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<p align="center">Lab 7</p>

<p align="center">Part 1</p>

1. I would respond by saying that having gaps in the spreadsheet is not a good idea because it is not as easy to find the primary key. I would say this could be fixed by putting the table in First Normal Form, which I would then offer to do for him.

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	10-30-2005	35.00
WP09	77740	05-27-2005	35.00

3. The primary key here is the combination of the PackageID and TagNumber.

<p align="center">Part 2</p>

4.

PackageID	TagNumber	InstallDate	SoftwareCostUSD	PackageName	Computer
AC01	32808	09-13-2005	754.95	GraphFun	Lenovo
DB32	32808	12-03-2005	380.00	Frogger	Lenovo
DB32	37691	06-15-2005	380.00	Frogger	Apple
DB33	57772	05-27-2005	412.77	QBert	IBM
WP08	32808	01-12-2006	185.00	ChessMaster	Lenovo
WP08	37691	06-15-2005	227.50	ChessMaster	Apple
WP08	57222	05-27-2005	170.24	ChessMaster	IBM
WP09	59836	10-30-2005	35.00	TicTacToe	HP
WP09	77740	05-27-2005	35.00	TicTacToe	Dell

5. PackageID → PackageName

   TagNumber → Computer

PackageID + InstallDate → SoftwareCostUSD

PackageName → PackageID

Computer → TagNumber

6. This table is not in second normal form because there are partial key dependencies. There are no attributes that depend on the entire primary key, which is the combination of PackageID and TagNumber. However, both the PackageID and TagNumber are needed to uniquely identify a row of the data, so the primary key cannot be reduced any further. A table must be in second normal form to reach third normal form, and therefore it is not in third normal form.

Part 3

Packages

PackageID	PackageName
AC01	GraphFun
DB32	Frogger
DB33	QBert
WP08	ChessMaster
WP09	TicTacToe

Primary Keys: PackageID, PackageName

Functional Dependencies: PackageID → PackageName; PackageName → PackageID

Computers

TagNumber	ModelName
32808	Lenovo
37691	Apple
57772	IBM
59836	HP
77740	Dell

Primary Keys: TagNumber, ModelName

Functional Dependencies: TagNumber → ModelName; ModelName → TagNumber

Installations

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

Primary Key: PackageID + InstallDate

Functional Dependencies: PackageID + InstallDate → SoftwareCostUSD

9. These tables are in second normal form because there are no partial key dependencies, meaning each non-primary key attribute is dependent on the entire primary key. The Packages and Computers tables are in second normal form because there are only two columns, so each attribute in one column must be determined by an attribute in the other column, meaning a partial key dependency is not possible. In the Installations table, the SoftwareCostUSD is dependent on both the PackageID and InstallDate, so it is not a partial key dependency.

The tables are in third normal form because they are in second normal form and they have no transitive dependencies. There are no cases in the tables where one key determines one attribute but not another, because there are so few attributes within the tables. In the Packages and Computers tables, A → B and B → A, and there is no third attribute so a transitive dependency is not possible. In the Installations table, AB → C. Since there is only one non-primary key attribute and both of the other attributes determine the third attribute, then a transitive dependency is not possible. There would only be a transitive dependency if A → B and B → C, which is not the case here.

10.