What is SQL

- SQL stands for **Structured Query Language**.
- It is designed for managing data in a relational database management system (RDBMS).
- It is pronounced as S-Q-L or sometime **See-Qwell**.
- SQL is a database language, it is used for database creation, deletion, fetching rows and modifying rows etc.
- SQL is based on relational algebra and tuple relational calculus.

All DBMS like MySQL, Oracle, MS Access, Sybase, Informix, Postgres and SQL Server use SQL as standard database language.

Why SQL is required

SQL is required:

- To create new databases, tables and views
- To insert records in a database
- To update records in a database
- To delete records from a database
- To retrieve data from a database

What SQL does

- With SQL, we can query our database in a numbers of ways, using English-like statements.
- With SQL, user can access data from relational database management system.
- It allows user to describe the data.
- It allows user to define the data in database and manipulate it when needed.
- It allows user to create and drop database and table.
- It allows user to create view, stored procedure, function in a database.
- It allows user to set permission on tables, procedure and view.

What is RDBMS

RDBMS stands for *Relational Database Management Systems.* .

All modern database management systems like SQL, MS SQL Server, IBM DB2, ORACLE, My-SQL and Microsoft Access are based on RDBMS.

It is called Relational Data Base Management System (RDBMS) because it is based on relational model introduced by E.F. Codd.

How it works

Data is represented in terms of tuples (rows) in RDBMS.

Relational database is most commonly used database. It contains number of tables and each table has its own primary key.

Due to a collection of organized set of tables, data can be accessed easily in RDBMS.

Brief History of RDBMS

During 1970 to 1972, E.F. Codd published a paper to propose the use of relational database model.

RDBMS is originally based on that E.F. Codd's relational model invention.

What is table

The RDBMS database uses tables to store data. A table is a collection of related data entries and contains rows and columns to store data.

A table is the simplest example of data storage in RDBMS.

Let's see the example of student table.

ID	Name	AGE	COURSE
1	Ajeet	24	B.Tech
2	aryan	20	C.A
3	Mahesh	21	BCA
4	Ratan	22	MCA
5	Vimal	26	BSC

What is field

Field is a smaller entity of the table which contains specific information about every record in the table. In the above example, the field in the student table consist of id, name, age, course.

What is row or record

A row of a table is also called record. It contains the specific information of each individual entry in the table. It is a horizontal entity in the table. For example: The above table contains 5 records.

Let's see one record/row in the table.

| 1 | Ajeet | 24 | B.Tech |

What is column

A column is a vertical entity in the table which contains all information associated with a specific field in a table. For example: "name" is a column in the above table which contains all information about student's name.

Ajeet
Aryan
Mahesh
Ratan
Vimal

NULL Values

The NULL value of the table specifies that the field has been left blank during record creation. It is totally different from the value filled with zero or a field that contains space.

Data Integrity

There are the following categories of data integrity exist with each RDBMS:

Entity integrity: It specifies that there should be no duplicate rows in a table.

Domain integrity: It enforces valid entries for a given column by restricting the type, the format, or the range of values.

Referential integrity: It specifies that rows cannot be deleted, which are used by other records.

User-defined integrity: It enforces some specific business rules that are defined by users. These rules are different from entity, domain or referential integrity.

What is Database

A **database** is *an organized collection of data*.

Database handlers create database in such a way that only one set of software program provide access of data to all the users.

The **main purpose** of database is to operate large amount of information by storing, retrieving and managing.

There are many **dynamic websites** on the world wide web now a days which are handled through databases. For example, a model to checks the availability of rooms in a hotel. It is an example of dynamic website that uses database.

There are many **database available** like MySQL, Sybase, Oracle, Mango DB, Informix, Postgre, SQL Server etc.

SQL or Structured Query Language is used to perform operation on the data stored in a database. SQL depends on relational algebra and tuple relational calculus.

A cylindrical structure is used to display the image of a database.

Difference between DBMS and RDBMS

Although DBMS and RDBMS both are used to store information in physical database but there are some remarkable differences between them.

The main differences between DBMS and RDBMS are given below:

No.	DBMS	RDBMS
1)	DBMS applications store **data as file**.	RDBMS applications store **data in a tabular form**.
2)	In DBMS, data is generally stored in either a hierarchical form or a navigational form.	In RDBMS, the tables have an identifier called primary key and the data values are stored in the form of tables.
3)	**Normalization is not** present in DBMS.	**Normalization is** present in RDBMS.
4)	DBMS does **not apply any security** with regards to data manipulation.	RDBMS **defines the integrity constraint** for the purpose of ACID (Atomocity, Consistency, Isolation and Durability) property.
5)	DBMS uses file system to store data, so there will be **no relation between the tables**.	in RDBMS, data values are stored in the form of tables, so a **relationship** between these data values will be stored in the form of a table as well.
6)	DBMS has to provide some uniform methods to access the stored information.	RDBMS system supports a tabular structure of the data and a relationship between them to access the stored information.
7)	DBMS **does not support distributed database**.	RDBMS **supports distributed database**.
8)	DBMS is meant to be for small organization and **deal with small data**. it supports **single user**.	RDBMS is designed to **handle large amount of data**. it supports **multiple users**.
9)	Examples of DBMS are file systems, **xml** etc.	Example of RDBMS are **mysql**, **postgre**, **sql server**, **oracle** etc.

After observing the differences between DBMS and RDBMS, you can say that RDBMS is an extension of DBMS. There are many software products in the market today who are compatible for both DBMS and RDBMS. Means today a RDBMS application is DBMS application and vice-versa.

SQL Syntax

SQL follows some unique set of rules and guidelines called syntax. Here, we are providing all the basic SQL syntax.

- **SQL** is not case sensitive. Generally SQL keywords are written in uppercase.
- SQL statements are dependent on text lines. We can place a single SQL statement on one or multiple text lines.
- You can perform most of the action in a database with SQL statements.
- SQL depends on relational algebra and tuple relational calculus.

SQL statement

SQL statements are started with any of the SQL commands/keywords like SELECT, INSERT, UPDATE, DELETE, ALTER, DROP etc. and the statement ends with a semicolon (;).

Example of SQL statement:

1. SELECT"column_name"FROM"table_name";

Why semicolon is used after SQL statements:

Semicolon is used to separate SQL statements. It is a standard way to separate SQL statements in a database system in which more than one SQL statements are used in the same call.

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

SQL Commands

These are the some important SQL command:

SELECT: it extracts data from a database.

UPDATE: it updates data in database.

DELETE: it deletes data from database.

CREATE TABLE: it creates a new table.

ALTER TABLE: it is used to modify the table.

DROP TABLE: it deletes a table.

CREATE DATABASE: it creates a new database.

ALTER DATABASE: It is used to modify a database.

INSERT INTO: it inserts new data into a database.

CREATE INDEX: it is used to create an index (search key).

DROP INDEX: it deletes an index.

SQL Data Types

The SQL data type defines a kind of value that a column can contain.

In a database table, every column is required to have a name and a data type.

Data Type varies from database to database. For example, MySQL supports INT but Oracle supports NUMBER for integer values.

These are the general data types in SQL.

Data-type	Syntax	Explanation
Integer	INTEGER	The integer data type is used to specify an integer value.
Smallint	SMALLINT	The smallint data type is used to specify small integer value.
Numeric	NUMERIC(P,S)	It specifies a numeric value. Here 'p' is precision value and 's' is scale value.
Real	REAL	The real integer is used to specify a single precision floating point number.
Decimal	DECIMAL(P,S)	It specifies a decimal value. Here 'p' is precision value and 's' is scale value.
Double precision	DOUBLE PRECISION	It specifies double precision floating point number.
Float	FLOAT(P)	It specifies floating-point value e.g. 12.3, 4.5 etc. Here, 'p' is precision value.
Character	CHAR(X)	Here, 'x' is the character's number to store.
Character varying	VARCHAR2(X)	Here, 'x' is the character's number to store
Bit	BIT(X)	Here, 'x' is the number of bits to store
Bit varying	BIT VARYING(X)	Here, 'x' is the number of bits to store (length can vary up to x).
Date	DATE	It stores year, month and days values.
Time	TIME	It stores hour, minute and second values
Timestamp	TIMESTAMP	The timestamp data type is used to store year, month, day, hour, minute and second values.
Time with time zone	TIME WITH TIME ZONE	It is exactly same as time but also store an offset from UTC of the time specified.
Timestamp with time zone	TIMESTAMP with TIME ZONE	It is same as timestamp but also stores an offset from UTC of the time specified.

SQL Operators

SQL statements generally contain some reserved words or characters that are used to perform operations such as comparison and arithmetical operations etc. These reserved words or characters are known as operators.

Generally there are three types of operators in SQL:

1. SQL Arithmetic Operators
2. SQL Comparison Operators
3. SQL Logical Operators

SQL Arithmetic Operators:

Let's assume two variables "a" and "b". Here "a" is valued 50 and "b" valued 100.

Example:

Operators	Descriptions	Examples
+	It is used to add containing values of both operands	a+b will give 150
-	It subtracts right hand operand from left hand operand	a-b will give -50
*	It multiply both operand?s values	a*b will give 5000
/	It divides left hand operand by right hand operand	b/a will give 2
%	It divides left hand operand by right hand operand and returns reminder	b%a will give 0

SQL Comparison Operators:

Let's take two variables "a" and "b" that are valued 50 and 100.

Operator	Description	Example
=	Examine both operands value that are equal or not,if yes condition become true.	(a=b) is not true
!=	This is used to check the value of both operands equal or not,if not condition become true.	(a!=b) is true
< >	Examines the operand?s value equal or not, if values are not equal condition is true	(a<>b) is true
>	Examine the left operand value is greater than right Operand, if yes condition becomes true	(a>b) is not true
<	Examines the left operand value is less than right Operand, if yes condition becomes true	(a
>=	Examines that the value of left operand is greater than or equal to the value of right operand or not,if yes condition become true	(a>=b) is not true
<=	Examines that the value of left operand is less than or equal to the value of right operand or not, if yes condition becomes true	(a<=b) is true
!<	Examines that the left operand value is not less than the right operand value	(a!
!>	Examines that the value of left operand is not greater than the value of right operand	(a!>b) is true

SQL Logical Operators:

This is the list of logical operators used in SQL.

Operator	Description
ALL	this is used to compare a value to all values in another value set.
AND	this operator allows the existence of multiple conditions in an SQL statement.
ANY	this operator is used to compare the value in list according to the condition.
BETWEEN	this operator is used to search for values, that are within a set of values
IN	this operator is used to compare a value to that specified list value
NOT	the NOT operator reverse the meaning of any logical operator
OR	this operator is used to combine multiple conditions in SQL statements
EXISTS	the EXISTS operator is used to search for the presence of a row in a specified table
LIKE	this operator is used to compare a value to similar values using wildcard operator