Hands-on Lab : String Patterns, Sorting and Grouping

Estimated time needed: 35 minutes

In this lab, you will go through some SQL practice problems that will provide hands-on experience with string patterns, sorting result sets and grouping result sets.

Software Used in this Lab

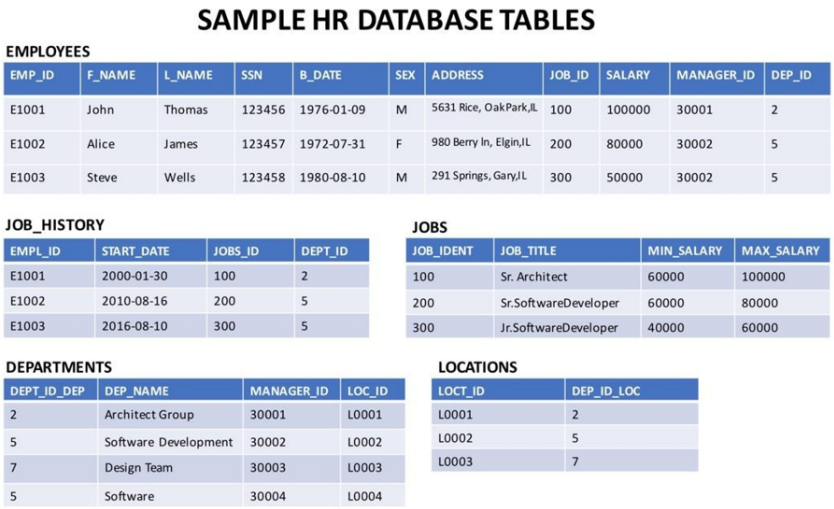
In this lab, you will use an IBM Db2 Database. Db2 is a Relational Database Management System (RDBMS) from IBM, designed to store, analyze and retrieve data efficiently.

To complete this lab you will utilize a Db2 database service on IBM Cloud. If you did not already complete this lab task earlier in this module, you will not yet have access to Db2 on IBM Cloud, and you will need to follow the lab below first:

- Hands-on Lab : Sign up for IBM Cloud, Create Db2 service instance and Get started with the Db2 console

Database Used in this Lab

The database used in this lab is an internal database. You will be working on a sample HR database. This HR database schema consists of 5 tables called **EMPLOYEES**, **JOB_HISTORY**, **JOBS**, **DEPARTMENTS** and **LOCATIONS**. Each table has a few rows of sample data. The following diagram shows the tables for the HR database:



NOTE: This lab requires you to have all 5 of these tables of the HR database populated with sample data on Db2. If you didn't complete the earlier lab in this module, you won't have the tables above populated with sample data on Db2, so you will need to go through the lab below first:

- Hands-on Lab : Create tables using SQL scripts and Load data into tables

Objectives

After completing this lab, you will be able to:

- Simplify a SELECT statement by using string patterns, ranges, or sets of values
- Sort the result set in either ascending or descending order and identify which column to use for the sorting order
- Eliminate duplicates from a result set and further restrict a result set

NOTE : Make sure that you are using the CSV file and datasets from the same instruction file.

Instructions

When you approach the exercises in this lab, follow the instructions to run the queries on Db2:

- Go to the Resource List of IBM Cloud by logging in where you can find the Db2 service instance that you created in a previous lab under **Services** section. Click on the **Db2-xx service**. Next, open the Db2 Console by clicking on **Open Console** button. Click on the 3-bar menu icon in the top left corner and go to the **Run SQL** page. The Run SQL tool enables you to run SQL statements.
    - If needed, follow Hands-on Lab : Sign up for IBM Cloud, Create Db2 service instance and Get started with the Db2 console

Exercise 1: String Patterns

In this exercise, you will go through some SQL problems on String Patterns.

1. Problem:

Retrieve all employees whose address is in Elgin,IL.

▼ Hint

Use the LIKE operator to find similar strings.

▼ Solution

```
1. 1
2. 2
3. 3
1. SELECT F_NAME , L_NAME
2. FROM EMPLOYEES
3. WHERE ADDRESS LIKE '%Elgin,IL%';
```

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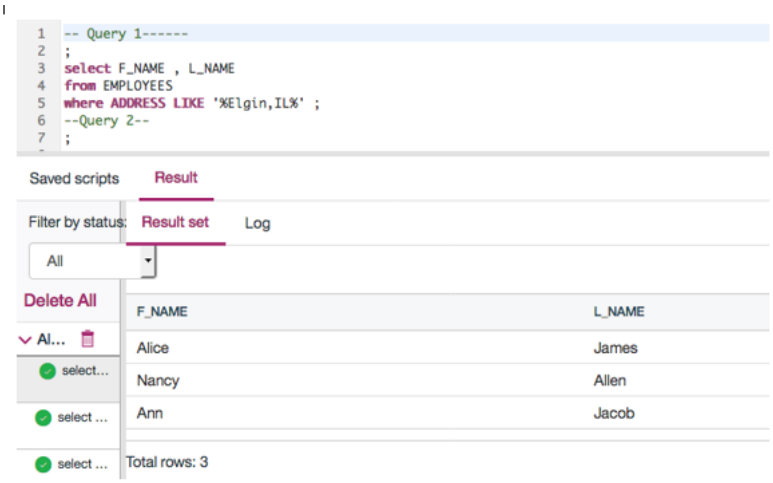
▼ Output



2. Problem:

Retrieve all employees who were born during the 1970's.

▼ Hint

Use the LIKE operator to find similar strings.

▼ Solution

```
1. 1
2. 2
3. 3
1. SELECT F_NAME , L_NAME
2. FROM EMPLOYEES
3. WHERE B_DATE LIKE '197%';
```

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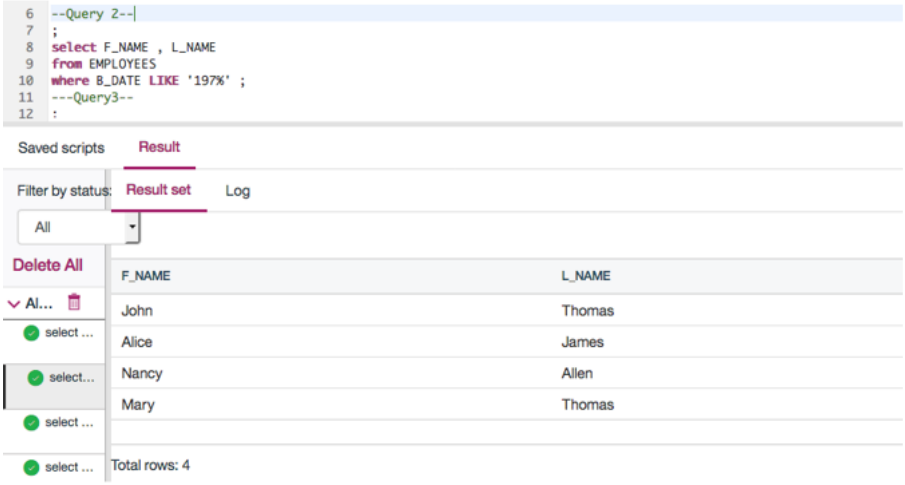
▼ Output



3. Problem:

Retrieve all employees in department 5 whose salary is between 60000 and 70000.

▼ Hint

Use the keyword BETWEEN for this SQL problem.

▼ Solution

```
1. 1
2. 2
3. 3
1. SELECT *
2. FROM EMPLOYEES
3. WHERE (SALARY BETWEEN 60000 AND 70000) AND DEP_ID = 5;
```

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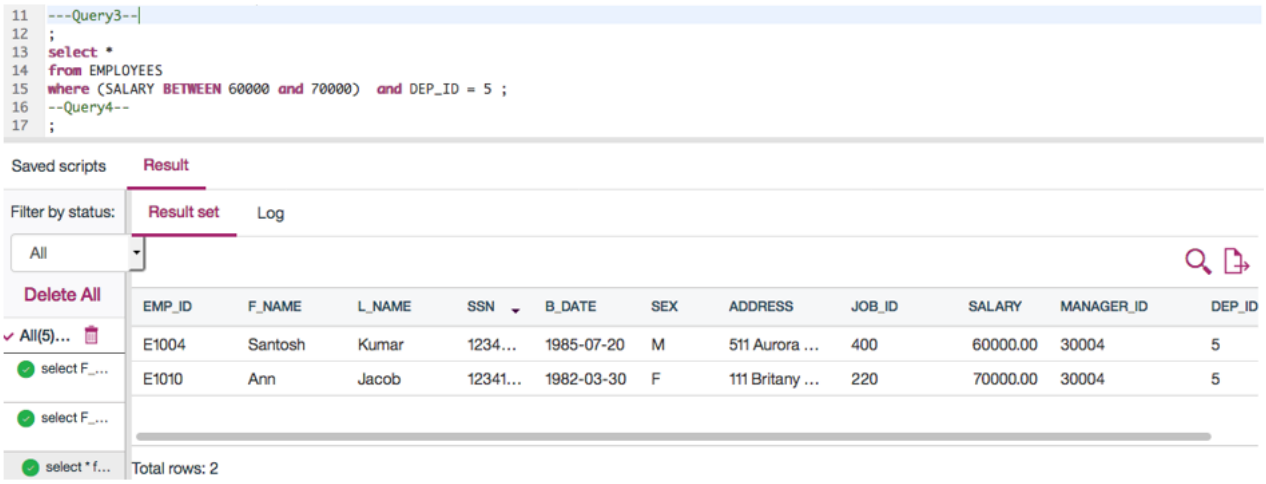
▼ Output



Exercise 2: Sorting

In this exercise, you will go through some SQL problems on Sorting.

1. Problem:

Retrieve a list of employees ordered by department ID.

▼ Hint

Use the ORDER BY clause for this SQL problem. By default, the ORDER BY clause sorts the records in ascending order.

▼ Solution

```
1. 1
2. 2
3. 3
1. SELECT F_NAME, L_NAME, DEP_ID
2. FROM EMPLOYEES
3. ORDER BY DEP_ID;
```

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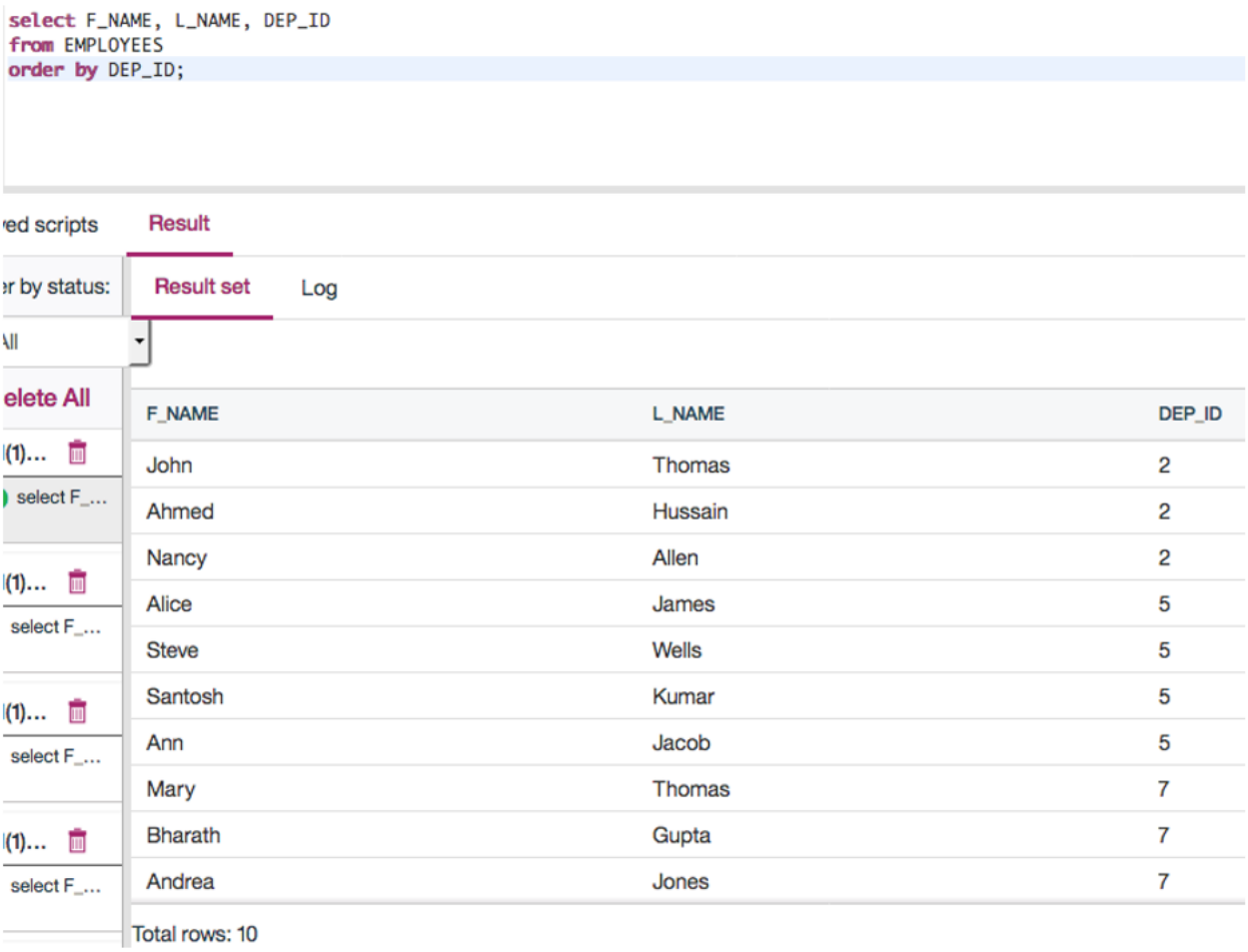
▼ Output



2. Problem:

   Retrieve a list of employees ordered in descending order by department ID and within each department ordered alphabetically in descending order by last name.

▼ Hint

Use the ORDER BY clause with DESC for this SQL problem.

▼ Solution

```
1. 1
2. 2
3. 3
1. SELECT F_NAME, L_NAME, DEP_ID
2. FROM EMPLOYEES
3. ORDER BY DEP_ID DESC, L_NAME DESC;
```

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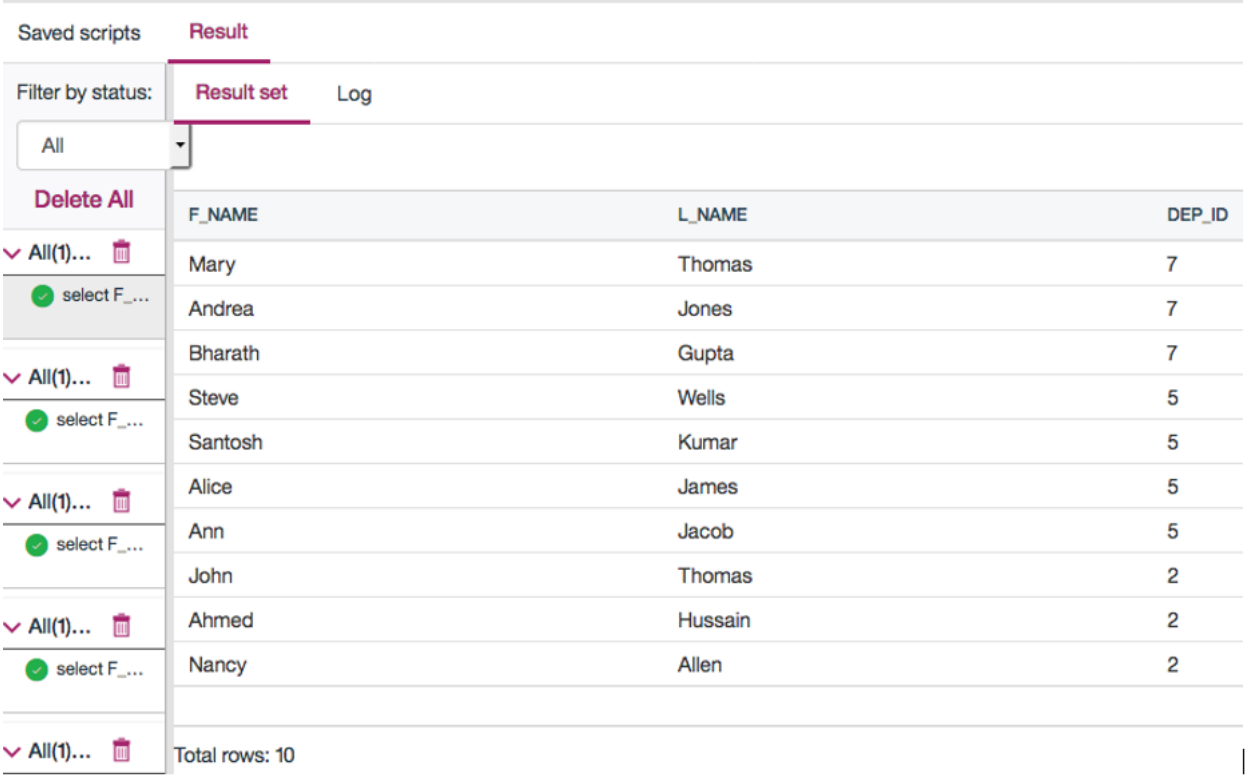
▼ Output

```
select F_NAME, L_NAME, DEP_ID
from EMPLOYEES
order by DEP_ID desc, L_NAME desc;
```



F_NAME	L_NAME	DEP_ID
Mary	Thomas	7
Andrea	Jones	7
Bharath	Gupta	7
Steve	Wells	5
Santosh	Kumar	5
Alice	James	5
Ann	Jacob	5
John	Thomas	2
Ahmed	Hussain	2
Nancy	Allen	2

3. (Optional) Problem:

   In SQL problem 2 (Exercise 2 Problem 2), use department name instead of department ID. Retrieve a list of employees ordered by department name, and within each department ordered alphabetically in descending order by last name.

▼ Hint

Department name is in the DEPARTMENTS table. So your query will need to retrieve data from more than one table. Don鴿worry if you are not able to figure this SQL problem out. We鬪 cover working with multiple tables in the lecture **Working with Multiple Tables**.

▼ Solution

```
1. 1
2. 2
3. 3
4. 4
1. SELECT D.DEP_NAME , E.F_NAME, E.L_NAME
2. FROM EMPLOYEES as E, DEPARTMENTS as D
3. WHERE E.DEP_ID = D.DEPT_ID_DEP
4. ORDER BY D.DEP_NAME, E.L_NAME DESC;
```

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In the SQL Query above, `D` and `E` are aliases for the table names. Once you define an alias like `D` in your query, you can simply write `D.COLUMN_NAME` rather than the full form `DEPARTMENTS.COLUMN_NAME`.

▼ Output

```
--Query4--
;
select D.DEP_NAME , E.F_NAME, E.L_NAME
from EMPLOYEES as E, DEPARTMENTS as D
where E.DEP_ID = D.DEPT_ID_DEP
order by D.DEP_NAME, E.L_NAME desc ;
--Query5--
```

Saved scripts | Result

Filter by status: | Result set | Log

All

Delete All

All(5)...

select F_...

select F_...

select * fr...

select D...

select DE...

DEP_NAME	F_NAME	L_NAME
Architect Group	John	Thomas
Architect Group	Ahmed	Hussain
Architect Group	Nancy	Allen
Design Team	Mary	Thomas
Design Team	Andrea	Jones
Design Team	Bharath	Gupta
Software Group	Steve	Wells
Software Group	Santosh	Kumar
Software Group	Alice	James
Software Group	Ann	Jacob

Total rows: 10

Exercise 3: Grouping

In this exercise, you will go through some SQL problems on Grouping.

NOTE: The SQL problems in this exercise involve usage of SQL Aggregate functions AVG and COUNT. COUNT has been covered earlier. AVG is a function that can be used to calculate the Average or Mean of all values of a specified column in the result set. For example, to retrieve the average salary for all employees in the EMPLOYEES table, issue the query: `SELECT AVG(SALARY) FROM EMPLOYEES;`. You will learn more about AVG and other aggregate functions later in the lecture **Built-in Database Functions**.

1. Problem:

   For each department ID retrieve the number of employees in the department.

▼ Hint

Use COUNT(*) to retrieve the total count of a column, and then GROUP BY.

▼ Solution

```
1. 1
2. 2
3. 3
1. SELECT DEP_ID, COUNT(*)
2. FROM EMPLOYEES
3. GROUP BY DEP_ID;
```

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▼ Output

```
select DEP_ID, COUNT(*)
from EMPLOYEES
group by DEP_ID;
```

ved scripts | Result

er by status: | Result set | Log

All

lete All

select...

select ...

DEP_ID	2
2	3
5	4
7	3

Total rows: 3

2. Problem:

For each department retrieve the number of employees in the department, and the average employee salary in the department..

▼ Hint

Use COUNT(*) to retrieve the total count of a column, and AVG() function to compute average salaries, and then GROUP BY.

▼ Solution

```
1. 1
2. 2
3. 3
1. SELECT DEP_ID, COUNT(*), AVG(SALARY)
2. FROM EMPLOYEES
3. GROUP BY DEP_ID;
```

Copied!

▼ Output

3. Problem:

Label the computed columns in the result set of SQL problem 2 (Exercise 3 Problem 2) as NUM_EMPLOYEES and AVG_SALARY.

▼ Hint

Use SQL Aliases: `column_name AS alias_name`. For example, AVG(SALARY) AS “AVG_SALARY”.

▼ Solution

```
1. 1
2. 2
3. 3
1. SELECT DEP_ID, COUNT(*) AS "NUM_EMPLOYEES", AVG(SALARY) AS "AVG_SALARY"
2. FROM EMPLOYEES
3. GROUP BY DEP_ID;
```

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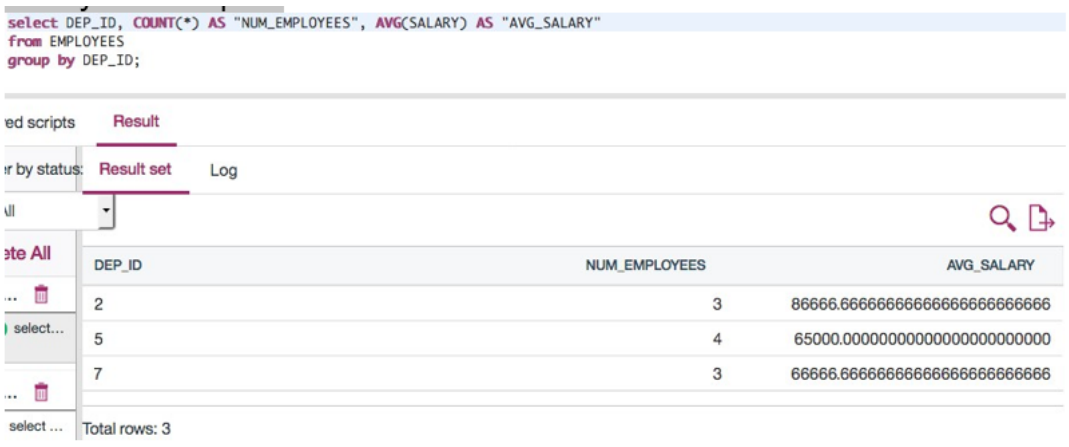
▼ Output



4. Problem:

In SQL problem 3 (Exercise 3 Problem 3), order the result set by Average Salary..

▼ Hint

Use ORDER BY after the GROUP BY.

▼ Solution

```
1. 1
2. 2
3. 3
4. 4
1. SELECT DEP_ID, COUNT(*) AS "NUM_EMPLOYEES", AVG(SALARY) AS "AVG_SALARY"
2. FROM EMPLOYEES
3. GROUP BY DEP_ID
4. ORDER BY AVG_SALARY;
```

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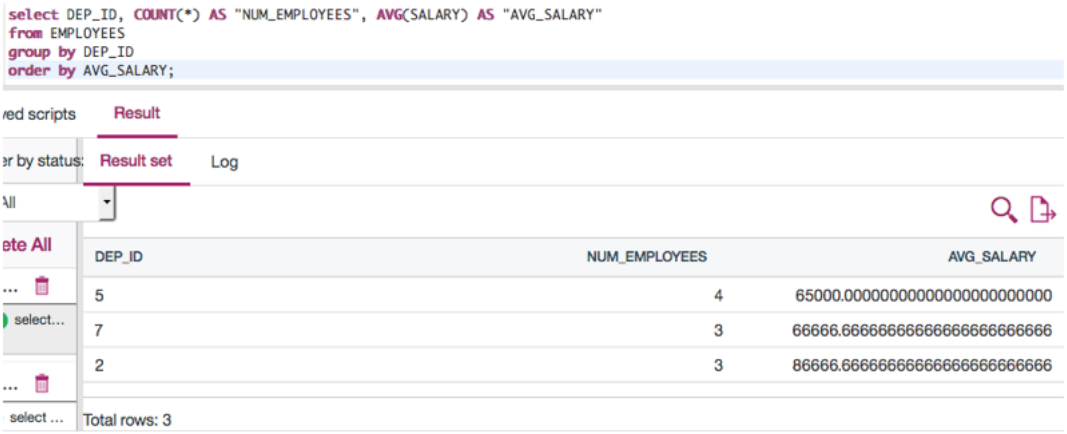
▼ Output



5. Problem:

In SQL problem 4 (Exercise 3 Problem 4), limit the result to departments with fewer than 4 employees.

▼ Hint

Use HAVING after the GROUP BY, and use the count() function in the HAVING clause instead of the column label.

▼ Solution

```
1. 1
2. 2
3. 3
4. 4
5. 5
1. SELECT DEP_ID, COUNT(*) AS "NUM_EMPLOYEES", AVG(SALARY) AS "AVG_SALARY"
2. FROM EMPLOYEES
3. GROUP BY DEP_ID
4. HAVING count(*) < 4
5. ORDER BY AVG_SALARY;
```

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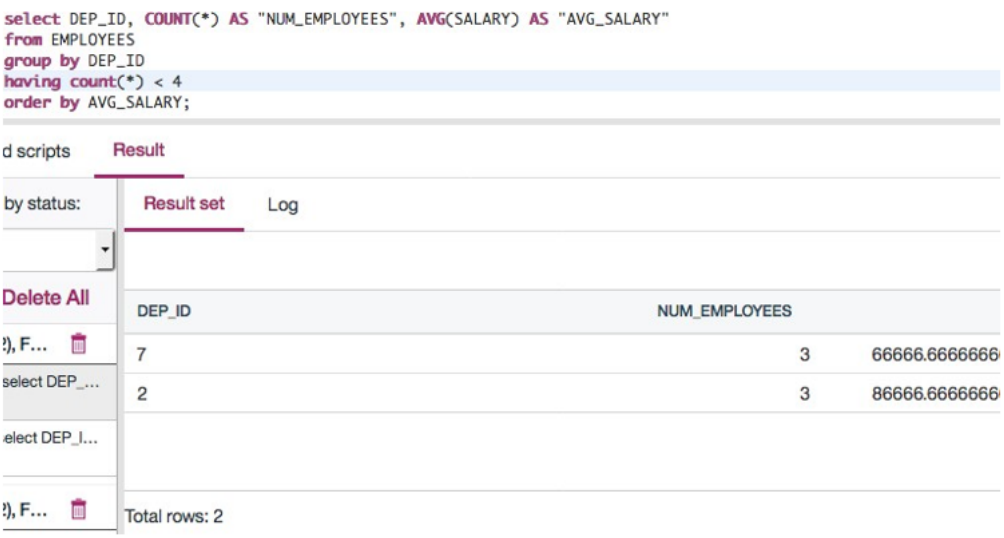
▼ Output



Solution Script

If you would like to run all the solution queries of the SQL problems of this lab with a script, download the script below. Upload the script to the Db2 console and run. Follow Hands-on Lab : Create tables using SQL scripts and Load data into tables on how to upload a script to Db2 console and run it.

- StringPattern-Sorting-Grouping_Solution_Script.sql

Congratulations! You have completed this lab, and you are ready for the next topic.

Author(s)

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Changelog

Date	Version	Changed by	Change Description
2023-05-10	2.2	Eric Hao & Vladislav Boyko	Updated Page Frames
2020-12-24	2.1	Steve Ryan	ID Reviewed
2020-12-08	2.0	Sandip Saha Joy	Created revised version from DB0201EN
2020	1.0	Rav Ahuja	Created initial version