First Normal Form

First Normal Form (1NF)

- A relation in which the intersection of each row and column contains one and only one value.
- **A table is in first normal form (1NF) if and only if every non key attribute is functionally dependent on the primary key.**

UNF to 1NF

- Nominate an attribute or group of attributes to act as the key for the unnormalised table.

- Identify the repeating group(s) in the unnormalised table which repeats for the key attribute(s).

UNF to 1NF

- The steps involved in transforming an unnormalised table into a set of first normal form tables are as follows:

    1. Place the primary key attribute and the attribute(s) that are functionally dependent on the primary key into a table of their own.

    2. Place the primary key attribute and the repeating (multivalued) attribute(s) into a table of their own.

Example

PPS	Name	ProjCode	Hours
123456789	Smith, John	ABC PQR	32.5 7.5
333456781	English, Joyce	ABC XYZ JKL	20 14 6
345123876	Ryan, Melanie	PQR XYZ	23 17

EmployeeProject

Example

- The schema of this relation can be represented as follows:

  EmployeeProject (PPS, Name, {PROJS (ProjCode, Hours)})

- The set braces {} identify the attribute PROJS as multivalued, and we list the component attributes that form PROJS between parenthesis ().

Example

- The attributes ProjCode and Hours are clearly not functionally dependent on PPS, i.e. for any given value for PPS, there is **not** one value for attributes ProjCode nor Hours.

- We must remove the repeating attributes and place them into a new table.

Example

1. Place the primary key attribute (PPS) and the attribute(s) (Name) that are functionally dependent on the primary key into a table of their own as follows:

   Employee(PPS, Name)

   Primary key PPS

Example

2. Place the primary key attribute (PPS) and the repeating (multivalued) attribute(s) (ProjCode, Hours) into a table of their own as follows:

   EmployeeProject(PPS, ProjCode, Hours)
   Primary key PPS, ProjCode
   Foreign key PPS references Employee(PPS)

- Note that the posted key value (PPS) is known as a *foreign* key. It is the link between the two tables.

- The primary key value of this table, EmployeeProject is a composite primary key (PPS, ProjCode). The table requires a composite primary key value, as no attribute on its own is unique.

Exercise

DistributionCenter(dCenterNo, dAddress,
{PhoneNumbers(dTelNos)})
Primary key dCenterNo

DistributionCenter

dCenterNo	dAddress	dTelNos
D001	8 Jefferson Way, Portland, OR 97201	503-555-3618, 503-555-2727, 503-555-6534
D002	City Center Plaza, Seattle, WA 98122	206-555-6756, 206-555-8836
D003	14 – 8th Avenue, New York, NY 10012	212-371-3000
D004	2 W. El Camino, San Francisco, CA 94087	822-555-3131, 822-555-4112

Exercise

- The relation (DistributionCenter) is unnormalised (not in First Normal Form)

  i. Why?

  ii. Explain the steps involved in transforming the relation into First Normal Form (1NF).

  iii. Transform the relation into a set of First Normal Form (1NF) relations.

Exercise