returning all combinations of two inputs:

SELECT EMP1.BusinessEntityID, EMP2.JobTitle

FROM HumanResources.Employee AS EMP1

CROSS JOIN HumanResources.Employee AS EMP2;

Self Join:

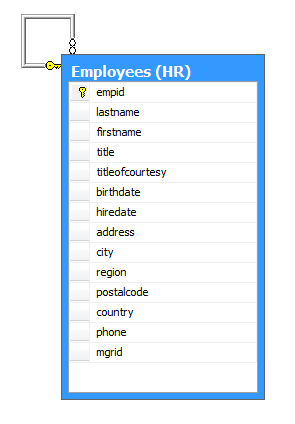
Why use self-joins?

Compare rows in same table to each other

Create two instances of same table in FROM clause

At least one alias required

Example: Return all employees and the name of the employee’s manager



Return all employees with ID of employee’s manager when a manager exists (INNER JOIN):

SELECT EMP.EmpID, EMP.LastName, EMP.JobTitle, EMP.MgrID, MGR.LastName

FROM HR.Employees AS EMP

INNER JOIN HR.Employees AS MGR

ON EMP.MgrID = MGR.EmpID;

Return all employees with ID of manager (OUTER JOIN). This will return NULL for the CEO:

SELECT EMP.EmpID, EMP.LastName,

EMP.Title, MGR.MgrID

FROM HumanResources.Employee AS EMP

LEFT OUTER JOIN HumanResources.Employee AS MGR

ON EMP.MgrID = MGR.EmpID;

Order By clause:

ORDER BY sorts rows in results for presentation purposes

Use of ORDER BY guarantees the sort order of the result

Last clause to be logically processed(processed after SELECT)

Sorts all NULLs together

ORDER BY can refer to:

Columns by name, alias or ordinal position (not recommended)

Columns not part of SELECT list unless DISTINCT clause specified

Declare sort order with ASC or DESC

SELECT SalesOrderID, CustomerID, OrderDate

FROM Sales.SalesOrderHeader

ORDER BY OrderDate;

SELECT SalesOrderID, CustomerID, YEAR(OrderDate) AS OrderYear

FROM Sales.SalesOrderHeader

ORDER BY OrderYear;

SELECT SalesOrderID, CustomerID, OrderDate

FROM Sales.SalesOrderHeader

ORDER BY OrderDate DESC;

WHERE clause:

WHERE clauses use predicates

Must be expressed as logical conditions

Only rows for which predicate evaluates to TRUE are accepted

Values of FALSE or UNKNOWN are filtered out

WHERE clause follows FROM, precedes other clauses

Can’t see aliases declared in SELECT clause

Can be optimized by SQL Server to use indexes

SELECT CustomerID, TerritoryID

FROM Sales.Customer

WHERE TerritoryID = 6;

SELECT CustomerID, TerritoryID

FROM Sales.Customer

WHERE TerritoryID >= 6;

SELECT CustomerID, TerritoryID, StoreID

FROM Sales.Customer

WHERE StoreID >= 1000 AND StoreID <= 1200;

Filtering data in the SELECT clause:

TOP allows you to limit the number or percentage of rows returned

Works with ORDER BY clause to limit rows by sort order

If ORDER BY list is not unique, results are not deterministic (no single correct result set)

Modify ORDER BY list to ensure uniqueness, or use TOP WITH TIES

Added to SELECT clause:

SELECT TOP (N) | TOP (N) Percent

With percent, number of rows rounded up

SELECT TOP (N) WITH TIES

Retrieve duplicates where applicable (nondeterministic)

TOP is proprietary to Microsoft SQL Server

SELECT TOP (20) SalesOrderID, CustomerID, TotalDue

FROM Sales.SalesOrderHeader

ORDER BY TotalDue DESC;

--this might show u 23 rows

SELECT TOP (20) WITH TIES SalesOrderID, CustomerID, TotalDue

FROM Sales.SalesOrderHeader

ORDER BY TotalDue DESC;

SELECT TOP (1) PERCENT SalesOrderID, CustomerID, TotalDue

FROM Sales.SalesOrderHeader

ORDER BY TotalDue DESC;

Offset: could be used for paging…It offsets the result set by the number of records specified. Here we are getting rows 21 to 30.

select \* from Production.Product

order by ListPrice, ProductID

offset 20 rows

fetch next 10 rows only;

Union: if only say union, then the combined result set would have distinct records. UNION ALL would remove duplicates

--i had to use wrapper selects as otherwise it threw an error

select \* from (

select top(2) Name,ListPrice,Color from Production.Product as p

where Color='Black'

order by ListPrice desc

) as a

Union all

select \* from(

select top(2) Name,ListPrice,Color from Production.Product as p

where Color='Red'

order by ListPrice desc

) as b

Null values:

Different components of SQL Server handle NULL differently

Query filters (ON, WHERE, HAVING) filter out UNKNOWNs

CHECK constraints accept UNKNOWNS

ORDER BY, DISTINCT treat NULLs as equals

Testing for NULL

Use IS NULL or IS NOT NULL rather than = NULL or <> NULL

SELECT CustomerID, StoreID, TerritoryID

FROM Sales.Customer

WHERE StoreID IS NULL

ORDER BY TerritoryID

SQL server data types:

SQL Server associates columns, expressions, variables, and parameters with data types

Data types determine what kind of data can be stored in the field:

Integers, characters, dates, money, binary strings, etc.

SQL Server supplies several built-in data types

Developers can also define custom types

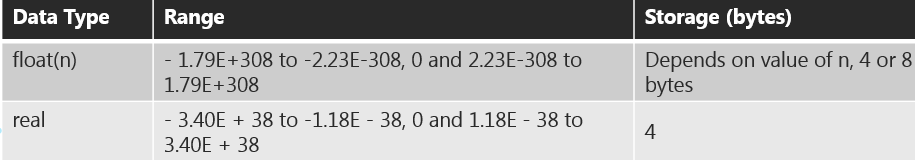
Aliases in T-SQL

User-defined types in .NET code

Built-in data types are categorized as shown in the table below

|  |  |
| --- | --- |
| **SQL Server Data Type Categories** | |
| Exact numeric | Unicode characters |
| Approximate numeric | Binary strings |
| Date and time | Other |
| Character strings |  |

Approximate Numeric types:



float(24) is the ISO synonym for float

In float(n), n is the number of bytes used to store the mantissa of the float number in scientific notation

Values of float are truncated when converted to integer types

Exact Numeric types:

|  |  |  |
| --- | --- | --- |
| **Data type** | **Range** | **Storage (bytes)** |
| tinyint | 0 to 255 | 1 |
| smallint | -32,768 to 32,767 | 2 |
| int | 2^31 (-2,147,483,648) to  2^31-1 (2,147,483,647) | 4 |
| Bigint | -2^63 (-9,223,372,036,854,775,808) to 2^63-1 (9,223,372,036,854,775,807) | 8 |
| bit | 1, 0 or NULL | 1 |
| decimal/numeric | - 10^38 +1 through 10^38 – 1 when maximum precision is used | 5-17 |
| money | -922,337,203,685,477.5808 to 922,337,203,685,477.5807 | 8 |
| smallmoney | - 214,748.3648 to 214,748.3647 | 4 |

Decimal/numeric are functionally equivalent and use precision and scale parameters:

DECLARE @mydecimal AS DECIMAL(8,2)

Note that the bit field still uses 1 byte. Strange.

Binary String data types: for storing blobs. Say image data.

|  |  |  |
| --- | --- | --- |
| **Data Type** | **Range** | **Storage (bytes)** |
| binary(n) | 1-8000 bytes | n bytes |
| varbinary(n) | 1-8000 bytes | actual length + 2 |
| varbinary(MAX) | 1-2.1 billion (approx) bytes | actual length + 2 |

Other data types:

|  |  |  |  |
| --- | --- | --- | --- |
| **Data Type** | **Range** | **Storage (bytes)** | **Remarks** |
| rowversion | Auto-generated | 8 | Successor type to timestamp |
| uniqueidentifier | Auto-generated | 16 | Globally unique identifier (GUID) |
| xml | 0-2 GB | 0-2 GB | Stores XML in native hierarchical structure |
| cursor | N/A | N/A | Not a storage data type |
| hierarchyid | N/A | Depends on content | Represents position in a hierarchy |
| sql\_variant | 0-8000 bytes | Depends on content | Can store data of various data types |
| table | N/A | N/A | Not a storage data type, used for query and programmatic operations |

Converting strings with parse:

PARSE is new function in SQL Server 2012 that converts strings to date, time, and number types

|  |  |
| --- | --- |
| **sPARSE element** | **Comment** |
| String\_value | Formatted nvarchar(4000) input |
| Data\_type | Requested data type ouput |
| Culture | Optional string in .NET culture form: en-US, es-ES, ar-SA, etc. |

SELECT PARSE('02/12/2012' AS datetime2 USING 'en-US') AS parse\_result;

--this is the iso format as well as the ansi format. yyyy-mm-dd

select OrderDate from Sales.SalesOrderHeader

select PARSE('2011-05-31' as datetime using 'en-US')

select try\_parse('hejc' as datetime using 'en-US')

Parse is going from string to date and Format will go form date to string

SELECT FORMAT(ORDERDATE,'yyyy:MM:dd HH','sv-SE' )FROM SALES.SALESORDERHEADER

Character data types:

SQL Server supports two kinds of character data types:

Regular: CHAR, VARCHAR

One byte stored per character

Only 256 possible characters – limits language support

Unicode: NCHAR, NVARCHAR

Two bytes stored per character

65k characters represented – multiple language support

Precede characters with N' (National)

TEXT, NTEXT deprecated

Use VARCHAR(MAX), NVARCHAR(MAX) instead

|  |  |  |
| --- | --- | --- |
| **Data Type** | **Range** | **Storage** |
| CHAR(n),  NCHAR(n) | 1-8000 characters | n bytes, padded  2\*n bytes, padded |
| VARCHAR(n), NVARCHAR(n) | 1-8000 characters | Actual length +2 bytes  2\* (Actual length) +2 bytes |
| VARCHAR(MAX), NVARCHAR(MAX) | 1-2^31-1 characters | Actual length + 2 |

CHAR, NCHAR are fixed length

VARCHAR, NVARCHAR are variable length

Character data is delimited with single quotes

SQL Server uses the + (plus) sign to concatenate characters: Concatenating a value with a NULL returns a NULL

SELECT BusinessEntityID, FirstName, LastName, FirstName + N' ' + LastName AS FullName

FROM Person.Person;

SQL Server 2012 introduces CONCAT() function: Converts NULL to empty string before concatenation

SELECT AddressLine1, City, StateProvinceID,  CONCAT(AddressLine1, ', ' + City, ', ' + PostalCode) AS Location

FROM Person.Address

Character string functions

|  |  |  |
| --- | --- | --- |
| **Function** | **Syntax** | **Remarks** |
| SUBSTRING() | SUBSTRING (expression , start , length) | Returns part of an expression |
| LEFT(), RIGHT() | LEFT (expression , integer\_value) RIGHT (expression , integer\_value) | LEFT() returns left part of string up to integer\_value. RIGHT() returns right part of string. |
| LEN(), DATALENGTH() | LEN ( string\_expression )  DATALENGTH ( expression ) | LEN() returns the number of characters of the specified string expression, excluding trailing blanks. DATALENGTH() returns the number bytes used. |
| CHARINDEX() | CHARINDEX ( expressionToFind, expressionToSearch ) | Searches an expression for another expression and returns its starting position if found. Optional start position. |
| REPLACE() | REPLACE ( string\_expression , string\_pattern , string\_replacement ) | Replaces all occurrences of a specified string value with another string value. |
| UPPER(), LOWER() | UPPER ( character\_expression )  LOWER ( character\_expression ) | UPPER() returns a character expression with lowercase character data converted to uppercase. LOWER() converts uppercase to lowercase. |

Like predicate:

The LIKE predicate used to check a character string against a pattern

Patterns expressed with symbols

% (Percent) represents a string of any length

\_ (Underscore) represents a single character

[<List of characters>] represents a single character within the supplied list

[<Character> - <character>] represents a single character within the specified range

[^<Character list or range>] represents a single character not in the specified list or range

ESCAPE Character allows you to search for a character that is also a wildcard character (%, \_, [, ] for example)

SELECT ProductLine, Name,ProductNumber

FROM Production.Product

WHERE Name LIKE 'Mountain%'

Performance: If the wild card '%' is after the string, then the index on Name column would be used for searching and thus would be fast. If the wild card is at the start of the string, then index could not be used and a scan would have to be performed and would be slow.

Date and time data types:

Older versions of SQL Server supported only DATETIME and SMALLDATETIME

DATE, TIME, DATETIME2, and DATETIMEOFFSET introduced in SQL Server 2008

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data Type** | **Storage (bytes)** | **Date Range** | **Accuracy** | **Recommended Entry Format** |
| DATETIME | 8 | January 1, 1753 to December 31, 9999 | 3-1/3 milliseconds | 'YYMMDD hh:mm:ss:nnn' |
| SMALLDATETIME | 4 | January 1, 1900 to June 6, 2079 | 1 minute | 'YYMMDD hh:mm:ss:nnn' |
| DATETIME2 | 6 to 8 | January 1, 0001 to December 31, 9999 | 100 nanoseconds | 'YYMMDD hh:mm:ss.nnnnnn' |
| DATE | 3 | January 1, 0001 to December 31, 9999 | 1 day | 'YYYY-MM-DD' |
| TIME | 3 to 5 |  | 100 nanoseconds | 'hh:mm:ss:nnnnnnn' |
| DATETIMEOFFSET | 8 to 10 | January 1, 0001 to December 31, 9999 | 100 nanoseconds | 'YY-MM-DD hh:mm:ss:nnnnnnn [+|-]hh:mm' |

--datettime2 works correctly due to precision/accuracy...

--datetime would round up here...anyway, u would be off by anwhere between 3 to 1/3 milliseconds and tha could play up in

--a unexpected way.So .997 is taken as the end of the day

select CAST('2013-09-13 23:59:59.999' as datetime) ;--returns 2013-09-14 00:00:00.000

select CAST('2013-09-13 23:59:59.998' as datetime) ;--returns 2013-09-13 23:59:59.997

select CAST('2013-09-13 23:59:59.997' as datetime) ;--returns 2013-09-13 23:59:59.997

select CAST('2013-09-13 23:59:59.99' as datetime) ;--returns 2013-09-13 23:59:59.990

select CAST('2013-09-13 23:59:59.999' as datetime2) ;--returns 2013-09-13 23:59:59.9990000

we should use < tomorrow in datetime predicates to avoid problems like these

|  |  |  |
| --- | --- | --- |
| **Data Type** | **Language-Neutral Formats** | **Examples** |
| DATETIME | 'YYYYMMDD hh:mm:ss.nnn'  'YYYY-MM-DDThh:mm:ss.nnn'  'YYYYMMDD' | '20120212 12:30:15.123'  '2012-02-12T12:30:15.123'  '20120212' |
| SMALLDATETIME | 'YYYYMMDD hh:mm'  'YYYY-MM-DDThh:mm'  'YYYYMMDD' | '20120212 12:30'  '2012-02-12T12:30'  '20120212' |
| DATETIME2 | 'YYYY-MM-DD'  'YYYYMMDD hh:mm:ss.nnnnnnn'  'YYYY-MM-DD hh:mm:ss.nnnnnnn'  'YYYY-MM-DDThh:mm:ss.nnnnnnn'  'YYYYMMDD'  'YYYY-MM-DD' | '20120212 12:30:15.1234567'  '2012-02-12 12:30:15.1234567'  '2012-02-12T12:30:15.1234567'  '20120212'  '2012-02-12' |
| DATE | 'YYYYMMDD'  'YYYY-MM-DD' | '20120212'  '2012-02-12' |
| TIME | 'hh:mm:ss.nnnnnnn' | '12:30:15.1234567' |
| DATETIMEOFFSET | 'YYYYMMDD hh:mm:ss.nnnnnnn [+|-]hh:mm'  'YYYY-MM-DD hh:mm:ss.nnnnnnn [+|-]hh:mm'  'YYYYMMDD'  'YYYY-MM-DD' | '20120212 12:30:15.1234567 +02:00'  '2012-02-12 12:30:15.1234567 +02:00'  '20120212'  '2012-02-12' |

SQL Server doesn't offer an option for entering a date or time value explicitly

Dates and times are entered as character literals and converted explicitly or implicitly

For example, CHAR converted to DATETIME due to precedence

Formats are language-dependent, can cause confusion

Best practices:

Use character strings to express date and time values

Use language-neutral formats

--this works

SELECT SalesOrderID, CustomerID, OrderDate

FROM Sales.SalesOrderHeader

WHERE OrderDate = '20110531';

--this works as well

SELECT SalesOrderID, CustomerID, OrderDate

FROM Sales.SalesOrderHeader

WHERE OrderDate = '2011-05-31';

DATETIME, SMALLDATETIME, DATETIME2, and DATETIMEOFFSET include both date and time data

If only date is specified, time set to midnight (all zeroes)

If only time is specified, date set to base date (January 1, 1900)

DECLARE @DateOnly DATETIME = '20120212';

SELECT @DateOnly;--returns 2012-02-12 00:00:00.000

Date values converted from character literals often omit time

Queries written with equality operator for date will match midnight

SELECT SalesOrderID, CustomerID, OrderDate

FROM Sales.SalesOrderHeader

WHERE OrderDate = '20110531';

If time values are stored, queries need to account for time past midnight on a date

Use range filters instead of equality

SELECT SalesOrderID, CustomerID, OrderDate

FROM Sales.SalesOrderHeader

WHERE OrderDate >= '20110531' and OrderDate< '20110601' ;

Date and time functions:

|  |  |  |
| --- | --- | --- |
| **Function** | **Return Type** | **Remarks** |
| GETDATE() | datetime | Current date and time. No time zone offset. |
| GETUTCDATE() | datetime | Current date and time in UTC. |
| CURRENT\_TIMESTAMP | datetime | Current date and time. No time zone offset. ANSI standard. |
| SYSDATETIME() | datetime2 | Current date and time. No time zone offset |
| STSUTCDATETIME() | datetime2 | Current date and time in UTC. |
| SYSDATETIMEOFFSET() | datetimeoffset | Current date and time. Includes time zone offset |

SELECT CURRENT\_TIMESTAMP;

SELECT SYSUTCDATETIME();

Functions that return part of date and times:

|  |  |  |  |
| --- | --- | --- | --- |
| **Function** | **Syntax** | **Return Type** | **Remarks** |
| DATENAME() | DATENAME(datepart, date) | nvarchar | Use 'year', 'month', 'day' as datepart |
| DATEPART() | DATEPART(datepart, date) | int | Use 'year', 'month', 'day' as datepart |
| DAY() | DAY(datevalue) | int |  |
| MONTH() | MONTH(datevalue) | int |  |
| YEAR() | YEAR(datevalue) | int |  |

SELECT DATENAME(year,'20120212');

SELECT DAY('20120212');

Functions that return date and time from parts:

|  |  |  |
| --- | --- | --- |
| **Function** | **Syntax** | **Return Type** |
| DATEFROMPARTS() | DATEFROMPARTS(year, month, day) | date |
| DATETIMEFROMPARTS() | DATETIMEFROMPARTS(year, month, day, hour, minute, seconds, milliseconds) | datetime |
| DATETIME2FROMPARTS() | DATETIME2FROMPARTS(year, month, day, hour, minute, seconds, fractions, precision) | Datetime2 |
| DATETIMEOFFSETFROMPARTS() | DATETIMEOFFSETFROMPARTS(year, month, day, hour, minute, seconds, fractions, hour\_offset, minute\_offset, precision) | datetime |
| SMALLDATETIMEFROMPARTS() | SMALLDATETIMEFROMPARTS(year, month, day, hour, minute) | smalldatetime |
| TIMEFROMPARTS() | TIMEFROMPARTS(hour, minute, seconds, fractions, precision) | time |
|  |  |  |

SELECT DATEFROMPARTS(2012,2,12);

SELECT DATETIME2FROMPARTS(2012,2,12,8,30,0,0,0);

Functions that modify date and time values:

|  |  |  |
| --- | --- | --- |
| **Function** | **Syntax** | **Remarks** |
| DATEADD() | DATEADD(datepart, interval, date) | Adds interval to date, returns same datatype as date |
| EOMONTH() | EOMONTH(start\_date, interval) | Returns last day of month as start date, with optional offset |
| SWITCHOFFSET() | SWITCHOFFSET(datetimeoffset, time\_zone) | Changes time zone offset |
| TODATETIMEOFFSET() | TODATETIMEOFFSET(expression, time\_zone) | Converts datetime2 into datetimeoffset |

SELECT DATEADD(day,1,'20120212');

SELECT EOMONTH('20120212');

Functions that operate on date and time values:

|  |  |  |
| --- | --- | --- |
| **Function** | **Syntax** | **Remarks** |
| DATEDIFF() | DATEDIFF(datepart, start\_date, end\_date) | Returns the number of boundaries crossed for the specified datepart |
| ISDATE() | ISDATE(expression) | Determines whether a datetime or smalldate time is a valid value |

Converting with cast:

Converts a value from one data type to another

Can be used in SELECT and WHERE clauses

ANSI standard

Truncation can occur if converting to smaller data type

CAST Example:

SELECT CAST(SYSDATETIME() AS date) AS 'TodaysDate';

Returns an error if data types are incompatible:

--attempt to convert datetime2 to int

SELECT CAST(SYSDATETIME() AS int);

Converting with convert:

Converts a value from one data type to another

Can be used in SELECT and WHERE clauses

CONVERT is specific to SQL Server, not standards-based

Style specifies how input value is converted:

Date, time, numeric, XML, etc.

Example:

SELECT CONVERT(CHAR(8), CURRENT\_TIMESTAMP,112) AS ISO\_style;

**SQL Server 2012 built-in function types**:

|  |  |
| --- | --- |
| **Function Category** | **Description** |
| Scalar | Operate on a single row, return a single value |
| Grouped Aggregate | Take one or more values but return a single, summarizing value |
| Window | Operate on a window (set) of rows |
| Rowset | Return a virtual table that can be used subsequently in a T-SQL statement |

Scalar functions:

Scalar function categories

* Configuration
* Conversion
* Cursor
* Date and Time
* Logical
* Mathematical
* Metadata
* Security
* String
* System
* System Statistical
* Text and Image

Operate on elements from a single row as inputs, return a single value as output.

Return a single (scalar) value

Can be used like an expressionin queries

May be deterministic or non-deterministic

Collation depends on input value or default collation of database

SELECT SalesOrderID, YEAR(OrderDate) AS OrderYear

FROM Sales.SalesOrderHeader;

SELECT ABS(-1.0), ABS(0.0), ABS(1.0);

SELECT CAST(SYSDATETIME() AS date);

SELECT DB\_NAME() AS current\_database;

Window functions:

Functions applied to a window, or set of rows

Include ranking, offset, aggregate and distribution functions

SELECT TOP(5) ProductID, Name, ListPrice, RANK() OVER(ORDER BY ListPrice DESC) AS RankByPrice

FROM Production.Product

ORDER BY RankByPrice;

749 Road-150 Red, 62 3578.27 1

750 Road-150 Red, 44 3578.27 1

751 Road-150 Red, 48 3578.27 1

752 Road-150 Red, 52 3578.27 1

753 Road-150 Red, 56 3578.27 1

select ROW\_NUMBER() over (order by SalesOrderDetailID) as rownum1

,\*

from Sales.SalesOrderDetail as t

order by SalesOrderDetailID

select ROW\_NUMBER() over (order by SalesOrderDetailID) as rownum1

, ROW\_NUMBER() over (partition by salesorderid order by SalesOrderDetailID) as rownum1

,\*

from Sales.SalesOrderDetail as t

order by SalesOrderDetailID

select ROW\_NUMBER() over (order by SalesOrderDetailID) as rownum1

, ROW\_NUMBER() over (partition by salesorderid order by SalesOrderDetailID) as rownum1

, SUM(UnitPrice) over (partition by salesorderid ) as totalorderprice

,\*

from Sales.SalesOrderDetail as t

order by SalesOrderDetailID

select ROW\_NUMBER() over (order by SalesOrderDetailID) as rownum1

, ROW\_NUMBER() over (partition by salesorderid order by SalesOrderDetailID) as rownum1

, SUM(UnitPrice) over (partition by salesorderid ) as totalorderprice

, SUM(UnitPrice) over () as totaltotalorderprice

,\*

from Sales.SalesOrderDetail as t

order by SalesOrderDetailID

SELECT TOP(5) ProductID, Name, ListPrice, RANK() OVER(ORDER BY ListPrice DESC) AS RankByPrice

FROM Production.Product

ORDER BY RankByPrice;

**Writing logical tests with functions**:

ISNUMERIC tests whether an input expression is a valid numeric data type

Returns a 1 when the input evaluates to any valid numeric type, including FLOAT and MONEY, otherwise returns 0

SELECT ISNUMERIC('SQL') AS isnmumeric\_result;

SELECT ISNUMERIC('101.99') AS isnmumeric\_result;

**Performing conditional tests with IIF**:

IIF returns one of two values, depending on a logical test

Shorthand for a two-outcome CASE expression

|  |  |
| --- | --- |
| **IIF Element** | **Comments** |
| Boolean\_expression | Logical test evaluating to TRUE, FALSE, or UNKNOWN |
| True\_value | Value returned if expression evaluates to TRUE |
| False\_value | Value returned if expression evaluates to FALSE or UNKNOWN |

SELECT ProductID, ListPrice,

IIF(ListPrice > 50, 'high', 'low') AS PricePoint

FROM Production.Product;

**Selecting items from a list with CHOOSE**:

CHOOSE returns an item from a list as specified by an index value

CHOOSE example:

SELECT CHOOSE (3, 'Beverages', 'Condiments', 'Confections') AS choose\_result;

**Aggregate Functions**:

* SUM
* MIN
* MAX
* AVG
* COUNT
* COUNT\_BIG
* STDEV
* STDEVP
* VAR
* VARP
* CHECKSUM\_AGG
* GROUPING
* GROUPING\_ID

Return a scalar value (with no column name)

Ignore NULLs except in COUNT(\*)

Can be used in

SELECT, HAVING, and ORDER BY clauses

Frequently used with GROUP BY clause

SELECT COUNT (DISTINCT SalesOrderID) AS UniqueOrders,

AVG(UnitPrice) AS Avg\_UnitPrice, MIN(OrderQty)AS Min\_OrderQty, MAX(LineTotal) AS Max\_LineTotal

FROM Sales.SalesOrderDetail;

Using DISTINCT with aggregate functions:

Use DISTINCT with aggregate functions to summarize only unique values

DISTINCT aggregates eliminate duplicate values, not rows (unlike SELECT DISTINCT)

Compare (with partial results):

SELECT SalesPersonID, YEAR(OrderDate) AS OrderYear,

COUNT(CustomerID) AS All\_Custs,

COUNT(DISTINCT CustomerID) AS Unique\_Custs

FROM Sales.SalesOrderHeader

GROUP BY SalesPersonID, YEAR(OrderDate);

--all orders

select \* from Sales.SalesOrderHeader

--now i want to get maximum of 1 order per customer??

--first how many customers do i have

select COUNT(distinct CustomerID) from Sales.SalesOrderHeader--returns 19119

--so i should have 19119 orders returned as a result of actual query to be answered

--group by would not work..

--select \* from Sales.SalesOrderHeader

--group by CustomerID

--we need all the order details...not only the customer id

select CustomerID from Sales.SalesOrderHeader

group by CustomerID

--i can't use distinct as it will use ditinct over the entrier row. But i can use this row\_number thing for this problem.

select

ROW\_NUMBER() over (partition by customerID order by OrderDate desc) as rn

,\*

from Sales.SalesOrderHeader

--i cant use this as rn column name is not avaiable at the time of execution of where clause

--select

--ROW\_NUMBER() over (partition by customerID order by OrderDate desc) as rn

--,\*

--from Sales.SalesOrderHeader

--where rn =1

--now i cant do this as all the ranking functions are calculated at select time

--select

--ROW\_NUMBER() over (partition by customerID order by OrderDate desc) as rn

--,\*

--from Sales.SalesOrderHeader

--where ROW\_NUMBER() over (partition by customerID order by OrderDate desc) =1

--but this would work...u can compare the count of rows returned and it would be 19119

select \* from(

select

ROW\_NUMBER() over (partition by customerID order by OrderDate desc) as rn

,\*

from Sales.SalesOrderHeader

) as a

where rn=1;

--now lets say i want to get all orders that are made in the same day. now if they are made in the same day, they will get different row\_numbers

--but if i use rank, then all the order with the same order date will come back with same rank..this will return more that 19119 rows

select \* from(

select

rank() over (partition by customerID order by OrderDate desc) as rn

,\*

from Sales.SalesOrderHeader

) as a

where rn=1;

**Group by clause**:

GROUP BY creates groups for output rows, according to unique combination of values specified in the GROUP BY clause

SELECT <select\_list>

FROM <table\_source>

WHERE <search\_condition>

GROUP BY <group\_by\_list>;

GROUP BY calculates a summary value for aggregate functions in subsequent phases

SELECT SalesPersonID, COUNT(\*) AS Cnt

FROM Sales.SalesOrderHeader

GROUP BY SalesPersonID;

Detail rows are “lost” after GROUP BY clause is processed

HAVING, SELECT, and ORDER BY must return a single value per group

All columns in SELECT, HAVING, and ORDER BY must appear in GROUP BY clause or be inputs to aggregate expressions

If a query uses GROUP BY, all subsequent phases operate on the groups, not source rows

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| **Logical Order** | **Phase** | **Comments** |
| 5 | SELECT |  |
| 1 | FROM |  |
| 2 | WHERE |  |
| 3 | GROUP BY | Creates groups |
| 4 | HAVING | Operates on groups |
| 6 | ORDER BY |  |

If a query uses group by, then all subsequent phases operate on the group, not on the source rows

Using GROUP BY with aggregate functions:

Aggregate functions are commonly used in SELECT clause, summarize per group:

SELECT CustomerID, COUNT(\*) AS cnt

FROM Sales.SalesOrderHeader

GROUP BY CustomerID;

Aggregate functions may refer to any columns, not just those in GROUP BY clause

SELECT productid, MAX(OrderQty) AS largest\_order

FROM Sales.SalesOrderDetail

GROUP BY productid;

Filtering grouped data using HAVING Clause:

HAVING clause provides a search condition that each group must satisfy

HAVING clause is processed after GROUP BY

SELECT CustomerID, COUNT(\*) AS Count\_Orders

FROM Sales.SalesOrderHeader

GROUP BY CustomerID

HAVING COUNT(\*) > 10;

Compare HAVING to WHERE clauses:

WHERE filters rows before groups created

Controls which rows are placed into groups

HAVING filters groups

Controls which groups are passed to next logical phase

Using a COUNT(\*) expression in HAVING clause is useful to solve common business problems:

Show only customers that have placed more than one order:

SELECT Cust.Customerid, COUNT(\*) AS cnt

FROM Sales.Customer AS Cust

JOIN Sales.SalesOrderHeader AS Ord ON Cust.CustomerID = ORD.CustomerID

GROUP BY Cust.CustomerID

HAVING COUNT(\*) > 1;

Show only products that appear on 10 or more orders:

SELECT Prod.ProductID, COUNT(\*) AS cnt

FROM Production.Product AS Prod

JOIN Sales.SalesOrderDetail AS Ord ON Prod.ProductID = Ord.ProductID

GROUP BY Prod.ProductID

HAVING COUNT(\*) >= 10;

**Working with subqueries**:

Subqueries are nested queries or queries within queries

Results from inner query are passed to outer query

Inner query acts like an expression from perspective of outer query

Subqueries can be self-contained or correlated

Self-contained subqueries have no dependency on outer query

Correlated subqueries depend on values from outer query

Subqueries can be scalar, multi-valued, or table-valued

Scalar subquery returns single value to outer query

Can be used anywhere single-valued expression can be used: SELECT, WHERE, etc.

SELECT SalesOrderID, ProductID, UnitPrice, OrderQty

FROM Sales.SalesOrderDetail

WHERE SalesOrderID =

(SELECT MAX(SalesOrderID) AS LastOrder

FROM Sales.SalesOrderHeader);

If inner query returns an empty set, result is converted to NULL

Construction of outer query determines whether inner query must return a single value

Multi-valued subquery returns multiple values as a single column set to the outer query

Used with IN predicate

If any value in the subquery result matches IN predicate expression, the predicate returns TRUE

SELECT CustomerID, SalesOrderId,TerritoryID

FROM Sales.SalesorderHeader

WHERE CustomerID IN (

SELECT CustomerID

FROM Sales.Customer

WHERE TerritoryID = 10);

May also be expressed as a JOIN (test both for performance)

The keyword EXISTS does not follow a column name or other expression.

The SELECT list of a subquery introduced by EXISTS typically only uses an asterisk (\*).

SELECT CustomerID, PersonID

FROM Sales.Customer AS Cust

WHERE EXISTS (

SELECT \*

FROM Sales.SalesOrderHeader AS Ord

WHERE Cust.CustomerID = Ord.CustomerID);

SELECT CustomerID, PersonID

FROM Sales.Customer AS Cust

WHERE NOT EXISTS (

SELECT \*

FROM Sales.SalesOrderHeader AS Ord

WHERE Cust.CustomerID = Ord.CustomerID);

--in a complex query, the derived table expressions can become unreadable. so then use common table expressions.

--it is just declaring the expression before hand

with a as(

select

rank() over (partition by customerID order by OrderDate desc) as rn

,\*

from Sales.SalesOrderHeader

)

select \* from a

where rn=1

--find number of orders per customer

select

CustomerID, COUNT(\*) as ordercnt

from Sales.SalesOrderHeader

group by CustomerID

--here as well we have repeat the expression

select

case

when RevisionNumber = 3 then 'ok'

else 'not ok'

end as status

, count(\*) as ordercnt

from Sales.SalesOrderHeader

group by case

when RevisionNumber = 3 then 'ok'

else 'not ok'

end;

with a as (

select

case

when RevisionNumber = 3 then 'ok'

else 'not ok'

end as status

from Sales.SalesOrderHeader

)

select status,count(\*) from a

group by status

**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 HumanResources.EmployeeList

AS

SELECT BusinessEntityID, JobTitle, HireDate, VacationHours

FROM HumanResources.Employee;

go

SELECT \* FROM HumanResources.EmployeeList

go

Creating simple inline table-valued functions:

Table-valued functions 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 (@SalesOrderID INT)

RETURNS TABLE

AS

RETURN

SELECT SalesOrderID,

CAST((OrderQty \* UnitPrice \* (1 - SpecialOfferID))

AS DECIMAL(8, 2)) AS LineTotal

FROM Sales.SalesOrderDetail

WHERE SalesOrderID = @SalesOrderID ;

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

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| **Derived Tables Must** | **Derived Tables May** |
| * 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 | * Use internal or external aliases for columns * Refer to parameters and/or variables * Be nested within other derived tables |

Passing arguments to derived tables:

Derived tables may refer to arguments

Arguments may 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;

Creating queries with common table expressions:

Use WITH clause to create a CTE:

Define the table expression in WITH clause

Reference the CTE in the outer query

Assign column aliases (inline or external)

Pass arguments if desired

WITH CTE\_year AS

(

SELECT YEAR(OrderDate) AS OrderYear, customerID

FROM Sales.SalesOrderHeader

)

SELECT orderyear, COUNT(DISTINCT CustomerID) AS CustCount

FROM CTE\_year

GROUP BY OrderYear;

Why would you use a view vs a table valued function?? Table valued function is just a view that takes parameters