



Database Programming with PL/SQL

2-5

Writing PL/SQL Executable Statements



Objectives

This lesson covers the following objectives:

- Construct accurate variable assignment statements in PL/SQL
- Construct accurate statements using built-in SQL functions in PL/SQL
- Differentiate between implicit and explicit conversions of data types
- Describe when implicit conversions of data types take place

Objectives

This lesson covers the following objectives:

- List the drawbacks of implicit data type conversions
- Construct accurate statements using functions to explicitly convert data types
- Construct statements using operators in PL/SQL

Purpose

- We've introduced variables and identifiers.
- Now, you build your knowledge of the PL/SQL programming language by writing code to assign variable values. These values can be literals.
- They can also be functions. SQL provides a number of predefined functions that you can use in SQL statements. Most of these functions are also valid in PL/SQL expressions.

Assigning New Values to Variables

- Character and date literals must be enclosed in single quotation marks.

```
v_name      := 'Henderson';  
v_start_date := '12-DEC-2005';
```

- Statements can continue over several lines.

```
v_quote := 'The only thing that we can know is that we know nothing and  
that is the highest flight of human reason.';
```

Assigning New Values to Variables

- Numbers can be simple values or scientific notation (2E5 meaning 2×10 to the power of 5 = 200,000).

```
v_my_integer := 100;  
v_my_sci_not := 2E5;
```



SQL Functions in PL/SQL

- You are already familiar with functions in SQL statements. For example:

```
SELECT country_name, LAST_DAY(date_of_independence)
FROM wf_countries
WHERE date_of_independence IS NOT NULL;
```

- You can also use these functions in PL/SQL procedural statements. For example:

```
DECLARE
    v_last_day DATE;
BEGIN
    v_last_day := LAST_DAY(SYSDATE);
    DBMS_OUTPUT.PUT_LINE(v_last_day);
END;
```


SQL Functions in PL/SQL

Available in procedural statements:

- Single-row character
- Single-row number
- Date
- Data-type conversion
- Miscellaneous functions

Not available in procedural statements:

- DECODE
- Group functions

Character Functions

- Valid character functions in PL/SQL include:

ASCII	LENGTH	RPAD
CHR	LOWER	RTRIM
CONCAT	LPAD	SUBSTR
INITCAP	LTRIM	TRIM
INSTR	REPLACE	UPPER

- This is not an exhaustive list. Refer to the Oracle documentation for the complete list.

Examples of Character Functions

- Get the length of a string:

```
v_desc_size          INTEGER(5);  
v_prod_description VARCHAR2(70):='You can use this product with your  
radios for higher frequency';  
  
-- get the length of the string in prod_description  
v_desc_size:= LENGTH(v_prod_description);
```

- Convert the name of the country capitol to upper case:

```
v_capitol_name:= UPPER(v_capitol_name);
```

- Concatenate the first and last names:

```
v_emp_name:= v_first_name||' '||v_last_name;
```

Number Functions

- Valid number functions in PL/SQL include:

ABS	EXP	ROUND
ACOS	LN	SIGN
ASIN	LOG	SIN
ATAN	MOD	TAN
COS	POWER	TRUNC

- This is not an exhaustive list. Refer to the Oracle documentation for the complete list.

Examples of Number Functions

- Get the sign of a number:

```
DECLARE
  v_my_num BINARY_INTEGER := -56664;
BEGIN
  DBMS_OUTPUT.PUT_LINE(SIGN(v_my_num));
END;
```

- Round a number to 0 decimal places:

```
DECLARE
  v_median_age NUMBER(6,2);
BEGIN
  SELECT median_age INTO v_median_age
  FROM wf_countries WHERE country_id=27;
  DBMS_OUTPUT.PUT_LINE(ROUND(v_median_age,0));
END;
```

Date Functions

- Valid date functions in PL/SQL include:

ADD_MONTHS	MONTHS_BETWEEN
CURRENT_DATE	ROUND
CURRENT_TIMESTAMP	SYSDATE
LAST_DAY	TRUNC

- This is not an exhaustive list. Refer to the Oracle documentation for the complete list.

Examples of Date Functions

- Add months to a date:

```
DECLARE
    v_new_date    DATE;
    v_num_months  NUMBER := 6;
BEGIN
    v_new_date := ADD_MONTHS(SYSDATE,v_num_months);
    DBMS_OUTPUT.PUT_LINE(v_new_date);
END;
```

- Calculate the number of months between two dates:

```
DECLARE
    v_no_months  PLS_INTEGER:=0;
BEGIN
    v_no_months := MONTHS_BETWEEN('31-JAN-2006','31-MAY-2005');
    DBMS_OUTPUT.PUT_LINE(v_no_months);
END;
```

Data-Type Conversion

- In any programming language, converting one data type to another is a common requirement. PL/SQL can handle such conversions with scalar data types.
- Data-type conversions can be of two types:
 - Implicit conversions
 - Explicit conversions



Implicit Conversions

- In implicit conversions, PL/SQL attempts to convert data types dynamically if they are mixed in a statement. Implicit conversions can happen between many types in PL/SQL, as illustrated by the following chart.

	DATE	LONG	NUMBER	PLS_INTEGER	VARCHAR2
DATE	N/A	X			X
LONG		N/A			X
NUMBER		X	N/A	X	X
PLS_INTEGER		X	X	N/A	X
VARCHAR2	X	X	X	X	N/A

Example of Implicit Conversion

- In this example, the variable `v_sal_increase` is of type `VARCHAR2`. While calculating the total salary, PL/SQL first converts `v_sal_increase` to `NUMBER` and then performs the operation. The result of the operation is the `NUMBER` type.

```
DECLARE
    v_salary          NUMBER(6) := 6000;
    v_sal_increase    VARCHAR2(5) := '1000';
    v_total_salary     v_salary%TYPE;
BEGIN
    v_total_salary := v_salary + v_sal_increase;
    DBMS_OUTPUT.PUT_LINE(v_total_salary);
END;
```

Drawbacks of Implicit Conversions

At first glance, implicit conversions might seem useful; however, there are several drawbacks:

- Implicit conversions can be slower.
- When you use implicit conversions, you lose control over your program because you are making an assumption about how Oracle handles the data. If Oracle changes the conversion rules, then your code can be affected.

Drawbacks of Implicit Conversions

- Implicit conversion rules depend upon the environment in which you are running.
 - For example, the date format varies depending on the language setting and installation type. Code that uses implicit conversion might not run on a different server or in a different language.
- Code that uses implicit conversion is harder to read and understand.

Drawbacks of Implicit Conversions

- It is the programmer's responsibility to ensure that values can be converted. For instance, PL/SQL can convert the CHAR value '02-JUN-1992' to a DATE value, but cannot convert the CHAR value 'Yesterday' to a DATE value. Similarly, PL/SQL cannot convert a VARCHAR2 value containing alphabetic characters to a NUMBER value.

Valid?	Statement
Yes	<code>v_new_date DATE := '02-JUN-1992';</code>
No	<code>v_new_date DATE := 'Yesterday';</code>
Yes	<code>v_my_number NUMBER := '123';</code>
No	<code>v_my_number NUMBER := 'abc';</code>

Explicit Conversions

- Explicit conversions convert values from one data type to another by using built-in functions. Examples of conversion functions include:

TO_NUMBER ()	ROWIDTONCHAR ()
TO_CHAR ()	HEXTORAW ()
TO_CLOB ()	RAWTOHEX ()
CHARTOROWID ()	RAWTONHEX ()
ROWIDTOCHAR ()	TO_DATE ()

Examples of Explicit Conversions

- TO_CHAR

```
BEGIN
  DBMS_OUTPUT.PUT_LINE(TO_CHAR(SYSDATE, 'Month YYYY')) ;
END ;
```

- TO_DATE

```
BEGIN
  DBMS_OUTPUT.PUT_LINE(TO_DATE('April-1999', 'Month-YYYY')) ;
END ;
```

Examples of Explicit Conversions

- TO_NUMBER

```
DECLARE
  v_a VARCHAR2(10) := '-123456';
  v_b VARCHAR2(10) := '+987654';
  v_c PLS_INTEGER;
BEGIN
  v_c := TO_NUMBER(v_a) + TO_NUMBER(v_b);
  DBMS_OUTPUT.PUT_LINE(v_c);
END;
```


Data Type Conversion Examples

- Example 1

```
v_date_of_joining DATE:= '02-Feb-2000';
```

- Example 2

```
v_date_of_joining DATE:= 'February 02,2000';
```

- Example 3

```
v_date_of_joining DATE:= TO_DATE('February 02,2000','Month DD,YYYY');
```

Operators in PL/SQL

- The operations within an expression are performed in a particular order depending on their precedence (priority).

- Logical
- Arithmetic
- Concatenation
- Parentheses to control the order of operations
- Exponential operator (**)



Same as in SQL

Operators in PL/SQL

- The following table shows the default order of operations from high priority to low priority:

Operator	Operation
<code>**</code>	Exponentiation
<code>+</code> , <code>-</code>	Identity, negation
<code>*</code> , <code>/</code>	Multiplication, division
<code>+</code> , <code>-</code> , <code> </code>	Addition, subtraction, concatenation
<code>=</code> , <code><</code> , <code>></code> , <code><=</code> , <code>>=</code> , <code><></code> , <code>!=</code> , <code>~=</code> , <code>^=</code> , <code>IS NULL</code> , <code>LIKE</code> , <code>BETWEEN</code> , <code>IN</code>	Comparison
<code>NOT</code>	Logical negation
<code>AND</code>	Conjunction
<code>OR</code>	Inclusion

Operators in PL/SQL Examples

- Increment the counter for a loop.

```
v_loop_count := v_loop_count + 1;
```

- Set the value of a Boolean flag.

```
v_good_sal := v_sal BETWEEN 50000 AND 150000;
```

- Validate whether an employee number contains a value.

```
v_valid := (v_empno IS NOT NULL);
```

Terminology

Key terms used in this lesson included:

- Explicit conversion
- Implicit conversion

Summary

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