

SQL → Session 1. {Data is the New Oil}

- ① Computer
- ② Internet
- ③ AI

Evolution

common → data

We perform only four thing on database.

- ① Create
- ② Retrieve
- ③ Update
- ④ Delete.

Properties of an Ideal Database.

- ① Integrity → { accurate + consistency }
- ② Availability → 24x7
- ③ Security →
- ④ Independent of application. → iOS, windows etc.
- ⑤ Concurrency → Response time should be fast

Types of Databases.

→ Row based

① Relational Databases:- Also known as SQL database, these databases use a relational model to organize data into tables with rows and columns. { SQL Server, Oracle, MySQL, PostgreSQL, Microsoft Access }

Ex:-

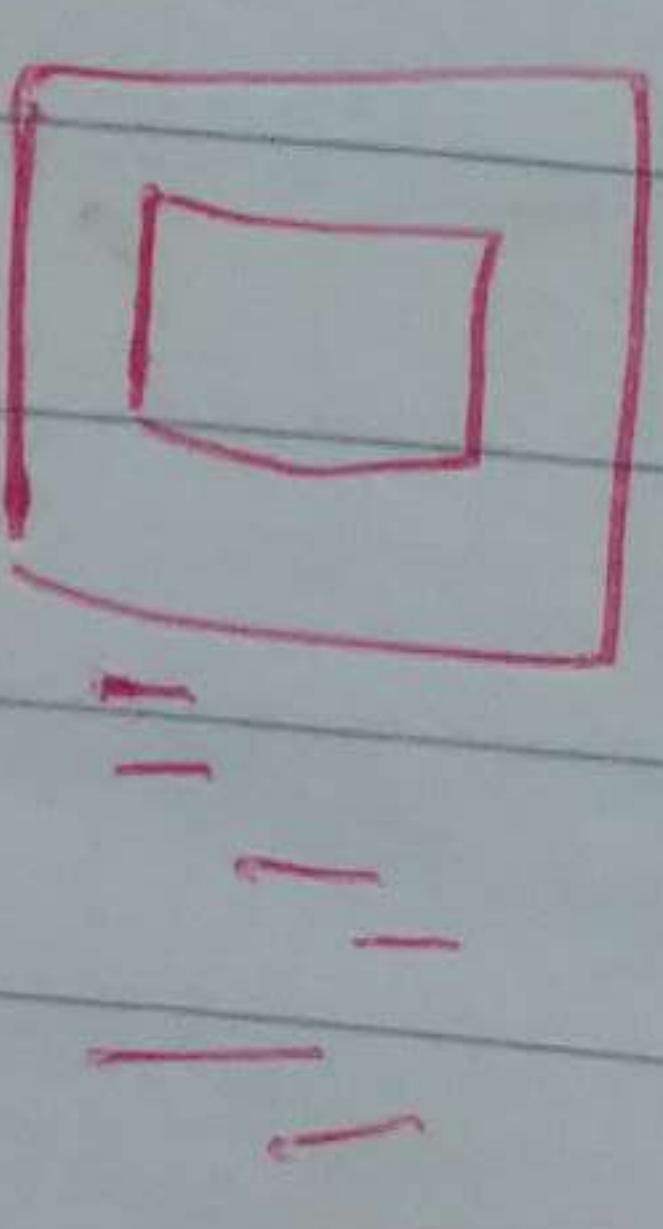
Sport person

car owned by sport person

→ Not Only SQL

② NoSQL Databases:- These databases are designed to handle large amount of unstructured or semi-structured data, such as document, image, video. { MongoDB }

Ex:- Instagram post



③ Column Data
rows, making
applications. (

Ex:-
→ A
→ B
→ C

Name
A
B
C

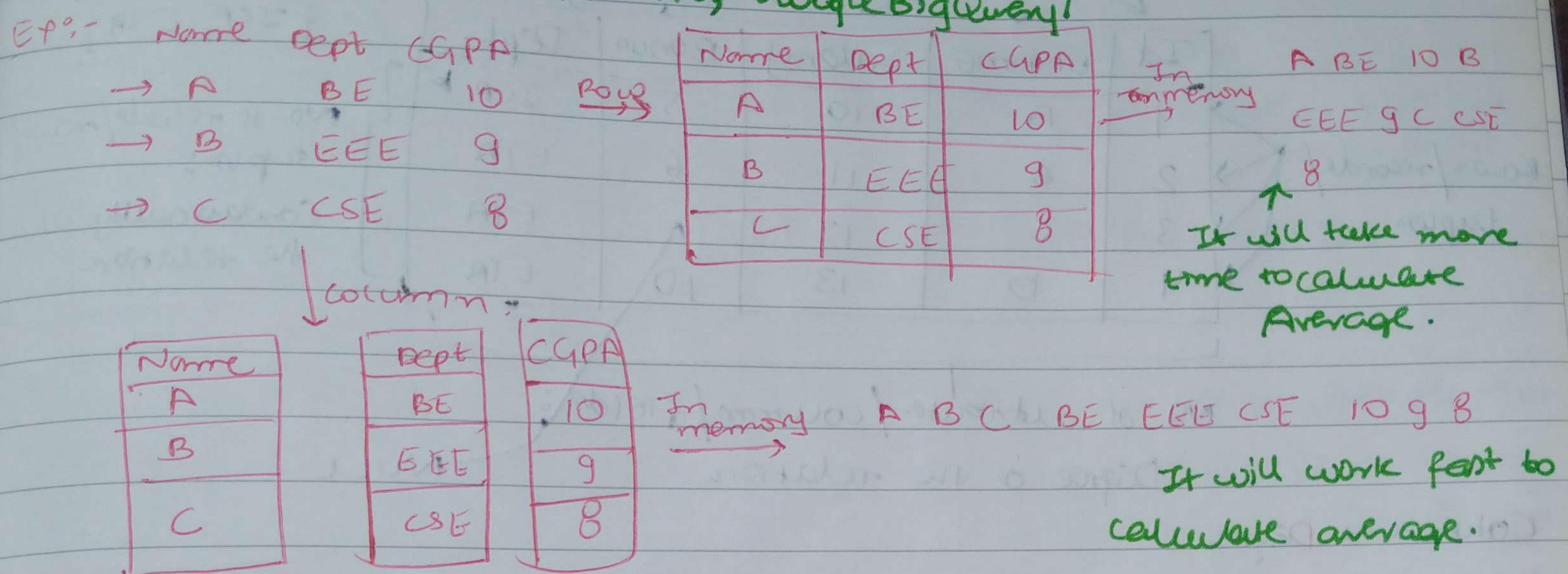
④ Graph da
structure da
systems. (N

⑤ Key-value
Key and va
needs (Red

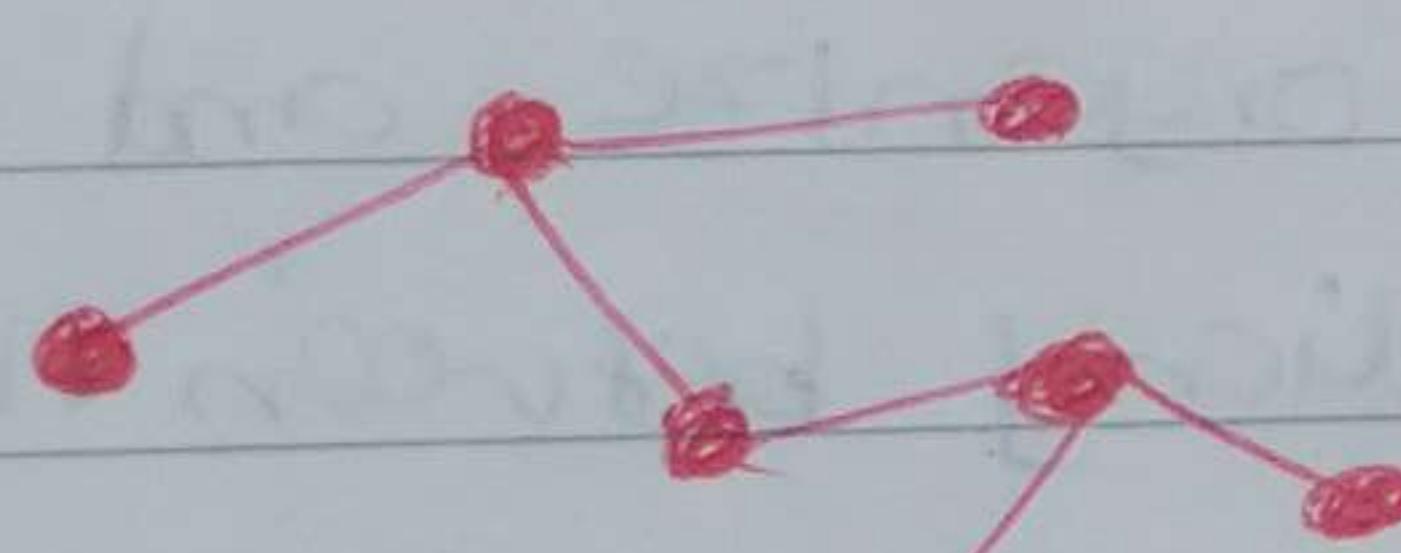
Ex:- Twitt

→ **Column based**

③ Column Databases :- These databases store data in columns rather than rows, making them well-suited for data warehousing and analytical applications. (Amazon Redshift, Google BigQuery)



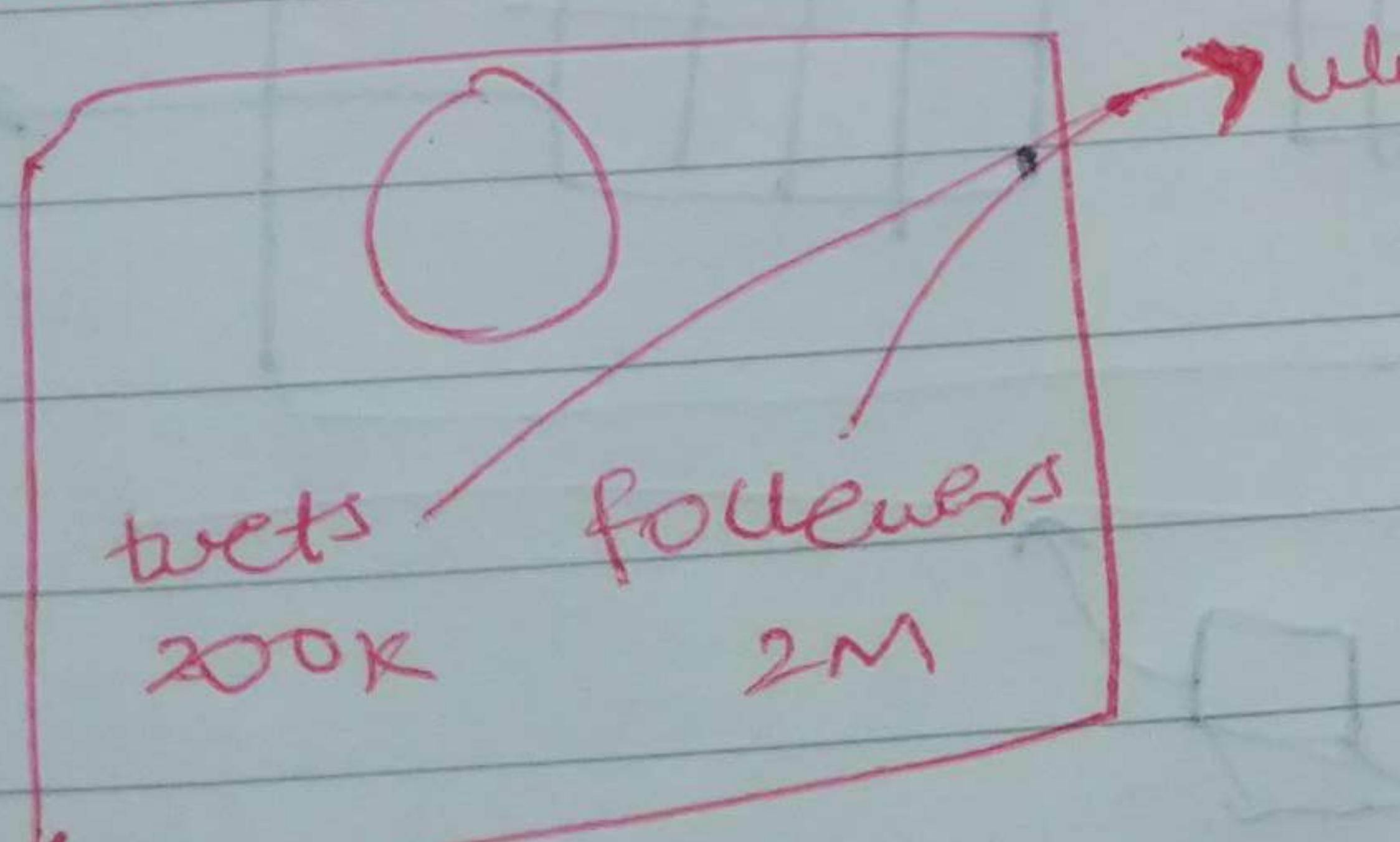
④ Graph databases - These databases are used to store and query graph-structure data, such as social network connections or recommendation systems. (Neo4j, Amazon Neptune)



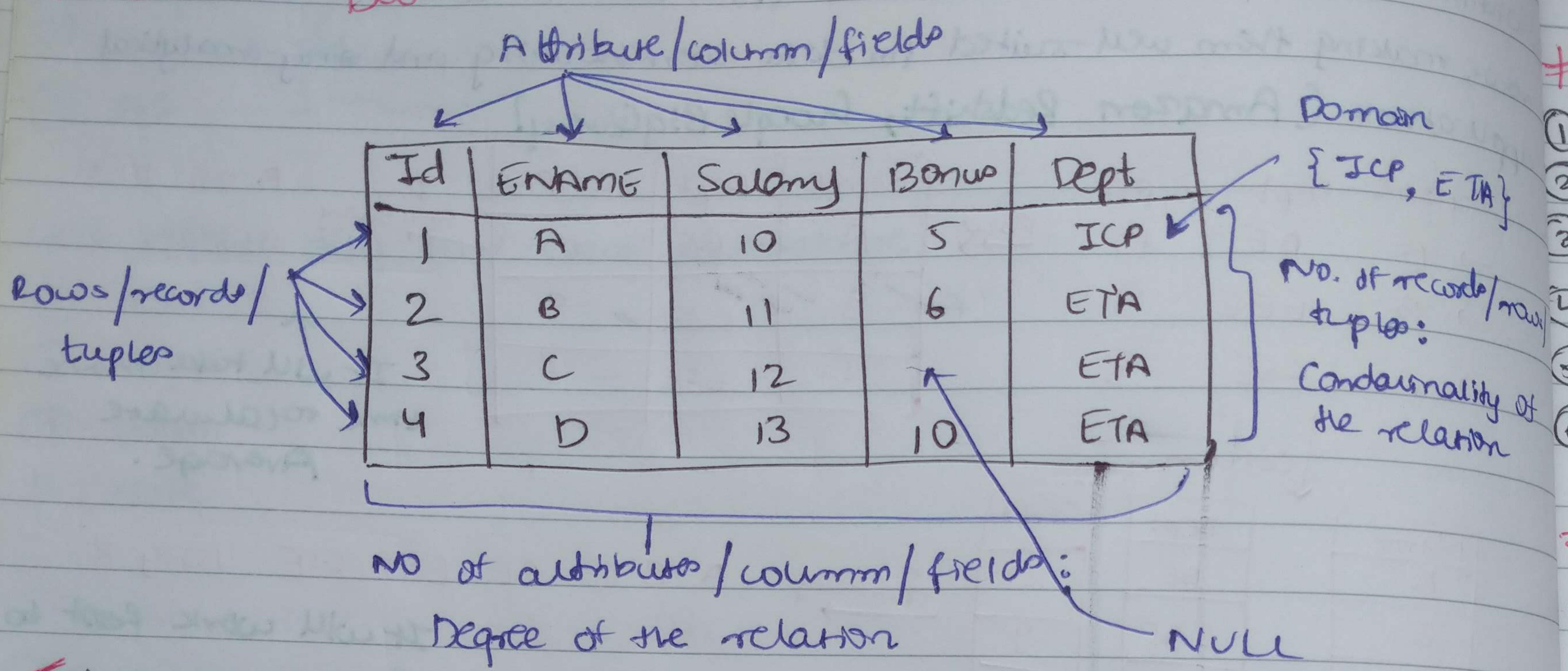
→ **The calculated database**.

⑤ Key-value databases:- These database store data as a collection of key and value, making them well-suited for caching and simple data storage needs (Redis and Amazon DynamoDB)

Ex:- Twitter



Relational Database

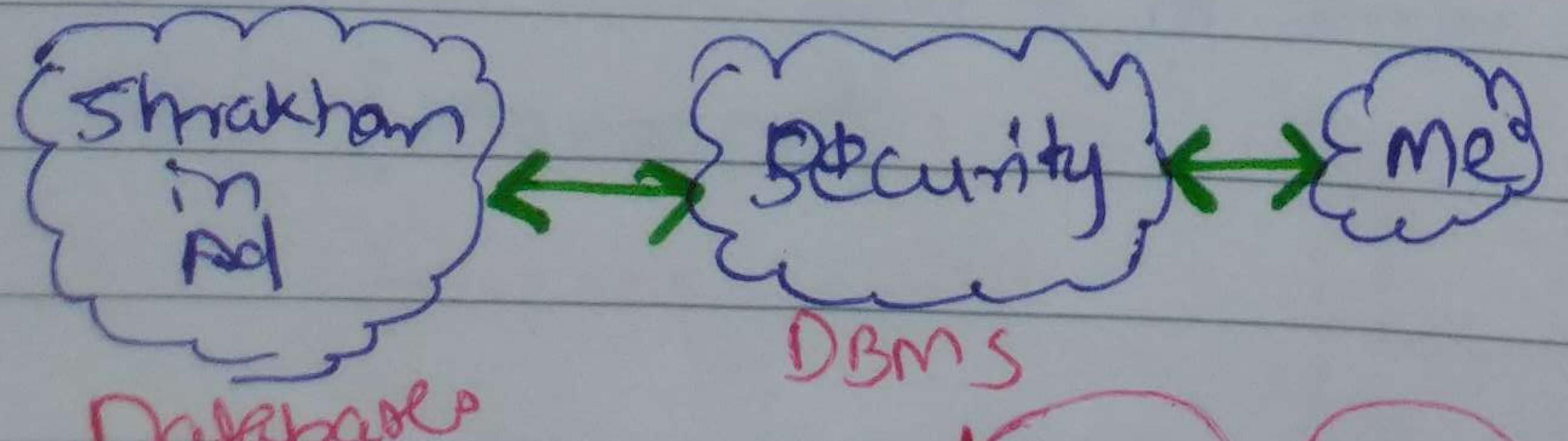
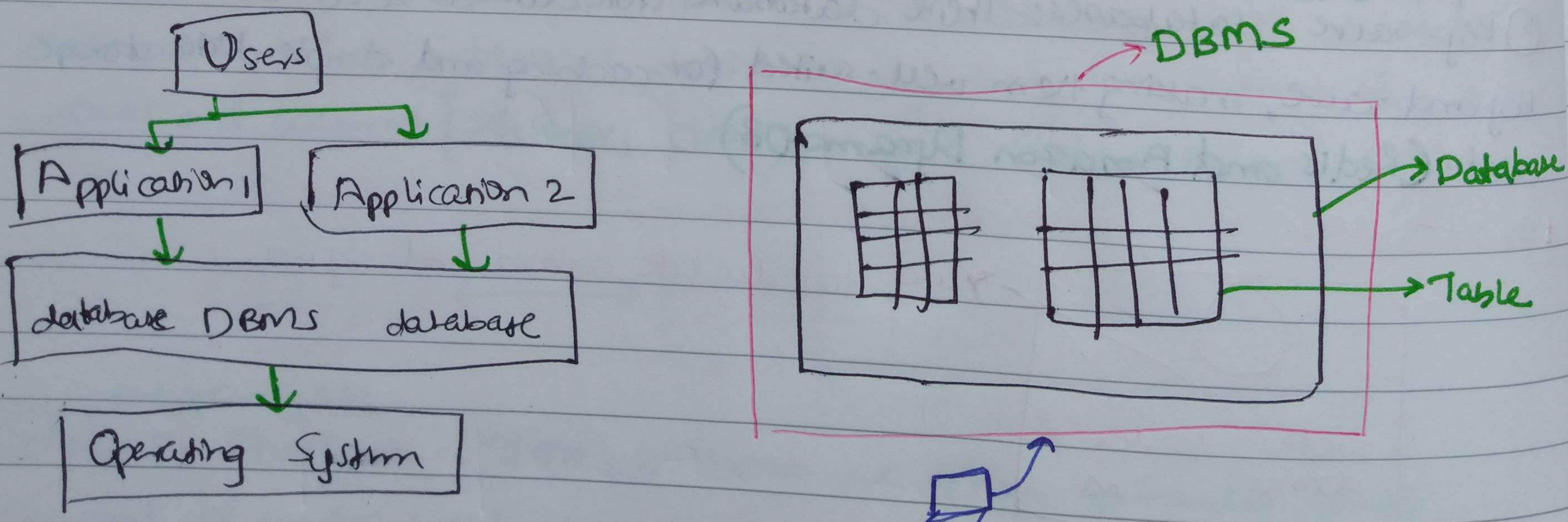


Column → Degree

Rows → Cardinality

What is DBMS

→ A database management system (DBMS) is a software system that provides the interfaces and tools needed to store, organize and manage data in a database. A DBMS acts as an intermediary between the database and the applications or users that access the data stored in the database.



Functions of

- ① Data Management
- ② Integrity - Maintaining consistency
- ③ Concurrency - Synchronizing multiple users
- ④ Transaction - Managing transactions
- ⑤ Security - Access control
- ⑥ Utilities - Data manipulation

Database Keys

① **Super Key:** A uniquely identifies the integrity of the data and ensures

① Super Key:

A super key is within a relation

Rollno
1
2

- Roll no
- Email
- Rollno + Name
- Rollno + Rollno
- Rollno + Rollno
- name + Rollno
- Rollno
- Rollno

② Candidate keys are redundant attributes used to identify

Functions of DBMS

- ① Data Management - Store, retrieve and modify data
- ② Integrity - Maintain accuracy of data.
- ③ Concurrency - Simultaneous data access for multiple users
- ④ Transaction - Modification to database must either be successful or must not happen at all
- ⑤ Security - Access to authorized users only
- ⑥ Utilities - Data import/export, user management, backup, logging

Database Keys

① Super key:- A key in a database is an attribute or a set of attributes that uniquely identifies a tuple (row) in a table. Keys play a crucial role in ensuring the integrity and reliability of a database by enforcing unique constraints on the data and establishing relationships between tables.

① Super Key:-

A super key is a combination of columns that uniquely identifies any row within a relational database management system (RDBMS) table.

Rollno	Name	Branch	Email
1	Nitish Singh	CSE	nitish@gmail.com
2	Ankit Verma	EEE	ankit@gmail.com

- Roll no ✓
- Email ✓
- Rollno + Name ✗
- Rollno + Branch ✗
- Rollno + Email ✗
- name + branch + Email ✗
- Rollno + branch + name ✗
- Rollno + Name + Branch + Email ✗

② Candidate key:- A candidate key is a minimal super key, meaning it has no redundant attributes. In other words, it's the smallest set of attributes that can be used to uniquely identify a tuple (row) in the table.

③ Primary Key :- { No Null, no duplicate }

A primary key is a unique identifier for each tuple in a table. There can only be one primary key in a table, and it cannot contain null values.
Good to have ① Numeric ② small ③ constant { not frequent changes }
 \therefore Round column.

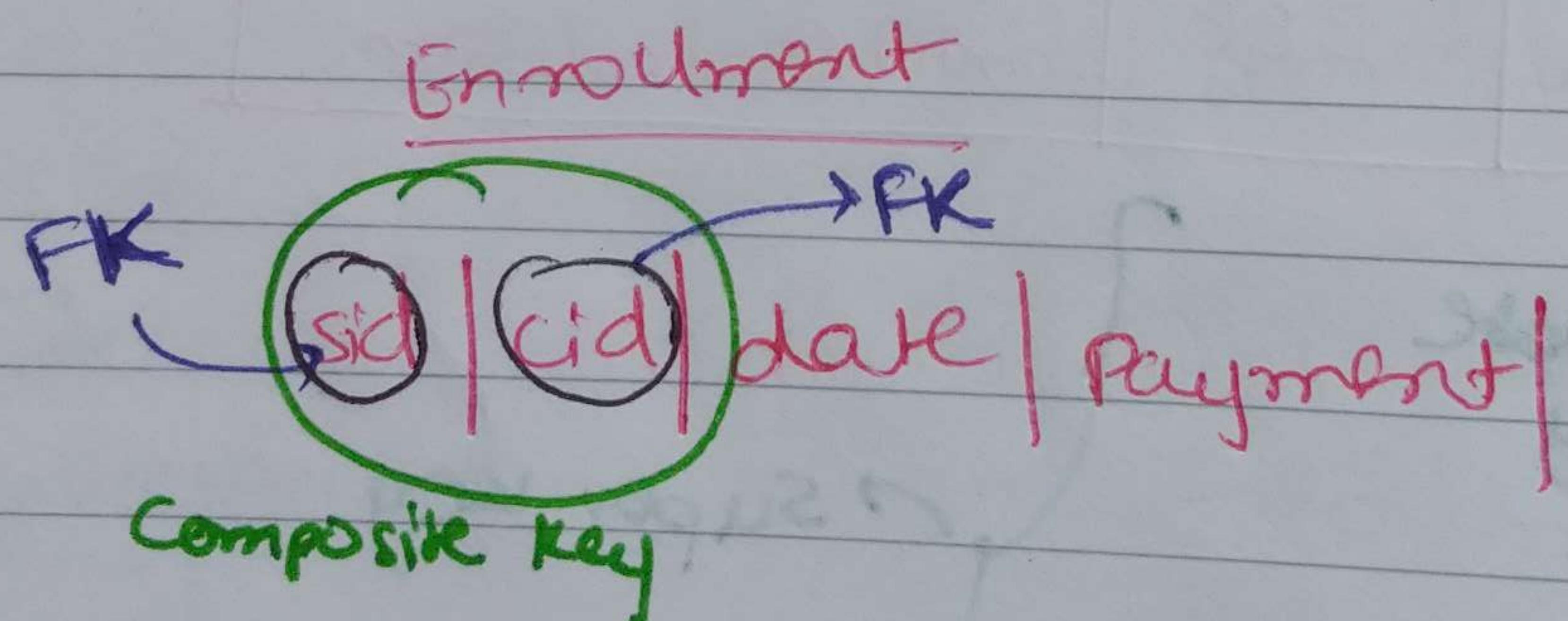
④ Alternate Key :- [CK - PK = AK]

An alternate key is a candidate key that is not used as the primary key.
 \therefore Email column.

⑤ Composite Key :-

A composite key is a primary key that is made up of two or more attributes. Composite key are used when a single attribute is not sufficient to uniquely identify a tuple in a table.

Student		Course	
sid	name email phone	cid	name price instructor



⑥ Surrogate key :- { Proxy ~~table~~ column }

sid	name branch cgpa	\rightarrow no primary key
PK		

⑦ Foreign Key :-

A foreign key is a primary key from one table that is used to establish a relationship with another table.

Cardinal

Cardinality
of an entity
number of
instances of

{ 1 table }



1:1

One to one

Person

Drawbacks

① Complex consumption

② Cost :- software

③ Scalability

more

④ Data

database

file da

⑤ Security

sensitivity

of cu

⑥ Data

a new

⑦ Flexibility

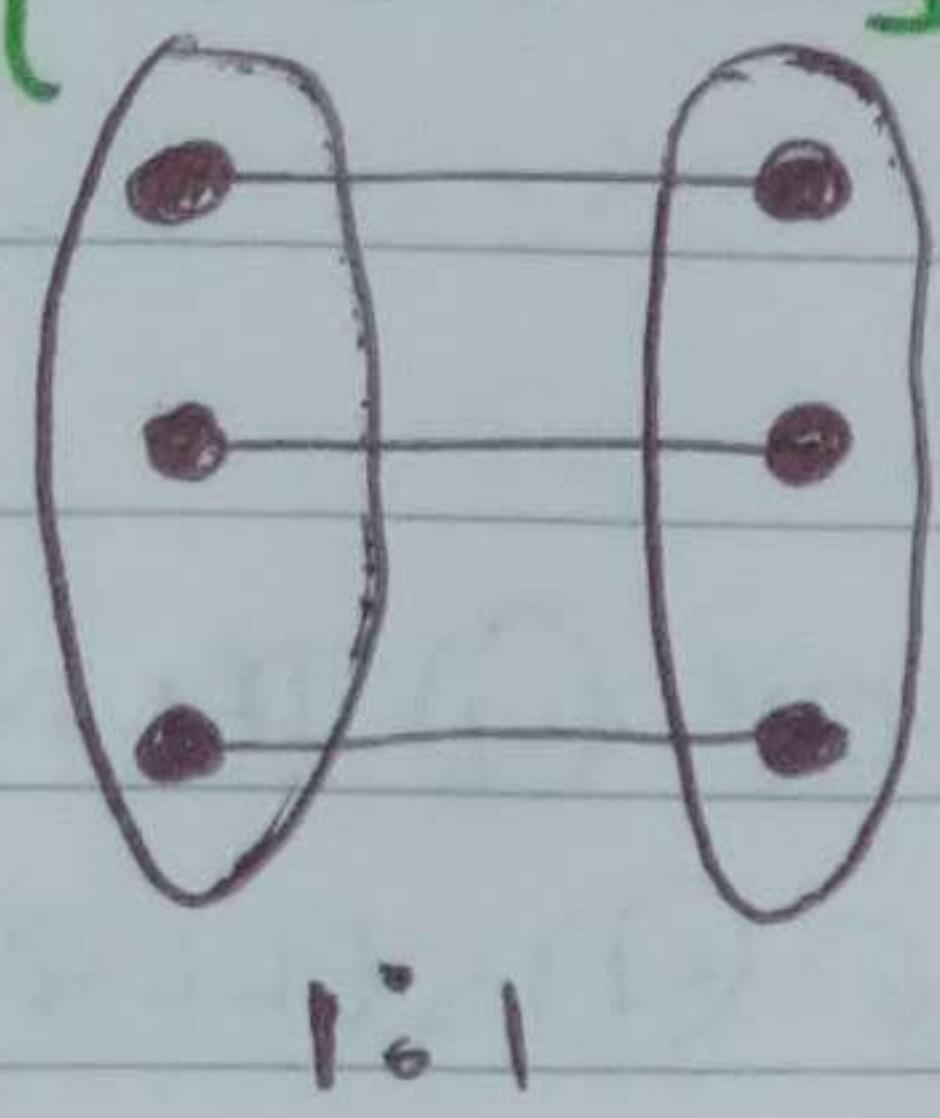
make

new

Cardinality of a Relationship.

Cardinality in database relationship refers to the number/number of occurrences of an entity in a relationship with another entity. Cardinality defines the number of instances of one entity that can be associated with a single instance of the related entity.

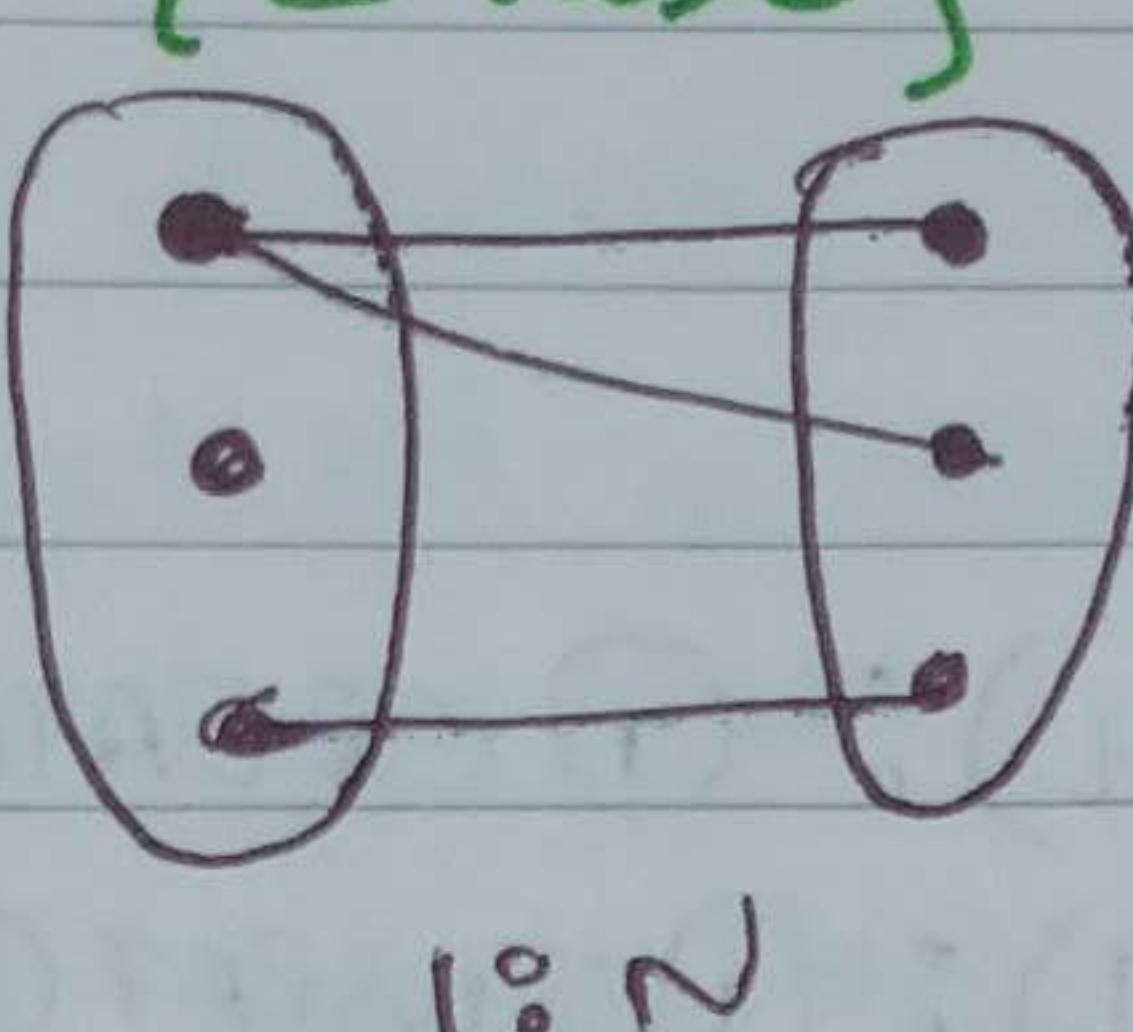
{ 1 table }



One to one relationship

Person \leftrightarrow Driving License

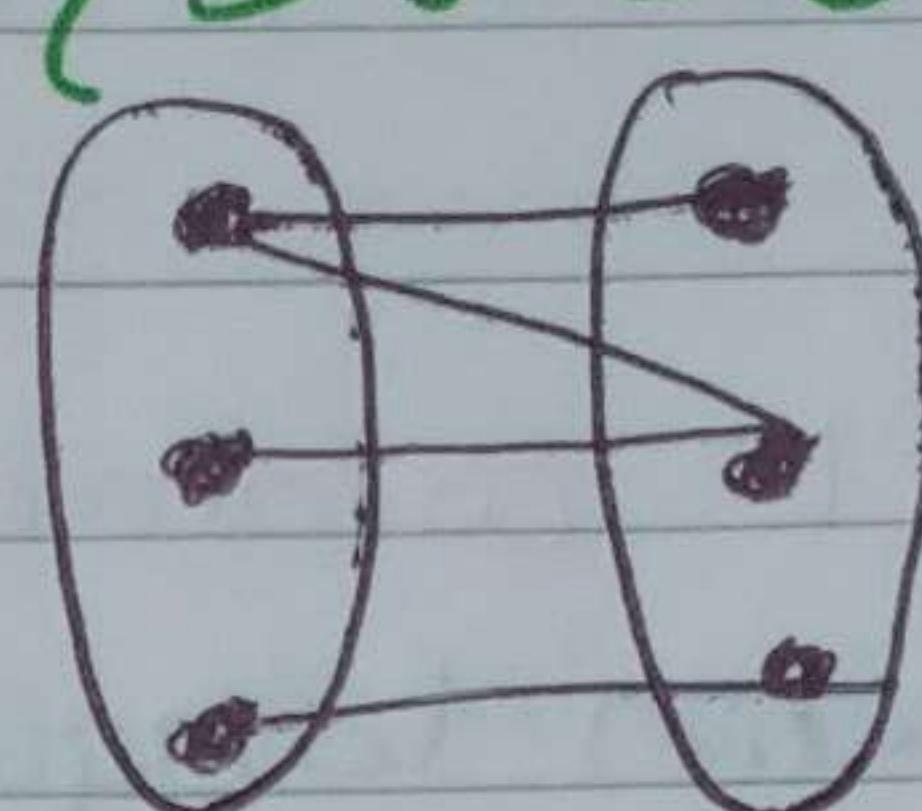
{ 2 tables }



One to many relationship

Student \rightarrow College

{ 3 tables }



Many-to-many relationship

Student \rightarrow course
Udemy

Drawbacks of Database

- ① Complexity:- Setting up and maintaining a database can be complex and time-consuming, especially for large and complex systems.
- ② Cost:- The cost of setting up and maintaining a database, including hardware, software, and personnel, can be high.
- ③ Scalability:- As the amount of data stored in a database grows, it can become more difficult to manage, leading to performance and scalability issues.
- ④ Data Integrity:- Ensuring the accuracy and consistency of data stored in a database can be a challenge, especially when multiple users are updating the data simultaneously.
- ⑤ Security:- Securing a database from unauthorized access and protecting sensitive information can be difficult, especially with the increasing threat of cyber attacks.
- ⑥ Data Migration:- Moving data from one database to another or upgrading to a new database can be a complex and time-consuming process.
- ⑦ Flexibility:- The structure of a database is often rigid and inflexible, making it difficult to adapt to changing requirements or to accommodate new types of data.

What is SQL:-

SQL is a programming language used for managing and manipulating data in relational databases. It allows you to insert, update, retrieve, and delete data in database. It is widely used for data management in many applications, websites, and businesses. In simple terms, SQL is used to communicate with and control database.

Type of SQL commands:-

- ① Data Definition Language (DDL):- ① CREATE ② ALTER ③ DROP ④ TRUNCATE
- ② Data Manipulation Language (DML):- ① INSERT ② UPDATE ③ DELETE ④ SELECT
- ③ Data Control Language (DCL):- ① GRANT ② REVOKE
- ④ Transaction Control Language (TCL):- ① COMMIT ② ROLLBACK

DDL commands for Database:-

- ① CREATE
 - CREATE DATABASE compux
 - CREATE DATABASE IF NOT EXIST compux
- ② DROP
 - DROP DATABASE compux
 - DROP DATABASE IF EXIST compux

DDL Commands for Tables:-

- ① CREATE
 - CREATE TABLE users (
 - userid INTEGER,
 - name VARCHAR(255),
 - email VARCHAR(255),
 - password VARCHAR(255)
 -)
- ② TRUNCATE
 - TRUNCATE TABLE users
- ③ DROP
 - DROP TABLE IF EXISTS users
- ④ ALTER

- ① Add Column

- ② Delete Column

- ③ Modify column

Data Integrity

Data integrity consistency of the and trustworthiness protected from them are various

① Constraints:-

be met for data used to enforce consistent data

② Transactions:-

single unit

③ Normalization

ensure data

Constraint

constraints in

- ① NOT NULL
- ⑤ CHECK

Referential

① RESTRICTIONS

Data Integrity

Data integrity in databases refers to the accuracy, completeness and consistency of the data stored in a database. It is a measure of the reliability and trustworthiness of the data and ensures that the data in a database is protected from errors, corruption, or unauthorized changes.

There are various methods used to ensure data integrity, including:

① Constraints:- Constraints in databases are rules or conditions that must be met for data to be inserted, updated, or deleted in a database table. They are used to enforce the integrity of the data stored in a database and to prevent data from becoming inconsistent or corrupted.

② Transaction:- a sequence of database operations that are treated as a single unit of work.

③ Normalization; a design technique that minimizes data redundancy and ensure data consistency by organizing data into separate tables.

Constraints in MySQL

Constraints in databases are rules or conditions that must be met for data to be inserted, updated, or deleted in a database table.

- ① NOT NULL
- ② UNIQUE (combo)
- ③ PRIMARY KEY
- ④ AUTO INCREMENT
- ⑤ CHECK
- ⑥ DEFAULT
- ⑦ FOREIGN KEY { All + cascade }

Referential Actions:

- ① RESTRICT
- ② CASCADE
- ③ SET NULL
- ④ SET DEFAULT