**Normalization**

In the field of relation database design, normalization is a systematic way of ensuring that a database structure is suitable for general purpose and free of certain undesirable characteristics Insertion, Update, and Delete anomalies that could lead to a loss of data integrity. E.F Codd is the inventor of the relational model.

**The Normal Forms**

The database community has developed a series of guidelines for ensuring that databases are normalized. These are referred to as normal forms and are numbered from one (the lowest form of normalization, referred to as [first normal form](http://databases.about.com/od/specificproducts/l/aa1nf.htm) or 1NF) through five (fifth normal form or 5NF). In practical applications, you'll often see [1NF](http://databases.about.com/od/specificproducts/l/aa1nf.htm), [2NF](http://databases.about.com/od/specificproducts/a/2nf.htm), and [3NF](http://databases.about.com/od/specificproducts/l/aa3nf.htm) along with the occasional 4NF. Fifth normal form is very rarely seen and won't be discussed in this article.   
  
Before we begin our discussion of the normal forms, it's important to point out that they are guidelines and guidelines only. Occasionally, it becomes necessary to stray from them to meet practical business requirements. However, when variations take place, it's extremely important to evaluate any possible ramifications they could have on your system and account for possible inconsistencies. That said, let's explore the normal forms.

**First Normal Form (1NF)**

First normal form (1NF) sets the very basic rules for an organized database:

Eliminate duplicative [columns](http://databases.about.com/library/glossary/bldef-column.htm) from the same table. Create separate tables for each group of related data and identify each [row](http://databases.about.com/library/glossary/bldef-row.htm) with a unique column or set of columns (the [primary key](http://databases.about.com/library/glossary/bldef-primarykey.htm)).

**Second Normal Form (2NF)**

Second normal form (2NF) further addresses the concept of removing duplicative data:

Meet all the requirements of the first normal form. Remove subsets of data that apply to multiple rows of a table and place them in separate tables. Create relationships between these new tables and their predecessors through the use of [foreign keys](http://databases.about.com/library/glossary/bldef-foreignkey.htm).

**Third Normal Form (3NF)**

Third normal form (3NF) goes one large step further:

Meet all the requirements of the second normal form. Remove columns that are not dependent upon the primary key.

**Fourth Normal Form (4NF)**

Finally, fourth normal form (4NF) has one additional requirement:

Meet all the requirements of the third normal form. A relation is in 4NF if it has no multi-valued dependencies.