Introduction to SQL

SQL is a standard language for accessing and manipulating databases.

What is SQL?

- SQL stands for Structured Query Language
- SQL lets you access and manipulate databases
- SQL is an ANSI (American National Standards Institute) standard

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What Can SQL do?

- SQL can execute queries against a database
- SQL can retrieve data from a database
- SQL can insert records in a database
- SQL can update records in a database
- SQL can delete records from a database
- SQL can create new databases
- SQL can create new tables in a database
- SQL can create stored procedures in a database
- SQL can create views in a database
- SQL can set permissions on tables, procedures, and views

SQL is a Standard - BUT....

Although SQL is an ANSI (American National Standards Institute) standard, there are different versions of the SQL language.

However, to be compliant with the ANSI standard, they all support at least the major commands (such as SELECT, UPDATE, DELETE, INSERT, WHERE) in a similar manner.

Note: Most of the SQL database programs also have their own proprietary extensions in addition to the SQL standard!

Using SQL in Your Web Site

To build a web site that shows data from a database, you will need:

- An RDBMS database program (i.e. MS Access, SQL Server, MySQL)
- To use a server-side scripting language, like PHP or ASP
- To use SQL to get the data you want
- To use HTML / CSS

RDBMS

RDBMS stands for Relational Database Management System.

RDBMS is the basis for SQL, and for all modern database systems such as MS SQL Server, IBM DB2, Oracle, MySQL, and Microsoft Access.

The data in RDBMS is stored in database objects called tables.

A table is a collection of related data entries and it consists of columns and rows.

SQL Syntax

Database Tables

A database most often contains one or more tables. Each table is identified by a name (e.g. "Customers" or "Orders"). Tables contain records (rows) with data.

In this tutorial we will use the well-known Northwind sample database (included in MS Access and MS SQL Server).

Below is a selection from the "Customers" table:

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico
4	Around the Horn	Thomas Hardy	120 Hanover Sq.	London	WA1 1DP	UK
5	Berglunds snabbköp	Christina Berglund	Berguvsvägen 8	Luleå	S-958 22	Sweden

The table above contains five records (one for each customer) and seven columns (CustomerID, CustomerName, ContactName, Address, City, PostalCode, and Country).

SQL Statements

Most of the actions you need to perform on a database are done with SQL statements.

The following SQL statement selects all the records in the "Customers" table:

Example

```
SELECT * FROM Customers;
```

Try it Yourself »

In this tutorial we will teach you all about the different SQL statements.

Keep in Mind That...

- SQL keywords are NOT case sensitive: select is the same as SELECT

In this tutorial we will write all SQL keywords in upper-case.

Semicolon after SQL Statements?

Some database systems require a semicolon at the end of each SQL statement.

Semicolon is the standard way to separate each SQL statement in database systems that allow more than one SQL statement to be executed in the same call to the server.

In this tutorial, we will use semicolon at the end of each SQL statement.

Some of The Most Important SQL Commands

- **SELECT** - extracts data from a database
- **UPDATE** - updates data in a database
- **DELETE** - deletes data from a database
- **INSERT INTO** - inserts new data into a database
- **CREATE DATABASE** - creates a new database
- **ALTER DATABASE** - modifies a database
- **CREATE TABLE** - creates a new table
- **ALTER TABLE** - modifies a table
- **DROP TABLE** - deletes a table
- **CREATE INDEX** - creates an index (search key)
- **DROP INDEX** - deletes an index

SQL SELECT Statement

The SELECT statement is used to select data from a database.

The SQL SELECT Statement

The SELECT statement is used to select data from a database.

The result is stored in a result table, called the result-set.

SQL SELECT Syntax

```
SELECT column_name,column_name
FROM table_name;
```

and

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
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5		Berglunds snabbköp	Christina Berglund	Berguvsvägen 8	Luleå	S-958 22	Sweden

```
SELECT * FROM table_name;
```

Demo Database

In this tutorial we will use the well-known Northwind sample database.

Below is a selection from the "Customers" table:

SELECT Column Example

The following SQL statement selects the "CustomerName" and "City" columns from the "Customers" table:

Example

```
SELECT CustomerName,City FROM Customers;
```

Try it Yourself »

SELECT * Example

The following SQL statement selects all the columns from the "Customers" table:

Example

```
SELECT * FROM Customers;
```

Try it Yourself »

Navigation in a Result-set

Most database software systems allow navigation in the result-set with programming functions, like: Move-To-First-Record, Get-Record-Content, Move-To-Next-Record, etc.

Programming functions like these are not a part of this tutorial. To learn about accessing data with function calls, please visit our PHP tutorial.

SQL SELECT Statement

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The SELECT statement is used to select data from a database.

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and

```
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```

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SELECT Column Example

The following SQL statement selects the "CustomerName" and "City" columns from the "Customers" table:

Example

```
SELECT CustomerName,City FROM Customers;
```

Try it Yourself »

SELECT * Example

The following SQL statement selects all the columns from the "Customers" table:

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```
SELECT * FROM Customers;
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Navigation in a Result-set

Most database software systems allow navigation in the result-set with programming functions, like: Move-To-First-Record, Get-Record-Content, Move-To-Next-Record, etc.

Programming functions like these are not a part of this tutorial. To learn about accessing data with function calls, please visit our PHP tutorial.

SQL WHERE Clause

The WHERE clause is used to filter records.

The SQL WHERE Clause

The WHERE clause is used to extract only those records that fulfill a specified criterion.

SQL WHERE Syntax

```
SELECT column_name,column_name
FROM table_name
WHERE column_name operator value;
```

Demo Database

In this tutorial we will use the well-known Northwind sample database.

Below is a selection from the "Customers" table:

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico
4	Around the Horn	Thomas Hardy	120 Hanover Sq.	London	WA1 1DP	UK
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WHERE Clause Example

The following SQL statement selects all the customers from the country "Mexico", in the "Customers" table:

Example

```
SELECT * FROM Customers
WHERE Country='Mexico';
```

Try it Yourself »

Text Fields vs. Numeric Fields

SQL requires single quotes around text values (most database systems will also allow double quotes).

However, numeric fields should not be enclosed in quotes:

Example

```
SELECT * FROM Customers
WHERE CustomerID=1;
```

Try it Yourself »

Operators in The WHERE Clause

The following operators can be used in the WHERE clause:

Operator	Description
=	Equal

<>	Not equal. **Note:** In some versions of SQL this operator may be written as !=
>	Greater than
<	Less than
>=	Greater than or equal
<=	Less than or equal
BETWEEN	Between an inclusive range
LIKE	Search for a pattern
IN	To specify multiple possible values for a column

SQL AND & OR Operators

The AND & OR operators are used to filter records based on more than one condition.

The SQL AND & OR Operators

The AND operator displays a record if both the first condition AND the second condition are true.

The OR operator displays a record if either the first condition OR the second condition is true.

Demo Database

In this tutorial we will use the well-known Northwind sample database.

Below is a selection from the "Customers" table:

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico
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---

AND Operator Example

The following SQL statement selects all customers from the country "Germany" AND the city "Berlin", in the "Customers" table:

Example

```
SELECT * FROM Customers
WHERE Country='Germany'
AND City='Berlin';
```

Try it Yourself »

OR Operator Example

The following SQL statement selects all customers from the city "Berlin" OR "München", in the "Customers" table:

Example

```
SELECT * FROM Customers
WHERE City='Berlin'
OR City='München';
```

Try it Yourself »

Combining AND & OR

You can also combine AND and OR (use parenthesis to form complex expressions).

The following SQL statement selects all customers from the country "Germany" AND the city must be equal to "Berlin" OR "München", in the "Customers" table:

Example

```
SELECT * FROM Customers
WHERE Country='Germany'
AND (City='Berlin' OR City='München');
```

Try it Yourself »

SQL ORDER BY Keyword

The ORDER BY keyword is used to sort the result-set.

The SQL ORDER BY Keyword

The ORDER BY keyword is used to sort the result-set by one or more columns.

The ORDER BY keyword sorts the records in ascending order by default. To sort the records in a descending order, you can use the DESC keyword.

SQL ORDER BY Syntax

```
SELECT column_name, column_name
FROM table_name
ORDER BY column_name ASC|DESC, column_name ASC|DESC;
```

Demo Database

In this tutorial we will use the well-known Northwind sample database.

Below is a selection from the "Customers" table:

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany

2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico
4	Around the Horn	Thomas Hardy	120 Hanover Sq.	London	WA1 1DP	UK
5	Berglunds snabbköp	Christina Berglund	Berguvsvägen 8	Luleå	S-958 22	Sweden

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ORDER BY Example

The following SQL statement selects all customers from the "Customers" table, sorted by the "Country" column:

Example

```
SELECT * FROM Customers
ORDER BY Country;
```

Try it Yourself »

ORDER BY DESC Example

The following SQL statement selects all customers from the "Customers" table, sorted DESCENDING by the "Country" column:

Example

```
SELECT * FROM Customers
ORDER BY Country DESC;
```

Try it Yourself »

ORDER BY Several Columns Example

The following SQL statement selects all customers from the "Customers" table, sorted by the "Country" and the "CustomerName" column:

Example

```
SELECT * FROM Customers
ORDER BY Country, CustomerName;
```

Try it Yourself »

ORDER BY Several Columns Example 2

The following SQL statement selects all customers from the "Customers" table, sorted ascending by the "Country" and descending by the "CustomerName" column:

Example

```
SELECT * FROM Customers
ORDER BY Country ASC, CustomerName DESC;
```

Try it Yourself »

SQL INSERT INTO Statement

The INSERT INTO statement is used to insert new records in a table.

The SQL INSERT INTO Statement

The INSERT INTO statement is used to insert new records in a table.

SQL INSERT INTO Syntax

It is possible to write the INSERT INTO statement in two forms.

The first form does not specify the column names where the data will be inserted, only their values:

```
INSERT INTO table_name
VALUES (value1,value2,value3,...);
```

The second form specifies both the column names and the values to be inserted:

```
INSERT INTO table_name (column1,column2,column3,...)
VALUES (value1,value2,value3,...);
```

Demo Database

In this tutorial we will use the well-known Northwind sample database.

Below is a selection from the "Customers" table:

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
87	Wartian Herkku	Pirkko Koskitalo	Torikatu 38	Oulu	90110	Finland
88	Wellington Importadora	Paula Parente	Rua do Mercado, 12	Resende	08737-363	Brazil

89	White Clover Markets	Karl Jablonski	305 - 14th Ave. S. Suite 3B	Seattle	98128	USA
90	Wilman Kala	Matti Karttunen	Keskuskatu 45	Helsinki	21240	Finland
91	Wolski	Zbyszek	ul. Filtrowa 68	Walla	01-012	Poland

INSERT INTO Example

Assume we wish to insert a new row in the "Customers" table.

We can use the following SQL statement:

Example

```
INSERT INTO Customers (CustomerName, ContactName, Address, City,
PostalCode, Country)
VALUES ('Cardinal','Tom B. Erichsen','Skagen
21','Stavanger','4006','Norway');
```

Try it Yourself »

The selection from the "Customers" table will now look like this:

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
87	Wartian Herkku	Pirkko Koskitalo	Torikatu 38	Oulu	90110	Finland

88	Wellington Importadora	Paula Parente	Rua do Mercado, 12	Resende	08737-363	Brazil
89	White Clover Markets	Karl Jablonski	305 - 14th Ave. S. Suite 3B	Seattle	98128	USA
90	Wilman Kala	Matti Karttunen	Keskuskatu 45	Helsinki	21240	Finland
91	Wolski	Zbyszek	ul. Filtrowa 68	Walla	01-012	Poland
92	Cardinal	Tom B. Erichsen	Skagen 21	Stavanger	4006	Norway

Did you notice that we did not insert any number into the CustomerID field?
The CustomerID column is automatically updated with a unique number for each record in the table.

Insert Data Only in Specified Columns

It is also possible to only insert data in specific columns.

The following SQL statement will insert a new row, but only insert data in the "CustomerName", "City", and "Country" columns (and the CustomerID field will of course also be updated automatically):

Example

```
INSERT INTO Customers (CustomerName, City, Country)
VALUES ('Cardinal', 'Stavanger', 'Norway');
```

Try it Yourself »

The selection from the "Customers" table will now look like this:

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
87	Wartian Herkku	Pirkko Koskitalo	Torikatu 38	Oulu	90110	Finland
88	Wellington Importadora	Paula Parente	Rua do Mercado, 12	Resende	08737-363	Brazil
89	White Clover Markets	Karl Jablonski	305 - 14th Ave. S. Suite 3B	Seattle	98128	USA
90	Wilman Kala	Matti Karttunen	Keskuskatu 45	Helsinki	21240	Finland
91	Wolski	Zbyszek	ul. Filtrowa 68	Walla	01-012	Poland
92	Cardinal	null	null	Stavanger	null	Norway

SQL UPDATE Statement

Example

Change the value of the "City" column of a record in the "Customers" table:

```
UPDATE Customers
SET City='Hamburg'
WHERE CustomerID=1;
```

Try it Yourself »

The SQL UPDATE Statement

The UPDATE statement is used to update existing records in a table.

Syntax

```
UPDATE table_name
SET column1=value1,column2=value2,...
WHERE some_column=some_value;
```

Notice the WHERE clause in the SQL UPDATE statement!
The WHERE clause specifies which record or records that should be updated. If you omit the WHERE clause, all records will be updated!

Demo Database

In this tutorial we will use the well-known Northwind sample database.

Below is a selection from the "Customers" table:

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico

3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico
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UPDATE Multiple Columns

To update more than one column, use a comma as seperator.

Assume we wish to update the customer "Alfreds Futterkiste" with a new contact person *and* city.

We use the following SQL statement:

Example

```
UPDATE Customers
SET ContactName='Alfred Schmidt', City='Frankfurt'
WHERE CustomerID=1;
```

Try it Yourself »

The selection from the "Customers" table will now look like this:

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Alfred Schmidt	Obere Str. 57	Frankfurt	12209	Germany

2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico
4	Around the Horn	Thomas Hardy	120 Hanover Sq.	London	WA1 1DP	UK
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---

UPDATE Multiple Records

In an update statement, it is the WHERE clause that determines how many records which will be updated.

The WHERE clause: `WHERE Country='Mexico'` will update all records which have the value "Mexico" in the field "Country".

Example

```
UPDATE Customers
SET ContactName='Juan'
WHERE Country='Mexico';
```

Try it Yourself »

The selection from the "Customers" table will now look like this:

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country

1		Alfreds Futterkiste	Alfred Schmidt	Obere Str. 57	Frankfurt	12209	Germany
2		Ana Trujillo Emparedados y helados	Juan	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3		Antonio Moreno Taquería	Juan	Mataderos 2312	México D.F.	05023	Mexico
4		Around the Horn	Thomas Hardy	120 Hanover Sq.	London	WA1 1DP	UK
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---

Update Warning!

Be careful when updating records. If we omit the WHERE clause, ALL records will be updated:

Example

```
UPDATE Customers
SET ContactName='Juan';
```

Try it Yourself »

The selection from the "Customers" table will now look like this:

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country

1	Alfreds Futterkiste	Juan	Obere Str. 57	Frankfurt	12209	Germany
2	Ana Trujillo Emparedados y helados	Juan	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Juan	Mataderos 2312	México D.F.	05023	Mexico
4	Around the Horn	Juan	120 Hanover Sq.	London	WA1 1DP	UK
5	Berglunds snabbköp	Juan	Berguvsvägen 8	Luleå	S-958 22	Sweden

SQL DELETE Statement

The DELETE statement is used to delete records in a table.

The SQL DELETE Statement

The DELETE statement is used to delete rows in a table.

SQL DELETE Syntax

```
DELETE FROM table_name
WHERE some_column=some_value;
```

Notice the WHERE clause in the SQL DELETE statement!
The WHERE clause specifies which record or records that should be deleted. If you omit the WHERE clause, all records will be deleted!

Demo Database

In this tutorial we will use the well-known Northwind sample database.

Below is a selection from the "Customers" table:

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico
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5	Berglunds snabbköp	Christina Berglund	Berguvsvägen 8	Luleå	S-958 22	Sweden

SQL DELETE Example

Assume we wish to delete the customer "Alfreds Futterkiste" from the "Customers" table.

We use the following SQL statement:

Example

```
DELETE FROM Customers
WHERE CustomerName='Alfreds Futterkiste' AND ContactName='Maria Anders';
```

Try it Yourself »

The "Customers" table will now look like this:

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico
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Delete All Data

It is possible to delete all rows in a table without deleting the table. This means that the table structure, attributes, and indexes will be intact:

```
DELETE FROM table_name;
```

or

```
DELETE * FROM table_name;
```

Note: Be very careful when deleting records. You cannot undo this statement!

SQL SELECT TOP Clause

The SQL SELECT TOP Clause

The SELECT TOP clause is used to specify the number of records to return.

The SELECT TOP clause can be very useful on large tables with thousands of records. Returning a large number of records can impact on performance.

Note: Not all database systems support the SELECT TOP clause.

SQL Server / MS Access Syntax

```
SELECT TOP number|percent column_name(s)
FROM table_name;
```

SQL SELECT TOP Equivalent in MySQL and Oracle

MySQL Syntax

```
SELECT column_name(s)
FROM table_name
LIMIT number;
```

Example

```
SELECT *
FROM Persons
LIMIT 5;
```

Oracle Syntax

```
SELECT column_name(s)
FROM table_name
WHERE ROWNUM <= number;
```

Example

```
SELECT *
FROM Persons
WHERE ROWNUM <=5;
```

Demo Database

In this tutorial we will use the well-known Northwind sample database.

Below is a selection from the "Customers" table:

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico

4		Around the Horn	Thomas Hardy	120 Hanover Sq.	London	WA1 1DP	UK
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---

SQL SELECT TOP Example

The following SQL statement selects the two first records from the "Customers" table:

Example

```
SELECT TOP 2 * FROM Customers;
```

Try it Yourself »

SQL SELECT TOP PERCENT Example

The following SQL statement selects the first 50% of the records from the "Customers" table:

Example

```
SELECT TOP 50 PERCENT * FROM Customers;
```

Try it Yourself »

SQL LIKE Operator

The LIKE operator is used in a WHERE clause to search for a specified pattern in a column.

The SQL LIKE Operator

The LIKE operator is used to search for a specified pattern in a column.

SQL LIKE Syntax

```
SELECT column_name(s)
FROM table_name
WHERE column_name LIKE pattern;
```

Demo Database

In this tutorial we will use the well-known Northwind sample database.

Below is a selection from the "Customers" table:

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico

4		Around the Horn	Thomas Hardy	120 Hanover Sq.	London	WA1 1DP	UK
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SQL LIKE Operator Examples

The following SQL statement selects all customers with a City starting with the letter "s":

Example

```
SELECT * FROM Customers
WHERE City LIKE 's%';
```

Try it Yourself »

Tip: The "%" sign is used to define wildcards (missing letters) both before and after the pattern. You will learn more about wildcards in the next chapter.

The following SQL statement selects all customers with a City ending with the letter "s":

Example

```
SELECT * FROM Customers
WHERE City LIKE '%s';
```

Try it Yourself »

The following SQL statement selects all customers with a Country containing the pattern "land":

Example

```
SELECT * FROM Customers
WHERE Country LIKE '%land%';
```

Try it Yourself »

Using the NOT keyword allows you to select records that do NOT match the pattern.

The following SQL statement selects all customers with Country NOT containing the pattern "land":

Example

```
SELECT * FROM Customers
WHERE Country NOT LIKE '%land%';
```

SQL Wildcards

A wildcard character can be used to substitute for any other character(s) in a string.

SQL Wildcard Characters

In SQL, wildcard characters are used with the SQL LIKE operator.

SQL wildcards are used to search for data within a table.

With SQL, the wildcards are:

Wildcard	Description
%	A substitute for zero or more characters
_	A substitute for a single character

[*charlist*]	Sets and ranges of characters to match
[^*charlist*] or [!*charlist*]	Matches only a character NOT specified within the brackets

---

Demo Database

In this tutorial we will use the well-known Northwind sample database.

Below is a selection from the "Customers" table:

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico
4	Around the Horn	Thomas Hardy	120 Hanover Sq.	London	WA1 1DP	UK

5		Berglunds snabbköp	Christina Berglund	Berguvsvägen 8	Luleå	S-958 22	Sweden

---

Using the SQL % Wildcard

The following SQL statement selects all customers with a City starting with "ber":

Example

```
SELECT * FROM Customers
WHERE City LIKE 'ber%';
```

Try it Yourself »

The following SQL statement selects all customers with a City containing the pattern "es":

Example

```
SELECT * FROM Customers
WHERE City LIKE '%es%';
```

Try it Yourself »

Using the SQL _ Wildcard

The following SQL statement selects all customers with a City starting with any character, followed by "erlin":

Example

```
SELECT * FROM Customers
WHERE City LIKE '_erlin';
```

Try it Yourself »

The following SQL statement selects all customers with a City starting with "L", followed by any character, followed by "n", followed by any character, followed by "on":

Example

```
SELECT * FROM Customers
WHERE City LIKE 'L_n_on';
```

Try it Yourself »

Using the SQL [charlist] Wildcard

The following SQL statement selects all customers with a City starting with "b", "s", or "p":

Example

```
SELECT * FROM Customers
WHERE City LIKE '[bsp]%';
```

Try it Yourself »

The following SQL statement selects all customers with a City starting with "a", "b", or "c":

Example

```
SELECT * FROM Customers
WHERE City LIKE '[a-c]%';
```

Try it Yourself »

The two following SQL statements selects all customers with a City NOT starting with "b", "s", or "p":

Example

```
SELECT * FROM Customers
WHERE City LIKE '[!bsp]%';
```

Try it Yourself »

Or:

Example

```
SELECT * FROM Customers
WHERE City NOT LIKE '[bsp]%';
```

Try it Yourself »

SQL IN Operator

The IN Operator

The IN operator allows you to specify multiple values in a WHERE clause.

SQL IN Syntax

```
SELECT column_name(s)
FROM table_name
WHERE column_name IN (value1,value2,...);
```

Demo Database

In this tutorial we will use the well-known Northwind sample database.

Below is a selection from the "Customers" table:

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico

3		Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico
4		Around the Horn	Thomas Hardy	120 Hanover Sq.	London	WA1 1DP	UK
5		Berglunds snabbköp	Christina Berglund	Berguvsvägen 8	Luleå	S-958 22	Sweden

---

IN Operator Example

The following SQL statement selects all customers with a City of "Paris" or "London":

Example

```
SELECT * FROM Customers
WHERE City IN ('Paris','London');
```

Try it Yourself »

SQL BETWEEN Operator

The BETWEEN operator is used to select values within a range.

The SQL BETWEEN Operator

The BETWEEN operator selects values within a range. The values can be numbers, text, or dates.

SQL BETWEEN Syntax

```
SELECT column_name(s)
FROM table_name
WHERE column_name BETWEEN value1 AND value2;
```

Demo Database

In this tutorial we will use the well-known Northwind sample database.

Below is a selection from the "Products" table:

ProductID	ProductName	SupplierID	CategoryID	Unit	Price
1	Chais	1	1	10 boxes x 20 bags	18
2	Chang	1	1	24 - 12 oz bottles	19
3	Aniseed Syrup	1	2	12 - 550 ml bottles	10
4	Chef Anton's Cajun Seasoning	1	2	48 - 6 oz jars	22
5	Chef Anton's Gumbo Mix	1	2	36 boxes	21.35

BETWEEN Operator Example

The following SQL statement selects all products with a price BETWEEN 10 and 20:

Example

```
SELECT * FROM Products
WHERE Price BETWEEN 10 AND 20;
```

Try it Yourself »

NOT BETWEEN Operator Example

To display the products outside the range of the previous example, use NOT BETWEEN:

Example

```
SELECT * FROM Products
WHERE Price NOT BETWEEN 10 AND 20;
```

Try it Yourself »

BETWEEN Operator with IN Example

The following SQL statement selects all products with a price BETWEEN 10 and 20, but products with a CategoryID of 1,2, or 3 should not be displayed:

Example

```
SELECT * FROM Products
WHERE (Price BETWEEN 10 AND 20)
AND NOT CategoryID IN (1,2,3);
```

Try it Yourself »

BETWEEN Operator with Text Value Example

The following SQL statement selects all products with a ProductName beginning with any of the letter BETWEEN 'C' and 'M':

Example

```
SELECT * FROM Products
WHERE ProductName BETWEEN 'C' AND 'M';
```

Try it Yourself »

NOT BETWEEN Operator with Text Value Example

The following SQL statement selects all products with a ProductName beginning with any of the letter NOT BETWEEN 'C' and 'M':

Example

```
SELECT * FROM Products
WHERE ProductName NOT BETWEEN 'C' AND 'M';
```

Try it Yourself »

Sample Table

Below is a selection from the "Orders" table:

OrderID	CustomerID	EmployeeID	OrderDate	ShipperID
10248	90	5	7/4/1996	3
10249	81	6	7/5/1996	1

10250	34	4	7/8/1996	2
10251	84	3	7/9/1996	1
10252	76	4	7/10/1996	2

BETWEEN Operator with Date Value Example

The following SQL statement selects all orders with an OrderDate BETWEEN '04-July-1996' and '09-July-1996':

Example

```
SELECT * FROM Orders
WHERE OrderDate BETWEEN #07/04/1996# AND #07/09/1996#;
```

Try it Yourself »

Notice that the BETWEEN operator can produce different result in different databases!
In some databases, BETWEEN selects fields that are between and excluding the test values.
In other databases, BETWEEN selects fields that are between and including the test values.
And in other databases, BETWEEN selects fields between the test values, including the first test value and excluding the last test value.

Therefore: Check how your database treats the BETWEEN operator!

SQL Aliases

SQL aliases are used to temporarily rename a table or a column heading.

SQL Aliases

SQL aliases are used to give a database table, or a column in a table, a temporary name.

Basically aliases are created to make column names more readable.

SQL Alias Syntax for Columns

```
SELECT column_name AS alias_name
FROM table_name;
```

SQL Alias Syntax for Tables

```
SELECT column_name(s)
FROM table_name AS alias_name;
```

Demo Database

In this tutorial we will use the well-known Northwind sample database.

Below is a selection from the "Customers" table:

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico
4	Around the Horn	Thomas Hardy	120 Hanover Sq.	London	WA1 1DP	UK

And a selection from the "Orders" table:

OrderID	CustomerID	EmployeeID	OrderDate	ShipperID
10354	58	8	1996-11-14	3
10355	4	6	1996-11-15	1
10356	86	6	1996-11-18	2

Alias Example for Table Columns

The following SQL statement specifies two aliases, one for the CustomerName column and one for the ContactName column. **Tip:** It requires double quotation marks or square brackets if the column name contains spaces:

Example

```
SELECT CustomerName AS Customer, ContactName AS [Contact Person]
FROM Customers;
```

Try it Yourself »

In the following SQL statement we combine four columns (Address, City, PostalCode, and Country) and create an alias named "Address":

Example

```
SELECT CustomerName, Address+', '+City+', '+PostalCode+',
'+Country AS Address
FROM Customers;
```

Try it Yourself »

Note: To get the SQL statement above to work in MySQL use the following:

```
SELECT CustomerName, CONCAT(Address,', ',City,', ',PostalCode,',
',Country) AS Address
FROM Customers;
```

Alias Example for Tables

The following SQL statement selects all the orders from the customer with CustomerID=4 (Around the Horn). We use the "Customers" and "Orders" tables, and give them the table aliases of "c" and "o" respectively (Here we have used aliases to make the SQL shorter):

Example

```
SELECT o.OrderID, o.OrderDate, c.CustomerName
FROM Customers AS c, Orders AS o
WHERE c.CustomerName="Around the Horn" AND c.CustomerID=o.CustomerID;
```

Try it Yourself »

The same SQL statement without aliases:

Example

```
SELECT Orders.OrderID, Orders.OrderDate, Customers.CustomerName
FROM Customers, Orders
WHERE Customers.CustomerName="Around the
Horn" AND Customers.CustomerID=Orders.CustomerID;
```

Try it Yourself »

Aliases can be useful when:

- There are more than one table involved in a query
- Functions are used in the query
- Column names are big or not very readable
- Two or more columns are combined together

SQL Joins

SQL joins are used to combine rows from two or more tables.

SQL JOIN

An SQL JOIN clause is used to combine rows from two or more tables, based on a common field between them.

The most common type of join is: **SQL INNER JOIN (simple join)**. An SQL INNER JOIN returns all rows from multiple tables where the join condition is met.

Let's look at a selection from the "Orders" table:

OrderID	CustomerID	OrderDate
10308	2	1996-09-18
10309	37	1996-09-19
10310	77	1996-09-20

Then, have a look at a selection from the "Customers" table:

CustomerID	CustomerName	ContactName	Country
1	Alfreds Futterkiste	Maria Anders	Germany
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Mexico

3	Antonio Moreno Taquería	Antonio Moreno	Mexico

Notice that the "CustomerID" column in the "Orders" table refers to the "CustomerID" in the "Customers" table. The relationship between the two tables above is the "CustomerID" column.

Then, if we run the following SQL statement (that contains an INNER JOIN):

Example

```
SELECT Orders.OrderID, Customers.CustomerName, Orders.OrderDate
FROM Orders
INNER JOIN Customers
ON Orders.CustomerID=Customers.CustomerID;
```

Try it Yourself »

it will produce something like this:

OrderID	CustomerName	OrderDate
10308	Ana Trujillo Emparedados y helados	9/18/1996
10365	Antonio Moreno Taquería	11/27/1996
10383	Around the Horn	12/16/1996
10355	Around the Horn	11/15/1996
10278	Berglunds snabbköp	8/12/1996

Different SQL JOINs

Before we continue with examples, we will list the types of the different SQL JOINs you can use:

- **INNER JOIN**: Returns all rows when there is at least one match in BOTH tables
- **LEFT JOIN**: Return all rows from the left table, and the matched rows from the right table
- **RIGHT JOIN**: Return all rows from the right table, and the matched rows from the left table
- **FULL JOIN**: Return all rows when there is a match in ONE of the tables

SQL INNER JOIN Keyword

SQL INNER JOIN Keyword

The INNER JOIN keyword selects all rows from both tables as long as there is a match between the columns in both tables.

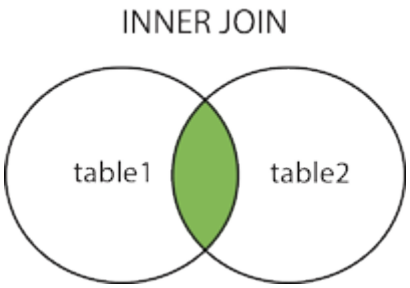
SQL INNER JOIN Syntax

```
SELECT column_name(s)
FROM table1
INNER JOIN table2
ON table1.column_name=table2.column_name;
```

or:

```
SELECT column_name(s)
FROM table1
JOIN table2
ON table1.column_name=table2.column_name;
```

PS! INNER JOIN is the same as JOIN.



Demo Database

In this tutorial we will use the well-known Northwind sample database.

Below is a selection from the "Customers" table:

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico

And a selection from the "Orders" table:

OrderID	CustomerID	EmployeeID	OrderDate	ShipperID
10308	2	7	1996-09-18	3

10309	37	3	1996-09-19	1
10310	77	8	1996-09-20	2

SQL INNER JOIN Example

The following SQL statement will return all customers with orders:

Example

```
SELECT Customers.CustomerName, Orders.OrderID
FROM Customers
INNER JOIN Orders
ON Customers.CustomerID=Orders.CustomerID
ORDER BY Customers.CustomerName;
```

Try it Yourself »

Note: The INNER JOIN keyword selects all rows from both tables as long as there is a match between the columns. If there are rows in the "Customers" table that do not have matches in "Orders", these customers will NOT be listed.

SQL LEFT JOIN Keyword

SQL LEFT JOIN Keyword

The LEFT JOIN keyword returns all rows from the left table (table1), with the matching rows in the right table (table2). The result is NULL in the right side when there is no match.

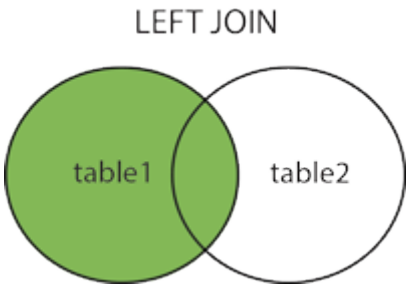
SQL LEFT JOIN Syntax

```
SELECT column_name(s)
FROM table1
LEFT JOIN table2
ON table1.column_name=table2.column_name;
```

or:

```
SELECT column_name(s)
FROM table1
LEFT OUTER JOIN table2
ON table1.column_name=table2.column_name;
```

PS! In some databases LEFT JOIN is called LEFT OUTER JOIN.



Demo Database

In this tutorial we will use the well-known Northwind sample database.

Below is a selection from the "Customers" table:

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico

3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico

And a selection from the "Orders" table:

OrderID	CustomerID	EmployeeID	OrderDate	ShipperID
10308	2	7	1996-09-18	3
10309	37	3	1996-09-19	1
10310	77	8	1996-09-20	2

SQL LEFT JOIN Example

The following SQL statement will return all customers, and any orders they might have:

Example

```
SELECT Customers.CustomerName, Orders.OrderID
FROM Customers
LEFT JOIN Orders
ON Customers.CustomerID=Orders.CustomerID
ORDER BY Customers.CustomerName;
```

Try it Yourself »

Note: The LEFT JOIN keyword returns all the rows from the left table (Customers), even if there are no matches in the right table (Orders).

SQL RIGHT JOIN Keyword

SQL RIGHT JOIN Keyword

The RIGHT JOIN keyword returns all rows from the right table (table2), with the matching rows in the left table (table1). The result is NULL in the left side when there is no match.

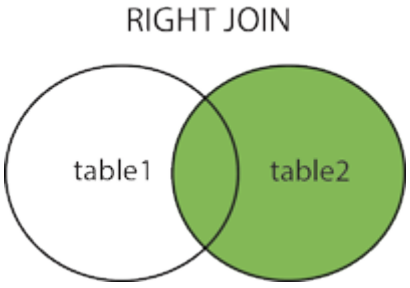
SQL RIGHT JOIN Syntax

```
SELECT column_name(s)
FROM table1
RIGHT JOIN table2
ON table1.column_name=table2.column_name;
```

or:

```
SELECT column_name(s)
FROM table1
RIGHT OUTER JOIN table2
ON table1.column_name=table2.column_name;
```

PS! In some databases RIGHT JOIN is called RIGHT OUTER JOIN.



Demo Database

In this tutorial we will use the well-known Northwind sample database.

Below is a selection from the "Orders" table:

OrderID	CustomerID	EmployeeID	OrderDate	ShipperID
10308	2	7	1996-09-18	3
10309	37	3	1996-09-19	1
10310	77	8	1996-09-20	2

And a selection from the "Employees" table:

EmployeeID	LastName	FirstName	BirthDate	Photo	Notes
1	Davolio	Nancy	12/8/1968	EmpID1.pic	Education includes a BA in psychology.....
2	Fuller	Andrew	2/19/1952	EmpID2.pic	Andrew received his BTS commercial and....
3	Leverling	Janet	8/30/1963	EmpID3.pic	Janet has a BS degree in chemistry....

SQL RIGHT JOIN Example

The following SQL statement will return all employees, and any orders they have placed:

Example

```
SELECT Orders.OrderID, Employees.FirstName
FROM Orders
```

```
RIGHT JOIN Employees
ON Orders.EmployeeID=Employees.EmployeeID
ORDER BY Orders.OrderID;
```

Try it Yourself »

Note: The RIGHT JOIN keyword returns all the rows from the right table (Employees), even if there are no matches in the left table (Orders).

SQL FULL OUTER JOIN Keyword

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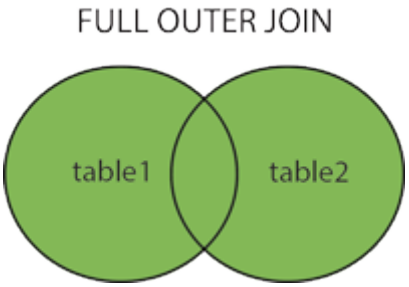
SQL FULL OUTER JOIN Keyword

The FULL OUTER JOIN keyword returns all rows from the left table (table1) and from the right table (table2).

The FULL OUTER JOIN keyword combines the result of both LEFT and RIGHT joins.

SQL FULL OUTER JOIN Syntax

```
SELECT column_name(s)
FROM table1
FULL OUTER JOIN table2
ON table1.column_name=table2.column_name;
```



Demo Database

In this tutorial we will use the well-known Northwind sample database.

Below is a selection from the "Customers" table:

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico

And a selection from the "Orders" table:

OrderID	CustomerID	EmployeeID	OrderDate	ShipperID
10308	2	7	1996-09-18	3
10309	37	3	1996-09-19	1
10310	77	8	1996-09-20	2

SQL FULL OUTER JOIN Example

The following SQL statement selects all customers, and all orders:

```
SELECT Customers.CustomerName, Orders.OrderID
FROM Customers
FULL OUTER JOIN Orders
ON Customers.CustomerID=Orders.CustomerID
ORDER BY Customers.CustomerName;
```

A selection from the result set may look like this:

CustomerName	OrderID
Alfreds Futterkiste	
Ana Trujillo Emparedados y helados	10308
Antonio Moreno Taquería	10365
	10382
	10351

Note: The FULL OUTER JOIN keyword returns all the rows from the left table (Customers), and all the rows from the right table (Orders). If there are rows in "Customers" that do not have matches in "Orders", or if there are rows in "Orders" that do not have matches in "Customers", those rows will be listed as well.

SQL UNION Operator

The SQL UNION operator combines the result of two or more SELECT statements.

The SQL UNION Operator

The UNION operator is used to combine the result-set of two or more SELECT statements.

Notice that each SELECT statement within the UNION must have the same number of columns. The columns must also have similar data types. Also, the columns in each SELECT statement must be in the same order.

SQL UNION Syntax

```
SELECT column_name(s) FROM table1
UNION
SELECT column_name(s) FROM table2;
```

Note: The UNION operator selects only distinct values by default. To allow duplicate values, use the ALL keyword with UNION.

SQL UNION ALL Syntax

```
SELECT column_name(s) FROM table1
UNION ALL
SELECT column_name(s) FROM table2;
```

PS: The column names in the result-set of a UNION are usually equal to the column names in the first SELECT statement in the UNION.

Demo Database

In this tutorial we will use the well-known Northwind sample database.

Below is a selection from the "Customers" table:

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country

1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico

And a selection from the "Suppliers" table:

SupplierID	SupplierName	ContactName	Address	City	PostalCode	Country
1	Exotic Liquid	Charlotte Cooper	49 Gilbert St.	London	EC1 4SD	UK
2	New Orleans Cajun Delights	Shelley Burke	P.O. Box 78934	New Orleans	70117	USA
3	Grandma Kelly's Homestead	Regina Murphy	707 Oxford Rd.	Ann Arbor	48104	USA

SQL UNION Example

The following SQL statement selects all the **different** cities (only distinct values) from the "Customers" and the "Suppliers" tables:

Example

```
SELECT City FROM Customers
UNION
SELECT City FROM Suppliers
ORDER BY City;
```

Try it Yourself »

Note: UNION cannot be used to list ALL cities from the two tables. If several customers and suppliers share the same city, each city will only be listed once. UNION selects only distinct values. Use UNION ALL to also select duplicate values!

SQL UNION ALL Example

The following SQL statement uses UNION ALL to select **all** (duplicate values also) cities from the "Customers" and "Suppliers" tables:

Example

```
SELECT City FROM Customers
UNION ALL
SELECT City FROM Suppliers
ORDER BY City;
```

Try it Yourself »

SQL UNION ALL With WHERE

The following SQL statement uses UNION ALL to select **all** (duplicate values also) **German** cities from the "Customers" and "Suppliers" tables:

Example

```
SELECT City, Country FROM Customers
WHERE Country='Germany'
UNION ALL
SELECT City, Country FROM Suppliers
WHERE Country='Germany'
ORDER BY City;
```

Try it Yourself »

SQL SELECT INTO Statement

With SQL, you can copy information from one table into another.

The SELECT INTO statement copies data from one table and inserts it into a new table.

The SQL SELECT INTO Statement

The SELECT INTO statement selects data from one table and inserts it into a new table.

SQL SELECT INTO Syntax

We can copy all columns into the new table:

```
SELECT *
INTO newtable [IN externaldb]
FROM table1;
```

Or we can copy only the columns we want into the new table:

```
SELECT column_name(s)
INTO newtable [IN externaldb]
FROM table1;
```

The new table will be created with the column-names and types as defined in the SELECT statement. You can apply new names using the AS clause.

SQL SELECT INTO Examples

Create a backup copy of Customers:

```
SELECT *
INTO CustomersBackup2013
FROM Customers;
```

Use the IN clause to copy the table into another database:

```
SELECT *
INTO CustomersBackup2013 IN 'Backup.mdb'
FROM Customers;
```

Copy only a few columns into the new table:

```
SELECT CustomerName, ContactName
INTO CustomersBackup2013
FROM Customers;
```

Copy only the German customers into the new table:

```
SELECT *
INTO CustomersBackup2013
FROM Customers
WHERE Country='Germany';
```

Copy data from more than one table into the new table:

```
SELECT Customers.CustomerName, Orders.OrderID
INTO CustomersOrderBackup2013
FROM Customers
LEFT JOIN Orders
ON Customers.CustomerID=Orders.CustomerID;
```

Tip: The SELECT INTO statement can also be used to create a new, empty table using the schema of another. Just add a WHERE clause that causes the query to return no data:

```
SELECT *
INTO newtable
FROM table1
WHERE 1=0;
```

SQL INSERT INTO SELECT Statement

With SQL, you can copy information from one table into another.

The INSERT INTO SELECT statement copies data from one table and inserts it into an existing table.

The SQL INSERT INTO SELECT Statement

The INSERT INTO SELECT statement selects data from one table and inserts it into an existing table. Any existing rows in the target table are unaffected.

SQL INSERT INTO SELECT Syntax

We can copy all columns from one table to another, existing table:

```
INSERT INTO table2
SELECT * FROM table1;
```

Or we can copy only the columns we want to into another, existing table:

```
INSERT INTO table2
(column_name(s))
SELECT column_name(s)
FROM table1;
```

Demo Database

In this tutorial we will use the well-known Northwind sample database.

Below is a selection from the "Customers" table:

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany

2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico

And a selection from the "Suppliers" table:

SupplierID	SupplierName	ContactName	Address	City	Postal Code	Country	Phone
1	Exotic Liquid	Charlotte Cooper	49 Gilbert St.	Londona	EC1 4SD	UK	(171) 555-2222
2	New Orleans Cajun Delights	Shelley Burke	P.O. Box 78934	New Orleans	70117	USA	(100) 555-4822
3	Grandma Kelly's Homestead	Regina Murphy	707 Oxford Rd.	Ann Arbor	48104	USA	(313) 555-5735

SQL INSERT INTO SELECT Examples

Copy only a few columns from "Suppliers" into "Customers":

Example

```
INSERT INTO Customers (CustomerName, Country)
SELECT SupplierName, Country FROM Suppliers;
```

Try it Yourself »

Copy only the German suppliers into "Customers":

Example

```
INSERT INTO Customers (CustomerName, Country)
SELECT SupplierName, Country FROM Suppliers
WHERE Country='Germany';
```

Try it Yourself »

SQL CREATE DATABASE Statement

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The SQL CREATE DATABASE Statement

The CREATE DATABASE statement is used to create a database.

SQL CREATE DATABASE Syntax

```
CREATE DATABASE dbname;
```

SQL CREATE DATABASE Example

The following SQL statement creates a database called "my_db":

```
CREATE DATABASE my_db;
```

Database tables can be added with the CREATE TABLE statement.

SQL CREATE TABLE Statement

The SQL CREATE TABLE Statement

The CREATE TABLE statement is used to create a table in a database.

Tables are organized into rows and columns; and each table must have a name.

SQL CREATE TABLE Syntax

```
CREATE TABLE table_name
(
column_name1 data_type(size),
column_name2 data_type(size),
column_name3 data_type(size),
....
);
```

The column_name parameters specify the names of the columns of the table.

The data_type parameter specifies what type of data the column can hold (e.g. varchar, integer, decimal, date, etc.).

The size parameter specifies the maximum length of the column of the table.

Tip: For an overview of the data types available in MS Access, MySQL, and SQL Server, go to our complete Data Types Reference.

SQL CREATE TABLE Example

Now we want to create a table called "Persons" that contains five columns: PersonID, LastName, FirstName, Address, and City.

We use the following CREATE TABLE statement:

Example

```
CREATE TABLE Persons
(
PersonID int,
LastName varchar(255),
FirstName varchar(255),
Address varchar(255),
City varchar(255)
);
```

Try it Yourself »

The PersonID column is of type int and will hold an integer.

The LastName, FirstName, Address, and City columns are of type varchar and will hold characters, and the maximum length for these fields is 255 characters.

The empty "Persons" table will now look like this:

PersonID	LastName	FirstName	Address	City

Tip: The empty table can be filled with data with the INSERT INTO statement.

SQL Constraints

SQL Constraints

SQL constraints are used to specify rules for the data in a table.

If there is any violation between the constraint and the data action, the action is aborted by the constraint.

Constraints can be specified when the table is created (inside the CREATE TABLE statement) or after the table is created (inside the ALTER TABLE statement).

SQL CREATE TABLE + CONSTRAINT Syntax

```
CREATE TABLE table_name
(
column_name1 data_type(size) constraint_name,
column_name2 data_type(size) constraint_name,
```

```
column_name3 data_type(size) constraint_name,
....
);
```

In SQL, we have the following constraints:

- **NOT NULL** - Indicates that a column cannot store NULL value
- **UNIQUE** - Ensures that each row for a column must have a unique value
- **PRIMARY KEY** - A combination of a NOT NULL and UNIQUE. Ensures that a column (or combination of two or more columns) have a unique identity which helps to find a particular record in a table more easily and quickly
- **FOREIGN KEY** - Ensure the referential integrity of the data in one table to match values in another table
- **CHECK** - Ensures that the value in a column meets a specific condition
- **DEFAULT** - Specifies a default value for a column

The next chapters will describe each constraint in detail.

SQL NOT NULL Constraint

By default, a table column can hold NULL values.

SQL NOT NULL Constraint

The NOT NULL constraint enforces a column to NOT accept NULL values.

The NOT NULL constraint enforces a field to always contain a value. This means that you cannot insert a new record, or update a record without adding a value to this field.

The following SQL enforces the "P_Id" column and the "LastName" column to not accept NULL values:

Example

```
CREATE TABLE PersonsNotNull
(
P_Id int NOT NULL,
```

```
LastName varchar(255) NOT NULL,
FirstName varchar(255),
Address varchar(255),
City varchar(255)
)
```

Try it Yourself »

SQL UNIQUE Constraint

SQL 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

The following SQL creates a UNIQUE constraint on the "P_Id" column when the "Persons" table is created:

SQL Server / Oracle / MS Access:

```
CREATE TABLE Persons
(
P_Id int NOT NULL UNIQUE,
LastName varchar(255) NOT NULL,
FirstName varchar(255),
Address varchar(255),
City varchar(255)
)
```

MySQL:

```
CREATE TABLE Persons
(
P_Id int NOT NULL,
LastName varchar(255) NOT NULL,
FirstName varchar(255),
Address varchar(255),
City varchar(255),
UNIQUE (P_Id)
)
```

To allow naming of a UNIQUE constraint, and for defining a UNIQUE constraint on multiple columns, use the following SQL syntax:

MySQL / SQL Server / Oracle / MS Access:

```
CREATE TABLE Persons
(
P_Id int NOT NULL,
LastName varchar(255) NOT NULL,
FirstName varchar(255),
Address varchar(255),
City varchar(255),
CONSTRAINT uc_PersonID UNIQUE (P_Id,LastName)
)
```

SQL UNIQUE Constraint on ALTER TABLE

To create a UNIQUE constraint on the "P_Id" column when the table is already created, use the following SQL:

MySQL / SQL Server / Oracle / MS Access:

```
ALTER TABLE Persons
ADD UNIQUE (P_Id)
```

To allow naming of a UNIQUE constraint, and for defining a UNIQUE constraint on multiple columns, use the following SQL syntax:

MySQL / SQL Server / Oracle / MS Access:

```
ALTER TABLE Persons
ADD CONSTRAINT uc_PersonID UNIQUE (P_Id,LastName)
```

SQL PRIMARY KEY Constraint

SQL PRIMARY KEY Constraint

The PRIMARY KEY constraint uniquely identifies each record in a database table.

Primary keys must contain UNIQUE values.

A primary key column cannot contain NULL values.

Most tables should have a primary key, and each table can have only ONE primary key.

SQL PRIMARY KEY Constraint on CREATE TABLE

The following SQL creates a PRIMARY KEY on the "P_Id" column when the "Persons" table is created:

MySQL:

```
CREATE TABLE Persons
(
P_Id int NOT NULL,
LastName varchar(255) NOT NULL,
FirstName varchar(255),
Address varchar(255),
City varchar(255),
PRIMARY KEY (P_Id)
)
```

SQL Server / Oracle / MS Access:

```
CREATE TABLE Persons
(
P_Id int NOT NULL PRIMARY KEY,
```

```
LastName varchar(255) NOT NULL,
FirstName varchar(255),
Address varchar(255),
City varchar(255)
)
```

To allow naming of a PRIMARY KEY constraint, and for defining a PRIMARY KEY constraint on multiple columns, use the following SQL syntax:

MySQL / SQL Server / Oracle / MS Access:

```
CREATE TABLE Persons
(
P_Id int NOT NULL,
LastName varchar(255) NOT NULL,
FirstName varchar(255),
Address varchar(255),
City varchar(255),
CONSTRAINT pk_PersonID PRIMARY KEY (P_Id,LastName)
)
```

Note: In the example above there is only ONE PRIMARY KEY (pk_PersonID). However, the VALUE of the primary key is made up of TWO COLUMNS (P_Id + LastName).

SQL PRIMARY KEY Constraint on ALTER TABLE

To create a PRIMARY KEY constraint on the "P_Id" column when the table is already created, use the following SQL:

MySQL / SQL Server / Oracle / MS Access:

```
ALTER TABLE Persons
ADD PRIMARY KEY (P_Id)
```

To allow naming of a PRIMARY KEY constraint, and for defining a PRIMARY KEY constraint on multiple columns, use the following SQL syntax:

MySQL / SQL Server / Oracle / MS Access:

```
ALTER TABLE Persons
ADD CONSTRAINT pk_PersonID PRIMARY KEY (P_Id,LastName)
```

Note: If you use the ALTER TABLE statement to add a primary key, the primary key column(s) must already have been declared to not contain NULL values (when the table was first created).

To DROP a PRIMARY KEY Constraint

To drop a PRIMARY KEY constraint, use the following SQL:

MySQL:

```
ALTER TABLE Persons
DROP PRIMARY KEY
```

SQL Server / Oracle / MS Access:

```
ALTER TABLE Persons
DROP CONSTRAINT pk_PersonID
```

SQL FOREIGN KEY Constraint

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SQL FOREIGN KEY Constraint

A FOREIGN KEY in one table points to a PRIMARY KEY in another table.

Let's illustrate the foreign key with an example. Look at the following two tables:

The "Persons" table:

P_Id	LastName	FirstName	Address	City
1	Hansen	Ola	Timoteivn 10	Sandnes

2	Svendson	Tove	Borgvn 23	Sandnes
3	Pettersen	Kari	Storgt 20	Stavanger

The "Orders" table:

O_Id	OrderNo	P_Id
1	77895	3
2	44678	3
3	22456	2
4	24562	1

Note that the "P_Id" column in the "Orders" table points to the "P_Id" column in the "Persons" table.

The "P_Id" column in the "Persons" table is the PRIMARY KEY in the "Persons" table.

The "P_Id" column in the "Orders" table is a FOREIGN KEY in the "Orders" table.

The FOREIGN KEY constraint is used to prevent actions that would destroy links between tables.

The FOREIGN KEY constraint also prevents invalid data from being inserted into the foreign key column, because it has to be one of the values contained in the table it points to.

SQL FOREIGN KEY Constraint on CREATE TABLE

The following SQL creates a FOREIGN KEY on the "P_Id" column when the "Orders" table is created:

MySQL:

```
CREATE TABLE Orders
(
O_Id int NOT NULL,
OrderNo int NOT NULL,
P_Id int,
PRIMARY KEY (O_Id),
FOREIGN KEY (P_Id) REFERENCES Persons(P_Id)
)
```

SQL Server / Oracle / MS Access:

```
CREATE TABLE Orders
(
O_Id int NOT NULL PRIMARY KEY,
OrderNo int NOT NULL,
P_Id int FOREIGN KEY REFERENCES Persons(P_Id)
)
```

To allow naming of a FOREIGN KEY constraint, and for defining a FOREIGN KEY constraint on multiple columns, use the following SQL syntax:

MySQL / SQL Server / Oracle / MS Access:

```
CREATE TABLE Orders
(
O_Id int NOT NULL,
OrderNo int NOT NULL,
P_Id int,
PRIMARY KEY (O_Id),
CONSTRAINT fk_PerOrders FOREIGN KEY (P_Id)
REFERENCES Persons(P_Id)
)
```

SQL FOREIGN KEY Constraint on ALTER TABLE

To create a FOREIGN KEY constraint on the "P_Id" column when the "Orders" table is already created, use the following SQL:

MySQL / SQL Server / Oracle / MS Access:

```
ALTER TABLE Orders
ADD FOREIGN KEY (P_Id)
REFERENCES Persons(P_Id)
```

To allow naming of a FOREIGN KEY constraint, and for defining a FOREIGN KEY constraint on multiple columns, use the following SQL syntax:

MySQL / SQL Server / Oracle / MS Access:

```
ALTER TABLE Orders
ADD CONSTRAINT fk_PerOrders
FOREIGN KEY (P_Id)
REFERENCES Persons(P_Id)
```

To DROP a FOREIGN KEY Constraint

To drop a FOREIGN KEY constraint, use the following SQL:

MySQL:

```
ALTER TABLE Orders
DROP FOREIGN KEY fk_PerOrders
```

SQL Server / Oracle / MS Access:

```
ALTER TABLE Orders
DROP CONSTRAINT fk_PerOrders
```

SQL CHECK Constraint

SQL CHECK Constraint

The CHECK constraint is used to limit the value range that can be placed in a column.

If you define a CHECK constraint on a single column it allows only certain values for this column.

If you define a CHECK constraint on a table it can limit the values in certain columns based on values in other columns in the row.

SQL CHECK Constraint on CREATE TABLE

The following SQL creates a CHECK constraint on the "P_Id" column when the "Persons" table is created. The CHECK constraint specifies that the column "P_Id" must only include integers greater than 0.

MySQL:

```
CREATE TABLE Persons
(
P_Id int NOT NULL,
LastName varchar(255) NOT NULL,
FirstName varchar(255),
Address varchar(255),
City varchar(255),
CHECK (P_Id>0)
)
```

SQL Server / Oracle / MS Access:

```
CREATE TABLE Persons
(
P_Id int NOT NULL CHECK (P_Id>0),
LastName varchar(255) NOT NULL,
FirstName varchar(255),
Address varchar(255),
City varchar(255)
)
```

To allow naming of a CHECK constraint, and for defining a CHECK constraint on multiple columns, use the following SQL syntax:

MySQL / SQL Server / Oracle / MS Access:

```
CREATE TABLE Persons
(
P_Id int NOT NULL,
LastName varchar(255) NOT NULL,
FirstName varchar(255),
Address varchar(255),
```

```
City varchar(255),
CONSTRAINT chk_Person CHECK (P_Id>0 AND City='Sandnes')
)
```

SQL CHECK Constraint on ALTER TABLE

To create a CHECK constraint on the "P_Id" column when the table is already created, use the following SQL:

MySQL / SQL Server / Oracle / MS Access:

```
ALTER TABLE Persons
ADD CHECK (P_Id>0)
```

To allow naming of a CHECK constraint, and for defining a CHECK constraint on multiple columns, use the following SQL syntax:

MySQL / SQL Server / Oracle / MS Access:

```
ALTER TABLE Persons
ADD CONSTRAINT chk_Person CHECK (P_Id>0 AND City='Sandnes')
```

To DROP a CHECK Constraint

To drop a CHECK constraint, use the following SQL:

SQL Server / Oracle / MS Access:

```
ALTER TABLE Persons
DROP CONSTRAINT chk_Person
```

MySQL:

```
ALTER TABLE Persons
DROP CHECK chk_Person
```

SQL DEFAULT Constraint

SQL DEFAULT Constraint

The DEFAULT constraint is used to insert a default value into a column.

The default value will be added to all new records, if no other value is specified.

SQL DEFAULT Constraint on CREATE TABLE

The following SQL creates a DEFAULT constraint on the "City" column when the "Persons" table is created:

My SQL / SQL Server / Oracle / MS Access:

```
CREATE TABLE Persons
(
P_Id int NOT NULL,
LastName varchar(255) NOT NULL,
FirstName varchar(255),
Address varchar(255),
City varchar(255) DEFAULT 'Sandnes'
)
```

The DEFAULT constraint can also be used to insert system values, by using functions like GETDATE():

```
CREATE TABLE Orders
(
O_Id int NOT NULL,
OrderNo int NOT NULL,
P_Id int,
OrderDate date DEFAULT GETDATE()
)
```

SQL DEFAULT Constraint on ALTER TABLE

To create a DEFAULT constraint on the "City" column when the table is already created, use the following SQL:

MySQL:

```
ALTER TABLE Persons
ALTER City SET DEFAULT 'SANDNES'
```

SQL Server / MS Access:

```
ALTER TABLE Persons
ALTER COLUMN City SET DEFAULT 'SANDNES'
```

Oracle:

```
ALTER TABLE Persons
MODIFY City DEFAULT 'SANDNES'
```

To DROP a DEFAULT Constraint

To drop a DEFAULT constraint, use the following SQL:

MySQL:

```
ALTER TABLE Persons
ALTER City DROP DEFAULT
```

SQL Server / Oracle / MS Access:

```
ALTER TABLE Persons
ALTER COLUMN City DROP DEFAULT
```

SQL CREATE INDEX Statement

The CREATE INDEX statement is used to create indexes in tables.

Indexes allow the database application to find data fast; without reading the whole table.

Indexes

An index can be created in a table to find data more quickly and efficiently.

The users cannot see the indexes, they are just used to speed up searches/queries.

Note: Updating a table with indexes takes more time than updating a table without (because the indexes also need an update). So you should only create indexes on columns (and tables) that will be frequently searched against.

SQL CREATE INDEX Syntax

Creates an index on a table. Duplicate values are allowed:

```
CREATE INDEX index_name
ON table_name (column_name)
```

SQL CREATE UNIQUE INDEX Syntax

Creates a unique index on a table. Duplicate values are not allowed:

```
CREATE UNIQUE INDEX index_name
ON table_name (column_name)
```

Note: The syntax for creating indexes varies among different databases. Therefore: Check the syntax for creating indexes in your database.

CREATE INDEX Example

The SQL statement below creates an index named "PIndex" on the "LastName" column in the "Persons" table:

```
CREATE INDEX PIndex
ON Persons (LastName)
```

If you want to create an index on a combination of columns, you can list the column names within the parentheses, separated by commas:

```
CREATE INDEX PIndex
ON Persons (LastName, FirstName)
```

SQL DROP INDEX, DROP TABLE, and DROP DATABASE

Indexes, tables, and databases can easily be deleted/removed with the DROP statement.

The DROP INDEX Statement

The DROP INDEX statement is used to delete an index in a table.

DROP INDEX Syntax for MS Access:

```
DROP INDEX index_name ON table_name
```

DROP INDEX Syntax for MS SQL Server:

```
DROP INDEX table_name.index_name
```

DROP INDEX Syntax for DB2/Oracle:

```
DROP INDEX index_name
```

DROP INDEX Syntax for MySQL:

```
ALTER TABLE table_name DROP INDEX index_name
```

The DROP TABLE Statement

The DROP TABLE statement is used to delete a table.

```
DROP TABLE table_name
```

The DROP DATABASE Statement

The DROP DATABASE statement is used to delete a database.

```
DROP DATABASE database_name
```

The TRUNCATE TABLE Statement

What if we only want to delete the data inside the table, and not the table itself?

Then, use the TRUNCATE TABLE statement:

```
TRUNCATE TABLE table_name
```

SQL ALTER TABLE Statement

The ALTER TABLE Statement

The ALTER TABLE statement is used to add, delete, or modify columns in an existing table.

SQL ALTER TABLE Syntax

To add a column in a table, use the following syntax:

```
ALTER TABLE table_name
ADD column_name datatype
```

To delete a column in a table, use the following syntax (notice that some database systems don't allow deleting a column):

```
ALTER TABLE table_name
DROP COLUMN column_name
```

To change the data type of a column in a table, use the following syntax:

SQL Server / MS Access:

```
ALTER TABLE table_name
ALTER COLUMN column_name datatype
```

My SQL / Oracle (prior version 10G):

```
ALTER TABLE table_name
MODIFY COLUMN column_name datatype
```

Oracle 10G and later:

```
ALTER TABLE table_name
MODIFY column_name datatype
```

SQL ALTER TABLE Example

Look at the "Persons" table:

P_Id	LastName	FirstName	Address
1	Hansen	Ola	Timoteivn 10
2	Svendson	Tove	Borgvn 23
3	Pettersen	Kari	Storgt 20

Now we want to add a column named "DateOfBirth" in the "Persons" table.

We use the following SQL statement:

```
ALTER TABLE Persons
ADD DateOfBirth date
```

Notice that the new column, "DateOfBirth", is of type date and is going to hold a date. The data type specifies what type of data the column can hold. For a complete reference of all the data types available in MS Access, MySQL, and SQL Server, go to our complete Data Types reference.

The "Persons" table will now look like this:

P_Id	LastName	FirstName	Address	City	DateOfBirth
1	Hansen	Ola	Timoteivn 10	Sandnes	
2	Svendson	Tove	Borgvn 23	Sandnes	
3	Pettersen	Kari	Storgt 20	Stavanger	

Change Data Type Example

Now we want to change the data type of the column named "DateOfBirth" in the "Persons" table.

We use the following SQL statement:

```
ALTER TABLE Persons
ALTER COLUMN DateOfBirth year
```

Notice that the "DateOfBirth" column is now of type year and is going to hold a year in a two-digit or four-digit format.

DROP COLUMN Example

Next, we want to delete the column named "DateOfBirth" in the "Persons" table.

We use the following SQL statement:

```
ALTER TABLE Persons
DROP COLUMN DateOfBirth
```

The "Persons" table will now look like this:

P_Id	LastName	FirstName	Address	City
1	Hansen	Ola	Timoteivn 10	Sandnes
2	Svendson	Tove	Borgvn 23	Sandnes
3	Pettersen	Kari	Storgt 20	Stavanger

SQL AUTO INCREMENT Field

Auto-increment allows a unique number to be generated when a new record is inserted into a table.

AUTO INCREMENT a Field

Very often we would like the value of the primary key field to be created automatically every time a new record is inserted.

We would like to create an auto-increment field in a table.

Syntax for MySQL

The following SQL statement defines the "ID" column to be an auto-increment primary key field in the "Persons" table:

```
CREATE TABLE Persons
(
ID int NOT NULL AUTO_INCREMENT,
LastName varchar(255) NOT NULL,
```

```
FirstName varchar(255),
Address varchar(255),
City varchar(255),
PRIMARY KEY (ID)
)
```

MySQL uses the AUTO_INCREMENT keyword to perform an auto-increment feature.

By default, the starting value for AUTO_INCREMENT is 1, and it will increment by 1 for each new record.

To let the AUTO_INCREMENT sequence start with another value, use the following SQL statement:

```
ALTER TABLE Persons AUTO_INCREMENT=100
```

To insert a new record into the "Persons" table, we will NOT have to specify a value for the "ID" column (a unique value will be added automatically):

```
INSERT INTO Persons (FirstName,LastName)
VALUES ('Lars','Monsen')
```

The SQL statement above would insert a new record into the "Persons" table. The "ID" column would be assigned a unique value. The "FirstName" column would be set to "Lars" and the "LastName" column would be set to "Monsen".

Syntax for SQL Server

The following SQL statement defines the "ID" column to be an auto-increment primary key field in the "Persons" table:

```
CREATE TABLE Persons
(
ID int IDENTITY(1,1) PRIMARY KEY,
LastName varchar(255) NOT NULL,
FirstName varchar(255),
Address varchar(255),
City varchar(255)
)
```

The MS SQL Server uses the IDENTITY keyword to perform an auto-increment feature.

In the example above, the starting value for IDENTITY is 1, and it will increment by 1 for each new record.

Tip: To specify that the "ID" column should start at value 10 and increment by 5, change it to IDENTITY(10,5).

To insert a new record into the "Persons" table, we will NOT have to specify a value for the "ID" column (a unique value will be added automatically):

```
INSERT INTO Persons (FirstName,LastName)
VALUES ('Lars','Monsen')
```

The SQL statement above would insert a new record into the "Persons" table. The "ID" column would be assigned a unique value. The "FirstName" column would be set to "Lars" and the "LastName" column would be set to "Monsen".

Syntax for Access

The following SQL statement defines the "ID" column to be an auto-increment primary key field in the "Persons" table:

```
CREATE TABLE Persons
(
ID Integer PRIMARY KEY AUTOINCREMENT,
LastName varchar(255) NOT NULL,
FirstName varchar(255),
Address varchar(255),
City varchar(255)
)
```

The MS Access uses the AUTOINCREMENT keyword to perform an auto-increment feature.

By default, the starting value for AUTOINCREMENT is 1, and it will increment by 1 for each new record.

Tip: To specify that the "ID" column should start at value 10 and increment by 5, change the autoincrement to AUTOINCREMENT(10,5).

To insert a new record into the "Persons" table, we will NOT have to specify a value for the "ID" column (a unique value will be added automatically):

```
INSERT INTO Persons (FirstName,LastName)
VALUES ('Lars','Monsen')
```

The SQL statement above would insert a new record into the "Persons" table. The "P_Id" column would be assigned a unique value. The "FirstName" column would be set to "Lars" and the "LastName" column would be set to "Monsen".

Syntax for Oracle

In Oracle the code is a little bit more tricky.

You will have to create an auto-increment field with the sequence object (this object generates a number sequence).

Use the following CREATE SEQUENCE syntax:

```
CREATE SEQUENCE seq_person
MINVALUE 1
START WITH 1
INCREMENT BY 1
CACHE 10
```

The code above creates a sequence object called seq_person, that starts with 1 and will increment by 1. It will also cache up to 10 values for performance. The cache option specifies how many sequence values will be stored in memory for faster access.

To insert a new record into the "Persons" table, we will have to use the nextval function (this function retrieves the next value from seq_person sequence):

```
INSERT INTO Persons (ID,FirstName,LastName)
VALUES (seq_person.nextval,'Lars','Monsen')
```

The SQL statement above would insert a new record into the "Persons" table. The "ID" column would be assigned the next number from the seq_person sequence. The "FirstName" column would be set to "Lars" and the "LastName" column would be set to "Monsen".

SQL Views

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A view is a virtual table.

This chapter shows how to create, update, and delete a view.

SQL CREATE VIEW Statement

In SQL, a view is a virtual table based on the result-set of an SQL statement.

A view contains rows and columns, just like a real table. The fields in a view are fields from one or more real tables in the database.

You can add SQL functions, WHERE, and JOIN statements to a view and present the data as if the data were coming from one single table.

SQL CREATE VIEW Syntax

```
CREATE VIEW view_name AS
SELECT column_name(s)
FROM table_name
WHERE condition
```

Note: A view always shows up-to-date data! The database engine recreates the data, using the view's SQL statement, every time a user queries a view.

SQL CREATE VIEW Examples

If you have the Northwind database you can see that it has several views installed by default.

The view "Current Product List" lists all active products (products that are not discontinued) from the "Products" table. The view is created with the following SQL:

```
CREATE VIEW [Current Product List] AS
SELECT ProductID,ProductName
FROM Products
WHERE Discontinued=No
```

We can query the view above as follows:

```
SELECT * FROM [Current Product List]
```

Another view in the Northwind sample database selects every product in the "Products" table with a unit price higher than the average unit price:

```
CREATE VIEW [Products Above Average Price] AS
SELECT ProductName,UnitPrice
```

```
FROM Products
WHERE UnitPrice>(SELECT AVG(UnitPrice) FROM Products)
```

We can query the view above as follows:

```
SELECT * FROM [Products Above Average Price]
```

Another view in the Northwind database calculates the total sale for each category in 1997. Note that this view selects its data from another view called "Product Sales for 1997":

```
CREATE VIEW [Category Sales For 1997] AS
SELECT DISTINCT CategoryName,Sum(ProductSales) AS CategorySales
FROM [Product Sales for 1997]
GROUP BY CategoryName
```

We can query the view above as follows:

```
SELECT * FROM [Category Sales For 1997]
```

We can also add a condition to the query. Now we want to see the total sale only for the category "Beverages":

```
SELECT * FROM [Category Sales For 1997]
WHERE CategoryName='Beverages'
```

SQL Updating a View

You can update a view by using the following syntax:

SQL CREATE OR REPLACE VIEW Syntax

```
CREATE OR REPLACE VIEW view_name AS
SELECT column_name(s)
FROM table_name
WHERE condition
```

Now we want to add the "Category" column to the "Current Product List" view. We will update the view with the following SQL:

```
CREATE OR REPLACE VIEW [Current Product List] AS
SELECT ProductID,ProductName,Category
FROM Products
WHERE Discontinued=No
```

SQL Dropping a View

You can delete a view with the DROP VIEW command.

SQL DROP VIEW Syntax

```
DROP VIEW view_name
```

SQL NULL Values

NULL values represent missing unknown data.

By default, a table column can hold NULL values.

This chapter will explain the IS NULL and IS NOT NULL operators.

SQL NULL Values

If a column in a table is optional, we can insert a new record or update an existing record without adding a value to this column. This means that the field will be saved with a NULL value.

NULL values are treated differently from other values.

NULL is used as a placeholder for unknown or inapplicable values.

Note: It is not possible to compare NULL and 0; they are not equivalent.

SQL Working with NULL Values

Look at the following "Persons" table:

P_Id	LastName	FirstName	Address	City

1	Hansen	Ola		Sandnes
2	Svendson	Tove	Borgvn 23	Sandnes
3	Pettersen	Kari		Stavanger

Suppose that the "Address" column in the "Persons" table is optional. This means that if we insert a record with no value for the "Address" column, the "Address" column will be saved with a NULL value.

How can we test for NULL values?

It is not possible to test for NULL values with comparison operators, such as =, <, or <>.

We will have to use the IS NULL and IS NOT NULL operators instead.

SQL IS NULL

How do we select only the records with NULL values in the "Address" column?

We will have to use the IS NULL operator:

```
SELECT LastName,FirstName,Address FROM Persons
WHERE Address IS NULL
```

The result-set will look like this:

LastName	FirstName	Address
Hansen	Ola	

Pettersen	Kari

Tip: Always use IS NULL to look for NULL values.

SQL IS NOT NULL

How do we select only the records with no NULL values in the "Address" column?

We will have to use the IS NOT NULL operator:

```
SELECT LastName,FirstName,Address FROM Persons
WHERE Address IS NOT NULL
```

The result-set will look like this:

LastName	FirstName	Address
Svendson	Tove	Borgvn 23

SQL GROUP BY Statement

The GROUP BY Statement

The GROUP BY statement is used in conjunction with the aggregate functions to group the result-set by one or more columns.

SQL GROUP BY Syntax

```
SELECT column_name, aggregate_function(column_name)
FROM table_name
WHERE column_name operator value
GROUP BY column_name;
```

Demo Database

In this tutorial we will use the well-known Northwind sample database.

Below is a selection from the "Orders" table:

OrderID	CustomerID	EmployeeID	OrderDate	ShipperID
10248	90	5	1996-07-04	3
10249	81	6	1996-07-05	1
10250	34	4	1996-07-08	2

And a selection from the "Shippers" table:

ShipperID	ShipperName
1	Speedy Express
2	United Package

3	Federal Shipping

And a selection from the "Employees" table:

EmployeeID	LastName	FirstName	BirthDate	Photo	Notes
1	Davolio	Nancy	1968-12-08	EmpID1.pic	Education includes a BA....
2	Fuller	Andrew	1952-02-19	EmpID2.pic	Andrew received his BTS....
3	Leverling	Janet	1963-08-30	EmpID3.pic	Janet has a BS degree....

SQL GROUP BY Example

Now we want to find the number of orders sent by each shipper.

The following SQL statement counts as orders grouped by shippers:

Example

```
SELECT Shippers.ShipperName,COUNT(Orders.OrderID) AS NumberOfOrders FROM O
rders
LEFT JOIN Shippers
ON Orders.ShipperID=Shippers.ShipperID
GROUP BY ShipperName;
```

Try it Yourself »

GROUP BY More Than One Column

We can also use the GROUP BY statement on more than one column, like this:

Example

```
SELECT Shippers.ShipperName, Employees.LastName,
COUNT(Orders.OrderID) AS NumberOfOrders
FROM ((Orders
INNER JOIN Shippers
ON Orders.ShipperID=Shippers.ShipperID)
INNER JOIN Employees
ON Orders.EmployeeID=Employees.EmployeeID)
GROUP BY ShipperName,LastName;
```

Try it Yourself »

SQL HAVING Clause

The HAVING Clause

The HAVING clause was added to SQL because the WHERE keyword could not be used with aggregate functions.

SQL HAVING Syntax

```
SELECT column_name, aggregate_function(column_name)
FROM table_name
WHERE column_name operator value
GROUP BY column_name
HAVING aggregate_function(column_name) operator value;
```

Demo Database

In this tutorial we will use the well-known Northwind sample database.

Below is a selection from the "Orders" table:

OrderID	CustomerID	EmployeeID	OrderDate	ShipperID
10248	90	5	1996-07-04	3
10249	81	6	1996-07-05	1
10250	34	4	1996-07-08	2

And a selection from the "Employees" table:

EmployeeID	LastName	FirstName	BirthDate	Photo	Notes
1	Davolio	Nancy	1968-12-08	EmpID1.pic	Education includes a BA....
2	Fuller	Andrew	1952-02-19	EmpID2.pic	Andrew received his BTS....
3	Leverling	Janet	1963-08-30	EmpID3.pic	Janet has a BS degree....

SQL HAVING Example

Now we want to find if any of the employees has registered more than 10 orders.

We use the following SQL statement:

Example

```
SELECT Employees.LastName, COUNT(Orders.OrderID) AS NumberOfOrders FROM (O
rders
INNER JOIN Employees
ON Orders.EmployeeID=Employees.EmployeeID)
GROUP BY LastName
HAVING COUNT(Orders.OrderID) > 10;
```

Try it Yourself »

Now we want to find if the employees "Davolio" or "Fuller" have registered more than 25 orders.

We add an ordinary WHERE clause to the SQL statement:

Example

```
SELECT Employees.LastName, COUNT(Orders.OrderID) AS NumberOfOrders FROM Or
ders
INNER JOIN Employees
ON Orders.EmployeeID=Employees.EmployeeID
WHERE LastName='Davolio' OR LastName='Fuller'
GROUP BY LastName
HAVING COUNT(Orders.OrderID) > 25;
```

Try it Yourself »

SQL Functions

SQL has many built-in functions for performing calculations on data.

SQL Aggregate Functions

SQL aggregate functions return a single value, calculated from values in a column.

Function	Description
AVG()	Returns the average value
COUNT()	Returns the number of rows
FIRST()	Returns the first value
LAST()	Returns the last value
MAX()	Returns the largest value
MIN()	Returns the smallest value
ROUND()	Rounds a numeric field to the number of decimals specified
SUM()	Returns the sum

SQL String Functions

Function	Description

CHARINDEX	Searches an expression in a string expression and returns its starting position if found
CONCAT()	
LEFT()	
LEN() / LENGTH()	Returns the length of the value in a text field
LOWER() / LCASE()	Converts character data to lower case
LTRIM()	
SUBSTRING() / MID()	Extract characters from a text field
PATINDEX()	
REPLACE()	
RIGHT()	
RTRIM()	

UPPER() / UCASE()	Converts character data to upper case

SQL Date Functions

MySQL Date Functions

The following table lists the most important built-in date functions in MySQL:

Function	Description
NOW()	Returns the current date and time
CURDATE()	Returns the current date
CURTIME()	Returns the current time
DATE()	Extracts the date part of a date or date/time expression
EXTRACT()	Returns a single part of a date/time
DATE_ADD()	Adds a specified time interval to a date
DATE_SUB()	Subtracts a specified time interval from a date

DATEDIFF()	Returns the number of days between two dates
DATE_FORMAT()	Displays date/time data in different formats

SQL Server Date Functions

The following table lists the most important built-in date functions in SQL Server:

Function	Description
GETDATE()	Returns the current date and time
DATEPART()	Returns a single part of a date/time
DATEADD()	Adds or subtracts a specified time interval from a date
DATEDIFF()	Returns the time between two dates
CONVERT()	Displays date/time data in different formats

SQL Date and Time Data Types and Functions

Function	Description
FORMAT()	Formats how a field is to be displayed
NOW()	Returns the current system date and time

SQL Dates

The most difficult part when working with dates is to be sure that the format of the date you are trying to insert, matches the format of the date column in the database.

As long as your data contains only the date portion, your queries will work as expected. However, if a time portion is involved, it gets more complicated.

SQL Date Data Types

MySQL comes with the following data types for storing a date or a date/time value in the database:

- DATE - format YYYY-MM-DD
- DATETIME - format: YYYY-MM-DD HH:MI:SS
- TIMESTAMP - format: YYYY-MM-DD HH:MI:SS
- YEAR - format YYYY or YY

SQL Server comes with the following data types for storing a date or a date/time value in the database:

- DATE - format YYYY-MM-DD
- DATETIME - format: YYYY-MM-DD HH:MI:SS
- SMALLDATETIME - format: YYYY-MM-DD HH:MI:SS
- TIMESTAMP - format: a unique number

Note: The date types are chosen for a column when you create a new table in your database!

For an overview of all data types available, go to our complete Data Types reference.

SQL Working with Dates

You can compare two dates easily if there is no time component involved!

Assume we have the following "Orders" table:

OrderId	ProductName	OrderDate
1	Geitost	2008-11-11
2	Camembert Pierrot	2008-11-09
3	Mozzarella di Giovanni	2008-11-11
4	Mascarpone Fabioli	2008-10-29

Now we want to select the records with an OrderDate of "2008-11-11" from the table above.

We use the following SELECT statement:

```
SELECT * FROM Orders WHERE OrderDate='2008-11-11'
```

The result-set will look like this:

OrderId	ProductName	OrderDate

1	Geitost	2008-11-11
3	Mozzarella di Giovanni	2008-11-11

Now, assume that the "Orders" table looks like this (notice the time component in the "OrderDate" column):

OrderId	ProductName	OrderDate
1	Geitost	2008-11-11 13:23:44
2	Camembert Pierrot	2008-11-09 15:45:21
3	Mozzarella di Giovanni	2008-11-11 11:12:01
4	Mascarpone Fabioli	2008-10-29 14:56:59

If we use the same SELECT statement as above:

```
SELECT * FROM Orders WHERE OrderDate='2008-11-11'
```

we will get no result! This is because the query is looking only for dates with no time portion.

Tip: If you want to keep your queries simple and easy to maintain, do not allow time components in your dates!

SQL NULL Functions

SQL ISNULL(), NVL(), IFNULL() and COALESCE() Functions

Look at the following "Products" table:

P_Id	ProductName	UnitPrice	UnitsInStock	UnitsOnOrder
1	Jarlsberg	10.45	16	15
2	Mascarpone	32.56	23	
3	Gorgonzola	15.67	9	20

Suppose that the "UnitsOnOrder" column is optional, and may contain NULL values.

We have the following SELECT statement:

```
SELECT ProductName,UnitPrice*(UnitsInStock+UnitsOnOrder)
FROM Products
```

In the example above, if any of the "UnitsOnOrder" values are NULL, the result is NULL.

Microsoft's ISNULL() function is used to specify how we want to treat NULL values.

The NVL(), IFNULL(), and COALESCE() functions can also be used to achieve the same result.

In this case we want NULL values to be zero.

Below, if "UnitsOnOrder" is NULL it will not harm the calculation, because ISNULL() returns a zero if the value is NULL:

MS Access

```
SELECT ProductName,UnitPrice*(UnitsInStock+IIF(ISNULL(UnitsOnOrder),0,Unit
sOnOrder))
FROM Products
```

SQL Server

```
SELECT ProductName,UnitPrice*(UnitsInStock+ISNULL(UnitsOnOrder,0))
FROM Products
```

Oracle

Oracle does not have an ISNULL() function. However, we can use the NVL() function to achieve the same result:

```
SELECT ProductName,UnitPrice*(UnitsInStock+NVL(UnitsOnOrder,0))
FROM Products
```

MySQL

MySQL does have an ISNULL() function. However, it works a little bit different from Microsoft's ISNULL() function.

In MySQL we can use the IFNULL() function, like this:

```
SELECT ProductName,UnitPrice*(UnitsInStock+IFNULL(UnitsOnOrder,0))
FROM Products
```

or we can use the COALESCE() function, like this:

```
SELECT ProductName,UnitPrice*(UnitsInStock+COALESCE(UnitsOnOrder,0))
FROM Products
```

SQL Operators

SQL Arithmetic Operators

Operator	Description
+	Add
-	Subtract
*	Multiply
/	Divide
%	Modulo

SQL Bitwise Operators

Operator	Description
&	Bitwise AND
|	Bitwise OR
^	Bitwise exclusive OR

SQL Comparison Operators

Operator	Description
=	Equal to
>	Greater than
<	Less than
>=	Greater than or equal to
<=	Less than or equal to
<>	Not equal to

SQL Compound Operators

Operator	Description
+=	Add equals
-=	Subtract equals

*=	Multiply equals
/=	Divide equals
%=	Modulo equals
&=	Bitwise AND equals
^-=	Bitwise exclusive equals
|*=	Bitwise OR equals

SQL Logical Operators

Operator	**Description**
ALL	TRUE if all of a set of comparisons are TRUE
AND	TRUE if both expressions are TRUE
ANY	TRUE if any one of a set of comparisons are TRUE

BETWEEN	TRUE if the operand is within the range of comparisons
EXISTS	TRUE if a subquery contains any rows
IN	TRUE if the operand is equal to one of a list of expressions
LIKE	TRUE if the operand matches a pattern
NOT	Reverses the value of any other operator
OR	TRUE if either expression is TRUE
SOME	TRUE if some of a set of comparisons are TRUE

SQL General Data Types

A data type defines what kind of value a column can contain.

SQL General Data Types

Each column in a database table is required to have a name and a data type.

SQL developers have to decide what types of data will be stored inside each and every table column when creating a SQL table. The data type is a label and a guideline for SQL to understand what type of data is expected inside of each column, and it also identifies how SQL will interact with the stored data.

The following table lists the general data types in SQL:

Data type	Description
CHARACTER(n)	Character string. Fixed-length n
VARCHAR(n) or CHARACTER VARYING(n)	Character string. Variable length. Maximum length n
BINARY(n)	Binary string. Fixed-length n
BOOLEAN	Stores TRUE or FALSE values
VARBINARY(n) or BINARY VARYING(n)	Binary string. Variable length. Maximum length n
INTEGER(p)	Integer numerical (no decimal). Precision p
SMALLINT	Integer numerical (no decimal). Precision 5
INTEGER	Integer numerical (no decimal). Precision 10
BIGINT	Integer numerical (no decimal). Precision 19

DECIMAL(p,s)	Exact numerical, precision p, scale s. Example: decimal(5,2) is a number that has 3 digits before the decimal and 2 digits after the decimal
NUMERIC(p,s)	Exact numerical, precision p, scale s. (Same as DECIMAL)
FLOAT(p)	Approximate numerical, mantissa precision p. A floating number in base 10 exponential notation. The size argument for this type consists of a single number specifying the minimum precision
REAL	Approximate numerical, mantissa precision 7
FLOAT	Approximate numerical, mantissa precision 16
DOUBLE PRECISION	Approximate numerical, mantissa precision 16
DATE	Stores year, month, and day values
TIME	Stores hour, minute, and second values
TIMESTAMP	Stores year, month, day, hour, minute, and second values
INTERVAL	Composed of a number of integer fields, representing a period of time, depending on the type of interval

ARRAY	A set-length and ordered collection of elements
MULTISET	A variable-length and unordered collection of elements
XML	Stores XML data

SQL Data Type Quick Reference

However, different databases offer different choices for the data type definition.

The following table shows some of the common names of data types between the various database platforms:

Data type	Access	SQLServer	Oracle	MySQL	PostgreSQL
boolean	Yes/No	Bit	Byte	N/A	Boolean
integer	Number (integer)	Int	Number	Int Integer	Int Integer
float	Number (single)	Float Real	Number	Float	Numeric
currency	Currency	Money	N/A	N/A	Money

string (fixed)	N/A	Char	Char	Char	Char
string (variable)	Text (<256) Memo (65k+)	Varchar	Varchar Varchar2	Varchar	Varchar
binary object	OLE Object Memo	Binary (fixed up to 8K) Varbinary (<8K) Image (<2GB)	Long Raw	Blob Text	Binary Varbinary

Note: Data types might have different names in different database. And even if the name is the same, the size and other details may be different! **Always check the documentation!**

SQL Data Types for Various DBs

SQL Server Data Types

String types:

Data type	Description	Storage
char(n)	Fixed width character string. Maximum 8,000 characters	Defined width
varchar(n)	Variable width character string. Maximum 8,000 characters	2 bytes + number of chars

varchar(max)	Variable width character string. Maximum 1,073,741,824 characters	2 bytes + number of chars
text	Variable width character string. Maximum 2GB of text data	4 bytes + number of chars
nchar	Fixed width Unicode string. Maximum 4,000 characters	Defined width x 2
nvarchar	Variable width Unicode string. Maximum 4,000 characters	
nvarchar(max)	Variable width Unicode string. Maximum 536,870,912 characters	
ntext	Variable width Unicode string. Maximum 2GB of text data	
bit	Allows 0, 1, or NULL	
binary(n)	Fixed width binary string. Maximum 8,000 bytes	
varbinary	Variable width binary string. Maximum 8,000 bytes	
varbinary(max)	Variable width binary string. Maximum 2GB	
image	Variable width binary string. Maximum 2GB	

Number types:

Data type	Description	Storage
tinyint	Allows whole numbers from 0 to 255	1 byte
smallint	Allows whole numbers between -32,768 and 32,767	2 bytes
int	Allows whole numbers between -2,147,483,648 and 2,147,483,647	4 bytes
bigint	Allows whole numbers between -9,223,372,036,854,775,808 and 9,223,372,036,854,775,807	8 bytes
decimal(p,s)	Fixed precision and scale numbers. Allows numbers from -10^38 +1 to 10^38 –1. The p parameter indicates the maximum total number of digits that can be stored (both to the left and to the right of the decimal point). p must be a value from 1 to 38. Default is 18. The s parameter indicates the maximum number of digits stored to the right of the decimal point. s must be a value from 0 to p. Default value is 0	5-17 bytes
numeric(p,s)	Fixed precision and scale numbers. Allows numbers from -10^38 +1 to 10^38 –1. The p parameter indicates the maximum total number of digits that can be stored (both to the left and to the right of the decimal point). p must be a value from 1 to 38. Default is 18. The s parameter indicates the maximum number of digits stored to the right of the decimal point. s must be a value from 0 to p. Default value is 0	5-17 bytes
smallmoney	Monetary data from -214,748.3648 to 214,748.3647	4 bytes

money	Monetary data from -922,337,203,685,477.5808 to 922,337,203,685,477.5807	8 bytes
float(n)	Floating precision number data from -1.79E + 308 to 1.79E + 308. The n parameter indicates whether the field should hold 4 or 8 bytes. float(24) holds a 4-byte field and float(53) holds an 8-byte field. Default value of n is 53.	4 or 8 bytes
real	Floating precision number data from -3.40E + 38 to 3.40E + 38	4 bytes

Date types:

Data type	Description	Storage
datetime	From January 1, 1753 to December 31, 9999 with an accuracy of 3.33 milliseconds	8 bytes
datetime2	From January 1, 0001 to December 31, 9999 with an accuracy of 100 nanoseconds	6-8 bytes
smalldatetime	From January 1, 1900 to June 6, 2079 with an accuracy of 1 minute	4 bytes
date	Store a date only. From January 1, 0001 to December 31, 9999	3 bytes
time	Store a time only to an accuracy of 100 nanoseconds	3-5 bytes
datetimeoffset	The same as datetime2 with the addition of a time zone offset	8-10 bytes

timestamp	Stores a unique number that gets updated every time a row gets created or modified. The timestamp value is based upon an internal clock and does not correspond to real time. Each table may have only one timestamp variable

Other data types:

Data type	Description
sql_variant	Stores up to 8,000 bytes of data of various data types, except text, ntext, and timestamp
uniqueidentifier	Stores a globally unique identifier (GUID)
xml	Stores XML formatted data. Maximum 2GB
cursor	Stores a reference to a cursor used for database operations
table	Stores a result-set for later processing

SQL Statement	Syntax
AND / OR	SELECT column_name(s) FROM table_name WHERE condition AND|OR condition

ALTER TABLE	ALTER TABLE table_name ADD column_name datatype or ALTER TABLE table_name DROP COLUMN column_name
AS (alias)	SELECT column_name AS column_alias FROM table_name or SELECT column_name FROM table_name AS table_alias
BETWEEN	SELECT column_name(s) FROM table_name WHERE column_name BETWEEN value1 AND value2
CREATE DATABASE	CREATE DATABASE database_name
CREATE TABLE	CREATE TABLE table_name (column_name1 data_type, column_name2 data_type, column_name3 data_type, ...)
CREATE INDEX	CREATE INDEX index_name ON table_name (column_name) or CREATE UNIQUE INDEX index_name ON table_name (column_name)
CREATE VIEW	CREATE VIEW view_name AS SELECT column_name(s) FROM table_name WHERE condition
DELETE	DELETE FROM table_name WHERE some_column=some_value

	or DELETE FROM table_name (**Note:** Deletes the entire table!!) DELETE * FROM table_name (**Note:** Deletes the entire table!!)
DROP DATABASE	DROP DATABASE database_name
DROP INDEX	DROP INDEX table_name.index_name (SQL Server) DROP INDEX index_name ON table_name (MS Access) DROP INDEX index_name (DB2/Oracle) ALTER TABLE table_name DROP INDEX index_name (MySQL)
DROP TABLE	DROP TABLE table_name

EXISTS	IF EXISTS (SELECT * FROM table_name WHERE id = ?)
	BEGIN
	--do what needs to be done if exists
	END
	ELSE
	BEGIN
	--do what needs to be done if not
	END

GROUP BY	SELECT column_name, aggregate_function(column_name) FROM table_name WHERE column_name operator value GROUP BY column_name
HAVING	SELECT column_name, aggregate_function(column_name) FROM table_name WHERE column_name operator value GROUP BY column_name HAVING aggregate_function(column_name) operator value
IN	SELECT column_name(s) FROM table_name WHERE column_name IN (value1,value2,..)

INSERT INTO	INSERT INTO table_name VALUES (value1, value2, value3,....) *or* INSERT INTO table_name (column1, column2, column3,...) VALUES (value1, value2, value3,....)
INNER JOIN	SELECT column_name(s) FROM table_name1 INNER JOIN table_name2 ON table_name1.column_name=table_name2.column_name
LEFT JOIN	SELECT column_name(s) FROM table_name1 LEFT JOIN table_name2 ON table_name1.column_name=table_name2.column_name
RIGHT JOIN	SELECT column_name(s) FROM table_name1 RIGHT JOIN table_name2 ON table_name1.column_name=table_name2.column_name
FULL JOIN	SELECT column_name(s) FROM table_name1 FULL JOIN table_name2 ON table_name1.column_name=table_name2.column_name
LIKE	SELECT column_name(s) FROM table_name WHERE column_name LIKE pattern
ORDER BY	SELECT column_name(s) FROM table_name ORDER BY column_name [ASC|DESC]
SELECT	SELECT column_name(s) FROM table_name
SELECT *	SELECT * FROM table_name
SELECT DISTINCT	SELECT DISTINCT column_name(s) FROM table_name

SELECT INTO	SELECT * INTO new_table_name [IN externaldatabase] FROM old_table_name *or* SELECT column_name(s) INTO new_table_name [IN externaldatabase] FROM old_table_name
SELECT TOP	SELECT TOP number|percent column_name(s) FROM table_name
TRUNCATE TABLE	TRUNCATE TABLE table_name
UNION	SELECT column_name(s) FROM table_name1 UNION SELECT column_name(s) FROM table_name2
UNION ALL	SELECT column_name(s) FROM table_name1 UNION ALL SELECT column_name(s) FROM table_name2
UPDATE	UPDATE table_name SET column1=value, column2=value,... WHERE some_column=some_value
WHERE	SELECT column_name(s) FROM table_name WHERE column_name operator value