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Venkata Kanukollu
kvrmurthysrcm@gmail.com

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SQL Tutorial

Last Updated : 07 Mar, 2025

SQL is a **Structured query language** used to access and **manipulate data** in databases. SQL stands for Structured Query Language. We can create, update, delete, and retrieve data in databases like MySQL, Oracle, PostgreSQL, etc. Overall, SQL is a query language that communicates with databases.

In this **SQL tutorial**, you'll learn all the basic to advanced SQL concepts like **SQL queries**, **SQL join**, **SQL injection**, **SQL insert**, and creating tables in SQL.

SQL Uses

SQL's integration with various technologies makes it essential for managing and querying data in <u>databases</u>. Whether it's in traditional relational databases (RDBMS) or modern technologies such as machine learning, AI, and blockchain, SQL plays a key role. It works seamlessly with <u>DBMS</u> (Database Management Systems) to help users interact with data, whether stored in structured <u>RDBMS</u> or other types of databases.

- **Data Science & Analytics:** Used for querying large datasets, data cleaning, and analysis. Analysts use SQL to generate reports and insights that inform business decisions.
- **Machine Learning & AI:** Helps in preparing and managing the data required for training machine learning models and AI algorithms. It is used for data cleaning, transformation, and extraction.
- **Web Development:** Used to manage user data, e-commerce

- **Cloud and Big Data:** SQL is integrated into cloud-based databases (e.g., Amazon RDS, Microsoft Azure SQL) and Big Data platforms (e.g., Apache Hive) to enable seamless data querying and management.
- **Blockchain and Decentralized Systems:** In blockchain systems, SQL can be used to manage off-chain data, providing efficient data storage and retrieval alongside decentralized ledger technology.

How SQL work?

When you interact with a database, you typically use SQL commands to perform these operations. These commands are translated into actions by the SQL Engine, the core component responsible for processing queries. The SQL Engine parses and compiles SQL queries, optimizing and executing them to interact with the stored data. The SQL Engine also ensures that data retrieval and modifications are efficient and consistent.

Different DBMS tools (like MySQL, SQL Server, etc.) provide an interface and APIs that users can use to interact with the database. These tools provide a user-friendly way to write and execute SQL queries, but internally, they rely on their respective SQL Engines to process these commands.

For example, MySQL uses its own SQL Engine to parse, optimize, and execute queries, while SQL Server has a different SQL Engine for the same task. These engines ensure that SQL queries are executed in a way that respects the underlying database structure and the specific DBMS's optimizations.

Example

In this detailed SQL tutorial for beginners, we'll explore practical **SQL examples** for managing employee data within a database. We'll create a table to store employee information and populate it with sample data like Employee Id, Name, Age, Department, and Salary.

Query:

```
SELECT * FROM employees WHERE Salary > 55000.00;
```

Basics

SQL or Structured Query Language is a fundamental skill for anyone who wants to interact with databases. This standard Query Language all users to create, manage, and retrieve data from relational databases. In this SQL tutorial PDF, we have listed all the basics of SQL. Explore this section to sharpen your SQL basics.

- Introduction
- Data Types
- Operators
- Commands

Create Database

The first step to storing the information electronically using SQL includes creating database. And in this section we will learn how to Create, Select, Drop, and Rename databases with examples.

- CREATE Database
- DROP Database
- RENAME Database
- SELECT Database

Tables

The cornerstone of any SQL database is the table. Basically, these structure functions is very similar to spreadsheets, which store data in very organized grid format. In this section, you will learn how to Create, Drop, Delete, and more related to Table.

- CREATE TABLE

- [TRUNCATE TABLE](#)
- [COPY TABLE](#)
- [TEMP TABLE](#)
- [ALTER TABLE](#)

CRUD Operations

In this section, you will learn about the SQL Queries like SELECT statement, SELECT LAST, and more. Explore this section and learn how to use these queries.

- [SELECT Statement](#)
- [INSERT INTO](#)
- [INSERT Multiple Rows](#)
- [UPDATE Statement](#)
- [DELETE Statement](#)
- [DELETE Duplicate Rows](#)

Clauses

Unlock the power of SQL Clauses with this SQL tutorial. Here in this section, you will learn how to use SELECT, WHERE, JOIN, GROUP BY, and more to query databases effectively.

- [WHERE Clause](#)
- [WITH Clause](#)
- [HAVING Clause](#)
- [ORDER By Clause](#)
- [Group By Clause](#)
- [LIMIT Clause](#)
- [Distinct Clause](#)
- [FETCH](#)
- [Aliases](#)

SQL Operators" refers to the fundamental symbols and keywords within the SQL that enable users to perform various operations and SQL AND, OR, LIKE, NOT, and more operators on databases. Here, we have discussed all the SQL operators in a detailed manner with examples.

- AND Operator
- OR Operator
- Logical Operators
- LIKE Operator
- IN Operator
- NOT Operator
- NOT EQUAL Operator
- IS NULL Operator
- UNION Operator
- UNION ALL Operator
- EXCEPT Operator
- BETWEEN Operator
- ALL and ANY
- INTERSECT Operator
- EXISTS Operator
- CASE Operator

Aggregate Functions

Whether you are calculating the total sales revenue for a particular product, finding the average age of customers, or determining the highest value in a dataset, SQL Aggregate Functions make these tasks straightforward and manageable.

- Aggregate Function
- Count() Function
- SUM() Function
- MIN() Function

Data Constraints

Constraints act as rules or conditions imposed on the data, dictating what values are permissible and what actions can be taken. They play a crucial role in maintaining the quality and coherence of the database by preventing errors. So, explore this section to get a hand on SQL Data Constraints.

- NOT NULL Constraints
- Primary Key Constraints
- Foreign Key Constraints
- Composite Key
- Unique Constraints
- Alternate Key
- CHECK Constraints
- DEFAULT Constraints

Joining Data

SQL joins serve as the weaver's tool, allowing you to seamlessly merge data from multiple tables based on common threads. So explore this section to learn how to use JOIN command.

- JOIN
- Outer Join
- Left Join
- Right Join
- Full Join
- Cross Join
- Self Join
- UPDATE with JOIN
- DELETE JOIN
- Recursive Join

SQL functions offer an efficient and versatile approach to data analysis. By leveraging these functions within your queries, you can enhance the depth and accuracy of your insights, transforming raw data into actionable knowledge.

- Date Functions
- String Functions
- Numeric Functions
- Statistical Functions
- JSON Functions
- Conversion Functions
- Datatype Functions
- LTRIM Function
- UPPER Function
- RTRIM Function

Views

Views makes easier for anyone to access the information they need, without getting bogged down in complicated queries. Views also act like a helpful security guard, keeping the most sensitive information in the back room, while still allowing access to what's needed.

- CREATE VIEW
- UPDATE VIEW
- RENAME VIEW
- DELETE VIEW

Indexes

Indexes work by organizing specific columns in a particular order, allowing the database to quickly pinpoint the information you need. And in this section, we have listed all the points that one has to learn while learning SQL.

- [Drop Index](#)
- [Show Indexes](#)
- [Unique Index](#)
- [Clustered Index vs Non-Clustered Index](#)

Subquery

Subqueries allow you to perform nested queries within a larger query, enabling more complex data retrieval. They help in filtering data or performing operations on data that would otherwise require multiple queries.

- [Subquery](#)
- [Correlated Subqueries](#)
- [Nested Queries](#)

Miscellaneous Topics

In this miscellaneous section, you will encounter concepts like stored procedures for automating repetitive tasks, triggers for automated actions based on data changes, and window functions for complex calculations within a single query.

- [Wildcards Operators](#)
- [Comments](#)
- [Pivot and Unpivot](#)
- [Trigger](#)
- [Hosting](#)
- [Performance Tuning](#)
- [Stored Procedures](#)
- [Transactions](#)
- [Sub Queries](#)
- [Using Sequences](#)
- [Auto Increment](#)

- [Common Table Expressions](#)
- [Database Tuning](#)
- [Dynamic](#)
- [Regular Expressions](#)

Exercises, Interview Questions & Cheat Sheet

This section provides hands-on exercises and commonly asked interview questions to help solidify your SQL knowledge. It also includes a cheat sheet for quick reference, making SQL concepts easier to grasp.

- [Exercises](#)
- [Quiz](#)
- [Interview Questions](#)
- [Query Interview Questions](#)
- [Cheat Sheet](#)
- [30 Days of SQL – From Basic to Advanced](#)

Advanced SQL & Databases

Advanced SQL topics explore techniques like optimization, complex joins, and working with large-scale databases. This section also covers the use of advanced functions and stored procedures to handle sophisticated database operations.

Database Design and Modeling

Database design focuses on creating an efficient database structure that is scalable and meets user requirements. Modeling involves defining relationships, entities, and constraints to ensure data integrity and efficient querying.

- [Introduction of ER Model](#)
- [How to Draw Entity Relationship Diagrams (ERDs)](#)

- [Types of Functional dependencies](#)
- [Rules of Inference](#)
- [Normal Forms in DBMS](#)
- [Denormalization in Databases](#)
- [Database Design](#)

Database Security

Database security protects data from unauthorized access, corruption, and breaches. It includes encryption, authentication, and user privilege management to safeguard sensitive information stored in databases.

- [Injection](#)
- [Types of SQL Injection](#)
- [Data Encryption](#)
- [Database Recovery Techniques in DBMS](#)
- [Backup](#)
- [How to Restore SQL Server Database From Backup?](#)

Projects

SQL projects provide practical experience in applying SQL concepts to real-world problems. These projects allow you to build and manage databases for various domains, enhancing your hands-on skills in database design and querying.

- Ola SQL Data Analysis
- Walmert Sales Data Analysis
- Music Store Data Analysis
- Healthcare Sysytem
- Library Management system
- [Personal Blogging Platform: Mastering Database Architecture and](#)
  CRUD Operations

- E-commerce Database
- Movie Reservation System

Database Connectivity

Database connectivity enables applications to interact with databases through established protocols and drivers. This section covers how to establish secure connections and manage database interactions in programming languages like PHP, Python, and Java.

- [ORM (Object-Relational Mapping)](#)
- [ODM (Object-Document Mapping)](#)
- [ODBC (Open Database Connectivity)](#)

Applications

In data-driven industries where managing databases is very important in regular, Here are some important SQL applications.

- To support client/server architecture, software engineers use SQL to establish the connection between the back-end and front-end.
- SQL can also be used in the 3-tier architecture of a client, an application server, and a database.
- SQL is used as a Data Definition Language(DDL) in which we can independently create a database, define the structure, use it, and discard it when its work is done.
- SQL is used as a **Data Manipulation Language(DML)** in which we can enter data, modify data, and extract data.
- SQL is used as a Data Control Language(DCL) it specifies how we can protect our database against corruption and misuse.