

Normalization



First normal form (1 NF)

- A relation schema is said to be in First normal form if the values in the relation are atomic.
- In simple words, there should be no repeating groups in particular column.
- A value can be defined as an atomic value if it doesn't contain any multi valued attribute and no composite attribute.

Table which is not in First normal form.

Student	Age	Subject
Aravind	15	Comp, Maths
Ashok	14	Maths
Santhi	17	Maths

- In First Normal Form, any row must not have a column in which more than one value is saved, like separated with commas. Rather than that, we must separate such data into multiple rows.



Student Table following 1NF

Student	Age	Subject
Aravind	15	Comp
Aravind	15	Maths
Ashok	14	Maths
Santhi	17	Maths

- Using the First Normal Form, data redundancy increases, as there will be many columns with same data in multiple rows but each row as a whole will be unique.

- **Rule:** Any multi-valued attributes (repeating groups) have been removed, so there is a single value at the intersection of each row and column of the table



Functional dependency:

- Normalization is based on the analysis of functional dependency.
- A functional dependency is a constraint between two or more attributes.



Functional dependency:

- For example in a relation 'R' attributes 'B' is functionally dependent on the attribute 'A' .
- i.e. the value of 'A' uniquely determines the value of 'B'.
- The functional dependency is represented by a right arrow (\rightarrow).

$$A \rightarrow B$$



Functional dependency:

- An attribute may be functionally dependence on two or more attributes.
- For example the relation STUDENT contains attribute like Sno, Sname, course_id and date completed.
- In the above example, the attribute date _complete is functionally dependent on course_Id.
- Sno, Course_Id \rightarrow date completed.

Functional dependency:

- **Determinant:-** The attributes on the left hand side of the arrow in a functional dependency is called determinant. In the above example determinants are Sno, Course_Id.



