

Step-by-Step Example of Normalization

PURCHASE ORDER		Order Date	May 7, 2015	
Order ID	123			
Supplier ID	789			
Address	Quick & Cheap Company, Inc. 456 Oak Avenue Somewhere City, NY 54321			
Article ID	Description	Quantity	Unit Price	Total Price
ZS-322	Hammer	3	12.50	37.50
AB-153	Pliers	4	9.95	39.80
CF-563	Saw	2	20.00	40.00
Total Amount				117.30
Delivery Date	May 20, 2015			
Salesperson	J. Doe		Printed on May 21, 2015 by P. Ano	

All Data

Order ID	Order ID
Order Date	Order Date
Supplier ID	Supplier ID
Supplier Name	Supplier Name
Supplier Address	Supplier Address
Supplier City	Supplier City
Supplier Postal Code	Supplier Postal Code
Article ID	Article ID
Description	Description
Quantity	Quantity
Unit Price	Unit Price
Total Price	Total Price
Total Amount	Total Amount
Delivery Date	Delivery Date
Salesperson	Salesperson
Printing Date	Printing Date
Printed By	Printed By

ONF: Remove calculated fields and parameters

1NF: Determine PK and separate repeating groups

<u>Order ID</u>	<i>repeating group:</i>
Order Date	Article ID
Supplier ID	Description
Supplier Name	Quantity
Supplier Address	Unit Price
Supplier City	
Supplier Postal Code	
Delivery Date	
Salesperson	

This results in two entities/tables for 1NF:

ORDER
<u>Order ID</u>
Order Date
Supplier ID
Supplier Name
Supplier Address
Supplier City
Supplier Postal Code
Delivery Date
Salesperson

ORDERDETAIL
<u>Order ID</u>
<u>Article ID</u>
Description
Quantity
Unit Price

hint: PK of new group in most cases combination of key original group + key new group

2NF: Separate groups whose non-key columns are not functionally dependent on the entire PK

hint: groups containing only one key field are already in 2 NF, so ORDER is already in 2NF.

Both *Description* and *Unit Price* are only determined by *Article ID*, not by a combination of *Order ID* and *Article ID*. Only *Quantity* remains dependent on the combination of both *Order ID* and *Article ID*.

This results in 3 entities/tables for 2NF:

ORDER
<u>Order ID</u>
Order Date
Supplier ID
Supplier Name
Supplier Address
Supplier City
Supplier Postal Code
Delivery Date
Salesperson

ORDERDETAIL
<u>Order ID</u>
<u>Article ID</u>
Quantity

ARTICLE
<u>Article ID</u>
Description
Unit Price

3NF: Separate groups whose non-key columns are functionally dependent on each other

hint: groups containing only one non-key attribute are already in 3NF, so ORDERDETAIL is already in 3NF.

Supplier Name, Address, City and Postal Code are only dependent on non-key attribute *Supplier ID* so these need to be moved to a separate entity/table. This results in 4 entities/tables for 3NF:

ORDER
<u>Order ID</u>
Order Date
Supplier ID
Delivery Date
Salesperson

SUPPLIER
<u>Supplier ID</u>
Supplier Name
Supplier Address
Supplier City
Supplier Postal Code

ORDERDETAIL
<u>Order ID</u>
<u>Article ID</u>
Quantity

ARTICLE
<u>Article ID</u>
Description
Unit Price

The resulting Entity Relationship Diagram (ERD)

