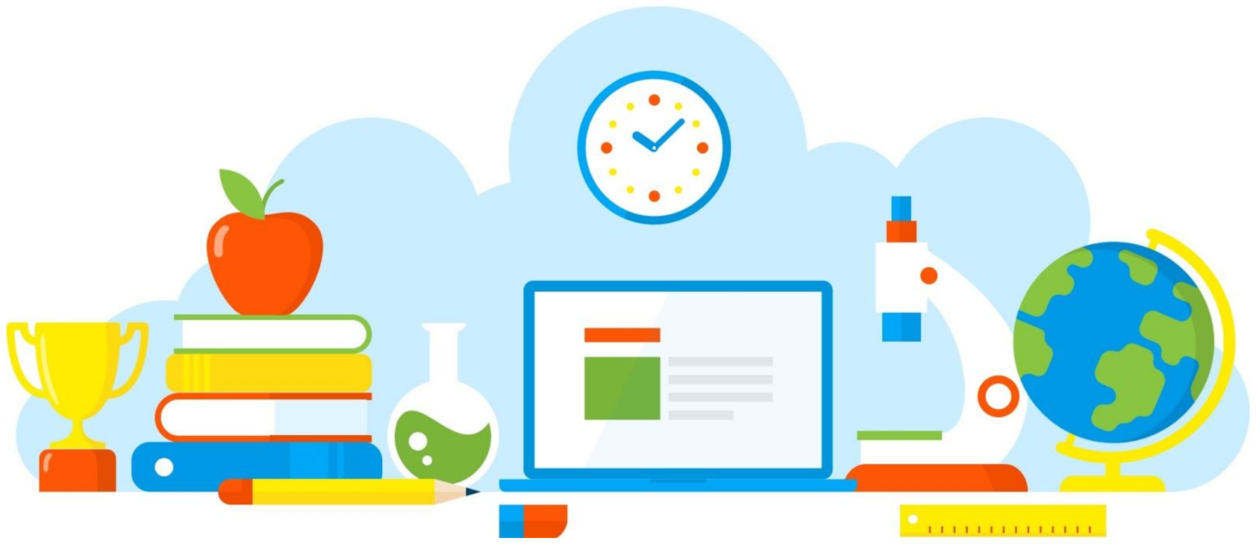


DBMS- LAB

Database Management System Lab Manual

DEPT OF ISE

PL / SQL

Ramaiah Institute Of Technology
Bengaluru

Introduction

PL/SQL is a combination of SQL along with the procedural features of programming languages. It was developed by Oracle Corporation in the early 90's to enhance the capabilities of SQL. PL/SQL is one of three key programming languages embedded in the Oracle Database, along with SQL itself and Java.

Syllabus

Consider the following database for a **BANK** system:

BRANCH (Code, Name, Assets)
CUSTOMER (SSN, Name, Place)
ACCOUNT (AccNo, SSN, Code, Balance)

Consider the following database for **EMPLOYEE** system:

EMPLOYEE (SSN,Name,Salary,DeptNo)

i) Create the above tables by stating the primary and foreign keys
ii) Insert the following tuples to the tables (As in page no. = 2)

Problem Statements :

1. Write a PL/SQL program to display the contents of the above tables and then update the balance of a few accounts.

2. Write a program that gives all employees in department 10 a 15% pay increase. Display a message displaying how many employees were awarded the increase.

3. Write a PL/SQL program to check whether a given number is prime or not

4. Using cursors demonstrate the process of copying the contents of one table to a new table

5. Write a PL/SQL program to print the first 8 fibonacci numbers

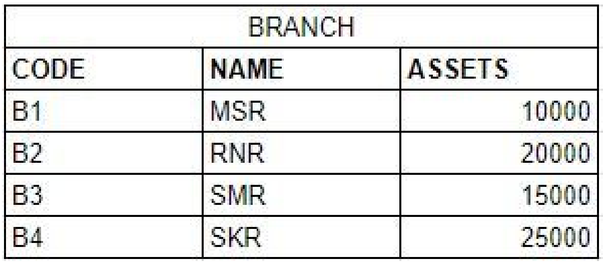
6. Write a PL/SQL procedure to find the factorial of a given number and a program to call the same

7. Write a PL/SQL program to check whether a given number is palindrome or not

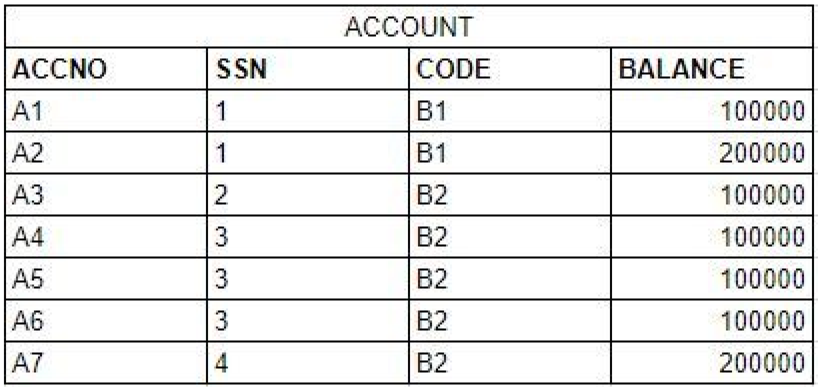
8. Consider the following EMPLOYEE relation schema.Write a trigger to raise an error if the table is modified on a specific day (Eg., Saturday or Sunday) of the week

Database Schema with data

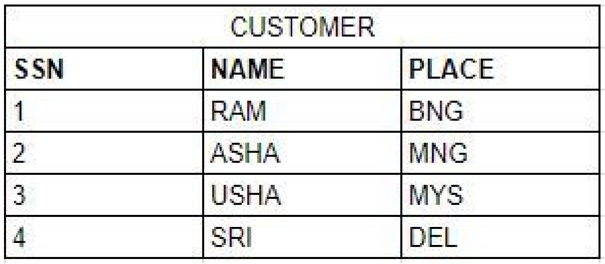
BANK



BRANCH		
CODE	**NAME**	**ASSETS**
B1	MSR	10000
B2	RNR	20000
B3	SMR	15000
B4	SKR	25000

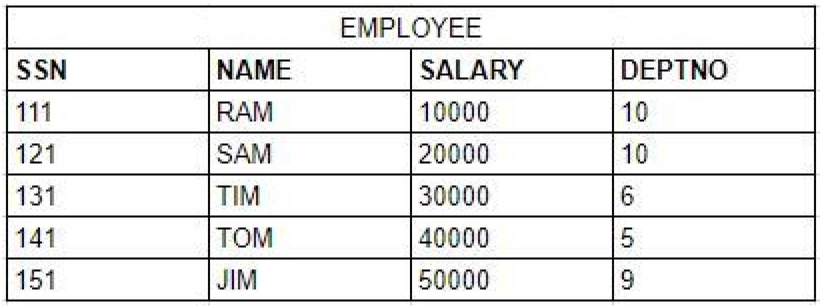


ACCOUNT			
ACCNO	**SSN**	**CODE**	**BALANCE**
A1	1	B1	100000
A2	1	B1	200000
A3	2	B2	100000
A4	3	B2	100000
A5	3	B2	100000
A6	3	B2	100000
A7	4	B2	200000



CUSTOMER		
SSN	**NAME**	**PLACE**
1	RAM	BNG
2	ASHA	MNG
3	USHA	MYS
4	SRI	DEL

EMPLOYEE



EMPLOYEE			
SSN	**NAME**	**SALARY**	**DEPTNO**
111	RAM	10000	10
121	SAM	20000	10
131	TIM	30000	6
141	TOM	40000	5
151	JIM	50000	9

SQL Queries to build the schema and insert data

```
CREATE TABLE BRANCH_DETAIL (
     CODE VARCHAR(2) PRIMARY KEY,
     NAME VARCHAR(3),
     ASSETS NUMBER(6)  );
CREATE TABLE CUSTOMER_DETAIL(
    SSN NUMBER(1) PRIMARY KEY,
    NAME VARCHAR(20) ,
    PLACE VARCHAR(3)  );
CREATE TABLE ACCOUNT_DETAIL(
    ACCNO VARCHAR(2) PRIMARY KEY,
    SSN   NUMBER(1) REFERENCES CUSTOMER_DETAIL(SSN) ON DELETE CASCADE,
    CODE  VARCHAR(2) REFERENCES BRANCH_DETAIL(CODE) ON DELETE CASCADE,
    BALANCE NUMBER(7) );
CREATE TABLE EMPLOYEE_DETAIL (
     SSN NUMBER(3) PRIMARY KEY,
     NAME VARCHAR(20),
     SALARY NUMBER(6),
     DEPTNO NUMBER(3)  );


INSERT INTO BRANCH_DETAIL VALUES ('&CODE', ‘&NAME’, &ASSETS);
INSERT INTO CUSTOMER_DETAIL VALUES (&SSN,'&NAME','&PLACE');
INSERT INTO ACCOUNT_DETAIL VALUES ('&ACCNO',&SSN,'&CODE’,&BALANCE);
INSERT INTO EMPLOYEE_DETAIL VALUES (&SSN,'&NAME',&SALARY,&DEPTNO);
```

PL/SQL PROGRAMS :

1. Write a PL/SQL program to display the contents of the above tables and then update the balance of a few accounts.

PL/SQL PROGRAM :

```
SET SERVEROUTPUT ON

BEGIN

 FOR rec IN (SELECT * FROM BRANCH_DETAIL)

  LOOP

    dbms_output.put_line('CODE : ' || rec.code || ' NAME : '|| rec.name ||
' ASSETS : '|| rec.assets);

  END LOOP;

 FOR rec IN (SELECT * FROM CUSTOMER_DETAIL)

  LOOP

    dbms_output.put_line('SSN : ' || rec.ssn || ' NAME : '|| rec.name ||
' PLACE : '|| rec.place);

  END LOOP;

 FOR rec IN (SELECT * FROM ACCOUNT_DETAIL)

  LOOP

    dbms_output.put_line('ACCNo : ' || rec.accno || ' SSN : '|| rec.ssn
|| ' CODE : '|| rec.code || ' BALANCE : '|| rec.balance);

  END LOOP;

UPDATE ACCOUNT_DETAIL

SET BALANCE=120000

WHERE SSN=1;

dbms_output.put_line(‘SOME ROWS ARE UPDATED’ );

END;

/
```

OUTPUT :

```
CODE : B1 NAME : MSR ASSETS : 10000
CODE : B2 NAME : RNR ASSETS : 20000
CODE : B3 NAME : SMR ASSETS : 15000
CODE : B4 NAME : SKR ASSETS : 25000

SSN : 1 NAME : Ram PLACE : BNG
SSN : 2 NAME : Asha PLACE : MNG
SSN : 3 NAME : Usha PLACE : MYS
SSN : 4 NAME : Sri PLACE : DEL

ACCNo : A1 SSN : 1 CODE : B1 BALANCE : 120000
ACCNo : A2 SSN : 1 CODE : B1 BALANCE : 120000
ACCNo : A3 SSN : 2 CODE : B2 BALANCE : 100000
ACCNo : A4 SSN : 3 CODE : B2 BALANCE : 100000
ACCNo : A5 SSN : 3 CODE : B2 BALANCE : 100000
ACCNo : A6 SSN : 3 CODE : B2 BALANCE : 100000
ACCNo : A7 SSN : 4 CODE : B2 BALANCE : 200000

SOME ROWS ARE UPDATED
```

SYNTAX :

FOR LOOP SYNTAX

```
FOR EACH_REC IN  (SQL QUERY) LOOP
        Sequence_of_statements ;
END LOOP;
```

- EACH_REC IS A ROW RETURNED BY THE SQL QUERY. IT IS A CURSOR

2. Write a program that gives all employees in department 10 a 15% pay increase. Display a message displaying how many employees were awarded the increase.

PL/SQL :

```
SET SERVEROUTPUT ON

BEGIN

UPDATE  EMPLOYEE_DETAIL

SET SALARY = CASE

            WHEN  DEPTNO = 10  THEN  salary+(salary * 0.15)

            ELSE  salary     -- not strictly necessary. just to make sure.

            END

WHERE DEPTNO IN (10);

dbms_output.put_line(TO_Char(SQL%ROWCOUNT)||' rows affected.') ;

END ;

/
```

OUTPUT :

2 rows affected.

SYNTAX :

CASE STATEMENT :

```
CASE selector
    WHEN 'value1' THEN S1;
    WHEN 'value2' THEN S2;
    ELSE Sn;  -- default case
END;
```

%ROWCOUNT

- It is an IMPLICIT CURSOR which returns the number of rows affected by an INSERT, UPDATE, or DELETE statement, or returned by a SELECT INTO statement.

3. Write a PL/SQL program to check whether a given number is prime or not

PL/SQL :

```
SET SERVEROUTPUT ON
DECLARE
    n number;
    i number;
    flag number;
BEGIN
    i:=2;
    flag:=1;
    n:=12;
    FOR i in 2..n/2
     LOOP
      IF MOD(n,i)=0 THEN
            flag:=0;
            exit;
        END IF ;
    END LOOP ;
    IF flag=1 THEN
      dbms_output.put_line('PRIME');
    ELSE
      dbms_output.put_line('NOT PRIME');
    END IF;
END;
/
```

OUTPUT :

```
Enter Value for n : 12

NOT PRIME
```

SYNTAX :

IF CONDITION :

```
IF condition THEN   S1;
ELSE
         S2;
END IF;
```

MOD FUNCTION :

- The Oracle PL/SQL **MOD** (short for *modulus*) function returns the remainder when one argument is divided by the second argument.

4. Using cursors demonstrate the process of copying the contents of one table to a new table

PL/SQL PROGRAM :

```
SET SERVEROUTPUT ON

DECLARE

  c_id        employee_detail.ssn%type;

  c_name     employee_detail.Name%type;

  c_salary   employee_detail.salary%type;

  c_deptno   employee_detail.deptno%type;

  CURSOR c1

     IS  SELECT SSN ,NAME,SALARY,DEPTNO

         FROM  EMPLOYEE_DETAIL;

BEGIN

 OPEN c1;

 LOOP

   FETCH  c1  INTO c_id, c_name, c_salary,c_deptno;

   EXIT WHEN   c1%notfound;

INSERT INTO EMPLOYEE_DETAIL_COPYVALUES(c_id,c_name,c_salary,c_deptno);

END LOOP;

   CLOSE c1;

dbms_output.put_line(‘SUCCESSFULLY COPIED TO NEW TABLE');

END;

/
```

NOTE :

CREATE DUPLICATE TABLE BEFORE EXECUTING.

```
CREATE TABLE EMPLOYEE_DETAIL_COPY(
        SSN NUMBER(3) PRIMARY KEY,
        NAME VARCHAR(20),
        SALARY NUMBER(6),
        DEPTNO NUMBER(3) );
```

OUTPUT :

SUCCESSFULLY COPIED TO NEW TABLE

SYNTAX :

CURSOR :

- A **cursor** is a pointer to this context area. PL/SQL controls the context area through a cursor. A cursor holds the rows(one or more) returned by a SQL statement.

OPEN cursor ;

- Opening the cursor allocates the memory for the cursor and makes it ready for fetching the rows returned by the SQL statement into it.

FETCH cursor INTO [VARIABLES] ;

- Fetching the cursor involves accessing one row at a time.

CLOSE cursor;

- Closing the cursor means releasing the allocated memory.

5. Write a PL/SQL program to print the first 8 fibonacci numbers

PL/SQL PROGRAM :

```
SET SERVEROUTPUT ON

DECLARE

    first       number :=0;

    Second      number:=1;

    third       number;

    n           number:=8;

    i           number;

 BEGIN

    dbms_output.put_line('Fibonacci series is:');

    dbms_output.put_line(first);

    dbms_output.put_line(second);

    FOR i iN  2..n

   LOOP

        third := first + second ;

        first:= second ;

        second:= third;

        dbms_output.put_line(third);

    END LOOP;

END;

/
```

OUTPUT :

```
Fibonacci series is:
0
1
1
2
3
5
8
13
21
```

6. Write a PL/SQL procedure to find the factorial of a given number and a program to call the same

PL/SQL PROCEDURE :

```
SET SERVEROUTPUT ON

CREATE OR REPLACE PROCEDURE findFactorial

AS

 n number;

 fac number:=1;

 i number;

 BEGIN

   n:=&n;

   FOR i IN 1..n

    LOOP

        fac:= fac * i ;

    END LOOP;

    dbms_output.put_line('Factorial='||fac);

END;

/
```

EXECUTE findFactorial;   *-- EXECUTING THE PROCEDURE*

SHOW ERROR PROCEDURE findFactorial; *--debugging query to see the errors*

OUTPUT :

```
Enter value of n : 5

Factorial = 120
```

7. Write a PL/SQL program to check whether a given number is palindrome or not

PL/SQL PROGRAM :

```
SET SERVEROUTPUT ON
DECLARE
    str1 varchar(50):='&n';
    str2 varchar(50);
    len number;
    i number;
 BEGIN
    len: = length(str1);
    FOR i IN REVERSE 1..len
    LOOP
        str2:=str2 || substr(str1,i,1);
    END LOOP;
    IF str1=str2 THEN
        dbms_output.put_line('IT’S PALINDROME');
    ELSE
        dbms_output.put_line('IT’S NOT PALINDROME');
    END IF ;
END;
/
```

OUTPUT :

```
Enter value of n : AAABBAAA

IT’S NOT PALINDROME
```

SYNTAX :

REVERSE FOR LOOP :

```
        FOR var  IN REVERSE l.. 20
          LOOP  S1;
          END LOOP ;
```

LENGTH FUNCTION :

LENGTH (string1);

- LENGTH function returns the length of the specified string.

SUBSTR FUNCTION :

SUBSTR(string , start_position , length);

- SUBSTR functions allows you to extract a substring from a string.

8. Consider the following EMPLOYEE relation schema.Write a trigger to raise an error if the table is modified on a specific day (Eg., Thursday or Wednesday) of the week

PL/SQL TRIGGER :

```
SET SERVEROUTPUT ON

CREATE OR  REPLACE  TRIGGER  tri_employee

BEFORE  insert or update

ON EMPLOYEE_DETAIL

FOR EACH ROW

DECLARE

     rec varchar2(10) ;

BEGIN

     SELECT to_char(sysdate,'Dy') INTO rec FROM dual;

     IF rec = 'Thu' OR  rec='Wed' THEN

        dbms_output.put_line(rec);

        raise_application_error(-20343, 'NOT ALLOWED TO ENTER');

     END IF ;

END ;

/

show error

INSERT INTO EMPLOYEE_DETAIL  VALUES (499,'RAM',10000,10);
```

OUTPUT :

```
Trigger created.
No errors.

Thu

INSERT INTO EMPLOYEE_DETAIL_COPY VALUES (499,'RAM',10000,10)

ERROR at line 1:
ORA-20343: NOT ALLOWED TO ENTER
```

SYNTAX :

TRIGGER :

- Triggers are stored programs, which are automatically executed or fired when some events occur.

to_char(**sysdate** , 'Dy') **FUNCTION:**

- Strips first three letters of the day of the week from current date, current date is returned by **sysdate** and converts it into varchar.

RAISE APPLICATION ERROR :

```
raise_application_error(error number, ‘error message’);
```

- `It raises application error with given error message and number.`

NOT IN SYLLABUS OF LAB

- BUT IN THEORY

1. Write a PL/SQL FUNCTION to find the factorial of a given number and a program to call the same

```
SET SERVEROUTPUT ON

DECLARE

   a number;

   b number;

   fac number :=1;

   i number;

FUNCTION findFactorial(x IN number)

RETURN number IS z number;

BEGIN

   FOR i IN 1..x

    LOOP

        fac:= fac * i ;

    END LOOP;

    z:=fac;

   RETURN z;

END;

BEGIN

   a:= 7;

   b:= findFactorial(a);

   dbms_output.put_line(' Factorial of 7 is ' || b);

END;

/
```

Additional Source

Install MongoDB Enterprise in Ubuntu :

1 . Import Public Key (RSA) for Package Mgmt.

dbms@dbmslab $ sudo apt-key adv --keyserver hkp://keyserver.ubuntu.com:80 --recv 0C49F3730359A14518585931BC711F9BA15703C6

2. Install according the system requirements

***For Ubuntu Xenial(16.04) please refer your OS and Package ***

dbms@dbmslab $ echo "deb [arch=amd64,arm64,ppc64el,s390x] http://repo.mongodb.com/apt/ubuntu xenial/mongodb-enterprise/3.4 multiverse" | sudo tee /etc/apt/sources.list.d/mongodb-enterprise.list

***For Ubuntu Trusty (14.04) please refer your OS and Package ***

dbms@dbmslab $ echo "deb [arch=amd64] http://repo.mongodb.com/apt/ubuntu trusty/mongodb-enterprise/3.4 multiverse" | sudo tee /etc/apt/sources.list.d/mongodb-enterprise.list

dbms@dbmslab $ sudo apt-get install mongodb-enterprise

3. Now after Successful installation . to start MongoDB Server issue the following cmd

dbms@dbmslab $ sudo service mongod start

4. Now to get MongoShell ,issue the following cmd

dbms@dbmslab $ mongo

You will have Mongo Shell Running in the terminal

5.Now to stop MongoDB Server , issue the following cmd

dbms@dbmslab $ sudo service mongod stop

Other Useful References :

Tutorial For Oracle SQL and PL/SQL

https://www.tutorialspoint.com/plsql/index.htm

https://www.tutorialspoint.com/oracle_sql/index.asp

Tutorial For MongoDB

www.tutorialspoint.com/mongodb/

Documentation Of MongoDb and Oracle

https://docs.mongodb.com/manual/

https://docs.oracle.com/cd/E11882_01/nav/portal_4.htm

(Be Great if You find the above link helpful)

Online Execution

https://www.tutorialspoint.com/oracle_terminal_online.php

HAPPY CODING !