SQL Tutorial

SQL is a standard language for storing, manipulating and retrieving data in databases.

Our SQL tutorial will teach you how to use SQL in: MySQL, SQL Server, MS Access, Oracle, Sybase, Informix, Postgres, and other database systems.

Start learning SQL now »

Examples in Each Chapter

With our online SQL editor, you can edit the SQL statements, and click on a button to view the result.

Example

```
SELECT * FROM Customers;
```

Click on the "Try it Yourself" button to see how it works.

SQL Exercises

Exercise:

Insert the missing statement to get all the columns from the `Customers` table.

```
         * FROM Customers;
```

Submit Answer »

Start the Exercise

SQL Examples

Learn by examples! This tutorial supplements all explanations with clarifying examples.

See All SQL Examples

SQL Quiz Test

Test your SQL skills at W3Schools!

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SQL Data Types

Data types and ranges for Microsoft Access, MySQL and SQL Server.

SQL Data Types

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 became a standard of the American National Standards Institute (ANSI) in 1986, and of the International Organization for Standardization (ISO) in 1987

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/ISO 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 to style the page

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.

Look at the "Customers" table:

Example

```
SELECT * FROM Customers;
```

Try it Yourself »

Every table is broken up into smaller entities called fields. The fields in the Customers table consist of CustomerID, CustomerName, ContactName, Address, City, PostalCode and Country. A field is a column in a table that is designed to maintain specific information about every record in the table.

A record, also called a row, is each individual entry that exists in a table. For example, there are 91 records in the above Customers table. A record is a horizontal entity in a table.

A column is a vertical entity in a table that contains all information associated with a specific field in a table.

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 SQL SELECT Statement

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

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

SELECT Syntax

```
SELECT column1, column2, ...
FROM table_name;
```

Here, column1, column2, ... are the field names of the table you want to select data from. If you want to select all the fields available in the table, use the following syntax:

```
SELECT * FROM table_name;
```

Demo Database

Below is a selection from the "Customers" table in the Northwind sample database:

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

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 »

Exercise:

Insert the missing statement to get all the columns from the `Customers` table.

```
          * FROM Customers;
```

Submit Answer »

Start the Exercise

SQL SELECT DISTINCT Statement

The SQL SELECT DISTINCT Statement

The `SELECT DISTINCT` statement is used to return only distinct (different) values.

Inside a table, a column often contains many duplicate values; and sometimes you only want to list the different (distinct) values.

SELECT DISTINCT Syntax

```
SELECT DISTINCT column1, column2, ...
FROM table_name;
```

Demo Database

Below is a selection from the "Customers" table in the Northwind sample database:

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

SELECT Example Without DISTINCT

The following SQL statement selects all (including the duplicates) values from the "Country" column in the "Customers" table:

Example

```
SELECT Country FROM Customers;
```

Try it Yourself »

Now, let us use the `SELECT DISTINCT` statement and see the result.

SELECT DISTINCT Examples

The following SQL statement selects only the DISTINCT values from the "Country" column in the "Customers" table:

Example

```
SELECT DISTINCT Country FROM Customers;
```

Try it Yourself »

The following SQL statement lists the number of different (distinct) customer countries:

Example

```
SELECT COUNT(DISTINCT Country) FROM Customers;
```

Try it Yourself »

Note: The example above will not work in Firefox! Because COUNT(DISTINCT *column_name*) is not supported in Microsoft Access databases. Firefox is using Microsoft Access in our examples.

Here is the workaround for MS Access:

Example

```
SELECT Count(*) AS DistinctCountries
FROM (SELECT DISTINCT Country FROM Customers);
```

Try it Yourself »

Exercise:

Select all the different values from the `Country` column in the `Customers` table.

```
[      ] [      ] Country FROM Customers;
```

Submit Answer »

Start the Exercise

SQL WHERE Clause

The SQL WHERE Clause

The `WHERE` clause is used to filter records.

It is used to extract only those records that fulfill a specified condition.

WHERE Syntax

```
SELECT column1, column2, ...
FROM table_name
WHERE condition;
```

Note: The `WHERE` clause is not only used in `SELECT` statements, it is also used in `UPDATE`, `DELETE`, etc.!

Demo Database

Below is a selection from the "Customers" table in the Northwind sample database:

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

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	Example

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

Exercise:

Select all records where the `City` column has the value "Berlin".

```
SELECT * FROM Customers
[      ] [      ] = [      ];
```

Submit Answer »

Start the Exercise

SQL AND, OR and NOT Operators

The SQL AND, OR and NOT Operators

The `WHERE` clause can be combined with `AND`, `OR`, and `NOT` operators.

The `AND` and `OR` operators are used to filter records based on more than one condition:

- The `AND` operator displays a record if all the conditions separated by `AND` are TRUE.
- The `OR` operator displays a record if any of the conditions separated by `OR` is TRUE.

The `NOT` operator displays a record if the condition(s) is NOT TRUE.

AND Syntax

```
SELECT column1, column2, ...
FROM table_name
WHERE condition1 AND condition2 AND condition3 ...;
```

OR Syntax

```
SELECT column1, column2, ...
FROM table_name
WHERE condition1 OR condition2 OR condition3 ...;
```

NOT Syntax

```
SELECT column1, column2, ...
FROM table_name
WHERE NOT condition;
```

Demo Database

The table below shows the complete "Customers" table from the Northwind sample database:

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
6	Blauer See Delikatessen	Hanna Moos	Forsterstr. 57	Mannheim	68306	Germany
7	Blondel père et fils	Frédérique Citeaux	24, place Kléber	Strasbourg	67000	France
8	Bólido Comidas preparadas	Martín Sommer	C/ Araquil, 67	Madrid	28023	Spain

9	Bon app'	Laurence Lebihans	12, rue des Bouchers	Marseille	13008	France
10	Bottom-Dollar Marketse	Elizabeth Lincoln	23 Tsawassen Blvd.	Tsawassen	T2F 8M4	Canada
11	B's Beverages	Victoria Ashworth	Fauntleroy Circus	London	EC2 5NT	UK
12	Cactus Comidas para llevar	Patricio Simpson	Cerrito 333	Buenos Aires	1010	Argentina
13	Centro comercial Moctezuma	Francisco Chang	Sierras de Granada 9993	México D.F.	05022	Mexico
14	Chop-suey Chinese	Yang Wang	Hauptstr. 29	Bern	3012	Switzerland
15	Comércio Mineiro	Pedro Afonso	Av. dos Lusíadas, 23	São Paulo	05432-043	Brazil
16	Consolidated Holdings	Elizabeth Brown	Berkeley Gardens 12 Brewery	London	WX1 6LT	UK
17	Drachenblut Delikatessend	Sven Ottlieb	Walserweg 21	Aachen	52066	Germany

18	Du monde entier	Janine Labrune	67, rue des Cinquante Otages	Nantes	44000	France
19	Eastern Connection	Ann Devon	35 King George	London	WX3 6FW	UK
20	Ernst Handel	Roland Mendel	Kirchgasse 6	Graz	8010	Austria
21	Familia Arquibaldo	Aria Cruz	Rua Orós, 92	São Paulo	05442-030	Brazil
22	FISSA Fabrica Inter. Salchichas S.A.	Diego Roel	C/ Moralzarzal, 86	Madrid	28034	Spain
23	Folies gourmandes	Martine Rancé	184, chaussée de Tournai	Lille	59000	France
24	Folk och fä HB	Maria Larsson	Åkergatan 24	Bräcke	S-844 67	Sweden
25	Frankenversand	Peter Franken	Berliner Platz 43	München	80805	Germany
26	France restauration	Carine Schmitt	54, rue Royale	Nantes	44000	France

27	Franchi S.p.A.	Paolo Accorti	Via Monte Bianco 34	Torino	10100	Italy
28	Furia Bacalhau e Frutos do Mar	Lino Rodriguez	Jardim das rosas n. 32	Lisboa	1675	Portugal
29	Galería del gastrónomo	Eduardo Saavedra	Rambla de Cataluña, 23	Barcelona	08022	Spain
30	Godos Cocina Típica	José Pedro Freyre	C/ Romero, 33	Sevilla	41101	Spain
31	Gourmet Lanchonetes	André Fonseca	Av. Brasil, 442	Campinas	04876-786	Brazil
32	Great Lakes Food Market	Howard Snyder	2732 Baker Blvd.	Eugene	97403	USA
33	GROSELLA-Restaurante	Manuel Pereira	5ª Ave. Los Palos Grandes	Caracas	1081	Venezuela
34	Hanari Carnes	Mario Pontes	Rua do Paço, 67	Rio de Janeiro	05454-876	Brazil
35	HILARIÓN-Abastos	Carlos Hernández	Carrera 22 con Ave. Carlos Soublette #8-35	San Cristóbal	5022	Venezuela

36	Hungry Coyote Import Store	Yoshi Latimer	City Center Plaza 516 Main St.	Elgin	97827	USA
37	Hungry Owl All-Night Grocers	Patricia McKenna	8 Johnstown Road	Cork		Ireland
38	Island Trading	Helen Bennett	Garden House Crowther Way	Cowes	PO31 7PJ	UK
39	Königlich Essen	Philip Cramer	Maubelstr. 90	Brandenburg	14776	Germany
40	La corne d'abondance	Daniel Tonini	67, avenue de l'Europe	Versailles	78000	France
41	La maison d'Asie	Annette Roulet	1 rue Alsace-Lorraine	Toulouse	31000	France
42	Laughing Bacchus Wine Cellars	Yoshi Tannamuri	1900 Oak St.	Vancouver	V3F 2K1	Canada
43	Lazy K Kountry Store	John Steel	12 Orchestra Terrace	Walla Walla	99362	USA
44	Lehmanns Marktstand	Renate Messner	Magazinweg 7	Frankfurt a.M.	60528	Germany

45	Let's Stop N Shop	Jaime Yorres	87 Polk St. Suite 5	San Francisco	94117	USA
46	LILA-Supermercado	Carlos González	Carrera 52 con Ave. Bolívar #65-98 Llano Largo	Barquisimeto	3508	Venezuela
47	LINO-Delicateses	Felipe Izquierdo	Ave. 5 de Mayo Porlamar	I. de Margarita	4980	Venezuela
48	Lonesome Pine Restaurant	Fran Wilson	89 Chiaroscuro Rd.	Portland	97219	USA
49	Magazzini Alimentari Riuniti	Giovanni Rovelli	Via Ludovico il Moro 22	Bergamo	24100	Italy
50	Maison Dewey	Catherine Dewey	Rue Joseph-Bens 532	Bruxelles	B-1180	Belgium
51	Mère Paillarde	Jean Fresnière	43 rue St. Laurent	Montréal	H1J 1C3	Canada
52	Morgenstern Gesundkost	Alexander Feuer	Heerstr. 22	Leipzig	04179	Germany
53	North/South	Simon Crowther	South House 300 Queensbridge	London	SW7 1RZ	UK

54	Océano Atlántico Ltda.	Yvonne Moncada	Ing. Gustavo Moncada 8585 Piso 20-A	Buenos Aires	1010	Argentina
55	Old World Delicatessen	Rene Phillips	2743 Bering St.	Anchorage	99508	USA
56	Ottilies Käseladen	Henriette Pfalzheim	Mehrheimerstr. 369	Köln	50739	Germany
57	Paris spécialités	Marie Bertrand	265, boulevard Charonne	Paris	75012	France
58	Pericles Comidas clásicas	Guillermo Fernández	Calle Dr. Jorge Cash 321	México D.F.	05033	Mexico
59	Piccolo und mehr	Georg Pipps	Geislweg 14	Salzburg	5020	Austria
60	Princesa Isabel Vinhoss	Isabel de Castro	Estrada da saúde n. 58	Lisboa	1756	Portugal
61	Que Delícia	Bernardo Batista	Rua da Panificadora, 12	Rio de Janeiro	02389-673	Brazil
62	Queen Cozinha	Lúcia Carvalho	Alameda dos Canàrios, 891	São Paulo	05487-020	Brazil

63	QUICK-Stop	Horst Kloss	Taucherstraße 10	Cunewalde	01307	Germany
64	Rancho grande	Sergio Gutiérrez	Av. del Libertador 900	Buenos Aires	1010	Argentina
65	Rattlesnake Canyon Grocery	Paula Wilson	2817 Milton Dr.	Albuquerque	87110	USA
66	Reggiani Caseifici	Maurizio Moroni	Strada Provinciale 124	Reggio Emilia	42100	Italy
67	Ricardo Adocicados	Janete Limeira	Av. Copacabana, 267	Rio de Janeiro	02389-890	Brazil
68	Richter Supermarkt	Michael Holz	Grenzacherweg 237	Genève	1203	Switzerland
69	Romero y tomillo	Alejandra Camino	Gran Vía, 1	Madrid	28001	Spain
70	Santé Gourmet	Jonas Bergulfsen	Erling Skakkes gate 78	Stavern	4110	Norway
71	Save-a-lot Markets	Jose Pavarotti	187 Suffolk Ln.	Boise	83720	USA

72	Seven Seas Imports	Hari Kumar	90 Wadhurst Rd.	London	OX15 4NB	UK
73	Simons bistro	Jytte Petersen	Vinbæltet 34	København	1734	Denmark
74	Spécialités du monde	Dominique Perrier	25, rue Lauriston	Paris	75016	France
75	Split Rail Beer & Ale	Art Braunschweig er	P.O. Box 555	Lander	82520	USA
76	Suprêmes délices	Pascale Cartrain	Boulevard Tirou, 255	Charleroi	B-6000	Belgium
77	The Big Cheese	Liz Nixon	89 Jefferson Way Suite 2	Portland	97201	USA
78	The Cracker Box	Liu Wong	55 Grizzly Peak Rd.	Butte	59801	USA
79	Toms Spezialitäten	Karin Josephs	Luisenstr. 48	Münster	44087	Germany
80	Tortuga Restaurante	Miguel Angel Paolino	Avda. Azteca 123	México D.F.	05033	Mexico

81	Tradição Hipermercados	Anabela Domingues	Av. Inês de Castro, 414	São Paulo	05634-030	Brazil
82	Trail's Head Gourmet Provisioners	Helvetius Nagy	722 DaVinci Blvd.	Kirkland	98034	USA
83	Vaffeljernet	Palle Ibsen	Smagsløget 45	Århus	8200	Denmark
84	Victuailles en stock	Mary Saveley	2, rue du Commerce	Lyon	69004	France
85	Vins et alcools Chevalier	Paul Henriot	59 rue de l'Abbaye	Reims	51100	France
86	Die Wandernde Kuh	Rita Müller	Adenauerallee 900	Stuttgart	70563	Germany
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

AND Example

The following SQL statement selects all fields from "Customers" where country is "Germany" AND city is "Berlin":

Example

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

Try it Yourself »

OR Example

The following SQL statement selects all fields from "Customers" where city is "Berlin" OR "München":

Example

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

Try it Yourself »

The following SQL statement selects all fields from "Customers" where country is "Germany" OR "Spain":

Example

```
SELECT * FROM Customers
WHERE Country='Germany' OR Country='Spain';
```

Try it Yourself »

NOT Example

The following SQL statement selects all fields from "Customers" where country is NOT "Germany":

Example

```
SELECT * FROM Customers
WHERE NOT Country='Germany';
```

Try it Yourself »

Combining AND, OR and NOT

You can also combine the `AND`, `OR` and `NOT` operators.

The following SQL statement selects all fields from "Customers" where country is "Germany" AND city must be "Berlin" OR "München" (use parenthesis to form complex expressions):

Example

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

Try it Yourself »

The following SQL statement selects all fields from "Customers" where country is NOT "Germany" and NOT "USA":

Example

```
SELECT * FROM Customers
WHERE NOT Country='Germany' AND NOT Country='USA';
```

Try it Yourself »

Exercise:

Select all records where the `City` column has the value 'Berlin' and the `PostalCode` column has the value 12209.

```
           * FROM Customers
           City = 'Berlin'
                     = 12209;
```

Submit Answer »

Start the Exercise

SQL ORDER BY Keyword

The SQL ORDER BY Keyword

The `ORDER BY` keyword is used to sort the result-set in ascending or descending order.

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

ORDER BY Syntax

```
SELECT column1, column2, ...
FROM table_name
ORDER BY column1, column2, ... ASC|DESC;
```

Demo Database

Below is a selection from the "Customers" table in the Northwind sample database:

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

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. This means that it orders by Country, but if some rows have the same Country, it orders them by CustomerName:

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 »

Exercise:

Select all records from the `Customers` table, sort the result alphabetically by the column `City`.

```
SELECT * FROM Customers
[      ] [      ];
```

Submit Answer »

Start the Exercise

SQL INSERT INTO Statement

The SQL INSERT INTO Statement

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

INSERT INTO Syntax

It is possible to write the `INSERT INTO` statement in two ways:

1. Specify both the column names and the values to be inserted:

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

2. If you are adding values for all the columns of the table, you do not need to specify the column names in the SQL query. However, make sure the order of the values is in the same order as the columns in the table. Here, the `INSERT INTO` syntax would be as follows:

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

Demo Database

Below is a selection from the "Customers" table in the Northwind sample database:

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
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

The following SQL statement inserts a new record in the "Customers" table:

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
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 an auto-increment field and will be generated automatically when a new record is inserted into 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 record, but only insert data in the "CustomerName", "City", and "Country" columns (CustomerID will 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
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

Exercise:

Insert a new record in the `Customers` table.

```
[    ] Customers [    ]
CustomerName,
Address,
City,
PostalCode,
Country[    ]
[    ] [    ]
'Hekkan Burger',
'Gateveien 15',
'Sandnes',
'4306',
'Norway'      ;
```

Submit Answer »

Start the Exercise

SQL NULL Values

What is a NULL Value?

A field with a NULL value is a field with no value.

If a field in a table is optional, it is possible to insert a new record or update a record without adding a value to this field. Then, the field will be saved with a NULL value.

Note: A NULL value is different from a zero value or a field that contains spaces. A field with a NULL value is one that has been left blank during record creation!

How to 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.

IS NULL Syntax

```
SELECT column_names
FROM table_name
WHERE column_name IS NULL;
```

IS NOT NULL Syntax

```
SELECT column_names
FROM table_name
WHERE column_name IS NOT NULL;
```

Demo Database

Below is a selection from the "Customers" table in the Northwind sample database:

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 IS NULL Operator

The `IS NULL` operator is used to test for empty values (NULL values).

The following SQL lists all customers with a NULL value in the "Address" field:

Example

```
SELECT CustomerName, ContactName, Address
FROM Customers
WHERE Address IS NULL;
```

Try it Yourself »

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

The IS NOT NULL Operator

The `IS NOT NULL` operator is used to test for non-empty values (NOT NULL values).

The following SQL lists all customers with a value in the "Address" field:

Example

```
SELECT CustomerName, ContactName, Address
FROM Customers
WHERE Address IS NOT NULL;
```

Try it Yourself »

Exercise:

Select all records from the `Customers` where the `PostalCode` column is empty.

```
SELECT * FROM Customers
WHERE [      ] [      ] [      ];
```

Submit Answer »

Start the Exercise

SQL UPDATE Statement

The SQL UPDATE Statement

The `UPDATE` statement is used to modify the existing records in a table.

UPDATE Syntax

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

Note: Be careful when updating records in a table! Notice the `WHERE` clause in the `UPDATE` statement. The `WHERE` clause specifies which record(s) that should be updated. If you omit the `WHERE` clause, all records in the table will be updated!

Demo Database

Below is a selection from the "Customers" table in the Northwind sample database:

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

UPDATE Table

The following SQL statement updates the first customer (CustomerID = 1) with a new contact person *and* a new city.

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

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

UPDATE Multiple Records

It is the WHERE clause that determines how many records will be updated.

The following SQL statement will update the ContactName to "Juan" for all records where country is "Mexico":

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

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

Update Warning!

Be careful when updating records. If you 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

Exercise:

Update the `City` column of all records in the `Customers` table.

```
           Customers
           City = 'Oslo';
```

Submit Answer »

Start the Exercise

SQL DELETE Statement

The SQL DELETE Statement

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

DELETE Syntax

```
DELETE FROM table_name WHERE condition;
```

Note: Be careful when deleting records in a table! Notice the `WHERE` clause in the `DELETE` statement. The `WHERE` clause specifies which record(s) should be deleted. If you omit the `WHERE` clause, all records in the table will be deleted!

Demo Database

Below is a selection from the "Customers" table in the Northwind sample database:

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

SQL DELETE Example

The following SQL statement deletes the customer "Alfreds Futterkiste" from the "Customers" table:

Example

```
DELETE FROM Customers WHERE CustomerName='Alfreds Futterkiste';
```

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
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

Delete All Records

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;
```

The following SQL statement deletes all rows in the "Customers" table, without deleting the table:

Example

```
DELETE FROM Customers;
```

Try it Yourself »

Exercise:

Delete all the records from the `Customers` table where the `Country` value is 'Norway'.

```
          Customers
          Country = 'Norway';
```

Submit Answer »

Start the Exercise

SQL TOP, LIMIT, FETCH FIRST or ROWNUM Clause

The SQL SELECT TOP Clause

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

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

Note: Not all database systems support the `SELECT TOP` clause. MySQL supports the `LIMIT` clause to select a limited number of records, while Oracle uses `FETCH FIRST n ROWS ONLY` and `ROWNUM`.

SQL Server / MS Access Syntax:

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

MySQL Syntax:

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

Oracle 12 Syntax:

```
SELECT column_name(s)
FROM table_name
ORDER BY column_name(s)
FETCH FIRST number ROWS ONLY;
```

Older Oracle Syntax:

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

Older Oracle Syntax (with ORDER BY):

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

Demo Database

Below is a selection from the "Customers" table in the Northwind sample database:

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

SQL TOP, LIMIT and FETCH FIRST Examples

The following SQL statement selects the first three records from the "Customers" table (for SQL Server/MS Access):

Example

```
SELECT TOP 3 * FROM Customers;
```

Try it Yourself »

The following SQL statement shows the equivalent example for MySQL:

Example

```
SELECT * FROM Customers
LIMIT 3;
```

Try it Yourself »

The following SQL statement shows the equivalent example for Oracle:

Example

```
SELECT * FROM Customers
FETCH FIRST 3 ROWS ONLY;
```

SQL TOP PERCENT Example

The following SQL statement selects the first 50% of the records from the "Customers" table (for SQL Server/MS Access):

Example

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

Try it Yourself »

The following SQL statement shows the equivalent example for Oracle:

Example

```
SELECT * FROM Customers
FETCH FIRST 50 PERCENT ROWS ONLY;
```

ADD a WHERE CLAUSE

The following SQL statement selects the first three records from the "Customers" table, where the country is "Germany" (for SQL Server/MS Access):

Example

```
SELECT TOP 3 * FROM Customers
WHERE Country='Germany';
```

Try it Yourself »

The following SQL statement shows the equivalent example for MySQL:

Example

```
SELECT * FROM Customers
WHERE Country='Germany'
LIMIT 3;
```

Try it Yourself »

The following SQL statement shows the equivalent example for Oracle:

Example

```
SELECT * FROM Customers
WHERE Country='Germany'
FETCH FIRST 3 ROWS ONLY;
```

SQL MIN() and MAX() Functions

The SQL MIN() and MAX() Functions

The `MIN()` function returns the smallest value of the selected column.

The `MAX()` function returns the largest value of the selected column.

MIN() Syntax

```
SELECT MIN(column_name)
FROM table_name
WHERE condition;
```

MAX() Syntax

```
SELECT MAX(column_name)
FROM table_name
WHERE condition;
```

Demo Database

Below is a selection from the "Products" table in the Northwind sample database:

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	2	2	48 - 6 oz jars	22

5	Chef Anton's Gumbo Mix	2	2	36 boxes	21.35

MIN() Example

The following SQL statement finds the price of the cheapest product:

Example

```
SELECT MIN(Price) AS SmallestPrice
FROM Products;
```

Try it Yourself »

MAX() Example

The following SQL statement finds the price of the most expensive product:

Example

```
SELECT MAX(Price) AS LargestPrice
FROM Products;
```

Try it Yourself »

Exercise:

Use the `MIN` function to select the record with the smallest value of the `Price` column.

```
SELECT 
FROM Products;
```

Submit Answer »

Start the Exercise

SQL COUNT(), AVG() and SUM() Functions

The SQL COUNT(), AVG() and SUM() Functions

The `COUNT()` function returns the number of rows that matches a specified criterion.

COUNT() Syntax

```
SELECT COUNT(column_name)
FROM table_name
WHERE condition;
```

The `AVG()` function returns the average value of a numeric column.

AVG() Syntax

```
SELECT AVG(column_name)
FROM table_name
WHERE condition;
```

The `SUM()` function returns the total sum of a numeric column.

SUM() Syntax

```
SELECT SUM(column_name)
FROM table_name
WHERE condition;
```

Demo Database

Below is a selection from the "Products" table in the Northwind sample database:

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	2	2	48 - 6 oz jars	22
5	Chef Anton's Gumbo Mix	2	2	36 boxes	21.35

COUNT() Example

The following SQL statement finds the number of products:

Example

```
SELECT COUNT(ProductID)
FROM Products;
```

Try it Yourself »

Note: NULL values are not counted.

AVG() Example

The following SQL statement finds the average price of all products:

Example

```
SELECT AVG(Price)
FROM Products;
```

Try it Yourself »

Note: NULL values are ignored.

Demo Database

Below is a selection from the "OrderDetails" table in the Northwind sample database:

OrderDetailID	OrderID	ProductID	Quantity
1	10248	11	12
2	10248	42	10
3	10248	72	5
4	10249	14	9
5	10249	51	40

SUM() Example

The following SQL statement finds the sum of the "Quantity" fields in the "OrderDetails" table:

Example

```
SELECT SUM(Quantity)
FROM OrderDetails;
```

Try it Yourself »

Note: NULL values are ignored.

Exercise:

Use the correct function to return the number of records that have the `Price` value set to 18.

```
SELECT        (*)
FROM Products
          Price = 18;
```

Submit Answer »

Start the Exercise

SQL LIKE Operator

The SQL LIKE Operator

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

There are two wildcards often used in conjunction with the LIKE operator:

- The percent sign (%) represents zero, one, or multiple characters
- The underscore sign (_) represents one, single character

Note: MS Access uses an asterisk (*) instead of the percent sign (%), and a question mark (?) instead of the underscore (_).

The percent sign and the underscore can also be used in combinations!

LIKE Syntax

```
SELECT column1, column2, ...
FROM table_name
WHERE columnN LIKE pattern;
```

Tip: You can also combine any number of conditions using AND or OR operators.

Here are some examples showing different LIKE operators with '%' and '_' wildcards:

LIKE Operator	Description
WHERE CustomerName LIKE 'a%'	Finds any values that start with "a"
WHERE CustomerName LIKE '%a'	Finds any values that end with "a"
WHERE CustomerName LIKE '%or%'	Finds any values that have "or" in any position

WHERE CustomerName LIKE '_r%'	Finds any values that have "r" in the second position
WHERE CustomerName LIKE 'a_%'	Finds any values that start with "a" and are at least 2 characters in length
WHERE CustomerName LIKE 'a__%'	Finds any values that start with "a" and are at least 3 characters in length
WHERE ContactName LIKE 'a%o'	Finds any values that start with "a" and ends with "o"

Demo Database

The table below shows the complete "Customers" table from the Northwind sample database:

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
6	Blauer See Delikatessen	Hanna Moos	Forsterstr. 57	Mannheim	68306	Germany
7	Blondel père et fils	Frédérique Citeaux	24, place Kléber	Strasbourg	67000	France
8	Bólido Comidas preparadas	Martín Sommer	C/ Araquil, 67	Madrid	28023	Spain
9	Bon app'	Laurence Lebihans	12, rue des Bouchers	Marseille	13008	France
10	Bottom-Dollar Marketse	Elizabeth Lincoln	23 Tsawassen Blvd.	Tsawassen	T2F 8M4	Canada
11	B's Beverages	Victoria Ashworth	Fauntleroy Circus	London	EC2 5NT	UK

12	Cactus Comidas para llevar	Patricio Simpson	Cerrito 333	Buenos Aires	1010	Argentina
13	Centro comercial Moctezuma	Francisco Chang	Sierras de Granada 9993	México D.F.	05022	Mexico
14	Chop-suey Chinese	Yang Wang	Hauptstr. 29	Bern	3012	Switzerland
15	Comércio Mineiro	Pedro Afonso	Av. dos Lusíadas, 23	São Paulo	05432-043	Brazil
16	Consolidated Holdings	Elizabeth Brown	Berkeley Gardens 12 Brewery	London	WX1 6LT	UK
17	Drachenblut Delikatessend	Sven Ottlieb	Walserweg 21	Aachen	52066	Germany
18	Du monde entier	Janine Labrune	67, rue des Cinquante Otages	Nantes	44000	France
19	Eastern Connection	Ann Devon	35 King George	London	WX3 6FW	UK
20	Ernst Handel	Roland Mendel	Kirchgasse 6	Graz	8010	Austria

21	Familia Arquibaldo	Aria Cruz	Rua Orós, 92	São Paulo	05442-030	Brazil
22	FISSA Fabrica Inter. Salchichas S.A.	Diego Roel	C/ Moralzarzal, 86	Madrid	28034	Spain
23	Folies gourmandes	Martine Rancé	184, chaussée de Tournai	Lille	59000	France
24	Folk och fä HB	Maria Larsson	Åkergatan 24	Bräcke	S-844 67	Sweden
25	Frankenversand	Peter Franken	Berliner Platz 43	München	80805	Germany
26	France restauration	Carine Schmitt	54, rue Royale	Nantes	44000	France
27	Franchi S.p.A.	Paolo Accorti	Via Monte Bianco 34	Torino	10100	Italy
28	Furia Bacalhau e Frutos do Mar	Lino Rodriguez	Jardim das rosas n. 32	Lisboa	1675	Portugal
29	Galería del gastrónomo	Eduardo Saavedra	Rambla de Cataluña, 23	Barcelona	08022	Spain

30	Godos Cocina Típica	José Pedro Freyre	C/ Romero, 33	Sevilla	41101	Spain
31	Gourmet Lanchonetes	André Fonseca	Av. Brasil, 442	Campinas	04876-786	Brazil
32	Great Lakes Food Market	Howard Snyder	2732 Baker Blvd.	Eugene	97403	USA
33	GROSELLA-Restaurante	Manuel Pereira	5ª Ave. Los Palos Grandes	Caracas	1081	Venezuela
34	Hanari Carnes	Mario Pontes	Rua do Paço, 67	Rio de Janeiro	05454-876	Brazil
35	HILARIÓN-Abastos	Carlos Hernández	Carrera 22 con Ave. Carlos Soublette #8-35	San Cristóbal	5022	Venezuela
36	Hungry Coyote Import Store	Yoshi Latimer	City Center Plaza 516 Main St.	Elgin	97827	USA
37	Hungry Owl All-Night Grocers	Patricia McKenna	8 Johnstown Road	Cork		Ireland
38	Island Trading	Helen Bennett	Garden House Crowther Way	Cowes	PO31 7PJ	UK

39	Königlich Essen	Philip Cramer	Maubelstr. 90	Brandenburg	14776	Germany
40	La corne d'abondance	Daniel Tonini	67, avenue de l'Europe	Versailles	78000	France
41	La maison d'Asie	Annette Roulet	1 rue Alsace-Lorraine	Toulouse	31000	France
42	Laughing Bacchus Wine Cellars	Yoshi Tannamuri	1900 Oak St.	Vancouver	V3F 2K1	Canada
43	Lazy K Kountry Store	John Steel	12 Orchestra Terrace	Walla Walla	99362	USA
44	Lehmanns Marktstand	Renate Messner	Magazinweg 7	Frankfurt a.M.	60528	Germany
45	Let's Stop N Shop	Jaime Yorres	87 Polk St. Suite 5	San Francisco	94117	USA
46	LILA-Supermercado	Carlos González	Carrera 52 con Ave. Bolívar #65-98 Llano Largo	Barquisimeto	3508	Venezuela
47	LINO-Delicateses	Felipe Izquierdo	Ave. 5 de Mayo Porlamar	I. de Margarita	4980	Venezuela

48	Lonesome Pine Restaurant	Fran Wilson	89 Chiaroscuro Rd.	Portland	97219	USA
49	Magazzini Alimentari Riuniti	Giovanni Rovelli	Via Ludovico il Moro 22	Bergamo	24100	Italy
50	Maison Dewey	Catherine Dewey	Rue Joseph-Bens 532	Bruxelles	B-1180	Belgium
51	Mère Paillarde	Jean Fresnière	43 rue St. Laurent	Montréal	H1J 1C3	Canada
52	Morgenstern Gesundkost	Alexander Feuer	Heerstr. 22	Leipzig	04179	Germany
53	North/South	Simon Crowther	South House 300 Queensbridge	London	SW7 1RZ	UK
54	Océano Atlántico Ltda.	Yvonne Moncada	Ing. Gustavo Moncada 8585 Piso 20-A	Buenos Aires	1010	Argentina
55	Old World Delicatessen	Rene Phillips	2743 Bering St.	Anchorage	99508	USA
56	Ottilies Käseladen	Henriette Pfalzheim	Mehrheimerstr. 369	Köln	50739	Germany

57	Paris spécialités	Marie Bertrand	265, boulevard Charonne	Paris	75012	France
58	Pericles Comidas clásicas	Guillermo Fernández	Calle Dr. Jorge Cash 321	México D.F.	05033	Mexico
59	Piccolo und mehr	Georg Pipps	Geislweg 14	Salzburg	5020	Austria
60	Princesa Isabel Vinhoss	Isabel de Castro	Estrada da saúde n. 58	Lisboa	1756	Portugal
61	Que Delícia	Bernardo Batista	Rua da Panificadora, 12	Rio de Janeiro	02389-673	Brazil
62	Queen Cozinha	Lúcia Carvalho	Alameda dos Canàrios, 891	São Paulo	05487-020	Brazil
63	QUICK-Stop	Horst Kloss	Taucherstraße 10	Cunewalde	01307	Germany
64	Rancho grande	Sergio Gutiérrez	Av. del Libertador 900	Buenos Aires	1010	Argentina
65	Rattlesnake Canyon Grocery	Paula Wilson	2817 Milton Dr.	Albuquerque	87110	USA

66	Reggiani Caseifici	Maurizio Moroni	Strada Provinciale 124	Reggio Emilia	42100	Italy
67	Ricardo Adocicados	Janete Limeira	Av. Copacabana, 267	Rio de Janeiro	02389-890	Brazil
68	Richter Supermarkt	Michael Holz	Grenzacherweg 237	Genève	1203	Switzerland
69	Romero y tomillo	Alejandra Camino	Gran Vía, 1	Madrid	28001	Spain
70	Santé Gourmet	Jonas Bergulfsen	Erling Skakkes gate 78	Stavern	4110	Norway
71	Save-a-lot Markets	Jose Pavarotti	187 Suffolk Ln.	Boise	83720	USA
72	Seven Seas Imports	Hari Kumar	90 Wadhurst Rd.	London	OX15 4NB	UK
73	Simons bistro	Jytte Petersen	Vinbæltet 34	København	1734	Denmark
74	Spécialités du monde	Dominique Perrier	25, rue Lauriston	Paris	75016	France

75	Split Rail Beer & Ale	Art Braunschweiger	P.O. Box 555	Lander	82520	USA
76	Suprêmes délices	Pascale Cartrain	Boulevard Tirou, 255	Charleroi	B-6000	Belgium
77	The Big Cheese	Liz Nixon	89 Jefferson Way Suite 2	Portland	97201	USA
78	The Cracker Box	Liu Wong	55 Grizzly Peak Rd.	Butte	59801	USA
79	Toms Spezialitäten	Karin Josephs	Luisenstr. 48	Münster	44087	Germany
80	Tortuga Restaurante	Miguel Angel Paolino	Avda. Azteca 123	México D.F.	05033	Mexico
81	Tradição Hipermercados	Anabela Domingues	Av. Inês de Castro, 414	São Paulo	05634-030	Brazil
82	Trail's Head Gourmet Provisioners	Helvetius Nagy	722 DaVinci Blvd.	Kirkland	98034	USA
83	Vaffeljernet	Palle Ibsen	Smagsløget 45	Århus	8200	Denmark

84	Victuailles en stock	Mary Saveley	2, rue du Commerce	Lyon	69004	France
85	Vins et alcools Chevalier	Paul Henriot	59 rue de l'Abbaye	Reims	51100	France
86	Die Wandernde Kuh	Rita Müller	Adenauerallee 900	Stuttgart	70563	Germany
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

SQL LIKE Examples

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

Example

```
SELECT * FROM Customers
WHERE CustomerName LIKE 'a%';
```

Try it Yourself »

The following SQL statement selects all customers with a CustomerName ending with "a":

Example

```
SELECT * FROM Customers
WHERE CustomerName LIKE '%a';
```

Try it Yourself »

The following SQL statement selects all customers with a CustomerName that have "or" in any position:

Example

```
SELECT * FROM Customers
WHERE CustomerName LIKE '%or%';
```

Try it Yourself »

The following SQL statement selects all customers with a CustomerName that have "r" in the second position:

Example

```
SELECT * FROM Customers
WHERE CustomerName LIKE '_r%';
```

Try it Yourself »

The following SQL statement selects all customers with a CustomerName that starts with "a" and are at least 3 characters in length:

Example

```
SELECT * FROM Customers
WHERE CustomerName LIKE 'a__%';
```

Try it Yourself »

The following SQL statement selects all customers with a ContactName that starts with "a" and ends with "o":

Example

```sql
SELECT * FROM Customers
WHERE ContactName LIKE 'a%o';
```

Try it Yourself »

The following SQL statement selects all customers with a CustomerName that does NOT start with "a":

Example

```sql
SELECT * FROM Customers
WHERE CustomerName NOT LIKE 'a%';
```

Try it Yourself »

Exercise:

Select all records where the value of the `City` column starts with the letter "a".

```
SELECT * FROM Customers
          ;
```

Submit Answer »

Start the Exercise

SQL Wildcards

SQL Wildcard Characters

A wildcard character is used to substitute one or more characters in a string.

Wildcard characters are used with the `LIKE` operator. The `LIKE` operator is used in a `WHERE` clause to search for a specified pattern in a column.

Wildcard Characters in MS Access

Symbol	Description	Example
*	Represents zero or more characters	bl* finds bl, black, blue, and blob
?	Represents a single character	h?t finds hot, hat, and hit
[]	Represents any single character within the brackets	h[oa]t finds hot and hat, but not hit
!	Represents any character not in the brackets	h[!oa]t finds hit, but not hot and hat
-	Represents any single character within the specified range	c[a-b]t finds cat and cbt
#	Represents any single numeric character	2#5 finds 205, 215, 225, 235, 245, 255, 265, 275, 285, and 295

Wildcard Characters in SQL Server

Symbol	Description	Example
%	Represents zero or more characters	bl% finds bl, black, blue, and blob
_	Represents a single character	h_t finds hot, hat, and hit
[]	Represents any single character within the brackets	h[oa]t finds hot and hat, but not hit
^	Represents any character not in the brackets	h[^oa]t finds hit, but not hot and hat
-	Represents any single character within the specified range	c[a-b]t finds cat and cbt

All the wildcards can also be used in combinations!

Here are some examples showing different `LIKE` operators with '%' and '_' wildcards:

LIKE Operator	Description
WHERE CustomerName LIKE 'a%'	Finds any values that starts with "a"

WHERE CustomerName LIKE '%a'	Finds any values that ends with "a"
WHERE CustomerName LIKE '%or%'	Finds any values that have "or" in any position
WHERE CustomerName LIKE '_r%'	Finds any values that have "r" in the second position
WHERE CustomerName LIKE 'a__%'	Finds any values that starts with "a" and are at least 3 characters in length
WHERE ContactName LIKE 'a%o'	Finds any values that starts with "a" and ends with "o"

Demo Database

The table below shows the complete "Customers" table from the Northwind sample database:

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
6	Blauer See Delikatessen	Hanna Moos	Forsterstr. 57	Mannheim	68306	Germany
7	Blondel père et fils	Frédérique Citeaux	24, place Kléber	Strasbourg	67000	France
8	Bólido Comidas preparadas	Martín Sommer	C/ Araquil, 67	Madrid	28023	Spain
9	Bon app'	Laurence Lebihans	12, rue des Bouchers	Marseille	13008	France
10	Bottom-Dollar Marketse	Elizabeth Lincoln	23 Tsawassen Blvd.	Tsawassen	T2F 8M4	Canada

11	B's Beverages	Victoria Ashworth	Fauntleroy Circus	London	EC2 5NT	UK
12	Cactus Comidas para llevar	Patricio Simpson	Cerrito 333	Buenos Aires	1010	Argentina
13	Centro comercial Moctezuma	Francisco Chang	Sierras de Granada 9993	México D.F.	05022	Mexico
14	Chop-suey Chinese	Yang Wang	Hauptstr. 29	Bern	3012	Switzerland
15	Comércio Mineiro	Pedro Afonso	Av. dos Lusíadas, 23	São Paulo	05432-043	Brazil
16	Consolidated Holdings	Elizabeth Brown	Berkeley Gardens 12 Brewery	London	WX1 6LT	UK
17	Drachenblut Delikatessend	Sven Ottlieb	Walserweg 21	Aachen	52066	Germany
18	Du monde entier	Janine Labrune	67, rue des Cinquante Otages	Nantes	44000	France
19	Eastern Connection	Ann Devon	35 King George	London	WX3 6FW	UK

20	Ernst Handel	Roland Mendel	Kirchgasse 6	Graz	8010	Austria
21	Familia Arquibaldo	Aria Cruz	Rua Orós, 92	São Paulo	05442-030	Brazil
22	FISSA Fabrica Inter. Salchichas S.A.	Diego Roel	C/ Moralzarzal, 86	Madrid	28034	Spain
23	Folies gourmandes	Martine Rancé	184, chaussée de Tournai	Lille	59000	France
24	Folk och fä HB	Maria Larsson	Åkergatan 24	Bräcke	S-844 67	Sweden
25	Frankenversand	Peter Franken	Berliner Platz 43	München	80805	Germany
26	France restauration	Carine Schmitt	54, rue Royale	Nantes	44000	France
27	Franchi S.p.A.	Paolo Accorti	Via Monte Bianco 34	Torino	10100	Italy
28	Furia Bacalhau e Frutos do Mar	Lino Rodriguez	Jardim das rosas n. 32	Lisboa	1675	Portugal

29	Galería del gastrónomo	Eduardo Saavedra	Rambla de Cataluña, 23	Barcelona	08022	Spain
30	Godos Cocina Típica	José Pedro Freyre	C/ Romero, 33	Sevilla	41101	Spain
31	Gourmet Lanchonetes	André Fonseca	Av. Brasil, 442	Campinas	04876-786	Brazil
32	Great Lakes Food Market	Howard Snyder	2732 Baker Blvd.	Eugene	97403	USA
33	GROSELLA-Restaurante	Manuel Pereira	5ª Ave. Los Palos Grandes	Caracas	1081	Venezuela
34	Hanari Carnes	Mario Pontes	Rua do Paço, 67	Rio de Janeiro	05454-876	Brazil
35	HILARIÓN-Abastos	Carlos Hernández	Carrera 22 con Ave. Carlos Soublette #8-35	San Cristóbal	5022	Venezuela
36	Hungry Coyote Import Store	Yoshi Latimer	City Center Plaza 516 Main St.	Elgin	97827	USA
37	Hungry Owl All-Night Grocers	Patricia McKenna	8 Johnstown Road	Cork		Ireland

38	Island Trading	Helen Bennett	Garden House Crowther Way	Cowes	PO31 7PJ	UK
39	Königlich Essen	Philip Cramer	Maubelstr. 90	Brandenburg	14776	Germany
40	La corne d'abondance	Daniel Tonini	67, avenue de l'Europe	Versailles	78000	France
41	La maison d'Asie	Annette Roulet	1 rue Alsace-Lorraine	Toulouse	31000	France
42	Laughing Bacchus Wine Cellars	Yoshi Tannamuri	1900 Oak St.	Vancouver	V3F 2K1	Canada
43	Lazy K Kountry Store	John Steel	12 Orchestra Terrace	Walla Walla	99362	USA
44	Lehmanns Marktstand	Renate Messner	Magazinweg 7	Frankfurt a.M.	60528	Germany
45	Let's Stop N Shop	Jaime Yorres	87 Polk St. Suite 5	San Francisco	94117	USA
46	LILA-Supermercado	Carlos González	Carrera 52 con Ave. Bolívar #65-98 Llano Largo	Barquisimeto	3508	Venezuela

47	LINO-Delicateses	Felipe Izquierdo	Ave. 5 de Mayo Porlamar	I. de Margarita	4980	Venezuela
48	Lonesome Pine Restaurant	Fran Wilson	89 Chiaroscuro Rd.	Portland	97219	USA
49	Magazzini Alimentari Riuniti	Giovanni Rovelli	Via Ludovico il Moro 22	Bergamo	24100	Italy
50	Maison Dewey	Catherine Dewey	Rue Joseph-Bens 532	Bruxelles	B-1180	Belgium
51	Mère Paillarde	Jean Fresnière	43 rue St. Laurent	Montréal	H1J 1C3	Canada
52	Morgenstern Gesundkost	Alexander Feuer	Heerstr. 22	Leipzig	04179	Germany
53	North/South	Simon Crowther	South House 300 Queensbridge	London	SW7 1RZ	UK
54	Océano Atlántico Ltda.	Yvonne Moncada	Ing. Gustavo Moncada 8585 Piso 20-A	Buenos Aires	1010	Argentina
55	Old World Delicatessen	Rene Phillips	2743 Bering St.	Anchorage	99508	USA

56	Ottilies Käseladen	Henriette Pfalzheim	Mehrheimerstr. 369	Köln	50739	Germany
57	Paris spécialités	Marie Bertrand	265, boulevard Charonne	Paris	75012	France
58	Pericles Comidas clásicas	Guillermo Fernández	Calle Dr. Jorge Cash 321	México D.F.	05033	Mexico
59	Piccolo und mehr	Georg Pipps	Geislweg 14	Salzburg	5020	Austria
60	Princesa Isabel Vinhoss	Isabel de Castro	Estrada da saúde n. 58	Lisboa	1756	Portugal
61	Que Delícia	Bernardo Batista	Rua da Panificadora, 12	Rio de Janeiro	02389-673	Brazil
62	Queen Cozinha	Lúcia Carvalho	Alameda dos Canàrios, 891	São Paulo	05487-020	Brazil
63	QUICK-Stop	Horst Kloss	Taucherstraße 10	Cunewalde	01307	Germany
64	Rancho grande	Sergio Gutiérrez	Av. del Libertador 900	Buenos Aires	1010	Argentina

65	Rattlesnake Canyon Grocery	Paula Wilson	2817 Milton Dr.	Albuquerque	87110	USA
66	Reggiani Caseifici	Maurizio Moroni	Strada Provinciale 124	Reggio Emilia	42100	Italy
67	Ricardo Adocicados	Janete Limeira	Av. Copacabana, 267	Rio de Janeiro	02389-890	Brazil
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91	Wolski	Zbyszek	ul. Filtrowa 68	Walla	01-012	Poland

Using the % 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 _ Wildcard

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

Example

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

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 [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 »

Using the [!charlist] Wildcard

The two following SQL statements select 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 »

Exercise:

Select all records where the second letter of the `City` is an "a".

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

Submit Answer »

Start the Exercise

SQL IN Operator

The SQL IN Operator

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

The IN operator is a shorthand for multiple OR conditions.

IN Syntax

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

or:

```
SELECT column_name(s)
FROM table_name
WHERE column_name IN (SELECT STATEMENT);
```

Demo Database

The table below shows the complete "Customers" table from the Northwind sample database:

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6	Blauer See Delikatessen	Hanna Moos	Forsterstr. 57	Mannheim	68306	Germany
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28	Furia Bacalhau e Frutos do Mar	Lino Rodriguez	Jardim das rosas n. 32	Lisboa	1675	Portugal
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42	Laughing Bacchus Wine Cellars	Yoshi Tannamuri	1900 Oak St.	Vancouver	V3F 2K1	Canada
43	Lazy K Kountry Store	John Steel	12 Orchestra Terrace	Walla Walla	99362	USA
44	Lehmanns Marktstand	Renate Messner	Magazinweg 7	Frankfurt a.M.	60528	Germany
45	Let's Stop N Shop	Jaime Yorres	87 Polk St. Suite 5	San Francisco	94117	USA
46	LILA-Supermercado	Carlos González	Carrera 52 con Ave. Bolívar #65-98 Llano Largo	Barquisimet o	3508	Venezuela
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52	Morgenstern Gesundkost	Alexander Feuer	Heerstr. 22	Leipzig	04179	Germany
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55	Old World Delicatessen	Rene Phillips	2743 Bering St.	Anchorage	99508	USA
56	Ottilies Käseladen	Henriette Pfalzheim	Mehrheimerstr. 369	Köln	50739	Germany

57	Paris spécialités	Marie Bertrand	265, boulevard Charonne	Paris	75012	France
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59	Piccolo und mehr	Georg Pipps	Geislweg 14	Salzburg	5020	Austria
60	Princesa Isabel Vinhoss	Isabel de Castro	Estrada da saúde n. 58	Lisboa	1756	Portugal
61	Que Delícia	Bernardo Batista	Rua da Panificadora, 12	Rio de Janeiro	02389-673	Brazil
62	Queen Cozinha	Lúcia Carvalho	Alameda dos Canàrios, 891	São Paulo	05487-020	Brazil
63	QUICK-Stop	Horst Kloss	Taucherstraße 10	Cunewalde	01307	Germany
64	Rancho grande	Sergio Gutiérrez	Av. del Libertador 900	Buenos Aires	1010	Argentina
65	Rattlesnake Canyon Grocery	Paula Wilson	2817 Milton Dr.	Albuquerque	87110	USA

66	Reggiani Caseifici	Maurizio Moroni	Strada Provinciale 124	Reggio Emilia	42100	Italy
67	Ricardo Adocicados	Janete Limeira	Av. Copacabana, 267	Rio de Janeiro	02389-890	Brazil
68	Richter Supermarkt	Michael Holz	Grenzacherweg 237	Genève	1203	Switzerland
69	Romero y tomillo	Alejandra Camino	Gran Vía, 1	Madrid	28001	Spain
70	Santé Gourmet	Jonas Bergulfsen	Erling Skakkes gate 78	Stavern	4110	Norway
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75	Split Rail Beer & Ale	Art Braunschweiger	P.O. Box 555	Lander	82520	USA
76	Suprêmes délices	Pascale Cartrain	Boulevard Tirou, 255	Charleroi	B-6000	Belgium
77	The Big Cheese	Liz Nixon	89 Jefferson Way Suite 2	Portland	97201	USA
78	The Cracker Box	Liu Wong	55 Grizzly Peak Rd.	Butte	59801	USA
79	Toms Spezialitäten	Karin Josephs	Luisenstr. 48	Münster	44087	Germany
80	Tortuga Restaurante	Miguel Angel Paolino	Avda. Azteca 123	México D.F.	05033	Mexico
81	Tradição Hipermercados	Anabela Domingues	Av. Inês de Castro, 414	São Paulo	05634-030	Brazil
82	Trail's Head Gourmet Provisioners	Helvetius Nagy	722 DaVinci Blvd.	Kirkland	98034	USA
83	Vaffeljernet	Palle Ibsen	Smagsløget 45	Århus	8200	Denmark

84	Victuailles en stock	Mary Saveley	2, rue du Commerce	Lyon	69004	France
85	Vins et alcools Chevalier	Paul Henriot	59 rue de l'Abbaye	Reims	51100	France
86	Die Wandernde Kuh	Rita Müller	Adenauerallee 900	Stuttgart	70563	Germany
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

IN Operator Examples

The following SQL statement selects all customers that are located in "Germany", "France" or "UK":

Example

```
SELECT * FROM Customers
WHERE Country IN ('Germany', 'France', 'UK');
```

Try it Yourself »

The following SQL statement selects all customers that are NOT located in "Germany", "France" or "UK":

Example

```
SELECT * FROM Customers
WHERE Country NOT IN ('Germany', 'France', 'UK');
```

Try it Yourself »

The following SQL statement selects all customers that are from the same countries as the suppliers:

Example

```
SELECT * FROM Customers
WHERE Country IN (SELECT Country FROM Suppliers);
```

Try it Yourself »

Exercise:

Use the `IN` operator to select all the records where `Country` is either "Norway" or "France".

```
SELECT * FROM Customers
[      ] [      ]  'France'[      ];
```

Submit Answer »

Start the Exercise

SQL BETWEEN Operator

The SQL BETWEEN Operator

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

The `BETWEEN` operator is inclusive: begin and end values are included.

BETWEEN Syntax

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

Demo Database

Below is a selection from the "Products" table in the Northwind sample database:

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 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 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 with IN Example

The following SQL statement selects all products with a price between 10 and 20. In addition; do not show products with a CategoryID of 1,2, or 3:

Example

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

Try it Yourself »

BETWEEN Text Values Example

The following SQL statement selects all products with a ProductName between Carnarvon Tigers and Mozzarella di Giovanni:

Example

```
SELECT * FROM Products
WHERE ProductName BETWEEN 'Carnarvon Tigers' AND 'Mozzarella di Giovanni'
ORDER BY ProductName;
```

Try it Yourself »

The following SQL statement selects all products with a ProductName between Carnarvon Tigers and Chef Anton's Cajun Seasoning:

Example

```
SELECT * FROM Products
WHERE ProductName BETWEEN "Carnarvon Tigers" AND "Chef Anton's Cajun
Seasoning"
ORDER BY ProductName;
```

Try it Yourself »

NOT BETWEEN Text Values Example

The following SQL statement selects all products with a ProductName not between Carnarvon Tigers and Mozzarella di Giovanni:

Example

```
SELECT * FROM Products
WHERE ProductName NOT BETWEEN 'Carnarvon Tigers' AND 'Mozzarella di
Giovanni'
ORDER BY ProductName;
```

Try it Yourself »

Sample Table

Below is a selection from the "Orders" table in the Northwind sample database:

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 Dates Example

The following SQL statement selects all orders with an OrderDate between '01-July-1996' and '31-July-1996':

Example

```
SELECT * FROM Orders
WHERE OrderDate BETWEEN #07/01/1996# AND #07/31/1996#;
```

Try it Yourself »

OR:

Example

```
SELECT * FROM Orders
WHERE OrderDate BETWEEN '1996-07-01' AND '1996-07-31';
```

Try it Yourself »

Exercise:

Use the `BETWEEN` operator to select all the records where the value of the `Price` column is between 10 and 20.

```
SELECT * FROM Products
WHERE Price          ;
```

Submit Answer »

Start the Exercise

SQL Aliases

SQL Aliases

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

Aliases are often used to make column names more readable.

An alias only exists for the duration of that query.

An alias is created with the `AS` keyword.

Alias Column Syntax

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

Alias Table Syntax

```
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 for Columns Examples

The following SQL statement creates two aliases, one for the CustomerID column and one for the CustomerName column:

Example

```
SELECT CustomerID AS ID, CustomerName AS Customer
FROM Customers;
```

Try it Yourself »

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

Example

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

Try it Yourself »

The following SQL statement creates an alias named "Address" that combine four columns (Address, PostalCode, City and Country):

Example

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

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

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

Alias for Tables Example

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 use 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 following SQL statement is the same as above, but 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

Exercise:

When displaying the `Customers` table, make an ALIAS of the `PostalCode` column, the column should be called `Pno` instead.

```
SELECT CustomerName,
Address,
PostalCode 
FROM Customers;
```

Submit Answer »

Start the Exercise

SQL Joins

SQL JOIN

A `JOIN` clause is used to combine rows from two or more tables, based on a related column between them.

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, 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, we can create the following SQL statement (that contains an `INNER JOIN`), that selects records that have matching values in both tables:

Example

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

Try it Yourself »

and it will produce something like this:

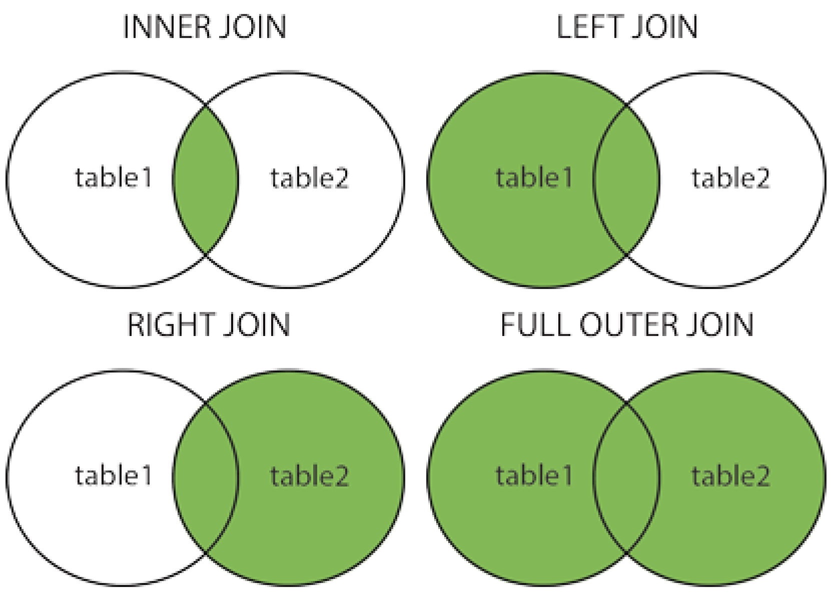
OrderID	CustomerName	OrderDate
10308	Ana Trujillo Emparedados y helados	9/18/1996
10365	Antonio Moreno Taquería	11/27/1996
10383	Around the Horn	12/16/1996
10355	Around the Horn	11/15/1996
10278	Berglunds snabbköp	8/12/1996

Different Types of SQL JOINs

Here are the different types of the JOINs in SQL:

- `(INNER) JOIN`: Returns records that have matching values in both tables
- `LEFT (OUTER) JOIN`: Returns all records from the left table, and the matched records from the right table

- RIGHT (OUTER) JOIN: Returns all records from the right table, and the matched records from the left table
- FULL (OUTER) JOIN: Returns all records when there is a match in either left or right table



Exercise:

Insert the missing parts in the JOIN clause to join the two tables Orders and Customers, using the CustomerID field in both tables as the relationship between the two tables.

```
SELECT *
FROM Orders
LEFT JOIN Customers
[    ] = [    ] ;
```

Submit Answer »

Start the Exercise

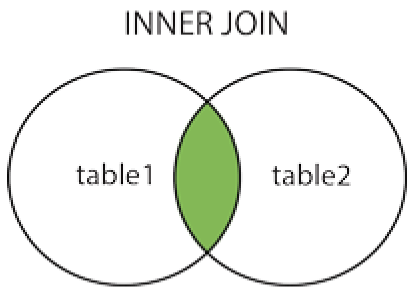
SQL INNER JOIN Keyword

SQL INNER JOIN Keyword

The `INNER JOIN` keyword selects records that have matching values in both tables.

INNER JOIN Syntax

```
SELECT column_name(s)
FROM table1
INNER 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 "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 "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

SQL INNER JOIN Example

The following SQL statement selects all orders with customer information:

Example

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

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 records in the "Orders" table that do not have matches in "Customers", these orders will not be shown!

JOIN Three Tables

The following SQL statement selects all orders with customer and shipper information:

Example

```
SELECT Orders.OrderID, Customers.CustomerName, Shippers.ShipperName
FROM ((Orders
INNER JOIN Customers ON Orders.CustomerID = Customers.CustomerID)
INNER JOIN Shippers ON Orders.ShipperID = Shippers.ShipperID);
```

Try it Yourself »

Exercise:

Choose the correct `JOIN` clause to select all records from the two tables where there is a match in both tables.

```
SELECT *
FROM Orders

ON Orders.CustomerID=Customers.CustomerID;
```

Submit Answer »

Start the Exercise

SQL LEFT JOIN Keyword

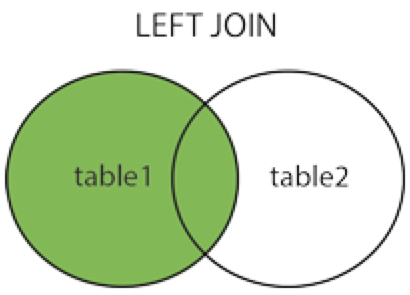
SQL LEFT JOIN Keyword

The `LEFT JOIN` keyword returns all records from the left table (table1), and the matching records from the right table (table2). The result is 0 records from the right side, if there is no match.

LEFT JOIN Syntax

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

Note: 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 select 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 records from the left table (Customers), even if there are no matches in the right table (Orders).

SQL RIGHT JOIN Keyword

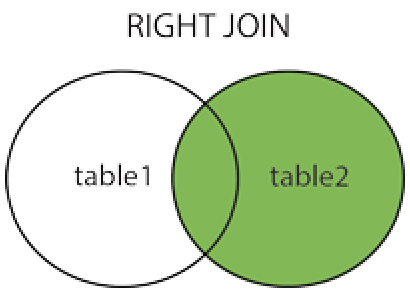
SQL RIGHT JOIN Keyword

The `RIGHT JOIN` keyword returns all records from the right table (table2), and the matching records from the left table (table1). The result is 0 records from the left side, if there is no match.

RIGHT JOIN Syntax

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

Note: 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
1	Davolio	Nancy	12/8/1968	EmpID1.pic
2	Fuller	Andrew	2/19/1952	EmpID2.pic
3	Leverling	Janet	8/30/1963	EmpID3.pic

SQL RIGHT JOIN Example

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

Example

```
SELECT Orders.OrderID, Employees.LastName, 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 records from the right table (Employees), even if there are no matches in the left table (Orders).

Exercise:

Choose the correct `JOIN` clause to select all the records from the `Customers` table plus all the matches in the `Orders` table.

```
SELECT *
FROM Orders

ON Orders.CustomerID=Customers.CustomerID;
```

Submit Answer »

Start the Exercise

SQL FULL OUTER JOIN Keyword

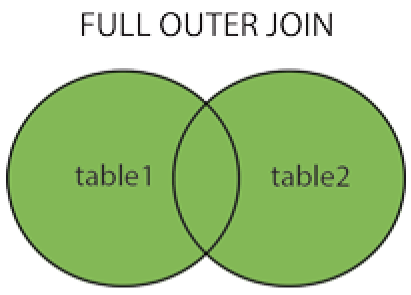
SQL FULL OUTER JOIN Keyword

The `FULL OUTER JOIN` keyword returns all records when there is a match in left (table1) or right (table2) table records.

Tip: `FULL OUTER JOIN` and `FULL JOIN` are the same.

FULL OUTER JOIN Syntax

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



Note: `FULL OUTER JOIN` can potentially return very large result-sets!

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

Null	10309
Null	10310
Alfreds Futterkiste	*Null*
Ana Trujillo Emparedados y helados	10308
Antonio Moreno Taquería	*Null*

Note: The `FULL OUTER JOIN` keyword returns all matching records from both tables whether the other table matches or not. So, 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 Self Join

SQL Self Join

A self join is a regular join, but the table is joined with itself.

Self Join Syntax

```
SELECT column_name(s)
FROM table1 T1, table1 T2
WHERE condition;
```

T1 and *T2* are different table aliases for the same table.

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

SQL Self Join Example

The following SQL statement matches customers that are from the same city:

Example

```
SELECT A.CustomerName AS CustomerName1,
B.CustomerName AS CustomerName2, A.City
FROM Customers A, Customers B
WHERE A.CustomerID <> B.CustomerID
AND A.City = B.City
ORDER BY A.City;
```

Try it Yourself »

SQL UNION Operator

The SQL UNION Operator

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

- Every SELECT statement within UNION must have the same number of columns
- The columns must also have similar data types
- The columns in every SELECT statement must also be in the same order

UNION Syntax

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

UNION ALL Syntax

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

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

Note: The column names in the result-set are usually equal to the column names in the first SELECT statement.

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 returns the cities (only distinct values) from both the "Customers" and the "Suppliers" table:

Example

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

Try it Yourself »

Note: If some customers or suppliers have the same city, each city will only be listed once, because `UNION` selects only distinct values. Use `UNION ALL` to also select duplicate values!

SQL UNION ALL Example

The following SQL statement returns the cities (duplicate values also) from both the "Customers" and the "Suppliers" table:

Example

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

Try it Yourself »

SQL UNION With WHERE

The following SQL statement returns the German cities (only distinct values) from both the "Customers" and the "Suppliers" table:

Example

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

Try it Yourself »

SQL UNION ALL With WHERE

The following SQL statement returns the German cities (duplicate values also) from both the "Customers" and the "Suppliers" table:

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 »

Another UNION Example

The following SQL statement lists all customers and suppliers:

Example

```
SELECT 'Customer' AS Type, ContactName, City, Country
FROM Customers
UNION
SELECT 'Supplier', ContactName, City, Country
FROM Suppliers;
```

Try it Yourself »

Notice the "AS Type" above - it is an alias. SQL Aliases are used to give a table or a column a temporary name. An alias only exists for the duration of the query. So, here we have created a temporary column named "Type", that list whether the contact person is a "Customer" or a "Supplier".

SQL GROUP BY Statement

The SQL GROUP BY Statement

The `GROUP BY` statement groups rows that have the same values into summary rows, like "find the number of customers in each country".

The `GROUP BY` statement is often used with aggregate functions (`COUNT()`, `MAX()`, `MIN()`, `SUM()`, `AVG()`) to group the result-set by one or more columns.

GROUP BY Syntax

```
SELECT column_name(s)
FROM table_name
WHERE condition
GROUP BY column_name(s)
ORDER BY column_name(s);
```

Demo Database

Below is a selection from the "Customers" table in the Northwind sample database:

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

SQL GROUP BY Examples

The following SQL statement lists the number of customers in each country:

Example

```
SELECT COUNT(CustomerID), Country
FROM Customers
GROUP BY Country;
```

Try it Yourself »

The following SQL statement lists the number of customers in each country, sorted high to low:

Example

```
SELECT COUNT(CustomerID), Country
FROM Customers
GROUP BY Country
ORDER BY COUNT(CustomerID) DESC;
```

Try it Yourself »

Demo Database

Below is a selection from the "Orders" table in the Northwind sample database:

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

GROUP BY With JOIN Example

The following SQL statement lists the number of orders sent by each shipper:

Example

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

Try it Yourself »

Exercise:

List the number of customers in each country.

```
SELECT       (CustomerID),
Country
FROM Customers
         ;
```

Submit Answer »

Start the Exercise

SQL HAVING Clause

The SQL HAVING Clause

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

HAVING Syntax

```
SELECT column_name(s)
FROM table_name
WHERE condition
GROUP BY column_name(s)
HAVING condition
ORDER BY column_name(s);
```

Demo Database

Below is a selection from the "Customers" table in the Northwind sample database:

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

SQL HAVING Examples

The following SQL statement lists the number of customers in each country. Only include countries with more than 5 customers:

Example

```
SELECT COUNT(CustomerID), Country
FROM Customers
GROUP BY Country
HAVING COUNT(CustomerID) > 5;
```

Try it Yourself »

The following SQL statement lists the number of customers in each country, sorted high to low (Only include countries with more than 5 customers):

Example

```
SELECT COUNT(CustomerID), Country
FROM Customers
GROUP BY Country
HAVING COUNT(CustomerID) > 5
ORDER BY COUNT(CustomerID) DESC;
```

Try it Yourself »

Demo Database

Below is a selection from the "Orders" table in the Northwind sample database:

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....

More HAVING Examples

The following SQL statement lists the employees that have registered more than 10 orders:

Example

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

Try it Yourself »

The following SQL statement lists if the employees "Davolio" or "Fuller" have registered more than 25 orders:

Example

```
SELECT Employees.LastName, COUNT(Orders.OrderID) AS NumberOfOrders
FROM Orders
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 EXISTS Operator

The SQL EXISTS Operator

The `EXISTS` operator is used to test for the existence of any record in a subquery.

The `EXISTS` operator returns TRUE if the subquery returns one or more records.

EXISTS Syntax

```
SELECT column_name(s)
FROM table_name
WHERE EXISTS
(SELECT column_name FROM table_name WHERE condition);
```

Demo Database

Below is a selection from the "Products" table in the Northwind sample database:

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	2	2	48 - 6 oz jars	22
5	Chef Anton's Gumbo Mix	2	2	36 boxes	21.35

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
4	Tokyo Traders	Yoshi Nagase	9-8 Sekimai Musashino-shi	Tokyo	100	Japan

SQL EXISTS Examples

The following SQL statement returns TRUE and lists the suppliers with a product price less than 20:

Example

```
SELECT SupplierName
FROM Suppliers
WHERE EXISTS (SELECT ProductName FROM Products WHERE Products.SupplierID =
Suppliers.supplierID AND Price < 20);
```

Try it Yourself »

The following SQL statement returns TRUE and lists the suppliers with a product price equal to 22:

Example

```
SELECT SupplierName
FROM Suppliers
```

```
WHERE EXISTS (SELECT ProductName FROM Products WHERE Products.SupplierID =
Suppliers.supplierID AND Price = 22);
```

Try it Yourself »

SQL ANY and ALL Operators

The SQL ANY and ALL Operators

The ANY and ALL operators allow you to perform a comparison between a single column value and a range of other values.

The SQL ANY Operator

The ANY operator:

- returns a boolean value as a result
- returns TRUE if ANY of the subquery values meet the condition

ANY means that the condition will be true if the operation is true for any of the values in the range.

ANY Syntax

```
SELECT column_name(s)
FROM table_name
WHERE column_name operator ANY
  (SELECT column_name
  FROM table_name
  WHERE condition);
```

Note: The *operator* must be a standard comparison operator (=, <>, !=, >, >=, <, or <=).

The SQL ALL Operator

The ALL operator:

- returns a boolean value as a result
- returns TRUE if ALL of the subquery values meet the condition
- is used with SELECT, WHERE and HAVING statements

ALL means that the condition will be true only if the operation is true for all values in the range.

ALL Syntax With SELECT

```
SELECT ALL column_name(s)
FROM table_name
WHERE condition;
```

ALL Syntax With WHERE or HAVING

```
SELECT column_name(s)
FROM table_name
WHERE column_name operator ALL
  (SELECT column_name
  FROM table_name
  WHERE condition);
```

Note: The *operator* must be a standard comparison operator (=, <>, !=, >, >=, <, or <=).

Demo Database

Below is a selection from the **"Products"** table in the Northwind sample database:

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	2	2	48 - 6 oz jars	22
5	Chef Anton's Gumbo Mix	2	2	36 boxes	21.35

6	Grandma's Boysenberry Spread	3	2	12 - 8 oz jars	25
7	Uncle Bob's Organic Dried Pears	3	7	12 - 1 lb pkgs.	30
8	Northwoods Cranberry Sauce	3	2	12 - 12 oz jars	40
9	Mishi Kobe Niku	4	6	18 - 500 g pkgs.	97

And a selection from the **"OrderDetails"** table:

OrderDetailID	OrderID	ProductID	Quantity
1	10248	11	12
2	10248	42	10
3	10248	72	5
4	10249	14	9
5	10249	51	40
6	10250	41	10

7	10250	51	35
8	10250	65	15
9	10251	22	6
10	10251	57	15

SQL ANY Examples

The following SQL statement lists the ProductName if it finds ANY records in the OrderDetails table has Quantity equal to 10 (this will return TRUE because the Quantity column has some values of 10):

Example

```
SELECT ProductName
FROM Products
WHERE ProductID = ANY
  (SELECT ProductID
  FROM OrderDetails
  WHERE Quantity = 10);
```

Try it Yourself »

The following SQL statement lists the ProductName if it finds ANY records in the OrderDetails table has Quantity larger than 99 (this will return TRUE because the Quantity column has some values larger than 99):

Example

```
SELECT ProductName
FROM Products
WHERE ProductID = ANY
  (SELECT ProductID
  FROM OrderDetails
  WHERE Quantity > 99);
```

Try it Yourself »

The following SQL statement lists the ProductName if it finds ANY records in the OrderDetails table has Quantity larger than 1000 (this will return FALSE because the Quantity column has no values larger than 1000):

Example

```
SELECT ProductName
FROM Products
WHERE ProductID = ANY
  (SELECT ProductID
  FROM OrderDetails
  WHERE Quantity > 1000);
```

Try it Yourself »

SQL ALL Examples

The following SQL statement lists ALL the product names:

Example

```
SELECT ALL ProductName
FROM Products
WHERE TRUE;
```

Try it Yourself »

The following SQL statement lists the ProductName if ALL the records in the OrderDetails table has Quantity equal to 10. This will of course return FALSE because the Quantity column has many different values (not only the value of 10):

Example

```
SELECT ProductName
FROM Products
WHERE ProductID = ALL
  (SELECT ProductID
  FROM OrderDetails
  WHERE Quantity = 10);
```

Try it Yourself »

SQL SELECT INTO Statement

The SQL SELECT INTO Statement

The `SELECT INTO` statement copies data from one table into a new table.

SELECT INTO Syntax

Copy all columns into a new table:

```
SELECT *
INTO newtable [IN externaldb]
FROM oldtable
WHERE condition;
```

Copy only some columns into a new table:

```
SELECT column1, column2, column3, ...
INTO newtable [IN externaldb]
FROM oldtable
WHERE condition;
```

The new table will be created with the column-names and types as defined in the old table. You can create new column names using the `AS` clause.

SQL SELECT INTO Examples

The following SQL statement creates a backup copy of Customers:

```
SELECT * INTO CustomersBackup2017
FROM Customers;
```

The following SQL statement uses the `IN` clause to copy the table into a new table in another database:

```
SELECT * INTO CustomersBackup2017 IN 'Backup.mdb'
FROM Customers;
```

The following SQL statement copies only a few columns into a new table:

```
SELECT CustomerName, ContactName INTO CustomersBackup2017
FROM Customers;
```

The following SQL statement copies only the German customers into a new table:

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

The following SQL statement copies data from more than one table into a new table:

```
SELECT Customers.CustomerName, Orders.OrderID
INTO CustomersOrderBackup2017
FROM Customers
LEFT JOIN Orders ON Customers.CustomerID = Orders.CustomerID;
```

Tip: `SELECT INTO` 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 oldtable
WHERE 1 = 0;
```

SQL INSERT INTO SELECT Statement

The SQL INSERT INTO SELECT Statement

The `INSERT INTO SELECT` statement copies data from one table and inserts it into another table.

The `INSERT INTO SELECT` statement requires that the data types in source and target tables match.

Note: The existing records in the target table are unaffected.

INSERT INTO SELECT Syntax

Copy all columns from one table to another table:

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

Copy only some columns from one table into another table:

```
INSERT INTO table2 (column1, column2, column3, ...)
SELECT column1, column2, column3, ...
FROM table1
WHERE condition;
```

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
1	Exotic Liquid	Charlotte Cooper	49 Gilbert St.	Londona	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 INSERT INTO SELECT Examples

The following SQL statement copies "Suppliers" into "Customers" (the columns that are not filled with data, will contain NULL):

Example

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

Try it Yourself »

The following SQL statement copies "Suppliers" into "Customers" (fill all columns):

Example

```
INSERT INTO Customers (CustomerName, ContactName, Address, City,
PostalCode, Country)
SELECT SupplierName, ContactName, Address, City,
PostalCode, Country FROM Suppliers;
```

Try it Yourself »

The following SQL statement copies only the German suppliers into "Customers":

Example

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

Try it Yourself »

SQL CASE Expression

The SQL CASE Expression

The `CASE` expression goes through conditions and returns a value when the first condition is met (like an if-then-else statement). So, once a condition is true, it will stop reading and return the result. If no conditions are true, it returns the value in the `ELSE` clause.

If there is no `ELSE` part and no conditions are true, it returns NULL.

CASE Syntax

```
CASE
    WHEN condition1 THEN result1
    WHEN condition2 THEN result2
    WHEN conditionN THEN resultN
    ELSE result
END;
```

Demo Database

Below is a selection from the "OrderDetails" table in the Northwind sample database:

OrderDetailID	OrderID	ProductID	Quantity
1	10248	11	12
2	10248	42	10
3	10248	72	5
4	10249	14	9

5	10249	51	40

SQL CASE Examples

The following SQL goes through conditions and returns a value when the first condition is met:

Example

```
SELECT OrderID, Quantity,
CASE
    WHEN Quantity > 30 THEN 'The quantity is greater than 30'
    WHEN Quantity = 30 THEN 'The quantity is 30'
    ELSE 'The quantity is under 30'
END AS QuantityText
FROM OrderDetails;
```

Try it Yourself »

The following SQL will order the customers by City. However, if City is NULL, then order by Country:

Example

```
SELECT CustomerName, City, Country
FROM Customers
ORDER BY
(CASE
    WHEN City IS NULL THEN Country
    ELSE City
END);
```

Try it Yourself »

SQL NULL Functions

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

Look at 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 will be NULL.

Solutions

MySQL

The MySQL IFNULL() function lets you return an alternative value if an expression is NULL:

```
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 Server

The SQL Server ISNULL() function lets you return an alternative value when an expression is NULL:

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

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

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

MS Access

The MS Access IsNull() function returns TRUE (-1) if the expression is a null value, otherwise FALSE (0):

```
SELECT ProductName, UnitPrice * (UnitsInStock +
IIF(IsNull(UnitsOnOrder), 0, UnitsOnOrder))
FROM Products;
```

Oracle

The Oracle NVL() function achieves the same result:

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

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

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

SQL Stored Procedures for SQL Server

What is a Stored Procedure?

A stored procedure is a prepared SQL code that you can save, so the code can be reused over and over again.

So if you have an SQL query that you write over and over again, save it as a stored procedure, and then just call it to execute it.

You can also pass parameters to a stored procedure, so that the stored procedure can act based on the parameter value(s) that is passed.

Stored Procedure Syntax

```
CREATE PROCEDURE procedure_name
AS
sql_statement
GO;
```

Execute a Stored Procedure

```
EXEC procedure_name;
```

Demo Database

Below is a selection from the "Customers" table in the Northwind sample database:

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

Stored Procedure Example

The following SQL statement creates a stored procedure named "SelectAllCustomers" that selects all records from the "Customers" table:

Example

```
CREATE PROCEDURE SelectAllCustomers
AS
SELECT * FROM Customers
GO;
```

Execute the stored procedure above as follows:

Example

```
EXEC SelectAllCustomers;
```

Stored Procedure With One Parameter

The following SQL statement creates a stored procedure that selects Customers from a particular City from the "Customers" table:

Example

```
CREATE PROCEDURE SelectAllCustomers @City nvarchar(30)
AS
SELECT * FROM Customers WHERE City = @City
GO;
```

Execute the stored procedure above as follows:

Example

```
EXEC SelectAllCustomers @City = 'London';
```

Stored Procedure With Multiple Parameters

Setting up multiple parameters is very easy. Just list each parameter and the data type separated by a comma as shown below.

The following SQL statement creates a stored procedure that selects Customers from a particular City with a particular PostalCode from the "Customers" table:

Example

```
CREATE PROCEDURE SelectAllCustomers @City nvarchar(30), @PostalCode
nvarchar(10)
AS
SELECT * FROM Customers WHERE City = @City AND PostalCode = @PostalCode
GO;
```

Execute the stored procedure above as follows:

Example

```
EXEC SelectAllCustomers @City = 'London', @PostalCode = 'WA1 1DP';
```

SQL Comments

SQL Comments

Comments are used to explain sections of SQL statements, or to prevent execution of SQL statements.

Note: The examples in this chapter will not work in Firefox and Microsoft Edge!

Comments are not supported in Microsoft Access databases. Firefox and Microsoft Edge are using Microsoft Access database in our examples.

Single Line Comments

Single line comments start with `--`.

Any text between -- and the end of the line will be ignored (will not be executed).

The following example uses a single-line comment as an explanation:

Example

```
--Select all:
SELECT * FROM Customers;
```

Try it Yourself »

The following example uses a single-line comment to ignore the end of a line:

Example

```
SELECT * FROM Customers -- WHERE City='Berlin';
```

Try it Yourself »

The following example uses a single-line comment to ignore a statement:

Example

```
--SELECT * FROM Customers;
SELECT * FROM Products;
```

Try it Yourself »

Multi-line Comments

Multi-line comments start with `/*` and end with `*/`.

Any text between /* and */ will be ignored.

The following example uses a multi-line comment as an explanation:

Example

```
/*Select all the columns
of all the records
in the Customers table:*/
SELECT * FROM Customers;
```

Try it Yourself »

The following example uses a multi-line comment to ignore many statements:

Example

```
/*SELECT * FROM Customers;
SELECT * FROM Products;
SELECT * FROM Orders;
SELECT * FROM Categories;*/
SELECT * FROM Suppliers;
```

Try it Yourself »

To ignore just a part of a statement, also use the /* */ comment.
The following example uses a comment to ignore part of a line:

Example

```
SELECT CustomerName, /*City,*/ Country FROM Customers;
```

Try it Yourself »

The following example uses a comment to ignore part of a statement:

Example

```
SELECT * FROM Customers WHERE (CustomerName LIKE 'L%'
OR CustomerName LIKE 'R%' /*OR CustomerName LIKE 'S%'
OR CustomerName LIKE 'T%'*/ OR CustomerName LIKE 'W%')
AND Country='USA'
ORDER BY CustomerName;
```

Try it Yourself »

SQL Operators

SQL Arithmetic Operators

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

SQL Bitwise Operators

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

SQL Comparison Operators

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

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**	**Example**
ALL	TRUE if all of the subquery values meet the condition	Try it
AND	TRUE if all the conditions separated by AND is TRUE	Try it
ANY	TRUE if any of the subquery values meet the condition	Try it

BETWEEN	TRUE if the operand is within the range of comparisons	Try it
EXISTS	TRUE if the subquery returns one or more records	Try it
IN	TRUE if the operand is equal to one of a list of expressions	Try it
LIKE	TRUE if the operand matches a pattern	Try it
NOT	Displays a record if the condition(s) is NOT TRUE	Try it
OR	TRUE if any of the conditions separated by OR is TRUE	Try it
SOME	TRUE if any of the subquery values meet the condition	Try it

SQL CREATE DATABASE Statement

The SQL CREATE DATABASE Statement

The `CREATE DATABASE` statement is used to create a new SQL database.

Syntax

```
CREATE DATABASE databasename;
```

CREATE DATABASE Example

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

Example

```
CREATE DATABASE testDB;
```

Tip: Make sure you have admin privilege before creating any database. Once a database is created, you can check it in the list of databases with the following SQL command: `SHOW DATABASES`;

Exercise:

Write the correct SQL statement to create a new database called `testDB`.

```
[          ];
```

Submit Answer »

Start the Exercise

SQL DROP DATABASE Statement

The SQL DROP DATABASE Statement

The `DROP DATABASE` statement is used to drop an existing SQL database.

Syntax

```
DROP DATABASE databasename;
```

Note: Be careful before dropping a database. Deleting a database will result in loss of complete information stored in the database!

DROP DATABASE Example

The following SQL statement drops the existing database "testDB":

Example

```
DROP DATABASE testDB;
```

Tip: Make sure you have admin privilege before dropping any database. Once a database is dropped, you can check it in the list of databases with the following SQL command: `SHOW DATABASES;`

Exercise:

Write the correct SQL statement to delete a database named `testDB`.

```
[          ];
```

Submit Answer »

Start the Exercise

SQL BACKUP DATABASE for SQL Server

The SQL BACKUP DATABASE Statement

The `BACKUP DATABASE` statement is used in SQL Server to create a full back up of an existing SQL database.

Syntax

```
BACKUP DATABASE databasename
TO DISK = 'filepath';
```

The SQL BACKUP WITH DIFFERENTIAL Statement

A differential back up only backs up the parts of the database that have changed since the last full database backup.

Syntax

```
BACKUP DATABASE databasename
TO DISK = 'filepath'
WITH DIFFERENTIAL;
```

BACKUP DATABASE Example

The following SQL statement creates a full back up of the existing database "testDB" to the D disk:

Example

```
BACKUP DATABASE testDB
TO DISK = 'D:\backups\testDB.bak';
```

Tip: Always back up the database to a different drive than the actual database. Then, if you get a disk crash, you will not lose your backup file along with the database.

BACKUP WITH DIFFERENTIAL Example

The following SQL statement creates a differential back up of the database "testDB":

Example

```
BACKUP DATABASE testDB
TO DISK = 'D:\backups\testDB.bak'
WITH DIFFERENTIAL;
```

Tip: A differential back up reduces the back up time (since only the changes are backed up).

SQL CREATE TABLE Statement

The SQL CREATE TABLE Statement

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

Syntax

```
CREATE TABLE table_name (
    column1 datatype,
    column2 datatype,
    column3 datatype,
   ....
);
```

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

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

Tip: For an overview of the available data types, go to our complete Data Types Reference.

SQL CREATE TABLE Example

The following example creates a table called "Persons" that contains five columns: PersonID, LastName, FirstName, Address, and City:

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 "Persons" table can now be filled with data with the SQL INSERT INTO statement.

Create Table Using Another Table

A copy of an existing table can also be created using `CREATE TABLE`.

The new table gets the same column definitions. All columns or specific columns can be selected.

If you create a new table using an existing table, the new table will be filled with the existing values from the old table.

Syntax

```
CREATE TABLE new_table_name AS
    SELECT column1, column2,...
    FROM existing_table_name
    WHERE ....;
```

The following SQL creates a new table called "TestTables" (which is a copy of the "Customers" table):

Example

```
CREATE TABLE TestTable AS
SELECT customername, contactname
FROM customers;
```

Try it Yourself »

Exercise:

Write the correct SQL statement to create a new table called `Persons`.

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

Submit Answer »

Start the Exercise

SQL DROP TABLE Statement

The SQL DROP TABLE Statement

The `DROP TABLE` statement is used to drop an existing table in a database.

Syntax

```
DROP TABLE table_name;
```

Note: Be careful before dropping a table. Deleting a table will result in loss of complete information stored in the table!

SQL DROP TABLE Example

The following SQL statement drops the existing table "Shippers":

Example

```
DROP TABLE Shippers;
```

Try it Yourself »

SQL TRUNCATE TABLE

The `TRUNCATE TABLE` statement is used to delete the data inside a table, but not the table itself.

Syntax

```
TRUNCATE TABLE table_name;
```

Exercise:

Write the correct SQL statement to delete a table called `Persons`.

```
[          ] Persons;
```

Submit Answer »

Start the Exercise

SQL ALTER TABLE Statement

SQL ALTER TABLE Statement

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

The `ALTER TABLE` statement is also used to add and drop various constraints on an existing table.

ALTER TABLE - ADD Column

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

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

The following SQL adds an "Email" column to the "Customers" table:

Example

```
ALTER TABLE Customers
ADD Email varchar(255);
```

Try it Yourself »

ALTER TABLE - DROP COLUMN

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;
```

The following SQL deletes the "Email" column from the "Customers" table:

Example

```
ALTER TABLE Customers
DROP COLUMN Email;
```

Try it Yourself »

ALTER TABLE - ALTER/MODIFY COLUMN

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:

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

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:

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- 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:

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

Exercise:

Add a column of type `DATE` called `Birthday`.

```
[      ] Persons
[      ];
```

Submit Answer »

Start the Exercise

SQL Constraints

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

SQL Create Constraints

Constraints can be specified when the table is created with the `CREATE TABLE` statement, or after the table is created with the `ALTER TABLE` statement.

Syntax

```
CREATE TABLE table_name (
    column1 datatype constraint,
    column2 datatype constraint,
    column3 datatype constraint,
    ....
);
```

SQL Constraints

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

Constraints are used to limit the type of data that can go into a table. This ensures the accuracy and reliability of the data in the table. If there is any violation between the constraint and the data action, the action is aborted.

Constraints can be column level or table level. Column level constraints apply to a column, and table level constraints apply to the whole table.

The following constraints are commonly used in SQL:

- `NOT NULL` - Ensures that a column cannot have a NULL value
- `UNIQUE` - Ensures that all values in a column are different
- `PRIMARY KEY` - A combination of a `NOT NULL` and `UNIQUE`. Uniquely identifies each row in a table
- `FOREIGN KEY` - Prevents actions that would destroy links between tables
- `CHECK` - Ensures that the values in a column satisfies a specific condition
- `DEFAULT` - Sets a default value for a column if no value is specified
- `CREATE INDEX` - Used to create and retrieve data from the database very quickly

SQL NOT NULL Constraint

SQL NOT NULL Constraint

By default, a column can hold NULL values.

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

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

SQL NOT NULL on CREATE TABLE

The following SQL ensures that the "ID", "LastName", and "FirstName" columns will NOT accept NULL values when the "Persons" table is created:

Example

```
CREATE TABLE Persons (
    ID int NOT NULL,
    LastName varchar(255) NOT NULL,
    FirstName varchar(255) NOT NULL,
    Age int
);
```

Try it Yourself »

SQL NOT NULL on ALTER TABLE

To create a `NOT NULL` constraint on the "Age" column when the "Persons" table is already created, use the following SQL:

SQL Server / MS Access:

```
ALTER TABLE Persons
ALTER COLUMN Age int NOT NULL;
```

My SQL / Oracle (prior version 10G):

```
ALTER TABLE Persons
MODIFY COLUMN Age int NOT NULL;
```

Oracle 10G and later:

```sql
ALTER TABLE Persons
MODIFY Age int NOT NULL;
```

SQL UNIQUE Constraint

SQL UNIQUE Constraint

The UNIQUE constraint ensures that all values in a column are different.

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

A PRIMARY KEY constraint automatically has a UNIQUE constraint.

However, 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 "ID" column when the "Persons" table is created:

SQL Server / Oracle / MS Access:

```
CREATE TABLE Persons (
    ID int NOT NULL UNIQUE,
    LastName varchar(255) NOT NULL,
    FirstName varchar(255),
    Age int
);
```

MySQL:

```
CREATE TABLE Persons (
    ID int NOT NULL,
    LastName varchar(255) NOT NULL,
    FirstName varchar(255),
    Age int,
    UNIQUE (ID)
);
```

To name a UNIQUE constraint, and to define a UNIQUE constraint on multiple columns, use the following SQL syntax:

MySQL / SQL Server / Oracle / MS Access:

```
CREATE TABLE Persons (
    ID int NOT NULL,
    LastName varchar(255) NOT NULL,
    FirstName varchar(255),
    Age int,
    CONSTRAINT UC_Person UNIQUE (ID,LastName)
);
```

SQL UNIQUE Constraint on ALTER TABLE

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

MySQL / SQL Server / Oracle / MS Access:

```
ALTER TABLE Persons
ADD UNIQUE (ID);
```

To name a `UNIQUE` constraint, and to define a `UNIQUE` constraint on multiple columns, use the following SQL syntax:

MySQL / SQL Server / Oracle / MS Access:

```
ALTER TABLE Persons
ADD CONSTRAINT UC_Person UNIQUE (ID,LastName);
```

DROP a UNIQUE Constraint

To drop a `UNIQUE` constraint, use the following SQL:

MySQL:

```
ALTER TABLE Persons
DROP INDEX UC_Person;
```

SQL Server / Oracle / MS Access:

```
ALTER TABLE Persons
DROP CONSTRAINT UC_Person;
```

SQL PRIMARY KEY Constraint

SQL PRIMARY KEY Constraint

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

Primary keys must contain UNIQUE values, and cannot contain NULL values.

A table can have only ONE primary key; and in the table, this primary key can consist of single or multiple columns (fields).

SQL PRIMARY KEY on CREATE TABLE

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

MySQL:

```
CREATE TABLE Persons (
    ID int NOT NULL,
    LastName varchar(255) NOT NULL,
    FirstName varchar(255),
    Age int,
    PRIMARY KEY (ID)
);
```

SQL Server / Oracle / MS Access:

```
CREATE TABLE Persons (
    ID int NOT NULL PRIMARY KEY,
    LastName varchar(255) NOT NULL,
    FirstName varchar(255),
    Age int
);
```

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 (
    ID int NOT NULL,
    LastName varchar(255) NOT NULL,
    FirstName varchar(255),
    Age int,
    CONSTRAINT PK_Person PRIMARY KEY (ID,LastName)
);
```

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

SQL PRIMARY KEY on ALTER TABLE

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

MySQL / SQL Server / Oracle / MS Access:

```
ALTER TABLE Persons
ADD PRIMARY KEY (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_Person PRIMARY KEY (ID,LastName);
```

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

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_Person;
```

SQL FOREIGN KEY Constraint

SQL FOREIGN KEY Constraint

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

A `FOREIGN KEY` is a field (or collection of fields) in one table, that refers to the `PRIMARY KEY` in another table.

The table with the foreign key is called the child table, and the table with the primary key is called the referenced or parent table.

Look at the following two tables:

Persons Table

PersonID	LastName	FirstName	Age
1	Hansen	Ola	30
2	Svendson	Tove	23
3	Pettersen	Kari	20

Orders Table

OrderID	OrderNumber	PersonID
1	77895	3

2	44678	3
3	22456	2
4	24562	1

Notice that the "PersonID" column in the "Orders" table points to the "PersonID" column in the "Persons" table.

The "PersonID" column in the "Persons" table is the `PRIMARY KEY` in the "Persons" table.

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

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

SQL FOREIGN KEY on CREATE TABLE

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

MySQL:

```
CREATE TABLE Orders (
    OrderID int NOT NULL,
    OrderNumber int NOT NULL,
    PersonID int,
    PRIMARY KEY (OrderID),
    FOREIGN KEY (PersonID) REFERENCES Persons(PersonID)
);
```

SQL Server / Oracle / MS Access:

```
CREATE TABLE Orders (
    OrderID int NOT NULL PRIMARY KEY,
    OrderNumber int NOT NULL,
    PersonID int FOREIGN KEY REFERENCES Persons(PersonID)
);
```

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 (
    OrderID int NOT NULL,
    OrderNumber int NOT NULL,
    PersonID int,
    PRIMARY KEY (OrderID),
    CONSTRAINT FK_PersonOrder FOREIGN KEY (PersonID)
    REFERENCES Persons(PersonID)
);
```

SQL FOREIGN KEY on ALTER TABLE

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

MySQL / SQL Server / Oracle / MS Access:

```
ALTER TABLE Orders
ADD FOREIGN KEY (PersonID) REFERENCES Persons(PersonID);
```

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_PersonOrder
FOREIGN KEY (PersonID) REFERENCES Persons(PersonID);
```

DROP a FOREIGN KEY Constraint

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

MySQL:

```
ALTER TABLE Orders
DROP FOREIGN KEY FK_PersonOrder;
```

SQL Server / Oracle / MS Access:

```
ALTER TABLE Orders
DROP CONSTRAINT FK_PersonOrder;
```

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 column it will allow 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 on CREATE TABLE

The following SQL creates a CHECK constraint on the "Age" column when the "Persons" table is created. The CHECK constraint ensures that the age of a person must be 18, or older:

MySQL:

```
CREATE TABLE Persons (
    ID int NOT NULL,
    LastName varchar(255) NOT NULL,
    FirstName varchar(255),
    Age int,
    CHECK (Age>=18)
);
```

SQL Server / Oracle / MS Access:

```
CREATE TABLE Persons (
    ID int NOT NULL,
    LastName varchar(255) NOT NULL,
    FirstName varchar(255),
    Age int CHECK (Age>=18)
);
```

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 (
    ID int NOT NULL,
    LastName varchar(255) NOT NULL,
    FirstName varchar(255),
    Age int,
    City varchar(255),
    CONSTRAINT CHK_Person CHECK (Age>=18 AND City='Sandnes')
);
```

SQL CHECK on ALTER TABLE

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

MySQL / SQL Server / Oracle / MS Access:

```
ALTER TABLE Persons
ADD CHECK (Age>=18);
```

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_PersonAge CHECK (Age>=18 AND City='Sandnes');
```

DROP a CHECK Constraint

To drop a `CHECK` constraint, use the following SQL:

SQL Server / Oracle / MS Access:

```
ALTER TABLE Persons
DROP CONSTRAINT CHK_PersonAge;
```

MySQL:

```
ALTER TABLE Persons
DROP CHECK CHK_PersonAge;
```

SQL DEFAULT Constraint

SQL DEFAULT Constraint

The DEFAULT constraint is used to set a default value for a column.

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

SQL DEFAULT on CREATE TABLE

The following SQL sets a DEFAULT value for the "City" column when the "Persons" table is created:

My SQL / SQL Server / Oracle / MS Access:

```
CREATE TABLE Persons (
    ID int NOT NULL,
    LastName varchar(255) NOT NULL,
    FirstName varchar(255),
    Age int,
    City varchar(255) DEFAULT 'Sandnes'
);
```

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

```
CREATE TABLE Orders (
    ID int NOT NULL,
    OrderNumber int NOT NULL,
    OrderDate date DEFAULT GETDATE()
);
```

SQL DEFAULT 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:

```
ALTER TABLE Persons
ADD CONSTRAINT df_City
DEFAULT 'Sandnes' FOR City;
```

MS Access:

```
ALTER TABLE Persons
ALTER COLUMN City SET DEFAULT 'Sandnes';
```

Oracle:

```
ALTER TABLE Persons
MODIFY City DEFAULT 'Sandnes';
```

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 Server:

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

SQL CREATE INDEX Statement

SQL CREATE INDEX Statement

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

Indexes are used to retrieve data from the database more quickly than otherwise. 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, only create indexes on columns that will be frequently searched against.

CREATE INDEX Syntax

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

```
CREATE INDEX index_name
ON table_name (column1, column2, ...);
```

CREATE UNIQUE INDEX Syntax

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

```
CREATE UNIQUE INDEX index_name
ON table_name (column1, column2, ...);
```

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 "idx_lastname" on the "LastName" column in the "Persons" table:

```
CREATE INDEX idx_lastname
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 idx_pname
ON Persons (LastName, FirstName);
```

DROP INDEX Statement

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

MS Access:

```
DROP INDEX index_name ON table_name;
```

SQL Server:

```
DROP INDEX table_name.index_name;
```

DB2/Oracle:

```
DROP INDEX index_name;
```

MySQL:

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

SQL AUTO INCREMENT Field

AUTO INCREMENT Field

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

Often this is the primary key field that we would like to be created automatically every time a new record is inserted.

Syntax for MySQL

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

```
CREATE TABLE Persons (
    Personid int NOT NULL AUTO_INCREMENT,
    LastName varchar(255) NOT NULL,
    FirstName varchar(255),
    Age int,
    PRIMARY KEY (Personid)
);
```

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 "Personid" 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 "Personid" 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 "Personid" column to be an auto-increment primary key field in the "Persons" table:

```
CREATE TABLE Persons (
    Personid int IDENTITY(1,1) PRIMARY KEY,
    LastName varchar(255) NOT NULL,
    FirstName varchar(255),
    Age int
);
```

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 "Personid" 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 "Personid" 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 "Personid" 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 "Personid" column to be an auto-increment primary key field in the "Persons" table:

```
CREATE TABLE Persons (
    Personid AUTOINCREMENT PRIMARY KEY,
    LastName varchar(255) NOT NULL,
    FirstName varchar(255),
    Age int
);
```

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 "Personid" 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 "Personid" 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 "Personid" 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 (Personid,FirstName,LastName)
VALUES (seq_person.nextval,'Lars','Monsen');
```

The SQL statement above would insert a new record into the "Persons" table. The "Personid" 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 Working With Dates

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!

SQL Working with Dates

Look at the following table:

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

Note: Two dates can easily be compared if there is no time component involved!

Now, assume that the "Orders" table looks like this (notice the added 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: To keep your queries simple and easy to maintain, do not use time-components in your dates, unless you have to!

SQL Views

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 statements and functions to a view and present the data as if the data were coming from one single table.

A view is created with the `CREATE VIEW` statement.

CREATE VIEW Syntax

```
CREATE VIEW view_name AS
SELECT column1, column2, ...
FROM table_name
WHERE condition;
```

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

SQL CREATE VIEW Examples

The following SQL creates a view that shows all customers from Brazil:

Example

```
CREATE VIEW [Brazil Customers] AS
SELECT CustomerName, ContactName
FROM Customers
WHERE Country = 'Brazil';
```

Try it Yourself »

We can query the view above as follows:

Example

```
SELECT * FROM [Brazil Customers];
```

Try it Yourself »

The following SQL creates a view that selects every product in the "Products" table with a price higher than the average price:

Example

```
CREATE VIEW [Products Above Average Price] AS
SELECT ProductName, Price
FROM Products
WHERE Price > (SELECT AVG(Price) FROM Products);
```

Try it Yourself »

We can query the view above as follows:

Example

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

Try it Yourself »

SQL Updating a View

A view can be updated with the `CREATE OR REPLACE VIEW` statement.

SQL CREATE OR REPLACE VIEW Syntax

```
CREATE OR REPLACE VIEW view_name AS
SELECT column1, column2, ...
FROM table_name
WHERE condition;
```

The following SQL adds the "City" column to the "Brazil Customers" view:

Example

```
CREATE OR REPLACE VIEW [Brazil Customers] AS
SELECT CustomerName, ContactName, City
FROM Customers
WHERE Country = 'Brazil';
```

Try it Yourself »

SQL Dropping a View

A view is deleted with the `DROP VIEW` statement.

SQL DROP VIEW Syntax

```
DROP VIEW view_name;
```

The following SQL drops the "Brazil Customers" view:

Example

```
DROP VIEW [Brazil Customers];
```

Try it Yourself »

SQL Injection

SQL Injection

SQL injection is a code injection technique that might destroy your database.

SQL injection is one of the most common web hacking techniques.

SQL injection is the placement of malicious code in SQL statements, via web page input.

SQL in Web Pages

SQL injection usually occurs when you ask a user for input, like their username/userid, and instead of a name/id, the user gives you an SQL statement that you will **unknowingly** run on your database.

Look at the following example which creates a `SELECT` statement by adding a variable (txtUserId) to a select string. The variable is fetched from user input (getRequestString):

Example

```
txtUserId = getRequestString("UserId");
txtSQL = "SELECT * FROM Users WHERE UserId = " + txtUserId;
```

The rest of this chapter describes the potential dangers of using user input in SQL statements.

SQL Injection Based on 1=1 is Always True

Look at the example above again. The original purpose of the code was to create an SQL statement to select a user, with a given user id.

If there is nothing to prevent a user from entering "wrong" input, the user can enter some "smart" input like this:

UserId: 105 OR 1=

Then, the SQL statement will look like this:

```
SELECT * FROM Users WHERE UserId = 105 OR 1=1;
```

The SQL above is valid and will return ALL rows from the "Users" table, since **OR 1=1** is always TRUE.

Does the example above look dangerous? What if the "Users" table contains names and passwords?

The SQL statement above is much the same as this:

```
SELECT UserId, Name, Password FROM Users WHERE UserId = 105 or 1=1;
```

A hacker might get access to all the user names and passwords in a database, by simply inserting 105 OR 1=1 into the input field.

SQL Injection Based on ""="" is Always True

Here is an example of a user login on a web site:

Username:
John Doe

Password:
myPass

Example

```
uName = getRequestString("username");
uPass = getRequestString("userpassword");

sql = 'SELECT * FROM Users WHERE Name ="' + uName + '" AND Pass ="' +
uPass + '"'
```

Result

```
SELECT * FROM Users WHERE Name ="John Doe" AND Pass ="myPass"
```

A hacker might get access to user names and passwords in a database by simply inserting " OR ""=" into the user name or password text box:

User Name:

Password:

The code at the server will create a valid SQL statement like this:

Result

```
SELECT * FROM Users WHERE Name ="" or ""="" AND Pass ="" or ""=""
```

The SQL above is valid and will return all rows from the "Users" table, since **OR ""=""** is always TRUE.

SQL Injection Based on Batched SQL Statements

Most databases support batched SQL statement.

A batch of SQL statements is a group of two or more SQL statements, separated by semicolons.

The SQL statement below will return all rows from the "Users" table, then delete the "Suppliers" table.

Example

```
SELECT * FROM Users; DROP TABLE Suppliers
```

Look at the following example:

Example

```
txtUserId = getRequestString("UserId");
txtSQL = "SELECT * FROM Users WHERE UserId = " + txtUserId;
```

And the following input:

User id: 105; DROP

The valid SQL statement would look like this:

Result

```
SELECT * FROM Users WHERE UserId = 105; DROP TABLE Suppliers;
```

Use SQL Parameters for Protection

To protect a web site from SQL injection, you can use SQL parameters.

SQL parameters are values that are added to an SQL query at execution time, in a controlled manner.

ASP.NET Razor Example

```
txtUserId = getRequestString("UserId");
txtSQL = "SELECT * FROM Users WHERE UserId = @0";
db.Execute(txtSQL,txtUserId);
```

Note that parameters are represented in the SQL statement by a @ marker.

The SQL engine checks each parameter to ensure that it is correct for its column and are treated literally, and not as part of the SQL to be executed.

Another Example

```
txtNam = getRequestString("CustomerName");
txtAdd = getRequestString("Address");
txtCit = getRequestString("City");
txtSQL = "INSERT INTO Customers (CustomerName,Address,City)
Values(@0,@1,@2)";
db.Execute(txtSQL,txtNam,txtAdd,txtCit);
```

Examples

The following examples shows how to build parameterized queries in some common web languages.

SELECT STATEMENT IN ASP.NET:

```
txtUserId = getRequestString("UserId");
sql = "SELECT * FROM Customers WHERE CustomerId = @0";
command = new SqlCommand(sql);
command.Parameters.AddWithValue("@0",txtUserId);
command.ExecuteReader();
```

INSERT INTO STATEMENT IN ASP.NET:

```
txtNam = getRequestString("CustomerName");
txtAdd = getRequestString("Address");
txtCit = getRequestString("City");
```

```
txtSQL = "INSERT INTO Customers (CustomerName,Address,City)
Values(@0,@1,@2)";
command = new SqlCommand(txtSQL);
command.Parameters.AddWithValue("@0",txtNam);
command.Parameters.AddWithValue("@1",txtAdd);
command.Parameters.AddWithValue("@2",txtCit);
command.ExecuteNonQuery();
```

INSERT INTO STATEMENT IN PHP:

```
$stmt = $dbh->prepare("INSERT INTO Customers
(CustomerName,Address,City)
VALUES (:nam, :add, :cit)");
$stmt->bindParam(':nam', $txtNam);
$stmt->bindParam(':add', $txtAdd);
$stmt->bindParam(':cit', $txtCit);
$stmt->execute();
```

SQL Hosting

SQL Hosting

If you want your web site to be able to store and retrieve data from a database, your web server should have access to a database-system that uses the SQL language.

If your web server is hosted by an Internet Service Provider (ISP), you will have to look for SQL hosting plans.

The most common SQL hosting databases are MS SQL Server, Oracle, MySQL, and MS Access.

MS SQL Server

Microsoft's SQL Server is a popular database software for database-driven web sites with high traffic.

SQL Server is a very powerful, robust and full featured SQL database system.

Oracle

Oracle is also a popular database software for database-driven web sites with high traffic.

Oracle is a very powerful, robust and full featured SQL database system.

MySQL

MySQL is also a popular database software for web sites.

MySQL is a very powerful, robust and full featured SQL database system.

MySQL is an inexpensive alternative to the expensive Microsoft and Oracle solutions.

MS Access

When a web site requires only a simple database, Microsoft Access can be a solution.

MS Access is not well suited for very high-traffic, and not as powerful as MySQL, SQL Server, or Oracle.

SQL Data Types for MySQL, SQL Server, and MS Access

The data type of a column defines what value the column can hold: integer, character, money, date and time, binary, and so on.

SQL Data Types

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

An SQL developer must decide what type of data that will be stored inside each column when creating a table. The data type is 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.

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!**

MySQL Data Types (Version 8.0)

In MySQL there are three main data types: string, numeric, and date and time.

String Data Types

Data type	Description
CHAR(size)	A FIXED length string (can contain letters, numbers, and special characters). The *size* parameter specifies the column length in characters - can be from 0 to 255. Default is 1
VARCHAR(size)	A VARIABLE length string (can contain letters, numbers, and special characters). The *size* parameter specifies the maximum string length in characters - can be from 0 to 65535

BINARY(size)	Equal to CHAR(), but stores binary byte strings. The *size* parameter specifies the column length in bytes. Default is 1
VARBINARY(size)	Equal to VARCHAR(), but stores binary byte strings. The *size* parameter specifies the maximum column length in bytes.
TINYBLOB	For BLOBs (Binary Large Objects). Max length: 255 bytes
TINYTEXT	Holds a string with a maximum length of 255 characters
TEXT(size)	Holds a string with a maximum length of 65,535 bytes
BLOB(size)	For BLOBs (Binary Large Objects). Holds up to 65,535 bytes of data
MEDIUMTEXT	Holds a string with a maximum length of 16,777,215 characters
MEDIUMBLOB	For BLOBs (Binary Large Objects). Holds up to 16,777,215 bytes of data
LONGTEXT	Holds a string with a maximum length of 4,294,967,295 characters
LONGBLOB	For BLOBs (Binary Large Objects). Holds up to 4,294,967,295 bytes of data
ENUM(val1, val2, val3, ...)	A string object that can have only one value, chosen from a list of possible values. You can list up to 65535 values in an ENUM list. If a

	value is inserted that is not in the list, a blank value will be inserted. The values are sorted in the order you enter them
SET(val1, val2, val3, ...)	A string object that can have 0 or more values, chosen from a list of possible values. You can list up to 64 values in a SET list

Numeric Data Types

Data type	**Description**
BIT(*size*)	A bit-value type. The number of bits per value is specified in *size*. The *size* parameter can hold a value from 1 to 64. The default value for *size* is 1.
TINYINT(*size*)	A very small integer. Signed range is from -128 to 127. Unsigned range is from 0 to 255. The *size* parameter specifies the maximum display width (which is 255)
BOOL	Zero is considered as false, nonzero values are considered as true.
BOOLEAN	Equal to BOOL
SMALLINT(*size*)	A small integer. Signed range is from -32768 to 32767. Unsigned range is from 0 to 65535. The *size* parameter specifies the maximum display width (which is 255)
MEDIUMINT(*size*)	A medium integer. Signed range is from -8388608 to 8388607. Unsigned range is from 0 to 16777215. The *size* parameter specifies the maximum display width (which is 255)

INT(*size*)	A medium integer. Signed range is from -2147483648 to 2147483647. Unsigned range is from 0 to 4294967295. The *size* parameter specifies the maximum display width (which is 255)
INTEGER(*size*)	Equal to INT(size)
BIGINT(*size*)	A large integer. Signed range is from -9223372036854775808 to 9223372036854775807. Unsigned range is from 0 to 18446744073709551615. The *size* parameter specifies the maximum display width (which is 255)
FLOAT(*size*, *d*)	A floating point number. The total number of digits is specified in *size*. The number of digits after the decimal point is specified in the *d* parameter. This syntax is deprecated in MySQL 8.0.17, and it will be removed in future MySQL versions
FLOAT(*p*)	A floating point number. MySQL uses the *p* value to determine whether to use FLOAT or DOUBLE for the resulting data type. If *p* is from 0 to 24, the data type becomes FLOAT(). If *p* is from 25 to 53, the data type becomes DOUBLE()
DOUBLE(*size*, *d*)	A normal-size floating point number. The total number of digits is specified in *size*. The number of digits after the decimal point is specified in the *d* parameter
DOUBLE PRECISION(*size*, *d*)	
DECIMAL(*size*, *d*)	An exact fixed-point number. The total number of digits is specified in *size*. The number of digits after the decimal point is specified in the *d* parameter. The maximum number for *size* is 65. The

	maximum number for *d* is 30. The default value for *size* is 10. The default value for *d* is 0.
DEC(*size*, *d*)	Equal to DECIMAL(size,d)

Note: All the numeric data types may have an extra option: UNSIGNED or ZEROFILL. If you add the UNSIGNED option, MySQL disallows negative values for the column. If you add the ZEROFILL option, MySQL automatically also adds the UNSIGNED attribute to the column.

Date and Time Data Types

Data type	**Description**
DATE	A date. Format: YYYY-MM-DD. The supported range is from '1000-01-01' to '9999-12-31'
DATETIME(*fsp*)	A date and time combination. Format: YYYY-MM-DD hh:mm:ss. The supported range is from '1000-01-01 00:00:00' to '9999-12-31 23:59:59'. Adding DEFAULT and ON UPDATE in the column definition to get automatic initialization and updating to the current date and time
TIMESTAMP(*fsp*)	A timestamp. TIMESTAMP values are stored as the number of seconds since the Unix epoch ('1970-01-01 00:00:00' UTC). Format: YYYY-MM-DD hh:mm:ss. The supported range is from '1970-01-01 00:00:01' UTC to '2038-01-09 03:14:07' UTC. Automatic initialization and updating to the current date and time can be specified using DEFAULT CURRENT_TIMESTAMP and ON UPDATE CURRENT_TIMESTAMP in the column definition

TIME(*fsp*)	A time. Format: hh:mm:ss. The supported range is from '-838:59:59' to '838:59:59'
YEAR	A year in four-digit format. Values allowed in four-digit format: 1901 to 2155, and 0000. MySQL 8.0 does not support year in two-digit format.

SQL Server Data Types

String Data Types

Data type	**Description**	**Max size**	**Storage**
char(n)	Fixed width character string	8,000 characters	Defined width
varchar(n)	Variable width character string	8,000 characters	2 bytes + number of chars
varchar(max)	Variable width character string	1,073,741,824 characters	2 bytes + number of chars
text	Variable width character string	2GB of text data	4 bytes + number of chars
nchar	Fixed width Unicode string	4,000 characters	Defined width x 2

nvarchar	Variable width Unicode string	4,000 characters
nvarchar(max)	Variable width Unicode string	536,870,912 characters
ntext	Variable width Unicode string	2GB of text data
binary(n)	Fixed width binary string	8,000 bytes
varbinary	Variable width binary string	8,000 bytes
varbinary(max)	Variable width binary string	2GB
image	Variable width binary string	2GB

Numeric Data Types

Data type	**Description**	**Storage**
bit	Integer that can be 0, 1, or NULL	
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.	4 or 8 bytes

	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.	
real	Floating precision number data from -3.40E + 38 to 3.40E + 38	4 bytes

Date and Time Data 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

MS Access Data Types

Data type	Description	Storage
Text	Use for text or combinations of text and numbers. 255 characters maximum	

Memo	Memo is used for larger amounts of text. Stores up to 65,536 characters. **Note:** You cannot sort a memo field. However, they are searchable	
Byte	Allows whole numbers from 0 to 255	1 byte
Integer	Allows whole numbers between -32,768 and 32,767	2 bytes
Long	Allows whole numbers between -2,147,483,648 and 2,147,483,647	4 bytes
Single	Single precision floating-point. Will handle most decimals	4 bytes
Double	Double precision floating-point. Will handle most decimals	8 bytes
Currency	Use for currency. Holds up to 15 digits of whole dollars, plus 4 decimal places. **Tip:** You can choose which country's currency to use	8 bytes
AutoNumber	AutoNumber fields automatically give each record its own number, usually starting at 1	4 bytes
Date/Time	Use for dates and times	8 bytes
Yes/No	A logical field can be displayed as Yes/No, True/False, or On/Off. In code, use the constants True and False (equivalent to -1 and 0). **Note:** Null values are not allowed in Yes/No fields	1 bit

Ole Object	Can store pictures, audio, video, or other BLOBs (Binary Large Objects)	up to 1GB
Hyperlink	Contain links to other files, including web pages	
Lookup Wizard	Let you type a list of options, which can then be chosen from a drop-down list	4 bytes

SQL Keywords Reference

This SQL keywords reference contains the reserved words in SQL.

SQL Keywords

Keyword	Description
ADD	Adds a column in an existing table
ADD CONSTRAINT	Adds a constraint after a table is already created
ALL	Returns true if all of the subquery values meet the condition
ALTER	Adds, deletes, or modifies columns in a table, or changes the data type of a column in a table
ALTER COLUMN	Changes the data type of a column in a table
ALTER TABLE	Adds, deletes, or modifies columns in a table
AND	Only includes rows where both conditions is true
ANY	Returns true if any of the subquery values meet the condition

AS	Renames a column or table with an alias
ASC	Sorts the result set in ascending order
BACKUP DATABASE	Creates a back up of an existing database
BETWEEN	Selects values within a given range
CASE	Creates different outputs based on conditions
CHECK	A constraint that limits the value that can be placed in a column
COLUMN	Changes the data type of a column or deletes a column in a table
CONSTRAINT	Adds or deletes a constraint
CREATE	Creates a database, index, view, table, or procedure
CREATE DATABASE	Creates a new SQL database
CREATE INDEX	Creates an index on a table (allows duplicate values)

CREATE OR REPLACE VIEW	Updates a view
CREATE TABLE	Creates a new table in the database
CREATE PROCEDURE	Creates a stored procedure
CREATE UNIQUE INDEX	Creates a unique index on a table (no duplicate values)
CREATE VIEW	Creates a view based on the result set of a SELECT statement
DATABASE	Creates or deletes an SQL database
DEFAULT	A constraint that provides a default value for a column
DELETE	Deletes rows from a table
DESC	Sorts the result set in descending order
DISTINCT	Selects only distinct (different) values

DROP	Deletes a column, constraint, database, index, table, or view
DROP COLUMN	Deletes a column in a table
DROP CONSTRAINT	Deletes a UNIQUE, PRIMARY KEY, FOREIGN KEY, or CHECK constraint
DROP DATABASE	Deletes an existing SQL database
DROP DEFAULT	Deletes a DEFAULT constraint
DROP INDEX	Deletes an index in a table
DROP TABLE	Deletes an existing table in the database
DROP VIEW	Deletes a view
EXEC	Executes a stored procedure
EXISTS	Tests for the existence of any record in a subquery
FOREIGN KEY	A constraint that is a key used to link two tables together

FROM	Specifies which table to select or delete data from
FULL OUTER JOIN	Returns all rows when there is a match in either left table or right table
GROUP BY	Groups the result set (used with aggregate functions: COUNT, MAX, MIN, SUM, AVG)
HAVING	Used instead of WHERE with aggregate functions
IN	Allows you to specify multiple values in a WHERE clause
INDEX	Creates or deletes an index in a table
INNER JOIN	Returns rows that have matching values in both tables
INSERT INTO	Inserts new rows in a table
INSERT INTO SELECT	Copies data from one table into another table
IS NULL	Tests for empty values

IS NOT NULL	Tests for non-empty values
JOIN	Joins tables
LEFT JOIN	Returns all rows from the left table, and the matching rows from the right table
LIKE	Searches for a specified pattern in a column
LIMIT	Specifies the number of records to return in the result set
NOT	Only includes rows where a condition is not true
NOT NULL	A constraint that enforces a column to not accept NULL values
OR	Includes rows where either condition is true
ORDER BY	Sorts the result set in ascending or descending order
OUTER JOIN	Returns all rows when there is a match in either left table or right table

PRIMARY KEY	A constraint that uniquely identifies each record in a database table
PROCEDURE	A stored procedure
RIGHT JOIN	Returns all rows from the right table, and the matching rows from the left table
ROWNUM	Specifies the number of records to return in the result set
SELECT	Selects data from a database
SELECT DISTINCT	Selects only distinct (different) values
SELECT INTO	Copies data from one table into a new table
SELECT TOP	Specifies the number of records to return in the result set
SET	Specifies which columns and values that should be updated in a table
TABLE	Creates a table, or adds, deletes, or modifies columns in a table, or deletes a table or data inside a table

TOP	Specifies the number of records to return in the result set
TRUNCATE TABLE	Deletes the data inside a table, but not the table itself
UNION	Combines the result set of two or more SELECT statements (only distinct values)
UNION ALL	Combines the result set of two or more SELECT statements (allows duplicate values)
UNIQUE	A constraint that ensures that all values in a column are unique
UPDATE	Updates existing rows in a table
VALUES	Specifies the values of an INSERT INTO statement
VIEW	Creates, updates, or deletes a view
WHERE	Filters a result set to include only records that fulfill a specified condition

MySQL Functions

MySQL has many built-in functions.

This reference contains string, numeric, date, and some advanced functions in MySQL.

MySQL String Functions

Function	Description
ASCII	Returns the ASCII value for the specific character
CHAR_LENGTH	Returns the length of a string (in characters)
CHARACTER_LENGTH	Returns the length of a string (in characters)
CONCAT	Adds two or more expressions together
CONCAT_WS	Adds two or more expressions together with a separator
FIELD	Returns the index position of a value in a list of values
FIND_IN_SET	Returns the position of a string within a list of strings

FORMAT	Formats a number to a format like "#,###,###.##", rounded to a specified number of decimal places
INSERT	Inserts a string within a string at the specified position and for a certain number of characters
INSTR	Returns the position of the first occurrence of a string in another string
LCASE	Converts a string to lower-case
LEFT	Extracts a number of characters from a string (starting from left)
LENGTH	Returns the length of a string (in bytes)
LOCATE	Returns the position of the first occurrence of a substring in a string
LOWER	Converts a string to lower-case
LPAD	Left-pads a string with another string, to a certain length
LTRIM	Removes leading spaces from a string

MID	Extracts a substring from a string (starting at any position)
POSITION	Returns the position of the first occurrence of a substring in a string
REPEAT	Repeats a string as many times as specified
REPLACE	Replaces all occurrences of a substring within a string, with a new substring
REVERSE	Reverses a string and returns the result
RIGHT	Extracts a number of characters from a string (starting from right)
RPAD	Right-pads a string with another string, to a certain length
RTRIM	Removes trailing spaces from a string
SPACE	Returns a string of the specified number of space characters
STRCMP	Compares two strings

SUBSTR	Extracts a substring from a string (starting at any position)
SUBSTRING	Extracts a substring from a string (starting at any position)
SUBSTRING_INDEX	Returns a substring of a string before a specified number of delimiter occurs
TRIM	Removes leading and trailing spaces from a string
UCASE	Converts a string to upper-case
UPPER	Converts a string to upper-case

MySQL Numeric Functions

Function	Description
ABS	Returns the absolute value of a number
ACOS	Returns the arc cosine of a number
ASIN	Returns the arc sine of a number

ATAN	Returns the arc tangent of one or two numbers
ATAN2	Returns the arc tangent of two numbers
AVG	Returns the average value of an expression
CEIL	Returns the smallest integer value that is >= to a number
CEILING	Returns the smallest integer value that is >= to a number
COS	Returns the cosine of a number
COT	Returns the cotangent of a number
COUNT	Returns the number of records returned by a select query
DEGREES	Converts a value in radians to degrees
DIV	Used for integer division
EXP	Returns e raised to the power of a specified number
FLOOR	Returns the largest integer value that is <= to a number

GREATEST	Returns the greatest value of the list of arguments
LEAST	Returns the smallest value of the list of arguments
LN	Returns the natural logarithm of a number
LOG	Returns the natural logarithm of a number, or the logarithm of a number to a specified base
LOG10	Returns the natural logarithm of a number to base 10
LOG2	Returns the natural logarithm of a number to base 2
MAX	Returns the maximum value in a set of values
MIN	Returns the minimum value in a set of values
MOD	Returns the remainder of a number divided by another number
PI	Returns the value of PI
POW	Returns the value of a number raised to the power of another number

POWER	Returns the value of a number raised to the power of another number
RADIANS	Converts a degree value into radians
RAND	Returns a random number
ROUND	Rounds a number to a specified number of decimal places
SIGN	Returns the sign of a number
SIN	Returns the sine of a number
SQRT	Returns the square root of a number
SUM	Calculates the sum of a set of values
TAN	Returns the tangent of a number
TRUNCATE	Truncates a number to the specified number of decimal places

MySQL Date Functions

Function	Description
ADDDATE	Adds a time/date interval to a date and then returns the date
ADDTIME	Adds a time interval to a time/datetime and then returns the time/datetime
CURDATE	Returns the current date
CURRENT_DATE	Returns the current date
CURRENT_TIME	Returns the current time
CURRENT_TIMESTAMP	Returns the current date and time
CURTIME	Returns the current time
DATE	Extracts the date part from a datetime expression
DATEDIFF	Returns the number of days between two date values

DATE_ADD	Adds a time/date interval to a date and then returns the date
DATE_FORMAT	Formats a date
DATE_SUB	Subtracts a time/date interval from a date and then returns the date
DAY	Returns the day of the month for a given date
DAYNAME	Returns the weekday name for a given date
DAYOFMONTH	Returns the day of the month for a given date
DAYOFWEEK	Returns the weekday index for a given date
DAYOFYEAR	Returns the day of the year for a given date
EXTRACT	Extracts a part from a given date
FROM_DAYS	Returns a date from a numeric datevalue
HOUR	Returns the hour part for a given date

LAST_DAY	Extracts the last day of the month for a given date
LOCALTIME	Returns the current date and time
LOCALTIMESTAMP	Returns the current date and time
MAKEDATE	Creates and returns a date based on a year and a number of days value
MAKETIME	Creates and returns a time based on an hour, minute, and second value
MICROSECOND	Returns the microsecond part of a time/datetime
MINUTE	Returns the minute part of a time/datetime
MONTH	Returns the month part for a given date
MONTHNAME	Returns the name of the month for a given date
NOW	Returns the current date and time
PERIOD_ADD	Adds a specified number of months to a period

PERIOD_DIFF	Returns the difference between two periods
QUARTER	Returns the quarter of the year for a given date value
SECOND	Returns the seconds part of a time/datetime
SEC_TO_TIME	Returns a time value based on the specified seconds
STR_TO_DATE	Returns a date based on a string and a format
SUBDATE	Subtracts a time/date interval from a date and then returns the date
SUBTIME	Subtracts a time interval from a datetime and then returns the time/datetime
SYSDATE	Returns the current date and time
TIME	Extracts the time part from a given time/datetime
TIME_FORMAT	Formats a time by a specified format

TIME_TO_SEC	Converts a time value into seconds
TIMEDIFF	Returns the difference between two time/datetime expressions
TIMESTAMP	Returns a datetime value based on a date or datetime value
TO_DAYS	Returns the number of days between a date and date "0000-00-00"
WEEK	Returns the week number for a given date
WEEKDAY	Returns the weekday number for a given date
WEEKOFYEAR	Returns the week number for a given date
YEAR	Returns the year part for a given date
YEARWEEK	Returns the year and week number for a given date

MySQL Advanced Functions

Function	Description
BIN	Returns a binary representation of a number
BINARY	Converts a value to a binary string
CASE	Goes through conditions and return a value when the first condition is met
CAST	Converts a value (of any type) into a specified datatype
COALESCE	Returns the first non-null value in a list
CONNECTION_ID	Returns the unique connection ID for the current connection
CONV	Converts a number from one numeric base system to another
CONVERT	Converts a value into the specified datatype or character set

CURRENT_USER	Returns the user name and host name for the MySQL account that the server used to authenticate the current client
DATABASE	Returns the name of the current database
IF	Returns a value if a condition is TRUE, or another value if a condition is FALSE
IFNULL	Return a specified value if the expression is NULL, otherwise return the expression
ISNULL	Returns 1 or 0 depending on whether an expression is NULL
LAST_INSERT_ID	Returns the AUTO_INCREMENT id of the last row that has been inserted or updated in a table
NULLIF	Compares two expressions and returns NULL if they are equal. Otherwise, the first expression is returned
SESSION_USER	Returns the current MySQL user name and host name
SYSTEM_USER	Returns the current MySQL user name and host name
USER	Returns the current MySQL user name and host name

VERSION	Returns the current version of the MySQL database

SQL Server Functions

SQL Server has many built-in functions.

This reference contains string, numeric, date, conversion, and some advanced functions in SQL Server.

SQL Server String Functions

Function	Description
ASCII	Returns the ASCII value for the specific character
CHAR	Returns the character based on the ASCII code
CHARINDEX	Returns the position of a substring in a string
CONCAT	Adds two or more strings together
Concat with +	Adds two or more strings together
CONCAT_WS	Adds two or more strings together with a separator
DATALENGTH	Returns the number of bytes used to represent an expression

DIFFERENCE	Compares two SOUNDEX values, and returns an integer value
FORMAT	Formats a value with the specified format
LEFT	Extracts a number of characters from a string (starting from left)
LEN	Returns the length of a string
LOWER	Converts a string to lower-case
LTRIM	Removes leading spaces from a string
NCHAR	Returns the Unicode character based on the number code
PATINDEX	Returns the position of a pattern in a string
QUOTENAME	Returns a Unicode string with delimiters added to make the string a valid SQL Server delimited identifier
REPLACE	Replaces all occurrences of a substring within a string, with a new substring
REPLICATE	Repeats a string a specified number of times

REVERSE	Reverses a string and returns the result
RIGHT	Extracts a number of characters from a string (starting from right)
RTRIM	Removes trailing spaces from a string
SOUNDEX	Returns a four-character code to evaluate the similarity of two strings
SPACE	Returns a string of the specified number of space characters
STR	Returns a number as string
STUFF	Deletes a part of a string and then inserts another part into the string, starting at a specified position
SUBSTRING	Extracts some characters from a string
TRANSLATE	Returns the string from the first argument after the characters specified in the second argument are translated into the characters specified in the third argument.
TRIM	Removes leading and trailing spaces (or other specified characters) from a string

UNICODE	Returns the Unicode value for the first character of the input expression
UPPER	Converts a string to upper-case

SQL Server Math/Numeric Functions

Function	Description
ABS	Returns the absolute value of a number
ACOS	Returns the arc cosine of a number
ASIN	Returns the arc sine of a number
ATAN	Returns the arc tangent of a number
ATN2	Returns the arc tangent of two numbers
AVG	Returns the average value of an expression
CEILING	Returns the smallest integer value that is >= a number

COUNT	Returns the number of records returned by a select query
COS	Returns the cosine of a number
COT	Returns the cotangent of a number
DEGREES	Converts a value in radians to degrees
EXP	Returns e raised to the power of a specified number
FLOOR	Returns the largest integer value that is <= to a number
LOG	Returns the natural logarithm of a number, or the logarithm of a number to a specified base
LOG10	Returns the natural logarithm of a number to base 10
MAX	Returns the maximum value in a set of values
MIN	Returns the minimum value in a set of values
PI	Returns the value of PI

POWER	Returns the value of a number raised to the power of another number
RADIANS	Converts a degree value into radians
RAND	Returns a random number
ROUND	Rounds a number to a specified number of decimal places
SIGN	Returns the sign of a number
SIN	Returns the sine of a number
SQRT	Returns the square root of a number
SQUARE	Returns the square of a number
SUM	Calculates the sum of a set of values
TAN	Returns the tangent of a number

SQL Server Date Functions

Function	Description
CURRENT_TIMESTAMP	Returns the current date and time
DATEADD	Adds a time/date interval to a date and then returns the date
DATEDIFF	Returns the difference between two dates
DATEFROMPARTS	Returns a date from the specified parts (year, month, and day values)
DATENAME	Returns a specified part of a date (as string)
DATEPART	Returns a specified part of a date (as integer)
DAY	Returns the day of the month for a specified date
GETDATE	Returns the current database system date and time
GETUTCDATE	Returns the current database system UTC date and time

ISDATE	Checks an expression and returns 1 if it is a valid date, otherwise 0
MONTH	Returns the month part for a specified date (a number from 1 to 12)
SYSDATETIME	Returns the date and time of the SQL Server
YEAR	Returns the year part for a specified date

SQL Server Advanced Functions

Function	Description
CAST	Converts a value (of any type) into a specified datatype
COALESCE	Returns the first non-null value in a list
CONVERT	Converts a value (of any type) into a specified datatype
CURRENT_USER	Returns the name of the current user in the SQL Server database

IIF	Returns a value if a condition is TRUE, or another value if a condition is FALSE
ISNULL	Return a specified value if the expression is NULL, otherwise return the expression
ISNUMERIC	Tests whether an expression is numeric
NULLIF	Returns NULL if two expressions are equal
SESSION_USER	Returns the name of the current user in the SQL Server database
SESSIONPROPERTY	Returns the session settings for a specified option
SYSTEM_USER	Returns the login name for the current user
USER_NAME	Returns the database user name based on the specified id

MS Access Functions

MS Access has many built-in functions.

This reference contains the string, numeric, and date functions in MS Access.

MS Access String Functions

Function	Description
Asc	Returns the ASCII value for the specific character
Chr	Returns the character for the specified ASCII number code
Concat with &	Adds two or more strings together
CurDir	Returns the full path for a specified drive
Format	Formats a value with the specified format
InStr	Gets the position of the first occurrence of a string in another
InstrRev	Gets the position of the first occurrence of a string in another, from the end of string

LCase	Converts a string to lower-case
Left	Extracts a number of characters from a string (starting from left)
Len	Returns the length of a string
LTrim	Removes leading spaces from a string
Mid	Extracts some characters from a string (starting at any position)
Replace	Replaces a substring within a string, with another substring, a specified number of times
Right	Extracts a number of characters from a string (starting from right)
RTrim	Removes trailing spaces from a string
Space	Returns a string of the specified number of space characters
Split	Splits a string into an array of substrings

Str	Returns a number as string
StrComp	Compares two strings
StrConv	Returns a converted string
StrReverse	Reverses a string and returns the result
Trim	Removes both leading and trailing spaces from a string
UCase	Converts a string to upper-case

MS Access Numeric Functions

Function	Description
Abs	Returns the absolute value of a number
Atn	Returns the arc tangent of a number
Avg	Returns the average value of an expression

Cos	Returns the cosine of an angle
Count	Returns the number of records returned by a select query
Exp	Returns e raised to the power of a specified number
Fix	Returns the integer part of a number
Format	Formats a numeric value with the specified format
Int	Returns the integer part of a number
Max	Returns the maximum value in a set of values
Min	Returns the minimum value in a set of values
Randomize	Initializes the random number generator (used by Rnd()) with a seed
Rnd	Returns a random number
Round	Rounds a number to a specified number of decimal places

Sgn	Returns the sign of a number
Sqr	Returns the square root of a number
Sum	Calculates the sum of a set of values
Val	Reads a string and returns the numbers found in the string

MS Access Date Functions

Function	Description
Date	Returns the current system date
DateAdd	Adds a time/date interval to a date and then returns the date
DateDiff	Returns the difference between two dates
DatePart	Returns a specified part of a date (as an integer)
DateSerial	Returns a date from the specified parts (year, month, and day values)

DateValue	Returns a date based on a string
Day	Returns the day of the month for a given date
Format	Formats a date value with the specified format
Hour	Returns the hour part of a time/datetime
Minute	Returns the minute part of a time/datetime
Month	Returns the month part of a given date
MonthName	Returns the name of the month based on a number
Now	Returns the current date and time based on the computer's system date and time
Second	Returns the seconds part of a time/datetime
Time	Returns the current system time
TimeSerial	Returns a time from the specified parts (hour, minute, and second value)

TimeValue	Returns a time based on a string
Weekday	Returns the weekday number for a given date
WeekdayName	Returns the weekday name based on a number
Year	Returns the year part of a given date

MS Access Some Other Functions

Function	Description
CurrentUser	Returns the name of the current database user
Environ	Returns a string that contains the value of an operating system environment variable
IsDate	Checks whether an expression can be converted to a date
IsNull	Checks whether an expression contains Null (no data)
IsNumeric	Checks whether an expression is a valid number

SQL Quick Reference from W3Schools

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

Source : https://www.w3schools.com/sql/sql_quickref.asp

SQL Examples

SQL Syntax

Select all the records from a specific table ("Customers")

Example Explained

SQL SELECT

SELECT ColumnSELECT *

Examples Explained

SQL SELECT DISTINCT

SELECT DISTINCTSELECT COUNT(DISTINCT column_name)SELECT COUNT(DISTINCT column_name) workaround for MS Access

Examples Explained

SQL WHERE

WHERE ClauseText Fields vs. Numeric Fields

Examples Explained

SQL AND, OR and NOT Operators

ANDORNOTCombining AND, OR and NOT

Examples Explained

SQL ORDER BY

ORDER BYORDER BY DESCORDER BY Several Columns

Examples Explained

SQL INSERT INTO

INSERT INTOInsert data in specific columns

Examples Explained

SQL NULL Values

IS NULL OperatorIS NOT NULL Operator

Examples Explained

SQL Update

UPDATE TableUPDATE Multiple RecordsUPDATE Warning (if you omit the WHERE clause, all records will be updated)

Examples Explained

SQL DELETE

DELETEDELETE All Records

Examples Explained

SQL SELECT TOP

SELECT TOPLIMITSELECT TOP PERCENTSELECT TOP and add a WHERE Clause

Examples Explained

SQL MIN() and MAX()

MIN()MAX()

Examples Explained

SQL COUNT, AVG() and SUM()

COUNT()AVG()SUM()

Examples Explained

SQL LIKE

LIKE - select all table rows starting with "a"LIKE - select all table rows ending with "a"LIKE - select all table rows that have "or" in any positionLIKE - select all table rows that have "r" in the second positionLIKE - select all table rows that starts with "a" and ends with "o"LIKE - select all table rows that does NOT start with "a"

Examples Explained

SQL Wildcards

Using the % WildcardUsing the _ WildcardUsing the [charlist] WildcardUsing the [!charlist] Wildcard

Examples Explained

SQL IN

INNOT IN

Examples Explained

SQL BETWEEN

BETWEENNOT BETWEENBETWEEN with INBETWEEN Text ValuesNOT BETWEEN Text Values

Examples Explained

SQL Aliases

Alias for ColumnsTwo AliasesAlias for Tables

Examples Explained

SQL Joins

INNER JOINLEFT JOINRIGHT JOINSelf JOIN

Examples Explained

SQL UNION

UNIONUNION ALLUNION With WHEREUNION ALL With WHERE

Examples Explained

SQL GROUP BY

GROUP BYGROUP BY and ORDER BYGROUP BY With JOIN

Examples Explained

SQL HAVING

HAVING and GROUP BYHAVING and ORDER BY

Examples Explained

SQL EXISTS

EXISTS

Example Explained

SQL ANY and ALL

ANYALL

Examples Explained

SQL INSERT INTO SELECT

INSERT INTO SELECTINSERT INTO SELECT with WHERE

Examples Explained

SQL CASE

CASE 1CASE 2

Examples Explained

SQL Comments

Single Line CommentsSingle Line Comments At The End Of a LineMulti-line Comments

Examples Explained

SQL Database

SQL Database tutorials can be found here:

SQL Create DB

SQL Drop DB

SQL Backup DB

SQL Create Table

SQL Drop Table

SQL Alter Table

SQL Constraints

SQL Not Null

SQL Unique

SQL Primary Key

SQL Foreign Key

SQL Check

SQL Default

SQL Index

SQL Auto Increment

SQL Dates

SQL Views

SQL Injection

SQL Hosting