

Pratt
Last

A Guide to

SQL ^{8e}

A GUIDE TO SQL

Eighth Edition

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A GUIDE TO SQL

Eighth Edition

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PREFACE

Structured Query Language (or SQL, which is pronounced “se-quel,” or “ess-cue-ell”) is a popular computer language that is used by diverse groups such as home computer users, owners of small businesses, end users in large organizations, and programmers. Although this text uses the SQL implementation in the Oracle Database 10g Express Edition as a vehicle for teaching SQL, its chapter material, examples, and exercises can be completed using any SQL implementation.

A Guide to SQL, Eighth Edition is written for a wide range of teaching levels, from students taking introductory computer science classes to those students in advanced information systems classes. This text can be used for a standalone course on SQL or in conjunction with a database concepts text where students are required to learn SQL.

The chapters in this text should be covered in order. Students should complete the end-of-chapter exercises and the examples within the chapters for maximum learning. Because the content of Chapter 8 assumes that the reader has had instruction or experience in at least one programming language, the instructor should determine whether students will understand its concepts. Students without a programming background will have difficulty understanding the topic of embedded SQL. Instructors can easily omit Chapter 8 from the text in situations where students are not comfortable with programming examples.

The Eighth Edition builds on the success of previous editions by presenting basic SQL commands in the context of a business that uses SQL to manage orders, parts, customers, and sales reps. Like in previous editions, this edition uses Oracle as the vehicle to present SQL commands. Like the last edition, this edition addresses SQL in Access™ by showing the Access versions of the same commands when they differ from the Oracle versions. This new edition also shows SQL Server commands when they differ from the Oracle versions. Differences for Access and SQL Server users are featured in “User” notes, which make it easy for students to identify differences for the SQL implementation they are using. Students can download the Oracle 10g Database Express Edition from the Oracle Web site for free and use it to complete this text without having to purchase or install the full Oracle program.

The Eighth Edition includes an entire chapter on database design, showing students how to create an appropriate design that satisfies a given set of requirements, and includes coverage of the important topics of stored procedures and triggers. The text also contains updated exercises for the Premiere Products, Henry Books, and Alexamara Marina Group cases.

DISTINGUISHING FEATURES

Use of Examples

Each chapter contains multiple examples that use SQL to solve a problem. Following each example, students will read about the commands that are used to solve the stated problem, and then they will see the SQL commands used to arrive at the solution. For most students, learning through examples is the most effective way to master material. For this reason, instructors should encourage students to read the chapters at the computer and input the commands shown in the figures.

Case Studies

A running case study—Premiere Products—is presented in all of the examples within the chapters and in the first set of exercises at the end of each chapter. Although the database is small in order to be manageable, the examples and exercises for the Premiere Products database simulate what a real business can accomplish using SQL commands. Using the same case study as examples within the chapter and in the end-of-chapter exercises ensures a high level of continuity to reinforce learning.

A second case study—the Henry Books database—is used in a second set of exercises at the end of each chapter. A third case study—the Alexamara Marina Group database—is used in a third set of exercises at the end of each chapter. The second and third case studies give students a chance to venture out “on their own” without the direct guidance of examples from the text.

Question and Answer Sections

A special type of exercise, called a Q&A, is used throughout the book. These exercises force students to consider special issues and understand important questions before continuing with their study. The answer to each Q&A appears after the question. Students are encouraged to formulate their own answers before reading the ones provided in the text to ensure that they understand new material before proceeding.

“User” Notes for Access™ and SQL Server Users

When an SQL command has a different use or format in Access or SQL Server, it appears in a User note. When you encounter a User note for the SQL implementation you are using, be sure to read its contents. You might also review the User notes for other SQL implementations so you are aware of the differences that occur from one implementation of SQL to another.

Review Material

A Summary and Key Terms list appear at the end of each chapter, followed by Review Questions that test students’ recall of the important points in the chapter and occasionally test their ability to apply what they have learned. The answers to the odd-numbered Review Questions are provided in Appendix C. Each chapter also contains exercises related to the Premiere Products, Henry Books, and Alexamara Marina Group databases.

Appendices

Three appendices appear at the end of this text. Appendix A is an SQL reference that describes the purpose and syntax for the major SQL commands featured in the text. Students can use Appendix A to identify how and when to use important commands quickly. The SQL reference appendix contains references to specific pages in the text where the command is discussed to make it easy for students to find additional information when they need to refer back to the section in the book where the topic is covered.

Appendix B includes a “How Do I” reference, which lets students cross-reference the appropriate section in Appendix A by searching for the answer to a question. Appendix C includes answers to the odd-numbered Review Questions.

Relationship to Concepts of Database Management, Sixth Edition

For database courses featuring SQL, this SQL text can be bundled with *Concepts of Database Management, Sixth Edition* by Pratt and Adamski (Course Technology). The data and pedagogy between the two texts is consistent, and the instructor's manuals for both books include feedback and suggestions for using the texts together.

Instructor Support

The Eighth Edition includes a package of proven supplements for instructors and students. The Instructor's Resources offer a detailed electronic Instructor's Manual, figure files, Microsoft® PowerPoint® presentations, and the ExamView® Test Bank. The Instructor's Manual includes suggestions and strategies for using this text, as well as answers to Review Questions and solutions to the end-of-chapter exercises. Figure files allow instructors to create their own presentations using figures appearing in the text. Instructors can also take advantage of lecture presentations provided on PowerPoint slides; these presentations follow each chapter's coverage precisely, include chapter figures, and can be customized. ExamView is a powerful objective-based test generator that enables instructors to create paper, LAN, or Web-based tests from test banks designed specifically for this Course Technology text. Users can utilize the ultra-efficient QuickTest Wizard to create tests in less than five minutes by taking advantage of Course Technology's question banks, or can customize their own exams from scratch.

The Instructor's Resources include copies of the databases for the Premiere Products, Henry Books, and Alexamara Marina Group cases in Microsoft Access 2007 and 2003 formats and script files to create the tables and data in these databases in Oracle and SQL Server. These files are provided so instructors have the choice of assigning exercises in which students create the databases used in this text and load them with data, or they can provide the starting Access databases or Oracle or SQL Server script files to students to automate and simplify these tasks.

ORGANIZATION OF THE TEXT

The text contains eight chapters and three appendices, which are described in the following sections.

Chapter 1: Introduction to Premiere Products, Henry Books, and Alexamara Marina Group

Chapter 1 introduces the three database cases that are used throughout the text: Premiere Products, Henry Books, and Alexamara Marina Group. Many Q&A exercises are provided throughout the chapter to ensure that students understand how to manipulate the database on paper before they begin working in SQL.

Chapter 2: Database Design Fundamentals

Chapter 2 covers important concepts and terminology associated with relational databases, functional dependence, and primary keys, followed by a method for designing a database to satisfy a given set of requirements. It also illustrates the normalization process for finding and correcting a variety of potential problems in database designs. Finally, it shows how to represent database designs graphically using entity-relationship diagrams.

Chapter 3: Creating Tables

In Chapter 3, students begin using a DBMS by creating and running SQL commands to create tables, use data types, and add rows to tables. Chapter 3 also discusses the role of and use of nulls.

Chapter 4: Single-Table Queries

Chapter 4 is the first of two chapters on using SQL commands to query a database. The queries in Chapter 4 all involve single tables. Included in this chapter are discussions of simple and compound conditions; computed columns; the SQL BETWEEN, LIKE, and IN operators; using SQL aggregate functions; nesting queries; grouping data; and retrieving columns with null values.

Chapter 5: Multiple-Table Queries

Chapter 5 completes the discussion of querying a database by demonstrating queries that join more than one table. Included in this chapter are discussions of the SQL IN and EXISTS operators, nested subqueries, using aliases, joining a table to itself, SQL set operations, and the use of the ALL and ANY operators. The chapter also includes coverage of various types of joins.

Chapter 6: Updating Data

In Chapter 6, students learn how to use the SQL COMMIT, ROLLBACK, UPDATE, INSERT, and DELETE commands to update table data. Students also learn how to create a new table from an existing table and how to change the structure of a table. The chapter also includes coverage of transactions, including both their purpose and implementation.

Chapter 7: Database Administration

Chapter 7 covers the database administration features of SQL, including the use of views; granting and revoking database privileges to users; creating, dropping, and using an index; using and obtaining information from the system catalog; and using integrity constraints to control data entry.

Chapter 8: SQL Functions and Procedures

Chapter 8 begins with a discussion of some important SQL functions that act on single rows. Students will also learn how to use PL/SQL and T-SQL to cover the process of embedding SQL commands in another language. Included in this chapter are discussions of using embedded SQL to insert new rows and change and delete existing rows. Also included is a discussion of how to retrieve single rows using embedded SQL commands and how to use cursors to retrieve multiple rows. Chapter 8 also includes a section showing some techniques for using SQL in Visual Basic (Access). The chapter concludes with a discussion of triggers.

Appendix A: SQL Reference

Appendix A includes a command reference for all the major SQL clauses and operators that are featured in the chapters. Students can use Appendix A as a quick resource when constructing commands. Each command includes a short description, a table that shows

the required and optional clauses and operators, and an example and its results. It also contains a reference to the pages in the text where the command is covered.

Appendix B: How Do I Reference

Appendix B provides students with an opportunity to ask a question, such as “How do I delete rows?”, and to identify the appropriate section in Appendix A to use to find the answer. Appendix B is extremely valuable when students know what task they want to accomplish but can’t remember the exact SQL command they need.

Appendix C: Answers to Odd-Numbered Review Questions

Answers to the odd-numbered Review Questions in each chapter appear in this appendix so students can make sure that they are completing the Review Questions correctly.

GENERAL NOTES TO THE STUDENT

You can download the databases used in this text from www.cengage.com. The Access data files for this book include three Access 2003 databases (Premiere Products.mdb, Henry Books.mdb, and Alexamara Marina Group.mdb), which you can open in Access 2000, 2002, or 2003; and three Access 2007 databases (Premiere Products.accdb, Henry Books.accdb, and Alexamara Marina Group.accdb), which you can open in Access 2007.

The data files also include script files for Oracle and SQL Server that you can use to create or drop the Premiere Products, Henry Books, and Alexamara Marina Group databases.

The script files saved in the Oracle folder have the following functions:

Oracle-Alexamara.sql: Creates all the tables in the Alexamara Marina Group database and adds all the data. Run this script file to create the Alexamara Marina Group database. (*Note:* This script file assumes you have not previously created any of the tables in the database. If you have created any of the tables, you should run the Oracle-DropAlexamara.sql script prior to running the Oracle-Alexamara.sql script.)

Oracle-Henry.sql: Creates all the tables in the Henry Books database and adds all the data. Run this script file to create the Henry Books database. (*Note:* This script file assumes you have not previously created any of the tables in the database. If you have created any of the tables, you should run the Oracle-DropHenry.sql script prior to running the Oracle-Henry.sql script.)

Oracle-Premiere.sql: Creates all the tables in the Premiere Products database and adds all the data. Run this script file to create the Premiere Products database. (*Note:* This script file assumes you have not previously created any of the tables in the database. If you have created any of the tables, you should run the Oracle-DropPremiere.sql script prior to running the Oracle-Premiere.sql script.)

Oracle-DropAlexamara.sql: Drops (deletes) all the tables and data in the Alexamara Marina Group database.

Oracle-DropHenry.sql: Drops (deletes) all the tables and data in the Henry Books database.

Oracle-DropPremiere.sql: Drops (deletes) all the tables and data in the Premiere Products database.

The script files saved in the SQL Server folder have the following functions:

SQLServer-Alexamara.sql: Creates all the tables in the Alexamara Marina Group database and adds all the data. Run this script file to create the Alexamara Marina Group database. (*Note:* This script file assumes you have not previously created any of the tables in the database. If you have created any of the tables, you should run the SQLServer-DropAlexamara.sql script prior to running the SQLServer-Alexamara.sql script.)

SQLServer-Henry.sql: Creates all the tables in the Henry Books database and adds all the data. Run this script file to create the Henry Books database. (*Note:* This script file assumes you have not previously created any of the tables in the database. If you have created any of the tables, you should run the SQLServer-DropHenry.sql script prior to running the SQLServer-Henry.sql script.)

SQLServer-Premiere.sql: Creates all the tables in the Premiere Products database and adds all the data. Run this script file to create the Premiere Products database. (*Note:* This script file assumes you have not previously created any of the tables in the database. If you have created any of the tables, you should run the SQLServer-DropPremiere.sql script prior to running the SQLServer-Premiere.sql script.)

SQLServer-DropAlexamara.sql: Drops (deletes) all the tables and data in the Alexamara Marina Group database.

SQLServer-DropHenry.sql: Drops (deletes) all the tables and data in the Henry Books database.

SQLServer-DropPremiere.sql: Drops (deletes) all the tables and data in the Premiere Products database.

For details on running script files in Oracle or SQL Server, check with your instructor. You can also refer to Chapter 3 in the text for information about creating and using scripts.

For information about downloading the Oracle Database 10g Express Edition software, please visit the Oracle Web site. For information about SQL Server 2005, please visit the Microsoft Web site. Information about Microsoft Access is also available at the Microsoft Web site.

Embedded Questions

In many places, you'll find Q&A sections to ensure that you understand some crucial material before you proceed. In some cases, the questions are designed to give you the chance to consider some special concept in advance of its actual presentation. In all cases, the answer to each question appears immediately after the question. You can simply read the question and its answer, but you will benefit from taking time to determine the answer to the question before checking your answer against the one given in the text.

End-of-Chapter Material

The end-of-chapter material consists of a Summary, a Key Terms list, Review Questions, and exercises for the Premiere Products, Henry Books, and Alexamara Marina Group databases. The Summary briefly describes the material covered in the chapter. The Review Questions require you to recall and apply the important material in the chapter. The answers to the odd-numbered Review Questions appear in Appendix C so you can check

your progress. The Premiere Products, Henry Books, and Alexamara Marina Group exercises test your knowledge of the chapter material; your instructor will assign one or more of these exercises for you to complete.

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CHAPTER **1**

INTRODUCTION TO PREMIERE PRODUCTS, HENRY BOOKS, AND ALEXAMARA MARINA GROUP

LEARNING OBJECTIVES

Objectives

- Introduce Premiere Products, a company whose database is used as the basis for many of the examples throughout the text
- Introduce Henry Books, a company whose database is used as a case that runs throughout the text
- Introduce Alexamara Marina Group, a company whose database is used as an additional case that runs throughout the text

INTRODUCTION

In this chapter, you will examine the database requirements of Premiere Products, a company that will be used in the examples throughout the text. Then you will examine the database requirements for Henry Books and Alexamara Marina Group, whose databases are featured in the exercises that appear at the end of each chapter.

WHAT IS A DATABASE?

Throughout this text, you will work with databases for three organizations: Premiere Products, Henry Books, and Alexamara Marina Group. A **database** is a structure that contains different categories of information and the relationships between these categories. The Premiere Products database, for example, contains information about categories such as sales representatives (sales reps), customers, orders, and parts. The Henry Books database contains information about categories such as books, publishers, authors, and branches. The Alexamara Marina Group database contains information about categories such as marinas, slips and the boats in them, service categories, and service requests.

Each database also contains relationships between categories. For example, the Premiere Products database contains information that relates sales reps to the customers they represent and customers to the orders they have placed. The Henry Books database contains information that relates publishers to the books they publish and authors to the books they have written. The Alexamara Marina Group database contains information that relates the boats in the slips at the marina to the owners of the boats.

As you work through the chapters in this text, you will learn more about these databases and how to view and update the information they contain. As you read each chapter, you will see examples from the Premiere Products database. At the end of each chapter, your instructor might assign the exercises for the Premiere Products, Henry Books, or Alexamara Marina Group databases.

THE PREMIERE PRODUCTS DATABASE

The management of Premiere Products, a distributor of appliances, housewares, and sporting goods, has determined that the company's recent growth no longer makes it feasible to maintain customer, order, and inventory data using its manual systems. With the data stored in a database, management will be able to ensure that the data is current and more accurate than in the present manual systems. In addition, managers will be able to obtain answers to their questions concerning the data in the database easily and quickly, with the option of producing a variety of useful reports.

Management has determined that Premiere Products must maintain the following information about its sales reps, customers, and parts inventory in the new database:

- The number, last name, first name, address, total commission, and commission rate for each sales rep
- The customer number, name, address, current balance, and credit limit for each customer, as well as the number of the sales rep who represents the customer
- The part number, description, number of units on hand, item class, number of the warehouse where the item is stored, and unit price for each part in inventory

Premiere Products also must store information about orders. Figure 1-1 shows a sample order.

PREMIERE PRODUCTS				
ORDER: 21617		DATE: 10/23/2010		
CUSTOMER: 608 Johnson's Department Store 372 Oxford Sheldon FL 33553		SALES REP: 65 Juan Perez		
PART NUMBER	PART DESCRIPTION	NUMBER ORDERED	PRICE	TOTAL
BV06	Home Gym	2	794.95	1589.90
CD52	Microwave Oven	4	150.00	600.00
ORDERTOTAL >>				2189.90

FIGURE 1-1 Sample order

The sample order shown in Figure 1-1 has three sections:

- The heading (top) of the order contains the company name; the order number and date; the customer's number, name, and address; and the sales rep's number and name.
- The body of the order contains one or more order lines, sometimes called line items. Each order line contains a part number, a part description, the number of units of the part ordered, and the quoted price for the part. Each order line also contains a total, usually called an extension, which is the result of multiplying the number ordered by the quoted price.
- Finally, the footing (bottom) of the order contains the order total.

Premiere Products also must store the following items in the database for each customer's order:

- For each order, the database must store the order number, the date the order was placed, and the number of the customer that placed the order. The customer's name and address and the number of the sales rep who represents the customer are stored with the customer information. The name of the sales rep is stored with the sales rep information.
- For each order, the database must store the order number, the part number, the number of units ordered, and the quoted price for each order line. The part description is stored with the information about parts. The result of multiplying the number of units ordered by the quoted price is not stored because the database can calculate it when needed.
- The overall order total is not stored. Instead, the database calculates the total whenever an order is printed or displayed on the screen.

Figure 1-2 shows sample data for Premiere Products.

REP

REP_NUM	LAST_NAME	FIRST_NAME	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

CUSTOMER_NUM	CUSTOMER_NAME	STREET	CITY	STATE	ZIP	BALANCE	CREDIT_LIMIT	REP_NUM
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 1-2 Sample data for Premiere Products

ORDERS

ORDER_NUM	ORDER_DATE	CUSTOMER_NUM
21608	10/20/2010	148
21610	10/20/2010	356
21613	10/21/2010	408
21614	10/21/2010	282
21617	10/23/2010	608
21619	10/23/2010	148
21623	10/23/2010	608

ORDER_LINE

ORDER_NUM	PART_NUM	NUM_ORDERED	QUOTED_PRICE
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

PART

PART_NUM	DESCRIPTION	ON_HAND	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 1-2 Sample data for Premiere Products (continued)

In the REP table, you see that there are three sales reps, whose numbers are 20, 35, and 65. The name of sales rep 20 is Valerie Kaiser. Her street address is 624 Randall. She lives in Grove, Florida, and her zip code is 33321. Her total commission is \$20,542.50, and her commission rate is five percent (0.05).

In the CUSTOMER table, 10 Premiere Products customers are identified with the numbers 148, 282, 356, 408, 462, 524, 608, 687, 725, and 842. The name of customer number 148 is Al's Appliance and Sport. This customer's address is 2837 Greenway in Fillmore, Florida, with a zip code of 33336. The customer's current balance is \$6,550.00, and its credit limit is \$7,500.00. The number 20 in the REP_NUM column indicates that Al's Appliance and Sport is represented by sales rep 20 (Valerie Kaiser).

Skipping to the table named PART, you see that there are 10 parts, whose part numbers are AT94, BV06, CD52, DL71, DR93, DW11, FD21, KL62, KT03, and KV29. Part AT94 is an iron, and the company has 50 units of this part on hand. Irons are in item class HW (housewares) and are stored in warehouse 3. The price of an iron is \$24.95. Other item classes are AP (appliances) and SG (sporting goods).

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