

AN OPENSOURCE EBOOK

# INTRODUCTION TO



---

**Bobby Iliev**

<b>About the book</b>	<b>8</b>
About the author	9
Sponsors	10
Ebook PDF Generation Tool	12
Book Cover	13
License	14
<b>Databases</b>	<b>15</b>
Tables and columns	16
<b>MySQL</b>	<b>17</b>
Installing MySQL	18
Accessing MySQL via CLI	20
Creating a database	21
Configuring .my.cnf	22
The mysqladmin command	23
GUI clients	24
<b>Tables</b>	<b>25</b>
Data types	26
Creating a database	27
Creating tables	29
Rename tables	31
Dropping tables	32
Allowing NULL values	33
Specifying a primary key	34

Updating tables .....	35
Truncate table .....	37
<b>Basic Syntax .....</b>	<b>38</b>
INSERT .....	39
SELECT .....	40
UPDATE .....	41
DELETE .....	42
Comments .....	43
Conclusion .....	44
<b>SELECT .....</b>	<b>45</b>
SELECT all columns .....	47
Pattern matching .....	48
Formatting .....	50
SELECT specific columns only .....	51
SELECT with no FROM Clause .....	52
SELECT with Arithmetic Operations .....	53
LIMIT .....	54
COUNT .....	55
MIN, MAX, AVG, and SUM .....	56
DISTINCT .....	57
Conclusion .....	59
<b>WHERE .....</b>	<b>60</b>
WHERE Clause example .....	61
Operators .....	63
AND keyword .....	64
OR keyword .....	65
LIKE operator .....	66

<b>IN operator</b>	<b>67</b>
IS operator	68
BETWEEN operator	69
Conclusion	70
<b>Sorting with ORDER and GROUP BY</b>	<b>71</b>
ORDER BY	72
GROUP BY	74
HAVING Clause	75
<b>INSERT</b>	<b>76</b>
Inserting multiple records	78
Inserting multiple records using another table	79
<b>UPDATE</b>	<b>80</b>
<b>DELETE</b>	<b>83</b>
<b>JOIN</b>	<b>84</b>
CROSS JOIN	87
INNER JOIN	89
LEFT JOIN	92
RIGHT JOIN	93
Conclusion	95
<b>SQL   DDL, DQL, DML, DCL and TCL Commands</b>	<b>96</b>
<b>SQL Sub Queries</b>	<b>101</b>

<b>SQL - UNIONS CLAUSE</b>	<b>105</b>
<b>Relational Keys- Keys in a Relational Database</b>	<b>109</b>
Types of Relational Keys	110
<b>Logical Operator Keywords</b>	<b>112</b>
<b>HAVING Clause</b>	<b>113</b>
Syntax	114
Description	115
Aggregate Functions	116
Aggregate Functions Examples	117
Having clause Examples	120
<b>Essential MySQL Functions</b>	<b>122</b>
Numeric Functions	123
STRING Functions	124
DATE Functions	126
Formatting Dates and Times	127
Calculating Dates and Times	128
<b>Triggers In SQL</b>	<b>129</b>
<b>Example :</b>	<b>131</b>
<b>Transaction Control Language</b>	<b>134</b>
TCL Commands	135
COMMIT	136
ROLLBACK	137

SAVEPOINT .....	138
Examples .....	139
Conclusion .....	142
<b>Data Control Language .....</b>	<b>143</b>
DCL Commands .....	144
GRANT .....	145
REVOKE .....	146
Conclusion .....	149
<b>The MySQL dump command .....</b>	<b>150</b>
Exporting a Database .....	151
Exporting all databases .....	152
<b>Automated backups .....</b>	<b>154</b>
Conclusion .....	155
<b>Learn Materialize by running streaming SQL on your nginx logs .....</b>	<b>156</b>
<b>Prerequisites .....</b>	<b>157</b>
<b>What is Materialize .....</b>	<b>158</b>
<b>Installing Materialize .....</b>	<b>159</b>
<b>Installing mzcli .....</b>	<b>160</b>
Installing nginx .....	161
Adding a Materialize Source .....	162
<b>Creating a Materialized View .....</b>	<b>164</b>

<b>Reading from the view .....</b>	<b>166</b>
------------------------------------	------------

<b>Conclusion .....</b>	<b>168</b>
-------------------------	------------

<b>Conclusion .....</b>	<b>169</b>
-------------------------	------------

Other eBooks .....	170
--------------------	-----

- **This version was published on October 13 2021**

This is an open-source introduction to SQL guide that will help you learn the basics of SQL and start using relational databases for your SysOps, DevOps, and Dev projects. No matter if you are a DevOps/SysOps engineer, developer, or just a Linux enthusiast, you will most likely have to use SQL at some point in your career.

The guide is suitable for anyone working as a developer, system administrator, or a DevOps engineer and wants to learn the basics of SQL.



My name is Bobby Iliev, and I have been working as a Linux DevOps Engineer since 2014. I am an avid Linux lover and supporter of the open-source movement philosophy. I am always doing that which I cannot do in order that I may learn how to do it, and I believe in sharing knowledge.

I think it's essential always to keep professional and surround yourself with good people, work hard, and be nice to everyone. You have to perform at a consistently higher level than others. That's the mark of a true professional.

For more information, please visit my blog at <https://bobbyiliev.com>, follow me on Twitter [@bobbyiliev\\_](#) and [YouTube](#).

This book is made possible thanks to these fantastic companies!

The Streaming Database for Real-time Analytics.

[Materialize](#) is a reactive database that delivers incremental view updates. Materialize helps developers easily build with streaming data using standard SQL.

DigitalOcean is a cloud services platform delivering the simplicity developers love and businesses trust to run production applications at scale.

It provides highly available, secure, and scalable compute, storage, and networking solutions that help developers build great software faster.

Founded in 2012 with offices in New York and Cambridge, MA, DigitalOcean offers transparent and affordable pricing, an elegant user interface, and one of the largest libraries of open source resources available.

For more information, please visit <https://www.digitalocean.com> or follow [@digitalocean](#) on Twitter.

If you are new to DigitalOcean, you can get a free \$100 credit and spin up your own servers via this referral link here:

[Free \\$100 Credit For DigitalOcean](#)

The DevDojo is a resource to learn all things web development and web design. Learn on your lunch break or wake up and enjoy a cup of coffee with us to learn something new.

Join this developer community, and we can all learn together, build together, and grow together.

[Join DevDojo](#)

For more information, please visit <https://www.devdojo.com> or follow [@thedevdojo](https://twitter.com/thedevdojo) on Twitter.

This ebook was generated by [Ibis](#) developed by [Mohamed Said](#).

Ibis is a PHP tool that helps you write eBooks in markdown.

The cover for this ebook was created with [Canva.com](https://www.canva.com).

If you ever need to create a graphic, poster, invitation, logo, presentation - or anything that looks good — give Canva a go.

## MIT License

Copyright (c) 2020 Bobby Iliev

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

Before we dive deep into SQL, let's quickly define what a database is.

The definition of databases from Wikipedia is:

A database is an organized collection of data, generally stored and accessed electronically from a computer system.

In other words, a database is a collection of data stored and structured in different database tables.

You've most likely worked with spreadsheet systems like Excel or Google Sheets. At the very basic, database tables are quite similar to spreadsheets.

Each table has different **columns** which could contain different types of data.

For example, if you have a todo list app, you would have a database, and in your database, you would have different tables storing different information like:

- Users - In the users table, you would have some data for your users like: `username`, `name`, and `active`, for example.
- Tasks - The tasks table would store all of the tasks that you are planning to do. The columns of the tasks table would be for example, `task_name`, `status`, `due_date` and `priority`.

The Users table will look like this:

id	username	name	active
1	bobby	Bobby Iliev	true
2	grisi	Greisi I.	true
3	devdojo	Dev Dojo	false

Rundown of the table structure:

- We have 4 columns: `id`, `username`, `name` and `active`.
- We also have 3 entries/users.
- The `id` column is a unique identifier of each user and is auto-incremented.

In the next chapter, we will learn how to install MySQL and create our first database.



Now that you know what a database, table, and column are, the next thing that you would need to do is install a database service where you would be running your SQL queries on.

We will be using MySQL as it is free, open-source, and very widely used.

Depending on your operating system, to install MySQL run the following commands.

To install MySQL on a Linux or Ubuntu machine, run the following commands:

- First update your **apt** repository:

```
sudo apt update -y
```

- Then install MySQL:

```
sudo apt install mysql-server mysql-client
```

We are installing two packages, one is the actual MySQL server, and the other is the MySQL client, which would allow us to connect to the MySQL server and run our queries.

To check if MySQL is running, run the following command:

```
sudo systemctl status mysql.service
```

To secure your MySQL server, you could run the following command:

```
sudo mysql_secure_installation
```

Then follow the prompt and choose a secure password and save it in a secure place like a password manager.

With that, you would have MySQL installed on your Ubuntu server. The above should also work just fine on Debian.

I would recommend installing MySQL using [Homebrew](#):

```
brew install mysql
```

After that, start MySQL:

```
brew services start mysql
```

And finally, secure it:

```
mysql_secure_installation
```

In case that you ever need to stop the MySQL service, you could do so with the following command:

```
brew services stop mysql
```

To install MySQL on Windows, I would recommend following the steps from the official documentation here:

<https://dev.mysql.com/doc/refman/8.0/en/windows-installation.html>

To access MySQL run the `mysql` command followed by your user:

```
mysql -u root -p
```

After that, switch to the **demo** database that we created in the previous chapter:

```
USE demo;
```

To exit the just type the following:

```
exit;
```

## `.my.cnf`

By configuring the `~/.my.cnf` file in your user's home directory, MySQL would allow you to log in without prompting you for a password.

To make that change, what you need to do is first create a `.my.cnf` file in your user's home directory:

```
touch ~/.my.cnf
```

After that, set secure permissions so that other regular users could not read the file:

```
chmod 600 ~/.my.cnf
```

Then using your favourite text editor, open the file:

```
nano ~/.my.cnf
```

And add the following configuration:

```
[client]
user=YOUR_MYSQL_USERNAME
password=YOUR_MYSQL_PASSWORD
```

Make sure to update your MySQL credentials accordingly, then save the file and exit.

After that, if you run just `mysql`, you will be authenticated directly with the credentials that you've specified in the `~/.my.cnf` file without being prompted for a password.

As a quick test, you could check all of your open SQL connections by running the following command:

```
mysqladmin proc
```

The `mysqladmin` tool would also use the client details from the `~/.my.cnf` file, and it would list your current MySQL process list.

Another cool thing that you could try doing is combining this with the `watch` command and kind of monitor your MySQL connections in almost real-time:

```
watch -n1 mysqladmin proc
```

To stop the `watch` command, just hit `CTRL+C`

If you prefer using GUI clients, you could take a look at the following ones and install them locally on your laptop:

- [MySQL Workbench](#)
- [Sequel Pro](#)
- [TablePlus](#)

This will allow you to connect to your database via a graphical interface rather than the `mysql` command-line tool.

If you want to have a production-ready MySQL database, I would recommend giving DigitalOcean a try:

[Worry-free managed database hosting](#)



Before we get started with SQL, let's learn how to create tables and columns.

As an example, we are going to create a `users` table with the following columns:

- `id` - this is going to be the primary key of the table and would be the unique identifier of each user.
- `username` - this column would hold the username of our users.
- `name` - here, we will store the full name of users.
- `status` - here, we will store the status of a user, which would indicate if a user is active or not.

You need to specify the data type of each column.

In our case it would be like this:

- `id` - Integer
- `username` - Varchar
- `name` - Varchar
- `status` - Number

The most common data types that you would come across are:

- **CHAR**(size): Fixed-length character string with a maximum length of 255 bytes.
- **VARCHAR**(size): Variable-length character string. Max size is specified in parenthesis.
- **TEXT**(size): A string with a maximum length of 65,535 bytes.
- **INTEGER**(size) or **INT**(size): A medium integer.
- **BOOLEAN** or **BOOL**: Holds a true or false value.
- **DATE**: Holds a date.

Let's have the following users table as an example:

- **id**: We would want to set the ID to **INT**.
- **name**: The name should fit in a **VARCHAR** column.
- **about**: As the about section could be longer, we could set the column data type to **TEXT**.
- **birthday**: For the birthday column of the user, we could use **DATE**.

For more information on all data types available, make sure to check out the official documentation [here](#).

As we briefly covered in the previous chapter, before you could create tables, you would need to create a database by running the following:

- First access MySQL:

```
mysql -u root -p
```

- Then create a database called `demo_db`:

```
CREATE DATABASE demo_db;
```

Note: the database name needs to be unique, if you already have a database named `demo_db` you would receive an error that the database already exists.

You can consider this database as the container where we would create all of the tables in.

Once you've created the database, you need to switch to that database:

```
USE demo_db;
```

You can think of this as accessing a directory in Linux with the `cd` command. With `USE`, we switch to a specific database.

Alternatively, if you do not want to 'switch' to the specific database, you would need to specify the so-called fully qualified table name. For example, if you had a `users` table in the `demo_db`, and you wanted to select all of the entries from that table, you could use one of the following two approaches:

- Switch to the `demo_db` first and then run a select statement:

```
USE demo_db;  
SELECT username FROM users;
```

- Alternatively, rather than using the **USE** command first, specify the database name followed by the table name separated with a dot:  
**db\_name.table\_name:**

```
SELECT username FROM demo_db.users;
```

We are going to cover the **SELECT** statement more in-depth in the following chapters.

In order to create a table, you need to use the **CREATE TABLE** statement followed by the columns that you want to have in that table and their data type.

Let's say that we wanted to create a **users** table with the following columns:

- **id**: An integer value
- **username**: A varchar value
- **about**: A text type
- **birthday**: Date
- **active**: True or false

The query that we would need to run to create that table would be:

```
CREATE TABLE users
(
    id INT,
    username VARCHAR(255),
    about TEXT,
    birthday DATE,
    active BOOL
);
```

Note: You need to select a database first with the **USE** command as mentioned above. Otherwise you will get the following error: `ERROR 1046 (3D000): No database selected.

To list the available tables, you could run the following command:

```
SHOW TABLES;
```

Output:

```
+-----+
| Tables_in_demo_db |
+-----+
| users              |
+-----+
```

You can create a new table from an existing table by using the **CREATE TABLE AS** statement.

Let's test that by creating a new table from the table **users** which we created earlier.

```
CREATE TABLE users2 AS
(
    SELECT * FROM users
);
```

The output that you would get would be:

```
Query OK, 0 rows affected (0.07 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

Note: When creating a table in this way, the new table will be populated with the records from the existing table (based on the SELECT Statement)

This is a sample from "Introduction to SQL" by Bobby Iliev.

For more information, [Click here](#).