

# 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 programming interface ribbon. In the **Database** section, click **MySQL**.

To start the MySQL engine, click **Start**.

Lab | IBMCloud | Launch Application

File Edit Selection View Go Run Terminal Help

SKILLS NETWORKS

MySQL x

▼ DATABASES

MySQL INACTIVE

PostgreSQL INACTIVE

Cassandra INACTIVE

MongoDB INACTIVE

> BIG DATA

> CLOUD

> OTHER

MySQL INACTIVE

v8.0.22 | v5.0.4 | v14.14

Connect to MySQL and phpMyAdmin directly in your Skills Network Labs environment.

Start

Summary Connection Information Details

Get started with MySQL in a faster, easier way. To launch your database, hit the Start button.

Once **MySQL** has started, click the **phpMyAdmin** button to open **phpMyAdmin** in the same window.

Lab

IBMCLOUD

Launch Application

FileEditSelectionViewGoRunTerminalHelp

MySQL x phpMyAdmin

MySQL

ACTIVE

v8.0.22 | v5.0.4 | v14.14

Connect to MySQL and phpMyAdmin directly in your Skills Network Labs environment.

Stop

SummaryConnection InformationDetails

Your database and phpMyAdmin server are now ready to use and available with the following login credentials. For more details on how to navigate MySQL, please check out the Details section.

Username: malikas

Password:

You can manage MySQL via:

phpMyAdmin

Or to interact with the database in the terminal, select one of these options:

MySQL CLINew Terminal

You will see the phpMyAdmin GUI tool.

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phpMyAdmin

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🖨️ Server: mysql:3306

🗄️ Databases

📄 SQL

📊 Status

👤 User accounts

📤 Export

General settings

☰ Server connection collation: 

❓

 utf8mb4\_unicode\_ci 

▼

🔑

 More settings

Appearance settings

🗣️

 Language 

❓

English

▼

🎨

 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**.

The encoding will be left as **utf8mb4\_0900\_ai\_ci**. UTF-8 is the most commonly used character encoding for content or data.

Databases

SQL

Status

User accounts

Export

Import

Settings

Binary log

Replication

Variables

Charsets

Databases

Create database

Mysql\_learners

utf8mb4\_0900\_ai\_ci

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.

12/26/23, 9:07 PM

about:blank

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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: 

Choose File

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

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

Character set of the file: 

utf-8

Partial import:

☒ Allow the interruption of an import in case the script detects it is close to the PHP timeout limit. *(This might be a good way to import large files, however it might also interrupt the import)*

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

0

Other options:

☒ Enable foreign key checks

Format:

SQL

Console

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.

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# 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:

```
1. 1
1. SELECT SUM(COST) FROM PETRESCUE;
```

Copied!

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

```
1. 1
1. SELECT SUM(COST) AS SUM_OF_COST FROM PETRESCUE;
```

Copied!

- 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:

```
1. 1
1. SELECT MAX(QUANTITY) FROM PETRESCUE;
```

Copied!

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

```
1. 1
1. SELECT MIN(QUANTITY) FROM PETRESCUE;
```

Copied!

- 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

```
1. 1
1. SELECT AVG(COST) FROM PETRESCUE;
```

Copied!

# 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:

```
1. 1
1. SELECT ROUND(COST) FROM PETRESCUE;
```

Copied!

The query could also be written as:

```
1. 1
```



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

Copied!

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

```
1. 1
1. SELECT ROUND(COST, 2) FROM PETRESCUE;
```

Copied!

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:

```
1. 1
1. SELECT LENGTH(ANIMAL) FROM PETRESCUE;
```

Copied!

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:

```
1. 1
1. SELECT UCASE(ANIMAL) FROM PETRESCUE;
```

Copied!

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

```
1. 1
1. SELECT LCASE(ANIMAL) FROM PETRESCUE;
```

Copied!

# Date Functions

1. Write a query that displays the day of the month when cats have been rescued.

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:

```
1. 1
1. SELECT DAY(RESCUEDATE) FROM PETRESCUE;
```

Copied!

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

```
1. 1
1. SELECT MONTH(RESCUEDATE) FROM PETRESCUE;
```

Copied!

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

```
1. 1
1. SELECT YEAR(RESCUEDATE) FROM PETRESCUE;
```

Copied!

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:

```
1. 1
1. SELECT DATE_ADD(RESCUEDATE, INTERVAL 3 DAY) FROM PETRESCUE
```

Copied!

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

```
1. 1
1. SELECT DATE_ADD(RESCUEDATE, INTERVAL 2 MONTH) FROM PETRESCUE
```

Copied!

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.

```
1. 1
1. SELECT DATE_SUB(RESCUEDATE, INTERVAL 3 DAY) FROM PETRESCUE
```

Copied!

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:

```
1. 1
1. SELECT DATEDIFF(CURRENT_DATE, RESCUEDATE) FROM PETRESCUE
```

Copied!

`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

```
1. 1
1. SELECT FROM_DAYS(DATEDIFF(CURRENT_DATE, RESCUEDATE)) FROM PETRESCUE
```

Copied!

# 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
- ▶ Click here for the solution

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

- ▶ Click here for a hint
- ▶ Click here for the solution

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
- ▶ Click here for the solution

4. Write a query that displays the number of rescues in the 5<sup>th</sup> month.
- Click here for a hint

► Click here for the solution
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

► Click here for Solution

## 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.

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### Changelog

| Date       | Version | Changed by                   | Change Description      |
|------------|---------|------------------------------|-------------------------|
| 2023-10-12 | 0.8     | Mercedes Schneider           | QA Pass w/Edits         |
| 2023-10-11 | 0.7     | Misty Taylor                 | ID Check                |
| 2023-10-10 | 0.6     | Abhishek Gagneja             | Updated instruction set |
| 2023-05-05 | 0.5     | Rahul Jaideep                | Updated Markdown file   |
| 2022-10-28 | 0.4     | Appalabhaktula Hema          | Corrected the query     |
| 2022-07-27 | 0.3     | Lakshmi Holla                | Updated HTML tag        |
| 2022-07-04 | 0.2     | Malika                       | Updated screenshot      |
| 2021-11-01 | 0.1     | Lakshmi Holla, Malika Singla | Initial Version         |

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