SQL Skill Enhancement Session

GUVI

CENTRE FOR CONTINUING EDUCATION
INDIAN INSTITUTE OF TECHNOLOGY MADRAS


language
SQL
structured
query

What is a database ?

- A database is a collection of data stored in a format that can be easily accessible.

- A software application used to manage the Database is called DBMS-Database Management System

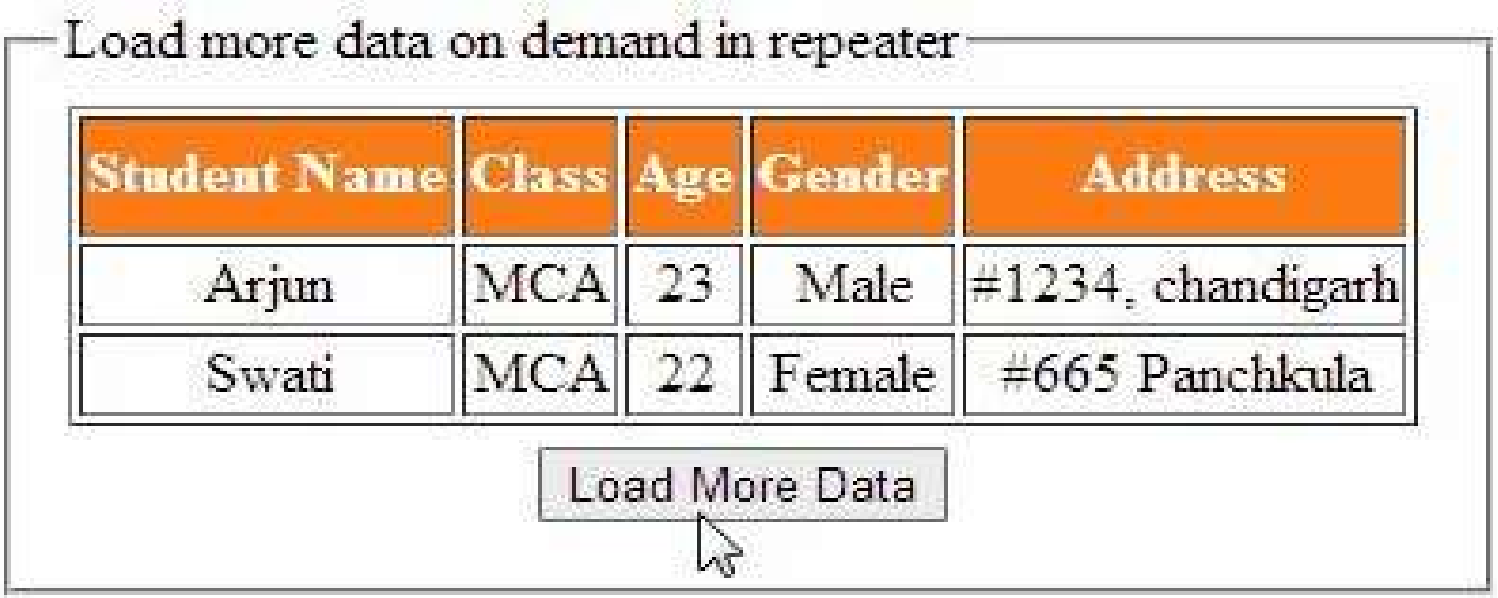
What is SQL ?

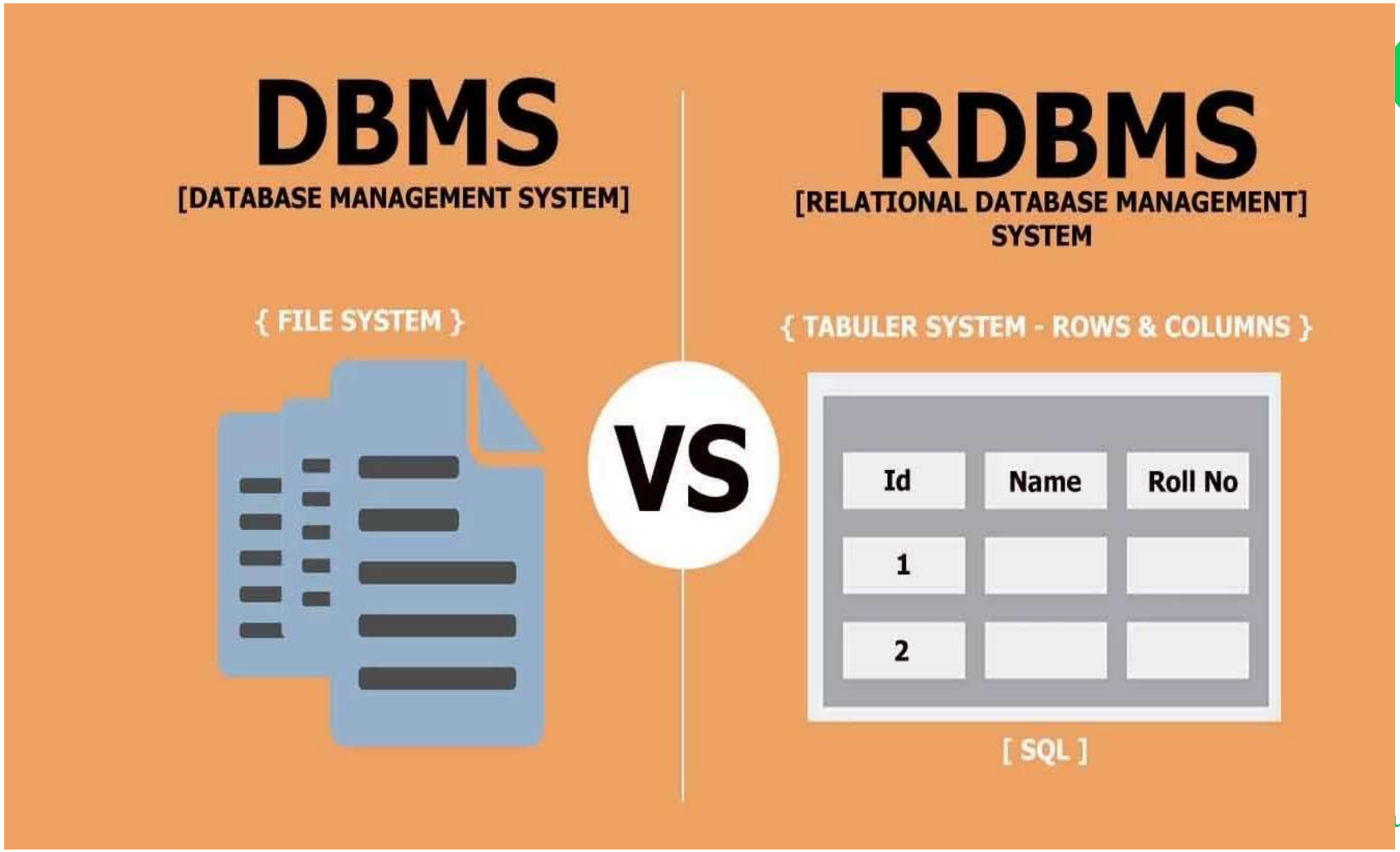
- SQL stands for **Structured Query Language**. SQL is used to communicate with database and it is used for storing and managing data in Relational Database Management System
- The SQL programming language was developed in the 1970s by IBM researchers **Raymond Boyce** and **Donald Chamberlin**
- It is a standard language for Relational Database System. SQL can be used to insert, search, update, and delete database records

History of SQL ?

- 1970: Dr. Edgard Codd publishes a research paper on the relational data model for large shared data banks.
- 1973: IBM researchers Donald Chamberlain and Raymond Boyce begin developing the language, called **Structured English Query Language (SEQUEL).**
- 1974: Both Chamberlain and Boyce develop a SQL-based relational database management system called Relational Software Inc, inspired by Codd's research paper.
- 1979: IBM releases the first commercially available SQL data system.
- 1986: It is standardized by the American National Standards Institute (ANSI).

Why do we need SQL?




DBMS
[DATABASE MANAGEMENT SYSTEM]
{ FILE SYSTEM }
VS
RDBMS
[RELATIONAL DATABASE MANAGEMENT] SYSTEM
{ TABULER SYSTEM - ROWS & COLUMNS }
Id
Name
Roll No
1
2
[SQL]

RDBMS

- Data is represented in terms of tuples (rows) in RDBMS. A relational database is the most commonly used database.
- It contains several tables, and each table has its primary key.
- Due to a collection of an organized set of tables, data can be accessed easily in RDBMS.

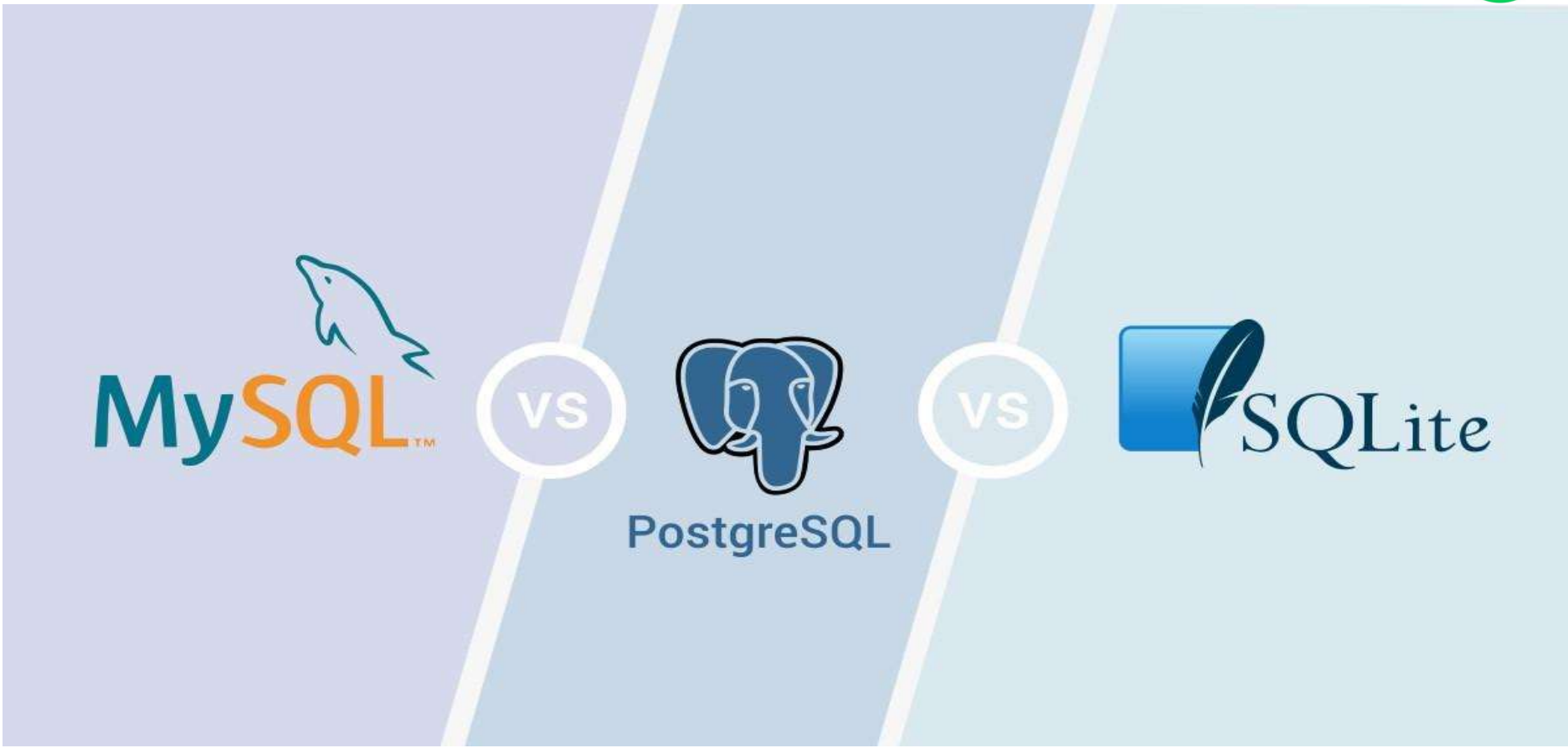
What is the Difference between DBMS and RDBMS?

- In **DBMS,** the data is stored as a file e.g.XML, Microsoft Access , whereas in **RDBMS**, data is stored in the form of tables e.g. Oracle, MySQL server
- Data in the form of a table are linked together in RDBMS where as there won't be any link between data in DBMS

Relational Databases

	**Microsoft SQL Server** **Developer:** Microsoft	**Initial Release:** 1989
	**MySQL** **Developer:** Oracle Corporation	**Initial Release:** 23 May 1995
	**PostgreSQL** **Developer:** PostgreSQL Global Development Group	**Initial Release:** 8 July 1996
	**SQLite** **Developer:** D. Richard Hipp	**Initial Release:** 17 Aug. 2000
	**Oracle Database** **Developer:** Oracle Corporation	**Initial Release:** 1979
	**MariaDB** **Developer:** MariaDB Corporation Ab	**Initial Release:** 29 Oct. 2009
	**Informix** **Developer:** IBM	**Initial Release:** 17 Nov. 2020
	**Apache Derby** **Developer:** Apache Software Foundation	**Initial Release:** 19 May 2022
	**Amazon RDS** **Developer:** Amazon.com	**Initial Release:** 26 Oct. 2009
	**H2 Database Engine** **Developer:** Thomas Mueller	**Initial Release:** Dec. 2005
	**Sybase ASE** **Developer:** Sybase – A SAP Company	**Initial Release:** 1987

Comparing databases



Comparing databases

SQLite vs. MySQL vs. Postgres

	Pros	Cons	When to use	When not to use
SQLite	Small footprint User-friendly Portable	Limited concurrency No user management Security	Embedded applications Disk access replacement Testing	Working with lots of data High write volumes Network access is required
MySQL	Popularity & ease of use Security Speed Replication	Known limitations Licensing & proprietary features Slowed development	Distributed operations Websites & web applications Expected future growth	SQL compliance is necessary Concurrency & large data volumes
Postgres	SQL compliance Open-source & community-driven Extensible	Memory performance Popularity	Data integrity is important Integration w/other tools Complex operations	Speed is imperative Simple setups Complex replication

Comparing databases

	MySQL	PostgreSQL
SELECT...	SELECT col1, col2	SELECT col1, col2
Data from tables is case sensitive?	No WHERE name = 'John' Or WHERE name = 'john' are the same	Yes WHERE name = 'John' Or WHERE name = 'john' are not the same
Using quotation marks	name = 'John' or name = "John"	name = 'John' only
Aliases for columns and tables	SELECT AVG(col1) AS avg1	SELECT AVG(col1) AS avg1
Working with dates	CURDATE() CURTIME() EXTRACT()	CURRENT_DATE() CURRENT_TIME() EXTRACT()

Top 5 SQL Query Tools

- MySQL Workbench
- pgAdmin(Postgresql)
- dbForge Studio for mysql
- phpMyAdmin
- HeidiSQL
- DBeaver

Types of Database languages

- **Data Definition Language (DDL)**
  - Create
  - Alter
  - Drop
  - Truncate
- **Data Manipulation Language(DML)**
  - Insert
  - Update
  - Delete
- **Data Query Language (DQL)**
  - Select
- **Data Control Language(DCL)**
  - Grant
  - Revoke
- **Transaction Control Language(TCL)**
  - Commit
  - Roll Back
  - Save Point

DDL COMMANDS

list of DDL statements are:

- **CREATE:** This command is used when creating a database or objects like tables, views, indexes, store procedures, functions, and triggers. –
- **DROP:** While deleting an object from the database.
- **ALTER:** Used while altering the structure of the database.
- **TRUNCATE:** Used when we are removing all the records of a table.
- **RENAME:** This command is used while renaming an object existing in the database.

DML COMMANDS

list of DDL statements are:

- **INSERT:** This command is used to insert data into a table.
- **UPDATE:** This command we are using to update an existing data of a table.
- **DELETE:** Using this command, we can delete data from a table.

DQL COMMANDS

We have one DQL command, which is:

SELECT: By using this command, we can retrieve the data from the database.

DCL COMMANDS

- **GRANT:** By using this command, we can give user access privileges to the database. So that we can allow specified users to perform specific tasks.
- **REVOKE:** This command removes the user's access privileges approved by the GRANT command.

TCL COMMANDS

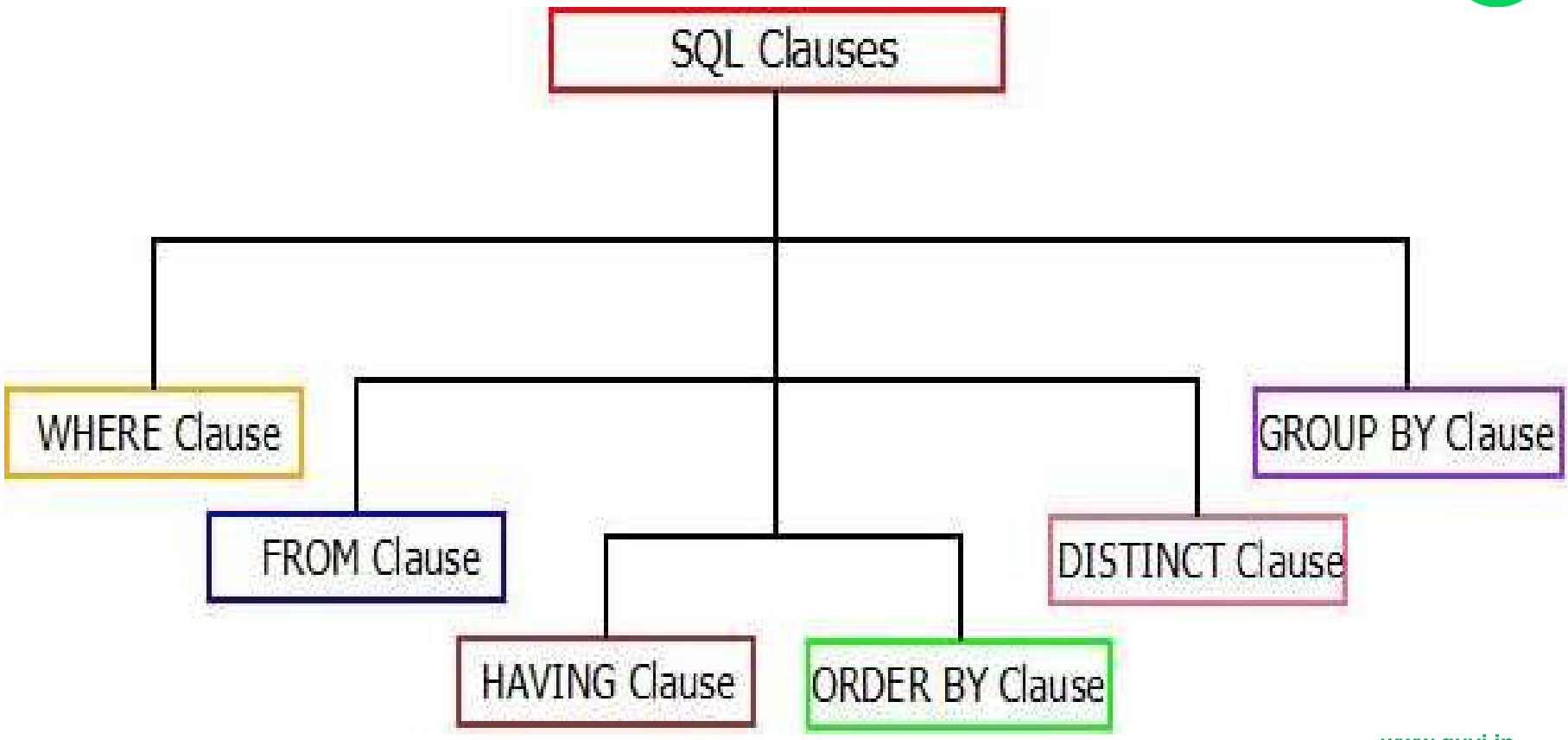
Here are the following TCL commands are:

- **COMMIT:** This command is used to save the transactions.
- **ROLLBACK:** This command is used to undo changes or roll back a transaction in case of any error occurs.
- **SAVEPOINT:** This command is used to roll back a transaction to a specific point rather than the complete transaction.

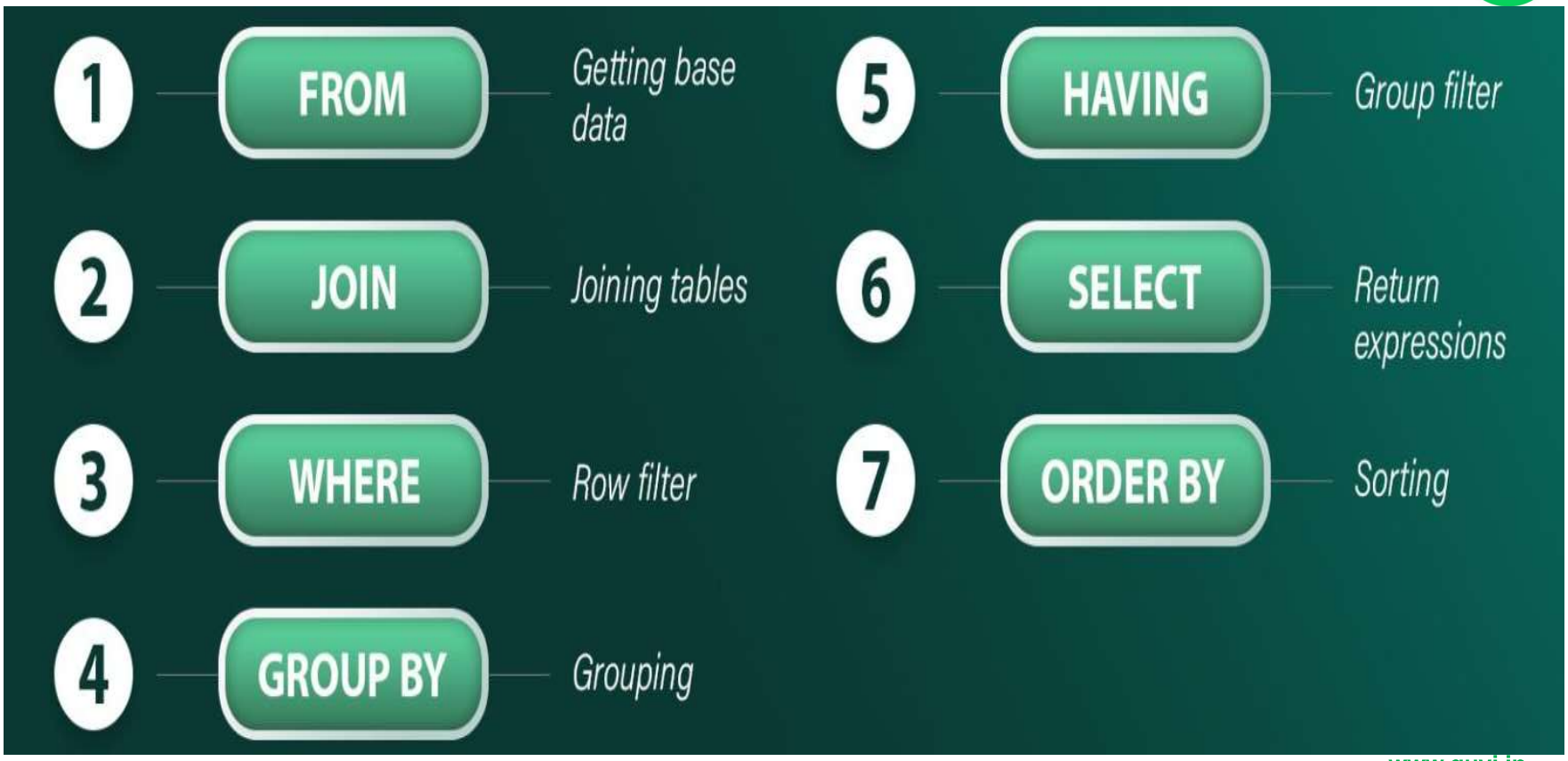
Car_sales database

```
CREATE DATABASE car_sales;

USE car_sales;


CREATE TABLE sales_product

(

    sales_person_ID int unsigned,

    customer_ID int unsigned,

    selldate date,

    manufacturer varchar(50),

    manufacturer_ID int unsigned,

    model varchar(50),

    model_ID int unsigned,
```

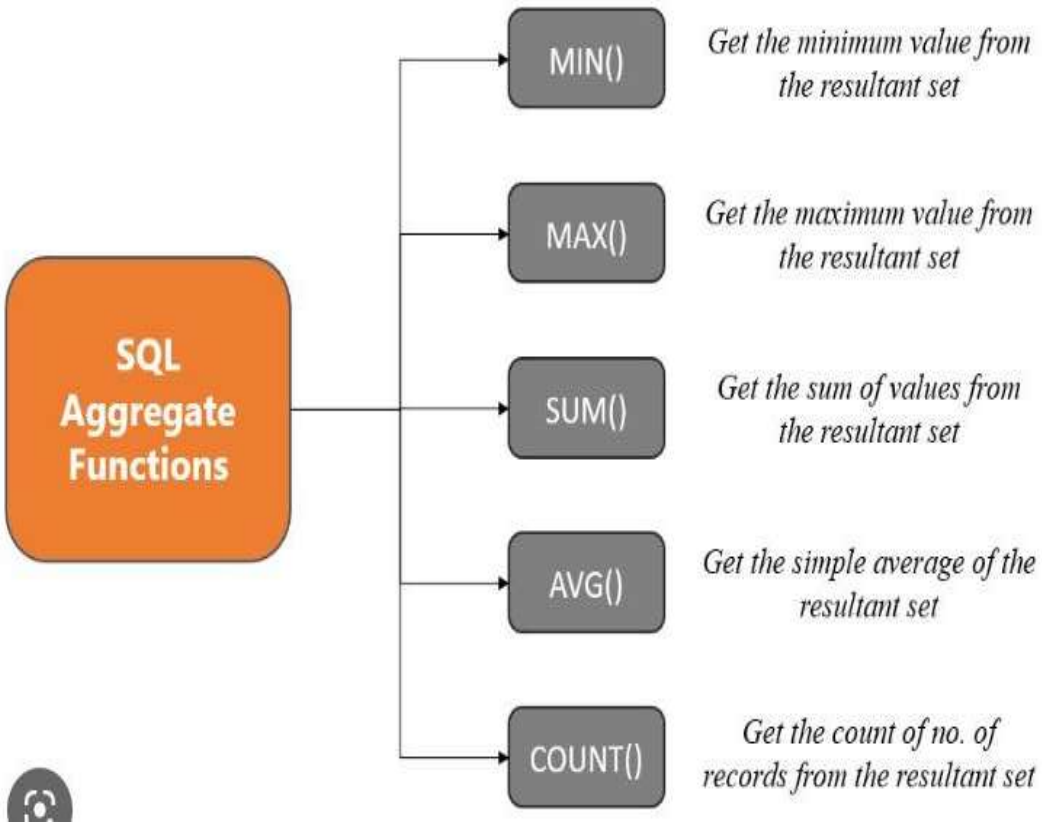
SQL Clauses

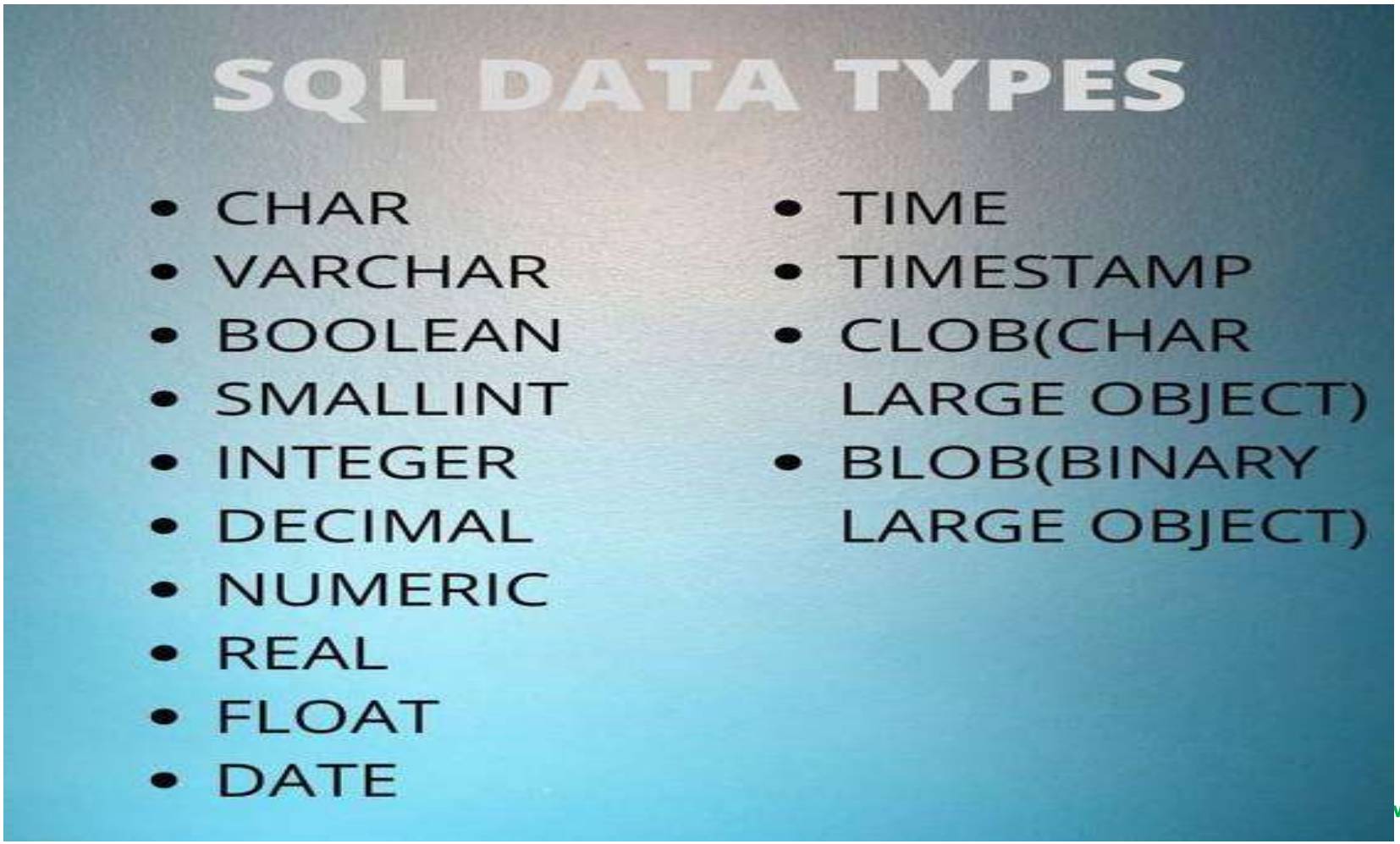


Query Execution Order



Aggregate functions




SQL DATA TYPES
CHAR
VARCHAR
BOOLEAN
SMALLINT
INTEGER
DECIMAL
NUMERIC
REAL
FLOAT
DATE
TIME
TIMESTAMP
CLOB(CHAR LARGE OBJECT)
BLOB(BINARY LARGE OBJECT)

Difference between CHAR & VARCHAR

CHAR

- We should use the char datatype when we expect the data values in a column to be of the same length.
- CHAR takes one byte for each character.
- Better performance than varchar

VARCHAR

- We should use the char datatype when we expect the data values in a column to be of Variable length.
- VARCHAR takes one byte for each character and some extra bytes for holding the length information.
- Performance is not better than char.

OPERATORS

- **ARITHMETIC + - * / %**
- **COMPARISON < <= > >= = !=**
- **LOGICAL - AND, OR, NOT, IN, BETWEEN,ALL, LIKE ,ANY**

  Eg. WHERE CITY IN (”Chennai”,”Mysore”), NOT IN

- **BITWISE- BITWISE AND & , BITWISE OR |**
  -

CLAUSES- LIMIT, ORDER BY, GROUP BY, HAVING

- **SELECT * FROM TABLE1 LIMIT 10;**

- **GROUP BY- Groups rows that have same values into summary rows. It collects data from multiple records and groups the result by one or more column. It is used along with an aggregate function.**
  Eg. Select city, count(empname) from emp group by city;

- **ORDER BY- Sorts in ascending / descending order**

- **HAVING - Used along with group by for specifying the conditions**