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Database Management
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Lab 7: Normalization One

Part One: Kramerica CEO Miles Meservy has put together a spreadsheet of all the data he has so far, which he personally collected.

1. **As he shows you the spreadsheet, having just signed your consulting agreement, he asks what you think of it. How do you reply?**
   For the love of Codd, this needs to be fixed. All of the data about Kramerica's software packages is crammed into one table. And, even worse, there are multiple values in some of the cells. If we break the data up into smaller tables, then it will be easier to modify the data (if need be) and we will reduce the chance of inconsistency among the data.
2. **Put his data in 1NF and display it. (Show me the table; no SQL.)**

PackageID	TagNumber	InstallDate	SoftwareCostUSD
AC01	32808	09-13-2005	754.95
DB32	32808	12-03-2005	380.00
DB32	37691	06-15-2005	380.00
DB33	57772	05-27-2005	412.77
WP08	32808	01-12-2006	185.00
WP08	37691	06-15-2005	227.50
WP08	57222	05-27-2005	170.24
WP09	59836	10-30-2005	35.00
WP09	77740	05-27-2005	35.00

3. **What is the primary key?**
   (PackageID, TagNumber)

Part Two: Add two columns of new data: one column for software package name (e.g., Zork, Portal, etc.) and one for computer model (e.g., IBM, Apple, etc.). Be sure that your new data is consistent with the original data. **Do not add any additional columns**.

4. **Display the new table.**

PackageID	TagNumber	InstallDate	SoftwareCostUSD	SoftwarePackageName	ComputerModel
AC01	32808	09-13-2005	754.95	Postbooks	Macintosh
DB32	32808	12-03-2005	380.00	Zork	Macintosh
DB32	37691	06-15-2005	380.00	Zork	Lenovo
DB33	57772	05-27-2005	412.77	Odoo	Acer
WP08	32808	01-12-2006	185.00	Portal	Macintosh
WP08	37691	06-15-2005	227.50	Portal	Lenovo
WP08	57222	05-27-2005	170.24	Portal	IBM
WP09	59836	10-30-2005	35.00	TurboCash	Dell
WP09	77740	05-27-2005	35.00	TurboCash	HP

5. **Identify and document all functional dependencies.**
   PackageID, TagNumber → InstallDate, SoftwareCostUSD, SoftwarePackageName, ComputerModel
   TagNumber → ComputerModel
   PackageID → SoftwarePackageName

6. **Explain why this new table is <u>not</u> in third normal form.**
   This new table is not in third normal form because there are multiple dependencies. There are also too many columns for the table – it is one large table filled with data, rather than what it should be, which is multiple, smaller tables of data.

Part Three: Decompose your 1NF table into a set of tables that are in at least third normal form. (BCNF would be better.) Remember that it's wrong to add artificial keys to associative entities. Actually, as I said before, do not add any additional columns.

7. **Identify all primary keys (determinants) for all tables.**
   (PackageID, TagNumber), (PackageID), (TagNumber)

8. **Identify all functional dependencies for all tables.**
   PackageID, TagNumber → InstallDate, SoftwareCostUSD
   PackageID, TagNumber → InstallDate
   PackageID, TagNumber → SoftwareCostUSD

9. **Explain why the new tables are in third normal form.**
   The new tables are in third normal form because there aren't multiple dependencies. Non-key attributes are also not determined by an entire determinant, but a portion of it. Additionally, non-key attributes are determined only by keys that were in the original table. We did not create any artificial keys.

10. **Draw a beautiful E/R diagram. (I realize that this isn't that beautiful because I did it in Word.)**