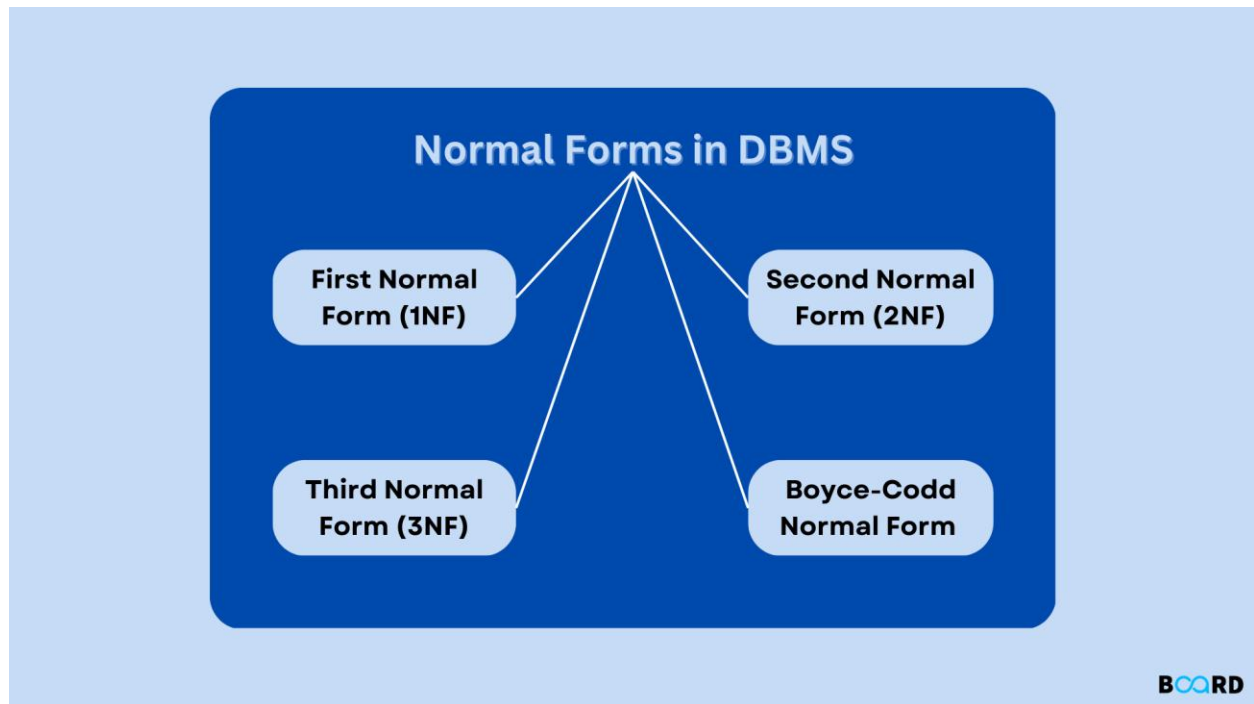


# Normal Forms in DBMS



The process of Database normalization refers to the technique used for organising data/info in a database. It's a systematic approach that helps us decompose tables for eliminating the repetition or redundancy of data in the database. It also helps avoid all the undesirable characteristics in a database, such as anomalies with Deletion, Update, and Insertion. Normalization follows a multi-step process in which data will be put in a tabular form. Thus, it removes the duplicated data out of the relation tables.

## What is Normal Form in DBMS?

The process of organising information/data in a database is known as normalization. This process helps us minimise the redundancy of data from a set of relations or a single relation. It also helps us eliminate several undesirable characteristics, such as Update, Insertion, and Deleting of Anomalies.



## Anomalies in a Database

When the design of a database isn't perfect, it may consist of anomalies. These anomalies can be a nightmare for database administrators. It is next to impossible to manage any database that has these anomalies. Let us discuss a few of these:

- **Update Anomalies:** When the data elements/ items are scattered and aren't really linked properly to each other, it may lead to some strange situations. For instance, if we try updating a data element with its copies scattered all over various places, then only a few instances will be updated properly. On the other hand, the rest others will be left with their old values. These types of instances will always leave a database in a state that's pretty inconsistent.
- **Deletion Anomalies:** When we try to delete any record, a few parts of it are left undeleted due to unawareness, then the info/ data will get stored at some separate place.
- **Insert Anomalies:** It happens when we try inserting data in some non-existent record.

The normalization methods help us remove all such anomalies and ultimately bring a database to a very consistent and streamlined state.

## Uses of Normal Forms in DBMS

The process of normalization helps us divide a larger table in the database into various smaller tables and then link their using relationships. Normal forms are basically useful for reducing the overall redundancy (repeating data) from the tables present in a database, so as to ensure logical storage.

## Types of Normal Forms in DBMS

Normal forms are of four major forms: 1NF, 2NF, 3NF, and BCNF.

A majority of the database systems have their databases normalized up to the 3NF in DBMS. But here are the normal forms that are used in DBMS:



**1NF:** We can say that a relation is in 1NF when it consists of an atomic value.

**2NF:** We can say that a relation is in 2NF when it is already in 1NF, but all the non-key attributes fully and functionally depend on their primary keys.

**3NF:** We can say that a relation is in 3NF when it is already in 2NF, but it does not consist of any transitive dependencies.

**4NF:** We can say that a relation is in 4NF when it is in BCNF or Boyce-Codd Normal Form, but it does not have any multi-valued dependencies.

**5NF:** We can say that a relation is in the 5NF when it is already in 4NF, but it does not consist of the join dependencies. Also, the joining must be lossless here.

### Boyce-Codd Normal Form in DBMS or BCNF

BCNF is nothing but an extension to the Third Normal Form on very strict terms. Thus, it is known as the 3.5 Normal Form. The BCNF entails that:

- In the case of any functional dependency  $Z \rightarrow P$  that is non-trivial, Z has to be a super key.

When you look at the image here, Cand\_ID acts as a super-key in the case of the relation Candidate\_Detail, while Pin acts as the super-key in the PinCodes relation. Thus, here:

Cand\_ID  $\rightarrow$  Cand\_Name, Pin

and also,

Pin  $\rightarrow$  City

Thus, it confirms that both of these relations here are in BCNF.



## Frequently Asked Questions on Normal Forms in DBMS

### What are the 5 normal forms?

**Answer** – Normal forms are of four major forms: 1NF, 2NF, 3NF, and BCNF. A majority of the database systems have their databases normalized up to the 3NF in DBMS. But here are the normal forms that are used in DBMS:

1NF

2NF

3NF

4NF

5NF

### What are the normal forms in DBMS with examples?

The process of organising information/data in a database is known as normalization. This process helps us minimise the redundancy of data from a set of relations or a single relation. It also helps us eliminate several undesirable characteristics, such as Update, Insertion, and Deleting of Anomalies.

### Which normal form is considered adequate for normal relational database design?

3NF is sufficient to design a normal relational database since a majority of third normal form tables stay free from anomalies of deletion, updating, and insertion. Added to this, 3NF is bound to ensure losslessness and preserve functional dependencies.

### What is BCNF normal form in DBMS?

**Answer** – BCNF is nothing but an extension to the Third Normal Form on very strict terms. Thus, it is known as the 3.5 Normal Form. The BCNF entails that:

- In the case of any functional dependency  $Z \rightarrow P$  that is non-trivial, Z has to be a super key.

