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Database Programming with SQL

5-2

NULL Functions

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

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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

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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

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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"

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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

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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

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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)

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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

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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 Abel Taylor King	.2 .3 .2 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	

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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

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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

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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

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

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)
```

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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

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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)
```

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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

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Terminology

Key terms used in this lesson included:

- NVL
- NVL2
- NULLIF
- COALESCE

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Summary

In this lesson, you should have learned how to:

- Demonstrate and explain the evaluation of a nested function
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