**NORMALIZATION**

Defination:

1. Database normalization is a database schema design technique, by which an existing schema is modified to minimize repetition and data dependency.
2. Normalization split a large table into smaller tables and define relationships between them to increases the clarity in organizing data.

*Overall Source:* [*https://www.w3schools.in/dbms/database-normalization*](https://www.w3schools.in/dbms/database-normalization)

# **Types for normalization:**

1. First Normal Form (1NF)
2. Second Normal Form (2NF)
3. Third Normal Form (3NF)
4. Boyce-Codd Normal Form (BCNF)
5. Fourth Normal Form (4NF)
6. Fifth Normal Form (5NF)

# **First Normal Form (1NF)**

Each column has unique in 1NF.

**Example:** Sample Employee table, it displays employees are working with multiple departments.

|  |  |  |  |
| --- | --- | --- | --- |
| Emp\_first\_name | Emp\_last\_name | Age | Department |
| Saket | Pant | 31 | HR |
| Anup | Gour | 37 | Sales, Marketing |
| Kevin | Piterson | 44 | Consultant |
| Roshan | Pawar | 36 | Quality Assurance |
| Ravi | Sathe | 42 | Senior Developer |

*Employee table following 1NF:*

|  |  |  |  |
| --- | --- | --- | --- |
| Emp\_first\_name | Emp\_last\_name | Age | Department |
| Saket | Pant | 31 | HR |
| Anup | Gour | 37 | Sales |
| Anup | Gour | 37 | Marketing |
| Kevin | Piterson | 44 | Consultant |
| Roshan | Pawar | 36 | Quality Assurance |
| Ravi | Sathe | 42 | Senior Developer |

# **Second Normal Form (2NF)**

The entity should be considered already in 1NF, and all attributes within the entity should depend only on the unique identifier of the entity.

**Example:**

*Sample Products table:*

|  |  |  |  |
| --- | --- | --- | --- |
| Product\_ID | Product | Brand | Cost |
| 1 | Monitor | Apple | 97000 |
| 2 | Monitor | Asus | 56000 |
| 3 | Printer | HP | 12000 |
| 4 | Keyboard | Logitech | 3500 |

*Product table following 2NF:*

*Products Category table:*

|  |  |
| --- | --- |
| Product\_ID | Product |
| 1 | Monitor |
| 2 | Printer |
| 3 | Keyboard |

*Brand table:*

|  |  |
| --- | --- |
| Brand\_ID | Brand |
| 1 | Apple |
| 2 | Asus |
| 3 | HP |
| 4 | Logitech |

*Products Brand table:*

|  |  |  |
| --- | --- | --- |
| pb\_ID | Product\_ID | Brand\_ID |
| 1 | 1 | 1 |
| 2 | 1 | 2 |
| 3 | 2 | 3 |
| 4 | 3 | 4 |

# **Third Normal Form (3NF)**

* The entity should be considered already in 2NF, and no column entry should be dependent on any other entry (value) other than the key for the table.
* If such an entity exists, move it outside into a new table.

* 3NF is achieved, considered as the database is normalized.

# **Boyce-Codd Normal Form (BCNF)**

3NF and all tables in the database should be only one primary key.

# **Fourth Normal Form (4NF)**

Tables cannot have multi-valued dependencies on a Primary Key.

1. Fifth Normal Form (5NF)

* A composite key should not have any cyclic dependencies.