COURSE TECHNOLOGY
CENGAGE Learning™

Oracle 12*c*: SQL

Chapter 1
Overview of Database Concepts

Objectives

- Define database terms
- Identify the purpose of a database management system (DBMS)
- Explain database design using entity-relationship models and normalization
- Explain the purpose of a Structured Query Language (SQL)
- Understand how this textbook's topics are sequenced and how the two sample databases are used

Database Terminology

- Database – logical structure to store data
- Database management system (DBMS) – software used to create and interact with the database

Database Components

- Character
- Field
- Record
- File

Database Components - Character

- Basic unit of data
- Can be a letter, number, or special symbol

Database Components - Field

- A group of related characters
- Represents an attribute or characteristic of an entity
- Corresponds to a column in the physical database

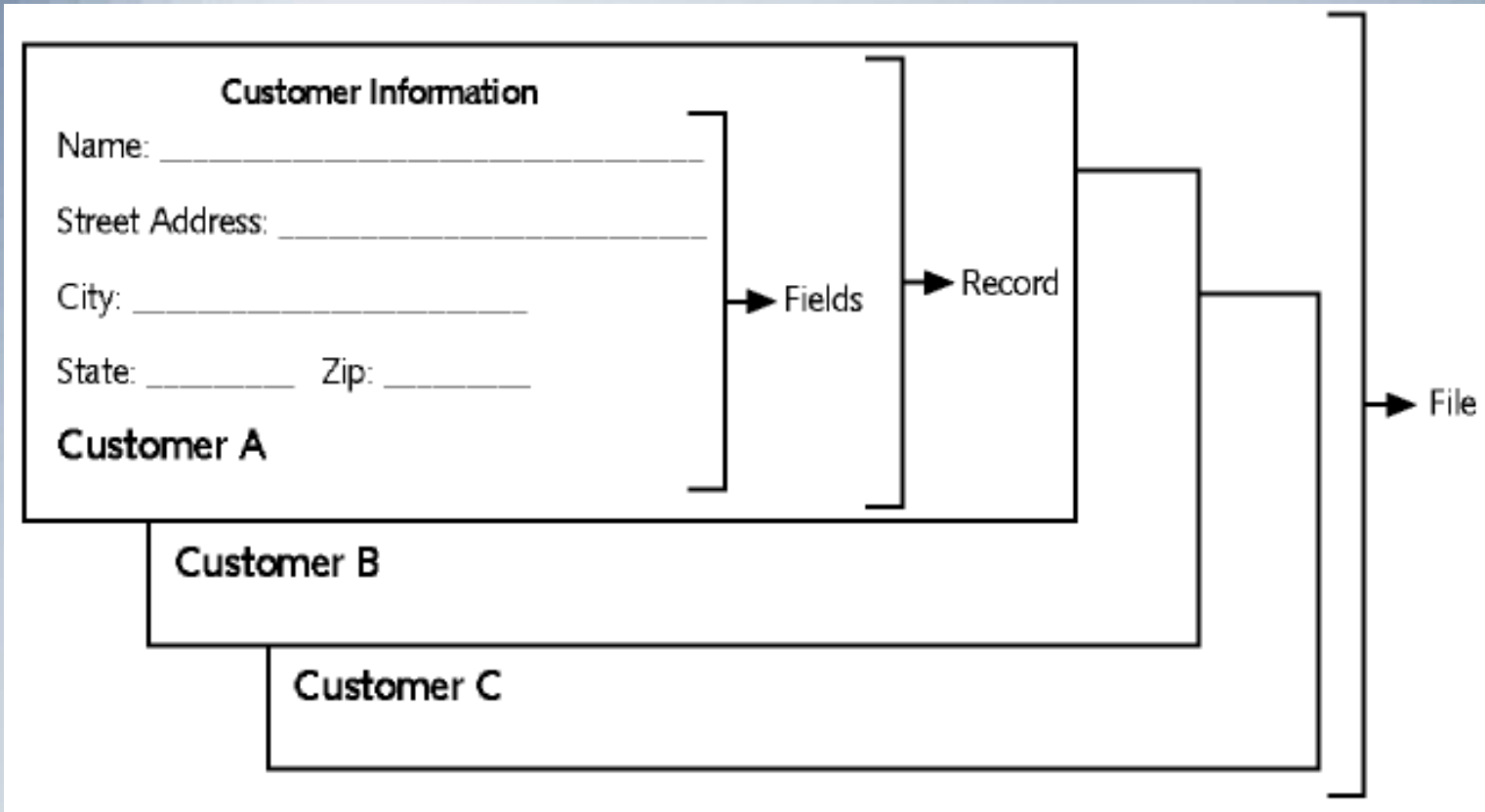
Database Components - Record

- A collection of fields for one specific entity
- Corresponds to a row in the physical database

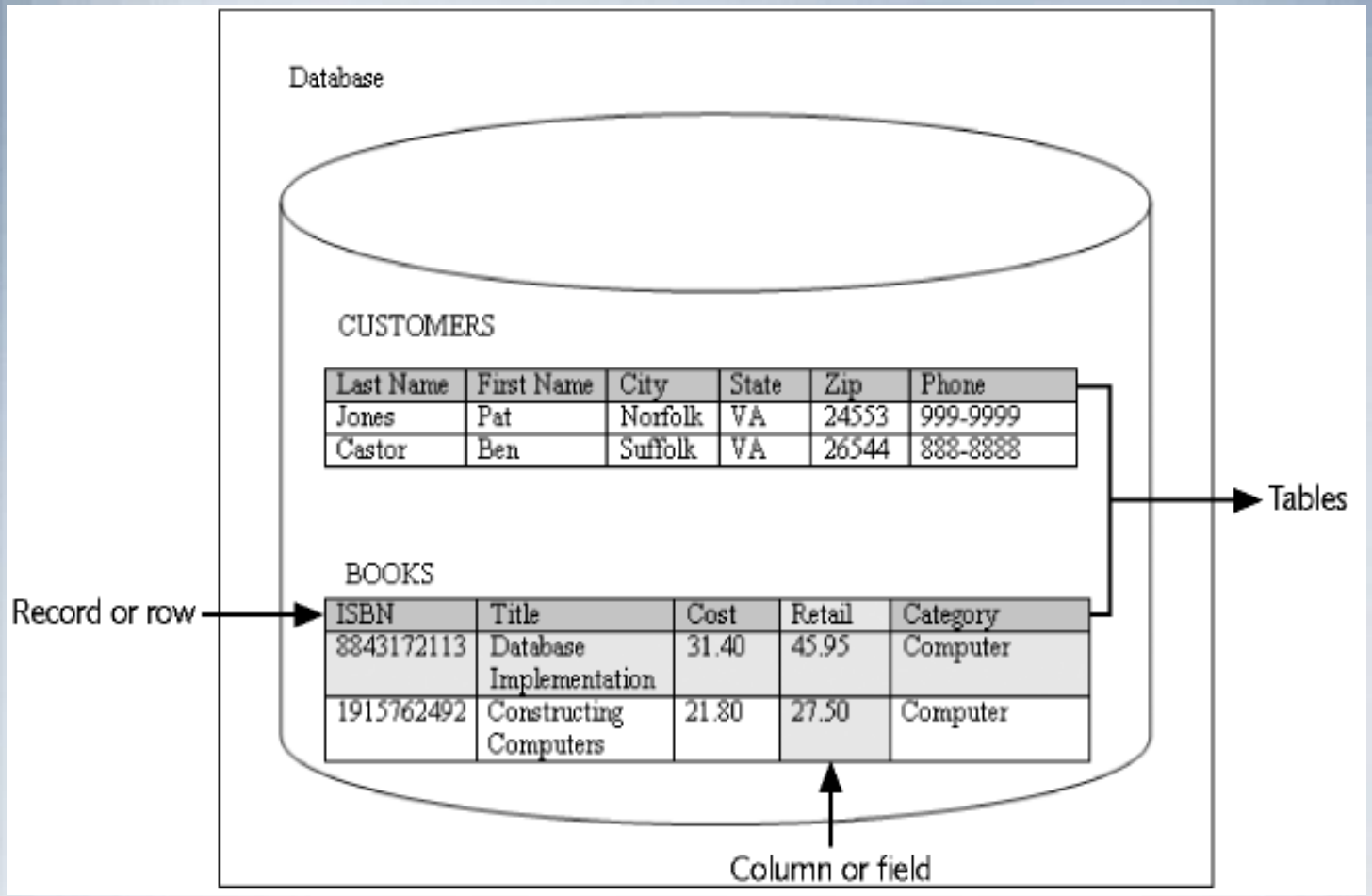
Database Components - File

- A group of records about the same type of entity

Components Example



Database Example



Database Management System

- *Data storage*: manage the physical structure of the database
- *Security*: control user access and privileges
- *Multiuser access*: manage concurrent data access
- *Backup*: enable recovery options for database failures
- *Data access language*: provide a language that allows database access
- *Data integrity*: enable constraints or checks on data
- *Data dictionary*: maintain information about database structure

Database Design

- Systems Development Life Cycle (SDLC)
- Entity-relationship model (E-R model)
- Normalization

Systems Development Life Cycle (SDLC)

- Systems investigation – understanding the problem
- Systems analysis – understanding the solution
- Systems design – creating the logical and physical components
- Systems implementation – placing completed system into operation
- Systems maintenance and review – evaluating the implemented system

Entity-Relationship Model (E-R Model)

- Used to depict the relationship that exists among entities
- The following relationships can be included in an E-R model:
  - One-to-one
  - One-to-many
  - Many-to-many

E-R Model Notation Examples

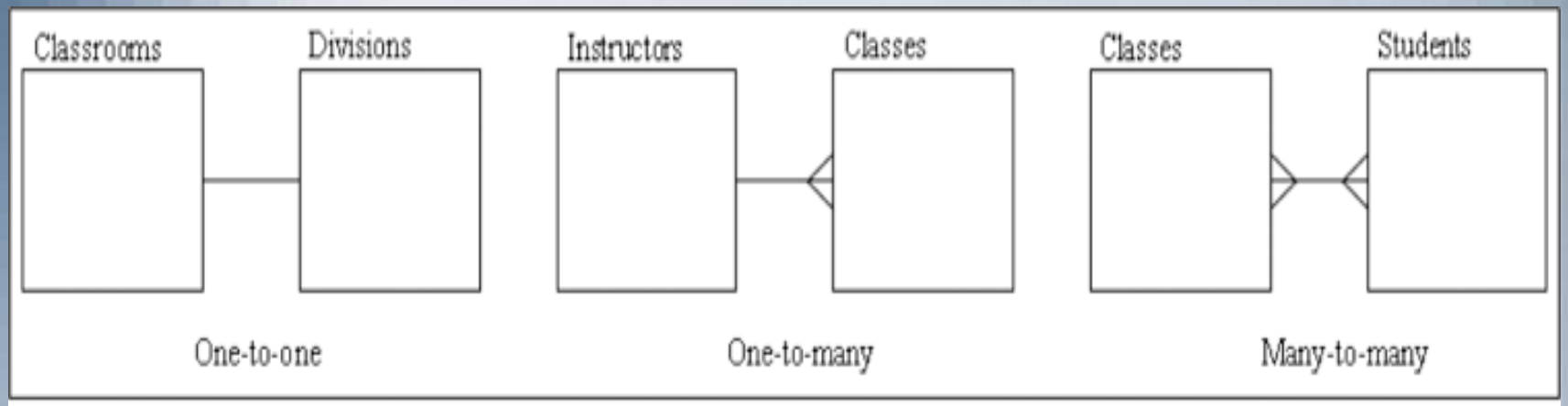


FIGURE 1-3 E-R Model notation examples

One-to-One Relationship

- Each occurrence of data in one entity is represented by only one occurrence of data in the other entity
- Example: Each individual has just one Social Security number (SSN) and each SSN is assigned to just one person

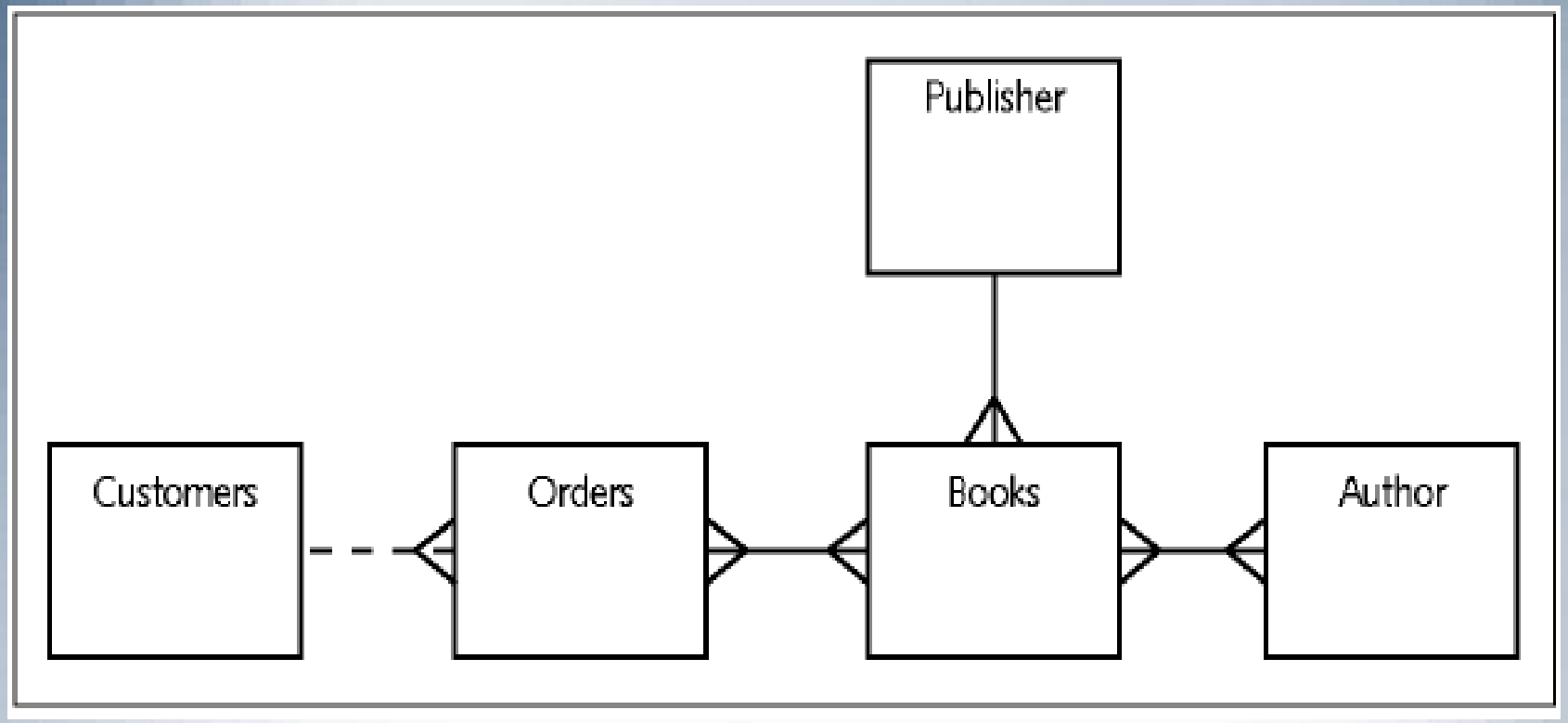
One-to-Many Relationship

- Each occurrence of data in one entity can be represented by many occurrences of the data in the other entity
- Example: A class has only one instructor, but each instructor can teach many classes

Many-to-Many Relationship

- Data can have multiple occurrences in both entities
- Example: A student can take many classes, and each class is composed of many students
- Can not be included in the physical database

JustLee Example E-R Model



Database Normalization

- Determines required tables and columns for each table
- Multistep process
- Used to reduce or control data redundancy

Database Normalization (continued)

- Data redundancy – refers to having the same data in different places within a database
- Data anomalies – refers to data inconsistencies

TABLE 1-1 Single-Table Approach Example

Last Name	First Name	City	State	Zip	Order Date	Order #
Jones	Pat	Norfolk	VA	24553	3/22/2009	45720
Jones	Pat	Norfolk	VA	24553	5/28/2009	48243
Jones	Pat	Suffolk	VA	26544	9/05/2009	51932

Unnormalized Data

- Contains repeating groups in the Author column in the BOOKS table

TABLE 1-2 ISBN as the Primary Key

ISBN	Title	Publication Date	Cost	Retail	Category	Publisher	Contact	Author
8843172113	Database Implementation	04-JUN-03	31.40	55.95	Computer	American Publishing	Davidson	T. Peterson, J. Austin, J. Adams
1915762492	Handcranked Computers	21-JAN-05	21.80	25.00	Computer	American Publishing	Davidson	W. White, L. White

First-Normal Form (1NF)

- Primary key is identified
- Repeating groups are eliminated

First-Normal Form (1NF) (continued)

- ISBN and Author columns together create a composite primary key

TABLE 1-3 The BOOKS Table in 1NF

ISBN	Title	Publication Date	Cost	Retail	Category	Publisher	Contact	Author
8843172113	Database Implementation	04-JUN-03	31.40	55.95	Computer	American Publishing	Davidson	T. Peterson
8843172113	Database Implementation	04-JUN-03	31.40	55.95	Computer	American Publishing	Davidson	J. Austin
8843172113	Database Implementation	04-JUN-03	31.40	55.95	Computer	American Publishing	Davidson	J. Adams
1915762492	Handcranked Computers	21-JAN-05	21.80	25.00	Computer	American Publishing	Davidson	W. White
1915762492	Handcranked Computers	21-JAN-05	21.80	25.00	Computer	American Publishing	Davidson	L. White

Composite Primary Key

- More than one column is required to uniquely identify a row
- Can lead to partial dependency – a column is only dependent on a portion of the primary key

Second-Normal Form (2NF)

- Partial dependency must be eliminated
  - Break the composite primary key into two parts, each part representing a separate table

Second-Normal Form (2NF) (continued)

- BOOKS table in 2NF

TABLE 1-4 The BOOKS Table in 2NF

ISBN	Title	Publication Date	Cost	Retail	Category	Publisher	Contact
8843172113	Database Implementation	04-JUN-03	31.40	55.95	Computer	American Publishing	Davidson
1915762492	Handcranked Computers	21-JAN-05	21.80	25.00	Computer	American Publishing	Davidson

Third-Normal Form (3NF)

- Publisher contact name has been removed

TABLE 1-5 The BOOKS Table in 3NF

ISBN	Title	Publication Date	Cost	Retail	Category	Publisher
8843172113	Database Implementation	04-JUN-03	31.40	55.95	Computer	American Publishing
1915762492	Handcranked Computers	21-JAN-05	21.80	25.00	Computer	American Publishing

Summary of Normalization Steps

- 1NF: eliminate repeating groups, identify the primary key
- 2NF: table is in 1NF, and partial dependencies are eliminated
- 3NF: table is in 2NF, and transitive dependencies are eliminated

Relating Tables within the Database

- Once tables are normalized, make certain tables are linked
- Tables are linked through a common field
- A common field is usually a primary key in one table and a foreign key in the other table

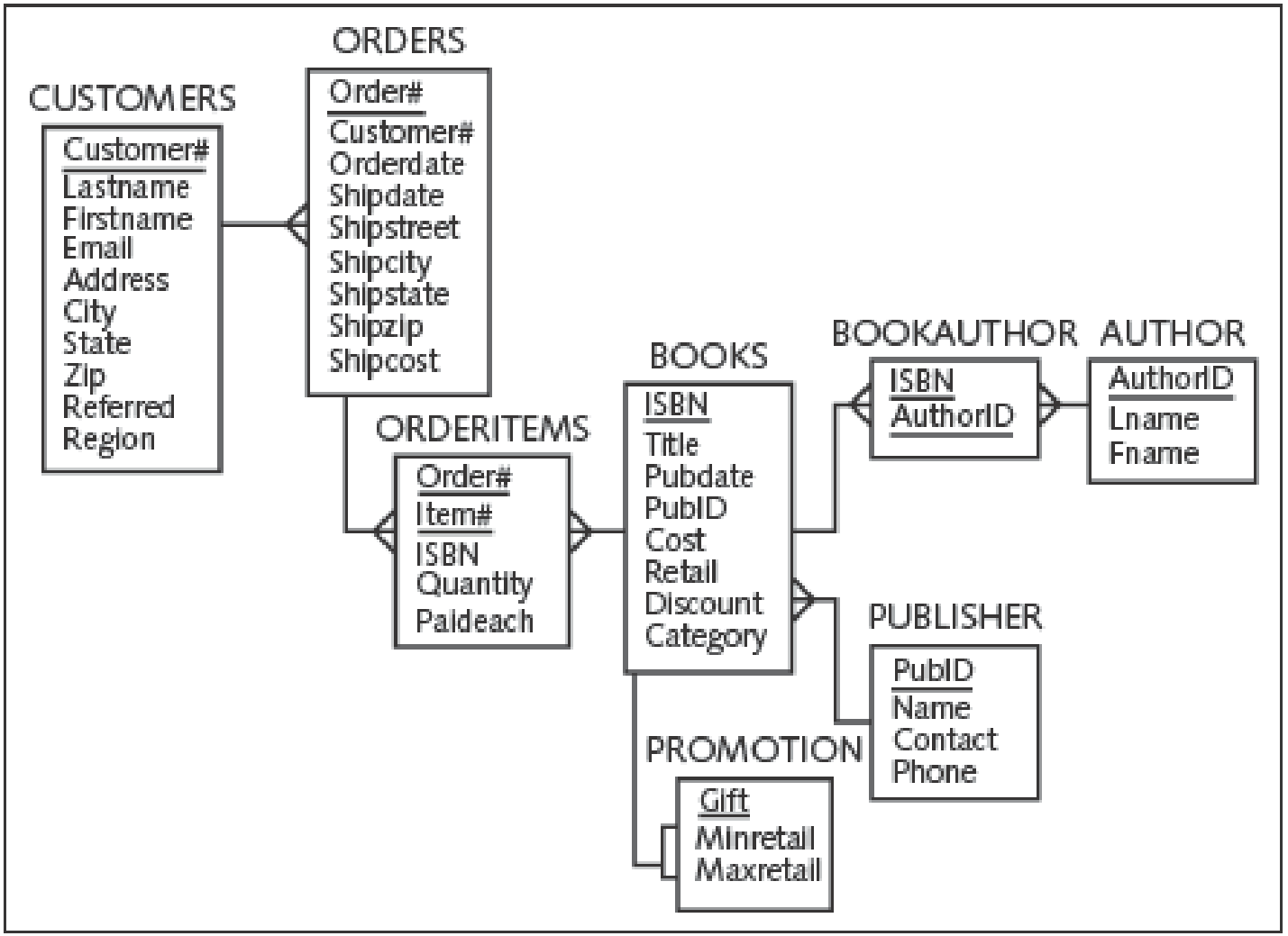


FIGURE 1-5 JustLee Books's table structures after normalization

Lookup Table

- Common reference for descriptive data tables referenced in a foreign key

TABLE 1-6 Possible Category Lookup Table

Category Code	Category Description
10	Computer
20	Cooking
30	Business
40	Family Literature

Structured Query Language (SQL)

- Data sublanguage
- Used to:
  - Create or modify tables
  - Add data to tables
  - Edit data in tables
  - Retrieve data from tables
- ANSI and ISO standards

Databases Used in this Textbook – JustLee Books Database

- Assumptions
  - No back orders or partial shipments
  - Only U.S. addresses
  - Completed orders are transferred to the annual SALES table at the end of each month to enable faster processing on the ORDERS table

Topic Sequence

- The first half of the text will focus on creating a database
- The second half of the text will focus on querying or retrieving data from a database

Summary

- A DBMS is used to create and maintain a database
- A database is composed of a group of interrelated tables
- A file is a group of related records; a file is also called a table in the physical database
- A record is a group of related fields regarding one specific entity; a record is also called a row
- A record is considered unnormalized if it contains repeating groups

Summary (continued)

- A record is in first-normal form (1NF) if no repeating groups exist and it has a primary key
- Second-normal form (2NF) is achieved if the record is in 1NF and has no partial dependencies
- After a record is in 2NF and all transitive dependencies have been removed, then it is in third-normal form (3NF), which is generally sufficient for most databases
- A primary key is used to uniquely identify each record

Summary (continued)

- A common field is used to join data contained in different tables
- A foreign key is a common field that exists between two tables but is also a primary key in one of the tables
- A lookup table is a common term for a table referenced in a foreign key
- A Structured Query Language (SQL) is a data sublanguage that navigates the data stored within a database's tables