ENOSIS LEARNING - SQL SERVER NOTES

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**SQL Server**

# SQL Server - Data Types

|  |  |
| --- | --- |
| **SQL Server** | **Data Precision** |
| **BIT** | Integer: 0 or 1 |
| **TINYINT** | Positive Integer 0 -> 255 |
| **SMALLINT** | Signed Integer -32,768 -> 32,767 |
| **INT** | Signed Integer -2^31 -> 2^31-1 |
| **BIGINT** | Signed Integer -2^63 -> 2^63-1 |
| **REAL** | Floating precision -1.79E + 308 -> 1.79E + 308 |
| **FLOAT** | Floating precision -3.40E + 38 -> 3.40E + 38 |
| **MONEY** | 4 decimal places, -2^63/10000 -> 2^63-1/10000 |
| **SMALLMONEY** | 4 decimal places, -214,748.3648 -> 214,748.3647 |
| **DECIMAL** | Fixed precision -10^38 + 1 -> 10^38 – 1 |
| **NUMERIC** | Fixed precision -10^38 + 1 -> 10^38 – 1 |
| **DATETIME** | Date+Time 1753-01-01 -> 9999-12-31, accuracy of 3.33 ms |
| **SMALLDATETIME** | Date+Time 1900-01-01 -> 2079-06-06, accuracy of one minute |
| **CHARn** | Fixed-length non-Unicode string to 8,000 characters |
| **NCHARn** | Fixed-length Unicode string to 4,000 characters |
| **VARCHARn** | Variable-length non-Unicode string to 8,000 characters |
| **NVARCHARn** | Variable-length Unicode string to 4,000 characters |
| **TEXT** | Variable-length non-Unicode string to 2,147,483,647 characters |
| **NTEXT** | Variable-length Unicode string to 1,073,741,823 characters |
| **BINARY** | Fixed-length binary data up to 8,000 characters |
| **VARBINARY** | Variable-length binary data up to 8,000 characters |
| **IMAGE** | Variable-length binary data up to 2,147,483,647 characters  |

# **Create Table**

The mechanics of creating a table are relatively straight forward. Being able to design a well thought out database that will scale to meet the needs of a large scale enterprise is a very challenging undertaking. In these examples we will be working through development of a fairly simple three table database. In doing so we will get to cover a good deal of the development basics for creating tables and indexes.

**Syntax for Creating Table**

**Create Table table\_name**

**(**

**Colname1 datatype,**

**Colname2 datatype,**

**Colname3 datatype,**

**….,**

**…**

**)**

**Creating the person table**

CREATE TABLE person

 (

num INT NOT NULL ,

firstname VARCHAR(20) NULL ,

lastname VARCHAR(30) NULL ,

gender\_code VARCHAR(1) NULL ,

birth\_dttm DATETIME NULL ,

inactive\_date DATETIME NULL

 )

**Creating the phone table**

CREATE TABLE phone

 (

person\_num INT NOT NULL ,

type\_code CHAR(3) NOT NULL ,

area\_code CHAR(3) NULL ,

exchange CHAR(3) NULL ,

extension CHAR(4) NULL

 )

**Creating the address table**

CREATE TABLE address

 (

person\_num INT NOT NULL ,

type\_code CHAR(4) NOT NULL ,

street1 CHAR(30) NULL ,

street2 CHAR(30) NULL ,

city CHAR(30) NULL ,

state CHAR(2) NULL ,

postal\_code CHAR(10) NULL ,

 CONSTRAINT PK\_address PRIMARY KEY CLUSTERED

 (person\_num ASC, type\_code ASC) ON [PRIMARY]

 )

# SQL Server - SQL Table Basics - Altering/Adding Columns

## **Adding column**

You can add new columns to an existing table. .

Alter table table\_name add column\_namedatatype

ALTER TABLE [phone]**ADD** inactive\_date DATETIME NULL

## **Alter column**

You can add modify an existing column

ALTER TABLE [dbo].[person]**ALTER COLUMN** [lastname] VARCHAR(35) NULL

**Considerations for altering a column**

* Reducing precision (example, going from CHAR(20) to CHAR(15)) can cause data truncation and should be avoided unless you are absolutely sure their will be no impact to the data.
* Changing data types should typically be avoided. There are exceptions to this. For example, changing a CHAR(20) to a VARCHAR(20) on columns where the average storage length is 10 can save disk space.

ALTER TABLE [ database\_name . [ schema\_name ] . | schema\_name . ] table\_name

{

 ALTER COLUMN column\_name

 {

[ type\_schema\_name. ] type\_name[ ( { precision [ , scale ]

 | max | xml\_schema\_collection } ) ]

[ COLLATEcollation\_name ]

[ NULL | NOT NULL ] [ SPARSE ]

 | {ADD | DROP }

        { ROWGUIDCOL | PERSISTED | NOT FOR REPLICATION | SPARSE }

 }

        | [ WITH { CHECK | NOCHECK } ]

    | ADD

   {

<column\_definition>

   | <computed\_column\_definition>

   | <table\_constraint>

      | <column\_set\_definition>

   } [ ,...n ]

    | DROP

   {

[ CONSTRAINT ] constraint\_name

    [ WITH ( <drop\_clustered\_constraint\_option> [ ,...n ] ) ]

 | COLUMN column\_name

 } [ ,...n ]

    | [ WITH { CHECK | NOCHECK } ] { CHECK | NOCHECK } CONSTRAINT

   { ALL | constraint\_name [ ,...n ] }

    | { ENABLE | DISABLE } TRIGGER

   { ALL | trigger\_name [ ,...n ] }

    | { ENABLE | DISABLE } CHANGE\_TRACKING

   [ WITH ( TRACK\_COLUMNS\_UPDATED = { ON | OFF } ) ]

    | SWITCH [ PARTITIONsource\_partition\_number\_expression ]

   TO target\_table

[ PARTITIONtarget\_partition\_number\_expression ]

 | SET ( FILESTREAM\_ON = { partition\_scheme\_name | filegroup |

 "default" | "NULL" } )

    | REBUILD

      [ [PARTITION = ALL]

        [ WITH ( <rebuild\_option> [ ,...n ] ) ]

      | [ PARTITION = partition\_number

           [ WITH ( <single\_partition\_rebuild\_option> [ ,...n ] )]

        ]

      ]

    | (<table\_option>)

}

[ ; ]

# RENAMING COLUMN

**RENAME COLUMN**

***sp\_RENAME 'TableName.[OldColumnName]' ,‘[NewColumnName]', 'COLUMN'***

**Example :sp\_RENAME 'Table\_First.Name', 'NameChange' , 'COLUMN'**

**RENAME TABLE**

***sp\_RENAME '[OldTableName]' , '[NewTableName]'***

**Example :sp\_RENAME 'Table\_First', 'Table\_Last'**

## **SELECT STATEMENT**

## Syntax

SELECT [ DISTINCT ] [ TOP *n* [ PERCENT ]] *select\_list*
FROM *table\_source*
[ WHERE *search\_condition*]
[ GROUP BY *group\_by\_expression*]
[ HAVING *search\_condition*]
[ ORDER BY *order\_expression* [ ASC | DESC ] ]

## **INSERT STATEMENT**

## Syntax

INSERT [ INTO]  { *table\_name*  | *view\_name*} [ **(** *column\_list***)** ] VALUES  **(** *expression* [ **,**...*n*] **)**

**OR**

INSERT [ INTO]  { *table\_name*  | *view\_name*} [ **(** *column\_list***)** ] select\_statement

INSERTING MULTIPLE VALUES USING SINGLE INSERT STATEMENT :

In SQL Server 2008 you can insert multiple rows using a single SQL INSERT statement.

INSERT INTO Table ( Column1, Column2 ) VALUES

( Value1, Value2 ), ( Value1, Value2 )

## Example

INSERT table1 (c1)VALUES (9)

OR

INSERT table1 (c1)SELECT c1FROM table2

 **UPDATE STATEMENT:**Changes existing data in a table.

## Syntax

UPDATE  { *table\_name*  | *view\_name*}
SET { *column\_name***=***expression* } [ **,**...*n* ]
[ FROM { *table\_name*  | *view\_name*} [ **,**...*n* ] ]
[ WHERE <search\_condition> ]

## Example

UPDATE table1SET c1 = 9

**DELETE STATEMENT:**Removes rows from a table.

## Syntax

DELETE { *table\_name*  | *view\_name*}
[ FROM { *table\_name*  | *view\_name*} [ **,**...*n* ] ]
[ WHERE <search\_condition> ]

## Example

DELETE table1WHERE table1.c1 > 10

# SQL TRUNCATE Statement

The SQL TRUNCATE command is used to delete all the rows from the table and free the space containing the table.

### Syntax to TRUNCATE a table:

TRUNCATE TABLE table\_name;

**For Example:** To delete all the rows from employee table, the query would be like,

TRUNCATE TABLE employee;

**Difference between DELETE and TRUNCATE Statements:**

**DELETE Statement:** This command deletes only the rows from the table based on the condition given in the where clause or deletes all the rows from the table if no condition is specified. But it does not free the space containing the table.

**TRUNCATE statement:** This command is used to delete all the rows from the table and free the space containing the table.

# SQL DROP Statement:

The SQL DROP command is used to remove an object from the database. If you drop a table, all the rows in the table is deleted and the table structure is removed from the database. Once a table is dropped we cannot get it back, so be careful while using DROP command. When a table is dropped all the references to the table will not be valid.

**Syntax to drop a sql table structure:**

DROP TABLE table\_name;

**For Example:** To drop the table employee, the query would be like

DROP TABLE employee;

**Difference between DROP and TRUNCATE Statement:**

If a table is dropped, all the relationships with other tables will no longer be valid, the integrity constraints will be dropped, grant or access privileges on the table will also be dropped, if want use the table again it has to be recreated with the integrity constraints, access privileges and the relationships with other tables should be established again. But, if a table is truncated, the table structure remains the same, therefore any of the above problems will not exist.

## Copying Data Between Tables

It is common to want to copy information from one [table](http://www.blackwasp.co.uk/SQLCreateTables1.aspx) into another using T-SQL, possibly within a [stored procedure](http://www.blackwasp.co.uk/SQLStoredProcedures.aspx). This is useful when archiving older data from a table that is used heavily and should be kept small. It is also common to copy data into a [temporary table](http://www.blackwasp.co.uk/SQLTemporaryTables.aspx) prior to a long-running or complex operation, especially if that operation would otherwise compromise the performance of the system.

There are many ways in which information can be transferred between tables. In this article we will examine two that each require only a single line of T-SQL code.

### INSERT INTO SELECT

The first method of copying data is to insert data using the [INSERT command](http://www.blackwasp.co.uk/SQLBasicManipulation.aspx) but instead of providing a VALUES clause containing the information for the new row, a [SELECT statement](http://www.blackwasp.co.uk/SQLBasicQueries.aspx) is used as a [subquery](http://www.blackwasp.co.uk/SQLSubqueries.aspx). The data generated from the select statement is added into the table defined in the INSERT. Any existing rows in the target table are unaffected.

If the schemas of the two tables are identical, you can perform the operation without specifying the columns that you wish to insert into, as in the following sample code:

|  |
| --- |
| INSERTINTOTable2SELECT\* FROMTable1 |
|  |

The above example will copy all of the information from Table1 into Table2. You can, of course, filter the rows with a WHERE clause, [group the data](http://www.blackwasp.co.uk/SQLGroupBy.aspx) or use other clauses to pre-process the information as long as the structure of the selected columns is compatible with the columns in the target table.

If you do not wish to insert data into every column of the target table you can provide a column list for both the INSERT and SELECT parts of the statement. Any columns in the target table that are omitted from the column list will have their [default value](http://www.blackwasp.co.uk/SQLDefaultColumns.aspx) or be NULL after the operation.

|  |
| --- |
| INSERTINTOTable2(Column1, Column3)SELECTColumn1, Column3FROMTable1 |
|  |
|  |
|  |

NB: If you are copying information into a table with an IDENTITY column you should either omit that column from the list or [enable inserting of identity values](http://www.blackwasp.co.uk/SQLInsertIdentity.aspx) for the period of the operation.

### SELECT INTO

The second method is to query the database to obtain and pre-process the information that you wish to copy and use the INTO clause to specify the name for a new table. The new table will be created using columns with the names and types defined in the SELECT statement. The names can differ from the original source columns if you apply new names using the AS clause.

This method can be faster and more efficient than the first if your database is configured to use the simple or bulk logged recovery method, as the logging generated by the statement will be minimal.

|  |
| --- |
| SELECTColumn1, Column2, Column3**INTONewTable**FROMTable1 |

 This method of copying can also be used to create a new, empty table using the schema of another. To do so, simply add a WHERE clause that causes the query to return no data:

|  |
| --- |
| SELECTColumn1, Column2, Column3INTONewTableFROMTable1WHERE1 = 0 |

# **SQL SERVER – Creating Primary Key, Foreign Key and Default Constraint**

***Primary key, Foreign Key and Default constraint*** are the 3 main constraints that need to be considered while creating tables or even after that. It seems very easy to apply these constraints but still we have some confusions and problems while implementing it. So I tried to write about these constraints that can be created or added at different levels and in different ways or methods.

## **Primary Key Constraint:**

Primary Keys constraints prevents duplicate values for columns and provides unique identifier to each column, as well it creates clustered index on the columns.

1)      Create Table Statement  to create Primary Key

a.       Column Level

CREATE TABLEProducts
(
ProductIDINT CONSTRAINT pk\_products\_pidPRIMARY KEY,
ProductNameVARCHAR(25)
)

b.      Table Level

CREATE TABLE Products
(
ProductIDINT,
ProductNameVARCHAR(25)
CONSTRAINT pk\_products\_pidPRIMARY KEY(ProductID)
)

2)      Alter Table Statement to create Primary Key

ALTER TABLE Products
ADD CONSTRAINT pk\_products\_pidPRIMARY KEY(ProductID)
GO

3)      Alter Statement to Drop Primary key

ALTER TABLEProducts
DROP CONSTRAINT pk\_products\_pid;

## **Foreign Key Constraint:**

When a FOREIGN KEY constraint is added to an existing column or columns in the table SQL Server, by default checks the existing data in the columns to ensure that all values, except NULL, exist in the column(s) of the referenced PRIMARY KEY or UNIQUE constraint.

1)      Create Table Statement  to create Foreign Key

a.       Column Level

USE AdventureWorks2008
GO
CREATE TABLE ProductSales
(
SalesIDINT CONSTRAINT pk\_productSales\_sidPRIMARY KEY,
ProductIDINT CONSTRAINT fk\_productSales\_pidFOREIGN KEY REFERENCES Products(ProductID),
SalesPersonVARCHAR(25)
);

b.      Table Level

CREATE TABLE ProductSales
(
SalesIDINT,
ProductIDINT,
SalesPersonVARCHAR(25)
CONSTRAINT pk\_productSales\_sidPRIMARY KEY(SalesID),
CONSTRAINT fk\_productSales\_pidFOREIGN KEY(ProductID)REFERENCES Products(ProductID)
);
**Alter Table Statement to create Foreign Key**

**ALTER TABLE ProductSales ADD CONSTRAINT fk\_productSales\_pid FOREIGN KEY(ProductID)REFERENCES Products(ProductID)**

1. **Alter Table Statement to Drop Foreign Key**

**ALTER TABLE ProductSales DROP CONSTRAINT fk\_productSales\_pid;**

## **unique constraint**

The UNIQUE constraint uniquely identifies each record in a database table.

The UNIQUE and PRIMARY KEY constraints both provide a guarantee for uniqueness for a column or set of columns.

A PRIMARY KEY constraint automatically has a UNIQUE constraint defined on it.

Note that you can have many UNIQUE constraints per table, but only one PRIMARY KEY constraint per table.

***SQL UNIQUE Constraint on CREATE TABLE***

CREATE TABLE Persons
(
P\_Idint NOT NULL CONSTRAINT PK\_Id UNIQUE,
LastNamevarchar(255) NOT NULL,
FirstNamevarchar(255),
Address varchar(255),
City varchar(255)
)

***ALTER TABLE:***

*ALTER TABLE TABLE\_NAME ADD CONSTRAINT uc\_PersonID UNIQUE (P\_Id,LastName)*

## **check CONSTRAINT**

CREATE TABLE Persons
(
P\_Idint NOT NULL CHECK (P\_Id>0),
LastNamevarchar(255) NOT NULL,
FirstNamevarchar(255),
Address varchar(255),
City varchar(255)
)

CREATE TABLE Persons
(
P\_Idint NOT NULL,
LastNamevarchar(255) NOT NULL,
FirstNamevarchar(255),
Address varchar(255),
City varchar(255),
CONSTRAINT chk\_Person CHECK (P\_Id>0 AND City='Sandnes')
)

**ALTER TABLE Persons ADD CHECK (P\_Id>0)**

## **Default Constraint:**

Default constraint when created on some column will have the default data which is given in the constraint when no records or data is inserted in that column.

**1)      Create Table Statement to create Default Constraint**

***a.       Column Level***

CREATE TABLE Customer
(
CustomerIDINT CONSTRAINT pk\_customer\_cidPRIMARY KEY,
CustomerNameVARCHAR(30),
CustomerAddressVARCHAR(50) CONSTRAINT df\_customer\_AddDEFAULT 'UNKNOWN'
)

***b.      Table Level : Not applicable for Default Constraint***

2)      Alter Table Statement to Add Default Constraint

ALTER TABLE Customer
ADD CONSTRAINT df\_customer\_AddDEFAULT 'UNKNOWN' FOR CustomerAddress
AGO

3)      Alter Table to Drop Default Constraint

ALTER TABLE Customer
DROP CONSTRAINT df\_customer\_Add
GO

You can create a CHECK constraint as part of the table definition when you create a table. If a table already exists, you can add a CHECK constraint. Tables and columns can contain multiple CHECK constraints.

If a CHECK constraint already exists, you can modify or delete it. For example, you may want to modify the expression that is used by the CHECK constraint on a column in the table.

|  |
| --- |
| **NoteNote** |
| To modify a CHECK constraint, you must first delete the existing CHECK constraint and then re-create it with the new definition. |

The following Transact-SQL example creates a new table, and then modifies the table by adding a CHECK constraint to the CreditRating column.

IF OBJECT\_ID ('dbo.Vendors', 'U') IS NOT NULL

DROP TABLE dbo.Vendors;

GO

CREATE TABLE dbo.Vendors

 (VendorIDint PRIMARY KEY, VendorNamenvarchar (50),

CreditRatingtinyint)

GO

ALTER TABLE dbo.Vendors ADD CONSTRAINT CK\_Vendor\_CreditRating

 CHECK (CreditRating>= 1 AND CreditRating<= 5)

# JOINS IN SQL-SERVER

**INNER JOIN** - Match rows between the two tables specified in the INNER JOIN statement based on one or more columns having matching data. Preferably the join is based on referential integrity enforcing the relationship between the tables to ensure data integrity.

Just to add a little commentary to the basic definitions above, in general the INNER JOIN option is considered to be the most common join needed in applications and/or queries. Although that is the case in some environments, it is really dependent on the database design, referential integrity and data needed for the application. As such, please take the time to understand the data being requested then select the proper join option.

Although most join logic is based on matching values between the two columns specified, it is possible to also include logic using greater than, less than, not equals, etc.

**LEFT OUTER JOIN** - Based on the two tables specified in the join clause, all data is returned from the left table. On the right table, the matching data is returned in addition to NULL values where a record exists in the left table, but not in the right table.

Another item to keep in mind is that the LEFT and RIGHT OUTER JOIN logic is opposite of one another. So you can change either the order of the tables in the specific join statement or change the JOIN from left to right or vice versa and get the same results.

RIGHT OUTER JOIN - Based on the two tables specified in the join clause, all data is returned from the right table. On the left table, the matching data is returned in addition to NULL values where a record exists in the right table but not in the left table.

## INNER JOIN

This join returns rows when there is at least one match in both the tables.


**OUTER JOIN**

There are three different Outer Join methods.

LEFT
This join returns all the rows from the left table in conjunction with the matching rows from the right table. If there are no columns matching in the right table, it returns NULL values.


RIGHT
This join returns all the rows from the right table in conjunction with the matching rows from the left able. If there are no columns matching in the left table, it returns NULL values.


FULL
This join combines left outer join and right after join. It returns row from either table when the conditions are met and returns null value when there is no match.


## CROSS JOIN

This join is a Cartesian join that does not necessitate any condition to join. The result set contains records that are multiplication of record number from both the tables.

What is Normalization?

 Normalization is a process of **eliminating redundant** data and **storing** the **related information** in a table.

1. Eliminating Redundant data.
2. Faster update
3. Improve performance
4. Performance in indexes

**Normalization forms**
**1. First Normal Form (1NF)**

    If a Table is said to be 1NF then it should satisfy following rules.

* **Each cell must have one value**
* **Eliminating Duplicate Columns**
* Create a separate table for group of related data and **each row must be identify by primary key.**

That means each cell must have single value and each row should be uniquely identified by Primary key

|  |  |  |
| --- | --- | --- |
| **Name** | **Department** | **Phone Number** |
| **Rajesh** | Computer | 3452342,1234563,2345612 |
| **Suresh** | Electronics | 2398521,2323177,5302994 |
| **Praba** | Civil | 3958218 |

In the above we can see the duplicate columns phone numbers have more than one value, we have to eliminate that and create a group of related data with unique row identification by specifying a primary key for the table

Rule 1. By applying above rule each cell must have one value above table changes like below

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Department | Phone Number | Phone Number | Phone Number |
| Rajesh | Computer | 3452342 | 1234563 | 2345612 |
| Suresh | Electronics | 2398521 | 2323177 | 5302994 |
| Praba | Civil | 3958218 |  |  |

Rule 2 &3 . By applying second rule and third rule no more duplicate columns and each row must be unique is applied     to above table.

|  |  |  |  |
| --- | --- | --- | --- |
| **Id** | **Name** | **Department** | **Phone Number** |
| **1** | Rajesh | Computer | 3452342 |
| **2** | Rajesh | Computer | 1234563 |
| **3** | Rajesh | Computer | 2345612 |
| **4** | Suresh | Electronics | 2398521 |
| **5** | Suresh | Electronics | 2323177 |
| **6** | Suresh | Electronics | 5302994 |
| **7** | Praba | Civil | 3958218 |

**2. Second Normal Form (2NF)**

    The Table must be in second normal form , Then it should satisfy the following rules.

* It should satisfy first normal form
* Separate the particular columns ,values are duplicated in each row  should be place in separate table
* Create the relationship between the tables

From the above table we can see the column name and department are repeated in each row ,This two columns can be maintained in another table and make a relationship between these two tables

|  |  |  |  |
| --- | --- | --- | --- |
| **EmpId** | **Name** | **Department** | **DeptLocation** |
| **1** | Rajesh | Computer |  |
| **2** | Suresh | Electronics |  |
| **3** | Praba | Civil |  |
| **4** | Anil | Computer |  |

|  |  |  |
| --- | --- | --- |
| **Id** | **EmpId** | **PhoneNumber** |
| **1** | 1 | 3452342 |
| **2** | 1 | 1234563 |
| **3** | 1 | 2345612 |
| **4** | 2 | 2398521 |
| **5** | 2 | 2323177 |
| **6** | 2 | 5302994 |
| **7** | 3 | 3958218 |

In the above table Empid is played as Primary key for the first table and foreign key for the second table.

**3. Third Normal Form (3NF)**

     The table must be in 3NF,if it is satisfying the following rules

* Must be in 2NF
* Separate the columns that are not dependent upon the primary key of the table.

|  |  |  |
| --- | --- | --- |
| **Product** | **Price** | **Tax** |
| **LED** | 23000 | 20% |
| **AC** | 15000 | 10% |
| **Fridge** | 12000 | 15% |

From the above table you can see that Tax Column is not dependent on Product Primary key column, It is dependent on Price so we separate that in to two different table.

|  |  |
| --- | --- |
| **Product** | **Price** |
| **LED** | 23000 |
| **AC** | 15000 |
| **Fridge** | 12000 |

|  |  |
| --- | --- |
| **Price** | **Tax** |
| **23000** | 20% |
| **15000** | 10% |
| **12000** | 15% |

**4. Fourth Normal Form (4NF)**

* It should be in 3NF
* The non key columns should be dependent on full primary key instead of partial key , If then separate it.

From the following table "EmployeeName" Non-Key column not dependent on full primary key "ManagerId,EmployeeId,TaskID" it depends upon the EmployeeId  Partial Key so it can be separated.

|  |  |  |  |
| --- | --- | --- | --- |
| **ManagerId** | **EmployeeId** | **TaskID** | **EmployeeName** |
| **M1** | E1 | T1 | Rajesh |
| **M2** | E1 | T1 | Rajesh |
|  |  |  |  |

|  |  |  |
| --- | --- | --- |
| **ManagerId** | **EmployeeId** | **TaskID** |
| **M1** | E1 | T1 |
| **M2** | E1 | T1 |

|  |  |
| --- | --- |
| **EmployeeId** | **EmployeeName** |
| **E1** | Rajesh |

That's it from this article we can see the normalization and there concepts Fully.

# OPERATORS

When a complex expression has multiple operators, operator precedence determines the sequence in which the operations are performed.

Operators have the precedence levels shown in the following table. An operator on higher levels is evaluated before an operator on a lower level.

|  |  |
| --- | --- |
| **Level** | **Operators** |
| 1 | ~ (Bitwise NOT) |
| 2 | \* (Multiply), / (Division), % (Modulo) |
| 3 | + (Positive), - (Negative), + (Add), (+ Concatenate), - (Subtract), & (Bitwise AND), ^ (Bitwise Exclusive OR), | (Bitwise OR) |
| 4 | =, >, <, >=, <=, <>, !=, !>, !< (Comparison operators) |
| 5 | NOT |
| 6 | AND |
| 7 | ALL, ANY, BETWEEN, IN, LIKE, OR, SOME |
| 8 | = (Assignment) |

**SQL SERVER IDENTIFIERS**

All databases, servers, and database objects in SQL Server (such as tables, constraints, stored procedures, views, columns, and data types) must have unique names, or identifiers. They are assigned when an object is created, and used thereafter to identify the object. The identifier for the object may, if needed, be changed.
The following are the rules for creating identifiers:

Identifiers may have between 1 and 128 characters. There are exceptions to this rule: certain objects are limited (for instance, temporary tables can have identifiers up to only 116 characters long). Before Microsoft SQL Server 7.0, identifiers were limited to 30 characters.

The first character of the identifier must be a letter, underscore ( \_ ), at sign (

## PROGRAMMING WITH OPERATORS

When two operators in an expression have the same operator precedence level, they are evaluated left to right based on their position in the expression. For example, in the expression that is used in the following SET statement, the subtraction operator is evaluated before the addition operator.

DECLARE @MyNumberint

SET @MyNumber = 4 - 2 + 27

-- Evaluates to 2 + 27 which yields an expression result of 29.

SELECT @MyNumber

Use parentheses to override the defined precedence of the operators in an expression. Everything within the parentheses is evaluated first to yield a single value before that value can be used by any operator outside the parentheses.

For example, in the expression used in the following SET statement, the multiplication operator has a higher precedence than the addition operator. Therefore, it is evaluated first; the expression result is 13.

DECLARE @MyNumberint

SET @MyNumber = 2 \* 4 + 5

-- Evaluates to 8 + 5 which yields an expression result of 13.

SELECT @MyNumber

In the expression used in the following SET statement, the parentheses cause the addition to be performed first. The expression result is 18.

DECLARE @MyNumberint

SET @MyNumber = 2 \* (4 + 5)

-- Evaluates to 2 \* 9 which yields an expression result of 18.

SELECT @MyNumber

If an expression has nested parentheses, the most deeply nested expression is evaluated first. The following example contains nested parentheses, with the expression 5 - 3 in the most deeply nested set of parentheses. This expression yields a value of 2. Then, the addition operator (+) adds this result to 4. This yields a value of 6. Finally, the 6 is multiplied by 2 to yield an expression result of 12.

DECLARE @MyNumberint

SET @MyNumber = 2 \* (4 + (5 - 3) )

-- Evaluates to 2 \* (4 + 2) which then evaluates to 2 \* 6, and

-- yields an expression result of 12.

SELECT @MyNumber

# STORED PROCEDURES

**What Are Stored Procedures?**

Have you ever written SQL statements, like inserts, selects, and updates? Then you have already written most of a stored procedure. A stored procedure is an already written SQL statement that is saved in the database. If you find yourself using the same query over and over again, it would make sense to put it into a stored procedure.An example is:

execusp\_displayallusers

The name of the stored procedure is "usp\_displayallusers", and "exec" tells SQL Server to execute the code in the stored procedure. (Note: "usp\_" in front of the stored procedure name is used to designate this stored procedure as a user-created stored procedure.) The code inside the stored procedure can be something as simple as:

SELECT \* FROM USERLIST

This "select" statement will return all data in the USERLIST table. You may think, skeptically, that stored procedures aren’t terribly useful. Just save the query and run it when you need to. Too easy, right?

Well, there is more to the story. Many queries get more complex than "select \* from . . ."  Also, you may want to call the stored procedure from an application, such as an ASP page, Visual Basic application, or a Java servlet. With a stored procedure, you can store all the logic in the database, and use a simple command to call the stored procedure. Later, if you decide to migrate from ASP to J2EE, you only need to change the application layer, which will be significantly easier. Much of the business logic will remain in the database.

 **Getting Started with Stored Procedures**

will be ready to start coding!

What does the entire stored procedure look like?  Let’s pull it all together.

CREATE PROCEDURE usp\_adduser

@login varchar(20),
@pswdvarchar(20),
@f\_namevarchar(25),
@l\_namevarchar(35),
@address\_1 varchar(30),
@address\_2 varchar(30),
@city varchar(30),
@state char(2),
@zipcode char(10),
@email varchar(50)

AS

INSERT INTO USERLIST (login, pswd, f\_name, l\_name, address\_1, address\_2, city, state, zipcode, email)

VALUES (@login, @pswd, @f\_name, @l\_name, @address\_1, @address\_2, @city, @state, @zipcode, @email)

Now, we have a stored procedure that can accept external data. What do we do with it?  How do we get the data?  It’s not that hard; I promise. We’ll start with the "exec" statement we used when we wrote our first stored procedure. Remember?

execusp\_displayallusers

 We have a new stored procedure to execute, so this time, the command will be:

 execusp\_adduser

 There is still the issue of how to get our data into the stored procedure. Otherwise, all those variables will be useless. To get data into our stored procedure, simply add the information (in single quotes ' ') after the execute statement.

 execusp\_adduser ' '

 Remember to pass as many parameters as you have variables, otherwise SQL Server will throw an error. Since we have ten variables, your execute statement should look like this:

 exec usp\_adduser ' ', ' ', ' ', ' ', ' ', ' ', ' ', ' ', ' ', ' '

 Next, let’s include the data that we will want to pass to usp\_adduser. Your execute statement will look like:

 exec usp\_adduser 'dnelson', 'dean2003', 'Dean', 'Nelson', '200 Berkeley Street', ' ', 'Boston', 'MA', '02116', 'dnelson@test.com'

 Running the query should be successful, and SQL Server will tell you that one row has been affected. Now, let’s try using input variables with some other query types.

##### Code:

CREATE PROCEDURE spSelectStudent1 (@Course INTEGER=2, @Grade INTEGER=3)
AS
SELECT \* FROM Students
WHERE Std\_Course=@Course AND Std\_Grade<= @Grade
GO
EXEC spSelectStudent1;

##### Output:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Id | Name | Std\_Course | Phone | Std\_Grade |
|  |  |  |  |  |
| 1 | Joe Mathew | 2 | 12345 | 2 |
|  |  |  |  |  |

(1 row(s) affected)

##### Explanation:

The stored procedures can be created with optional parameters with default values, so that if no values are assigned to the parameters then the default value will be taken as the value of the parameter.

In the above example, the procedure is executed without any parameter. So it takes the default parameters, which are @Course as 2, @Grade as 3.

##### Language(s): MS SQL Server

##### Code:

EXEC spSelectStudent1 @Course=4, @Grade=4;

##### Output:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Id | Name | Std\_Course | Phone | Std\_Grade |
|  |  |  |  |  |
| 2 | Rock Feller | 4 | 46565 | 3 |
|  |  |  |  |  |

(1 row(s) affected)

##### Explanation:

In the above example, the procedure takes the specified parameters of @Course as 4, @Grade as 4.

##### Language(s): MS SQL Server

## Output Parameters in Stored Procedures

# Setting up output paramters for a stored procedure is basically the same as setting up input parameters, the only difference is that you use the OUTPUT clause after the parameter name to specify that it should return a value.  The output clause can be specified by either using the keyword "OUTPUT" or just "OUT".

Example

|  |
| --- |
| CREATE PROCEDURE dbo.uspGetAddressCount @City nvarchar(30), @AddressCount int OUTPUTASSELECT @AddressCount = count(\*) FROM AdventureWorks.Person.Address WHERE City = @City |

To call this stored procedure we would execute it as follows.  First we are going to declare a variable, execute the stored procedure and then select the returned valued.

DECLARE @AddressCount int

EXEC dbo.uspGetAddressCount @City = 'Calgary', @AddressCount = @AddressCount OUTPUT

SELECT @AddressCount

This can also be done as follows, where the stored procedure parameter names are not passed.

DECLARE @AddressCount int

EXEC dbo.uspGetAddressCount 'Calgary', @AddressCount OUTPUT

SELECT @AddressCount

#### **SPs - Auto Executing-startup procedures**

You can designate stored procedures to execute every time the SQL Server is started. These types of procedures cannot accept any input parameters and have to be owned by a member of SYSADMIN fixed server role. To designate stored procedures for automatic execution use the sp\_procoption system stored procedure.

The only option allowed by this procedure is 'startup'. The procedure to be started automatically MUST reside in the Master database. The following example makes the procedure execute automatically every time the server starts up:

**sp\_procoption my\_procedure, 'startup', 'on'**

This option could be useful if you have specific processing requirements or tasks that need to be perform at server startup - for instance you might wish to backup all of your user databases every time SQL Server is started.

# VIEWS

A view is a virtual table that consists of columns from one or more tables. Though it is similar to a table, it is stored in the database. It is a query stored as an object. Hence, a view is an object that derives its data from one or more tables. These tables are referred to as base or underlying tables. Once you have defined a view, you can reference it like any other table in a database.

A view serves as a security mechanism. This ensures that users are able to retrieve and modify only the data seen by them. Users cannot see or access the remaining data in the underlying tables. A view also serves as a mechanism to simplify query execution. Complex queries can be stored in the form as a view, and data from the view can be extracted using simple queries.

* A view consists of a SELECT statement that stored with a database. Because views are stored as part of the database, they can be managed independently of the applications that use them.
* A view behaves like a virtual table. Since you can code a view name anywhere you can code a table name. a view is sometimes called a viewed table.
* Views can be used to restrict the data that a user is allowed to access or to present data in a form that is easy for the user to understand. In some database users may be allowed to access data only through views.
1. **User Defined Views**

These types of view are defined by users. We have two types of user defined views.

* 1. **Simple View**

When we create a view on a single table, it is called simple view.

* + 1. ***--Now Insert data to table Employee\_Test***
		2. **InsertintoEmployee\_Testvalues ('Amit','PHP',12000,'SE');**
		3. **InsertintoEmployee\_Testvalues ('Mohan','ASP.NET',15000,'TL');**
		4. **InsertintoEmployee\_Testvalues ('Avin','C#',14000,'SE');**
		5. **InsertintoEmployee\_Testvalues ('Manoj','JAVA',22000,'SSE');**
		6. **InsertintoEmployee\_Testvalues ('Riyaz','VB',18000,'TH');**
		7. ***-- Now create view on single table Employee\_Test***
		8. **createVIEWvw\_Employee\_Test**
		9. **AS**
		10. **SelectEmp\_ID ,Emp\_Name ,Emp\_Designation**
		11. **FromEmployee\_Test**
		12. ***-- Query view like as table***
		13. **Select \* fromvw\_Employee\_Test**

**In simple view we can insert, update, delete data.** We can only insert data in simple view if we have primary key and all not null fields in the view.

* + 1. ***-- Insert data to view vw\_Employee\_Test***
		2. **insertintovw\_Employee\_Test(Emp\_Name, Emp\_Designation) values ('Shailu','SSE')**
		3. ***-- Now see the affected view***
		4. **Select \* fromvw\_Employee\_Test**
		5. ***-- Update data to view vw\_Employee\_Test***
		6. **Updatevw\_Employee\_TestsetEmp\_Name = 'Pawan'whereEmp\_ID = 6**
		7. ***-- Now see the affected view***
		8. **Select \* fromvw\_Employee\_Test**

****

* + 1. ***-- Delete data from view vw\_Employee\_Test***
		2. **deletefromvw\_Employee\_TestwhereEmp\_ID = 6**
		3. ***-- Now see the affected view***
		4. **Select \* fromvw\_Employee\_Test**
	1. **Complex View**

When we create a view on more than one table, it is called complex view.

* + 1. ***--Create another table***
		2. **createtablePersonal\_Info**
		3. **(**
		4. **Emp\_Namevarchar(55),**
		5. **FNamevarchar(55),**
		6. **DOB varchar(55),**
		7. **Address varchar(55),**
		8. **Mobile int,**
		9. **State varchar(55)**
		10. **)**
		11. ***-- Now Insert data***
		12. **InsertintoPersonal\_Infovalues ('G.Chaudary','22-10-1985','Ghaziabad',96548922,'UP');**
		13. **InsertintoPersonal\_Infovalues ('B.S.Chauhan','02-07-1986','Haridwar',96548200,'UK');**
		14. **InsertintoPersonal\_Infovalues ('A.Panwar','30-04-1987','Noida',97437821,'UP');**
		15. **InsertintoPersonal\_Infovalues ('H.C.Patak','20-07-1986','Rampur',80109747,'UP');**
		16. **InsertintoPersonal\_Infovalues ('M.Shekh','21-10-1985','Delhi',96547954,'Delhi');**
		17. ***-- Now create view on two tables Employee\_Test and Personal\_Info***
		18. **CreateVIEWvw\_Employee\_Personal\_Info**
		19. **As**
		20. **Selecte.Emp\_ID, e.Emp\_Name,e.Emp\_Designation,p.DOB,p.Mobile**
		21. **FromEmployee\_Test e INNERJOINPersonal\_Info p**
		22. **One.Emp\_Name = p. Emp\_Name**
		23. ***-- Now Query view like as table***
		24. **Select \* fromvw\_Employee\_Personal\_Info**

****

**We can only update data in complex view.**We can't insert data in complex view.

* + 1. ***--Update view***
		2. **updatevw\_Employee\_Personal\_InfosetEmp\_Designation = 'SSE'whereEmp\_ID = 3**
		3. ***-- See affected view***
		4. **Select \* fromvw\_Employee\_Personal\_Info**

****

CREATEVIEW UserDetails

AS

select\*from EmployeeEquity\_UserDetails

SELECT\*FROM USERDETAILS

INSERTINTO USERDETAILS VALUES(38,'admin','12345','dillip\_parhi@yahoo.com',2,'sunil','pat','32403120','992244997','viman nagar','admin','ss')

UPDATE USERDETAILS SET LastName ='patangare'where userid = 5

CREATEVIEW UserDetailsType

AS

select E.[UserId],E.[CompanyId],E.[UserName],E.[Password],E.[UserEmail],E.[UserTypeId],E.[FirstName],E.[LastName],

 E.[PhoneNumber],E.[MobileNumber],E.[Address],E.[UserType],E.[Company],EU.UserTypeDesc

from

EmployeeEquity\_UserDetails E innerjoin EmployeeEquity\_UserType EU

ON E.UserTypeId = EU.UserTypeId

# Functions

A stored procedure is like a miniature program in SQL Server. It can be as simple as a select statement, or as complex as a long script that adds, deletes, updates, and/or reads data from multiple tables in a database. (Stored procedures can also implement loops and cursors which both allow you to work with smaller results or row by row operations on data.)

The SQL Server functions are option for doing certain operations in SQL Server. **They can not be used to update, delete, or add records to the database.**

They simply return a single value or a table value. They can only be use to select records. However, they can be called very easily from within standard SQL, such as:

SELECT dbo.functionname('Parameter1')

OR

SELECT Name, dbo.Functionname('Parameter1') FROM sysObjects

For simple reusable select operations, functions can simply your code. Just be wary of using JOIN clauses in your functions. If your function has a JOIN clause and you call it from another select statement that returns multiple results, that function call with JOIN those tables together for EACH line returned in the result set. So though they can be helpful in simpling some logic, they can also be a performance bottleneck if they're not used properly.

|  |
| --- |
| User defined scalar function also returns single value as a result of actions perform by function. We return any datatype value from function. --Create a table CREATE TABLE Employee(EmpIDint PRIMARY KEY,FirstNamevarchar(50) NULL,LastNamevarchar(50) NULL, Salary int NULL, Address varchar(100) NULL,)--Insert DataInsert into Employee(EmpID,FirstName,LastName,Salary,Address) Values(1,'Mohan','Chauahn',22000,'Delhi');Insert into Employee(EmpID,FirstName,LastName,Salary,Address) Values(2,'Asif','Khan',15000,'Delhi');Insert into Employee(EmpID,FirstName,LastName,Salary,Address) Values(3,'Bhuvnesh','Shakya',19000,'Noida');Insert into Employee(EmpID,FirstName,LastName,Salary,Address) Values(4,'Deepak','Kumar',19000,'Noida');-- Select \* from Employee http://www.dotnet-tricks.com/Content/images/sqlserver/udfn_tbl.png --Create function to get emp full name Create function fnGetEmpFullName( @FirstNamevarchar(50), @LastNamevarchar(50))returns varchar(101)AsBegin return (Select @FirstName + ' '+ @LastName);end  --Now call the above created functionSelect dbo.fnGetEmpFullName(FirstName,LastName) as Name, Salary from Employee http://www.dotnet-tricks.com/Content/images/sqlserver/udfn_fullname.png |

The first UDF I will look at is the scalar-valued UDF. The script below defines a function named dbo.udf\_GetProductSales that accepts three parameters and returns a MONEY value. The function uses the three input parameters as criteria in calculating the total sales from the SalesHistory table.

CREATE FUNCTION dbo.udf\_GetProductSales

 (

       @Product VARCHAR(10),

       @BeginDate DATETIME,

       @EndDate DATETIME

 )

 RETURNS MONEY

 AS

 BEGIN

       DECLARE @Sales MONEY

       SELECT @Sales = SUM(SalePrice)

       FROM SalesHistory

       WHERE

             Product = @Product AND

SaleDate BETWEEN @BeginDate AND @EndDate

       RETURN(@Sales)

 END

The script below calls the UDF created in the above script.

**Note:** The schema the function belongs to must be used in the call. In this case, the function belongs to the dbo schema.

SELECT dbo.udf\_GetProductSales ('PoolTable', '1/1/1990', '1/1/2000')

Although the use of a correlated sub-query is sometimes confusing and complicated, the use of them can help solve some of the more challenging query problems. While using these special queries is useful, they only return one column of data. I’ll show you how to use the APPLY operator to accept column values from a table and return a table-result of correlated values.

CREATE FUNCTION dbo.udf\_GetProductSalesTable

 (

       @Product VARCHAR (10),

       @SaleID INT

 )

 RETURNS @SalesTable TABLE

 (

       SalesTotal MONEY,

       SalesCount INT

 )

 BEGIN

       INSERT INTO @SalesTable(SalesTotal, SalesCount)

       SELECT

             SUM(SalePrice), COUNT(SaleID)

       FROM

             SalesHistory

       WHERE

             Product = @Product AND

             SaleID<= @SaleID

       RETURN

 END

 GO

User-defined scalar functions return a single data value of the type defined in the RETURNS clause. For an inline scalar function, there is no function body; the scalar value is the result of a single statement. For a multistatement scalar function, the function body, defined in a BEGIN...END block, contains a series of Transact-SQL statements that return the single value. The return type can be any data type except text, ntext, image, cursor, and timestamp.

The following examples creates a multistatement scalar function. The function takes one input value, a ProductID, and returns a single data value, the aggregated quantity of the specified product in inventory.

Transact-SQL

USE AdventureWorks2008R2;

GO

IF OBJECT\_ID (N'dbo.ufnGetInventoryStock', N'FN') IS NOT NULL

 DROP FUNCTION ufnGetInventoryStock;

GO

CREATE FUNCTION dbo.ufnGetInventoryStock(@ProductIDint)

RETURNS int

AS

-- Returns the stock level for the product.

BEGIN

 DECLARE @ret int;

 SELECT @ret = SUM(p.Quantity)

 FROM Production.ProductInventory p

 WHERE p.ProductID = @ProductID

 AND p.LocationID = '6';

 IF (@ret IS NULL)

 SET @ret = 0;

 RETURN @ret;

END;

GO

The following example uses the ufnGetInventoryStock function to return the current inventory quantity for products that have a ProductModelID between 75 and 80.

Transact-SQL

USE AdventureWorks2008R2;

GO

SELECT ProductModelID, Name, dbo.ufnGetInventoryStock(ProductID)AS CurrentSupply

FROM Production.Product

WHERE ProductModelID BETWEEN 75 and 80;

GO

**Table-Valued Functions**

User-defined table-valued functions return a table data type. For an inline table-valued function, there is no function body; the table is the result set of a single SELECT statement.

The following example creates an inline table-valued function. The function takes one input parameter, a customer (store) ID, and returns the columns ProductID, Name, and the aggregate of year-to-date sales as YTD Total for each product sold to the store.

Transact-SQL

USE AdventureWorks2008R2;

GO

IF OBJECT\_ID (N'Sales.ufn\_SalesByStore', N'IF') IS NOT NULL

 DROP FUNCTION Sales.ufn\_SalesByStore;

GO

**CREATE FUNCTION Sales.ufn\_SalesByStore (@storeidint)**

**RETURNS TABLE**

**AS**

**RETURN**

**(**

 **SELECT P.ProductID, P.Name, SUM(SD.LineTotal) AS 'Total'**

 **FROM Production.Product AS P**

 **JOIN Sales.SalesOrderDetail AS SD ON SD.ProductID = P.ProductID**

 **JOIN Sales.SalesOrderHeader AS SH ON SH.SalesOrderID = SD.SalesOrderID**

 **JOIN Sales.Customer AS C ON SH.CustomerID = C.CustomerID**

 **WHERE C.StoreID = @storeid**

 **GROUP BY P.ProductID, P.Name**

**);**

The following example invokes the function and specifies customer ID 602.

Transact-SQL

SELECT \* FROM Sales.ufn\_SalesByStore (602);

**Difference between stored procedures and functions.**

1. **Unlike Stored Procedure, Function returns only single value.**
2. **Unlike Stored Procedure, Function accepts only input parameters.**
3. **Unlike Stored Procedure, Function is not used to Insert, Update, Delete data in database table(s).**
4. **Like Stored Procedure, Function can be nested up to 32 levels.**
5. **User Defined Function can have upto 1023 input parameters while a Stored Procedure can have upto 21000 input parameters.**
6. **User Defined Function can't returns XML Data Type.**
7. **User Defined Function doesn't support Exception handling.**
8. **User Defined Function can call only Extended Stored Procedure.**
9. **User Defined Function doesn't support set options like set ROWCOUNT etc.**

# IN-BUILT FUNCTIONS

|  |
| --- |
|  |

## **AGGRERIATE FUNCTIONS**

* **AVG** - Calculates the arithmetic mean (average) of the data values contained within a column. The column must contain numeric values.
* **MAX and MIN** - Calculate the maximum and minimum data value of the column, respectively. The column can contain numeric, string, and date/time values.
* **SUM** - Calculates the total of all data values in a column. The column must contain numeric values.
* **COUNT** - Calculates the number of (non-null) data values in a column. The only aggregate function not being applied to columns is COUNT(\*). This function returns the number of rows (whether or not particular columns have NULL values).

## **Numeric functions**

* Numeric functions within Transact-SQL are mathematical functions for modifying numeric values. The following numeric functions are available:

|  |  |
| --- | --- |
| **Function** | **Explanation** |
| ABS(n) | Returns the absolute value (i.e., negative values are returned as positive) of the numeric expression **n**. Example:SELECT ABS(–5.767) = 5.767, SELECT ABS(6.384) = 6.384 |
| ACOS(n) | Calculates arc cosine of **n**. **n** and the resulting value belong to the FLOAT data type. |
| ASIN(n) | Calculates the arc sine of **n**. **n** and the resulting value belong to the FLOAT data type. |
| ATAN(n) | Calculates the arc tangent of **n**. **n** and the resulting value belong to the FLOAT data type. |
| ATN2(n,m) | Calculates the arc tangent of **n/m. n, m,** and the resulting value belong to the FLOAT data type. |
| CEILING(n) | Returns the smallest integer value greater or equal to the specified parameter. Examples:SELECT CEILING(4.88) = 5SELECT CEILING(–4.88) = –4 |
| COS(n) | Calculates the cosine of **n. n** and the resulting value belong to the FLOAT data type. |
| COT(n) | Calculates the cotangent of **n. n** and the resulting value belong to the FLOAT data type. |
| DEGREES(n) | Converts radians to degrees. Examples:SELECT DEGREES(PI()/2) = 90.0SELECT DEGREES(0.75) = 42.97 |
| EXP(n) | Calculates the value **e^n**. Example: SELECT EXP(1) = 2.7183 |
| FLOOR(n) | Calculates the largest integer value less than or equal to the specified value **n**. Example:SELECT FLOOR(4.88) = 4 |
| LOG(n) | Calculates the natural (i.e., base e) logarithm of **n**. Examples:SELECT LOG(4.67) = 1.54SELECT LOG(0.12) = –2.12 |
| LOG10(n) | Calculates the logarithm (base 10) for **n**. Examples:SELECT LOG10(4.67) = 0.67SELECT LOG10(0.12) = –0.92 |
| PI() | Returns the value of the number pi (3.14). |
| POWER(x,y) | Calculates the value **x^y**. Examples: SELECT POWER(3.12,5) = 295.65SELECT POWER(81,0.5) = 9 |
| RADIANS(n) | Converts degrees to radians. Examples:SELECT RADIANS(90.0) = 1.57SELECT RADIANS(42.97) = 0.75 |
| RAND | Returns a random number between 0 and 1 with a FLOAT data type. |
| ROUND(n, p,[t]) | Rounds the value of the number **n** by using the precision **p**. Use positive values of **p** to round on the right side of the decimal point and use negative values to round on the left side. An optional parameter **t** causes **n** to be truncated. Examples:SELECT ROUND(5.4567,3) = 5.4570SELECT ROUND(345.4567,–1) = 350.0000SELECT ROUND(345.4567,–1,1) = 340.0000 |
| ROWCOUNT\_BIG | Returns the number of rows that have been affected by the last Transact-SQL statement executed by the system. The return value of this function has the BIGINT data type. |
| SIGN(n) | Returns the sign of the value **n** as a number (+1 for positive, –1 for negative, and 0 for zero).Example:SELECT SIGN(0.88) = 1 |
| SIN(n) | Calculates the sine of **n. n** and the resulting value belong to the FLOAT data type. |
| SQRT(n) | Calculates the square root of **n**. Example:SELECT SQRT(9) = 3 |
| SQUARE(n) | Returns the square of the given expression. Example:SELECT SQUARE(9) = 81 |
| TAN(n) | Calculates the tangent of **n. n** and the resulting value belong to the FLOAT data type. |

## **Date Functions**

Date functions calculate the respective date or time portion of an expression or return the value from a time interval. Transact-SQL supports the following date functions:

|  |  |
| --- | --- |
| **Function** | **Explanation** |
| GETDATE() | Returns the current system date and time. Example:SELECT GETDATE() = 2008-01-01 13:03:31.390 |
| DATEPART(item,date) | Returns the specified part **item** of a date **date** as an integer. Examples:SELECT DATEPART(month, '01.01.2005') = 1 (1 = January)SELECT DATEPART(weekday, '01.01.2005') = 7 (7 = Sunday) |
| DATENAME(item, date) | Returns the specified part **item** of the date **date** as a character string. Example:SELECT DATENAME(weekday, '01.01.2005') = Saturday |
| DATEDIFF(item,dat1,dat2) | Calculates the difference between the two date parts **dat1** and **dat2** and returns the result as an integer in units specified by the value **item**. Example:SELECT DATEDIFF(year, BirthDate, GETDATE()) AS age FROM employee; -> returns the age of each employee.SELECTDATEDIFF(YEAR,'05/10/1984',GETDATE())SELECTDATEDIFF(MONTH,'05/10/1984',GETDATE())SELECTDATEDIFF(DAY,'05/10/1984',GETDATE())SELECTDATEDIFF(HOUR,'05/10/1984',GETDATE())SELECTDATEDIFF(MINUTE,'05/10/1984',GETDATE()) |
| DATEADD(i,n,d) | Adds the number **n** of units specified by the value **i** to the given date **d**. Example:SELECT DATEADD(DAY,3,HireDate) AS age FROM employee; -> adds three days to the starting date of employment of every employee (see the **sample** database). |
| **DAY()**This function returns an integer representing the day part of the specified date.select DAY(<date>) | This function returns an integer representing the day part of the specified date.select DAY(<date>) |
| **MONTH()** | This function returns an integer representing the month part of the specified date.select MONTH(<date>) |
| **YEAR()** | This function returns an integer representing the year part of the specified date.select YEAR(<date>) |

## **String Functions**

String functions are used to manipulate data values in a column, usually of a character data type. Transact-SQL supports the following string functions:

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| **Function** | **Explanation** |
| ASCII(character) | Converts the specified character to the equivalent integer (ASCII) code. Returns an integer. Example:SELECT ASCII('A') = 65 |
| CHAR(integer) | Converts the ASCII code to the equivalent character. Example:SELECT CHAR(65) = 'A'. |
| CHARINDEX(z1,z2) | Returns the starting position where the partial string **z1** first occurs in the string **z2**. Returns 0 if **z1** does not occur in **z2**. Example:SELECT CHARINDEX('bl', 'table') = 3. |
| DIFFERENCE(z1,z2) | Returns an integer, 0 through 4, that is the difference of SOUNDEX values of two strings **z1** and **z2**. (SOUNDEX returns a number that specifies the sound of a string. With this method, strings with similar sounds can be determined.) Example:SELECT DIFFERENCE('spelling', 'telling') = 2 (sounds a little bit similar, 0 = doesn't sound similar) |
| LEFT(z, length) | Returns the first **length** characters from the string **z**.Select left(‘Ravi Singh’,4) |
| LEN(z) | Returns the number of characters, instead of the number of bytes, of the specified string expression, excluding trailing blanks.Select len(‘Ravi Singh’,4) |
| LOWER(z1) | Converts all uppercase letters of the string **z1** to lowercase letters. Lowercase letters and numbers, and other characters, do not change. Example:SELECT LOWER('BiG') = 'big' |
| LTRIM(z) | Removes leading blanks in the string **z**. Example:SELECT LTRIM(' String') = 'String' |
| NCHAR(i) | Returns the Unicode character with the specified integer code, as defined by the Unicode standard. |
| QUOTENAME(char\_string) | Returns a Unicode string with the delimiters added to make the input string a valid delimited identifier. |
| PATINDEX(%p%,expr) | Returns the starting position of the first occurrence of a pattern **p** in a specified expression **expr**, or zeros if the pattern is not found. Examples:1) SELECT PATINDEX('%gs%', 'longstring') = 4;2) SELECT RIGHT(ContactName, LEN(ContactName)-PATINDEX('% %',ContactName)) AS First\_name FROM Customers;(The second query returns all first names from the **customers** column.) |
| REPLACE(str1,str2,str3) | Replaces all occurrences of the **str2** in the **str1** with the **str3**. Example:SELECT REPLACE('shave' , 's' , 'be') = behave |
| REPLICATE(z,i) | Repeats string **z i** times. Example:SELECT REPLICATE('a',10) = 'aaaaaaaaaa' |
| REVERSE(z) | Displays the string **z** in the reverse order. Example:SELECT REVERSE('calculate') = 'etaluclac' |
| RIGHT(z,length) | Returns the last **length** characters from the string **z**. Example:SELECT RIGHT('Notebook',4) = 'book' |
| RTRIM(z) | Removes trailing blanks of the string **z**. Example:SELECT RTRIM('Notebook ') = 'Notebook' |
| SOUNDEX(a) | Returns a four-character SOUNDEX code to determine the similarity between two strings.Example:SELECT SOUNDEX('spelling') = S145 |
| SPACE(length) | Returns a string with spaces of length specified by **length**. Example:SELECT SPACE = ' ' |
| STR(f,[len [,d]]) | Converts the specified float expression **f** into a string. **len** is the length of the string including decimal point, sign, digits, and spaces (10 by default), and **d** is the number of digits to the right of the decimal point to be returned. Example:SELECT STR(3.45678,4,2) = '3.46' |
| STUFF(z1,a,length,z2) | Replaces the partial string **z1** with the partial string **z2** starting at position a, replacing **length** characters of **z1**. Examples:SELECT STUFF('Notebook',5,0, ' in a ') = 'Note in a book'SELECT STUFF('Notebook',1,4, 'Hand') = 'Handbook' |
| SUBSTRING(z,a,length) | Creates a partial string from string **z** starting at the position a with a length of **length**.Example:SELECT SUBSTRING('wardrobe',1,4) = 'ward' |
| UNICODE | Returns the integer value, as defined by the Unicode standard, for the first character of the input expression. |
| UPPER(z) | Converts all lowercase letters of string **z** to uppercase letters. Uppercase letters and numbers do not change. Example:SELECT UPPER('loWer') = 'LOWER' |

## CONVERT()

Explicitly converts an expression of one data type to another.CASTandCONVERTprovide similar functionality.

Syntax :-

CONVERT ( data\_type [ ( length ) ] , expression [ , style ] )

Here 'expression' can be any validexpression, 'data\_type' is the target data type and 'length' is an optional integer that specifies the length of the target data type. The default value is 30. Style is an integer expression that specifies how the CONVERT function is to translate expression. If style is NULL then NULL is returned. The range is determined by data\_type.

Now we will explore the different styles of date and time formatting with CONVERT.

### Converting DATETIME to VARCHAR

The Transact-SQL (T-SQL) Convert function can be used to convert data between different types. When converting a DATETIME value to a VARCHAR value a style code can be used for getting the output in different format.

SELECTCONVERT(VARCHAR, GETDATE(), 0) -- May 4 2013 2:14PM

### Converting VARCHAR to DATETIME

The style code is equally important when converting a VARCHAR to a DATETIME value. I'm using the output from the previous sql code and different style codes, lets see how it works.

SELECTCONVERT(DATETIME, 'May 4 2013 2:14PM', 0) -- 2013-05-04 14:14:00.000

SELECTCONVERT(DATETIME, 'May 4 2013 2:14PM', 130) -- Conversion failed when converting date and/or time from character string.

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| **Standard Date Formats** |
| **Date Format** | **Standard** | **SQL Statement** | **Sample Output** |
| Mon DD YYYY 1HH:MIAM (or PM) | Default | SELECT CONVERT(VARCHAR(20), GETDATE(), 100) | Jan 1 2005 1:29PM 1 |
| MM/DD/YY | USA | SELECT CONVERT(VARCHAR(8), GETDATE(), 1) AS [MM/DD/YY] | 11/23/98 |
| MM/DD/YYYY | USA | SELECT CONVERT(VARCHAR(10), GETDATE(), 101) AS [MM/DD/YYYY] | 11/23/1998 |
| YY.MM.DD | ANSI | SELECT CONVERT(VARCHAR(8), GETDATE(), 2) AS [YY.MM.DD] | 72.01.01 |
| YYYY.MM.DD | ANSI | SELECT CONVERT(VARCHAR(10), GETDATE(), 102) AS [YYYY.MM.DD] | 1972.01.01 |
| DD/MM/YY | British/French | SELECT CONVERT(VARCHAR(8), GETDATE(), 3) AS [DD/MM/YY] | 19/02/72 |
| DD/MM/YYYY | British/French | SELECT CONVERT(VARCHAR(10), GETDATE(), 103) AS [DD/MM/YYYY] | 19/02/1972 |
| DD.MM.YY | German | SELECT CONVERT(VARCHAR(8), GETDATE(), 4) AS [DD.MM.YY] | 25.12.05 |
| DD.MM.YYYY | German | SELECT CONVERT(VARCHAR(10), GETDATE(), 104) AS [DD.MM.YYYY] | 25.12.2005 |
| DD-MM-YY | Italian | SELECT CONVERT(VARCHAR(8), GETDATE(), 5) AS [DD-MM-YY] | 24-01-98 |
| DD-MM-YYYY | Italian | SELECT CONVERT(VARCHAR(10), GETDATE(), 105) AS [DD-MM-YYYY] | 24-01-1998 |
| DD Mon YY 1 | - | SELECT CONVERT(VARCHAR(9), GETDATE(), 6) AS [DD MON YY] | 04 Jul 06 1 |
| DD Mon YYYY 1 | - | SELECT CONVERT(VARCHAR(11), GETDATE(), 106) AS [DD MON YYYY] | 04 Jul 2006 1 |
| Mon DD, YY 1 | - | SELECT CONVERT(VARCHAR(10), GETDATE(), 7) AS [Mon DD, YY] | Jan 24, 98 1 |
| Mon DD, YYYY 1 | - | SELECT CONVERT(VARCHAR(12), GETDATE(), 107) AS [Mon DD, YYYY] | Jan 24, 1998 1 |
| HH:MM:SS | - | SELECT CONVERT(VARCHAR(8), GETDATE(), 108) | 03:24:53 |
| Mon DD YYYY HH:MI:SS:MMMAM (or PM) 1 | Default + milliseconds | SELECT CONVERT(VARCHAR(26), GETDATE(), 109) | Apr 28 2006 12:32:29:253PM 1 |
| MM-DD-YY | USA | SELECT CONVERT(VARCHAR(8), GETDATE(), 10) AS [MM-DD-YY] | 01-01-06 |
| MM-DD-YYYY | USA | SELECT CONVERT(VARCHAR(10), GETDATE(), 110) AS [MM-DD-YYYY] | 01-01-2006 |
| YY/MM/DD | - | SELECT CONVERT(VARCHAR(8), GETDATE(), 11) AS [YY/MM/DD] | 98/11/23 |
| YYYY/MM/DD | - | SELECT CONVERT(VARCHAR(10), GETDATE(), 111) AS [YYYY/MM/DD] | 1998/11/23 |
| YYMMDD | ISO | SELECT CONVERT(VARCHAR(6), GETDATE(), 12) AS [YYMMDD] | 980124 |
| YYYYMMDD | ISO | SELECT CONVERT(VARCHAR(8), GETDATE(), 112) AS [YYYYMMDD] | 19980124 |
| DD Mon YYYY HH:MM:SS:MMM(24h) 1 | Europe default + milliseconds | SELECT CONVERT(VARCHAR(24), GETDATE(), 113) | 28 Apr 2006 00:34:55:190 1 |
| HH:MI:SS:MMM(24H) | - | SELECT CONVERT(VARCHAR(12), GETDATE(), 114) AS [HH:MI:SS:MMM(24H)] | 11:34:23:013 |
| YYYY-MM-DD HH:MI:SS(24h) | ODBC Canonical | SELECT CONVERT(VARCHAR(19), GETDATE(), 120) | 1972-01-01 13:42:24 |
| YYYY-MM-DD HH:MI:SS.MMM(24h) | ODBC Canonical(with milliseconds) | SELECT CONVERT(VARCHAR(23), GETDATE(), 121) | 1972-02-19 06:35:24.489 |
| YYYY-MM-DDTHH:MM:SS:MMM | ISO8601 | SELECT CONVERT(VARCHAR(23), GETDATE(), 126) | 1998-11-23T11:25:43:250 |
| DD Mon YYYY HH:MI:SS:MMMAM 1 | Kuwaiti | SELECT CONVERT(VARCHAR(26), GETDATE(), 130) | 28 Apr 2006 12:39:32:429AM 1 |
| DD/MM/YYYY HH:MI:SS:MMMAM | Kuwaiti | SELECT CONVERT(VARCHAR(25), GETDATE(), 131) | 28/04/2006 12:39:32:429AM |

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| Here are some more date formats that does not come standard in SQL Server as part of the **CONVERT** function.

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| **Extended Date Formats** |
| **Date Format** | **SQL Statement** | **Sample Output** |
| YY-MM-DD | SELECT SUBSTRING(CONVERT(VARCHAR(10), GETDATE(), 120), 3, 8) AS [YY-MM-DD]SELECT REPLACE(CONVERT(VARCHAR(8), GETDATE(), 11), '/', '-') AS [YY-MM-DD] | 99-01-24 |
| YYYY-MM-DD | SELECT CONVERT(VARCHAR(10), GETDATE(), 120) AS [YYYY-MM-DD]SELECT REPLACE(CONVERT(VARCHAR(10), GETDATE(), 111), '/', '-') AS [YYYY-MM-DD] | 1999-01-24 |
| MM/YY | SELECT RIGHT(CONVERT(VARCHAR(8), GETDATE(), 3), 5) AS [MM/YY]SELECT SUBSTRING(CONVERT(VARCHAR(8), GETDATE(), 3), 4, 5) AS [MM/YY] | 08/99 |
| MM/YYYY | SELECT RIGHT(CONVERT(VARCHAR(10), GETDATE(), 103), 7) AS [MM/YYYY] | 12/2005 |
| YY/MM | SELECT CONVERT(VARCHAR(5), GETDATE(), 11) AS [YY/MM] | 99/08 |
| YYYY/MM | SELECT CONVERT(VARCHAR(7), GETDATE(), 111) AS [YYYY/MM] | 2005/12 |
| Month DD, YYYY 1 | SELECT DATENAME(MM, GETDATE()) + RIGHT(CONVERT(VARCHAR(12), GETDATE(), 107), 9) AS [Month DD, YYYY] | July 04, 2006 1 |
| Mon YYYY 1 | SELECT SUBSTRING(CONVERT(VARCHAR(11), GETDATE(), 113), 4, 8) AS [Mon YYYY] | Apr 2006 1 |
| Month YYYY 1 | SELECT DATENAME(MM, GETDATE()) + ' ' + CAST(YEAR(GETDATE()) AS VARCHAR(4)) AS [Month YYYY]  | February 2006 1 |
| DD Month 1 | SELECT CAST(DAY(GETDATE()) AS VARCHAR(2)) + ' ' + DATENAME(MM, GETDATE()) AS [DD Month] | 11 September 1 |
| Month DD 1 | SELECT DATENAME(MM, GETDATE()) + ' ' + CAST(DAY(GETDATE()) AS VARCHAR(2)) AS [Month DD] | September 11 1 |
| DD Month YY 1 | SELECT CAST(DAY(GETDATE()) AS VARCHAR(2)) + ' ' + DATENAME(MM, GETDATE()) + ' ' + RIGHT(CAST(YEAR(GETDATE()) AS VARCHAR(4)), 2) AS [DD Month YY] | 19 February 72 1 |
| DD Month YYYY 1 | SELECT CAST(DAY(GETDATE()) AS VARCHAR(2)) + ' ' + DATENAME(MM, GETDATE()) + ' ' + CAST(YEAR(GETDATE()) AS VARCHAR(4)) AS [DD Month YYYY] | 11 September 2002 1 |
| MM-YY | SELECT RIGHT(CONVERT(VARCHAR(8), GETDATE(), 5), 5) AS [MM-YY]SELECT SUBSTRING(CONVERT(VARCHAR(8), GETDATE(), 5), 4, 5) AS [MM-YY] | 12/92 |
| MM-YYYY | SELECT RIGHT(CONVERT(VARCHAR(10), GETDATE(), 105), 7) AS [MM-YYYY] | 05-2006 |
| YY-MM | SELECT RIGHT(CONVERT(VARCHAR(7), GETDATE(), 120), 5) AS [YY-MM]SELECT SUBSTRING(CONVERT(VARCHAR(10), GETDATE(), 120), 3, 5) AS [YY-MM] | 92/12 |
| YYYY-MM | SELECT CONVERT(VARCHAR(7), GETDATE(), 120) AS [YYYY-MM] | 2006-05 |
| MMDDYY | SELECT REPLACE(CONVERT(VARCHAR(10), GETDATE(), 1), '/', '') AS [MMDDYY] | 122506 |
| MMDDYYYY | SELECT REPLACE(CONVERT(VARCHAR(10), GETDATE(), 101), '/', '') AS [MMDDYYYY] | 12252006 |
| DDMMYY | SELECT REPLACE(CONVERT(VARCHAR(10), GETDATE(), 3), '/', '') AS [DDMMYY] | 240702 |
| DDMMYYYY | SELECT REPLACE(CONVERT(VARCHAR(10), GETDATE(), 103), '/', '') AS [DDMMYYYY] | 24072002 |
| Mon-YY 1 | SELECT REPLACE(RIGHT(CONVERT(VARCHAR(9), GETDATE(), 6), 6), ' ', '-') AS [Mon-YY] | Sep-02 1 |
| Mon-YYYY 1 | SELECT REPLACE(RIGHT(CONVERT(VARCHAR(11), GETDATE(), 106), 8), ' ', '-') AS [Mon-YYYY] | Sep-2002 1 |
| DD-Mon-YY 1 | SELECT REPLACE(CONVERT(VARCHAR(9), GETDATE(), 6), ' ', '-') AS [DD-Mon-YY] | 25-Dec-05 1 |
| DD-Mon-YYYY 1 | SELECT REPLACE(CONVERT(VARCHAR(11), GETDATE(), 106), ' ', '-') AS [DD-Mon-YYYY] | 25-Dec-2005 1 |

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# TRIGGERS IN SQLSERVER

**What is a Trigger**

A trigger is a special kind of a store procedure that executes in response to certain action on the table like insertion, deletion or updation of data. It is a database object which is bound to a table and is executed automatically. You can’t explicitly invoke **triggers**. The only way to do this is by performing the required action no the table that they are assigned to.

**Types Of Triggers**

There are three action query types that you use in **SQL** which are INSERT, UPDATE and DELETE. So, there are three types of **triggers** and hybrids that come from mixing and matching the events and timings that fire them.

Basically, **triggers** are classified into two main types:-

(i) After **Triggers** (For **Triggers**)
(ii) Instead Of **Triggers**

## **After Triggers**

These **triggers** run after an insert, update or delete on a table. They are **not supported for views.**
AFTER **TRIGGERS** can be classified further into three types as:

(a) AFTER INSERT Trigger.
(b) AFTER UPDATE Trigger.
(c) AFTER DELETE Trigger.

Let’s create After**triggers**. First of all, let’s create a table and insert some sample data. Then, on this table, I will be attaching several **triggers**.

CREATE TABLE Employee\_Test

(

Emp\_ID INT Identity,

Emp\_nameVarchar(100),

Emp\_Sal Decimal (10,2)

)

INSERT INTO Employee\_Test VALUES ('Anees',1000);

INSERT INTO Employee\_Test VALUES ('Rick',1200);

INSERT INTO Employee\_Test VALUES ('John',1100);

INSERT INTO Employee\_Test VALUES ('Stephen',1300);

INSERT INTO Employee\_Test VALUES ('Maria',1400);

I will be creating an AFTER INSERT TRIGGER which will insert the rows inserted into the table into another audit table. The main purpose of this audit table is to record the changes in the main table. This can be thought of as a generic audit trigger.

Now, create the audit table as:-

CREATE TABLE Employee\_Test\_Audit

(

Emp\_IDint,

Emp\_namevarchar(100),

Emp\_Sal decimal (10,2),

Audit\_Actionvarchar(100),

Audit\_Timestampdatetime

)

**(a) AFTER INSERT Trigger**

This trigger is fired after an INSERT on the table. Let’s create the trigger as:-

CREATE TRIGGER trgAfterInsert ON [dbo].[Employee\_Test]

FOR INSERT

AS

 declare @empidint;

 declare @empnamevarchar(100);

 declare @empsal decimal(10,2);

 declare @audit\_actionvarchar(100);

 select @empid=i.Emp\_ID from inserted i;

 select @empname=i.Emp\_Name from inserted i;

 select @empsal=i.Emp\_Sal from inserted i;

 set @audit\_action='Inserted Record -- After Insert Trigger.';

 insert into Employee\_Test\_Audit

 (Emp\_ID,Emp\_Name,Emp\_Sal,Audit\_Action,Audit\_Timestamp)

 values(@empid,@empname,@empsal,@audit\_action,getdate());

 PRINT 'AFTER INSERT trigger fired.'

GO

The CREATE TRIGGER statement is used to create the trigger. THE ON clause specifies the table name on which the trigger is to be attached. The FOR INSERT specifies that this is an AFTER INSERT trigger. In place of FOR INSERT, AFTER INSERT can be used. Both of them mean the same.
In the trigger body, table named **inserted** has been used. This table is a logical table and contains the row that has been inserted. I have selected the fields from the logical inserted table from the row that has been inserted into different variables, and finally inserted those values into the Audit table.
To see the newly created trigger in action, lets insert a row into the main table as :

insert into Employee\_Test values('Chris',1500);

Now, a record has been inserted into the Employee\_Test table. The AFTER INSERT trigger attached to this table has inserted the record into the Employee\_Test\_Audit as:-

6Chris 1500.00 Inserted Record -- After Insert Trigger. **2008**-04-2612:00:55.700

**(b) AFTER UPDATE Trigger**

This trigger is fired after an update on the table. Let’s create the trigger as:-

CREATE TRIGGER trgAfterUpdate ON [dbo].[Employee\_Test]

FOR UPDATE

AS

 declare @empidint;

 declare @empnamevarchar(100);

 declare @empsal decimal(10,2);

 declare @audit\_actionvarchar(100);

 select @empid=i.Emp\_ID from inserted i;

 select @empname=i.Emp\_Name from inserted i;

 select @empsal=i.Emp\_Sal from inserted i;

 if update(Emp\_Name)

 set @audit\_action='Updated Record -- After Update Trigger.';

 if update(Emp\_Sal)

 set @audit\_action='Updated Record -- After Update Trigger.';

 insert into Employee\_Test\_Audit(Emp\_ID,Emp\_Name,Emp\_Sal,Audit\_Action,Audit\_Timestamp)

 values(@empid,@empname,@empsal,@audit\_action,getdate());

 PRINT 'AFTER UPDATE Trigger fired.'

GO

The AFTER UPDATE Trigger is created in which the updated record is inserted into the audit table. There is **no logical table updated like the logical table inserted.** We can obtain the updated value of a field from the **update(column\_name)** function. In our trigger, we have used, **if update(Emp\_Name)** to check if the column Emp\_Name has been updated. We have similarly checked the column Emp\_Sal for an update.
Let’s update a record column and see what happens.

updateEmployee\_Test set Emp\_Sal=1550 where Emp\_ID=6

This inserts the row into the audit table as:-

6 Chris1550.00 Updated Record -- After Update Trigger. **2008**-04-2612:38:11.843

**(c) AFTER DELETE Trigger**

This trigger is fired after a delete on the table. Let’s create the trigger as:-

CREATE TRIGGER trgAfterDelete ON [dbo].[Employee\_Test]

AFTER DELETE

AS

 declare @empidint;

 declare @empnamevarchar(100);

 declare @empsal decimal(10,2);

 declare @audit\_actionvarchar(100);

 select @empid=d.Emp\_ID from deleted d;

 select @empname=d.Emp\_Name from deleted d;

 select @empsal=d.Emp\_Sal from deleted d;

 set @audit\_action='Deleted -- After Delete Trigger.';

 insert into Employee\_Test\_Audit

(Emp\_ID,Emp\_Name,Emp\_Sal,Audit\_Action,Audit\_Timestamp)

 values(@empid,@empname,@empsal,@audit\_action,getdate());

 PRINT 'AFTER DELETE TRIGGER fired.'

GO

In this trigger, the deleted record’s data is picked from the **logical deleted table** and inserted into the audit table.
Let’s fire a delete on the main table.
A record has been inserted into the audit table as:-

6 Chris 1550.00 Deleted -- After Delete Trigger. **2008**-04-2612:52:13.867

All the **triggers** can be enabled/disabled on the table using the statement

ALTER TABLE Employee\_Test {ENABLE|DISBALE} TRIGGER ALL

Specific **Triggers** can be enabled or disabled as :-

ALTER TABLE Employee\_Test DISABLE TRIGGER trgAfterDelete

This disables the After Delete Trigger named trgAfterDelete on the specified table.

## **Instead Of Triggers**

These can be used as an interceptor for anything that anyonr tried to do on our table or view. If you define an *Instead Of trigger* on a table for the Delete operation, they try to delete rows, and they will not actually get deleted (unless you issue another delete instruction from within the trigger)
INSTEAD OF **TRIGGERS** can be classified further into three types as:-

(a) INSTEAD OF INSERT Trigger.
(b) INSTEAD OF UPDATE Trigger.
(c) INSTEAD OF DELETE Trigger.

(a) Let’s create an Instead Of Delete Trigger as:-

CREATE TRIGGER trgInsteadOfDelete ON [dbo].[Employee\_Test]

INSTEAD OF DELETE

AS

 declare @emp\_idint;

 declare @emp\_namevarchar(100);

 declare @emp\_salint;

 select @emp\_id=d.Emp\_ID from deleted d;

 select @emp\_name=d.Emp\_Name from deleted d;

 select @emp\_sal=d.Emp\_Sal from deleted d;

 BEGIN

 if(@emp\_sal>1200)

 begin

 RAISERROR('Cannot delete where salary > 1200',16,1);

 ROLLBACK;

 end

 else

 begin

 delete from Employee\_Test where Emp\_ID=@emp\_id;

 COMMIT;

 insert into Employee\_Test\_Audit(Emp\_ID,Emp\_Name,Emp\_Sal,Audit\_Action,Audit\_Timestamp)

 values(@emp\_id,@emp\_name,@emp\_sal,'Deleted -- Instead Of Delete Trigger.',getdate());

 PRINT 'Record Deleted -- Instead Of Delete Trigger.'

 end

 END

GO

This trigger will prevent the deletion of records from the table where Emp\_Sal> 1200. If such a record is deleted, the Instead Of Trigger will rollback the transaction, otherwise the transaction will be committed.
Now, let’s try to delete a record with the Emp\_Sal>1200 as:-

delete from Employee\_Test where Emp\_ID=4

This will print an error message as defined in the RAISE ERROR statement as:-

**Server**: Msg50000, Level 16, State 1, Procedure trgInsteadOfDelete, Line 15

Cannot delete where salary >1200

And this record will not be deleted.
In a similar way, you can code Instead of Insert and Instead Of Update **triggers** on your tables.

Nested Trigger: - In Sql Server, triggers are said to be nested when the action of one trigger initiates another trigger that may be on the same table or on the different table. For example, suppose there is a trigger t1 defined on the table tbl1 and there is another trigger t2 defined on the table tbl2, if the action of the trigger t1 initiates the trigger t2 then both the triggers are said to be nested. In SQL Server, triggers can be nested up to 32 levels. If the action of nested triggers results in an infinite loop, then after the 32 level, the trigger terminates. Since the triggers are executed within a transaction, therefore failure at any level of within nested triggers can cancel the entire transaction, and it result in total rollback.

Triggers are nested when a trigger performs an action that initiates another trigger, which can initiate another trigger, and so on. Triggers can be nested up to 32 levels, and you can control whether triggers can be nested through the **nested triggers** server configuration option.

If nested triggers are allowed and a trigger in the chain starts an infinite loop, the nesting level is exceeded and the trigger terminates.

You can use nested triggers to perform useful housekeeping functions such as storing a backup copy of rows affected by a previous trigger. For example, you can create a trigger on **titleauthor** that saves a backup copy of the **titleauthor** rows that the **delcascadetrig** trigger deleted. With the **delcascadetrig** trigger in effect, deleting **title\_id** PS2091 from **titles** deletes the corresponding row or rows from **titleauthor**. To save the data, you create a DELETE trigger on **titleauthor** that saves the deleted data into another separately created table, **del\_save**. For example:

CREATE TRIGGER savedel

 ON titleauthor

FOR DELETE

AS

 INSERT del\_save

 SELECT \* FROM deleted

Using nested triggers in an order-dependent sequence is not recommended. Use separate triggers to cascade data modifications.

**Note**  Because triggers execute within a transaction, a failure at any level of a set of nested triggers cancels the entire transaction, and all data modifications are rolled back. Include PRINT statements in your triggers so that you can determine where the failure occurred.

**Recursive Triggers**

A trigger does not call itself recursively unless the RECURSIVE\_TRIGGERS database option is set. There are two types of recursion:

* Direct recursion

Occurs when a trigger fires and performs an action that causes the same trigger to fire again. For example, an application updates table **T3**, which causes trigger **Trig3** to fire. **Trig3** updates table **T3** again, which causes trigger **Trig3** to fire again.

* Indirect recursion

Occurs when a trigger fires and performs an action that causes another trigger (either on the same table or on another table) to fire. This second trigger performs an action that causes the original trigger to fire again. For example, an application updates table **T1**, which causes trigger **Trig1** to fire. **Trig1** updates table **T2**, which causes trigger **Trig2** to fire. **Trig2** in turn updates table **T1** that causes **Trig1** to fire again.

Only direct recursion is prevented when the RECURSIVE\_TRIGGERS database option is set to OFF. To disable indirect recursion, set the **nested triggers** server option to **0**, as well.

**Examples**

**A. Use recursive triggers to solve self-referencing relationships**

One use for recursive triggers is on a table with a self-referencing relationship (also known as transitive closure). For example, the table**emp\_mgr** defines:

* An employee (**emp**) in a company.
* The manager for each employee (**mgr**).
* The total number of employees in the organizational tree reporting to each employee (**NoOfReports**).

A recursive UPDATE trigger can be used to keep the **NoOfReports** column up-to-date as new employee records are inserted. The INSERT trigger updates the **NoOfReports** column of the manager record, which recursively updates the **NoOfReports** column of other records up the management hierarchy.

|  |
| --- |
| USE pubsGO-- Turn recursive triggers ON in the database.ALTER DATABASE pubs SET RECURSIVE\_TRIGGERS ONGOCREATE TABLE emp\_mgr (emp char(30) PRIMARY KEY,mgr char(30) NULL FOREIGN KEY REFERENCES emp\_mgr(emp),NoOfReportsint DEFAULT 0)GOCREATE TRIGGER emp\_mgrins ON emp\_mgrFOR INSERTASDECLARE @e char(30), @m char(30)DECLARE c1 CURSOR FOR SELECT emp\_mgr.emp FROM emp\_mgr, inserted WHERE emp\_mgr.emp = inserted.mgrOPEN c1FETCH NEXT FROM c1 INTO @eWHILE @@fetch\_status = 0BEGIN UPDATE emp\_mgr SET emp\_mgr.NoOfReports = emp\_mgr.NoOfReports + 1 -- Add 1 for newly WHERE emp\_mgr.emp = @e -- added employee. FETCH NEXT FROM c1 INTO @eENDCLOSE c1DEALLOCATE c1GO-- This recursive UPDATE trigger works assuming:-- 1. Only singleton updates on emp\_mgr.-- 2. No inserts in the middle of the org tree.CREATE TRIGGER emp\_mgrupd ON emp\_mgr FOR UPDATEASIF UPDATE (mgr)BEGIN UPDATE emp\_mgr SET emp\_mgr.NoOfReports = emp\_mgr.NoOfReports + 1 -- Increment mgr's FROM inserted -- (no. of reports) by WHERE emp\_mgr.emp = inserted.mgr -- 1 for the new report. UPDATE emp\_mgr SET emp\_mgr.NoOfReports = emp\_mgr.NoOfReports - 1 -- Decrement mgr's FROM deleted -- (no. of reports) by 1 WHERE emp\_mgr.emp = deleted.mgr -- for the new report.ENDGO-- Insert some test data rows.INSERT emp\_mgr(emp, mgr) VALUES ('Harry', NULL)INSERT emp\_mgr(emp, mgr) VALUES ('Alice', 'Harry')INSERT emp\_mgr(emp, mgr) VALUES ('Paul', 'Alice')INSERT emp\_mgr(emp, mgr) VALUES ('Joe', 'Alice')INSERT emp\_mgr(emp, mgr) VALUES ('Dave', 'Joe')GOSELECT \* FROM emp\_mgrGO-- Change Dave's manager from Joe to HarryUPDATE emp\_mgr SET mgr = 'Harry'WHERE emp = 'Dave'GOSELECT \* FROM emp\_mgr |

# **CURSOR**

In SQL procedures, a cursor make it possible to define a result set (a set of data rows) and perform complex logic on a row by row basis. By using the same mechanics, an SQL procedure can also define a result set and return it directly to the caller of the SQL procedure or to a client application.

A cursor can be viewed as a pointer to one row in a set of rows. The cursor can only reference one row at a time, but can move to other rows of the result set as needed.

A Cursor impacts the performance of the SQL Server since it uses the SQL Server instances' memory, reduce concurrency, decrease network bandwidth and lock resources. Hence it is mandatory to understand the cursor types and its functions so that you can use suitable cursor according to your needs.

You should avoid the use of cursor. Basically you should use cursor alternatives like as WHILE loop, sub queries, Temporary tables and Table variables.

**Type of CURSOR:

Static**: This is lowest type of CURSOR and used to use for finding data and generating reports. Once getting the data into the CURSOR you will not identify any modification done in data after retrieving it because it make a copy of your data into the temp table of tempDB.

A static cursor populates the result set at the time of cursor creation and query result is cached for the lifetime of the cursor. A static cursor can move forward and backward direction. A static cursor is slower and use more memory in comparison to other cursor. Hence you should use it only if scrolling is required and other types of cursors are not suitable.

You can't update, delete data using static cursor. It is not sensitive to any changes to the original data source. By default static cursors are scrollable.

**Forward\_Only**: This is the default type of CURSOR and really very similar to Static CURSOR the only difference you will find it, it will move forward only. In short, this CURSOR will scroll from first to last no other movement supported.

**Fast\_Forward**: this is a mixture of Forward Only and Read-only.

**Dynamic**: this CURSOR will be bit slow as it will accept any data modification done by any user even after you fetch the data because you scroll around the CURSOR. Data membership, value and its order will be changed in each FETCH if any data modification has been done in record set.
A dynamic cursor allows you to see the data updation, deletion and insertion in the data source while the cursor is open. Hence a dynamic cursor is sensitive to any changes to the data source and supports update, delete operations. By default dynamic cursors are scrollable.

**Keyset-Driven**: when you open this CURSOR, membership key and order of row are fixed in CURSOR.

**Steps for CURSOR:**
**DECLARE**: Defines a CURSOR with standard SELECT statement. This must be done before you open the CURSOR.

**OPEN**: physically open the CURSOR and received the record set exist in table at the time of opening the CURSOR.

**FETCH**: CURSOR always points to one row at a time and FETCH is retrieve the value from that row to manipulate it further.

**CLOSE**: CLOSE will release the lock on table made by CURSOR. If you wish than you can re-open CURSOR after closes it.

**DEALLOCATE**: Once you are done with CURSOR, do DEALLOCATE it and removes the memory from the server. You can open the CURSOR once you close it but can’t re-open CURSOR once you DEALLOCATE it.

To use cursors in SQL procedures, you need to do the following:

1. Declare a cursor that defines a result set.
2. Open the cursor to establish the result set.
3. Fetch the data into local variables as needed from the cursor, one row at a time.
4. Close the cursor when done

To work with cursors you must use the following SQL statements:

* DECLARE CURSOR
* OPEN
* FETCH
* CLOSE

DECLARE @Variable1 INT, @Variable2 INT

**DECLARE CursorName CURSOR FAST\_FORWARD**

**FOR**

**SELECT idcol FROM CursorTest**

OPEN CursorName

**FETCH NEXT FROM CursorName INTO @Variable1**

WHILE @@FETCH\_STATUS = 0

BEGIN

PRINT CAST(@Variable1 AS VARCHAR(5))

FETCH NEXT FROM CursorName

INTO @Variable1

END

CLOSE CursorName

DEALLOCATE CursorName

DECLARE Employee\_Cursor CURSOR FOR

SELECT BusinessEntityID, JobTitle

FROM AdventureWorks2008R2.HumanResources.Employee;

OPEN Employee\_Cursor;

FETCH NEXT FROM Employee\_Cursor;

WHILE @@FETCH\_STATUS = 0

   BEGIN

      FETCH NEXT FROM Employee\_Cursor;

   END;

CLOSE Employee\_Cursor;

DEALLOCATE Employee\_Cursor;

GO

The main option for a cursor is whether the data is on the **client** or the **server**.

**Client** cursors are good for spreading the workload across many workstations.

**Server** cursors are good for lightweight clients who can't afford to cache a large result set. Server cursors do not support multiple result sets or these SQL keywords: COMPUTE, COMPUTE BY, FOR BROWSE, or INTO.

**Types of Cursor**

* **Forward-Only**
* **Static**
* **Keyset**
* **Dynamic**

The syntax for specifying a cursor is dependent on the method for making the cursor. SQL Server supports two possible methods for making cursors: via DECLARE CURSOR or via a DB API. Applications should choose one or the other but not both.

USE pubs

GO

DECLARE authors\_cursor CURSORFOR

SELECT au\_lname FROM authors

WHERE au\_lname LIKE'D%'

ORDERBY au\_lname

OPEN authors\_cursor

FETCH NEXT FROM authors\_cursor

WHILE@@FETCH\_STATUS= 0

BEGIN

FETCH NEXT FROM authors\_cursor

END

CLOSE authors\_cursor

DEALLOCATE authors\_cursor

**Example SQL Server Cursor :To BackUp all the database in a server**

|  |
| --- |
| DECLARE @name VARCHAR(50) -- database name  DECLARE @path VARCHAR(256) -- path for backup files  DECLARE @fileNameVARCHAR(256) -- filename for backup  DECLARE @fileDateVARCHAR(20) -- used for file name SET @path = 'C:\Backup\'  SELECT @fileDate= CONVERT(VARCHAR(20),GETDATE(),112) DECLARE db\_cursorCURSOR FOR  SELECT name FROM MASTER.dbo.sysdatabasesWHERE name NOT IN ('master','model','msdb','tempdb')  OPEN db\_cursor   FETCH NEXT FROM db\_cursorINTO @name   WHILE @@FETCH\_STATUS = 0   BEGIN          SET @fileName= @path + @name + '\_' + @fileDate+ '.BAK'         BACKUP DATABASE @name TO DISK = @fileName         FETCH NEXT FROM db\_cursorINTO @name   END   CLOSE db\_cursor   DEALLOCATE db\_cursor |

**SQL Server Cursor Components**

Based on the example above, cursors include these components:

* DECLARE statements - Declare variables used in the code block
* SET\SELECT statements - Initialize the variables to a specific value
* DECLARE CURSOR statement - Populate the cursor with values that will be evaluated
	+ NOTE - There are an equal number of variables in the DECLARE <cursor\_name> CURSOR FOR statement as there are in the SELECT statement.  This could be 1 or many variables and associated columns.
* OPEN statement - Open the cursor to begin data processing
* FETCH NEXT statements - Assign the specific values from the cursor to the variables
	+ NOTE - This logic is used for the initial population before the WHILE statement and then again during each loop in the process as a portion of the WHILE statement
* WHILE statement - Condition to begin and continue data processing
* BEGIN...END statement - Start and end of the code block
	+ NOTE - Based on the data processing multiple BEGIN...END statements can be used
* Data processing - In this example, this logic is to backup a database to a specific path and file name, but this could be just about any DML or administrative logic
* CLOSE statement - Releases the current data and associated locks, but permits the cursor to be re-opened
* DEALLOCATE statement - Destroys the cursor

**SQL Server 2005**

* Here is another version of this same process.  The overall process is the same, but it uses the new tables in SQL Server 2005.  It also uses the Try Catch processing which was discussed in this previous tip, [SQL Server 2005 - Try Catch Exception Handling](http://www.mssqltips.com/sqlservertip/1027/sql-server-2005-try-and-catch-exception-handling/). Both of the examples will produce the same ouput.

|  |
| --- |
| BEGIN try  DECLARE @table\_name VARCHAR(500) ;  DECLARE @schema\_name VARCHAR(500) ;  DECLARE @tab1 TABLE(         tablename VARCHAR (500) collate database\_default,       schemaname VARCHAR(500) collate database\_default);  DECLARE  @temp\_table TABLE (             tablename sysname,       row\_count INT ,       reserved VARCHAR(50) collate database\_default,       data VARCHAR(50) collate database\_default,       index\_size VARCHAR(50) collate database\_default,       unused VARCHAR(50) collate database\_default  );  INSERT INTO @tab1  SELECT t1.name ,       t2.name  FROM sys.tables t1  INNER JOIN sys.schemas t2 ON ( t1.schema\_id = t2.schema\_id );    DECLARE c1 CURSOR FOR  SELECT t2.name + '.' + t1.name   FROM sys.tables t1  INNER JOIN sys.schemas t2 ON ( t1.schema\_id = t2.schema\_id );    OPEN c1;  FETCH NEXT FROM c1 INTO @table\_name; WHILE @@FETCH\_STATUS = 0  BEGIN           SET @table\_name = REPLACE(@table\_name, '[','');          SET @table\_name = REPLACE(@table\_name, ']','');          -- make sure the object exists before calling sp\_spacedused        IF EXISTS(SELECT OBJECT\_ID FROM sys.objects WHERE OBJECT\_ID = OBJECT\_ID(@table\_name))         BEGIN                 INSERT INTO @temp\_table EXEC sp\_spaceused @table\_name, false ;         END                  FETCH NEXT FROM c1 INTO @table\_name;  END;  CLOSE c1;  DEALLOCATE c1;  SELECT t1.\* ,       t2.schemaname  FROM @temp\_table t1  INNER JOIN @tab1 t2 ON (t1.tablename = t2.tablename ) ORDER BY  schemaname,tablename; END try  BEGIN catch  SELECT -100 AS l1 ,       ERROR\_NUMBER() AS tablename,       ERROR\_SEVERITY() AS row\_count,       ERROR\_STATE() AS reserved ,       ERROR\_MESSAGE() AS data ,       1 AS index\_size, 1 AS unused, 1 AS schemaname  END catch |

* Here is some sample output after running this against the AdventureWorks database.



# **INDEXES IN SQL SERVER**

So an index can be defined as:

* “*An index is an on-disk structure associated with a table or views that speed retrieval of rows from the table or view. An index contains keys built from one or more columns in the table or view”. These keys are stored in a structure (B-tree=) that enables SQL Server to find the row or rows associated with the key values quickly and efficiently.*”
* *“An index is a database object created and maintained by DBMS. It is essentially a list of the contents of a column or group of columns. Indexes are ordered so that extremely first search can be computed through them to find data.”*

**Why Use an Index?**

Use of SQL server indexes provide many facilities such as:

* Rapid access of information
* Efficient access of information
* Enforcement of uniqueness constraints

Correct use of indexes can make the difference between a top performing database with high customer satisfaction and a non-performing database with low customer satisfaction.

**4. Types of Indexes**

SQL Server has two major types of indexes:

1. Clustered
2. Non-Clustered

The index type refers to the way the index is stored internally by SQL Server. So a table or view can contain the two types of indexes.

**4.1 Clustered**

An index defined as being clustered, defines the physical order that the data in a table is stored. Only one cluster can be defined per table. So it can be defined as:

* Clustered indexes sort and store the data rows in the table or view based on their key values. These are the columns included in the index definition. There can be only one clustered index per table, because the data rows themselves can be sorted in only one order.
* The only time the data rows in a table are stored in sorted order is when the table contains a clustered index. When a table has a clustered index, the table is called a clustered table. If a table has no clustered index, its data rows are stored in an unordered structure called a heap.
* Internals of Clustered Index
* So what exactly is the clustered index? This is B-tree. Let’s see what is that.

* The image above shows a small table with ID as the primary key (and clustered index). As the side note, SQL Server creates clustered index on the primary key field by default.
* Leaf level (the bottom one) contains actual table data sorted by ID. As you can see, the data pages are linked into the double-linked list so SQL Server can scan the index in both directions.
* Levels above the leaf level called “intermediate levels”. Every index row on those levels points to the separate data pages in the level below. At the top level (root level) there is only one page. There could be several intermediate levels based on the table size. But the top root level of the index always has 1 data page.
* So let’s see how it actually works: Assuming you want to select the record with ID = 50. SQL Server start from the root level and find that first row contains ID=1 and the second row contains ID=57. It means that the row with ID=50 would be located on the data page started with ID=1 on the next level of the index. So the next step is analyzing **the first data page** on the intermediate level which contains IDs from 1 to 50. So SQL Server finds the row with ID=50 and jump on the leaf level page with the actual data.
* SQL Server does not require you to create the clustered indexes - tables without such indexes called heap tables.

**4.2 Non-Clustered**

As a non-clustered index is stored in a separate structure to the base table, it is possible to create the non-clustered index on a different file group to the base table. So it can be defined as:

* Non-Clustered indexes have a structure separate from the data rows. A non-clustered index contains the non-clustered index key values and each key value entry has a pointer to the data row that contains the key value.
* The pointer from an index row in a non-clustered index to a data row is called a row locator. The structure of the row locator depends on whether the data pages are stored in a heap or a clustered table. For a heap, a row locator is a pointer to the row. For a clustered table, the row locator is the clustered index key.
* You can add nonkey columns to the leaf level of the Non-Clustered index to by-pass existing index key limits, 900 bytes and 16 key columns, and execute fully covered, indexed, queries.
* Now let’s look at the non-clustered index. Assuming we have the index by Name field.


|  |
| --- |
| Example of Creating a IndexCREATE UNIQUE NONCLUSTERED INDEX IX\_NC\_PresidentNumber -- specify index name |
|     ON dbo.Presidents (PresidentNumber) -- specify table and column name |

* The structure of the index is exactly the same with the exception that leaf level does not contain table data but values for the clustered index. It does not really matter if you specify ID in the index definition, it would be there. For the heap tables, leaf level contains actual RID - Row id which consists of
* FileId: PageNumber:RowNumber. Annotation at the end of the book is a good example. It does not include the actual paragraph from the book but the page # (clustered index)
* Let’s see how SQL Server works when it uses non-clustered index for the lookups on the tables with clustered index. As you can see, first it needs to find ID of the row(s) and next perform clustered index lookup in order to obtain the actual table data. This operation called “Key lookup” or “Bookmark lookup” on the previous editions of SQL Server.
* Things I would like us to remember:
1. Non clustered index has the value of the clustered index on the leaf level
2. As result when SQL Server use non-clustered index for lookup, it needs to traverse clustered index to get the value for the actual data row.

## Uniqueness

An index can be defined either as unique or non-unique. A unique index ensures that the data contained within the unique index columns appear only once within the table, including “NULL”. A unique index is commonly implemented to support the constraints.

SQLServer automatically enforces the uniqueness of the columns contained within a unique index. If an attempt is made to INSERT a value/data that already exists in the table, then an error will be generated by the SQLServer and finally the attempt to INSERT the data will fail.

A non-unique index is also applicable as there can be duplicate data; a non-unique index has more overhead than a unique index when retrieving data.

##### Creating an Index – Transact-SQL

If we want to create an index by using Transact – SQL , we must know the columns detail for index creation. A sample syntax is given below.

##### Syntax

CREATEINDEX<index\_type><index\_name>ON<table\_name> (

<column\_name1><index\_order>,

<column\_name2><index\_order>,

)

CREATEUNIQUEINDEX<index\_type><index\_name>ON<table\_name> (

<column\_name1><index\_order>,

<column\_name2><index\_order>,

)

Syntax:

CREATE [ UNIQUE ] [ CLUSTERED | NONCLUSTERED ]
    INDEX index\_name ON table ( column1, ... )
[ WITH
       [ PAD\_INDEX ]
       [ [ , ] FILLFACTOR = fillfactor1 ]
       [ [ , ] IGNORE\_DUP\_KEY ]
       [ [ , ] DROP\_EXISTING ]
       [ [ , ] STATISTICS\_NORECOMPUTE ]
]
[ ON filegroup1 ]

UNIQUE

Indicates that a unique index is to be created.

CLUSTERED

Indicates that the index created is a clustered index.

NONCLUSTERED

Indicates that the index created is a nonclustered index.

index\_name

Is the name of the index.

table

The name of the table on which the index is to be created.

column1, ...

The column or columns to which the index is to be applied.

PAD\_INDEX

Specifies the space to be left open on each page (node) in the intermediate levels of the index. (This is useful only when FILLFACTOR is specified).

FILLFACTOR = fillfactor1

Specifies the fillfactor for the index as fillfactor1.

IGNORE\_DUP\_KEY

#### Create a single nonclustered index

|  |
| --- |
| CREATEUNIQUENONCLUSTERED INDEXIX\_NC\_PresidentNumber -- specify index name |
|     ONdbo.Presidents (PresidentNumber) -- specify table and column name |

#### Create a multi-column (composite) nonclustered index

|  |
| --- |
| CREATEUNIQUENONCLUSTERED INDEXIX\_NC\_PresidentNumber\_PresidentName -- specify index name |
|     ONdbo.Presidents (PresidentNumber,PresidentName) -- specify table and column names |

#### Create a multi-column (composite) clustered index

|  |
| --- |
| CREATEUNIQUECLUSTERED INDEXIX\_C\_PresidentNumber -- specify index name |
|     ONdbo.Presidents (PresidentNumber,PresidentName) -- specify table and column names |

##### 7.3 Drop an Index

Removes one or more indexes from the current database.

The DROP INDEX statement does not apply to indexes created by defining PRIMARY KEY or UNIQUE constraints (created by using the PRIMARY KEY or UNIQUE options of either the CREATE TABLE or ALTER TABLE statements, respectively). For more information about PRIMARY or UNIQUE KEY constraints, see "CREATE TABLE" or "ALTER TABLE" in this volume.

##### Syntax

DROPINDEX'table.index | view.index'[ ,...n ]

|  |
| --- |
| USE YourDatabaseName;DROP INDEX IX\_Product\_1    ON dbo.Product;You can also drop multiple indexes within a single transaction:USE YourDatabaseName;DROP INDEXIX\_Product\_1 ON dbo.Product,IX\_Customer\_1 ON dbo.Customer; |

## bulk insert

***BULK INSERT MyTable FROM ‘C:\SpreadSheet.csv’ WITH (fieldterminator = ‘,’,rowterminator = ‘\n’)***

**Temp Tables**

SQL Server provides the concept of **temporary table** which helps the developer in a great way. These tables can be created at **runtime** and can do the all kinds of operations that one normal table can do. But, based on the table types, the scope is limited. These tables are created inside tempdb database.

In this article, I am just going to give a quick overview for beginners on those temporary tables. Please give your valuable suggestions and feedback to improve this article.

**Different Types of Temporary Tables**

SQL Server provides two types of temp tables based on the behavior and scope of the table. These are:

* Local Temp Table
* Global Temp Table

**Local Temp Table**

Local temp tables are only available to the current connection for the user; and they are automatically deleted when the user disconnects from instances. Local temporary table name is stared with hash ("#") sign.

**Global Temp Table**

Global Temporary tables name starts with a double hash ("##"). Once this table has been created by a connection, like a permanent table it is then available to any user by any connection. It can only be deleted once all connections have been closed.

**Creating Temporary Table in SQL Server 2005**

As I have already discussed, there are two types of temporary tables available. Here I am going to describe each of them.

**Local Temporary Table**

The syntax given below is used to create a **local Temp table** in SQL Server 2005:

CREATE TABLE #LocalTempTable(

UserIDint,

UserNamevarchar(50),

UserAddressvarchar(150))

The above script will create a temporary table in tempdbdatabase. We can insert or delete records in the temporary table similar to a general table like:

insert into #LocalTempTable values ( 1, 'Abhijit','India');

Now select records from that table:

select \* from #LocalTempTable

After execution of all these statements, if you close the query window and again execute "Insert" or "Select" Command, it will throw the following error:

Msg 208, Level 16, State 0, Line 1

Invalid object name '#LocalTempTable'.

This is because the **scope of Local Temporary table** is only bounded with the current connection of current user.

**Global Temporary Table**

The scope of Global temporary table is the same for the entire user for a particular connection. We need to put "##" with the name of Global temporary tables. Below is the syntax for creating a Global Temporary Table:

CREATE TABLE ##NewGlobalTempTable(

UserID int,

UserName varchar(50),

UserAddress varchar(150))

The above script will create a temporary table in **tempdb database**. We can insert or delete records in the temporary table similar to a general table like:

insert into ##NewGlobalTempTable values ( 1, 'Abhijit','India');

Now select records from that table:

select \* from ##NewGlobalTempTable

Global temporary tables are visible to all SQL Server connections. When you create one of these, all the users can see it.

**Storage Location of Temporary Table**

Temporary tables are stored inside the **Temporary Folder of tempdb**. Whenever we create a temporary table, it goes to **Temporary folder of tempdb database**.



Now, if we deeply look into the name of Local Temporary table names, a 'dash' is associated with each and every table name along with an ID. Have a look at the image below:



SQL server does all this automatically, we do not need to worry about this; we need to only use the table name.

**When to Use Temporary Tables?**

Below are the scenarios where we can use temporary tables:

* When we are doing large number of row manipulation in stored procedures.
* This is useful to replace the cursor. We can store the result set data into a temp table, then we can manipulate the data from there.
* When we are having a complex join operation.

**Points to Remember Before Using Temporary Tables**

* Temporary table created on tempdbof SQL Server. This is a separate database. So, this is an additional overhead and can causes performance issues.
* Number of rows and columns need to be as minimum as needed.
* Tables need to be deleted when they are done with their work.

**Alternative Approach: Table Variable**

Alternative of Temporary table is the **Table variable** which can do all kinds of operations that we can perform in Temp table. Below is the syntax for using **Table variable**.

Declare @TempTableVariable TABLE (

UserIDint,

UserNamevarchar(50),

UserAddressvarchar(150))

The below scripts are used to insert and read the records for Tablevariables:

insert into @TempTableVariable values ( 1, 'Abhijit','India');

Now select records from that tablevariable:

select \* from @TempTableVariable

**When to Use Table Variable Over Temp Table**

Tablevariable is always useful **for less data**. If the result set returns a large number of records, we need to go for temp table.

DECLARE@TempCustomerTABLE
(
   CustomerIduniqueidentifier,
   FirstNamenvarchar(100),
   LastNamenvarchar(100),
   Email nvarchar(100)
);
INSERTINTO@TempCustomer
SELECTCustomerId,FirstName,LastName, Email
FROM
    CustomerWHERECustomerId=@CustomerId

select\*from(select cr.name,cr.coursename from candidate\_registration cr innerjoin courses\_detail cd

on cr.COURSEID = CD.COURSEID) emp wherenamelike'eil%'

**CASE STATEMENTS**

The basic syntax for a simple CASE expressions is shown below:

CASE *expression*
 WHEN *expression1* THEN *expression1*
 [[WHEN *expression2* THEN *expression2*] [...]]
 [ELSE *expressionN*]
END

**Syntax:**
CASE expression
WHEN expression1 THEN expression1
[[WHEN expression2 THEN expression2] [...]]
[ELSE expressionN]
END
**Example:**

DECLARE @TestValINT
SET @TestVal= 3
SELECT
CASE @TestVal
WHEN 1 THEN 'First'
WHEN 2 THEN 'Second'
WHEN 3 THEN 'Third'
ELSE 'Other'
END

CASE :

SELECT empID,empname,CASE gender

 WHEN 'M' THEN 'Male'
 WHEN 'F' THEN 'Female'

 ELSE 'NA'

 END FROM employee

**EXAMPLE OF CASE :**

SELECT STUDENTID,SUB\_SCIENCE,

Grade=CASE

WHEN SUB\_SCIENCE > 60 THEN'FIRST'

WHEN SUB\_SCIENCE > 45 and SUB\_SCIENCE > 60 THEN'SECOND'

WHEN SUB\_SCIENCE > 45 and SUB\_SCIENCE < 35 THEN'THIRD'

ENDFROM STUDENTMARKS

**WHILE LOOP:**

DECLARE @intFlagINT
SET @intFlag= 1
WHILE (@intFlag<=5)
BEGIN
PRINT @intFlag
SET @intFlag= @intFlag+ 1
END
**EXAMPLE OF TABLE USING WHILE LOOP**

|  |
| --- |
| createtablehospitals(IDintidentity(1,1),HospitalIDint,Emailnvarchar(200),Descriptionnvarchar(200))CREATEPROCEDUREpopulateHospitalsASBEGINDECLARE@hidINTSET@hid=16;WHILE@hid< 100BEGININSERThospitals([HospitalID],Email,Description)VALUES(@hid,'user'+LTRIM(STR(@hid))+'@mail.com','Sample Description'+LTRIM(STR(@hid)));SET@hid=@hid+ 1;ENDENDEXECpopulateHospitalsSELECT\*FROMhospitals |

DECLARE@uniqueIdint

DECLARE@TEMPTABLE(uniqueIdint)

-- Insert into the temporary table a list of the records to be updated

INSERTINTO@TEMP(uniqueId)

SELECTuniqueId FROMmyTable

-- Start looping through the records

WHILE EXISTS (SELECT\* FROM@TEMP)

BEGIN

    -- Grab the first record out

    SELECTTop1 @uniqueId = uniqueId FROM@TEMP

    PRINT 'Working on @uniqueId = '+ CAST(@uniqueId asvarchar(100))

    -- Perform some update on the record

    UPDATEmyTable SETmyField = 'something or other'WHEREuniqueId = @uniqueId

    -- Drop the record so we can move onto the next one

    DELETEFROM@TEMPWHEREuniqueId = @uniqueId

END

# EXCEPTION HANDLING

BEGIN TRY

     { sql\_statement | statement\_block }

END TRY

BEGIN CATCH

     [ {sql\_statement | statement\_block } ]

END CATCH

[ ; ]

sql\_statement

Is any Transact-SQL statement.

statement\_block

Any group of Transact-SQL statements in a batch or enclosed in a BEGIN…END block.

A TRY…CATCH construct catches all execution errors that have a severity higher than 10 that do not close the database connection.

A TRY block must be immediately followed by an associated CATCH block. Including any other statements between the END TRY and BEGIN CATCH statements generates a syntax error.

A TRY…CATCH construct cannot span multiple batches. A TRY…CATCH construct cannot span multiple blocks of Transact-SQL statements. For example, a TRY…CATCH construct cannot span two BEGIN…END blocks of Transact-SQL statements and cannot span an IF…ELSE construct.

If any part of the error information must be returned to the application, the code in the CATCH block must do so by using mechanisms such as SELECT result sets or the RAISERROR and PRINT statements.

TRY…CATCH constructs can be nested. Either a TRY block or a CATCH block can contain nested TRY…CATCH constructs. For example, a CATCH block can contain an embedded TRY…CATCH construct to handle errors encountered by the CATCH code.

Errors encountered in a CATCH block are treated like errors generated anywhere else. If the CATCH block contains a nested TRY…CATCH construct, any error in the nested TRY block will pass control to the nested CATCH block. If there is no nested TRY…CATCH construct, the error is passed back to the caller.

TRY…CATCH constructs catch unhandled errors from stored procedures or triggers executed by the code in the TRY block. Alternatively, the stored procedures or triggers can contain their own TRY…CATCH constructs to handle errors generated by their code. For example, when a TRY block executes a stored procedure and an error occurs in the stored procedure, the error can be handled in the following ways:

* If the stored procedure does not contain its own TRY…CATCH construct, the error returns control to the CATCH block associated with the TRY block that contains the EXECUTE statement.
* If the stored procedure contains a TRY…CATCH construct, the error transfers control to the CATCH block in the stored procedure. When the CATCH block code finishes, control is passed back to the statement immediately after the EXECUTE statement that called the stored procedure.

GOTO statements cannot be used to enter a TRY or CATCH block. GOTO statements can be used to jump to a label inside the same TRY or CATCH block or to leave a TRY or CATCH block.

The TRY…CATCH construct cannot be used in a user-defined function.

**Retrieving Error Information**

In the scope of a CATCH block, the following system functions can be used to obtain information about the error that caused the CATCH block to be executed:

* ERROR\_NUMBER() returns the number of the error.
* ERROR\_SEVERITY() returns the severity.
* ERROR\_STATE() returns the error state number.
* ERROR\_PROCEDURE() returns the name of the stored procedure or trigger where the error occurred.
* ERROR\_LINE() returns the line number inside the routine that caused the error.
* ERROR\_MESSAGE() returns the complete text of the error message. The text includes the values supplied for any substitutable parameters, such as lengths, object names, or times.

These functions return NULL if they are called outside the scope of the CATCH block. Error information can be retrieved by using these functions from anywhere within the scope of the CATCH block. For example, the following script shows a stored procedure that contains error-handling functions. In the CATCH block of a TRY…CATCH construct, the stored procedure is called and information about the error is returned.

USE AdventureWorks2012;

-- Verify that the stored procedure does not already exist.

IF OBJECT\_ID ( 'usp\_GetErrorInfo', 'P' ) IS NOT NULL

 DROP PROCEDURE usp\_GetErrorInfo;

-- Create procedure to retrieve error information.

CREATE PROCEDURE usp\_GetErrorInfo

AS

SELECT

 ERROR\_NUMBER() AS ErrorNumber

,ERROR\_SEVERITY() AS ErrorSeverity

,ERROR\_STATE() AS ErrorState

,ERROR\_PROCEDURE() AS ErrorProcedure

,ERROR\_LINE() AS ErrorLine

,ERROR\_MESSAGE() AS ErrorMessage;

GO

BEGIN TRY

 -- Generate divide-by-zero error.

 SELECT 1/0;

END TRY

BEGIN CATCH

 -- Execute error retrieval routine.

 EXECUTE usp\_GetErrorInfo;

END CATCH;

**Errors Unaffected by a TRY…CATCH Construct**

TRY…CATCH constructs do not trap the following conditions:

* Warnings or informational messages that have a severity of 10 or lower.
* Errors that have a severity of 20 or higher that stop the SQL Server Database Engine task processing for the session. If an error occurs that has severity of 20 or higher and the database connection is not disrupted, TRY…CATCH will handle the error.
* Attentions, such as client-interrupt requests or broken client connections.
* When the session is ended by a system administrator by using the KILL statement.

The following types of errors are not handled by a CATCH block when they occur at the same level of execution as the TRY…CATCH construct:

* Compile errors, such as syntax errors, that prevent a batch from running.
* Errors that occur during statement-level recompilation, such as object name resolution errors that occur after compilation because of deferred name resolution.

These errors are returned to the level that ran the batch, stored procedure, or trigger.

If an error occurs during compilation or statement-level recompilation at a lower execution level (for example, when executing sp\_executesql or a user-defined stored procedure) inside the TRY block, the error occurs at a lower level than the TRY…CATCH construct and will be handled by the associated CATCH block.

The following example shows how an object name resolution error generated by a SELECT statement is not caught by the TRY…CATCH construct, but is caught by the CATCH block when the same SELECT statement is executed inside a stored procedure.

BEGIN TRY

 -- Table does not exist; object name resolution

 -- error not caught.

 SELECT \* FROM NonexistentTable;

END TRY

BEGIN CATCH

 SELECT ERROR\_NUMBER() AS ErrorNumber

,ERROR\_MESSAGE() AS ErrorMessage;

END CATCH

The error is not caught and control passes out of the TRY…CATCH construct to the next higher level.

Running the SELECT statement inside a stored procedure will cause the error to occur at a level lower than the TRY block. The error will be handled by the TRY…CATCH construct.

-- Verify that the stored procedure does not exist.

IF OBJECT\_ID ( N'usp\_ExampleProc', N'P' ) IS NOT NULL

 DROP PROCEDURE usp\_ExampleProc;

GO

-- Create a stored procedure that will cause an

-- object resolution error.

CREATE PROCEDURE usp\_ExampleProc

AS

 SELECT \* FROM NonexistentTable;

GO

BEGIN TRY

 EXECUTE usp\_ExampleProc;

END TRY

BEGIN CATCH

 SELECT

 ERROR\_NUMBER() AS ErrorNumber

,ERROR\_MESSAGE() AS ErrorMessage;

END CATCH;

**ADDING CUSTOM ERROR MESSAGES**

**SP\_addmessage:**

We use the SP\_admessage Stored Procedure to define a User Defined Custom Error Message. This Stored Procedure adds a record to the sys.message system view.
A User Defined message should have a message number of 50000 or higher with a severity of 1 to 25.

**Syntax:**

sp\_addmessage [ @msgnum = ] msg\_id ,[ @severity = ] severity ,[ @msgtext = ] 'msg'[ , [ @lang = ] language' ][ , [ @with\_log = ] 'with\_log' ]
[ , [ @replace = ] 'replace' ]

Here mcg\_id is the id of the message which can be between 50000 and 2147483647.

The severity is the level of the message which can be between 1 and 25. For User Defined messages we can use it a value of 0 to 19. The severity level between 20 to 25 can be set by the administrator. Severity levels from 20 through 25 are considered fatal.

The actual error message is "msg", which uses a data type of nvarchar(255). The maximum characters limit is 2,047. Any more than that will be truncated.

The language is used if you want to specify any language. Replace is used when the same message number already exists, but you want to replace the string for that ID, you have to use this parameter.

**RAISERROR:**

The RAISERROR statement generates an error message by either retrieving the message from the sys.messages catalog view or constructing the message string at runtime. It is used to invoke the the User Defined error message. First we create a User Defined error message using SP\_addmessage and after that we invoke that by the use of RAISERROR.

**Syntax:**

RAISERROR ( { msg\_id  }{ ,severity ,state }[ ,argument [ ,...n ] ] )[ WITH option [ ,...n ] ]
 **Example:**

EXECsp\_addmessage500021,10,'THis error message is created by ENOSIS LEARNING'go

RAISERROR (500021, 10, 1) **Output:
**

 **Replacement of Message.**

EXECsp\_addmessage500021,10,'Previous error message is replaced by ENOSIS LEARNING',

@lang='us\_english',

@with\_log='false',

@replace='replace'

GO

RAISERROR (500021, 10, 1) **Output:


Altering the message:**

execsp\_altermessage500021,@parameter='with\_log', @parameter\_value='true'

**Output:
Droping the message:**

execsp\_dropmessage500021 **Output:
**

USE master

EXEC sp\_addmessage 50001, 1, N'This message is not that big of a deal. This is not caught by error handling, and prints this message to the screen.';

EXEC sp\_addmessage 50002, 16, N'This actually causes an error, and is caught by error-handling';

EXEC sp\_addmessage 50003, 20, N'This causes an error, and stops any further processing.  This is not caught by error handling.';

|  |
| --- |
| EXECsp\_addmessage50001, **1**,N'This message is not that big of a deal. This is not caught by error handling, and prints this message to the screen.';EXECsp\_addmessage50002, **16**,N'This actually causes an error, and is caught by error-handling';EXECsp\_addmessage50003, **20**,N'This causes an error, and stops any further processing. This is not caught by error handling.'; |

**Using custom error messages**

**Select \* from sys.messages**

**To view the error messages.**

Now that my custom error messages are defined, I can use them inside my database engine. To invoke these errors, I'll use the RAISERROR TSQL construct. RAISERROR accepts an error number, a severity level, and a state number.

The following snippet uses RAISERROR inside of a TRY...CATCH construct. I am including the WITH LOG option of the RAISERROR statement to write the error message to the application log so that I can review it later if necessary. (This particular error does not invoke the CATCH block due to the severity of the error.)

BEGIN TRY

            RAISERROR (50001, 1, 1) WITH LOG

END TRY

BEGIN CATCH

            SELECT ERROR\_MESSAGE (), ERROR\_NUMBER()

END CATCH

This statement invokes the second custom error message I define above. This message has a defined severity of 16, which will get caught by my CATCH statement. These types of error messages are some of the more commonly seen messages inside the SQL Server database engine.

BEGIN TRY

            RAISERROR  (50002,16,1) WITH LOG

END TRY

BEGIN CATCH

            SELECT ERROR\_MESSAGE (), ERROR\_NUMBER ()

END CATCH

This final snippet calls the third custom message defined above. Due to the severity level defined in this custom error, the CATCH block is not invoked; in fact, the statement and connection is immediately terminated.

BEGIN TRY

            RAISERROR  (50003, 20,1) WITH LOG

END TRY

BEGIN CATCH

            SELECT ERROR\_MESSAGE(), ERROR\_NUMBER ()

END CATCH

After I run the above statement, I receive the following error:

Msg 2745, Level 16, State 2, Line 2

Process ID 51 has raised user error 50003, severity 20. SQL Server is terminating this process.

Msg 50003, Level 20, State 1, Line 2

This causes an error, and stops any further processing.  This is not caught by error handling.

Msg 0, Level 20, State 0, Line 0

A severe error occurred on the current command.  The results, if any, should be discarded.

The error is marked as so severe that if I were to run the same statement again, I receive the following error:

Msg 233, Level 20, State 0, Line 0

A transport-level error has occurred when receiving results from the server. (provider: Shared Memory Provider, error: 0 - No process is on the other end of the pipe.)

This error states that the connection has been terminated.

Example

|  |
| --- |
| ALTERprocedure **[dbo]**.[esp\_insert](@id int,@name nvarchar(200),@salary int)asbeginbegintryinsertinto **emp** values(@id,@name,@salary)RAISERROR (50001, **1**, **1**)WITHLOGendtrybegincatchSELECTERROR\_NUMBER()AS **ErrorNumber**,ERROR\_MESSAGE()AS **ErrorMessage**endcatchendexec **esp\_insert**1,'amit',20000 |



#### **TRANSACTIONS IN SQL SERVER**

CREATE PROCEDURE addTitle(@title\_id VARCHAR(6), @au\_id VARCHAR(11),

 @title VARCHAR(20), @title\_type CHAR(12))

AS

BEGIN TRAN

 INSERT titles(title\_id, title, type)

 VALUES (@title\_id, @title, @title\_type)

 IF (@@ERROR <> 0) BEGIN

 PRINT 'Unexpected error occurred!'

 ROLLBACK TRAN

 RETURN 1

 END

 INSERT titleauthor(au\_id, title\_id)

 VALUES (@au\_id, @title\_id)

 IF (@@ERROR <> 0) BEGIN

 PRINT 'Unexpected error occurred!'

 ROLLBACK TRAN

 RETURN 1

 END

COMMIT TRAN

RETURN 0

BEGIN TRAN

BEGINTRY

insertinto EMPLOYEE\_DETAIL values ('test1',GETDATE())

insertinto EMPLOYEE\_DETAIL values ('test1','2012/32/32')

ENDTRY

BEGINCATCH

ROLLBACK TRAN

ENDCATCH

COMMIT TRAN

You can use savepoints in rolling back portions of transactions to predefined locations. A T-SQL savepoint defines a location to which a transaction can return if part of the transaction is conditionally canceled.

Keep in mind that SQL updates and rollbacks generally are expensive operations. So savepoints are useful only in situations where errors are unlikely and checking the validity of an update beforehand is relatively costly.

The syntax for typical server savepoint usage (where SAVE TRANSACTION permissions default to any valid user) is:

 SAVE TRANSACTION SavepointName

IF @@error= some Error

BEGIN

 ROLLBACK TRANSACTION SavepointName

COMMIT TRANSACTION

END

A word to the wise: whenever you roll back a transaction to a savepoint, it must proceed to completion or be canceled altogether. Therefore a COMMIT or a complete ROLLBACK should always follow a rollback to savepoint, because the resources used during the transaction (namely the SQL locks) are held until the completion of the transaction. When part of a transaction rolls back to a savepoint, resources continue to be held until either the completion of the transaction or a rollback of the complete transaction. In other words, even after rollback to a midpoint, the transaction is considered open and must be closed by either committing work or rolling back the entire transaction.

|  |
| --- |
| Begin trybegin traninsertinto **emp** values(3,'ravi',56000)insertinto **emp** values(4,'sandeep',66000)save transaction **s1**insert into **emp** values(5,'anil',76000)insert into **emp** values(4,'rajdeep',36000)insert into **emp** values(6,'amitabh',26000)commit tranend trybegin catchrollback transaction **s1**SELECT ERROR\_NUMBER()AS **ErrorNumber**,ERROR\_SEVERITY()AS **ErrorSeverity**,ERROR\_STATE()AS **ErrorState**,ERROR\_PROCEDURE()AS **ErrorProcedure**,ERROR\_LINE()AS **ErrorLine**,ERROR\_MESSAGE()AS **ErrorMessage**End catch |