

Assignment 3

Database Normalization and First Normal Form (1NF)

Why Normalization Is Important

Normalization is an important concept in database design because it helps organize data in a clean and structured way. The main idea of normalization is to **avoid storing the same information again and again** in a database.

When data is normalized:

- The database becomes **more accurate**
- Data remains **consistent**
- Information is **easier to update and manage**
- Storage space is used **efficiently**

Simple Example

Imagine writing the same phone number in ten different places.

If the number changes, you must update it ten times.

Normalization avoids this situation by storing the information **only once**.

Problems When a Database Is Not Normalized

If a database is not normalized, it can lead to several serious problems.

1. Data Redundancy

Data redundancy means **repeating the same data multiple times**.

Example:

If a customer's name is stored in every order record, the same name is repeated again and again.

Why this is a problem:

- Wastes storage space
 - Increases chances of inconsistency
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2. Update Problem

When the same data exists in many places, updating it becomes difficult.

Example:

If a customer changes their name, it must be updated in all records.

If one record is missed, the database will show **different names for the same customer**.

3. Insertion Problem

Sometimes, new data cannot be added without adding unnecessary information.

Example:

If a table requires product details for every order, you may not be able to add a new customer unless they place an order.

4. Deletion Problem

Deleting data may accidentally remove important information.

Example:

If you delete the only order of a customer, you might also lose the customer's details completely.

These problems make the database **unreliable, confusing, and difficult to maintain**.

Conversion of Unnormalized Data into First Normal Form (1NF)

Given Unnormalized Table

Order_ID	Customer_Name	Product
101	Rahul	Laptop
101	Rahul	Mouse

Why This Table Is Not in 1NF

The **Products** column contains **more than one value** ([Laptop](#), [Mouse](#)) in a single cell.

This violates the rule of **First Normal Form**.

Rule of First Normal Form (1NF)

A table is in **First Normal Form (1NF)** when:

- Each column contains **only one value**
 - No column has **multiple values in a single cell**
 - Each record can be uniquely identified
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Table Converted into 1NF

Order_ID	Customer_Name	Product
101	Rahul	Laptop
101	Rahul	Mouse

Explanation of the Conversion

The multi-valued **Products** column has been split so that:

- Each row contains **only one product**
- The data becomes **simple, clear, and structured**

Now:

- Each cell holds a single value
 - The table follows the rules of **First Normal Form (1NF)**
 - The data is easier to query and manage
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Conclusion

Normalization improves the quality of a database by:

- Removing duplicate data
- Preventing update, insertion, and deletion problems
- Making data consistent and reliable

Converting data into **First Normal Form (1NF)** is the **first and most important step** toward building a well-structured and dependable database system.
