2020

Lab Manual

Databases lab

Using Single-Row Functions to Customize Output

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2/22/2020

Student information:

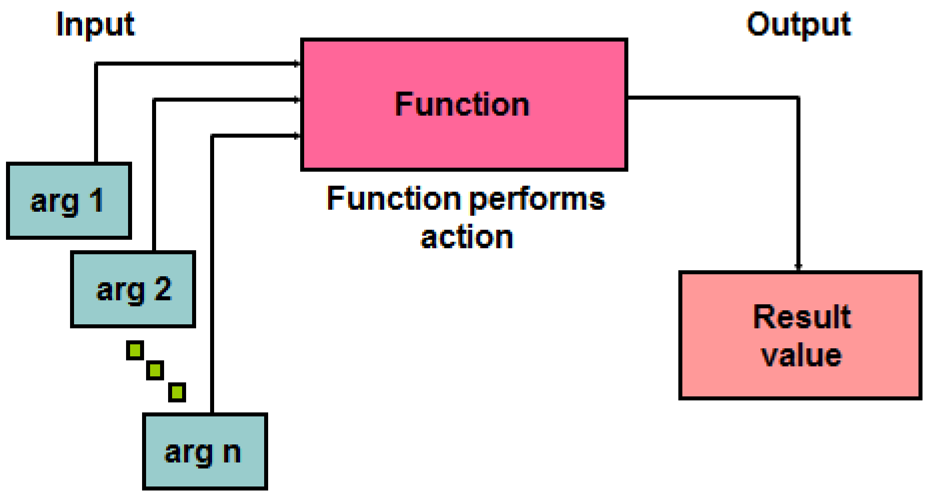
Student name	
Student number	
Grade	

Objectives

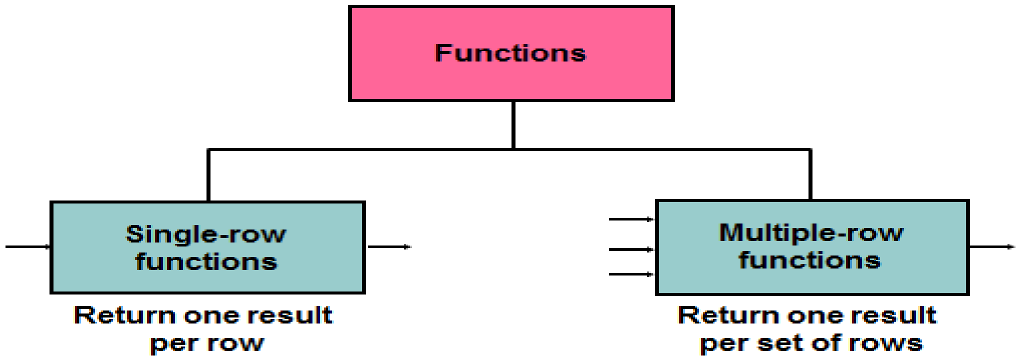
After completing this lesson, you should be able to do the following:

- **Describe various types of functions that are available in SQL**
- **Use character, number, and date functions in SELECT statements**

SQL Functions



Two Types of SQL Functions



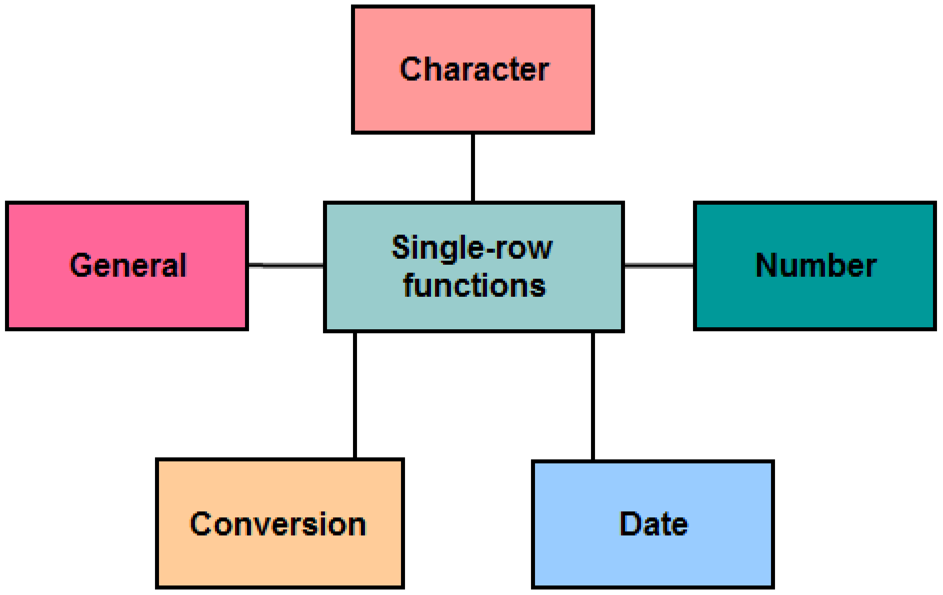
Single-Row Functions

Single-row functions:

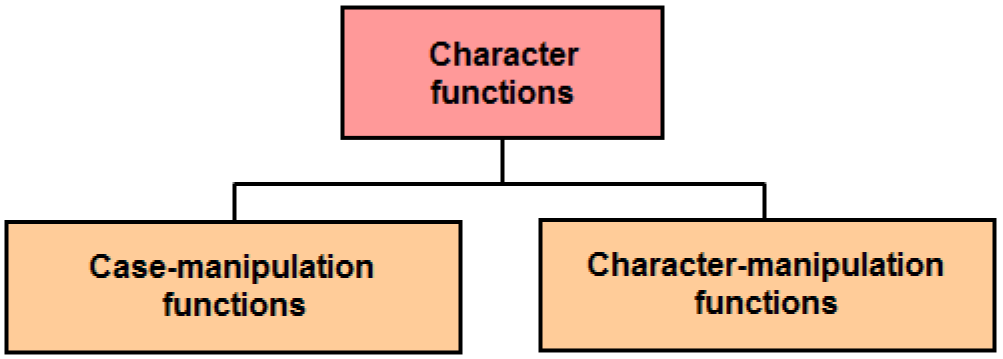
- **Manipulate data items**
- **Accept arguments and return one value**
- **Act on each row that is returned**
- **Return one result per row**
- **May modify the data type**
- **Can be nested**
- **Accept arguments that can be a column or an expression**

```
function_name [(arg1, arg2,...)]
```

Single-Row Functions



1. Character Functions



Case-manipulation functions	Character-manipulation functions
LOWER	CONCAT
UPPER	SUBSTR
INITCAP	LENGTH
	INSTR
	LPAD | RPAD
	TRIM
	REPLACE

Case-Manipulation Functions

These functions convert case for character strings:

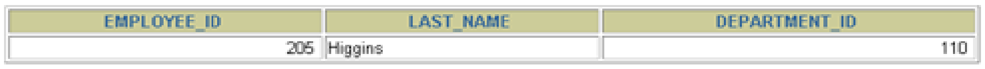
Function	Result
LOWER('SQL Course')	sql course
UPPER('SQL Course')	SQL COURSE
INITCAP('SQL Course')	Sql Course

Using Case-Manipulation Functions

Display the employee number, name, and department number for employee Higgins:

```
SELECT employee_id, last_name, department_id
FROM   employees
WHERE  last_name = 'higgins';
no rows selected
```

```
SELECT employee_id, last_name, department_id
FROM   employees
WHERE  LOWER(last_name) = 'higgins';
```



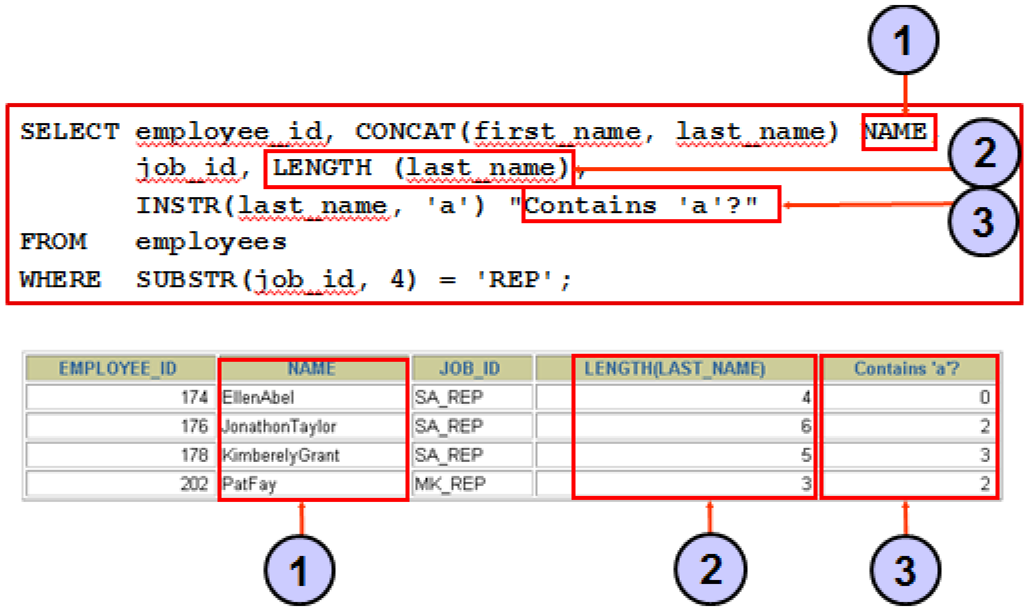
EMPLOYEE_ID	LAST_NAME	DEPARTMENT_ID
205	Higgins	110

Character-Manipulation Functions

These functions manipulate character strings:

Function	Result
CONCAT('Hello', 'World')	HelloWorld
SUBSTR('HelloWorld',1,5)	Hello
LENGTH('HelloWorld')	10
INSTR('HelloWorld', 'W')	6
LPAD(salary,10,'*')	*****24000
RPAD(salary, 10, '*')	24000*****
REPLACE ('JACK and JUE','J','BL')	BLACK and BLUE
TRIM('H' FROM 'HelloWorld')	elloWorld

Using the Character-Manipulation Functions



```
SELECT employee_id, CONCAT(first_name, last_name) NAME,
       job_id, LENGTH (last_name),
       INSTR(last_name, 'a') "Contains 'a'?"
FROM   employees
WHERE  SUBSTR(job_id, 4) = 'REP';
```

EMPLOYEE_ID	NAME	JOB_ID	LENGTH(LAST_NAME)	Contains 'a'?
174	EllenAbel	SA_REP	4	0
176	JonathonTaylor	SA_REP	6	2
178	KimberelyGrant	SA_REP	5	3
202	PatFay	MK_REP	3	2

2. Number Functions

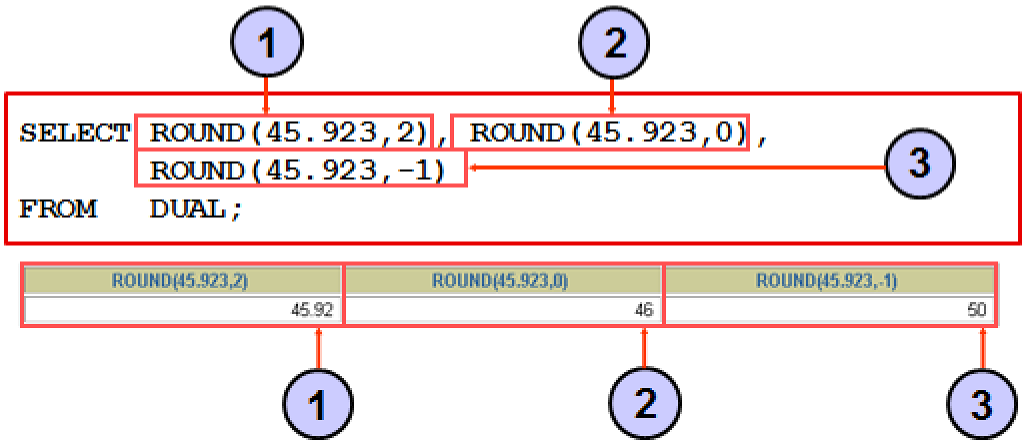
a. **ROUND: Rounds value to specified decimal**

b. **TRUNC: Truncates value to specified decimal**

c. **MOD: Returns remainder of division**

Function	Result
ROUND(45.926,2)	45.93
TRUNC(45.926,2)	45.92
MOD(1600,300)	100

Using the ROUND Function

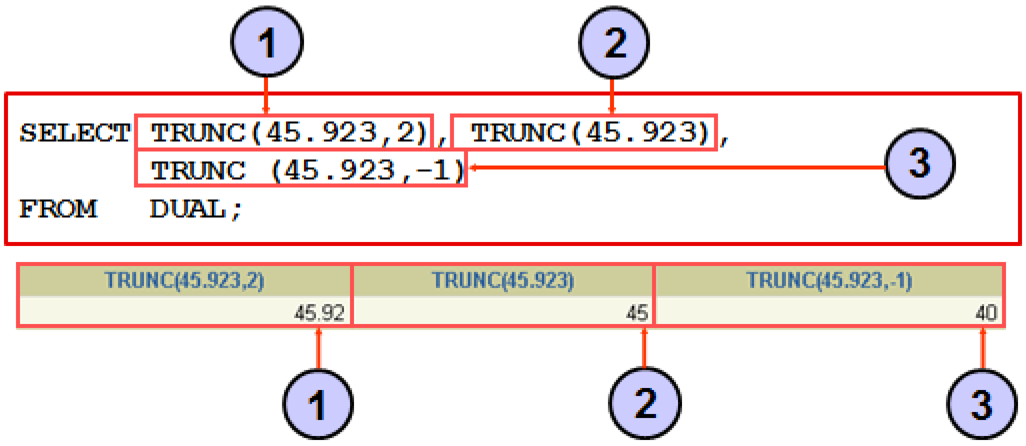


```
SELECT ROUND(45.923,2), ROUND(45.923,0),
       ROUND(45.923,-1)
FROM   DUAL;
```

ROUND(45.923,2)	ROUND(45.923,0)	ROUND(45.923,-1)
45.92	46	50

DUAL is a dummy table that you can use to view results from functions and calculations.

Using the TRUNC Function



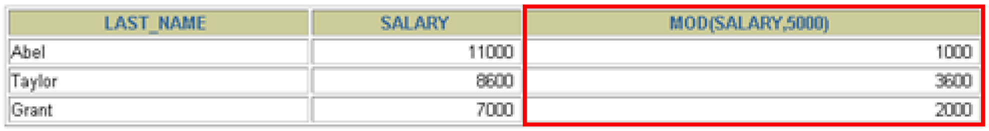
```
SELECT TRUNC(45.923,2), TRUNC(45.923),
       TRUNC (45.923,-1)
FROM   DUAL;
```

TRUNC(45.923,2)	TRUNC(45.923)	TRUNC(45.923,-1)
45.92	45	40

Using the MOD Function

For all employees with job title of Sales Representative, calculate the remainder of the salary after it is divided by 5,000.

```
SELECT last_name, salary, MOD(salary, 5000)
FROM   employees
WHERE  job_id = 'SA_REP';
```



LAST_NAME	SALARY	MOD(SALARY,5000)
Abel	11000	1000
Taylor	8600	3600
Grant	7000	2000

3. Working with Dates

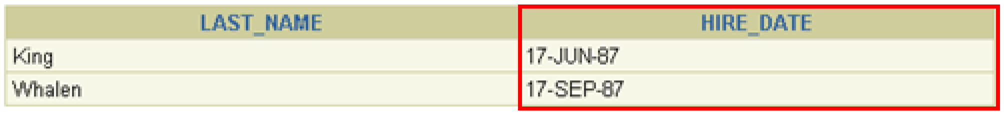
a. **The Oracle database stores dates in an internal numeric format: century, year, month, day, hours, minutes, and seconds.**

b. **The default date display format is DD-MON-RR.**

   i. **Enables you to store 21st-century dates in the 20th century by specifying only the last two digits of the year**

   ii. **Enables you to store 20th-century dates in the 21st century in the same way**

```
SELECT last_name, hire_date
FROM   employees
WHERE  hire_date < '01-FEB-88';
```



LAST_NAME	HIRE_DATE
King	17-JUN-87
Whalen	17-SEP-87

Note

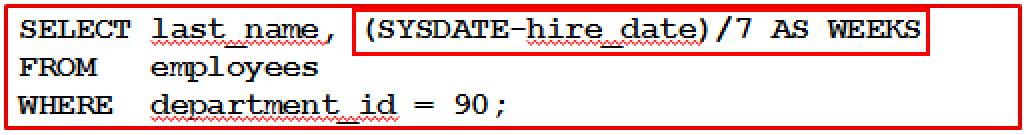
SYSDATE is a function that returns:

- **Date**
- **Time**

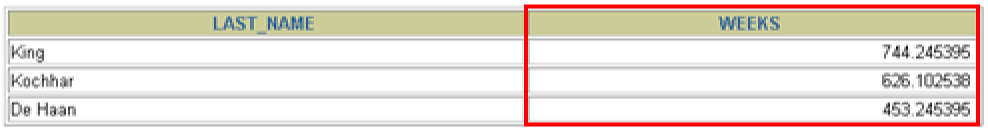
Arithmetic with Dates

- Add or subtract a number to or from a date for a resultant date value.
- Subtract two dates to find the number of days between those dates.
- Add hours to a date by dividing the number of hours by 24.

Using Arithmetic Operators with Dates



```
SELECT last_name, (SYSDATE-hire_date)/7 AS WEEKS
FROM   employees
WHERE  department_id = 90;
```



LAST_NAME	WEEKS
King	744.245395
Kochhar	626.102538
De Haan	453.245395

Date Functions

Function	Result
MONTHS_BETWEEN	Number of months between two dates
ADD_MONTHS	Add calendar months to date
NEXT_DAY	Next day of the date specified
LAST_DAY	Last day of the month
ROUND	Round date
TRUNC	Truncate date

Function	Result
MONTHS_BETWEEN ('01-SEP-95','11-JAN-94')	19.6774194
ADD_MONTHS ('11-JAN-94',6)	'11-JUL-94'
NEXT_DAY ('01-SEP-95','FRIDAY')	'08-SEP-95'
LAST_DAY ('01-FEB-95')	'28-FEB-95'

Practice 3: Overview of Part 1

This practice covers the following topics:

- Writing a query that displays the current date
- Creating queries that require the use of numeric, character, and date functions
- Performing calculations of years and months of service for an employee

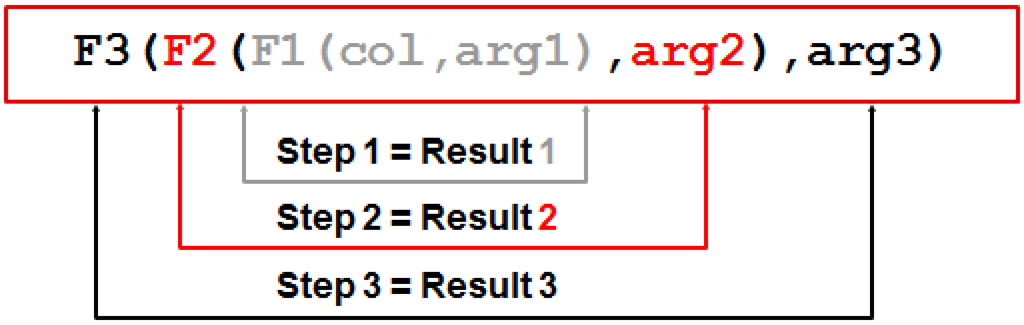
RR Date Format

Current Year	Specified Date	RR Format	YY Format
1995	27-OCT-95	1995	1995
1995	27-OCT-17	2017	1917
2001	27-OCT-17	2017	2017
2001	27-OCT-95	1995	2095

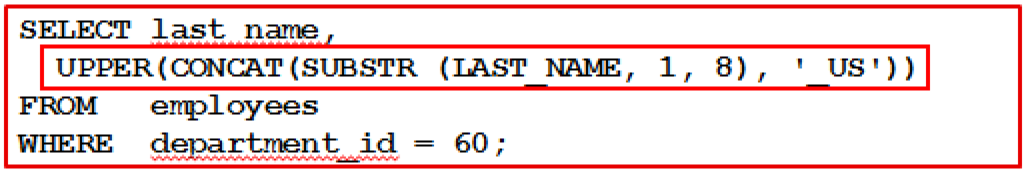
		If the specified two-digit year is:	
		0–49	50–99
If two digits of the current year are:	0–49	The return date is in the current century	The return date is in the century before the current one
	50–99	The return date is in the century after the current one	The return date is in the current century

Nesting Functions

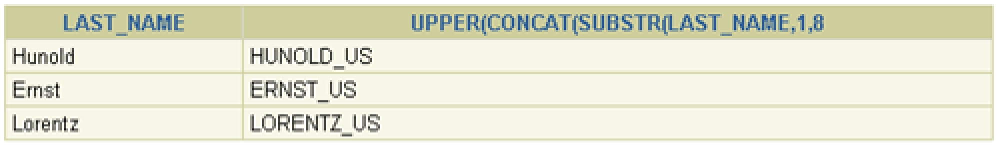
- Single-row functions can be nested to any level.
- Nested functions are evaluated from deepest level to the least deep level.



Nesting Functions



```
SELECT last_name,
  UPPER(CONCAT(SUBSTR (LAST_NAME, 1, 8), '_US'))
FROM   employees
WHERE  department_id = 60;
```



LAST_NAME	UPPER(CONCAT(SUBSTR(LAST_NAME,1,8
Hunold	HUNOLD_US
Ernst	ERNST_US
Lorentz	LORENTZ_US

General Functions

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

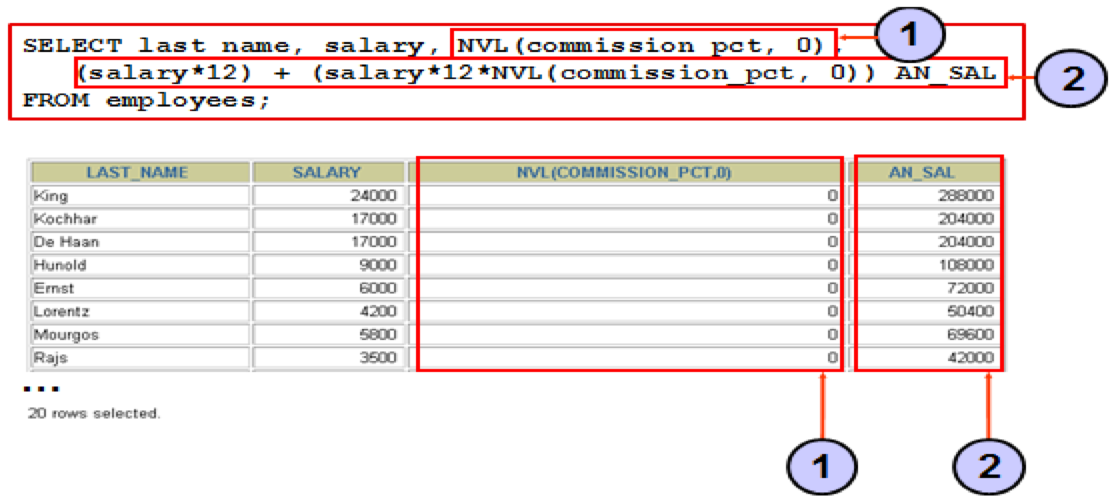
- **NVL (expr1, expr2)**
- **NVL2 (expr1, expr2, expr3)**
- **NULLIF (expr1, expr2)**
- **COALESCE (expr1, expr2, ..., expr*n*)**

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')**

Using the NVL Function



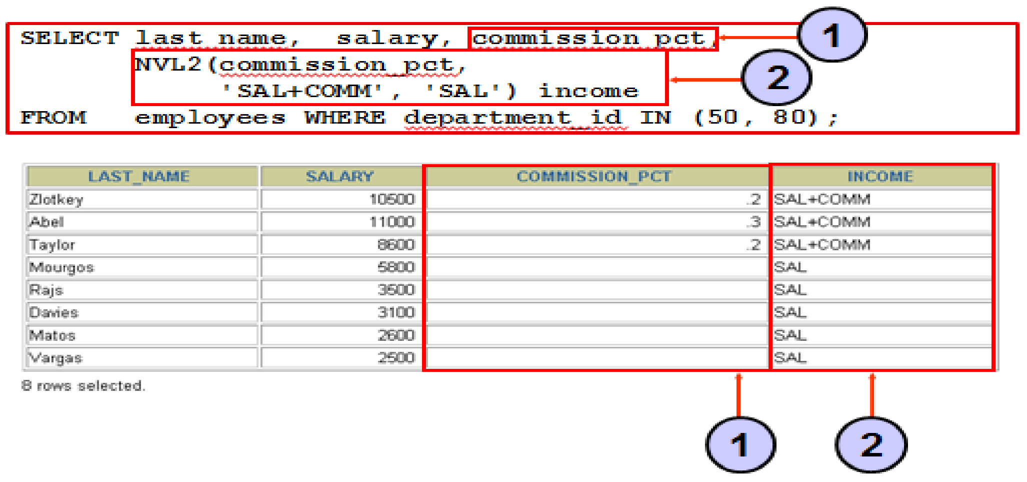
```
SELECT last_name, salary, NVL(commission_pct, 0),
   (salary*12) + (salary*12*NVL(commission_pct, 0)) AN_SAL
FROM employees;
```

LAST_NAME	SALARY	NVL(COMMISSION_PCT,0)	AN_SAL
King	24000	0	288000
Kochhar	17000	0	204000
De Haan	17000	0	204000
Hunold	9000	0	108000
Ernst	6000	0	72000
Lorentz	4200	0	50400
Mourgos	5800	0	69600
Rajs	3500	0	42000

...

20 rows selected.

Using the NVL2 Function

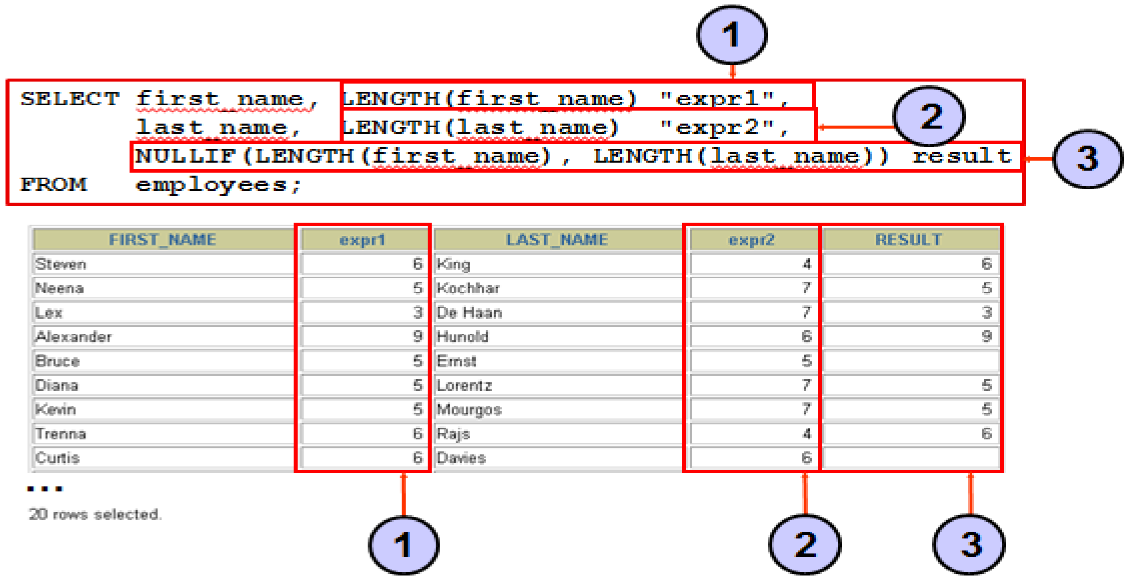


```
SELECT last_name,  salary, commission_pct,
        NVL2(commission_pct,
            'SAL+COMM', 'SAL') income
FROM    employees WHERE department_id IN (50, 80);
```

LAST_NAME	SALARY	COMMISSION_PCT	INCOME
Zlotkey	10500	.2	SAL+COMM
Abel	11000	.3	SAL+COMM
Taylor	8600	.2	SAL+COMM
Mourgos	5800		SAL
Rajs	3500		SAL
Davies	3100		SAL
Matos	2600		SAL
Vargas	2500		SAL

8 rows selected.

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
Steven	6	King	4	6
Neena	5	Kochhar	7	5
Lex	3	De Haan	7	3
Alexander	9	Hunold	6	9
Bruce	5	Ernst	5	
Diana	5	Lorentz	7	5
Kevin	5	Mourgos	7	5
Trenna	6	Rajs	4	6
Curtis	6	Davies	6	

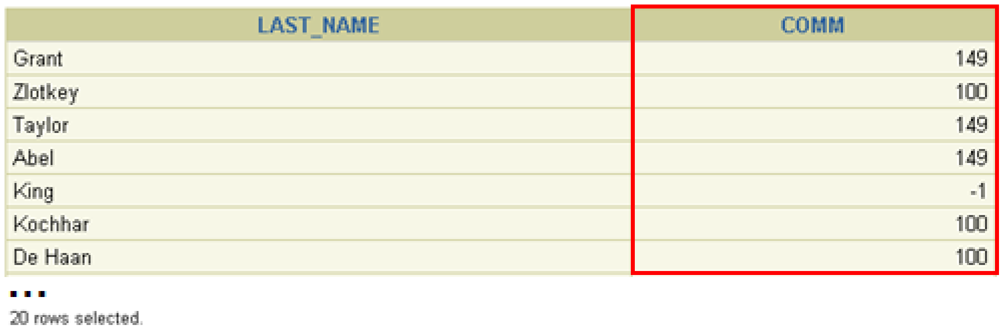
...

20 rows selected.

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.**

```
SELECT last_name,
       COALESCE(manager_id,commission_pct, -1) comm
FROM   employees
ORDER BY commission_pct;
```



LAST_NAME	COMM
Grant	149
Zlotkey	100
Taylor	149
Abel	149
King	-1
Kochhar	100
De Haan	100

...

20 rows selected.

Conditional Expressions

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

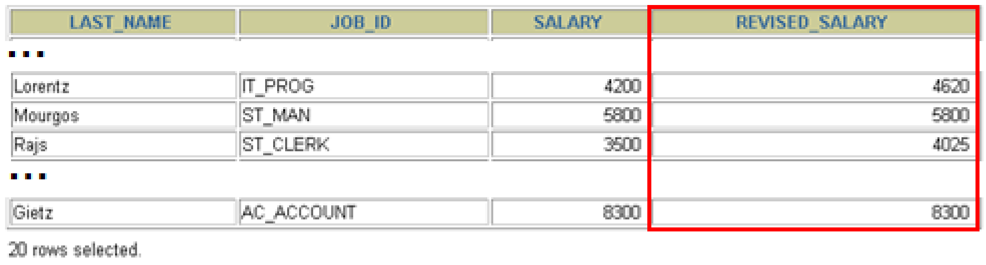
CASE Expression

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
```

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
...			
Lorentz	IT_PROG	4200	4620
Mourgos	ST_MAN	5800	5800
Rajs	ST_CLERK	3500	4025
...			
Gietz	AC_ACCOUNT	8300	8300

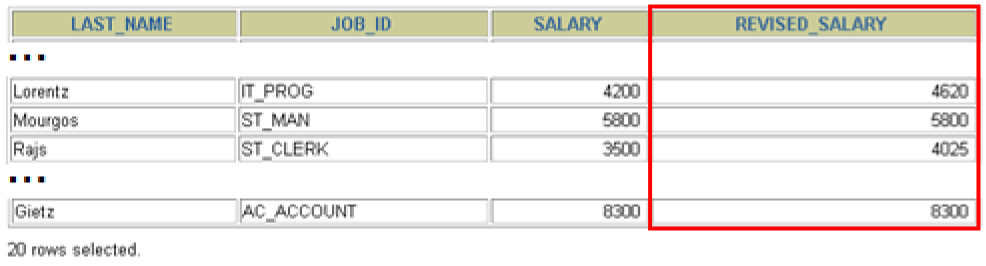
20 rows selected.

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])
```

```
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
...			
Lorentz	IT_PROG	4200	4620
Mourgos	ST_MAN	5800	5800
Rajs	ST_CLERK	3500	4025
...			
Gietz	AC_ACCOUNT	8300	8300

20 rows selected.

Using the DECODE Function

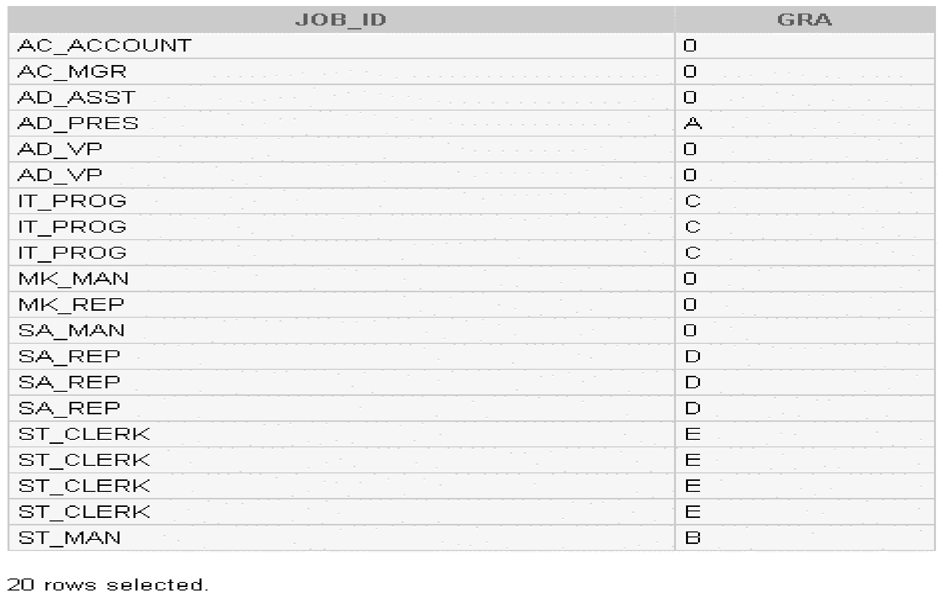
Display the applicable tax rate for each employee in department 80:

```
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;
```

Lab exercises:

Exercise 1: Using the DECODE function, write a query that displays the grade of all employees based on the value of the column JOB_ID, using the following data:

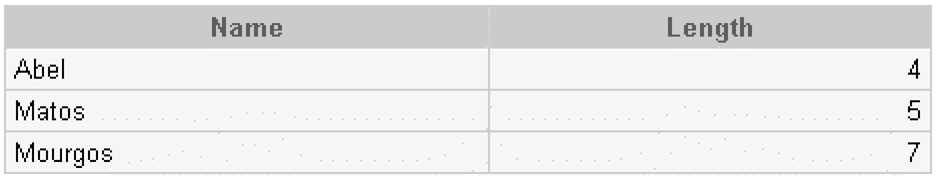
Job	*Grade*
AD_PRES	A
ST_MAN	B
IT_PROG	C
SA_REP	D
ST_CLERK	E
None of the above	0



JOB_ID	GRA
AC_ACCOUNT	0
AC_MGR	0
AD_ASST	0
AD_PRES	A
AD_VP	0
AD_VP	0
IT_PROG	C
IT_PROG	C
IT_PROG	C
MK_MAN	0
MK_REP	0
SA_MAN	0
SA_REP	D
SA_REP	D
SA_REP	D
ST_CLERK	E
ST_CLERK	E
ST_CLERK	E
ST_CLERK	E
ST_MAN	B

20 rows selected.

Exercise 2: Write a query that displays the last name (with the first letter uppercase and all other letters lowercase) and the length of the last name for all employees whose name starts with the letters J, A, or M. Give each column an appropriate label. Sort the results by the employees' last names.



Name	Length
Abel	4
Matos	5
Mourgos	7

Exercise 3: The HR department needs a report to display the employee number, last name, salary, and salary increased by 15.5% (expressed as a whole number) for each employee. Label the column New Salary.