

## 1. What is SQL?



SQL (Structured Query Language) – a standard language used to store, manage, and retrieve data from a database.

Applications:

- Creating and managing databases
- Data Science
- Banking Systems
- Any other web app where collection of data is involved

## 2. What is Querying?

Querying means asking questions to a database using SQL commands to get specific data.

Example:

```
SELECT name, salary FROM employees WHERE department = 'HR';
```

## 3. SQL vs MySQL

SQL is a language for managing data, while MySQL is a database system that uses SQL to store and process data.

### SQL

It is a **language** used to manage data in databases.

Example: SQL commands like SELECT, INSERT, DELETE.

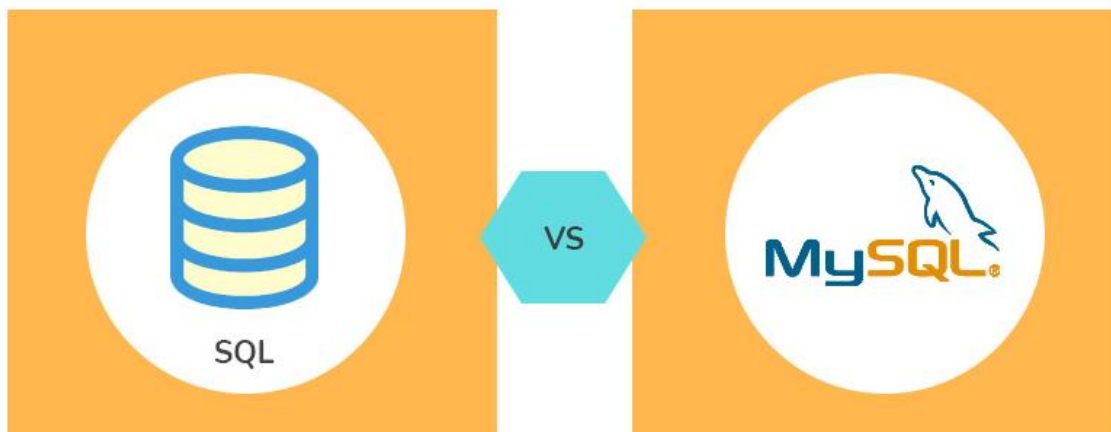
SQL is a **standard**.

### MySQL

It is a **database management system (DBMS)** that uses SQL to interact with the data.

Example: A software like MySQL Server that stores and manages data.

MySQL is an **implementation** of SQL.



## 4. What is DBMS?

**DBMS (Database Management System)** is software that stores and manages data electronically.

Examples: MS Access, MySQL, Oracle.

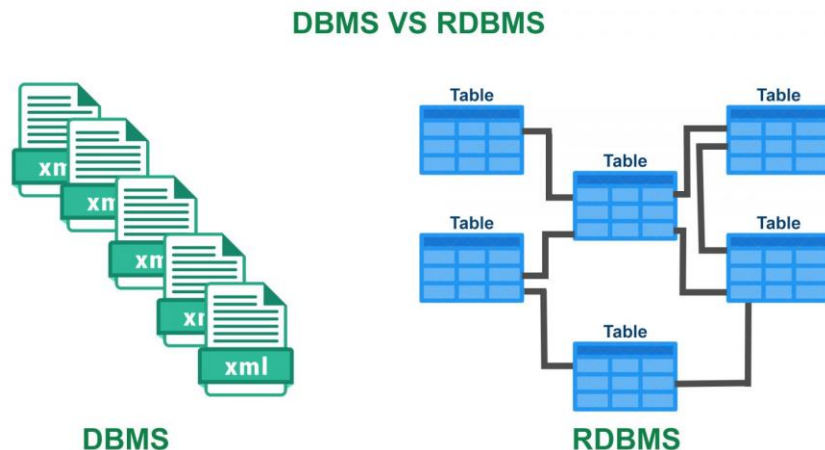
### Drawbacks:

- Data redundancy (same data stored multiple times)
- Slower for complex queries
- Limited data security
- Doesn't support complex relationships between data
- Difficult to handle large amounts of data efficiently

## 5. DBMS vs RDBMS

DBMS stores data in files or flat tables, whereas RDBMS stores data in related tables using Primary and Foreign Keys. RDBMS reduces redundancy and improves data integrity.

DBMS	RDBMS
Data stored in <b>files</b> or <b>non-relational tables</b> .	Data stored in <b>related (relational) tables</b> .
Doesn't support relationships (keys).	Supports relationships using <b>Primary Key</b> and <b>Foreign Key</b> .
Example: MS Access, dBase.	Example: MySQL, Oracle, PostgreSQL.
No normalization.	Supports normalization to reduce redundancy.



## 6. DDL and DML Commands

### **DDL (Data Definition Language):**

Used to **define or change structure** of the database (tables, schema).

Examples:

- CREATE – create table
- ALTER – modify table
- DROP – delete table
- TRUNCATE – remove all rows

### **DML (Data Manipulation Language):**

Used to **manipulate or handle data** inside tables.

Examples:

- INSERT – add data
- UPDATE – modify data
- DELETE – remove data
- SELECT – fetch data

## 7. SQL Clauses

Clauses used inside queries: SELECT, FROM, WHERE, GROUP BY, ORDER BY, HAVING. They form a complete SQL statement.

Explain all **SQL clauses**.

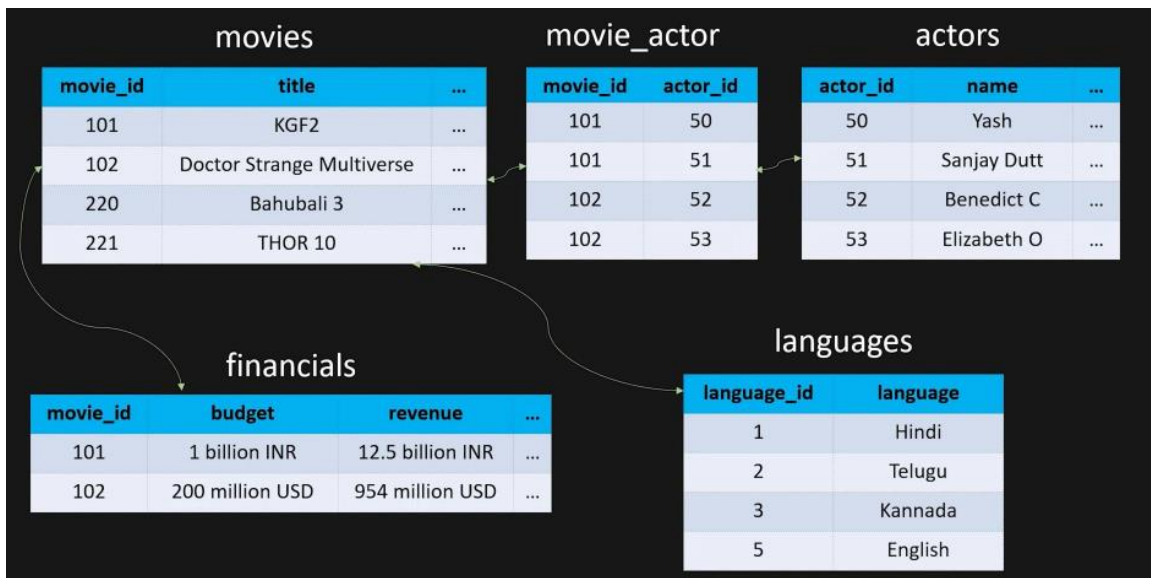
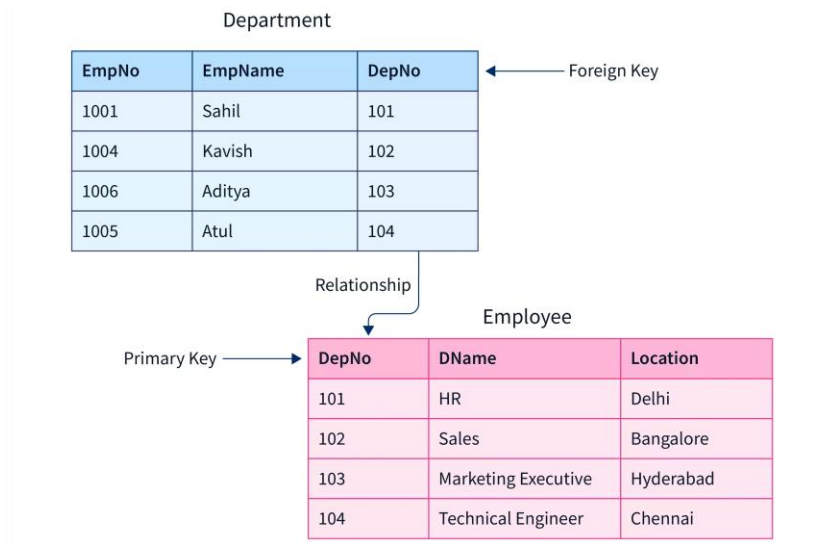
- SELECT → to choose columns
- FROM → to choose table
- WHERE → to filter data
- GROUP BY → to group data
- ORDER BY → to sort data
- HAVING → to filter groups

Together, they form an **SQL query statement**.

## 8. Primary Key and Foreign Key

Primary Key: Unique ID for each record, cannot be NULL.

Foreign Key: Refers to the primary key of another table to create relationships.

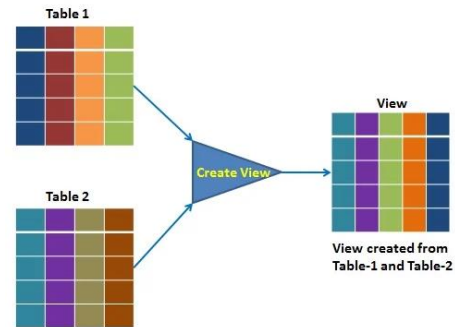
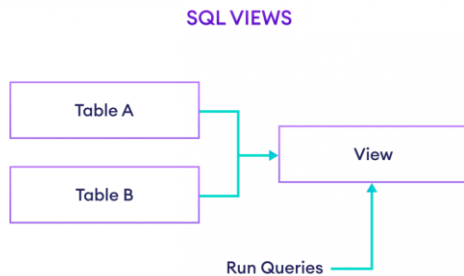


## 9. View

A View is a virtual table based on a query result. It simplifies complex queries and enhances data security.

Example:

```
CREATE VIEW high_salary AS SELECT name, salary FROM employees WHERE salary > 50000;
```

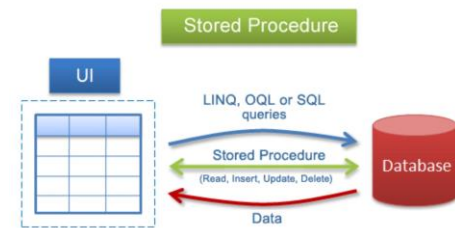


## 10. Function

Function is a block of code that performs a calculation and returns one value.

Types: **Built-in** (SUM, AVG ,COUNT) and **User-defined** (custom functions eg : Fiscal Year).

## 11. Stored Procedure



Stored Procedure is a set of SQL statements saved in the database to perform a specific task.

Example:

```
CREATE PROCEDURE AddEmployee(IN name, IN salary) ...
```

Called using: `CALL AddEmployee(karan, 60000);`

### Difference between Function and Stored Procedure:

Feature	Function	Stored Procedure
Returns a value	Always returns one	May or may not return
Used in	SQL queries	Called separately
Purpose	Calculation	Complete operations

## 12. OLAP vs OLTP

### OLTP (Online Transaction Processing)

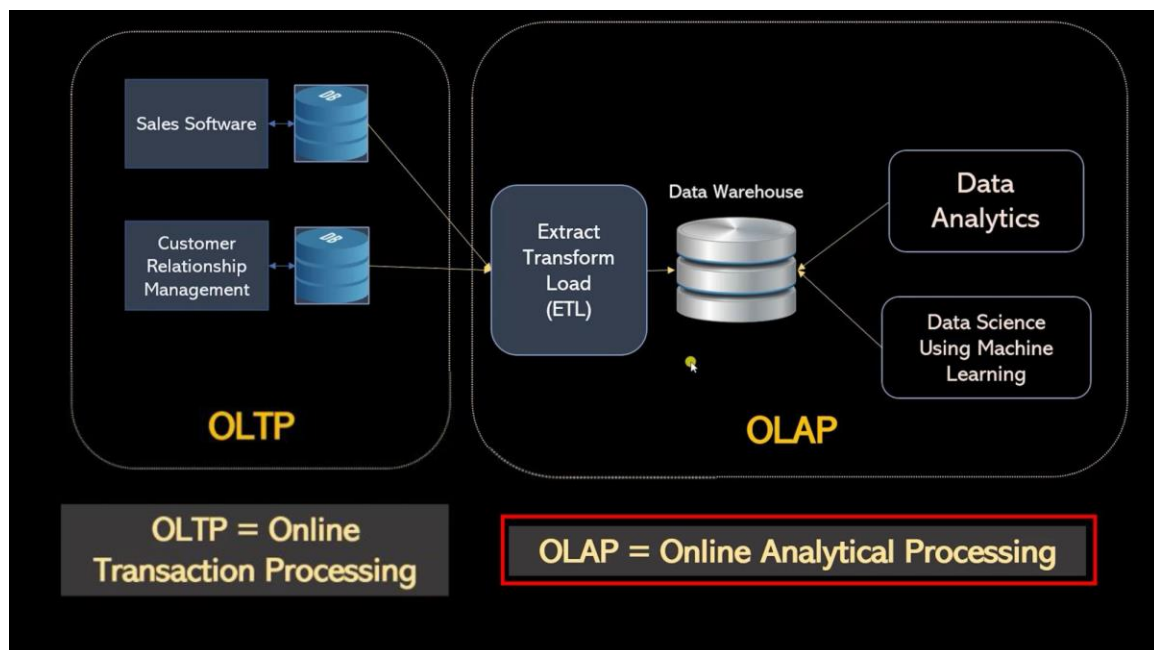
- Used for **daily transactions** (insert, update, delete).
- Example: ATM transactions, online booking, order processing.
- Focus: **Speed and accuracy** for real-time data.

### OLAP (Online Analytical Processing)

- Used for **data analysis and reporting**.
- Example: Business reports, data summaries, dashboards.
- Focus: **Complex queries** and decision-making.

Feature	OLTP (Online Transaction Processing)	OLAP (Online Analytical Processing)
Purpose	Day-to-day operations	Data analysis & reporting
Data	Current & detailed	Historical & summarized
Operations	Insert, update, delete	Complex queries, aggregation
Speed	Fast for transactions	Optimized for reading large data
Example	ATM system, online shopping	Business dashboards, data warehouse

## DATA WAREHOUSE , ETL , OLAP OLTP



## 13. Why Shift from DBMS to RDBMS?

### Reason for shift:

DBMS had many **limitations** that RDBMS solved.

Problem in DBMS	Solution in RDBMS
Data redundancy	Normalization removes duplicate data
No relationship between data	Relationships added using <b>Primary Key &amp; Foreign Key</b>
Poor data integrity	Enforced through <b>constraints</b>
Limited security	User access control introduced
Hard to manage large data	Efficient management using relational model
Slower for complex queries	SQL provides powerful query capabilities

### In short:

RDBMS was needed to handle **large, related, and complex data** efficiently with **better integrity, consistency, and speed**.

## Quick Summary Table

Concept	Meaning	Example
SQL	Language to manage data	<code>SELECT * FROM students;</code>
DBMS	Software to manage databases	MS Access
RDBMS	DBMS with relational structure	MySQL, Oracle
DDL	Structure commands	CREATE, DROP
DML	Data commands	SELECT, INSERT
View	Virtual table	<code>CREATE VIEW ...</code>
Function	Returns single value	<code>SUM(salary)</code>
Procedure	Performs a task	<code>CALL AddEmployee()</code>
OLTP	Real-time data	Banking
OLAP	Analytical data	Reports

## DATABASE DESIGN

Ref :

<https://github.com/d-hackmt/DBMS---SQL-BSC-SY-SSE/tree/main/Db%20from%20scratch>

