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Oracle SQL and Introductory PL/SQL

Linda L. Preece

Southern Illinois University Carbondale



ORACLE SQL AND INTRODUCTORY PL/SQL

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Dedication

To my parents, John and Charlotte Brune, for inspiring a passion for learning within me. To my husband, John, for his unconditional love and understanding. To my daughter, Jessica, for providing me with regular reminders that life is about far more than just work. With love, I dedicate this book to all of you.

Preface

Intended Audience

This book provides basic coverage of Oracle's SQL and an introduction to Oracle's PL/SQL. It is intended for use in a second or third database course. Students are expected to be familiar with the fundamentals of database design and general usage prior to the beginning of the course.

The Method

The focus of the book is on the most commonly used SQL statements. The format is similar to that used for teaching math in that for each new statement, a concept is explained, general syntax is presented, and examples are solved. By this point in their college careers, there is usually no need for students to type examples verbatim out of a book, so that is not the intent here. Instead, students should read each chapter and then practice on their own by writing solutions to the exercises at the end of the chapter. Finally (and most importantly), computer work should be completed as assigned by the instructor.

Key Features

Overview of Example Database Creation

Two small databases are used in the examples. One is for a fictitious medical clinic, and the other is for a fictitious movie rental business. Specific entity-relationship (E-R) diagrams, table structures, and table contents are listed later in this preface and again in Appendix B.

The SQL* Plus tool for Oracle 9i was used for all examples. SQL* Plus is a command-line tool used to interact with the Oracle server. The user types a command at the prompt (there is no GUI) and presses Enter. Then the command is executed by the server, and the results are returned to the user's screen.

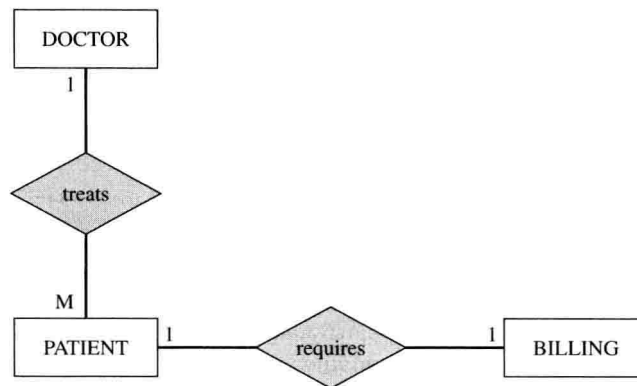
Typed commands may be saved to files with SQL extensions (called script files) for modification or for later use. A text editor (such as Notepad) is used to create or modify these scripts.

The SQL* Plus tool was also used for the initial creation of the tables, and an overview of that process is included here.

First, the user ID *lpreece* was created by the author's departmental database administrator, allowing the author to access the department's Oracle 9i server. The SQL* Plus tool was then used to connect to the server with that user ID. Tables were created by typing CREATE TABLE commands at the SQL* Plus prompt. Data values were placed in the tables by using INSERT commands. All additions were made permanent by using the COMMIT command. Specific script files for creating and filling the tables used in the example databases are included at the book's website.

The Example Databases

The first database represents a small medical clinic where each patient has one doctor, and each doctor may see many patients. Due to the large number of attributes associated with the patient entity, the original entity has been divided into two tables: PATIENT, which includes data needed for making appointments, and BILLING, which includes data needed for customer billing. All doctor-related information is maintained in one table, DOCTOR. The specific E-R diagram and table contents are shown here.



Note: A system date of July 1, 2003, was used for testing each example, and therefore, all data stored in the tables revolves around that particular date.

The DOCTOR Table

DOC_ID	DOC_NAME	DATEHIRED	SALPERMON	AREA	SUPERVISOR_ID	CHGPERAPPT	ANNUAL_BONUS
432	Harrison	05-DEC-94	12000	Pediatrics	100	75	4500
509	Vester	09-JAN-02	8100	Pediatrics	432	40	
389	Lewis	21-JAN-96	10000	Pediatrics	432	40	2250
504	Cotner	16-JUN-98	11500	Neurology	289	85	7500
235	Smith	22-JUN-98	4550	Family Practice	100	25	2250
356	James	01-AUG-98	7950	Neurology	289	80	6500
558	James	02-MAY-95	9800	Orthopedics	876	85	7700
876	Robertson	02-MAR-95	10500	Orthopedics	100	90	8900
889	Thompson	18-MAR-97	6500	Rehab	100	65	3200
239	Pronger	18-DEC-99	3500	Rehab	889	40	
289	Borque	30-JUN-89	16500	Neurology	100	95	6500
100	Stevenson	30-JUN-79	23500	Director			

The PATIENT Table

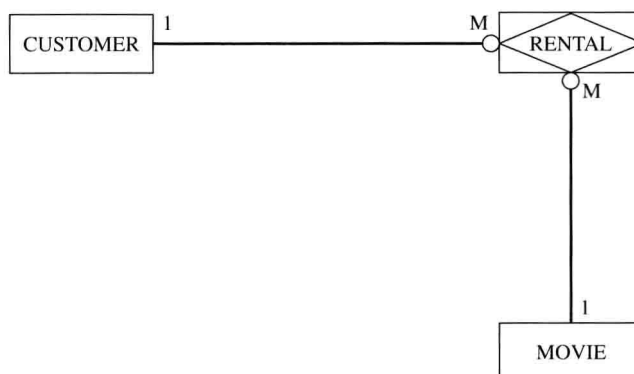
PT_ID	PT_LNAME	PT_FNAME	PTDOB	DOC_ID	NEXTAPPTD	LASTAPPTD
168	James	Paul	14-MAR-97	432	01-JUL-03	01-JUN-03
331	Anderson	Brian	31-MAR-48	235	01-JUL-03	01-JUN-03
313	James	Scott	26-MAR-33	235	20-JUL-03	20-JUN-03
816	Smith	Jason	12-DEC-99	509	15-NOV-03	15-MAY-03
314	Porter	Susan	14-NOV-67	235	01-OCT-03	01-MAR-03
315	Saillez	Debbie	09-SEP-55	235	01-JUL-03	01-JUN-03
719	Rogers	Anthony	01-JAN-42	504	01-NOV-03	01-JAN-03
264	Walters	Stephanie	26-JAN-45	504	12-DEC-03	12-DEC-02
267	Westra	Lynn	12-JUL-57	235	02-FEB-04	02-FEB-03
103	Poole	Jennifer	13-MAY-02	389	01-DEC-03	01-JUN-03
108	Baily	Ryan	25-DEC-77	235	06-JUN-05	06-JUN-03
943	Crow	Lewis	10-NOV-49	235	01-JUL-05	01-MAR-02
847	Cochran	John	28-MAR-48	356	02-DEC-05	01-JAN-02
163	Roach	Becky	08-SEP-75	235	01-DEC-05	01-JAN-02
504	Jackson	John	08-NOV-43	235	21-JUL-03	10-NOV-02

809	Kowalczyk	Paul	12-NOV-51	558	29-JUL-03	19-JUN-03
703	Davis	Linda	17-JUL-02	509	21-JUL-03	22-MAY-03
307	Jones	J.C.	17-JUL-02	509	21-JUL-03	22-MAY-03
439	Wright	Chasity	23-APR-73	235		
696	Vanderchuck	Keith	08-AUG-68	504		15-JUN-03
966	McGinnis	Allen	03-MAY-59	504		15-JUN-03
669	Sakic	Joe	16-SEP-76	504		15-JUN-03

The BILLING Table

PT_ID	BALANCE	DUE DATE	PHONE	ADDR	CITY	ST	ZIP	PT_INS
168	15650	21-AUG-03	833-9569	128 W. Apple #4	Jonesboro	IL	62952	SIH
331	300	09-SEP-03	833-5587	3434 Mulberry St.	Anna	IL	62906	BCBS
313	0	01-JAN-04	893-9987	334 Tailgate Ln	COBDEN	IL	62920	Military
816	0	01-JAN-04	833-6654	8814 W. Apple	JONESBORO	IL	62952	SIH
314	100	31-MAR-03	457-6658	445 Oak St.	Carbondale	IL	62901	BCBS
264	35000	11-JAN-03	942-8065	8898 Bighill Drive	HERRIN	IL	62948	MediSupplA
103	4500	01-JUL-03	833-5547	298 Murphy School Rd	Anna	IL	62906	HealthCare
108	0	01-JAN-05	833-5542	334 Pansie Hill Rd.	JONESBORO	IL	62952	HealthCare
943	0	01-JAN-07	529-9963	456 E. Grand #14	Carbondale	IL	62901	Military
847	98000	31-JAN-02	549-8854	6543 W. Parkview Ln.	Carbondale	IL	62901	BCBS
504	0	01-JAN-03	549-6139	6657 N. Allen	Carbondale	IL	62901	QualityCare
809	450	19-JUL-03	687-8852	3345 Hwy 127 N.	Murphysboro	IL	62966	QualityCare
703	225	31-AUG-03	529-8332	909 N. Brown St.	Carbondale	IL	62901	HealthCare
696	79850	15-JUL-03	549-7231	5546 W. James	Carbondale	IL	62901	BCBS
966	98700	15-JUL-03	833-5375	9009 Taylor Ave.	Anna	IL	62906	BCBS
267	0	01-JAN-05	942-3321	6755 US Route 148	HERRIN	IL	62948	QualityCare
307	450	31-AUG-03	457-6967	234 N. Allen	Carbondale	IL	62901	HealthCare
719	0	01-JAN-04	549-7848	867 Henderson St.	Carbondale	IL	62901	HealthCare
439	500	31-AUG-03	833-5541	4456 N. Springer	Anna	IL	62906	QualityCare
315	1500	14-SEP-03	833-6272	404 Williford Rd.	JONESBORO	IL	62952	HealthCare
163	0	01-JAN-04	833-2133	129 Fountain St.	Anna	IL	62906	HealthCare
669	128450	15-JUL-03	833-6654	353 Tin Bender Rd.	Jonesboro	IL	62952	BCBS

The second database could be used for a movie rental business, where each movie may be rented by many customers, and each customer may rent many movies. Movie data is stored in the MOVIE table, and customer data is stored in the CUSTOMER table. The RENTAL table is used as a bridge (also called bridging table, linking table, or intersection table) between the movie and customer entities.



The CUSTOMER Table

C_ID	PHONE	LNAME	FNAME	CURR_BAL	DUE DATE
388	549-6730	Woolard	Jessica		
402	529-8420	St. James	Ellen	4.99	03-JUL-03
673	549-8400	Akers	Janet	9.97	23-JUN-03
579	549-1234	Poston	Blaine		
799	549-6711	Ackers	John	1.99	01-JUL-03
767	453-8228	Ralston	Cheri	14.9	30-JUN-03
133	453-2271	Akers	Leita	20.18	02-JUL-03
239	549-1235	Macke	Greg		
400	549-8440	Salyers	Loretta	5	06-JUL-03
701	549-8840	Williams	Tisha	20	28-JUN-03

The MOVIE Table

M_ID	FEE	TITLE	CATEGORY
204	1.99	City of Angels	Drama
216	2.99	Ocean's Eleven	Action
233	2.99	Gone in 60 Seconds	Action
236	.99	Monsters, Inc.	Kids
237	.99	E.T.	Kids
249	1.99	U-571	Action
254	2.99	Road to Perdition	Drama
255	2.99	Amelie	Foreign
278	1.99	Monster's Ball	Drama
287	2.99	A Knight's Tale	
289	1.99	The Royal Tenenbaums	Comedy
304	2.99	Wild, Wild West	Comedy
315	2.99	Himalaya	Foreign
316	.99	Horse Whisperer	Drama
320	1.99	A Beautiful Mind	Drama
324	2.99	Field of Dreams	Family
325	2.99	Beautiful Life	Foreign
337	1.99	Grease	
349	1.99	Cast Away	Drama
354	2.99	O Brother	
355	1.99	Spiderman	Kids

The RENTAL Table

C_ID	M_ID	DATE_OUT	DUE DATE
673	216	30-JUN-03	02-JUL-03
673	249	30-JUN-03	01-JUL-03
388	320	01-JUL-03	04-JUL-03
400	354	29-JUN-03	30-JUN-03
579	354	01-JUL-03	04-JUL-03
673	304	29-JUN-03	01-JUL-03
673	337	01-JUL-03	04-JUL-03
388	216	30-JUN-03	02-JUL-03

388	316	01-JUL-03	04-JUL-03
388	236	01-JUL-03	04-JUL-03
400	320	01-JUL-03	04-JUL-03
400	255	29-JUN-03	01-JUL-03
701	216	30-JUN-03	02-JUL-03
701	278	29-JUN-03	01-JUL-03
579	320	01-JUL-03	03-JUL-03

General Syntax Standards

The following syntax standards are used throughout this book whenever general syntax is presented:

- Words that are entirely uppercase represent keywords and should be used as is.
- Words that are entirely lowercase represent items that should be replaced with the appropriate item for the application.
- Items and/or phrases enclosed in square brackets [] are optional; the brackets are not typed and are not part of the syntax.
- Items enclosed in curly braces { } and separated by a vertical bar | indicate choices available; choose one. The braces are not typed, and are not part of the syntax.

Again, those standards will be used when general statement syntax is given. When specific rather than general syntax is given (as is the case for each example), then similar standards will be used. Uppercase will be used for keywords only, and lowercase will be used for all other identifiers. The only exceptions are items contained in quotes, as those are always case-sensitive.

The case standards are only for the purpose of improving readability. As far as the software is concerned, the case makes no difference (unless the character string is enclosed within quotes). Also, be aware that when the commands typed are echoed to the screen by the Oracle software, they will be entirely uppercase; there is no facility for avoiding that conversion.

The bottom line here is that you will see a variety of cases used throughout your work with this software, and the only time it makes a difference in execution results is when the item is within quotes.

Using SQL* Plus

Specifics of connecting to the appropriate Oracle server should be provided by your instructor. Open the SQL* Plus tool to connect to the database. You will be prompted for the user ID, password, and host string. Use those provided by your instructor. Once connected and logged on, your session begins with the SQL> prompt displayed on the screen.

If you are using the software included with the book as a stand-alone system rather than using a client/server system, follow the steps listed in the documentation included with the software to mount and open a sample database. Once connected, you should see the prompt SQL> on the screen.

The list of commonly used SQL* Plus commands is fairly short and is presented here. In general, you will type each command at the prompt and press Enter. The syntax error messages that could be generated are usually self-explanatory, or can be looked up in the documentation that accompanies the software. As with SQL statements, SQL* Plus commands are not case-sensitive with the exception of values enclosed in quotes.

You should usually begin each session with these two commands:

1. **SET ECHO ON** This causes commands executed from a file to be echoed to the screen. This is quite helpful when debugging code and trying to locate syntax errors, as an asterisk (*) is usually displayed directly below the location of the syntax error. If you forget to use this command, then you will not see a copy of the commands on the screen during execution and debugging is more difficult.
2. **SPOOL path:filename.txt** This opens a spool file named *filename.txt*, and sends a copy of all screen output to the file. This spool file will contain a copy of everything you do in SQL* Plus (including your mistakes). Your instructor may require that you turn in a copy of your spool file for each lab assignment or session.

Spool files are *not* executable by the Oracle software; they are merely a record of your work. They are text-only files, and can be edited in NotePad (or whichever text processor is defined in your installation). Depending on your instructor's preferences, you may or may not edit out your mistakes before submitting your spool file for grading.

You should end each session with these two commands:

1. **SPOOL OFF** This closes the spool file, emptying out any text left in the spool buffer. If you open the spool file without closing it with this command, then the file may not contain a copy of the last portion of your session, as it may still be in the spool buffer. Therefore, avoid looking at an open spool file, and there really should be no need to do so.

Again, a common misconception is that the commands in the spool file are executable, so those new to SQL* Plus sometimes try to open and execute the spool file. Unfortunately, that doesn't work. Just consider the spool file to be a record of your work and that's all.

2. **EXIT** This ends the Oracle session and logs you off.

Other commonly used commands are as follows:

1. **DESCRIBE tablename (Example: DESCRIBE patient)** This will list the column definitions (names and types) for the specified table.
2. **SAVE filename (with NO extension) (Example: SAVE step1)** This will create a new script file named *filename* with an sql extension, and the file will contain a copy of the SQL statement currently in the SQL buffer. The SQL buffer will always contain the most recently executed SQL statement. SQL Plus commands are not stored in the buffer, and therefore, cannot be saved with this command.

The default storage location for this script file is implementation dependent, but is usually C:\oracle\ora90\Bin\filename.sql. If you prefer, you can instead save the file to a location of your choice by including a path, as in SAVE path:\filename.

If the script file already exists and you want to replace it, add the REPLACE option at the end by typing SAVE path:\filename REPLACE.

3. **EDIT filename (with NO extension) (Example: EDIT step1)** This will open NotePad (or other text processor, depending on your installation). If the file does not exist, then a new script file will be created (with an automatic sql extension). If the script file already exists, then it will be opened so that changes can be made. As with the SAVE command, a path may be included in front of the filename.

Be sure to save your changes and exit NotePad before returning to SQL Plus. If you leave NotePad open and just return to SQL Plus, the computer may lock up.

4. **@path:filename (Example: @step1)** This command executes the SQL statements and/or SQL Plus commands in the script file named *filename.sql*. As with the SAVE and EDIT commands, a path may be included in front of the filename.

In general, you will type an SQL statement (such as SELECT or UPDATE) at the SQL> prompt. If there are no syntax errors, the results will be displayed on the screen. However, if syntax errors are present, an asterisk (*) will be displayed directly beneath the likely source of the error. At that point, you should use the SAVE command to save the SQL statement to a script file. Then EDIT the script file, correcting the source of the syntax error. Then at the SQL> prompt, execute the script file with the @ command. Repeat as needed until all syntax errors are removed.

Clarifications

Script files are files with an **sql** extension that contain SQL statements and perhaps also SQL Plus commands. Script files are executable by the Oracle software. They are text-only files, and can be edited in NotePad (or other text processor depending on your installation).

Spool files will have a **txt** extension, and will contain a copy of everything you do in SQL Plus (including your mistakes). Spool files are *not* executable by the Oracle software. They are text-only files and can be edited in NotePad (or other text processor depending on your installation). Depending on your instructor's preferences, you may or may not edit out your mistakes before submitting your spool file for grading.

Teaching and Learning Resources

Website. The book's website at www.mhhe.com/preece provides instructors with SQL templates and solutions to end of chapter material.

Videos. The McGraw-Hill/Irwin Information Systems Video Library contains 2002 and 2003 video updates features various companies demonstrating the use of a multitude of IT areas such as intranets, multimedia, or computer-based training systems and concepts like client/server computing and business process reengineering. This Library is available free to adopters. For further information visit www.mhhe.com/business/mis/videos or www.mhhe.com/catalogs/irwin/mis/cio_index.mhtml or contact your local McGraw-Hill/Irwin sales representative.

Video Guide. A video guide for all updates is available on the Preece website.

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Chapter

1

Basic SELECT Statements

The SELECT statement is used to display table contents. All rows and columns or just selected columns and/or selected rows may be displayed. Column aliases can be used to improve the readability of the output. Column values may be calculated as the result of an expression, and rows may be displayed in a specific order. At any point, the user can supply values to be used within the SELECT through substitution parameters.

Section A: Fundamentals

Part 1: Column Selections and Aliases

General syntax of the basic SELECT statement is as follows:

```
SELECT column-list  
FROM table-name;
```

- where
- 1) column-list consists of one or more column names separated by commas. If all columns are to be included, then an asterisk (*) may be used for the column-list.
 - 2) table-name is the name of the table.

Example 1.A.1

Display the contents of the DOCTOR table. (Use a small font to avoid wraparound.)

```
SQL: SELECT *  
      FROM doctor;
```

Execution Results

DOC_ID	DOC_NAME	DATEHIRED	SALPERMON	AREA	SUPERVISOR_ID	CHGPERAPPT	ANNUAL_BONUS
432	Harrison	05-DEC-94	12000	Pediatrics	100	75	4500
509	Vester	09-JAN-02	8100	Pediatrics	432	40	
389	Lewis	21-JAN-96	10000	Pediatrics	432	40	2250
504	Cotner	16-JUN-98	11500	Neurology	289	85	7500
235	Smith	22-JUN-98	4550	Family Practice	100	25	2250
356	James	01-AUG-98	7950	Neurology	289	80	6500
558	James	02-MAY-95	9800	Orthopedics	876	85	7700
876	Robertson	02-MAR-95	10500	Orthopedics	100	90	8000


```

889 Thompson 18-MAR-97      6500 Rehab      100      65      3200
239 Pronger  18-DEC-99      3500 Rehab      889      40
289 Borque   30-JUN-89      16500 Neurology  100      95      6500
100 Stevenson 30-JUN-79      23500 Director
12 rows selected.

```

Note: Variations in case are used only as an aid to the user in differentiating between keywords and other types of identifiers. As far as the software is concerned, the case makes no difference (unless the character string is enclosed within quotes). Hence, `SELECT* FROM doctor`, `select* from DOCTOR`, and `Select* fROM dOcToR` will each give the same execution results. Again, the conventions used in this book are uppercase for keywords only, and lowercase for all other identifiers.

Example 1.A.2

Display the contents of the CUSTOMER table.

```
SQL: SELECT *
      FROM customer;
```

Execution Results

C_ID	PHONE	LNAME	FNAME	CURR_BAL	DUEDATE
388	549-6730	Woolard	Jessica		
402	529-8420	St. James	Ellen	4.99	03-JUL-03
673	549-8400	Akers	Janet	9.97	23-JUN-03
579	549-1234	Poston	Blaine		
799	549-6711	Ackers	John	1.99	01-JUL-03
767	453-8228	Ralston	Cheri	14.9	30-JUN-03
133	453-2271	Akers	Leita	20.18	02-JUL-03
239	549-1235	Macke	Greg		
400	549-8440	Salyers	Loretta	5	06-JUL-03
701	549-8840	Williams	Tisha	20	28-JUN-03

10 rows selected.

Identical results could be produced by replacing the `*` with a list of the attribute names, separated by commas, as shown in the next statement.

```
SQL: SELECT c_id, phone, lname, fname, curr_bal, duedate
      FROM customer;
```

Execution Results

C_ID	PHONE	LNAME	FNAME	CURR_BAL	DUEDATE
388	549-6730	Woolard	Jessica		
402	529-8420	St. James	Ellen	4.99	03-JUL-03
673	549-8400	Akers	Janet	9.97	23-JUN-03
579	549-1234	Poston	Blaine		
799	549-6711	Ackers	John	1.99	01-JUL-03
767	453-8228	Ralston	Cheri	14.9	30-JUN-03
133	453-2271	Akers	Leita	20.18	02-JUL-03
239	549-1235	Macke	Greg		
400	549-8440	Salyers	Loretta	5	06-JUL-03
701	549-8840	Williams	Tisha	20	28-JUN-03

10 rows selected.