C:\Users\truuser\Pictures\bill amstrong.jpgNormalization & Definitions

**1NF:**  a relation has no multi-valued attributes. In other words, it is a relation in relational model.

**2NF:**  a relation is in 1NF and every non-PK attribute is **fully functionally** dependent on the PK.

**3NF:**  a relation is in 2NF and no non-PK is **transitively** dependent on the PK. In other words, there are no FKs between non-PKs.

**Partial dependency:** A,B 🡪 C and (B🡪 C or A 🡪 C)

**Transitive dependency:** A🡪 B and B 🡪 C, then A 🡪 C (Amstrong’s axiom)

**Superkey:** An attribute, or set of attributes, that uniquely identifies a tuple within a relation (DS p. 100)

**Candidate key (CK):** A superkey such that no proper subset is a superkey within the relation. CK has two properties: uniqueness and irreducibility.

**Primary key (PK):** The CK that is selected to uniquely identify tuples. **Alternative key** (AK) the CK that is not selected to be the PK.

**General definition for 2NF**: a relation is in 1NF and every non-CK attribute is **fully** functionally dependent on any CK.

**General definition for 3NF**: a relation is in 2NF and no non-CK attribute is **transitively** dependent on the CK.

**Boyce-Codd Normal Form (BCNF):** A relation is in BCNF if and only if every determinant is a candidate key

Note: Be aware that there are various definitions on the Web.

1. Normalize (to 3NF) the following two relations:

Orders (Order\_id, Order\_date, customer\_id, customer\_name, customer\_address)

Order\_items (Order\_id, item\_id, item description, item\_qty, item\_price)

2. Is the following relation in the 3NF? Why yes or no?

Vehicle(V\_ID, VIN, make, color, model, year) VIN is a Vehicle Identification Number

3. The following table is not in 3NF. Why?

| *branchNo* | *branchAddress* | *telNo* | *mgrStaffNo* | *Mgrname* |
| --- | --- | --- | --- | --- |
| B001 | 8 Jefferson Way, Portland, OR 97201 | 503-555-3618 | S1500 | Tom Daniels |
| B002 | City Center Plaza, Seattle, WA 98122 | 206-555-6756 | S0010 | Mary Martinez |
| B003 | 14 - 8th Avenue, New York, NY 10012 | 212-371-3000 | S0145 | Art Peters |
| B004 | 16 - 14th Avenue, Seattle, WA 98128 | 206-555-3131 | S2250 | Sally Stern |

1. The purpose of this form shown below is to record the medication given to a particular patient at the Wellmeadows Hospital. Create a set of relations in 3NF to represent the data. 