

Hands-on Lab: Built-in Functions



Estimated time needed: 20 minutes

In SQL, you can access many built-in functions that may be used to get more variety in our data analysis. These functions include aggregation functions (like MAX, MIN, SUM, and AVG), string functions (like LENGTH, UCASE, and LCASE), scalar functions (like ROUND), and a variety of date functions as well. In this tab, you'll get hands-on practice on how to use all of them.

Software Used in this Lab

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



To complete this lab, you will use 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.

Objectives

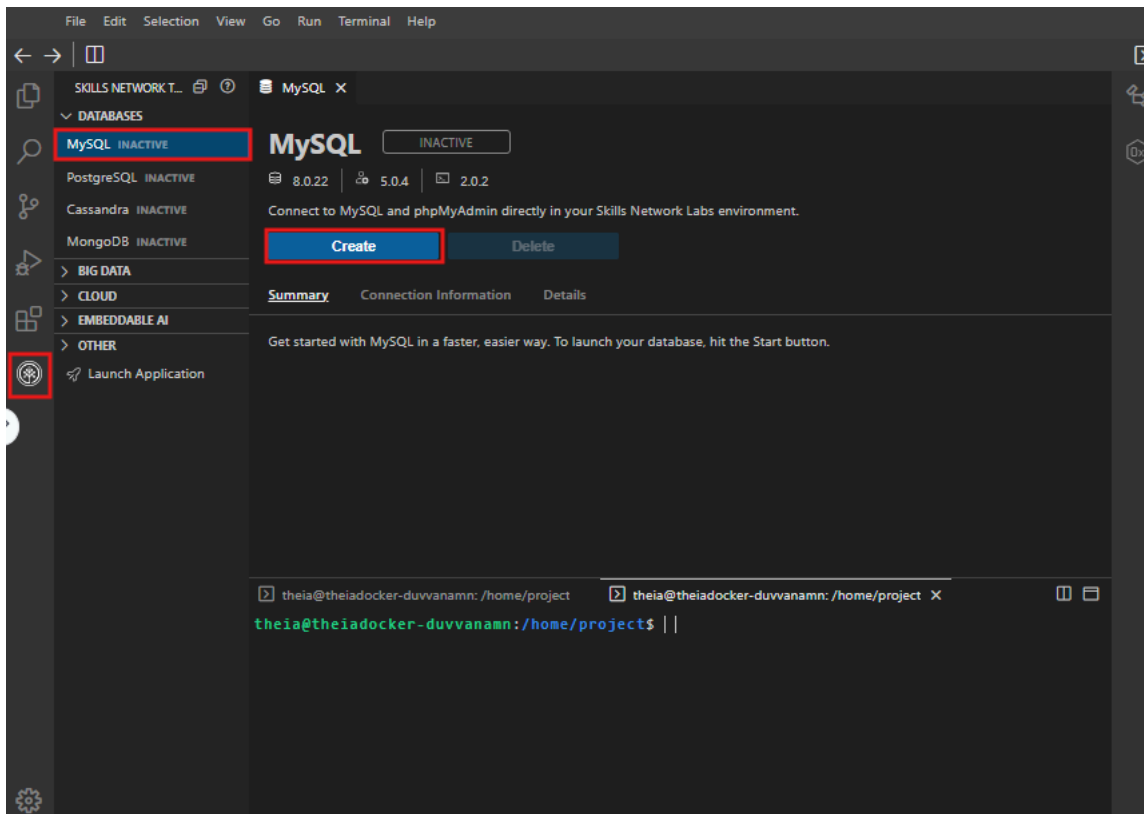
After completing this lab, you will be able to compose queries in phpMyAdmin with MySQL using:

- Aggregation Functions
- Scalar Functions
- String Functions
- Date Functions

Create the database

Click on **Skills Network Toolbox**. In the **Database** section, click **MySQL**.

To start the MySQL, click **Create**.



Once **MySQL** has started, click the **phpMyAdmin** button to open **phpMyAdmin** in the same window. Alternatively, click the **toggle button** next to the phpMyAdmin button to open phpMyAdmin in a new browser tab.

The screenshot shows the Skills Network Labs interface for a MySQL database. On the left, a sidebar lists various database categories: DATABASES (MySQL ACTIVE, PostgreSQL INACTIVE, Cassandra INACTIVE, MongoDB INACTIVE), BIG DATA, CLOUD, EMBEDDABLE AI, and OTHER (Launch Application). The main panel displays the MySQL database status as 'ACTIVE' with version 8.0.22, 5.0.4, and 2.0.2. It includes 'Create' and 'Delete' buttons. Below this, there are tabs for 'Summary', 'Connection Information', and 'Details'. The 'Summary' tab is selected, showing instructions on how to connect to MySQL and phpMyAdmin. A red box highlights the 'phpMyAdmin' button, and a red arrow points to it. At the bottom, there is a terminal window with the prompt 'theia@theiadocker-duvvanam:/home/project\$'.

You will see the phpMyAdmin GUI tool.

The screenshot shows the phpMyAdmin web interface. The browser address bar displays the URL: `sandipsahajo-8080.theiadocker-27.proxy.cognitiveclas`. The phpMyAdmin logo is at the top left of the main content area. Below the logo are navigation icons for Home, Servers, Help, Documents, Settings, and Logout. There are two tabs: 'Recent' and 'Favorites'. The left sidebar contains a tree view of databases: 'New' (with a green plus icon), 'information_schema', 'mysql', 'performance_schema', 'sakila', and 'sys'. Each database entry has a plus icon to its left. The right pane shows the 'Server: mysql:3306' header. Below this are three tabs: 'Databases', 'SQL', and 'Status'. The 'General settings' section is active, showing 'Server connection collation: utf8mb4' and a 'More settings' link. The 'Appearance settings' section is also visible, showing 'Language: English' and 'Theme: pmahomme'.

In the tree view, click **New** to create a new empty database. Then, enter **MySQL_Learners** as the name of the database and click **Create**.

Leave the default **utf8** encoding. UTF-8 is the most commonly used character encoding for content or data.

Databases

SQL

Status

User accounts

Export

Import

Settings

Binary log

Re

Databases

Create database

Create

	Database	Collation	Master replication	Action
<input type="checkbox"/>	information_schema	utf8_general_ci	Replicated	Check privileges
<input type="checkbox"/>	mysql	utf8mb4_0900_ai_ci	Replicated	Check privileges
<input type="checkbox"/>	performance_schema	utf8mb4_0900_ai_ci	Replicated	Check privileges
<input type="checkbox"/>	sys	utf8mb4_0900_ai_ci	Replicated	Check privileges
Total: 4				

☐ Check all

With selected: Drop

Note: Enabling the database statistics here might cause heavy traffic between the web server and the MySQL server.

- **Enable statistics**

Create the PETRESCUE table

Rather than create the table manually by typing the DDL commands in the SQL editor, you will execute a script containing the create table command.

Download the script file [PETRESCUE-CREATE.sql](#)

Note: To download, right-click on the link above and click on **Save As** or **Save Link As** depending on your browser. Remember to save the file as a .sql file and not HTML.

Next, load the .sql file to your database using the **Import** option as shown in the image below.

Importing into the database "Mysql_learners"

File to import:

File may be compressed (gzip, bzip2, zip) or uncompressed.
A compressed file's name must end in **[format].[compression]**. Example: **.sql.zip**

Browse your computer: PETRESCUE-CREATE.sql (Max: 2,048KiB)

You may also drag and drop a file on any page.

Character set of the file:

Partial import:

☒ Allow the interruption of an import in case the script detects it is close to the PHP timeout limit. (The script will stop importing when it reaches the timeout limit.)

Skip this number of queries (for SQL) starting from the first one:

Other options:

☒ Enable foreign key checks

Format:

PETRESCUE-CREAT....sql HR_Database_Crea....sql

Upon execution, the table PETRESCUE will be created in the Mysql_Learners database and loaded with a set of values as well. The attributes of the PETRESCUE table are:

Column Name	Data Type	Description
ID	INTEGER	ID of the entry
ANIMAL	VARCHAR(20)	Type of animal
QUANTITY	INTEGER	Number of animals
COST	DECIMAL(6,2)	Cost incurred
RESCUEDATE	DATE	Date of Rescue

Once the table is loaded, you may open the sql editor to start executing the queries.

Aggregation Functions

1. Write a query that calculates the total cost of all animal rescues in the PETRESCUE table.

For this query, we will use the function `SUM(COLUMN_NAME)`. The output of this query will be the total value of all elements in the column. The query for this question can be written as:

```
SELECT SUM(COST) FROM PETRESCUE;
```

You can further assign a label to the query `SUM_OF_COST`.

```
SELECT SUM(COST) AS SUM_OF_COST FROM PETRESCUE;
```

2. Write a query that displays the maximum quantity of animals rescued (of any kind).

For this query, we will use the function `MAX(COLUMN_NAME)`. The output of this query will be the maximum value of all elements in the column. The query for this question can be written as:

```
SELECT MAX(QUANTITY) FROM PETRESCUE;
```

The query can easily be changed to display the minimum quantity using the MIN function instead.

```
SELECT MIN(QUANTITY) FROM PETRESCUE;
```

3. Write a query that displays the average cost of animals rescued.

For this query, we will use AVG(COLUMN_NAME). The output of this query will be the average of all elements in the column. The query for this question can be written as

```
SELECT AVG(COST) FROM PETRESCUE;
```

Scalar Functions and String Functions

1. Write a query that displays the rounded integral cost of each rescue.

For this query, we will use the function ROUND(COLUMN_NAME, NUMBER_OF_DECIMALS). The output of this query will be the value of each element in the column rounded to the specified number of decimal places. Note that the second argument is optional and, if omitted, results in rounding to an integer value. The query for this question can be written as:

```
SELECT ROUND(COST) FROM PETRESCUE;
```

The query could also be written as:

```
SELECT ROUND(COST, 0) FROM PETRESCUE;
```

In case the question was to round the value to 2 decimal places, the query would change to:

```
SELECT ROUND(COST, 2) FROM PETRESCUE;
```

2. Write a query that displays the length of each animal name.

For this query, we will use the function LENGTH(COLUMN_NAME). The output of this query will be the length of each element in the column. The query for this question can be written as:

```
SELECT LENGTH(ANIMAL) FROM PETRESCUE;
```

3. Write a query that displays the animal name in each rescue in uppercase.

For this query, we will use the function UCASE(COLUMN_NAME). The output of this query will be each element in the column in upper case letters. The query for this question can be written as:

```
SELECT UCASE(ANIMAL) FROM PETRESCUE;
```

Just as easily, the user could ask for a lower case representation, and the query would be changed to:

```
SELECT LCASE(ANIMAL) FROM PETRESCUE;
```

Date Functions

1. Write a query that displays the rescue date.

For this query, we will use the function DAY(COLUMN_NAME). The output of this query will be only the DAY part of the date in the column. The query for this question can be written as:

```
SELECT DAY(RESCUEDATE) FROM PETRESCUE;
```

In case the query was asking for MONTH of rescue, the query would change to:

```
SELECT MONTH(RESCUEDATE) FROM PETRESCUE;
```

In case the query was asking for YEAR of rescue, the query would change to:

```
SELECT YEAR(RESCUEDATE) FROM PETRESCUE;
```

2. Animals rescued should see the vet within three days of arrival. Write a query that displays the third day of each rescue.

For this query, we will use the function DATE_ADD(COLUMN_NAME, INTERVAL Number Date_element). Here, the quantity in Number and in Date_element will combine to form the interval to be added to the date in the column. For the given question, the query would be:

```
SELECT DATE_ADD(RESCUEDATE, INTERVAL 3 DAY) FROM PETRESCUE
```

If the question was to add 2 months to the date, the query would change to:

```
SELECT DATE_ADD(RESCUEDATE, INTERVAL 2 MONTH) FROM PETRESCUE
```

Similarly, we can retrieve a date before the one given in the column by a given number using the function DATE_SUB. By modifying the same example, the following query would provide the date 3 days before the rescue.

```
SELECT DATE_SUB(RESCUEDATE, INTERVAL 3 DAY) FROM PETRESCUE
```

3. Write a query that displays the length of time the animals have been rescued, for example, the difference between the current date and the rescue date.

For this query, we will use the function DATEDIFF(Date_1, Date_2). This function calculates the difference between the two given dates and gives the output in number of days. For the given question, the query would be:

```
SELECT DATEDIFF(CURRENT_DATE, RESCUEDATE) FROM PETRESCUE
```

CURRENT_DATE is also an inbuilt function that returns the present date as known to the server.

To present the output in a YYYY-MM-DD format, another function FROM_DAYS(number_of_days) can be used. This function takes a number of days and returns the required formatted output. The query above would thus be modified to

```
SELECT FROM_DAYS(DATEDIFF(CURRENT_DATE, RESCUEDATE)) FROM PETRESCUE
```

Practice Problems

1. Write a query that displays the average cost of rescuing a single dog. Note that the cost per dog would not be the same in different instances.

▼ Click here for a hint

For such a problem, you must use the 'AVG' function on 'COST/QUANTITY', for example, cost per unit quantity.

▼ Click here for the solution

```
SELECT AVG(COST/QUANTITY) FROM PETRESCUE WHERE ANIMAL = 'Dog';
```

2. Write a query that displays the animal name in each rescue in uppercase without duplications.

▼ Click here for a hint

To write this query, you must use the 'DISTINCT' and 'UCASE' functions.

▼ Click here for the solution

```
SELECT DISTINCT UCASE(ANIMAL) FROM PETRESCUE;
```

3. Write a query that displays all the columns from the PETRESCUE table where the animal(s) rescued are cats. Use **cat** in lowercase in the query.

▼ Click here for a hint

You have to use 'LCASE' function for writing this query.

▼ Click here for the solution

```
SELECT * FROM PETRESCUE WHERE LCASE(ANIMAL)="cat";
```

4. Write a query that displays the number of rescues in the 5th month.

▼ Click here for a hint

You must use the 'SUM' AND 'MONTH' function to write this query.

▼ Click here for the solution

```
SELECT SUM(QUANTITY) FROM PETRESCUE WHERE MONTH(RESCUEDATE)="05";
```

5. The rescue shelter is supposed to find good homes for all animals within 1 year of their rescue. Write a query that displays the ID and the target date.

▼ Click here for a hint

You have to use the 'DATE_ADD' function for writing this query.

▼ Click here for Solution

```
SELECT ID, DATE_ADD(RESCUEDATE, INTERVAL 1 YEAR) FROM PETRESCUE;
```

Conclusion

Congratulations on completing this lab.

You are now able to:

- Use aggregation functions to calculate total, maximum, minimum, and average values of numerical attributes.
- Use scalar functions to round a floating value to the desired number of decimal places.
- Use string functions to convert text into upper or lower cases.
- Use date operations to manipulate data columns with the attribute as date.

Author(s)

[Lakshmi Holla](#)

[Malika Singla](#)

[Abhishek Gagneja](#)

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