Using Conversion Functions and Conditional Expressions

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Objectives

After completing this lesson, you should be able to do the following:

- Describe the various types of conversion functions that are available in SQL
- Use the `TO_CHAR`, `TO_NUMBER`, and `TO_DATE` conversion functions
- Apply conditional expressions in a `SELECT` statement

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This lesson focuses on functions that convert data from one type to another (for example, conversion from character data to numeric data) and discusses the conditional expressions in SQL `SELECT` statements.
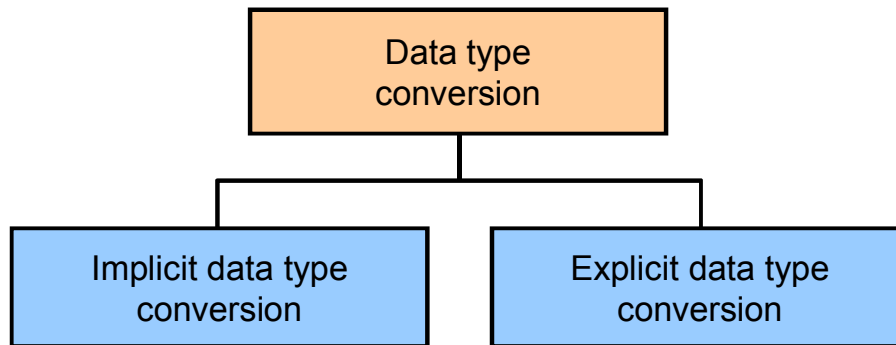
Lesson Agenda

- **Implicit and explicit data type conversion**
- `TO_CHAR, TO_DATE, TO_NUMBER` functions
- General functions:
  - `NVL`
  - `NVL2`
  - `NULLIF`
  - `COALESCE`
- Conditional expressions:
  - `CASE`
  - `DECODE`

Conversion Functions

```
          ┌─────────────────────┐
          │     Data type       │
          │     conversion      │
          └─────────────────────┘
                     │
         ┌───────────┴───────────┐
┌─────────────────┐     ┌─────────────────┐
│ Implicit data type│     │ Explicit data type│
│    conversion     │     │    conversion     │
└─────────────────┘     └─────────────────┘
```

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In addition to Oracle data types, columns of tables in an Oracle Database can be defined by using the American National Standards Institute (ANSI), DB2, and SQL/DS data types. However, the Oracle server internally converts such data types to Oracle data types.

In some cases, the Oracle server receives data of one data type where it expects data of a different data type. When this happens, the Oracle server can automatically convert the data to the expected data type. This data type conversion can be done *implicitly* by the Oracle server or *explicitly* by the user.

Implicit data type conversions work according to the rules explained in the following slides.

Explicit data type conversions are performed by using the conversion functions. Conversion functions convert a value from one data type to another. Generally, the form of the function names follows the convention *data type* TO *data type*. The first data type is the input data type and the second data type is the output.

Note: Although implicit data type conversion is available, it is recommended that you do the explicit data type conversion to ensure the reliability of your SQL statements.

Implicit Data Type Conversion

In expressions, the Oracle server can automatically convert the following:

From	To
VARCHAR2 or CHAR	NUMBER
VARCHAR2 or CHAR	DATE

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Oracle server can automatically perform data type conversion in an expression. For example, the expression `hire_date > '01-JAN-90'` results in the implicit conversion from the string `'01-JAN-90'` to a date. Therefore, a VARCHAR2 or CHAR value can be implicitly converted to a number or date data type in an expression.

Note: CHAR to NUMBER conversions succeed only if the character string represents a valid number.

Implicit Data Type Conversion

For expression evaluation, the Oracle server can automatically convert the following:
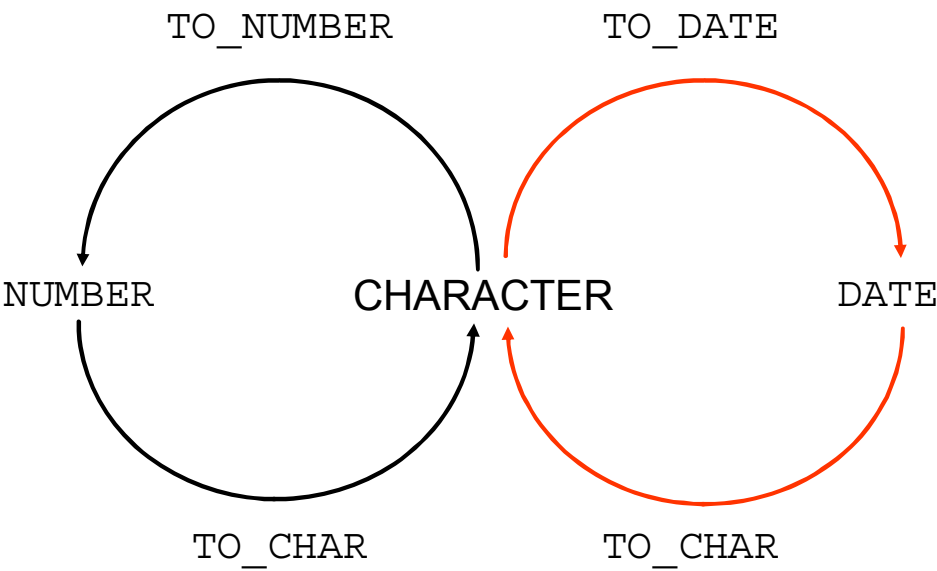
From	To
NUMBER	VARCHAR2 or CHAR
DATE	VARCHAR2 or CHAR

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In general, the Oracle server uses the rule for expressions when a data type conversion is needed. For example, the expression `grade = 2` results in the implicit conversion of the number `2` to the string "2" because grade is a `CHAR(2)` column.

Explicit Data Type Conversion

```
        TO_NUMBER                    TO_DATE


NUMBER          CHARACTER                    DATE


        TO_CHAR                      TO_CHAR
```

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SQL provides three functions to convert a value from one data type to another:

Function	Purpose
TO_CHAR(*number|date [, fmt [, nlsparams]]*)	Converts a number or date value to a VARCHAR2 character string with the format model *fmt* **Number conversion:** The nlsparams parameter specifies the following characters, which are returned by number format elements: • Decimal character • Group separator • Local currency symbol • International currency symbol If nlsparams or any other parameter is omitted, this function uses the default parameter values for the session.

Function	Purpose
`TO_NUMBER(char[,fmt[,nlsparams]])`	Converts a character string containing digits to a number in the format specified by the optional format model *fmt*.
	The `nlsparams` parameter has the same purpose in this function as in the `TO_CHAR` function for number conversion.
`TO_DATE(char[,fmt[,nlsparams]])`	Converts a character string representing a date to a date value according to *fmt* that is specified. If *fmt* is omitted, the format is `DD-MON-YY`.
	The `nlsparams` parameter has the same purpose in this function as in the `TO_CHAR` function for date conversion.

Note: The list of functions mentioned in this lesson includes only some of the available conversion functions.

For more information, see the "Conversion Functions" section in *Oracle Database SQL Language Reference* for 12*c* database.

Lesson Agenda

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    - `DECODE`

Using the `TO_CHAR` Function with Dates

```
TO_CHAR(date[,'format_model'])
```

The format model:

- Must be enclosed with single quotation marks
- Is case-sensitive
- Can include any valid date format element
- Has an `fm` element to remove padded blanks or suppress leading zeros
- Is separated from the date value by a comma

`TO_CHAR` converts a datetime data type to a value of `VARCHAR2` data type in the format specified by the *format_model*. A format model is a character literal that describes the format of datetime stored in a character string. For example, the datetime format model for the string `'11-Nov-2000'` is `'DD-Mon-YYYY'`. You can use the `TO_CHAR` function to convert a date from its default format to the one that you specify.

Guidelines

- The format model must be enclosed with single quotation marks and is case-sensitive.
- The format model can include any valid date format element. But be sure to separate the date value from the format model with a comma.
- The names of days and months in the output are automatically padded with blanks.
- To remove padded blanks or to suppress leading zeros, use the fill mode `fm` element.

```
SELECT employee_id, TO_CHAR(hire_date, 'MM/YY') Month_Hired
FROM    employees
WHERE   last_name = 'Higgins';
```

	EMPLOYEE_ID	MONTH_HIRED
1	205	06/02

Elements of the Date Format Model

Element	Result
YYYY	Full year in numbers
YEAR	Year spelled out (in English)
MM	Two-digit value for the month
MONTH	Full name of the month
MON	Three-letter abbreviation of the month
DY	Three-letter abbreviation of the day of the week
DAY	Full name of the day of the week
DD	Numeric day of the month

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Elements of the Date Format Model

- Time elements format the time portion of the date:

HH24:MI:SS AM	15:45:32 PM

- Add character strings by enclosing them with double quotation marks:

DD "of" MONTH	12 of OCTOBER

- Number suffixes spell out numbers:

ddspth	fourteenth

Use the formats that are listed in the following tables to display time information and literals, and to change numerals to spelled numbers.

Element	Description
AM or PM	Meridian indicator
A.M. or P.M.	Meridian indicator with periods
HH or HH12	12 hour format
HH24	24 hour format
MI	Minute (0–59)
SS	Second (0–59)
SSSSS	Seconds past midnight (0–86399)

Other Formats

Element	Description
/ . ,	Punctuation is reproduced in the result.
"of the"	Quoted string is reproduced in the result.

Specifying Suffixes to Influence Number Display

Element	Description
TH	Ordinal number (for example, DDTH for 4TH)
SP	Spelled-out number (for example, DDSP for FOUR)
SPTH or THSP	Spelled-out ordinal numbers (for example, DDSPTH for FOURTH)

Using the `TO_CHAR` Function with Dates

```
SELECT last_name,
       TO_CHAR(hire_date, 'fmDD Month YYYY')
       AS HIREDATE
FROM    employees;
```

	LAST_NAME	HIREDATE
1	King	17 June 2003
2	Kochhar	21 September 2005
3	De Haan	13 January 2001
4	Hunold	3 January 2006
5	Ernst	21 May 2007
6	Lorentz	7 February 2007
7	Mourgos	16 November 2007
8	Rajs	17 October 2003

...

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The SQL statement in the slide displays the last names and hire dates for all the employees. The hire date appears as 17 June 2003.

Example

Modify the example in the slide to display the dates in a format that appears as "Seventeenth of June 2003 12:00:00 AM."

```
SELECT  last_name,
 TO_CHAR(hire_date,
        'fmDdspth "of" Month YYYY fmHH:MI:SS AM')
 HIREDATE
FROM     employees;
```

	LAST_NAME	HIREDATE
1	King	Seventeenth of June 2003 12:00:00 AM
2	Kochhar	Twenty-First of September 2005 12:00:00 AM

...

Notice that the month follows the format model specified; in other words, the first letter is capitalized and the rest are in lowercase.

Using the `TO_CHAR` Function with Numbers

```
TO_CHAR(number[, 'format_model'])
```

These are some of the format elements that you can use with the `TO_CHAR` function to display a number value as a character:

Element	Result
9	Represents a number
0	Forces a zero to be displayed
$	Places a floating dollar sign
L	Uses the floating local currency symbol
.	Prints a decimal point
,	Prints a comma as a thousands indicator

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When working with number values, such as character strings, you should convert those numbers to the character data type using the `TO_CHAR` function, which translates a value of `NUMBER` data type to `VARCHAR2` data type. This technique is especially useful with concatenation.

Number Format Elements

If you are converting a number to the character data type, you can use the following format elements:

Element	Description	Example	Result
9	Numeric position (number of 9s determine display width)	999999	1234
0	Display leading zeros	099999	001234
$	Floating dollar sign	$999999	$1234
L	Floating local currency symbol	L999999	FF1234
D	Returns the decimal character in the specified position. The default is a period (.).	9999D99	1234.00
.	Decimal point in position specified	999999.99	1234.00
G	Returns the group separator in the specified position. You can specify multiple group separators in a number format model.	9G999	1,234
,	Comma in position specified	999,999	1,234
MI	Minus signs to right (negative values)	999999MI	1234-
PR	Parenthesize negative numbers	999999PR	<1234>
EEEE	Scientific notation (format must specify four Es)	99.999EEEE	1.234E+03
U	Returns in the specified position the "Euro" (or other) dual currency	U9999	€1234
V	Multiply by 10 n times (n = number of 9s after V)	9999V99	123400
S	Returns the negative or positive value	S9999	-1234 or +1234
B	Display zero values as blank, not 0	B9999.99	1234.00

Using the `TO_CHAR` Function with Numbers

```
SELECT TO_CHAR(salary, '$99,999.00') SALARY
FROM   employees
WHERE  last_name = 'Ernst';
```

	SALARY
1	$6,000.00

- The Oracle server displays a string of number signs (#) in place of a whole number whose digits exceed the number of digits provided in the format model.
- The Oracle server rounds the stored decimal value to the number of decimal places provided in the format model.

Using the `TO_NUMBER` and `TO_DATE` Functions

- Convert a character string to a number format using the `TO_NUMBER` function:

```
TO_NUMBER(char[, 'format_model'])
```

- Convert a character string to a date format using the `TO_DATE` function:

```
TO_DATE(char[, 'format_model'])
```

- These functions have an `fx` modifier. This modifier specifies the exact match for the character argument and date format model of a `TO_DATE` function.

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You may want to convert a character string to either a number or a date. To accomplish this task, use the `TO_NUMBER` or `TO_DATE` functions. The format model that you select is based on the previously demonstrated format elements.

The `fx` modifier specifies the exact match for the character argument and date format model of a `TO_DATE` function:

- Punctuation and quoted text in the character argument must exactly match (except for case) the corresponding parts of the format model.
- The character argument cannot have extra blanks. Without `fx`, the Oracle server ignores extra blanks.
- Numeric data in the character argument must have the same number of digits as the corresponding element in the format model. Without `fx`, the numbers in the character argument can omit leading zeros.

Example

Display the name and hire date for all employees who started on May 24, 2007. There are two spaces after the month *May* and before the number *24* in the following example. Because the `fx` modifier is used, an exact match is required and the spaces after the word *May* are not recognized:

```
SELECT last_name, hire_date
FROM    employees
WHERE   hire_date = TO_DATE('May  24, 2007', 'fxMonth DD, YYYY');
```

The resulting error output looks like this:

```
ORA-01858: a non-numeric character was found where a numeric was expected
01858. 00000 - "a non-numeric character was found where a numeric was expected"
*Cause:   The input data to be converted using a date format model was
          incorrect. The input data did not contain a number where a number was
          required by the format model.
*Action:  Fix the input data or the date format model to make sure the
          elements match in number and type. Then retry the operation.
```

To see the output, correct the query by deleting the extra space between 'May' and '24'.

```
SELECT last_name, hire_date
FROM    employees
WHERE   hire_date = TO_DATE('May 24, 2007', 'fxMonth DD, YYYY');
```

	LAST_NAME	HIRE_DATE
1	Grant	24-MAY-07

Using `TO_CHAR` and `TO_DATE` Functions with the `RR` Date Format

To find employees hired before 1990, use the `RR` date format, which produces the same results whether the command is run in 1999 or now:

```
SELECT last_name, TO_CHAR(hire_date, 'DD-Mon-YYYY')
FROM  employees
WHERE hire_date < TO_DATE('01-Jan-90','DD-Mon-RR');
```

	LAST_NAME	TO_CHAR(HIRE_DATE,'DD-MON-YYYY')
1	Popp	03-Feb-1989

To find employees who were hired before 1990, the `RR` format can be used. Because the current year is greater than 1999, the `RR` format interprets the year portion of the date from 1950 to 1999.

Alternatively, the following command, results in no rows being selected because the `YY` format interprets the year portion of the date in the current century (2090).

```
SELECT last_name, TO_CHAR(hire_date, 'DD-Mon-yyyy')
FROM    employees
WHERE   TO_DATE(hire_date, 'DD-Mon-yy') < '01-Jan-90';
```

> Query Result ×
>
> SQL | All Rows Fetched: 0 in 0.002 seconds
>
> LAST_N... | TO_CH...

Notice that no rows are retrieved from the above query.

Lesson Agenda

- Implicit and explicit data type conversion
- `TO_CHAR`, `TO_DATE`, `TO_NUMBER` functions
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  - `NULLIF`
  - `COALESCE`
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General Functions

The following functions work with any data type and pertain to using nulls:

- `NVL (expr1, expr2)`
- `NVL2 (expr1, expr2, expr3)`
- `NULLIF (expr1, expr2)`
- `COALESCE (expr1, expr2, ..., exprn)`

These functions work with any data type and pertain to the use of null values in the expression list.

Function	Description
NVL	Converts a null value to an actual value
NVL2	If `expr1` is not null, `NVL2` returns `expr2`. If `expr1` is null, `NVL2` returns `expr3`. The argument `expr1` can have any data type.
NULLIF	Compares two expressions and returns null if they are equal; returns the first expression if they are not equal
COALESCE	Returns the first non-null expression in the expression list

Note: For more information about the hundreds of functions available, see the "Functions" section in *Oracle Database SQL Language Reference* for 12*c* database.

NVL Function

Converts a null value to an actual value:

- Data types that can be used are date, character, and number.
- Data types must match:
  - `NVL(commission_pct,0)`
  - `NVL(hire_date,'01-JAN-97')`
  - `NVL(job_id,'No Job Yet')`

To convert a null value to an actual value, use the `NVL` function.

Syntax

`NVL (expr1, expr2)`

In the syntax:

- *expr1* is the source value or expression that may contain a null
- *expr2* is the target value for converting the null

You can use the `NVL` function with any data type, but the return value is always the same as the data type of *expr1*.

NVL Conversions for Various Data Types

Data Type	Conversion Example
`NUMBER`	`NVL(number_column,9)`
`DATE`	`NVL(date_column, '01-JAN-95')`
`CHAR or VARCHAR2`	`NVL(character_column, 'Unavailable')`

Using the NVL Function

```
SELECT last_name, salary, NVL(commission_pct, 0),
    (salary*12) + (salary*12*NVL(commission_pct, 0)) AN_SAL
FROM employees;
```

	LAST_NAME	SALARY	NVL(COMMISSION_PCT,0)	AN_SAL
1	King	24000	0	288000
2	Kochhar	17000	0	204000
3	De Haan	17000	0	204000
4	Hunold	9000	0	108000
5	Ernst	6000	0	72000
6	Lorentz	4200	0	50400
7	Mourgos	5800	0	69600
8	Rajs	3500	0	42000
9	Davies	3100	0	37200
10	Matos	2600	0	31200

...

To calculate the annual compensation of all employees, you need to multiply the monthly salary by 12 and then add the commission percentage to the result:

```
SELECT last_name, salary, commission_pct,
  (salary*12) + (salary*12*commission_pct) AN_SAL
FROM    employees;
```

	LAST_NAME	SALARY	COMMISSION_PCT	AN_SAL
1	King	24000	(null)	(null)
2	Kochhar	17000	(null)	(null)

...

14	Taylor	8600	0.2	123840
15	Grant	7000	0.15	96600
16	Whalen	4400	(null)	(null)
17	Hartstein	13000	(null)	(null)
18	Fay	6000	(null)	(null)
19	Higgins	12008	(null)	(null)
20	Gietz	8300	(null)	(null)

Notice that the annual compensation is calculated for only those employees who earn a commission. If any column value in an expression is null, the result is null. To calculate values for all employees, you must convert the null value to a number before applying the arithmetic operator. In the example in the slide, the NVL function is used to convert null values to zero.

Using the `NVL2` Function

```
SELECT last_name,  salary, commission_pct,          1
       NVL2(commission_pct,                          2
            'SAL+COMM', 'SAL') income
FROM    employees WHERE department_id IN (50, 80);
```

	LAST_NAME	SALARY	COMMISSION_PCT	INCOME
1	Mourgos	5800	(null)	SAL
2	Rajs	3500	(null)	SAL
3	Davies	3100	(null)	SAL
4	Matos	2600	(null)	SAL
5	Vargas	2500	(null)	SAL
6	Zlotkey	10500	0.2	SAL+COMM
7	Abel	11000	0.3	SAL+COMM
8	Taylor	8600	0.2	SAL+COMM

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The `NVL2` function examines the first expression. If the first expression is not null, the `NVL2` function returns the second expression. If the first expression is null, the third expression is returned.

Syntax

```
NVL2(expr1, expr2, expr3)
```

In the syntax:

- *expr1* is the source value or expression that may contain a null
- *expr2* is the value that is returned if *expr1* is not null
- *expr3* is the value that is returned if *expr1* is null

In the example shown in the slide, the `COMMISSION_PCT` column is examined. If a value is detected, the text literal value of `SAL+COMM` is returned. If the `COMMISSION_PCT` column contains a null value, the text literal value of `SAL` is returned.

Note: The argument *expr1* can have any data type. The arguments *expr2* and *expr3* can have any data types except `LONG`.

Using the `NULLIF` Function

```
SELECT first_name, LENGTH(first_name)  "expr1",
       last_name,  LENGTH(last_name)   "expr2",
       NULLIF(LENGTH(first_name), LENGTH(last_name))  result
FROM    employees;
```

	FIRST_NAME	expr1	LAST_NAME	expr2	RESULT
1	Ellen	5	Abel	4	5
2	Curtis	6	Davies	6	(null)
3	Lex	3	De Haan	7	3
4	Bruce	5	Ernst	5	(null)
5	Pat	3	Fay	3	(null)
6	William	7	Gietz	5	7
7	Kimberely	9	Grant	5	9
8	Michael	7	Hartstein	9	7
9	Shelley	7	Higgins	7	(null)

...

The `NULLIF` function compares two expressions.

Syntax

    NULLIF (*expr1, expr2*)

In the syntax:

- `NULLIF` compares *expr1* and *expr2*. If they are equal, the function returns null. If they are not, the function returns *expr1*. However, you cannot specify the literal `NULL` for *expr1*.

In the example shown in the slide, the length of the first name in the `EMPLOYEES` table is compared to the length of the last name in the `EMPLOYEES` table. When the lengths of the names are equal, a null value is displayed. When the lengths of the names are not equal, the length of the first name is displayed.

Using the `COALESCE` Function

- The advantage of the `COALESCE` function over the `NVL` function is that the `COALESCE` function can take multiple alternate values.
- If the first expression is not null, the `COALESCE` function returns that expression; otherwise, it does a `COALESCE` of the remaining expressions.

The `COALESCE` function returns the first non-null expression in the list.

Syntax

```
COALESCE (expr1, expr2, ... exprn)
```

In the syntax:

- `expr1` returns this expression if it is not null
- `expr2` returns this expression if the first expression is null and this expression is not null
- `exprn` returns this expression if the preceding expressions are null

Note that all expressions must be of the same data type.

Using the `COALESCE` Function

```
SELECT last_name, employee_id,
COALESCE(TO_CHAR(commission_pct),TO_CHAR(manager_id),
         'No commission and no manager')
FROM employees;
```

	LAST_NAME	EMPLOYEE_ID	COALESCE(TO_CHAR(COMMISSION_PCT),TO_CHAR(MANAGER_ID),'NOCOMMISSIONANDNOMANAGER')
1	King	100	No commission and no manager
2	Kochhar	101	100
3	De Haan	102	100
4	Hunold	103	102

...

13	Abel	174	.3
14	Taylor	176	.2
15	Grant	178	.15
16	Whalen	200	101
17	Hartstein	201	100
18	Fay	202	201
19	Higgins	205	101
20	Gietz	206	205

In the example shown in the slide, if the `manager_id` value is not null, it is displayed. If the `manager_id` value is null, the `commission_pct` is displayed. If the `manager_id` and `commission_pct` values are null, "No commission and no manager" is displayed. Note that `TO_CHAR` function is applied so that all expressions are of the same data type.

Example

For the employees who do not get any commission, your organization wants to give a salary increment of $2,000 and for employees who get commission, the query should compute the new salary that is equal to the existing salary added to the commission amount.

```
SELECT last_name, salary, commission_pct,
 COALESCE((salary+(commission_pct*salary)), salary+2000)"New
  Salary"
FROM    employees;
```

Note: Examine the output. For employees who do not get any commission, the New Salary column shows the salary incremented by $2,000 and for employees who get commission, the New Salary column shows the computed commission amount added to the salary.

	LAST_NAME	SALARY	COMMISSION_PCT	New Salary
1	King	24000	(null)	26000
2	Kochhar	17000	(null)	19000
3	De Haan	17000	(null)	19000
4	Hunold	9000	(null)	11000
5	Ernst	6000	(null)	8000
6	Lorentz	4200	(null)	6200
7	Mourgos	5800	(null)	7800
8	Rajs	3500	(null)	5500
9	Davies	3100	(null)	5100
10	Matos	2600	(null)	4600
11	Vargas	2500	(null)	4500
12	Zlotkey	10500	0.2	12600
13	Abel	11000	0.3	14300
14	Taylor	8600	0.2	10320
15	Grant	7000	0.15	8050
16	Whalen	4400	(null)	6400
17	Hartstein	13000	(null)	15000
18	Fay	6000	(null)	8000
19	Higgins	12008	(null)	14008
20	Gietz	8300	(null)	10300

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  - `DECODE`

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Conditional Expressions

- Provide the use of the `IF-THEN-ELSE` logic within a SQL statement.
- Use two methods:
  - `CASE` expression
  - `DECODE` function

The two methods that are used to implement conditional processing (`IF-THEN-ELSE` logic) in a SQL statement are the `CASE` expression and the `DECODE` function.

Note: The `CASE` expression complies with the ANSI SQL. The `DECODE` function is specific to Oracle syntax.

CASE Expression

Facilitates conditional inquiries by doing the work of an `IF-THEN-ELSE` statement:

```
CASE expr WHEN comparison_expr1 THEN return_expr1
         [WHEN comparison_expr2 THEN return_expr2
          WHEN comparison_exprn THEN return_exprn
          ELSE else_expr]
END
```

CASE expressions allow you to use the `IF-THEN-ELSE` logic in SQL statements without having to invoke procedures.

In a simple CASE expression, the Oracle server searches for the first `WHEN ... THEN` pair for which `expr` is equal to `comparison_expr` and returns `return_expr`. If none of the `WHEN ... THEN` pairs meet this condition, and if an `ELSE` clause exists, the Oracle server returns `else_expr`. Otherwise, the Oracle server returns a null. You cannot specify the literal `NULL` for all the `return_expr`s and the `else_expr`.

The expressions `expr` and `comparison_expr` must be of the same data type, which can be `CHAR`, `VARCHAR2`, `NCHAR`, or `NVARCHAR2`, `NUMBER`, `BINARY_FLOAT`, or `BINARY_DOUBLE` or must all have a numeric datatype. All of the return values (`return_expr`) must be of the same data type.

If all expressions have a numeric datatype, then Oracle determines the argument with the highest numeric precedence, implicitly converts the remaining arguments to that datatype, and returns that datatype.

Using the `CASE` Expression

Facilitates conditional inquiries by doing the work of an `IF-THEN-ELSE` statement:

```
SELECT  last_name, job_id, salary,
        CASE job_id WHEN 'IT_PROG'  THEN  1.10*salary
                    WHEN 'ST_CLERK' THEN  1.15*salary
                    WHEN 'SA_REP'   THEN  1.20*salary
        ELSE        salary END      "REVISED_SALARY"
FROM    employees;
```

	LAST_NAME	JOB_ID	SALARY	REVISED_SALARY
1	King	AD_PRES	24000	24000
...				
4	Hunold	IT_PROG	9000	9900
5	Ernst	IT_PROG	6000	6600
6	Lorentz	IT_PROG	4200	4620
7	Mourgos	ST_MAN	5800	5800
8	Rajs	ST_CLERK	3500	4025
9	Davies	ST_CLERK	3100	3565
10	Matos	ST_CLERK	2600	2990
11	Vargas	ST_CLERK	2500	2875
...				
13	Abel	SA_REP	11000	13200
14	Taylor	SA_REP	8600	10320
15	Grant	SA_REP	7000	8400

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In the SQL statement in the slide, the value of JOB_ID is decoded. If JOB_ID is IT_PROG, the salary increase is 10%; if JOB_ID is ST_CLERK, the salary increase is 15%; if JOB_ID is SA_REP, the salary increase is 20%. For all other job roles, there is no increase in salary.

The same statement can be written with the DECODE function.

The following code is an example of the searched CASE expression. In a searched CASE expression, the search occurs from left to right until an occurrence of the listed condition is found, and then it returns the return expression. If no condition is found to be true, and if an ELSE clause exists, the return expression in the ELSE clause is returned; otherwise, a NULL is returned.

```
SELECT last_name,salary,
(CASE WHEN salary<5000 THEN 'Low'
      WHEN salary<10000 THEN 'Medium'
      WHEN salary<20000 THEN 'Good'
      ELSE 'Excellent'
END) qualified_salary
FROM employees;
```

DECODE Function

Facilitates conditional inquiries by doing the work of a CASE expression or an IF-THEN-ELSE statement:

```
DECODE(col|expression, search1, result1
                   [, search2, result2,...,]
                   [, default])
```

The DECODE function decodes an expression in a way similar to the IF-THEN-ELSE logic that is used in various languages. The DECODE function decodes *expression* after comparing it to each *search* value. If the expression is the same as *search*, *result* is returned.

If the default value is omitted, a null value is returned where a search value does not match any of the result values.

Using the DECODE Function

```
SELECT last_name, job_id, salary,
       DECODE(job_id, 'IT_PROG',  1.10*salary,
                      'ST_CLERK', 1.15*salary,
                      'SA_REP',   1.20*salary,
              salary)
       REVISED_SALARY
FROM   employees;
```

	LAST_NAME	JOB_ID	SALARY	REVISED_SALARY
...				
4	Hunold	IT_PROG	9000	9900
5	Ernst	IT_PROG	6000	6600
6	Lorentz	IT_PROG	4200	4620
7	Mourgos	ST_MAN	5800	5800
8	Rajs	ST_CLERK	3500	4025
9	Davies	ST_CLERK	3100	3565
10	Matos	ST_CLERK	2600	2990
11	Vargas	ST_CLERK	2500	2875
12	Zlotkey	SA_MAN	10500	10500
...				
13	Abel	SA_REP	11000	13200
14	Taylor	SA_REP	8600	10320
15	Grant	SA_REP	7000	8400

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In the SQL statement in the slide, the value of JOB_ID is tested. If JOB_ID is IT_PROG, the salary increase is 10%; if JOB_ID is ST_CLERK, the salary increase is 15%; if JOB_ID is SA_REP, the salary increase is 20%. For all other job roles, there is no increase in salary.

The same statement can be expressed in pseudocode as an IF-THEN-ELSE statement:

```
IF job_id = 'IT_PROG'     THEN  salary = salary*1.10
IF job_id = 'ST_CLERK'    THEN  salary = salary*1.15
IF job_id = 'SA_REP'      THEN  salary = salary*1.20
ELSE salary = salary
```

Using the DECODE Function

Display the applicable tax rate for each employee in department 80:

```
SELECT last_name, salary,
       DECODE (TRUNC(salary/2000, 0),
                      0, 0.00,
                      1, 0.09,
                      2, 0.20,
                      3, 0.30,
                      4, 0.40,
                      5, 0.42,
                      6, 0.44,
                         0.45) TAX_RATE
FROM    employees
WHERE   department_id = 80;
```

This slide shows another example using the DECODE function. In this example, you determine the tax rate for each employee in department 80 based on the monthly salary. The tax rates are as follows:

Monthly Salary Range	Tax Rate
$0.00–1,999.99	00%
$2,000.00–3,999.99	09%
$4,000.00–5,999.99	20%
$6,000.00–7,999.99	30%
$8,000.00–9,999.99	40%
$10,000.00–11,999.99	42%
$12,200.00–13,999.99	44%
$14,000.00 or greater	45%

	LAST_NAME	SALARY	TAX_RATE
1	Zlotkey	10500	0.42
2	Abel	11000	0.42
3	Taylor	8600	0.4

Quiz

The `TO_NUMBER` function converts either character strings or date values to a number in the format specified by the optional format model.

  a. True

  b. False

Answer: b

Summary

In this lesson, you should have learned how to:

- Alter date formats for display using functions
- Convert column data types using functions
- Use `NVL` functions
- Use `IF-THEN-ELSE` logic and other conditional expressions in a `SELECT` statement

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Remember the following:

- Conversion functions can convert character, date, and numeric values: `TO_CHAR`, `TO_DATE`, `TO_NUMBER`
- There are several functions that pertain to nulls, including `NVL`, `NVL2`, `NULLIF`, and `COALESCE`.
- The `IF-THEN-ELSE` logic can be applied within a SQL statement by using the `CASE` expression or the `DECODE` function.

Practice 5: Overview

This practice covers the following topics:

- Creating queries that use `TO_CHAR`, `TO_DATE`, and other `DATE` functions
- Creating queries that use conditional expressions such as `DECODE` and `CASE`

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This practice provides a variety of exercises using `TO_CHAR` and `TO_DATE` functions, and conditional expressions such as `DECODE` and `CASE`. Remember that for nested functions, the results are evaluated from the innermost function to the outermost function.