Pre-Requisites

- Install a RDBMS such as PostgreSQL, MySQL, Oracle, Microsoft SQL Server etc.

- Install an IDE such as PgAdmin, MySQL Workbench, SQL Developer, Microsoft SQL Server Management Studio etc.

Which role can you target after learning SQL

- Data Analyst
- Data Engineer
- Data Scientist
- SQL Developer
- Business Analyst
- Software Engineer
- Quality Analyst
- Etc…

Basic Terminologies

- Data
- Database (Relational Database)
- RDBMS
- SQL / Sequel / Structured Query Language
- Table
- Column
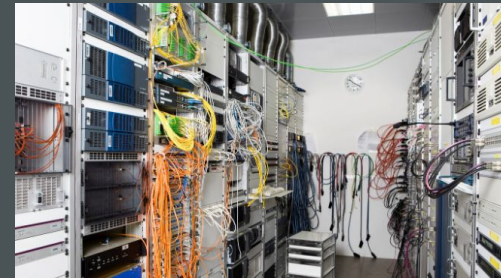- Rows / Record
- Query / Statement

Data

- Anything & Everything can be considered as data.
- Any information or fact can be considered as data.
- For an insurance company, details related to its employees, customers, their products or even their address can be data.
- Data can be in any form such as a text message or an image or a video or a document or single character itself.
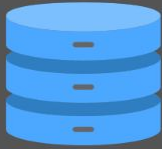
Database

- Container which is filled with data or information which is electronically stored in a computer system.

- Data in any form can be stored in the database.

- All companies use some sort of database to store their data.

- Purpose of storing data in the database is:
  - Easily Accessed
  - Modified
  - Protected
  - Analyzed

DB-ENGINES

Knowledge Base of Relational and NoSQL Database Management Systems

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- Complete ranking
- Relational DBMS
- Key-value stores
- Document stores
- Time Series DBMS
- Graph DBMS
- Search engines
- Object oriented DBMS
- RDF stores
- Vector DBMS
- Wide column stores
- Multivalue DBMS
- Spatial DBMS
- Native XML DBMS
- Event Stores
- Content stores
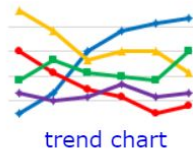- Navigational DBMS

Special reports

Ranking > Complete Ranking

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DB-Engines Ranking

The DB-Engines Ranking ranks database management systems according to their popularity. The ranking is updated monthly.

Read more about the method of calculating the scores.

trend chart

421 systems in ranking, June 2024

Rank			DBMS	Database Model	Score		
Jun 2024	May 2024	Jun 2023			Jun 2024	May 2024	Jun 2023
1.	1.	1.	Oracle 🔼	Relational, Multi-model ℹ	1244.08	+7.79	+12.61
2.	2.	2.	MySQL 🔼	Relational, Multi-model ℹ	1061.34	-22.39	-102.59
3.	3.	3.	Microsoft SQL Server 🔼	Relational, Multi-model ℹ	821.56	-2.73	-108.50
4.	4.	4.	PostgreSQL 🔼	Relational, Multi-model ℹ	636.25	-9.30	+23.43
5.	5.	5.	MongoDB 🔼	Document, Multi-model ℹ	421.08	-0.58	-4.29
6	6	6	Redis 🔼	Key-value, Multi-model ℹ	155.94	-1.86	-11.41

RDBMS vs DATABASE
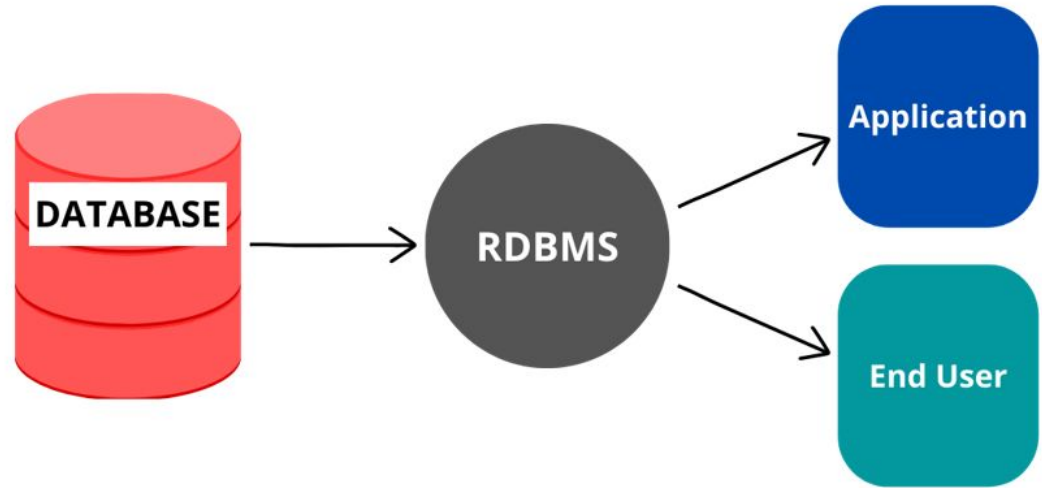
The software used to store, manage, query, and retrieve data stored in a relational database is called a **relational database management system** (RDBMS)

SQL

- Structured Query Language (SQL). Also referred to as "SEQUEL"
- SQL is a programming language used to interact with Relational Database Management System.
- SQL is primarily used in RDBMS.
- All major RDBMS like Oracle, MySQL, MSSQL, PostgreSQL etc use SQL.
- Using SQL, you can:
  - Read data from a RDBMS
  - Write data into a RDBMS
  - Create, modify or delete database
  - Analyze data
  - Build reports

How is data stored in RDBMS ?

- In RDBMS, data is stored in multiple tables.

- Each table can have a set of rows and columns.

- Different tables will be related to each other through certain columns forming relationship between these tables.

TABLE 1					
	COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5
ROW 1	data	data	data	data	data
ROW 2	data	data	data	data	data
ROW 3	data	data	data	data	data
ROW 4	data	data	data	data	data

Sample data in table
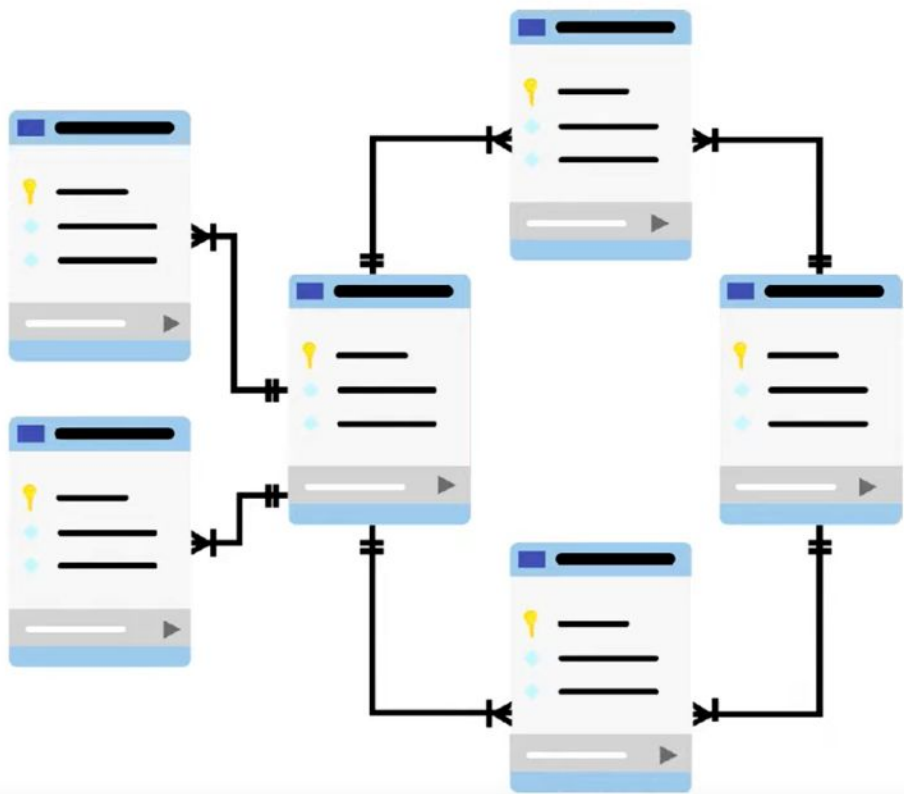
Relational Database

CUSTOMER ID	NAME	AGE
C001	Mohan	55
C002	Ramesh	43
C003	Siddharth	21

ORDER ID	DATE	CUST ID	PROD ID
ORD001	20-Nov-20	C001	PRD1
ORD002	13-Jul-13	C003	PRD2
ORD003	14-Apr-17	C003	PRD1

PRODUCT ID	PRICE	CURRENCY
PRD1	1000	MYR
PRD2	500	MYR
PRD3	250	MYR
PRD4	75	MYR

Is SQL different in different RDBMS ?

- Oracle
- MySQL
- Microsoft SQL Server (MSSQL)
- PostgreSQL

SQL COMMANDS

DDL	DML	DCL	TCL	DQL
DATA DEFINITION LANGUAGE	DATA MANIPULATION LANGUAGE	DATA CONTROL LANGUAGE	TRANSACTION CONTROL LANGUAGE	DATA QUERY LANGUAGE
CREATE	INSERT	GRANT	COMMIT	SELECT
DROP	UPDATE	REVOKE	ROLLBACK	
ALTER	DELETE		SAVEPOINT	
TRUNCATE	MERGE			

Database objects   Data in object   Access
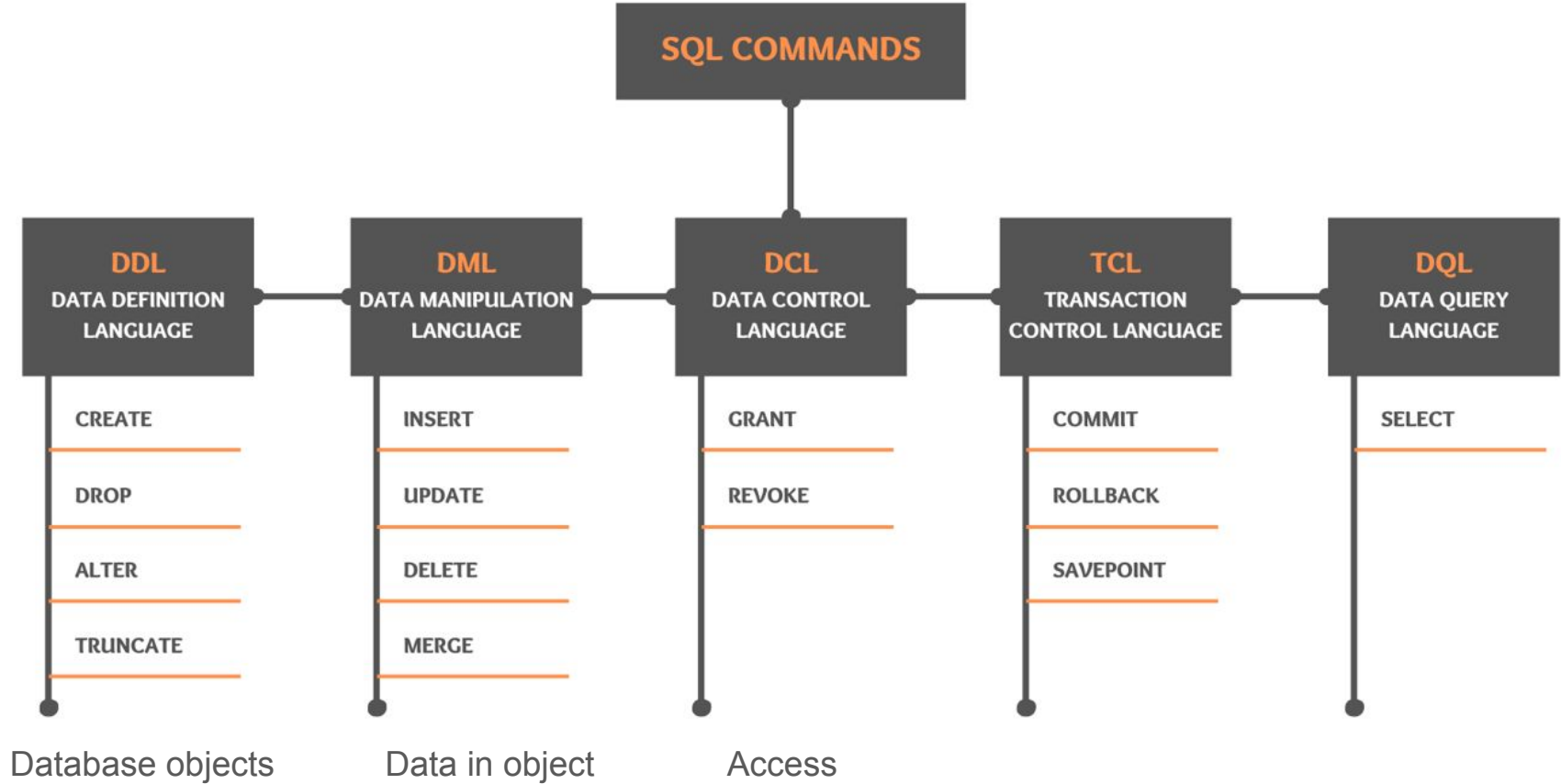
DDL Commands

- Data Definition Language
- Used to define the structure of a database object such as Table, Views, Procedure, Function etc.
- Commands include:
  - CREATE
  - ALTER
  - DROP
  - TRUNCATE

```sql
CREATE TABLE IF NOT EXISTS STUDENTS
    (
        ID                  VARCHAR(20) PRIMARY KEY
      , FIRST_NAME          VARCHAR(100) NOT NULL
      , LAST_NAME           VARCHAR(100) NOT NULL
      , GENDER              VARCHAR(10) CHECK (GENDER IN ('M', 'F', 'Male', 'Female'))
      , AGE                 INT
      , DOB                 DATE
      , GRADE               FLOAT
      , IS_ACTIVE           BOOLEAN
      , CONSTRAINT CH_STUDENTS_AGE CHECK (AGE > 0)
    );



ALTER TABLE STUDENTS DROP COLUMN GRADE;

ALTER TABLE STUDENTS ALTER COLUMN IS_ACTIVE TYPE VARCHAR(1);

ALTER TABLE STUDENTS RENAME TO STUDENTS123;

ALTER TABLE STUDENTS123 RENAME COLUMN IS_ACTIVE TO ACTIVE;

ALTER TABLE STUDENTS123 RENAME TO STUDENTS;

DROP TABLE IF EXISTS STUDENTS;

TRUNCATE TABLE STUDENTS;
```

Data Type

- INT / NUMBER
- VARCHAR / STRING
- DATE
- FLOAT / DECIMAL
- BOOLEAN

TABLE 1					
	COLUMN 1	**COLUMN 2**	**COLUMN 3**	**COLUMN 4**	**COLUMN 5**
ROW 1	Green	9	05/07/1986	5.5	TRUE
ROW 2	Forest 5	100	1986-07-05	0.1	FALSE
ROW 3	123 _- ABC	854376872	5-Jul-86	6890.99	FALSE
ROW 4	123	0	5-Jul-1986	99.0	TRUE
	VARCHAR	**INT**	**DATE**	**FLOAT**	**BOOLEAN**

Constraints

- **CHECK** constraint allows you to control the values that can be inserted into a column.

- By applying **NOT NULL** constraint on a column, you make sure that this column will never have NULL values.

- **UNIQUE** constraint makes sure that the values in your column are always unique. It can have NULL values.

- A table can only have one **PRIMARY KEY** constraint. Primary key constraint can either be applied to a single column or to a combination of different columns. If a column (or if a combination of multiple columns) is defined as a primary key, then this column/columns will always have unique values across all the rows of that table. Also, primary key column cannot have null values hence primary key can be treated as a combination of UNIQUE and NOT NULL constraints.

- **FOREIGN KEY** constraint can be used to form relation between tables. It basically helps to create a master child relation between 2 tables.

DML Commands

- Data Manipulation Language
- DML commands are used to load, modify and remove data from the database.
- Commands include:
  - INSERT
  - UPDATE
  - DELETE
  - MERGE

```sql
INSERT INTO STUDENTS VALUES
    ('STD10001','Lindy','O''Connell','Male',6,TO_DATE('2014-01-13', 'YYYY-MM-DD'), 8.5, TRUE),
    ('STD10002','Madison','Walder','Male',6,TO_DATE('2014-01-19', 'YYYY-MM-DD'), 7.9, TRUE),
    ('STD10003','Marve','Sheaber','Male',6,TO_DATE('2014-03-11', 'YYYY-MM-DD'), 9.0, FALSE);


INSERT INTO STUDENTS (ID, FIRST_NAME, LAST_NAME, GENDER, AGE, DOB, GRADE, IS_ACTIVE)
    VALUES ('STD10001','Lindy','O''Connell','Male',6,TO_DATE('2014-01-13', 'YYYY-MM-DD'), 8.5, TRUE);
INSERT INTO STUDENTS (ID, FIRST_NAME, LAST_NAME, GENDER, AGE, DOB, GRADE, IS_ACTIVE)
    VALUES ('STD10002','Madison','Walder','Male',6,TO_DATE('2014-01-19', 'YYYY-MM-DD'), 7.9, TRUE);
INSERT INTO STUDENTS (ID, FIRST_NAME, LAST_NAME, GENDER, AGE, DOB, GRADE, IS_ACTIVE)
    VALUES ('STD10003','Marve','Sheaber','Male',6,TO_DATE('2014-03-11', 'YYYY-MM-DD'), 9.0, FALSE);

COMMIT;
```

```sql
UPDATE STUDENTS
SET LAST_NAME = 'Johnson'
WHERE ID = 'STD10001';

COMMIT;
```

```sql
DELETE FROM STUDENTS WHERE ID = 'STD10001';

COMMIT;
```

TCL Commands

- Transaction Control Language

- Includes COMMIT, ROLLBACK and SAVEPOINT

- Used to save/unsave open transactions in a database session

DCL Commands

- **Data Control Language**

- Includes **GRANT** and **REVOKE** statements.

- Used to provide or remove permission on a database object to a database user.

DQL Commands

- **Data Query Language**
- Includes only the SELECT statement
- Can be used to read data from one or multiple tables.
- Contains following clauses:
  - SELECT – list of columns
  - FROM – list of tables
  - WHERE – filter conditions and join conditions
- Can also include following clauses:
  - GROUP BY – Grouping of data based on specified column(s)
  - HAVING – Filter condition for the grouped data
  - ORDER BY
  - LIMIT / TOP

Thank You