

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 unnormalized table.
- Identify the repeating group(s) in the unnormalized 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	32.5
		PQR	7.5
333456781	English, Joyce	ABC	20
		XYZ	14
		JKL	6
345123876	Ryan, Melanie	PQR	23
		XYZ	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.