Database Normalization

Database normalization is the process of organizing data to reduce redundancy and improve data integrity.

- **First Normal Form (1NF)**: This is the most basic level of normalization. In 1NF, each table cell should contain only a single value, and each column should have a unique name. The first normal form helps to eliminate duplicate data and simplify queries. A relation is in first normal form if every attribute in that relation is a single valued attribute.

- **Second Normal Form (2NF)**: 2NF eliminates redundant data by requiring that each non-key attribute be dependent on the primary key. This means that each column should be directly related to the primary key, and not to other columns.

- **Third Normal Form (3NF)**: 3NF builds on 2NF by requiring that all non-key attributes are independent of each other. A relation is said to be in third normal form, if we did not have any transitive dependency for non-prime attributes. This means that each column should be directly related to the primary key, and not to any other columns in the same table.

- **Boyce-Codd Normal Form (BCNF)**: BCNF is a stricter form of 3NF that ensures that each determinant in a table is a candidate key. In other words, BCNF ensures that each non-key attribute is dependent only on the candidate key.

- **Fourth Normal Form (4NF)**: 4NF is a further refinement of BCNF that ensures that a table does not contain any multi-valued dependencies.

- **Fifth Normal Form (5NF)**: 5NF is the highest level of normalization and involves decomposing a table into smaller tables to remove data redundancy and improve data integrity.