

## Software requirements

Download Xampp from <https://www.apachefriends.org/download.html>

Download latest version of php 8.2.12 + (Feb 2024)

## How to open mysql server

Go to xampp control panel and start apache server and mysql server

Then go to browser and enter URL <http://localhost/phpmyadmin/>

From home page of mysql server select databases section and create new database.

# 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

# MySQL RDBMS

## 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

The columns in the "Customers" table above are: CustomerID, CustomerName, ContactName, Address, City, PostalCode and Country.

## 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:

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

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

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

## 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.

## 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`

## 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.

## 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

## 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;`

---

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

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 *` Example

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

`Select * 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 DISTINCT city FROM students`

`SELECT DISTINCT fname FROM students;`

SELECT Example Without DISTINCT

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

`SELECT city from students`

---

`Select count(distinct city ) from students`



## 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.!

## 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:

Select \* from students where city = 'rajkot'

Select \* from students where roll > 5

Select \* from students where not roll > 5;

Select \* from students where roll != 5;

## 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 ...;
```

### 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;
```

---

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

```
SELECT * FROM `students` WHERE roll = 1 and fname = 'udit';
```

```
SELECT * FROM `students` WHERE roll = 1 or roll = 2;
```

```
SELECT * FROM `students` WHERE roll = 1 or city = 'rajkot';
```

```
SELECT * FROM `students` WHERE roll = 1 and city = 'rajkot' or city = 'surat';
```

```
SELECT * from students WHERE not city = 'rajkot'
```

## 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 ORDER by fname
```

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

```
SELECT * FROM students ORDER by fname, city
```

```
SELECT * FROM students ORDER by fname, city desc
```

## 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, gender, dateofbirth, phone) values ("Rachit",  
"Chauhan", "Baroda", "rachit@gmail.com", "male", "2002-02-02", "9900009900")
```

```
INSERT into students values ("Rachit", "Chauhan", "Baroda", "rachit@gmail.com", "male", "2002-02-  
02", "9900009900")
```

```
Error:Column count doesn't match value count at row 1
```

### Insert Data Only in Specified Columns

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

```
INSERT into students (fname, lname, city, email, gender) values ("Rachit", "Chauhan", "Baroda",  
"rachit@gmail.com", "male");
```

## 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.

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

```
SELECT * FROM `students` WHERE dateofbirth = 'NULL'; // no data
```

```
SELECT * FROM `students` WHERE dateofbirth IS NULL;
```

```
SELECT * FROM `students` WHERE dateofbirth IS NOT NULL;
```

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;
```

## The IS NULL Operator

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

**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 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, ... 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!

`UPDATE students set city = 'Gandhinagar' //always use where while update data`

`update students set fname = 'Yagnik', lname = 'Yadav', city = 'Bhavanagar' WHERE roll = 3`

`update students set fname = 'Yagnik', lname = 'Yadav', city = 'Bhavanagar' WHERE roll > 3 and roll < 6;`

`UPDATE students set city = 'Rajkot' WHERE roll >= 5`

### UPDATE Multiple Records

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

### Update Warning!

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

`UPDATE students set fname = 'tushar', lname = 'kadam' WHERE roll = 4`

## 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
```

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

The SQL query below says "return only 3 records, start on record 4 (`OFFSET 3`)":

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

### ADD a WHERE CLAUSE

```
SELECT * FROM `students` where city = 'rajkot' Limit 5
```

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

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

```
SELECT max(fees) FROM students
```

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



## 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;
```

```
SELECT COUNT(fees) FROM students
```

```
SELECT COUNT(fees) FROM students WHERE fees > 10000;
```

```
SELECT sum(fees) FROM students WHERE fees > 10000;
```

```
SELECT count(fees), sum(fees) FROM students WHERE fees > 10000;
```

```
SELECT count(fees), sum(fees), avg(fees) FROM students
```

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;
```

## The MySQL 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!

### SQL DELETE Example

`DELETE FROM students WHERE roll = 5`

`DELETE FROM students WHERE city = 'rajkot'`

### 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 students`

`INSERT into students (fname, lname, city, email, gender, dateofbirth, phone, fees) values ("Rachit", "Chauhan", "Baroda", "rachit@gmail.com", "male", "2002-02-02", "9900009900", 15000);`

- Add multiple rows and check for roll number

It is possible to delete all the data from table and reset complete structure of the table with truncate clause

`TRUNCATE TABLE students`

`INSERT into students (fname, lname, city, email, gender, dateofbirth, phone, fees) values ("Rachit", "Chauhan", "Baroda", "rachit@gmail.com", "male", "2002-02-02", "9900009900", 15000);`

- Add multiple rows and check for roll number // started from 1

Insert some data in table

```
INSERT INTO `students` (`roll`, `fname`, `lname`, `city`, `email`, `gender`, `dateofbirth`, `phone`,  
`fees`, `admissiondate`) VALUES (NULL, 'udit', 'ghetiya', 'Rajula', 'udit@gmail.com', 'male', '2004-02-  
11', '998899889900', '18000', current_timestamp()),(NULL, 'Gaurang', 'Pandya', 'Baroda',  
'gaurang@gmail.com', 'male', '2004-02-11', '998899889900', '15000', current_timestamp()),(NULL,  
'yograjsinh', 'Rana', 'Junagadh', 'yorajsinh@gmail.com', 'male', '2004-02-11', '998899889900',  
'22000', current_timestamp()),(NULL, 'yadav', 'yagnik', 'Bhavanagar', 'yagnik@gmail.com', 'male',  
'2004-02-11', '998899889900', '19000', current_timestamp()),(NULL, 'Rachit', 'Chauhan', 'Jamnagar',  
'rachit@gmail.com', 'male', '2004-02-11', '998899889900', '12000', current_timestamp()),(NULL,  
'adarsh', 'chavda', 'amreli', 'adarsh@gmail.com', 'male', '2004-02-11', '998899889900', '12000',  
current_timestamp()),(NULL, 'rohan', 'dasadiya', 'Bhuj', 'rohan@gmail.com', 'male', '2004-02-11',  
'998899889900', '13000', current_timestamp()),(NULL, 'Tushar', 'Kadam', 'Morbi',  
'Tushar@gmail.com', 'male', '2004-02-11', '998899889900', '19000', current_timestamp()),(NULL,  
'Yash', 'Vaghela', 'Vadodara', 'yash@gmail.com', 'male', '2004-02-11', '998899889900', '22000',  
current_timestamp()),(NULL, 'Jayrajsinh', 'Parmar', 'Limdi', 'jayrajsinh@gmail.com', 'male', '2004-02-  
11', '998899889900', '24000', current_timestamp());
```

## The MySQL 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

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.

```
SELECT * FROM students WHERE fname like 'a%'
```

```
SELECT * FROM students WHERE fname like '%t';
```

```
SELECT * FROM students WHERE fname like '%i%';
```

```
SELECT * FROM students WHERE fname like '_a%';
```

```
SELECT * FROM students WHERE fname like 'a_%';
```

```
SELECT * FROM students WHERE fname like 'r__%';
```

```
SELECT * FROM students WHERE fname like 'r%t';
```

```
SELECT * FROM students WHERE fname not like 'r%t';
```

## MySQL 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 MySQL

Symbol	Description	Example
<code>%</code>	Represents zero or more characters	<code>bl%</code> finds bl, black, blue, and blob
<code>_</code>	Represents a single character	<code>h_t</code> finds hot, hat, and hit

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

```
SELECT * FROM students WHERE city = 'surat' or city = 'rajkot' OR city = 'baroda' or city = 'morbi';
```

```
SELECT * FROM students WHERE city in ('rajkot', 'baroda', 'amreli', 'bhuj', 'junagadh')
```

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

---

```
SELECT * FROM students WHERE roll in (SELECT roll from students WHERE not city = 'rajkot');
```

Outer query (sub query),

**First Execute sub query and get result from database, place this result data between in () and execute outer query,**

```
SELECT * from students WHERE roll in (SELECT roll FROM marks WHERE result = 'pass');
```

---

```
SELECT * from students WHERE roll not in (SELECT roll FROM marks WHERE result = 'pass');
```

## The MySQL 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;
```

```
SELECT * FROM students WHERE fees BETWEEN 5000 and 15000
```

```
SELECT * FROM students WHERE fees not BETWEEN 5000 and 15000;
```

```
SELECT * FROM students WHERE fname BETWEEN 'adarsh' and 'tushar'
```

```
SELECT * FROM students WHERE dateofbirth BETWEEN '2000-01-01' and '2005-12-31'
```

## MySQL Aliases

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;
```

```
SELECT fname as FirstName FROM students
```

```
SELECT fname as "First Name" FROM students;
```

```
SELECT roll as "Roll Number", fname as "First Name", lname as "Last Name" FROM students;
```

```
SELECT concat_ws(" - ", roll, fname, lname, city) as "Student Data" FROM students
```

---

### Without join and alias

```
SELECT students.roll, students.fname, students.lname, students.city, students.email,  
students.gender, students.dateofbirth, students.phone, students.fees, marks.total, marks.result  
FROM students, marks WHERE students.fname = 'bhavdeep' and students.roll = marks.roll;
```

### With alias

```
SELECT s.roll, s.fname, s.lname, s.city, s.email, s.gender, s.dateofbirth, s.phone, s.fees, m.total,  
m.result FROM students as s, marks as m WHERE s.fname = 'bhavdeep' and s.roll = m.roll;
```

```
SELECT CURRENT_TIMESTAMP
```

```
SELECT CURRENT_TIMESTAMP as "Today is :";
```

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



# MySQL Joins

## MySQL Joining Tables

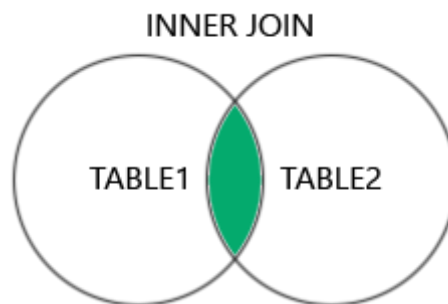
A `JOIN` clause is used to combine rows from two or more tables, based on a related column between them.

```
SELECT students.roll, students.fname, students.lname, students.city, students.email,  
students.gender, students.dateofbirth, students.phone, students.course, students.course,  
students.admissiondate, marks.total, marks.result from students inner JOIN marks on students.roll =  
marks.roll
```

```
SELECT s.roll, s.fname, s.lname, s.city, s.email, s.gender, s.dateofbirth, s.phone, s.course, s.course,  
s.admissiondate, m.total, m.result from students s inner JOIN marks m on s.roll = m.roll;
```

## MySQL 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;
```

```
SELECT s.roll, s.fname, s.lname, s.city, s.email, s.gender, s.dateofbirth, s.phone, s.course, s.course,  
s.admissiondate, m.total, m.result, a.absents, a.presents from students s inner JOIN marks m on s.roll  
= m.roll INNER join attendance a on s.roll = a.roll;
```

```
SELECT s.*, m.total, m.result, a.absents, a.presents from students s inner JOIN marks m on s.roll =  
m.roll INNER join attendance a on s.roll = a.roll;
```

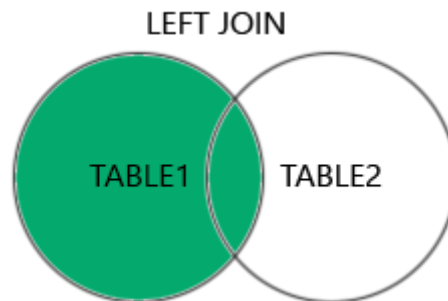
```
SELECT s.*, m.*, a.absents, a.presents from students s inner JOIN marks m on s.roll = m.roll INNER  
join attendance a on s.roll = a.roll;
```

**/// never do this**

```
SELECT s.*, m.*, a.* from students s inner JOIN marks m on s.roll = m.roll INNER join attendance a on  
s.roll = a.roll;
```

## MySQL LEFT JOIN Keyword

The `LEFT JOIN` keyword returns all records from the left table (table1), and the matching records (if any) from the right table (table2).



### LEFT JOIN Syntax

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

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

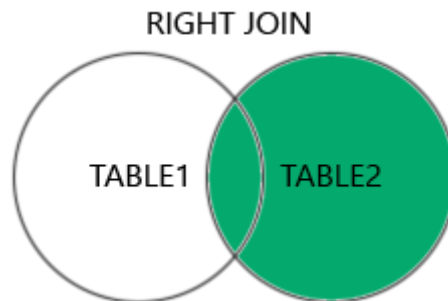
```
select s.roll, s.fname, s.lname, s.city, s.email, s.gender, s.dateofbirth, s.phone, s.fees, s.course,  
s.admissiondate, m.total, m.result from students s left join marks m on s.roll = m.roll;
```

grab all the data from left table (students ) if there is no data in right table (marks) then sql show NULL for empty values

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

## MySQL RIGHT JOIN Keyword

The `RIGHT JOIN` keyword returns all records from the right table (table2), and the matching records (if any) from the left table (table1).



### RIGHT JOIN Syntax

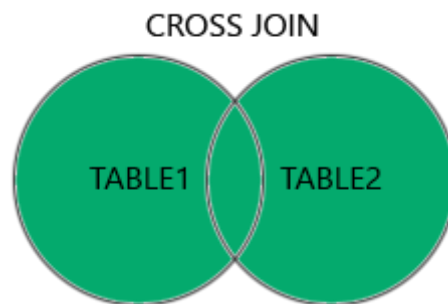
```
SELECT column_name(s) FROM table1 RIGHT JOIN table2 ON table1.column_name =  
table2.column_name;
```

```
select s.roll, s.fname, s.lname, s.city, s.email, s.gender, s.dateofbirth, s.phone, s.fees, s.course,  
s.admissiondate, m.total, m.result from students s right join marks m on s.roll = m.roll;
```

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

## SQL CROSS JOIN Keyword

The `CROSS JOIN` keyword returns all records from both tables (table1 and table2).



### CROSS JOIN Syntax

```
SELECT column_name(s) FROM table1 CROSS JOIN table2;
```

**Note:** `CROSS JOIN` can potentially return very large result-sets!

```
SELECT * from students CROSS join marks;
```

**Note:** The `CROSS 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.

If you add a `WHERE` clause (if table1 and table2 has a relationship), the `CROSS JOIN` will produce the same result as the `INNER JOIN` clause:

```
SELECT * from students CROSS join marks WHERE students.roll = marks.roll;
```

## MySQL 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*;

SELECT t1.fname, t1.lname from students t1, students t2 WHERE t1.roll != t2.roll and t1.city = t2.city;

SELECT t1.roll, t1.fname, t1.lname, t1.city from students t1, students t2 WHERE t1.roll != t2.roll and t1.city = t2.city;

## The MySQL 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;
```

```
SELECT * from students
```

```
UNION
```

```
SELECT * FROM students1
```

### 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;
```

```
SELECT * from students
```

```
UNION ALL
```

```
SELECT * FROM students1;
```

```
SELECT * from students
```

```
UNION ALL
```

```
SELECT * FROM students1 ORDER by city;
```

```
SELECT * from students where city = 'rajkot'
```

```
UNION ALL
```

```
SELECT * FROM students1 where city = 'rajkot';
```

# MySQL GROUP BY Statement

## The MySQL 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.

```
SELECT city, count(city) FROM students GROUP by (city)
```

## GROUP BY With JOIN Example

```
SELECT students.roll, COUNT(marks.marksid), sum(marks.total) from students INNER join marks on  
students.roll = marks.roll GROUP by (roll);
```



## The MySQL 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);
```

```
SELECT city, count(city) from students GROUP by (city) having count(city) = 1;
```

```
SELECT city, count(city) from students GROUP by (city) having count(city) > 1;
```

```
SELECT students.roll, COUNT(marks.marksid), sum(marks.total) from students INNER join marks on
students.roll = marks.roll GROUP by (roll) HAVING sum(marks.total) >= 400;
```

## The MySQL 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);
```

```
SELECT * from students WHERE EXISTS (SELECT roll FROM marks WHERE result = 'pass');
```

```
SELECT * from students WHERE EXISTS (SELECT roll FROM marks WHERE result = 'ATKT');
```

```
SELECT students.roll, students.fname, students.lname from students where EXISTS (SELECT roll
FROM marks WHERE students.roll = marks.roll and marks.result = 'pass')
```

```
SELECT students.roll, students.fname, students.lname from students where not EXISTS (SELECT roll
FROM marks WHERE students.roll = marks.roll and marks.result = 'pass');
```

# MySQL ANY and ALL Operators

## The MySQL 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 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.

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

```
SELECT * FROM students WHERE roll = any (SELECT roll FROM marks WHERE result = 'pass')
```

### The 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.

```
SELECT all fname FROM students WHERE true
```

# MySQL INSERT INTO SELECT Statement

## The MySQL 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 matches.

**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;
```

```
INSERT into students1 (fname, lname, city, email, gender, dateofbirth, phone, fees, course) SELECT  
fname, lname, city, email, gender, dateofbirth, phone, fees, course from students
```

```
INSERT into students1 (fname, lname, city, email, gender, dateofbirth, phone, fees, course) SELECT  
fname, lname, city, email, gender, dateofbirth, phone, fees, course from students where city =  
'rajkot';
```

## MySQL INSERT INTO SELECT Examples

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

# MySQL CASE Statement

## The MySQL CASE Statement

The `CASE` statement 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;`

```
SELECT roll, fname, lname, gender, city, email FROM students
```

```
SELECT roll, fname, lname, gender, city,
```

```
case
```

```
    WHEN city = 'Rajkot' THEN "Home Town"
```

```
    WHEN city = 'Surat' THEN "Too much Far from Home Town"
```

```
    WHEN city = 'morbi' THEN "Near by Home Town"
```

```
    WHEN city = 'limdi' THEN "Far from Home Town"
```

```
    WHEN city = 'Bhavanagar' THEN "Far from Home Town"
```

```
    WHEN city = 'Amreli' THEN "Near by Home Town"
```

```
    WHEN city = 'Jamnagar' THEN "Near by Home Town"
```

```
    WHEN city = 'Bhuj' THEN "Far from Home Town"
```

```
    WHEN city = 'Rajula' THEN "Far from Home Town"
```

```
    WHEN city = 'vadodara' or city = 'baroda' THEN "Far from Home Town"
```

```
    else "Unkonown istance"
```

```
end as "Distance From Rajkot", email FROM students;
```

# MySQL NULL Functions

## MySQL IFNULL() and COALESCE() Functions

```
SELECT roll, sum(absents + presents) as "Total Working Days" from attendance GROUP by (roll);
```

## MySQL IFNULL() Function

The MySQL [IFNULL\(\)](#) function lets you return an alternative value if an expression is NULL.

The example below returns 0 if the value is NULL:

```
SELECT roll, sum(ifnull(absents, 0) + ifnull(presents, 0)) as "Total Working Days" from attendance GROUP by (roll);
```

## MySQL COALESCE() Function

```
SELECT roll, sum(coalesce(absents, 0) + coalesce(presents, 0)) as "Total Working Days" from attendance GROUP by (roll);
```

## MySQL Comments

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

---

### Single Line Comments

Single line comments start with --.

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

-- find null values and replace with 0

```
SELECT roll, sum(coalesce(absents, 0) + coalesce(presents, 0)) as "Total Working Days" from  
attendance GROUP by (roll);
```

### 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;
```

/\* find null values and replace with 0 (this is multiline comment in MySql)\*/

```
SELECT roll, sum(coalesce(absents, 0) + coalesce(presents, 0)) as "Total Working Days" from  
attendance GROUP by (roll);
```



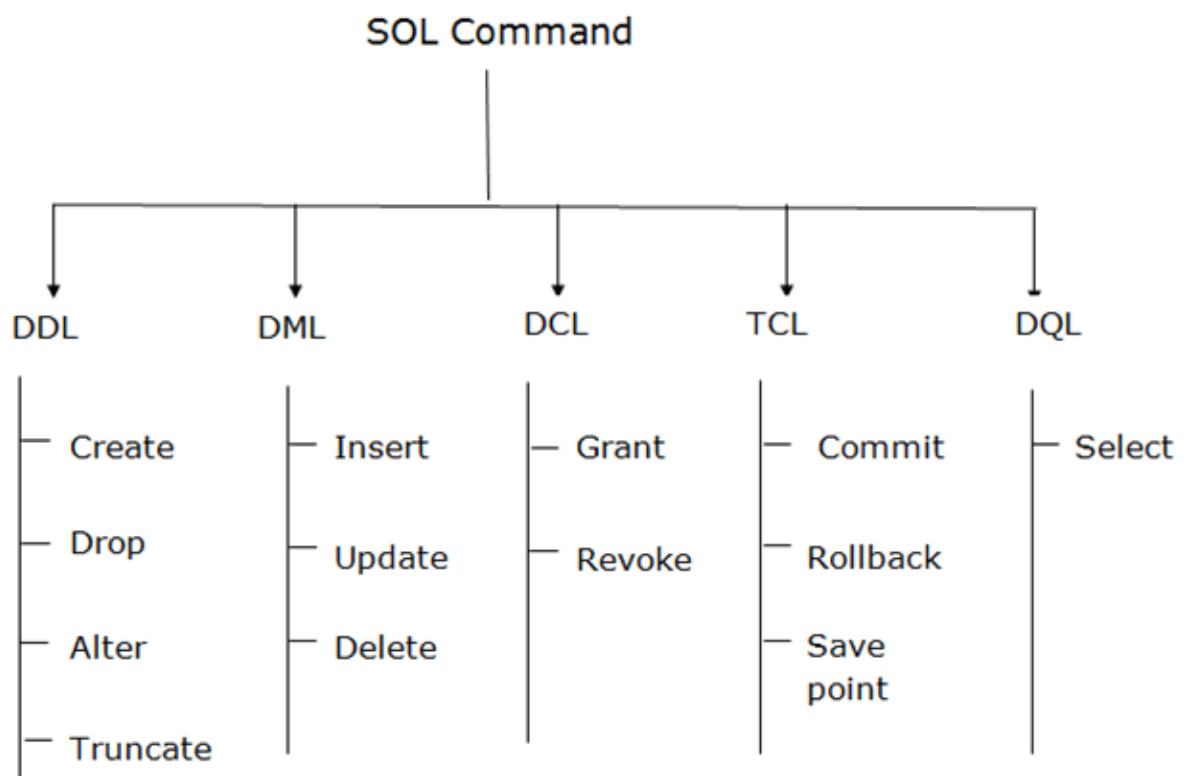


# SQL Commands

- SQL commands are instructions. It is used to communicate with the database. It is also used to perform specific tasks, functions, and queries of data.
- SQL can perform various tasks like create a table, add data to tables, drop the table, modify the table, set permission for users.

## Types of SQL Commands

There are five types of SQL commands: DDL, DML, DCL, TCL, and DQL.



### 1. Data Definition Language (DDL)

- DDL changes the structure of the table like creating a table, deleting a table, altering a table, etc.
- All the command of DDL are auto-committed that means it permanently save all the changes in the database.

Here are some commands that come under DDL:

- CREATE
- ALTER
- DROP
- TRUNCATE

## 2. Data Manipulation Language

- DML commands are used to modify the database. It is responsible for all form of changes in the database.
- The command of DML is not auto-committed that means it can't permanently save all the changes in the database. They can be rollback.

## 3. Data Control Language

DCL commands are used to grant and take back authority from any database user.

Here are some commands that come under DCL:

- Grant
- Revoke

## 4. Transaction Control Language

TCL commands can only use with DML commands like INSERT, DELETE and UPDATE only.

These operations are automatically committed in the database that's why they cannot be used while creating tables or dropping them.

Here are some commands that come under TCL:

- COMMIT
- ROLLBACK
- SAVEPOINT

## 5. Data Query Language

DQL is used to fetch the data from the database.

It uses only one command:

- SELECT

**a. SELECT:** This is the same as the projection operation of relational algebra. It is used to select the attribute based on the condition described by WHERE clause.

# MySQL CREATE DATABASE Statement

## The MySQL CREATE DATABASE Statement

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

Syntax

`CREATE DATABASE databasename;`

**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;`

```
show DATABASES;
```

```
create DATABASE demo729;
```

```
show DATABASES
```

# The MySQL 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!

```
show DATABASES
```

```
DROP DATABASE demo729
```

```
show DATABASES
```

**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;`

## The MySQL 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.).

```
CREATE TABLE persons (personid int AUTO_INCREMENT PRIMARY key, fname varchar(20), lname  
varchar(20), email varchar(128), phone varchar(15), gender varchar(6), `dateof birth` date)
```

## 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 ....;
```

```
CREATE TABLE persons_backup as SELECT * from persons
```

```
CREATE TABLE persons_backup1 as SELECT personid, fname, lname from persons;
```

# MySQL ALTER TABLE Statement

## MySQL 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;
```

```
ALTER TABLE persons add COLUMN city varchar(30)
```

```
ALTER TABLE persons add COLUMN state varchar(30), add COLUMN country varchar(20)
```

```
ALTER TABLE persons add COLUMN zipcode int after city
```

### 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;
```

```
ALTER TABLE persons DROP COLUMN zipcode
```

### ALTER TABLE- MODIFY COLUMN

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

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

```
ALTER TABLE persons MODIFY COLUMN gender varchar(10)
```

# MySQL DROP TABLE Statement

## The MySQL 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!

```
drop TABLE persons_backup1
```

## MySQL TRUNCATE TABLE

The `TRUNCATE TABLE` statement is used to delete (reset the table structure to new – auto Increment) the data inside a table, but **not** the table itself.

Syntax

`TRUNCATE TABLE table_name;`

```
TRUNCATE TABLE students1
```

# MySQL Constraints

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

## 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,  
    ....  
);
```

## MySQL 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



# MySQL NOT NULL Constraint

## MySQL 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.

### NOT NULL on CREATE TABLE

```
create table persons1 (personid int AUTO_INCREMENT PRIMARY key, fname varchar(20) not null, lname varchar(20) not null, city varchar(20) not null)
```

```
INSERT INTO persons1 (fname, lname, city) values ('Bhavdeep', 'Sorathiya', 'Rajkot')
```

```
INSERT INTO persons1 (fname, lname, city) values ('Bhavdeep', 'Sorathiya', NULL);
```

```
1048 - Column 'city' cannot be null
```

### NOT NULL on ALTER TABLE

```
ALTER table persons1 add COLUMN age int
```

```
ALTER TABLE persons1 MODIFY COLUMN age int not null
```

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

```
INSERT INTO persons1 (fname, lname, city, age) values ('Bhavdeep', 'Sorathiya', 'baroda', NULL);
```

# MySQL UNIQUE Constraint

## MySQL 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.

## UNIQUE Constraint on CREATE TABLE

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

```
create table persons (personid int not null, fname varchar(20) not null, lname varchar(20) not null, city varchar(20) not null, UNIQUE(personid))
```

```
INSERT into persons (personid, fname, lname, city) values (1, 'Udit', 'Ghetiya', 'Rajkot')
```

```
INSERT into persons (personid, fname, lname, city) values (1, 'Udit', 'patel', 'Rajkot');
```

```
#1062 - Duplicate entry '1' for key 'personid'
```

```
INSERT into persons (personid, fname, lname, city) values (2, 'Udit', 'patel', 'Rajkot');
```

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

```
drop table persons;
```

```
create table persons (personid int not null, fname varchar(20) not null, lname varchar(20) not null, city varchar(20) not null, CONSTRAINT unqid UNIQUE (personid))
```

```
INSERT into persons (personid, fname, lname, city) values (1, 'Udit', 'Ghetiya', 'Rajkot')
```

```
INSERT into persons (personid, fname, lname, city) values (1, 'Udit', 'Ghetiya', 'Rajkot')
```

```
#1062 - Duplicate entry '1' for key 'unqid'
```

```
Following query drop named constrained unqid from persons table.
```

```
alter TABLE persons drop CONSTRAINT unqid
```

```
INSERT into persons (personid, fname, lname, city) values (1, 'Udit', 'Ghetiya', 'Rajkot')
```

```
INSERT into persons (personid, fname, lname, city) values (1, 'Udit', 'Ghetiya', 'Rajkot')
```

```
INSERT into persons (personid, fname, lname, city) values (1, 'Udit', 'Ghetiya', 'Rajkot')
```

## UNIQUE Constraint on ALTER TABLE

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

Truncate table persons

```
alter TABLE persons add UNIQUE(personid)
```

```
INSERT into persons (personid, fname, lname, city) values (1, 'Udit', 'Ghetiya', 'Rajkot')
```

```
INSERT into persons (personid, fname, lname, city) values (1, 'Udit', 'Ghetiya', 'Rajkot')
```

---

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

drop table persons

```
create table persons (personid int not null, fname varchar(20) not null, lname varchar(20) not null, city varchar(20) not null)
```

```
ALTER TABLE persons add CONSTRAINT unqid UNIQUE (personid)
```

```
INSERT into persons (personid, fname, lname, city) values (1, 'Udit', 'Ghetiya', 'Rajkot')
```

```
INSERT into persons (personid, fname, lname, city) values (1, 'Udit', 'Ghetiya', 'Rajkot')
```

---

```
INSERT into persons (personid, fname, lname, city) values (null, 'Udit', 'Ghetiya', 'Rajkot')
```

```
INSERT into persons (personid, fname, lname, city) values (null, 'Udit', 'Ghetiya', 'Rajkot')
```

- Major drawback of unique constraint is it allows NULL values in column.

## DROP a UNIQUE Constraint

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

```
ALTER table persons drop CONSTRAINT unqid
```

---

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

```
create table listoftown (townid int AUTO_INCREMENT PRIMARY key, townname varchar(20) UNIQUE, cityname varchar(20), district varchar(20), state varchar(20))
```

```
INSERT INTO listoftown (townname, cityname, district, state) values ('Navagam', 'Rajkot', 'Rajkot', 'Gujarat')
```

```
INSERT INTO listoftown (townname, cityname, district, state) values ('Navagam', 'Bhuj', 'Kutchh', 'Gujarat');
```

```
#1062 - Duplicate entry 'Navagam' for key 'townname'
```

```
drop table listoftown
```

```
create table listoftown (townid int AUTO_INCREMENT PRIMARY key, townname varchar(20), cityname varchar(20), district varchar(20), state varchar(20), CONSTRAINT unqtown UNIQUE(townname, cityname, district))
```

```
INSERT INTO listoftown (townname, cityname, district, state) values ('Navagam', 'Rajkot', 'Rajkot', 'Gujarat')
```

```
INSERT INTO listoftown (townname, cityname, district, state) values ('Navagam', 'Bhuj', 'Kutchh', 'Gujarat');
```

# MySQL PRIMARY KEY Constraint

## MySQL 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).

## PRIMARY KEY on CREATE TABLE

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

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

```
CREATE TABLE person (id int, fname varchar(20) not null, lname varchar(20) not null, city varchar(20) not null, PRIMARY key(id))
```

```
INSERT into person (id, fname, lname, city) VALUES(1, 'bhavdeep', 'sorathiya', 'rajkot')
```

```
INSERT into person (id, fname, lname, city) VALUES(1, 'bhavdeep', 'sorathiya', 'rajkot')
```

```
#1062 - Duplicate entry '1' for key 'PRIMARY'
```

```
drop TABLE person
```

```
CREATE TABLE person (id int, fname varchar(20) not null, lname varchar(20) not null, city varchar(20) not null, CONSTRAINT prikey_id PRIMARY key (id))
```

```
INSERT into person (id, fname, lname, city) VALUES(1, 'bhavdeep', 'sorathiya', 'rajkot')
```

```
INSERT into person (id, fname, lname, city) VALUES(1, 'bhavdeep', 'sorathiya', 'rajkot')
```

```
#1062 - Duplicate entry '1' for key 'PRIMARY'
```

```
ALTER TABLE person drop PRIMARY KEY
```

```
INSERT into person (id, fname, lname, city) VALUES(1, 'bhavdeep', 'sorathiya', 'rajkot')
```

```
INSERT into person (id, fname, lname, city) VALUES(1, 'bhavdeep', 'sorathiya', 'rajkot')
```

```
INSERT into person (id, fname, lname, city) VALUES(1, 'bhavdeep', 'sorathiya', 'rajkot')
```

```
Drop table person
```

## 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:

```
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:

```
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).

---

```
CREATE TABLE person (id int, fname varchar(20) not null, lname varchar(20) not null, city varchar(20) not null)
```

```
ALTER TABLE person add PRIMARY key (id)
```

```
INSERT into person (id, fname, lname, city) VALUES(1, 'bhavdeep', 'sorathiya', 'rajkot')
```

```
INSERT into person (id, fname, lname, city) VALUES(1, 'bhavdeep', 'sorathiya', 'rajkot')
```

```
ALTER TABLE person drop PRIMARY key
```

```
ALTER TABLE person add PRIMARY key (id, fname)
```

```
INSERT into person (id, fname, lname, city) VALUES(1, 'bhavdeep', 'sorathiya', 'rajkot');
```

```
INSERT into person (id, fname, lname, city) VALUES(1, 'bhavdip', 'sorathiya', 'rajkot')
```

```
INSERT into person (id, fname, lname, city) VALUES(2, 'bhavdip', 'sorathiya', 'rajkot');
```

```
INSERT into person (id, fname, lname, city) VALUES(2, 'bhavdip', 'sorathiya', 'rajkot');
```

```
#1062 - Duplicate entry '2-bhavdip' for key 'PRIMARY'
```

## DROP a PRIMARY KEY Constraint

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

```
ALTER TABLE Person DROP PRIMARY KEY;
```

# MySQL FOREIGN KEY Constraint

## MySQL 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.

---



## FOREIGN KEY on CREATE TABLE

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

```
create TABLE fees (feesid int AUTO_INCREMENT PRIMARY key, roll int, paymentdate date, amount  
int, paymentmode varchar(10), paymenttimestamp timestamp DEFAULT CURRENT_TIMESTAMP)
```

```
INSERT INTO `fees` (`feesid`, `roll`, `paymentdate`, `amount`, `paymentmode`, `paymenttimestamp`)  
VALUES (NULL, '123', '2024-02-17', '5000', 'cash', current_timestamp());
```

Above data is invalid because we don't have student with roll 123

```
drop TABLE fees
```

```
create TABLE fees (feesid int AUTO_INCREMENT PRIMARY key, roll int, paymentdate date, amount  
int, paymentmode varchar(10), paymenttimestamp timestamp DEFAULT CURRENT_TIMESTAMP,  
FOREIGN key (roll) REFERENCES students(roll))
```

```
INSERT INTO `fees` (`feesid`, `roll`, `paymentdate`, `amount`, `paymentmode`, `paymenttimestamp`)  
VALUES (NULL, '123', '2024-02-17', '5000', 'cash', current_timestamp());
```

```
#1452 - Cannot add or update a child row: a foreign key constraint fails  
(`729_2324`.`fees`, CONSTRAINT `fees_ibfk_1` FOREIGN KEY (`roll`)  
REFERENCES `students` (`roll`))
```

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

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

```
drop TABLE fees
```

```
create TABLE fees (feesid int AUTO_INCREMENT PRIMARY key, roll int, paymentdate date, amount  
int, paymentmode varchar(10), paymenttimestamp timestamp DEFAULT CURRENT_TIMESTAMP,  
CONSTRAINT fk_roll FOREIGN key (roll) REFERENCES students(roll))
```

```
INSERT INTO `fees` (`feesid`, `roll`, `paymentdate`, `amount`, `paymentmode`, `paymenttimestamp`)  
VALUES (NULL, '123', '2024-02-17', '5000', 'cash', current_timestamp());
```

```
#1452 - Cannot add or update a child row: a foreign key constraint fails  
(`729_2324`.`fees`, CONSTRAINT `fk_roll` FOREIGN KEY (`roll`) REFERENCES  
`students` (`roll`))
```

## DROP a FOREIGN KEY Constraint

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

```
ALTER TABLE fees DROP CONSTRAINT fk_roll
```

```
INSERT INTO `fees` (`feesid`, `roll`, `paymentdate`, `amount`, `paymentmode`, `paymenttimestamp`)
VALUES (NULL, '123', '2024-02-17', '5000', 'cash', current_timestamp());
```

```
INSERT INTO `fees` (`feesid`, `roll`, `paymentdate`, `amount`, `paymentmode`, `paymenttimestamp`)
VALUES (NULL, '1234', '2024-02-17', '5000', 'cash', current_timestamp());
```

## 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:

```
ALTER TABLE fees add CONSTRAINT fk_roll FOREIGN key(roll) REFERENCES students(roll)
```

```
#1452 - Cannot add or update a child row: a foreign key constraint fails
(`729_2324`.`#sql-2668_353`, CONSTRAINT `fk_roll` FOREIGN KEY (`roll`)
REFERENCES `students` (`roll`))
```

```
TRUNCATE TABLE fees
```

```
ALTER TABLE fees add CONSTRAINT fk_roll FOREIGN key(roll) REFERENCES students(roll)
```

```
INSERT INTO `fees` (`feesid`, `roll`, `paymentdate`, `amount`, `paymentmode`, `paymenttimestamp`)
VALUES (NULL, '1', '2024-02-17', '4000', 'cash', current_timestamp()), (NULL, '2', '2024-02-17', '3500',
'case', current_timestamp());
```

```
DELETE from students WHERE roll = 1
```

```
#1451 - Cannot delete or update a parent row: a foreign key constraint
fails (`729_2324`.`fees`, CONSTRAINT `fk_roll` FOREIGN KEY (`roll`)
REFERENCES `students` (`roll`))
```

## MySQL 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.

### 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:

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

```
drop TABLE person
```

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

```
INSERT into persons (id, lastname, firstname, age) VALUES (1, 'bhavdeep', 'sorathiya', 21)
```

```
INSERT into persons (id, lastname, firstname, age) VALUES (1, 'bhavdeep', 'sorathiya', 17);
```

```
#4025 - CONSTRAINT `CONSTRAINT_1` failed for `729_2324`.`persons`
```

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

```
drop TABLE persons
```

```
CREATE TABLE persons (id int AUTO_INCREMENT PRIMARY key, fname varchar(20), lname  
varchar(20), city varchar(20), age int, CONSTRAINT checkAge CHECK (age >= 18 and age <=50))
```

```
INSERT into persons (fname, lname, city, age) VALUES ('bhavdeep', 'sorathiya', 'Rajkot', 19)
```

```
INSERT into persons (fname, lname, city, age) VALUES ('bhavdeep', 'sorathiya', 'Rajkot', 51);
```

```
#4025 - CONSTRAINT `checkAge` failed for `729_2324`.`persons`
```

```
ALTER TABLE persons drop CONSTRAINT checkage
```

```
INSERT into persons (fname, lname, city, age) VALUES ('bhavdeep', 'sorathiya', 'Rajkot', 51);
```

```
INSERT into persons (fname, lname, city, age) VALUES ('bhavdeep', 'sorathiya', 'Rajkot', 15);
```

```
ALTER TABLE persons add CONSTRAINT checkAge check (age >= 18 and age <= 50)
```

```
TRUNCATE TABLE persons
```

```
ALTER TABLE persons add CONSTRAINT checkAge check (age >= 18 and age <= 50)
```

```
INSERT into persons (fname, lname, city, age) VALUES ('bhavdeep', 'sorathiya', 'Rajkot', 15);
```

```
#4025 - CONSTRAINT `checkAge` failed for `729_2324`.`persons`
```

# MySQL DEFAULT Constraint

## MySQL 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.

### DEFAULT on CREATE TABLE

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

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

drop TABLE persons

```
CREATE TABLE persons (id int AUTO_INCREMENT PRIMARY key, fname varchar(20), lname  
varchar(20), city varchar(20) DEFAULT 'Rajkot', age int)
```

```
INSERT into persons (fname, lname, age) VALUES ('Udit', 'Ghetiya', 22)
```

```
Select * from persons
```

The `DEFAULT` constraint can also be used to insert system values, by using functions like [`CURRENT\_DATE\(\)`](#):

```
ALTER TABLE persons add COLUMN recordDate timestamp DEFAULT CURRENT_TIMESTAMP
```

```
INSERT into persons (fname, lname, age) VALUES ('Udit', 'Ghetiya', 22)
```

```
Select * from persons
```

```
ALTER TABLE persons add COLUMN state varchar(20) after city
```

```
ALTER TABLE persons MODIFY COLUMN state varchar(20) DEFAULT 'Gujarat'
```

```
INSERT into persons (fname, lname, age) VALUES ('Udit', 'Ghetiya', 22)
```

```
Select * from persons
```

```
ALTER TABLE persons ALTER state DROP DEFAULT
```

```
INSERT into persons (fname, lname, age) VALUES ('Udit', 'Ghetiya', 22)
```

# MySQL CREATE INDEX Statement

## MySQL 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 index fnameData on students(fname)
```

### 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, ...);

ALTER TABLE students drop index fnamedata

CREATE UNIQUE index fnameData on students(fname)
```

# MySQL AUTO INCREMENT Field

## What is an 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.

## MySQL AUTO\_INCREMENT Keyword

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.

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

```
CREATE TABLE persons (id int AUTO_INCREMENT PRIMARY key, fname varchar(20), lname varchar(20), city varchar(20))
```

```
INSERT into persons (fname, lname, city) VALUES ('yadav', 'yagnik', 'rajkot')
```

```
Select * from persons
```

```
ALTER TABLE persons AUTO_INCREMENT = 1000
```

```
INSERT into persons (fname, lname, city) VALUES ('yadav', 'yagnik', 'rajkot')
```

```
SELECT * FROM `persons`
```

# MySQL Working with Dates

## MySQL 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.

## MySQL 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

**Note:** The date data type are set for a column when you create a new table in your database!

## Working with Dates

```
SELECT * from students WHERE dateofbirth > '2004-12-31'
```

```
SELECT * from students WHERE dateofbirth < '2004-12-31'
```

```
SELECT * from students WHERE dateofbirth = '2004-02-11';
```

```
SELECT * from students WHERE dateofbirth = '2004-2-11';
```

```
SELECT * from students WHERE dateofbirth = '04-2-11';
```

```
SELECT * from students WHERE dateofbirth BETWEEN '2000-01-01' and '2003-12-31'
```

```
SELECT * from students WHERE dateofbirth BETWEEN '2000-01-01' and '2003-12-31'  
ORDER by (dateofbirth);
```

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

```
SELECT * from students WHERE admissiondate = '2024-02-09'
```

```
SELECT * from students WHERE admissiondate like '2024-02-09%';
```

```
SELECT * from students WHERE admissiondate not like '2024-02-09%';
```

```
SELECT * from students WHERE date(admissiondate) = '2024-02-09';
```



**Tip:** To keep your queries simple and easy to maintain, do not use time-components in your dates, unless you have to!

# MySQL Views

## MySQL 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;`

`CREATE view getStudents as SELECT * from students`

`SELECT * from getstudents`

---

```
CREATE or REPLACE VIEW getstudents as SELECT students.roll, students.fname, students.lname,
students.city, students.email, students.gender, students.dateofbirth, students.phone, students.fees,
students.course, marks.total, marks.result, attendance.absents, attendance.presents from students
INNER join marks on students.roll = marks.roll INNER join attendance on students.roll =
attendance.roll;
```

```
SELECT * FROM getstudents;
```

```
SELECT * FROM getstudents WHERE roll = 5;
```

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

```
CREATE or REPLACE VIEW `get students` as SELECT students.roll, students.fname, students.lname,
students.city, students.email, students.gender, students.dateofbirth, students.phone, students.fees,
students.course, marks.total, marks.result, attendance.absents, attendance.presents from students
INNER join marks on students.roll = marks.roll INNER join attendance on students.roll =
attendance.roll;
```

## MySQL Updating a View

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

### CREATE OR REPLACE VIEW Syntax

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

## MySQL Dropping a View

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

DROP VIEW Syntax

`DROP VIEW` *view\_name*;

DROP view `get Students`

drop VIEW getstudents

# MySQL Data Types

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

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.

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 <i>size</i> 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 <i>size</i> parameter specifies the maximum column length in characters - can be from 0 to 65535
BINARY(size)	Equal to CHAR(), but stores binary byte strings. The <i>size</i> parameter specifies the column length in bytes. Default is 1
VARBINARY(size)	Equal to VARCHAR(), but stores binary byte strings. The <i>size</i> 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
LOBLOB	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( <i>size</i> )	A bit-value type. The number of bits per value is specified in <i>size</i> . The <i>size</i> parameter can hold a value from 1 to 64. The default value for <i>size</i> is 1.
TINYINT( <i>size</i> )	A very small integer. Signed range is from -128 to 127. Unsigned range is from 0 to 255. The <i>size</i> 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( <i>size</i> )	A small integer. Signed range is from -32768 to 32767. Unsigned range is from 0 to 65535. The <i>size</i> parameter specifies the maximum display width (which is 255)
MEDIUMINT( <i>size</i> )	A medium integer. Signed range is from -8388608 to 8388607. Unsigned range is from 0 to 16777215. The <i>size</i> parameter specifies the maximum display width (which is 255)
INT( <i>size</i> )	A medium integer. Signed range is from -2147483648 to 2147483647. Unsigned range is from 0 to 4294967295. The <i>size</i> parameter specifies the maximum display width (which is 255)
INTEGER( <i>size</i> )	Equal to INT( <i>size</i> )
BIGINT( <i>size</i> )	A large integer. Signed range is from -9223372036854775808 to 9223372036854775807. Unsigned range is from 0 to 18446744073709551615. The <i>size</i> parameter specifies the maximum display width (which is 255)
FLOAT( <i>size</i> , <i>d</i> )	A floating point number. The total number of digits is specified in <i>size</i> . The number of digits after the decimal point is specified in the <i>d</i> parameter. This syntax is deprecated in MySQL 8.0.17, and it will be removed in future MySQL versions
FLOAT( <i>p</i> )	A floating point number. MySQL uses the <i>p</i> value to determine whether to use FLOAT or DOUBLE for the resulting data type. If <i>p</i> is from 0 to 24, the data type becomes FLOAT(). If <i>p</i> is from 25 to 53, the data type becomes DOUBLE()
DOUBLE( <i>size</i> , <i>d</i> )	A normal-size floating point number. The total number of digits is specified in <i>size</i> . The number of digits after the decimal point is specified in the <i>d</i> parameter
DOUBLE PRECISION( <i>size</i> , <i>d</i> )	

DECIMAL( <i>size</i> , <i>d</i> )	An exact fixed-point number. The total number of digits is specified in <i>size</i> . The number of digits after the decimal point is specified in the <i>d</i> parameter. The maximum number for <i>size</i> is 65. The maximum number for <i>d</i> is 30. The default value for <i>size</i> is 10. The default value for <i>d</i> is 0.
DEC( <i>size</i> , <i>d</i> )	Equal to DECIMAL( <i>size</i> , <i>d</i> )

**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( <i>fsp</i> )	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( <i>fsp</i> )	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( <i>fsp</i> )	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.

# 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
<a href="#"><u>ASCII</u></a>	Returns the ASCII value for the specific character
<a href="#"><u>CHAR_LENGTH</u></a>	Returns the length of a string (in characters)
<a href="#"><u>CHARACTER_LENGTH</u></a>	Returns the length of a string (in characters)
<a href="#"><u>CONCAT</u></a>	Adds two or more expressions together
<a href="#"><u>CONCAT_WS</u></a>	Adds two or more expressions together with a separator
<a href="#"><u>FIELD</u></a>	Returns the index position of a value in a list of values
<a href="#"><u>FIND_IN_SET</u></a>	Returns the position of a string within a list of strings
<a href="#"><u>FORMAT</u></a>	Formats a number to a format like "#,###,###.##", rounded to a specified number of decimal places
<a href="#"><u>INSERT</u></a>	Inserts a string within a string at the specified position and for a certain number of characters
<a href="#"><u>INSTR</u></a>	Returns the position of the first occurrence of a string in another string
<a href="#"><u>LCASE</u></a>	Converts a string to lower-case
<a href="#"><u>LEFT</u></a>	Extracts a number of characters from a string (starting from left)
<a href="#"><u>LENGTH</u></a>	Returns the length of a string (in bytes)
<a href="#"><u>LOCATE</u></a>	Returns the position of the first occurrence of a substring in a string
<a href="#"><u>LOWER</u></a>	Converts a string to lower-case
<a href="#"><u>LPAD</u></a>	Left-pads a string with another string, to a certain length
<a href="#"><u>LTRIM</u></a>	Removes leading spaces from a string
<a href="#"><u>MID</u></a>	Extracts a substring from a string (starting at any position)
<a href="#"><u>POSITION</u></a>	Returns the position of the first occurrence of a substring in a string
<a href="#"><u>REPEAT</u></a>	Repeats a string as many times as specified

<a href="#"><u>REPLACE</u></a>	Replaces all occurrences of a substring within a string, with a new substring
<a href="#"><u>REVERSE</u></a>	Reverses a string and returns the result
<a href="#"><u>RIGHT</u></a>	Extracts a number of characters from a string (starting from right)
<a href="#"><u>RPAD</u></a>	Right-pads a string with another string, to a certain length
<a href="#"><u>RTRIM</u></a>	Removes trailing spaces from a string
<a href="#"><u>SPACE</u></a>	Returns a string of the specified number of space characters
<a href="#"><u>STRCMP</u></a>	Compares two strings
<a href="#"><u>SUBSTR</u></a>	Extracts a substring from a string (starting at any position)
<a href="#"><u>SUBSTRING</u></a>	Extracts a substring from a string (starting at any position)
<a href="#"><u>SUBSTRING_INDEX</u></a>	Returns a substring of a string before a specified number of delimiter occurs
<a href="#"><u>TRIM</u></a>	Removes leading and trailing spaces from a string
<a href="#"><u>UCASE</u></a>	Converts a string to upper-case
<a href="#"><u>UPPER</u></a>	Converts a string to upper-case

## Examples

```
select ascii('a');
```

```
select char_length('Rajkot');
```

```
SELECT roll, fname, char_length(fname) from students
```

```
SELECT roll, fname, character_length(fname) from students;
```

```
SELECT roll, concat(fname, lname) as "Full Name" from students;
```

```
SELECT roll, concat(fname, " ",lname) as "Full Name" from students;
```

```
SELECT roll, concat_ws(" ",fname,lname,city) as "Full Name" from students;
```

```
SELECT roll, concat_ws(" - ",fname,lname,city) as "Full Name" from students;
```

```
SELECT field("s", "s", "q", "l")
```

```
SELECT field("k", "r", "a", "j", "k", "o", "t");
```

```
SELECT find_in_set("k", "r,a,j,k,o,t");
```



```

SELECT find_in_set("a", "r,a,j,k,o,t");

SELECT format(12345.6789, 2);

SELECT INSERT("W3Schools.com", 1, 9, "Example");

SELECT INSTR("W3Schools.com", "3") AS MatchPosition;

SELECT lcase(fname), lcase(lname), lcase(city) from students

SELECT lcase(concat_ws(" ", fname, lname, city)) from students;

SELECT roll, fname, left(fname, 4) from students

SELECT roll, fname, right(fname, 4) from students;

SELECT roll, fname, length(fname) from students;

SELECT LOCATE("3", "W3Schools.com") AS MatchPosition;

SELECT roll, fname, lower(fname), lcase(fname) FROM students

SELECT roll, fname, lpad(fname, 20) FROM students;

SELECT roll, fname, rpad(fname, 20) FROM students;

SELECT ltrim("    Rajkot  ")

SELECT rtrim("    Rajkot  ");

SELECT mid("Rajkot", 1, 3)

SELECT POSITION("3" IN "W3Schools.com") AS MatchPosition;

SELECT fname, REPEAT(fname, 5) from students

SELECT REPLACE("SQL Tutorial", "SQL", "HTML");

SELECT roll, fname, reverse(fname) from students

SELECT space(10)

SELECT strcmp("Rajkot", "Rajkot")

SELECT strcmp("Rajkot", "tajkot");

SELECT strcmp("tajkot", "rajkot");

SELECT SUBSTR("SQL Tutorial", 5, 3) AS ExtractString;

SELECT SUBSTRING("SQL Tutorial", 5, 3) AS ExtractString;

SELECT SUBSTRING_INDEX("www.w3schools.com", ".", 1);

SELECT trim("  www.w3schools.com  ");

SELECT roll, fname, ucase(fname), upper(fname) FROM students

```

## MySQL Advanced Functions

Function	Description
<a href="#"><u>BIN</u></a>	Returns a binary representation of a number
<a href="#"><u>BINARY</u></a>	Converts a value to a binary string
<a href="#"><u>CASE</u></a>	Goes through conditions and return a value when the first condition is met
<a href="#"><u>CAST</u></a>	Converts a value (of any type) into a specified datatype
<a href="#"><u>COALESCE</u></a>	Returns the first non-null value in a list
<a href="#"><u>CONNECTION_ID</u></a>	Returns the unique connection ID for the current connection
<a href="#"><u>CONV</u></a>	Converts a number from one numeric base system to another
<a href="#"><u>CONVERT</u></a>	Converts a value into the specified datatype or character set
<a href="#"><u>CURRENT_USER</u></a>	Returns the user name and host name for the MySQL account that the server used to authenticate the current client
<a href="#"><u>DATABASE</u></a>	Returns the name of the current database
<a href="#"><u>IF</u></a>	Returns a value if a condition is TRUE, or another value if a condition is FALSE
<a href="#"><u>IFNULL</u></a>	Return a specified value if the expression is NULL, otherwise return the expression
<a href="#"><u>ISNULL</u></a>	Returns 1 or 0 depending on whether an expression is NULL
<a href="#"><u>LAST_INSERT_ID</u></a>	Returns the AUTO_INCREMENT id of the last row that has been inserted or updated in a table
<a href="#"><u>NULLIF</u></a>	Compares two expressions and returns NULL if they are equal. Otherwise, the first expression is returned
<a href="#"><u>SESSION_USER</u></a>	Returns the current MySQL user name and host name
<a href="#"><u>SYSTEM_USER</u></a>	Returns the current MySQL user name and host name
<a href="#"><u>USER</u></a>	Returns the current MySQL user name and host name
<a href="#"><u>VERSION</u></a>	Returns the current version of the MySQL database

SELECT bin(12)

SELECT BINARY "W3Schools.com";

SELECT roll, fname, lname, gender, case when gender = 'male' then 'Bike' when gender = 'female' then 'Scooter' else 'City Bus' end as "Vehicle" from students

```
SELECT cast(CURRENT_TIMESTAMP as DATE)
```

```
SELECT roll, absents, presents, (COALESCE(absents, 0)+ COALESCE(presents,0)) as "Total Days" from attendance;
```

```
SELECT roll, absents, presents, (ifnull(absents, 0)+ ifnull(presents,0)) as "Total Days" from attendance;
```

```
SELECT CONNECTION_ID();
```

```
SELECT CONV(15, 10, 2); --convert 15 decimal to binary
```

```
SELECT CONV(15, 10, 16);
```

```
SELECT CONV(1110011010101000101, 2, 10);
```

```
SELECT CURRENT_USER()
```

```
SELECT SESSION_USER()
```

```
SELECT SYSTEM_USER();
```

```
SELECT USER();
```

```
SELECT DATABASE()
```

```
SELECT roll, if(roll > 5, "2024-02-25", "2024-02-26") as "Exam Date", fname, lname from students;
```

```
SELECT roll, absents, isnull(absents), presents, isnull(presents) from attendance;
```

```
SELECT * from attendance WHERE isnull(absents);
```

```
SELECT * from attendance WHERE isnull(absents) or isnull(presents);
```

```
SELECT last_insert_id()
```

```
SELECT NULLIF(25, "Hello");
```

```
SELECT NULLIF(25,25);
```

```
SELECT version()
```

## MySQL Numeric Functions

Function	Description
<a href="#"><u>ABS</u></a>	Returns the absolute value of a number
<a href="#"><u>ACOS</u></a>	Returns the arc cosine of a number
<a href="#"><u>ASIN</u></a>	Returns the arc sine of a number
<a href="#"><u>ATAN</u></a>	Returns the arc tangent of one or two numbers
<a href="#"><u>ATAN2</u></a>	Returns the arc tangent of two numbers
<a href="#"><u>AVG</u></a>	Returns the average value of an expression
<a href="#"><u>CEIL</u></a>	Returns the smallest integer value that is $\geq$ to a number
<a href="#"><u>CEILING</u></a>	Returns the smallest integer value that is $\geq$ to a number
<a href="#"><u>COS</u></a>	Returns the cosine of a number
<a href="#"><u>COT</u></a>	Returns the cotangent of a number
<a href="#"><u>COUNT</u></a>	Returns the number of records returned by a select query
<a href="#"><u>DEGREES</u></a>	Converts a value in radians to degrees
<a href="#"><u>DIV</u></a>	Used for integer division
<a href="#"><u>EXP</u></a>	Returns e raised to the power of a specified number
<a href="#"><u>FLOOR</u></a>	Returns the largest integer value that is $\leq$ to a number
<a href="#"><u>GREATEST</u></a>	Returns the greatest value of the list of arguments
<a href="#"><u>LEAST</u></a>	Returns the smallest value of the list of arguments
<a href="#"><u>LN</u></a>	Returns the natural logarithm of a number
<a href="#"><u>LOG</u></a>	Returns the natural logarithm of a number, or the logarithm of a number to a specified base
<a href="#"><u>LOG10</u></a>	Returns the natural logarithm of a number to base 10
<a href="#"><u>LOG2</u></a>	Returns the natural logarithm of a number to base 2
<a href="#"><u>MAX</u></a>	Returns the maximum value in a set of values
<a href="#"><u>MIN</u></a>	Returns the minimum value in a set of values
<a href="#"><u>MOD</u></a>	Returns the remainder of a number divided by another number
<a href="#"><u>PI</u></a>	Returns the value of PI

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

```

SELECT abs(-123)
SELECT acos(0.3)
SELECT asin(0.3);
SELECT atan(0.3);
SELECT atan2(0.3);
SELECT avg(presents) from attendance;
SELECT ceil(12.34)
SELECT ceiling(12.34);
SELECT cos(0.12)
SELECT cot(0.12);
SELECT COUNT(roll) from students WHERE city = 'rajkot'
SELECT degrees(1.2)
SELECT 100 div 5
SELECT 100 mod 6;
SELECT exp(1)
SELECT floor(12.34)
SELECT greatest(11, 22, 33, 44, 55, 66, 77, 88, 99)

```

```
SELECT least(11, 22, 33, 44, 55, 66, 77, 88, 99);
```

```
SELECT ln(0.12)
```

```
SELECT log(0.12);
```

```
SELECT log2(0.12);
```

```
SELECT log10(0.12);
```

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

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

```
SELECT pi()
```

```
SELECT pow(2, 10)
```

```
SELECT power(2, 10);
```

```
SELECT radians(180)
```

```
SELECT rand();
```

```
SELECT round(12345.6789, 6);
```

```
SELECT sign(10)
```

```
SELECT sin(0.12);
```

```
SELECT sqrt(144)
```

```
SELECT sum(absents) from attendance;
```

```
SELECT tan(0.12)
```

```
SELECT TRUNCATE(123.456, 1)
```

## MySQL Date Functions

Function	Description
<a href="#"><u>ADDDATE</u></a>	Adds a time/date interval to a date and then returns the date
<a href="#"><u>ADDTIME</u></a>	Adds a time interval to a time/datetime and then returns the time/datetime
<a href="#"><u>CURDATE</u></a>	Returns the current date
<a href="#"><u>CURRENT_DATE</u></a>	Returns the current date
<a href="#"><u>CURRENT_TIME</u></a>	Returns the current time
<a href="#"><u>CURRENT_TIMESTAMP</u></a>	Returns the current date and time
<a href="#"><u>CURTIME</u></a>	Returns the current time
<a href="#"><u>DATE</u></a>	Extracts the date part from a datetime expression
<a href="#"><u>DATEDIFF</u></a>	Returns the number of days between two date values
<a href="#"><u>DATE_ADD</u></a>	Adds a time/date interval to a date and then returns the date
<a href="#"><u>DATE_FORMAT</u></a>	Formats a date
<a href="#"><u>DATE_SUB</u></a>	Subtracts a time/date interval from a date and then returns the date
<a href="#"><u>DAY</u></a>	Returns the day of the month for a given date
<a href="#"><u>DAYNAME</u></a>	Returns the weekday name for a given date
<a href="#"><u>DAYOFMONTH</u></a>	Returns the day of the month for a given date
<a href="#"><u>DAYOFWEEK</u></a>	Returns the weekday index for a given date
<a href="#"><u>DAYOFYEAR</u></a>	Returns the day of the year for a given date
<a href="#"><u>EXTRACT</u></a>	Extracts a part from a given date
<a href="#"><u>FROM_DAYS</u></a>	Returns a date from a numeric datevalue
<a href="#"><u> HOUR</u></a>	Returns the hour part for a given date
<a href="#"><u>LAST_DAY</u></a>	Extracts the last day of the month for a given date
<a href="#"><u>LOCALTIME</u></a>	Returns the current date and time
<a href="#"><u>LOCALTIMESTAMP</u></a>	Returns the current date and time
<a href="#"><u>MAKEDATE</u></a>	Creates and returns a date based on a year and a number of days value
<a href="#"><u>MAKETIME</u></a>	Creates and returns a time based on an hour, minute, and second value

<a href="#"><u>MICROSECOND</u></a>	Returns the microsecond part of a time/datetime
<a href="#"><u>MINUTE</u></a>	Returns the minute part of a time/datetime
<a href="#"><u>MONTH</u></a>	Returns the month part for a given date
<a href="#"><u>MONTHNAME</u></a>	Returns the name of the month for a given date
<a href="#"><u>NOW</u></a>	Returns the current date and time
<a href="#"><u>PERIOD_ADD</u></a>	Adds a specified number of months to a period
<a href="#"><u>PERIOD_DIFF</u></a>	Returns the difference between two periods
<a href="#"><u>QUARTER</u></a>	Returns the quarter of the year for a given date value
<a href="#"><u>SECOND</u></a>	Returns the seconds part of a time/datetime
<a href="#"><u>SEC_TO_TIME</u></a>	Returns a time value based on the specified seconds
<a href="#"><u>STR_TO_DATE</u></a>	Returns a date based on a string and a format
<a href="#"><u>SUBDATE</u></a>	Subtracts a time/date interval from a date and then returns the date
<a href="#"><u>SUBTIME</u></a>	Subtracts a time interval from a datetime and then returns the time/datetime
<a href="#"><u>SYSDATE</u></a>	Returns the current date and time
<a href="#"><u>TIME</u></a>	Extracts the time part from a given time/datetime
<a href="#"><u>TIME_FORMAT</u></a>	Formats a time by a specified format
<a href="#"><u>TIME_TO_SEC</u></a>	Converts a time value into seconds
<a href="#"><u>TIMEDIFF</u></a>	Returns the difference between two time/datetime expressions
<a href="#"><u>TIMESTAMP</u></a>	Returns a datetime value based on a date or datetime value
<a href="#"><u>TO_DAYS</u></a>	Returns the number of days between a date and date "0000-00-00"
<a href="#"><u>WEEK</u></a>	Returns the week number for a given date
<a href="#"><u>WEEKDAY</u></a>	Returns the weekday number for a given date
<a href="#"><u>WEEKOFYEAR</u></a>	Returns the week number for a given date
<a href="#"><u>YEAR</u></a>	Returns the year part for a given date
<a href="#"><u>YEARWEEK</u></a>	Returns the year and week number for a given date

SELECT adddate(CURRENT\_DATE, INTERVAL 30 day)



```
SELECT adddate(CURRENT_DATE, INTERVAL 30 month);
SELECT CURRENT_TIMESTAMP, addtime(CURRENT_TIMESTAMP, 2);
SELECT CURRENT_DATE
SELECT CURRENT_TIME
SELECT CURRENT_TIMESTAMP
SELECT CURTIME()
SELECT year(CURRENT_TIMESTAMP)
SELECT month(CURRENT_TIMESTAMP);
SELECT day(CURRENT_TIMESTAMP);
SELECT date(CURRENT_TIMESTAMP);
SELECT hour(CURRENT_TIMESTAMP);
SELECT minute(CURRENT_TIMESTAMP);
SELECT second(CURRENT_TIMESTAMP);
SELECT datediff(CURRENT_DATE, "2001-04-26")
SELECT date_add(CURRENT_DATE, INTERVAL 20 day)
SELECT date_format(CURRENT_DATE, "%d / %m / %Y %h : %i : %s");
SELECT date_sub(CURRENT_TIMESTAMP, INTERVAL 50 month)
SELECT dayname(CURRENT_TIMESTAMP)
SELECT dayofmonth(CURRENT_TIMESTAMP);
SELECT dayofweek(CURRENT_TIMESTAMP);
SELECT dayofyear(CURRENT_TIMESTAMP);
SELECT extract(month from CURRENT_TIMESTAMP)
SELECT from_days(739303);
SELECT last_day(CURRENT_TIMESTAMP)
SELECT LOCALTIME
SELECT LOCALTIMESTAMP
SELECT makedate(2022, 5)
SELECT maketime(15, 15, 15)
SELECT microsecond("2024-02-22 15:15:14.0384")
SELECT monthname(CURRENT_TIMESTAMP)
SELECT now()
```

```
SELECT period_add(202401, 30);  
SELECT period_diff(202401, 202003);  
SELECT quarter(CURRENT_TIMESTAMP)  
SELECT SEC_TO_TIME(3600);  
SELECT STR_TO_DATE("August 10 2017", "%M %d %Y");  
SELECT subdate(CURRENT_TIMESTAMP, INTERVAL 10 year)  
SELECT sysdate()  
SELECT time(CURRENT_TIMESTAMP)  
SELECT TIME_FORMAT(CURRENT_TIMESTAMP, "%H %i %s");  
SELECT TIME_TO_SEC(CURRENT_TIMESTAMP);  
SELECT TIMEDIFF("13:10:11", "13:10:10");  
SELECT TIMESTAMP("2017-07-23", "13:10:11");  
SELECT to_days(CURRENT_TIMESTAMP)  
SELECT week(CURRENT_TIMESTAMP);  
SELECT weekday(CURRENT_TIMESTAMP);  
SELECT weekofyear(CURRENT_DATE);  
SELECT yearweek(CURRENT_DATE);
```