



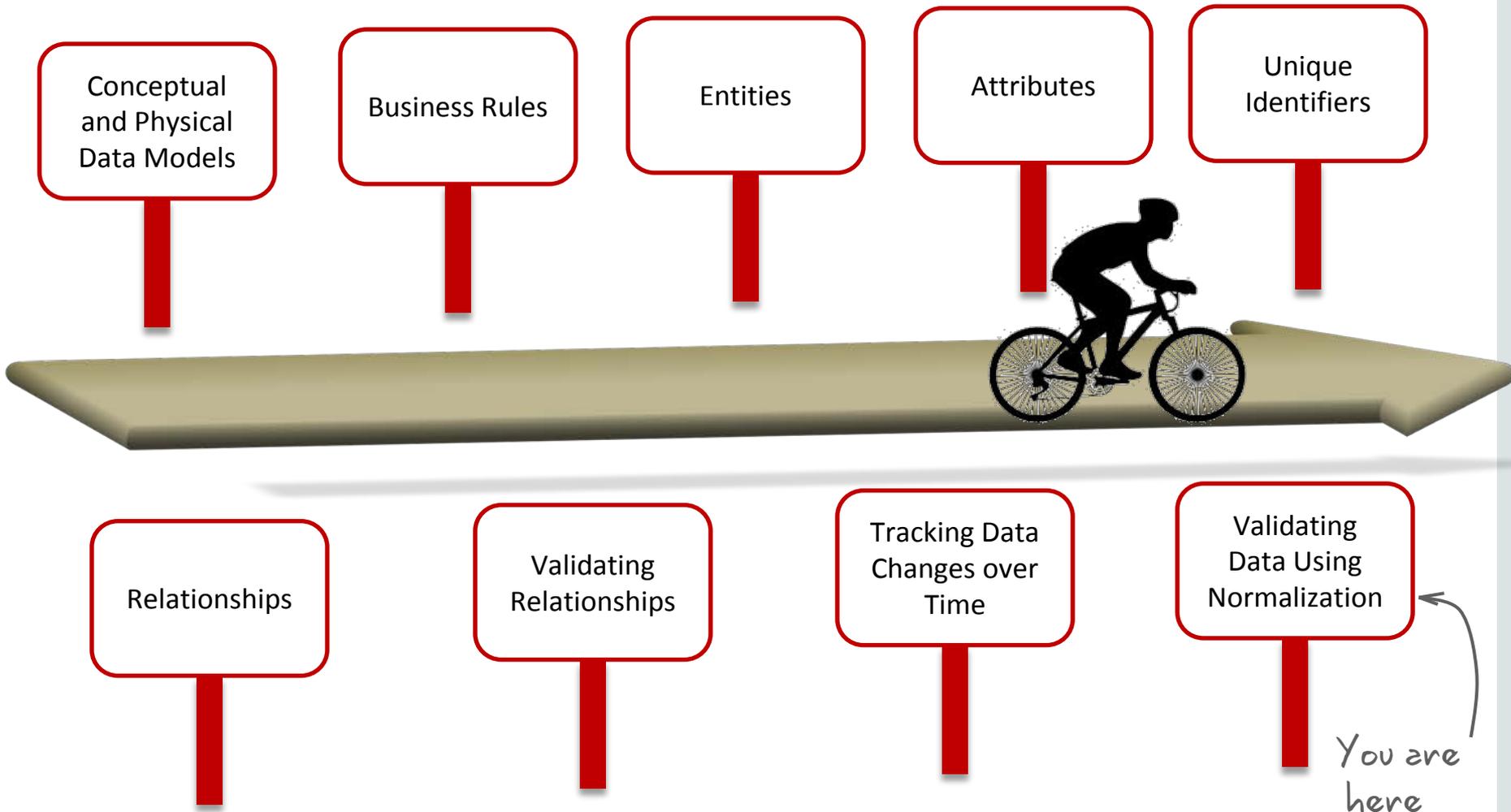
Database Foundations

3-9

Validating Data Using Normalization



Roadmap



Objectives

This lesson covers the following objective:

- Use normalization to validate data



Why Should You Normalize Data?

- Reduce redundant data in the existing design
- Increase the integrity of data and the design's stability
- Eliminate other types of data inconsistencies and anomalies
- Identify missing tables, columns, and constraints



What Is Normalization?

- Normalization is a relational database concept, but its principles apply to data modeling.
- Rules:

Rule	Description
First Normal Form (1NF)	All attributes must be single-valued.
Second Normal Form (2NF)	An attribute must be dependent on its entity's entire UID.
Third Normal Form (3NF)	No non-UID attributes can be dependent on another non-UID attribute.

Types of Normal Forms

Main types of normal forms introduced by E.F. Codd:

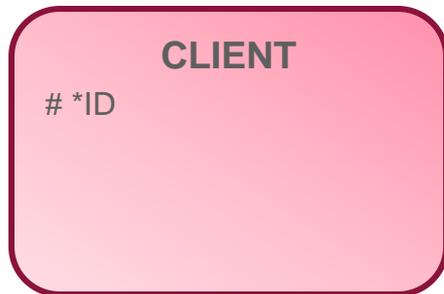
- First Normal Form (1NF)
- Second Normal Form (2NF)
- Third Normal Form (3NF)
- Boyce Codd Normal Form (BCNF)

First Normal Form (1NF)

All attributes must be single-valued.

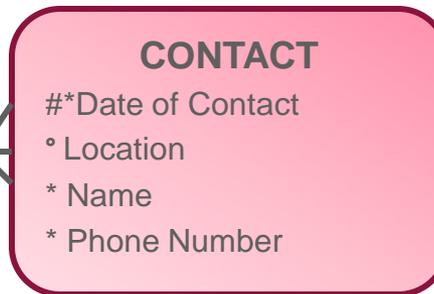


The Date Contacted and Contact Details attributes have multiple values. Therefore, this is not in 1NF.



made

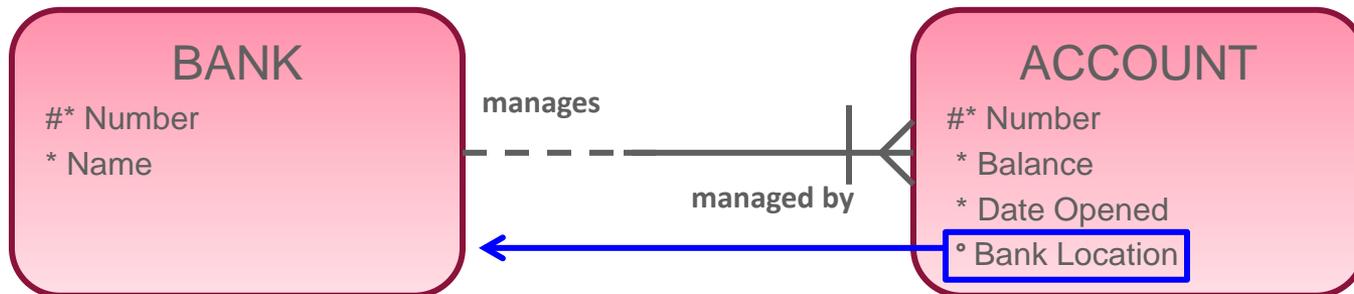
tied to



Create an additional entity, **CONTACT**, with a 1:M relationship to **CLIENT**.

Second Normal Form (2NF)

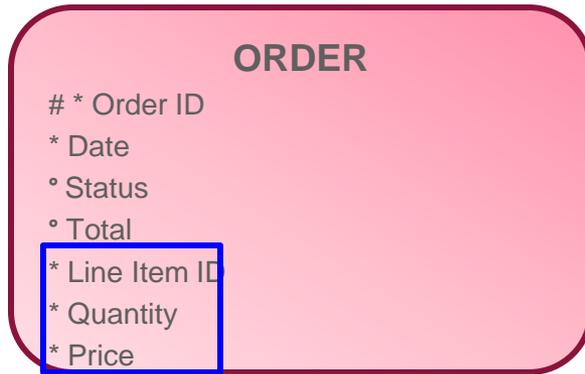
An attribute must be dependent on its entity's entire UID.



The Bank Location attribute is dependent on BANK , not on ACCOUNT. Therefore, this is not in 2NF. Move the attribute to the BANK entity.

Third Normal Form (3NF)

Each attribute depends only on the UID of its entity.



The Quantity and Price attributes are dependent on the Order ID (UID) and Line Item ID (non-UID). Therefore, this is not in 3NF.

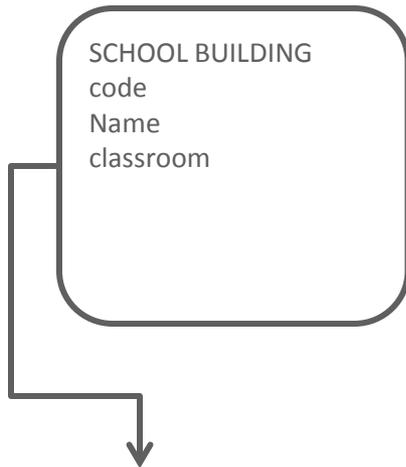


Create a new **ORDER ITEM** entity. Move the Line Item ID, Quantity, and Price attributes to the new entity, and then create an identifying relationship.

Boyce Codd Normal Form

- A table is in Boyce-Codd Normal Form (BCNF) if it is in 3NF and if every determinant is a candidate key.
- A candidate key can be defined as an attribute or a combination of attributes that can be uniquely used to identify a record in a table.

First Normal Form (1 NF): Example 1



Un-normalized Information pertaining to School Building and classrooms located in the building

School Building Code	Building Name	Address	Floor Number	Number of Classrooms Number

School Building Code uniquely identifies a row and is called the primary key of the table.

Second Normal Form (2 NF): Example 1

School Building Code	Building Name	Address	Floor Number	Department

Table holds information about the school building and the departments.

2 NF



School Building Code	Building Name	Address	Department Code

Department Code	Department Name	Floor

Data pertaining to the school building and department has been split into two tables.

Third Normal Form (3 NF): Example 1

School Building Code	Building Name	Address	Department Code

Department Code	Department Name	Floor Code

3 NF



School Building Code	Building Name	Address	Department Code

Department Code	Department Name	Floor Code

Floor Code	Floor Name

The transitive dependencies between the tables are removed.

Normalization Example 2: Unnormalized Data

Ordered by:

Customer ID :

Customer Name :

Address Line 1 :

Address Line 2 :

Address Line 3 :

City, State ZIP : ,

Ship to:

Ship Via :

Name :

Address Line 1 :

Address Line 2 :

Address Line 3 :

City, State ZIP : ,

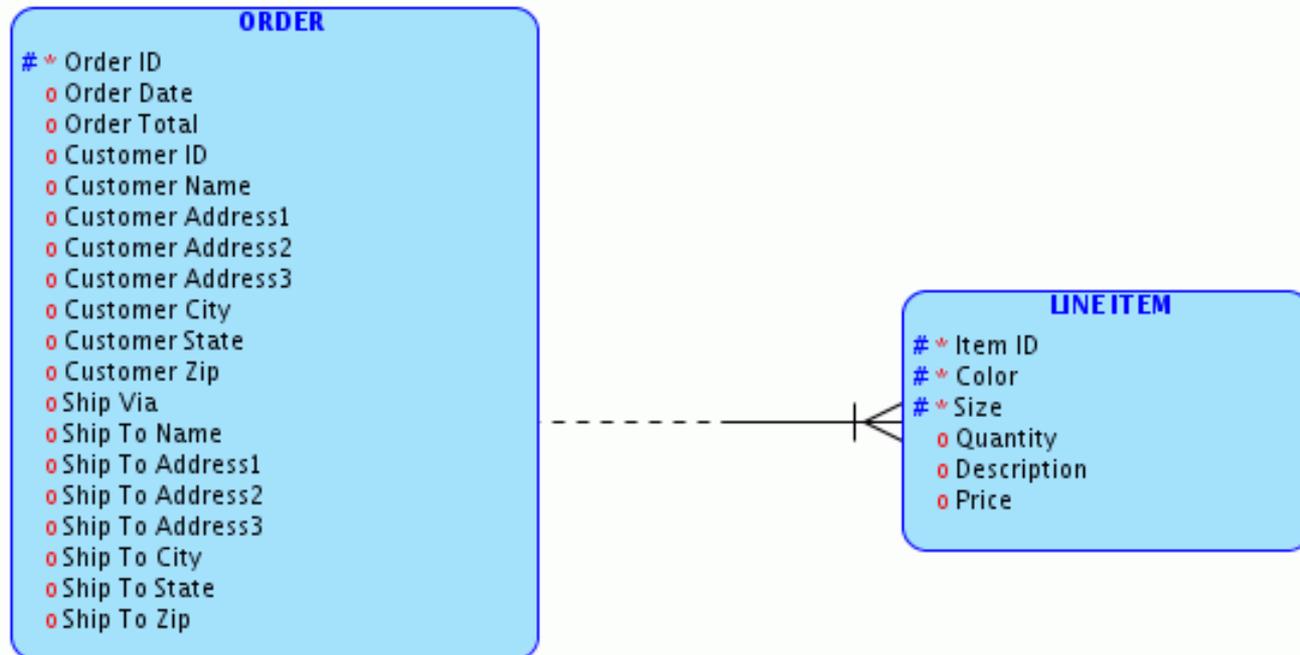
<u>Item ID</u>	<u>Color</u>	<u>Size</u>	<u>Quantity</u>	<u>Description</u>	<u>Price</u>

Order Total:

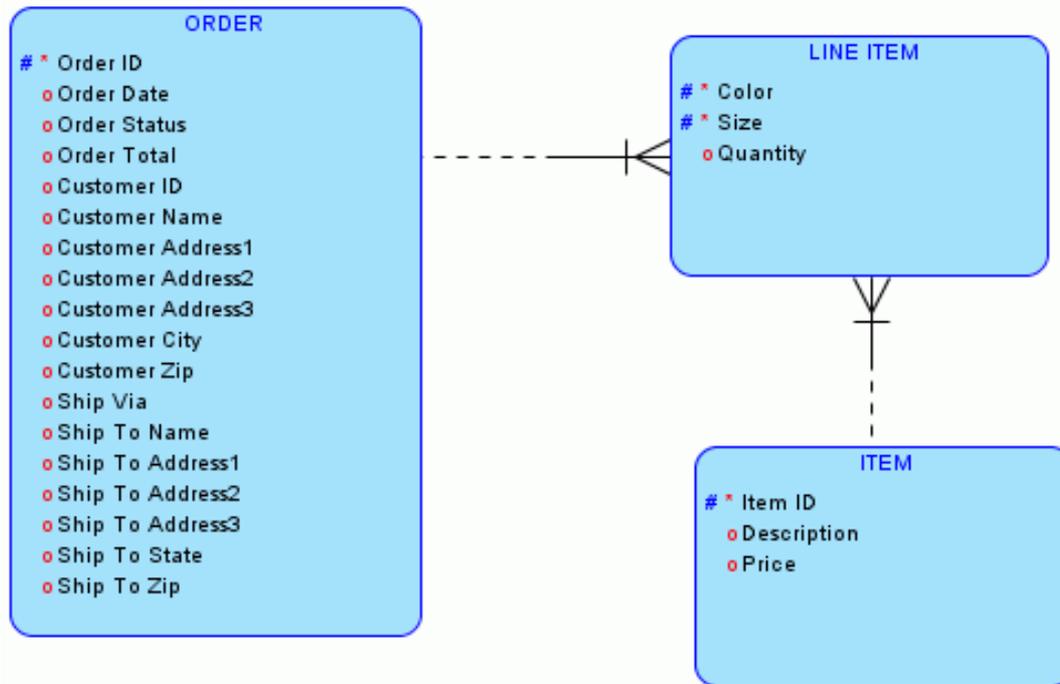
Normalization Example 2: Transforming to First Normal Form

ORDER	
# *	Order ID
o	Order Date
o	Order Total
o	Customer ID
o	Customer Name
o	Customer Address1
o	Customer Address2
o	Customer Address3
o	Customer City
o	Customer State
o	Customer Zip
o	Ship Via
o	Ship To Name
o	Ship To Address1
o	Ship To Address2
o	Ship To Address3
o	Ship To City
o	Ship To State
o	Ship To Zip
o	Item ID
o	Color
o	Size
o	Quantity
o	Description
o	Price

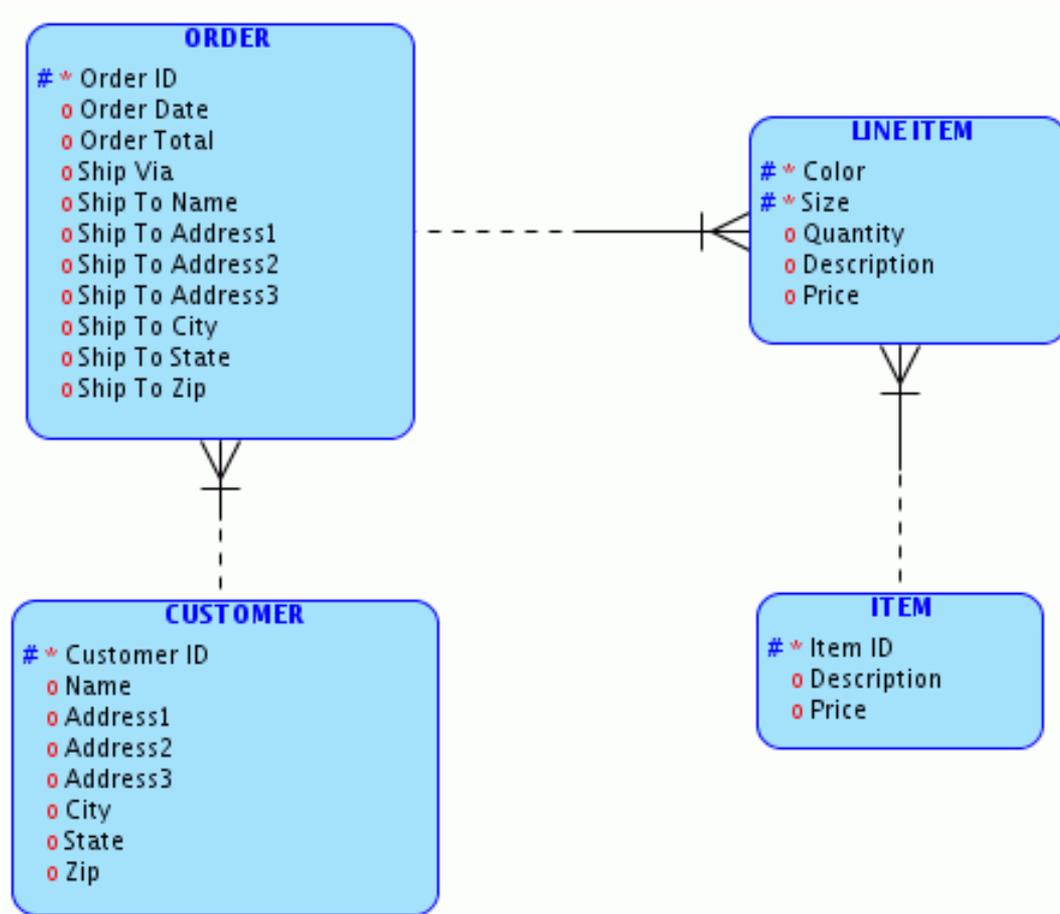
Normalization Example 2: Transforming to First Normal Form



Normalization Example 2: Transforming to Second Normal Form



Normalization Example 2: Transforming to Third Normal Form



Summary

In this lesson, you should have learned how to use normalization to validate data.



