

Oracle Database 10g: PL/SQL Fundamentals

Volume 2 • Additional Practices

D17112GC21

Edition 2.1

December 2006

D48245

ORACLE®

Authors

Tulika Srivastava
Sunitha Patel

Technical Contributors and Reviewers

Chaitanya Koratamaddi
Christoph Burandt
Zarko Cesljas
Dairy Chan
Isabelle Cornu
Kathryn Cunningham
Burt Demchick
Joel Goodman
Jonathan Grove
Jessie Ho
Craig Hollister
Alison Holloway
Bryn Llewellyn
Malika Marghadi
Hildegard Mayr
Nancy Greenberg
Miyuki Osato
Nagavalli Pataballa
Srinivas Putrevu
Bryan Roberts
Helen Robertson
Grant Spencer
Lex Van Der Werff

Editors

Richard Wallis
Arijit Ghosh

Graphic Designer

Steve Elwood

Publishers

Nita Brozowski
Srividya Rameshkumar

Copyright © 2006, Oracle. All rights reserved.

Disclaimer

This document contains proprietary information and is protected by copyright and other intellectual property laws. You may copy and print this document solely for your own use in an Oracle training course. The document may not be modified or altered in any way. Except where your use constitutes "fair use" under copyright law, you may not use, share, download, upload, copy, print, display, perform, reproduce, publish, license, post, transmit, or distribute this document in whole or in part without the express authorization of Oracle.

The information contained in this document is subject to change without notice. If you find any problems in the document, please report them in writing to: Oracle University, 500 Oracle Parkway, Redwood Shores, California 94065 USA. This document is not warranted to be error-free.

Restricted Rights Notice

If this documentation is delivered to the United States Government or anyone using the documentation on behalf of the United States Government, the following notice is applicable:

U.S. GOVERNMENT RIGHTS

The U.S. Government's rights to use, modify, reproduce, release, perform, display, or disclose these training materials are restricted by the terms of the applicable Oracle license agreement and/or the applicable U.S. Government contract.

Trademark Notice

Oracle, JD Edwards, PeopleSoft, and Siebel are registered trademarks of Oracle Corporation and/or its affiliates. Other names may be trademarks of their respective owners.

Contents

Preface

I Introduction

- Objectives I-2
- Course Objectives I-3
- Course Agenda I-4
- The Human Resources (hr) Data Set I-6
- Oracle 10g Grid Infrastructure I-8
- Oracle Database 10g I-9
- Oracle Application Server 10g I-10
- Oracle Enterprise Manager 10g Grid Control I-11
- Oracle Internet Platform I-12
- Summary I-13
- Course Practices I-14

1 Introduction to PL/SQL

- Objectives 1-2
- What is PL/SQL? 1-3
- About PL/SQL 1-4
- PL/SQL Environment 1-5
- Benefits of PL/SQL 1-6
- PL/SQL Block Structure 1-9
- Block Types 1-11
- Programs Constructs 1-13
- PL/SQL Programming Environments 1-15
- iSQL*Plus Architecture 1-18
- Create an Anonymous Block 1-19
- Execute an Anonymous Block 1-20
- Test the Output of a PL/SQL Block 1-21
- Summary 1-23
- Practice 1: Overview 1-24

2 Declaring PL/SQL Variables

- Objectives 2-2
- Use of Variables 2-3
- Identifiers 2-4
- Handling Variables in PL/SQL 2-5
- Declaring and Initializing PL/SQL Variables 2-6
- Delimiters in String Literals 2-8
- Types of Variables 2-9
- Guidelines for Declaring and Initializing PL/SQL Variables 2-11
- Guidelines for Declaring PL/SQL Variables 2-12
- Scalar Data Types 2-13
- Base Scalar Data Types 2-14

BINARY_FLOAT and BINARY_DOUBLE 2-18
Declaring Scalar Variables 2-20
%TYPE Attribute 2-21
Declaring Variables with the %TYPE Attribute 2-23
Declaring Boolean Variables 2-24
Bind Variables 2-25
Printing Bind Variables 2-27
Substitution Variables 2-29
Prompt for Substitution Variables 2-31
Using DEFINE for User Variable 2-32
Composite Data Types 2-33
LOB Data Type Variables 2-34
Summary 2-35
Practice 2: Overview 2-36

3 Writing Executable Statements

Objectives 3-2
Lexical Units in a PL/SQL Block 3-3
PL/SQL Block Syntax and Guidelines 3-5
Commenting Code 3-6
SQL Functions in PL/SQL 3-7
SQL Functions in PL/SQL: Examples 3-8
Data Type Conversion 3-9
Nested Blocks 3-12
Variable Scope and Visibility 3-14
Qualify an Identifier 3-16
Determining Variable Scope 3-17
Operators in PL/SQL 3-18
Programming Guidelines 3-20
Indenting Code 3-21
Summary 3-22
Practice 3: Overview 3-23

4 Interacting with the Oracle Server

Objectives 4-2
SQL Statements in PL/SQL 4-3
SELECT Statements in PL/SQL 4-5
Retrieving Data in PL/SQL 4-9
Naming Conventions 4-11
Manipulating Data Using PL/SQL 4-13
Inserting Data 4-14
Updating Data 4-15
Deleting Data 4-16
Merging Rows 4-17
SQL Cursor 4-19
SQL Cursor Attributes for Implicit Cursors 4-21
Summary 4-23
Practice 4: Overview 4-24

5 Writing Control Structures

Objectives 5-2
Controlling Flow of Execution 5-3
IF Statements 5-4
Simple IF Statement 5-6
IF THEN ELSE Statement 5-7
IF ELSIF ELSE Clause 5-8
NULL Values in IF Statements 5-9
CASE Expressions 5-10
CASE Expressions: Example 5-11
Searched CASE Expressions 5-12
CASE Statement 5-13
Handling Nulls 5-14
Logic Tables 5-15
Boolean Conditions 5-16
Iterative Control: LOOP Statements 5-17
Basic Loops 5-18
WHILE Loops 5-20
FOR Loops 5-22
Guidelines for Loops 5-26
Nested Loops and Labels 5-27
Summary 5-29
Practice 5: Overview 5-30

6 Working with Composite Data Types

Objectives 6-2
Composite Data Types 6-3
PL/SQL Records 6-5
Creating a PL/SQL Record 6-6
PL/SQL Record Structure 6-8
%ROWTYPE Attribute 6-9
Advantages of Using %ROWTYPE 6-11
%ROWTYPE Attribute 6-12
Inserting a Record by Using %ROWTYPE 6-13
Updating a Row in a Table by Using a Record 6-14
INDEX BY Tables or Associative Arrays 6-15
Creating an INDEX BY Table 6-16
INDEX BY Table Structure 6-18
Creating an INDEX BY Table 6-19
Using INDEX BY Table Methods 6-20
INDEX BY Table of Records 6-21
INDEX BY Table of Records: Example 6-23
Nested Tables 6-24
VARRAY 6-26
Summary 6-27
Practice 6: Overview 6-28

7 Using Explicit Cursors

Objectives 7-2

Cursors 7-3

Explicit Cursor Operations 7-4

Controlling Explicit Cursors 7-5

Declaring the Cursor 7-7

Opening the Cursor 7-9

Fetching Data from the Cursor 7-10

Closing the Cursor 7-13

Cursors and Records 7-14

Cursor FOR Loops 7-15

Explicit Cursor Attributes 7-17

%ISOPEN Attribute 7-18

%ROWCOUNT and %NOTFOUND: Example 7-19

Cursor FOR Loops Using Subqueries 7-20

Cursors with Parameters 7-21

FOR UPDATE Clause 7-23

WHERE CURRENT OF Clause 7-25

Cursors with Subqueries 7-26

Summary 7-27

Practice 7: Overview 7-28

8 Handling Exceptions

Objectives 8-2

Example of an Exception 8-3

Handling Exceptions with PL/SQL 8-5

Handling Exceptions 8-6

Exception Types 8-7

Trapping Exceptions 8-8

Guidelines for Trapping Exceptions 8-10

Trapping Predefined Oracle Server Errors 8-11

Trapping Non-Predefined Oracle Server Errors 8-14

Non-Predefined Error 8-15

Functions for Trapping Exceptions 8-16

Trapping User-Defined Exceptions 8-18

Calling Environments 8-20

Propagating Exceptions in a Subblock 8-21

RAISE_APPLICATION_ERROR Procedure 8-22

Summary 8-25

Practice 8: Overview 8-26

9 Creating Stored Procedures and Functions

Objectives 9-2

Procedures and Functions 9-3

Differences Between Anonymous Blocks and Subprograms 9-4

Procedure: Syntax 9-5

Procedure: Example 9-6

Invoking the Procedure 9-8

Function: Syntax 9-9
Function: Example 9-10
Invoking the Function 9-11
Passing Parameter to the Function 9-12
Invoking the Function with a Parameter 9-13
Summary 9-14
Practice 9: Overview 9-15

Appendix: A Practice Solutions

Appendix: B Table Descriptions and Data

Appendix: C REF Cursors

Appendix: D JDeveloper

Appendix: E Using SQL Developer

Index

Additional Practices

Additional Practice Solutions

Carlos Gomes (supersuporte@gmail.com) has a non-transferable
license to use this Student Guide.

Additional Practices

Carlos Gomes (supersuporte@gmail.com) has a non-transferable
license to use this Student Guide.

Additional Practices Overview

These additional practices are provided as a supplement to the course *Oracle Database 10g: PL/SQL Fundamentals*. In these practices, you apply the concepts that you learned in *Oracle Database 10g: PL/SQL Fundamentals*.

These additional practices provide supplemental practice in declaring variables, writing executable statements, interacting with the Oracle server, writing control structures, and working with composite data types, cursors, and handle exceptions. The tables used in this portion of the additional practices include employees, jobs, job_history, and departments.

Carlos Gomes (supersuporte@gmail.com) has a non-transferable license to use this Student Guide.

Additional Practice 1 and 2

Note: These exercises can be used for extra practice when discussing how to declare variables and write executable statements.

1. Evaluate each of the following declarations. Determine which of them are not legal and explain why.

a. DECLARE

name,dept VARCHAR2(14);

b. DECLARE

test NUMBER(5);

c. DECLARE

MAXSALARY NUMBER(7,2) = 5000;

d. DECLARE

JOINDATE BOOLEAN := SYSDATE;

2. In each of the following assignments, determine the data type of the resulting expression.

a. email := firstname || to_char(empno);

b. confirm := to_date('20-JAN-1999', 'DD-MON-YYYY');

c. sal := (1000*12) + 500

d. test := FALSE;

e. temp := temp1 < (temp2/ 3);

f. var := sysdate;

Additional Practice 3

3. DECLARE

```
    custid      NUMBER(4) := 1600;
    custname    VARCHAR2(300) := 'Women Sports Club';
    new_custid  NUMBER(3) := 500;

BEGIN
DECLARE
    custid      NUMBER(4) := 0;
    custname    VARCHAR2(300) := 'Shape up Sports Club';
    new_custid  NUMBER(3) := 300;
    new_custname VARCHAR2(300) := 'Jansports Club';
```

BEGIN

```
    custid := new_custid;
    custname := custname || ' ' || new_custname;
```

1

END;

2

```
    custid := (custid *12) / 10;
```

END;

/

Evaluate the PL/SQL block given above and determine the data type and value of each of the following variables according to the rules of scoping:

- The value of CUSTID at position 1 is:
- The value of CUSTNAME at position 1 is:
- The value of NEW_CUSTID at position 2 is:
- The value of NEW_CUSTNAME at position 1 is:
- The value of CUSTID at position 2 is:
- The value of CUSTNAME at position 2 is:

Note: These exercises can be used for extra practice when discussing how to interact with the Oracle server and write control structures.

- Write a PL/SQL block to accept a year and check whether it is a leap year. For example, if the year entered is 1990, the output should be “1990 is not a leap year.”

Hint: The year should be exactly divisible by 4 but not divisible by 100, or it should be divisible by 400.

Additional Practice 4 and 5

Test your solution with the following years:

1990	Not a leap year
2000	Leap year
1996	Leap year
1886	Not a leap year
1992	Leap year
1824	Leap year

old 2: YEAR NUMBER(4) := &P_YEAR;

new 2: YEAR NUMBER(4) := 1990;

1990 is not a leap year

PL/SQL procedure successfully completed.

5. a. For the exercises below, you will require a temporary table to store the results. You can either create the table yourself or run the lab_ap_05.sql script that will create the table for you. Create a table named TEMP with the following three columns:

Column Name	NUM_STORE	CHAR_STORE	DATE_STORE
Key Type			
Nulls/Unique			
FK Table			
FK Column			
Data Type	Number	VARCHAR2	Date
Length	7,2	35	

- b. Write a PL/SQL block that contains two variables, MESSAGE and DATE_WRITTEN. Declare MESSAGE as VARCHAR2 data type with a length of 35 and DATE_WRITTEN as DATE data type. Assign the following values to the variables:

Variable	Contents
MESSAGE	This is my first PL/SQL program
DATE_WRITTEN	Current date

Store the values in appropriate columns of the TEMP table. Verify your results by querying the TEMP table.

NUM_STORE	CHAR_STORE	DATE_STORE
	This is my first PLSQL Program	19-FEB-04

Additional Practice 6 and 7

6. a. Store a department number in an *iSQL*Plus* substitution variable.
b. Write a PL/SQL block to print the number of people working in that department.
Hint: Enable DBMS_OUTPUT in *iSQL*Plus* with SET SERVEROUTPUT ON.

```
old 3: DEPTNO DEPARTMENTS.department_id%TYPE :=  
&P_DEPTNO;  
new 3: DEPTNO DEPARTMENTS.department_id%TYPE := 30;  
6 employee(s) work for department number 30  
PL/SQL procedure successfully completed.
```

7. Write a PL/SQL block to declare a variable called `sal` to store the salary of an employee.

In the executable part of the program, do the following:

- a. Store an employee name in an *iSQL*Plus* substitution variable.
- b. Store his or her salary in the `sal` variable.
- c. If the salary is less than 3,000, give the employee a raise of 500 and display the message "<Employee Name>'s salary updated" in the window.
- d. If the salary is more than 3,000, print the employee's salary in the format, "<Employee Name> earns"
- e. Test the PL/SQL block for the following last names:

LAST_NAME	SALARY
Pataballa	4800
Greenberg	12000
Ernst	6000

Note: Undefine the variable that stores the employee's name at the end of the script.

Additional Practice 8 and 9

8. Write a PL/SQL block to store the salary of an employee in an *iSQL*Plus* substitution variable.

In the executable part of the program, do the following:

- Calculate the annual salary as salary * 12.
- Calculate the bonus as indicated below:

Annual Salary	Bonus
>= 20,000	2,000
19,999 - 10,000	1,000
<= 9,999	500

- Display the amount of the bonus in the window in the following format:
“The bonus is \$.....”
- Test the PL/SQL for the following test cases:

SALARY	BONUS
5000	2000
1000	1000
15000	2000

Note: These exercises can be used for extra practice when discussing how to work with composite data types, cursors and handling exceptions.

9. a. Execute the script `lab_ap_09_a.sql` to create a temporary table called `emp`. Write a PL/SQL block to store an employee number, the new department number, and the percentage increase in the salary in *iSQL*Plus* substitution variables.
- b. Update the department ID of the employee with the new department number, and update the salary with the new salary. Use the `emp` table for the updates. After the update is complete, display the message, “Update complete” in the window. If no matching records are found, display “No Data Found.” Test the PL/SQL block for the following test cases:

EMPLOYEE_ID	NEW_DEPARTMEN T_ID	% INCREASE	MESSAGE
100	20	2	Update Complete
10	30	5	No Data found
126	40	3	Update Complete

Additional Practice 10 and 11

10. Create a PL/SQL block to declare a cursor EMP_CUR to select the employee name, salary, and hire date from the employees table. Process each row from the cursor, and if the salary is greater than 15,000 and the hire date is greater than 01-FEB-1988, display the employee name, salary, and hire date in the window in the format shown in the sample output below:

```
Kochhar earns 17000 and joined the organization on 21-SEP-89
De Haan earns 17000 and joined the organization on 13-JAN-93
PL/SQL procedure successfully completed.
```

11. Create a PL/SQL block to retrieve the last name and department ID of each employee from the EMPLOYEES table for those employees whose EMPLOYEE_ID is less than 114. From the values retrieved from the employees table, populate two PL/SQL tables, one to store the records of the employee last names and the other to store the records of their department IDs. Using a loop, retrieve the employee name information and the salary information from the PL/SQL tables and display it in the window, using DBMS_OUTPUT.PUT_LINE. Display these details for the first 15 employees in the PL/SQL tables.

```
Employee Name: King Department_id: 90
Employee Name: Kochhar Department_id: 90
Employee Name: De Haan Department_id: 90
Employee Name: Hunold Department_id: 60
Employee Name: Ernst Department_id: 60
Employee Name: Austin Department_id: 60
Employee Name: Pataballa Department_id: 60
Employee Name: Lorentz Department_id: 60
Employee Name: Greenberg Department_id: 100
Employee Name: Favier Department_id: 100
Employee Name: Chen Department_id: 100
Employee Name: Sciarra Department_id: 100
Employee Name: Urman Department_id: 100
Employee Name: Popp Department_id: 100
Employee Name: Raphaely Department_id: 30
PL/SQL procedure successfully completed.
```


Additional Practice 12, 13, and 14

12. a. Create a PL/SQL block that declares a cursor called `DATE_CUR`. Pass a parameter of `DATE` data type to the cursor and print the details of all the employees who have joined after that date.

```
DEFINE P_HIREDATE = 08-MAR-00
```

- b. Test the PL/SQL block for the following hire dates: 08-MAR-00, 25-JUN-97, 28-SEP-98, 07-FEB-99.

```
166 Ande 24-MAR-00
```

```
167 Banda 21-APR-00
```

```
173 Kumar 21-APR-00
```

```
PL/SQL procedure successfully completed.
```

13. Execute the script `lab_ap_09_a.sql` to re-create the `emp` table. Create a PL/SQL block to promote clerks who earn more than 3,000 to the job title `SR CLERK` and increase their salaries by 10%. Use the `EMP` table for this practice. Verify the results by querying on the `emp` table.

Hint: Use a cursor with `FOR UPDATE` and `CURRENT OF` syntax.

14. a. For the exercise below, you will require a table to store the results. You can create the `analysis` table yourself or run the `lab_ap_14_a.sql` script that creates the table for you. Create a table called `analysis` with the following three columns:

Column Name	ENAME	YEARS	SAL
Key Type			
Nulls/Unique			
FK Table			
FK Column			
Data Type	VARCHAR2	Number	Number
Length	20	2	8, 2

- b. Create a PL/SQL block to populate the `analysis` table with the information from the `employees` table. Use an `iSQL*Plus` substitution variable to store an employee's last name.

Additional Practice 12, 13, and 14 (continued)

- c. Query the `employees` table to find if the number of years that the employee has been with the organization is greater than five, and if the salary is less than 3,500, raise an exception. Handle the exception with an appropriate exception handler that inserts the following values into the `analysis` table: employee last name, number of years of service, and the current salary. Otherwise display `Not due for a raise` in the window. Verify the results by querying the `analysis` table. Use the following test cases to test the PL/SQL block:

LAST_NAME	MESSAGE
Austin	Not due for a raise
Nayer	Not due for a raise
Fripp	Not due for a raise
Khoo	Due for a raise

Additional Practice Solutions

Carlos Gomes (supersuporte@gmail.com) has a non-transferable
license to use this Student Guide.

Additional Practice 1 and 2: Solutions

1. Evaluate each of the following declarations. Determine which of them are *not* legal and explain why.

a. DECLARE

```
name,dept    VARCHAR2(14);
```

This is illegal because only one identifier per declaration is allowed.

b. DECLARE

```
test         NUMBER(5);
```

This is legal.

c. DECLARE

```
MAXSALARY    NUMBER(7,2) = 5000;
```

This is illegal because the assignment operator is wrong. It should be :=.

d. DECLARE

```
JOINDATE     BOOLEAN := SYSDATE;
```

This is illegal because there is a mismatch in the data types. A Boolean data type cannot be assigned a date value. The data type should be date.

2. In each of the following assignments, determine the data type of the resulting expression.

a. email := firstname || to_char(empno);

Character string

b. confirm := to_date('20-JAN-1999', 'DD-MON-YYYY');

Date

c. sal := (1000*12) + 500

Number

d. test := FALSE;

Boolean

e. temp := temp1 < (temp2/ 3);

Boolean

f. var := sysdate;

Date

Additional Practice 3: Solutions

3. DECLARE

```
    custid      NUMBER(4) := 1600;
    custname     VARCHAR2(300) := 'Women Sports Club';
    new_custid   NUMBER(3) := 500;
```

BEGIN

DECLARE

```
    custid      NUMBER(4) := 0;
    custname     VARCHAR2(300) := 'Shape up Sports Club';
    new_custid   NUMBER(3) := 300;
    new_custname VARCHAR2(300) := 'Jansports Club';
```

BEGIN

```
    custid := new_custid;
    custname := custname || ' ' || new_custname;
```

1

END;

```
    custid := (custid * 12) / 10;
```

2

END;

/

Evaluate the PL/SQL block given above and determine the data type and value of each of the following variables, according to the rules of scoping:

- The value of CUSTID at position 1 is:
300, and the data type is NUMBER
- The value of CUSTNAME at position 1 is:
Shape up Sports Club Jansports Club, and the data type is VARCHAR2
- The value of NEW_CUSTID at position 1 is:
500, and the data type is NUMBER (or INTEGER)
- The value of NEW_CUSTNAME at position 1 is:
Jansports Club, and the data type is VARCHAR2
- The value of CUSTID at position 2 is:
1920, and the data type is NUMBER
- The value of CUSTNAME at position 2 is:
Women Sports Club, and the data type is VARCHAR2

Additional Practice 4: Solutions

4. Write a PL/SQL block to accept a year and check whether it is a leap year. For example, if the year entered is 1990, the output should be “1990 is not a leap year.”

Hint: The year should be exactly divisible by 4 but not divisible by 100, or it should be divisible by 400.

Test your solution with the following years:

1990	Not a leap year
2000	Leap year
1996	Leap year
1886	Not a leap year
1992	Leap year
1824	Leap year

```
SET SERVEROUTPUT ON
```

```
DECLARE
```

```
    YEAR NUMBER(4) := &P_YEAR;
```

```
    REMAINDER1 NUMBER(5,2);
```

```
    REMAINDER2 NUMBER(5,2);
```

```
    REMAINDER3 NUMBER(5,2);
```

```
BEGIN
```

```
    REMAINDER1 := MOD(YEAR,4);
```

```
    REMAINDER2 := MOD(YEAR,100);
```

```
    REMAINDER3 := MOD(YEAR,400);
```

```
    IF ((REMAINDER1 = 0 AND REMAINDER2 <> 0 )  
        OR REMAINDER3 = 0) THEN
```

```
        DBMS_OUTPUT.PUT_LINE(YEAR || ' is a leap year');
```

```
    ELSE
```

```
        DBMS_OUTPUT.PUT_LINE (YEAR || ' is not a leap year');
```

```
    END IF;
```

```
END;
```

```
/
```

```
SET SERVEROUTPUT OFF
```

Additional Practice 5: Solutions

5. a. For the following exercises, you will require a temporary table to store the results. You can either create the table yourself or run the `lab_ap_05.sql` script that will create the table for you. Create a table named `TEMP` with the following three columns:

Column Name	NUM_STORE	CHAR_STORE	DATE_STORE
Key Type			
Nulls/Unique			
FK Table			
FK Column			
Data Type	Number	VARCHAR2	Date
Length	7,2	35	

```
CREATE TABLE temp
(num_store NUMBER(7,2),
char_store VARCHAR2(35),
date_store DATE);
```

- b. Write a PL/SQL block that contains two variables, `MESSAGE` and `DATE_WRITTEN`. Declare `MESSAGE` as `VARCHAR2` data type with a length of 35 and `DATE_WRITTEN` as `DATE` data type. Assign the following values to the variables:

Variable	Contents
<code>MESSAGE</code>	This is my first PL/SQL program
<code>DATE_WRITTEN</code>	Current date

Store the values in appropriate columns of the `TEMP` table. Verify your results by querying the `TEMP` table.

```
SET SERVEROUTPUT ON
DECLARE
MESSAGE VARCHAR2(35);
DATE_WRITTEN DATE;
BEGIN
MESSAGE := 'This is my first PLSQL Program';
DATE_WRITTEN := SYSDATE;
INSERT INTO temp(char_store,date_store)
VALUES (MESSAGE,date_wrITTEN);
END;
/
SELECT * FROM TEMP;
```

Additional Practices 6 and 7 Solutions

6. a. Store a department number in a *iSQL*Plus* substitution variable

```
DEFINE P_DEPTNO = 30
```

- b. Write a PL/SQL block to print the number of people working in that department.

Hint: Enable DBMS_OUTPUT in *iSQL*Plus* with SET SERVEROUTPUT ON.

```
SET SERVEROUTPUT ON
```

```
DECLARE
```

```
    HOWMANY NUMBER(3);
```

```
    DEPTNO DEPARTMENTS.department_id%TYPE := &P_DEPTNO;
```

```
BEGIN
```

```
    SELECT COUNT(*) INTO HOWMANY FROM employees
```

```
    WHERE department_id = DEPTNO;
```

```
    DBMS_OUTPUT.PUT_LINE (HOWMANY || ' employee(s) work  
    for department number ' || DEPTNO);
```

```
END;
```

```
/
```

```
SET SERVEROUTPUT OFF
```

7. Write a PL/SQL block to declare a variable called sal to store the salary of an employee. In the executable part of the program, do the following:

- a. Store an employee name in an *iSQL*Plus* substitution variable:

```
SET SERVEROUTPUT ON
```

```
DEFINE P_LASTNAME = Pataballa
```

- b. Store his or her salary in the sal variable

- c. If the salary is less than 3,000, give the employee a raise of 500 and display the message "<Employee Name>'s salary updated" in the window.

- d. If the salary is more than 3,000, print the employee's salary in the format, "<Employee Name> earns"

- e. Test the PL/SQL block for the last names.

LAST_NAME	SALARY
Pataballa	4800
Greenberg	12000
Ernst	6000

Note: Undefine the variable that stores the employee's name at the end of the script.

Additional Practices 7 and 8: Solutions

```
DECLARE
    SAL NUMBER(7,2);
    LASTNAME EMPLOYEES.LAST_NAME%TYPE;
BEGIN
    SELECT salary INTO SAL
    FROM employees
    WHERE last_name = INITCAP('&P_LASTNAME') FOR UPDATE of
    salary;

    LASTNAME := INITCAP('&P_LASTNAME');
    IF SAL < 3000 THEN
        UPDATE employees SET salary = salary + 500
        WHERE last_name = INITCAP('&P_LASTNAME') ;
        DBMS_OUTPUT.PUT_LINE (LASTNAME || ''s salary
updated');
    ELSE
        DBMS_OUTPUT.PUT_LINE (LASTNAME || ' earns ' ||
TO_CHAR(SAL));
    END IF;
END;
/
SET SERVEROUTPUT OFF
UNDEFINE P_LASTNAME
```

8. Write a PL/SQL block to store the salary of an employee in an *iSQL**Plus substitution variable. In the executable part of the program, do the following:

- Calculate the annual salary as salary * 12.
- Calculate the bonus as indicated below:

Annual Salary	Bonus
>= 20,000	2,000
19,999 - 10,000	1,000
<= 9,999	500

- Display the amount of the bonus in the window in the following format:
“The bonus is \$.....”
- Test the PL/SQL for the following test cases:

SALARY	BONUS
5000	2000
1000	1000
15000	2000

Additional Practices 8 and 9: Solutions

```
SET SERVEROUTPUT ON
DEFINE P_SALARY = 5000
DECLARE
    SAL    NUMBER(7,2) := &P_SALARY;
    BONUS   NUMBER(7,2);
    ANN_SALARY NUMBER(15,2);
BEGIN
    ANN_SALARY := SAL * 12;
    IF ANN_SALARY >= 20000 THEN
        BONUS := 2000;
    ELSIF ANN_SALARY <= 19999 AND ANN_SALARY >=10000 THEN
        BONUS := 1000;
    ELSE
        BONUS := 500;
    END IF;
    DBMS_OUTPUT.PUT_LINE ('The Bonus is $ ' ||
        TO_CHAR(BONUS));
END;
/
SET SERVEROUTPUT OFF
```

9. a. Execute the script lab_ap_09_a.sql to create a temporary table called emp. Write a PL/SQL block to store an employee number, the new department number, and the percentage increase in the salary in iSQL*Plus substitution variables.

```
SET SERVEROUTPUT ON
DEFINE P_EMPNO = 100
DEFINE P_NEW_DEPTNO = 10
DEFINE P_PER_INCREASE = 2
```

- b. Update the department ID of the employee with the new department number, and update the salary with the new salary. Use the emp table for the updates. After the update is complete, display the message, "Update complete" in the window. If no matching records are found, display the message, "No Data Found." Test the PL/SQL block for the following test cases.

EMPLOYEE_ID	NEW_DEPARTMENT_ID	% INCREASE	MESSAGE
100	20	2	Update Complete
10	30	5	No Data found
126	40	3	Update Complete

Additional Practices 9 and 10: Solutions

```
DECLARE
    EMPNO emp.EMPLOYEE_ID%TYPE := &P_EMPNO;
    NEW_DEPTNO emp.DEPARTMENT_ID%TYPE := &P_NEW_DEPTNO;
    PER_INCREASE NUMBER(7,2) := &P_PER_INCREASE;
BEGIN
    UPDATE emp
    SET department_id = NEW_DEPTNO,
        salary = salary + (salary * PER_INCREASE/100)
    WHERE employee_id = EMPNO;
    IF SQL%ROWCOUNT = 0 THEN
        DBMS_OUTPUT.PUT_LINE ('No Data Found');
    ELSE
        DBMS_OUTPUT.PUT_LINE ('Update Complete');
    END IF;
END;
/
SET SERVEROUTPUT OFF
```

10. Create a PL/SQL block to declare a cursor EMP_CUR to select the employee name, salary, and hire date from the employees table. Process each row from the cursor, and if the salary is greater than 15,000 and the hire date is greater than 01-FEB-1988, display the employee name, salary, and hire date in the window.

```
SET SERVEROUTPUT ON
DECLARE
    CURSOR EMP_CUR IS
        SELECT last_name,salary,hire_date FROM EMPLOYEES;
    ENAME VARCHAR2(25);
    SAL    NUMBER(7,2);
    HIREDATE DATE;
BEGIN
    OPEN EMP_CUR;
    FETCH EMP_CUR INTO ENAME,SAL,HIREDATE;
    WHILE EMP_CUR%FOUND
    LOOP
        IF SAL > 15000 AND HIREDATE >= TO_DATE('01-FEB-1988','DD-MON-YYYY') THEN
            DBMS_OUTPUT.PUT_LINE (ENAME || ' earns ' ||
                TO_CHAR(SAL) || ' '
                and joined the organization on ' ||
                TO_DATE(HIREDATE,'DD-Mon-YYYY')));
        END IF;
    END LOOP;
END;
```

Additional Practices 10 and 11: Solutions

```
FETCH EMP_CUR INTO ENAME,SAL,HIREDATE;
END LOOP;
CLOSE EMP_CUR;
END;
/
SET SERVEROUTPUT OFF
```

11. Create a PL/SQL block to retrieve the last name and department ID of each employee from the employees table for those employees whose EMPLOYEE_ID is less than 114. From the values retrieved from the employees table, populate two PL/SQL tables, one to store the records of the employee last names and the other to store the records of their department IDs. Using a loop, retrieve the employee name information and the salary information from the PL/SQL tables and display it in the window, using DBMS_OUTPUT.PUT_LINE. Display these details for the first 15 employees in the PL/SQL tables.

```
SET SERVEROUTPUT ON
DECLARE
    TYPE Table_Ename is table of employees.last_name%TYPE
    INDEX BY BINARY_INTEGER;
    TYPE Table_dept is table of employees.department_id%TYPE
    INDEX BY BINARY_INTEGER;
    Tename Table_Ename;
    Tdept Table_dept;
    i BINARY_INTEGER :=0;
    CURSOR Namedept IS SELECT last_name,department_id from
    employees WHERE employee_id < 115;
    TRACK NUMBER := 15;
BEGIN
    FOR emprec in Namedept
    LOOP
        i := i +1;
        Tename(i) := emprec.last_name;
        Tdept(i) := emprec.department_id;
    END LOOP;
```

Additional Practices 11 and 12: Solutions

```
FOR i IN 1..TRACK
  LOOP
    DBMS_OUTPUT.PUT_LINE ('Employee Name: ' ||
      Tename(i) || ' Department_id: ' || Tdept(i));
  END LOOP;
END;
/
SET SERVEROUTPUT OFF
```

12. a. Create a PL/SQL block that declares a cursor called DATE_CUR. Pass a parameter of DATE data type to the cursor and print the details of all the employees who have joined after that date.

```
SET SERVEROUTPUT ON
```

```
DEFINE P_HIREDATE = 08-MAR-00
```

- b. Test the PL/SQL block for the following hire dates: 08-MAR-00, 25-JUN-97, 28-SEP-98, 07-FEB-99.

```
DECLARE
```

```
CURSOR DATE_CURSOR(JOIN_DATE DATE) IS
  SELECT employee_id,last_name,hire_date FROM employees
  WHERE HIRE_DATE >JOIN_DATE ;
EMPNO    employees.employee_id%TYPE;
ENAME    employees.last_name%TYPE;
HIREDATE  employees.hire_date%TYPE;
HDATE    employees.hire_date%TYPE := '&P_HIREDATE';
```

```
BEGIN
```

```
OPEN DATE_CURSOR(HDATE);
```

```
LOOP
```

```
  FETCH DATE_CURSOR INTO EMPNO,ENAME,HIREDATE;
```

```
  EXIT WHEN DATE_CURSOR%NOTFOUND;
```

```
  DBMS_OUTPUT.PUT_LINE (EMPNO || ' ' || ENAME || ' ' ||
    HIREDATE);
```

```
  END LOOP;
```

```
END;
```

```
/
```

```
SET SERVEROUTPUT OFF;
```

Additional Practice 13: Solutions

13. Execute the script lab_ap_09_a.sql to re-create the emp table. Create a PL/SQL block to promote clerks who earn more than 3,000 to SR CLERK and increase their salaries by 10%. Use the emp table for this practice. Verify the results by querying on the emp table.

Hint: Use a cursor with FOR UPDATE and CURRENT OF syntax.

```
DECLARE
  CURSOR Senior_Clerk IS
    SELECT employee_id, job_id FROM emp
    WHERE job_id = 'ST_CLERK' AND salary > 3000
    FOR UPDATE OF job_id;
BEGIN
  FOR Emrec IN Senior_Clerk
  LOOP
    UPDATE emp
    SET job_id = 'SR_CLERK',
        salary = 1.1 * salary
    WHERE CURRENT OF Senior_Clerk;
  END LOOP;
  COMMIT;
END;
/
SELECT * FROM emp;
```

Additional Practice 14: Solutions

14. a. For the following exercise, you will require a table to store the results. You can create the `analysis` table yourself or run the `lab_ap_14_a.sql` script that creates the table for you. Create a table called `analysis` with the following three columns:

Column Name	ENAME	YEARS	SAL
Key Type			
Nulls/Unique			
FK Table			
FK Column			
Data Type	VARCHAR2	Number	Number
Length	20	2	8,2

```
CREATE TABLE analysis
(ename Varchar2(20),
years Number(2),
sal Number(8,2));
```

- b. Create a PL/SQL block to populate the `analysis` table with the information from the `employees` table. Use an `iSQL*Plus` substitution variable to store an employee's last name.

```
SET SERVEROUTPUT ON
DEFINE P_ENAME = Austin
```

- c. Query the `employees` table to find if the number of years that the employee has been with the organization is greater than five, and if the salary is less than 3,500, raise an exception. Handle the exception with an appropriate exception handler that inserts the following values into the `analysis` table: employee last name, number of years of service, and the current salary. Otherwise display `Not due for a raise` in the window. Verify the results by querying the `analysis` table. Use the following test cases to test the PL/SQL block.

LAST_NAME	MESSAGE
Austin	Not due for a raise
Nayer	Not due for a raise
Fripp	Not due for a raise
Khoo	Due for a raise

Additional Practice 14: Solutions (continued)

```
DECLARE
    DUE_FOR_RAISE EXCEPTION;
    HIREDATE EMPLOYEES.HIRE_DATE%TYPE;
    ENAME EMPLOYEES.LAST_NAME%TYPE := INITCAP( '& P_ENAME' );
    SAL EMPLOYEES.SALARY%TYPE;
    YEARS NUMBER(2);
BEGIN
    SELECT LAST_NAME, SALARY, HIRE_DATE
    INTO ENAME, SAL, HIREDATE
    FROM employees WHERE last_name = ENAME;
    YEARS := MONTHS_BETWEEN(SYSDATE, HIREDATE) / 12;
    IF SAL < 3500 AND YEARS > 5 THEN
        RAISE DUE_FOR_RAISE;
    ELSE
        DBMS_OUTPUT.PUT_LINE ('Not due for a raise');
    END IF;
EXCEPTION
    WHEN DUE_FOR_RAISE THEN
        INSERT INTO ANALYSIS (ENAME, YEARS, SAL)
        VALUES (ENAME, YEARS, SAL);
END;
/
```