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

PART 1

1. As he shows you the spreadsheet, having just signed your consulting agreement, he asks what you think of it. How do you reply?
 - a. I reply by saying that the spreadsheet should be normalized, or restructured into several tables in order to reduce redundancy and make it easier to update the information as the company grows. The spreadsheet does not follow the 1st normal form rule (all intersections must be atomic). Certain rows have too much information and should be split into two or more rows.

2. Put his data in 1NF and display it. (Show me the table; no SQL.)

PackageID	TagNumber	Install Date	SoftwareCostUSD
AC01	32808	9-13-2005	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?

a. The primary key is a composite primary key → PackageID and TagNumber

PART 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.

4. Display the new table

PackageID	TagNumber	InstallDate	SoftwareCost USD	SoftwareName	ComputerModel
AC01	32808	9-13-2005	754.95	Zork	IBM
DB32	32808	12-03-2005	380.00	Portal	IBM
DB32	37691	06-15-2005	380.00	Portal	Windows
DB33	57772	05-27-2005	412.77	DND	Dell
WP08	32808	01-12-2006	185.00	Minecraft	IBM
WP08	37691	06-15-2005	227.50	Minecraft	Windows
WP08	57222	05-27-2005	170.24	Minecraft	Apple
WP09	59836	10-30-2005	35.00	Sims4	Lenovo
WP09	77740	05-27-2005	35.00	Sims4	HP

5. Identify and document all functional dependencies

a. PackageID → SoftwareName

i. PackageID determines what SoftwareName is, meaning whatever software is to be downloaded, is based on what the PackageID is.

b. TagNumber → ComputerModel

i. TagNumber determines what the computer model being used is.

c. (PackageID, TagNumber) → InstallDate, SoftwareCostUSD, ComputerModel

i. The cost of the software is dependent upon the primary key (the unique combination of PackageID and TagNumber that defines each row)

6. Explain why this new table is **not** in the third normal form.

a. In order to be compliant with the third normal form, a table must be in the second normal form (no non-prime functional dependencies on a subset of a candidate key) and also not contain any transitive dependencies (non-prime attributes cannot depend on other nonprime attributes).

- i. SoftwareName is dependent on a prime attribute (PackageID)
- ii. TagNumer is dependent on a prime attribute (TagNumber)
- iii. This table is not in 2NF, so therefore is not in 3NF

PART 3 → : Decompose your 1NF table into a set of tables that are in at least third normal form. (BCNF would be better.)

Softwares

PackageID	SoftwareName
AC01	Zork
DB32	Portal
DB33	DND
WP08	Minecraft
WP09	Sims4

Computers

TagNumber	ComputerModel
32808	IBM
37691	Windows
57772	Dell
57222	Apple
59836	Lenovo
77740	HP

Software Installations

PackageID	TagNumber	InstallDate	SoftwareCost USD
AC01	32808	9-13-2005	754.95
DB32	32808	12-03-2005	380.00
DB32	37691	06-15-2005	380.00
DB33	57772	05-27-2005	412.77
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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

7. Identify all primary keys (determinants) for all tables:
 - a. Softwares Table \rightarrow PackageID
 - b. Computers Table \rightarrow TagNumber
 - c. Software Installations \rightarrow PackageID, TagNumber
8. Identify all functional dependencies for all tables
 - a. Softwares Table: PackageID \rightarrow SoftwareName
 - b. Computers Table: TagNumber \rightarrow ComputerModel
 - c. Software Installations: (PackageID, TagNumber) \rightarrow InstallDate, SoftwareCostUSD
9. Explain why the new tables are in third normal form
 - a. The new tables are in third normal form because each one has no functional dependencies on only a part of a composite candidate key and each one also has no non-prime attributes dependent on other non-prime attributes. In each table, the primary key is the only thing that determines all other attributes.
10. ER Diagram:

