

## Understanding to SQL (Structured Query Language)

SQL stands for Structured Query Language. SQL was the first commercial language introduced for E.F Codd's Relational model of database. Today almost all RDBMS(MySql, Oracle, Infomix, Sybase, MS Access) use SQL as the standard database query language. SQL is used to perform all types of data operations in RDBMS. SQL to store, query, and manipulate data. SQL is a special-purpose programming language designed for managing data in a relational database.

SQL became a standard of the American National Standards Institute (ANSI) in 1986, and of the International Organization for Standardization (ISO) in 1987. Most DBMS primarily to the ANSI SQL Standard although it includes a few of its own extensions to the language. A query is a structured set of instructions and criteria for retrieving, adding, modifying, and deleting database information. However, structured query language, or SQL (sometimes pronounced *sequel*), is a standard data manipulation language among many DBMSs.

SQL defines following ways to manipulate data stored in an RDBMS. There are following five categorical commands of SQL.

### 1. DDL: Data Definition Language

This includes changes to the structure of the table like creation of table, altering table, deleting a table etc. All DDL commands are auto-committed. That means it saves all the changes permanently in the database.

Command	Description
CREATE	to create new table or database
ALTER	for alteration
TRUNCATE	delete data from table
DROP	to drop a table
RENAME	to rename a table
COMMENT	is used to add comments to the data dictionary

### 2. DML: Data Manipulation Language

DML commands are used for manipulating the data stored in the table and not the table itself. DML commands are not auto-committed. It means changes are not permanent to database, they can be rolled back.

Command	Description
INSERT	to insert a new row
UPDATE	to update existing row
DELETE	to delete a row
MERGE	merging two rows or two tables

### 3. DQL: Data Query Language

Data query language is used to fetch data from tables based on conditions that we can easily apply.

Command	Description
SELECT	retrieve records from one or more table

### 4. TCL: Transaction Control Language

These commands are to keep a check on other commands and their effect on the database. These commands can annul changes made by other commands by rolling the data back to its original state. It can also make any temporary change permanent.

Command	Description
COMMIT	to permanently save
ROLLBACK	to undo change
SAVEPOINT	to save temporarily

### 5. DCL: Data Control Language

Data control languages are the commands to grant and take back authority from any database user.

Command	Description
GRANT	grant permission of right
REVOKE	Take back permission.

## Working with MySQL Databases

SQL keywords are NOT case sensitive: select is the same as SELECT, UDATE etc. We will use all SQL commands in upper-case.

### Show/Display Databases

**mysql> SHOW DATABASES;** ←

```

C:\Users\student>cd\
C:\>cd xampp
C:\xampp>cd mysql\bin
C:\xampp\mysql\bin>mysql -u root
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 3
Server version: 5.1.33-community MySQL Community Server (GPL)

Type 'help;' or '\h' for help. Type '\c' to clear the buffer.

mysql> show databases;
+-----+
| Database |
+-----+
| information_schema |
| cdcol      |
| mysql      |
| phpmyadmin |
| test       |
| webauth    |
+-----+
6 rows in set (0.00 sec)

mysql>
    
```

**mysql> CREATE DATABASE Aligarh;** ←

Apply above command and again run *show databases* command than display changes in databases list and create will be new database of Student.

```

mysql> show databases;
+-----+
| Database |
+-----+
| information_schema |
| cdcol      |
| mysql      |
| phpmyadmin |
| test       |
| webauth    |
+-----+
6 rows in set (0.00 sec)

mysql> create database Aligarh;
Query OK, 1 row affected (0.00 sec)

mysql> show databases;
+-----+
| Database |
+-----+
| information_schema |
| aligarh      |
| cdcol      |
| mysql      |
| phpmyadmin |
| test       |
| webauth    |
+-----+
7 rows in set (0.00 sec)

mysql>
    
```

Use or select Database.

```
mysql> USE Aligarh; ←
```

Show tables;

```
mysql> SHOW TABLES; ←
```

```

Command Prompt - mysql -u root

mysql> create database Aligarh;
Query OK, 1 row affected (0.00 sec)

mysql> show databases;
+-----+
| Database |
+-----+
| information_schema |
| aligarh |
| cdcol |
| mysql |
| phpmyadmin |
| test |
| webauth |
+-----+
7 rows in set (0.00 sec)

mysql> use aligarh;
Database changed
mysql> show tables;
Empty set (0.00 sec)

mysql>
    
```

Create new Table

Syntax

```

CREATE TABLE <TABLE_NAME>
(
    column_name1 datatype1,
    column_name2 datatype2,
    ...
);
    
```

```
mysql> CREATE TABLE Students (Roll int, Name varchar(20), Gender varchar(6),Technology varchar(25));
```

←

```

Command Prompt - mysql -u root

mysql> show databases;
+-----+
| Database |
+-----+
| information_schema |
| aligarh |
| cdcol |
| mysql |
| phpmyadmin |
| test |
| webauth |
+-----+
7 rows in set (0.00 sec)

mysql> use aligarh;
Database changed
mysql> show tables;
Empty set (0.00 sec)

mysql> create table Students (Roll int, Name varchar(20), Gender varchar(6),Technology varchar(25));
Query OK, 0 rows affected (0.05 sec)

mysql>
    
```

### Field/Column data types in MySQL

The fields in a table store data according to type. Recall that one of the most important purposes of a variables data type is to determine how much memory the computer allocates for the data stored in the variable. Similarly, the data types in database fields determine how much storage space the computer allocates for the data in the database. MySQL includes numerous data types that are categorized into numeric, string and other data types.

### Type of field in MySQL

Type	Size	Description
<b>CHAR</b> [Length]	Length bytes	A fixed-length field from 0 to 255 characters long
<b>VARCHAR</b> [Length]	String length + 1 bytes	A variable-length field from 0 to 65,535 characters long
<b>TINYTEXT</b>	String length + 1 bytes	A string with a maximum length of 255 characters
<b>TEXT</b>	String length + 2 bytes	A string with a maximum length of 65,535 characters
<b>MEDIUMTEXT</b>	String length + 3 bytes	A string with a maximum length of 16,777,215 characters
<b>LONGTEXT</b>	String length + 4 bytes	A string with a maximum length of 4,294,967,295 characters
<b>TINYINT</b> [Length]	1 byte	Range of –128 to 127 or 0 to 255 unsigned
<b>SMALLINT</b> [Length]	2 bytes	Range of –32,768 to 32,767 or 0 to 65,535 unsigned
<b>INT</b> [Length]	4 bytes	Range of –2,147,483,648 to 2,147,483,647 or 0 to 4,294,967,295
<b>FLOAT</b> [Length, Decimals]	4 bytes	A small number with a floating decimal point
<b>DOUBLE</b> [Length, Decimals]	8 bytes	A large number with a floating decimal point
<b>DATE</b>	3 bytes	In the format of YYYY-MM-DD
<b>DATETIME</b>	8 bytes	In the format of YYYY-MM-DD HH:MM:SS
<b>TIME</b>	3 bytes	In the format of HH:MM:SS

### Display/Describe table structure

mysql> **DESCRIBE** Students; ←

```

Command Prompt - mysql -u root
| webauth |
+-----+
7 rows in set (0.00 sec)

mysql> use aligarh;
Database changed
mysql> show tables;
Empty set (0.00 sec)

mysql> create table Students (Roll int, Name varchar(20), Gender varchar(6),Technology varchar(25));
Query OK, 0 rows affected (0.05 sec)

mysql> desc Students;
+-----+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| Roll  | int(11) | YES |     | NULL    |       |
| Name  | varchar(20) | YES |     | NULL    |       |
| Gender | varchar(6) | YES |     | NULL    |       |
| Technology | varchar(25) | YES |     | NULL    |       |
+-----+-----+-----+-----+-----+-----+
4 rows in set (0.03 sec)

mysql>
    
```

mysql> **CREATE TABLE** Marks (Roll int, Month Date, Math tinyint, English tinyint, Urdu tinyint); ←

Create new table with Roll,Month , Math,English and Urdu fields/columns with required data types integer , Date and tinyint and again run *describe Marks* command than display Marks table structure.

```

Command Prompt - mysql -u root

mysql> create table Marks (Roll int, Month Date, Math tinyint, English tinyint, Urdu tinyint);
Query OK, 0 rows affected (0.03 sec)

mysql> describe Marks;
+-----+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| Roll  | int(11) | YES |     | NULL    |       |
| Month | date   | YES |     | NULL    |       |
| Math  | tinyint(4) | YES |     | NULL    |       |
| English | tinyint(4) | YES |     | NULL    |       |
| Urdu  | tinyint(4) | YES |     | NULL    |       |
+-----+-----+-----+-----+-----+-----+
5 rows in set (0.00 sec)

mysql>
    
```

### Add new Field/Column

In this command To add a column named **ObtainMark** data type **integer** in a table **Marks**, use the following command:

mysql> **ALTER TABLE** Marks **ADD COLUMN** ObtainMark int ;

```

C:\ Command Prompt - mysql -u root
mysql> desc marks;
+-----+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| Roll  | int(11) | YES |     | NULL    |       |
| Month | date   | YES |     | NULL    |       |
| Math  | tinyint(4) | YES |     | NULL    |       |
| English | tinyint(4) | YES |     | NULL    |       |
| Urdu  | tinyint(4) | YES |     | NULL    |       |
+-----+-----+-----+-----+-----+-----+
5 rows in set (0.00 sec)

mysql> ALTER TABLE Marks ADD COLUMN ObtainMark int ;
Query OK, 0 rows affected (0.04 sec)
Records: 0 Duplicates: 0 Warnings: 0

mysql> desc marks;
+-----+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| Roll  | int(11) | YES |     | NULL    |       |
| Month | date   | YES |     | NULL    |       |
| Math  | tinyint(4) | YES |     | NULL    |       |
| English | tinyint(4) | YES |     | NULL    |       |
| Urdu  | tinyint(4) | YES |     | NULL    |       |
| ObtainMark | int(11) | YES |     | NULL    |       |
+-----+-----+-----+-----+-----+-----+
6 rows in set (0.00 sec)

mysql>
    
```

### Remove Field/Column

In this command To remove a column named **ObtainMark** in a table **Marks**, use the following command:

**mysql> ALTER TABLE Marks DROP COLUMN ObtainMark ;**

```

C:\ Command Prompt - mysql -u root
mysql> desc marks;
+-----+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| Roll  | int(11) | YES |     | NULL    |       |
| Month | date   | YES |     | NULL    |       |
| Math  | tinyint(4) | YES |     | NULL    |       |
| English | tinyint(4) | YES |     | NULL    |       |
| Urdu  | tinyint(4) | YES |     | NULL    |       |
| ObtainMark | tinyint(4) | YES |     | NULL    |       |
+-----+-----+-----+-----+-----+-----+
6 rows in set (0.02 sec)

mysql> ALTER TABLE Marks DROP COLUMN ObtainMark ;
Query OK, 0 rows affected (0.04 sec)
Records: 0 Duplicates: 0 Warnings: 0

mysql> desc marks;
+-----+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| Roll  | int(11) | YES |     | NULL    |       |
| Month | date   | YES |     | NULL    |       |
| Math  | tinyint(4) | YES |     | NULL    |       |
| English | tinyint(4) | YES |     | NULL    |       |
| Urdu  | tinyint(4) | YES |     | NULL    |       |
+-----+-----+-----+-----+-----+-----+
5 rows in set (0.00 sec)

mysql>
    
```

### Modify Field/Column Data Type

In this command to modify data type of column, named **ObtainMark** to change data type **smallint** replace by **int** in a table **Marks**, use the following command:

mysql> **ALTER TABLE** Marks **MODIFY** ObtainMark **smallint** ;

```

Command Prompt - mysql -u root
+-----+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| Roll  | int(11) | YES | | NULL | |
| Month | date   | YES | | NULL | |
| Math  | tinyint(4) | YES | | NULL | |
| English | tinyint(4) | YES | | NULL | |
| Urdu  | tinyint(4) | YES | | NULL | |
| ObtainMark | int(11) | YES | | NULL | |
+-----+-----+-----+-----+-----+-----+
6 rows in set (0.00 sec)

mysql> ALTER TABLE Marks MODIFY ObtainMark smallint;
Query OK, 0 rows affected (0.04 sec)
Records: 0 Duplicates: 0 Warnings: 0

mysql> desc marks;
+-----+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| Roll  | int(11) | YES | | NULL | |
| Month | date   | YES | | NULL | |
| Math  | tinyint(4) | YES | | NULL | |
| English | tinyint(4) | YES | | NULL | |
| Urdu  | tinyint(4) | YES | | NULL | |
| ObtainMark | smallint(6) | YES | | NULL | |
+-----+-----+-----+-----+-----+-----+
6 rows in set (0.00 sec)

mysql>
    
```

### Remove the Table

In this command To remove a Table named, **Marks** from database **Aligarh** use the following command:

mysql> **DROP TABLE** Marks ;

```

Command Prompt - mysql -u root
mysql> show tables;
+-----+
| Tables_in_aligarh |
+-----+
| marks              |
| students           |
+-----+
2 rows in set (0.00 sec)

mysql> DROP TABLE Marks;
Query OK, 0 rows affected (0.01 sec)

mysql> show tables;
+-----+
| Tables_in_aligarh |
+-----+
| students           |
+-----+
1 row in set (0.00 sec)

mysql>
    
```

### Remove the whole Table Data

The TRUNCATE TABLE statement is used to delete the data inside a table, but not the table itself. In this command to remove, completely Table data from Marks **use** the following command:

mysql> **TRUNK TABLE** Marks ;

### Rename the Table name

MySQL provides us with a very useful statement that changes the name of one or more tables. In this command To rename table named, from **Marks** to **Marksheet**, use the following command:

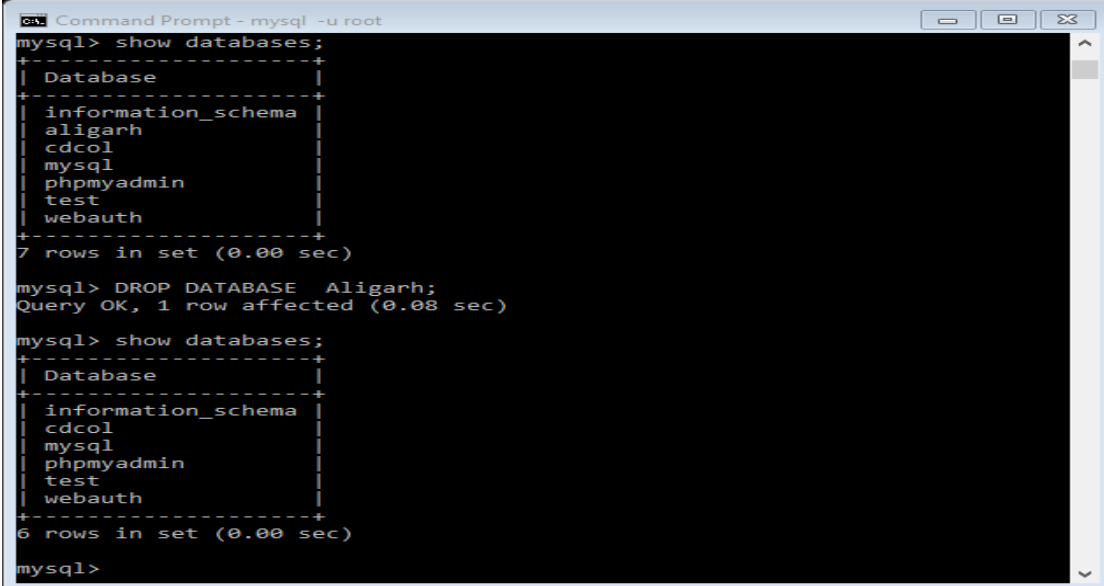


```
mysql> RENAME TABLE Marks TO Marksheet ;
```

## Remove the Database

The DROP DATABASE statement drops all tables in the database and deletes the database permanently. Therefore, you should be very careful when using this statement. In this command To remove database named, *Aligarh* from *MySQL DBMS*, use the following command:

```
mysql> DROP DATABASE Aligarh ;
```



```
Command Prompt - mysql -u root
mysql> show databases;
+-----+
| Database |
+-----+
| information_schema |
| aligarh |
| cdcol |
| mysql |
| phpmyadmin |
| test |
| webauth |
+-----+
7 rows in set (0.00 sec)

mysql> DROP DATABASE Aligarh;
Query OK, 1 row affected (0.08 sec)

mysql> show databases;
+-----+
| Database |
+-----+
| information_schema |
| cdcol |
| mysql |
| phpmyadmin |
| test |
| webauth |
+-----+
6 rows in set (0.00 sec)

mysql>
```

DDL or Data Definition Language actually consists of the SQL commands that can be used to define the database schema. It simply deals with descriptions of the database schema and is used to create and modify the structure of database objects in the database. Typically by creating, deleting, or modifying schema objects (such as databases, tables, and views)

## Exercise

## Theory Question

- 1) Define to SQL and why we use?
- 2) How many type of SQL commands?
- 3) Write major five types of field in the table with size range and description.
- 4) Write syntax of **Create table** commands of SQL.
- 5) Write five commands of DDL with Purpose.

## Practical Question.

- 1) Create table of **students** there field names are **Roll number** data type integer, **Name** data type varchar, **Father name** data type varchar, **Gender** data type Text, and **Technology Name** with suitable data size.
- 2) Create table of **Marksheet** There field names are **Roll number** data type integer, **Month** data type date, **Maths Marks** data type small integer, **Urdu Marks** data type small integer, **English Marks** data type small integer.
- 3) Add new column/fields of **Obtain Marks** in the table of Marksheet.
- 4) You change data type from **Text** to **varchar** of **Gender** field/column in the table **Students**.
- 5) Remove the table of **Students**.
- 6) Write syntax of create table commands.

## Objective MCQ's

- 1) Which is the subset of SQL commands used to manipulate MySQL Database structures, including tables?
  - a) Data Definition Language(DDL)
  - b) Data Manipulation Language(DML)
  - c) DML and DDL
  - d) None of the Mentioned
- 2) Which of the following is/are the DDL statements?
  - a) Create
  - b) Drop
  - c) Alter
  - d) All of the Mentioned
- 3) In SQL, which command(s) is (are) used to change a table's storage characteristics?
  - a) ALTER TABLE
  - b) MODIFY TABLE
  - c) CHANGE TABLE
  - d) All of the Mentioned
- 4) Which command is used for removing a table and all its data from the database:
  - a) Create command
  - b) Drop table command
  - c) Alter table command
  - d) All of the Mentioned