

## Oracle PL/SQL (Ch 10.5)

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### A Introduction to PL/SQL

- PL/SQL is Oracle's procedural language extension to standard SQL.
- PL/SQL provides condition handling, iteration, and nested processing in a block-structured language.
- Users can use PL/SQL to codify their business rules through the creation of procedures and packages, to trigger database events, or to add programming logic to the execution of SQL commands.

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### The Structures of a PL/SQL Program

- Declarations
  - Defines and initializes the variables and cursors used in the block.
- Executable Commands
  - Uses flow control commands (such as if commands and loops) to execute the commands and assign values to declared variables.
- Exception Handling
  - Provides customized handling of error conditions.

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### A typical PL/SQL Block

```
declare  
  <declarations section>  
begin  
  <executable commands>  
exception  
  <exception handling>  
end;
```

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### Declarations Section

- The declarations section starts with the **declare** keyword, followed by a list of variable and cursor definitions.
- Users can define variable to have constant values.
- Variables can inherit datatypes from existing columns and query results.

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### Example

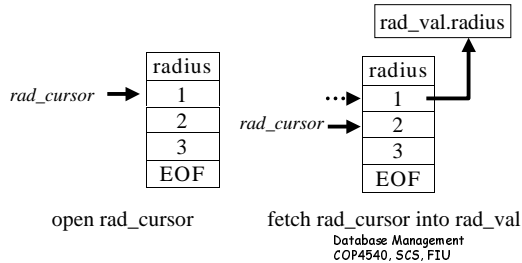
```
declare  
  pi      constant NUMBER(9,7) := 3.1415926;  
  radius  INTEGER(5);  
  area    NUMBER(14,2);  
begin  
  radius := 3;  
  area := pi * power(radius, 2);  
  insert into AREAS values (radius, area);  
end;
```

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## About Cursor

*cursor rad\_cursor is*  
*select \* from RADIUS\_VALUES;*

*rad\_val rad\_cursor%ROWTYPE*



## Example

```
declare
  pi      constant Number(9,7) := 3.1415926;
  area    NUMBER(14,2);
  cursor  rad_cursor is
    select * from RADIUS_VALUES;
  rad_val rad_cursor%ROWTYPE
begin
  open rad_cursor;
  fetch rad_cursor into rad_val;
  area := pi * power(rad_val.radius, 2);
  insert into AREAS values (rad_val.radius, area);
  close rad_cursor;
end;
```

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## Executable Commands Section

- The executable commands section starts with the keyword **begin**.
- In the executable commands section, users manipulate the variables and cursors declared in the declarations section.

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## Conditional Logic

- Within PL/SQL, users can use **if**, **else**, and **elsif** commands to control the flow of commands within the executable commands section.

```
If <some condition>
  then <some command>
elsif <some condition>
  then <some command>
else <some command>
endif
```

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## Example

```
declare
  pi      constant Number(9,7) := 3.1415926;
  area    NUMBER(14,2);
  cursor  rad_cursor is
    select * from RADISU_VALUS;
  rad_val rad_cursor%ROWTYPE
begin
  open rad_cursor;
  fetch rad_cursor into rad_val;
  area := pi * power(rad_val.radius, 2);
  if area > 30
  then
    insert into AREAS values (rad_val.radius, area);
  endif;
  close rad_cursor;
end;
```

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## Loops

- Simple loops.
  - A loop that keeps repeating until an *exit* or *exit when* statement is reached within loop
- FOR loops.
  - A loop that repeats a specified number of times.
- WHILE loops.
  - A loop that repeats until a condition is met.

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### Example

```

declare
  pi      constant NUMBER(9,7) := 3.1415926;
  radius  INTEGER(5);
  area    NUMBER(14,2);
begin
  radius := 3;
  loop
    area := pi * power(radius, 2);
    insert into AREAS values (radius, area);
    radius := radius + 1;
    exit when area > 100;
  end loop;
end;

```

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### Example

```

declare
  pi      constant NUMBER(9,7) := 3.1415926;
  radius  INTEGER(5);
  area    NUMBER(14,2);
begin
  for radius in 1 .. 7 loop
    area := pi * power(radius, 2);
    insert into AREAS values (radius, area);
  end loop;
end;

```

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### Example

```

declare
  pi      constant NUMBER(9,7) := 3.1415926;
  radius  INTEGER(5);
  area    NUMBER(14,2);
begin
  radius := 1;
  while radius <= 7
  loop
    area := pi * power(radius, 2);
    insert into AREAS values (radius, area);
    radius = radius + 1;
  end loop;
end;

```

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### Using Loops with Cursor

- Cursors have four attributes that can be used in the program.
  - FOUND
    - A record can be fetched from the cursor.
  - NOTFOUND
    - No more records can be fetched from the cursor.
  - ISOPEN
    - The cursor has been opened.
  - ROWCOUNT
    - The number of rows fetched from the cursor so far.

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### Example

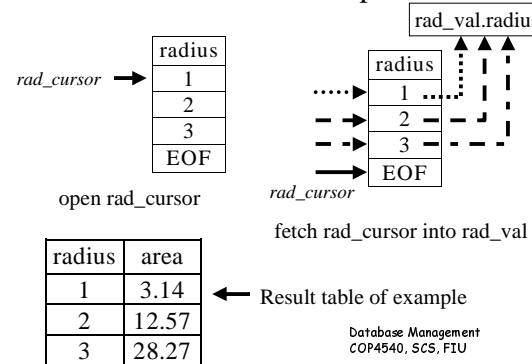
```

declare
  pi      constant Number(9,7) := 3.1415926;
  area    NUMBER(14,2);
  cursor  rad_cursor is
    select * from RADISU_VALUS;
  rad_val rad_cursor%ROWTYPE
begin
  open rad_cursor;
  loop
    fetch rad_cursor into rad_val;
    exit when rad_cursor%NOTFOUND;
    area := pi * power(rad_val.radius, 2);
    insert into AREAS values (rad_val.radius, area);
  end loop;
  close rad_cursor;
end;

```

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### Results of Example



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## Exception Handling Section

- The exception handling section of a PL/SQL program is optional.
- The except handling section starts with the keyword `exception`.
- When user-defined or system-related exception (errors) are encountered, the control of the PL/SQL program shifts to the exception handling section.

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## Example

```
declare
  pi          constant NUMBER(9,7) := 3.1415926;
  radius      INTEGER(5);
  area        NUMBER(14,2);
  var_test    NUMBER(14,2);
begin
  radius := 3;
  loop
    var_test := 1 / (radius - 4);
    area := pi * power(radius, 2);
    insert into AREAS values (radius, area);
    radius := radius + 1;
    exit when area > 100;
  end loop;
exception
  when ZERO_DIVIDE
  then insert into area values (0, 0);
end;
```

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## Example

```
DECLARE
  v_fname employee.fname%type;
  v_minit employee.minit%type;
  v_lname employee.lname%type;
  v_address employee.address%type;
  v_salary employee.salary%type;

BEGIN
  SELECT fname, minit, lname, address, salary
  INTO v_fname, v_minit, v_lname, v_address, v_salary
  FROM employee
  WHERE salary = (SELECT max(salary) FROM employee);
  DBMS_OUTPUT.PUT_LINE(v_fname, v_minit, v_lname, v_address, v_salary);

EXCEPTION
  WHEN OTHERS
  THEN DBMS_OUTPUT.PUT_LINE('Error Detected');

END;
```

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## Example

```
DECLARE
  avg_salary NUMBER;

BEGIN
  SELECT avg(salary) INTO avg_salary FROM employee;

  UPDATE employee SET salary = salary * 1.1
  WHERE salary < avg_salary;

  SELECT avg(salary) INTO avg_salary FROM employee;

  COMMIT;

EXCEPTION
  WHEN OTHERS THEN
  DBMS_OUTPUT.PUT_LINE('ERROR in Salary Update');
  ROLLBACK;

END;
```

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