

EXERCISE-6 **SINGLE ROW FUNCTION**

After the completion of this exercise, the students will be able to do the following:

- Describe various types of functions available in SQL.
- Use character, number and date functions in SELECT statement.
- Describe the use of conversion functions. **Single row functions:**

Manipulate data items.

Accept arguments and return one value.

Act on each row returned.

Return one result per row.

May modify the data type.

Can be nested.

Accept arguments which can be a column or an expression

Syntax

Function_name(arg1,...argn)

An argument can be one of the following

- ✓ User-supplied constant
- ✓ Variable value
- ✓ Column name
- ✓ Expression

Single Row

- Character Functions: Accept character input and can return both character and number values.
- Number functions: Accept numeric input and return numeric values.
- Date Functions: Operate on values of the DATE data type.
- Conversion Functions: Convert a value from one type to another.

Character Functions:

Case-manipulation functions Character-manipulation functions

1. Lower
2. Concat
3. Upper
4. Substr
5. Initcap
6. Length
7. Instr
8. Lpad/Rpad
9. Trim
10. Repalce

Function	Purpose
lower(column/expr)	Converts alpha character values to lowercase
upper(column/expr)	Converts alpha character values to uppercase
initcap(column/expr)	Converts alpha character values the to uppercase for the first letter of each word, all other letters in lowercase
concat(column1/expr1, column2/expr2)	Concatenates the first character to the second character

substr(column(expr,m,n)	Returns specified characters from character value starting at character position m, n characters long
length(column(expr)	Returns the number of characters in the expression
instr(column(expr,'string',m,n)	Returns the numeric position of a named string
lpad(column(expr, n, 'string')	Pads the character value right-justified to a total width of n character positions
rpad(column(expr, 'string', m,n)	Pads the character value left-justified to a total width of n character positions
trim(leading/trailing/both, trim_character FROM trim_source)	Enables you to trim heading or string, trailing or both from a character
replace(text, search_string, replacement_string)	

Example:

lower('SQL Course') → sql course
 upper('SQL Course') → SQL COURSE
 initcap('SQL Course') → Sql Course

SELECT 'The job id for'|| upper(last_name)||'is'||lower(job_id) AS "EMPLOYEE DETAILS" FROM employees;

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

Function	Result
CONCAT('hello', 'world')	helloworld
Substr('helloworld',1,5)	Hello
Length('helloworld')	10
Instr('helloworld', 'w')	6
Lpad(salary,10,'*')	*****2400 0
Rpad(salary,10,'*')	24000**** *
Trim('h' FROM 'helloworld')	elloworld

Command	Query	Output
initcap(char);	select initcap("hello") from dual;	Hello
lower (char); upper (char);	select lower ('HELLO') from dual; select upper ('hello') from dual;	Hello HELLO
ltrim (char,[set]);	select ltrim ('cseit', 'cse') from dual;	IT
rtrim (char,[set]);	select rtrim ('cseit', 'it') from dual;	CSE
replace (char,search string, replace string);	select replace ('jack and jue', 'j', 'bl') from dual;	black and blue
substr (char,m,n);	select substr ('information', 3, 4) from dual;	form

Example:

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)='ERP';

NUMBER FUNCTIONS

Function	Purpose
round(column/expr, n)	Rounds the value to specified decimal
trunc(column/expr,n)	Truncates value to specified decimal
mod(m,n)	Returns remainder of division

Example

Function	Result
round(45.926,2)	45.93
trunc(45.926,2)	45.92
mod(1600,300)	100

SELECT ROUND(45.923,2), ROUND(45.923,0), ROUND(45.923,-1) FROM dual; NOTE: Dual is a dummy table you can use to view results from functions and calculations. SELECT TRUNC(45.923,2), TRUNC(45.923), TRUNC(45.923,-2) FROM dual;

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

Working with Dates

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

- The default date display format is DD-MON-RR.
- Enables you to store 21st-century dates in the 20th century by specifying only the last two digits of the year
- Enables you to store 20th-century dates in the 21st century in the same way

Example

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

with Dates

SYSDATE is a function that returns:

- Date
- Time

Example

Display the current date using the DUAL table.

SELECT SYSDATE FROM DUAL;

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.

Arithmetic with Dates

Because the database stores dates as numbers, you can perform calculations using arithmetic Operators such as addition and subtraction. You can add and subtract number constants as well as dates. You can perform the following operations:

Operation Result Description

date + number Date Adds a number of days to a date
date - number Date Subtracts a number of days from a date
date - date Number of days Subtracts one date from another
date + number/24 Date Adds a number of hours to a date

Example

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

Date Functions

Date functions operate on Oracle dates. All date functions return a value of DATE data type except MONTHS_BETWEEN, which returns a numeric value.

- MONTHS_BETWEEN(date1, date2)::: Finds the number of months between date1 and date2. The result can be positive or negative. If date1 is later than date2, the result is positive; if date1 is earlier than date2, the result is negative. The noninteger part of the result represents a portion of the month.
- ADD_MONTHS(date, n)::: Adds n number of calendar months to date. The value of n must be an integer and

can be negative.

- **NEXT_DAY(date, 'char')**::: Finds the date of the next specified day of the week ('char') following date. The value of char may be a number representing a day or a character string.
- **LAST_DAY(date)**::: Finds the date of the last day of the month that contains date
- **ROUND(date[, 'fmt'])**::: Returns date rounded to the unit that is specified by the format model fmt. If the format model fmt is omitted, date is rounded to the nearest day.
- **TRUNC(date[, 'fmt'])**::: Returns date with the time portion of the day truncated to the unit that is specified by the format model fmt. If the format model fmt is omitted, date is truncated to the nearest day.

Using Date Functions

Example

Display the employee number, hire date, number of months employed, sixmonth review date, first Friday after hire date, and last day of the hire month for all employees who have been employed for fewer than 70 months.

```
SELECT employee_id, hire_date, MONTHS_BETWEEN(SYSDATE, hire_date)
TENURE, ADD_MONTHS(hire_date, 6) REVIEW, NEXT_DAY(hire_date, 'FRIDAY'),
LAST_DAY(hire_date)
FROM employees
WHERE MONTHS_BETWEEN(SYSDATE, hire_date) < 70;
```

Conversion Functions

This 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

Implicit Data Type Conversion

For assignments, the Oracle server can automatically convert the following:

For example, the expression hire_date > '01-JAN-90' results in the implicit conversion from the string '01-JAN-90' to a date.

For expression evaluation, the Oracle Server can automatically convert the following:

Explicit Data Type Conversion

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

Using the TO_CHAR Function with Dates

TO_CHAR(date, 'format_model')

The format model:

- Must be enclosed by 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

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

Elements of the Date Format Model

Sample Format Elements of Valid Date

Date Format Elements: Time Formats

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

Example

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

Modify example to display the dates in a format that appears as "Seventeenth of June 1987 12:00:00 AM."

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

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:

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

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

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 matching for the character argument and date format model of a TO_DATE function.
The fx modifier specifies exact matching 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, Oracle 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, numbers in the character argument can omit leading zeros.

```
SELECT last_name, hire_date FROM employees WHERE hire_date = TO_DATE('May 24, 1999',  
'fxMonth DD, YYYY');
```

Find the Solution for the following:

- Write a query to display the current date. Label the column Date.

Ans: SELECT CURRENT_DATE() AS Date;

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

Ans: `SELECT employee_id AS 'Employee Number', last_name, salary, ROUND(salary * 1.155) AS 'New Salary' FROM employees;`

3. Modify your query lab_03_02.sql to add a column that subtracts the old salary from the new salary. Label the column Increase.

Ans: `SELECT employee_id AS 'Employee Number', last_name, salary, ROUND(salary * 1.155) AS 'New Salary', ROUND(salary * 1.155) - salary AS Increase FROM employees;`

4. 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.

Ans: `SELECT CONCAT(UCASE(LEFT(last_name, 1)), LCASE(SUBSTRING(last_name, 2))) AS 'Formatted Last Name', LENGTH(last_name) AS 'Name Length' FROM employees WHERE last_name LIKE 'J%' OR last_name LIKE 'A%' OR last_name LIKE 'M%' ORDER BY last_name;`

5. Rewrite the query so that the user is prompted to enter a letter that starts the last name. For example, if the user enters H when prompted for a letter, then the output should show all employees whose last name starts with the letter H.

Ans: `SELECT CONCAT(UCASE(LEFT(last_name, 1)), LCASE(SUBSTRING(last_name, 2))) AS 'Formatted Last Name', LENGTH(last_name) AS 'Name Length' FROM employees WHERE last_name LIKE CONCAT('?', '%') ORDER BY last_name;`

6. The HR department wants to find the length of employment for each employee. For each employee, display the last name and calculate the number of months between today and the date on which the employee was hired. Label the column MONTHS_WORKED. Order your results by the number of months employed. Round the number of months up to the closest whole number. Note: Your results will differ.

Ans: `SELECT last_name, CEIL(TIMESTAMPDIFF(MONTH, hire_date, CURRENT_DATE())) AS MONTHS_WORKED FROM employees ORDER BY MONTHS_WORKED DESC;`

7. Create a report that produces the following for each employee:

<employee last name> earns <salary> monthly but wants <3 times salary>. Label the column Dream Salaries.

Ans: `SELECT CONCAT(last_name, ' earns ', salary, ' monthly but wants ', salary * 3) AS 'Dream Salaries' FROM employees;`

8. Create a query to display the last name and salary for all employees. Format the salary to be 15 characters long, left-padded with the \$ symbol. Label the column SALARY.

Ans: ~~SELECT~~ `last_name, LPAD(CONCAT('$', salary), 15, '$') AS SALARY FROM employees;`

9. Display each employee's last name, hire date, and salary review date, which is the first Monday after six months of service. Label the column REVIEW. Format the dates to appear in the format similar to "Monday, the Thirty-First of July, 2000."

Ans: SELECT last_name, hire_date, DATE_FORMAT(
 DATE_ADD(hire_date, INTERVAL (8 - DAYOFWEEK(DATE_ADD(hire_date,
 INTERVAL 6 MONTH))) % 7 DAY), '%W, the %D of %M, %Y') AS REVIEW
 FROM employees;

10. Display the last name, hire date, and day of the week on which the employee started. Label the column DAY. Order the results by the day of the week, starting with Monday.

Ans: SELECT last_name, hire_date, DAYNAME(hire_date) AS DAYFROM employees
 ORDER BY FIELD(DAYNAME(hire_date), 'Monday', 'Tuesday', 'Wednesday',
 'Thursday', 'Friday', 'Saturday', 'Sunday');

Evaluation Procedure	Marks awarded
Query(5)	5
Execution (5)	5
Viva(5)	5
Total (15)	15
Faculty Signature	Rajesh 19/05

Practice Questions

Introduction to Functions

1. For each task, choose whether a single-row or multiple row function would be most appropriate:

- a. Showing all of the email addresses in upper case letters **Single-Row**
- b. Determining the average salary for the employees in the sales department **Multiple-Row**
- c. Showing hire dates with the month spelled out (*September 1, 2004*) **Single-Row**
- d. Finding out the employees in each department that had the most seniority **Multiple-Row**
- e. Displaying the employees' salaries rounded to the hundreds place **Single-Row**
- f. Substituting zeros for null values when displaying employee commissions. **Single-Row**

2. The most common multiple-row functions are: AVG, COUNT, MAX, MIN, and SUM. Give your own definition for each of these functions.

Ans: **AVG()** – Calculates the average value of a numeric column.

COUNT() – Returns the number of rows that match a condition.

MAX() – Finds the highest value in a column.

MIN() – Finds the lowest value in a column.

SUM() – Adds up all values in a numeric column.

3. Test your definitions by substituting each of the multiple-row functions in this query. SELECT FUNCTION(salary) FROM employees. Write out each query and its results.

Ans: **SELECT AVG(salary) FROM employees;**

SELECT COUNT(salary) FROM employees;

SELECT MAX(salary) FROM employees;

SELECT MIN(salary) FROM employees;

SELECT SUM(salary) FROM employees;

Case and Character Manipulation

1. Using the three separate words "Oracle," "Internet," and "Academy," use one command to produce the following output: The Best Class Oracle Internet Academy

Ans: **SELECT CONCAT('The Best Class ', 'Oracle ', 'Internet ', 'Academy') AS Results;**

2. Use the string "Oracle Internet Academy" to produce the following output: The Net net

Ans: **SELECT CONCAT('The ', SUBSTRING('Oracle Internet Academy', 8, 3), ' ',**

LOWER(SUBSTRING('Oracle Internet Academy', 8, 3))) AS Result;

3. What is the length of the string "Oracle Internet Academy"?

Ans: **SELECT LENGTH('Oracle Internet Academy') AS Length;**

4. What's the position of "I" in "Oracle Internet Academy"?

Ans: **SELECT INSTR('Oracle Internet Academy', 'I') AS Position;**

5. Starting with the string "Oracle Internet Academy", pad the string to create

****Oracle****Internet****Academy****

Ans: **SELECT CONCAT('****', REPLACE('Oracle Internet Academy', ' ', '****'), '****') AS Padded;**

Number Functions

1. Display Oracle database employee last_name and salary for employee_ids between 100 and 102. Include a third column that divides each salary by 1.55 and rounds the result to two decimal places.

Ans: **SELECT last_name, salary, ROUND(salary / 1.55, 2) AS Adjusted_Salary FROM employees WHERE employee_id BETWEEN 100 AND 102;**

2. Display employee last_name and salary for those employees who work in department 80. Give each of them a raise of 5.333% and truncate the result to two decimal places.

Ans: **SELECT Last_name, Salary, TRUNCATE(salary * 1.05333, 2) AS New_Salary FROM employees WHERE department_id = 80;**

3. Use a MOD number function to determine whether 38873 is an even number or an odd number.

Ans: **SELECT MOD(38873, 2) AS Result;**

4. Use the DUAL table to process the following numbers:

845.553 - round to one decimal place

30695.348 - round to two decimal places

30695.348 - round to -2 decimal Places

2.3454 - truncate the .454 from the decimal places

Ans: **SELECT ROUND(845.553, 1) AS Rounded_1, ROUND(30695.348, 2) AS Rounded_2, ROUND(30695.348, -2) AS Rounded_Neg2, TRUNCATE(2.3454, 1) AS Truncated FROM DUAL;**

5. Divide each employee's salary by 3. Display only those employees' last names and salaries who earn salary that is a multiple of 3.

Ans: **SELECT last_name, salary FROM employees WHERE MOD(salary, 3) = 0;**

6. Divide 34 by 8. Show only the remainder of the division. Name the output as EXAMPLE.

Ans: **SELECT MOD(34, 8) AS EXAMPLE;**

7. How would you like your paycheck – rounded or truncated? What if your paycheck was calculated to be \$565.784 for the week, but you noticed that it was issued for \$565.78. The loss of .004 cent would probably make very little difference to you. However, what if this was done to a thousand people, a 100,000 people, or a million people! Would it make a difference then? How much difference?

Ans: **SELECT ROUND(565.784, 2) AS Rounded_Paycheck, TRUNCATE(565.784, 2) AS Truncated_Paycheck, ROUND(565.784, 2) - TRUNCATE(565.784, 2) AS Difference FROM DUAL;**

Evaluation Procedure	Marks awarded
Practice Evaluation (5)	5
Viva(5)	5
Total (10)	10
Faculty Signature	P. J. A. S. 9/9/25