Nested Relations

1. 1NF requires that all attributes have atomic (indivisible) domains.
2. The nested relational model is an extension of the relational model in which domains may be either atomic or relation-valued. This allows a complex object to be represented by a single tuple of a nested relation -- one-to-one correspondence between data items and objects.
3. Suppose the information to be stored consists of (i) document title, (ii) author_list (set of authors), (iii) date (day, month, year), and (iv) key_word_list (list of key words).
4. Example: A non-1NF document relation, *doc*.

title	author_list	date	keyword_list
		day month year	
salesplan	{Smith, Jones}	1 April 89	{profit, strategy}
stat. report	{Jones, Frick}	17 July 94	{profit, personnel}

5. The *doc* relation can be represented in 1NF, *doc*', but awkward. If we assume the following multi-value dependencies (MVDs) hold:

   ```
   title  →→  author

   title  →→  keyword

   title  →  day month year
   ```

   we can decompose the relation into 4NF using the schemes:

   ```
   (title, author)

   (title, keyword)

   (title, day, month, year)
   ```

6. But the non-1NF representation may be an easier-to-understand model (closer to user's view). The 4NF design would require users to include joins in their queries, thereby complicating interaction with the system. We could define a view, but we lose the one-to-one correspondence between tuples and documents.