



Hands-on Lab: String Patterns, Sorting and Grouping in MySQL using phpMyAdmin

Estimated time needed: 20 minutes

In this lab, you will learn how to create tables and load data in the MySQL database service using the phpMyAdmin graphical user interface (GUI) tool.

Software Used in this Lab

In this lab, you will use [MySQL](#). MySQL is a Relational Database Management System (RDBMS) designed to efficiently store, manipulate, and retrieve data.



To complete this lab you will utilize MySQL relational database service available as part of IBM Skills Network Labs (SN Labs) Cloud IDE. SN Labs is a virtual lab environment used in this course.

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:

SAMPLE HR DATABASE TABLES

EMPLOYEES

EMP_ID	F_NAME	L_NAME	SSN	B_DATE	SEX	ADDRESS	JOB_ID	SALARY	MANAGER_ID	DEP_ID
E1001	John	Thomas	123456	1976-01-09	M	5631 Rice, OakPark,IL	100	100000	30001	2
E1002	Alice	James	123457	1972-07-31	F	980 Berry Ln, Elgin,IL	200	80000	30002	5
E1003	Steve	Wells	123458	1980-08-10	M	291 Springs, Gary,IL	300	50000	30002	5

JOB_HISTORY

EMPL_ID	START_DATE	JOBS_ID	DEPT_ID
E1001	2000-01-30	100	2
E1002	2010-08-16	200	5
E1003	2016-08-10	300	5

JOBS

JOB_ID	JOB_TITLE	MIN_SALARY	MAX_SALARY
100	Sr. Architect	60000	100000
200	Sr. Software Developer	60000	80000
300	Jr. Software Developer	40000	60000

DEPARTMENTS

DEPT_ID	DEPT_NAME	MANAGER_ID	LOC_ID
2	Architect Group	30001	L0001
5	Software Development	30002	L0002
7	Design Team	30003	L0003
5	Software	30004	L0004

LOCATIONS

LOC_ID	DEPT_ID	LOC
L0001	2	
L0002	5	
L0003	7	

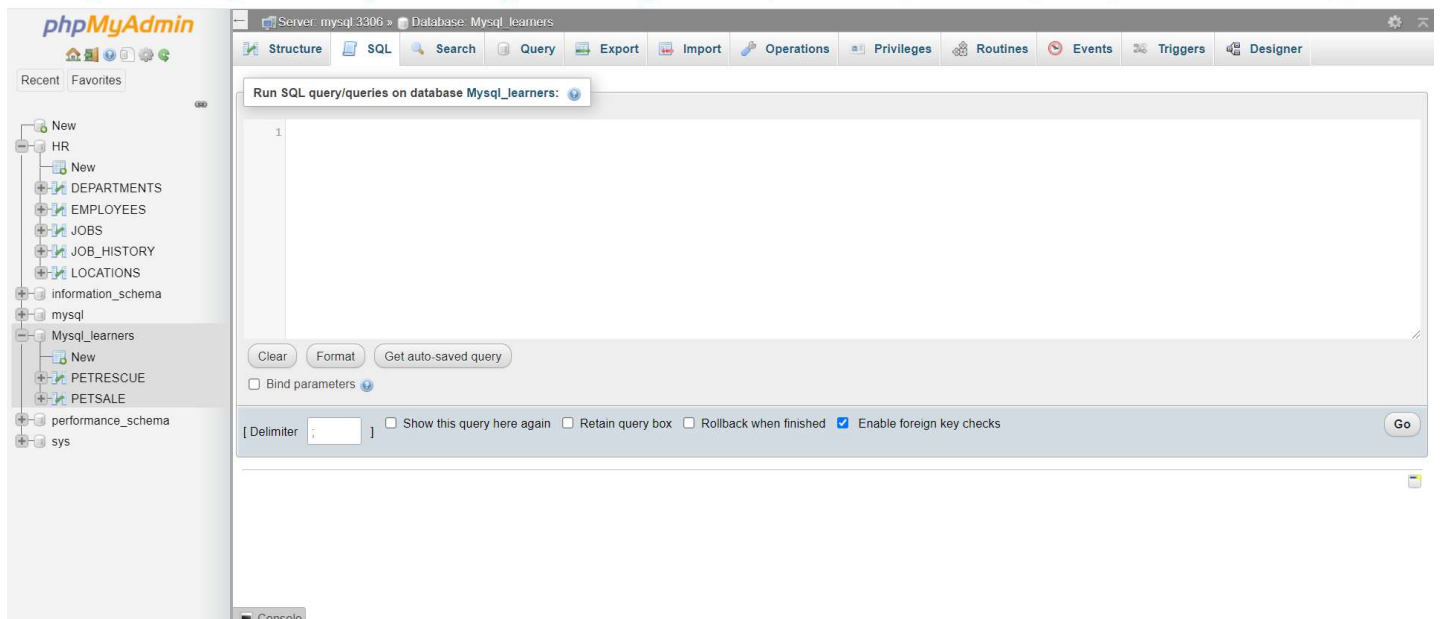
Objectives

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

Once the tables are loaded open the sql editor to start executing the functions.



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

```
SELECT F_NAME , L_NAME
FROM EMPLOYEES
WHERE ADDRESS LIKE '%Elgin,IL%';
```

▼ Output

The screenshot shows the phpMyAdmin interface with the SQL query entered in the editor. The query is: `SELECT F_NAME , L_NAME FROM EMPLOYEES WHERE ADDRESS LIKE '%Elgin,IL%';`. The output is displayed in a table with two columns: F_NAME and L_NAME. The table contains three rows of data: Alice James, Nancy Allen, and Ann Jacob.

	F_NAME	L_NAME
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	Alice	James
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	Nancy	Allen
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	Ann	Jacob

2. Problem:

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

▼ Hint













Use the LIKE operator to find similar strings.

▼ Solution

```
SELECT F_NAME , L_NAME
FROM EMPLOYEES
WHERE B_DATE LIKE '197%';
```

▼ Output

```
SELECT F_NAME , L_NAME
FROM EMPLOYEES
WHERE B_DATE LIKE '197%';
```

					F_NAME	L_NAME
<input type="checkbox"/>	 Edit	 Copy	 Delete	John	Thomas	
<input type="checkbox"/>	 Edit	 Copy	 Delete	Alice	James	
<input type="checkbox"/>	 Edit	 Copy	 Delete	Nancy	Allen	
<input type="checkbox"/>	 Edit	 Copy	 Delete	Mary	Thomas	

3. Problem:

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

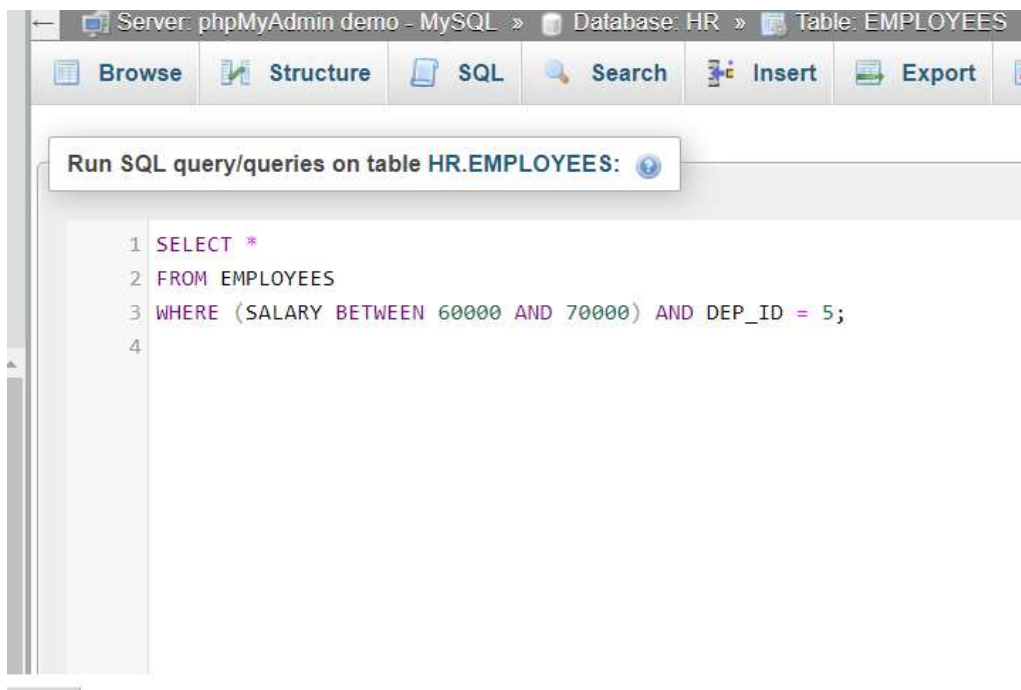
▼ Hint

Use the keyword BETWEEN for this SQL problem.

▼ Solution

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

▼ Output



	EMP_ID	F_NAME	L_NAME	SSN	B_DATE	SEX	ADDRESS	JOB_ID	SALARY	MANAGER_ID	DEP_ID
	E1004	Santosh	Kumar	123456	1985-07-20	M	511 Aurora Av, Aurora, IL	400	60000.00	30004	5
	E1010	Ann	Jacob	123415	1982-03-30	F	111 Britany Springs, Elgin, IL	220	70000.00	30004	5

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

```
SELECT F_NAME, L_NAME, DEP_ID
FROM EMPLOYEES
ORDER BY DEP_ID;
```

▼ Output

```

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

```

<input type="checkbox"/>				John	Thomas	2
<input type="checkbox"/>				Ahmed	Hussain	2
<input type="checkbox"/>				Nancy	Allen	2
<input type="checkbox"/>				Alice	James	5
<input type="checkbox"/>				Steve	Wells	5
<input type="checkbox"/>				Santosh	Kumar	5
<input type="checkbox"/>				Ann	Jacob	5
<input type="checkbox"/>				Mary	Thomas	7
<input type="checkbox"/>				Bharath	Gupta	7
<input type="checkbox"/>				Andrea	Jones	7

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

```

SELECT F_NAME, L_NAME, DEP_ID
FROM EMPLOYEES
ORDER BY DEP_ID DESC, L_NAME DESC;

```

▼ Output

Run SQL query/queries on table HR.EMPLOYEES:

```

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

```

<input type="checkbox"/>				Mary	Thomas	7
<input type="checkbox"/>				Andrea	Jones	7
<input type="checkbox"/>				Bharath	Gupta	7
<input type="checkbox"/>				Steve	Wells	5
<input type="checkbox"/>				Santosh	Kumar	5
<input type="checkbox"/>				Alice	James	5
<input type="checkbox"/>				Ann	Jacob	5
<input type="checkbox"/>				John	Thomas	2
<input type="checkbox"/>				Ahmed	Hussain	2
<input type="checkbox"/>				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't worry if you are not able to figure this SQL problem out. We'll cover working with multiple tables in the lecture **Working with Multiple Tables**.

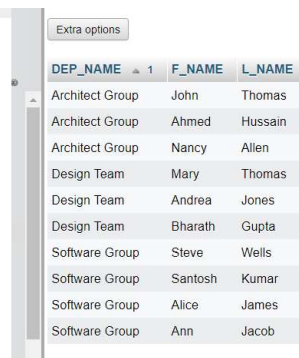
▼ Solution

```
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;
```

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

```
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;
```



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

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

```
SELECT DEP_ID, COUNT(*)
FROM EMPLOYEES
GROUP BY DEP_ID;
```

▼ Output

<pre> 1 SELECT DEP_ID, COUNT(*) 2 FROM EMPLOYEES 3 GROUP BY DEP_ID; </pre>	<div> <input type="checkbox"/> Profiling [Edit inline] [Edit] [Explain SQL] [Create PHP code] [Refresh] </div> <div> <input type="checkbox"/> Show all Number of rows: 25 Filter rows: <input type="text" value="Search this table"/> </div> <div>Extra options</div> <table> <thead> <tr> <th>DEP_ID</th> <th>COUNT(*)</th> </tr> </thead> <tbody> <tr> <td>2</td> <td>3</td> </tr> <tr> <td>5</td> <td>4</td> </tr> <tr> <td>7</td> <td>3</td> </tr> </tbody> </table> <div> <input type="checkbox"/> Show all Number of rows: 25 Filter rows: <input type="text" value="Search this table"/> </div>	DEP_ID	COUNT(*)	2	3	5	4	7	3
DEP_ID	COUNT(*)								
2	3								
5	4								
7	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

```

SELECT DEP_ID, COUNT(*), AVG(SALARY)
FROM EMPLOYEES
GROUP BY DEP_ID;

```

▼ Output

```

SELECT DEP_ID, COUNT(*), AVG(SALARY)
FROM EMPLOYEES
GROUP BY DEP_ID;

```

Extra options

DEP_ID	COUNT(*)	AVG(SALARY)
2	3	86666.666667
5	4	65000.000000
7	3	66666.666667

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

```

SELECT DEP_ID, COUNT(*) AS "NUM_EMPLOYEES", AVG(SALARY) AS "AVG_SALARY"
FROM EMPLOYEES
GROUP BY DEP_ID;

```

▼ Output

Output

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

☐ Show all

Number of rows: 25

Filter rows:

Extra options

DEP_ID	NUM_EMPLOYEES	AVG_SALARY
2	3	86666.666667
5	4	65000.000000
7	3	66666.666667

4. Problem:

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

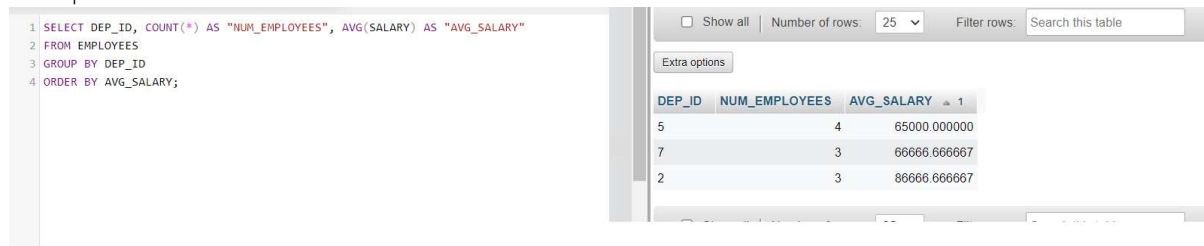
▼ Hint

Use ORDER BY after the GROUP BY.

▼ Solution

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

▼ Output



The screenshot shows a SQL query editor on the left with the following code:

```
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;
```

On the right, the query results are displayed in a table with the following data:

DEP_ID	NUM_EMPLOYEES	AVG_SALARY
5	4	65000.000000
7	3	66666.666667
2	3	86666.666667

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

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

▼ Output



The screenshot shows a SQL query editor on the left with the following code:

```
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;
```

On the right, the query results are displayed in a table with the following data:

DEP_ID	NUM_EMPLOYEES	AVG_SALARY
7	3	66666.666667
2	3	86666.666667

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. Import the script to phpadmin mysql interface and run. Follow [Hands-on Lab : Create tables using SQL scripts and Load data into tables](#) on how to upload a script to phpmyadmin 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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[Malika Singla](#)

Changelog

Date	Version	Changed by	Change Description
2021-11-01	0.1	Lakshmi Holla, Malika Singla	Initial Version

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