Marist College

# Lab 7

## Normalization 1

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# Part 1

1. My reply: “This is a good start for the spreadsheet, Fred. It has most of the data in it that we need. I think we should change the layout of it slightly though. It would be more effective to have separate tables that represent each individual piece of information. That way, if you need to reference something specific about a software package, you can go to the software table and change it there. Then, you would have a separate table relating all of the other entities. This will make relating elements to one another more organized.”
2.

| 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 | O10-30-2005 | 35.00 |
| WP09 | 77740 | 05-27-2005 | 35.00 |

3. The primary key of this table would be PackageID + TagNumber + InstallDate. This is the shortest combination of keys that guarantees uniqueness among the rows of the table.

# Part 2

4.

| PackageID | TagNumber | Install Date | Software CostUSD | SoftwarePackage Name | ComputerModel |
|---|---|---|---|---|---|
| AC01 | 32808 | 09-13-2005 | 754.95 | IntelliJ | Apple |
| DB32 | 32808 | 12-03-2005 | 380.00 | Eclipse | Apple |
| DB32 | 37691 | 06-15-2005 | 380.00 | Eclipse | Fujitsu |
| DB33 | 57772 | 05-27-2005 | 412.77 | MatLab | Lenovo |
| WP08 | 32808 | 01-12-2006 | 185.00 | Microsoft Office | Apple |
| WP08 | 37691 | 06-15-2005 | 227.50 | Microsoft Office | Fujitsu |
| WP08 | 57222 | 05-27-2005 | 170.24 | Microsoft Office | Dell |
| WP09 | 59836 | O10-30-2005 | 35.00 | Portal | Apple |
| WP09 | 77740 | 05-27-2005 | 35.00 | Portal | Lenovo |

5. Functional dependencies for this table:

PackageName → PackageID

PackageID determines what the PackageName would be.

ComputerModel → TagID

ComputerModel determines what the TagID would be.

SoftwareCostUSD → PackageID + TagNumber + InstallDate

Having a different software package installed on a different computer model is going to change the software cost. Additionally, it was stated that the cost of software on a specific computer changes based on when it was installed which is why InstallDate is a dependency here as well.

6. This table is not in 3NF because it does not satisfy the requirements of being in 2NF. To be considered 2NF, there must not be any partial key dependencies. That being said, we have ComputerModel and PackageName that do not follow this rule. The primary key is PackageID + TagNumber + InstallDate. ComputerModel only depends on TagNumber and PackageName only depends on PackageID and so we have two partial key dependencies, making it so this table is not in 3NF (or 2NF).

## Part 3

7. Tables and primary keys:

Table name: **Software**

Primary key: **PackageID**

| **PackageID** | **PackageName** |
|---|---|
| AC01 | Intellij |
| DB32 | Eclipse |
| DB33 | MatLab |
| WP08 | Microsoft Office |
| WP09 | Portal |

Table name: **Computers**

Primary key: **TagNumber**

| **TagNumber** | **ComputerName** |
|---|---|
| 32808 | Apple |
| 37691 | Fujitsu |
| 57772 | Lenovo |
| 57222 | Dell |
| 59836 | Apple |
| 77740 | Lenovo |

Table name: **Installations**

Primary key: **PackageID + TagNumber + InstallDate**

| 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 | O10-30-2005 | 35.00 |
| WP09 | 77740 | 05-27-2005 | 35.00 |

8. Functional dependencies:

- Software
    - SoftwareName → PackageID
- Computers
    - ComputerName → TagNumber
- Installations
    - SoftwareCostUSD → PackageID + TagNumber + InstallDate

9. The new tables are in 3NF because they are in 1NF, 2NF, and have no multi-key dependencies. The tables are in 1NF because they are atomic. That means that each cell in each table is in the simplest form it can be in without causing an insert, update, or delete anomaly. The tables are in 2NF because there are no partial key dependencies in any of the tables. For each table, every dependency is based on the whole primary key, not just part (or parts) of it. Finally, in addition to being in 1NF and 2NF, the tables have no multi-key dependencies. That means that for any dependency, it only relies on the whole primary key and nothing else (no extra keys).

10. ER-Diagram