Oracle Database: SQL Fundamentals I

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Practices for Lesson I

In this practice, you perform the following:

- Start Oracle SQL Developer and create a new connection to the `ora1` account.
- Use Oracle SQL Developer to examine data objects in the `ora1` account. The `ora1` account contains the `HR` schema tables.

Note the following location for the lab files:

```
\home\oracle\labs\sql1\labs
```

If you are asked to save any lab files, save them in this location.

In any practice, there may be exercises that are prefaced with the phrases "If you have time" or "If you want an extra challenge." Work on these exercises only if you have completed all other exercises within the allocated time and would like a further challenge to your skills.

Perform the practices slowly and precisely. You can experiment with saving and running command files. If you have any questions at any time, ask your instructor.

Note

1) All written practices use Oracle SQL Developer as the development environment. Although it is recommended that you use Oracle SQL Developer, you can also use SQL*Plus that is available in this course.
2) For any query, the sequence of rows retrieved from the database may differ from the screenshots shown.

Practice I-1: Introduction

This is the first of many practices in this course. The solutions (if you require them) can be found at the end of this practice. Practices are intended to cover most of the topics that are presented in the corresponding lesson.

Starting Oracle SQL Developer

1) Start Oracle SQL Developer using the SQL Developer desktop icon.

Creating a New Oracle SQL Developer Database Connection

2) To create a new database connection, in the Connections Navigator, right-click Connections. Select New Connection from the menu. The New/Select Database Connection dialog box appears.
3) Create a database connection using the following information:
   a) Connection Name: `myconnection`
   b) Username: `ora1`
   c) Password: `ora1`
   d) Hostname: `localhost`
   e) Port: `1521`
   f) SID: `ORCL`

Ensure that you select the Save Password check box.

Testing and Connecting Using the Oracle SQL Developer Database Connection

4) Test the new connection.
5) If the status is Success, connect to the database using this new connection.

Browsing the Tables in the Connections Navigator

6) In the Connections Navigator, view the objects available to you in the Tables node. Verify that the following tables are present:

```
COUNTRIES
DEPARTMENTS
EMPLOYEES
JOB_GRADES
JOB_HISTORY
JOBS
LOCATIONS
REGIONS
```

7) Browse the structure of the `EMPLOYEES` table.
8) View the data of the `DEPARTMENTS` table.

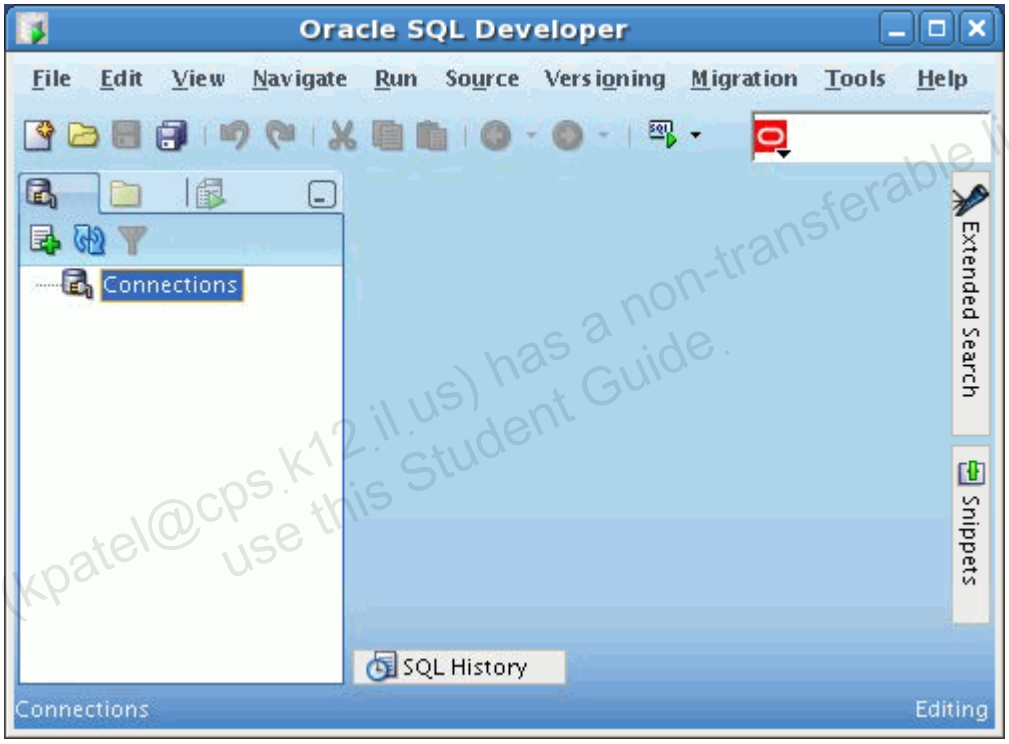
Practice Solutions I-1: Introduction

Starting Oracle SQL Developer

1) Start Oracle SQL Developer using the SQL Developer desktop icon.

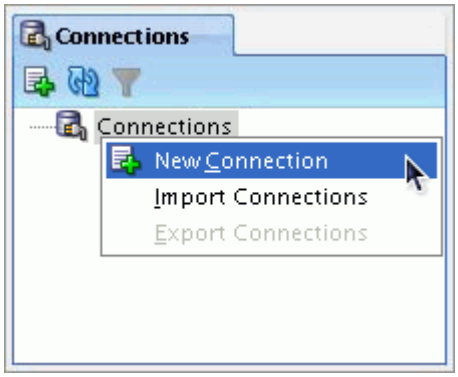
   a) Double-click the SQL Developer desktop icon.

   The SQL Developer Interface appears.

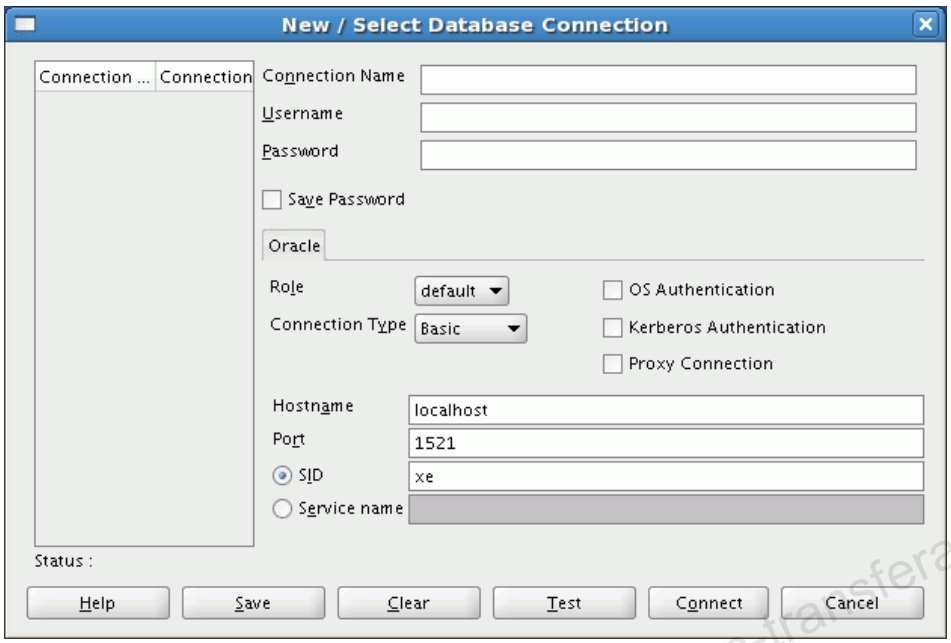


Creating a New Oracle SQL Developer Database Connection

2) To create a new database connection, in the Connections Navigator, right-click Connections and select New Connection from the menu.

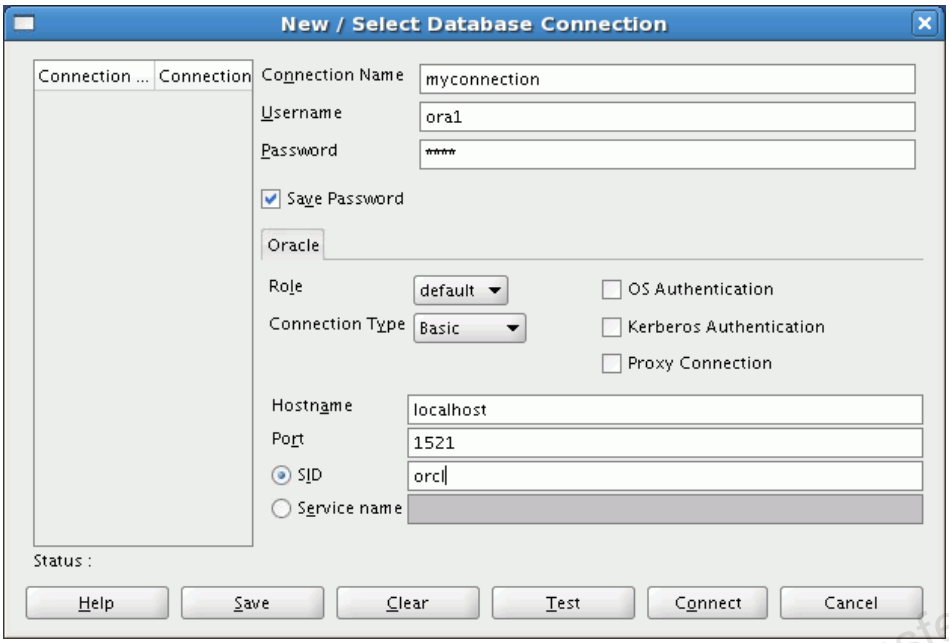


The New / Select Database Connection dialog box appears.



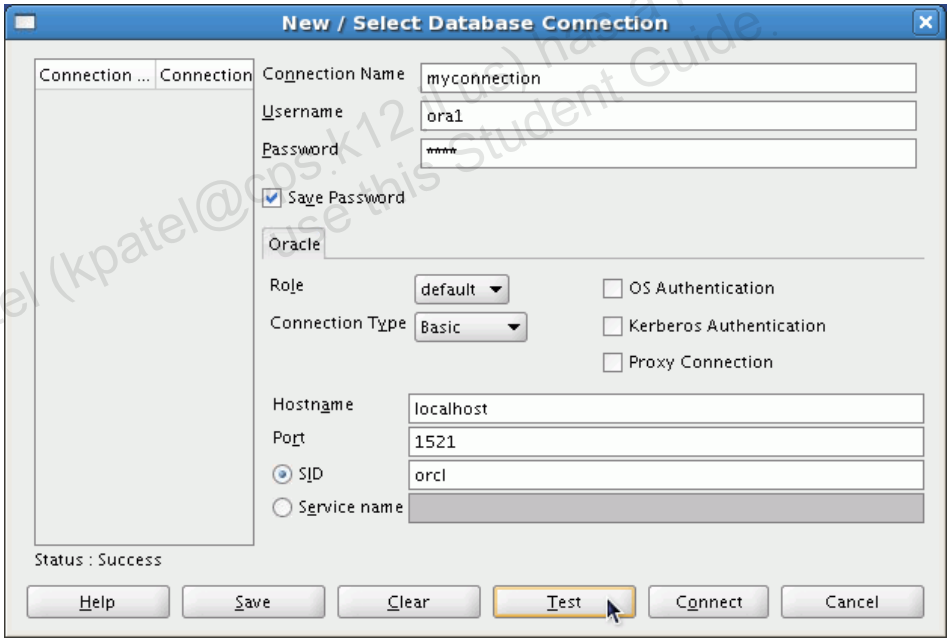
3) Create a database connection using the following information:
   a) Connection Name: `myconnection`
   b) Username: `ora1`
   c) Password: `ora1`
   d) Hostname: `localhost`
   e) Port: `1521`
   f) SID: `ORCL`

Ensure that you select the Save Password check box.

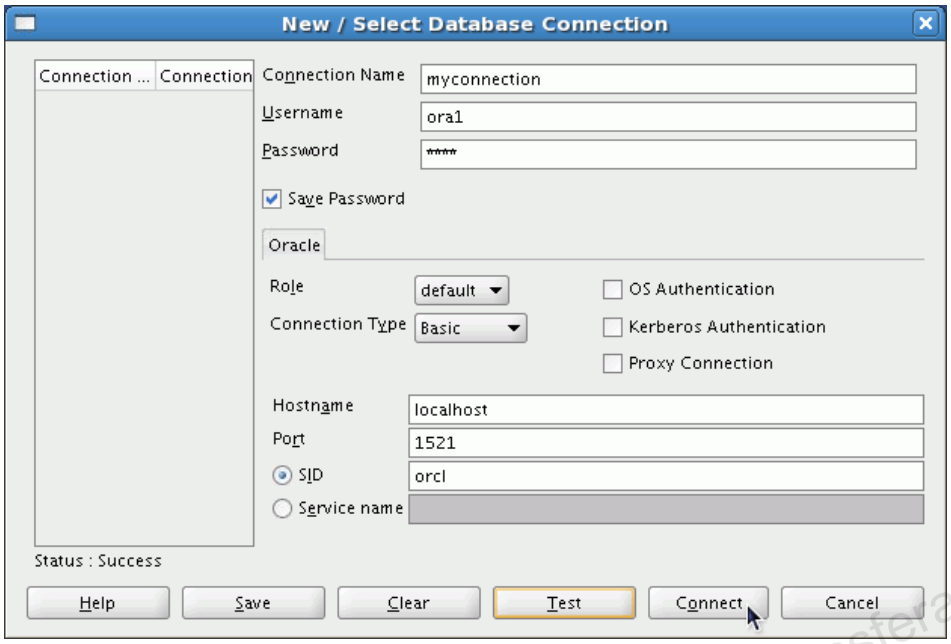


Testing and Connecting Using the Oracle SQL Developer Database Connection

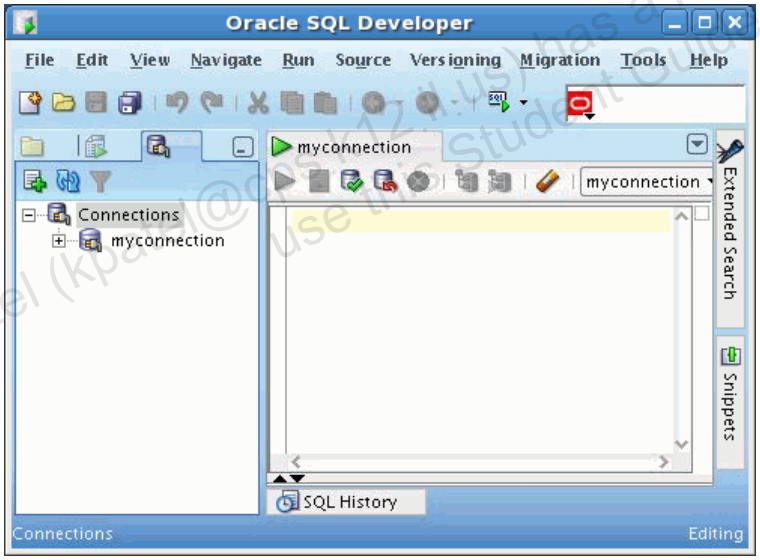
4) Test the new connection.



5) If the status is Success, connect to the database using this new connection.



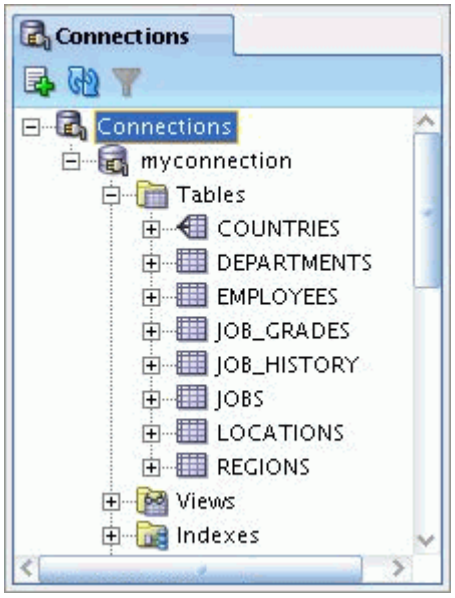
When you create a connection, a SQL Worksheet for that connection opens automatically.



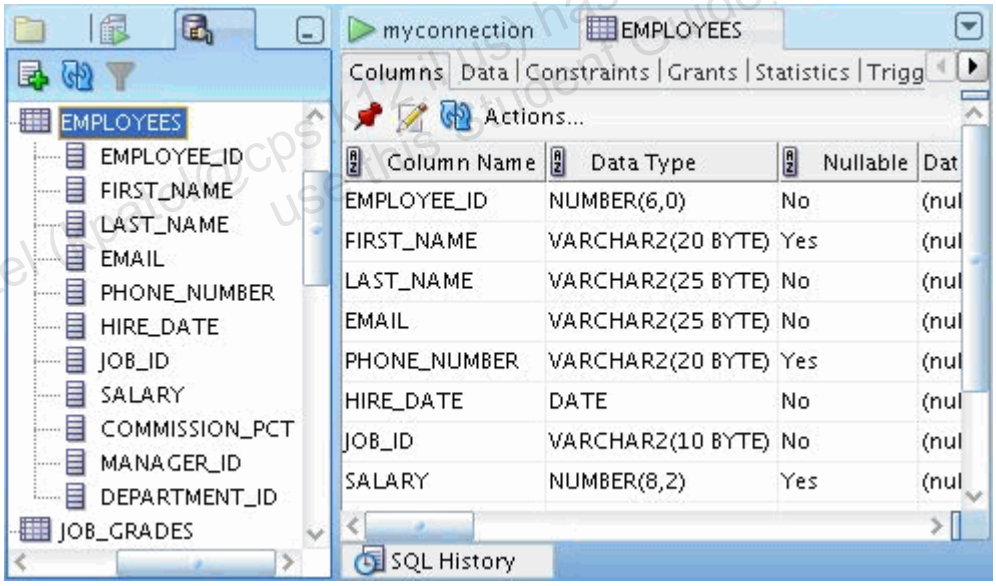
Browsing the Tables in the Connections Navigator

6) In the Connections Navigator, view the objects available to you in the Tables node. Verify that the following tables are present:

```
COUNTRIES
DEPARTMENTS
EMPLOYEES
JOB_GRADES
JOB_HISTORY
JOBS
LOCATIONS
REGIONS
```

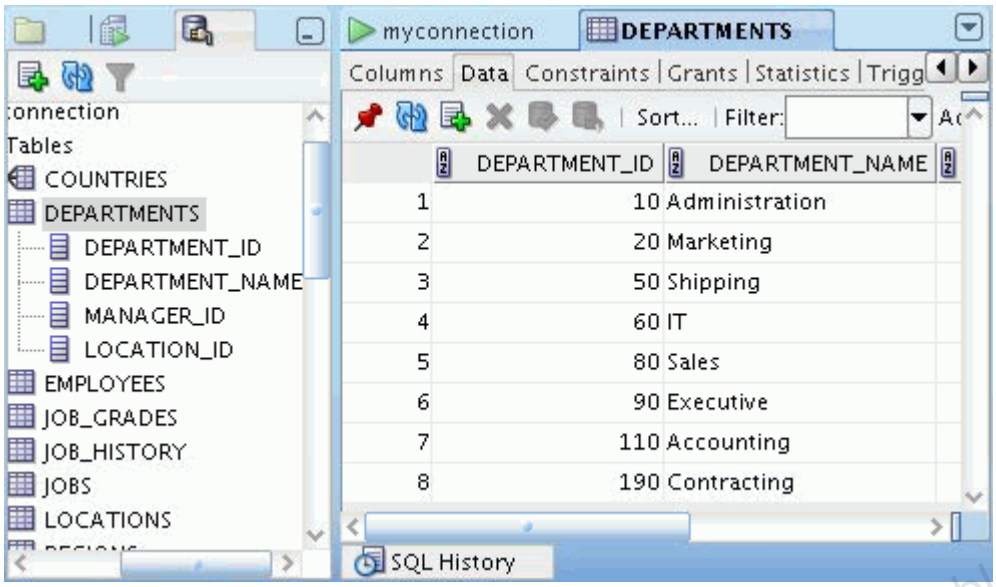


7) Browse the structure of the `EMPLOYEES` table.



8) View the data of the `DEPARTMENTS` table.

Practice Solutions I-1: Introduction (continued)



Practices for Lesson 1

In this practice, you write simple `SELECT` queries. The queries cover most of the `SELECT` clauses and operations that you learned in this lesson.

Practice 1-1: Retrieving Data Using the SQL `SELECT` Statement

Part 1

Test your knowledge:

1) The following `SELECT` statement executes successfully:

```
SELECT last_name, job_id, salary AS Sal
FROM   employees;
```

True/False

2) The following `SELECT` statement executes successfully:

```
SELECT *
FROM   job_grades;
```

True/False

3) There are four coding errors in the following statement. Can you identify them?

```
SELECT    employee_id, last_name
sal x 12  ANNUAL SALARY
FROM      employees;
```

Part 2

Note the following points before you begin with the practices:

- Save all your lab files at the following location:
  `/home/oracle/labs/sql1/labs`
- Enter your SQL statements in a SQL Worksheet. To save a script in SQL Developer, make sure that the required SQL worksheet is active and then from the File menu, select Save As to save your SQL statement as a `lab_<lessonno>_<stepno>.sql` script. When you are modifying an existing script, make sure that you use Save As to save it with a different file name.
- To run the query, click the Execute Statement icon in the SQL Worksheet. Alternatively, you can press [F9]. For DML and DDL statements, use the Run Script icon or press [F5].
- After you have executed the query, make sure that you do not enter your next query in the same worksheet. Open a new worksheet.

You have been hired as a SQL programmer for Acme Corporation. Your first task is to create some reports based on data from the Human Resources tables.

Practice 1-1: Retrieving Data Using the SQL SELECT Statement (continued)

4) Your first task is to determine the structure of the `DEPARTMENTS` table and its contents.

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

4 rows selected
```

	DEPARTMENT_ID	DEPARTMENT_NAME	MANAGER_ID	LOCATION_ID
1	10	Administration	200	1700
2	20	Marketing	201	1800
3	50	Shipping	124	1500
4	60	IT	103	1400
5	80	Sales	149	2500
6	90	Executive	100	1700
7	110	Accounting	205	1700
8	190	Contracting	(null)	1700

5) Determine the structure of the `EMPLOYEES` table.

```
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)

11 rows selected
```

The HR department wants a query to display the last name, job ID, hire date, and employee ID for each employee, with the employee ID appearing first. Provide an alias `STARTDATE` for the `HIRE_DATE` column. Save your SQL statement to a file named `lab_01_05.sql` so that you can dispatch this file to the HR department.

6) Test your query in the `lab_01_05.sql` file to ensure that it runs correctly.

Note: After you have executed the query, make sure that you do not enter your next query in the same worksheet. Open a new worksheet.

	EMPLOYEE_ID	LAST_NAME	JOB_ID	STARTDATE
1	200	Whalen	AD_ASST	17-SEP-87
2	201	Hartstein	MK_MAN	17-FEB-96
3	202	Fay	MK_REP	17-AUG-97
4	205	Higgins	AC_MGR	07-JUN-94
5	206	Gietz	AC_ACCOUNT	07-JUN-94

…

19	176	Taylor	SA_REP	24-MAR-98
20	178	Grant	SA_REP	24-MAY-99

7) The HR department wants a query to display all unique job IDs from the `EMPLOYEES` table.

	JOB_ID
1	AC_ACCOUNT
2	AC_MGR
3	AD_ASST
4	AD_PRES
5	AD_VP
6	IT_PROG
7	MK_MAN
8	MK_REP
9	SA_MAN
10	SA_REP
11	ST_CLERK
12	ST_MAN

Part 3

If you have time, complete the following exercises:

8) The HR department wants more descriptive column headings for its report on employees. Copy the statement from `lab_01_05.sql` to a new SQL Worksheet. Name the column headings `Emp #`, `Employee`, `Job`, and `Hire Date`, respectively. Then run the query again.

	Emp #	Employee	Job	Hire Date
1	200	Whalen	AD_ASST	17-SEP-87
2	201	Hartstein	MK_MAN	17-FEB-96
3	202	Fay	MK_REP	17-AUG-97
4	205	Higgins	AC_MGR	07-JUN-94
5	206	Gietz	AC_ACCOUNT	07-JUN-94

…

Practice 1-1: Retrieving Data Using the SQL SELECT Statement (continued)

19	176	Taylor	SA_REP	24-MAR-98
20	178	Grant	SA_REP	24-MAY-99

9) The HR department has requested a report of all employees and their job IDs. Display the last name concatenated with the job ID (separated by a comma and space) and name the column `Employee and Title`.

	Employee and Title
1	Abel, SA_REP
2	Davies, ST_CLERK
3	De Haan, AD_VP
4	Ernst, IT_PROG
5	Fay, MK_REP

...

19	Whalen, AD_ASST
20	Zlotkey, SA_MAN

If you want an extra challenge, complete the following exercise:

10) To familiarize yourself with the data in the `EMPLOYEES` table, create a query to display all the data from that table. Separate each column output by a comma. Name the column title `THE_OUTPUT`.

	THE_OUTPUT
1	200,Jennifer,Whalen,JWHALEN,515.123.4444,AD_ASST,101,17-SEP-87,4400,,10
2	201,Michael,Hartstein,MHARTSTE,515.123.5555,MK_MAN,100,17-FEB-96,13000,,20
3	202,Pat,Fay,PFAY,603.123.6666,MK_REP,201,17-AUG-97,6000,,20
4	205,Shelley,Higgins,SHIGGINS,515.123.8080,AC_MGR,101,07-JUN-94,12000,,110
5	206,William,Gietz,WGIETZ,515.123.8181,AC_ACCOUNT,205,07-JUN-94,8300,,110

...

19	176,Jonathon,Taylor,JTAYLOR,011.44.1644.429265,SA_REP,149,24-MAR-98,8600,.2,80
20	178,Kimberely,Grant,KGRANT,011.44.1644.429263,SA_REP,149,24-MAY-99,7000,.15,

Practice Solutions 1-1: Retrieving Data Using the SQL `SELECT` Statement

Part 1

Test your knowledge:

1) The following `SELECT` statement executes successfully:

```
SELECT last_name, job_id, salary AS Sal
FROM   employees;
```

True/False

2) The following `SELECT` statement executes successfully:

```
SELECT *
FROM   job_grades;
```

True/False

3) There are four coding errors in the following statement. Can you identify them?

```
SELECT    employee_id, last_name
sal x 12  ANNUAL SALARY
FROM      employees;
```

- **The `EMPLOYEES` table does not contain a column called `sal`. The column is called `SALARY`.**
- **The multiplication operator is *, not x, as shown in line 2.**
- **The `ANNUAL SALARY` alias cannot include spaces. The alias should read `ANNUAL_SALARY` or should be enclosed within double quotation marks.**
- **A comma is missing after the `LAST_NAME` column.**

Part 2

You have been hired as a SQL programmer for Acme Corporation. Your first task is to create some reports based on data from the Human Resources tables.

4) Your first task is to determine the structure of the `DEPARTMENTS` table and its contents.

   a. To determine the `DEPARTMENTS` table structure:

```
DESCRIBE departments
```

Practice Solutions 1-1: Retrieving Data Using the SQL `SELECT` Statement (continued)

b. To view the data contained in the `DEPARTMENTS` table:

```
SELECT *
FROM   departments;
```

5) Determine the structure of the `EMPLOYEES` table.

```
DESCRIBE employees
```

The HR department wants a query to display the last name, job ID, hire date, and employee ID for each employee, with the employee ID appearing first. Provide an alias `STARTDATE` for the `HIRE_DATE` column. Save your SQL statement to a file named `lab_01_05.sql` so that you can dispatch this file to the HR department.

```
SELECT employee_id, last_name, job_id, hire_date StartDate
FROM   employees;
```

6) Test your query in the `lab_01_05.sql` file to ensure that it runs correctly.

```
SELECT employee_id, last_name, job_id, hire_date StartDate
FROM   employees;
```

7) The HR department wants a query to display all unique job IDs from the `EMPLOYEES` table.

```
SELECT DISTINCT job_id
FROM   employees;
```

Part 3

If you have time, complete the following exercises:

8) The HR department wants more descriptive column headings for its report on employees. Copy the statement from `lab_01_05.sql` to a new SQL Worksheet. Name the column headings `Emp #`, `Employee`, `Job`, and `Hire Date`, respectively. Then run the query again.

```
SELECT employee_id "Emp #", last_name "Employee",
       job_id "Job", hire_date "Hire Date"
FROM   employees;
```

9) The HR department has requested a report of all employees and their job IDs. Display the last name concatenated with the job ID (separated by a comma and space) and name the column `Employee` and `Title`.

```
SELECT last_name||', '||job_id "Employee and Title"
FROM   employees;
```

Practice Solutions 1-1: Retrieving Data Using the SQL `SELECT` Statement (continued)

If you want an extra challenge, complete the following exercise:

10) To familiarize yourself with the data in the `EMPLOYEES` table, create a query to display all the data from that table. Separate each column output by a comma. Name the column title `THE_OUTPUT`.

```
SELECT employee_id || ',' || first_name || ',' || last_name
       || ',' || email || ',' || phone_number || ','|| job_id
       || ',' || manager_id || ',' || hire_date || ','
       || salary || ',' || commission_pct || ',' ||
department_id
       THE_OUTPUT
FROM   employees;
```

Practices for Lesson 2

In this practice, you build more reports, including statements that use the `WHERE` clause and the `ORDER BY` clause. You make the SQL statements more reusable and generic by including the ampersand substitution.

Practice 2-1: Restricting and Sorting Data

The HR department needs your assistance in creating some queries.

1) Because of budget issues, the HR department needs a report that displays the last name and salary of employees who earn more than $12,000. Save your SQL statement as a file named `lab_02_01.sql`. Run your query.

	LAST_NAME	SALARY
1	Hartstein	13000
2	King	24000
3	Kochhar	17000
4	De Haan	17000

2) Open a new SQL Worksheet. Create a report that displays the last name and department number for employee number 176. Run the query.

	LAST_NAME	DEPARTMENT_ID
1	Taylor	80

3) The HR department needs to find high-salary and low-salary employees. Modify `lab_02_01.sql` to display the last name and salary for any employee whose salary is not in the range of $5,000 to $12,000. Save your SQL statement as `lab_02_03.sql`.

	LAST_NAME	SALARY
1	Whalen	4400
2	Hartstein	13000
3	King	24000
4	Kochhar	17000
5	De Haan	17000
6	Lorentz	4200
7	Rajs	3500
8	Davies	3100
9	Matos	2600
10	Vargas	2500

4) Create a report to display the last name, job ID, and hire date for employees with the last names of Matos and Taylor. Order the query in ascending order by the hire date.

	LAST_NAME	JOB_ID	HIRE_DATE
1	Matos	ST_CLERK	15-MAR-98
2	Taylor	SA_REP	24-MAR-98

Practice 2-1: Restricting and Sorting Data (continued)

5) Display the last name and department ID of all employees in departments 20 or 50 in ascending alphabetical order by name.

	LAST_NAME	DEPARTMENT_ID
1	Davies	50
2	Fay	20
3	Hartstein	20
4	Matos	50
5	Mourgos	50
6	Rajs	50
7	Vargas	50

6) Modify `lab_02_03.sql` to display the last name and salary of employees who earn between $5,000 and $12,000, and are in department 20 or 50. Label the columns `Employee` and `Monthly Salary`, respectively. Save `lab_02_03.sql` as `lab_02_06.sql` again. Run the statement in `lab_02_06.sql`.

	Employee	Monthly Salary
1	Fay	6000
2	Mourgos	5800

7) The HR department needs a report that displays the last name and hire date for all employees who were hired in 1994.

	LAST_NAME	HIRE_DATE
1	Higgins	07-JUN-94
2	Gietz	07-JUN-94

8) Create a report to display the last name and job title of all employees who do not have a manager.

	LAST_NAME	JOB_ID
1	King	AD_PRES

9) Create a report to display the last name, salary, and commission of all employees who earn commissions. Sort data in descending order of salary and commissions.
Use the column's numeric position in the `ORDER BY` clause.

	LAST_NAME	SALARY	COMMISSION_PCT
1	Abel	11000	0.3
2	Zlotkey	10500	0.2
3	Taylor	8600	0.2
4	Grant	7000	0.15

Practice 2-1: Restricting and Sorting Data (continued)

10) Members of the HR department want to have more flexibility with the queries that you are writing. They would like a report that displays the last name and salary of employees who earn more than an amount that the user specifies after a prompt. Save this query to a file named `lab_02_10.sql`. If you enter 12000 when prompted, the report displays the following results:

	LAST_NAME	SALARY
1	Hartstein	13000
2	King	24000
3	Kochhar	17000
4	De Haan	17000

11) The HR department wants to run reports based on a manager. Create a query that prompts the user for a manager ID and generates the employee ID, last name, salary, and department for that manager's employees. The HR department wants the ability to sort the report on a selected column. You can test the data with the following values:

manager_id = 103, sorted by last_name:

	EMPLOYEE_ID	LAST_NAME	SALARY	DEPARTMENT_ID
1	104	Ernst	6000	60
2	107	Lorentz	4200	60

manager_id = 201, sorted by salary:

	EMPLOYEE_ID	LAST_NAME	SALARY	DEPARTMENT_ID
1	202	Fay	6000	20

manager_id = 124, sorted by employee_id:

	EMPLOYEE_ID	LAST_NAME	SALARY	DEPARTMENT_ID
1	141	Rajs	3500	50
2	142	Davies	3100	50
3	143	Matos	2600	50
4	144	Vargas	2500	50

If you have time, complete the following exercises:

12) Display all employee last names in which the third letter of the name is "a."

	LAST_NAME
1	Grant
2	Whalen

Practice 2-1: Restricting and Sorting Data (continued)

13) Display the last names of all employees who have both an "a" and an "e" in their last name.

	LAST_NAME
1	Davies
2	De Haan
3	Hartstein
4	Whalen

If you want an extra challenge, complete the following exercises:

14) Display the last name, job, and salary for all employees whose jobs are either those of a sales representative or of a stock clerk, and whose salaries are not equal to $2,500, $3,500, or $7,000.

	LAST_NAME	JOB_ID	SALARY
1	Abel	SA_REP	11000
2	Taylor	SA_REP	8600
3	Davies	ST_CLERK	3100
4	Matos	ST_CLERK	2600

15) Modify `lab_02_06.sql` to display the last name, salary, and commission for all employees whose commission is 20%. Save `lab_02_06.sql` as `lab_02_15.sql` again. Rerun the statement in `lab_02_15.sql`.

	Employee	Monthly Salary	COMMISSION_PCT
1	Zlotkey	10500	0.2
2	Taylor	8600	0.2

Practice Solutions 2-1: Restricting and Sorting Data

The HR department needs your assistance in creating some queries.

1) Because of budget issues, the HR department needs a report that displays the last name and salary of employees earning more than $12,000. Save your SQL statement as a file named `lab_02_01.sql`. Run your query.

```
SELECT  last_name, salary
FROM    employees
WHERE   salary > 12000;
```

2) Open a new SQL Worksheet. Create a report that displays the last name and department number for employee number 176.

```
SELECT  last_name, department_id
FROM    employees
WHERE   employee_id = 176;
```

3) The HR department needs to find high-salary and low-salary employees. Modify `lab_02_01.sql` to display the last name and salary for all employees whose salary is not in the range $5,000 through $12,000. Save your SQL statement as `lab_02_03.sql`.

```
SELECT  last_name, salary
FROM    employees
WHERE   salary NOT BETWEEN 5000 AND 12000;
```

4) Create a report to display the last name, job ID, and hire date for employees with the last names of Matos and Taylor. Order the query in ascending order by hire date.

```
SELECT  last_name, job_id, hire_date
FROM    employees
WHERE   last_name IN ('Matos', 'Taylor')
ORDER BY hire_date;
```

5) Display the last name and department ID of all employees in departments 20 or 50 in ascending alphabetical order by name.

```
SELECT   last_name, department_id
FROM     employees
WHERE    department_id IN (20, 50)
ORDER BY last_name ASC;
```

6) Modify `lab_02_03.sql` to list the last name and salary of employees who earn between $5,000 and $12,000, and are in department 20 or 50. Label the columns Employee and Monthly Salary, respectively. Save `lab_02_03.sql` as `lab_02_06.sql` again. Run the statement in `lab_02_06.sql`.

```
SELECT   last_name "Employee", salary "Monthly Salary"
FROM     employees
WHERE    salary  BETWEEN 5000 AND 12000
AND      department_id IN (20, 50);
```

7) The HR department needs a report that displays the last name and hire date for all employees who were hired in 1994.

```
SELECT   last_name, hire_date
FROM     employees
WHERE    hire_date LIKE '%94';
```

8) Create a report to display the last name and job title of all employees who do not have a manager.

```
SELECT   last_name, job_id
FROM     employees
WHERE    manager_id IS NULL;
```

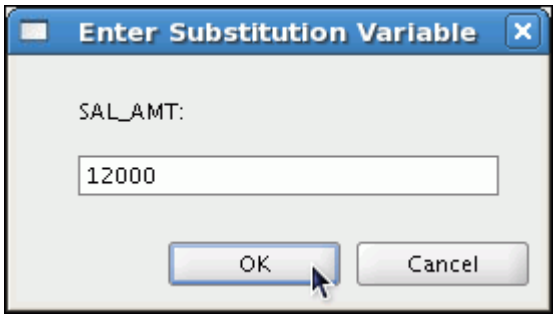
9) Create a report to display the last name, salary, and commission for all employees who earn commissions. Sort data in descending order of salary and commissions. Use the column's numeric position in the `ORDER BY` clause.

```
SELECT   last_name, salary, commission_pct
FROM     employees
WHERE    commission_pct IS NOT NULL
ORDER BY 2 DESC, 3 DESC;
```

10) Members of the HR department want to have more flexibility with the queries that you are writing. They would like a report that displays the last name and salary of employees who earn more than an amount that the user specifies after a prompt. (You can use the query created in practice exercise 1 and modify it.) Save this query to a file named `lab_02_10.sql`.

```
SELECT  last_name, salary
FROM    employees
WHERE   salary > &sal_amt;
```

Enter `12000` when prompted for a value in a dialog box. Click OK.



11) The HR department wants to run reports based on a manager. Create a query that prompts the user for a manager ID and generates the employee ID, last name, salary, and department for that manager's employees. The HR department wants the ability to sort the report on a selected column. You can test the data with the following values:

manager _id = 103, sorted by last_name
manager_id = 201, sorted by salary
manager_id = 124, sorted by employee_id

```
SELECT employee_id, last_name, salary, department_id
FROM employees
WHERE manager_id = &mgr_num
ORDER BY &order_col;
```

If you have the time, complete the following exercises:

12) Display all employee last names in which the third letter of the name is "a."

```
SELECT   last_name
FROM     employees
WHERE    last_name LIKE '__a%';
```

13) Display the last names of all employees who have both an "a" and an "e" in their last name.

```
SELECT   last_name
FROM     employees
WHERE    last_name LIKE '%a%'
AND      last_name LIKE '%e%';
```

If you want an extra challenge, complete the following exercises:

14) Display the last name, job, and salary for all employees whose job is that of a sales representative or a stock clerk, and whose salary is not equal to $2,500, $3,500, or $7,000.

```
SELECT   last_name, job_id, salary
FROM     employees
WHERE    job_id IN ('SA_REP', 'ST_CLERK')
AND      salary NOT IN (2500, 3500, 7000);
```

15) Modify `lab_02_06.sql` to display the last name, salary, and commission for all employees whose commission amount is 20%. Save `lab_02_06.sql` as `lab_02_15.sql` again. Rerun the statement in `lab_02_15.sql`.

```
SELECT   last_name "Employee", salary "Monthly Salary",
         commission_pct
FROM     employees
WHERE    commission_pct = .20;
```

Practices for Lesson 3

This practice provides a variety of exercises using different functions that are available for character, number, and date data types.

Practice 3-1: Using Single-Row Functions to Customize Output

1) Write a query to display the system date. Label the column `Date`.

   Note: If your database is remotely located in a different time zone, the output will be the date for the operating system on which the database resides.

	Date
1	10-JUN-09

2) The HR department needs a report to display the employee number, last name, salary, and salary increased by 15.5% (expressed as a whole number) for each employee. Label the column `New Salary`. Save your SQL statement in a file named `lab_03_02.sql`.

3) Run your query in the `lab_03_02.sql` file.

	EMPLOYEE_ID	LAST_NAME	SALARY	New Salary
1	200	Whalen	4400	5082
2	201	Hartstein	13000	15015
3	202	Fay	6000	6930
4	205	Higgins	12000	13860
5	206	Gietz	8300	9587

…

19	176	Taylor	8600	9933
20	178	Grant	7000	8085

4) Modify your query `lab_03_02.sql` to add a column that subtracts the old salary from the new salary. Label the column `Increase`. Save the contents of the file as `lab_03_04.sql`. Run the revised query.

	EMPLOYEE_ID	LAST_NAME	SALARY	New Salary	Increase
1	200	Whalen	4400	5082	682
2	201	Hartstein	13000	15015	2015
3	202	Fay	6000	6930	930
4	205	Higgins	12000	13860	1860
5	206	Gietz	8300	9587	1287

…

19	176	Taylor	8600	9933	1333
20	178	Grant	7000	8085	1085

Practice 3-1: Using Single-Row Functions to Customize Output (continued)

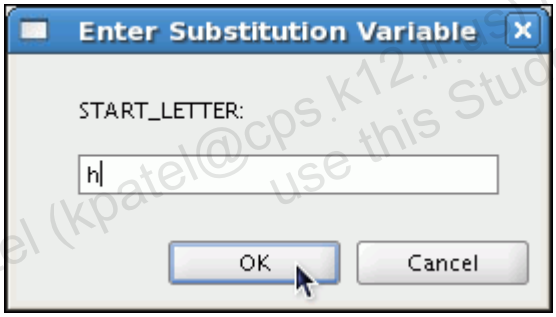
5) Write a query that displays the last name (with the first letter in uppercase and all the other letters in lowercase) and the length of the last name for all employees whose name starts with the letters "J," "A," or "M." Give each column an appropriate label. Sort the results by the employees' last names.

	Name	Length
1	Abel	4
2	Matos	5
3	Mourgos	7

Rewrite the query so that the user is prompted to enter a letter that the last name starts with. For example, if the user enters "H" (capitalized) when prompted for a letter, then the output should show all employees whose last name starts with the letter "H."

	Name	Length
1	Hartstein	9
2	Higgins	7
3	Hunold	6

Modify the query such that the case of the entered letter does not affect the output. The entered letter must be capitalized before being processed by the `SELECT` query.



	Name	Length
1	Hartstein	9
2	Higgins	7
3	Hunold	6

6) The HR department wants to find the duration of employment for each employee. For each employee, display the last name and calculate the number of months between today and the date on which the employee was hired. Label the column as `MONTHS_WORKED`. Order your results by the number of months employed. Round the number of months up to the closest whole number.

Note: Because this query depends on the date when it was executed, the values in the `MONTHS_WORKED` column will differ for you.

Practice 3-1: Using Single-Row Functions to Customize Output (continued)

	LAST_NAME	MONTHS_WORKED
1	Zlotkey	112
2	Mourgos	115
3	Grant	121
4	Lorentz	124
5	Vargas	131

...

19	Whalen	261
20	King	264

If you have time, complete the following exercises:

7) Create a query to display the last name and salary for all employees. Format the salary to be 15 characters long, left-padded with the $ symbol. Label the column `SALARY`.

	LAST_NAME	SALARY
1	Whalen	$$$$$$$$$$4400
2	Hartstein	$$$$$$$$$13000
3	Fay	$$$$$$$$$$6000
4	Higgins	$$$$$$$$$12000
5	Gietz	$$$$$$$$$$8300

...

19	Taylor	$$$$$$$$$$8600
20	Grant	$$$$$$$$$$7000

8) Create a query that displays the first eight characters of the employees' last names and indicates the amounts of their salaries with asterisks. Each asterisk signifies a thousand dollars. Sort the data in descending order of salary. Label the column `EMPLOYEES_AND_THEIR_SALARIES`.

	EMPLOYEES_AND_THEIR_SALARIES
1	King ************************
2	Kochhar ******************
3	De Haan ******************
4	Hartstei **************
5	Higgins **************

...

19	Matos	**
20	Vargas	**

Practice 3-1: Using Single-Row Functions to Customize Output (continued)

9) Create a query to display the last name and the number of weeks employed for all employees in department 90. Label the number of weeks column `TENURE`. Truncate the number of weeks value to 0 decimal places. Show the records in descending order of the employee's tenure.

   Note: The `TENURE` value will differ as it depends on the date on which you run the query.

	LAST_NAME	TENURE
1	King	1147
2	Kochhar	1028
3	De Haan	856

Practice Solutions 3-1: Using Single-Row Functions to Customize Output

1) Write a query to display the system date. Label the column `Date`.

   Note: If your database is remotely located in a different time zone, the output will be the date for the operating system on which the database resides.

```
SELECT  sysdate "Date"
FROM    dual;
```

2) The HR department needs a report to display the employee number, last name, salary, and salary increased by 15.5% (expressed as a whole number) for each employee. Label the column `New Salary`. Save your SQL statement in a file named `lab_03_02.sql`.

```
SELECT  employee_id, last_name, salary,
        ROUND(salary * 1.155, 0) "New Salary"
FROM    employees;
```

3) Run your query in the file `lab_03_02.sql`.

```
SELECT  employee_id, last_name, salary,
        ROUND(salary * 1.155, 0) "New Salary"
FROM    employees;
```

4) Modify your query `lab_03_02.sql` to add a column that subtracts the old salary from the new salary. Label the column `Increase`. Save the contents of the file as `lab_03_04.sql`. Run the revised query.

```
SELECT  employee_id, last_name, salary,
        ROUND(salary * 1.155, 0) "New Salary",
        ROUND(salary * 1.155, 0) - salary "Increase"
FROM    employees;
```

5) Write a query that displays the last name (with the first letter in uppercase and all the other letters in lowercase) and the length of the last name for all employees whose name starts with the letters “J,” “A,” or “M.” Give each column an appropriate label. Sort the results by the employees’ last names.

```
SELECT  INITCAP(last_name) "Name",
        LENGTH(last_name) "Length"
FROM    employees
WHERE   last_name LIKE 'J%'
OR      last_name LIKE 'M%'
OR      last_name LIKE 'A%'
ORDER BY last_name ;
```

Rewrite the query so that the user is prompted to enter a letter that starts the last name. For example, if the user enters `H` (capitalized) when prompted for a letter, then the output should show all employees whose last name starts with the letter “H.”

Practice Solutions 3-1: Using Single-Row Functions to Customize Output (continued)

```
SELECT  INITCAP(last_name) "Name",
        LENGTH(last_name) "Length"
FROM    employees
WHERE   last_name LIKE '&start_letter%'
ORDER BY last_name;
```

Modify the query such that the case of the entered letter does not affect the output. The entered letter must be capitalized before being processed by the SELECT query.

```
SELECT  INITCAP(last_name) "Name",
LENGTH(last_name) "Length"
FROM    employees
WHERE   last_name LIKE UPPER('&start_letter%' )
ORDER BY last_name;
```

6) The HR department wants to find the duration of employment for each employee. For each employee, display the last name and calculate the number of months between today and the date on which the employee was hired. Label the column MONTHS_WORKED. Order your results by the number of months employed. Round the number of months up to the closest whole number.

   Note: Because this query depends on the date when it was executed, the values in the MONTHS_WORKED column will differ for you.

```
SELECT last_name, ROUND(MONTHS_BETWEEN(
       SYSDATE, hire_date)) MONTHS_WORKED
FROM   employees
ORDER BY months_worked;
```

If you have the time, complete the following exercises:

7) Create a query to display the last name and salary for all employees. Format the salary to be 15 characters long, left-padded with the $ symbol. Label the column SALARY.

```
SELECT last_name,
       LPAD(salary, 15, '$') SALARY
FROM   employees;
```

8) Create a query that displays the first eight characters of the employees' last names and indicates the amounts of their salaries with asterisks. Each asterisk signifies a thousand dollars. Sort the data in descending order of salary. Label the column EMPLOYEES_AND_THEIR_SALARIES.

```
SELECT rpad(last_name, 8)||' '||
       rpad(' ', salary/1000+1, '*')
                EMPLOYEES_AND_THEIR_SALARIES
FROM  employees
ORDER BY salary DESC;
```

Practice Solutions 3-1: Using Single-Row Functions to Customize Output (continued)

9) Create a query to display the last name and the number of weeks employed for all employees in department 90. Label the number of weeks column `TENURE`. Truncate the number of weeks value to 0 decimal places. Show the records in descending order of the employee's tenure.

   Note: The `TENURE` value will differ as it depends on the date when you run the query.

```
SELECT last_name, trunc((SYSDATE-hire_date)/7) AS TENURE
FROM   employees
WHERE  department_id = 90
ORDER BY TENURE DESC
```

Practices for Lesson 4

This practice provides a variety of exercises using `TO_CHAR` and `TO_DATE` functions, and conditional expressions such as `DECODE` and `CASE`. Remember that for nested functions, the results are evaluated from the innermost function to the outermost function.

Practice 4-1: Using Conversion Functions and Conditional Expressions

1) Create a report that produces the following for each employee: `<employee last name>` earns `<salary> monthly but wants <3 times salary.>`. Label the column `Dream Salaries`.

	Dream Salaries
1	Whalen earns $4,400.00 monthly but wants $13,200.00.
2	Hartstein earns $13,000.00 monthly but wants $39,000.00.
3	Fay earns $6,000.00 monthly but wants $18,000.00.
4	Higgins earns $12,000.00 monthly but wants $36,000.00.
5	Gietz earns $8,300.00 monthly but wants $24,900.00.

...

19	Taylor earns $8,600.00 monthly but wants $25,800.00.
20	Grant earns $7,000.00 monthly but wants $21,000.00.

2) Display each employee's last name, hire date, and salary review date, which is the first Monday after six months of service. Label the column `REVIEW`. Format the dates to appear in the format similar to "Monday, the Thirty-First of July, 2000."

	LAST_NAME	HIRE_DATE	REVIEW
1	Whalen	17-SEP-87	Monday, the Twenty-First of March, 1988
2	Hartstein	17-FEB-96	Monday, the Nineteenth of August, 1996
3	Fay	17-AUG-97	Monday, the Twenty-Third of February, 1998
4	Higgins	07-JUN-94	Monday, the Twelfth of December, 1994
5	Gietz	07-JUN-94	Monday, the Twelfth of December, 1994

...

19	Taylor	24-MAR-98	Monday, the Twenty-Eighth of September, 1998
20	Grant	24-MAY-99	Monday, the Twenty-Ninth of November, 1999

3) Display the last name, hire date, and day of the week on which the employee started. Label the column `DAY`. Order the results by the day of the week, starting with Monday.

	LAST_NAME	HIRE_DATE	DAY
1	Grant	24-MAY-99	MONDAY
2	Ernst	21-MAY-91	TUESDAY
3	Taylor	24-MAR-98	TUESDAY
4	Rajs	17-OCT-95	TUESDAY
5	Mourgos	16-NOV-99	TUESDAY

...

19	Matos	15-MAR-98	SUNDAY
20	Fay	17-AUG-97	SUNDAY

Practice 4-1: Using Conversion Functions and Conditional Expressions (continued)

4) Create a query that displays the employees' last names and commission amounts. If an employee does not earn commission, show "No Commission." Label the column COMM.

	LAST_NAME	COMM
1	Whalen	No Commission
2	Hartstein	No Commission
3	Fay	No Commission
4	Higgins	No Commission
5	Gietz	No Commission

...

16	Vargas	No Commission
17	Zlotkey	.2
18	Abel	.3
19	Taylor	.2
20	Grant	.15

If you have time, complete the following exercises:

5) Using the DECODE function, write a query that displays the grade of all employees based on the value of the column JOB_ID, using the following data:

Job	*Grade*
AD_PRES	A
ST_MAN	B
IT_PROG	C
SA_REP	D
ST_CLERK	E
None of the above	0

	JOB_ID	GRADE
1	AC_ACCOUNT	0
2	AC_MGR	0
3	AD_ASST	0
4	AD_PRES	A
5	AD_VP	0
6	AD_VP	0
7	IT_PROG	C

...

14	SA_REP	D
15	SA_REP	D

...

19	ST_CLERK	E
20	ST_MAN	B

Practice 4-1: Using Conversion Functions and Conditional Expressions (continued)

6) Rewrite the statement in the preceding exercise by using the `CASE` syntax.

	JOB_ID	GRADE
1	AC_ACCOUNT	0
2	AC_MGR	0
3	AD_ASST	0
4	AD_PRES	A
5	AD_VP	0
6	AD_VP	0
7	IT_PROG	C

...

14	SA_REP	D
15	SA_REP	D

...

19	ST_CLERK	E
20	ST_MAN	B

Practice Solutions 4-1: Using Conversion Functions and Conditional Expressions

1) Create a report that produces the following for each employee: <*employee last name*> earns <*salary*> monthly but wants <*3 times salary.*>. Label the column `Dream Salaries`.

```
SELECT  last_name || ' earns '
        || TO_CHAR(salary, 'fm$99,999.00')
        || ' monthly but wants '
        || TO_CHAR(salary * 3, 'fm$99,999.00')
        || '.' "Dream Salaries"
FROM    employees;
```

2) Display each employee's last name, hire date, and salary review date, which is the first Monday after six months of service. Label the column `REVIEW`. Format the dates to appear in the format similar to "Monday, the Thirty-First of July, 2000."

```
SELECT last_name, hire_date,
       TO_CHAR(NEXT_DAY(ADD_MONTHS(hire_date, 6),'MONDAY'),
       'fmDay, "the" Ddspth "of" Month, YYYY') REVIEW
FROM    employees;
```

3) Display the last name, hire date, and day of the week on which the employee started. Label the column `DAY`. Order the results by the day of the week, starting with Monday.

```
SELECT last_name, hire_date,
       TO_CHAR(hire_date, 'DAY') DAY
FROM    employees
ORDER BY TO_CHAR(hire_date - 1, 'd');
```

4) Create a query that displays the employees' last names and commission amounts. If an employee does not earn commission, show "No Commission." Label the column `COMM`.

```
SELECT last_name,
       NVL(TO_CHAR(commission_pct), 'No Commission') COMM
FROM   employees;
```

5) Using the `DECODE` function, write a query that displays the grade of all employees based on the value of the `JOB_ID` column, using the following data:

Job	***Grade***
AD_PRES	A
ST_MAN	B
IT_PROG	C
SA_REP	D
ST_CLERK	E
None of the above	0

Practice Solutions 4-1: Using Conversion Functions and Conditional Expressions (continued)

```
SELECT job_id, decode (job_id,
                       'ST_CLERK',  'E',
                       'SA_REP',    'D',
                       'IT_PROG',   'C',
                       'ST_MAN',    'B',
                       'AD_PRES',   'A',
                       '0')GRADE
FROM employees;
```

6) Rewrite the statement in the preceding exercise by using the `CASE` syntax.

```
SELECT job_id, CASE job_id
               WHEN 'ST_CLERK' THEN 'E'
               WHEN 'SA_REP'   THEN 'D'
               WHEN 'IT_PROG'  THEN 'C'
               WHEN 'ST_MAN'   THEN 'B'
               WHEN 'AD_PRES'  THEN 'A'
               ELSE '0'  END  GRADE
FROM employees;
```

Practices for Lesson 5

At the end of this practice, you should be familiar with using group functions and selecting groups of data.

Practice 5-1: Reporting Aggregated Data Using the Group Functions

Determine the validity of the following three statements. Circle either True or False.

1) Group functions work across many rows to produce one result per group.
   True/False
2) Group functions include nulls in calculations.
   True/False
3) The `WHERE` clause restricts rows before inclusion in a group calculation.
   True/False

The HR department needs the following reports:

4) Find the highest, lowest, sum, and average salary of all employees. Label the columns `Maximum`, `Minimum`, `Sum`, and `Average`, respectively. Round your results to the nearest whole number. Save your SQL statement as `lab_05_04.sql`. Run the query.

	Maximum	Minimum	Sum	Average
1	24000	2500	175500	8775

5) Modify the query in `lab_05_04.sql` to display the minimum, maximum, sum, and average salary for each job type. Save `lab_05_04.sql` as `lab_05_05.sql` again. Run the statement in `lab_05_05.sql`.

	JOB_ID	Maximum	Minimum	Sum	Average
1	AC_MGR	12000	12000	12000	12000
2	AC_ACCOUNT	8300	8300	8300	8300
3	IT_PROG	9000	4200	19200	6400
4	ST_MAN	5800	5800	5800	5800
5	AD_ASST	4400	4400	4400	4400
6	AD_VP	17000	17000	34000	17000
7	MK_MAN	13000	13000	13000	13000
8	SA_MAN	10500	10500	10500	10500
9	MK_REP	6000	6000	6000	6000
10	AD_PRES	24000	24000	24000	24000
11	SA_REP	11000	7000	26600	8867
12	ST_CLERK	3500	2500	11700	2925

Practice 5-1: Reporting Aggregated Data Using the Group Functions (continued)

6) Write a query to display the number of people with the same job.

	JOB_ID	COUNT(*)
1	AC_ACCOUNT	1
2	AC_MGR	1
3	AD_ASST	1
4	AD_PRES	1
5	AD_VP	2
6	IT_PROG	3
7	MK_MAN	1
8	MK_REP	1
9	SA_MAN	1
10	SA_REP	3
11	ST_CLERK	4
12	ST_MAN	1

Generalize the query so that the user in the HR department is prompted for a job title. Save the script to a file named `lab_05_06.sql`. Run the query. Enter `IT_PROG` when prompted.

	JOB_ID	COUNT(*)
1	IT_PROG	3

7) Determine the number of managers without listing them. Label the column `Number of Managers`.
Hint: Use the `MANAGER_ID` column to determine the number of managers.

	Number of Managers
1	8

8) Find the difference between the highest and lowest salaries. Label the column `DIFFERENCE`.

	DIFFERENCE
1	21500

If you have time, complete the following exercises:

9) Create a report to display the manager number and the salary of the lowest-paid employee for that manager. Exclude anyone whose manager is not known. Exclude any groups where the minimum salary is $6,000 or less. Sort the output in descending order of salary.

	MANAGER_ID	MIN(SALARY)
1	102	9000
2	205	8300
3	149	7000

Practice 5-1: Reporting Aggregated Data Using the Group Functions (continued)

If you want an extra challenge, complete the following exercises:

10) Create a query to display the total number of employees and, of that total, the number of employees hired in 1995, 1996, 1997, and 1998. Create appropriate column headings.

	TOTAL	1995	1996	1997	1998
1	20	1	2	2	3

11) Create a matrix query to display the job, the salary for that job based on department number, and the total salary for that job, for departments 20, 50, 80, and 90, giving each column an appropriate heading.

	Job	Dept 20	Dept 50	Dept 80	Dept 90	Total
1	AC_MGR	(null)	(null)	(null)	(null)	12000
2	AC_ACCOUNT	(null)	(null)	(null)	(null)	8300
3	IT_PROG	(null)	(null)	(null)	(null)	19200
4	ST_MAN	(null)	5800	(null)	(null)	5800
5	AD_ASST	(null)	(null)	(null)	(null)	4400
6	AD_VP	(null)	(null)	(null)	34000	34000
7	MK_MAN	13000	(null)	(null)	(null)	13000
8	SA_MAN	(null)	(null)	10500	(null)	10500
9	MK_REP	6000	(null)	(null)	(null)	6000
10	AD_PRES	(null)	(null)	(null)	24000	24000
11	SA_REP	(null)	(null)	19600	(null)	26600
12	ST_CLERK	(null)	11700	(null)	(null)	11700

Practice Solutions 5-1: Reporting Aggregated Data Using the Group Functions

Determine the validity of the following three statements. Circle either True or False.

1) Group functions work across many rows to produce one result per group.
   True/False
2) Group functions include nulls in calculations.
   True/**False**
3) The `WHERE` clause restricts rows before inclusion in a group calculation.
   True/False

The HR department needs the following reports:

4) Find the highest, lowest, sum, and average salary of all employees. Label the columns `Maximum`, `Minimum`, `Sum`, and `Average`, respectively. Round your results to the nearest whole number. Save your SQL statement as `lab_05_04.sql`. Run the query.

```
SELECT ROUND(MAX(salary),0) "Maximum",
       ROUND(MIN(salary),0) "Minimum",
       ROUND(SUM(salary),0) "Sum",
       ROUND(AVG(salary),0) "Average"
FROM   employees;
```

5) Modify the query in `lab_05_04.sql` to display the minimum, maximum, sum, and average salary for each job type. Save `lab_05_04.sql` as `lab_05_05.sql` again. Run the statement in `lab_05_05.sql`.

```
SELECT job_id, ROUND(MAX(salary),0) "Maximum",
               ROUND(MIN(salary),0) "Minimum",
               ROUND(SUM(salary),0) "Sum",
               ROUND(AVG(salary),0) "Average"
FROM   employees
GROUP BY job_id;
```

6) Write a query to display the number of people with the same job.

```
SELECT job_id, COUNT(*)
FROM   employees
GROUP BY job_id;
```

Generalize the query so that the user in the HR department is prompted for a job title. Save the script to a file named `lab_05_06.sql`. Run the query. Enter `IT_PROG` when prompted and click OK.

```
SELECT job_id, COUNT(*)
FROM   employees
WHERE  job_id = '&job_title'
GROUP BY job_id;
```

Practice Solutions 5-1: Reporting Aggregated Data Using the Group Functions (continued)

7) Determine the number of managers without listing them. Label the column `Number of Managers`.
Hint: Use the `MANAGER_ID` column to determine the number of managers.

```
SELECT COUNT(DISTINCT manager_id) "Number of Managers"
FROM   employees;
```

8) Find the difference between the highest and lowest salaries. Label the column `DIFFERENCE`.

```
SELECT   MAX(salary) - MIN(salary) DIFFERENCE
FROM     employees;
```

If you have the time, complete the following exercises:

9) Create a report to display the manager number and the salary of the lowest-paid employee for that manager. Exclude anyone whose manager is not known. Exclude any groups where the minimum salary is $6,000 or less. Sort the output in descending order of salary.

```
SELECT   manager_id, MIN(salary)
FROM     employees
WHERE    manager_id IS NOT NULL
GROUP BY manager_id
HAVING   MIN(salary) > 6000
ORDER BY MIN(salary) DESC;
```

If you want an extra challenge, complete the following exercises:

10) Create a query that will display the total number of employees and, of that total, the number of employees hired in 1995, 1996, 1997, and 1998. Create appropriate column headings.

```
SELECT  COUNT(*) total,
        SUM(DECODE(TO_CHAR(hire_date,
'YYYY'),1995,1,0))"1995",
        SUM(DECODE(TO_CHAR(hire_date,
'YYYY'),1996,1,0))"1996",
        SUM(DECODE(TO_CHAR(hire_date,
'YYYY'),1997,1,0))"1997",
        SUM(DECODE(TO_CHAR(hire_date, 'YYYY'),1998,1,0))"1998"
FROM    employees;
```

Practice Solutions 5-1: Reporting Aggregated Data Using the Group Functions (continued)

11) Create a matrix query to display the job, the salary for that job based on the department number, and the total salary for that job, for departments 20, 50, 80, and 90, giving each column an appropriate heading.

```
SELECT   job_id "Job",
         SUM(DECODE(department_id , 20, salary)) "Dept 20",
         SUM(DECODE(department_id , 50, salary)) "Dept 50",
         SUM(DECODE(department_id , 80, salary)) "Dept 80",
         SUM(DECODE(department_id , 90, salary)) "Dept 90",
         SUM(salary) "Total"
FROM     employees
GROUP BY job_id;
```

Practices for Lesson 6

This practice is intended to give you experience in extracting data from more than one table using the SQL:1999–compliant joins.

Practice 6-1: Displaying Data from Multiple Tables Using Joins

1) Write a query for the HR department to produce the addresses of all the departments. Use the `LOCATIONS` and `COUNTRIES` tables. Show the location ID, street address, city, state or province, and country in the output. Use a `NATURAL JOIN` to produce the results.

	LOCATION_ID	STREET_ADDRESS	CITY	STATE_PROVINCE	COUNTRY_NAME
1	1400	2014 Jabberwocky Rd	Southlake	Texas	United States of America
2	1500	2011 Interiors Blvd	South San Francisco	California	United States of America
3	1700	2004 Charade Rd	Seattle	Washington	United States of America
4	1800	460 Bloor St. W.	Toronto	Ontario	Canada
5	2500	Magdalen Centre, The Oxford Science Park	Oxford	Oxford	United Kingdom

2) The HR department needs a report of only those employees with corresponding departments. Write a query to display the last name, department number, and department name for these employees.

	LAST_NAME	DEPARTMENT_ID	DEPARTMENT_NAME
1	Whalen	10	Administration
2	Hartstein	20	Marketing
3	Fay	20	Marketing
4	Davies	50	Shipping
5	Vargas	50	Shipping

…

18	Higgins	110	Accounting
19	Gietz	110	Accounting

3) The HR department needs a report of employees in Toronto. Display the last name, job, department number, and the department name for all employees who work in Toronto.

	LAST_NAME	JOB_ID	DEPARTMENT_ID	DEPARTMENT_NAME
1	Hartstein	MK_MAN	20	Marketing
2	Fay	MK_REP	20	Marketing

4) Create a report to display employees' last name and employee number along with their manager's last name and manager number. Label the columns `Employee`, `Emp#`, `Manager`, and `Mgr#`, respectively. Save your SQL statement as `lab_06_04.sql`. Run the query.

	Employee	EMP#	Manager	Mgr#
1	Hunold	103	De Haan	102
2	Fay	202	Hartstein	201
3	Gietz	206	Higgins	205
4	Lorentz	107	Hunold	103
5	Ernst	104	Hunold	103

…

Practice 6-1: Displaying Data from Multiple Tables Using Joins (continued)

18	Taylor	176	Zlotkey	149
19	Abel	174	Zlotkey	149

5) Modify `lab_06_04.sql` to display all employees including King, who has no manager. Order the results by the employee number. Save your SQL statement as `lab_06_05.sql`. Run the query in `lab_06_05.sql`.

	Employee	EMP#	Manager	Mgr#
1	King	100	(null)	(null)
2	Kochhar	101	King	100
3	De Haan	102	King	100
4	Hunold	103	De Haan	102
5	Ernst	104	Hunold	103

...

19	Higgins	205	Kochhar	101
20	Gietz	206	Higgins	205

6) Create a report for the HR department that displays employee last names, department numbers, and all the employees who work in the same department as a given employee. Give each column an appropriate label. Save the script to a file named `lab_06_06.sql`.

	DEPARTMENT	EMPLOYEE	COLLEAGUE
1	20	Fay	Hartstein
2	20	Hartstein	Fay
3	50	Davies	Matos
4	50	Davies	Mourgos
5	50	Davies	Rajs

...

41	110	Gietz	Higgins
42	110	Higgins	Gietz

7) The HR department needs a report on job grades and salaries. To familiarize yourself with the `JOB_GRADES` table, first show the structure of the `JOB_GRADES` table. Then create a query that displays the name, job, department name, salary, and grade for all employees.

```
DESC JOB_GRADES
Name                           Null     Type
------------------------------ -------- --------------
GRADE_LEVEL                             VARCHAR2(3)
LOWEST_SAL                              NUMBER
HIGHEST_SAL                             NUMBER

3 rows selected
```

Practice 6-1: Displaying Data from Multiple Tables Using Joins (continued)

	LAST_NAME	JOB_ID	DEPARTMENT_NAME	SALARY	GRADE_LEVEL
1	King	AD_PRES	Executive	24000	E
2	Kochhar	AD_VP	Executive	17000	E
3	De Haan	AD_VP	Executive	17000	E
4	Hartstein	MK_MAN	Marketing	13000	D
5	Higgins	AC_MGR	Accounting	12000	D

...

18	Matos	ST_CLERK	Shipping	2600	A
19	Vargas	ST_CLERK	Shipping	2500	A

If you want an extra challenge, complete the following exercises:

8) The HR department wants to determine the names of all the employees who were hired after Davies. Create a query to display the name and hire date of any employee hired after employee Davies.

	LAST_NAME	HIRE_DATE
1	Fay	17-AUG-97
2	Lorentz	07-FEB-99
3	Mourgos	16-NOV-99
4	Matos	15-MAR-98
5	Vargas	09-JUL-98
6	Zlotkey	29-JAN-00
7	Taylor	24-MAR-98
8	Grant	24-MAY-99

9) The HR department needs to find the names and hire dates of all the employees who were hired before their managers, along with their managers' names and hire dates. Save the script to a file named `lab_06_09.sql`.

	LAST_NAME	HIRE_DATE	LAST_NAME_1	HIRE_DATE_1
1	Whalen	17-SEP-87	Kochhar	21-SEP-89
2	Hunold	03-JAN-90	De Haan	13-JAN-93
3	Vargas	09-JUL-98	Mourgos	16-NOV-99
4	Matos	15-MAR-98	Mourgos	16-NOV-99
5	Davies	29-JAN-97	Mourgos	16-NOV-99
6	Rajs	17-OCT-95	Mourgos	16-NOV-99
7	Grant	24-MAY-99	Zlotkey	29-JAN-00
8	Taylor	24-MAR-98	Zlotkey	29-JAN-00
9	Abel	11-MAY-96	Zlotkey	29-JAN-00

Practice Solutions 6-1: Displaying Data from Multiple Tables Using Joins

1) Write a query for the HR department to produce the addresses of all the departments. Use the `LOCATIONS` and `COUNTRIES` tables. Show the location ID, street address, city, state or province, and country in the output. Use a `NATURAL JOIN` to produce the results.

```
SELECT location_id, street_address, city, state_province,
country_name
FROM   locations
NATURAL JOIN  countries;
```

2) The HR department needs a report of all employees. Write a query to display the last name, department number, and department name for all the employees.

```
SELECT last_name, department_id, department_name
FROM   employees
JOIN   departments
USING (department_id);
```

3) The HR department needs a report of employees in Toronto. Display the last name, job, department number, and department name for all employees who work in Toronto.

```
SELECT e.last_name, e.job_id, e.department_id,
d.department_name
FROM   employees e JOIN departments d
ON     (e.department_id = d.department_id)
JOIN   locations l
ON     (d.location_id = l.location_id)
WHERE LOWER(l.city) = 'toronto';
```

4) Create a report to display employees' last names and employee number along with their managers' last names and manager number. Label the columns `Employee`, `Emp#`, `Manager`, and `Mgr#`, respectively. Save your SQL statement as `lab_06_04.sql`. Run the query.

```
SELECT w.last_name "Employee", w.employee_id "EMP#",
       m.last_name "Manager", m.employee_id  "Mgr#"
FROM   employees w join employees m
ON     (w.manager_id = m.employee_id);
```

5) Modify `lab_06_04.sql` to display all employees including King, who has no manager. Order the results by the employee number. Save your SQL statement as `lab_06_05.sql`. Run the query in `lab_06_05.sql`.

```
SELECT w.last_name "Employee", w.employee_id "EMP#",
       m.last_name "Manager", m.employee_id  "Mgr#"
FROM   employees w
LEFT   OUTER JOIN employees m
ON     (w.manager_id = m.employee_id)
ORDER BY 2;
```

Practice Solutions 6-1: Displaying Data from Multiple Tables Using Joins (continued)

6) Create a report for the HR department that displays employee last names, department numbers, and all the employees who work in the same department as a given employee. Give each column an appropriate label. Save the script to a file named `lab_06_06.sql`. Run the query.

```
SELECT e.department_id department, e.last_name employee,
       c.last_name colleague
FROM   employees e JOIN employees c
ON     (e.department_id = c.department_id)
WHERE  e.employee_id <> c.employee_id
ORDER BY e.department_id, e.last_name, c.last_name;
```

7) The HR department needs a report on job grades and salaries. To familiarize yourself with the `JOB_GRADES` table, first show the structure of the `JOB_GRADES` table. Then create a query that displays the name, job, department name, salary, and grade for all employees.

```
DESC JOB_GRADES

SELECT e.last_name, e.job_id, d.department_name,
       e.salary, j.grade_level
FROM   employees e JOIN departments d
ON     (e.department_id = d.department_id)
JOIN   job_grades j
ON    (e.salary BETWEEN j.lowest_sal AND j.highest_sal);
```

If you want an extra challenge, complete the following exercises:

8) The HR department wants to determine the names of all employees who were hired after Davies. Create a query to display the name and hire date of any employee hired after employee Davies.

```
SELECT e.last_name, e.hire_date
FROM   employees e JOIN employees davies
ON     (davies.last_name = 'Davies')
WHERE  davies.hire_date < e.hire_date;
```

9) The HR department needs to find the names and hire dates for all employees who were hired before their managers, along with their managers' names and hire dates. Save the script to a file named `lab_06_09.sql`.

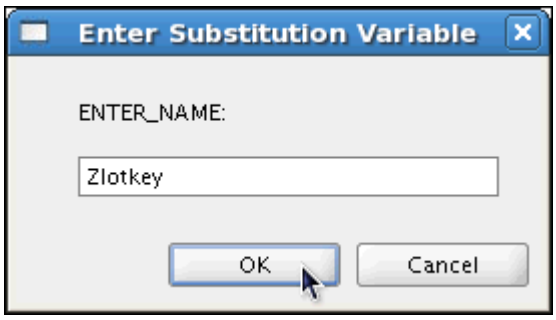
```
SELECT w.last_name, w.hire_date, m.last_name, m.hire_date
FROM   employees w JOIN employees m
ON    (w.manager_id = m.employee_id)
WHERE    w.hire_date <  m.hire_date;
```

Practices for Lesson 7

In this practice, you write complex queries using nested `SELECT` statements.
For practice questions, you may want to create the inner query first. Make sure that it runs and produces the data that you anticipate before you code the outer query.

Practice 7-1: Using Subqueries to Solve Queries

1) The HR department needs a query that prompts the user for an employee last name. The query then displays the last name and hire date of any employee in the same department as the employee whose name they supply (excluding that employee). For example, if the user enters `Zlotkey`, find all employees who work with Zlotkey (excluding Zlotkey).



	LAST_NAME	HIRE_DATE
1	Abel	11-MAY-96
2	Taylor	24-MAR-98

2) Create a report that displays the employee number, last name, and salary of all employees who earn more than the average salary. Sort the results in order of ascending salary.

	EMPLOYEE_ID	LAST_NAME	SALARY
1	103	Hunold	9000
2	149	Zlotkey	10500
3	174	Abel	11000
4	205	Higgins	12000
5	201	Hartstein	13000
6	102	De Haan	17000
7	101	Kochhar	17000
8	100	King	24000

3) Write a query that displays the employee number and last name of all employees who work in a department with any employee whose last name contains the letter "u." Save your SQL statement as `lab_07_03.sql`. Run your query.

	EMPLOYEE_ID	LAST_NAME
1	124	Mourgos
2	141	Rajs
3	142	Davies
4	143	Matos
5	144	Vargas
6	103	Hunold
7	104	Ernst
8	107	Lorentz

Practice 7-1: Using Subqueries to Solve Queries (continued)

4) The HR department needs a report that displays the last name, department number, and job ID of all employees whose department location ID is 1700.

	LAST_NAME	DEPARTMENT_ID	JOB_ID
1	Whalen	10	AD_ASST
2	King	90	AD_PRES
3	Kochhar	90	AD_VP
4	De Haan	90	AD_VP
5	Higgins	110	AC_MGR
6	Gietz	110	AC_ACCOUNT

Modify the query so that the user is prompted for a location ID. Save this to a file named `lab_07_04.sql`.

5) Create a report for HR that displays the last name and salary of every employee who reports to King.

	LAST_NAME	SALARY
1	Hartstein	13000
2	Kochhar	17000
3	De Haan	17000
4	Mourgos	5800
5	Zlotkey	10500

6) Create a report for HR that displays the department number, last name, and job ID for every employee in the Executive department.

	DEPARTMENT_ID	LAST_NAME	JOB_ID
1	90	King	AD_PRES
2	90	Kochhar	AD_VP
3	90	De Haan	AD_VP

7) Create a report that displays a list of all employees whose salary is more than the salary of any employee from department 60.

If you have the time, complete the following exercise:

8) Modify the query in `lab_07_03.sql` to display the employee number, last name, and salary of all employees who earn more than the average salary, and who work in a department with any employee whose last name contains a "u." Save `lab_07_03.sql` as `lab_07_08.sql` again. Run the statement in `lab_07_08.sql`.

	EMPLOYEE_ID	LAST_NAME	SALARY
1	103	Hunold	9000

Practice Solutions 7-1: Using Subqueries to Solve Queries

1) The HR department needs a query that prompts the user for an employee last name. The query then displays the last name and hire date of any employee in the same department as the employee whose name they supply (excluding that employee). For example, if the user enters `Zlotkey`, find all employees who work with Zlotkey (excluding Zlotkey).

```
UNDEFINE Enter_name

SELECT last_name, hire_date
FROM   employees
WHERE  department_id = (SELECT department_id
                        FROM   employees
                        WHERE  last_name = '&&Enter_name')
AND    last_name <> '&Enter_name';
```

2) Create a report that displays the employee number, last name, and salary of all employees who earn more than the average salary. Sort the results in order of ascending salary.

```
SELECT employee_id, last_name, salary
FROM   employees
WHERE  salary > (SELECT AVG(salary)
                 FROM   employees)
ORDER BY salary;
```

3) Write a query that displays the employee number and last name of all employees who work in a department with any employee whose last name contains a "u." Save your SQL statement as `lab_07_03.sql`. Run your query.

```
SELECT employee_id, last_name
FROM   employees
WHERE  department_id IN (SELECT department_id
                         FROM   employees
                         WHERE  last_name like '%u%');
```

4) The HR department needs a report that displays the last name, department number, and job ID of all employees whose department location ID is 1700.

```
SELECT last_name, department_id, job_id
FROM   employees
WHERE  department_id IN (SELECT department_id
                         FROM   departments
                         WHERE  location_id = 1700);
```

Practice Solutions 7-1: Using Subqueries to Solve Queries (continued)

Modify the query so that the user is prompted for a location ID. Save this to a file named `lab_07_04.sql`.

```
SELECT last_name, department_id, job_id
FROM   employees
WHERE  department_id IN (SELECT department_id
                         FROM   departments
                         WHERE  location_id =
&Enter_location);
```

5) Create a report for HR that displays the last name and salary of every employee who reports to King.

```
SELECT last_name, salary
FROM   employees
WHERE  manager_id = (SELECT employee_id
                     FROM   employees
                     WHERE  last_name = 'King');
```

6) Create a report for HR that displays the department number, last name, and job ID for every employee in the Executive department.

```
SELECT department_id, last_name, job_id
FROM   employees
WHERE  department_id IN (SELECT department_id
                         FROM   departments
                         WHERE  department_name =
'Executive');
```

7) Create a report that displays a list of all employees whose salary is more than the salary of any employee from department 60.

```
SELECT last_name FROM employees
WHERE salary > ANY (SELECT salary
                    FROM employees
                    WHERE department_id=60);
```

If you have the time, complete the following exercise:

8) Modify the query in `lab_07_03.sql` to display the employee number, last name, and salary of all employees who earn more than the average salary and who work in a department with any employee whose last name contains a "u." Save `lab_07_03.sql` to `lab_07_08.sql` again. Run the statement in `lab_07_08.sql`.

```
SELECT employee_id, last_name, salary
FROM   employees
WHERE  department_id IN (SELECT department_id
                         FROM   employees
                         WHERE  last_name like '%u%')
AND    salary > (SELECT AVG(salary)
                 FROM   employees);
```

Practices for Lesson 8

In this practice, you write queries using the set operators.

Practice 8-1: Using the Set Operators

1) The HR department needs a list of department IDs for departments that do not contain the job ID `ST_CLERK`. Use the set operators to create this report.

	DEPARTMENT_ID
1	10
2	20
3	60
4	80
5	90
6	110
7	190

2) The HR department needs a list of countries that have no departments located in them. Display the country ID and the name of the countries. Use the set operators to create this report.

	COUNTRY_ID	COUNTRY_NAME
1	DE	Germany

3) Produce a list of jobs for departments 10, 50, and 20, in that order. Display the job ID and department ID by using the set operators.

	JOB_ID	DEPARTMENT_ID
1	AD_ASST	10
2	ST_MAN	50
3	ST_CLERK	50
4	MK_MAN	20
5	MK_REP	20

4) Create a report that lists the employee IDs and job IDs of those employees who currently have a job title that is the same as their job title when they were initially hired by the company (that is, they changed jobs, but have now gone back to doing their original job).

	EMPLOYEE_ID	JOB_ID
1	176	SA_REP
2	200	AD_ASST

5) The HR department needs a report with the following specifications:

- Last name and department ID of all employees from the `EMPLOYEES` table, regardless of whether or not they belong to a department
- Department ID and department name of all departments from the `DEPARTMENTS` table, regardless of whether or not they have employees working in them

Write a compound query to accomplish this.

	LAST_NAME	DEPARTMENT_ID	TO_CHAR(NULL)
1	Abel	80	(null)
2	Davies	50	(null)
3	De Haan	90	(null)
4	Ernst	60	(null)
5	Fay	20	(null)
6	Gietz	110	(null)
7	Grant	(null)	(null)
8	Hartstein	20	(null)
9	Higgins	110	(null)
10	Hunold	60	(null)
11	King	90	(null)
12	Kochhar	90	(null)
13	Lorentz	60	(null)
14	Matos	50	(null)
15	Mourgos	50	(null)
16	Rajs	50	(null)
17	Taylor	80	(null)
18	Vargas	50	(null)
19	Whalen	10	(null)
20	Zlotkey	80	(null)
21	(null)	10	Administration
22	(null)	20	Marketing
23	(null)	50	Shipping
24	(null)	60	IT
25	(null)	80	Sales
26	(null)	90	Executive
27	(null)	110	Accounting
28	(null)	190	Contracting

Practice Solutions 8-1: Using the Set Operators

1) The HR department needs a list of department IDs for departments that do not contain the job ID `ST_CLERK`. Use the set operators to create this report.

```
SELECT department_id
FROM   departments
MINUS
SELECT department_id
FROM   employees
WHERE  job_id = 'ST_CLERK';
```

2) The HR department needs a list of countries that have no departments located in them. Display the country ID and the name of the countries. Use the set operators to create this report.

```
SELECT country_id,country_name
FROM countries
MINUS
SELECT l.country_id,c.country_name
FROM locations l JOIN countries c
ON (l.country_id = c.country_id)
JOIN departments d
ON d.location_id=l.location_id;
```

3) Produce a list of jobs for departments 10, 50, and 20, in that order. Display job ID and department ID using the set operators.

```
SELECT distinct job_id, department_id
FROM employees
WHERE department_id = 10
UNION ALL
SELECT DISTINCT job_id, department_id
FROM employees
WHERE department_id = 50
UNION ALL
SELECT DISTINCT job_id, department_id
FROM employees
WHERE department_id = 20
```

4) Create a report that lists the employee IDs and job IDs of those employees who currently have a job title that is the same as their job title when they were initially hired by the company (that is, they changed jobs, but have now gone back to doing their original job).

```
SELECT    employee_id,job_id
FROM      employees
INTERSECT
SELECT   employee_id,job_id
FROM     job_history;
```

5) The HR department needs a report with the following specifications:

- Last name and department ID of all the employees from the `EMPLOYEES` table, regardless of whether or not they belong to a department
- Department ID and department name of all the departments from the `DEPARTMENTS` table, regardless of whether or not they have employees working in them

Write a compound query to accomplish this.

```
SELECT last_name,department_id,TO_CHAR(null)
FROM   employees
UNION
SELECT TO_CHAR(null),department_id,department_name
FROM  departments;
```

Practices for Lesson 9

In this practice, you add rows to the `MY_EMPLOYEE` table, update and delete data from the table, and control your transactions. You run a script to create the `MY_EMPLOYEE` table.

Practice 9-1: Manipulating Data

The HR department wants you to create SQL statements to insert, update, and delete employee data. As a prototype, you use the MY_EMPLOYEE table before giving the statements to the HR department.

Note: For all the DML statements, use the Run Script icon (or press [F5]) to execute the query. This way you get to see the feedback messages on the Script Output tabbed page. For SELECT queries, continue to use the Execute Statement icon or press [F9] to get the formatted output on the Results tabbed page.

Insert data into the MY_EMPLOYEE table.

1) Run the statement in the lab_09_01.sql script to build the MY_EMPLOYEE table used in this practice.

2) Describe the structure of the MY_EMPLOYEE table to identify the column names.

```
DESCRIBE my_employee
Name                          Null     Type
----------------------------- -------- --------------
ID                            NOT NULL NUMBER(4)
LAST_NAME                              VARCHAR2(25)
FIRST_NAME                             VARCHAR2(25)
USERID                                 VARCHAR2(8)
SALARY                                 NUMBER(9,2)

5 rows selected
```

ID	LAST_NAME	FIRST_NAME	USERID	SALARY
1	Patel	Ralph	rpatel	895
2	Dancs	Betty	bdancs	860
3	Biri	Ben	bbiri	1100
4	Newman	Chad	cnewman	750
5	Ropeburn	Audrey	aropebur	1550

3) Create an INSERT statement to add the *first row* of data to the MY_EMPLOYEE table from the following sample data. Do not list the columns in the INSERT clause. *Do not enter all rows yet.*

Practice 9-1: Manipulating Data (continued)

4) Populate the `MY_EMPLOYEE` table with the second row of the sample data from the preceding list. This time, list the columns explicitly in the `INSERT` clause.

5) Confirm your addition to the table.

	ID	LAST_NAME	FIRST_NAME	USERID	SALARY
1	1	Patel	Ralph	rpatel	895
2	2	Dancs	Betty	bdancs	860

6) Write an `INSERT` statement in a dynamic reusable script file to load the remaining rows into the `MY_EMPLOYEE` table. The script should prompt for all the columns (`ID`, `LAST_NAME`, `FIRST_NAME`, `USERID`, and `SALARY`). Save this script to a `lab_09_06.sql` file.

7) Populate the table with the next two rows of the sample data listed in step 3 by running the `INSERT` statement in the script that you created.

8) Confirm your additions to the table.

	ID	LAST_NAME	FIRST_NAME	USERID	SALARY
1	1	Patel	Ralph	rpatel	895
2	2	Dancs	Betty	bdancs	860
3	3	Biri	Ben	bbiri	1100
4	4	Newman	Chad	cnewman	750

9) Make the data additions permanent.

Update and delete data in the `MY_EMPLOYEE` table.

10) Change the last name of employee 3 to Drexler.

11) Change the salary to $1,000 for all employees who have a salary less than $900.

12) Verify your changes to the table.

	ID	LAST_NAME	FIRST_NAME	USERID	SALARY
1	1	Patel	Ralph	rpatel	1000
2	2	Dancs	Betty	bdancs	1000
3	3	Drexler	Ben	bbiri	1100
4	4	Newman	Chad	cnewman	1000

13) Delete Betty Dancs from the `MY_EMPLOYEE` table.

14) Confirm your changes to the table.

	ID	LAST_NAME	FIRST_NAME	USERID	SALARY
1	1	Patel	Ralph	rpatel	1000
2	3	Drexler	Ben	bbiri	1100
3	4	Newman	Chad	cnewman	1000

15) Commit all pending changes.

Control data transaction to the `MY_EMPLOYEE` table.

16) Populate the table with the last row of the sample data listed in step 3 by using the statements in the script that you created in step 6. Run the statements in the script.

17) Confirm your addition to the table.

	ID	LAST_NAME	FIRST_NAME	USERID	SALARY
1	1	Patel	Ralph	rpatel	1000
2	3	Drexler	Ben	bbiri	1100
3	4	Newman	Chad	cnewman	1000
4	5	Ropeburn	Audrey	aropebur	1550

18) Mark an intermediate point in the processing of the transaction.

19) Delete all the rows from the `MY_EMPLOYEE` table.

20) Confirm that the table is empty.

21) Discard the most recent `DELETE` operation without discarding the earlier `INSERT` operation.

22) Confirm that the new row is still intact.

	ID	LAST_NAME	FIRST_NAME	USERID	SALARY
1	1	Patel	Ralph	rpatel	1000
2	3	Drexler	Ben	bbiri	1100
3	4	Newman	Chad	cnewman	1000
4	5	Ropeburn	Audrey	aropebur	1550

23) Make the data addition permanent.

If you have the time, complete the following exercise:

24) Modify the `lab_09_06.sql` script such that the `USERID` is generated automatically by concatenating the first letter of the first name and the first seven characters of the last name. The generated `USERID` must be in lowercase. Therefore, the script should not prompt for the `USERID`. Save this script to a file named `lab_09_24.sql`.

ID	LAST_NAME	FIRST_NAME	USERID	SALARY
6	Anthony	Mark	manthony	1230

Practice 9-1: Manipulating Data (continued)

25) Run the `lab_09_24.sql` script to insert the following record:

26) Confirm that the new row was added with correct `USERID`.

	ID	LAST_NAME	FIRST_NAME	USERID	SALARY
1	6	Anthony	Mark	manthony	1230

Practice Solutions 9-1: Manipulating Data

Insert data into the MY_EMPLOYEE table.

1) Run the statement in the lab_09_01.sql script to build the MY_EMPLOYEE table used in this practice.
   a) From File menu, select Open. In the Open dialog box, navigate to the /home/oracle/labs/sql1/labs folder, and then double-click lab_09_01.sql.
   b) After the statement is opened in a SQL Worksheet, click the Run Script icon to run the script. You get a Create Table succeeded message on the Script Output tabbed page.

2) Describe the structure of the MY_EMPLOYEE table to identify the column names.

```
DESCRIBE my_employee
```

3) Create an INSERT statement to add the first row of data to the MY_EMPLOYEE table from the following sample data. Do not list the columns in the INSERT clause.

ID	LAST_NAME	FIRST_NAME	USERID	SALARY
1	Patel	Ralph	rpatel	895
2	Dancs	Betty	bdancs	860
3	Biri	Ben	bbiri	1100
4	Newman	Chad	cnewman	750
5	Ropeburn	Audrey	aropebur	1550

```
INSERT INTO my_employee
  VALUES (1, 'Patel', 'Ralph', 'rpatel', 895);
```

4) Populate the MY_EMPLOYEE table with the second row of the sample data from the preceding list. This time, list the columns explicitly in the INSERT clause.

```
INSERT INTO my_employee (id, last_name, first_name,
                         userid, salary)
  VALUES (2, 'Dancs', 'Betty', 'bdancs', 860);
```

5) Confirm your additions to the table.

```
SELECT   *
FROM     my_employee;
```

6) Write an INSERT statement in a dynamic reusable script file to load the remaining rows into the MY_EMPLOYEE table. The script should prompt for all the columns (ID, LAST_NAME, FIRST_NAME, USERID, and SALARY). Save this script to a file named lab_09_06.sql.

```
INSERT INTO my_employee
VALUES (&p_id, '&p_last_name', '&p_first_name',
        '&p_userid', &p_salary);
```

7) Populate the table with the next two rows of sample data listed in step 3 by running the INSERT statement in the script that you created.

```
INSERT INTO my_employee
VALUES (&p_id, '&p_last_name', '&p_first_name',
       '&p_userid', &p_salary);
```

8) Confirm your additions to the table.

```
SELECT   *
FROM my_employee;
```

9) Make the data additions permanent.

```
COMMIT;
```

Update and delete data in the MY_EMPLOYEE table.

10) Change the last name of employee 3 to Drexler.

```
UPDATE  my_employee
SET     last_name = 'Drexler'
WHERE   id = 3;
```

11) Change the salary to $1,000 for all employees with a salary less than $900.

```
UPDATE  my_employee
SET     salary = 1000
WHERE   salary < 900;
```

12) Verify your changes to the table.

```
SELECT  *
FROM    my_employee;
```

13) Delete Betty Dancs from the MY_EMPLOYEE table.

```
DELETE
FROM  my_employee
WHERE last_name = 'Dancs';
```

14) Confirm your changes to the table.

```
SELECT  *
FROM    my_employee;
```

15) Commit all pending changes.

```
COMMIT;
```

Control data transaction to the `MY_EMPLOYEE` table.

16) Populate the table with the last row of the sample data listed in step 3 by using the statements in the script that you created in step 6. Run the statements in the script.

```
INSERT INTO my_employee
VALUES (&p_id, '&p_last_name', '&p_first_name',
   '&p_userid', &p_salary);
```

17) Confirm your addition to the table.

```
SELECT  *
FROM    my_employee;
```

18) Mark an intermediate point in the processing of the transaction.

```
SAVEPOINT step_17;
```

19) Delete all the rows from the `MY_EMPLOYEE` table.

```
DELETE
FROM  my_employee;
```

20) Confirm that the table is empty.

```
SELECT *
FROM   my_employee;
```

21) Discard the most recent `DELETE` operation without discarding the earlier `INSERT` operation.

```
ROLLBACK TO step_17;
```

22) Confirm that the new row is still intact.

```
SELECT *
FROM   my_employee;
```

23) Make the data addition permanent.

```
COMMIT;
```

Practice Solutions 9-1: Manipulating Data (continued)

If you have time, complete the following exercise:

24) Modify the `lab_09_06.sql` script such that the `USERID` is generated automatically by concatenating the first letter of the first name and the first seven characters of the last name. The generated `USERID` must be in lowercase. Therefore, the script should not prompt for the `USERID`. Save this script to a file named `lab_09_24.sql`.

```
SET ECHO OFF
SET VERIFY OFF
INSERT INTO my_employee
VALUES (&p_id, '&&p_last_name', '&&p_first_name',
   lower(substr('&p_first_name', 1, 1) ||
   substr('&p_last_name', 1, 7)), &p_salary);
SET VERIFY ON
SET ECHO ON
UNDEFINE p_first_name
UNDEFINE p_last_name
```

25) Run the `lab_09_24.sql` script to insert the following record:

ID	LAST_NAME	FIRST_NAME	USERID	SALARY
6	Anthony	Mark	manthony	1230

26) Confirm that the new row was added with the correct `USERID`.

```
SELECT *
FROM my_employee
WHERE ID='6';
```

Practices for Lesson 10

Create new tables by using the `CREATE TABLE` statement. Confirm that the new table was added to the database. You also learn to set the status of a table as `READ ONLY` and then revert to `READ/WRITE`.

Note: For all the `DDL` and `DML` statements, click the Run Script icon (or press [F5]) to execute the query in SQL Developer. This way you get to see the feedback messages on the Script Output tabbed page. For `SELECT` queries, continue to click the Execute Statement icon or press [F9] to get the formatted output on the Results tabbed page.

Practice 10-1: Using DDL Statements to Create and Manage Tables

Column Name	ID	NAME
Key Type	Primary key	
Nulls/Unique		
FK Table		
FK Column		
Data type	NUMBER	VARCHAR2
Length	7	25

1) Create the `DEPT` table based on the following table instance chart. Save the statement in a script called `lab_10_01.sql`, and then execute the statement in the script to create the table. Confirm that the table is created.

```
Name                          Null     Type
----------------------------- -------- -------------
ID                            NOT NULL NUMBER(7)
NAME                                   VARCHAR2(25)
```

2) Populate the `DEPT` table with data from the `DEPARTMENTS` table. Include only columns that you need.

3) Create the `EMP` table based on the following table instance chart. Save the statement in a script called `lab_10_03.sql`, and then execute the statement in the script to create the table. Confirm that the table is created.

Column Name	ID	LAST_NAME	FIRST_NAME	DEPT_ID
Key Type				
Nulls/Unique				
FK Table				DEPT
FK Column				ID
Data type	NUMBER	VARCHAR2	VARCHAR2	NUMBER
Length	7	25	25	7

Practice 10-1: Using DDL Statements to Create and Manage Tables (continued)

```
Name                          Null     Type
----------------------------- -------- -------------
ID                                     NUMBER(7)
LAST_NAME                              VARCHAR2(25)
FIRST_NAME                             VARCHAR2(25)
DEPT_ID                                NUMBER(7)
```

4) Create the EMPLOYEES2 table based on the structure of the EMPLOYEES table. Include only the EMPLOYEE_ID, FIRST_NAME, LAST_NAME, SALARY, and DEPARTMENT_ID columns. Name the columns in your new table ID, FIRST_NAME, LAST_NAME, SALARY, and DEPT_ID, respectively.

5) Alter the EMPLOYEES2 table status to read-only. Please note that this option is supported in Oracle Database 11*g*.

ID	FIRST_NAME	LAST_NAME	SALARY	DEPT_ID
34	Grant	Marcie	5678	10

6) Try to insert the following row in the EMPLOYEES2 table:

You get the following error message:

```
Error starting at line 1 in command:
INSERT INTO employees2
VALUES (34, 'Grant','Marcie',5678,10)
Error at Command Line:1 Column:12
Error report:
SQL Error: ORA-12081: update operation not allowed on table "ORA1"."EMPLOYEES2"
12081. 00000 -  "update operation not allowed on table \"%s\".\"%s\""
*Cause:    An attempt was made to update a read-only materialized view.
*Action:   No action required. Only Oracle is allowed to update a
           read-only materialized view.
```

7) Revert the EMPLOYEES2 table to the read/write status. Now, try to insert the same row again. Please note that this option is supported in Oracle Database 11*g*.

You should get the following messages:

```
ALTER TABLE employees2 succeeded.
1 rows inserted
```

8) Drop the EMPLOYEES2 table.

Practice Solutions 10-1: Using DDL Statements to Create and Manage Tables

Column Name	ID	NAME
Key Type	Primary key	
Nulls/Unique		
FK Table		
FK Column		
Data type	NUMBER	VARCHAR2
Length	7	25

1) Create the DEPT table based on the following table instance chart. Save the statement in a script called lab_10_01.sql, and then execute the statement in the script to create the table. Confirm that the table is created.

```
CREATE TABLE dept
 (id   NUMBER(7)CONSTRAINT department_id_pk PRIMARY KEY,
  name VARCHAR2(25));
```

To confirm that the table was created and to view its structure, issue the following command:

```
DESCRIBE dept
```

2) Populate the DEPT table with data from the DEPARTMENTS table. Include only those columns that you need.

```
INSERT INTO dept
  SELECT  department_id, department_name
  FROM    departments;
```

3) Create the EMP table based on the following table instance chart. Save the statement in a script called lab_10_03.sql, and then execute the statement in the script to create the table. Confirm that the table is created.

Column Name	ID	LAST_NAME	FIRST_NAME	DEPT_ID
Key Type				
Nulls/Unique				
FK Table				DEPT
FK Column				ID
Data type	NUMBER	VARCHAR2	VARCHAR2	NUMBER
Length	7	25	25	7

```
CREATE TABLE  emp
  (id           NUMBER(7),
   last_name     VARCHAR2(25),
   first_name    VARCHAR2(25),
   dept_id       NUMBER(7)
     CONSTRAINT emp_dept_id_FK REFERENCES dept (id)
   );
```

To confirm that the table was created and to view its structure:

```
DESCRIBE emp
```

4) Create the `EMPLOYEES2` table based on the structure of the `EMPLOYEES` table. Include only the `EMPLOYEE_ID`, `FIRST_NAME`, `LAST_NAME`, `SALARY`, and `DEPARTMENT_ID` columns. Name the columns in your new table `ID`, `FIRST_NAME`, `LAST_NAME`, `SALARY`, and `DEPT_ID`, respectively.

```
CREATE TABLE employees2 AS
  SELECT  employee_id id, first_name, last_name, salary,
          department_id dept_id
  FROM    employees;
```

5) Alter the `EMPLOYEES2` table status to read-only.

```
ALTER TABLE employees2 READ ONLY
```

6) Try to insert the following row in the `EMPLOYEES2` table.

ID	FIRST_NAME	LAST_NAME	SALARY	DEPT_ID
34	Grant	Marcie	5678	10

Note, you will get the "Update operation not allowed on table" error message. Therefore, you will not be allowed to insert any row into the table because it is assigned a read-only status.

```
INSERT INTO employees2
VALUES (34, 'Grant','Marcie',5678,10)
```

7) Revert the `EMPLOYEES2` table to the read/write status. Now try to insert the same row again.

Now, because the table is assigned a `READ WRITE` status, you will be allowed to insert a row into the table.

```
ALTER TABLE employees2 READ WRITE

INSERT INTO employees2
VALUES (34, 'Grant','Marcie',5678,10)
```

Practice Solutions 10-1: Using DDL Statements to Create and Manage Tables (continued)

8) Drop the `EMPLOYEES2` table.

Note: You can even drop a table that is in the `READ ONLY` mode. To test this, alter the table again to `READ ONLY` status, and then issue the `DROP TABLE` command. The table `EMPLOYEES2` will be dropped.

```
DROP TABLE employees2;
```

Practices for Lesson 11

Part 1 of this lesson's practice provides you with a variety of exercises in creating, using, and removing views. Complete questions 1–6 of this lesson.
Part 2 of this lesson's practice provides you with a variety of exercises in creating and using a sequence, an index, and a synonym. Complete questions 7–10 of this lesson.

Practice 11-1: Creating Other Schema Objects

Part 1

1) The staff in the HR department wants to hide some of the data in the `EMPLOYEES` table. Create a view called `EMPLOYEES_VU` based on the employee numbers, employee last names, and department numbers from the `EMPLOYEES` table. The heading for the employee name should be `EMPLOYEE`.

2) Confirm that the view works. Display the contents of the `EMPLOYEES_VU` view.

	EMPLOYEE_ID	EMPLOYEE	DEPARTMENT_ID
1	200	Whalen	10
2	201	Hartstein	20
3	202	Fay	20
4	205	Higgins	110
5	206	Gietz	110

…

19	205	Higgins	110
20	206	Gietz	110

3) Using your `EMPLOYEES_VU` view, write a query for the HR department to display all employee names and department numbers.

	EMPLOYEE	DEPARTMENT_ID
1	King	90
2	Kochhar	90
3	De Haan	90
4	Hunold	60
5	Ernst	60

…

19	Higgins	110
20	Gietz	110

4) Department 50 needs access to its employee data. Create a view named `DEPT50` that contains the employee numbers, employee last names, and department numbers for all employees in department 50. You have been asked to label the view columns `EMPNO`, `EMPLOYEE`, and `DEPTNO`. For security purposes, do not allow an employee to be reassigned to another department through the view.

5) Display the structure and contents of the `DEPT50` view.

```
DESCRIBE dept50
Name                          Null     Type
----------------------------- -------- -------------
EMPNO                         NOT NULL NUMBER(6)
EMPLOYEE                      NOT NULL VARCHAR2(25)
DEPTNO                                 NUMBER(4)
```

EMPNO	EMPLOYEE	DEPTNO
124	Mourgos	50
141	Rajs	50
142	Davies	50
143	Matos	50
144	Vargas	50

6) Test your view. Attempt to reassign Matos to department 80.

Part 2

7) You need a sequence that can be used with the `PRIMARY KEY` column of the `DEPT` table. The sequence should start at 200 and have a maximum value of 1,000. Have your sequence increment by 10. Name the sequence `DEPT_ID_SEQ`.

8) To test your sequence, write a script to insert two rows in the `DEPT` table. Name your script `lab_11_08.sql`. Be sure to use the sequence that you created for the ID column. Add two departments: Education and Administration. Confirm your additions. Run the commands in your script.

9) Create a nonunique index on the `NAME` column in the `DEPT` table.

10) Create a synonym for your `EMPLOYEES` table. Call it `EMP`.

Practice Solutions 11-1: Creating Other Schema Objects

Part 1

1) The staff in the HR department wants to hide some of the data in the EMPLOYEES table. Create a view called EMPLOYEES_VU based on the employee numbers, employee last names, and department numbers from the EMPLOYEES table. The heading for the employee name should be EMPLOYEE.

```
CREATE OR REPLACE VIEW employees_vu AS
    SELECT employee_id, last_name employee, department_id
    FROM employees;
```

2) Confirm that the view works. Display the contents of the EMPLOYEES_VU view.

```
SELECT   *
FROM     employees_vu;
```

3) Using your EMPLOYEES_VU view, write a query for the HR department to display all employee names and department numbers.

```
SELECT   employee, department_id
FROM     employees_vu;
```

4) Department 50 needs access to its employee data. Create a view named DEPT50 that contains the employee numbers, employee last names, and department numbers for all employees in department 50. They have requested that you label the view columns EMPNO, EMPLOYEE, and DEPTNO. For security purposes, do not allow an employee to be reassigned to another department through the view.

```
CREATE VIEW dept50 AS
   SELECT   employee_id empno, last_name employee,
            department_id deptno
   FROM     employees
   WHERE    department_id = 50
   WITH CHECK OPTION CONSTRAINT emp_dept_50;
```

5) Display the structure and contents of the DEPT50 view.

```
DESCRIBE dept50

SELECT   *
FROM     dept50;
```

6) Test your view. Attempt to reassign Matos to department 80.

```
UPDATE   dept50
SET      deptno = 80
WHERE    employee = 'Matos';
```

The error is because the DEPT50 view has been created with the WITH CHECK OPTION constraint. This ensures that the DEPTNO column in the view is protected from being changed.

Practice Solutions 11-1: Creating Other Schema Objects (continued)

Part 2

7) You need a sequence that can be used with the primary key column of the `DEPT` table. The sequence should start at 200 and have a maximum value of 1,000. Have your sequence increment by 10. Name the sequence `DEPT_ID_SEQ`.

```
CREATE SEQUENCE dept_id_seq
  START WITH 200
  INCREMENT BY 10
  MAXVALUE 1000;
```

8) To test your sequence, write a script to insert two rows in the `DEPT` table. Name your script `lab_11_08.sql`. Be sure to use the sequence that you created for the ID column. Add two departments: Education and Administration. Confirm your additions. Run the commands in your script.

```
INSERT INTO dept
VALUES (dept_id_seq.nextval, 'Education');

INSERT INTO dept
VALUES (dept_id_seq.nextval, 'Administration');
```

9) Create a nonunique index on the `NAME` column in the `DEPT` table.

```
CREATE INDEX dept_name_idx ON dept (name);
```

10) Create a synonym for your `EMPLOYEES` table. Call it `EMP`.

```
CREATE SYNONYM emp FOR EMPLOYEES;
```

Practices for Appendix F

This practice is intended to give you practical experience in extracting data from more than one table using the Oracle join syntax.

Practice F-1: Oracle Join Syntax

1) Write a query for the HR department to produce the addresses of all the departments. Use the `LOCATIONS` and `COUNTRIES` tables. Show the location ID, street address, city, state or province, and country in the output. Run the query.

	LOCATION_ID	STREET_ADDRESS	CITY	STATE_PROVINCE	COUNTRY_NAME
1	1400	2014 Jabberwocky Rd	Southlake	Texas	United States of America
2	1500	2011 Interiors Blvd	South San Francisco	California	United States of America
3	1700	2004 Charade Rd	Seattle	Washington	United States of America
4	1800	460 Bloor St. W.	Toronto	Ontario	Canada
5	2500	Magdalen Centre, The Oxford Science Park	Oxford	Oxford	United Kingdom

2) The HR department needs a report of all employees. Write a query to display the last name, department number, and department name for all employees. Run the query.

	LAST_NAME	DEPARTMENT_ID	DEPARTMENT_NAME
1	Whalen	10	Administration
2	Hartstein	20	Marketing
3	Fay	20	Marketing
4	Davies	50	Shipping
5	Vargas	50	Shipping

...

18	Higgins	110	Accounting
19	Gietz	110	Accounting

3) The HR department needs a report of employees in Toronto. Display the last name, job, department number, and department name for all employees who work in Toronto.

	LAST_NAME	JOB_ID	DEPARTMENT_ID	DEPARTMENT_NAME
1	Hartstein	MK_MAN	20	Marketing
2	Fay	MK_REP	20	Marketing

4) Create a report to display the employees' last names and employee number along with their managers' last names and manager number. Label the columns `Employee`, `Emp#`, `Manager`, and `Mgr#`, respectively. Save your SQL statement as `lab_f_04.sql`.

	Employee	EMP#	Manager	Mgr#
1	Hunold	103	De Haan	102
2	Fay	202	Hartstein	201
3	Gietz	206	Higgins	205
4	Lorentz	107	Hunold	103
5	Ernst	104	Hunold	103

...

18	Taylor	176	Zlotkey	149
19	Abel	174	Zlotkey	149

Practice F-1: Oracle Join Syntax (continued)

5) Modify `lab_f_04.sql` to display all employees including `King`, who has no manager. Order the results by the employee number. Save your SQL statement as `lab_f_05.sql`. Run the query in `lab_f_05.sql`.

	Employee	EMP#	Manager	Mgr#
1	Hunold	103	De Haan	102
2	Fay	202	Hartstein	201
3	Gietz	206	Higgins	205
4	Lorentz	107	Hunold	103
5	Ernst	104	Hunold	103

...

19	Abel	174	Zlotkey	149
20	King	100	(null)	(null)

6) Create a report for the HR department that displays employee last names, department numbers, and all employees who work in the same department as a given employee. Give each column an appropriate label. Save the script to a file named `lab_f_06.sql`.

	DEPARTMENT	EMPLOYEE	COLLEAGUE
1	20	Fay	Hartstein
2	20	Hartstein	Fay
3	50	Davies	Matos
4	50	Davies	Mourgos
5	50	Davies	Rajs

...

39	90	Kochhar	De Haan
40	90	Kochhar	King
41	110	Gietz	Higgins
42	110	Higgins	Gietz

7) The HR department needs a report on job grades and salaries. To familiarize yourself with the `JOB_GRADES` table, first show the structure of the `JOB_GRADES` table. Then create a query that displays the name, job, department name, salary, and grade for all employees.

```
Name                          Null     Type
----------------------------- -------- ------------
GRADE_LEVEL                            VARCHAR2(3)
LOWEST_SAL                             NUMBER
HIGHEST_SAL                            NUMBER
```

	LAST_NAME	JOB_ID	DEPARTMENT_NAME	SALARY	GRADE_LEVEL
1	King	AD_PRES	Executive	24000	E
2	De Haan	AD_VP	Executive	17000	E
3	Kochhar	AD_VP	Executive	17000	E
4	Hartstein	MK_MAN	Marketing	13000	D
5	Higgins	AC_MGR	Accounting	12000	D

...

18	Matos	ST_CLERK	Shipping	2600	A
19	Vargas	ST_CLERK	Shipping	2500	A

If you want an extra challenge, complete the following exercises:

8) The HR department wants to determine the names of all employees who were hired after `Davies`. Create a query to display the name and hire date of any employee hired after employee `Davies`.

	LAST_NAME	HIRE_DATE
1	Lorentz	07-FEB-99
2	Mourgos	16-NOV-99
3	Matos	15-MAR-98
4	Vargas	09-JUL-98
5	Zlotkey	29-JAN-00
6	Taylor	24-MAR-98
7	Grant	24-MAY-99
8	Fay	17-AUG-97

9) The HR department needs to find the names and hire dates for all employees who were hired before their managers, along with their managers' names and hire dates. Save the script to a file named `lab_f_09.sql`.

	LAST_NAME	HIRE_DATE	LAST_NAME_1	HIRE_DATE_1
1	Whalen	17-SEP-87	Kochhar	21-SEP-89
2	Hunold	03-JAN-90	De Haan	13-JAN-93
3	Vargas	09-JUL-98	Mourgos	16-NOV-99
4	Matos	15-MAR-98	Mourgos	16-NOV-99
5	Davies	29-JAN-97	Mourgos	16-NOV-99
6	Rajs	17-OCT-95	Mourgos	16-NOV-99
7	Grant	24-MAY-99	Zlotkey	29-JAN-00
8	Taylor	24-MAR-98	Zlotkey	29-JAN-00
9	Abel	11-MAY-96	Zlotkey	29-JAN-00

Practice Solutions F-1: Oracle Join Syntax

1) Write a query for the HR department to produce the addresses of all the departments. Use the `LOCATIONS` and `COUNTRIES` tables. Show the location ID, street address, city, state or province, and country in the output. Run the query.

```
SELECT location_id, street_address, city, state_province,
country_name
FROM   locations, countries
WHERE  locations.country_id = countries.country_id;
```

2) The HR department needs a report of all employees. Write a query to display the last name, department number, and department name for all employees. Run the query.

```
SELECT e.last_name, e.department_id, d.department_name
FROM   employees e, departments d
WHERE  e.department_id = d.department_id;
```

3) The HR department needs a report of employees in Toronto. Display the last name, job, department number, and department name for all employees who work in Toronto.

```
SELECT e.last_name, e.job_id, e.department_id,
d.department_name
FROM   employees e, departments d , locations l
WHERE  e.department_id = d.department_id
AND    d.location_id = l.location_id
AND    LOWER(l.city) = 'toronto';
```

4) Create a report to display the employee last name and the employee number along with the last name of the employee's manager and manager number. Label the columns `Employee`, `Emp#`, `Manager`, and `Mgr#`, respectively. Save your SQL statement as `lab_f_04.sql`.

```
SELECT w.last_name "Employee", w.employee_id "EMP#",
       m.last_name "Manager", m.employee_id  "Mgr#"
FROM   employees w, employees m
WHERE  w.manager_id = m.employee_id;
```

5) Modify `lab_f_04.sql` to display all employees including `King`, who has no manager. Order the results by the employee number. Save the SQL statement as `lab_f_05.sql`. Run the query in `lab_f_05.sql`.

```
SELECT w.last_name "Employee", w.employee_id "EMP#",
       m.last_name "Manager", m.employee_id  "Mgr#"
FROM   employees w, employees m
WHERE  w.manager_id  = m.employee_id (+);
```

Practice Solutions F-1: Oracle Join Syntax (continued)

6) Create a report for the HR department that displays employee last names, department numbers, and all the employees who work in the same department as a given employee. Give each column an appropriate label. Save the script to a file named `lab_f_06.sql`.

```
SELECT e1.department_id department, e1.last_name employee,
       e2.last_name colleague
FROM   employees e1, employees e2
WHERE  e1.department_id = e2.department_id
AND    e1.employee_id <> e2.employee_id
ORDER BY e1.department_id, e1.last_name, e2.last_name;
```

7) The HR department needs a report on job grades and salaries. To familiarize yourself with the `JOB_GRADES` table, first show the structure of the `JOB_GRADES` table. Then create a query that displays the name, job, department name, salary, and grade for all employees.

```
DESC JOB_GRADES

SELECT e.last_name, e.job_id, d.department_name,
       e.salary, j.grade_level
FROM   employees e, departments d, job_grades j
WHERE  e.department_id = d.department_id
AND    e.salary BETWEEN j.lowest_sal AND j.highest_sal;
```

If you want an extra challenge, complete the following exercises:

8) The HR department wants to determine the names of all employees hired after `Davies`. Create a query to display the name and hire date of any employee hired after `Davies`.

```
SELECT e.last_name, e.hire_date
FROM   employees e , employees davies
WHERE  davies.last_name = 'Davies'
AND    davies.hire_date < e.hire_date;
```

9) The HR department needs to find the names and hire dates for all employees who were hired before their managers, along with their managers' names and hire dates. Label the columns `Employee`, `Emp Hired`, `Manager`, and `Mgr Hired`, respectively. Save the script to a file named `lab_f_09.sql`.

```
SELECT w.last_name, w.hire_date, m.last_name, m.hire_date
FROM   employees w , employees m
WHERE  w.manager_id = m.employee_id
AND    w.hire_date <  m.hire_date;
```

Appendix AP
Additional Practices and Solutions

Table of Contents

Additional Practices

Practice 1-1

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

1) The HR department needs to find data for all the clerks who were hired after the year 1997.

	EMPLOYEE_ID	FIRST_NAME	LAST_NAME	EMAIL	PHONE_NUMBER	HIRE_DATE	JOB_ID	SALARY
1	143	Randall	Matos	RMATOS	650.121.2874	15-MAR-98	ST_CLERK	2600
2	144	Peter	Vargas	PVARGAS	650.121.2004	09-JUL-98	ST_CLERK	2500

2) The HR department needs a report of employees who earn commission. Show the last name, job, salary, and commission of those employees. Sort the data by salary in descending order.

	LAST_NAME	JOB_ID	SALARY	COMMISSION_PCT
1	Abel	SA_REP	11000	0.3
2	Zlotkey	SA_MAN	10500	0.2
3	Taylor	SA_REP	8600	0.2
4	Grant	SA_REP	7000	0.15

3) For budgeting purposes, the HR department needs a report on projected raises. The report should display those employees who have no commission, but who have a 10% raise in salary (round off the salaries).

	New salary
1	The salary of King after a 10% raise is 26400
2	The salary of Kochhar after a 10% raise is 18700
3	The salary of De Haan after a 10% raise is 18700
4	The salary of Hunold after a 10% raise is 9900
5	The salary of Ernst after a 10% raise is 6600
6	The salary of Lorentz after a 10% raise is 4620
7	The salary of Mourgos after a 10% raise is 6380
8	The salary of Rajs after a 10% raise is 3850
9	The salary of Davies after a 10% raise is 3410
10	The salary of Matos after a 10% raise is 2860
11	The salary of Vargas after a 10% raise is 2750
12	The salary of Whalen after a 10% raise is 4840
13	The salary of Hartstein after a 10% raise is 14300
14	The salary of Fay after a 10% raise is 6600
15	The salary of Higgins after a 10% raise is 13200
16	The salary of Gietz after a 10% raise is 9130

Practice 1-1 (continued)

4) Create a report of employees and their length of employment. Show the last names of all the employees together with the number of years and the number of completed months that they have been employed. Order the report by the length of their employment. The employee who has been employed the longest should appear at the top of the list.

	LAST_NAME	YEARS	MONTHS
1	King	22	0
2	Whalen	21	9
3	Kochhar	19	9
4	Hunold	19	6
5	Ernst	18	1
6	De Haan	16	6
7	Higgins	15	1
8	Gietz	15	1
9	Rajs	13	8
10	Hartstein	13	4
11	Abel	13	2
12	Davies	12	5
13	Fay	11	10
14	Matos	11	4
15	Taylor	11	3
16	Vargas	11	0
17	Lorentz	10	5
18	Grant	10	1
19	Mourgos	9	7
20	Zlotkey	9	5

5) Show those employees who have a last name starting with the letters “J,” “K,” “L,” or “M.”

	LAST_NAME
1	King
2	Kochhar
3	Lorentz
4	Matos
5	Mourgos

Practice 1-1 (continued)

6) Create a report that displays all employees, and indicate with the words *Yes* or *No* whether they receive a commission. Use the DECODE expression in your query.

	LAST_NAME	SALARY	COMMISSION
1	King	24000	No
2	Kochhar	17000	No
3	De Haan	17000	No
4	Hunold	9000	No
5	Ernst	6000	No
6	Lorentz	4200	No
7	Mourgos	5800	No
8	Rajs	3500	No
9	Davies	3100	No
10	Matos	2600	No
11	Vargas	2500	No
12	Zlotkey	10500	Yes
13	Abel	11000	Yes
14	Taylor	8600	Yes
15	Grant	7000	Yes
16	Whalen	4400	No
17	Hartstein	13000	No
18	Fay	6000	No
19	Higgins	12000	No
20	Gietz	8300	No

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

7) Create a report that displays the department name, location ID, last name, job title, and salary of those employees who work in a specific location. Prompt the user for the location. For example, if the user enters `1800`, these are the results:

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

8) Find the number of employees who have a last name that ends with the letter "n." Create two possible solutions.

	COUNT(*)
1	3

Practice 1-1 (continued)

9) Create a report that shows the name, location, and number of employees for each department. Make sure that the report also includes departments without employees.

	DEPARTMENT_ID	DEPARTMENT_NAME	LOCATION_ID	COUNT(E.EMPLOYEE_ID)
1	80	Sales	2500	3
2	110	Accounting	1700	2
3	10	Administration	1700	1
4	60	IT	1400	3
5	20	Marketing	1800	2
6	90	Executive	1700	3
7	50	Shipping	1500	5
8	190	Contracting	1700	0

10) The HR department needs to find the job titles in departments 10 and 20. Create a report to display the job IDs for those departments.

	JOB_ID
1	AD_ASST
2	MK_MAN
3	MK_REP

11) Create a report that displays the jobs that are found in the Administration and Executive departments. Also display the number of employees for these jobs. Show the job with the highest number of employees first.

	JOB_ID	FREQUENCY
1	AD_VP	2
2	AD_PRES	1
3	AD_ASST	1

These exercises can be used for extra practice after you have discussed the following topics: basic `SQL SELECT` statements, basic SQL Developer commands, SQL functions, joins, group functions, and subqueries.

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

	LAST_NAME	HIRE_DATE
1	De Haan	13-JAN-93
2	Hunold	03-JAN-90
3	Lorentz	07-FEB-99
4	Matos	15-MAR-98
5	Vargas	09-JUL-98
6	Abel	11-MAY-96
7	Higgins	07-JUN-94
8	Gietz	07-JUN-94

Practice 1-1 (continued)

13) Create a report that displays the following for all employees: last name, salary, and salary expressed in terms of thousands of dollars.

	LAST_NAME	SALARY	THOUSANDS
1	King	24000	24
2	Kochhar	17000	17
3	De Haan	17000	17
4	Hunold	9000	9
5	Ernst	6000	6
6	Lorentz	4200	4
7	Mourgos	5800	5
8	Rajs	3500	3
9	Davies	3100	3
10	Matos	2600	2
11	Vargas	2500	2
12	Zlotkey	10500	10
13	Abel	11000	11
14	Taylor	8600	8
15	Grant	7000	7
16	Whalen	4400	4
17	Hartstein	13000	13
18	Fay	6000	6
19	Higgins	12000	12
20	Gietz	8300	8

14) Show all the 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	GRADE_LEVEL
1	De Haan	King	24000	E
2	Hartstein	King	24000	E
3	Higgins	Kochhar	17000	E
4	Hunold	De Haan	17000	E
5	Kochhar	King	24000	E
6	Mourgos	King	24000	E
7	Whalen	Kochhar	17000	E
8	Zlotkey	King	24000	E

Practice 1-1 (continued)

15) Show the department number, name, number of employees, and average salary of all the 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	JOB_ID
1	10	Administration	1	4400.00	Whalen	4400	AD_ASST
2	20	Marketing	2	9500.00	Hartstein	13000	MK_MAN
3	20	Marketing	2	9500.00	Fay	6000	MK_REP
4	50	Shipping	5	3500.00	Davies	3100	ST_CLERK
5	50	Shipping	5	3500.00	Matos	2600	ST_CLERK
6	50	Shipping	5	3500.00	Rajs	3500	ST_CLERK
7	50	Shipping	5	3500.00	Mourgos	5800	ST_MAN
8	50	Shipping	5	3500.00	Vargas	2500	ST_CLERK
9	60	IT	3	6400.00	Hunold	9000	IT_PROG
10	60	IT	3	6400.00	Lorentz	4200	IT_PROG
11	60	IT	3	6400.00	Ernst	6000	IT_PROG
12	80	Sales	3	10033.33	Zlotkey	10500	SA_MAN
13	80	Sales	3	10033.33	Taylor	8600	SA_REP
14	80	Sales	3	10033.33	Abel	11000	SA_REP
15	90	Executive	3	19333.33	Kochhar	17000	AD_VP
16	90	Executive	3	19333.33	De Haan	17000	AD_VP
17	90	Executive	3	19333.33	King	24000	AD_PRES
18	110	Accounting	2	10150.00	Gietz	8300	AC_ACCOUNT
19	110	Accounting	2	10150.00	Higgins	12000	AC_MGR
20	(null)	(null)	0	No average	Grant	7000	SA_REP

16) Create a report to display the department number and lowest salary of the department with the highest average salary.

	DEPARTMENT_ID	MIN(SALARY)
1	90	17000

17) Create a report that displays departments where no sales representatives work. Include the department number, department name, manager ID, and the location in the output.

	DEPARTMENT_ID	DEPARTMENT_NAME	MANAGER_ID	LOCATION_ID
1	10	Administration	200	1700
2	20	Marketing	201	1800
3	50	Shipping	124	1500
4	60	IT	103	1400
5	90	Executive	100	1700
6	110	Accounting	205	1700
7	190	Contracting	(null)	1700

Practice 1-1 (continued)

18) Create the following statistical reports for the HR department: Include the department number, department name, and the number of employees working in each department that:

a) Employs fewer than three employees:

	DEPARTMENT_ID	DEPARTMENT_NAME	COUNT(*)
1	10	Administration	1
2	110	Accounting	2
3	20	Marketing	2

b) Has the highest number of employees:

	DEPARTMENT_ID	DEPARTMENT_NAME	COUNT(*)
1	50	Shipping	5

c) Has the lowest number of employees:

	DEPARTMENT_ID	DEPARTMENT_NAME	COUNT(*)
1	10	Administration	1

19) Create a report that displays the employee number, last name, salary, department number, and the average salary in their department for all employees.

	EMPLOYEE_ID	LAST_NAME	DEPARTMENT_ID	SALARY	AVG(S.SALARY)
1	149	Zlotkey	80	10500	10033.3333333333...
2	174	Abel	80	11000	10033.3333333333...
3	144	Vargas	50	2500	3500
4	101	Kochhar	90	17000	19333.3333333333...
5	100	King	90	24000	19333.3333333333...
6	103	Hunold	60	9000	6400
7	142	Davies	50	3100	3500
8	205	Higgins	110	12000	10150
9	104	Ernst	60	6000	6400
10	143	Matos	50	2600	3500
11	102	De Haan	90	17000	19333.3333333333...
12	107	Lorentz	60	4200	6400
13	141	Rajs	50	3500	3500
14	200	Whalen	10	4400	4400
15	202	Fay	20	6000	9500
16	176	Taylor	80	8600	10033.3333333333...
17	201	Hartstein	20	13000	9500
18	206	Gietz	110	8300	10150
19	124	Mourgos	50	5800	3500

Practice 1-1 (continued)

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

	LAST_NAME	DAY
1	Ernst	TUESDAY
2	Mourgos	TUESDAY
3	Rajs	TUESDAY
4	Taylor	TUESDAY
5	Higgins	TUESDAY
6	Gietz	TUESDAY

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

	LAST_NAME	BIRTHDAY
1	Hunold	January 03
2	De Haan	January 13
3	Davies	January 29
4	Zlotkey	January 29
5	Lorentz	February 07
6	Hartstein	February 17
7	Matos	March 15
8	Taylor	March 24
9	Abel	May 11
10	Ernst	May 21
11	Grant	May 24
12	Higgins	June 07
13	Gietz	June 07
14	King	June 17
15	Vargas	July 09
16	Fay	August 17
17	Whalen	September 17
18	Kochhar	September 21
19	Rajs	October 17
20	Mourgos	November 16

Practice Solutions 1-1

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

1) The HR department needs to find data for all of the clerks who were hired after the year 1997.

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

2) The HR department needs a report of employees who earn commission. Show the last name, job, salary, and commission of those employees. Sort the data by 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) For budgeting purposes, the HR department needs a report on projected raises. The report should display those employees who do not get a commission but who have a 10% raise in 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) Create a report of employees and their duration of employment. Show the last names of all employees together with the number of years and the number of completed months that they have been employed. Order the report by the duration of their employment. The employee who has been employed the longest should appear at the top of the list.

```
SELECT last_name,
       TRUNC(MONTHS_BETWEEN(SYSDATE, hire_date) / 12) YEARS,
       TRUNC(MOD(MONTHS_BETWEEN(SYSDATE, hire_date), 12))
   MONTHS
FROM employees
ORDER BY years DESC, MONTHS desc;
```

5) Show those employees who have a last name starting with the letters “J,” “K,” “L,” or “M.”

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

Practice Solutions 1-1 (continued)

6) Create a report that displays all employees, and indicate with the words *Yes* or *No* whether they receive a commission. Use the DECODE expression in your query.

```
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: basic SQL `SELECT` statement, basic SQL Developer commands, SQL functions, joins, and group functions.

7) Create a report that displays the department name, location ID, name, job title, and salary of those employees who work in a specific location. Prompt the user for the location.

   a) Enter `1800` for `location_id` when prompted.

```
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 = &location_id;
```

8) Find the number of employees who have a last name that ends with the letter "n." Create two possible solutions.

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

9) Create a report that shows the name, location, and number of employees for each department. Make sure that the report also includes departments without employees.

```
SELECT d.department_id, d.department_name,
       d.location_id,   COUNT(e.employee_id)
FROM   employees e RIGHT OUTER JOIN  departments d
ON     e.department_id = d.department_id
GROUP BY d.department_id, d.department_name, d.location_id;
```

10) The HR department needs to find the job titles in departments 10 and 20. Create a report to display the job IDs for those departments.

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

Practice Solutions 1-1 (continued)

11) Create a report that displays the jobs that are found in the Administration and Executive departments. Also display the number of employees for these jobs. Show the job with the highest number of employees first.

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

These exercises can be used for extra practice after you have discussed the following topics: basic SQL `SELECT` statements, basic SQL Developer commands, SQL functions, joins, group functions, and 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) Create a report that displays the following for all employees: last name, salary, and salary expressed in terms of thousands of dollars.

```
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 JOIN employees m
ON     e.manager_id = m.employee_id
JOIN   job_grades j
ON     m.salary BETWEEN j.lowest_sal AND j.highest_sal
AND    m.salary > 15000;
```

Practice Solutions 1-1 (continued)

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.

```
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 RIGHT OUTER JOIN employees e1
ON      d.department_id = e1.department_id
RIGHT OUTER JOIN  employees e2
ON    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;
```

16) Create a report to display the department number and 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) Create a report that displays the departments where no sales representatives work. Include the department number, department name, and location in the output.

```
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) Create the following statistical reports for the HR department: Include the department number, department name, and the number of employees working in each department that:

a) Employs fewer than three employees:

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

Practice Solutions 1-1 (continued)

b) Has the highest number of employees:

```
SELECT d.department_id, d.department_name, COUNT(*)
FROM   departments d JOIN employees e
ON     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 JOIN employees e
ON     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) Create a report that displays 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, e.salary,
AVG(s.salary)
FROM   employees e JOIN employees s
ON     e.department_id = s.department_id
GROUP BY e.employee_id, e.last_name, e.department_id,
e.salary;
```

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

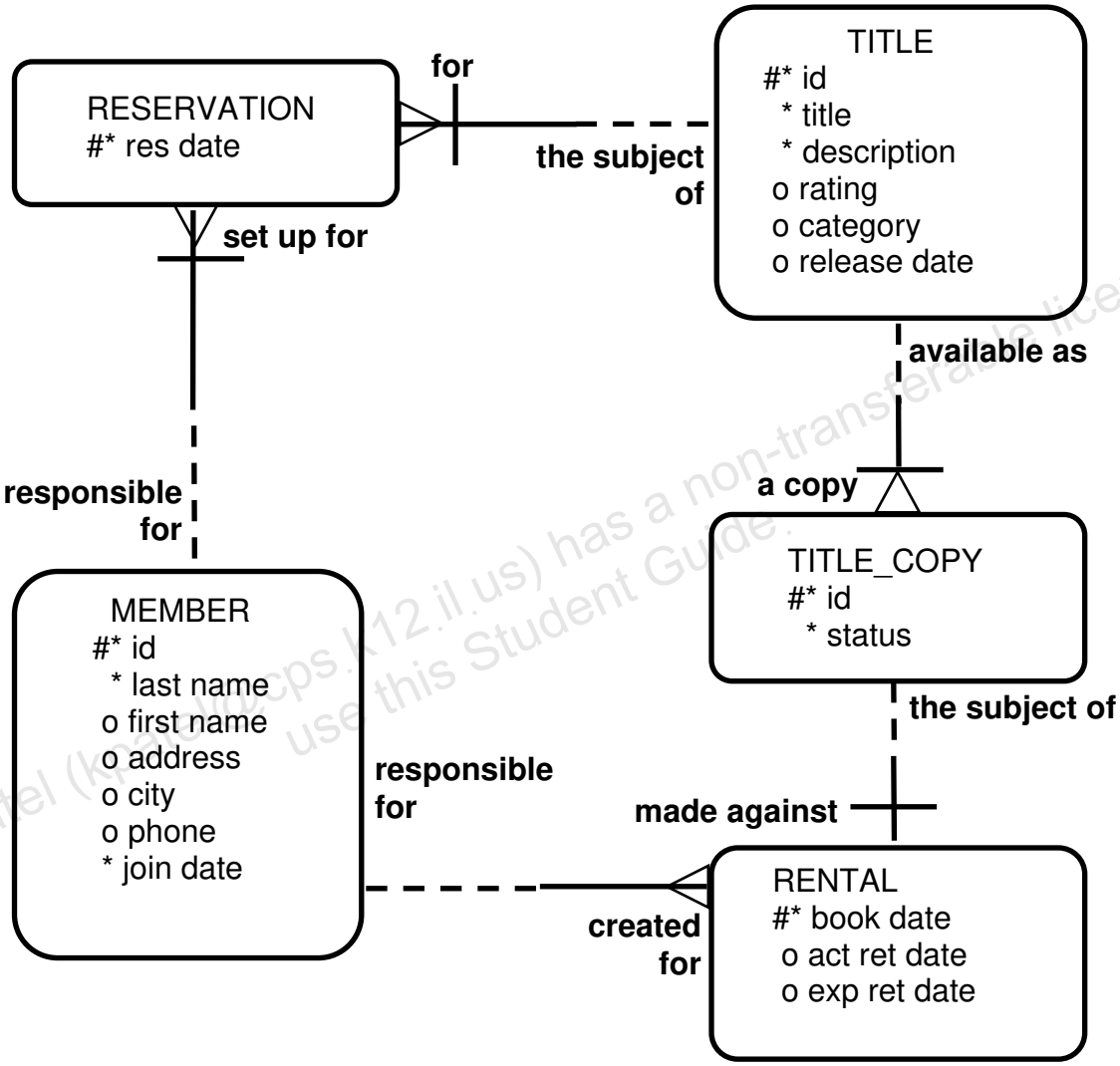
```
SELECT last_name, TO_CHAR(hire_date, 'DAY') day
FROM   employees
WHERE  TO_CHAR(hire_date, 'Day') =
       (SELECT TO_CHAR(hire_date, 'Day')
        FROM   employees
        GROUP BY TO_CHAR(hire_date, 'Day')
        HAVING COUNT(*) = (SELECT MAX(COUNT(*))
                           FROM   employees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

Case Study

In this case study, you build a set of database tables for a video application. After you create the tables, you insert, update, and delete records in a video store database and generate a report. The database contains only the essential tables.
The following is a diagram of the entities and attributes for the video application:



Note: If you want to build the tables, you can execute the commands in the `buildtab.sql` script in SQL Developer. If you want to drop the tables, you can execute the commands in the `dropvid.sql` script in SQL Developer. Then you can execute the commands in the `buildvid.sql` script in SQL Developer to create and populate the tables.
All the three SQL scripts are present in the `/home/oracle/labs/sql1/labs` folder.

- If you use the `buildtab.sql` script to build the tables, start with step 4.

Practice Solutions 1-1 (continued)

- If you use the `dropvid.sql` script to remove the video tables, start with step 1.
- If you use the `buildvid.sql` script to build and populate the tables, start with step 6(b).

Practice 2-1

1) Create the tables based on the following table instance charts. Choose the appropriate data types and be sure to add integrity constraints.

   a) Table name: MEMBER

Column_ Name	MEMBER_ ID	LAST_ NAME	FIRST_NAME	ADDRESS	CITY	PHONE	JOIN _ DATE
Key Type	PK						
Null/ Unique	NN,U	NN					NN
Default Value							System Date
Data Type	NUMBER	VARCHAR2	VARCHAR2	VARCHAR2	VARCHAR2	VARCHAR2	DATE
Length	10	25	25	100	30	15	

   b) Table name: TITLE

Column_ Name	TITLE_ID	TITLE	DESCRIPTION	RATING	CATEGORY	RELEASE_ DATE
Key Type	PK					
Null/ Unique	NN,U	NN	NN			
Check				G, PG, R, NC17, NR	DRAMA, COMEDY, ACTION, CHILD, SCIFI, DOCUMENTARY	
Data Type	NUMBER	VARCHAR2	VARCHAR2	VARCHAR2	VARCHAR2	DATE
Length	10	60	400	4	20	

c) Table name: TITLE_COPY

Column Name	COPY_ID	TITLE_ID	STATUS
Key Type	PK	PK,FK	
Null/ Unique	NN,U	NN,U	NN
Check			AVAILABLE, DESTROYED, RENTED, RESERVED
FK Ref Table		TITLE	
FK Ref Col		TITLE_ID	
Data Type	NUMBER	NUMBER	VARCHAR2
Length	10	10	15

d) Table name: RENTAL

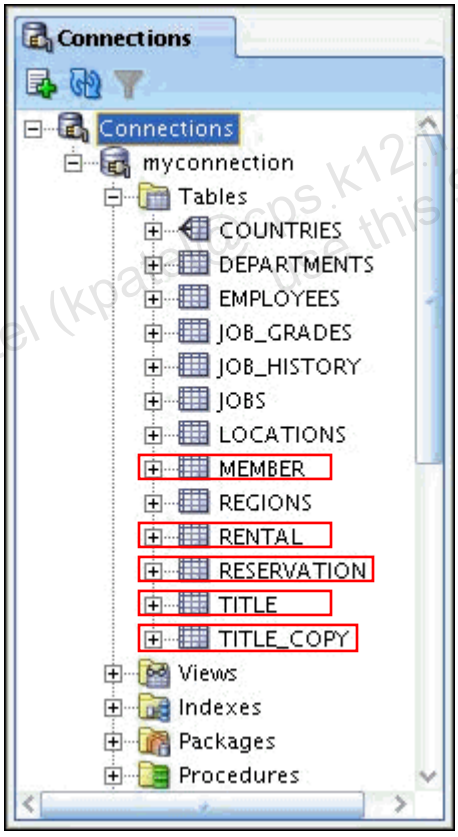
Column Name	BOOK_ DATE	MEMBER_ ID	COPY_ ID	ACT_RET_ DATE	EXP_RET_ DATE	TITLE_ ID
Key Type	PK	PK,FK1	PK,FK2			PK,FK2
Default Value	System Date				System Date + 2 days	
FK Ref Table		MEMBER	TITLE_ COPY			TITLE_ COPY
FK Ref Col		MEMBER_I D	COPY_ ID			TITLE_ID
Data Type	DATE	NUMBER	NUMBER	DATE	DATE	NUMBER
Length		10	10			10

Practice 2-1 (continued)

e) Table name: `RESERVATION`

Column Name	`RES_ DATE`	`MEMBER_ ID`	`TITLE_ ID`
Key Type	PK	PK,FK1	PK,FK2
Null/ Unique	NN,U	NN,U	NN
FK Ref Table		`MEMBER`	`TITLE`
FK Ref Column		`MEMBER_ID`	`TITLE_ID`
Data Type	`DATE`	`NUMBER`	`NUMBER`
Length		10	10

2) Verify that the tables were created properly by checking in the Connections Navigator in SQL Developer.



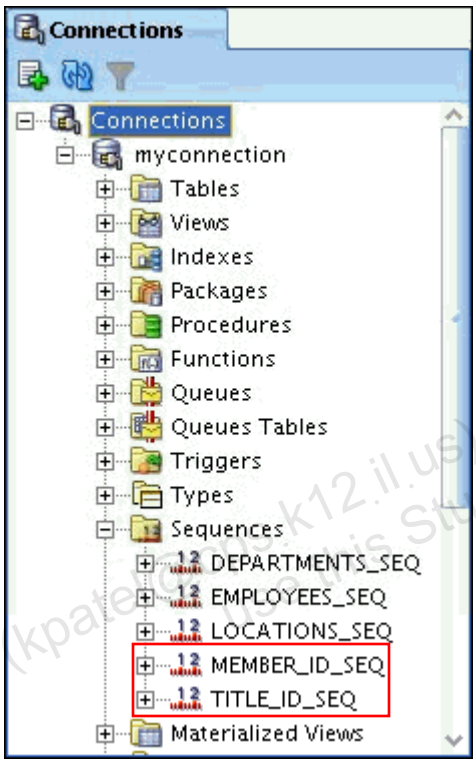
Practice 2-1 (continued)

3) Create sequences to uniquely identify each row in the `MEMBER` table and the `TITLE` table.

   a) Member number for the `MEMBER` table: Start with 101; do not allow caching of the values. Name the sequence `MEMBER_ID_SEQ`.

   b) Title number for the `TITLE` table: Start with 92; do not allow caching of the values. Name the sequence `TITLE_ID_SEQ`.

   c) Verify the existence of the sequences in the Connections Navigator in SQL Developer.



4) Add data to the tables. Create a script for each set of data to be added.

   a) Add movie titles to the `TITLE` table. Write a script to enter the movie information. Save the statements in a script named `lab_apcs_4a.sql`. Use the sequences to uniquely identify each title. Enter the release dates in the DD-MON-YYYY format. Remember that single quotation marks in a character field must be specially handled. Verify your additions.

	TITLE
1	Willie and Christmas Too
2	Alien Again
3	The Glob
4	My Day Off
5	Miracles on Ice
6	Soda Gang

Practice 2-1 (continued)

Title	Description	Rating	Category	Release_date
Willie and Christmas Too	All of Willie's friends make a Christmas list for Santa, but Willie has yet to add his own wish list.	G	CHILD	05-OCT-1995
Alien Again	Yet another installation of science fiction history. Can the heroine save the planet from the alien life form?	R	SCIFI	19-MAY-1995
The Glob	A meteor crashes near a small American town and unleashes carnivorous goo in this classic.	NR	SCIFI	12-AUG-1995
My Day Off	With a little luck and a lot of ingenuity, a teenager skips school for a day in New York.	PG	COMEDY	12-JUL-1995
Miracles on Ice	A six-year-old has doubts about Santa Claus, but she discovers that miracles really do exist.	PG	DRAMA	12-SEP-1995
Soda Gang	After discovering a cache of drugs, a young couple find themselves pitted against a vicious gang.	NR	ACTION	01-JUN-1995

b) Add data to the `MEMBER` table. Save the insert statements in a script named `lab_apcs_4b.sql`. Execute commands in the script. Be sure to use the sequence to add the member numbers.

First_ Name	Last_Name	Address	City	Phone	Join_Date
Carmen	Velasquez	283 King Street	Seattle	206-899-6666	08-MAR-1990
LaDoris	Ngao	5 Modrany	Bratislava	586-355-8882	08-MAR-1990
Midori	Nagayama	68 Via Centrale	Sao Paolo	254-852-5764	17-JUN-1991
Mark	Quick-to-See	6921 King Way	Lagos	63-559-7777	07-APR-1990
Audry	Ropeburn	86 Chu Street	Hong Kong	41-559-87	18-JAN-1991
Molly	Urguhart	3035 Laurier	Quebec	418-542-9988	18-JAN-1991

Practice 2-1 (continued)

c) Add the following movie copies in the `TITLE_COPY` table:

Note: Have the `TITLE_ID` numbers available for this exercise.

Title	Copy_Id	Status	Title	Copy_Id
Willie and Christmas Too	1	AVAILABLE	Willie and Christmas Too	1
Alien Again	1	AVAILABLE	Alien Again	1
	2	RENTED		2
The Glob	1	AVAILABLE	The Glob	1
My Day Off	1	AVAILABLE	My Day Off	1
	2	AVAILABLE		2
	3	RENTED		3
Miracles on Ice	1	AVAILABLE	Miracles on Ice	1
Soda Gang	1	AVAILABLE	Soda Gang	1

d) Add the following rentals to the `RENTAL` table:

Note: The title number may be different depending on the sequence number.

Title_ Id	Copy_ Id	Member_Id	Book_date	Exp_Ret_Date
92	1	101	3 days ago	1 day ago
93	2	101	1 day ago	1 day from now
95	3	102	2 days ago	Today
97	1	106	4 days ago	2 days ago

Practice 2-1 (continued)

5) Create a view named `TITLE_AVAIL` to show the movie titles, the availability of each copy, and its expected return date if rented. Query all rows from the view. Order the results by title.

   Note: Your results may be different.

	TITLE	COPY_ID	STATUS	EXP_RET_DATE
1	Alien Again	1	AVAILABLE	(null)
2	Alien Again	2	RENTED	15-JUL-09
3	Miracles on Ice	1	AVAILABLE	(null)
4	My Day Off	1	AVAILABLE	(null)
5	My Day Off	2	AVAILABLE	(null)
6	My Day Off	3	RENTED	16-JUL-09
7	Soda Gang	1	AVAILABLE	14-JUL-09
8	The Glob	1	AVAILABLE	(null)
9	Willie and Christmas Too	1	AVAILABLE	15-JUL-09

6) Make changes to the data in the tables.

   a) Add a new title. The movie is "Interstellar Wars," which is rated PG and classified as a science fiction movie. The release date is 07-JUL-77. The description is "Futuristic interstellar action movie. Can the rebels save the humans from the evil empire?" Be sure to add a title copy record for two copies.

   b) Enter two reservations. One reservation is for Carmen Velasquez, who wants to rent "Interstellar Wars." The other is for Mark Quick-to-See, who wants to rent "Soda Gang."

Practice 2-1 (continued)

7) Make a modification to one of the tables.

   a) Run the `lab_apcs_7a.sql` script located in the `/home/oracle/labs/sql1/labs` folder, to add a `PRICE` column to the `TITLE` table to record the purchase price of the video. Verify your modifications.

```
DESCRIBE title
Name                          Null     Type
----------------------------- -------- --------------
TITLE_ID                      NOT NULL NUMBER(10)
TITLE                         NOT NULL VARCHAR2(60)
DESCRIPTION                   NOT NULL VARCHAR2(400)
RATING                                 VARCHAR2(4)
CATEGORY                               VARCHAR2(20)
RELEASE_DATE                           DATE
PRICE                                  NUMBER(8,2)
```

Title	Price
Willie and Christmas Too	25
Alien Again	35
The Glob	35
My Day Off	35
Miracles on Ice	30
Soda Gang	35
Interstellar Wars	29

   b) Create a script named `lab_apcs_7b.sql` that contains update statements that update each video with a price according to the preceding list. Run the commands in the script.

   Note: Have the `TITLE_ID` numbers available for this exercise.

8) Create a report that contains each customer's history of renting videos. Be sure to include the customer name, movie rented, dates of the rental, and duration of rentals. Total the number of rentals for all customers for the reporting period. Save the commands that generate the report in a script file named `lab_apcs_8.sql`.

   Note: Your results may be different.

	MEMBER	TITLE	BOOK_DATE	DURATION
1	Carmen Velasquez	Willie and Christmas Too	13-JUL-09	1
2	Carmen Velasquez	Alien Again	15-JUL-09	(null)
3	LaDoris Ngao	My Day Off	14-JUL-09	(null)
4	Molly Urguhart	Soda Gang	12-JUL-09	2

Practice Solutions 2-1

1) Create the tables based on the following table instance charts. Choose the appropriate data types and be sure to add integrity constraints.

   a) Table name: MEMBER

```
CREATE TABLE member
     (member_id         NUMBER(10)
         CONSTRAINT member_member_id_pk PRIMARY KEY,
       last_name      VARCHAR2(25)
         CONSTRAINT member_last_name_nn NOT NULL,
       first_name     VARCHAR2(25),
       address        VARCHAR2(100),
       city           VARCHAR2(30),
       phone          VARCHAR2(15),
       join_date      DATE DEFAULT SYSDATE
         CONSTRAINT member_join_date_nn NOT NULL);
```

   b) Table name: TITLE

```
CREATE TABLE title
       (title_id         NUMBER(10)
         CONSTRAINT title_title_id_pk PRIMARY KEY,
       title           VARCHAR2(60)
         CONSTRAINT title_title_nn NOT NULL,
       description     VARCHAR2(400)
         CONSTRAINT title_description_nn NOT NULL,
       rating          VARCHAR2(4)
         CONSTRAINT title_rating_ck CHECK
         (rating IN ('G', 'PG', 'R', 'NC17', 'NR')),
       category        VARCHAR2(20)
         CONSTRAINT title_category_ck CHECK
         (category IN ('DRAMA', 'COMEDY', 'ACTION',
         'CHILD', 'SCIFI', 'DOCUMENTARY')),
       release_date    DATE);
```

   c) Table name: TITLE_COPY

```
CREATE TABLE title_copy
       (copy_id        NUMBER(10),
       title_id       NUMBER(10)
         CONSTRAINT title_copy_title_if_fk REFERENCES
title(title_id),
       status         VARCHAR2(15)
         CONSTRAINT title_copy_status_nn NOT NULL
         CONSTRAINT title_copy_status_ck CHECK (status IN
         ('AVAILABLE', 'DESTROYED','RENTED', 'RESERVED')),
       CONSTRAINT title_copy_copy_id_title_id_pk
         PRIMARY KEY (copy_id, title_id));
```

Practice Solutions 2-1 (continued)

d) Table name: RENTAL

```
CREATE TABLE rental
      (book_date    DATE DEFAULT SYSDATE,
       member_id       NUMBER(10)
         CONSTRAINT rental_member_id_fk REFERENCES
member(member_id),
       copy_id      NUMBER(10),
       act_ret_date DATE,
       exp_ret_date DATE DEFAULT SYSDATE + 2,
       title_id     NUMBER(10),
       CONSTRAINT rental_book_date_copy_title_pk
         PRIMARY KEY (book_date, member_id, copy_id,title_id),
       CONSTRAINT rental_copy_id_title_id_fk
         FOREIGN KEY (copy_id, title_id)
         REFERENCES title_copy(copy_id, title_id));
```

e) Table name: RESERVATION

```
CREATE TABLE reservation
      (res_date      DATE,
       member_id        NUMBER(10)
         CONSTRAINT reservation_member_id REFERENCES
member(member_id),
       title_id         NUMBER(10)
         CONSTRAINT reservation_title_id REFERENCES
title(title_id),
       CONSTRAINT reservation_resdate_mem_tit_pk PRIMARY KEY
         (res_date, member_id, title_id));
```

2) Verify that the tables were created properly by checking in the Connections Navigator in SQL Developer.

a) In the Connections Navigator, expand Connections > myconnection > Tables.

3) Create sequences to uniquely identify each row in the MEMBER table and the TITLE table.

a) Member number for the MEMBER table: Start with 101; do not allow caching of the values. Name the sequence MEMBER_ID_SEQ.

```
CREATE SEQUENCE member_id_seq
START WITH 101
NOCACHE;
```

b) Title number for the TITLE table: Start with 92; do not allow caching of the values. Name the sequence TITLE_ID_SEQ.

```
CREATE SEQUENCE title_id_seq
START WITH 92
NOCACHE;
```

c) Verify the existence of the sequences in the Connections Navigator in SQL Developer.

i) In the Connections Navigator, assuming that the myconnection node is expanded, expand Sequences.

4) Add data to the tables. Create a script for each set of data to be added.

a) Add movie titles to the `TITLE` table. Write a script to enter the movie information. Save the statements in a script named `lab_apcs_4a.sql`. Use the sequences to uniquely identify each title. Enter the release dates in the DD-MON-YYYY format. Remember that single quotation marks in a character field must be specially handled. Verify your additions.

```
INSERT INTO title(title_id, title, description, rating,
                  category, release_date)
VALUES  (title_id_seq.NEXTVAL, 'Willie and Christmas Too',
         'All of Willie''s friends make a Christmas list for
         Santa, but Willie has yet to add his own wish list.',
         'G', 'CHILD', TO_DATE('05-OCT-1995','DD-MON-YYYY'))
/
INSERT INTO title(title_id , title, description, rating,
                  category, release_date)
VALUES   (title_id_seq.NEXTVAL, 'Alien Again', 'Yet another
          installment of science fiction history.  Can the
          heroine save the planet from the alien life form?',
          'R', 'SCIFI', TO_DATE( '19-MAY-1995','DD-MON-YYYY'))
/
INSERT INTO title(title_id, title, description, rating,
                  category, release_date)
VALUES   (title_id_seq.NEXTVAL, 'The Glob', 'A meteor crashes
          near a small American town and unleashes carnivorous
          goo in this classic.', 'NR', 'SCIFI',
          TO_DATE( '12-AUG-1995','DD-MON-YYYY'))
/
INSERT INTO title(title_id, title, description, rating,
                  category, release_date)
VALUES    (title_id_seq.NEXTVAL, 'My Day Off', 'With a little
           luck and a lot ingenuity, a teenager skips school
for
           a day in New York.', 'PG', 'COMEDY',
           TO_DATE( '12-JUL-1995','DD-MON-YYYY'))
/
INSERT INTO title(title_id, title, description, rating,
                  category, release_date)
VALUES    (title_id_seq.NEXTVAL, 'Miracles on Ice', 'A six-
year-old has       doubts about Santa Claus, but she discovers
that miracles really do exist.', 'PG', 'DRAMA',
           TO_DATE('12-SEP-1995','DD-MON-YYYY'))
/
```

Practice Solutions 2-1 (continued)

```
INSERT INTO title(title_id, title, description, rating,
                  category, release_date)
VALUES    (title_id_seq.NEXTVAL, 'Soda Gang', 'After
discovering a cache of drugs, a young couple find themselves
pitted against a vicious gang.', 'NR', 'ACTION', TO_DATE('01-
JUN-1995','DD-MON-YYYY'))
/
COMMIT
/
SELECT  title
FROM    title;
```

b) Add data to the `MEMBER` table. Place the insert statements in a script named `lab_apcs_4b.sql`. Execute the commands in the script. Be sure to use the sequence to add the member numbers.

```
SET VERIFY OFF
INSERT INTO member(member_id, first_name, last_name,
            address, city, phone, join_date)
VALUES (member_id_seq.NEXTVAL, 'Carmen', 'Velasquez',
        '283 King Street', 'Seattle', '206-899-6666',
TO_DATE('08-MAR-1990',
        'DD-MM-YYYY'))
/

INSERT INTO member(member_id, first_name, last_name,
            address, city, phone, join_date)
VALUES (member_id_seq.NEXTVAL, 'LaDoris', 'Ngao',
        '5 Modrany', 'Bratislava', '586-355-8882',
TO_DATE('08-MAR-1990',
        'DD-MM-YYYY'))
/

INSERT INTO member(member_id, first_name, last_name,
            address, city, phone, join_date)
VALUES (member_id_seq.NEXTVAL, 'Midori', 'Nagayama',
        '68 Via Centrale', 'Sao Paolo', '254-852-5764',
TO_DATE('17-JUN-1991',
        'DD-MM-YYYY'))
/

INSERT INTO member(member_id, first_name, last_name,
            address, city, phone, join_date)
VALUES (member_id_seq.NEXTVAL, 'Mark', 'Quick-to-See',
        '6921 King Way', 'Lagos', '63-559-7777', TO_DATE('07-
APR-1990',
        'DD-MM-YYYY'))
/
```

```
INSERT INTO member(member_id, first_name, last_name,
            address, city, phone, join_date)
VALUES (member_id_seq.NEXTVAL, 'Audry', 'Ropeburn',
        '86 Chu Street', 'Hong Kong', '41-559-87',
TO_DATE('18-JAN-1991',
        'DD-MM-YYYY'))
/

INSERT INTO member(member_id, first_name, last_name,
            address, city, phone, join_date)
VALUES (member_id_seq.NEXTVAL, 'Molly', 'Urguhart',
        '3035 Laurier', 'Quebec', '418-542-9988', TO_DATE('18-
JAN-1991',
        'DD-MM-YYYY'));
/

COMMIT
SET VERIFY ON
```

c) Add the following movie copies in the `TITLE_COPY` table:

Note: Have the `TITLE_ID` numbers available for this exercise.

```
INSERT INTO title_copy(copy_id, title_id, status)
VALUES (1, 92, 'AVAILABLE')
/
INSERT INTO title_copy(copy_id, title_id, status)
VALUES (1, 93, 'AVAILABLE')
/
INSERT INTO title_copy(copy_id, title_id, status)
VALUES (2, 93, 'RENTED')
/
INSERT INTO title_copy(copy_id, title_id, status)
VALUES (1, 94, 'AVAILABLE')
/
INSERT INTO title_copy(copy_id, title_id, status)
VALUES (1, 95, 'AVAILABLE')
/
INSERT INTO title_copy(copy_id, title_id,status)
VALUES (2, 95, 'AVAILABLE')
/
INSERT INTO title_copy(copy_id, title_id,status)
VALUES (3, 95, 'RENTED')
/
INSERT INTO title_copy(copy_id, title_id,status)
VALUES (1, 96, 'AVAILABLE')
/
INSERT INTO title_copy(copy_id, title_id,status)
VALUES (1, 97, 'AVAILABLE')
/
```

d) Add the following rentals to the RENTAL table:

Note: The title number may be different depending on the sequence number.

```
INSERT INTO rental(title_id, copy_id, member_id,
                   book_date, exp_ret_date, act_ret_date)
VALUES (92, 1, 101, sysdate-3, sysdate-1, sysdate-2)
/
INSERT INTO rental(title_id, copy_id, member_id,
                   book_date, exp_ret_date, act_ret_date)
VALUES (93, 2, 101, sysdate-1, sysdate-1, NULL)
/
INSERT INTO rental(title_id, copy_id, member_id,
                   book_date, exp_ret_date, act_ret_date)
VALUES (95, 3, 102, sysdate-2, sysdate, NULL)
/
INSERT INTO rental(title_id, copy_id, member_id,
                   book_date, exp_ret_date,act_ret_date)
VALUES (97, 1, 106, sysdate-4, sysdate-2, sysdate-2)
/
COMMIT
/
```

5) Create a view named TITLE_AVAIL to show the movie titles, the availability of each copy, and its expected return date if rented. Query all rows from the view. Order the results by title.

Note: Your results may be different.

```
CREATE VIEW title_avail AS
  SELECT   t.title, c.copy_id, c.status, r.exp_ret_date
  FROM     title t JOIN title_copy c
  ON       t.title_id = c.title_id
  FULL OUTER JOIN rental r
  ON       c.copy_id = r.copy_id
  AND      c.title_id = r.title_id;

SELECT   *
FROM     title_avail
ORDER BY title, copy_id;
```

Practice Solutions 2-1 (continued)

6) Make changes to data in the tables.

   a) Add a new title. The movie is "Interstellar Wars," which is rated PG and classified as a science fiction movie. The release date is 07-JUL-77. The description is "Futuristic interstellar action movie. Can the rebels save the humans from the evil empire?" Be sure to add a title copy record for two copies.

```
INSERT INTO title(title_id, title, description, rating,
                  category, release_date)
VALUES (title_id_seq.NEXTVAL, 'Interstellar Wars',
        'Futuristic interstellar action movie.  Can the
         rebels save the humans from the evil empire?',
        'PG', 'SCIFI', '07-JUL-77')
/
INSERT INTO title_copy (copy_id, title_id, status)
VALUES (1, 98, 'AVAILABLE')
/
INSERT INTO title_copy (copy_id, title_id, status)
VALUES (2, 98, 'AVAILABLE')
/
```

   b) Enter two reservations. One reservation is for Carmen Velasquez, who wants to rent "Interstellar Wars." The other is for Mark Quick-to-See, who wants to rent "Soda Gang."

```
INSERT INTO reservation (res_date, member_id, title_id)
VALUES (SYSDATE, 101, 98)
/
INSERT INTO reservation (res_date, member_id, title_id)
VALUES (SYSDATE, 104, 97)
/
```

7) Make a modification to one of the tables.

   a) Run the `lab_apcs_7a.sql` script located in the `/home/oracle/labs/sql1/labs` folder, to add a `PRICE` column to the `TITLE` table to record the purchase price of the video. Verify your modifications.

```
ALTER TABLE title
ADD  (price NUMBER(8,2));

DESCRIBE title
```

b) Create a script named `lab_apcs_7b.sql` that contains update statements that update each video with a price according to the list provided. Run the commands in the script.

Note: Have the `TITLE_ID` numbers available for this exercise.

```
SET ECHO OFF
SET VERIFY OFF
UPDATE title
SET    price = &price
WHERE  title_id = &title_id;
SET VERIFY OFF
SET ECHO OFF
```

8) Create a report that contains each customer's history of renting videos. Be sure to include the customer name, movie rented, dates of the rental, and duration of rentals. Total the number of rentals for all customers for the reporting period. Save the commands that generate the report in a script file named `lab_apcs_8.sql`.

Note: Your results may be different.

```
SELECT  m.first_name||' '||m.last_name MEMBER, t.title,
        r.book_date, r.act_ret_date - r.book_date DURATION
FROM  member m
JOIN rental r
ON   r.member_id = m.member_id
JOIN title t
ON   r.title_id = t.title_id
ORDER BY member;
```

B

Table Descriptions

Schema Description

Overall Description

The Oracle Database sample schemas portray a sample company that operates worldwide to fill orders for several different products. The company has three divisions:

- **Human Resources:** Tracks information about the employees and facilities
- **Order Entry:** Tracks product inventories and sales through various channels
- **Sales History:** Tracks business statistics to facilitate business decisions

Each of these divisions is represented by a schema. In this course, you have access to the objects in all the schemas. However, the emphasis of the examples, demonstrations, and practices is on the `Human Resources` (`HR`) schema.

All scripts necessary to create the sample schemas reside in the `$ORACLE_HOME/demo/schema/` folder.

`Human Resources (HR)`

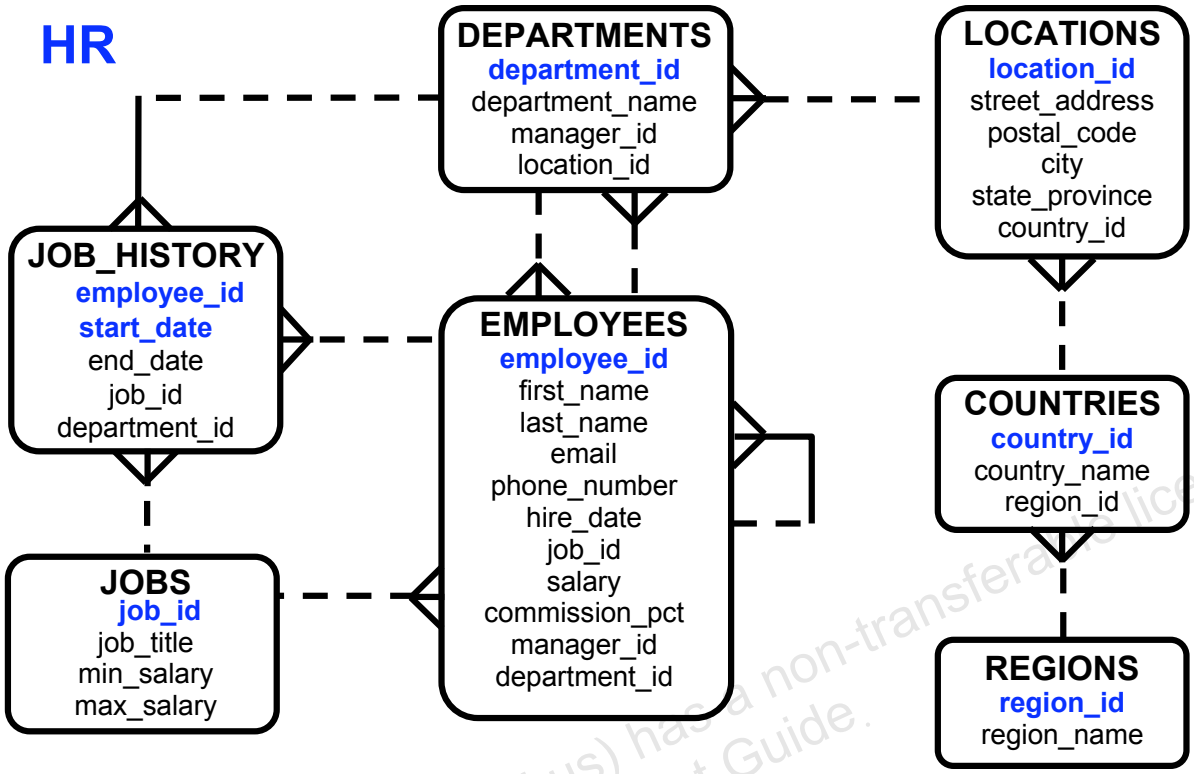
This is the schema that is used in this course. In the Human Resource (`HR`) records, each employee has an identification number, email address, job identification code, salary, and manager. Some employees earn commissions in addition to their salary.

The company also tracks information about jobs within the organization. Each job has an identification code, job title, and a minimum and maximum salary range for the job. Some employees have been with the company for a long time and have held different positions within the company. When an employee resigns, the duration the employee was working for, the job identification number, and the department are recorded.

The sample company is regionally diverse, so it tracks the locations of its warehouses and departments. Each employee is assigned to a department, and each department is identified either by a unique department number or a short name. Each department is associated with one location, and each location has a full address that includes the street name, postal code, city, state or province, and the country code.

In places where the departments and warehouses are located, the company records details such as the country name, currency symbol, currency name, and the region where the country is located geographically.

HR Entity Relationship Diagram



Human Resources (HR) Table Descriptions

```
DESCRIBE countries
```

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

```
SELECT * FROM countries;
```

	COUNTRY_ID	COUNTRY_NAME	REGION_ID
1	CA	Canada	2
2	DE	Germany	1
3	UK	United Kingdom	1
4	US	United States of America	2

Human Resources (HR) Table Descriptions (continued)

```
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
1	10	Administration	200	1700
2	20	Marketing	201	1800
3	50	Shipping	124	1500
4	60	IT	103	1400
5	80	Sales	149	2500
6	90	Executive	100	1700
7	110	Accounting	205	1700
8	190	Contracting	(null)	1700

Human Resources (HR) Table Descriptions (continued)

```
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_...	LAS...	EMAIL	PHONE_N...	HIRE_DATE	JOB_ID	SALARY	COMMISSIO...	MANAG...	DEPAR...
1	100	Steven	King	SKING	515.123.4567	17-JUN-87	AD_PRES	24000	(null)	(null)	90
2	101	Neena	Kochhar	NKOCHHAR	515.123.4568	21-SEP-89	AD_VP	17000	(null)	100	90
3	102	Lex	De Haan	LDEHAAN	515.123.4569	13-JAN-93	AD_VP	17000	(null)	100	90
4	103	Alexander	Hunold	AHUNOLD	590.423.4567	03-JAN-90	IT_PROG	9000	(null)	102	60
5	104	Bruce	Ernst	BERNST	590.423.4568	21-MAY-91	IT_PROG	6000	(null)	103	60
6	107	Diana	Lorentz	DLORENTZ	590.423.5567	07-FEB-99	IT_PROG	4200	(null)	103	60
7	124	Kevin	Mourgos	KMOURGOS	650.123.5234	16-NOV-99	ST_MAN	5800	(null)	100	50
8	141	Trenna	Rajs	TRAJS	650.121.8009	17-OCT-95	ST_CLERK	3500	(null)	124	50
9	142	Curtis	Davies	CDAVIES	650.121.2994	29-JAN-97	ST_CLERK	3100	(null)	124	50
10	143	Randall	Matos	RMATOS	650.121.2874	15-MAR-98	ST_CLERK	2600	(null)	124	50
11	144	Peter	Vargas	PVARGAS	650.121.2004	09-JUL-98	ST_CLERK	2500	(null)	124	50
12	149	Eleni	Zlotkey	EZLOTKEY	011.44.1344....	29-JAN-00	SA_MAN	10500	0.2	100	80
13	174	Ellen	Abel	EABEL	011.44.1644....	11-MAY-96	SA_REP	11000	0.3	149	80
14	176	Jonathon	Taylor	JTAYLOR	011.44.1644....	24-MAR-98	SA_REP	8600	0.2	149	80
15	178	Kimberely	Grant	KGRANT	011.44.1644....	24-MAY-99	SA_REP	7000	0.15	149	(null)
16	200	Jennifer	Whalen	JWHALEN	515.123.4444	17-SEP-87	AD_ASST	4400	(null)	101	10
17	201	Michael	Hartstein	MHARTSTE	515.123.5555	17-FEB-96	MK_MAN	13000	(null)	100	20
18	202	Pat	Fay	PFAY	603.123.6666	17-AUG-97	MK_REP	6000	(null)	201	20
19	205	Shelley	Higgins	SHIGGINS	515.123.8080	07-JUN-94	AC_MGR	12000	(null)	101	110
20	206	William	Gietz	WGIETZ	515.123.8181	07-JUN-94	AC_ACCOUNT	8300	(null)	205	110

Human Resources (HR) Table Descriptions (continued)

```
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_DATE	END_DATE	JOB_ID	DEPARTMENT_ID
1	102	13-JAN-93	24-JUL-98	IT_PROG	60
2	101	21-SEP-89	27-OCT-93	AC_ACCOUNT	110
3	101	28-OCT-93	15-MAR-97	AC_MGR	110
4	201	17-FEB-96	19-DEC-99	MK_REP	20
5	114	24-MAR-98	31-DEC-99	ST_CLERK	50
6	122	01-JAN-99	31-DEC-99	ST_CLERK	50
7	200	17-SEP-87	17-JUN-93	AD_ASST	90
8	176	24-MAR-98	31-DEC-98	SA_REP	80
9	176	01-JAN-99	31-DEC-99	SA_MAN	80
10	200	01-JUL-94	31-DEC-98	AC_ACCOUNT	90

Human Resources (HR) Table Descriptions (continued)

```
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
1	AD_PRES	President	20000	40000
2	AD_VP	Administration Vice President	15000	30000
3	AD_ASST	Administration Assistant	3000	6000
4	AC_MGR	Accounting Manager	8200	16000
5	AC_ACCOUNT	Public Accountant	4200	9000
6	SA_MAN	Sales Manager	10000	20000
7	SA_REP	Sales Representative	6000	12000
8	ST_MAN	Stock Manager	5500	8500
9	ST_CLERK	Stock Clerk	2000	5000
10	IT_PROG	Programmer	4000	10000
11	MK_MAN	Marketing Manager	9000	15000
12	MK_REP	Marketing Representative	4000	9000

Human Resources (HR) Table Descriptions (continued)

```
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	COUNTRY_ID
1	1400	2014 Jabberwocky Rd	26192	Southlake	Texas	US
2	1500	2011 Interiors Blvd	99236	South San Francisco	California	US
3	1700	2004 Charade Rd	98199	Seattle	Washington	US
4	1800	460 Bloor St. W.	ON M5S 1X8	Toronto	Ontario	CA
5	2500	Magdalen Centre, The Oxford Science Park	OX9 9ZB	Oxford	Oxford	UK

Human Resources (HR) Table Descriptions (continued)

```
DESCRIBE regions
```

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

```
SELECT * FROM regions
```

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

C

Using SQL Developer

Objectives

After completing this appendix, you should be able to do the following:

- List the key features of Oracle SQL Developer
- Identify the menu items of Oracle SQL Developer
- Create a database connection
- Manage database objects
- Use SQL Worksheet
- Save and run SQL scripts
- Create and save reports

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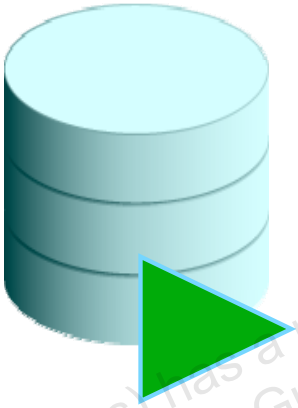
Objectives

In this appendix, you are introduced to the graphical tool called SQL Developer. You learn how to use SQL Developer for your database development tasks. You learn how to use SQL Worksheet to execute SQL statements and SQL scripts.

What Is Oracle SQL Developer?

- Oracle SQL Developer is a graphical tool that enhances productivity and simplifies database development tasks.
- You can connect to any target Oracle database schema by using standard Oracle database authentication.



SQL Developer

What Is Oracle SQL Developer?

Oracle SQL Developer is a free graphical tool designed to improve your productivity and simplify the development of everyday database tasks. With just a few clicks, you can easily create and debug stored procedures, test SQL statements, and view optimizer plans.

SQL Developer, which is the visual tool for database development, simplifies the following tasks:

- Browsing and managing database objects
- Executing SQL statements and scripts
- Editing and debugging PL/SQL statements
- Creating reports

You can connect to any target Oracle database schema by using standard Oracle database authentication. When connected, you can perform operations on objects in the database.

The SQL Developer 1.2 release tightly integrates with *Developer Migration Workbench* that provides users with a single point to browse database objects and data in third-party databases, and to migrate from these databases to Oracle. You can also connect to schemas for selected third-party (non-Oracle) databases, such as MySQL, Microsoft SQL Server, and Microsoft Access, and view metadata and data in these databases.

Additionally, SQL Developer includes support for Oracle Application Express 3.0.1 (Oracle APEX).

Specifications of SQL Developer

- Shipped along with Oracle Database 11*g* Release 2
- Developed in Java
- Supports Windows, Linux, and Mac OS X platforms
- Enables default connectivity using the JDBC Thin driver
- Connects to Oracle Database version 9.2.0.1 and later
- Freely downloadable from the following link:
  - http://www.oracle.com/technology/products/database/sql_developer/index.html

Specifications of SQL Developer

Oracle SQL Developer 1.5 is shipped along with Oracle Database 11*g* Release 2. SQL Developer is developed in Java leveraging the Oracle JDeveloper integrated development environment (IDE). Therefore, it is a cross-platform tool. The tool runs on Windows, Linux, and Mac operating system (OS) X platforms.

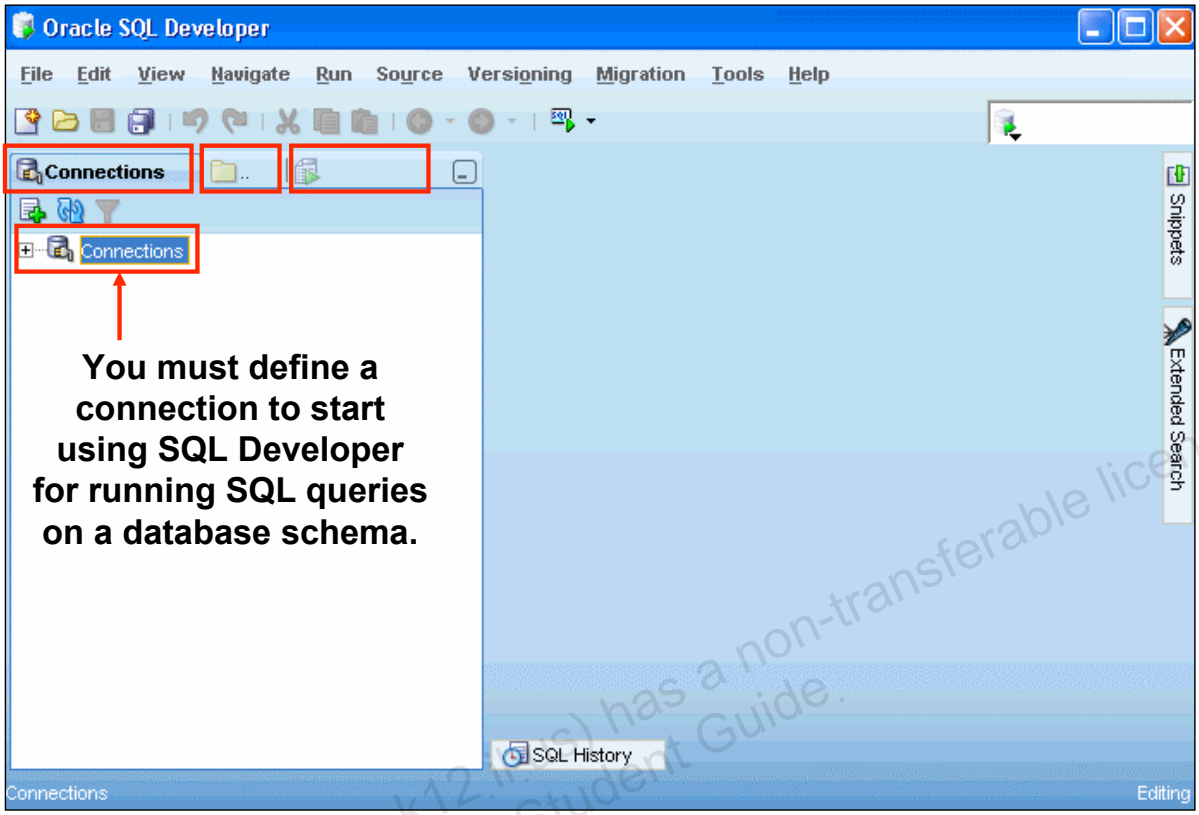
The default connectivity to the database is through the Java Database Connectivity (JDBC) Thin driver, and therefore, no Oracle Home is required. SQL Developer does not require an installer and you need to simply unzip the downloaded file. With SQL Developer, users can connect to Oracle Databases 9.2.0.1 and later, and all Oracle database editions including Express Edition.

Note

For Oracle Database versions before Oracle Database 11*g* Release 2, you will have to download and install SQL Developer. SQL Developer 1.5 is freely downloadable from the following link:
http://www.oracle.com/technology/products/database/sql_developer/index.html.

For instructions on how to install SQL Developer, see the Web site at:
http://download.oracle.com/docs/cd/E12151_01/index.htm

SQL Developer 1.5 Interface



SQL Developer 1.5 Interface

The SQL Developer 1.5 interface contains three main navigation tabs, from left to right:

- **Connections tab:** By using this tab, you can browse database objects and users to which you have access.
- **Files tab:** Identified by the Files folder icon, this tab enables you to access files from your local machine without having to use the File > Open menu.
- **Reports tab:** Identified by the Reports icon, this tab enables you to run predefined reports or create and add your own reports.

General Navigation and Use

SQL Developer uses the left side for navigation to find and select objects, and the right side to display information about selected objects. You can customize many aspects of the appearance and behavior of SQL Developer by setting preferences.

Note: You need to define at least one connection to be able to connect to a database schema and issue SQL queries or run procedures/functions.

SQL Developer 1.5 Interface (continued)

Menus

The following menus contain standard entries, plus entries for features specific to SQL Developer:

- **View:** Contains options that affect what is displayed in the SQL Developer interface
- **Navigate:** Contains options for navigating to panes and for executing subprograms
- **Run:** Contains the Run File and Execution Profile options that are relevant when a function or procedure is selected, and also debugging options.
- **Source:** Contains options for use when you edit functions and procedures
- **Versioning:** Provides integrated support for the following versioning and source control systems: CVS (Concurrent Versions System) and Subversion.
- **Migration:** Contains options related to migrating third-party databases to Oracle
- **Tools:** Invokes SQL Developer tools such as SQL*Plus, Preferences, and SQL Worksheet

Note: The Run menu also contains options that are relevant when a function or procedure is selected for debugging. These are the same options that are found in the Debug menu in version 1.2.

Creating a Database Connection

- You must have at least one database connection to use SQL Developer.
- You can create and test connections for:
  - Multiple databases
  - Multiple schemas
- SQL Developer automatically imports any connections defined in the `tnsnames.ora` file on your system.
- You can export connections to an Extensible Markup Language (XML) file.
- Each additional database connection created is listed in the Connections Navigator hierarchy.

Creating a Database Connection

A connection is a SQL Developer object that specifies the necessary information for connecting to a specific database as a specific user of that database. To use SQL Developer, you must have at least one database connection, which may be existing, created, or imported.

You can create and test connections for multiple databases and for multiple schemas.

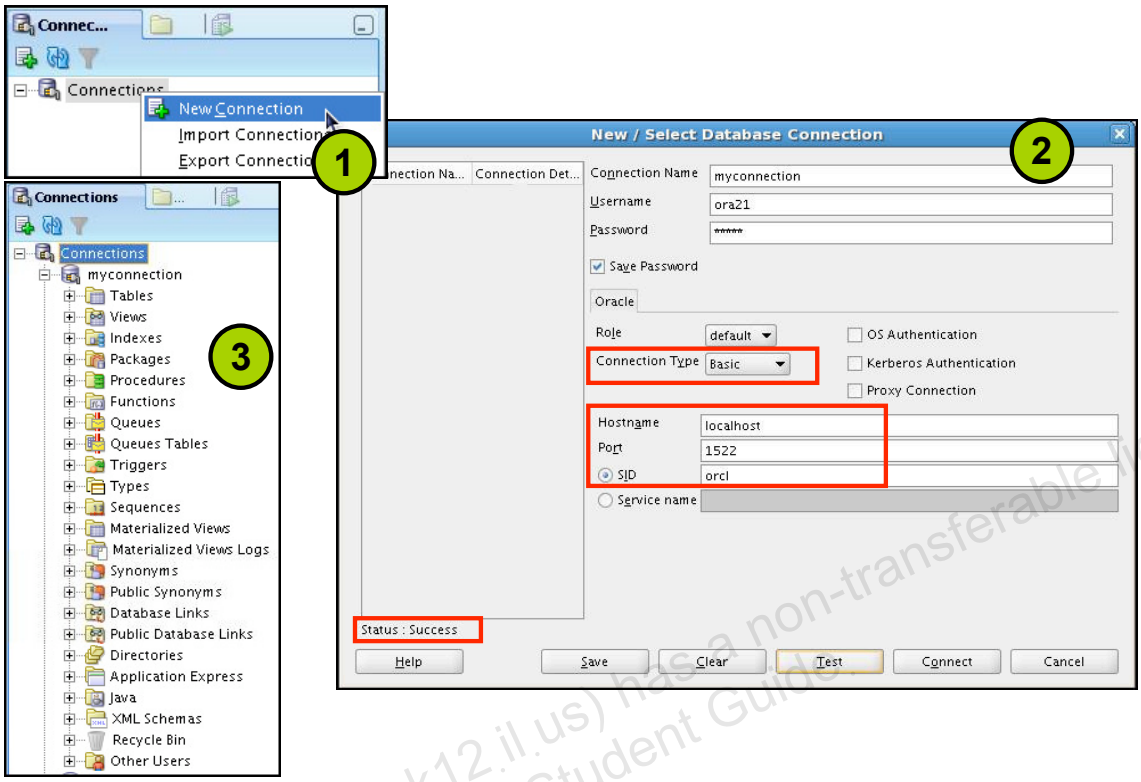
By default, the `tnsnames.ora` file is located in the `$ORACLE_HOME/network/admin` directory, but it can also be in the directory specified by the `TNS_ADMIN` environment variable or registry value. When you start SQL Developer and display the Database Connections dialog box, SQL Developer automatically imports any connections defined in the `tnsnames.ora` file on your system.

Note: On Windows, if the `tnsnames.ora` file exists, but its connections are not being used by SQL Developer, define `TNS_ADMIN` as a system environment variable.

You can export connections to an XML file so that you can reuse it.

You can create additional connections as different users to the same database or to connect to the different databases.

Creating a Database Connection



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Creating a Database Connection (continued)

To create a database connection, perform the following steps:

1. On the Connections tabbed page, right-click **Connections** and select **New Connection**.
2. In the New/Select Database Connection window, enter the connection name. Enter the username and password of the schema that you want to connect to.
   a) From the Role drop-down list, you can select either *default* or `SYSDBA`. (You choose `SYSDBA` for the `sys` user or any user with database administrator privileges.)
   b) You can select the connection type as:
      Basic: In this type, enter host name and SID for the database you want to connect to. Port is already set to 1521. You can also choose to enter the Service name directly if you use a remote database connection.
      TNS: You can select any one of the database aliases imported from the `tnsnames.ora` file.
      LDAP: You can look up database services in Oracle Internet Directory, which is a component of Oracle Identity Management.
      Advanced: You can define a custom Java Database Connectivity (JDBC) URL to connect to the database.
   c) Click Test to ensure that the connection has been set correctly.
   d) Click Connect.

Creating a Database Connection (continued)

If you select the Save Password check box, the password is saved to an XML file. So, after you close the SQL Developer connection and open it again, you are not prompted for the password.

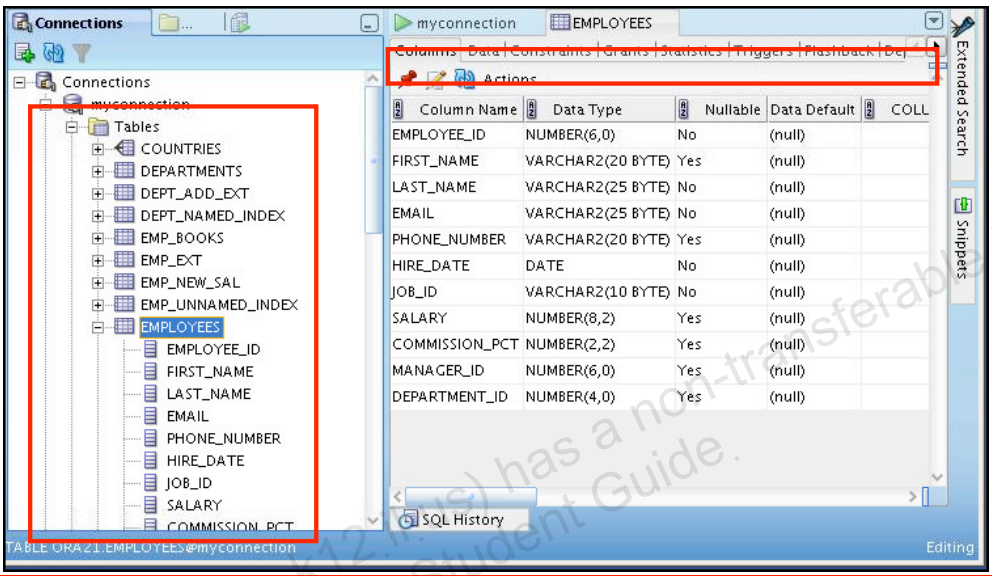
3. The connection gets added in the Connections Navigator. You can expand the connection to view the database objects and view object definitions—for example, dependencies, details, statistics, and so on.

Note: From the same New/Select Database Connection window, you can define connections to non-Oracle data sources using the Access, MySQL, and SQL Server tabs. However, these connections are read-only connections that enable you to browse objects and data in that data source.

Browsing Database Objects

Use the Connections Navigator to:

- Browse through many objects in a database schema
- Review the definitions of objects at a glance



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Browsing Database Objects

After you create a database connection, you can use the Connections Navigator to browse through many objects in a database schema including Tables, Views, Indexes, Packages, Procedures, Triggers, and Types.

SQL Developer uses the left side for navigation to find and select objects, and the right side to display information about the selected objects. You can customize many aspects of the appearance of SQL Developer by setting preferences.

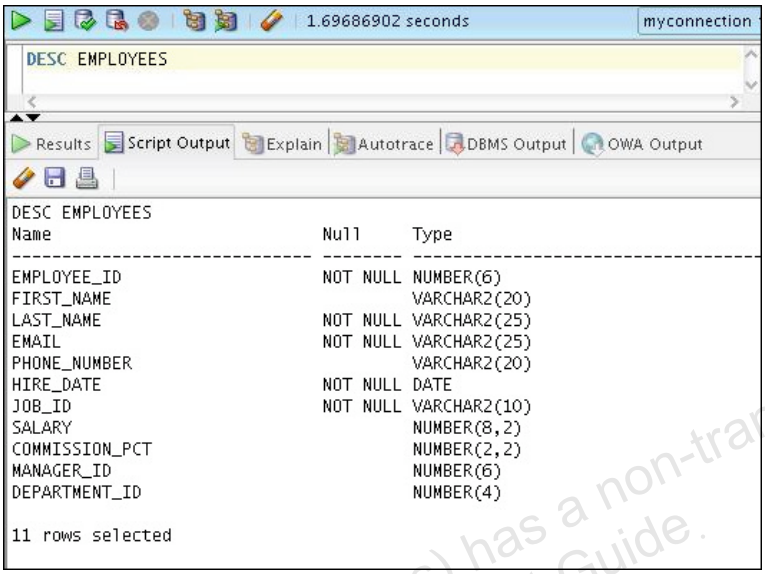
You can see the definition of the objects broken into tabs of information that is pulled out of the data dictionary. For example, if you select a table in the Navigator, the details about columns, constraints, grants, statistics, triggers, and so on are displayed on an easy-to-read tabbed page.

If you want to see the definition of the `EMPLOYEES` table as shown in the slide, perform the following steps:

1. Expand the Connections node in the Connections Navigator.
2. Expand Tables.
3. Click `EMPLOYEES`. By default, the Columns tab is selected. It shows the column description of the table. Using the Data tab, you can view the table data and also enter new rows, update data, and commit these changes to the database.

Displaying the Table Structure

Use the `DESCRIBE` command to display the structure of a table:



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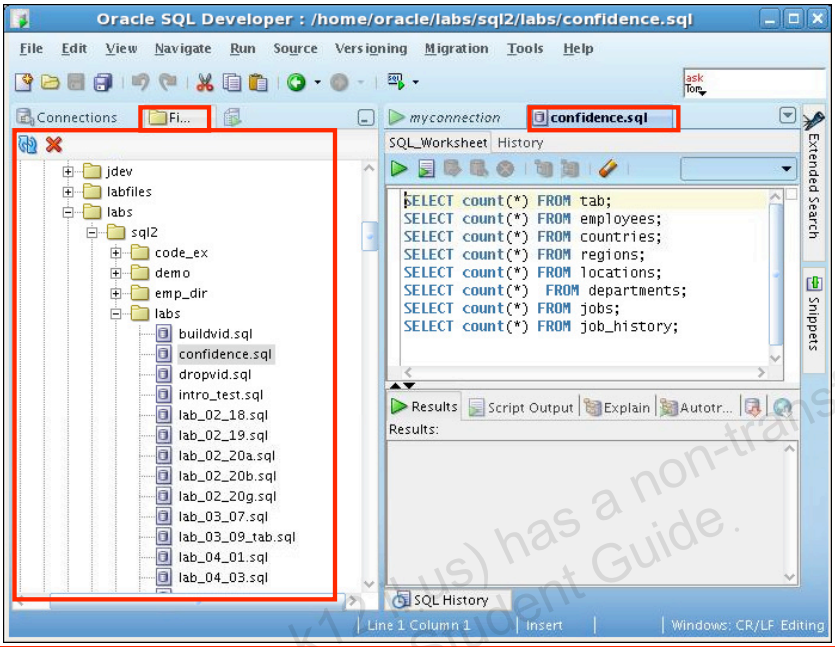
Displaying the Table Structure

In SQL Developer, you can also display the structure of a table using the `DESCRIBE` command. The result of the command is a display of column names and data types as well as an indication if a column must contain data.

Browsing Files

Use the File Navigator to explore the file system and open system files.



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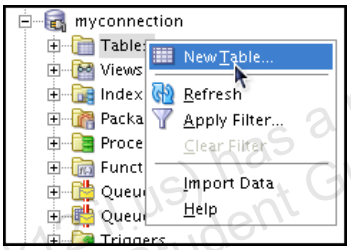
Browsing Database Objects

You can use the File Navigator to browse and open system files.

- To view the files navigator, click the Files tab, or select View > Files.
- To view the contents of a file, double-click a file name to display its contents in the SQL worksheet area.

Creating a Schema Object

- SQL Developer supports the creation of any schema object by:
  - Executing a SQL statement in SQL Worksheet
  - Using the context menu
- Edit the objects by using an edit dialog box or one of the many context-sensitive menus.
- View the data definition language (DDL) for adjustments such as creating a new object or editing an existing schema object.



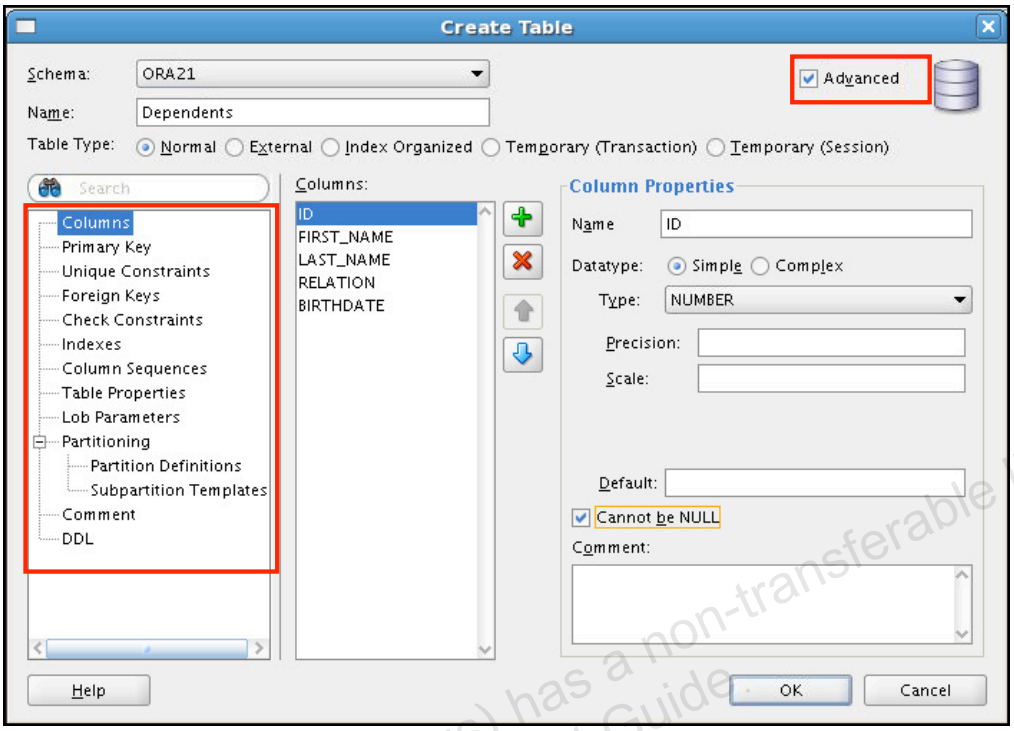
Creating a Schema Object

SQL Developer supports the creation of any schema object by executing a SQL statement in SQL Worksheet. Alternatively, you can create objects using the context menus. When created, you can edit the objects using an edit dialog box or one of the many context-sensitive menus.

As new objects are created or existing objects are edited, the DDL for those adjustments is available for review. An Export DDL option is available if you want to create the full DDL for one or more objects in the schema.

The slide shows how to create a table using the context menu. To open a dialog box for creating a new table, right-click Tables and select New Table. The dialog boxes to create and edit database objects have multiple tabs, each reflecting a logical grouping of properties for that type of object.

Creating a New Table: Example



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Creating a New Table: Example

In the Create Table dialog box, if you do not select the Advanced check box, you can create a table quickly by specifying columns and some frequently used features.

If you select the Advanced check box, the Create Table dialog box changes to one with multiple options, in which you can specify an extended set of features while you create the table.

The example in the slide shows how to create the `DEPENDENTS` table by selecting the Advanced check box.

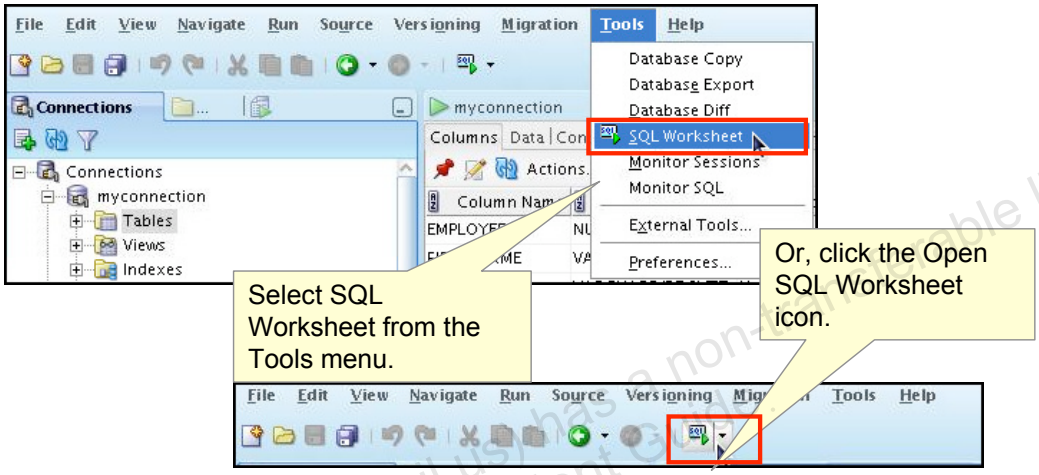
To create a new table, perform the following steps:

1. In the Connections Navigator, right-click Tables.
2. Select Create TABLE.
3. In the Create Table dialog box, select Advanced.
4. Specify the column information.
5. Click OK.

Although it is not required, you should also specify a primary key by using the Primary Key tab in the dialog box. Sometimes, you may want to edit the table that you have created; to do so, right-click the table in the Connections Navigator and select Edit.

Using the SQL Worksheet

- Use the SQL Worksheet to enter and execute SQL, PL/SQL, and SQL *Plus statements.
- Specify any actions that can be processed by the database connection associated with the worksheet.



Using the SQL Worksheet

When you connect to a database, a SQL Worksheet window for that connection automatically opens. You can use the SQL Worksheet to enter and execute SQL, PL/SQL, and SQL*Plus statements. The SQL Worksheet supports SQL*Plus statements to a certain extent. SQL*Plus statements that are not supported by the SQL Worksheet are ignored and not passed to the database.

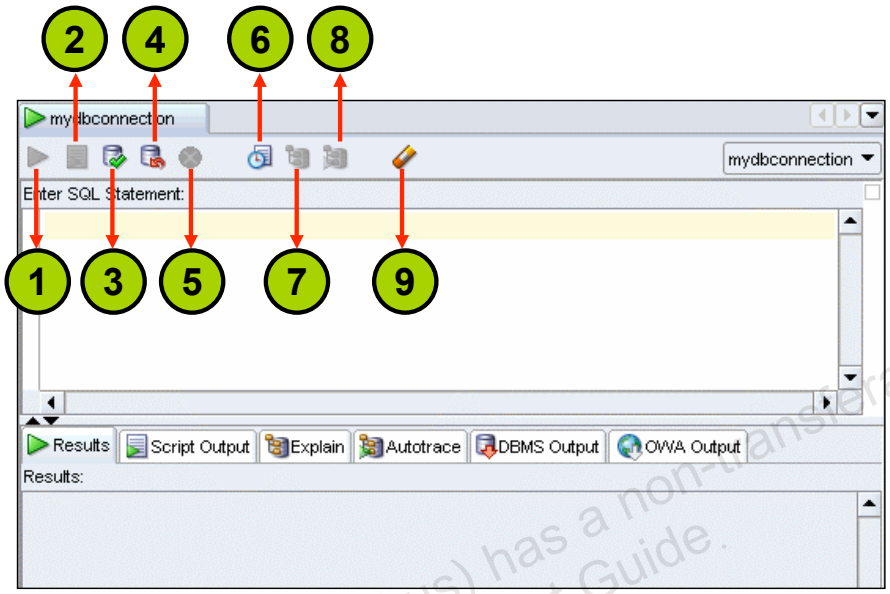
You can specify actions that can be processed by the database connection associated with the worksheet, such as:

- Creating a table
- Inserting data
- Creating and editing a trigger
- Selecting data from a table
- Saving the selected data to a file

You can display a SQL Worksheet by using one of the following:

- Select Tools > SQL Worksheet.
- Click the Open SQL Worksheet icon.

Using the SQL Worksheet



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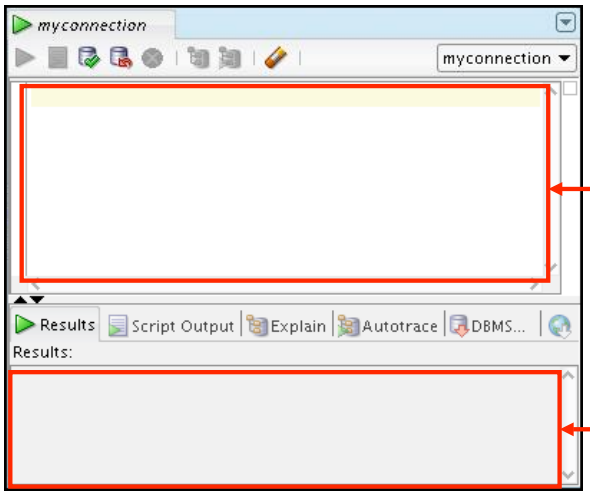
Using the SQL Worksheet (continued)

You may want to use the shortcut keys or icons to perform certain tasks such as executing a SQL statement, running a script, and viewing the history of SQL statements that you have executed. You can use the SQL Worksheet toolbar that contains icons to perform the following tasks:

1. **Execute Statement:** Executes the statement where the cursor is located in the Enter SQL Statement box. You can use bind variables in the SQL statements, but not substitution variables.
2. **Run Script:** Executes all statements in the Enter SQL Statement box by using the Script Runner. You can use substitution variables in the SQL statements, but not bind variables.
3. **Commit:** Writes any changes to the database and ends the transaction
4. **Rollback:** Discards any changes to the database, without writing them to the database, and ends the transaction
5. **Cancel:** Stops the execution of any statements currently being executed
6. **SQL History:** Displays a dialog box with information about SQL statements that you have executed
7. **Execute Explain Plan:** Generates the execution plan, which you can see by clicking the Explain tab
8. **Autotrace:** Generates trace information for the statement
9. **Clear:** Erases the statement or statements in the Enter SQL Statement box

Using the SQL Worksheet



Using the SQL Worksheet (continued)

When you connect to a database, a SQL Worksheet window for that connection automatically opens. You can use the SQL Worksheet to enter and execute SQL, PL/SQL, and SQL*Plus statements. All SQL and PL/SQL commands are supported as they are passed directly from the SQL Worksheet to the Oracle database. SQL*Plus commands used in the SQL Developer have to be interpreted by the SQL Worksheet before being passed to the database.

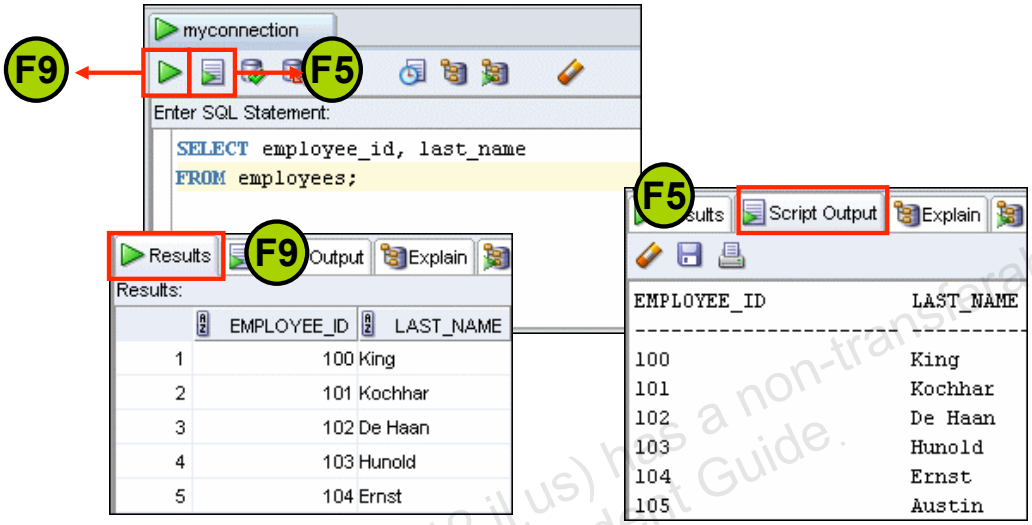
The SQL Worksheet currently supports a number of SQL*Plus commands. Commands not supported by the SQL Worksheet are ignored and are not sent to the Oracle database. Through the SQL Worksheet, you can execute SQL statements and some of the SQL*Plus commands.

You can display a SQL Worksheet by using any of the following options:

- Select Tools > SQL Worksheet.
- Click the Open SQL Worksheet icon.

Executing SQL Statements

Use the Enter SQL Statement box to enter single or multiple SQL statements.



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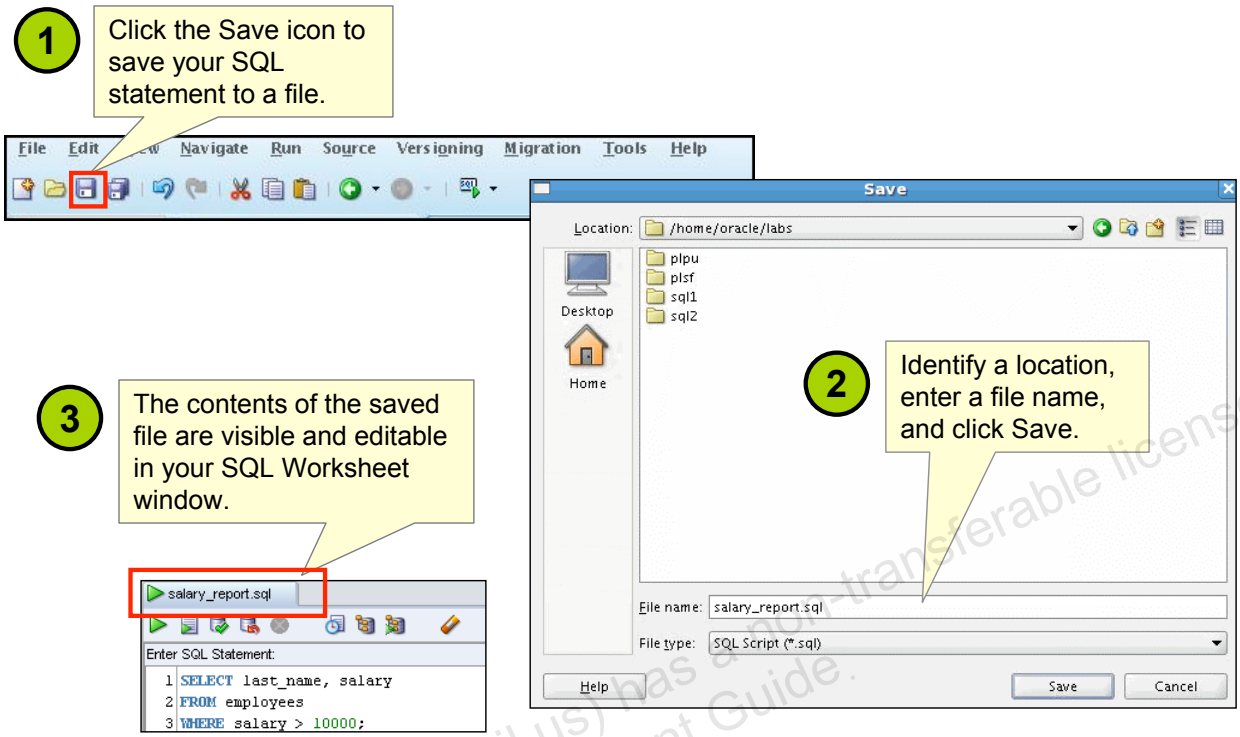
Executing SQL Statements

The example in the slide shows the difference in output for the same query when the [F9] key or Execute Statement is used versus the output when [F5] or Run Script is used.

Saving SQL Scripts



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Saving SQL Scripts

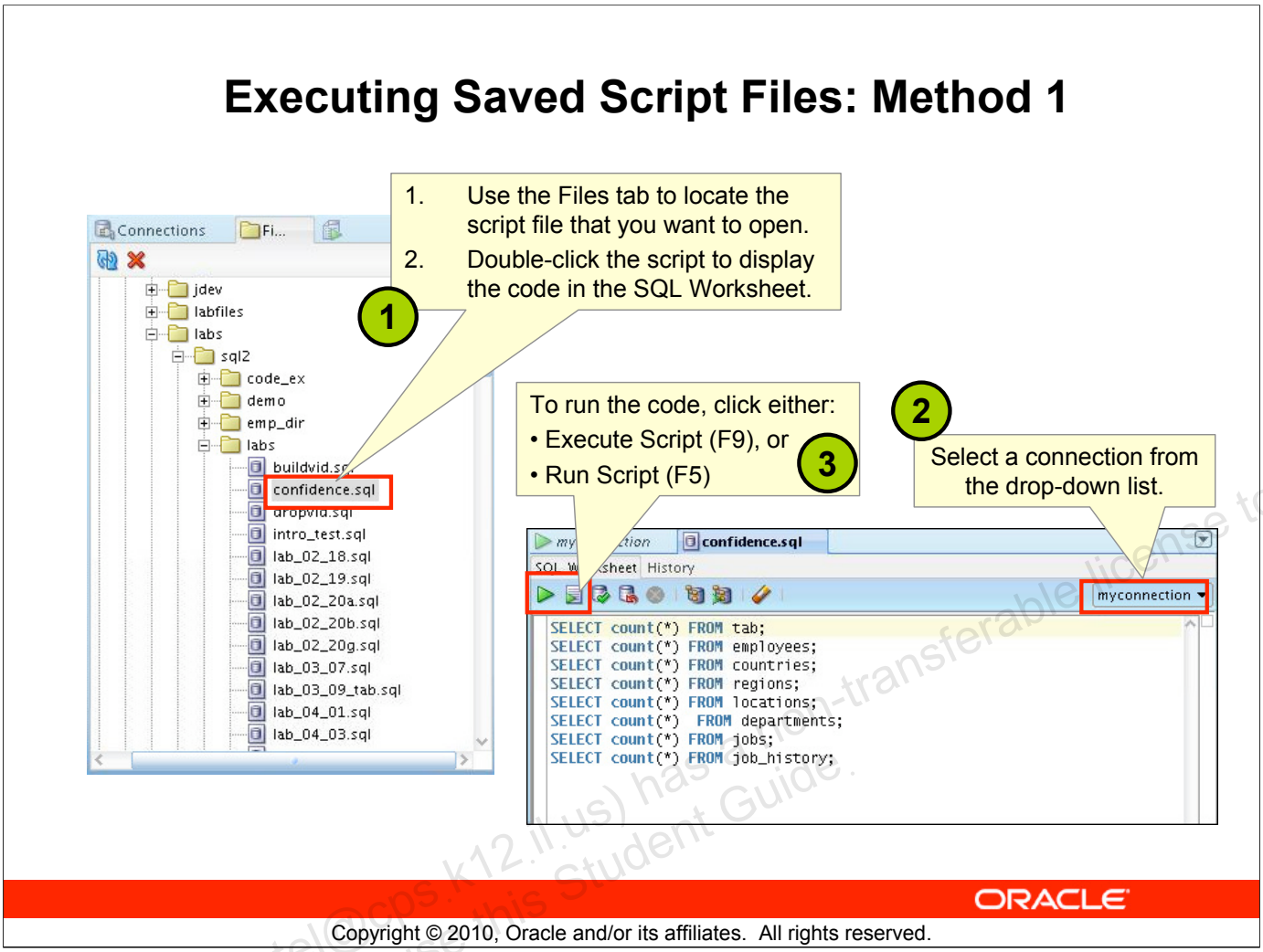
You can save your SQL statements from the SQL Worksheet into a text file. To save the contents of the Enter SQL Statement box, perform the following steps:

1. Click the Save icon or use the File > Save menu item.
2. In the Save dialog box, enter a file name and the location where you want the file saved.
3. Click Save.

After you save the contents to a file, the Enter SQL Statement window displays a tabbed page of your file contents. You can have multiple files open at the same time. Each file displays as a tabbed page.

Script Pathing

You can select a default path to look for scripts and to save scripts. Under Tools > Preferences > Database > Worksheet Parameters, enter a value in the "Select default path to look for scripts" field.



Executing Saved Script Files: Method 1

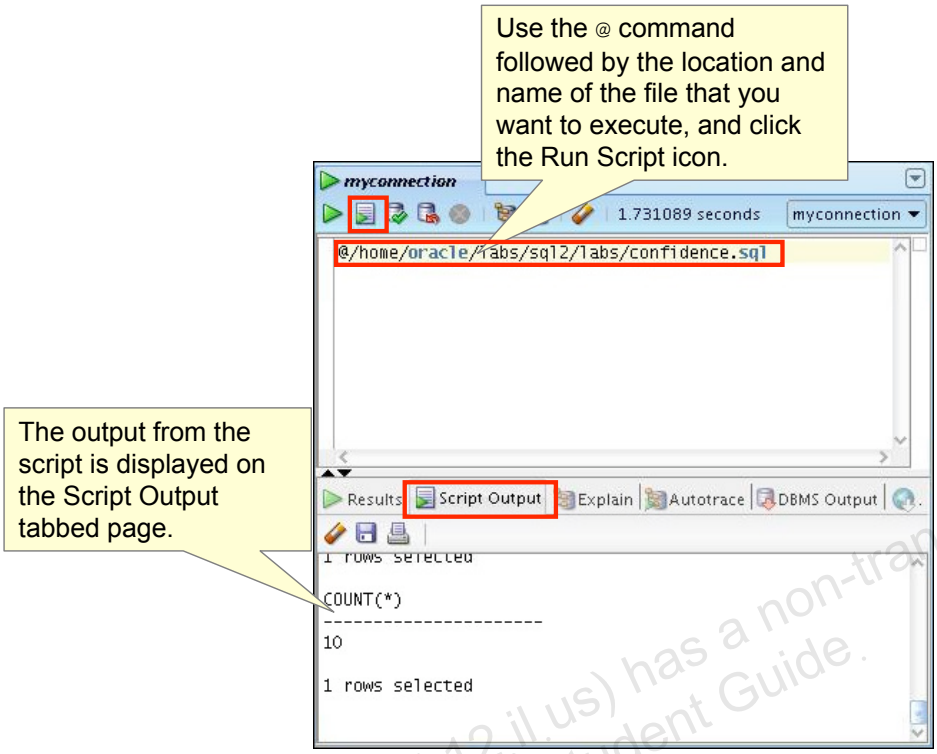
To open a script file and display the code in the SQL Worksheet area, perform the following steps:

1. In the files navigator, select (or navigate to) the script file that you want to open.
2. Double-click to open. The code of the script file is displayed in the SQL Worksheet area.
3. Select a connection from the connection drop-down list.
4. To run the code, click the Run Script (F5) icon on the SQL Worksheet toolbar. If you have not selected a connection from the connection drop-down list, a connection dialog box will appear. Select the connection you want to use for the script execution.

Alternatively, you can also do the following:

1. Select File > Open. The Open dialog box is displayed.
2. In the Open dialog box, select (or navigate to) the script file that you want to open.
3. Click Open. The code of the script file is displayed in the SQL Worksheet area.
4. Select a connection from the connection drop-down list.
5. To run the code, click the Run Script (F5) icon on the SQL Worksheet toolbar. If you have not selected a connection from the connection drop-down list, a connection dialog box will appear. Select the connection you want to use for the script execution

Executing Saved Script Files: Method 2

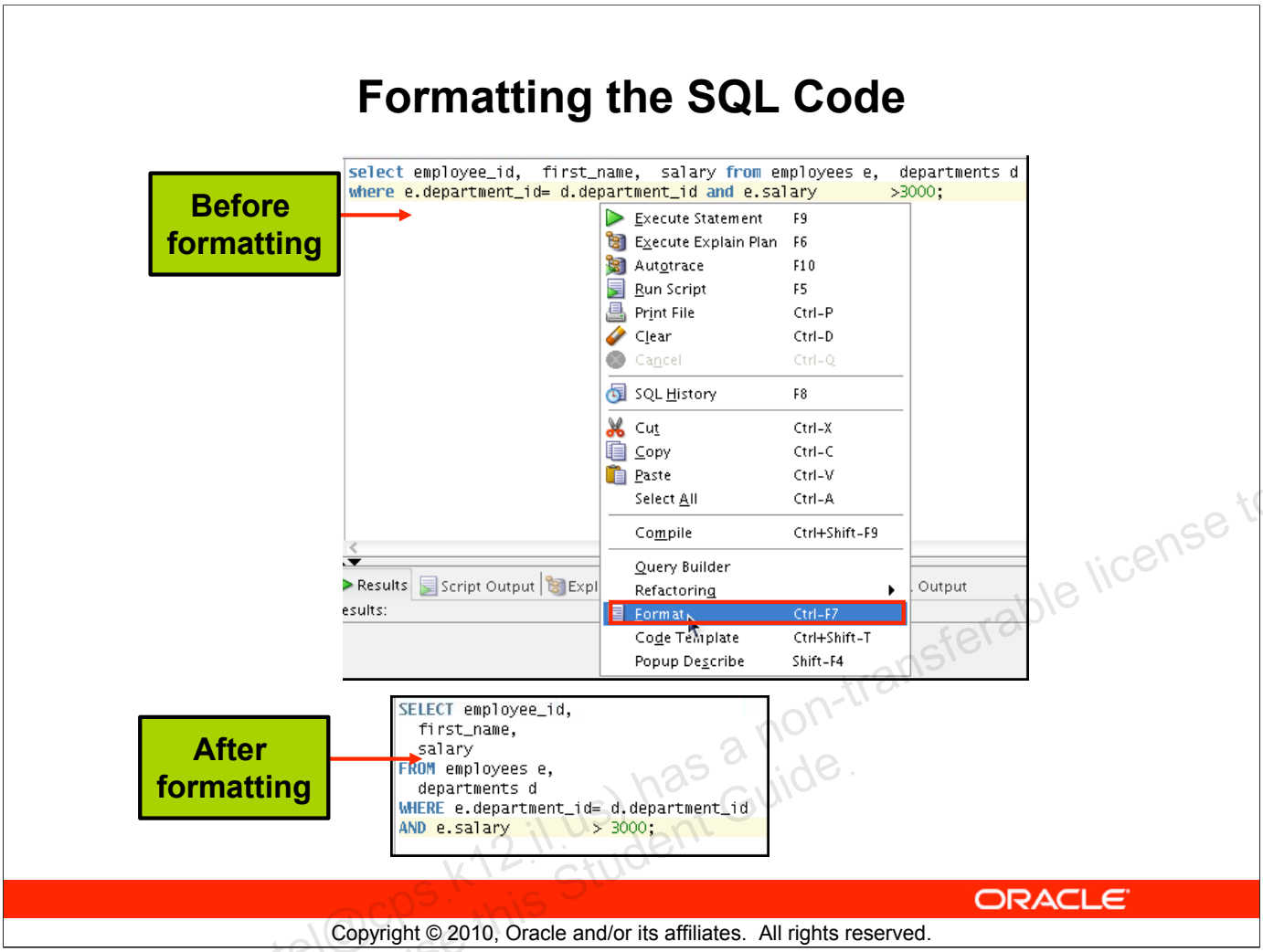


Executing Saved Script Files: Method 2

To run a saved SQL script, perform the following steps:

1. Use the **@** command, followed by the location, and name of the file you want to run, in the Enter SQL Statement window.
2. Click the Run Script icon.

The results from running the file are displayed on the Script Output tabbed page. You can also save the script output by clicking the Save icon on the Script Output tabbed page. The File Save dialog box appears and you can identify a name and location for your file.



Formatting the SQL Code

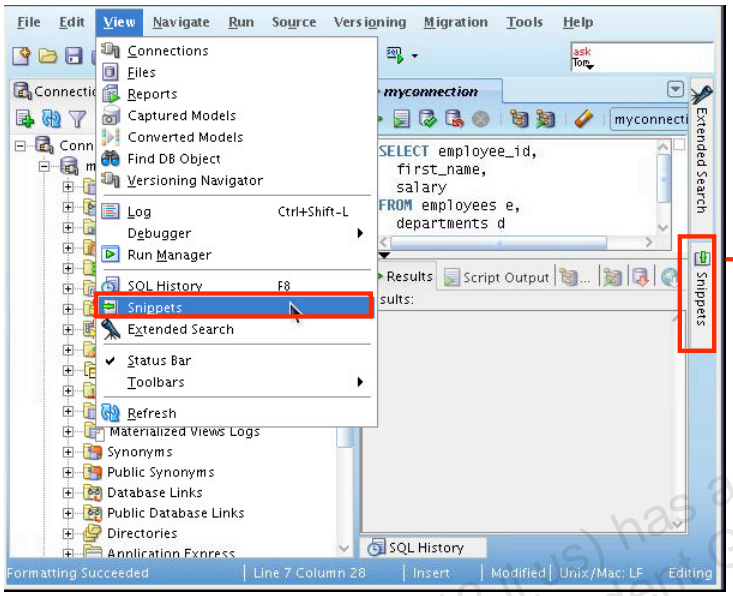
You may want to format the indentation, spacing, capitalization, and line separation of the SQL code. SQL Developer has a feature for formatting SQL code.

To format the SQL code, right-click in the statement area, and select Format SQL.

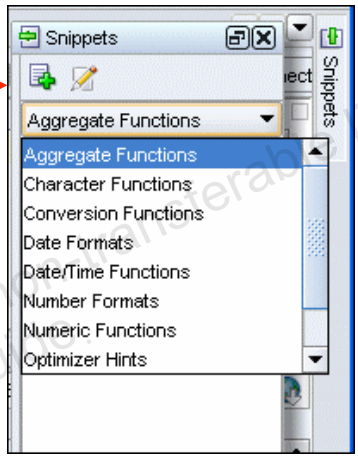
In the example in the slide, before formatting, the SQL code has the keywords not capitalized and the statement not properly indented. After formatting, the SQL code is beautified with the keywords capitalized and the statement properly indented.

Using Snippets

Snippets are code fragments that may be just syntax or examples.



When you place your cursor here, it shows the Snippets window. From the drop-down list, you can select the functions category that you want.



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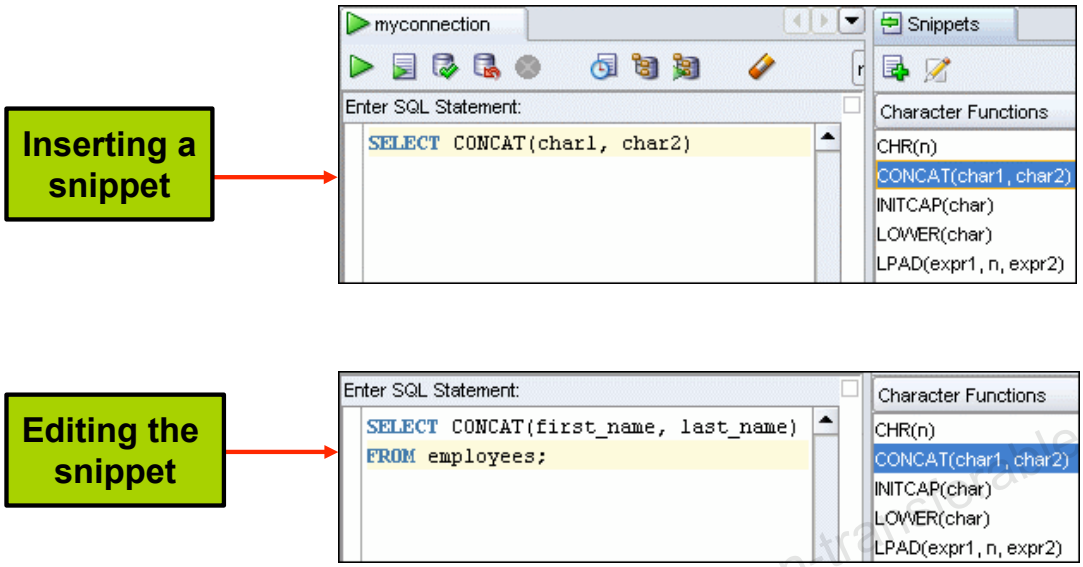
Using Snippets

You may want to use certain code fragments when you use the SQL Worksheet or create or edit a PL/SQL function or procedure. SQL Developer has the feature called Snippets. Snippets are code fragments such as SQL functions, Optimizer hints, and miscellaneous PL/SQL programming techniques. You can drag snippets into the Editor window.

To display Snippets, select View > Snippets.

The Snippets window is displayed at the right. You can use the drop-down list to select a group. A Snippets button is placed in the right window margin, so that you can display the Snippets window if it becomes hidden.

Using Snippets: Example



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Using Snippets: Example

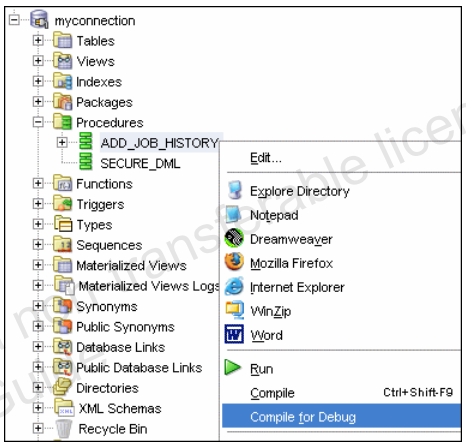
To insert a Snippet into your code in a SQL Worksheet or in a PL/SQL function or procedure, drag the snippet from the Snippets window to the desired place in your code. Then you can edit the syntax so that the SQL function is valid in the current context. To see a brief description of a SQL function in a tool tip, place the cursor over the function name.

The example in the slide shows that `CONCAT(char1, char2)` is dragged from the Character Functions group in the Snippets window. Then the `CONCAT` function syntax is edited and the rest of the statement is added as in the following:

```
SELECT CONCAT(first_name, last_name)
FROM employees;
```

Debugging Procedures and Functions

- Use SQL Developer to debug PL/SQL functions and procedures.
- Use the Compile for Debug option to perform a PL/SQL compilation so that the procedure can be debugged.
- Use the Debug menu options to set breakpoints, and to perform step into, step over tasks.



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Debugging Procedures and Functions

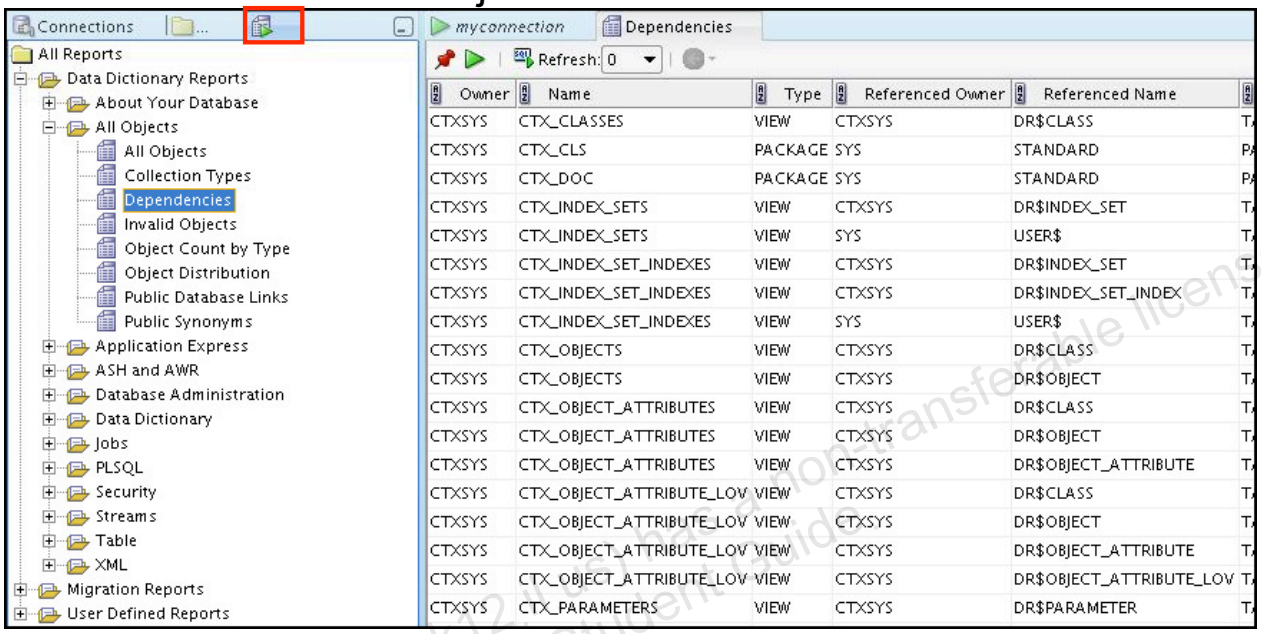
In SQL Developer, you can debug PL/SQL procedures and functions. Using the Debug menu options, you can perform the following debugging tasks:

- **Find Execution Point** goes to the next execution point.
- **Resume** continues execution.
- **Step Over** bypasses the next method and goes to the next statement after the method.
- **Step Into** goes to the first statement in the next method.
- **Step Out** leaves the current method and goes to the next statement.
- **Step to End of Method** goes to the last statement of the current method.
- **Pause** halts execution, but does not exit, thus allowing you to resume execution.
- **Terminate** halts and exits the execution. You cannot resume execution from this point; instead, to start running or debugging from the beginning of the function or procedure, click the Run or Debug icon on the Source tab toolbar.
- **Garbage Collection** removes invalid objects from the cache in favor of more frequently accessed and more valid objects.

These options are also available as icons on the debugging toolbar.

Database Reporting

SQL Developer provides a number of predefined reports about the database and its objects.



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Database Reporting

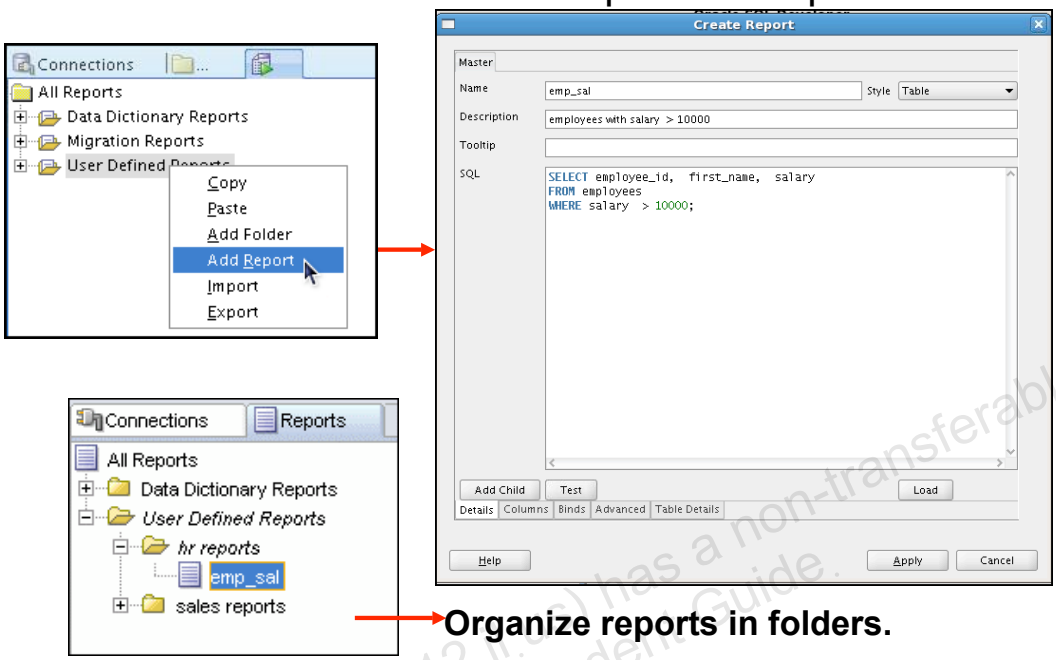
SQL Developer provides many reports about the database and its objects. These reports can be grouped into the following categories:

- About Your Database reports
- Database Administration reports
- Table reports
- PL/SQL reports
- Security reports
- XML reports
- Jobs reports
- Streams reports
- All Objects reports
- Data Dictionary reports
- User-Defined reports

To display reports, click the Reports tab at the left of the window. Individual reports are displayed in tabbed panes at the right of the window; and for each report, you can select (using a drop-down list) the database connection for which to display the report. For reports about objects, the objects shown are only those visible to the database user associated with the selected database connection, and the rows are usually ordered by Owner. You can also create your own user-defined reports.

Creating a User-Defined Report

Create and save user-defined reports for repeated use.



Organize reports in folders.

Creating a User-Defined Report

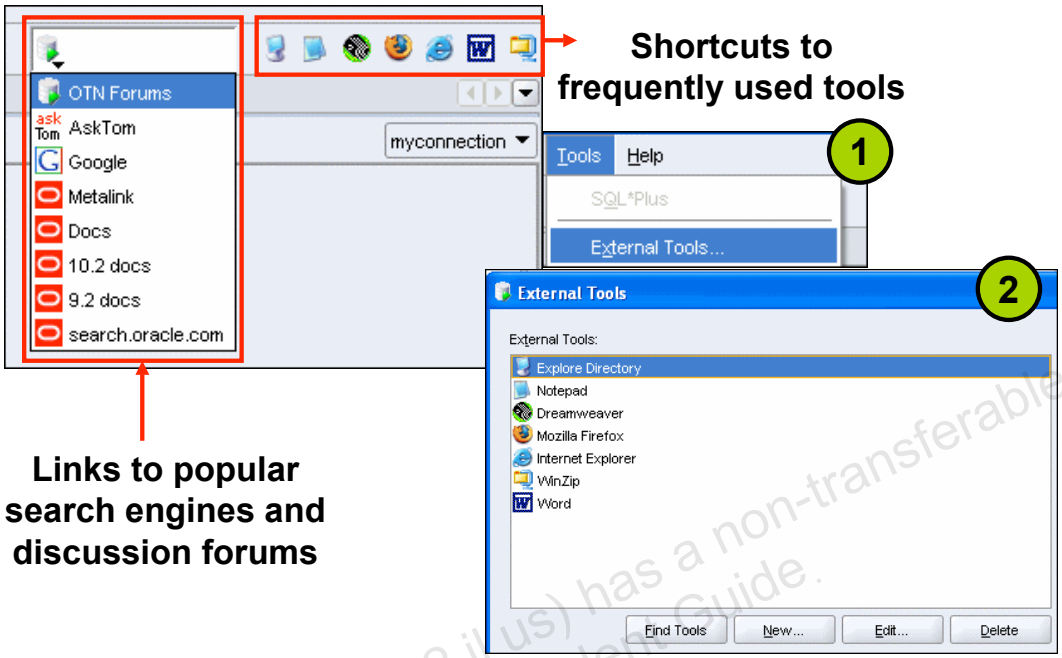
User-defined reports are reports created by SQL Developer users. To create a user-defined report, perform the following steps:

1. Right-click the User Defined Reports node under Reports, and select Add Report.
2. In the Create Report dialog box, specify the report name and the SQL query to retrieve information for the report. Then click Apply.

In the example in the slide, the report name is specified as `emp_sal`. An optional description is provided indicating that the report contains details of employees with `salary >= 10000`. The complete SQL statement for retrieving the information to be displayed in the user-defined report is specified in the SQL box. You can also include an optional tool tip to be displayed when the cursor stays briefly over the report name in the Reports navigator display.

You can organize user-defined reports in folders, and you can create a hierarchy of folders and subfolders. To create a folder for user-defined reports, right-click the User Defined Reports node or any folder name under that node and select Add Folder. Information about user-defined reports, including any folders for these reports, is stored in a file named `UserReports.xml` under the directory for user-specific information.

Search Engines and External Tools



Search Engines and External Tools

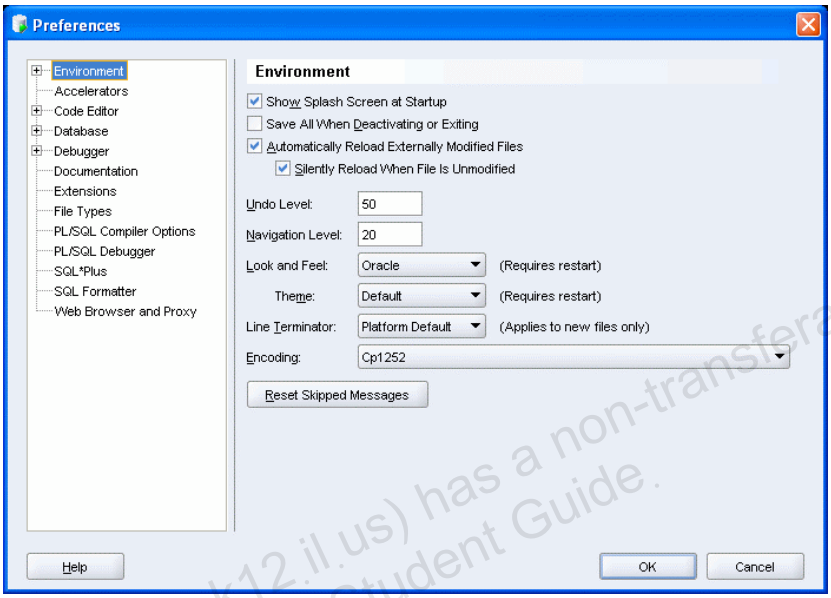
To enhance productivity of the SQL developers, SQL Developer has added quick links to popular search engines and discussion forums such as AskTom, Google, and so on. Also, you have shortcut icons to some of the frequently used tools such as Notepad, Microsoft Word, and Dreamweaver, available to you.

You can add external tools to the existing list or even delete shortcuts to tools that you do not use frequently. To do so, perform the following steps:

1. From the Tools menu, select External Tools.
2. In the External Tools dialog box, select New to add new tools. Select Delete to remove any tool from the list.

Setting Preferences

- Customize the SQL Developer interface and environment.
- In the Tools menu, select Preferences.



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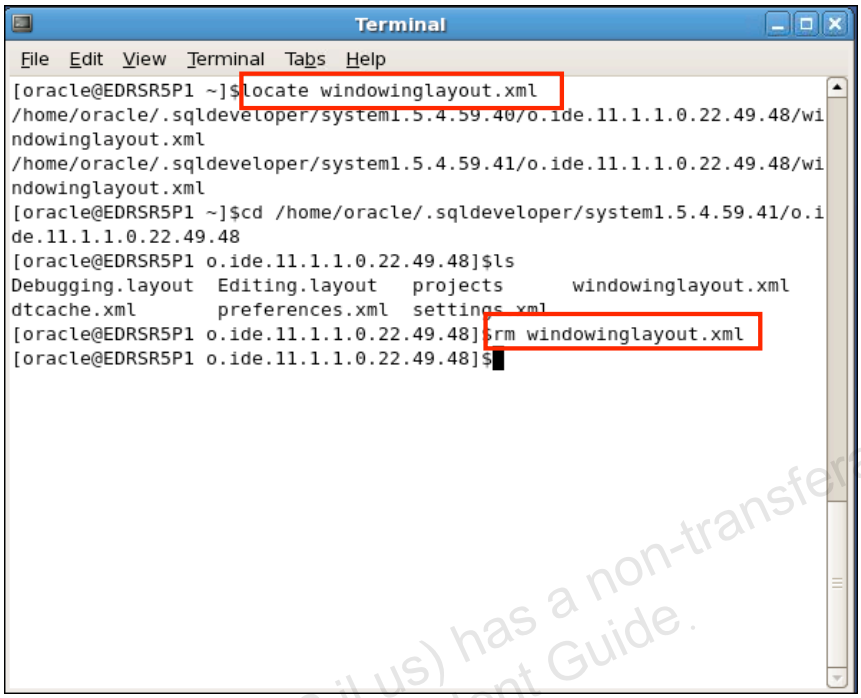
Setting Preferences

You can customize many aspects of the SQL Developer interface and environment by modifying SQL Developer preferences according to your preferences and needs. To modify SQL Developer preferences, select Tools, then Preferences.

The preferences are grouped into the following categories:

- Environment
- Accelerators (Keyboard shortcuts)
- Code Editors
- Database
- Debugger
- Documentation
- Extensions
- File Types
- Migration
- PL/SQL Compilers
- PL/SQL Debugger

Resetting the SQL Developer Layout



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Resetting the SQL Developer Layout

While working with SQL Developer, if the Connections Navigator disappears or if you cannot dock the Log window in its original place, perform the following steps to fix the problem:

1. Exit from SQL Developer.
2. Open a terminal window and use the locate command to find the location of `windowinglayout.xml`.
3. Go to the directory that has `windowinglayout.xml` and delete it.
4. Restart SQL Developer.

Summary

In this appendix, you should have learned how to use SQL Developer to do the following:

- Browse, create, and edit database objects
- Execute SQL statements and scripts in SQL Worksheet
- Create and save custom reports

Summary

SQL Developer is a free graphical tool to simplify database development tasks. Using SQL Developer, you can browse, create, and edit database objects. You can use SQL Worksheet to run SQL statements and scripts. SQL Developer enables you to create and save your own special set of reports for repeated use.

D

Using SQL*Plus

Objectives

After completing this appendix, you should be able to do the following:

- Log in to SQL*Plus
- Edit SQL commands
- Format the output using SQL*Plus commands
- Interact with script files

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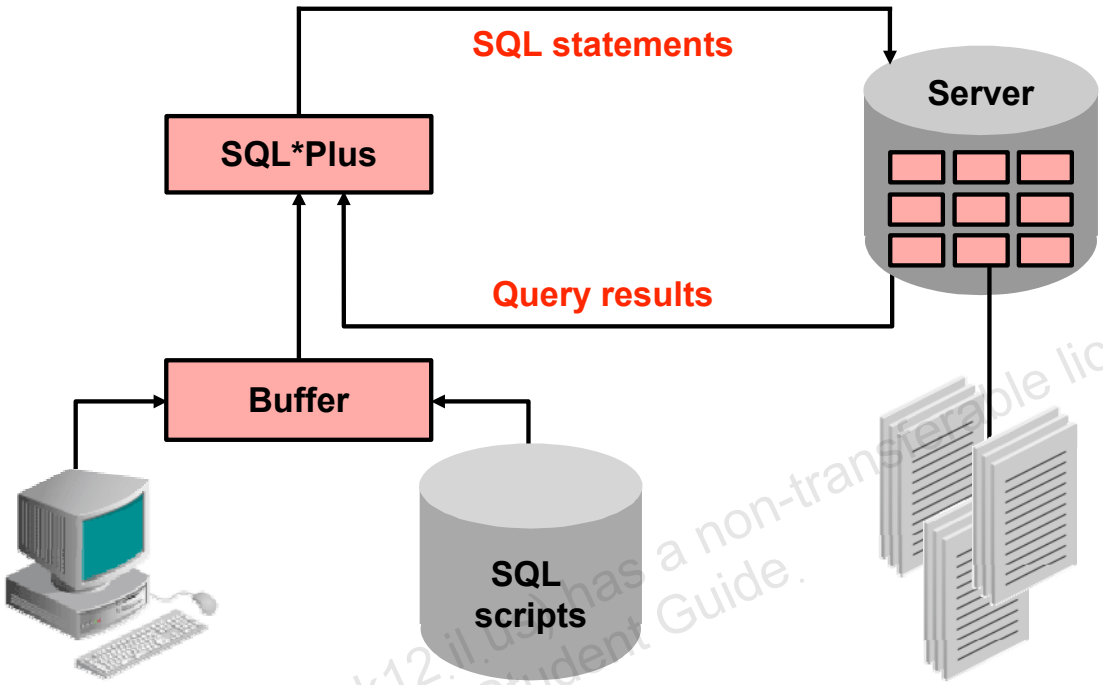
Objectives

You might want to create `SELECT` statements that can be used again and again. This appendix also covers the use of SQL*Plus commands to execute SQL statements. You learn how to format output using SQL*Plus commands, edit SQL commands, and save scripts in SQL*Plus.

SQL and SQL*Plus Interaction



SQL and SQL*Plus

SQL is a command language used for communication with the Oracle server from any tool or application. Oracle SQL contains many extensions. When you enter a SQL statement, it is stored in a part of memory called the *SQL buffer* and remains there until you enter a new SQL statement. SQL*Plus is an Oracle tool that recognizes and submits SQL statements to the Oracle9*i* Server for execution. It contains its own command language.

Features of SQL

- Can be used by a range of users, including those with little or no programming experience
- Is a nonprocedural language
- Reduces the amount of time required for creating and maintaining systems
- Is an English-like language

Features of SQL*Plus

- Accepts ad hoc entry of statements
- Accepts SQL input from files
- Provides a line editor for modifying SQL statements
- Controls environmental settings
- Formats query results into basic reports
- Accesses local and remote databases

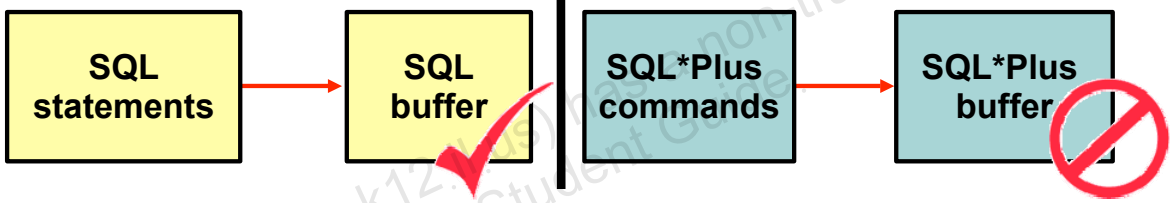
SQL Statements Versus SQL*Plus Commands

SQL

- A language
- ANSI-standard
- Keywords cannot be abbreviated.
- Statements manipulate data and table definitions in the database.

SQL*Plus

- An environment
- Oracle-proprietary
- Keywords can be abbreviated.
- Commands do not allow manipulation of values in the database.



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SQL and SQL*Plus (continued)

The following table compares SQL and SQL*Plus:

SQL	SQL*Plus
Is a language for communicating with the Oracle server to access data	Recognizes SQL statements and sends them to the server
Is based on American National Standards Institute (ANSI)–standard SQL	Is the Oracle-proprietary interface for executing SQL statements
Manipulates data and table definitions in the database	Does not allow manipulation of values in the database
Is entered into the SQL buffer on one or more lines	Is entered one line at a time, not stored in the SQL buffer
Does not have a continuation character	Uses a dash (–) as a continuation character if the command is longer than one line
Cannot be abbreviated	Can be abbreviated
Uses a termination character to execute commands immediately	Does not require termination characters; executes commands immediately
Uses functions to perform some formatting	Uses commands to format data

Overview of SQL*Plus

- Log in to SQL*Plus.
- Describe the table structure.
- Edit your SQL statement.
- Execute SQL from SQL*Plus.
- Save SQL statements to files and append SQL statements to files.
- Execute saved files.
- Load commands from the file to buffer to edit.

SQL*Plus

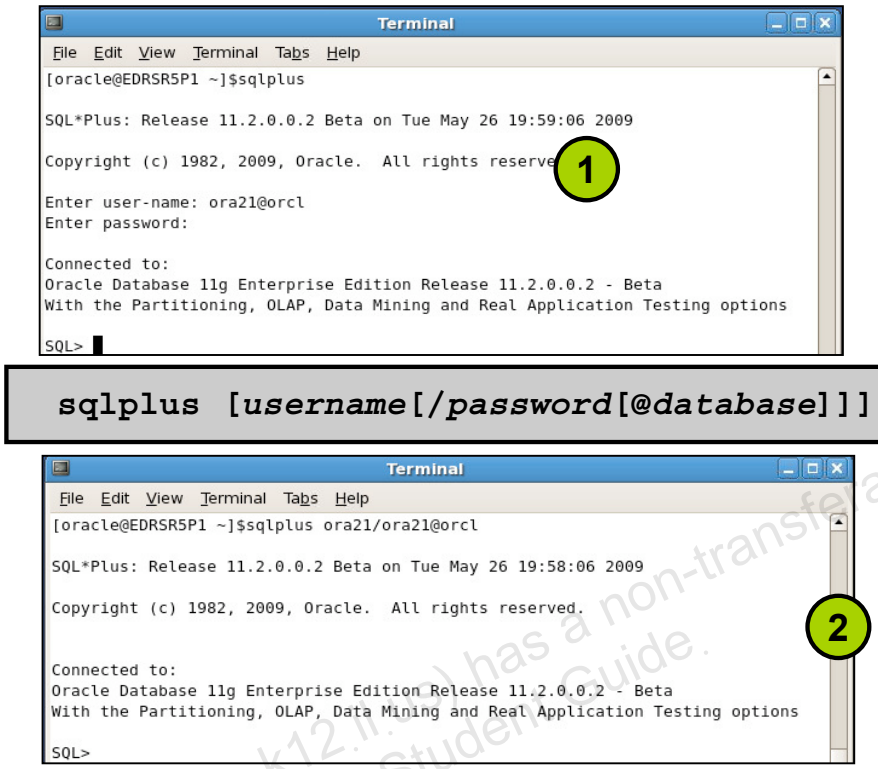
SQL*Plus is an environment in which you can:

- Execute SQL statements to retrieve, modify, add, and remove data from the database
- Format, perform calculations on, store, and print query results in the form of reports
- Create script files to store SQL statements for repeated use in the future

SQL*Plus commands can be divided into the following main categories:

Category	Purpose
Environment	Affect the general behavior of SQL statements for the session
Format	Format query results
File manipulation	Save, load, and run script files
Execution	Send SQL statements from the SQL buffer to the Oracle server
Edit	Modify SQL statements in the buffer
Interaction	Create and pass variables to SQL statements, print variable values, and print messages to the screen
Miscellaneous	Connect to the database, manipulate the SQL*Plus environment, and display column definitions

Logging In to SQL*Plus



Logging In to SQL*Plus

How you invoke SQL*Plus depends on which type of operating system you are running Oracle Database.

To log in from a Linux environment, perform the following steps:

1. Right-click your Linux desktop and select terminal.
2. Enter the `sqlplus` command shown in the slide.
3. Enter the username, password, and database name.

In the syntax:

username	Your database username
password	Your database password (Your password is visible if you enter it here.)
@database	The database connect string

Note: To ensure the integrity of your password, do not enter it at the operating system prompt. Instead, enter only your username. Enter your password at the password prompt.

Displaying the Table Structure

Use the SQL*Plus DESCRIBE command to display the structure of a table:

```
DESC[RIBE] tablename
```


Displaying the Table Structure

In SQL*Plus, you can display the structure of a table using the DESCRIBE command. The result of the command is a display of column names and data types as well as an indication if a column must contain data.

In the syntax:

tablename The name of any existing table, view, or synonym that is accessible to the user

To describe the DEPARTMENTS table, use this command:

```
SQL> 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)
```

Displaying the Table Structure

```
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)
```

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Displaying the Table Structure (continued)

The example in the slide displays the information about the structure of the `DEPARTMENTS` table. In the result:

`Null?`: Specifies whether a column must contain data (`NOT NULL` indicates that a column must contain data.)

`Type`: Displays the data type for a column

SQL*Plus Editing Commands

- A[PPEND] *text*
- C[HANGE] / *old* / *new*
- C[HANGE] / *text* /
- CL[EAR] BUFF[ER]
- DEL
- DEL *n*
- DEL *m n*

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SQL*Plus Editing Commands

SQL*Plus commands are entered one line at a time and are not stored in the SQL buffer.

Command	Description
A[PPEND] *text*	Adds text to the end of the current line
C[HANGE] / *old* / *new*	Changes *old* text to *new* in the current line
C[HANGE] / *text* /	Deletes *text* from the current line
CL[EAR] BUFF[ER]	Deletes all lines from the SQL buffer
DEL	Deletes current line
DEL *n*	Deletes line *n*
DEL *m n*	Deletes lines *m* to *n* inclusive

Guidelines

- If you press Enter before completing a command, SQL*Plus prompts you with a line number.
- You terminate the SQL buffer either by entering one of the terminator characters (semicolon or slash) or by pressing [Enter] twice. The SQL prompt appears.

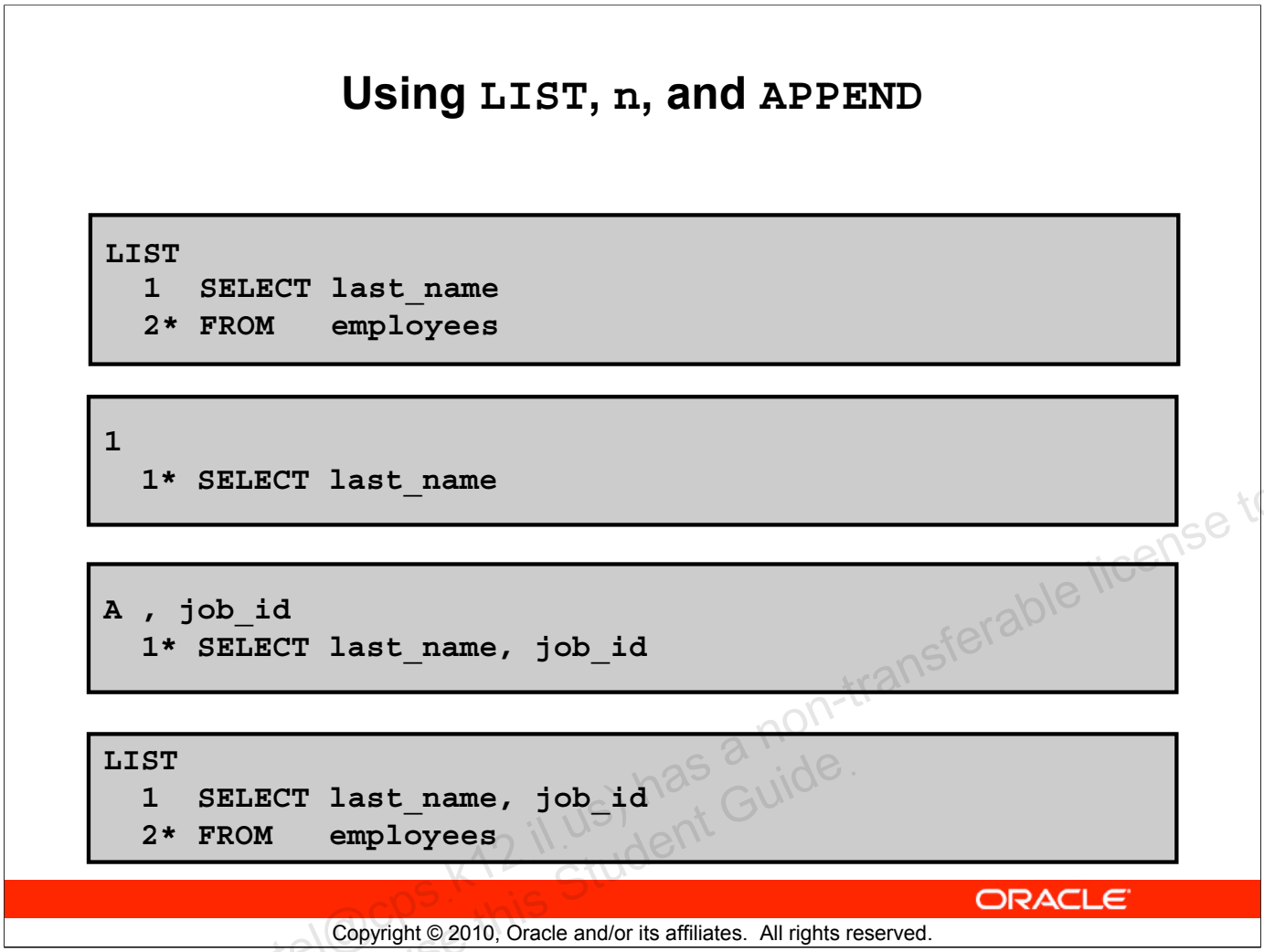
SQL*Plus Editing Commands

- I[NPUT]
- I[NPUT] *text*
- L[IST]
- L[IST] *n*
- L[IST] *m n*
- R[UN]
- *n*
- *n text*
- 0 *text*

SQL*Plus Editing Commands (continued)

Command	Description
I[NPUT]	Inserts an indefinite number of lines
I[NPUT] *text*	Inserts a line consisting of *text*
L[IST]	Lists all lines in the SQL buffer
L[IST] *n*	Lists one line (specified by *n*)
L[IST] *m n*	Lists a range of lines (*m* to *n*) inclusive
R[UN]	Displays and runs the current SQL statement in the buffer
n	Specifies the line to make the current line
n text	Replaces line *n* with *text*
0 *text*	Inserts a line before line 1

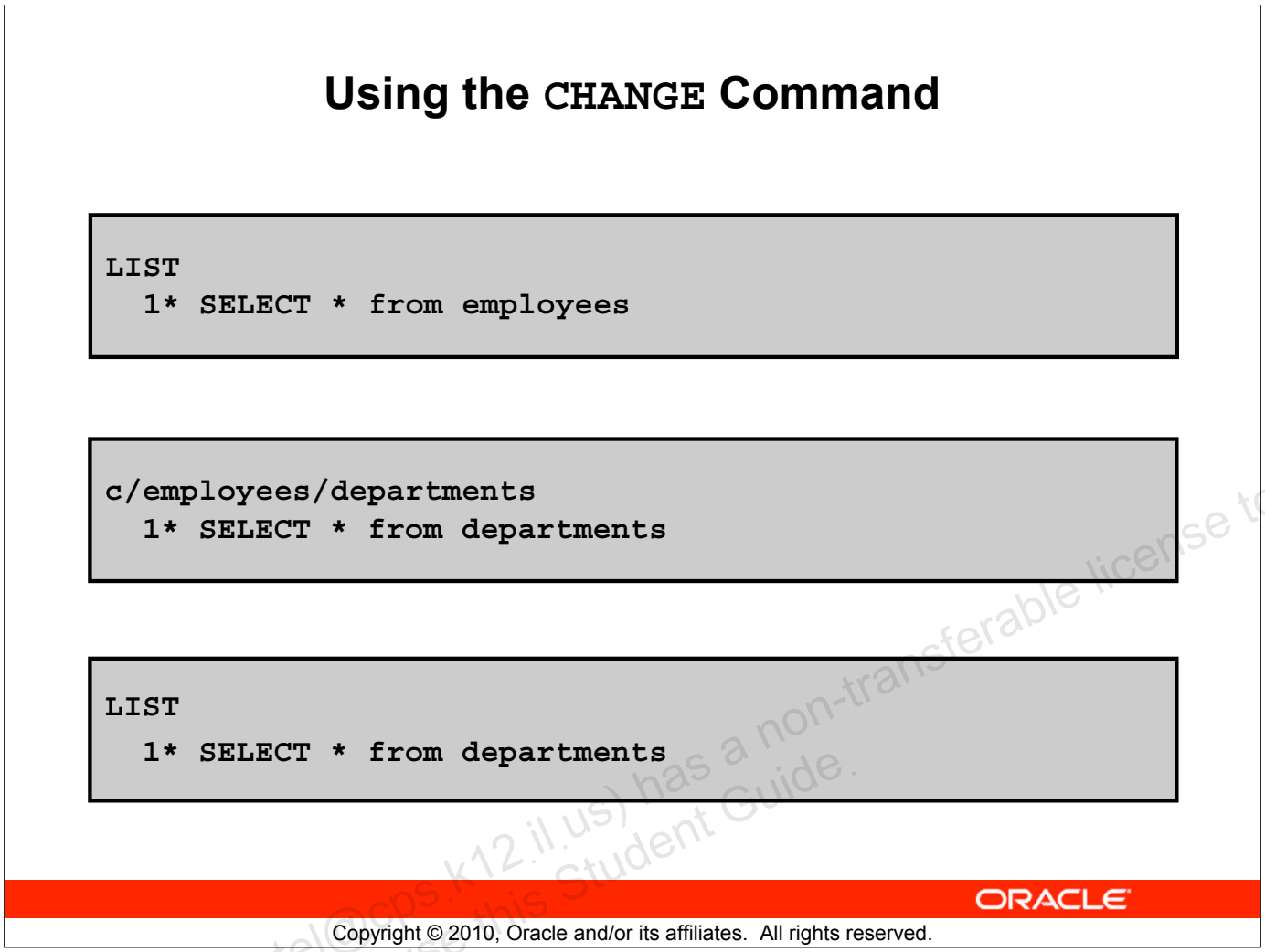
Note: You can enter only one SQL*Plus command for each SQL prompt. SQL*Plus commands are not stored in the buffer. To continue a SQL*Plus command on the next line, end the first line with a hyphen (-).



Using LIST, n, and APPEND

- Use the L[IST] command to display the contents of the SQL buffer. The asterisk (*) beside line 2 in the buffer indicates that line 2 is the current line. Any edits that you made apply to the current line.
- Change the number of the current line by entering the number (n) of the line that you want to edit. The new current line is displayed.
- Use the A[PPEND] command to add text to the current line. The newly edited line is displayed. Verify the new contents of the buffer by using the LIST command.

Note: Many SQL*Plus commands, including LIST and APPEND, can be abbreviated to just their first letter. LIST can be abbreviated to L; APPEND can be abbreviated to A.



Using the CHANGE Command

- Use `L[IST]` to display the contents of the buffer.
- Use the `C[HANGE]` command to alter the contents of the current line in the SQL buffer. In this case, replace the `employees` table with the `departments` table. The new current line is displayed.
- Use the `L[IST]` command to verify the new contents of the buffer.

SQL*Plus File Commands

- SAVE *filename*
- GET *filename*
- START *filename*
- @ *filename*
- EDIT *filename*
- SPOOL *filename*
- EXIT

SQL*Plus File Commands

SQL statements communicate with the Oracle server. SQL*Plus commands control the environment, format query results, and manage files. You can use the commands described in the following table:

Command	Description
SAV[E] *filename* [.ext] [REP[LACE]APP[END]]	Saves current contents of SQL buffer to a file. Use APPEND to add to an existing file; use REPLACE to overwrite an existing file. The default extension is .sql.
GET *filename* [.ext]	Writes the contents of a previously saved file to the SQL buffer. The default extension for the file name is .sql.
STA[RT] *filename* [.ext]	Runs a previously saved command file
@ *filename*	Runs a previously saved command file (same as START)
ED[IT]	Invokes the editor and saves the buffer contents to a file named afiedt.buf
ED[IT] [*filename*[.ext]]	Invokes the editor to edit the contents of a saved file
SPO[OL] [*filename*[.ext]|OFF|OUT]	Stores query results in a file. OFF closes the spool file. OUT closes the spool file and sends the file results to the printer.
EXIT	Quits SQL*Plus

Using the SAVE, START Commands

```
LIST
  1  SELECT last_name, manager_id, department_id
  2* FROM employees
```

```
SAVE my_query
  Created file my_query
```

```
START my_query

LAST_NAME                 MANAGER_ID DEPARTMENT_ID
------------------------- ---------- -------------
King                                          90
Kochhar                          100          90
...
107 rows selected.
```


Using the SAVE, START, and EDIT Commands

SAVE

Use the SAVE command to store the current contents of the buffer in a file. In this way, you can store frequently used scripts for use in the future.

START

Use the START command to run a script in SQL*Plus. You can also, alternatively, use the symbol @ to run a script.

```
@my_query
```

SERVEROUTPUT Command

- Use the SET SERVEROUT[PUT] command to control whether to display the output of stored procedures or PL/SQL blocks in SQL*Plus.
- The DBMS_OUTPUT line length limit is increased from 255 bytes to 32767 bytes.
- The default size is now unlimited.
- Resources are not preallocated when SERVEROUTPUT is set.
- Because there is no performance penalty, use UNLIMITED unless you want to conserve physical memory.

```
SET SERVEROUT[PUT] {ON | OFF} [SIZE {n | UNL[IMITED]}]
    [FOR[MAT] {WRA[PPED] | WOR[D_WRAPPED] | TRU[NCATED]}]
```

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SERVEROUTPUT Command

Most of the PL/SQL programs perform input and output through SQL statements, to store data in database tables or query those tables. All other PL/SQL input/output is done through APIs that interact with other programs. For example, the DBMS_OUTPUT package has procedures, such as PUT_LINE. To see the result outside of PL/SQL requires another program, such as SQL*Plus, to read and display the data passed to DBMS_OUTPUT.

SQL*Plus does not display DBMS_OUTPUT data unless you first issue the SQL*Plus command SET SERVEROUTPUT ON as follows:

```
SET SERVEROUTPUT ON
```

Note

- SIZE sets the number of bytes of the output that can be buffered within the Oracle Database server. The default is UNLIMITED. n cannot be less than 2000 or greater than 1,000,000.
- For additional information about SERVEROUTPUT, see *Oracle Database PL/SQL User's Guide and Reference 11g*.

Using the SQL*Plus SPOOL Command

```
SPO[OL] [file_name[.ext] [CRE[ATE] | REP[LACE] |
    APP[END]] | OFF | OUT]
```

Option	Description
file_name[.ext]	Spools output to the specified file name
CRE[ATE]	Creates a new file with the name specified
REP[LACE]	Replaces the contents of an existing file. If the file does not exist, REPLACE creates the file.
APP[END]	Adds the contents of the buffer to the end of the file you specify
OFF	Stops spooling
OUT	Stops spooling and sends the file to your computer's standard (default) printer

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Using the SQL*Plus SPOOL Command

The SPOOL command stores query results in a file or optionally sends the file to a printer. The SPOOL command has been enhanced. You can now append to, or replace an existing file, where previously you could only use SPOOL to create (and replace) a file. REPLACE is the default.

To spool output generated by commands in a script without displaying the output on the screen, use SET TERMOUT OFF. SET TERMOUT OFF does not affect output from commands that run interactively.

You must use quotes around file names containing white space. To create a valid HTML file using SPOOL APPEND commands, you must use PROMPT or a similar command to create the HTML page header and footer. The SPOOL APPEND command does not parse HTML tags. SET SQLPLUSCOMPAT[IBILITY] to 9.2 or earlier to disable the CREATE, APPEND and SAVE parameters.

Using the AUTOTRACE Command

- It displays a report after the successful execution of SQL DML statements such as SELECT, INSERT, UPDATE, or DELETE.
- The report can now include execution statistics and the query execution path.

```
SET AUTOT[RACE] {ON | OFF | TRACE[ONLY]} [EXP[LAIN]]
    [STAT[ISTICS]]
```

```
SET AUTOTRACE ON
-- The AUTOTRACE report includes both the optimizer
-- execution path and the SQL statement execution
-- statistics
```

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Using the AUTOTRACE Command

EXPLAIN shows the query execution path by performing an EXPLAIN PLAN. STATISTICS displays SQL statement statistics. The formatting of your AUTOTRACE report may vary depending on the version of the server to which you are connected and the configuration of the server. The DBMS_XPLAN package provides an easy way to display the output of the EXPLAIN PLAN command in several predefined formats.

Note

- For additional information about the package and subprograms, refer to *Oracle Database PL/SQL Packages and Types Reference 11g*.
- For additional information about the EXPLAIN PLAN, refer to *Oracle Database SQL Reference 11g*.
- For additional information about Execution Plans and the statistics, refer to *Oracle Database Performance Tuning Guide 11g*.

Summary

In this appendix, you should have learned how to use SQL*Plus as an environment to do the following:

- Execute SQL statements
- Edit SQL statements
- Format the output
- Interact with script files

Summary

SQL*Plus is an execution environment that you can use to send SQL commands to the database server and to edit and save SQL commands. You can execute commands from the SQL prompt or from a script file.

E

Using JDeveloper

Objectives

After completing this appendix, you should be able to do the following:

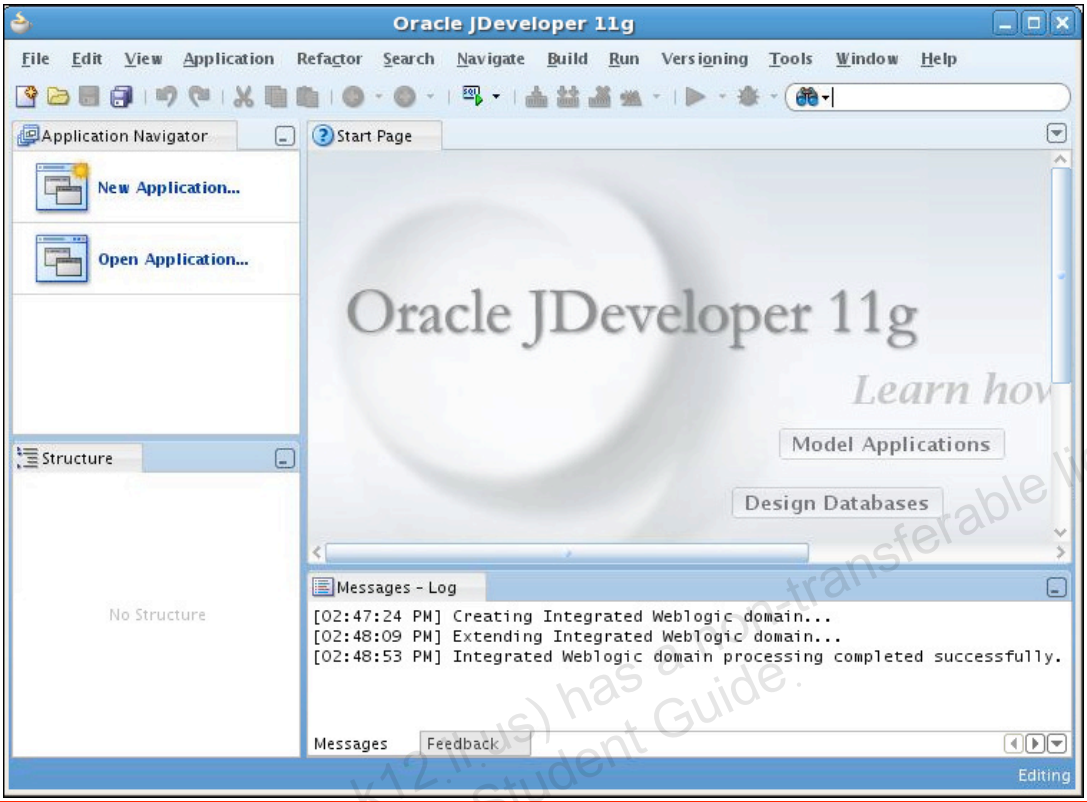
- List the key features of Oracle JDeveloper
- Create a database connection in JDeveloper
- Manage database objects in JDeveloper
- Use JDeveloper to execute SQL Commands
- Create and run PL/SQL Program Units

ORACLE

Objectives

In this appendix, you are introduced to JDeveloper. You learn how to use JDeveloper for your database development tasks.

Oracle JDeveloper

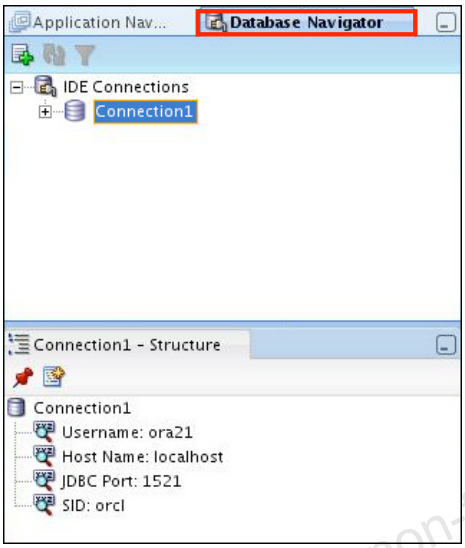


Oracle JDeveloper

Oracle JDeveloper is an integrated development environment (IDE) for developing and deploying Java applications and Web services. It supports every stage of the software development life cycle (SDLC) from modeling to deploying. It has the features to use the latest industry standards for Java, XML, and SQL while developing an application.

Oracle JDeveloper 11*g* initiates a new approach to J2EE development with features that enable visual and declarative development. This innovative approach makes J2EE development simple and efficient.

Database Navigator



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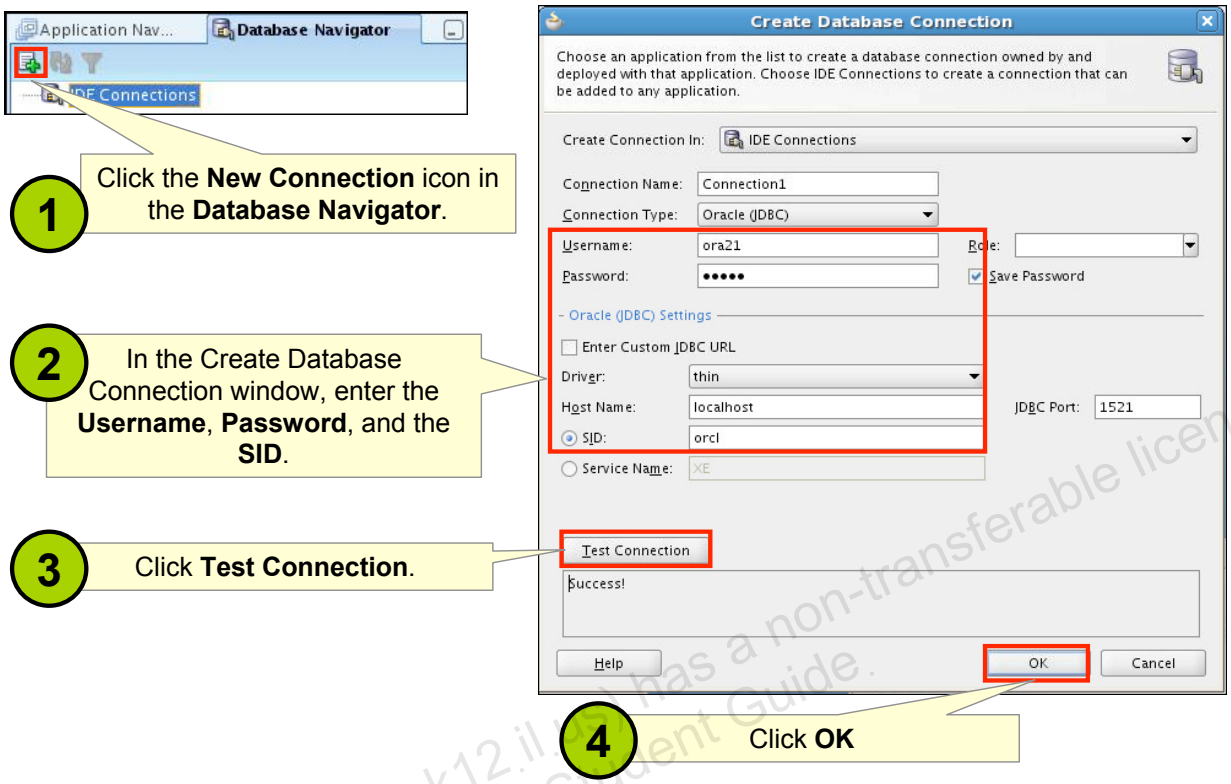
Database Navigator

Using Oracle JDeveloper, you can store the information necessary to connect to a database in an object called "connection." A connection is stored as part of the IDE settings, and can be exported and imported for easy sharing among groups of users. A connection serves several purposes from browsing the database and building applications, all the way through to deployment.

Creating Connection



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Creating Connection

A connection is an object that specifies the necessary information for connecting to a specific database as a specific user of that database. You can create and test connections for multiple databases and for multiple schemas.

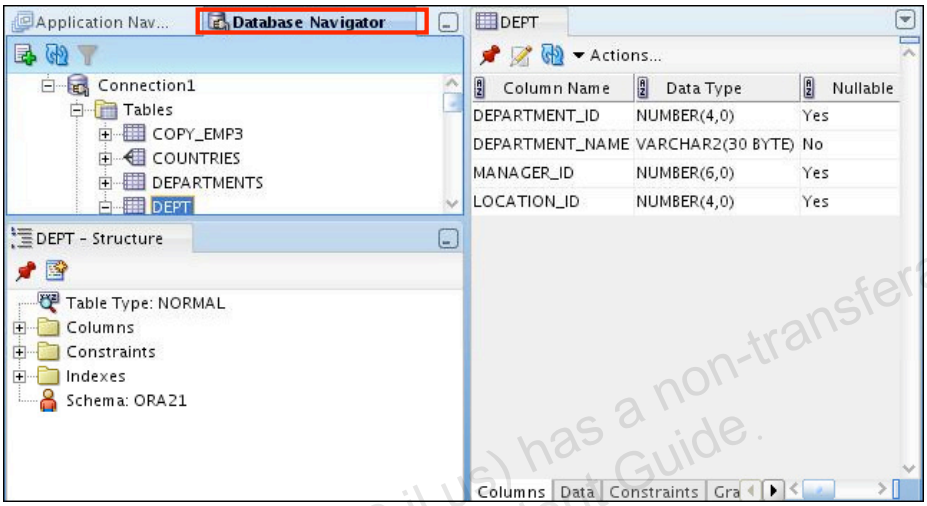
To create a database connection, perform the following steps:

1. Click the New Connection icon in the Database Navigator.
2. In the Create Database Connection window, enter the connection name. Enter the username and password of the schema that you want to connect to. Enter the SID of the Database you want to connect.
3. Click Test to ensure that the connection has been set correctly.
4. Click OK.

Browsing Database Objects

Use the Database Navigator to:

- Browse through many objects in a database schema
- Review the definitions of objects at a glance



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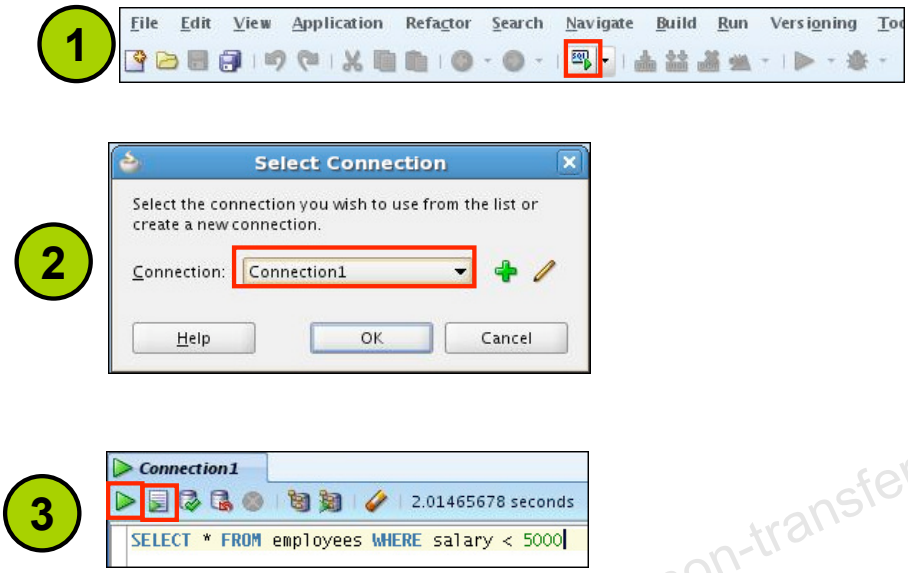
Browsing Database Objects

After you create a database connection, you can use the Database Navigator to browse through many objects in a database schema including Tables, Views, Indexes, Packages, Procedures, Triggers, and Types.

You can see the definition of the objects broken into tabs of information that is pulled out of the data dictionary. For example, if you select a table in the Navigator, the details about columns, constraints, grants, statistics, triggers, and so on are displayed on an easy-to-read Database Navigator.

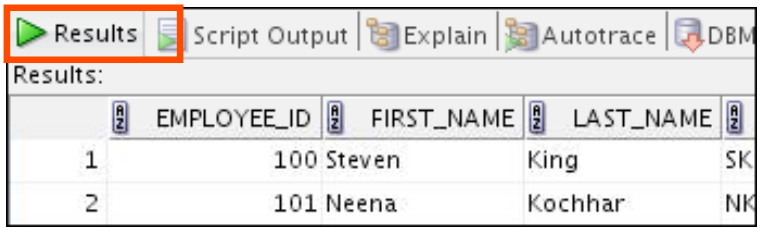
Executing SQL Statements



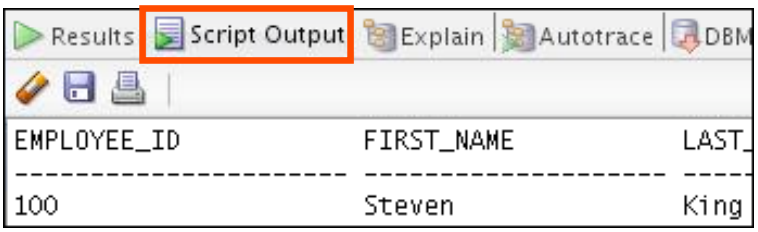
Executing SQL Statements

To execute a SQL statement, perform the following steps:

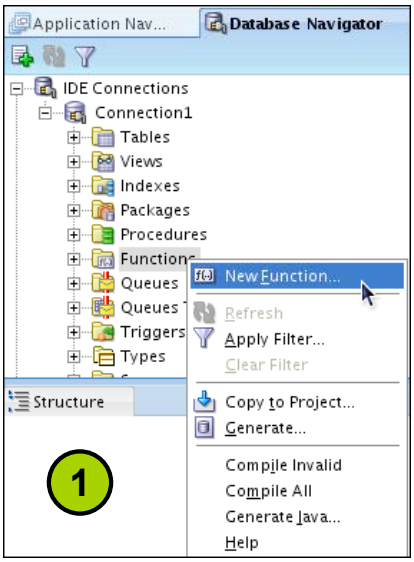
1. Click the Open SQL Worksheet icon.
2. Select the connection.
3. Execute the SQL command by clicking:
   1. The **Execute statement** button or by pressing F9. The output is as follows:

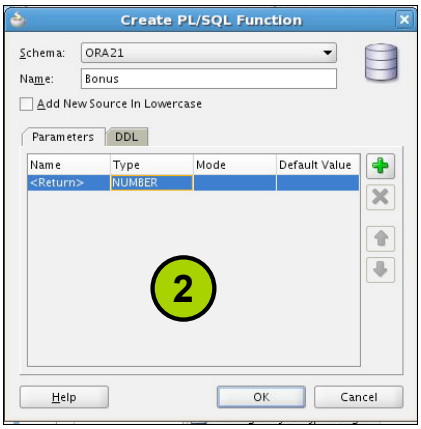


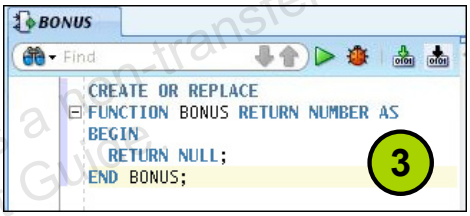
   2. The **Run Script** button or by pressing F5. The output is as follows:



Creating Program Units







Skeleton of the function

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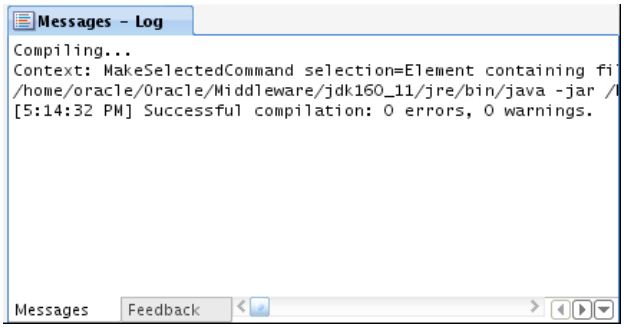
Creating Program Units

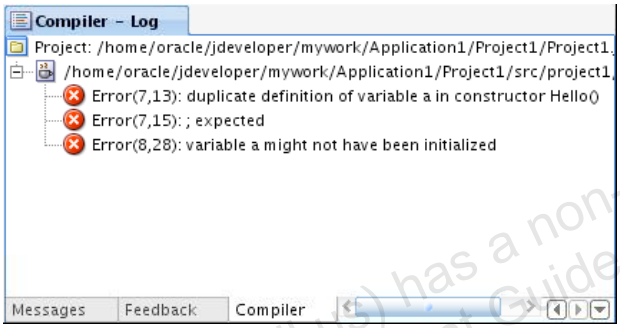
To create a PL/SQL program unit, perform the following steps:

1. Select View > Database Navigator. Select and expand a database connection. Right-click a folder corresponding to the object type (Procedures, Packages, Functions). Choose “New [Procedures|Packages|Functions].”
2. Enter a valid name for the function, package, or procedure and click OK.
3. A skeleton definition is created and opened in the Code Editor. You can then edit the subprogram to suit your need.

Compiling



Compilation with errors

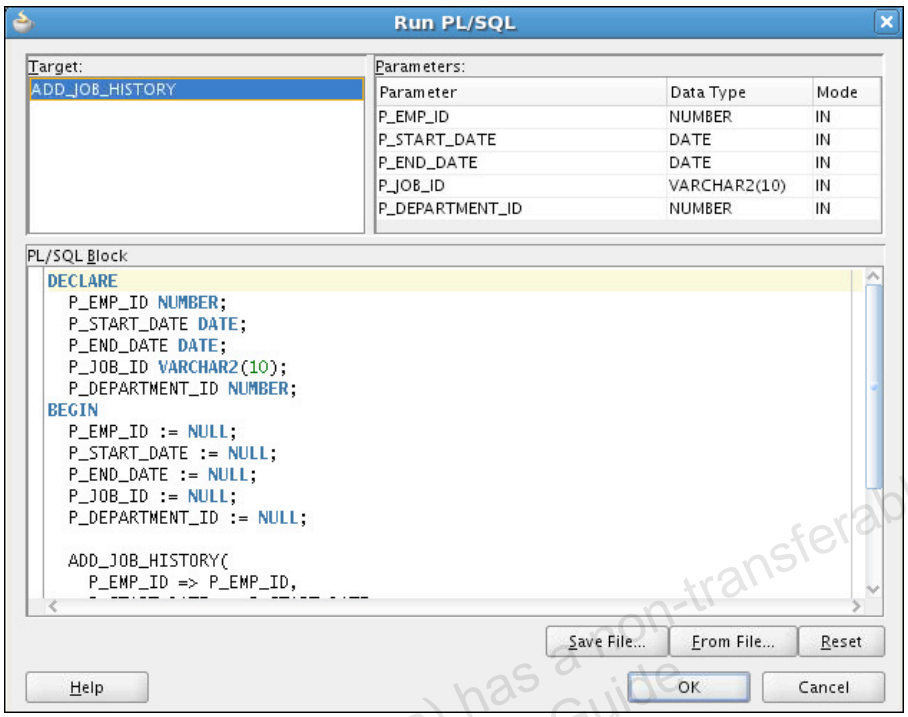


Compilation without errors

Compiling

After editing the skeleton definition, you need to compile the program unit. Right-click the PL/SQL object that you need to compile in the Connection Navigator, and then select Compile. Alternatively, you can also press [Ctrl] + [Shift] + [F9] to compile.

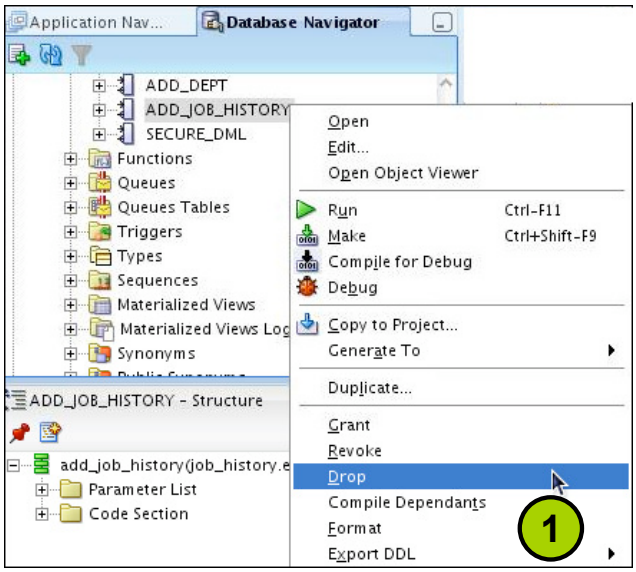
Running a Program Unit

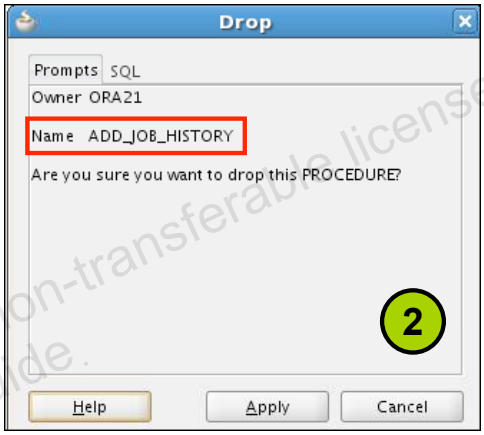


Running a Program Unit

To execute the program unit, right-click the object and click Run. The Run PL/SQL dialog box appears. You may need to change the `NULL` values with reasonable values that are passed into the program unit. After you change the values, click OK. The output is displayed in the Message-Log window.

Dropping a Program Unit





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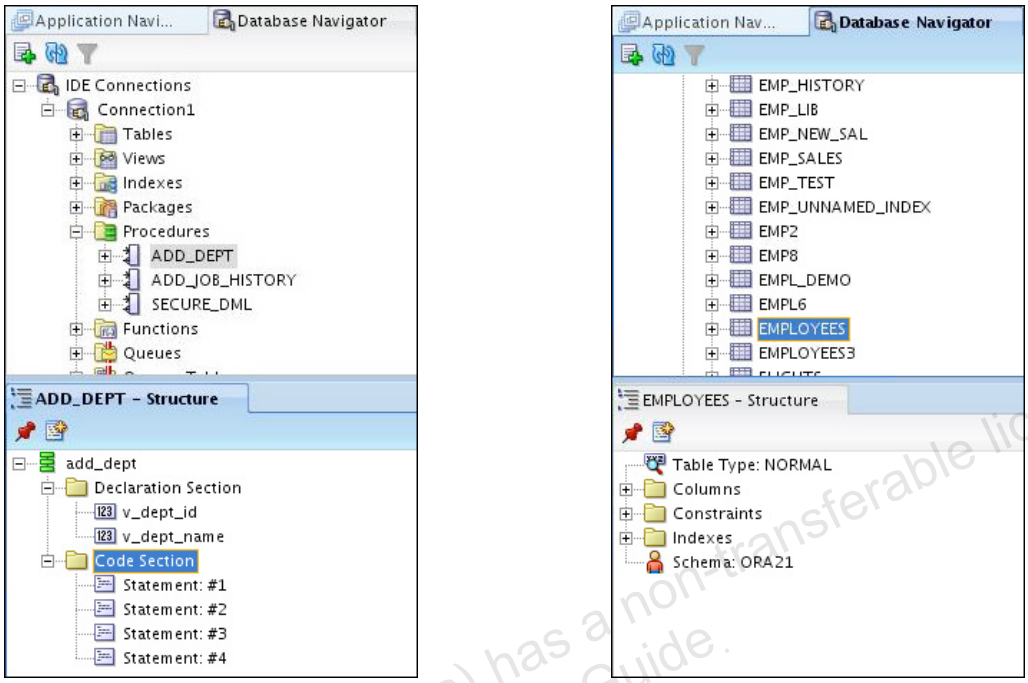
Dropping a Program Unit

To drop a program unit, right-click the object and select Drop. The Drop Confirmation dialog box appears; click **Apply**. The object is dropped from the database.

Structure Window



Structure Window

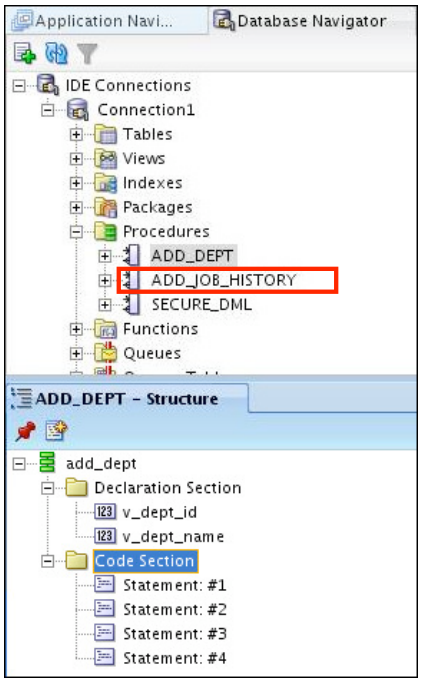
The Structure window offers a structural view of the data in the document currently selected in the active window of those windows that participate in providing structure: the navigators, the editors and viewers, and the Property Inspector.

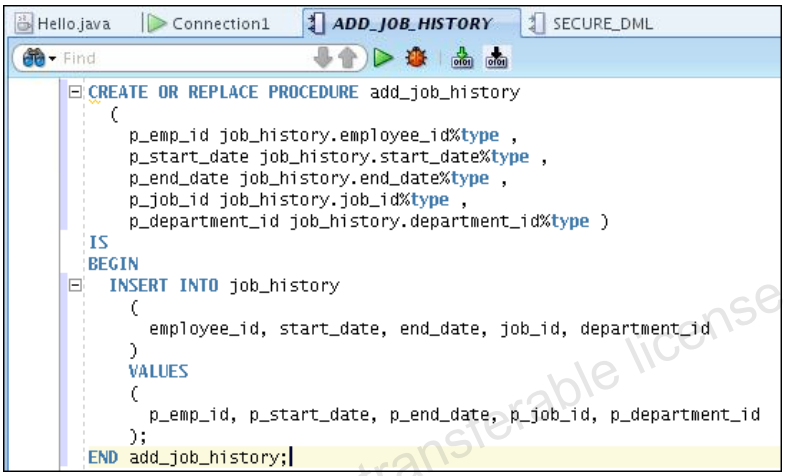
Click View > Structure window to view the Structure window.

In the Structure window, you can view the document data in a variety of ways. The structures available for display are based upon document type. For a Java file, you can view code structure, UI structure, or UI model data. For an XML file, you can view XML structure, design structure, or UI model data.

The Structure window is dynamic, tracking always the current selection of the active window (unless you freeze the window's contents on a particular view), as is pertinent to the currently active editor. When the current selection is a node in the navigator, the default editor is assumed. To change the view on the structure for the current selection, click a different structure tab.

Editor Window





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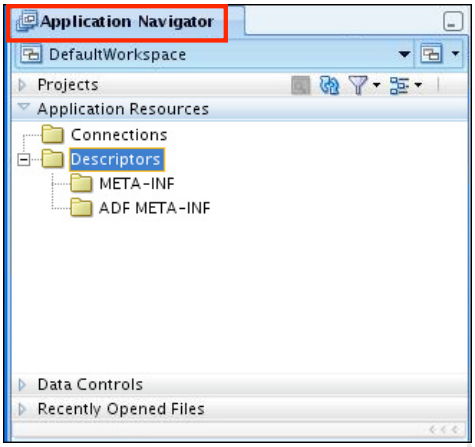
Editor Window

Double-clicking the name of a program unit opens it in the Editor window. You can view your project files all in one single editor window, you can open multiple views of the same file, or you can open multiple views of different files.

The tabs at the top of the editor window are the document tabs. Clicking a document tab gives that file focus, bringing it to the foreground of the window in the current editor.

The tabs at the bottom of the editor window for a given file are the editor tabs. Selecting an editor tab opens the file in that editor.

Application Navigator



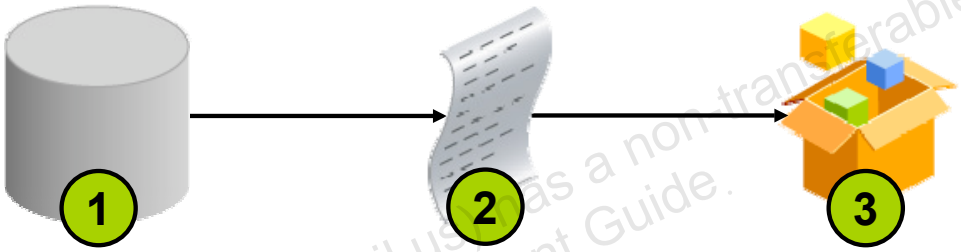
Application Navigator

The Applications - Navigator gives you a logical view of your application and the data it contains. The Applications - Navigator provides an infrastructure that the different extensions can plug in to and use to organize their data and menus in a consistent, abstract manner. While the Applications - Navigator can contain individual files (such as Java source files), it is designed to consolidate complex data. Complex data types such as entity objects, UML diagrams, EJB, or Web services appear in this navigator as single nodes. The raw files that make up these abstract nodes appear in the Structure window.

Deploying Java Stored Procedures

Before deploying Java stored procedures, perform the following steps:

1. Create a database connection.
2. Create a deployment profile.
3. Deploy the objects.



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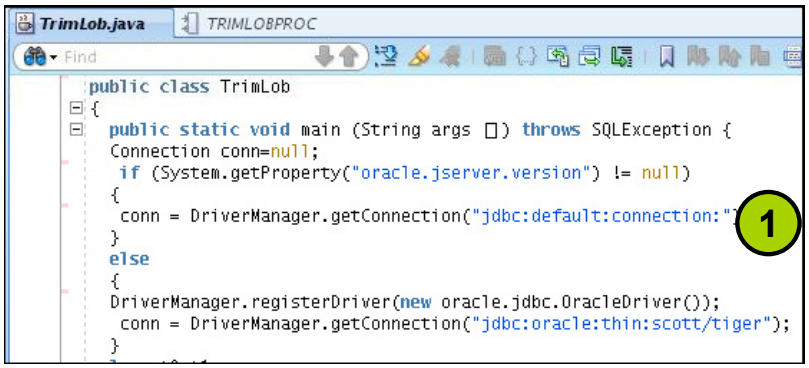
Deploying Java Stored Procedures

Create a deployment profile for Java stored procedures, and then deploy the classes and, optionally, any public static methods in JDeveloper using the settings in the profile.

Deploying to the database uses the information provided in the Deployment Profile Wizard and two Oracle Database utilities:

- `loadjava` loads the Java class containing the stored procedures to an Oracle database.
- `publish` generates the PL/SQL call–specific wrappers for the loaded public static methods. Publishing enables the Java methods to be called as PL/SQL functions or procedures.

Publishing Java to PL/SQL



Publishing Java to PL/SQL

The slide shows the Java code and illustrates how to publish the Java code in a PL/SQL procedure.

How Can I Learn More About JDeveloper 11*g*?

Topic	Website
Oracle JDeveloper Product Page	http://www.oracle.com/technology/products/jdev/index.html
Oracle JDeveloper 11*g* Tutorials	http://www.oracle.com/technology/obe/obe11jdev/11/index.html
Oracle JDeveloper 11*g* Product Documentation	http://www.oracle.com/technology/documentation/jdev.html
Oracle JDeveloper 11*g* Discussion Forum	http://forums.oracle.com/forums/forum.jspa?forumID=83

Summary

In this appendix, you should have learned to do the following:

- List the key features of Oracle JDeveloper
- Create a database connection in JDeveloper
- Manage database objects in JDeveloper
- Use JDeveloper to execute SQL Commands
- Create and run PL/SQL Program Units

F

Oracle Join Syntax

Objectives

After completing this appendix, you should be able to do the following:

- Write `SELECT` statements to access data from more than one table using equijoins and nonequijoins
- Join a table to itself by using a self-join
- View data that generally does not meet a join condition by using outer joins
- Generate a Cartesian product of all rows from two or more tables

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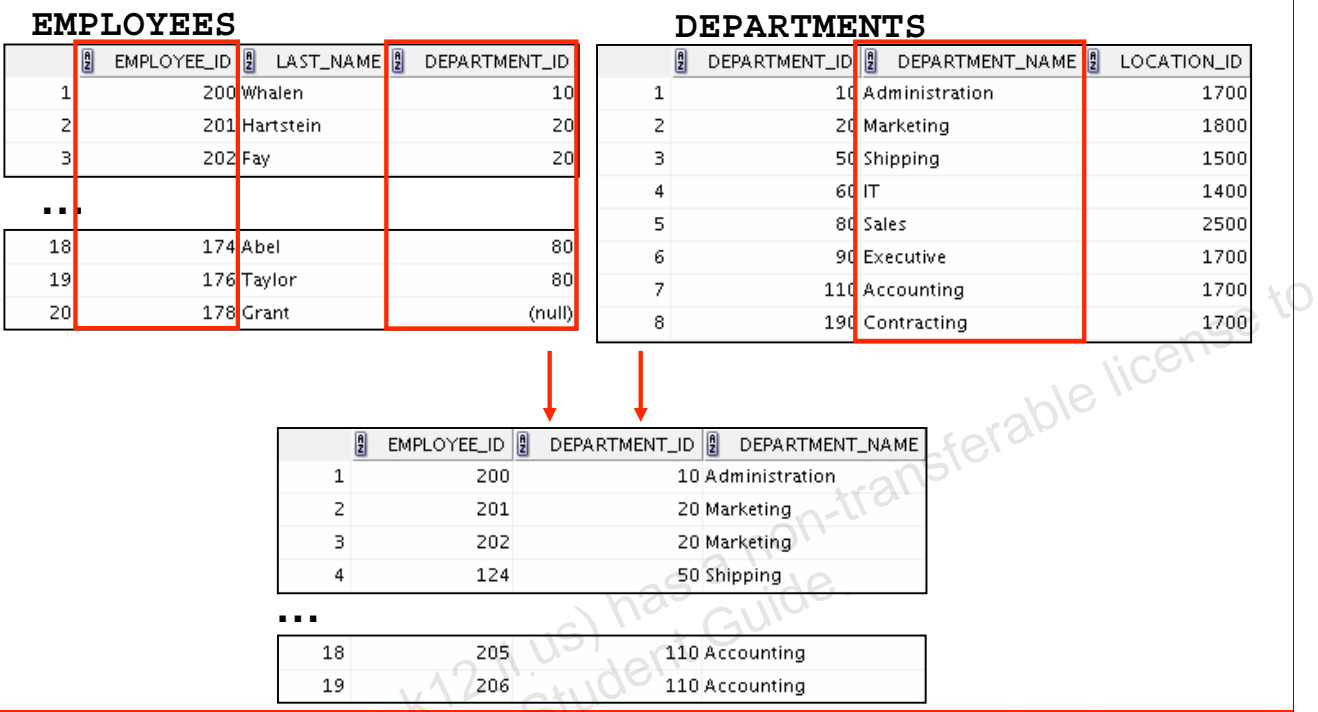
Objectives

This lesson explains how to obtain data from more than one table. A *join* is used to view information from multiple tables. Therefore, you can *join* tables together to view information from more than one table.

Note: Information about joins is found in the section on "SQL Queries and Subqueries: Joins" in *Oracle Database SQL Language Reference 11g, Release 1 (11.1)*.

Obtaining Data from Multiple Tables



Obtaining Data from Multiple Tables

Sometimes you need to use data from more than one table. In the example in the slide, the report displays data from two separate tables:

- Employee IDs exist in the `EMPLOYEES` table.
- Department IDs exist in both the `EMPLOYEES` and `DEPARTMENTS` tables.
- Department names exist in the `DEPARTMENTS` table.

To produce the report, you need to link the `EMPLOYEES` and `DEPARTMENTS` tables, and access data from both of them.

Cartesian Products

- A Cartesian product is formed when:
  - A join condition is omitted
  - A join condition is invalid
  - All rows in the first table are joined to all rows in the second table
- To avoid a Cartesian product, always include a valid join condition in a `WHERE` clause.

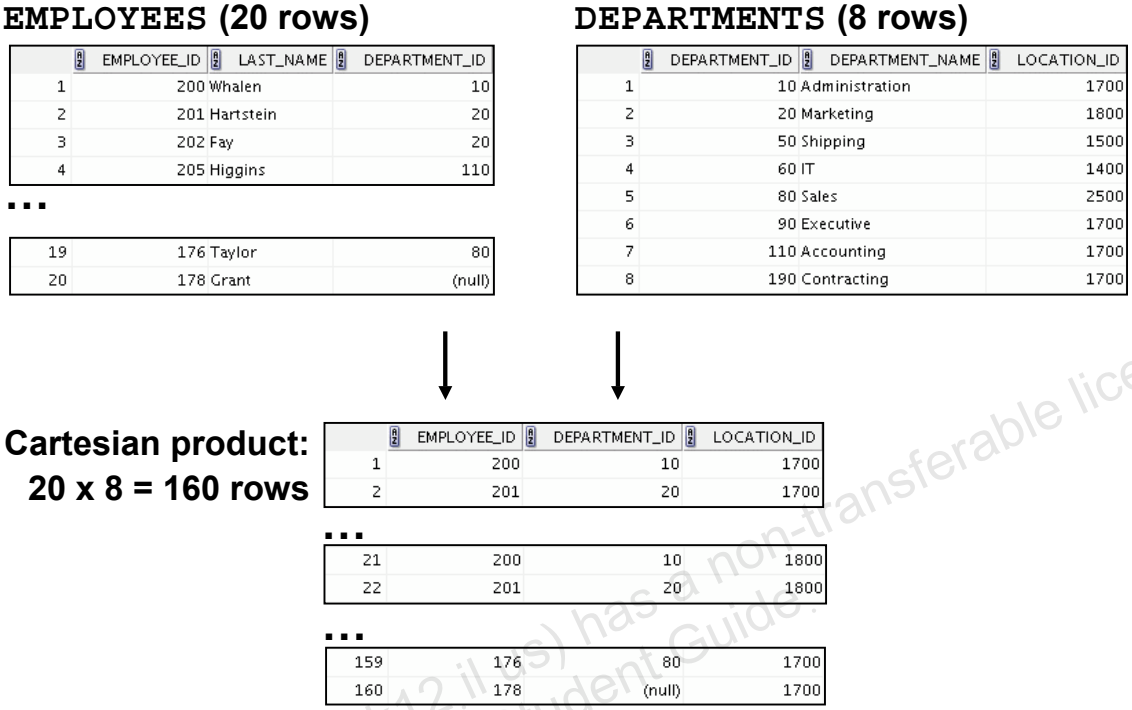
Cartesian Products

When a join condition is invalid or omitted completely, the result is a *Cartesian product*, in which all combinations of rows are displayed. In other words, all rows in the first table are joined to all rows in the second table.

A Cartesian product tends to generate a large number of rows and the result is rarely useful. Therefore, you should always include a valid join condition unless you have a specific need to combine all rows from all tables.

However, Cartesian products are useful for some tests when you need to generate a large number of rows to simulate a reasonable amount of data.

Generating a Cartesian Product



Generating a Cartesian Product

A Cartesian product is generated when a join condition is omitted. The example in the slide displays the last name of the employee and the department name from the EMPLOYEES and DEPARTMENTS tables, respectively. Because no join condition has been specified, all rows (20 rows) from the EMPLOYEES table are joined with all rows (8 rows) in the DEPARTMENTS table, thereby generating 160 rows in the output.

```
SELECT last_name, department_name dept_name
FROM employees, departments;
```

	LAST_NAME	DEPARTMENT_NAME
1	Abel	Administration
2	Davies	Administration
3	De Haan	Administration
4	Ernst	Administration
5	Fay	Administration
...		
158	Vargas	Contracting
159	Whalen	Contracting
160	Zlotkey	Contracting

Types of Oracle-Proprietary Joins

- Equijoin
- Nonequijoin
- Outer join
- Self-join

Types of Joins

To join tables, you can use Oracle's join syntax.

Note: Before the Oracle9*i* release, the join syntax was proprietary. The SQL:1999–compliant join syntax does not offer any performance benefits over the Oracle-proprietary join syntax.

Oracle does not have an equivalent syntax to support the `FULL OUTER JOIN` of the SQL:1999–compliant join syntax.

Joining Tables Using Oracle Syntax

Use a join to query data from more than one table:

```
SELECT   table1.column, table2.column
FROM     table1, table2
WHERE    table1.column1 = table2.column2;
```

- Write the join condition in the `WHERE` clause.
- Prefix the column name with the table name when the same column name appears in more than one table.

Joining Tables Using Oracle Syntax

When data from more than one table in the database is required, a *join* condition is used. Rows in one table can be joined to rows in another table according to common values that exist in the corresponding columns (that is, usually primary and foreign key columns).

To display data from two or more related tables, write a simple join condition in the `WHERE` clause.

In the syntax:

table1.column	Denotes the table and column from which data is retrieved
table1.column1 = table2.column2	Is the condition that joins (or relates) the tables together

Guidelines

- When writing a `SELECT` statement that joins tables, precede the column name with the table name for clarity and to enhance database access.
- If the same column name appears in more than one table, the column name must be prefixed with the table name.
- To join *n* tables together, you need a minimum of `n-1` join conditions. For example, to join four tables, a minimum of three joins is required. This rule may not apply if your table has a concatenated primary key, in which case more than one column is required to uniquely identify each row.

Qualifying Ambiguous Column Names

- Use table prefixes to qualify column names that are in multiple tables.
- Use table prefixes to improve performance.
- Use table aliases, instead of full table name prefixes.
- Table aliases give a table a shorter name.
  - Keeps SQL code smaller, uses less memory
- Use column aliases to distinguish columns that have identical names, but reside in different tables.

Qualifying Ambiguous Column Names

When joining two or more tables, you need to qualify the names of the columns with the table name to avoid ambiguity. Without the table prefixes, the `DEPARTMENT_ID` column in the `SELECT` list could be from either the `DEPARTMENTS` table or the `EMPLOYEES` table. Therefore, it is necessary to add the table prefix to execute your query. If there are no common column names between the two tables, there is no need to qualify the columns. However, using a table prefix improves performance, because you tell the Oracle server exactly where to find the columns.

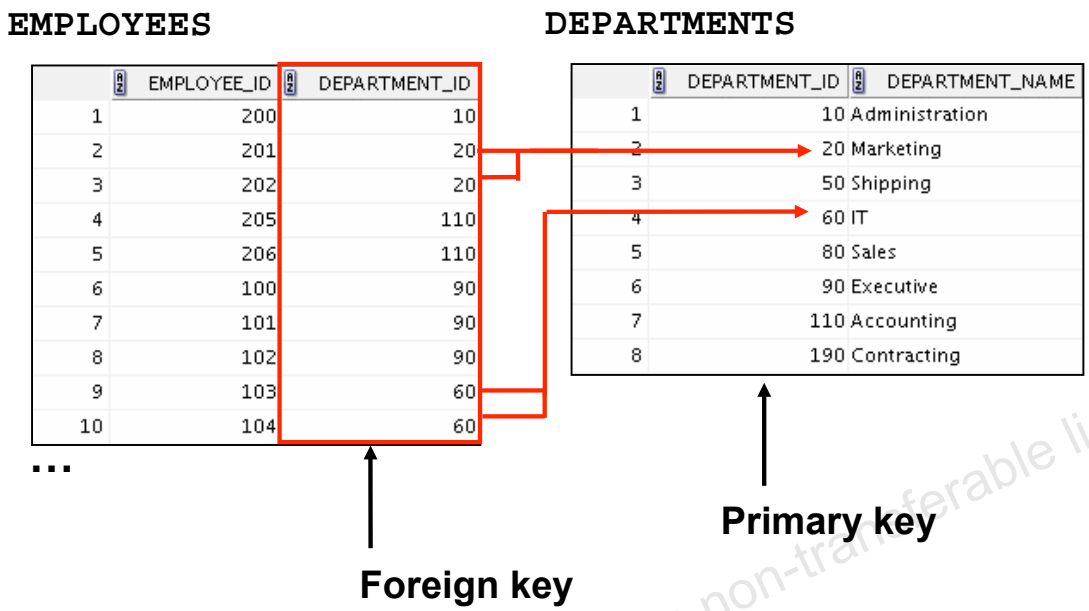
Qualifying column names with table names can be very time consuming, particularly if table names are lengthy. Therefore, you can use *table aliases*, instead of table names. Just as a column alias gives a column another name, a table alias gives a table another name. Table aliases help to keep SQL code smaller, thereby using less memory.

The table name is specified in full, followed by a space and then the table alias. For example, the `EMPLOYEES` table can be given an alias of `e`, and the `DEPARTMENTS` table an alias of `d`.

Guidelines

- Table aliases can be up to 30 characters in length, but shorter aliases are better than longer ones.
- If a table alias is used for a particular table name in the `FROM` clause, that table alias must be substituted for the table name throughout the `SELECT` statement.
- Table aliases should be meaningful.
- A table alias is valid only for the current `SELECT` statement.

Equijoins



Equijoins

To determine an employee's department name, you compare the value in the `DEPARTMENT_ID` column in the `EMPLOYEES` table with the `DEPARTMENT_ID` values in the `DEPARTMENTS` table. The relationship between the `EMPLOYEES` and `DEPARTMENTS` tables is an *equijoin*; that is, values in the `DEPARTMENT_ID` column in both tables must be equal. Often, this type of join involves primary and foreign key complements.

Note: Equijoins are also called *simple joins* or *inner joins*.

Retrieving Records with Equijoins

```
SELECT e.employee_id, e.last_name, e.department_id,
       d.department_id, d.location_id
FROM   employees e, departments d
WHERE  e.department_id = d.department_id;
```

	EMPLOYEE_ID	LAST_NAME	DEPARTMENT_ID	DEPARTMENT_ID_1	LOCATION_ID
1	200	Whalen	10	10	1700
2	201	Hartstein	20	20	1800
3	202	Fay	20	20	1800
4	144	Vargas	50	50	1500
5	143	Matos	50	50	1500
6	142	Davies	50	50	1500
7	141	Rajs	50	50	1500
8	124	Mourgos	50	50	1500
9	103	Hunold	60	60	1400
10	104	Ernst	60	60	1400
11	107	Lorentz	60	60	1400

...

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Retrieving Records with Equijoins

In the example in the slide:

- **The `SELECT` clause specifies the column names to retrieve:**
  - Employee last name, employee number, and department number, which are columns in the `EMPLOYEES` table
  - Department number, department name, and location ID, which are columns in the `DEPARTMENTS` table
- **The `FROM` clause specifies the two tables that the database must access:**
  - `EMPLOYEES` table
  - `DEPARTMENTS` table
- **The `WHERE` clause specifies how the tables are to be joined:**

```
e.department_id = d.department_id
```

Because the `DEPARTMENT_ID` column is common to both tables, it must be prefixed with the table alias to avoid ambiguity. Other columns that are not present in both the tables need not be qualified by a table alias, but it is recommended for better performance.

Note: When you use the Execute Statement icon to run the query, SQL Developer suffixes a "_1" to differentiate between the two `DEPARTMENT_ID`s.

Retrieving Records with Equijoins: Example

```
SELECT d.department_id, d.department_name,
       d.location_id, l.city
FROM   departments d, locations l
WHERE  d.location_id = l.location_id;
```

	DEPARTMENT_ID	DEPARTMENT_NAME	LOCATION_ID	CITY
1	60	IT	1400	Southlake
2	50	Shipping	1500	South San Francisco
3	10	Administration	1700	Seattle
4	90	Executive	1700	Seattle
5	110	Accounting	1700	Seattle
6	190	Contracting	1700	Seattle
7	20	Marketing	1800	Toronto
8	80	Sales	2500	Oxford

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Retrieving Records with Equijoins: Example

In the example in the slide, the `LOCATIONS` table is joined to the `DEPARTMENTS` table by the `LOCATION_ID` column, which is the only column of the same name in both the tables. Table aliases are used to qualify the columns and avoid ambiguity.

Additional Search Conditions Using the AND Operator

```
SELECT  d.department_id, d.department_name, l.city
FROM    departments d, locations l
WHERE   d.location_id = l.location_id
AND d.department_id IN (20, 50);
```

	DEPARTMENT_ID	DEPARTMENT_NAME	CITY
1	20	Marketing	Toronto
2	50	Shipping	South San Francisco

Additional Search Conditions Using the AND Operator

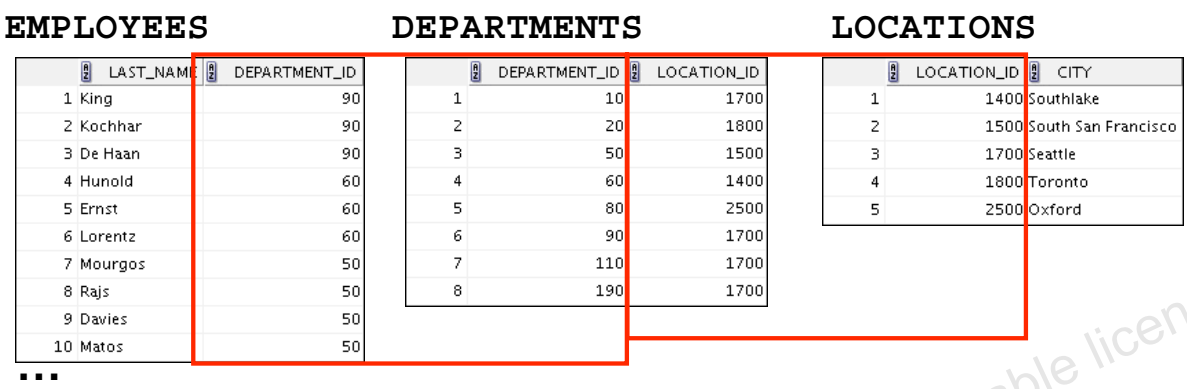
In addition to the join, you may have criteria for your WHERE clause to restrict the rows under consideration for one or more tables in the join. The example in the slide limits the rows of output to those with a department ID equal to 20 or 50:

For example, to display employee Matos' department number and department name, you need an additional condition in the WHERE clause.

```
SELECT  e.last_name, e.department_id,
        d.department_name
FROM    employees e, departments d
WHERE   e.department_id = d.department_id
AND     last_name = 'Matos';
```

	LAST_NAME	DEPARTMENT_ID	DEPARTMENT_NAME
1	Matos	50	Shipping

Joining More than Two Tables



	LAST_NAME	DEPARTMENT_ID
1	King	90
2	Kochhar	90
3	De Haan	90
4	Hunold	60
5	Ernst	60
6	Lorentz	60
7	Mourgos	50
8	Rajs	50
9	Davies	50
10	Matos	50

...

	DEPARTMENT_ID	LOCATION_ID
1	10	1700
2	20	1800
3	50	1500
4	60	1400
5	80	2500
6	90	1700
7	110	1700
8	190	1700

	LOCATION_ID	CITY
1	1400	Southlake
2	1500	South San Francisco
3	1700	Seattle
4	1800	Toronto
5	2500	Oxford

To join *n* tables together, you need a minimum of n–1 join conditions. For example, to join three tables, a minimum of two joins is required.

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Joining More than Two Tables

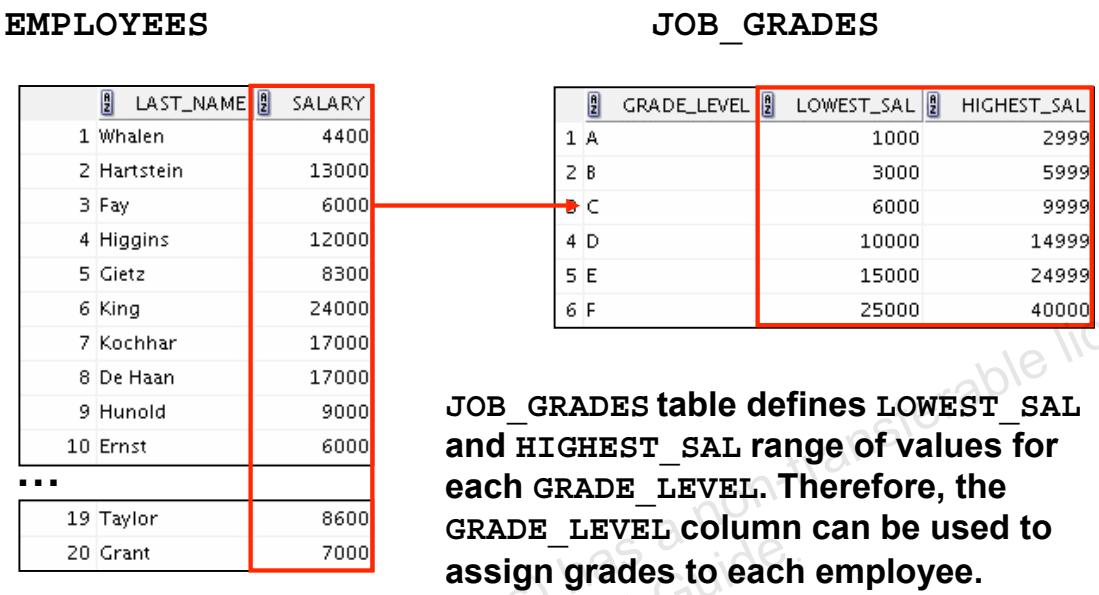
Sometimes you may need to join more than two tables. For example, to display the last name, the department name, and the city for each employee, you have to join the `EMPLOYEES`, `DEPARTMENTS`, and `LOCATIONS` tables.

```
SELECT e.last_name, d.department_name, l.city
FROM   employees e, departments d, locations l
WHERE  e.department_id = d.department_id
AND    d.location_id = l.location_id;
```

	LAST_NAME	DEPARTMENT_NAME	CITY
1	Abel	Sales	Oxford
2	Davies	Shipping	South San Francisco
3	De Haan	Executive	Seattle
4	Ernst	IT	Southlake
5	Fay	Marketing	Toronto

...

Nonequijoins



Nonequijoins

A nonequijoin is a join condition containing something other than an equality operator.

The relationship between the EMPLOYEES table and the JOB_GRADES table is an example of a nonequijoin. The SALARY column in the EMPLOYEES table ranges between the values in the LOWEST_SAL and HIGHEST_SAL columns of the JOB_GRADES table. Therefore, each employee can be graded based on the salary. The relationship is obtained using an operator other than the equality operator (=).

Retrieving Records with Nonequijoins

```
SELECT e.last_name, e.salary, j.grade_level
FROM   employees e, job_grades j
WHERE  e.salary
       BETWEEN j.lowest_sal AND j.highest_sal;
```

	LAST_NAME	SALARY	GRADE_LEVEL
1	Vargas	2500	A
2	Matos	2600	A
3	Davies	3100	B
4	Rajs	3500	B
5	Lorentz	4200	B
6	Whalen	4400	B
7	Mourgos	5800	B
8	Ernst	6000	C
9	Fay	6000	C
10	Grant	7000	C

...

Retrieving Records with Nonequijoins

The example in the slide creates a nonequijoin to evaluate an employee's salary grade. The salary must be *between* any pair of the low and high salary ranges.

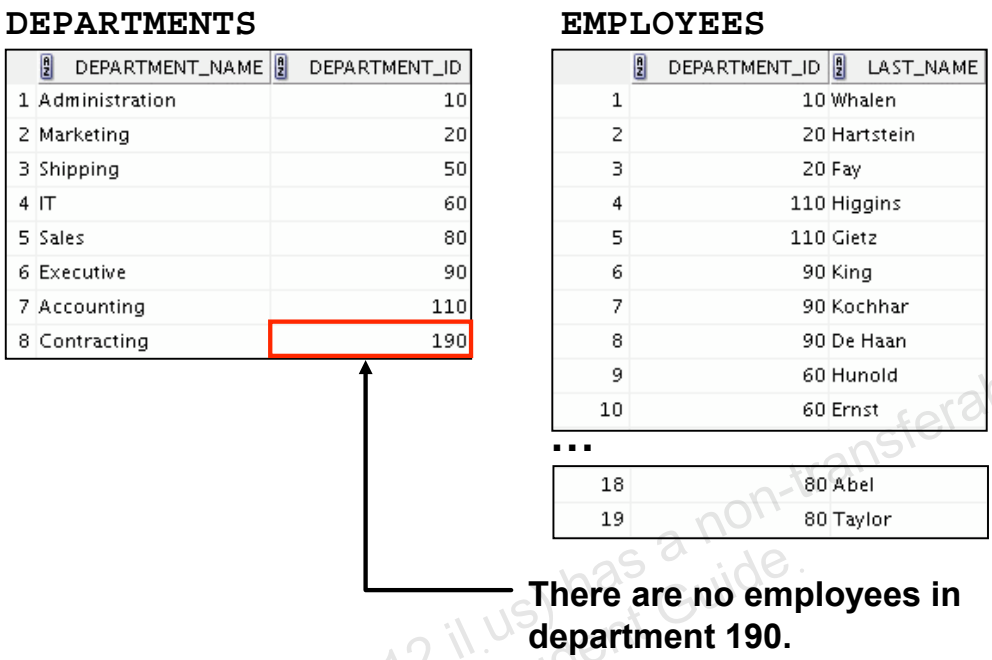
It is important to note that all employees appear exactly once when this query is executed. No employee is repeated in the list. There are two reasons for this:

- None of the rows in the job grade table contain grades that overlap. That is, the salary value for an employee can lie only between the low salary and high salary values of one of the rows in the salary grade table.
- All of the employees' salaries lie within the limits that are provided by the job grade table. That is, no employee earns less than the lowest value contained in the `LOWEST_SAL` column or more than the highest value contained in the `HIGHEST_SAL` column.

Note: Other conditions (such as `<=` and `>=`) can be used, but `BETWEEN` is the simplest. Remember to specify the low value first and the high value last when using the `BETWEEN` condition. The Oracle server translates the `BETWEEN` condition to a pair of `AND` conditions. Therefore, using `BETWEEN` has no performance benefits, but should be used only for logical simplicity.

Table aliases have been specified in the example in the slide for performance reasons, not because of possible ambiguity.

Returning Records with No Direct Match with Outer Joins



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Returning Records with No Direct Match with Outer Joins

If a row does not satisfy a join condition, the row does not appear in the query result. For example, in the equijoin condition of the `EMPLOYEES` and `DEPARTMENTS` tables, department ID 190 does not appear because there are no employees with that department ID recorded in the `EMPLOYEES` table. Similarly, there is an employee whose `DEPARTMENT_ID` is set to `NULL`, so this row will also not appear in the query result of an equijoin. To return the department record that does not have any employees, or to return the employee record that does not belong to any department, you can use the outer join.

Outer Joins: Syntax

- You use an outer join to see rows that do not meet the join condition.
- The outer join operator is the plus sign (+).

```
SELECT table1.column, table2.column
FROM   table1, table2
WHERE  table1.column(+) = table2.column;
```

```
SELECT table1.column, table2.column
FROM   table1, table2
WHERE  table1.column = table2.column(+);
```


Outer Joins: Syntax

Missing rows can be returned if an *outer join* operator is used in the join condition. The operator is a plus sign enclosed with parentheses (+), and is placed on the "side" of the join that is deficient in the information. This operator has the effect of creating one or more null rows, to which one or more rows from the nondeficient table can be joined.

In the syntax:

`table1.column =`	Is the condition that joins (or relates) the tables together
`table2.column (+)`	Is the outer join symbol, which can be placed on either side of the `WHERE` clause condition, but not on both sides (Place the outer join symbol following the name of the column in the table without the matching rows.)

Using Outer Joins

```
SELECT e.last_name, e.department_id, d.department_name
FROM   employees e, departments d
WHERE  e.department_id(+) = d.department_id ;
```

	LAST_NAME	DEPARTMENT_ID	DEPARTMENT_NAME
1	Whalen	10	Administration
2	Hartstein	20	Marketing
3	Fay	20	Marketing
4	Davies	50	Shipping
5	Vargas	50	Shipping
6	Rajs	50	Shipping
7	Mourgos	50	Shipping
8	Matos	50	Shipping
9	Hunold	60	IT
10	Ernst	60	IT
...			
19	Gietz	110	Accounting
20	(null)	(null)	Contracting

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Using Outer Joins

The example in the slide displays employee last names, department IDs, and department names. The Contracting department does not have any employees. The empty value is shown in the output.

Outer Join Restrictions

- The outer join operator can appear only on *one* side of the expression—the side in which the information is missing. It returns those rows, from one table, that have no direct match in the other table.
- A condition involving an outer join cannot use the `IN` operator or be linked to another condition by the `OR` operator.

Note: Oracle's join syntax does not have an equivalent for the `FULL OUTER JOIN` of the SQL:1999– compliant join syntax.

Outer Join: Another Example

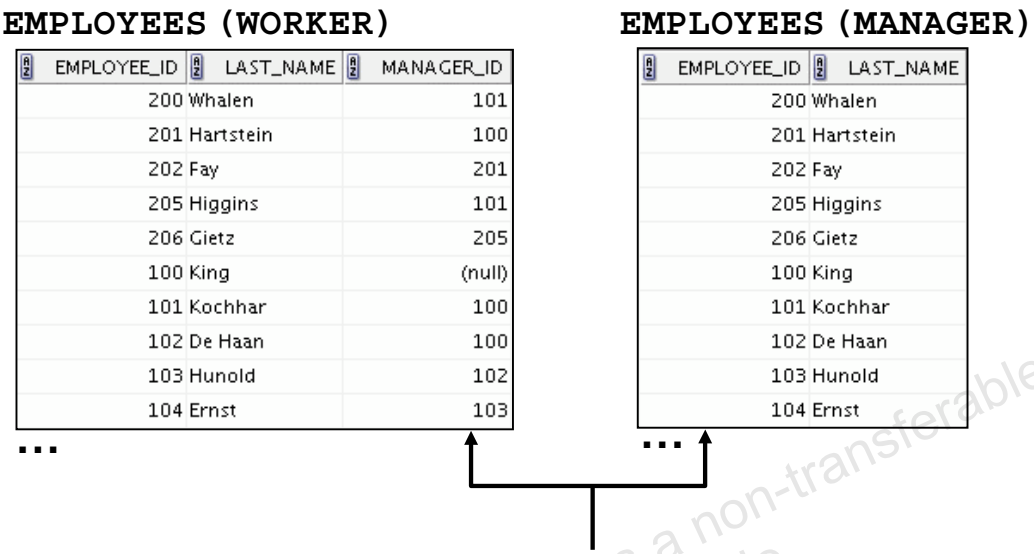
```
SELECT e.last_name, e.department_id, d.department_name
FROM   employees e, departments d
WHERE  e.department_id = d.department_id(+) ;
```

	LAST_NAME	DEPARTMENT_ID	DEPARTMENT_NAME
1	Whalen	10	Administration
2	Fay	20	Marketing
3	Hartstein	20	Marketing
4	Vargas	50	Shipping
5	Matos	50	Shipping
...			
16	Kochhar	90	Executive
17	King	90	Executive
18	Gietz	110	Accounting
19	Higgins	110	Accounting
20	Grant	(null)	(null)

Outer Join: Another Example

The query in the example in the slide retrieves all rows in the EMPLOYEES table, even if there is no match in the DEPARTMENTS table.

Joining a Table to Itself



MANAGER_ID in the WORKER table is equal to EMPLOYEE_ID in the MANAGER table.

Joining a Table to Itself

Sometimes you need to join a table to itself. To find the name of each employee's manager, you need to join the EMPLOYEES table to itself, or perform a self-join. For example, to find the name of Lorentz's manager, you need to:

- Find Lorentz in the EMPLOYEES table by looking at the LAST_NAME column
- Find the manager number for Lorentz by looking at the MANAGER_ID column. Lorentz's manager number is 103.
- Find the name of the manager with EMPLOYEE_ID 103 by looking at the LAST_NAME column. Hunold's employee number is 103, so Hunold is Lorentz's manager.

In this process, you look in the table twice. The first time you look in the table to find Lorentz in the LAST_NAME column and the MANAGER_ID value of 103. The second time you look in the EMPLOYEE_ID column to find 103 and the LAST_NAME column to find Hunold.

Self-Join: Example

```
SELECT worker.last_name || ' works for '
       || manager.last_name
FROM   employees worker, employees manager
WHERE  worker.manager_id = manager.employee_id ;
```

	WORKER.LAST_NAME||'WORKSFOR'||MANAGER.LAST_NAME
1	Hunold works for De Haan
2	Fay works for Hartstein
3	Gietz works for Higgins
4	Lorentz works for Hunold
5	Ernst works for Hunold
6	Zlotkey works for King
7	Mourgos works for King
8	Kochhar works for King
9	Hartstein works for King
10	De Haan works for King

...

Self-Join: Example

The example in the slide joins the EMPLOYEES table to itself. To simulate two tables in the FROM clause, there are two aliases, namely worker and manager, for the same table, EMPLOYEES.

In this example, the WHERE clause contains the join that means "where a worker's manager number matches the employee number for the manager."

Summary

In this appendix, you should have learned how to use joins to display data from multiple tables by using Oracle-proprietary syntax.

Summary

There are multiple ways to join tables.

Types of Joins

- Equijoins
- Nonequijoins
- Outer joins
- Self-joins

Cartesian Products

A Cartesian product results in a display of all combinations of rows. This is done by omitting the `WHERE` clause.

Table Aliases

- Table aliases speed up database access.
- Table aliases can help to keep SQL code smaller by conserving memory.

Practice F: Overview

This practice covers the following topics:

- Joining tables by using an equijoin
- Performing outer and self-joins
- Adding conditions

Practice F: Overview

This practice is intended to give you practical experience in extracting data from more than one table using the Oracle join syntax.

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