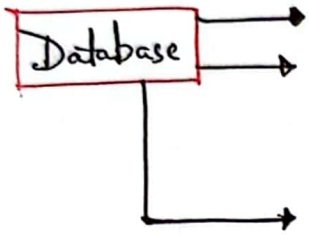
Database Management

Data V Information:

Data	Information
Data consists of raw, unprocessed facts and figures without any context.	Information is processed data that has been organized and presented in a context
Has no meaning on it's own	Has meaning and relevance
Data is the raw input	Information is derived from data
Examples: "42", "John", "2024-7-1"	Example: John is 42 years old as of July 1, 2024

Data Base:



- Designed to manage large bodies of information.
- Organized collection of Data typically stored and accessed electronically.
- support various types of data operations like querying, updating and management.

Types of Databases:

1. **Relational Database:** Store Data in structured tables with SQL queries. Enforce A → Atomicity, C → Consistency, I → Isolation, D → Durability and SQL for data manipulation and query.

   Example: MySQL, PostgreSQL, Oracle.

2. **Non-relational Databases:** Handle various data models (key-value, document, columnar, graph).

   Example: MongoDB, Redis

3. **Object oriented Database:** Store data as objects.

   Example: Object DB.

④ Graph DataBase

⑤ Centralized DataBase

⑥ Cloud DataBase

⑦ Distributed DataBase

Table, Record, field and Value:

① **Table:** An organized collection of data arranged in rows and columns.

② **Record:** An individual row in a table representing a single data entity.

③ **field:** Column in a table stores a specific catagory of Data.

④ **Value:** Actual data stored in a field within a record.

Example:

Student

Name	Roll	phone	Adress
Rahim	102	015-- -	Dhaka
Karim	104	017-- - -	comilla
Sajjad	106	018-- - -	Khulna

Whole "row" is a record of Karim.

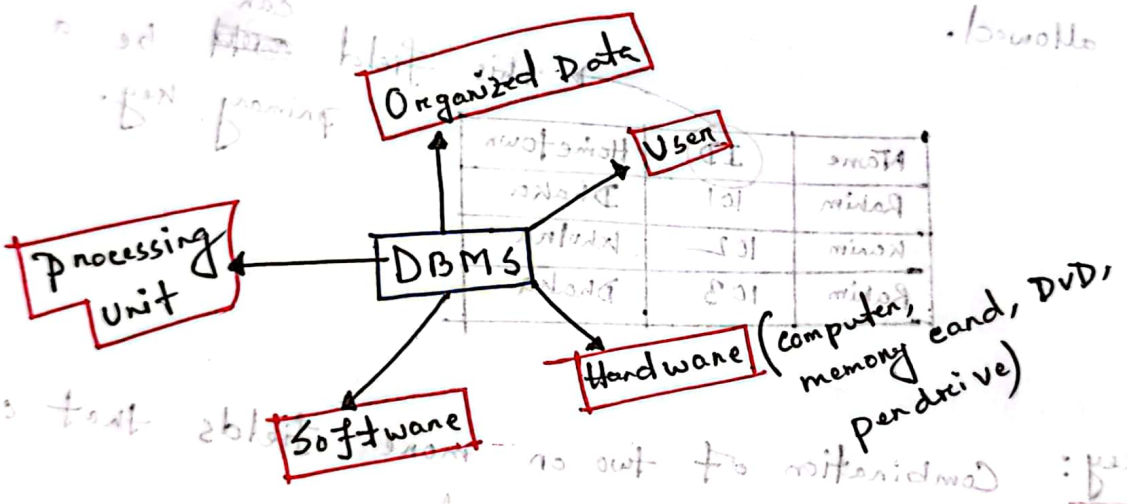
Value: Every cell except field represents a value.

field: Name
Roll
phone
Adress

DBMS and RDBMS:

DBMS → DataBase Management System

RDBMS → Relational DataBase Management System



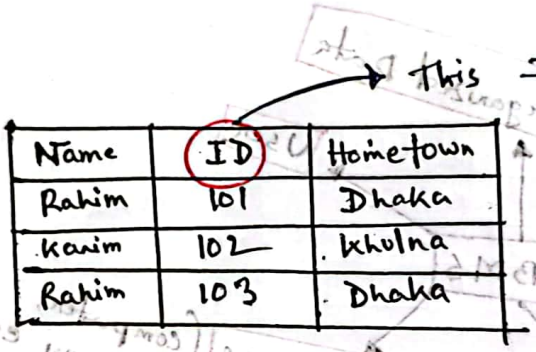
Advantage:

- Organized data stoned, easy to retrieve and rothen management.
- fast access to data.
- Parallel Accessing.

Key:

a key is a field on combination of fields used to uniquely identify and access records within a table.

- **primary key:** Unique identifier for each record, No duplicates allowed.



Name	ID	Hometown
Rahim	101	Dhaka
Karim	102	Khulna
Rahim	103	Dhaka

- **Composite key:** Combination of two or more fields that can uniquely identify a record.

Course	University	Credit
CS 101	DU	4
CS 102	BUET	3
CS 101	BUET	3

Here, No field is unique.

→ Course + University = Composite key

→ CS 101, DU — unique
CS 101, BUET — unique

- **Foreign Key:** Field linking to the primary key of another table, establishing a relationship.

student

Name	Roll
Rahim	101
Karim	102
Sajjad	103
Milon	104

primary key

library

Book	Roll
ABC	101
PQR	102
XYZ	102
1988	103

→ primary key of another table

→ So, it's a foreign key

Relation:

Relation refers to the association between tables that defines how data is related across different tables.

- **One-to-one (1:1) relationship:** Each record in one table is related to a single record of another table.

Student

Name	Roll
a	1
b	2
c	3

Contact

Roll	Phone	Adress
2	015--	Dhaka
1	01--	"
3	018--	"

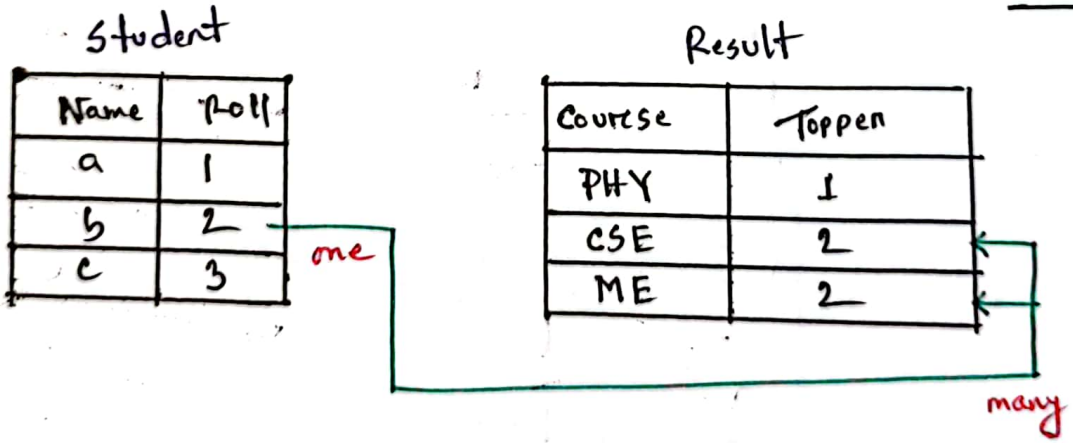
- **One-to-many Relationship:** Each record in one table can be related to multiple records of another table.

Student

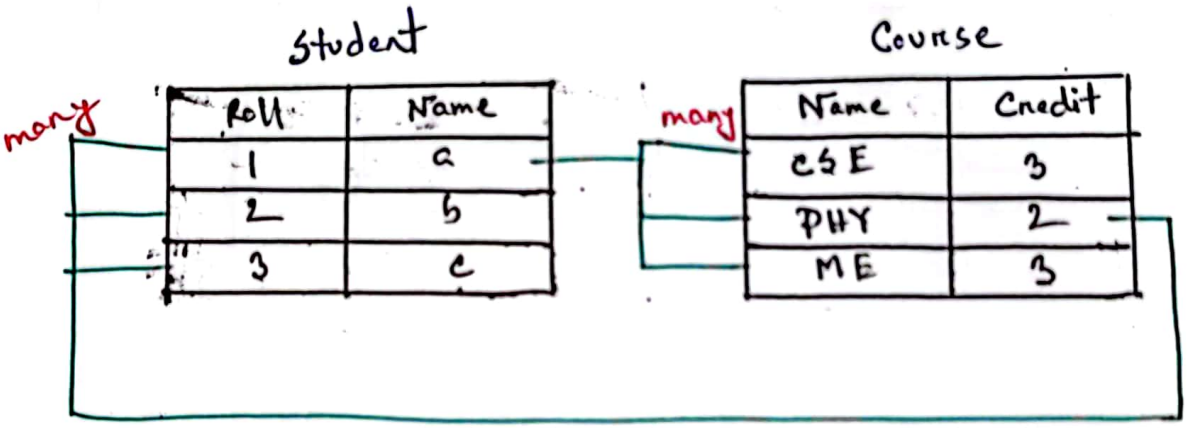
Name	Roll
a	1
b	2
c	3

Result

Course	Topper
PHY	1
CSE	2
ME	2

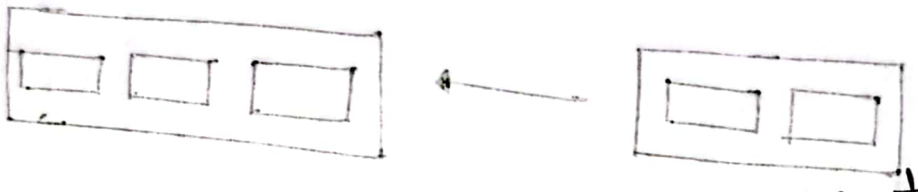


- **Many to many Relationship:** Each record in one table can be related to multiple records in another table, and vice versa.



Query:

A query is a request for data or information from a database. Queries are used to retrieve, insert, update and delete data from database tables.



Types:

① **Select Query:** Retrieves data from one or more table. To fetch data that matches specified criteria.

Example:

```
'SELECT * FROM Student WHERE Roll = '101';
```

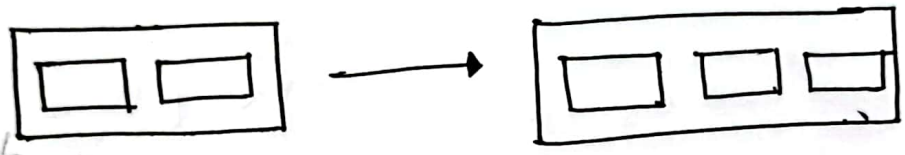
② **parameter Query:** prompts the user to provide criteria before executing. To dynamically fetch data based on user input.

Example:

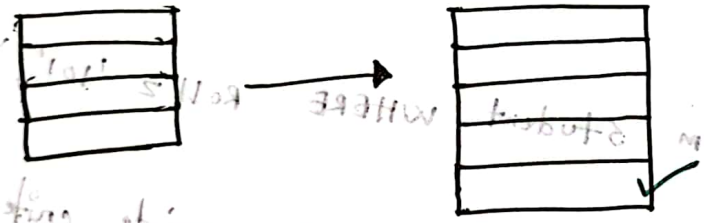
```
'SELECT * FROM student WHERE Roll = '?';
```

③ **Action Query:** Performs actions on data such as inserting, updating or deleting records.

- **Make Table:** Add an another table in the existing database



- **Append Query:** Adds new records to a table.



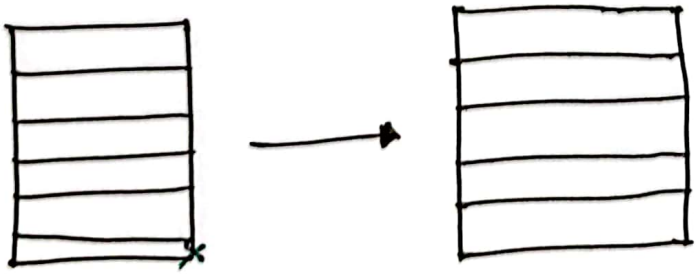
- **Updat Query:** Modifies existing records in a table.

102	Karim

→

102	Karem

- **Delete Query:** Removes records from a table.

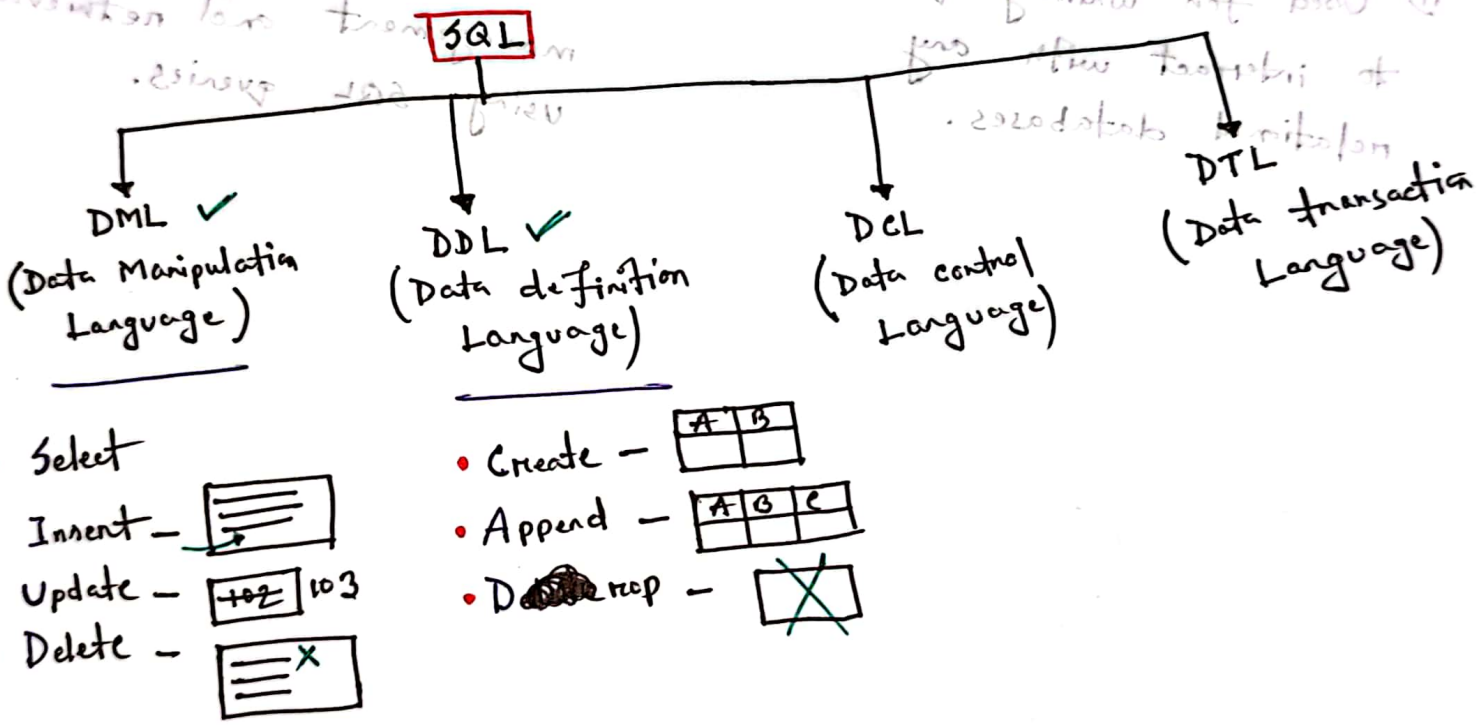


④ Crosstab Query: Summarizes data into a matrix format with rows and columns.

⑤ Unmatched Query: Find missing or unmatched data in a table.

Query Languages:

- QUEL → Query Language
- QBE → Query By Example
- SQL → Structured Query Language



SQL v MySQL :

SQL

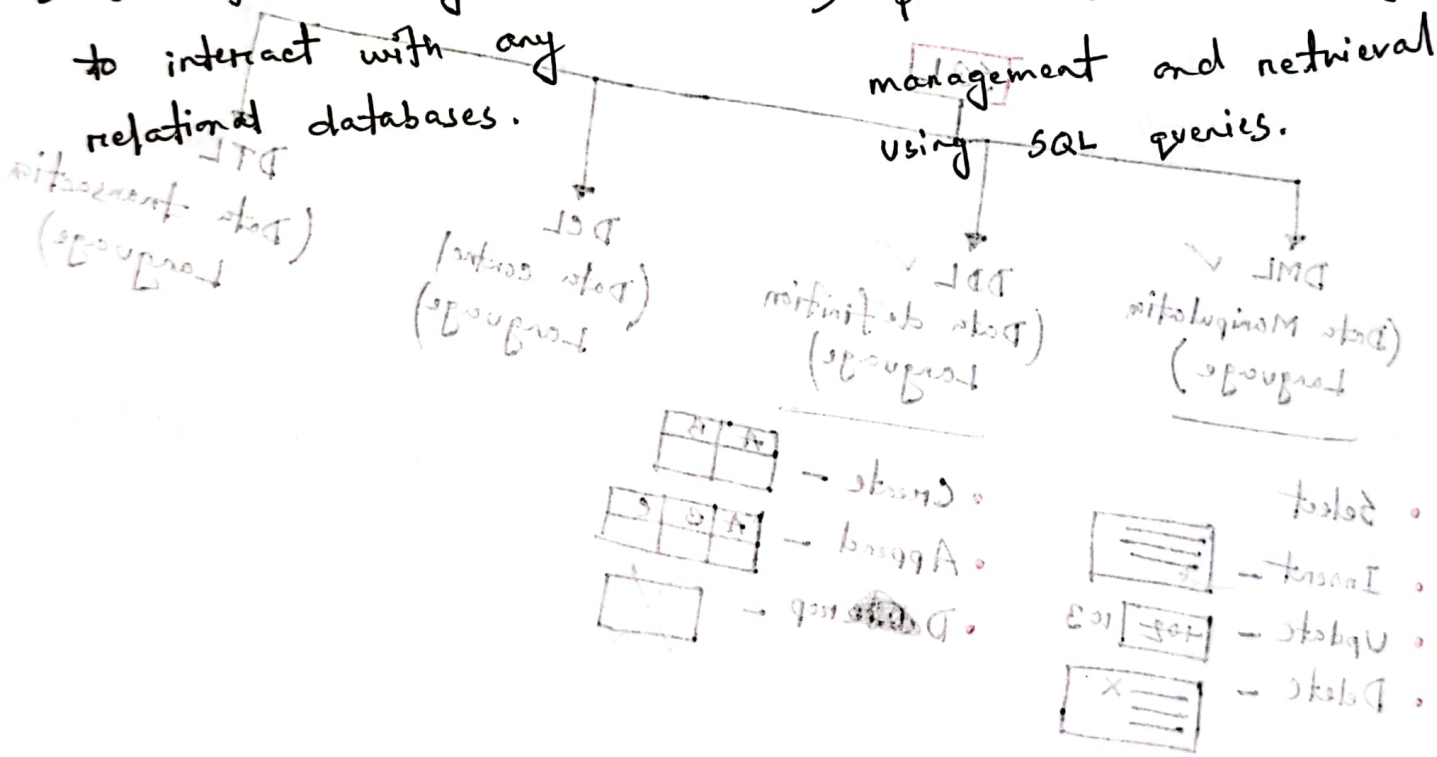
i) A programming language used to manage and manipulate databases.

ii) Used for writting queries to interact with any relational databases.

MySQL

i) An open source relational database management system that uses SQL to query databases.

ii) provides database storage, management and retrieval using SQL queries.



MySQL Data Types:

Create, Insert, Update, Delete, Drop:

- **Creating a Database:**

```
CREATE database programminghero;
```

Database Name

```
USE programminghero;
```

switch to programminghero database

- **Creating a Table:**

```
CREATE table student.(
    Roll CHAR(4), PRIMARY KEY,
    Name VARCHAR(50),
    Marks DOUBLE
);
```

field Name ← Roll

Set Roll field as PK(primary key).

- **Deleting a whole table:**

```
DROP table programminghero;
```

table Name

- **Insert:** Table existing, Data entry (Record)

```
INSERT INTO student → Table Name
(Roll, Name, Marks) VALUES ('1', 'Sanafat', 90);
```

field Name — Value to corresponding field.

— If no value given to a field it will automatically set to null.

- **Update:** Modifying existing data.

```
UPDATE student
SET Name = 'Sanafat Kaim'
WHERE ROll = 1;
```

Note: To update any data we have turn off the safe mode.

```
SET SQL_SAFE_UPDATES = 0;
```

To turn on

```
SET SQL_SAFE_UPDATES = 1;
```

- **Delete:** Deleting a record (complete row).

```
DELETE FROM student
WHERE Roll = 1;
```

Note: keyword here aren't case sensitive. Both upper and lower case letter can be used.