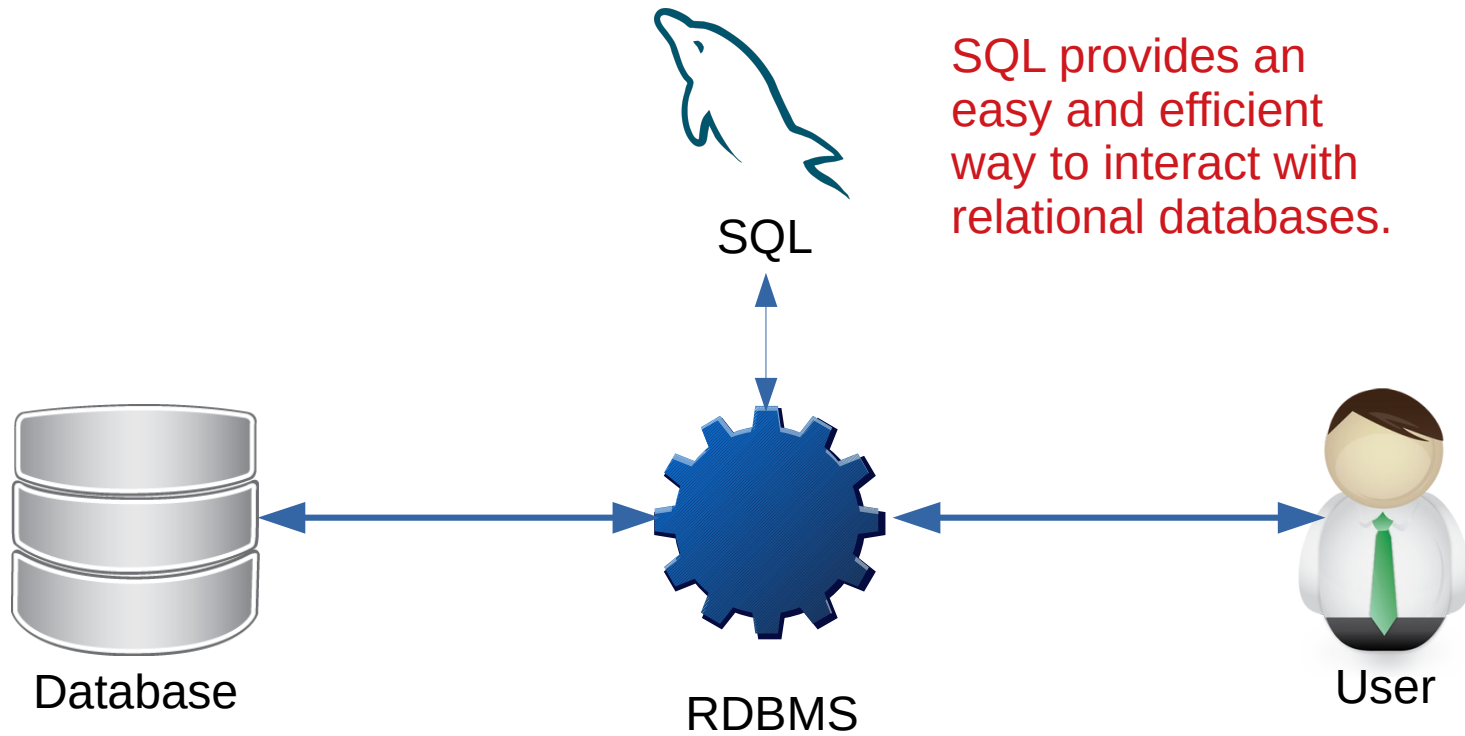# Chapter 9
Structured Query Language

What is Structured Query Language (SQL) ?

- SQL is developed by Donald D. Chamberlin and Raymond F. Boyce

- It is a language designed for managing data in relational database management system (RDBMS).

SQL

Database

RDBMS

User

SQL provides an easy and efficient way to interact with relational databases.

What are the components of SQL?

1) **Data Definition Language(DDL):** DDL is a component of SQL that provides commands to deal with the schema(Structure) of a database. DDL commands are used to create, modify and remove database objects like tables, views and keys. The common DDL commands are CREATE, ALTER and DROP.

2) **Data Manipulation Language(DML) :** DML is a component of SQL used to enhances efficient user interaction with Data Base System by a set of commands. It permits users to insert, delete and retrieve data from a database. The common DML commands are SELECT, INSERT, UPDATE and DELETE.

3) **Data Control Language(DCL) :** DCL is used to control access to database. It is used to control administrative privileges in a database. The common DCL commands are GRANT and REVOKE.

What are the use of GRANT and REVOKE commands?

- **GRANT** : Allows access privileges to the users to the database

- **REVOKE**: Withdraws user's access privileges given by GRAND

What are the data types of MySQL?

- Data type specifies the type of value that can be entered in a column in a table. It ensures the correctness of data.

- Data types in SQL are classified into three,

1) **Numeric data type**

2) **String data type**

3) **Date and time data type.**

1) Numeric data type

- The commonly used numeric data types in MySQL are INT or INTEGER and DEC or DECIMAL.

- a). **INT or INTEGERS** : They are whole numbers ie, without fractional part. They can be positive, negative or zero.

- b). **DEC or DECIMAL**: They are numbers with fraction. The syntax is DEC (Size, D) where Size is the total number of digits and D is the number of digits after the decimal point.

2) String Data Type

- A string is a group of characters. The two commonly used string data types in MYSQL are CHARACTER or CHAR and VARCHAR.

- a) **CHAR or CHARACTER** : Character includes letters, digits, special symbols etc. It is a fixed length data type. Syntax: CHAR (Size)

- b) **VARCHAR** : The VARCHAR data type represent variable length strings. It is similar to CHAR, but the space allocated for the data depends only on the actual size of the string

3) Date and Time data type

- The date data type is used for storing date and time data type is used for storing time.

- a)**Date:**-The date data type is used for storing date. The date in MySQL is represented in YYYY-MM-DD format(Standard format).

- b)**Time**:-The time data type is used for storing time. The format is HH:MM:SS.

What are constraints?

- Constraints are rules applied on data entered into the column of a table. They ensures the integrity of the relation . So they are known as integrity constraints.

- There are two types of constraints

1) **Column Constraints**

2) **Table Constraints**

Column constraints :

- These are applied only to individual columns. They are written immediately after the column.

- 1) **NOT NULL**:- This constraint ensures that a column can never have NULL(empty) values.

- 2) **AUTO_INCREMENT**:-The AUTO_INCREMENT keyword perform an auto increment ie, it automatically assigns a series of number automatically and insert it to column.

- 3) **UNIQUE**:- This constraint ensures that no two rows have the same value in a specified column. This constraint can be applied to those columns that have been declared NOT NULL.

- 4) **PRIMARY KEY**:- It declares a column as the primary key of a table. This column must not have null values and every value should be unique.

- 5) **DEFAULT:**- This constraint is used to specify a default value for a column.

Table Constraints :

- A table constraint can applied to an individual column or group of columns .

- It usually appears at the end of table definition.

- Examples of table constraints are UNIQUE and CHECK

- **CHECK**:-This constraint limits the values that can be inserted into a column of a table.

- **UNIQUE** constraint is an integrity constraint that ensures values in a column or group of columns to be unique. A UNIQUE constraint can be either a column constraint or a table constraint.

END

How to create a Database ?

1) Applications → Programming → MySQL

2) When asked for password, press enter button

3) Command to create Database:
   CREATE DATABASE <database_name>;

4) Command to open Database:
   USE <database_name>;

How to create a table?

- CREATE Command:

  The CREATE TABLE Command is used to create a table(relation).

- The syntax is :
  CREATE TABLE <TableName> (<ColumnName1> <DataType> [<Constraints>] , <ColumnName2> <DataType> [<Constraints>] ,.....................................);

CREATE TABLE STUDENT(ROLLNO INT PRIMARY KEY, NAME VARCHAR(20),

COURSE VARCHAR(20), TOTAL_MARK INT);

ROLL NO	NAME	COURSE	TOTAL_MARK

Relation (Table)

How to insert values in to a table

- This command is used to insert a row (tuple) into a table.

- Syntax :
  INSERT INTO <TABLENAME> VALUES(<Value1>,<Value2>,....);

- Eg:

-

  INSERT INTO STUDENT VALUES (1,'ANISH','COMMERCE',599);

How to view the contents of a Database

- The SELECT Command is used to select rows (tuples or records) from a table.

- The Syntax :

  SELECT <ColumnName1>,[<ColumnName2>,....]
  FROM <Table Name> ;

- Eg:-

  SELECT ROLLNO,NAME,TOTAL_MARK FROM STUDENT;

SELECT is used along with many other commands:

- i) **The DISTINCT Keyword** : It is used to avoid duplicate rows from the result of a select command. Eg:
  SELECT DISTINCT NAME FROM STUDENT;

- ii) **ALL** :The keyword ALL is used to display duplicate rows in a select command. Eg:
  SELECT ALL NAME FROM STUDENT;

- iii) **WHERE Clause** : The WHERE clause is used to select rows or columns from a table which satisfy a specific condition. The condition can be expressed using Relational operators or Logical operators.

- Eg:

- SELECT NAME, COURSE FROM STUDENT WHERE TOTAL_MARK>500;

- iv) **BETWEEN .... AND Operator** : It is used to specify a range .
  Eg:-
  SELECT * FROM STUDENT WHERE ROLLNO BETWEEN 10 AND 25;

- v)**LIKE** : The LIKE keyword is used to search for a specified pattern in a column. Eg:
  SELECT * FROM STUDENT WHERE NAME LIKE 'M%';

- vi) **IN Operator:** It is used for setting a condition satisfying any list of values. Eg:-
  SELECT * FROM STUDENT WHERE COURSE IN('COMMERCE', 'HUMANITIES');

- vii) **IS NULL** **Operator**: This Operator in a WHERE clause to find rows containing a null value in a particular column.
  Eg :
  SELECT * FROM STUDENT WHERE ROLLNO IS NULL ;
  Display details of students whose roll no is not specified.

- viii) **ORDER BY** **Clause**: The ORDER BY clause is used to sort the result of a select statement in ascending (ASC) or descending(DESC) order. The default order is ascending.

- Eg :

  SELECT * FROM STUDENT ORDER BY NAME ASC;

- ix) **COUNT (*) Function**: COUNT() function used to find the number of rows that matches a specified condition. It can used with DISTINCT command to avoid duplicate rows. EG:

SELECT COUNT(*) FROM STUDENT WHERE COURSE="COMMERCE";

- x) **GROUP BY Clause** : The GROUP BY clause is used to group the rows of a table based on a common value.
  Eg:-
  SELECT COURSE, COUNT(*) FROM STUDENT GROUP BY COURSE;
  Display each Course and Number of Students in each Course.

Other Useful Commands

- Command to show the available Databases:
  SHOW DATABASES;

- Command to show the available tables in a Database:
  SHOW TABLES;

- Command to show the structure of a table in a Database:
  DESC <table name>;

Q) What are the rules in naming Tables and Columns in MySQL?

1) The name must not be an SQL keyword.

2) The name may contain alphabets, digits, under score(_) and dollar ($) sign.

3) The name must contain at least one character.

4) The name should not be duplicate with the names of other tables in the same data base

5) The name of the table must not contain white space, special symbols.

END

How to alter a Table

- The ALTER TABLE Command is used to add new column, modify existing column, drop column or renaming a table.

- The alter command is used with commands:

I. ADD

II. MODIFY

III. DROP

IV. RENAME

I) The ALTER TABLE Command with ADD keyword is used to add columns .

Eg:

ALTER TABLE STUDENT ADD (PERCENTAGE DEC(5,2));

II) ALTER TABLE Command with MODIFY keyword is used to modify an existing column

Eg:

ALTER TABLE STUDENT MODIFY (PERCENTAGE DEC(6,3));

III) ALTER TABLE Command with DROP keyword used to remove a column from a table.
Eg:-
ALTER TABLE STUDENT DROP TOTAL_MARK ;

IV) ALTER TABLE Command with RENAME TO keyword used to rename an existing table
Eg:-
ALTER TABLE STUDENT RENAME TO STUDENT1;

How to update the data in a table

- **UPDATE** command is Used to change the values in a column of specified rows.

- The rows are set to new values using the SET keyword.

- Eg:
  UPDATE STUDENT SET ROLLNO=1111 WHERE NAME='ANISH';

How to Delete or remove data from table

- DELETE command is used to remove individual rows from a table

- Syntax:
  DELETE FROM <Table_Name> [WHERE <condition>] ;

- Eg.
  DELETE FROM STUDENT WHERE ROLLNO=1111;

END

How to delete and table and database

- DROP command
  It is used to permanently removes table from the database. Syntax:

- DROP TABLE <Table Name> ;

- Eg:- DROP TABLE STUDENT;

- DROP DATABASE PANANGAD;

END

Aggregate Functions

- The aggregate functions acts on a group of data and returns a single data. They are also called summary functions.

- Commonly used aggregate functions are:

Function	Return value
SUM()	Total of the values in the column specified as argument.
AVG()	Average of the values in the column specified as argument.
MIN()	Smallest value in the column specified as argument.
MAX()	Largest of the values in the column specified as argument.
COUNT()	Number of non NULL values in the column specified as argument.

Table 9.7: Some built-in functions of MySQL

- EG:

  SELECT AVG(TOTAL_MARK) FROM STUDENT;

  SELECT MIN(TOTAL_MARK) FROM STUDENT;
  SELECT MAX(TOTAL_MARK) FROM STUDENT;

  SELECT COUNT(TOTAL_MARK) FROM STUDENT;

  SELECT SUM(TOTAL_MARK) FROM STUDENT;

Q) What is Nested Query?

- A Nested query is a query placed within another SQL query.

- The inner query is known as the sub query and the query that contains the sub query is known outer query.

- Eg:
  SELECT Regno, Name FROM Student
  WHERE Score=(SELECT MAX(Score) FROM Student);

END

What is VIEW ?

- A view is a virtual table which is derived from one or more tables. The Tables from which tuples are collected to create a view is known as Base Table.

- View can be created using the DDL Command CREATE VIEW. All the DDL commands can be used in a view.

- Eg: CREATE VIEW STUDENT1 AS SELECT * FROM STUDENT WHERE COURSE='COMMERCE';

- This command will show the contents of the view:
  SELECT * FROM STUDENT1;

- DROP VIEW Command is used to remove a view.

- EG:

  DROP VIEW Student1;

What are the advantages of VIEW ?

- **Advantages of View are:**

- a). Views allows to setup different security levels for a table.

- b). Views allows to see the same data in a different way.

- c). It helps to hide complexity.

END

Previous Question

Roll_No.	Adm_No.	Name	Course	Score
11	2008	Abdulla	Commerce	90
12	2009	Prasanth	Commerce	85
13	2010	Jins	Commerce	75
14	2011	Praveen	Humanities	60
11	2012	Prasanth	Science	45
12	2013	Pallavi	Science	75
13	2014	Faizal	Science	60

- 1. Consider the following table student

- a) Can you suggest an attribute that can be selected as primary key? Justify your answer?

- b) Write SQL query to change the course attribute value 'Humanities' of the student Praveen to 'Commerce'

- c) Write SQL query to display the name and score of all the students who scored greater than 60

- d) Write SQL query to remove the details of students who scored less than 50

Answer

- 1

- a) Roll_No or Adm_No can be used as primary key because they uniquely identify the tupes

- b) update student set course='commerce' where name='Praveen';

- c) select name,score from student where score>60;

- d) delete from student where score<50;

Previous Question

- 2. Consider the table student with attribute admno, Name, course, percentage. Write the SQL statement to do the following

- i) Display all the student details

- ii) Modify the course 'Commerce' to 'Science'

- iii) Remove the student details with percentage below 35

- iv) Create a view from the above table with percentage greater than 90

Answer

- 2

- i) select * from student;

- ii) update student set course='science' where course='commerce';

- iii) delete from student where percentage<35;

- iv) create view stdview as select * from student where percentage>90;

Previous Questions

- 3. Define view in SQL and write the syntax of the command used to create a view

- 4. Write the names of any two column constraints and their usage

- 5. Define the following
  a) DML
  b) DDL
  c) DCL

- 6. Write the result of the following
  a) ALTER TABLE <table name> Drop <column name>
  b) DELETE * FROM <table name>
  c) DROP TABLE <table name>