

# Lab 09 – Normalization

## (2NF, 3NF)

### Objective:

#### Students will learn:

- To continue the **normalization** of user views from **1NF** to **2NF** and **3NF**
- How to identify and remove **partial dependencies**
- How to identify and remove **transitive dependencies**

### Submission:

**Save your lab file as a PDF file. You need to submit a single *PDF* file for this lab.**

***Your name and student ID MUST be in the PDF file or you will receive a mark of zero.***

***The name of the file must be as follow:***

DBS211\_L10\_LASTNAME.pdf

### Definitions:

Definition: A relation is in 1NF if it contains no multi-valued dependencies (also known as repeating groups).

Definition: A relation is in 2NF if it is in 1NF and it contains no Partial Dependencies.

Definition: A Partial Dependency occurs when a non-key attribute(s) is dependent on (or is determined by) a part of a composite primary key.

Definition: A relation is in 3NF if it is in 2NF and it contains no Transitive Dependencies.

Definition: A Transitive Dependency occurs when a non-key attribute (s) is dependent on (or is determined by) another non-key attribute.

### Instructions:

#### Part A - Second Normal Form (2NF)

Note: A relation that has only a simple primary key cannot have any partial dependencies!

**1.** Examine the following report:

Premiere Corporation Customer Orders					
Customer Number	Name	Order Number	Order Date	Sales Rep	Rep Last Name
124	Sally Adams	12489	2016-09-02	03	Jones
		12500	2016-09-05		
256	Ann Samuels	12495	2016-09-04	06	Smith
311	Don Charles	12491	2016-09-02	12	Diaz
315	Tom Daniels	12494	2016-09-04	06	Smith
522	Mary Nelson	12498	2016-09-05	12	Diaz
		12504	2016-09-05		

**Step 1:**

Create the UNF relation by creating a relation composed of all the attributes found in the User View. Don't forget to underline the primary key and place brackets around any multi-valued dependencies (also known as repeating groups) you may find.

UNF:

UNF: Customer [ (CK CustNo, CustName, RepNo, RepName), OrderNo, OrderDate ]

**Step 2:**

Create the 1NF relations by resolving the multi-valued dependencies (also known as repeating groups):

1NF

Now you are ready to create the 2NF relations by resolving the partial dependencies from the 1NF relations.

Your 1NF solution should look something like this:

1NF: Customer [ CK CustNo, CustName, RepNo, RepName ]  
Cust\_Order [CK OrderNo, OrderDate, FK CustNo ]

Note: if you did not get a similar solution, please talk to your instructor about it now! It is very important to get the correct UNF and 1NF relations.

**Step 3:**

The process for taking a relation from 1NF to 2NF involves resolving the partial dependencies. We see that from our definition of 2NF (page 1) a partial Dependency is when a non-key attribute is determined by a part of the primary key. We also read in the note (page 1) that we cannot have partial dependencies when there is a one-part Primary Key).

1NF: Customer [ CK **CustNo**, CustName, RepNo, RepName ]  
 Cust\_Order [CK **OrderNo**, OrderDate, FK CustNo ]

Now examine the CustOrder relation. Does it have a composite primary key ( a key made up of more than 1 field) ? \_\_\_\_\_

Identify the key attributes. \_\_\_\_\_

Identify the non-key attributes. \_\_\_\_\_

Are any of the non-key attributes determined by ONE of the key attributes?

\_\_\_\_\_

Which non-key attributes are determined by only one of the PK attributes?

\_\_\_\_\_.

We must create new relations for the partial dependencies.

Write the 3 possible PK's:

[CustNo ,  
 [OrderNo ,  
 [CustNo, OrderNo ,

Place all non-key attributes on the appropriate table (hint: choose the table with the least parts.

2NF:

CUSTOMER [ CustNo,  
 ORDER [ OrderNo  
 CUSTORDER [ CustNo, OrderNo,

1NF: Customer [ CK **CustNo**, CustName, RepNo, RepName ]  
 Cust\_Order [CK **OrderNo**, OrderDate, FK CustNo ]

**Part B (Third Normal Form (3NF))**

We now have a set of 2NF relations from our User View. Your 2NF solution should look something like this:

2NF:

Customer [ CustNo, CustName, RepNo, RepName ]  
 CustOrder [ CustNo, OrderNo ]  
 Order [ OrderNo, Orderdate ]

If you did not correctly identify the order relation, please ask your instructor about this process now!

We are now ready to identify any transitive dependencies we may have.

Note: A relation that has no transitive dependencies is already in 3NF!

1. Examine each of the 2NF relations and determine the following:

**Customer relation:** Key attributes \_\_\_\_\_

Non-key attributes: \_\_\_\_\_

**CustOrder relation** Key attributes \_\_\_\_\_

Non-key attributes \_\_\_\_\_

**Order relation** Key attributes \_\_\_\_\_

Non-key attributes: \_\_\_\_\_

**Note:** if a relation contains less than 2 non-key attributes, there cannot be any transitive dependencies. Therefore the CustOrder and Order relations cannot contain any transitive dependencies! Simply copy those relations to the 3NF solution.

Examine non-key attributes of the Customer relation. Do any of the non-key attributes determine any of the other non-key attributes? \_\_\_\_\_  
 If you answered yes, you are right. Fill in the blanks:

\_\_\_\_\_ is determined by \_\_\_\_\_

2. We must create a new relation for the transitive dependency. We do this by moving the non-key attributes involved in the transitive dependency to a new relation. The primary key of the new relation will be the non-key attribute that determines the other non-key attributes involved in the transitive dependency.

Write the DBDL for the new relation:

REP [ \_\_\_\_\_ ]

3. The last step in resolving the transitive dependency is to maintain the link (or relationship) between the relation that contained the transitive dependency (Customer) and the new relation (Rep). We do this by placing a foreign key to the new relation (Rep) into the relation that contained the transitive dependency (Customer). The foreign key will be the primary key of the new relation. Don't forget to identify it with **(FK)**

Complete the 3NF solution:

3NF:

CUSTORDER [ CustNo, OrderNo ]

ORDER [ OrderNo, Orderdate ]

CUSTOMER [CustNo, CustName, ] (fill in the foreign key)

REP [ ]

3NF: Customer [ CK CustNo, CustName, FK RepNo ]  
 Cust\_Order [ CK OrderNo, OrderDate, FK CustNo ]  
 Reps [ CK RepNo, RepName ]

## Lab 10 Submission:

For the following User View, determine the 1, 2 and 3NF and hand in this page to your instructor. The UNF relation has been provided.

### Premiere Corporation Order Detail Report

Order Number	Order Date	Cust Number	Cust Last Name	Part Number	Part Desc	Qty Ordered	Quoted Price
12489	2016-09-02 124	124	Adams	AX12	Iron	11	14.95
12491	2016-09-02 311	311	Charles	BT04	GasGrill	3	440.00
				BZ66	Washer	1	399.99
				CX11	MiniBlender	1	11.98
12494	2016-09-04	315	Daniels	CB03	Bike	4	279.96
12495	2016-09-04	256	Samuels	CX11	MiniBlender	2	23.96
12498	2016-09-05	522	Nelson	AZ52	Dartboard	2	12.96
				BA74	Basketbal	4	24.96
12500	2016-09-05	124	Adams	BT04	GasGrill	1	149.99
12504	2016-09-05	522	Nelson	CZ81	Treadmill	2	325.98

**UNF:**

**Order** [OrderNo, Orderdate, CustNo, CustLname, (PartNo, PartDesc, QtyOrd, Price)]

**1NF:**

**2NF:**

**3NF:**