How to Start MySql Server

Download latest version of XAMPP From https://www.apachefriends.org/download.html

Install XAMPP and open XAMPP Control Panel

From Control panel you need to start two services apache, mysql

Now open browser and enter URL http://localhost/phpmyadmin/ or press admin button from XAMPP control panel.

Now you are connected with MySql server home page

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

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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
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 columns in the "Customers" table above are: CustomerID, CustomerName, ContactName, Address, City, PostalCode and Country. The table has 5 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.

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.

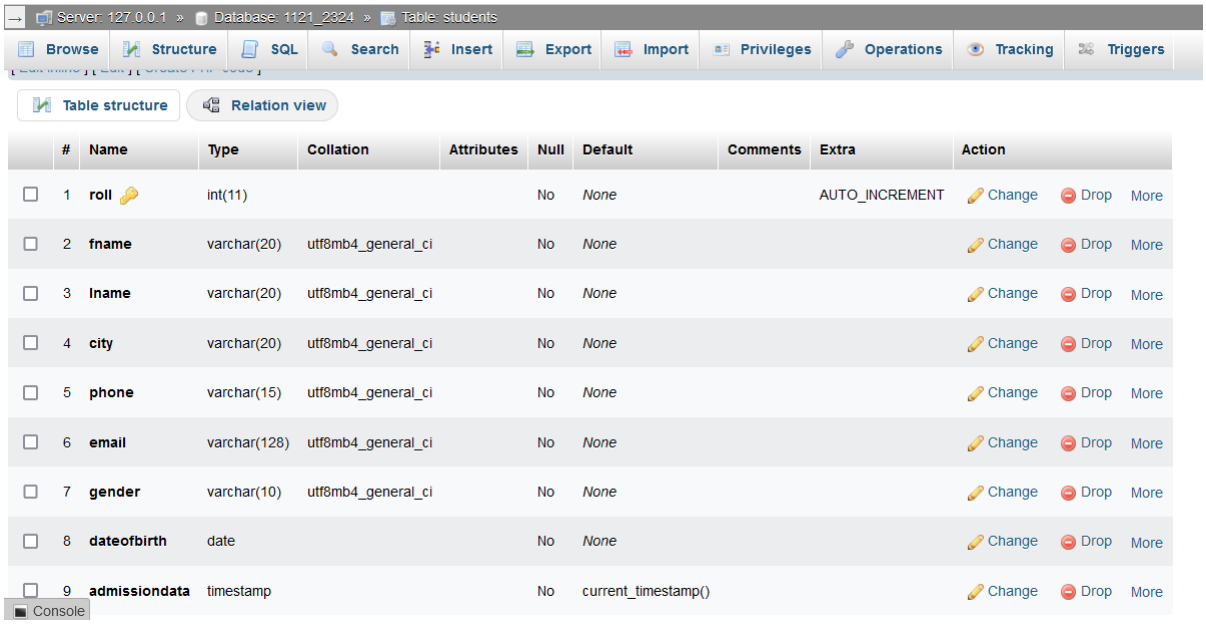
Semicolon is the standard way to separate each SQL statement in database systems that allow more than one SQL statement to be executed in the same call to the server.

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

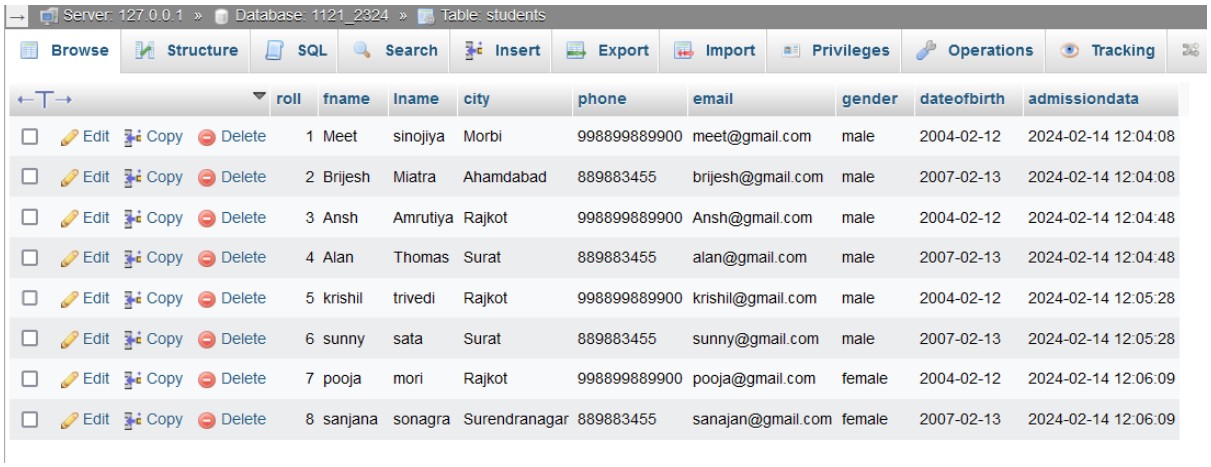
Some of The Most Important SQL Commands

- `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

Before continue with MySql you need to create sample database and add some data in it.



#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	roll	int(11)			No	None		AUTO_INCREMENT	Change Drop More
2	fname	varchar(20)	utf8mb4_general_ci		No	None			Change Drop More
3	lname	varchar(20)	utf8mb4_general_ci		No	None			Change Drop More
4	city	varchar(20)	utf8mb4_general_ci		No	None			Change Drop More
5	phone	varchar(15)	utf8mb4_general_ci		No	None			Change Drop More
6	email	varchar(128)	utf8mb4_general_ci		No	None			Change Drop More
7	gender	varchar(10)	utf8mb4_general_ci		No	None			Change Drop More
8	dateofbirth	date			No	None			Change Drop More
9	admissiondata	timestamp			No	current_timestamp()			Change Drop More



	roll	fname	lname	city	phone	email	gender	dateofbirth	admissiondata
Edit Copy Delete	1	Meet	sinojiya	Morbi	998899889900	meet@gmail.com	male	2004-02-12	2024-02-14 12:04:08
Edit Copy Delete	2	Brijesh	Miatra	Ahamdabad	889883455	brijesh@gmail.com	male	2007-02-13	2024-02-14 12:04:08
Edit Copy Delete	3	Ansh	Amrutiya	Rajkot	998899889900	Ansh@gmail.com	male	2004-02-12	2024-02-14 12:04:48
Edit Copy Delete	4	Alan	Thomas	Surat	889883455	alan@gmail.com	male	2007-02-13	2024-02-14 12:04:48
Edit Copy Delete	5	krishil	trivedi	Rajkot	998899889900	krishil@gmail.com	male	2004-02-12	2024-02-14 12:05:28
Edit Copy Delete	6	sunny	sata	Surat	889883455	sunny@gmail.com	male	2007-02-13	2024-02-14 12:05:28
Edit Copy Delete	7	pooja	mori	Rajkot	998899889900	pooja@gmail.com	female	2004-02-12	2024-02-14 12:06:09
Edit Copy Delete	8	sanjana	sonagra	Surendranagar	889883455	sanajan@gmail.com	female	2007-02-13	2024-02-14 12:06:09

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

```
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 city  from students;

SELECT DISTINCT city  from students;

SELECT count(DISTINCT city)  from students;

SELECT roll, fname, lname, dateofbirth 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*;

SELECT roll, fname, lname, dateofbirth from students WHERE roll = 1;

SELECT roll, fname, lname, dateofbirth from students WHERE roll > 5;

SELECT roll, fname, lname, dateofbirth from students WHERE not roll > 5;

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

SELECT * from students WHERE city = 'rajkot'

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

SELECT * from students WHERE city <> "rajkot";

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 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 = 'surat' or city = 'Rajkot';
```

NOT Syntax

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

```
SELECT * from students WHERE not (city = 'surat' or  city = 'Rajkot');
```

Combining AND, OR and NOT

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

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

```
SELECT * from students WHERE roll = 1 or roll = 5 and city = 'Rajkot';
```

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

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, city desc

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*, ...);

INSERT into students (fname, lname, city, phone, email, gender, dateofbirth) values ('demo', 'text', 'example', '9900009900', 'demo@example.com', 'male', '2001-02-01')

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 values ('demo', 'text', 'example', '9900009900', 'demo@example.com', 'male', '2001-02-01')
`#1136 - Column count doesn't match value count at row 1`

INSERT into students values (null,'demo', 'text', 'example', '9900009900', 'demo@example.com', 'male', '2001-02-01', null)

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) VALUES ('another', 'example', 'of insert')

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!

If you allow to NULL values in your table first you need to modify column to accept NULL values.

Go to structure section of our table then select specific column to allow null values click on change and select null check box and click save.

INSERT into students (fname, lname, city) VALUES ('another', 'example', 'of insert')

How to Test for NULL Values?

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

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

IS NULL Syntax

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

IS NOT NULL Syntax

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

SELECT * from students WHERE gender = 'NULL'

SELECT * from students WHERE gender = NULL;

SELECT * from students WHERE gender = '';

SELECT * from students WHERE gender is 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*, ... 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 = 'bhuj' WHERE roll = 1

UPDATE students set phone = '9090908080' WHERE roll = 1

UPDATE students set city = 'Gandhinagar'

UPDATE Multiple Records

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

UPDATE students set city = 'rajkot' WHERE roll >= 1 and roll <= 5

UPDATE students set city = 'ahamdabad' WHERE roll >= 6 and roll <= 10;

Update Warning!

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

UPDATE students set fname = 'KRISHIL', city = 'baroda', phone = '9998889990' WHERE roll = 5

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;

SELECT * FROM students where city = 'rajkot' LIMIT 5;

SELECT * FROM students LIMIT 5 OFFSET 5;

SELECT * FROM students LIMIT 5 OFFSET 10;

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 Customers LIMIT 3 OFFSET 3;
```

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

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

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 max(roll) FROM students
```

```
SELECT min(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;
```

MySQL LIKE Operator

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!

```
SELECT * from students

SELECT * from students WHERE fname like 'a%';

SELECT * from students WHERE fname like '%a%';

SELECT * from students WHERE fname like '%a';

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

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 's%a';
```

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

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

MySQL Wildcards

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
%	Represents zero or more characters	bl% finds bl, black, blue, and blob
_	Represents a single character	h_t finds hot, hat, and hit

The wildcards can also be used in combinations!

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

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

MySQL IN Operator

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, ...);
```

or:

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

SELECT * from students WHERE city = 'rajkot' or city = 'ahamdabad' or city = 'bhuj'

SELECT * from students WHERE city in ('rajkot', 'ahamdabad', 'baroda')

IN Operator Examples

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

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

SELECT * from students WHERE city in ('rajkot', 'ahamdabad', 'baroda')

```
SELECT * from students WHERE city not in('rajkot', 'ahamdabad', 'baroda');
```

MySQL BETWEEN Operator

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 roll BETWEEN 1 and 5
```

```
SELECT * FROM students WHERE roll not BETWEEN 1 and 5;
```

BETWEEN Text Values Example

```
SELECT * FROM students WHERE fname BETWEEN 'ansh' and 'krishil'
```

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

```
SELECT * FROM students WHERE dateofbirth not BETWEEN '2000-01-01' and '2005-12-31';
```

MySQL DELETE Statement

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!

If you try delete query on your table and you need to data back must create shadow copy of your current table to prevent any data loss

CREATE TABLE studentsBackup as SELECT * FROM students

SQL DELETE Example

DELETE from students WHERE Roll = 1

DELETE from students WHERE city = 'gandhinagar'

DELETE from students WHERE roll > 5

DELETE from students

Restore data from backup table

INSERT into students SELECT * from studentsbackup

Delete from students (empty students table)

INSERT into students (fname, lname, city, phone, email, gender, dateofbirth) values ('demo', 'text', 'example', '9900009900', 'demo@example.com', 'male', '2001-02-01')

Notice the roll number started from where we leave before delete

Select * from students

If you need to reset whole table with data and data structure then you need to run truncate table

TRUNCATE TABLE students

INSERT into students (fname, lname, city, phone, email, gender, dateofbirth) values ('demo', 'text', 'example', '9900009900', 'demo@example.com', 'male', '2001-02-01')

Select * from students

MySQL Aliases

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 * from students

SELECT roll, fname, lname, city, phone, email, gender, dateofbirth from students;

SELECT roll as "Roll Number", fname as "First Name", lname as "Last Name", city as "Home Town", phone as "Phone Number", email as "Email Address", gender as "Student Gender", dateofbirth as "Date of Birth" from students;

SELECT roll "Roll Number", fname "First Name", lname "Last Name", city "Home Town", phone "Phone Number", email "Email Address", gender "Student Gender", dateofbirth "Date of Birth" from students;

SELECT roll RollNumber, fname FirstName, lname LastName, city HomeTown, phone PhoneNumber, email EmailAddress, gender StudentGender, dateofbirth DateofBirth from students;

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

SELECT concat_ws("_", roll, fname, lname, city, email, phone, gender, dateofbirth, admissiondata) FROM students

SELECT concat_ws("_", roll, fname, lname, city, email, phone, gender, dateofbirth, admissiondata) as "Student Information" FROM students;

SELECT concat_ws(" * ", roll, fname, lname, city, email, phone, gender, dateofbirth, admissiondata) as "Student Information" FROM students;

Alias for Tables Example

Without alias

SELECT students.roll, students.fname, students.lname, students.city, students.phone, students.email, students.gender, students.dateofbirth, students.admissiondata, attendance.absents, attendance.presents from students, attendance WHERE students.roll = 1 and students.roll = attendance.roll

With alias

SELECT s.roll, s.fname, s.lname, s.city, s.phone, s.email, s.gender, s.dateofbirth, s.admissiondata, a.absents, a.presents from students as s, attendance as a WHERE s.roll = 1 and s.roll = a.roll;

SELECT s.roll, s.fname, s.lname, s.city, s.phone, s.email, s.gender, s.dateofbirth, s.admissiondata, a.absents, a.presents from students s, attendance a WHERE s.roll = 1 and s.roll = a.roll;

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

SELECT s.roll, s.fname, s.lname, s.city, s.phone, s.email, s.gender, s.dateofbirth, s.admissiondata, a.absents, a.presents, sum(a.absents+a.presents) from students s, attendance a WHERE s.roll = 1 and s.roll = a.roll;

SELECT s.roll, s.fname, s.lname, s.city, s.phone, s.email, s.gender, s.dateofbirth, s.admissiondata, a.absents, a.presents, sum(a.absents+a.presents) "Total Days" from students s, attendance a WHERE s.roll = 1 and s.roll = a.roll;

MySQL Joins

MySQL Joining Tables

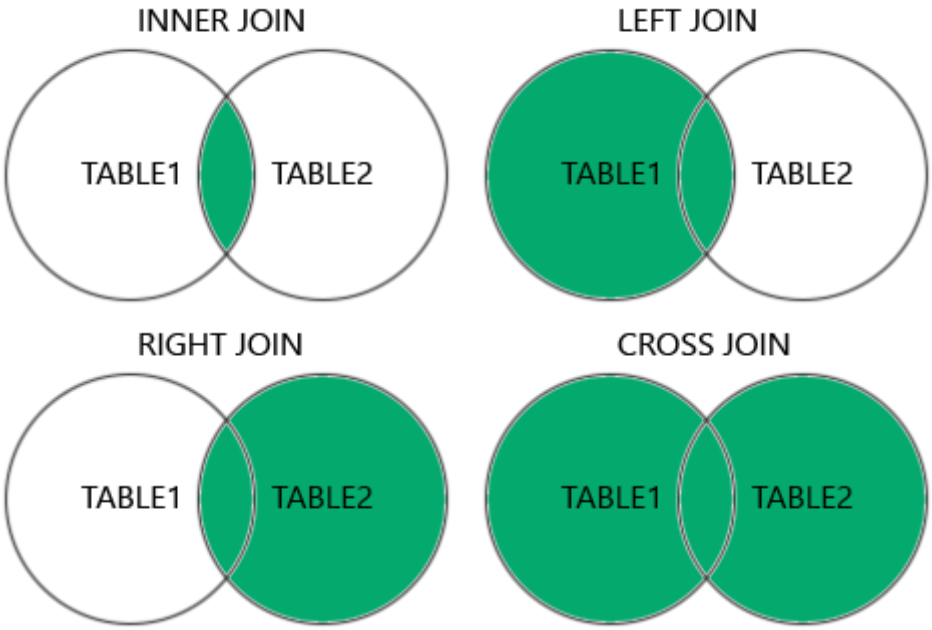
A `JOIN` clause is used to combine rows from two or more tables, based on a related column between them.

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

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

Supported Types of Joins in MySQL

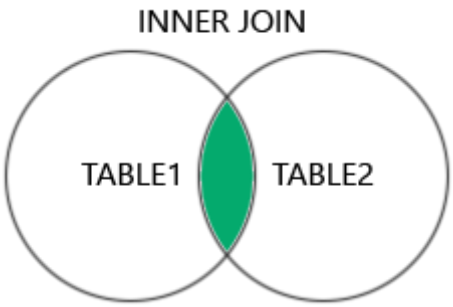
- `INNER JOIN`: Returns records that have matching values in both tables
- `LEFT JOIN`: Returns all records from the left table, and the matched records from the right table
- `RIGHT JOIN`: Returns all records from the right table, and the matched records from the left table
- `CROSS JOIN`: Returns all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



MySQL INNER JOIN Keyword

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.phone, s.email, s.gender, s.dateofbirth, s.admissiondata, m.total, m.result from students s inner JOIN marks m on s.roll = m.roll;

SELECT students.*, attendance.absents, attendance.presents FROM students INNER join attendance on students.roll = attendance.roll;

SELECT students.roll, students.fname, students.lname, students.city, students.phone, students.email, students.gender, students.dateofbirth, students.admissiondata, attendance.absents, attendance.presents from students INNER join attendance on students.roll = attendance.roll

JOIN Three Tables

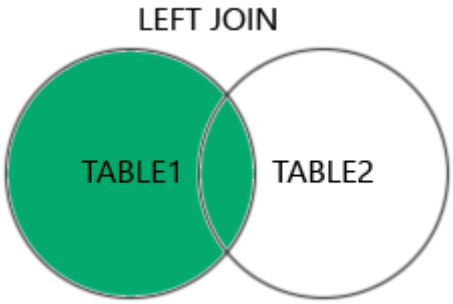
SELECT students.roll, students.fname, students.lname, students.city, students.phone, students.email, students.gender, students.dateofbirth, students.admissiondata, attendance.absents, attendance.presents, marks.total, marks.result from students INNER join attendance on students.roll = attendance.roll INNER join marks on students.roll = marks.roll;

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

MySQL LEFT JOIN Keyword

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*;

// inner join

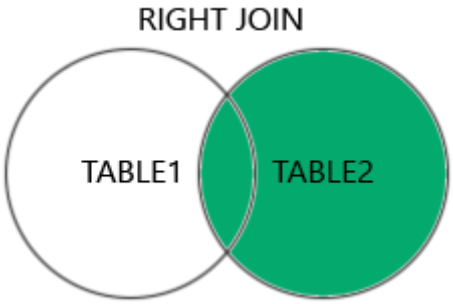
SELECT students.roll, students.fname, students.lname, students.city, students.phone, students.email, students.gender, students.dateofbirth, students.admissiondata, attendance.absents, attendance.presents from students INNER join attendance on students.roll = attendance.roll

// left join
SELECT students.roll, students.fname, students.lname, students.city, students.phone, students.email, students.gender, students.dateofbirth, students.admissiondata, attendance.absents, attendance.presents from students left join attendance on students.roll = attendance.roll;

MySQL RIGHT JOIN Keyword

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

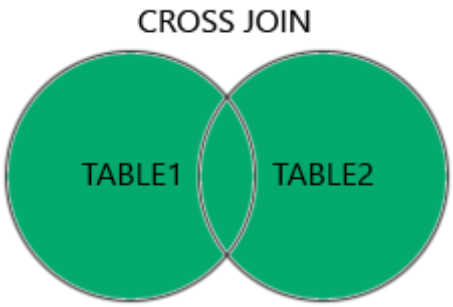
SELECT *column_name(s)* FROM *table1* RIGHT JOIN *table2* ON *table1.column_name* = *table2.column_name*;

SELECT students.roll, students.fname, students.lname, students.city, students.phone, students.email, students.gender, students.dateofbirth, students.admissiondata, attendance.absents, attendance.presents from students right join attendance on students.roll = attendance.roll;

MySQL CROSS JOIN Keyword

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!

MySQL CROSS JOIN Example

SELECT students.* from students CROSS join attendance

Return large resultset (total records of students * total records of attendance)

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

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 students.*, attendance.absents, attendance.presents from students CROSS join attendance WHERE students.roll = attendance.roll;

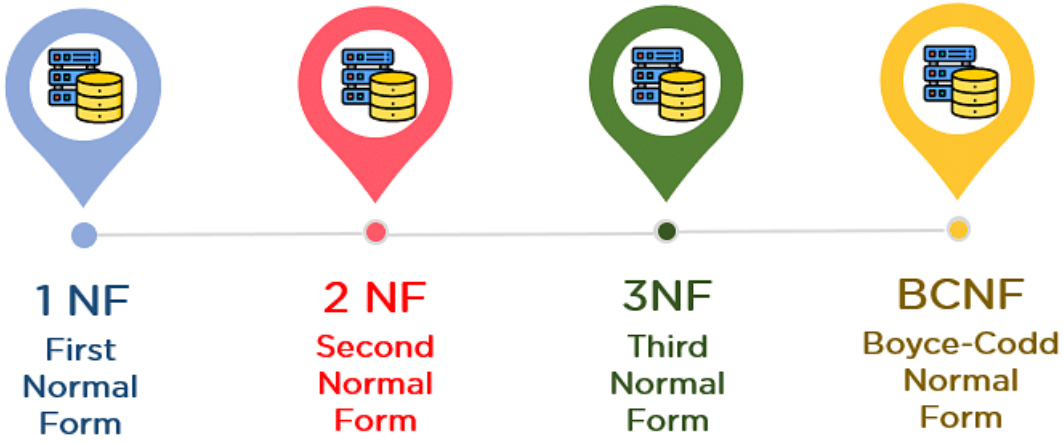
What Is Normalization in SQL?

Normalization is the process to eliminate data redundancy and enhance data integrity in the table. Normalization also helps to organize the data in the database. It is a multi-step process that sets the data into tabular form and removes the duplicated data from the relational tables.

Normalization organizes the columns and tables of a database to ensure that database integrity constraints properly execute their dependencies. It is a systematic technique of decomposing tables to eliminate data redundancy (repetition) and undesirable characteristics like Insertion, Update, and Deletion anomalies.

In 1970 Edgar F. Codd defined the First Normal Form.

Now let's understand the types of Normal forms with the help of examples.



1st Normal Form (1NF)

- A table is referred to as being in its First Normal Form if atomicity of the table is 1.
- Here, atomicity states that a single cell cannot hold multiple values. It must hold only a single-valued attribute.
- The First normal form disallows the multi-valued attribute, composite attribute, and their combinations.

Now you will understand the First Normal Form with the help of an example.

Below is a students' record table that has information about student roll number, student name, student course, and age of the student.

rollno	name	course	age
1	Rahul	c/c++	22
2	Harsh	java	18
3	Sahil	c/c++	23
4	Adam	c/c++	22
5	Lisa	java	24
6	James	c/c++	19
NULL	NULL	NULL	NULL

In the students record table, you can see that the course column has two values. Thus it does not follow the First Normal Form. Now, if you use the First Normal Form to the above table, you get the below table as a result.

rollno	name	course	age
1	Rahul	c	22
1	Rahul	c++	22
2	Harsh	java	18
3	Sahil	c	23
3	Sahil	c++	23
4	Adam	c	22
4	Adam	c++	22
5	Lisa	java	24
6	James	c	19
6	James	c++	19

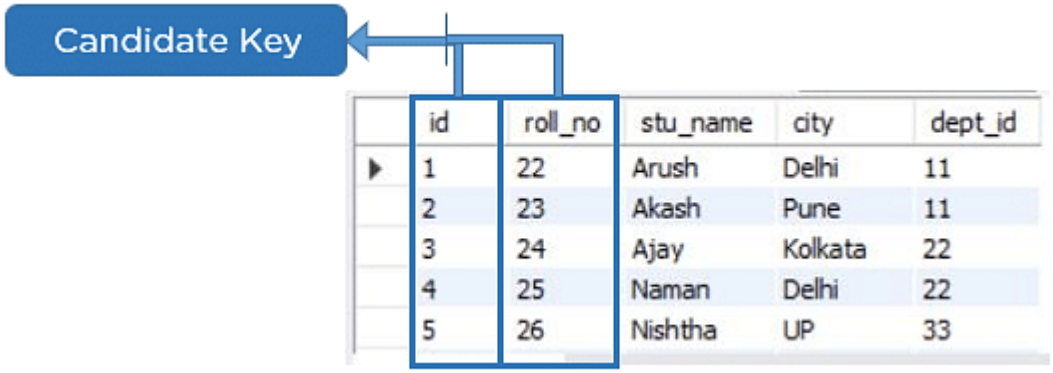
By applying the First Normal Form, you achieve atomicity, and also every column has unique values.

Before proceeding with the Second Normal Form, get familiar with Candidate Key and Super Key.

Candidate Key

A candidate key is a set of one or more columns that can identify a record uniquely in a table, and YOU can use each candidate key as a Primary Key.

Now, let's use an example to understand this better.



Super Key

Super key is a set of over one key that can identify a record uniquely in a table, and the Primary Key is a subset of Super Key.

Let's understand this with the help of an example.

Super Key

Super key is a set of over one key that can identify a record uniquely in a table, and the Primary Key is a subset of Super Key.

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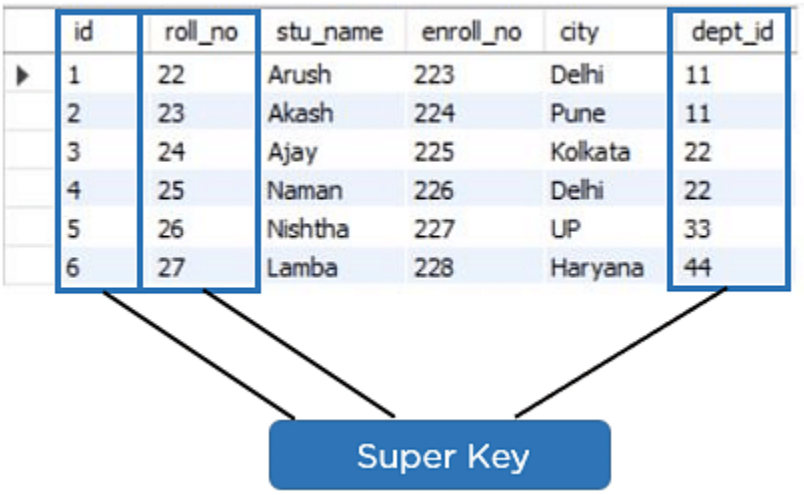

Second Normal Form (2NF)

The first condition for the table to be in Second Normal Form is that the table has to be in First Normal Form. The table should not possess partial dependency. The partial dependency here means the proper subset of the candidate key should give a non-prime attribute.

Now understand the Second Normal Form with the help of an example.

Consider the table Location:

cust_id	storeid	store_location
1	D1	Toronto
2	D3	Miami
3	T1	California
4	F2	Florida
5	H3	Texas

The Location table possesses a composite primary key cust_id, storeid. The non-key attribute is store_location. In this case, store_location only depends on storeid, which is a part of the primary key. Hence, this table does not fulfill the second normal form.

To bring the table to Second Normal Form, you need to split the table into two parts. This will give you the below tables:

cust_id	storeid
1	D1
2	D3
3	T1
4	F2
5	H3

storeid	store_location
D1	Toronto
D3	Miami
T1	California
F2	Florida
H3	Texas

As you have removed the partial functional dependency from the location table, the column store_location entirely depends on the primary key of that table, storeid.

Now that you understood the 1st and 2nd Normal forms, you will look at the next part of this Normalization in SQL tutorial.

Third Normal Form (3NF)

The first condition for the table to be in Third Normal Form is that the table should be in the Second Normal Form.

The second condition is that there should be no transitive dependency for non-prime attributes, which indicates that non-prime attributes (which are not a part of the candidate key) should not depend on other non-prime attributes in a table. Therefore, a transitive dependency is a functional dependency in which A → C (A determines C) indirectly, because of A → B and B → C (where it is not the case that B → A).

The third Normal Form ensures the reduction of data duplication. It is also used to achieve data integrity.

Below is a student table that has student id, student name, subject id, subject name, and address of the student as its columns.

stu_id	name	subid	sub	address
1	Arun	11	SQL	Delhi
2	Varun	12	Java	Bangalore
3	Harsh	13	C++	Delhi
4	Keshav	12	Java	Kochi

In the above student table, stu_id determines subid, and subid determines sub. Therefore, stu_id determines sub via subid. This implies that the table possesses a transitive functional dependency, and it does not fulfill the third normal form criteria.

Now to change the table to the third normal form, you need to divide the table as shown below:

stu_id	name	subid	address
1	Arun	11	Delhi
2	Varun	12	Bangalore
3	Harsh	13	Delhi
4	Keshav	12	Kochi

subid	subject
11	SQL
12	java
13	C++
12	Java

As you can see in both the tables, all the non-key attributes are now fully functional, dependent only on the primary key. In the first table, columns name, subid, and addresses only depend on stu_id. In the second table, the sub only depends on subid.

Boyce Codd Normal Form (BCNF)

Boyce Codd Normal Form is also known as 3.5 NF. It is the superior version of 3NF and was developed by Raymond F. Boyce and Edgar F. Codd to tackle certain types of anomalies which were not resolved with 3NF.

The first condition for the table to be in Boyce Codd Normal Form is that the table should be in the third normal form. Secondly, every Right-Hand Side (RHS) attribute of the functional dependencies should depend on the super key of that particular table.

For example :

You have a functional dependency $X \rightarrow Y$. In the particular functional dependency, X has to be the part of the super key of the provided table.

Consider the below subject table:

	stuid	subject	professor
▶	1	SQL	Prof. Mishra
	2	Java	Prof. Anand
	2	C++	Prof. Kanth
	3	Java	Prof. James
	4	DBMS	Prof. Lokesh

The subject table follows these conditions:

Each student can enroll in multiple subjects.

Multiple professors can teach a particular subject.

For each subject, it assigns a professor to the student.

In the above table, student_id and subject together form the primary key because using student_id and subject; you can determine all the table columns

Another important point to be noted here is that one professor teaches only one subject, but one subject may have two professors.

Which exhibit there is a dependency between subject and professor, i.e. subject depends on the professor's name.

to

The table is in 1st Normal form as all the column names are unique, all values are atomic, and all the values stored in a particular column are of the same domain.

The table also satisfies the 2nd Normal Form, as there is no Partial Dependency.

And, there is no Transitive Dependency; hence, the table also satisfies the 3rd Normal Form.

This table follows all the Normal forms except the Boyce Codd Normal Form.

As you can see stuid, and subject forms the primary key, which means the subject attribute is a prime attribute.

However, there exists yet another dependency - professor → subject

BCNF does not follow in the table as a subject is a prime attribute, the professor is a non-prime attribute.

To transform the table into the BCNF, you will divide the table into two parts. One table will hold stuid which already exists and the second table will hold a newly created column profid.

	stuid	profid
▶	1	101
	2	102
	2	103
	3	102
	4	104

And in the second table will have the columns profid, subject, and professor, which satisfies the BCNF.

	profid	subject	professor
▶	1	SQL	Prof. Mishra
	2	Java	Prof. Anand
	2	C++	Prof. Kanth
	3	Java	Prof. James
	4	DBMS	Prof. Lokesh

With this, you have reached the conclusion of the ‘Normalization in SQL’ tutorial.