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Lab 7

1. Tycho CEO Fred Johnson has put together a spreadsheet of all the data he has so far, which he personally collected.

(a) As he shows you the spreadsheet, having just signed your consulting agreement, he asks you what you think of it. How do you reply?

The design of the spreadsheet is a nice start to creating a fully functional database. In order to fix the already almost perfect data layout, the table would need to be arranged into first normal form. To fix that, each PackageID will need to grouped individually with its own TagNumber, rather than all together.

(b) 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 | 59536 | 10-30-2005 | 35.00 |
| WP09 | 77740 | 05-27-2005 | 35.00 |

(c) What is the primary key?

The primary key is a composite of the PackageID and TagNumber in order to uniquely identify each row.

2. 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.

(a) Display the new table.

| PackageID | TagNumber | InstallDate | SoftwareName | ComputerModel | SoftwareCostUSD |
|---|---|---|---|---|---|
| AC01 | 32808 | 09-13- | Portal | IBM | 754.95 |

| | | | | | |
|---|---|---|---|---|---|
| | | 2005 | | | |
| DB32 | 32808 | 12-03-2005 | Zork | IBM | 380.00 |
| DB32 | 37691 | 06-15-2005 | Zork | Dell | 380.00 |
| DB33 | 57772 | 05-27-2005 | Excel | Apple | 412.77 |
| WP08 | 32808 | 01-12-2006 | Word | IBM | 185.00 |
| WP08 | 37691 | 06-15-2005 | Word | Dell | 227.50 |
| WP08 | 57222 | 05-27-2005 | Word | Apple | 170.24 |
| WP09 | 59536 | 10-30-2005 | PowerPoint | Alienware | 35.00 |
| WP09 | 77740 | 05-27-2005 | PowerPoint | HP | 35.00 |

(b) Identify and document all functional dependencies.

PackageID, TagNumber |---> InstallDate, SoftwareName, ComputerModel, SoftwareCostUSD

(c) Explain why this new table is not in third normal form.

The new table is not in third normal form because it is not in second normal form due to partial key dependencies. Those dependencies exist because PackageID and TagNumber are combined as the unique identifier.

3. 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.

| **TagNumber** | **ComputerModel** |
|---|---|
| 32808 | IBM |
| 37691 | Dell |
| 57772 | Apple |
| 59836 | Alienware |
| 77740 | HP |

| PackageID | SoftwareName |
|---|---|
| AC01 | Portal |
| DB32 | Zork |

| | |
|---|---|
| DB33 | Excel |
| WP08 | Word |
| WP09 | PowerPoint |

(a) Identify all primary keys (determinants) for all tables.

The primary key in the first table is TagNumber. The primary key for the second table is PackageID.

(b) Identify all functional dependencies for all tables.

The functional dependency for the first table is TagNumber |---> ComputerModel. The functional dependency for the second table is PackageID |---> SoftwareName.

(c) Explain why the new tables are in third normal form.

The new tables are in third normal form due to the removal of the repeating groups of data in PackageID and TagNumber, a unique table for each group of related values, and the lack of fields that don't depend on a key.

(d) Draw a beautiful E/R diagram.