Concepts of Database Management
Seventh Edition

Chapter 1
Introduction to Database Management

Premiere Products Background

- Premiere Products
  - Distributor of appliances, houseware, and sporting goods
  - Uses spreadsheet software to maintain important data
  - Recent growth has made spreadsheet approach problematic

Premiere Products Background

Customer Number	Customer Name	Order Number	Order Date	Part Number	Part Description	Number Ordered	Quoted Price	Warehouse	Rep Number
148	Al's Appliance and Sport	21608	10/20/2013	AT94	Iron	11	$21.95	3	20
148	Al's Appliance and Sport	21619	10/23/2013	DR93	Gas Range	1	$495.00	2	20
282	Brookings Direct	21614	10/21/2013	KT03	Dishwasher	2	$595.00	3	35
356	Ferguson's	21610	10/20/2013	DR93	Gas Range	1	$495.00	2	65
356	Ferguson's	21610	10/20/2013	DW11	Washer	1	$399.99	3	65
408	The Everything Shop	21613	10/21/2013	KL62	Dryer	4	$329.95	1	35
608	Johnson's Department Store	21617	10/23/2013	BV06	Home Gym	2	$794.95	2	65
608	Johnson's Department Store	21617	10/23/2013	CD52	Microwave Oven	4	$150.00	1	65
608	Johnson's Department Store	21623	10/23/2013	KV29	Treadmill	2	$1,290.00	2	65

FIGURE 1-1: Sample orders spreadsheet

Premiere Products Background (continued)

- Problems using spreadsheet

  - **Redundancy**

    - Duplication of data or the storing of the same data in more than one place

  - Difficulty accessing related data

  - Limited security

  - Size limitations

Premiere Products Background (continued)

- Information Premiere Products needs to maintain
  - Sales Reps
    - Sales rep number, last name, first name, address, total commission, commission rate
  - Customers
    - Customer number, name, address, current balance, credit limit, number of customer's sales rep
  - Parts Inventory
    - Part number, description, number units on hand, item class, warehouse number, unit price

Premiere Products Background (continued)

FIGURE 1-2: Sample order

Premiere Products Background (continued)

- Items for each customer's order
  - Order
    - Order number, order date, customer number
  - Order line
    - Order number, part number, number of units ordered, quoted price
  - Overall order total
    - Not stored because it can be calculated

Database Background

- Database
  - Structure that can store information about:
    - Different categories of information
    - Relationships between those categories of information
- **Entity**
  - Person, place, object, event, or idea
  - Entities for Premiere Products: sales reps, customers, orders, and parts

Database Background (continued)

- **Attribute**
  - Characteristic or property of an entity
  - Example: Customer has name, street, city, etc.
  - May also be called a **field** or **column**
- **Relationship**
  - Association between entities
  - **One-to-many relationship**
    - Each rep is associated with many customers
    - Each customer is associated with a single rep

Database Background (continued)

FIGURE 1-3: Entities and attributes
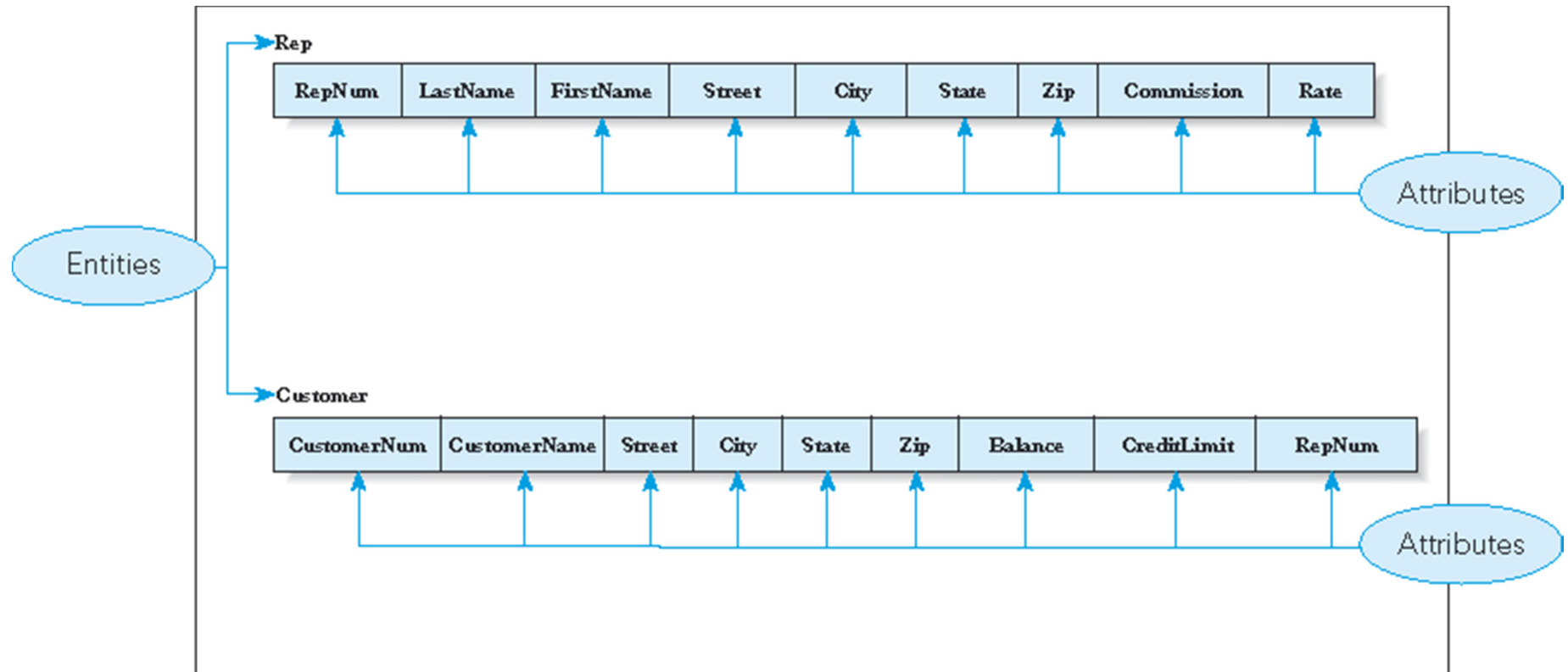
10

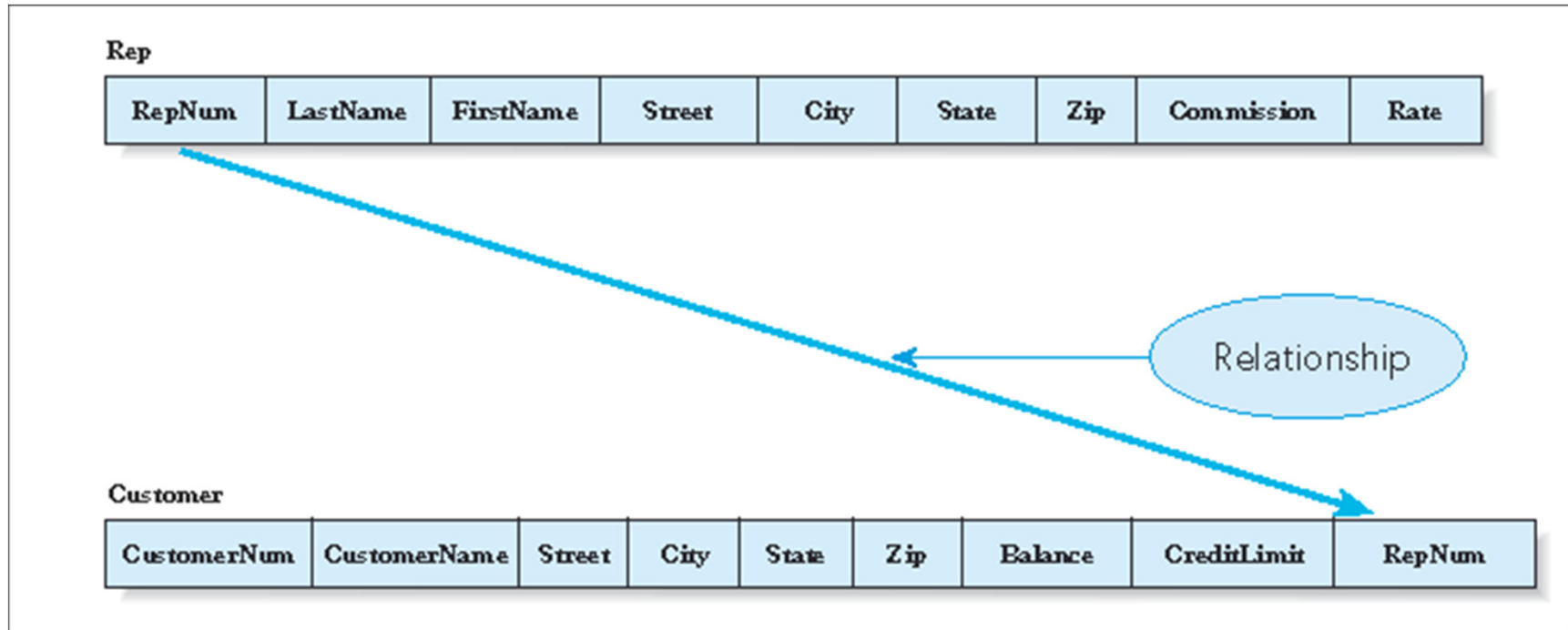# Database Background (continued)

FIGURE 1-4: One-to-many relationship

Database Background (continued)

- **Data file**
  - File used to store data
  - Computer counterpart to ordinary paper file
- **Database**
  - Structure that can store information about:
    - Multiple types of entities
    - Attributes of those entities
    - Relationships between the entities

Database Background (continued)

Rep

RepNum	LastName	FirstName	Street	City	State	Zip	Commission	Rate
20	Kaiser	Valerie	624 Randall	Grove	FL	33321	$20,542.50	0.05
35	Hull	Richard	532 Jackson	Sheldon	FL	33553	$39,216.00	0.07
65	Perez	Juan	1626 Taylor	Fillmore	FL	33336	$23,487.00	0.05

Customer

CustomerNum	CustomerName	Street	City	State	Zip	Balance	CreditLimit	RepNum
148	Al's Appliance and Sport	2837 Greenway	Fillmore	FL	33336	$6,550.00	$7,500.00	20
282	Brookings Direct	3827 Devon	Grove	FL	33321	$431.50	$10,000.00	35
356	Ferguson's	382 Wildwood	Northfield	FL	33146	$5,785.00	$7,500.00	65
408	The Everything Shop	1828 Raven	Crystal	FL	33503	$5,285.25	$5,000.00	35
462	Bargains Galore	3829 Central	Grove	FL	33321	$3,412.00	$10,000.00	65
524	Kline's	838 Ridgeland	Fillmore	FL	33336	$12,762.00	$15,000.00	20
608	Johnson's Department Store	372 Oxford	Sheldon	FL	33553	$2,106.00	$10,000.00	65
687	Lee's Sport and Appliance	282 Evergreen	Altonville	FL	32543	$2,851.00	$5,000.00	35
725	Deerfield's Four Seasons	282 Columbia	Sheldon	FL	33553	$248.00	$7,500.00	35
842	All Season	28 Lakeview	Grove	FL	33321	$8,221.00	$7,500.00	20

FIGURE 1-5: Sample data for Premiere Products

Database Background (continued)

Orders

OrderNum	OrderDate	CustomerNum
21608	10/20/2013	148
21610	10/20/2013	356
21613	10/21/2013	408
21614	10/21/2013	282
21617	10/23/2013	608
21619	10/23/2013	148
21623	10/23/2013	608

OrderLine

OrderNum	PartNum	NumOrdered	QuotedPrice
21608	AT94	11	$21.95
21610	DR93	1	$495.00
21610	DW11	1	$399.99
21613	KL62	4	$329.95
21614	KT03	2	$595.00
21617	BV06	2	$794.95
21617	CD52	4	$150.00
21619	DR93	1	$495.00
21623	KV29	2	$1,290.00

FIGURE 1-5: Sample data for Premiere Products (continued)

Database Background (continued)

Part

PartNum	Description	OnHand	Class	Warehouse	Price
AT94	Iron	50	HW	3	$24.95
BV06	Home Gym	45	SG	2	$794.95
CD52	Microwave Oven	32	AP	1	$165.00
DL71	Cordless Drill	21	HW	3	$129.95
DR93	Gas Range	8	AP	2	$495.00
DW11	Washer	12	AP	3	$399.99
FD21	Stand Mixer	22	HW	3	$159.95
KL62	Dryer	12	AP	1	$349.95
KT03	Dishwasher	8	AP	3	$595.00
KV29	Treadmill	9	SG	2	$1,390.00

FIGURE 1-5: Sample data for Premiere Products (continued)

Database Background (continued)

Orders

OrderNum	OrderDate	CustomerNum	PartNum	NumOrdered	QuotedPrice
21608	10/20/2013	148	AT94	11	$21.95
21610	10/20/2013	356	DR93 DW11	1 1	$495.00 $399.99
21613	10/21/2013	408	KL62	4	$329.95
21614	10/21/2013	282	KT03	2	$595.00
21617	10/23/2013	608	BV06 CD52	2 4	$794.95 $150.00
21619	10/23/2013	148	DR93	1	$495.00
21623	10/23/2013	608	KV29	2	$1,290.00

FIGURE 1-6: Alternative Orders table structure

Database Background (continued)

- **Entity-relationship (E-R) diagram**
  - Visual way to represent a database
  - Rectangles represent entities
  - Lines represent relationships between connected entities

Database Background (continued)

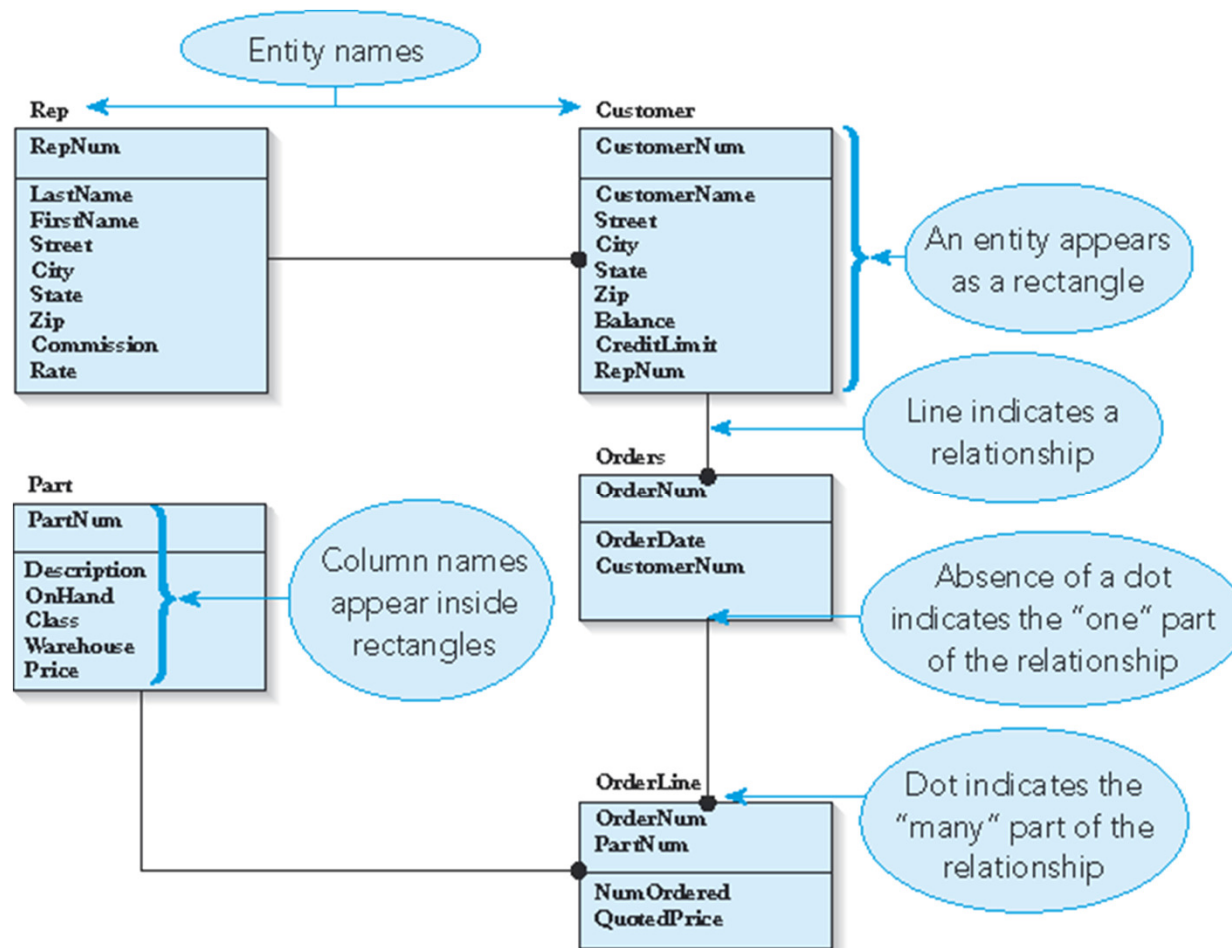**FIGURE 1-7: E-R diagram for the Premiere Products database**

Database Management Systems

- **Database management system (DBMS)**
  - Program, or collection of programs, through which users interact with a database
- Popular DBMSs: Access, Oracle, DB2, MySQL, and SQL Server
- Premiere Products decides to use Access
- **Database design**
  - Determining the structure of the required database

Database Management Systems (continued)

FIGURE 1-8: Using a DBMS directly
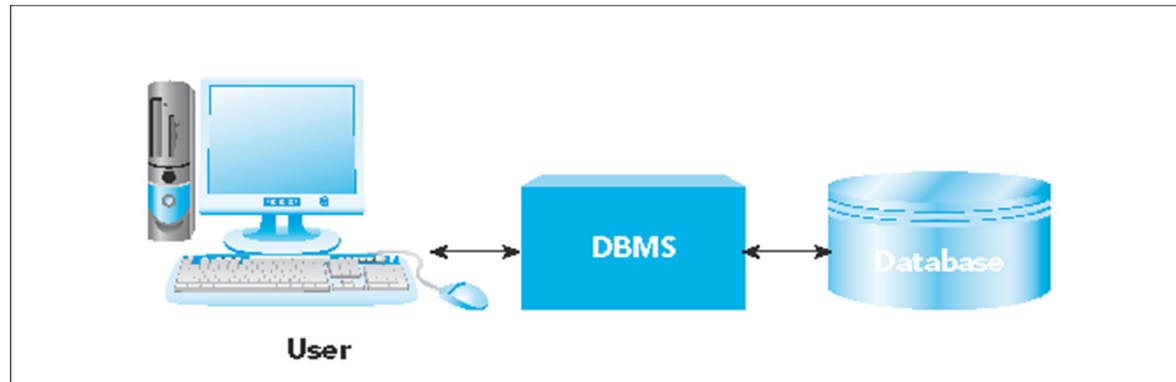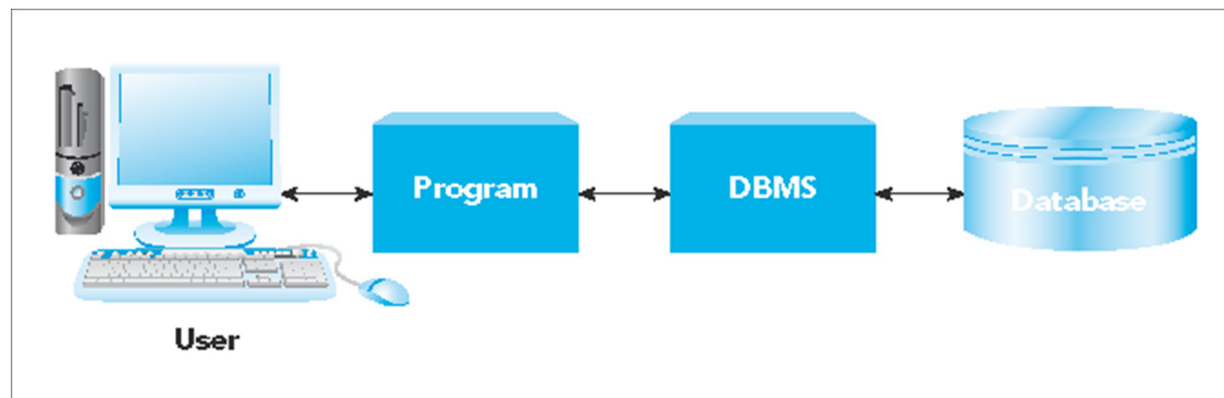

FIGURE 1-9: Using a DBMS through another program

20

Database Management Systems (continued)

- **Forms**
  - Screen objects used to maintain, view, and print data from a database
  - DBMS creates forms that Premiere Products needs

- Reports
  - DBMS creates reports for Premiere Products based on user's answers about the desired content and appearance of each report

Advantages of Database Processing

1. Getting more information from the same amount of data

2. Sharing data

3. Balancing conflicting requirements
   – **Database administrator** or **database administration (DBA**): person or group in charge of the database

4. Controlling redundancy

5. Facilitating consistency

Advantages of Database Processing (continued)

6. Improving integrity
   - **Integrity constraint**: a rule that data must follow in the database

7. Expanding security
   - **Security**: prevention of unauthorized access

8. Increasing productivity

9. Providing data independence
   - **Data independence**: can change structure of a database without changing the programs that access the database

Disadvantages of Database Processing

1. Larger file size
2. Increased complexity
3. Greater impact of failure
4. More difficult recovery

Introduction to Henry Books Database Case

- Henry Books
  - Book store chain operated by Ray Henry
  - Sells used books and remainders
- Henry decided to use database to gather and store information on:
  - Branches
  - Publishers
  - Authors
  - Books

Introduction to Henry Books Database Case (continued)

Branch

BranchNum	BranchName	BranchLocation
1	Henry Downtown	16 Riverview
2	Henry on the Hill	1289 Bedford
3	Henry Brentwood	Brentwood Mall
4	Henry Eastshore	Eastshore Mall

FIGURE 1-15: Sample branch and publisher data for Henry Books

Introduction to Henry Books Database Case (continued)

Publisher

PublisherCode	PublisherName	City
AH	Arkham House	Sauk City WI
AP	Arcade Publishing	New York
BA	Basic Books	Boulder CO
BP	Berkley Publishing	Boston
BY	Back Bay Books	New York
CT	Course Technology	Boston
FA	Fawcett Books	New York
FS	Farrar Straus & Giroux	New York
HC	HarperCollins Publishers	New York
JP	Jove Publications	New York
JT	Jeremy P. Tarcher	Los Angeles
LB	Lb Books	New York
MP	McPherson and Co.	Kingston
PE	Penguin USA	New York
PL	Plume	New York
PU	Putnam Publishing Group	New York
RH	Random House	New York
SB	Schoken Books	New York
SC	Scribner	New York
SS	Simon & Schuster	New York
ST	Scholastic Trade	New York
TA	Taunton Press	Newtown CT
TB	Tor Books	New York
TH	Thames and Hudson	New York
TO	Touchstone Books	Westport CT
VB	Vintage Books	New York
WN	W.W. Norton	New York
WP	Westview Press	Boulder CO

FIGURE 1-15: Sample branch and publisher data for Henry Books (continued)

Introduction to Henry Books Database Case (continued)

Author

AuthorNum	AuthorLast	AuthorFirst
1	Morrison	Toni
2	Solotaroff	Paul
3	Vintage	Vernor
4	Francis	Dick
5	Straub	Peter
6	King	Stephen
7	Pratt	Philip
8	Chase	Truddi
9	Collins	Bradley
10	Heller	Joseph
11	Wills	Gary
12	Hofstadter	Douglas R.
13	Lee	Harper
14	Ambrose	Stephen E.
15	Rowling	J.K.
16	Salinger	J.D.
17	Heaney	Seamus
18	Camus	Albert
19	Collins, Jr.	Bradley
20	Steinbeck	John
21	Castelman	Riva
22	Owen	Barbara
23	O'Rourke	Randy
24	Kidder	Tracy
25	Schleining	Lon

FIGURE 1-16: Sample author data for Henry Books

Introduction to Henry Books Database Case (continued)

Book

BookCode	Title	PublisherCode	Type	Paperback
0180	A Deepness in the Sky	TB	SFI	Yes
0189	Magic Terror	FA	HOR	Yes
0200	The Stranger	VB	FIC	Yes
0378	Venice	SS	ART	No
079X	Second Wind	PU	MYS	No
0808	The Edge	JP	MYS	Yes
1351	Dreamcatcher: A Novel	SC	HOR	No
1382	Treasure Chests	TA	ART	No
138X	Beloved	PL	FIC	Yes
2226	Harry Potter and the Prisoner of Azkaban	ST	SFI	No
2281	Van Gogh and Gauguin	WP	ART	No
2766	Of Mice and Men	PE	FIC	Yes
2908	Electric Light	FS	POE	No
3350	Group: Six People in Search of a Life	BP	PSY	Yes
3743	Nine Stories	LB	FIC	Yes
3906	The Soul of a New Machine	BY	SCI	Yes
5163	Travels with Charley	PE	TRA	Yes
5790	Catch-22	SC	FIC	Yes
6128	Jazz	PL	FIC	Yes
6328	Band of Brothers	TO	HIS	Yes
669X	A Guide to SQL	CT	CMP	Yes
6908	Franny and Zooey	LB	FIC	Yes
7405	East of Eden	PE	FIC	Yes
7443	Harry Potter and the Goblet of Fire	ST	SFI	No
7559	The Fall	VB	FIC	Yes
8092	Godel, Escher, Bach	BA	PHI	Yes
8720	When Rabbit Howls	JP	PSY	Yes
9611	Black House	RH	HOR	No
9627	Song of Solomon	PL	FIC	Yes
9701	The Grapes of Wrath	PE	FIC	Yes
9882	Slay Ride	JP	MYS	Yes
9883	The Catcher in the Rye	LB	FIC	Yes
9931	To Kill a Mockingbird	HC	FIC	No

FIGURE 1-17: Sample book data for Henry Books

Introduction to Henry Books Database Case (continued)

Wrote

BookCode	AuthorNum	Sequence
0180	3	1
0189	5	1
0200	18	1
0378	11	1
079X	4	1
0808	4	1
1351	6	1
1382	23	2
1382	25	1
138X	1	1
2226	15	1
2281	9	2
2281	19	1
2766	20	1
2908	17	1
3350	2	1
3743	16	1
3906	24	1

Wrote *(continued)*

BookCode	AuthorNum	Sequence
5163	20	1
5790	10	1
6128	1	1
6328	14	1
669X	7	1
6908	16	1
7405	20	1
7443	15	1
7559	18	1
8092	12	1
8720	8	1
9611	5	2
9611	6	1
9627	1	1
9701	20	1
9882	4	1
9883	16	1
9931	13	1

FIGURE 1-18: Sample data that relates books to authors and books to branches for Henry Books

Introduction to Henry Books Database Case (continued)

Copy

BookCode	BranchNum	CopyNum	Quality	Price
0180	1	1	Excellent	7.19
0180	1	1	Excellent	7.19
0189	2	1	Excellent	7.99
0189	2	2	Good	5.99
0200	1	1	Excellent	8.00
0200	2	1	Excellent	8.00
0200	2	2	Fair	3.50
0200	2	3	Poor	2.25
0378	3	1	Excellent	24.50
0378	3	2	Excellent	24.50
079X	2	1	Excellent	25.95
079X	3	1	Excellent	25.95
079X	3	2	Good	19.95
079X	4	1	Excellent	25.95
079X	4	2	Excellent	25.95
079X	4	3	Good	19.95
0808	2	1	Excellent	7.99
1351	2	1	Excellent	21.95
1351	2	2	Excellent	21.95
1351	2	3	Excellent	21.95
1351	2	4	Excellent	21.95
1351	3	1	Excellent	21.95
1351	3	2	Good	13.95
1382	2	1	Good	34.50
138X	2	1	Excellent	12.95
138X	2	2	Excellent	12.95
138X	2	3	Good	6.95
2226	1	1	Excellent	14.96
2226	1	2	Excellent	14.96
2226	1	3	Good	8.95
2226	3	1	Excellent	14.95
2226	3	2	Excellent	14.95
2226	4	1	Fair	3.95
2281	4	1	Excellent	21.00
2766	3	1	Excellent	7.95
2766	3	2	Good	3.95

Copy (continued)

BookCode	BranchNum	CopyNum	Quality	Price
2908	1	1	Excellent	14.95
2908	1	2	Excellent	14.95
2908	1	3	Good	8.50
2908	4	1	Good	8.50
3350	1	1	Excellent	10.40
3350	1	2	Excellent	10.40
3743	2	1	Excellent	5.99
3906	2	1	Excellent	12.16
3906	3	1	Excellent	12.16
3906	3	2	Good	4.50
5163	1	1	Excellent	7.95
5790	4	1	Excellent	12.00
5790	4	2	Good	5.95
6128	2	1	Excellent	12.95
6128	2	2	Excellent	12.95
6128	2	3	Excellent	12.95
6128	2	4	Excellent	12.95
6128	3	1	Excellent	12.95
6128	3	2	Excellent	12.95
6128	3	3	Good	4.75
6328	2	1	Excellent	9.95
6328	2	2	Excellent	9.95
669X	1	1	Excellent	39.95
669X	2	1	Excellent	39.95
6908	2	1	Excellent	5.99

FIGURE 1-18: Sample data that relates books to authors and books to branches for Henry Books (continued)

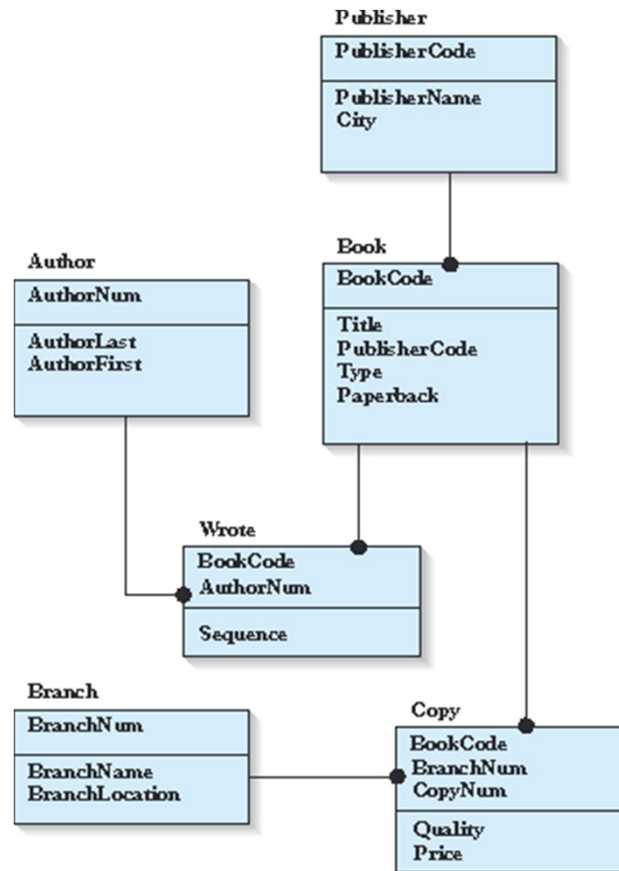# Introduction to Henry Books Database Case (continued)

FIGURE 1-19: E-R diagram for the Henry Books database

Introduction to the Alexamara Marina Group Database Case

- Alexamara Marina Group offers in-water boat storage to owners
  - Provides boat slips that boat owners can rent on an annual basis
  - Two marinas: Alexamara East and Alexamara Central
  - Provides boat repair and maintenance services
- Database used to store data

Introduction to the Alexamara Marina Group Database Case (continued)

Marina

MarinaNum	Name	Address	City	State	Zip
1	Alexamara East	108 2nd Ave	Brinman	FL	32273
2	Alexamara Central	283 Branston	W Brinman	FL	32274

FIGURE 1-20: Sample marina data for Alexamara Marina Group

Introduction to the Alexamara Marina Group Database Case (continued)

Owner

OwnerNum	LastName	FirstName	Address	City	State	Zip
AD57	Adney	Bruce and Jean	208 Citrus	Bowton	FL	31313
AN75	Anderson	Bill	18 Wilcox	Glander Bay	FL	31044
BL72	Blake	Mary	2672 Commodore	Bowton	FL	31313
EL25	Elend	Sandy and Bill	462 Riverside	Rivard	FL	31062
FE82	Feenstra	Daniel	7822 Coventry	Kaleva	FL	32521
JU92	Juarez	Maria	8922 Oak	Rivard	FL	31062
KE22	Kelly	Alyssa	5271 Waters	Bowton	FL	31313
NO27	Norton	Peter	2811 Lakewood	Lewiston	FL	32765
SM72	Smeltz	Becky and Dave	922 Garland	Glander Bay	FL	31044
TR72	Trent	Ashton	922 Crest	Bay Shores	FL	30992

FIGURE 1-21: Sample owner data for Alexamara Marina Group

Introduction to the Alexamara Marina Group Database Case (continued)

MarinaSlip

SlipID	MarinaNum	SlipNum	Length	RentalFee	BoatName	BoatType	OwnerNum
1	1	A1	40	$3,800.00	Anderson II	Sprite 4000	AN75
2	1	A2	40	$3,800.00	Our Toy	Ray 4025	EL25
3	1	A3	40	$3,600.00	Escape	Sprite 4000	KE22
4	1	B1	30	$2,400.00	Gypsy	Dolphin 28	JU92
5	1	B2	30	$2,600.00	Anderson III	Sprite 3000	AN75
6	2	1	25	$1,800.00	Bravo	Dolphin 25	AD57
7	2	2	25	$1,800.00	Chinook	Dolphin 22	FE82
8	2	3	25	$2,000.00	Listy	Dolphin 25	SM72
9	2	4	30	$2,500.00	Mermaid	Dolphin 28	BL72
10	2	5	40	$4,200.00	Axxon II	Dolphin 40	NO27
11	2	6	40	$4,200.00	Karvel	Ray 4025	TR72

FIGURE 1-22: Sample data about marina slips for Alexamara Marina Group

Introduction to the Alexamara Marina Group Database Case (continued)

ServiceCategory

CategoryNum	CategoryDescription
1	Routine engine maintenance
2	Engine repair
3	Air conditioning
4	Electrical systems
5	Fiberglass repair
6	Canvas installation
7	Canvas repair
8	Electronic systems (radar, GPS, autopilots, etc.)

FIGURE 1-23: Sample data about service categories for Alexamara Marina Group

Introduction to the Alexamara Marina Group Database Case (continued)

ServiceRequest

Service ID	Slip ID	Category Num	Description	Status	Est Hours	Spent Hours	Next ServiceDate
1	1	3	Air conditioner periodically stops with code indicating low coolant level. Diagnose and repair.	Technician has verified the problem. Air conditioning specialist has been called.	4	2	7/12/2013
2	5	4	Fuse on port motor blown on two occasions. Diagnose and repair.	Open	2	0	7/12/2013
3	4	1	Oil change and general routine maintenance (check fluid levels, clean sea strainers, etc.).	Service call has been scheduled.	1	0	7/16/2013
4	1	2	Engine oil level has been dropping drastically. Diagnose and repair.	Open	2	0	7/13/2013
5	3	5	Open pockets at base of two stantions.	Technician has completed the initial filling of the open pockets. Will complete the job after the initial fill has had sufficient time to dry.	4	2	7/13/2013
6	11	4	Electric-flush system periodically stops functioning. Diagnose and repair.	Open	3	0	
7	6	2	Engine overheating. Loss of coolant. Diagnose and repair.	Open	2	0	7/13/2013
8	6	2	Heat exchanger not operating correctly.	Technician has determined that the exchanger is faulty. New exchanger has been ordered.	4	1	7/17/2013
9	7	6	Canvas severely damaged in windstorm. Order and install new canvas.	Open	8	0	7/16/2013
10	2	8	Install new GPS and chart plotter.	Scheduled	7	0	7/17/2013
11	2	3	Air conditioning unit shuts down with "HHH" showing on the control panel.	Technician not able to replicate the problem. Air conditioning unit ran fine through multiple tests. Owner to notify technician if the problem recurs.	1	1	

FIGURE 1-24: Sample data about service requests for Alexamara Marina Group

Introduction to the Alexamara Marina Group Database Case (continued)

ServiceRequest *(continued)*

Service ID	Slip ID	Category Num	Description	Status	Est Hours	Spent Hours	Next ServiceDate
12	4	8	Both speed and depth readings on data unit are significantly less than the owner thinks they should be.	Technician has scheduled appointment with owner to attempt to verify the problem.	2	0	7/16/2013
13	8	2	Customer describes engine as making a "clattering" sound.	Technician suspects problem with either propeller or shaft and has scheduled the boat to be pulled from the water for further investigation.	5	2	7/12/2013
14	7	5	Owner accident caused damage to forward portion of port side.	Technician has scheduled repair.	6	0	7/13/2013
15	11	7	Canvas leaks around zippers in heavy rain. Install overlap around zippers to prevent leaks.	Overlap has been created. Installation has been scheduled.	8	3	7/17/2013

FIGURE 1-24: Sample data about service requests for Alexamara Marina Group (continued)

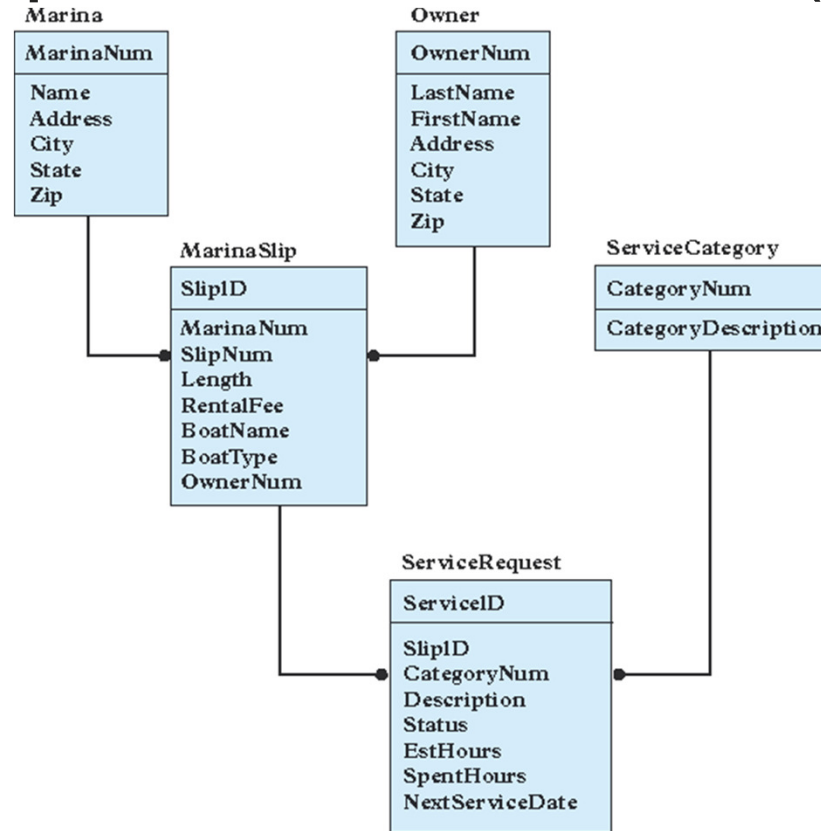# Introduction to the Alexamara Marina Group Database Case (continued)

FIGURE 1-25: E-R diagram for the Alexamara Marina Group database