

1 What is Normalization?

Normalization is the process of organizing data in a database to:

- Remove duplicate data
- Keep data accurate and consistent

It splits large, messy tables into **smaller, well-structured tables**.

2 Why is Normalization Important?

Normalization is important because it:

1. Reduces data redundancy
(Same data is not stored again and again)
2. Prevents data inconsistency
(If data is updated in one place, it stays correct everywhere)
3. Makes database easy to maintain
4. Improves data accuracy

3 Problems If a Database Is NOT Normalized

If a database is not normalized, the following problems occur:

- 1 Data Redundancy
 - Same data stored multiple times
 - Wastes memory
- 2 Update Anomaly
 - Updating data in one row but forgetting others
 - Example: Changing customer name in one record but not in all.
- 3 Insertion Anomaly
 - Cannot insert data without unnecessary information
 - Example: Cannot add a product unless a customer exists.
- 4 Deletion Anomaly
 - Deleting one record may delete important data
 - Example: Deleting an order may delete customer details.

4 Given Unnormalized Data

orderid	customer_name	products
101	Rahul	Laptop, Mouse

Products column contains multiple values

This violates 1NF rule

5 Convert to First Normal Form (1NF)

Each column should contain only single (atomic) values

No multiple values in one column

orderid	customer_name	products
101	Rahul	Laptop
101	Rahul	Mouse

Now each field has only **one value**

If Order_Id is PK

orderid	customer_name
101	Rahul

productid	product_name
p1	Laptop
p2	Mouse

orderid	productid
101	p1
101	p2

