

# MySQL Tutorial

MySQL is a widely used relational database management system (RDBMS).

MySQL is free and open-source.

MySQL is ideal for both small and large applications.

# Introduction to MySQL

MySQL is a very popular open-source relational database management system (RDBMS).

## What is MySQL?

- MySQL is a relational database management system
- MySQL is open-source
- MySQL is free
- MySQL is ideal for both small and large applications
- MySQL is very fast, reliable, scalable, and easy to use
- MySQL is cross-platform
- MySQL is compliant with the ANSI SQL standard
- MySQL was first released in 1995
- MySQL is developed, distributed, and supported by **Oracle Corporation**
- MySQL is named after co-founder Monty Widenius's daughter: My

## Who Uses MySQL?

- Huge websites like Facebook, Twitter, Airbnb, Booking.com, Uber, GitHub, YouTube, etc.
- Content Management Systems like WordPress, Drupal, Joomla!, Contao, etc.
- A very large number of web developers around the world

## Show Data On Your Web Site

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

- An RDBMS database program (like MySQL)
- A server-side scripting language, like PHP
- To use SQL to get the data you want
- To use HTML / CSS to style the page

## What is RDBMS?

RDBMS stands for Relational Database Management System.

RDBMS is a program used to maintain a relational database.

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

RDBMS uses [SQL queries](#) to access the data in the database.

## What is a Database Table?

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

A column holds specific information about every record in the table.

A record (or row) is each individual entry that exists in a table.

Look at a selection from the Northwind "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

The columns in the "Customers" table above are: CustomerID, CustomerName, ContactName, Address, City, PostalCode and Country. The table has 4 records (rows).

## What is a Relational Database?

A relational database defines database relationships in the form of tables. The tables are related to each other - based on data common to each.

Look at the following three tables "Customers", "Orders", and "Shippers" from the Northwind database:

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 relationship between the "Customers" table and the "Orders" table is the CustomerID column:

Orders Table

OrderID	CustomerID	EmployeeID	OrderDate	ShipperID
10278	5	8	1996-08-12	2
10280	5	2	1996-08-14	1
10308	2	7	1996-09-18	3
10355	4	6	1996-11-15	1
10365	3	3	1996-11-27	2
10383	4	8	1996-12-16	3
10384	5	3	1996-12-16	3

The relationship between the "Orders" table and the "Shippers" table is the ShipperID column:

Shippers Table

ShipperID	ShipperName	Phone
1	Speedy Express	(503) 555-9831
2	United Package	(503) 555-3199
3	Federal Shipping	(503) 555-9931

# MySQL SQL

## What is SQL (Structured Query Language)?

SQL is the standard language for dealing with Relational Databases.

SQL is used to insert, search, update, and delete database records.

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## How to Use SQL

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

```
SELECT * FROM Customers;
```

## 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

Create Database and Table as like following

Server: 127.0.0.1 » Database: 9211\_2324 » Table: students

[Browse](#)
[Structure](#)
[SQL](#)
[Search](#)
[Insert](#)
[Export](#)
[Import](#)
[Privileges](#)
[Operations](#)
[Tracking](#)
[Triggers](#)

[Table structure](#)
[Relation view](#)

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
<input type="checkbox"/>	1	roll			No	None		AUTO_INCREMENT	<a href="#">Change</a> <a href="#">Drop</a> <a href="#">More</a>
<input type="checkbox"/>	2	fname	utf8mb4_general_ci		No	None			<a href="#">Change</a> <a href="#">Drop</a> <a href="#">More</a>
<input type="checkbox"/>	3	lname	utf8mb4_general_ci		No	None			<a href="#">Change</a> <a href="#">Drop</a> <a href="#">More</a>
<input type="checkbox"/>	4	city	utf8mb4_general_ci		No	None			<a href="#">Change</a> <a href="#">Drop</a> <a href="#">More</a>
<input type="checkbox"/>	5	email	utf8mb4_general_ci		No	None			<a href="#">Change</a> <a href="#">Drop</a> <a href="#">More</a>
<input type="checkbox"/>	6	phone	utf8mb4_general_ci		No	None			<a href="#">Change</a> <a href="#">Drop</a> <a href="#">More</a>
<input type="checkbox"/>	7	gender	utf8mb4_general_ci		No	None			<a href="#">Change</a> <a href="#">Drop</a> <a href="#">More</a>
<input type="checkbox"/>	8	dateofbirth			No	None			<a href="#">Change</a> <a href="#">Drop</a> <a href="#">More</a>
<input type="checkbox"/>	9	admissiondata			No	current_timestamp()			<a href="#">Change</a> <a href="#">Drop</a> <a href="#">More</a>

Console

And add some data as following

Server: 127.0.0.1 » Database: 9211\_2324 » Table: students

[Browse](#)
[Structure](#)
[SQL](#)
[Search](#)
[Insert](#)
[Export](#)
[Import](#)
[Privileges](#)
[Operations](#)
[Tracking](#)
[Triggers](#)

	roll	fname	lname	city	email	phone	gender	dateofbirth	admissiondata
<input type="checkbox"/> <a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	1	hetvi	Maheswari	Morbi	hetvi@gmail.com	8787678678	female	2004-02-14	2024-02-14 10:03:04
<input type="checkbox"/> <a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	2	kenil	sangani	Rajkot	kenil@gmail.com	2457834578	male	2004-02-13	2024-02-14 10:04:10
<input type="checkbox"/> <a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	3	ridham	vishnuswami	Ahamdabad	ridham@gmail.com	989898989	male	2005-02-12	2024-02-14 10:04:10
<input type="checkbox"/> <a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	4	bhalabhai	bavaliya	Rajkot	bhalabhai@gmail.com	2457834578	male	2004-02-13	2024-02-14 10:04:51
<input type="checkbox"/> <a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	5	sumit	talsaniya	Ahamdabad	sumit@gmail.com	989898989	male	2005-02-12	2024-02-14 10:04:51
<input type="checkbox"/> <a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	6	het	dadhaniya	Rajkot	het@gmail.com	2457834578	male	2004-02-13	2024-02-14 10:05:28
<input type="checkbox"/> <a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	7	deepak	vavdiya	Ahamdabad	deepak@gmail.com	989898989	male	2005-02-12	2024-02-14 10:05:28
<input type="checkbox"/> <a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	8	dhrumil	nathani	Rajkot	dhrumin@gmail.com	2457834578	male	2004-02-13	2024-02-14 10:06:01
<input type="checkbox"/> <a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	9	sujal	khachariya	Ahamdabad	sujal@gmail.com	989898989	male	2005-02-12	2024-02-14 10:06:01
<input type="checkbox"/> <a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	10	riya	barad	Rajkot	riya@gmail.com	2457834578	female	2004-02-13	2024-02-14 10:06:40
<input type="checkbox"/> <a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	11	khushi	thakar	Ahamdabad	khushi@gmail.com	989898989	female	2005-02-12	2024-02-14 10:06:40
<input type="checkbox"/> <a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	12	hasti	vala	Rajkot	hasti@gmail.com	2457834578	female	2004-02-13	2024-02-14 10:07:22
<input type="checkbox"/> <a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	13	priya	thakar	Ahamdabad	priya@gmail.com	989898989	female	2005-02-12	2024-02-14 10:07:22

# MySQL SELECT Statement

## The MySQL 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;`

---

`SELECT * from students;`

`SELECT roll, fname, lname, city from students`



## The MySQL 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;`

`SELECT city from students;`

`SELECT DISTINCT city from students;`

The following SQL statement counts and returns the number of different (distinct) city in the "Students" table:

`SELECT count(DISTINCT city) from students;`

# MySQL WHERE Clause

## The MySQL 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.!

```
SELECT * FROM students WHERE roll = 1
```

```
SELECT * FROM students WHERE roll > 5;
```

```
SELECT * FROM students WHERE not roll > 5;
```

```
SELECT * FROM students WHERE city = 'rajkot';
```

```
SELECT * FROM students WHERE city <> 'rajkot';
```

```
SELECT * FROM students WHERE not city = 'rajkot';
```

```
SELECT * FROM students WHERE roll BETWEEN 1 and 5
```

# MySQL AND, OR and NOT Operators

## The MySQL 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 ...;
```

```
SELECT * from students WHERE roll = 1
```

```
SELECT * from students WHERE roll = 1 and city = 'Rajkot';
```

### OR Syntax

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

```
SELECT * from students WHERE city = 'morbi' or city = 'Rajkot';
```

### NOT Syntax

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

```
SELECT * from students WHERE not city = 'morbi' ;
```

## Combining AND, OR and NOT

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

```
SELECT * from students WHERE roll = 1 and city = 'rajkot' or city = 'morbi'
```

```
SELECT * from students WHERE roll = 1 and (city = 'rajkot' or city = 'morbi')
```

# MySQL ORDER BY Keyword

## The MySQL 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;
```

```
SELECT * from students;
```

```
SELECT * from students ORDER by fname;
```

### ORDER BY DESC Example

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

```
SELECT * from students ORDER by fname DESC;
```

### ORDER BY Several Columns Example

```
SELECT * from students ORDER by fname, city;
```

```
SELECT * from students ORDER by fname asc, city DESC;
```

# MySQL INSERT INTO Statement

## The MySQL 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, ...);
```

```
INSERT into students (fname, lname, city, email, phone, gender, dateofbirth) VALUES ('Demo', 'text', 'example', 'demo@example.com', '9876543210', 'male', '2001-01-01')
```

---

#### 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.

```
INSERT into students (fname, lname, city, email, phone) VALUES ('Demo', 'text', 'example', 'demo@example.com', '9876543210')
```

# MySQL 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!

```
INSERT into students (fname, lname, city, email, phone) VALUES ('Demo', 'text', 'example', 'demo@example.com', '9876543210')
```

```
SELECT * FROM `students` WHERE gender = '';
```

```
SELECT * FROM `students` WHERE gender = 'NULL';
```

```
SELECT * FROM `students` WHERE gender is null;
```

## 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;
```

```
SELECT * FROM `students` WHERE gender is null;
```

### IS NOT NULL Syntax

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

```
SELECT * FROM `students` WHERE gender is not null;
```

# MySQL UPDATE Statement

## The MySQL 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, ...`

**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!`WHERE condition;`

```
UPDATE students set gender = 'male' WHERE roll = 15 or roll = 16
```

```
UPDATE students set city = 'rajkot'
```

```
UPDATE students set city = 'surat' WHERE roll > 10
```

```
UPDATE students set city = 'ahamdabad' WHERE roll > 5 and roll < 10;
```

### UPDATE Multiple Records

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

```
UPDATE students set gender = 'female', dateofbirth = '2001-01-15' WHERE roll >= 15
```

### Update Warning!

Be careful when updating records. If you omit the `WHERE` clause, ALL records will be updated!

# MySQL LIMIT Clause

## The MySQL LIMIT Clause

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

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

### LIMIT Syntax

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

```
SELECT * FROM `students`
```

```
SELECT * FROM `students` limit 5;
```

What if we want to select records 6-10 (inclusive)?

MySQL provides a way to handle this: by using `OFFSET`.

The SQL query below says "return only 5 records, start on record 6 (`OFFSET 5`)":

```
SELECT * FROM `students` limit 5 OFFSET 5;
```

```
SELECT * FROM `students` limit 5 OFFSET 10;
```

```
SELECT * FROM students WHERE city = 'rajkot' LIMIT 10 ;
```

---

```
SELECT * from students LIMIT 5 OFFSET 10
```

```
SELECT * from students LIMIT 10, 5; -- offset 10 limit 5
```



# MySQL MIN() and MAX() Functions

## MySQL 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;
```

```
SELECT max(dateofbirth) FROM students
```

```
SELECT min(dateofbirth) FROM students;
```

```
SELECT min(roll) FROM students;
```

```
SELECT max(roll) FROM students;
```

# MySQL COUNT(), AVG() and SUM() Functions

## MySQL 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;
```

```
SELECT COUNT(roll) from students
```

```
SELECT COUNT(roll) from students WHERE city = 'rajkot';
```

```
SELECT COUNT(roll) from students WHERE not city = 'rajkot';
```

```
SELECT sum(roll) from students
```

```
SELECT avg(roll) from students
```

```
SELECT sum(roll), avg(roll) from students;
```