
SQL1

Student Guide • Additional Practices

40057GC10
Production 1.0
July 2001
D33483

ORACLE®

Authors

Nancy Greenberg
Priya Nathan

Technical Contributors and Reviewers

Josephine Turner
Martin Alvarez
Anna Atkinson
Don Bates
Marco Berbeek
Andrew Brannigan
Laszlo Czinkoczki
Michael Gerlach
Sharon Gray
Rosita Hanoman
Mozhe Jalali
Sarah Jones
Charbel Khouri
Christopher Lawless
Diana Lorentz
Nina Minchen
Cuong Nguyen
Daphne Nougier
Patrick Odell
Laura Pezzini
Stacey Procter
Maribel Renau
Bryan Roberts
Helen Robertson
Sunshine Salmon
Casa Sharif
Bernard Soleillant
Craig Spoonemore
Ruediger Steffan
Karla Villasenor
Andree Wheeley
Lachlan Williams

Publisher

Sheryl Domingue

Copyright © Oracle Corporation, 2000, 2001. All rights reserved.

This documentation contains proprietary information of Oracle Corporation. It is provided under a license agreement containing restrictions on use and disclosure and is also protected by copyright law. Reverse engineering of the software is prohibited. If this documentation is delivered to a U.S. Government Agency of the Department of Defense, then it is delivered with Restricted Rights and the following legend is applicable:

Restricted Rights Legend

Use, duplication or disclosure by the Government is subject to restrictions for commercial computer software and shall be deemed to be Restricted Rights software under Federal law, as set forth in subparagraph (c)(1)(ii) of DFARS 252.227-7013, Rights in Technical Data and Computer Software (October 1988).

This material or any portion of it may not be copied in any form or by any means without the express prior written permission of Oracle Corporation. Any other copying is a violation of copyright law and may result in civil and/or criminal penalties.

If this documentation is delivered to a U.S. Government Agency not within the Department of Defense, then it is delivered with "Restricted Rights," as defined in FAR 52.227-14, Rights in Data-General, including Alternate III (June 1987).

The information in this document is subject to change without notice. If you find any problems in the documentation, please report them in writing to Education Products, Oracle Corporation, 500 Oracle Parkway, Box SB-6, Redwood Shores, CA 94065. Oracle Corporation does not warrant that this document is error-free.

Oracle and all references to Oracle products are trademarks or registered trademarks of Oracle Corporation.

All other products or company names are used for identification purposes only, and may be trademarks of their respective owners.

Contents

Preface

Curriculum Map

I Introduction

- Objectives I-2
- Oracle9i I-3
- Oracle9i Application Server I-5
- Oracle9i Database I-6
- Oracle9i: Object Relational Database Management System I-8
- Oracle Internet Platform I-9
- System Development Life Cycle I-10
- Data Storage on Different Media I-12
- Relational Database Concept I-13
- Definition of a Relational Database I-14
- Data Models I-15
- Entity Relationship Model I-16
- Entity Relationship Modeling Conventions I-17
- Relating Multiple Tables I-19
- Relational Database Terminology I-20
- Relational Database Properties I-21
- Communicating with a RDBMS Using SQL I-22
- Relational Database Management System I-23
- SQL Statements I-24
- Tables Used in the Course I-25
- Summary I-26

1 Writing Basic SQL SELECT Statements

- Objectives 1-2
- Capabilities of SQL SELECT Statements 1-3
- Basic SELECT Statement 1-4
- Selecting All Columns 1-5
- Selecting Specific Columns 1-6
- Writing SQL Statements 1-7
- Column Heading Defaults 1-8
- Arithmetic Expressions 1-9
- Using Arithmetic Operators 1-10
- Operator Precedence 1-11
- Using Parentheses 1-13
- Defining a Null Value 1-14
- Null Values in Arithmetic Expressions 1-15
- Defining a Column Alias 1-16
- Using Column Aliases 1-17
- Concatenation Operator 1-18
- Using the Concatenation Operator 1-19

- Literal Character Strings 1-20
- Using Literal Character Strings 1-21
- Duplicate Rows 1-22
- Eliminating Duplicate Rows 1-23
- SQL and iSQL*Plus Interaction 1-24
- SQL Statements Versus iSQL*Plus Commands 1-25
- Overview of iSQL*Plus 1-26
- Logging In to iSQL*Plus 1-27
- The iSQL*Plus Environment 1-28
- Displaying Table Structure 1-29
- Interacting with Script Files 1-31
- Summary 1-34
- Practice Overview 1-35

2 Restricting and Sorting Data

- Objectives 2-2
- Limiting Rows Using a Selection 2-3
- Limiting the Rows Selected 2-4
- Using the WHERE Clause 2-5
- Character Strings and Dates 2-6
- Comparison Conditions 2-7
- Using Comparison Conditions 2-8
- Other Comparison Conditions 2-9
- Using the BETWEEN Condition 2-10
- Using the IN Condition 2-11
- Using the LIKE Condition 2-12
- Using the NULL Conditions 2-14
- Logical Conditions 2-15
- Using the AND Operator 2-16
- Using the OR Operator 2-17
- Using the NOT Operator 2-18
- Rules of Precedence 2-19
- ORDER BY Clause 2-22
- Sorting in Descending Order 2-23
- Sorting by Column Alias 2-24
- Sorting by Multiple Columns 2-25
- Summary 2-26
- Practice 2 Overview 2-27

3 Single-Row Functions

- Objectives 3-2
- SQL Functions 3-3
- Two Types of SQL Functions 3-4
- Single-Row Functions 3-5
- Character Functions 3-7

- Case Manipulation Functions 3-9
 - Using Case Manipulation Functions 3-10
 - Character-Manipulation Functions 3-11
 - Using the Character-Manipulation Functions 3-12
 - Number Functions 3-13
 - Using the ROUND Function 3-14
 - Using the TRUNC Function 3-15
 - Using the MOD Function 3-16
 - Working with Dates 3-17
 - Arithmetic with Dates 3-19
 - Using Arithmetic Operators with Dates 3-20
 - Date Functions 3-21
 - Using Date Functions 3-22
 - Practice 3, Part One: Overview 3-24
 - Conversion Functions 3-25
 - Implicit Data Type Conversion 3-26
 - Explicit Data Type Conversion 3-28
 - Using the TO_CHAR Function with Dates 3-31
 - Elements of the Date Format Model 3-32
 - Using the TO_CHAR Function with Dates 3-36
 - Using the TO_CHAR Function with Numbers 3-37
 - Using the TO_NUMBER and TO_DATE Functions 3-39
 - RR Date Format 3-40
 - Example of RR Date Format 3-41
 - Nesting Functions 3-42
 - General Functions 3-44
 - NVL Function 3-45
 - Using the NVL Function 3-46
 - Using the NVL2 Function 3-47
 - Using the NULLIF Function 3-48
 - Using the COALESCE Function 3-49
 - Conditional Expressions 3-51
 - The CASE Expression 3-52
 - Using the CASE Expression 3-53
 - The DECODE Function 3-54
 - Using the DECODE Function 3-55
 - Summary 3-57
 - Practice 3, Part Two: Overview 3-58

4 Displaying Data from Multiple Tables

- Objectives 4-2
- Obtaining Data from Multiple Tables 4-3

Cartesian Products	4-4
Generating a Cartesian Product	4-5
Types of Joins	4-6
Joining Tables Using Oracle Syntax	4-7
What is an Equijoin?	4-8
Retrieving Records with Equijoins	4-9
Additional Search Conditions Using the AND Operator	4-10
Qualifying Ambiguous Column Names	4-11
Using Table Aliases	4-12
Joining More than Two Tables	4-13
Non-Equijoins	4-14
Retrieving Records with Non-Equijoins	4-15
Outer Joins	4-16
Outer Joins Syntax	4-17
Using Outer Joins	4-18
Self Joins	4-19
Joining a Table to Itself	4-20
Practice 4, Part One: Overview	4-21
Joining Tables Using SQL: 1999 Syntax	4-22
Creating Cross Joins	4-23
Creating Natural Joins	4-24
Retrieving Records with Natural Joins	4-25
Creating Joins with the USING Clause	4-26
Retrieving Records with the USING Clause	4-27
Creating Joins with the ON Clause	4-28
Retrieving Records with the ON Clause	4-29
Creating Three-Way Joins with the ON Clause	4-30
INNER Versus OUTER Joins	4-31
LEFT OUTER JOIN	4-32
RIGHT OUTER JOIN	4-33
FULL OUTER JOIN	4-34
Additional Conditions	4-35
Summary	4-36
Practice 4, Part Two: Overview	4-37

5 Aggregating Data Using Group Functions

Objectives	5-2
What Are Group Functions?	5-3
Types of Group Functions	5-4
Group Functions Syntax	5-5
Using the AVG and SUM Functions	5-6
Using the MIN and MAX Functions	5-7

Using the COUNT Function 5-8
Using the DISTINCT Keyword 5-10
Group Functions and Null Values 5-11
Using the NVL Function with Group Functions 5-12
Creating Groups of Data 5-13
Creating Groups of Data: The GROUP BY Clause Syntax 5-14
Using the GROUP BY Clause 5-15
Grouping by More Than One Column 5-17
Using the GROUP BY Clause on Multiple Columns 5-18
Illegal Queries Using Group Functions 5-19
Excluding Group Results 5-21
Excluding Group Results: The HAVING Clause 5-22
Using the HAVING Clause 5-23
Nesting Group Functions 5-25
Summary 5-26
Practice 5 Overview 5-27

6 Subqueries

Objectives 6-2
Using a Subquery to Solve a Problem 6-3
Subquery Syntax 6-4
Using a Subquery 6-5
Guidelines for Using Subqueries 6-6
Types of Subqueries 6-7
Single-Row Subqueries 6-8
Executing Single-Row Subqueries 6-9
Using Group Functions in a Subquery 6-10
The HAVING Clause with Subqueries 6-11
What is Wrong with this Statement? 6-12
Will this Statement Return Rows? 6-13
Multiple-Row Subqueries 6-14
Using the ANY Operator in Multiple-Row Subqueries 6-15
Using the ALL Operator in Multiple-Row Subqueries 6-16
Null Values in a Subquery 6-17
Summary 6-18
Practice 6 Overview 6-19

7 Producing Readable Output with iSQL*Plus

- Objectives 7-2
- Substitution Variables 7-3
- Using the & Substitution Variable 7-5
- Character and Date Values with Substitution Variables 7-7
- Specifying Column Names, Expressions, and Text 7-8
- Defining Substitution Variables 7-10
- DEFINE and UNDEFINE Commands 7-11
- Using the DEFINE Command with & Substitution Variable 7-12
- Using the VERIFY Command 7-14
- Customizing the iSQL*Plus Environment 7-15
- SET Command Variables 7-16
- iSQL*Plus Format Commands 7-17
- The COLUMN Command 7-18
- Using the COLUMN Command 7-19
- COLUMN Format Models 7-20
- Using the BREAK Command 7-21
- Using the TTITLE and BTITLE Commands 7-22
- Creating a Script File to Run a Report 7-23
- Sample Report 7-25
- Summary 7-26
- Practice 7 Overview 7-27

8 Manipulating Data

- Objectives 8-2
- Data Manipulation Language 8-3
- Adding a New Row to a Table 8-4
- The INSERT Statement Syntax 8-5
- Inserting New Rows 8-6
- Inserting Rows with Null Values 8-7
- Inserting Special Values 8-8
- Inserting Specific Date Values 8-9
- Creating a Script 8-10
- Copying Rows from Another Table 8-11
- Changing Data in a Table 8-12
- The UPDATE Statement Syntax 8-13
- Updating Rows in a Table 8-14
- Updating Two Columns with a Subquery 8-15
- Updating Rows Based on Another Table 8-16
- Updating Rows: Integrity Constraint Error 8-17
- Removing a Row from a Table 8-18
- The DELETE Statement 8-19

- Deleting Rows from a Table 8-20
- Deleting Rows Based on Another Table 8-21
- Deleting Rows: Integrity Constraint Error 8-22
- Using a Subquery in an INSERT Statement 8-23
- Using the WITH CHECK OPTION Keyword on DML Statements 8-25
- Overview of the Explicit Default Feature 8-26
- Using Explicit Default Values 8-27
- The MERGE Statement 8-28
- The MERGE Statement Syntax 8-29
- Merging Rows 8-30
- Database Transactions 8-32
- Advantages of COMMIT and ROLLBACK Statements 8-34
- Controlling Transactions 8-35
- Rolling Back Changes to a Marker 8-36
- Implicit Transaction Processing 8-37
- State of the Data Before COMMIT or ROLLBACK 8-38
- State of the Data after COMMIT 8-39
- Committing Data 8-40
- State of the Data After ROLLBACK 8-41
- Statement-Level Rollback 8-42
- Read Consistency 8-43
- Implementation of Read Consistency 8-44
- Locking 8-45
- Implicit Locking 8-46
- Summary 8-47
- Practice 8 Overview 8-48
- Read Consistency Example 8-52

9 Creating and Managing Tables

- Objectives 9-2
- Database Objects 9-3
- Naming Rules 9-4
- The CREATE TABLE Statement 9-5
- Referencing Another User's Tables 9-6
- The DEFAULT Option 9-7
- Creating Tables 9-8
- Tables in the Oracle Database 9-9
- Querying the Data Dictionary 9-10
- Data Types 9-11
- Date/Time Data Types 9-13
- TIMESTAMP WITH TIME ZONE Data Type 9-15
- TIMESTAMP WITH LOCAL TIME Data Type 9-16

INTERVAL YEAR TO MONTH Data Type 9-17
Creating a Table by Using a Subquery Syntax 9-18
Creating a Table by Using a Subquery 9-19
The ALTER TABLE Statement 9-20
Adding a Column 9-22
Modifying a Column 9-24
Dropping a Column 9-25
The SET UNUSED Option 9-26
Dropping a Table 9-27
Changing the Name of an Object 9-28
Truncating a Table 9-29
Adding Comments to a Table 9-30
Summary 9-31
Practice 9 Overview 9-32

10 Including Constraints

Objectives 10-2
What are Constraints? 10-3
Constraint Guidelines 10-4
Defining Constraints 10-5
The NOT NULL Constraint 10-7
The UNIQUE Constraint 10-9
The PRIMARY KEY Constraint 10-11
The FOREIGN KEY Constraint 10-13
FOREIGN KEY Constraint Keywords 10-15
The CHECK Constraint 10-16
Adding a Constraint Syntax 10-17
Adding a Constraint 10-18
Dropping a Constraint 10-19
Disabling Constraints 10-20
Enabling Constraints 10-21
Cascading Constraints 10-22
Viewing Constraints 10-24
Viewing the Columns Associated with Constraints 10-25
Summary 10-26
Practice 10 Overview 10-27

11 Creating Views

- Objectives 11-2
- Database Objects 11-3
- What is a View? 11-4
- Why use Views? 11-5
- Simple Views and Complex Views 11-6
- Creating a View 11-7
- Retrieving Data from a View 11-10
- Querying a View 11-11
- Modifying a View 11-12
- Creating a Complex View 11-13
- Rules for Performing DML Operations on a View 11-14
- Using the WITH CHECK OPTION Clause 11-17
- Denying DML Operations 11-18
- Removing a View 11-20
- Inline Views 11-21
- Top-N Analysis 11-22
- Performing Top-N Analysis 11-23
- Example of Top-N Analysis 11-24
- Summary 11-25
- Practice 11 Overview 11-26

12 Other Database Objects

- Objectives 12-2
- Database Objects 12-3
- What is a Sequence? 12-4
- The CREATE SEQUENCE Statement Syntax 12-5
- Creating a Sequence 12-6
- Confirming Sequences 12-7
- NEXTVAL and CURRVAL Pseudocolumns 12-8
- Using a Sequence 12-10
- Modifying a Sequence 12-12
- Guidelines for Modifying a Sequence 12-13
- Removing a Sequence 12-14
- What is an Index? 12-15
- How Are Indexes Created? 12-16
- Creating an Index 12-17
- When to Create an Index 12-18
- When Not to Create an Index 12-19
- Confirming Indexes 12-20
- Function-Based Indexes 12-21

Removing an Index 12-22
Synonyms 12-23
Creating and Removing Synonyms 12-24
Summary 12-25
Practice 12 Overview 12-26

13 Controlling User Access

Objectives 13-2
Controlling User Access 13-3
Privileges 13-4
System Privileges 13-5
Creating Users 13-6
User System Privileges 13-7
Granting System Privileges 13-8
What is a Role? 13-9
Creating and Granting Privileges to a Role 13-10
Changing Your Password 13-11
Object Privileges 13-12
Granting Object Privileges 13-14
Using the WITH GRANT OPTION and PUBLIC Keywords 13-15
Confirming Privileges Granted 13-16
How to Revoke Object Privileges 13-17
Revoking Object Privileges 13-18
Database Links 13-19
Summary 13-21
Practice 13 Overview 13-22

14 SQL Workshop

Workshop Overview 14-2

A Practice Solutions

B Table Descriptions and Data

C Using SQL*Plus

Index

Additional Practices

Additional Practice Solutions

Additional Practices: Table Descriptions and Data

Additional Practices

These exercises can be used for extra practice after you have discussed the following topics: basic SQL SELECT statement, basic iSQL*Plus commands, and SQL functions.

1. Show all data of the clerks who have been hired after the year 1997.

EMPLOYEE_ID	FIRST_NAME	LAST_NAME	EMAIL	PHONE_NUMBER	HIRE_DATE
143	Randall	Matos	RMATOS	650.121.2874	15-MAR-96
144	Peter	Vargas	PVARGAS	650.121.2004	09-JUL-98

2. Show the last name, job, salary, and commission of those employees who earn commission. Sort the data by the salary in descending order.

LAST_NAME	JOB_ID	SALARY	COMMISSION_PCT
Abel	SA_REP	11000	.3
Zlotkey	SA_MAN	10500	.2
Taylor	SA_REP	8600	.2
Grant	SA_REP	7000	.15

3. Show the employees that have no commission with a 10% raise in their salary (round off the salaries).

New salary
The salary of King after a 10% raise is 26400
The salary of Kochhar after a 10% raise is 18700
The salary of De Haan after a 10% raise is 18700
The salary of Hunold after a 10% raise is 9900
The salary of Ernst after a 10% raise is 6600
The salary of Lorentz after a 10% raise is 4620
The salary of Mourgos after a 10% raise is 6380
The salary of Rajs after a 10% raise is 3850
The salary of Davies after a 10% raise is 3410
The salary of Matos after a 10% raise is 2860
The salary of Vargas after a 10% raise is 2750
The salary of Whalen after a 10% raise is 4840
The salary of Hartstein after a 10% raise is 14300
The salary of Fay after a 10% raise is 6600
New salary
The salary of Higgins after a 10% raise is 13200
The salary of Gietz after a 10% raise is 9130

16 rows selected.

4. Show the last names of all employees together with the number of years and the number of completed months that they have been employed.

LAST_NAME	YEARS	MONTHS
King	13	9
Kochhar	11	5
De Haan	8	2
Hunold	11	2
Ernst	9	9
Lorentz	2	1
Mourgos	1	4
Rajs	5	5
Davies	4	1
Matos	3	0

Gietz	b	9
-------	---	---

20 rows selected.

5. Show those employees that have a name starting with J, K, L, or M.

LAST_NAME
King
Kochhar
Lorentz
Mourgos
Matos

6. Show all employees, and indicate with “Yes” or “No” whether they receive a commission.

LAST_NAME	SALARY	COM
King	24000	No
Kochhar	17000	No
De Haan	17000	No
Hunold	9000	No
Ernst	6000	No
Lorentz	4200	No
Mourgos	5800	No
Rajs	3500	No

(Note: results continued on next page)

Davies	3100	No
Matos	2600	No
Vargas	2500	No
Zlotkey	10500	Yes
Abel	11000	Yes
Taylor	8600	Yes
LAST_NAME	SALARY	COM
Grant	7000	Yes
Whalen	4400	No
Hartstein	13000	No
Fay	6000	No
Higgins	12000	No
Gietz	8300	No

20 rows selected.

These exercises can be used for extra practice after you have discussed the following topics: SQL basic SELECT statement, basic *iSQL*Plus* commands, SQL functions, joins, and group functions.

7. Show the department names, locations, names, job titles, and salaries of employees who work in location 1800.

DEPARTMENT_NAME	LOCATION_ID	LAST_NAME	JOB_ID	SALARY
Marketing	1800	Hartstein	MK_MAN	13000
Marketing	1800	Fay	MK_REP	6000

8. How many employees have a name that ends with an *n*? Create two possible solutions.

COUNT(*)
3

9. Show the names and locations for all departments, and the number of employees working in each department. Make sure that departments without employees are included as well.

DEPARTMENT_ID	DEPARTMENT_NAME	LOCATION_ID	COUNT(E.EMPLOYEE_ID)
10	Administration	1700	1
20	Marketing	1800	2
50	Shipping	1500	5
60	IT	1400	3
80	Sales	2500	3
90	Executive	1700	3
110	Accounting	1700	2
190	Contracting	1700	0

8 rows selected.

10. Which jobs are found in departments 10 and 20?

JOB_ID
AD_ASST
MK_MAN
MK_REP

11. Which jobs are found in the Administration and Executive departments, and how many employees do these jobs? Show the job with the highest frequency first.

JOB_ID	FREQUENCY
AD_VP	2
AD_ASST	1
AD_PRES	1

These exercises can be used for some extra practice after you have discussed the following topics: basic SQL SELECT statements, basic *iSQL*Plus* commands, SQL functions, joins, group functions, subqueries.

12. Show all employees who were hired in the first half of the month (before the 16th of the month).

LAST_NAME	HIRE_DATE
De Haan	13-JAN-93
Hunold	03-JAN-90
Lorentz	07-FEB-99
Matos	15-MAR-98
Vargas	09-JUL-98
Abel	11-MAY-96
Higgins	07-JUN-94
Gietz	07-JUN-94

8 rows selected.

13. Show the names, salaries, and the number of dollars (in thousands) that all employees earn.

LAST_NAME	SALARY	THOUSANDS
King	24000	24
Kochhar	17000	17
De Haan	17000	17
Hunold	9000	9
Ernst	6000	6
Lorentz	4200	4
Mourgos	5800	5

(Note: Results continued on next page)

Rajs	3500	3
Davies	3100	3
Matos	2600	2
Vargas	2500	2
Zlotkey	10500	10
Abel	11000	11
Taylor	8600	8
LAST_NAME	SALARY	THOUSANDS
Grant	7000	7
Whalen	4400	4
Hartstein	13000	13
Fay	6000	6
Higgins	12000	12
Gietz	8300	8

20 rows selected.

14. Show all employees who have managers with a salary higher than \$ 15,000. Show the following data: employee name, manager name, manager salary, and salary grade of the manager.

LAST_NAME	MANAGER	SALARY	GRA
Kochhar	King	24000	E
De Haan	King	24000	E
Mourgos	King	24000	E
Zlotkey	King	24000	E
Hartstein	King	24000	E
Whalen	Kochhar	17000	E
Higgins	Kochhar	17000	E
Hunold	De Haan	17000	E

8 rows selected.

15. Show the department number, name, number of employees, and average salary of all departments, together with the names, salaries, and jobs of the employees working in each department.

DEPARTMENT_ID	DEPARTMENT_NAME	EMPLOYEES	AVG_SAL	LAST_NAME	SALARY
10	Administration	1	4400.00	Whalen	4400
20	Marketing	2	9500.00	Fay	6000
				Hartstein	13000
50	Shipping	5	3500.00	Davies	3100
				Matos	2600
				Mourgos	5800
				Rajs	3500
				Vargas	2500
60	IT	3	6400.00	Ernst	6000
				Hunold	9000
				Lorentz	4200
80	Sales	3	10033.33	Abel	11000
				Taylor	8600
				Zlotkey	10500
DEPARTMENT_ID	DEPARTMENT_NAME	EMPLOYEES	AVG_SAL	LAST_NAME	SALARY
90	Executive	3	19333.33	De Haan	17000
				King	24000
				Kochhar	17000
110	Accounting	2	10150.00	Gietz	8300
				Higgins	12000
190	Contracting	0	No average		

20 rows selected.
breaks cleared

16. Show the department number and the lowest salary of the department with the highest average salary.

DEPARTMENT_ID	MIN(SALARY)
90	17000

17. Show the department numbers, names, and locations of the departments where no sales representatives work.

DEPARTMENT_ID	DEPARTMENT_NAME	MANAGER_ID	LOCATION_ID
10	Administration	200	1700
20	Marketing	201	1800
50	Shipping	124	1500
60	IT	103	1400
90	Executive	100	1700
110	Accounting	205	1700
190	Contracting		1700

7 rows selected.

18. Show the department number, department name, and the number of employees working in each department that:

- a. Includes fewer than 3 employees:

DEPARTMENT_ID	DEPARTMENT_NAME	COUNT(*)
10	Administration	1
20	Marketing	2
110	Accounting	2

- b. Has the highest number of employees:

DEPARTMENT_ID	DEPARTMENT_NAME	COUNT(*)
50	Shipping	5

- c. Has the lowest number of employees:

DEPARTMENT_ID	DEPARTMENT_NAME	COUNT(*)
10	Administration	1

19. Show the employee number, last name, salary, department number, and the average salary in their department for all employees.

EMPLOYEE_ID	LAST_NAME	DEPARTMENT_ID	AVG(S.SALARY)
100	King	90	19333.3333
101	Kochhar	90	19333.3333
102	De Haan	90	19333.3333
103	Hunold	60	6400
104	Ernst	60	6400
107	Lorentz	60	6400
124	Mourgos	50	3500
141	Rajs	50	3500
142	Davies	50	3500
143	Matos	50	3500
144	Vargas	50	3500
149	Zlotkey	80	10033.3333
174	Abel	80	10033.3333
176	Taylor	80	10033.3333
EMPLOYEE_ID	LAST_NAME	DEPARTMENT_ID	AVG(S.SALARY)
200	Whalen	10	4400
201	Hartstein	20	9500
202	Fay	20	9500
205	Higgins	110	10150
206	Gietz	110	10150

19 rows selected.

20. Show all employees who were hired on the day of the week on which the highest number of employees were hired.

LAST_NAME	DAY
Ernst	TUESDAY
Mourgos	TUESDAY
Rajs	TUESDAY
Taylor	TUESDAY
Higgins	TUESDAY
Gietz	TUESDAY

6 rows selected.

21. Create an anniversary overview based on the hire date of the employees. Sort the anniversaries in ascending order.

LAST_NAME	BIRTHDAY
Hunold	January 03
De Haan	January 13
Davies	January 29
Zlotkey	January 29
Lorentz	February 07
Hartstein	February 17
Matos	March 15
Taylor	March 24
Abel	May 11
Ernst	May 21
Grant	May 24
Higgins	June 07
Gietz	June 07
King	June 17
LAST_NAME	BIRTHDAY
Vargas	July 09
Fay	August 17
Whalen	September 17
Kochhar	September 21
Rajs	October 17
Mourgos	November 16

20 rows selected.

**Additional
Practice
Solutions**

These exercises can be used for extra practice after you have discussed the following topics: basic SQL SELECT statement, basic *iSQL*Plus* commands, and SQL functions.

1. Show all data for clerks hired after the year 1997.

```
SELECT *
FROM employees
WHERE job_id = 'ST_CLERK'
AND hire_date > '31-DEC-1997';
```

2. Show the last name, job, salary, and commission of those employees who earn commission. Sort the data by the salary in descending order.

```
SELECT last_name, job_id, salary, commission_pct
FROM employees
WHERE commission_pct IS NOT NULL
ORDER BY salary DESC;
```

3. Show the employees who have no commission, but have a 10% raise in their salary (round off the salaries).

```
SELECT 'The salary of '||last_name||' after a 10% raise is '
      || ROUND(salary*1.10) "New salary"
FROM employees
WHERE commission_pct IS NULL;
```

4. Show the last names of all employees together with the number of years and the number of completed months that they have been employed.

```
SELECT last_name,
       TRUNC(MONTHS_BETWEEN(SYSDATE, hire_date) / 12) YEARS,
       TRUNC(MOD(MONTHS_BETWEEN(SYSDATE, hire_date), 12))
MONTHS
FROM employees;
```

5. Show those employees that have a name starting with J, K, L, or M.

```
SELECT last_name
FROM employees
WHERE SUBSTR(last_name, 1,1) IN ('J', 'K', 'L', 'M');
```


6. Show all employees, and indicate with “Yes” or “No” whether they receive a commission.

```
SELECT last_name, salary,
       decode(commission_pct, NULL, 'No', 'Yes') commission
FROM   employees;
```

These exercises can be used for extra practice after you have discussed the following topics: SQL basic SELECT statement, basic iSQL*Plus commands, SQL functions, joins, and group functions.

7. Show the department names, locations, names, job titles, and salaries of employees who work in location 1800.

```
SELECT d.department_name, d.location_id,
       e.last_name, e.job_id, e.salary
FROM   employees e, departments d
WHERE  e.department_id = d.department_id
AND    d.location_id = 1800;
```

8. How many employees have a name that ends with an “n”? Create two possible solutions.

```
SELECT COUNT(*)
FROM   employees
WHERE  last_name LIKE '%n';
```

```
SELECT COUNT(*)
FROM   employees
WHERE  SUBSTR(last_name, -1) = 'n';
```

9. Show the names and locations for all departments and the number of employees working in each department. Make sure that departments without employees are included as well.

```
SELECT d.department_id, d.department_name,
       d.location_id, COUNT(e.employee_id)
FROM   employees e, departments d
WHERE  e.department_id(+) = d.department_id
GROUP BY d.department_id, d.department_name, d.location_id;
```

10. Which jobs are found in departments 10 and 20?

```
SELECT DISTINCT job_id
FROM employees
WHERE department_id IN (10, 20);
```

11. Which jobs are found in the administrative and executive departments, and how many employees do these jobs? Show the job with the highest frequency first.

```
SELECT e.job_id, count(e.job_id) FREQUENCY
FROM employees e, departments d
WHERE e.department_id = d.department_id
AND d.department_name IN ('Administration', 'Executive')
GROUP BY e.job_id
ORDER BY FREQUENCY DESC;
```

These exercises can be used for some extra practice after you have discussed the following topics: basic SQL SELECT statements, basic iSQL*Plus commands, SQL functions, joins, group functions, subqueries.

12. Show all employees who were hired in the first half of the month (before the 16th of the month).

```
SELECT last_name, hire_date
FROM employees
WHERE TO_CHAR(hire_date, 'DD') < 16;
```

13. Show the names, salaries, and the number of dollars (in thousands) that each employee earns.

```
SELECT last_name, salary, TRUNC(salary, -3)/1000 Thousands
FROM employees;
```

14. Show all employees who have managers with a salary higher than \$15,000. Show the following data: employee name, manager name, manager salary, and salary grade of the manager.

```
SELECT e.last_name, m.last_name manager, m.salary,
       j.grade_level
FROM employees e, employees m, job_grades j
WHERE e.manager_id = m.employee_id
AND m.salary BETWEEN j.lowest_sal AND j.highest_sal
AND m.salary > 15000;
```

15. Show the department number, name, number of employees, and average salary of all departments, together with the names, salaries, and jobs of the employees working in each department.

```
BREAK ON department_id -
  ON department_name ON employees ON avg_sal SKIP 1

SELECT  d.department_id, d.department_name,
        count(e1.employee_id) employees,
        NVL(TO_CHAR(AVG(e1.salary), '99999.99'),
        'No average' ) avg_sal,
        e2.last_name, e2.salary, e2.job_id
FROM    departments d, employees e1, employees e2
WHERE   d.department_id = e1.department_id(+)
AND     d.department_id = e2.department_id(+)
GROUP BY d.department_id, d.department_name,
        e2.last_name, e2.salary, e2.job_id
ORDER BY d.department_id, employees;

CLEAR BREAKS
```

16. Show the department number and the lowest salary of the department with the highest average salary.

```
SELECT department_id, MIN(salary)
FROM   employees
GROUP BY department_id
HAVING AVG(salary) = (SELECT MAX(AVG(salary))
                     FROM   employees
                     GROUP BY department_id);
```

17. Show the department numbers, names, and locations of the departments where no sales representatives work.

```
SELECT *
FROM   departments
WHERE  department_id NOT IN(SELECT department_id
                           FROM   employees
                           WHERE  job_id = 'SA_REP'
                           AND   department_id IS NOT NULL);
```

18. Show the department number and name, and the number of employees working in each department that:

- a. Has fewer than three employees:

```
SELECT d.department_id, d.department_name, COUNT(*)
FROM   departments d, employees e
WHERE  d.department_id = e.department_id
GROUP BY d.department_id, d.department_name
HAVING COUNT(*) < 3;
```

b. Has the highest number of employees:

```
SELECT d.department_id, d.department_name, COUNT(*)
FROM departments d, employees e
WHERE d.department_id = e.department_id
GROUP BY d.department_id, d.department_name
HAVING COUNT(*) = (SELECT MAX(COUNT(*))
                   FROM employees
                   GROUP BY department_id);
```

c. Has the lowest number of employees:

```
SELECT d.department_id, d.department_name, COUNT(*)
FROM departments d, employees e
WHERE d.department_id = e.department_id
GROUP BY d.department_id, d.department_name
HAVING COUNT(*) = (SELECT MIN(COUNT(*))
                   FROM employees
                   GROUP BY department_id);
```

19. Show the employee number, last name, salary, department number, and the average salary in their department for all employees.

```
SELECT e.employee_id, e.last_name,
       e.department_id, AVG(s.salary)
FROM employees e, employees s
WHERE e.department_id = s.department_id
GROUP BY e.employee_id, e.last_name, e.department_id;
```

20. Show all employees who were hired on the day of the week on which the highest number of employees were hired.

```
SELECT last_name, TO_CHAR(hire_date, 'DAY') day
FROM employees
WHERE TO_CHAR(hire_date, 'Day') =
      (SELECT TO_CHAR(hire_date, 'Day')
       FROM employees
       GROUP BY TO_CHAR(hire_date, 'Day')
       HAVING COUNT(*) = (SELECT MAX(COUNT(*))
                           FROM employees
                           GROUP BY TO_CHAR(hire_date, 'Day')));
```

21. Create an anniversary overview based on the hire date of the employees. Sort the anniversaries in ascending order.

```
SELECT last_name, TO_CHAR(hire_date, 'Month DD') BIRTHDAY
FROM employees
ORDER BY TO_CHAR(hire_date, 'DDD');
```

Table Descriptions and Data

COUNTRIES Table

DESCRIBE countries

Name	Null?	Type
COUNTRY_ID	NOT NULL	CHAR(2)
COUNTRY_NAME		VARCHAR2(40)
REGION_ID		NUMBER

SELECT * FROM countries;

CO	COUNTRY_NAME	REGION_ID
CA	Canada	2
DE	Germany	1
UK	United Kingdom	1
US	United States of America	2

DEPARTMENTS Table

DESCRIBE departments

Name	Null?	Type
DEPARTMENT_ID	NOT NULL	NUMBER(4)
DEPARTMENT_NAME	NOT NULL	VARCHAR2(30)
MANAGER_ID		NUMBER(6)
LOCATION_ID		NUMBER(4)

SELECT * FROM departments;

DEPARTMENT_ID	DEPARTMENT_NAME	MANAGER_ID	LOCATION_ID
10	Administration	200	1700
20	Marketing	201	1800
50	Shipping	124	1500
60	IT	103	1400
80	Sales	149	2500
90	Executive	100	1700
110	Accounting	205	1700
190	Contracting		1700

8 rows selected.

EMPLOYEES Table

DESCRIBE employees

Name	Null?	Type
EMPLOYEE_ID	NOT NULL	NUMBER(6)
FIRST_NAME		VARCHAR2(20)
LAST_NAME	NOT NULL	VARCHAR2(25)
EMAIL	NOT NULL	VARCHAR2(25)
PHONE_NUMBER		VARCHAR2(20)
HIRE_DATE	NOT NULL	DATE
JOB_ID	NOT NULL	VARCHAR2(10)
SALARY		NUMBER(8,2)
COMMISSION_PCT		NUMBER(2,2)
MANAGER_ID		NUMBER(6)
DEPARTMENT_ID		NUMBER(4)

SELECT * FROM employees;

EMPLOYEE_ID	FIRST_NAME	LAST_NAME	EMAIL	PHONE_NUMBER	HIRE_DATE	JOB_ID	SA
100	Steven	King	SKING	515.123.4567	17-JUN-87	AD_PRES	
101	Neena	Kochhar	NKOCHHAR	515.123.4568	21-SEP-89	AD_VP	
102	Lex	De Haan	LDEHAAN	515.123.4569	13-JAN-93	AD_VP	
103	Alexander	Hunold	AHUNOLD	590.423.4567	03-JAN-90	IT_PROG	
104	Bruce	Ernst	BERNST	590.423.4568	21-MAY-91	IT_PROG	
107	Diana	Lorentz	DLORENTZ	590.423.5567	07-FEB-99	IT_PROG	
124	Kevin	Mourgos	KMOURGOS	650.123.5234	16-NOV-99	ST_MAN	
141	Trenna	Rajs	TRAJS	650.121.8009	17-OCT-95	ST_CLERK	
142	Curtis	Davies	CDAVIES	650.121.2994	29-JAN-97	ST_CLERK	
143	Randall	Matos	RMATOS	650.121.2874	15-MAR-98	ST_CLERK	
144	Peter	Vargas	PVARGAS	650.121.2004	09-JUL-98	ST_CLERK	
149	Eleni	Zlotkey	EZLOTKEY	011.44.1344.429018	29-JAN-00	SA_MAN	
174	Ellen	Abel	EABEL	011.44.1644.429267	11-MAY-96	SA_REP	
176	Jonathon	Taylor	JTAYLOR	011.44.1644.429265	24-MAR-98	SA_REP	
178	Kimberely	Grant	KGRANT	011.44.1644.429263	24-MAY-99	SA_REP	
200	Jennifer	Whalen	JWHALEN	515.123.4444	17-SEP-87	AD_ASST	
201	Michael	Hartstein	MHARTSTE	515.123.5555	17-FEB-96	MK_MAN	
202	Pat	Fay	PFAY	603.123.6666	17-AUG-97	MK_REP	
205	Shelley	Higgins	SHIGGINS	515.123.8080	07-JUN-94	AC_MGR	
206	William	Gietz	WGIETZ	515.123.8181	07-JUN-94	AC_ACCOUNT	

20 rows selected.

EMPLOYEES Table (continued)

	SALARY	COMMISSION_PCT	MANAGER_ID	DEPARTMENT_ID
	24000			90
	17000		100	90
	17000		100	90
	9000		102	60
	6000		103	60
	4200		103	60
	5800		100	50
	3500		124	50
	3100		124	50
	2600		124	50
	2500		124	50
	10500	.2	100	80
	11000	.3	149	80
	8600	.2	149	80
	7000	.15	149	
	4400		101	10
	13000		100	20
	6000		201	20
	12000		101	110
T	8300		205	110

JOBS Table

```
DESCRIBE jobs
```

Name	Null?	Type
JOB_ID	NOT NULL	VARCHAR2(10)
JOB_TITLE	NOT NULL	VARCHAR2(35)
MIN_SALARY		NUMBER(6)
MAX_SALARY		NUMBER(6)

```
SELECT * FROM jobs;
```

JOB_ID	JOB_TITLE	MIN_SALARY	MAX_SALARY
AD_PRES	President	20000	40000
AD_VP	Administration Vice President	15000	30000
AD_ASST	Administration Assistant	3000	6000
AC_MGR	Accounting Manager	8200	16000
AC_ACCOUNT	Public Accountant	4200	9000
SA_MAN	Sales Manager	10000	20000
SA_REP	Sales Representative	6000	12000
ST_MAN	Stock Manager	5500	8500
ST_CLERK	Stock Clerk	2000	5000
IT_PROG	Programmer	4000	10000
MK_MAN	Marketing Manager	9000	15000
MK_REP	Marketing Representative	4000	9000

12 rows selected.

JOB_GRADES Table

```
DESCRIBE job_grades
```

Name	Null?	Type
GRADE_LEVEL		VARCHAR2(3)
LOWEST_SAL		NUMBER
HIGHEST_SAL		NUMBER

```
SELECT * FROM job_grades;
```

GRA	LOWEST_SAL	HIGHEST_SAL
A	1000	2999
B	3000	5999
C	6000	9999
D	10000	14999
E	15000	24999
F	25000	40000

6 rows selected.

JOB_HISTORY Table

```
DESCRIBE job_history
```

Name	Null?	Type
EMPLOYEE_ID	NOT NULL	NUMBER(6)
START_DATE	NOT NULL	DATE
END_DATE	NOT NULL	DATE
JOB_ID	NOT NULL	VARCHAR2(10)
DEPARTMENT_ID		NUMBER(4)

```
SELECT * FROM job_history;
```

EMPLOYEE_ID	START_DAT	END_DATE	JOB_ID	DEPARTMENT_ID
102	13-JAN-93	24-JUL-98	IT_PROG	60
101	21-SEP-89	27-OCT-93	AC_ACCOUNT	110
101	28-OCT-93	15-MAR-97	AC_MGR	110
201	17-FEB-96	19-DEC-99	MK_REP	20
114	24-MAR-98	31-DEC-99	ST_CLERK	50
122	01-JAN-99	31-DEC-99	ST_CLERK	50
200	17-SEP-87	17-JUN-93	AD_ASST	90
176	24-MAR-98	31-DEC-98	SA_REP	80
176	01-JAN-99	31-DEC-99	SA_MAN	80
200	01-JUL-94	31-DEC-98	AC_ACCOUNT	90

10 rows selected.

LOCATIONS Table

DESCRIBE locations

Name	Null?	Type
LOCATION_ID	NOT NULL	NUMBER(4)
STREET_ADDRESS		VARCHAR2(40)
POSTAL_CODE		VARCHAR2(12)
CITY	NOT NULL	VARCHAR2(30)
STATE_PROVINCE		VARCHAR2(25)
COUNTRY_ID		CHAR(2)

SELECT * FROM locations;

LOCATION_ID	STREET_ADDRESS	POSTAL_CODE	CITY	STATE_PROVINCE	CO
1400	2014 Jabberwocky Rd	26192	Southlake	Texas	US
1500	2011 Interiors Blvd	99236	South San Francisco	California	US
1700	2004 Charade Rd	98199	Seattle	Washington	US
1800	460 Bloor St. W.	ON M5S 1X8	Toronto	Ontario	CA
2500	Magdalen Centre, The Oxford Science Park	OX9 9ZB	Oxford	Oxford	UK

REGIONS Table

```
DESCRIBE regions
```

Name	Null?	Type
REGION_ID	NOT NULL	NUMBER
REGION_NAME		VARCHAR2(25)

```
SELECT * FROM regions;
```

REGION_ID	REGION_NAME
1	Europe
2	Americas
3	Asia
4	Middle East and Africa