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Database Programming with SQL

5-2

NULL Functions

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Objectives

This lesson covers the following objectives:

- Demonstrate and explain the evaluation of a nested function
- List at least four general functions that work with any data type and relate to handling null values
- Explain the use of the COALESCE and the NVL functions
- Explain the use of general functions to deal with null values in data
- Construct and execute a SQL query that correctly applies NVL, NVL2, NULLIF, and COALESCE single-row functions

Purpose

- Besides functions that control how data is formatted or converted to another type, SQL uses a set of general functions designed specifically to deal with null values
- You may be wondering how a value that is unavailable, unassigned, unknown, or inapplicable can deserve so much attention
- Null may be "nothing," but it can affect how expressions are evaluated, how averages are computed, and where a value appears in a sorted list
- This lesson is all about handling null values

A lot of the power of SQL is to emulate decisions that we need to make every day. We need the date format changed to comply with how another country writes it. We need to issue payroll checks that have currency signs instead of just numbers.

How Functions are Evaluated

- Up to now, you have applied single-row functions in simple statements
- It is possible, however, to nest functions to any depth
- It is important to know how nested functions are evaluated
- "Nesting" refers to one thing being contained within another thing (like an egg contained within a nest)
- The following example is a nested function
- The evaluation process begins from the innermost level to the outermost level

How Functions are Evaluated

```
SELECT TO_CHAR(NEXT_DAY(ADD_MONTHS(hire_date, 6), 'FRIDAY'),  
'fmDay, Month ddth, YYYY') AS "Next Evaluation"  
FROM employees  
WHERE employee_id = 100;
```

- The result is:
 - Friday, December 18th, 1987



How Functions are Evaluated

```
SELECT TO_CHAR(NEXT_DAY(ADD_MONTHS(hire_date, 6), 'FRIDAY'),  
              'fmDay, Month ddth, YYYY') AS "Next Evaluation"  
FROM employees  
WHERE employee_id = 100;
```

- Step 1: The hire date is going to have six months added to it
- Step 2: The first Friday following the day returned at Step 1 will be identified
- Step 3: The default date format will be formatted to read and display the date returned by Step 2 in a format similar to: Friday, December 18th, 1987, and will appear in the output under the column name "Next Evaluation"

Nested functions are evaluated starting with the innermost function, working outwards.

Functions Pertaining to Null Values

- At the beginning of the course, the term "null" was introduced
- Null is the value that is unavailable, unassigned, unknown, or inapplicable
- As a result, we cannot test to see if it is the same as another value, because we do not know what value it has
- It isn't equal to anything, not even zero!
- But just because it really isn't anything doesn't mean that it is not important

Functions Pertaining to Null Values

- Imagine this question: Is it true that $X = Y$?
- In order to answer you have to know the values of X and Y
- Oracle has four general functions that pertain to the use of null values
- The four functions are:
 - NVL
 - NVL2
 - NULLIF
 - COALESCE

NVL Function

- The NVL function converts a null value to a known value of a fixed data type, either date, character, or number
- The data types of the null value column and the new value must be the same
- The NVL function is:

`NVL (expression 1 value that may contain a null, expression 2 value to substitute for null)`

- NVL (value or column that may contain a null, value to substitute for null)

NVL Function

- The following query uses the NVL function with character data types:

```
SELECT country_name, NVL(internet_extension, 'None')
       AS "Internet extn"
FROM wf_countries
WHERE location = 'Southern Africa'
ORDER BY internet_extension DESC;
```

- Null values are replaced with the text 'None'

COUNTRY_NAME	Internet extn
Juan de Nova Island	None
Europa Island	None
Republic of Zimbabwe	.zw
Republic of Zambia	.zm
Republic of South Africa	.za

NVL Function

- The data types of the null value column and the new value must be the same as shown in the following examples:

Examples:	Output	
SELECT last_name, NVL(commission_pct, 0) FROM employees WHERE department_id IN(80,90);	Zlotkey	.2
	Abel	.3
	Taylor	.2
	King	0
SELECT NVL(date_of_independence,'No date') FROM wf_countries; Note: date_of_independence is a Varchar2 data type	1-Jul-1867	
	15-Sep-1821	
	5-Jul-1975	
	No Date	

The NULL values in the tables have been substituted using the NVL function (Highlighted in red).

NVL Function

- You can use the NVL function to convert column values containing nulls to a number before doing calculations
- When an arithmetic calculation is performed with null, the result is null
- The NVL function can convert the null value to a number before arithmetic calculations are done to avoid a null result

NVL Function

- In the example, the commission_pct column in the employees table contains null values
- The NVL function is used to change the null to zero before arithmetic calculations

```
SELECT last_name,  
NVL(commission_pct, 0)*250  
  AS "Commission"  
FROM employees  
WHERE department_id IN(80,90);
```

LAST_NAME	Commission
Zlotkey	50
Abel	75
Taylor	50
King	0
Kochhar	0
De Haan	0

NVL2 Function

- The NVL2 function evaluates an expression with three values.
- If the first value is not null, then the NVL2 function returns the second expression
- If the first value is null, then the third expression is returned.
- The values in expression 1 can have any data type
- Expression 2 and expression 3 can have any data type except LONG
- The data type of the returned value is always the same as the data type of expression 2, unless expression 2 is character data, in which case the returned type is VARCHAR2

LONG is variable-length character data type up to 2 gigabytes in size. Data types will be covered in more depth later in the course.

NVL2 Function

- The NVL2 function is:

`NVL2 (expression 1 value that may contain a null, expression 2 value to return if expression 1 is not null, expression 3 value to replace if expression 1 is null)`

- An easy way to remember NVL2 is to think, "if expression 1 has a value, substitute expression 2; if expression 1 is null, substitute expression 3."

NVL2 Function

- The NVL2 function shown uses number data types for expressions 1, 2 and 3

```
SELECT last_name, salary,  
       NVL2(commission_pct, salary + (salary * commission_pct),  
       salary)  
       AS income  
FROM employees  
WHERE department_id IN(80,90);
```

LAST_NAME	SALARY	INCOME
Zlotkey	10500	12600
Abel	11000	14300
Taylor	8600	10320
King	24000	24000
Kochhar	17000	17000
De Haan	17000	17000

NVL2 checks if expression 1 (commission_pct) has a value. If it has a value, expression 2 is returned (salary + (salary * commission_pct)). If expression 1 is NULL, expression 3 is returned (salary).

NULLIF Function

- The NULLIF function compares two expressions
- If they are equal, the function returns null
- If they are not equal, the function returns the first expression
- The NULLIF function is:

```
NULLIF(expression 1, expression 2)
```

NULLIF Function

- In this example, NULLIF compares the length of employees first and last names
- If the length of both names are the same, NULLIF returns NULL (as in row 2 Curtis Davies), otherwise expression 1 LENGTH of first_name is returned

```
SELECT first_name, LENGTH(first_name) AS "Length FN", last_name,  
       LENGTH(last_name) AS "Length LN", NULLIF(LENGTH(first_name),  
       LENGTH(last_name)) AS "Compare Them"  
FROM employees;
```

FIRST_NAME	Length FN	LAST_NAME	Length LN	Compare Them
Ellen	5	Abel	4	5
Curtis	6	Davies	6	-
Lex	3	De Haan	7	3

NULLIF functions are often used after doing data migration projects to test if the data in the target system is the same as in the original source systems. So NULLIF is used to look for exceptions, not matches – normally nulls as a result from NULLIF is good, as you would want the data in the source and target systems to be exactly the same.

COALESCE Function

- The COALESCE function is an extension of the NVL function, except COALESCE can take multiple values
- The word "coalesce" literally means "to come together" and that is what happens
- If the first expression is null, the function continues down the line until a not null expression is found
- Of course, if the first expression has a value, the function returns the first expression and the function stops
- The COALESCE function is:

```
COALESCE (expression 1, expression 2, ...expression n)
```

COALESCE Function

- Examine the SELECT statement from the employees table shown at right
- If an employee has a value (not NULL)for commission_pct, this is returned, otherwise if salary has a value, return salary
- If an employees commission_pct and salary are NULL, return the number 10

```
SELECT last_name,  
       COALESCE(commission_pct, salary, 10)  
       AS "Comm"  
FROM employees  
ORDER BY commission_pct;
```

LAST_NAME	Comm
Grant	.15
Zlotkey	.2
Taylor	.2
Abel	.3
Higgins	12000
Gietz	8300

Terminology

Key terms used in this lesson included:

- NVL
- NVL2
- NULLIF
- COALESCE

Summary

In this lesson, you should have learned how to:

- Demonstrate and explain the evaluation of a nested function
- List at least four general functions that work with any data type and relate to handling null values
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