Oracle Database: PL/SQL Fundamentals

Additional Practices

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Chapter 1

Practices for Lesson 1

Practices Overview

There are no practices for this lesson.

Additional Practices and Solutions for Lesson 2

Chapter 2

Additional Practices for Lesson 2

Overview

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

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`.

Practice 2: Evaluating Declarations

Overview

These paper-based exercises are used for extra practice in declaring variables and writing executable statements.

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

```
1. DECLARE
   name,dept     VARCHAR2(14);
2. DECLARE
   test          NUMBER(5);
3. DECLARE
   MAXSALARY     NUMBER(7,2) = 5000;
4. DECLARE
   JOINDATE      BOOLEAN := SYSDATE;
```

Solution 2: Evaluating Declarations

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

1.
```
DECLARE
name,dept     VARCHAR2(14);
```
This is illegal because only one identifier per declaration is allowed.

2.
```
DECLARE
test          NUMBER(5);
```
This is legal.

3.
```
DECLARE
MAXSALARY     NUMBER(7,2) = 5000;
```
This is illegal because the assignment operator is wrong. It should be :=.

4.
```
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.

Additional Practices and Solutions for Lesson 3

Chapter 3

Practice 3: Evaluating Expressions

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

```
1. email := firstname || to_char(empno);

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

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

4. test := FALSE;

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

6. var := sysdate;
```

Solution 3: Evaluating Expressions

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

1. `email := firstname || to_char(empno);`

   Character string

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

   Date

3. `sal := (1000*12) +  500`

   Number

4. `test := FALSE;`

   Boolean

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

   Boolean

6. `var := sysdate;`

   Date

Additional Practices and Solutions for Lesson 4

Chapter 4

Practice 4: Evaluating Executable Statements

In this paper-based exercise, you evaluate the PL/SQL block, and then answer the questions that follow by determining the data type and value of each variable, according to the rules of scoping.

```
DECLARE
      v_custid    NUMBER(4) := 1600;
      v_custname VARCHAR2(300) := 'Women Sports Club';
      v_ new_custid   NUMBER(3) := 500;
BEGIN
DECLARE
      v_custid     NUMBER(4) := 0;
      v_custname  VARCHAR2(300) := 'Shape up Sports Club';
      v_new_custid  NUMBER(3) := 300;
      v_new_custname  VARCHAR2(300) := 'Jansports Club';
BEGIN
      v_custid := v_new_custid;
      v_custname := v_custname || ' ' ||  v_new_custname;
1 ---------->
END;
      v_custid := (v_custid *12) / 10;
2 ---------->
END;
```

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

1. `v_custid` at position 1:

2. `v_custname` at position 1:

3. `v_new_custid` at position 1:

4. `v_new_custname` at position 1:

5. `v_custid` at position 2:

6. `v_custname` at position 2:

Solution 4: Evaluating Executable Statements

Evaluate the following PL/SQL block. Then, answer the questions that follow by determining the data type and value of each of the following variables, according to the rules of scoping.

```
DECLARE
      v_custid    NUMBER(4) := 1600;
      v_custname VARCHAR2(300) := 'Women Sports Club';
      v_ new_custid   NUMBER(3) := 500;
BEGIN
DECLARE
      v_custid     NUMBER(4) := 0;
      v_custname  VARCHAR2(300) := 'Shape up Sports Club';
      v_new_custid  NUMBER(3) := 300;
      v_new_custname  VARCHAR2(300) := 'Jansports Club';
BEGIN
      v_custid := v_new_custid;
      v_custname := v_custname || ' ' ||  v_new_custname;
1 ---------->
END;
      v_custid := (v_custid *12) / 10;
2 ---------->
END;
```

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

1. `v_custid` at position 1:

   300, and the data type is `NUMBER`.

2. `v_custname` at position 1:

   Shape up Sports Club Jansports Club, and the data type is `VARCHAR2`.

3. `v_new_custid` at position 1:

   300, and the data type is `NUMBER` (or `INTEGER`).

4. `v_new_custname` at position 1:

   Jansports Club, and the data type is `VARCHAR2`.

5. `v_custid` at position 2:

   1920, and the data type is `NUMBER`.

6. `v_custname` at position 2:

   Women Sports Club, and the data type is `VARCHAR2`.

Additional Practices and Solutions for Lesson 5

Chapter 5

Practice 5-1: Interacting with the Oracle Server

For this exercise, a temporary table is required to store the results.

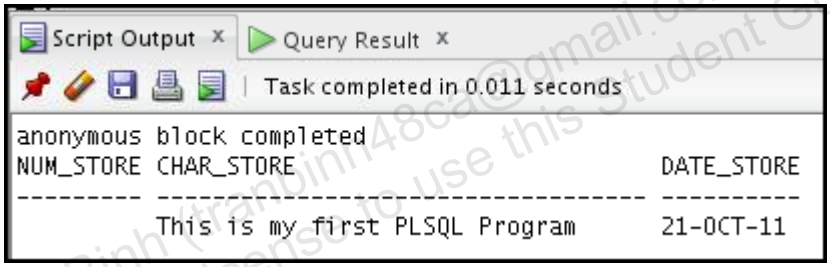
1. Run the `lab_ap_05.sql` script that creates the table described here:

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	

2. Write a PL/SQL block that performs the following:
   a. Declares two variables and assigns the following values to these variables:

Variable	Data type	Contents
V_MESSAGE	VARCHAR2(35)	This is my first PL/SQL program
V_ DATE_WRITTEN	DATE	Current date

   b. Stores the values from these variables in the appropriate `TEMP` table columns
3. Verify your results by querying the `TEMP` table. The output results should appear as follows:



Solution 5-1: Interacting with the Oracle Server

For this exercise, a temporary table is required to store the results.

1. Run the `lab_ap_05.sql` script that creates the table described here:

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	

2. Write a PL/SQL block that performs the following:
   a. Declares two variables and assigns the following values to these variables:

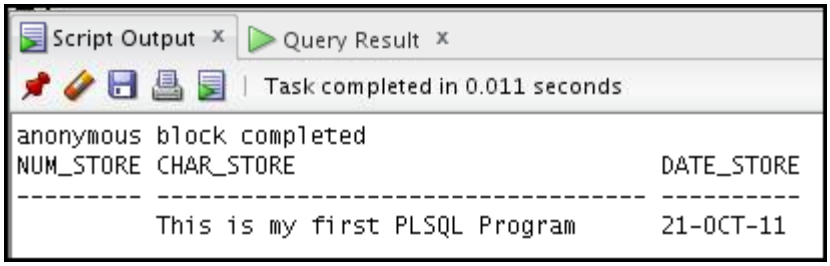
Variable	Data type	Contents
V_MESSAGE	VARCHAR2(35)	This is my first PL/SQL program
V_ DATE_WRITTEN	DATE	Current date

   b. Stores the values from these variables in the appropriate `TEMP` table columns

```
DECLARE
  V_MESSAGE VARCHAR2(35);
  V_DATE_WRITTEN DATE;
BEGIN
  V_MESSAGE := 'This is my first PLSQL Program';
  V_DATE_WRITTEN := SYSDATE;
  INSERT INTO temp(CHAR_STORE,DATE_STORE)
    VALUES (V_MESSAGE,V_DATE_WRITTEN);
END;
/
```

3. Verify your results by querying the `TEMP` table. The output results should look similar to the following:

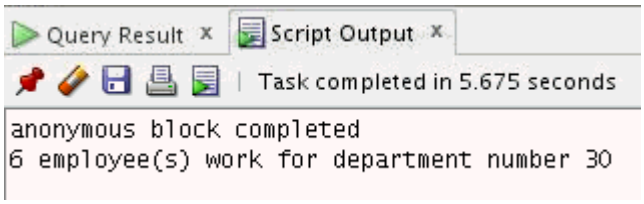
```
SELECT * FROM TEMP;
```



Practice 5-2: Interacting with the Oracle Server

In this exercise, you use data from the `employees` table.

1. Write a PL/SQL block to determine how many employees work for a specified department. The PL/SQL block should:
   - Use a substitution variable to store a department number
   - Print the number of people working in the specified department
2. When the block is run, a substitution variable window appears. Enter a valid department number and click OK. The output results should look similar to the following:



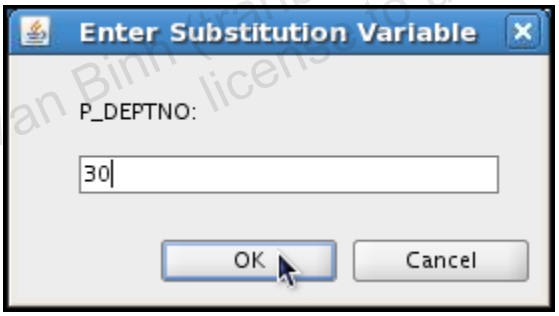
Solution 5-2: Interacting with the Oracle Server

In this exercise, you use data from the `employees` table.

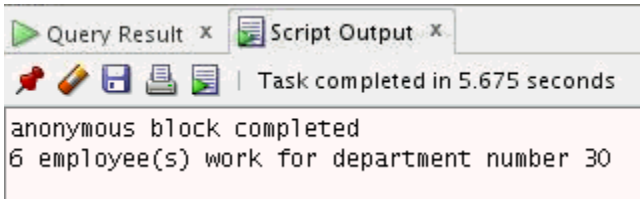
1. Write a PL/SQL block to determine how many employees work for a specified department. The PL/SQL block should:
   - Use a substitution variable to store a department number
   - Print the number of people working in the specified department

```
SET SERVEROUTPUT ON;
DECLARE
   V_HOWMANY NUMBER(3);
   V_DEPTNO DEPARTMENTS.department_id%TYPE := &P_DEPTNO;
BEGIN
   SELECT COUNT(*) INTO V_HOWMANY FROM employees
   WHERE department_id = V_DEPTNO;
   DBMS_OUTPUT.PUT_LINE (V_HOWMANY  || ' employee(s)
     work for department number ' ||V_DEPTNO);
END;
/
```

2. When the block is run, a substitution variable window appears. Enter a valid department number and click OK.



The output results should look similar to the following:



Additional Practices and Solutions for Lesson 6

Chapter 6

Practice 6-1: Writing Control Structures

In these practices, you use control structures to direct the logic of program flow.

1. Write a PL/SQL block to accept a year input and check whether it is a leap year.
   Hint: The year should be exactly divisible by 4 but not divisible by 100, or it should be divisible by 400.
2. Test your solution by using the following table. For example, if the year entered is 1990, the output should be “1990 is not a leap year.”

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

Solution 6-1: Writing Control Structure

1. Write a PL/SQL block to accept a year input and check whether it is a leap year.
   Hint: The year should be exactly divisible by 4 but not divisible by 100, or it should be divisible by 400.

```
SET SERVEROUTPUT ON;
DECLARE
   v_YEAR NUMBER(4) := &P_YEAR;
   v_REMAINDER1 NUMBER(5,2);
   v_REMAINDER2 NUMBER(5,2);
   v_REMAINDER3 NUMBER(5,2);
BEGIN
   v_REMAINDER1 := MOD(v_YEAR,4);
   v_REMAINDER2 := MOD(v_YEAR,100);
   v_REMAINDER3 := MOD(v_YEAR,400);
   IF ((v_REMAINDER1 = 0 AND v_REMAINDER2 <> 0 ) OR
       v_REMAINDER3 = 0) THEN
      DBMS_OUTPUT.PUT_LINE(v_YEAR || ' is a leap year');
   ELSE
      DBMS_OUTPUT.PUT_LINE(v_YEAR || ' is not a leap
      year');
   END IF;
END;
/
```

2. Test your solution by using the following table. For example, if the year entered is 1990, the output should be “1990 is not a leap year.”

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

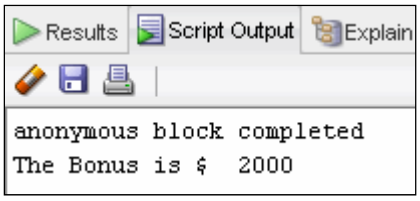
Practice 6-2: Writing Control Structures

1. Write a PL/SQL block to store the monthly salary of an employee in a substitution variable. The PL/SQL block should:

   - Calculate the annual salary as salary * 12
   - Calculate the bonus as indicated in the following table:

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

   - Display the amount of the bonus in the Script Output window in the following format:



2. Test the PL/SQL for the following test cases:

Monthly Salary	Bonus
3000	2000
1200	1000
800	500

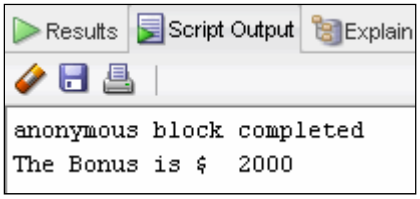
Solution 6-2: Writing Control Structures

1. Write a PL/SQL block to store the monthly salary of an employee in a substitution variable. The PL/SQL block should:

   - Calculate the annual salary as salary * 12
   - Calculate the bonus as indicated in the following table:

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

   - Display the amount of the bonus in the Script Output window in the following format:




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

2. Test the PL/SQL for the following test cases:

Monthly Salary	Bonus
3000	2000
1200	1000
800	500

Additional Practices and Solutions for Lesson 7

Chapter 7

Additional Practices for Lesson 7 and 8

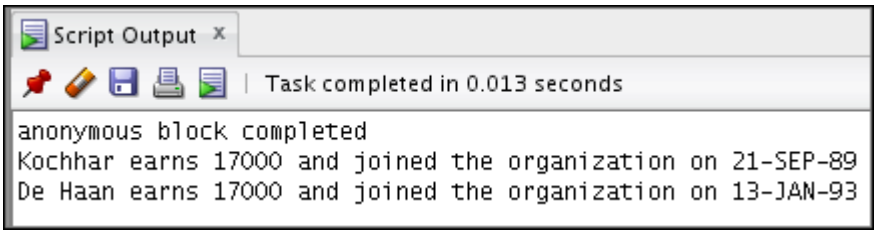
Overview

In the following exercises, you practice using associative arrays (this topic is covered in Lesson 7) and explicit cursors (this topic is covered in Lesson 8). In the first exercise, you define and use an explicit cursor to fetch data. In the second exercise, you combine the use of associative arrays with an explicit cursor to output data that meets a certain criteria.

Practice 7/8-1: Fetching Data with an Explicit Cursor

In this practice, you create a PL/SQL block to perform the following:

1. Declare a cursor named EMP_CUR to select the employee's last name, salary, and hire date from the EMPLOYEES table
2. Process each row from the cursor, and if the salary is greater than 15,000 and the hire date is later than 01-FEB-1988, display the employee name, salary, and hire date in the format shown in the following sample output:



Solution 7/8-1: Fetching Data with an Explicit Cursor

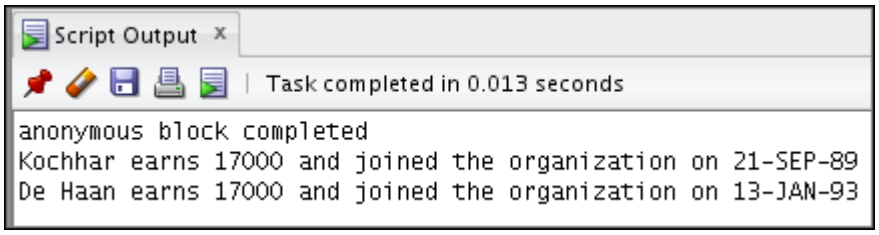
In this practice, you create a PL/SQL block to perform the following:

1. Declare a cursor named EMP_CUR to select the employee's last name, salary, and hire date from the EMPLOYEES table

```
SET SERVEROUTPUT ON;
DECLARE
  CURSOR C_EMP_CUR IS
    SELECT  last_name,salary,hire_date FROM EMPLOYEES;
  V_ENAME VARCHAR2(25);
  v_SAL   NUMBER(7,2);
  V_HIREDATE DATE;
```

2. Process each row from the cursor, and if the salary is greater than 15,000 and the hire date is later than 01-FEB-1988, display the employee name, salary, and hire date in the format shown in the following sample output:

```
BEGIN
  OPEN C_EMP_CUR;
  FETCH C_EMP_CUR INTO V_ENAME,V_SAL,V_HIREDATE;
  WHILE C_EMP_CUR%FOUND
  LOOP
    IF V_SAL > 15000 AND V_HIREDATE >=
       TO_DATE('01-FEB-1988','DD-MON-YYYY') THEN
         DBMS_OUTPUT.PUT_LINE (V_ENAME || ' earns '
         || TO_CHAR(V_SAL)||' and joined the organization on '
         || TO_DATE(V_HIREDATE,'DD-Mon-YYYY'));
    END IF;
    FETCH C_EMP_CUR INTO V_ENAME,V_SAL,V_HIREDATE;
  END LOOP;
  CLOSE C_EMP_CUR;
END;
/
```

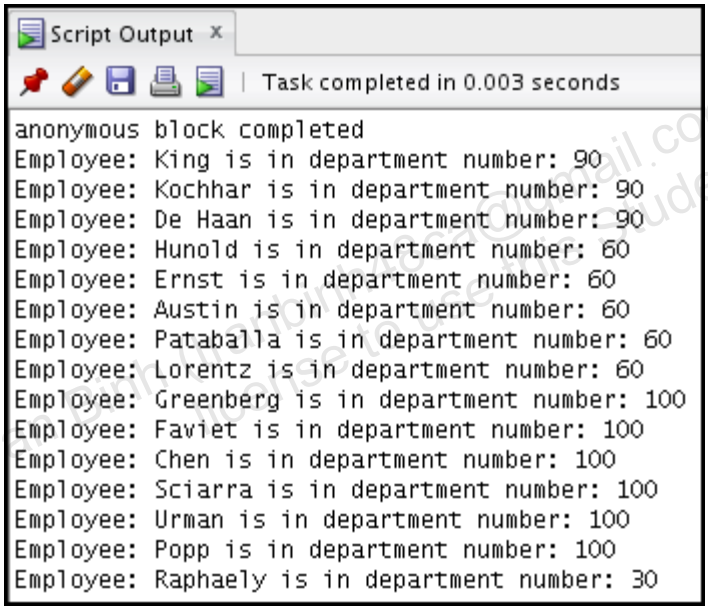


Practice 7/8-2: Using Associative Arrays and Explicit Cursors

In this practice, you create a PL/SQL block to retrieve and output the last name and department ID of each employee from the EMPLOYEES table for those employees whose EMPLOYEE_ID is less than 115.

In the PL/SQL block, use a cursor `FOR` loop strategy instead of the OPEN / FETCH / CLOSE cursor methods used in the previous practice.

1. In the declarative section:
   - Create two associative arrays. The unique key column for both arrays should be of the BINARY INTEGER data type. One array holds the employee's last name and the other holds the department ID.
   - Declare a cursor that selects the last name and department ID for employees whose ID is less than 115
   - Declare the appropriate counter variable to be used in the executable section
2. In the executable section, use a cursor `FOR` loop (covered in Lesson 8) to access the cursor values, assign them to the appropriate associative arrays, and output those values from the arrays. The correct output should return 15 rows, in the following format:



Solution 7/8-2: Using Associative Arrays and Explicit Cursors

In this practice, you create a PL/SQL block to retrieve and output the last name and department ID of each employee from the `EMPLOYEES` table for those employees whose `EMPLOYEE_ID` is less than 115.

In the PL/SQL block, use a cursor `FOR` loop strategy instead of the `OPEN` / `FETCH` / `CLOSE` cursor methods used in the previous practice.

1. In the declarative section:
   - Create two associative arrays. The unique key column for both arrays should be of the `BINARY INTEGER` data type. One array holds the employee's last name and the other holds the department ID.
   - Declare a counter variable to be used in the executable section
   - Declare a cursor that selects the last name and department ID for employees whose ID is less than 115

```
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;
```

2. In the executable section, use a cursor `FOR` loop (covered in Lesson 8) to access the cursor values, assign them to the appropriate associative arrays, and output those values from the arrays.

```
BEGIN
  FOR emprec in Namedept
  LOOP
    i         := i +1;
    Tename(i) := emprec.last_name;
     Tdept(i)  := emprec.department_id;
    DBMS_OUTPUT.PUT_LINE ('Employee: ' || Tename(i) ||
' is in department number: ' || Tdept(i));
  END LOOP;
END;
/
```

The correct output should return 15 rows, similar to the following:

```
anonymous block completed
Employee: King is in department number: 90
Employee: Kochhar is in department number: 90
Employee: De Haan is in department number: 90
Employee: Hunold is in department number: 60
Employee: Ernst is in department number: 60
Employee: Austin is in department number: 60
Employee: Pataballa is in department number: 60
Employee: Lorentz is in department number: 60
Employee: Greenberg is in department number: 100
Employee: Faviet is in department number: 100
Employee: Chen is in department number: 100
Employee: Sciarra is in department number: 100
Employee: Urman is in department number: 100
Employee: Popp is in department number: 100
Employee: Raphaely is in department number: 30
```

Additional Practices and Solutions for Lesson 8

Chapter 8

Practices for Lesson 8

Practices Overview

Practices of this lesson are included with lesson 7.

Additional Practices and Solutions for Lesson 9

Chapter 9

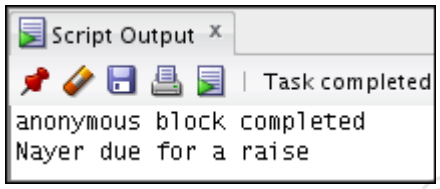
Practice 9-1: Handling Exceptions

For this exercise, you must first create a table to store some results. Run the `lab_ap_09.sql` script that creates the table for you. The script looks like the following:

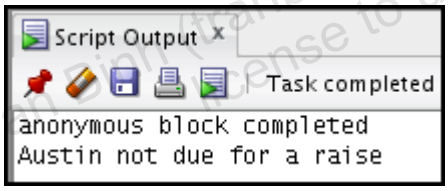
```
CREATE TABLE analysis
        (ename Varchar2(20), years Number(2), sal Number(8,2)
      );
```

In this practice, you write a PL/SQL block that handles an exception, as follows:

1. Declare variables for the employee last name, salary, and hire date. Use a substitution variable for the employee last name. Then, query the `employees` table for the `last_name`, `salary`, and `hire_date` of the specified employee.
2. If the employee has been with the organization for more than five years, and if that employee's salary is less than 3,500, raise an exception. In the exception handler, perform the following:
   - Output the following information: employee last name and the message "due for a raise," similar to the following:

   - Insert the last name, years of service, and salary into the `analysis` table.
3. If there is no exception, output the employee last name and the message "not due for a raise," similar to the following:

4. 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	Due for a raise
Fripp	Not due for a raise
Khoo	Due for a raise

Solution 9-1: Handling Exceptions

For this exercise, you must first create a table to store some results. Run the `lab_ap_09.sql` script that creates the table for you. The script looks similar to the following:

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

In this practice, you write a PL/SQL block that handles an exception, as follows:

1. Declare variables for the employee last name, salary, and hire date. Use a substitution variable for the employee last name. Then, query the `employees` table for the `last_name`, `salary`, and `hire_date` of the specified employee.
2. If the employee has been with the organization for more than five years, and if that employee's salary is less than 3,500, raise an exception. In the exception handler, perform the following:
   - Output the following information: employee last name and the message "due for a raise."
   - Insert the employee name, years of service, and salary into the `analysis` table.
3. If there is no exception, output the employee last name and the message "not due for a raise."

```
SET SERVEROUTPUT ON;
DECLARE
  E_DUE_FOR_RAISE EXCEPTION;
  V_HIREDATE EMPLOYEES.HIRE_DATE%TYPE;
  V_ENAME EMPLOYEES.LAST_NAME%TYPE :=  INITCAP( '& B_ENAME');
  V_SAL EMPLOYEES.SALARY%TYPE;
  V_YEARS NUMBER(2);
BEGIN
  SELECT LAST_NAME,SALARY,HIRE_DATE
  INTO V_ENAME,V_SAL,V_HIREDATE
  FROM employees WHERE last_name = V_ENAME;
  V_YEARS := MONTHS_BETWEEN(SYSDATE,V_HIREDATE)/12;
  IF V_SAL < 3500 AND V_YEARS > 5  THEN
  RAISE E_DUE_FOR_RAISE;
  ELSE
  DBMS_OUTPUT.PUT_LINE (V_NAME|| ' not due for a raise');
  END IF;
EXCEPTION
  WHEN E_DUE_FOR_RAISE THEN
    BEGIN
  DBMS_OUTPUT.PUT_LINE (V_NAME || ' due for a raise');
     INSERT INTO ANALYSIS(ENAME,YEARS,SAL)
       VALUES (V_ENAME,V_YEARS,V_SAL);
   END;
END;
/
```

4. 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	Due for a raise
Fripp	Not due for a raise
Khoo	Due for a raise

```
SELECT * FROM analysis;
```

	ENAME	YEARS	SAL
1	Nayer	14	3200
2	Khoo	16	3100