

Simple steps to consistent 3NF and 4NF tables

First step: Convert to 1NF by removing the repeating groups (i.e., those items within parentheses). When the parenthesis is removed, MAKE SURE that you underline the correct field(s) that make up the primary key for that repeating group.

Second, begin converting to 2NF by arranging each and every possible combination of the primary key fields.

Third, to complete the conversion to 2NF, move the remaining fields to be alongside the primary key that each one belongs with, and then name the tables.

Fourth, convert to 3NF by moving any other dependencies in the 2NF tables that are NOT solely dependent on the primary key in the table. (No such dependencies exist in the above tables, so they are in 3NF and we are DONE!)

Fifth, carefully consider possible multi-dependent combinations that may be hidden and need decomposition into 4th normal form. How? Consider each non-primary-key field in each table and decide if it ALWAYS and SOLEY depends on the primary key. IF the field is often optional, and/or if two or more fields may interact with each other (e.g., the student Major field affects the possible Minor field choices), and/or two or more fields depend on the primary key in uniquely different combinations (e.g., the student can take multiple different courses AND can be part of multiple different sports programs), consider shifting the affected field(s) to a separate table.

Before you are done, though, inspect for business-specific problems with your design. e.g., how will you deal with multiple checks that may have the same check number from different customers, and/or do you really want to type the bank name over and over, since many of your customers may well use the same bank? NOW is the time to fix these problems, before the tables are added to database, and forms, queries, and reports are programmer! Make sure that you've accommodated the necessary requirements and constraints that were established at the beginning, or ask the user for elaboration, or document your constraints/assumptions and ask for the user's approval/agreement.

Don't forget to NAME each of the tables and to complete the DBDL format if required!