Database Programming with PL/SQL

Agustín Alejandro Mota Hinojosa

November 10, 2023

Contents

1 Vocabulary

Statement that enables PL/SQL to perform actions selectively based on conditions.

IF

Control structures – Repetition statements that enable you to execute statements in a PL/SQL block repeatedly.

LOOP

An expression with a TRUE or FALSE value that is used to make a decision.

Condition

An expression that determines a course of action based on conditions and can be used outside a PL/SQL block in a SQL statement.

CASE

2 Try it / solve it

1. What is the purpose of a conditional control structure in PL/SQL?

The purpose of a conditional control structure is to analyse variables and choose a direction in which to go based on given parameters.

1. List the three categories of control structures in PL/SQL.

- **IF** conditional constructors
- **CASE** expressions
- **LOOP** control structures

2. List the keywords that can be part of an IF statement.

3. **IF**

4. **END IF**

5. **ELSIF**

6. **ELSE**

7. **THEN**

8. List the keywords that are a required part of an IF statement.

9. **IF**

10. **THEN**

11. **END IF**

12. Write a PL/SQL block to find the population of a given country in the countries table. Display a

13. message indicating whether the population is greater than or less than 1 billion (1,000,000,000).

14. Test your block twice using India (country$_{id}$ = 91) and United Kingdom (country$_{id}$ = 44). India's

15. population should be greater than 1 billion, while United Kingdom's should be less than 1 billion.

```
declare
  v_populatie wf_countries.population%TYPE;
begin
  select population into v_populatie
  from wf_countries
  where country_id=91;

  dbms_output.put_line(v_populatie);
```

```
    if v_populatie > 1000000000 then
      dbms_output.put_line('Mai mare de 1 miliard');
    else
      dbms_output.put_line('Mai mica de 1 miliard');
    end if;

    select population into v_populatie
    from wf_countries
    where country_id=44;

    dbms_output.put_line(v_populatie);

    if v_populatie > 1000000000 then
      dbms_output.put_line('Mai mare de 1 miliard');
    else
      dbms_output.put_line('Mai mica de 1 miliard');
    end if;
end;
```

1. Modify the code from the previous exercise so that it handles all the following cases:

   (a) Population is greater than 1 billion.
   (b) Population is greater than 0.
   (c) Population is 0.

2. Population is null. (Display: No data for this country.)

Run your code using the following country ids. Confirm the indicated results.

- China (country$_{id}$ = 86): Population is greater than 1 billion.

- United Kingdom (country$_{id}$ = 44): Population is greater than 0.

- Antarctica (country$_{id}$ = 672): Population is 0.

- Europa Island (country$_{id}$ = 15): No data for this country.

```
declare
  v_populatie wf_countries.population%TYPE;

begin
  select population into v_populatie
  from wf_countries
  where country_id=86;

  dbms_output.put_line(v_populatie);

  if v_populatie > 1000000000 then
    dbms_output.put_line('Population is greater than 1 billion');
  elsif v_populatie = 0 then
    dbms_output.put_line('Population is 0');
  elsif v_populatie <= 1000000000 then
    dbms_output.put_line('Population is greater than 0');
  else
    dbms_output.put_line('Population is null');
  end if;

  select population into v_populatie
  from wf_countries
  where country_id=44;

  dbms_output.put_line(v_populatie);

  if v_populatie > 1000000000 then
    dbms_output.put_line('Population is greater than 1 billion');
  elsif v_populatie = 0 then
    dbms_output.put_line('Population is 0');
  elsif v_populatie <= 1000000000 then
    dbms_output.put_line('Population is greater than 0');
  else
    dbms_output.put_line('Population is null');
  end if;

  select population into v_populatie
  from wf_countries
  where country_id=672;
```

```
   dbms_output.put_line(v_populatie);

   if v_populatie > 1000000000 then
     dbms_output.put_line('Population is greater than 1 billion');
   elsif v_populatie = 0 then
     dbms_output.put_line('Population is 0');
   elsif v_populatie <= 1000000000 then
     dbms_output.put_line('Population is greater than 0');
   else
     dbms_output.put_line('Population is null');
   end if;

   select population into v_populatie
   from wf_countries
   where country_id=15;

   dbms_output.put_line(v_populatie);

   if v_populatie > 1000000000 then
     dbms_output.put_line('Population is greater than 1 billion');
   elsif v_populatie = 0 then
     dbms_output.put_line('Population is 0');
   elsif v_populatie <= 1000000000 then
     dbms_output.put_line('Population is greater than 0');
   else
     dbms_output.put_line('Population is null');
   end if;
end;
```

1. Examine the following code:

```
DECLARE
  v_country_id countries.country_name%TYPE := 'ABC';
  v_ind_date countries.date_of_independence%TYPE;
  v_natl_holiday countries.national_holiday_date%TYPE;
BEGIN
  SELECT date_of_independence, national_holiday_date
  INTO v_ind_date, v_natl_holiday
  FROM countries
  WHERE country_id = v_country_id;
```

```
  IF v_ind_date IS NOT NULL THEN
    DBMS_OUTPUT.PUT_LINE('A');
  ELSIF v_natl_holiday IS NOT NULL THEN
    DBMS_OUTPUT.PUT_LINE('B');
  ELSIF v_natl_holiday IS NULL AND v_ind_date IS NULL THEN
    DBMS_OUTPUT.PUT_LINE('C');
  END IF;
END;
```

1. What would print if the country has an independence date equaling NULL and a national

   holiday date equaling NULL?

2. What would print if the country has an independence date equaling NULL and a national

   holiday date containing a value?

3. What would print if the country has an independence date equaling a value and a national

   holiday date equaling NULL?

4. Run a SELECT statement against the COUNTRIES table to determine whether the following

5. countries have independence dates or national holiday dates, or both. Predict the output of

6. running the anonymous block found at the beginning of this question.

7. Country - Country$_{ID}$ - IndependenceDate - National Holiday Date - Output should be

8. Antarctica - 672 - NO - NO - C

9. Iraq - 964 - Yes - No - A

10. Spain - 34 - NO - Yes - B

11. United States - 1 - Yes - No - A

12. Finally, run the anonymous block found at the beginning of this question using each of the

above country ids as input. Check whether your output answers are correct.

```
DECLARE
  v_ind_date wf_countries.date_of_independence%TYPE;
  v_natl_holiday wf_countries.national_holiday_date%TYPE;
BEGIN
  SELECT date_of_independence, national_holiday_date
  INTO v_ind_date, v_natl_holiday
  FROM wf_countries
  WHERE country_id = 672;

  IF v_ind_date IS NOT NULL THEN
    DBMS_OUTPUT.PUT_LINE('Have independence Date');
    DBMS_OUTPUT.PUT_LINE('No national holiday date');
    DBMS_OUTPUT.PUT_LINE('A');
  ELSIF v_natl_holiday IS NOT NULL THEN
    DBMS_OUTPUT.PUT_LINE('No independence Date');
    DBMS_OUTPUT.PUT_LINE('Have national holiday date');
    DBMS_OUTPUT.PUT_LINE('B');
  ELSIF v_natl_holiday IS NULL AND v_ind_date IS NULL THEN
    DBMS_OUTPUT.PUT_LINE('No independence Date');
    DBMS_OUTPUT.PUT_LINE('No national holiday date');
    DBMS_OUTPUT.PUT_LINE('C');
  END IF;

  SELECT date_of_independence, national_holiday_date
  INTO v_ind_date, v_natl_holiday
  FROM wf_countries
  WHERE country_id = 964;

  IF v_ind_date IS NOT NULL THEN
    DBMS_OUTPUT.PUT_LINE('Have independence Date');
    DBMS_OUTPUT.PUT_LINE('No national holiday date');
    DBMS_OUTPUT.PUT_LINE('A');
  ELSIF v_natl_holiday IS NOT NULL THEN
    DBMS_OUTPUT.PUT_LINE('No independence Date');
    DBMS_OUTPUT.PUT_LINE('Have national holiday date');
    DBMS_OUTPUT.PUT_LINE('B');
  ELSIF v_natl_holiday IS NULL AND v_ind_date IS NULL THEN
    DBMS_OUTPUT.PUT_LINE('No independence Date');
```

```
    DBMS_OUTPUT.PUT_LINE('No national holiday date');
    DBMS_OUTPUT.PUT_LINE('C');
END IF;

SELECT date_of_independence, national_holiday_date
INTO v_ind_date, v_natl_holiday
FROM wf_countries
WHERE country_id = 34;

IF v_ind_date IS NOT NULL THEN
    DBMS_OUTPUT.PUT_LINE('Have independence Date');
    DBMS_OUTPUT.PUT_LINE('No national holiday date');
    DBMS_OUTPUT.PUT_LINE('A');
ELSIF v_natl_holiday IS NOT NULL THEN
    DBMS_OUTPUT.PUT_LINE('No independence Date');
    DBMS_OUTPUT.PUT_LINE('Have national holiday date');
    DBMS_OUTPUT.PUT_LINE('B');
ELSIF v_natl_holiday IS NULL AND v_ind_date IS NULL THEN
    DBMS_OUTPUT.PUT_LINE('No independence Date');
    DBMS_OUTPUT.PUT_LINE('No national holiday date');
    DBMS_OUTPUT.PUT_LINE('C');
END IF;

SELECT date_of_independence, national_holiday_date
INTO v_ind_date, v_natl_holiday
FROM wf_countries
WHERE country_id = 1;

IF v_ind_date IS NOT NULL THEN
    DBMS_OUTPUT.PUT_LINE('Have independence Date');
    DBMS_OUTPUT.PUT_LINE('No national holiday date');
    DBMS_OUTPUT.PUT_LINE('A');
ELSIF v_natl_holiday IS NOT NULL THEN
    DBMS_OUTPUT.PUT_LINE('No independence Date');
    DBMS_OUTPUT.PUT_LINE('Have national holiday date');
    DBMS_OUTPUT.PUT_LINE('B');
ELSIF v_natl_holiday IS NULL AND v_ind_date IS NULL THEN
    DBMS_OUTPUT.PUT_LINE('No independence Date');
    DBMS_OUTPUT.PUT_LINE('No national holiday date');
    DBMS_OUTPUT.PUT_LINE('C');
```

```
    END IF;
END;
```

1. Examine the following code. What output do you think it will produce?

```
DECLARE
  v_num1 NUMBER(3) := 123;
  v_num2 NUMBER;
BEGIN
  IF v_num1 <> v_num2 THEN
    DBMS_OUTPUT.PUT_LINE('The two numbers are not equal');
  ELSE
    DBMS_OUTPUT.PUT_LINE('The two numbers are equal');
  END IF;
END;
```

2. 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: A leap year should be exactly divisible by 4, but not exactly divisible by 100. However, any year exactly divisible by 400 is a leap year. Test your solution with the following years:

Year Result Should Be

- 1990 Not a leap year

- 2000 Leap year

- 1996 Leap year

- 1900 Not a leap year

- 2016 Leap year

- 1884 Leap year

```
DECLARE
  v_year NUMBER(20) := 1990;
BEGIN
  IF MOD(v_year, TO_NUMBER(400)) = 0 THEN
```

```
      DBMS_OUTPUT.PUT_LINE('Leap year');
   ELSIF MOD(v_year, TO_NUMBER(100)) = 0 THEN
      DBMS_OUTPUT.PUT_LINE('Not a leap year');
   ELSIF MOD(v_year, TO_NUMBER(4)) = 0 THEN
      DBMS_OUTPUT.PUT_LINE('Leap year');
   ELSE
      DBMS_OUTPUT.PUT_LINE('Not a leap year');
   END IF;
END;
```