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Part One:

1. A computer installs many software packages and a software package is also installed on many computers at a time. Right away, we can see that there are a lot of duplications in the table. If we are going to update the name of a software package, we will have to do it as many times as it shows up in the table, if we miss one, the table becomes inconsistent. I rather let my eyes bleed than have inconsistent information in my database.

2.

TagNum	PackID	InstallDate	SoftwareCost
32808	AC01	09-13-1995	754.95
32808	DB32	12-03-1995	380.00
32808	WP08	01-12-1996	185.00
37691	DB32	06-15-1995	380.00
37691	WP08	06-15-1995	227.50
57772	DB33	05-27-1995	412.77
57222	WP08	05-27-1995	170.24
77740	WP09	05-27-1995	35.00
59836	WP09	10-30-1995	35.00

3. The primary key is the TagNum.

Part Two:

4.

TagNum	PackID	InstallDate	SoftwareCost	packageName	computerModel
32808	AC01	09-13-1995	754.95	Zork	HP
32808	DB32	12-03-1995	380.00	Portal	HP
32808	WP08	01-12-1996	185.00	Halo	HP
37691	DB32	06-15-1995	380.00	Portal	Dell
37691	WP08	06-15-1995	227.50	Halo	Dell
57772	DB33	05-27-1995	412.77	Diablo	Lenovo
57222	WP08	05-27-1995	170.24	Halo	Apple
77740	WP09	05-27-1995	35.00	Pacman	Msi
59836	WP09	10-30-1995	35.00	Pacman	Asus

5. TagNum -> ComputerModel
   PackID -> packageName
   TagNum, PackID -> InstallDate, SoftwareCost

6. The third normal form states that non-key attributes must provide a fact about the key, the whole key and nothing but the key. The primary key in this case is TagNum, but packageName is functionally dependent on PackID and it tells nothing about the

primary key TagNum. It violates the 3NF because it didn't provide a fact about the primary key.

Part Three:

7.

Package Table

PackID	PackageName
AC01	Zork
DB32	Portal
DB33	Diablo
WP08	Halo
WP09	Pacman

Computer Table

TagNum	ComputerModel
32808	HP
37691	Dell
57772	Lenovo
57222	Apple
77740	Msi
59836	Asus

Order Table

TagNum	PackID	InstallDate	SoftwareCost
32808	AC01	09-13-1995	754.95
32808	DB32	12-03-1995	380.00
32808	WP08	01-12-1996	185.00
37691	DB32	06-15-1995	380.00
37691	WP08	06-15-1995	227.50
57772	DB33	05-27-1995	412.77
57222	WP08	05-27-1995	170.24
77740	WP09	05-27-1995	35.00
59836	WP09	10-30-1995	35.00

Primary Key for Package Table is PackID

Primary Key for Computer Table is TagNum.

Primary Key (composite) for Order Table is TagNum and PackID.

8. Functional dependencies :
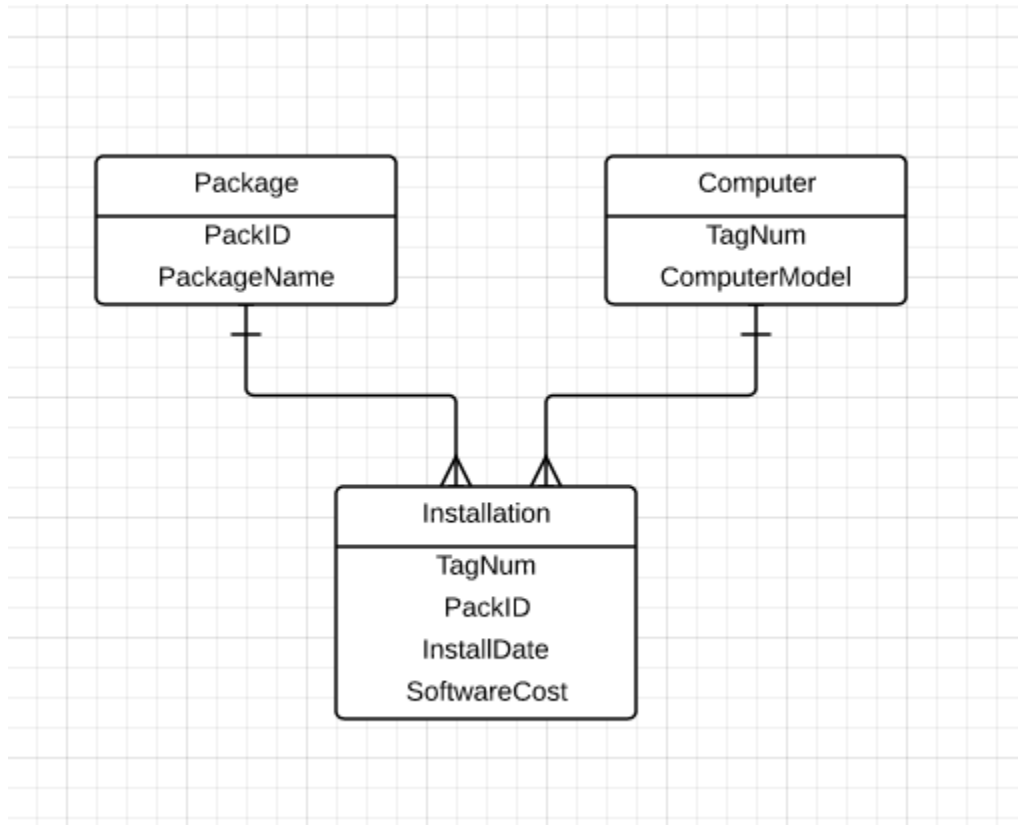Package Table: PackID -> PackageNme
Computer Table: TagNum -> ComputerModel
Order Table: {TagNum, PackID} -> {InstallDate, SoftwareCost}

9. PackageName provides the name of the package and nothing else. ComputerModel provides the brand of the computer for each TagNum and nothing else. InstallDate and SoftwareCost describe what software is installed on what computer (TagNum and PackID) and nothing else. All of these fields fulfill the requirement of the 3NF:

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non-key attribute provide a fact about the key, the whole key and nothing but the key.

```
┌─────────────────────┐          ┌─────────────────────┐
│      Package        │          │      Computer       │
├─────────────────────┤          ├─────────────────────┤
│      PackID         │          │      TagNum         │
│   PackageName       │          │   ComputerModel     │
└─────────────────────┘          └─────────────────────┘

            ┌─────────────────────┐
            │    Installation     │
            ├─────────────────────┤
            │      TagNum         │
            │      PackID         │
            │    InstallDate      │
            │   SoftwareCost      │
            └─────────────────────┘
```

10.