# Practical 06 Part II

## Introduction to Loops in PL/SQL

Loops allow repeated execution of a block of statements. PL/SQL supports three types of loops:
**BASIC LOOP** (Infinite Loop)
**WHILE LOOP** (Condition-based)
**FOR LOOP** (Counter-based)

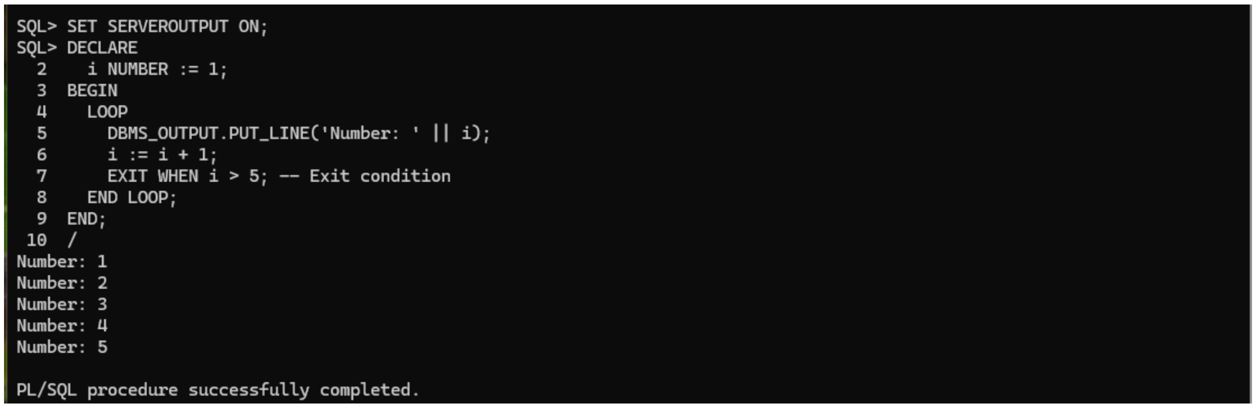
## BASIC LOOP (Must use EXIT condition)

A `LOOP` executes repeatedly until an `EXIT` condition is met.

### Example: Print numbers from 1 to 5 using LOOP

```
SET SERVEROUTPUT ON;

DECLARE
    i NUMBER := 1;
BEGIN
    LOOP
        DBMS_OUTPUT.PUT_LINE('Number: ' || i);
        i := i + 1;

        EXIT WHEN i > 5;  -- Exit condition
    END LOOP;
END;
/
```

**Explanation:** The loop runs indefinitely until `i` becomes greater than 5.



```
SQL> SET SERVEROUTPUT ON;
SQL> DECLARE
       i NUMBER := 1;
     BEGIN
       LOOP
         DBMS_OUTPUT.PUT_LINE('Number: ' || i);
         i := i + 1;
         EXIT WHEN i > 5; -- Exit condition
       END LOOP;
     END;
     /
Number: 1
Number: 2
Number: 3
Number: 4
Number: 5

PL/SQL procedure successfully completed.
```

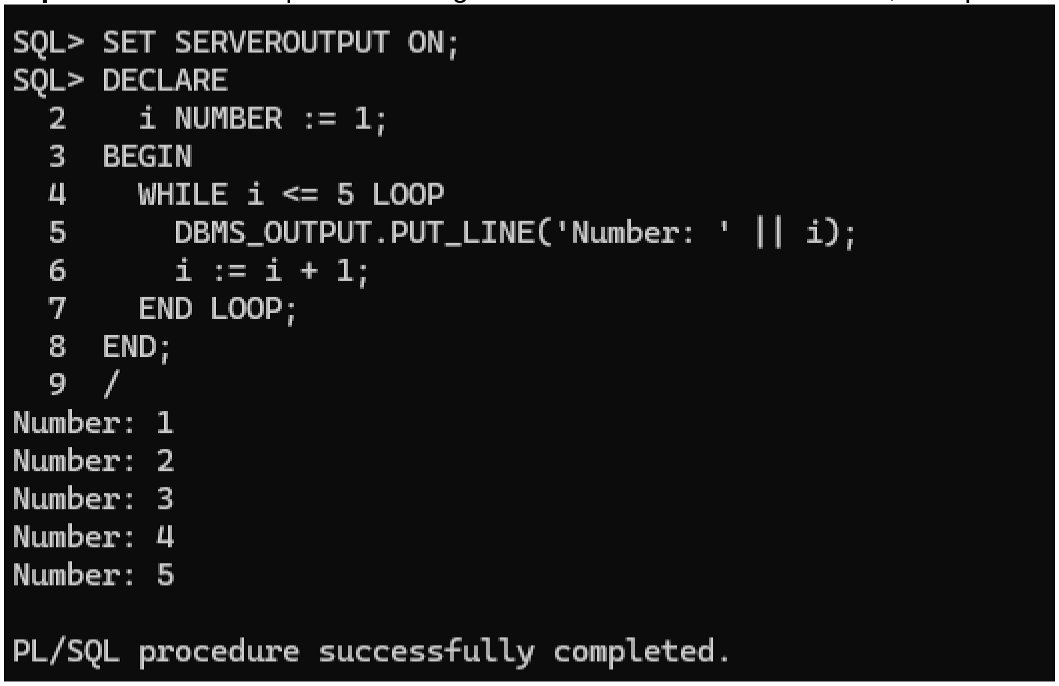
## WHILE LOOP (Executes as long as condition is `TRUE`)

A `WHILE` loop checks a condition before executing the block.

### Example: Print numbers from 1 to 5 using WHILE LOOP

```
SET SERVEROUTPUT ON;

DECLARE
    i NUMBER := 1;
BEGIN
    WHILE i <= 5 LOOP
        DBMS_OUTPUT.PUT_LINE('Number: ' || i);
        i := i + 1;
    END LOOP;
END;
/
```

**Explanation:** The loop runs as long as `i <= 5`. When `i` becomes 6, it stops.



```
SQL> SET SERVEROUTPUT ON;
SQL> DECLARE
  2    i NUMBER := 1;
  3  BEGIN
  4    WHILE i <= 5 LOOP
  5      DBMS_OUTPUT.PUT_LINE('Number: ' || i);
  6      i := i + 1;
  7    END LOOP;
  8  END;
  9  /
Number: 1
Number: 2
Number: 3
Number: 4
Number: 5

PL/SQL procedure successfully completed.
```

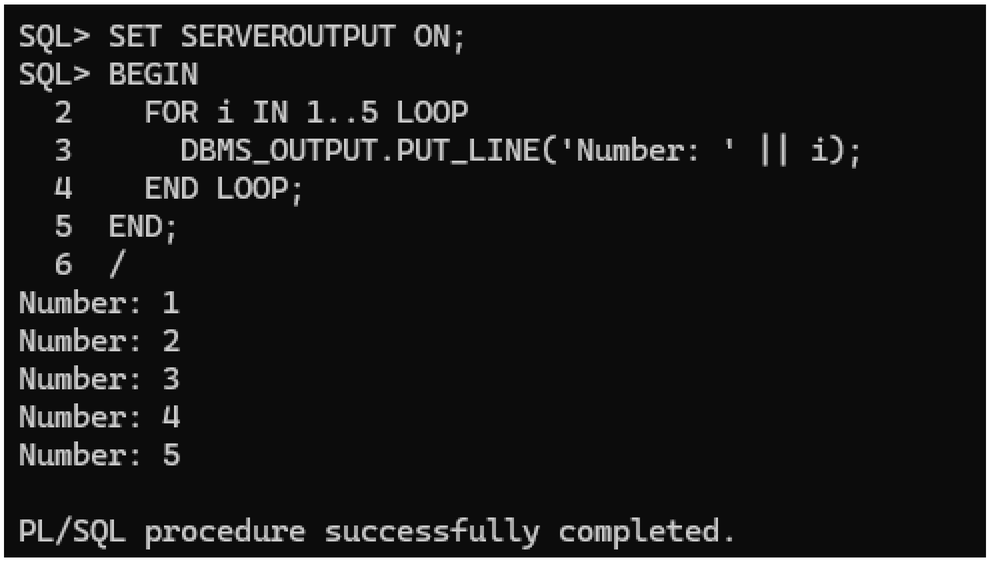
## FOR LOOP (Counter-based)

A `FOR` loop runs a fixed number of times.

### Example: Print numbers from 1 to 5 using FOR LOOP

```
SET SERVEROUTPUT ON;

BEGIN
    FOR i IN 1..5 LOOP
        DBMS_OUTPUT.PUT_LINE('Number: ' || i);
    END LOOP;
END;
/
```

**Explanation:** The loop runs automatically from `1 to 5`, eliminating the need for a manual counter.



```
SQL> SET SERVEROUTPUT ON;
SQL> BEGIN
  2    FOR i IN 1..5 LOOP
  3      DBMS_OUTPUT.PUT_LINE('Number: ' || i);
  4    END LOOP;
  5  END;
  6  /
Number: 1
Number: 2
Number: 3
Number: 4
Number: 5

PL/SQL procedure successfully completed.
```

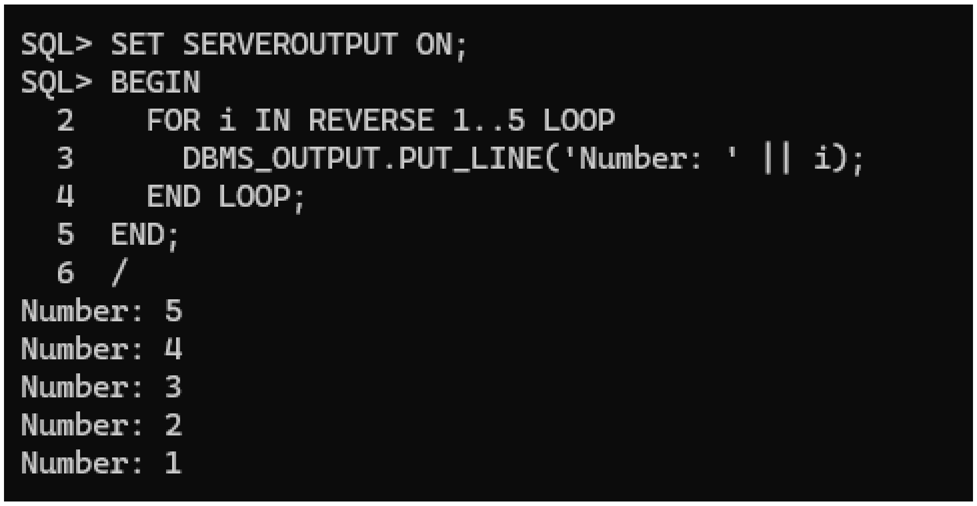
## REVERSE FOR LOOP

A `FOR` loop can count **backward** using `REVERSE`.

### Example: Print numbers from 5 to 1 using FOR LOOP

```
SET SERVEROUTPUT ON;

BEGIN
    FOR i IN REVERSE 1..5 LOOP
        DBMS_OUTPUT.PUT_LINE('Number: ' || i);
    END LOOP;
END;
/
```

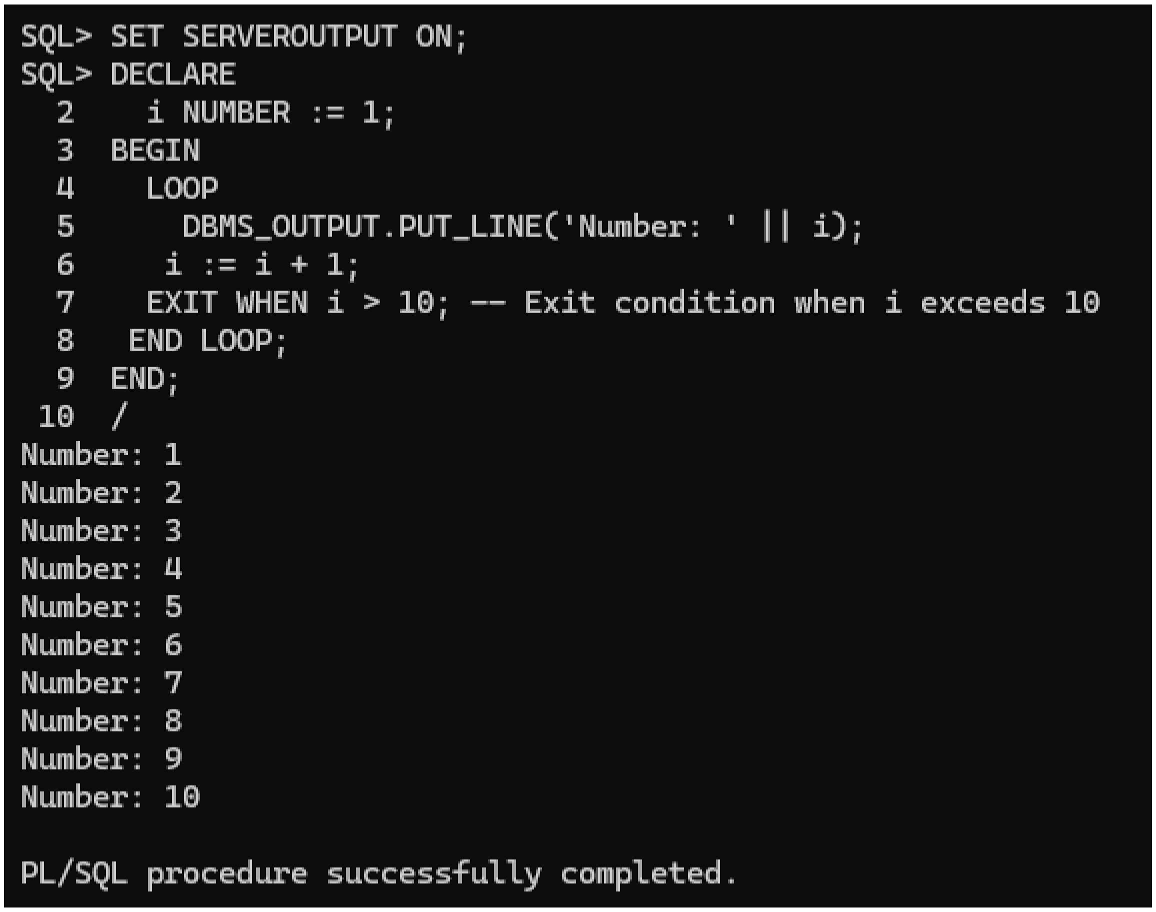
**Explanation:** The loop counts **down** from `5` to `1`.



```
SQL> SET SERVEROUTPUT ON;
SQL> BEGIN
  2    FOR i IN REVERSE 1..5 LOOP
  3      DBMS_OUTPUT.PUT_LINE('Number: ' || i);
  4    END LOOP;
  5  END;
  6  /
Number: 5
Number: 4
Number: 3
Number: 2
Number: 1
```

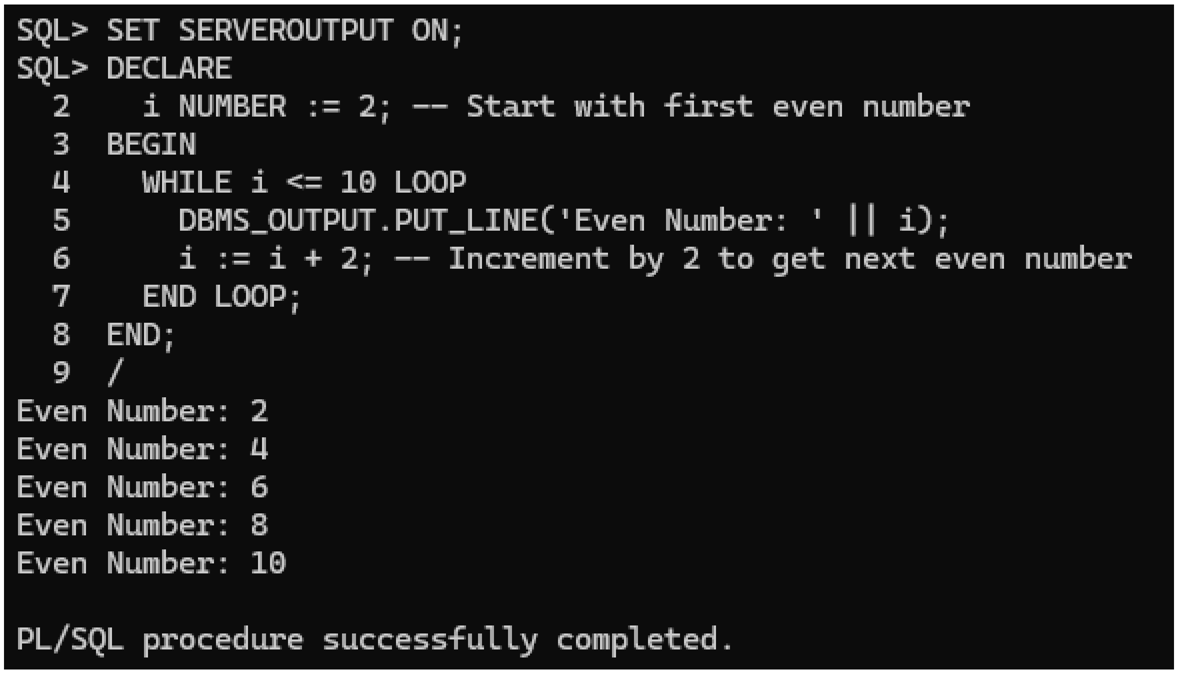
## Simple Tasks for Practice

Write a **BASIC LOOP** to print numbers from 1 to 10.



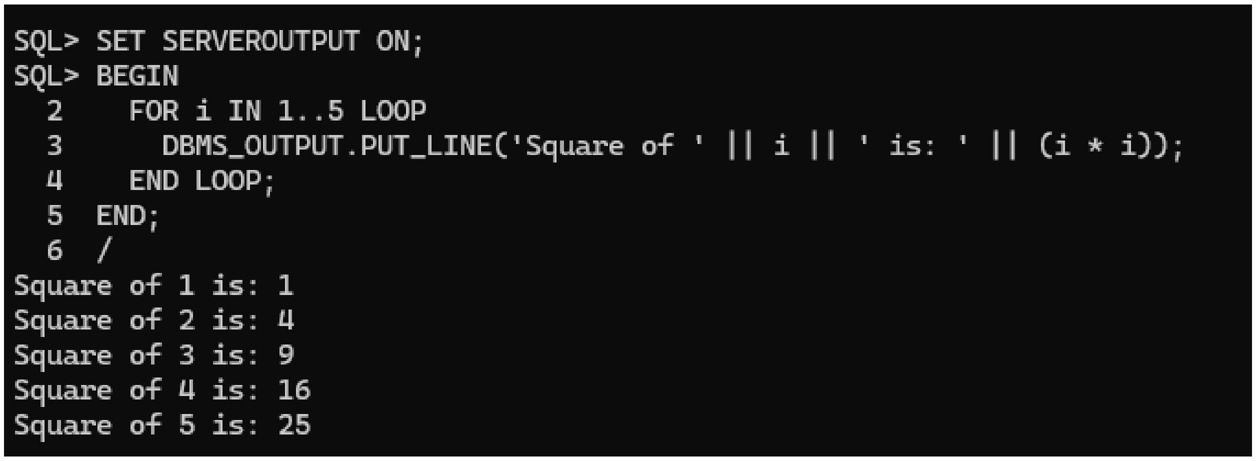
```
SQL> SET SERVEROUTPUT ON;
SQL> DECLARE
  2    i NUMBER := 1;
  3  BEGIN
  4    LOOP
  5      DBMS_OUTPUT.PUT_LINE('Number: ' || i);
  6     i := i + 1;
  7    EXIT WHEN i > 10; -- Exit condition when i exceeds 10
  8   END LOOP;
  9  END;
 10  /
Number: 1
Number: 2
Number: 3
Number: 4
Number: 5
Number: 6
Number: 7
Number: 8
Number: 9
Number: 10

PL/SQL procedure successfully completed.
```

Modify the **WHILE LOOP** to print **even numbers** from 2 to 10.



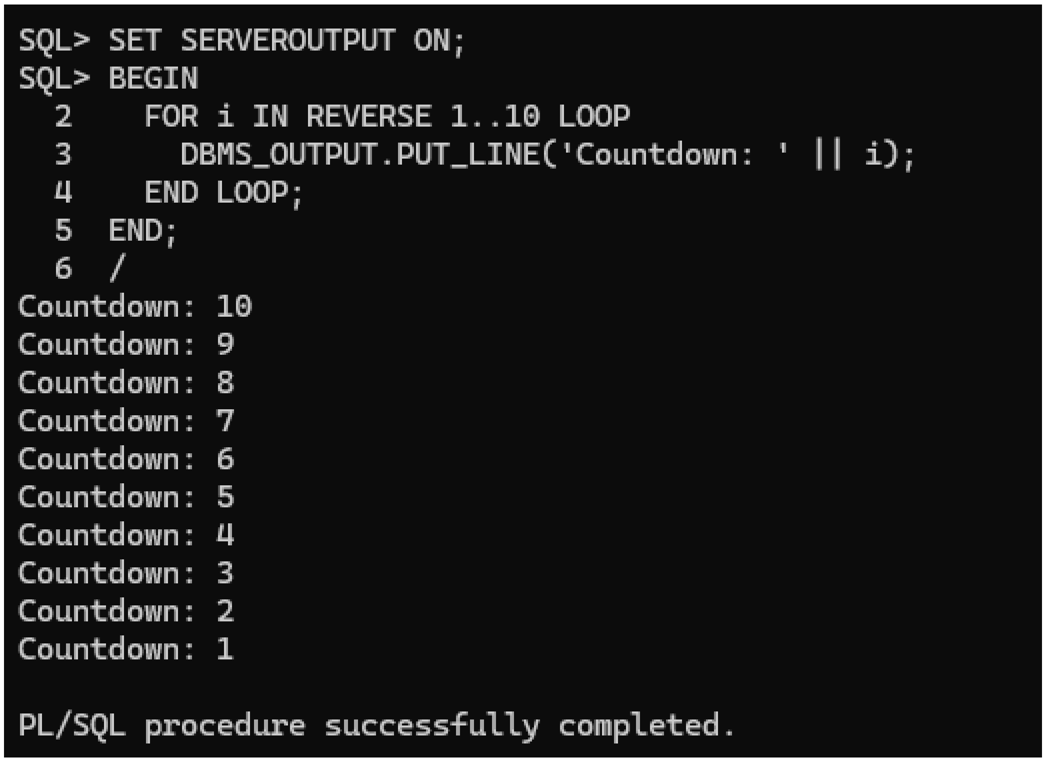
```
SQL> SET SERVEROUTPUT ON;
SQL> DECLARE
    i NUMBER := 2; -- Start with first even number
  BEGIN
    WHILE i <= 10 LOOP
      DBMS_OUTPUT.PUT_LINE('Even Number: ' || i);
      i := i + 2; -- Increment by 2 to get next even number
    END LOOP;
  END;
  /
Even Number: 2
Even Number: 4
Even Number: 6
Even Number: 8
Even Number: 10

PL/SQL procedure successfully completed.
```

Write a **FOR LOOP** to print the **square of numbers** from 1 to 5.



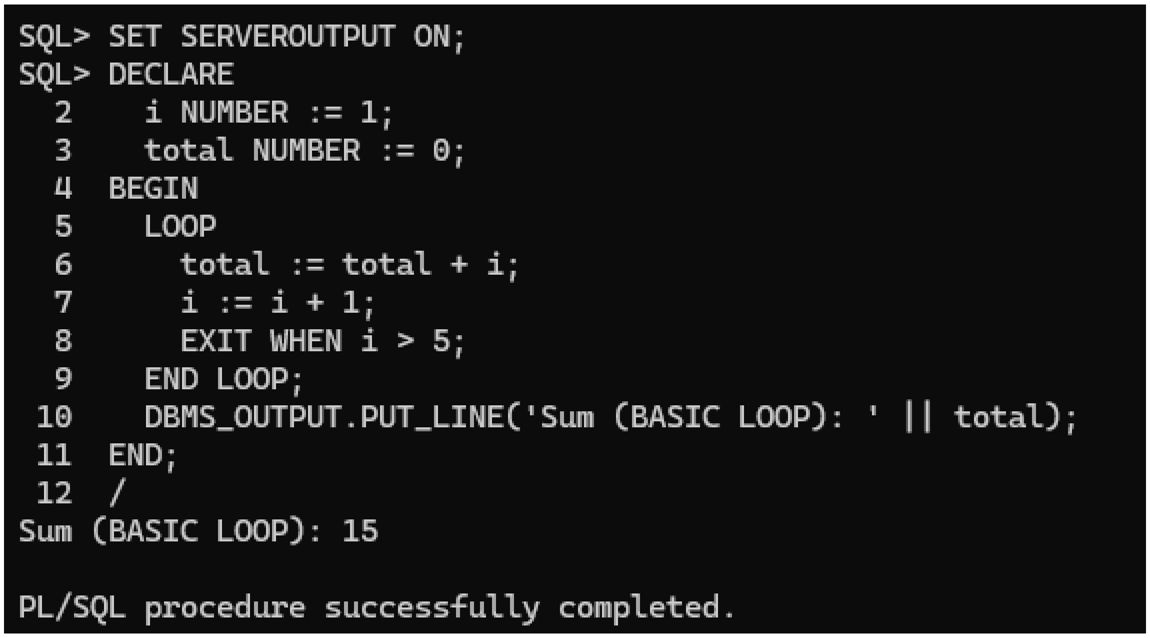
```
SQL> SET SERVEROUTPUT ON;
SQL> BEGIN
    FOR i IN 1..5 LOOP
      DBMS_OUTPUT.PUT_LINE('Square of ' || i || ' is: ' || (i * i));
    END LOOP;
  END;
  /
Square of 1 is: 1
Square of 2 is: 4
Square of 3 is: 9
Square of 4 is: 16
Square of 5 is: 25
```

Create a **REVERSE FOR LOOP** that prints numbers from 10 to 1.



```
SQL> SET SERVEROUTPUT ON;
SQL> BEGIN
       FOR i IN REVERSE 1..10 LOOP
         DBMS_OUTPUT.PUT_LINE('Countdown: ' || i);
       END LOOP;
     END;
     /
Countdown: 10
Countdown: 9
Countdown: 8
Countdown: 7
Countdown: 6
Countdown: 5
Countdown: 4
Countdown: 3
Countdown: 2
Countdown: 1

PL/SQL procedure successfully completed.
```

Write a loop that **calculates the sum of numbers from 1 to 5**.



```
SQL> SET SERVEROUTPUT ON;
SQL> DECLARE
       i NUMBER := 1;
       total NUMBER := 0;
     BEGIN
       LOOP
         total := total + i;
         i := i + 1;
         EXIT WHEN i > 5;
       END LOOP;
       DBMS_OUTPUT.PUT_LINE('Sum (BASIC LOOP): ' || total);
     END;
     /
Sum (BASIC LOOP): 15

PL/SQL procedure successfully completed.
```

## LOOPS USECASES IN DBMS

## BASIC LOOP (Must use EXIT condition)

The `LOOP` statement runs indefinitely unless explicitly stopped with an `EXIT` condition.

### Example 1: Insert 5 Records into a Table Using LOOP

```
BEGIN

    FOR i IN 1..5 LOOP

        INSERT INTO employees (id, name, salary) VALUES (i,
'Employee_' || i, 5000 + (i * 500));

    END LOOP;

    COMMIT;

END;

/
```

**Explanation:** Inserts 5 employees with incrementing salaries.

### Example 2: Fetch and Display Employee Names Using LOOP

```
DECLARE

    v_name employees.name%TYPE;

    CURSOR emp_cursor IS SELECT name FROM employees;
```

```
BEGIN

    OPEN emp_cursor;

    LOOP

        FETCH emp_cursor INTO v_name;

        EXIT WHEN emp_cursor%NOTFOUND;

        DBMS_OUTPUT.PUT_LINE('Employee: ' || v_name);

    END LOOP;

    CLOSE emp_cursor;

END;

/
```

**Explanation:** Uses a cursor to fetch and print employee names one by one.

### Example 3: Delete Employees with Salary Below 3000 Using LOOP

```
DECLARE

    CURSOR emp_cursor IS SELECT id FROM employees WHERE salary < 3000;

    v_id employees.id%TYPE;

BEGIN

    OPEN emp_cursor;

    LOOP

        FETCH emp_cursor INTO v_id;

        EXIT WHEN emp_cursor%NOTFOUND;
        DELETE FROM employees WHERE id = v_id;

    END LOOP;

    CLOSE emp_cursor;

    COMMIT;

END;

/
```

**Explanation:** Deletes employees earning less than 3000.

### Example 4: Update Salaries Using LOOP

```
DECLARE

    CURSOR emp_cursor IS SELECT id FROM employees;

    v_id employees.id%TYPE;

BEGIN

    OPEN emp_cursor;

    LOOP

        FETCH emp_cursor INTO v_id;

        EXIT WHEN emp_cursor%NOTFOUND;

        UPDATE employees SET salary = salary + 1000 WHERE id = v_id;

    END LOOP;

    CLOSE emp_cursor;

    COMMIT;
```

```
END;

/
```

**Explanation:** Increases salaries by 1000 for all employees.

## WHILE LOOP (Executes as long as the condition is TRUE)

### Example 1: Print Employee Names While ID ≤ 5

```
DECLARE

    v_id NUMBER := 1;

    v_name employees.name%TYPE;

BEGIN

    WHILE v_id <= 5 LOOP

        SELECT name INTO v_name FROM employees WHERE id = v_id;

        DBMS_OUTPUT.PUT_LINE('Employee: ' || v_name);

        v_id := v_id + 1;

    END LOOP;

END;

/
```

**Explanation:** Fetches and prints employee names for IDs 1 to 5.

### Example 2: Insert Employees Until a Certain Count

```
DECLARE

    v_count NUMBER := 0;

BEGIN

    WHILE v_count < 5 LOOP

        INSERT INTO employees (id, name, salary) VALUES (v_count + 10, 
'New_Employee', 4000);

        v_count := v_count + 1;

    END LOOP;

    COMMIT;

END;

/
```

**Explanation:** Inserts 5 new employees.

### Example 3: Fetch and Display Employees with Salary Above 6000

```
DECLARE

    CURSOR emp_cursor IS SELECT name FROM employees WHERE salary > 
6000;

    v_name employees.name%TYPE;

BEGIN

    OPEN emp_cursor;

    FETCH emp_cursor INTO v_name;

    WHILE emp_cursor%FOUND LOOP

        DBMS_OUTPUT.PUT_LINE('Employee: ' || v_name);
        FETCH emp_cursor INTO v_name;
    END LOOP;
    CLOSE emp_cursor;
END;
/
```

**Explanation:** Fetches employees earning more than 6000.

## Example 4: Deduct Salary Until Minimum Threshold

```
DECLARE
    v_salary NUMBER;
BEGIN
    SELECT salary INTO v_salary FROM employees WHERE id = 1;
    WHILE v_salary > 3000 LOOP
        UPDATE employees SET salary = salary - 500 WHERE id = 1;
        v_salary := v_salary - 500;
    END LOOP;
    COMMIT;
END;
/
```

**Explanation:** Deducts salary until it reaches 3000.

## FOR LOOP (Counter-based loop, runs a fixed number of times)

### Example 1: Insert 10 Employees Using FOR LOOP

```
BEGIN

    FOR i IN 1..10 LOOP

        INSERT INTO employees (id, name, salary) VALUES (i + 100, 
'Emp_' || i, 6000);

    END LOOP;

    COMMIT;

END;

/
```

**Explanation:** Inserts 10 employees with unique IDs.

### Example 2: Display First 5 Employees

```
BEGIN

    FOR emp IN (SELECT name FROM employees WHERE ROWNUM <= 5) LOOP

        DBMS_OUTPUT.PUT_LINE('Employee: ' || emp.name);

    END LOOP;

END;

/
```

**Explanation:** Prints the first 5 employee names.

## Example 3: Increase Salaries in a Range

```
BEGIN

    FOR i IN 1..10 LOOP

        UPDATE employees SET salary = salary + 500 WHERE id = i;

    END LOOP;

    COMMIT;

END;

/
```

**Explanation:** Increases salaries of employees with IDs 1 to 10.

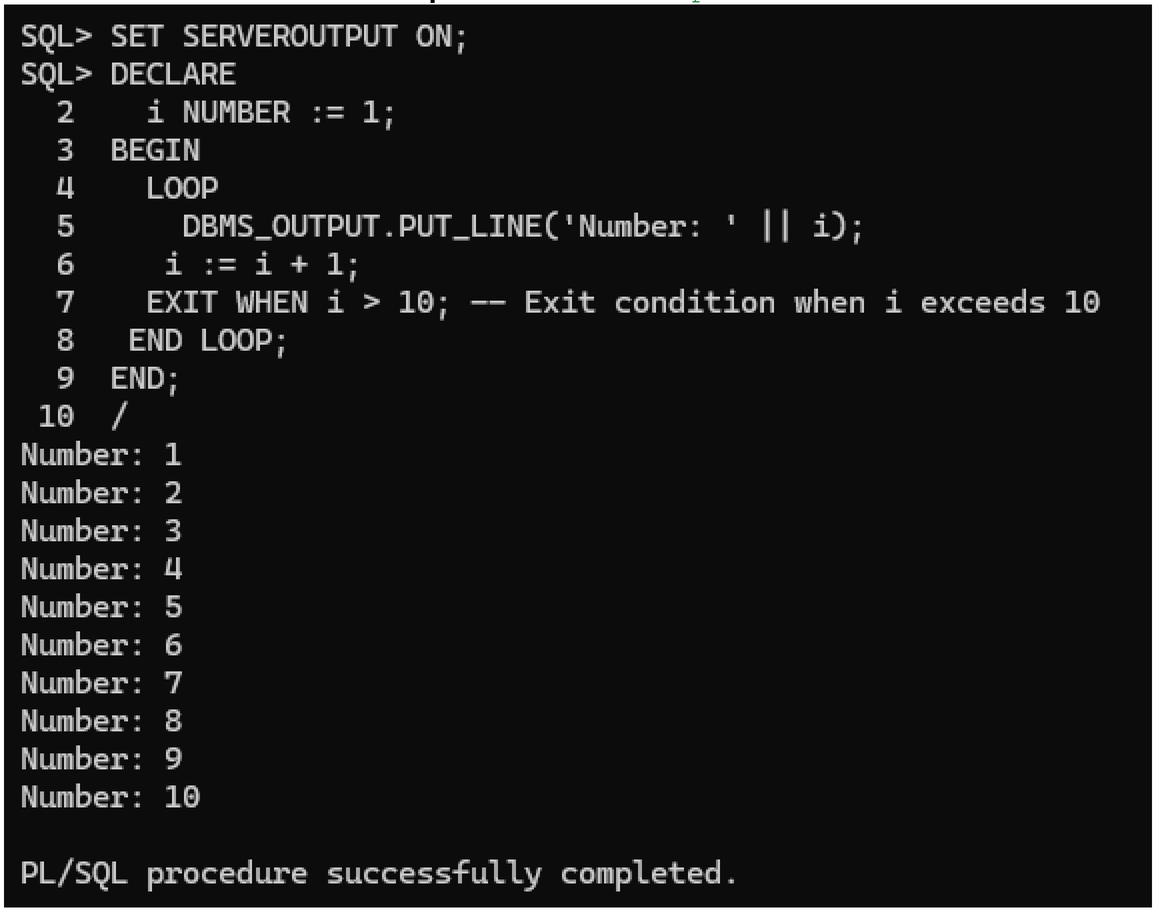
## Example 4: Delete Employees with ID Greater Than 50

```
BEGIN

    FOR i IN (SELECT id FROM employees WHERE id > 50) LOOP

        DELETE FROM employees WHERE id = i.id;

    END LOOP;

    COMMIT;

END;

/
```

**Explanation:** Deletes employees with IDs greater than 50.

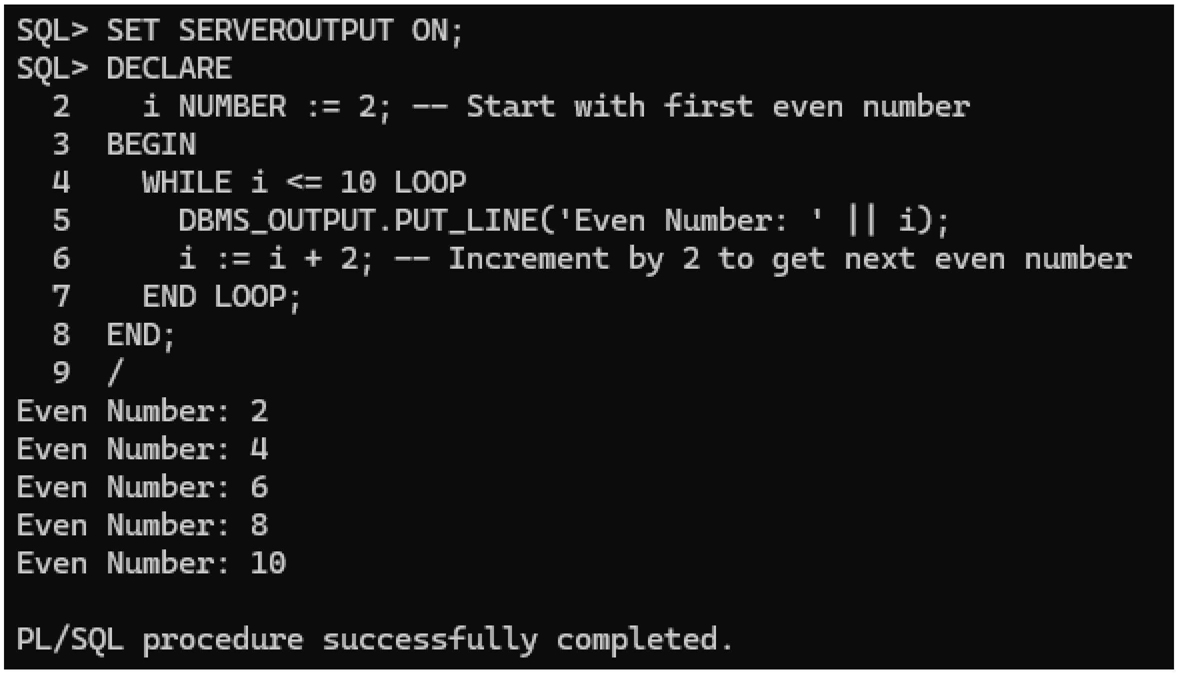
## Loops with database Simple Tasks for Practice

1. Write a **LOOP** to insert **5 new departments** into a `departments` table



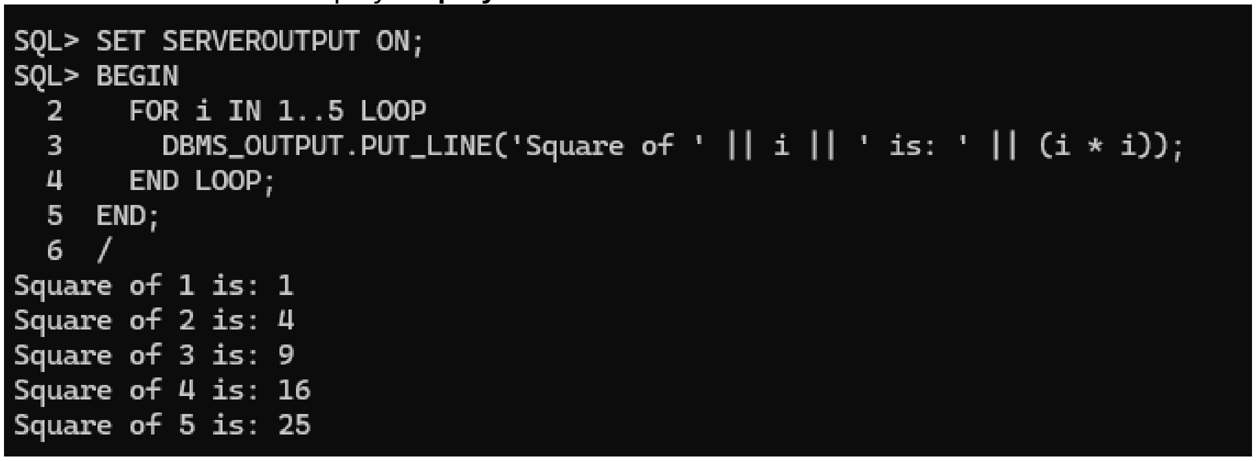
```
SQL> SET SERVEROUTPUT ON;
SQL> DECLARE
    i NUMBER := 1;
  BEGIN
    LOOP
      DBMS_OUTPUT.PUT_LINE('Number: ' || i);
     i := i + 1;
    EXIT WHEN i > 10; -- Exit condition when i exceeds 10
   END LOOP;
  END;
  /
Number: 1
Number: 2
Number: 3
Number: 4
Number: 5
Number: 6
Number: 7
Number: 8
Number: 9
Number: 10

PL/SQL procedure successfully completed.
```

2. Modify the **WHILE LOOP** to **increase salaries** until they reach 10,000.



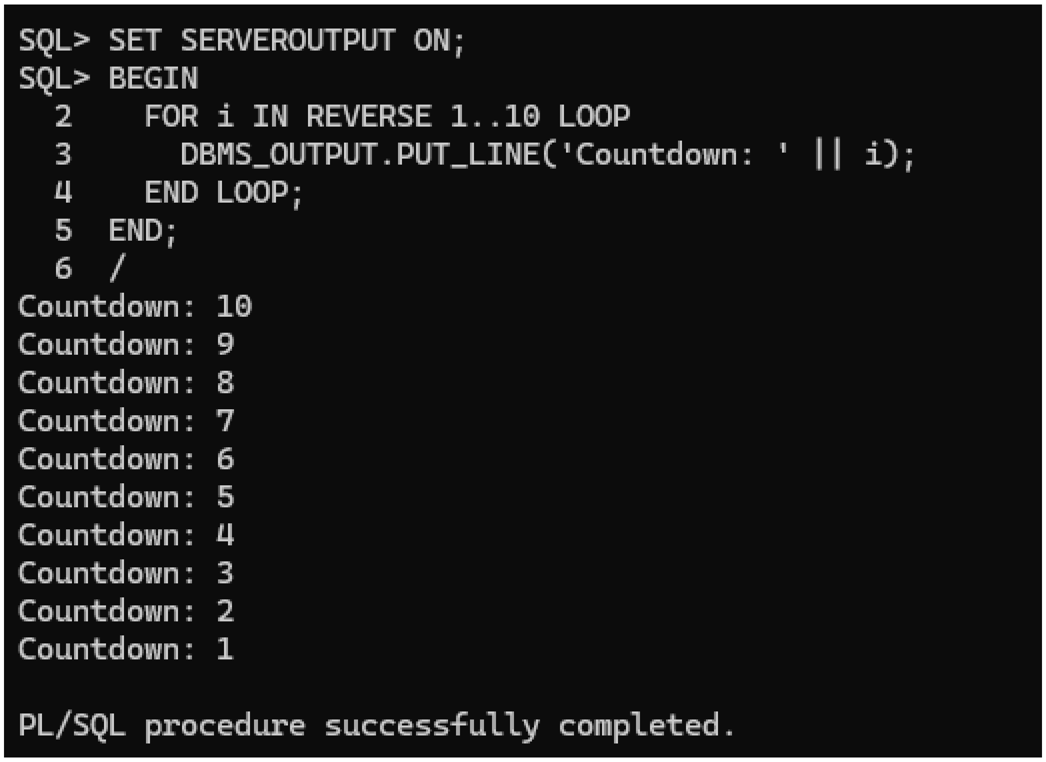
```
SQL> SET SERVEROUTPUT ON;
SQL> DECLARE
       i NUMBER := 2; -- Start with first even number
     BEGIN
       WHILE i <= 10 LOOP
         DBMS_OUTPUT.PUT_LINE('Even Number: ' || i);
         i := i + 2; -- Increment by 2 to get next even number
       END LOOP;
     END;
     /
Even Number: 2
Even Number: 4
Even Number: 6
Even Number: 8
Even Number: 10

PL/SQL procedure successfully completed.
```

3. Write a **FOR LOOP** to display **employee details** for IDs 1 to 5.



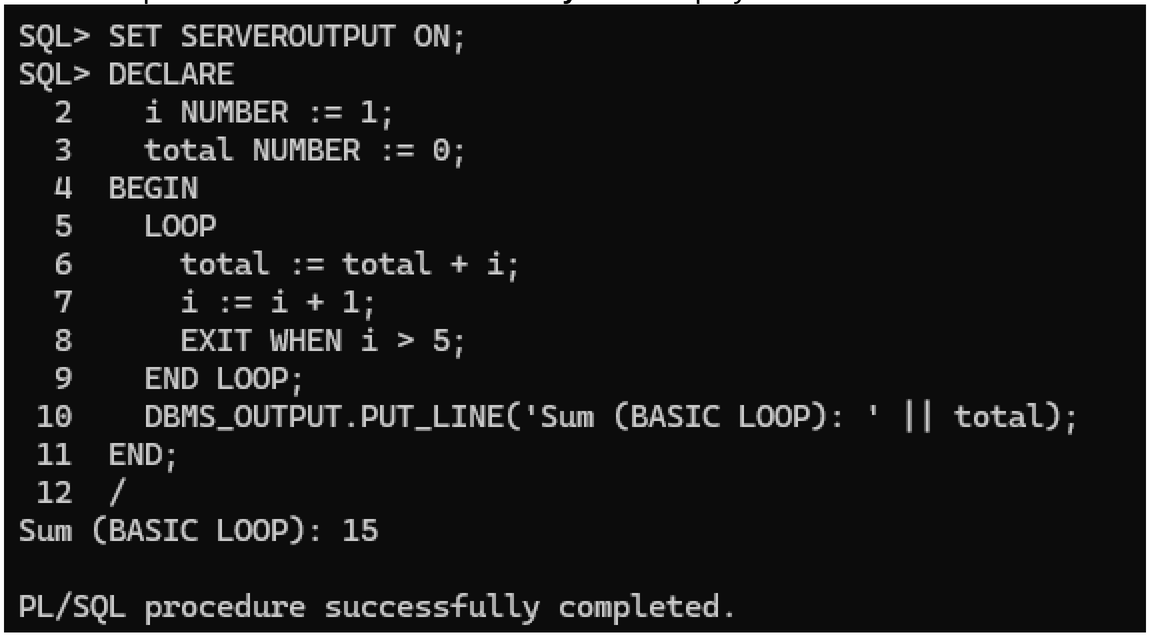
```
SQL> SET SERVEROUTPUT ON;
SQL> BEGIN
       FOR i IN 1..5 LOOP
         DBMS_OUTPUT.PUT_LINE('Square of ' || i || ' is: ' || (i * i));
       END LOOP;
     END;
     /
Square of 1 is: 1
Square of 2 is: 4
Square of 3 is: 9
Square of 4 is: 16
Square of 5 is: 25
```

4. Create a **cursor-based LOOP** that prints **employee names and salaries**.



```
SQL> SET SERVEROUTPUT ON;
SQL> BEGIN
       FOR i IN REVERSE 1..10 LOOP
         DBMS_OUTPUT.PUT_LINE('Countdown: ' || i);
       END LOOP;
     END;
     /
Countdown: 10
Countdown: 9
Countdown: 8
Countdown: 7
Countdown: 6
Countdown: 5
Countdown: 4
Countdown: 3
Countdown: 2
Countdown: 1

PL/SQL procedure successfully completed.
```

5. Write a loop that **calculates the total salary** of all employees.



```
SQL> SET SERVEROUTPUT ON;
SQL> DECLARE
       i NUMBER := 1;
       total NUMBER := 0;
     BEGIN
       LOOP
         total := total + i;
         i := i + 1;
         EXIT WHEN i > 5;
       END LOOP;
       DBMS_OUTPUT.PUT_LINE('Sum (BASIC LOOP): ' || total);
     END;
     /
Sum (BASIC LOOP): 15

PL/SQL procedure successfully completed.
```