

the Master Course

{C0DENATION}

Backend Development

Introduction to MySQL



Learning Objectives

To set up a cloud-based MySQL Add-On database.

To use MySQL Workbench to interact with a database.

To use SQL to perform CRUD operations on a database.

What is MySQL?

It is a **RDBMS** for interacting with a **SQL based database**.

Relational Database Management System.

RDBMS is the basis for SQL, and for all modern database systems such as MS SQL Server, IBM DB2, Oracle, MySQL, and Microsoft Access.

The data is held in tables.

A table is a collection of related data entries held in rows.



What is SQL?

SQL, or Structured Query Language, is a database language used for interacting with Relational Databases.

SQL allows you to write data queries and perform operations on relational databases.

MySQL is a database system that runs on a server.

The data in **MySQL** is stored in **database** objects called **tables**.

A **table** is a collection of related **data** entries and it consists of **columns** and **rows**.

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	5021	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	5023	Mexico
4	Around the Horn	Thomas Hardy	120 Hanover Sq.	London	WA1 1DP	UK
5	Berglunds snabbköp	Christina Berglund	Berguvsvägen 8	Luleå	S-958 22	Sweden
6	Blauer See Delikatessen	Hanna Moos	Forsterstr. 57	Mannheim	68306	Germany

Tables are broken up into columns called **fields**.

The fields in this Customers **table** are: CustomerID, CustomerName, ContactName, Address, City, PostalCode and Country.

A **database** contains one or more **tables**.

Each **table** is identified by a name (e.g. "Customers" or "Orders").

Tables contain **records (rows)** of data.

The biggest differences between **SQL** and **NoSQL** (MongoDB), are forced structure, entry relationships and database computation.

SQL data is stored in tables, which can be connected by relationships.

What are SQL Relationships?

SQL Relationships are **common fields** that exist in **two or more** tables.

Usually **Primary or Foreign Keys**, SQL relationships allow two or more sets of data to be called upon based on their **connection**.

AuthorID	AuthorName	Publisher
1	Stephen King	Penguin
2	J.R.R Tolkien	Harper Collins
3	Jane Austin	Penguin
4	Ian Felming	Hachette
5	Margaret Atwood	Macmillan
6	Emily Brontë	Harper Collins
BookId	AuthorId	bookName
1	1	The Shining
2	3	Emma
3	2	The Hobbit
4	6	Wuthering Heights
5	1	It
6	3	Pride and Prejudice

Primary Keys are usually an **identifying key** in a table.

They **must be unique** and can **never be null**.

Foreign Keys reference a **Primary Key** in another table.

But first, we need a MySQL database.



clever cloud

Clever-Cloud is a cloud service used to create databases (and other things)

Visit <https://clever-cloud.com> and sign up, for free.

Please **don't enter payment info** or worry about the nag!



Beware! Something is wrong with your payment methods.

To avoid any suspension of your services and deletion of your data, please following organisation:

- doesn't have any registered payment method. [Go to the billing page](#)

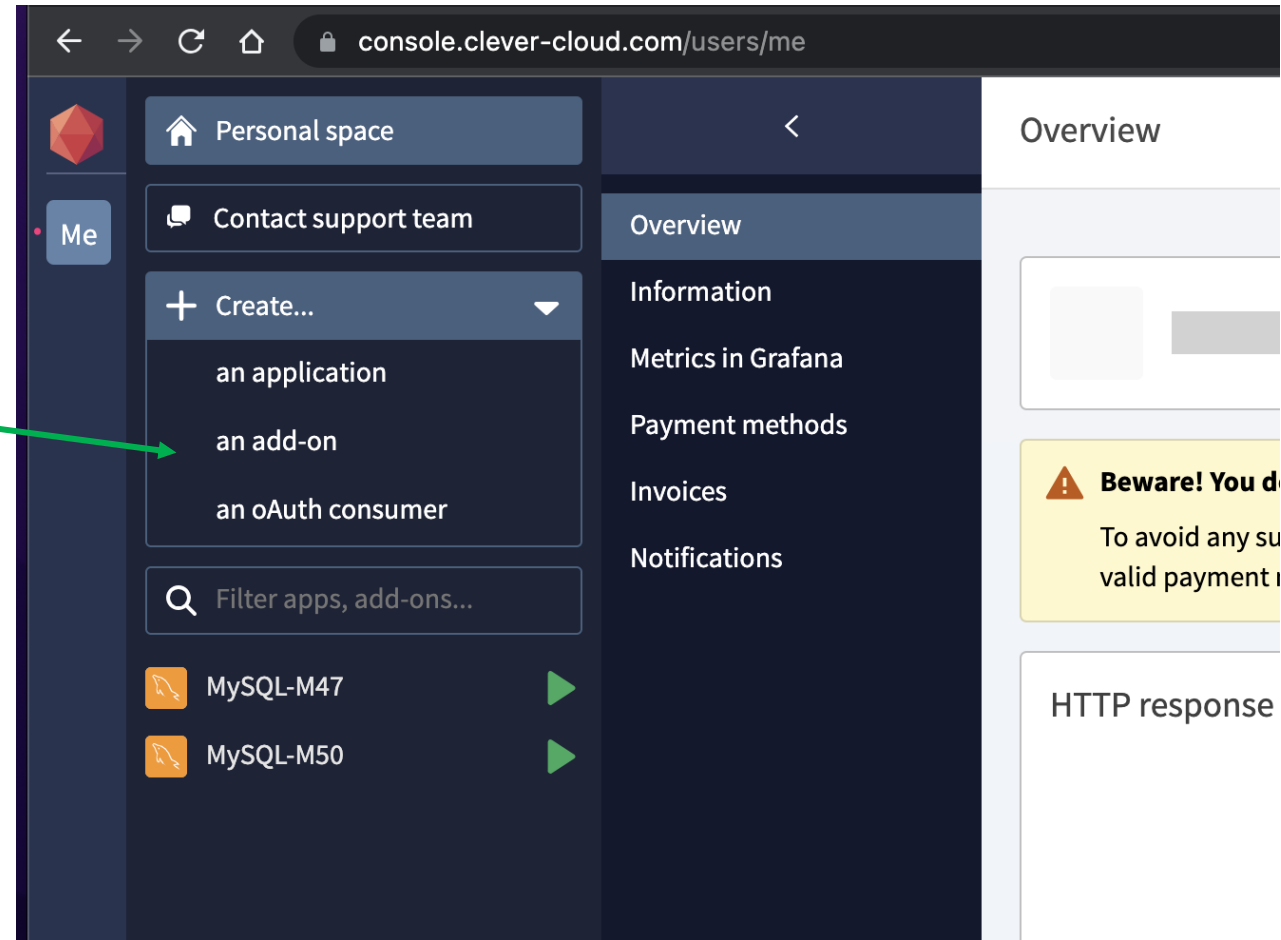
Clever Cloud - Database

We can create up to 5 free add-ons (databases)

Click 'Create',
then an add-on.



Select MySQL



Clever Cloud - Database

You will then see a big list of MySQL kinds.

Select the free
'dev' option.

There is a max connection limit of 5, and a size limit of 10mb – but it will be fine for our needs.

What kind of MySQL do you need?

	PLAN NAME	BACKUPS	LOGS	MAX CONNECTION LIMIT	MAX DB SIZE	MEMORY	METRICS	TYPE	VCPUS	ESTIM
<input type="radio"/>	DEV	Daily - 7 Retained	No	5	10 MB	Shared	No	Shared	Shared	
<input type="radio"/>	XXS Small Space	Daily - 7 retained	Yes	15	512 MB	512 MB	Yes	Dedicated	1	
<input type="radio"/>	XXS Medium Space	Daily - 7 retained	Yes	15	1 GB	512 MB	Yes	Dedicated	1	
<input type="radio"/>	XXS Big Space	Daily - 7 retained	Yes	15	2 GB	512 MB	Yes	Dedicated	1	
<input type="radio"/>	XS Tiny Space	Daily - 7 retained	Yes	75	2 GB	1 GB	Yes	Dedicated	1	
<input type="radio"/>	XS Small Space	Daily - 7 Retained	Yes	75	5 GB	1 GB	Yes	Dedicated	1	

Click 'NEXT' at the bottom right corner.

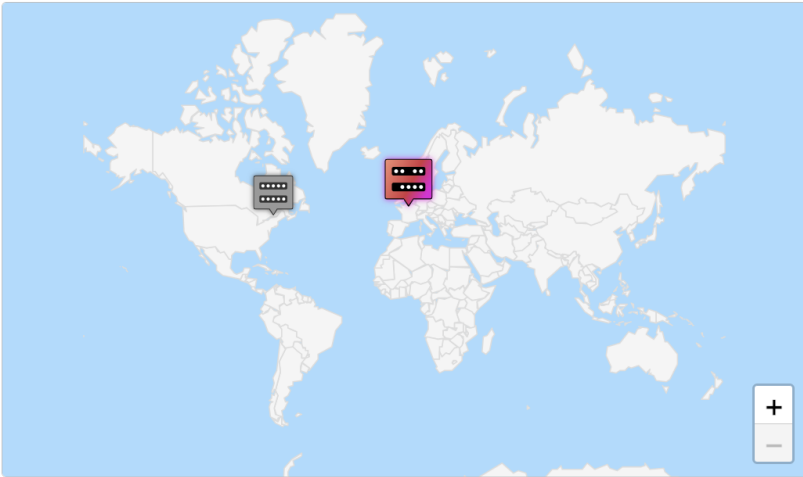
Clever Cloud - Database


Give your MySQL instance a suitable name.


What is the name of your MySQL add-on? In which region should it be located?



NAME: *

ZONE: *



**Paris** France
infra:clever-cloud

**Montreal** Canada
infra:ovh




NEXT

Choose **Paris!**
(it is closer to us than Canada)

click NEXT

Clever Cloud - Database

 MySQL by Clever Cloud

[Admin](#) [PHPMyAdmin](#) [Documentation](#)

TYPE	PLAN	CLUSTER	VERSION	REGION	STATUS	CREATION DATE	ID
MySQL	Dev	par-mysql-c6	8.0	par	ACTIVE	2023-06-21	mysql_6c408aa7-d3e9-480c-920c-05f21fa4833c

Database Credentials

Get credentials for manual connections to this database. [Export Environment Variables](#)

Host

Database Name

User

Password

Port

Connection URI

You will be shown your new server information...

Keep this Browser Tab open as we will need these details, shortly.

It's time to install MySQL Workbench ...

MySQL Workbench

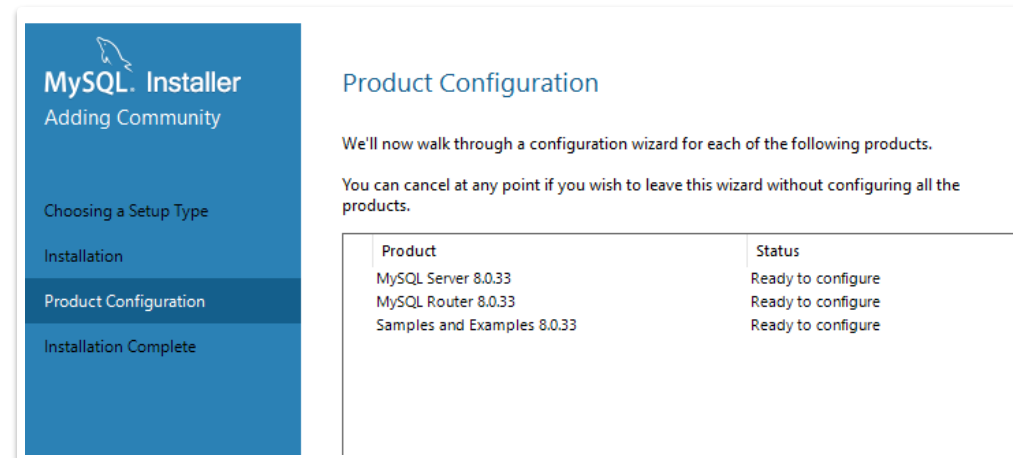
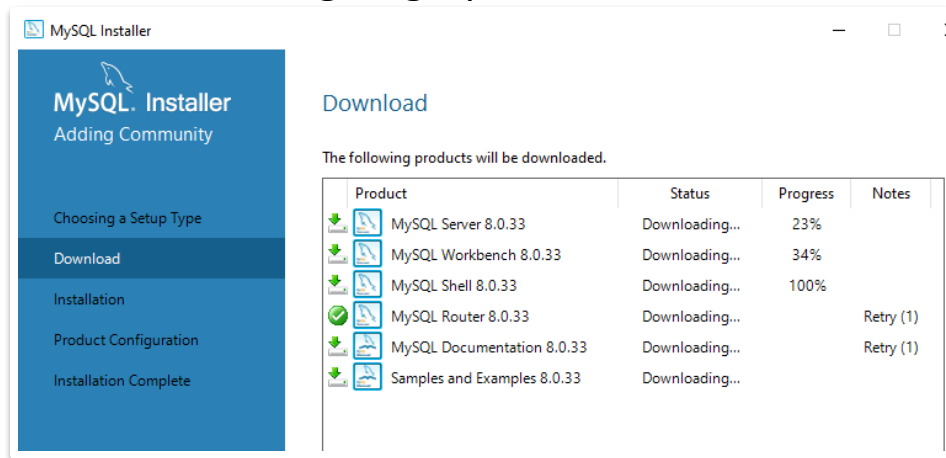


MySQL Workbench is a visual database design tool that integrates SQL development, administration, database design, creation and maintenance into a single integrated development environment for the MySQL database system.

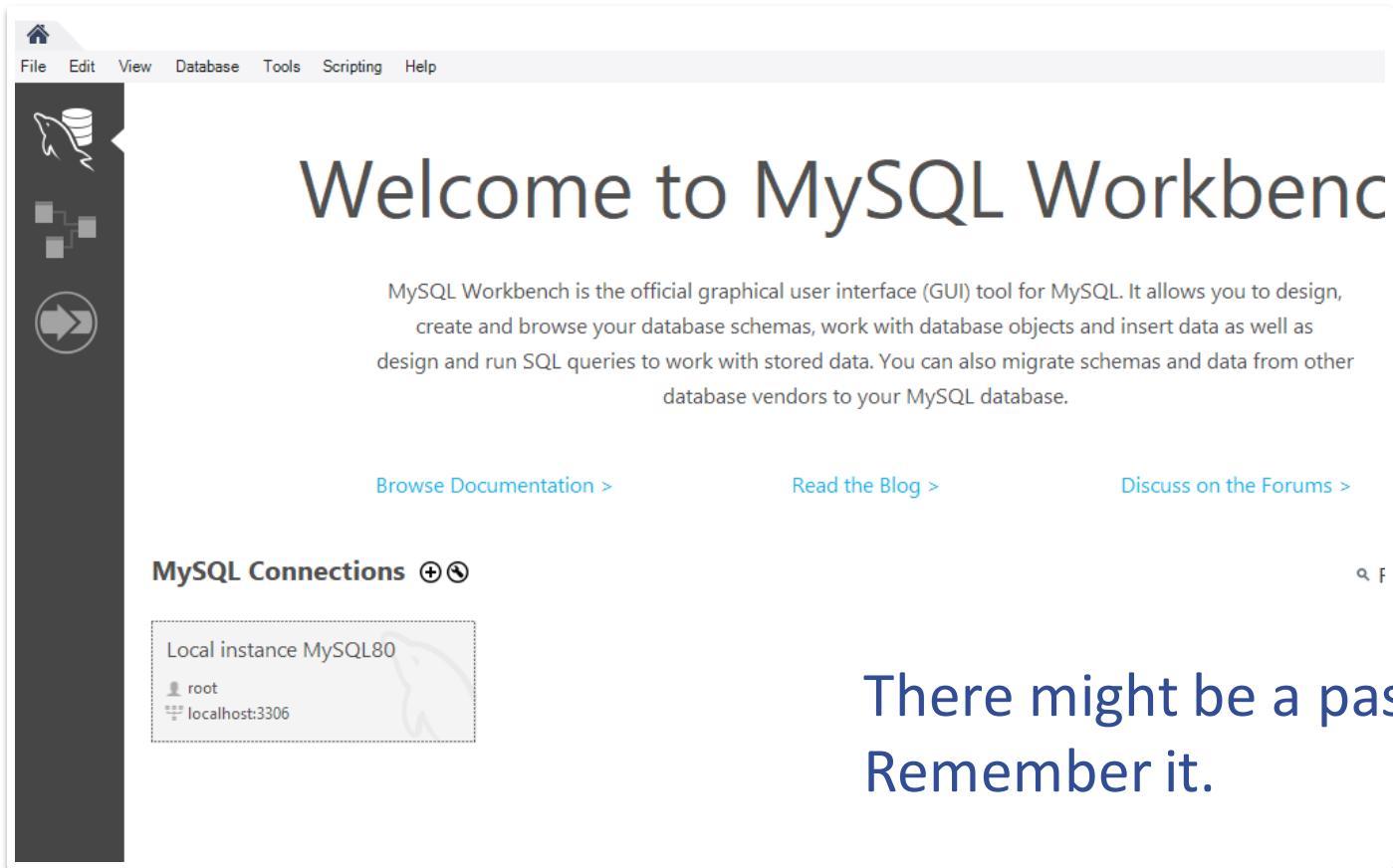
Sounds Great! Let's download it:

<https://dev.mysql.com/downloads/windows/installer/8.0.html>

Don't bother signing-up to Oracle...



MySQL Workbench



There might be a password for you to enter.
Remember it.

Click 'Next' for most other options, until you finally
see this screen...

All okay?

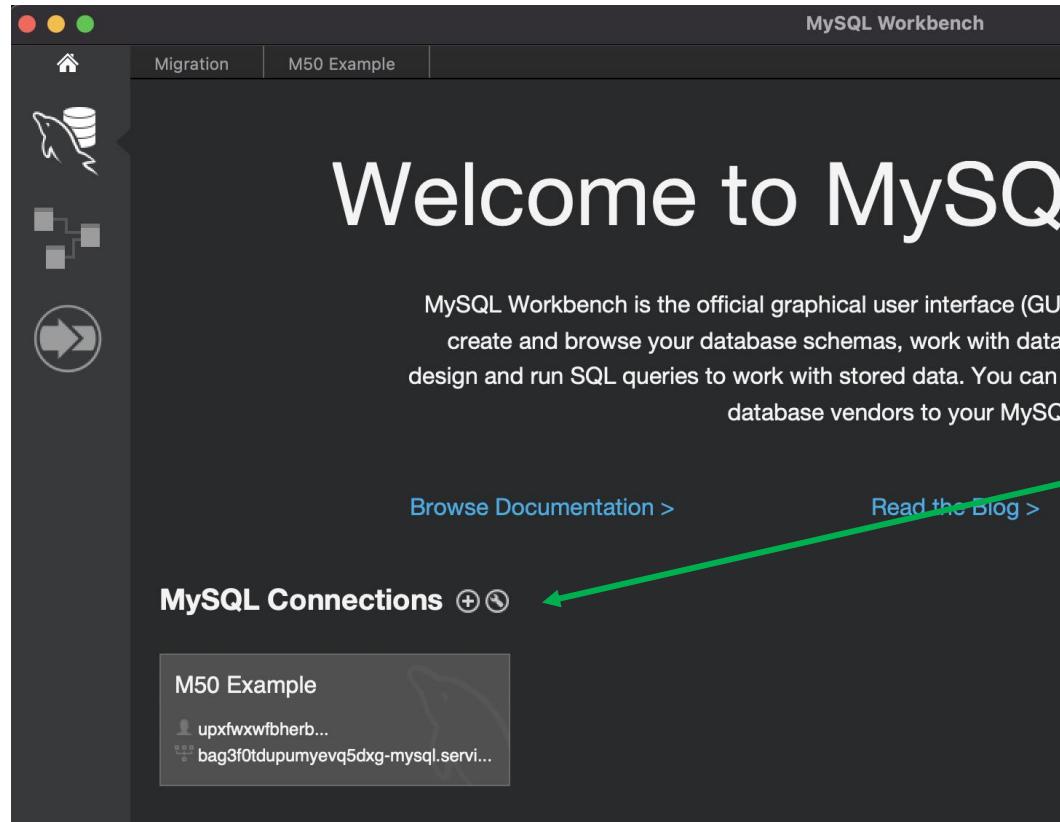
Let's move on to connecting this database up to our MySQL Workbench...

Clever Cloud ↔ MySQL Workbench

So, our relational database now sits on the cloud (**Clever Cloud**).

We need a way of connecting to it, and interacting with it, like we did with **MongoDB**.

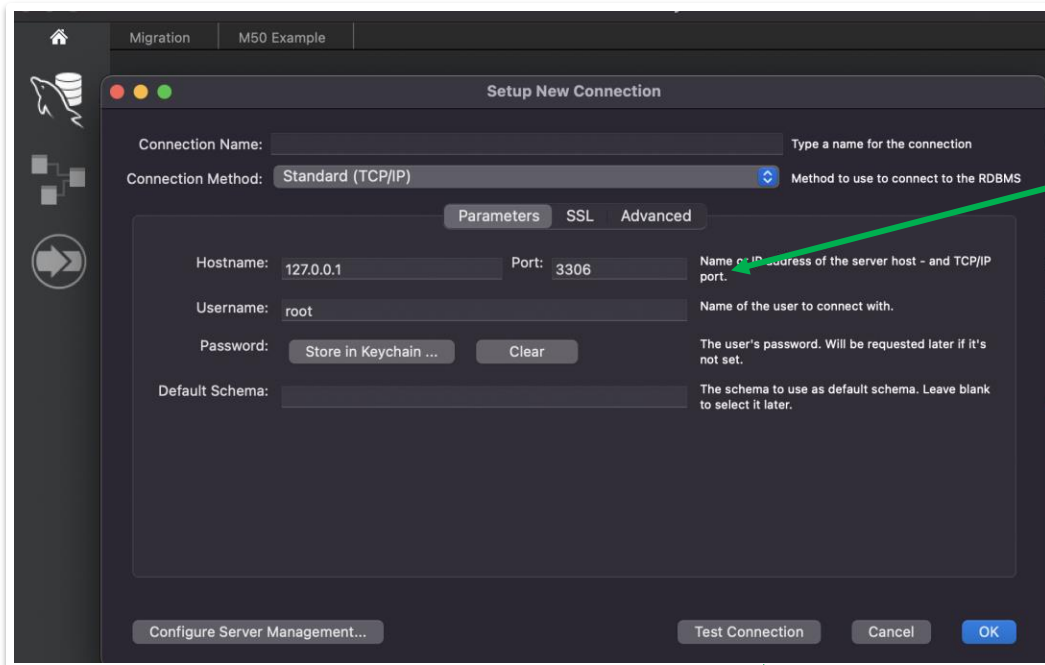
MySQL Workbench does this.



Click the small 'Circle-Plus' next to MySQL Connections

Clever Cloud ↔ MySQL Workbench

Copy the Clever Cloud Database Credentials across



The image shows the 'Setup New Connection' dialog in MySQL Workbench. The 'Parameters' tab is selected. The 'Connection Name' field is empty. The 'Connection Method' is set to 'Standard (TCP/IP)'. The 'Hostname' is '127.0.0.1' and the 'Port' is '3306'. The 'Username' is 'root'. The 'Password' field has buttons for 'Store in Keychain ...' and 'Clear'. The 'Default Schema' field is empty. A green arrow points from the 'Host' field in the Clever Cloud screenshot to the 'Hostname' field in this dialog.

Connection Name: Type a name for the connection

Connection Method: **Standard (TCP/IP)** Method to use to connect to the RDBMS

Parameters SSL Advanced

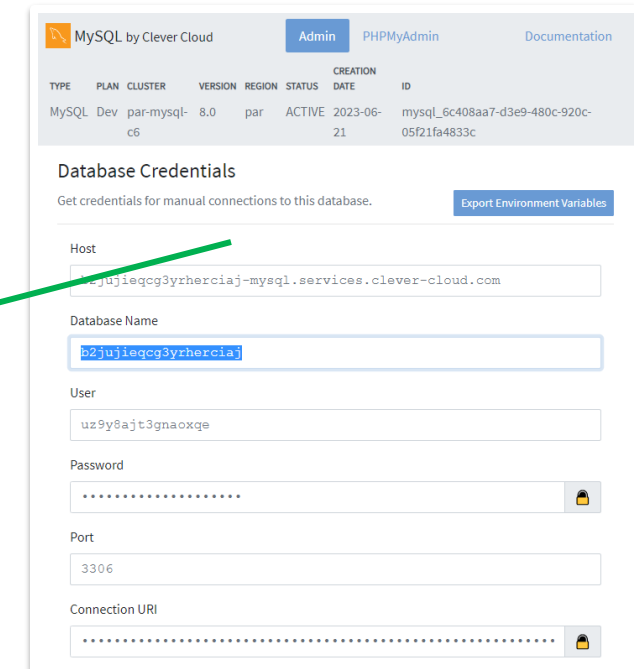
Hostname: 127.0.0.1 Port: 3306 Name or IP address of the server host - and TCP/IP port.

Username: root Name of the user to connect with.

Password: Store in Keychain ... Clear The user's password. Will be requested later if it's not set.

Default Schema: The schema to use as default schema. Leave blank to select it later.

Configure Server Management... Test Connection Cancel OK



The image shows the 'MySQL by Clever Cloud' 'Database Credentials' page. It displays a table with database information and a form for manual connections. A green arrow points from the 'Host' field in this form to the 'Hostname' field in the MySQL Workbench dialog.

MySQL by Clever Cloud Admin PHPMyAdmin Documentation

TYPE	PLAN	CLUSTER	VERSION	REGION	STATUS	CREATION DATE	ID
MySQL	Dev	par-mysql-c6	8.0	par	ACTIVE	2023-06-21	mysql_6c408aa7-d3e9-480c-920c-05f21fa4833c

Database Credentials

Get credentials for manual connections to this database. Export Environment Variables

Host: 127.0.0.1

Database Name: mysql

User: root

Password: Password

Port: 3306

Connection URI: Connection URI

Test your connection!

Well Done!
You have connected your database to
MySQL Workbench

MySQL Workbench

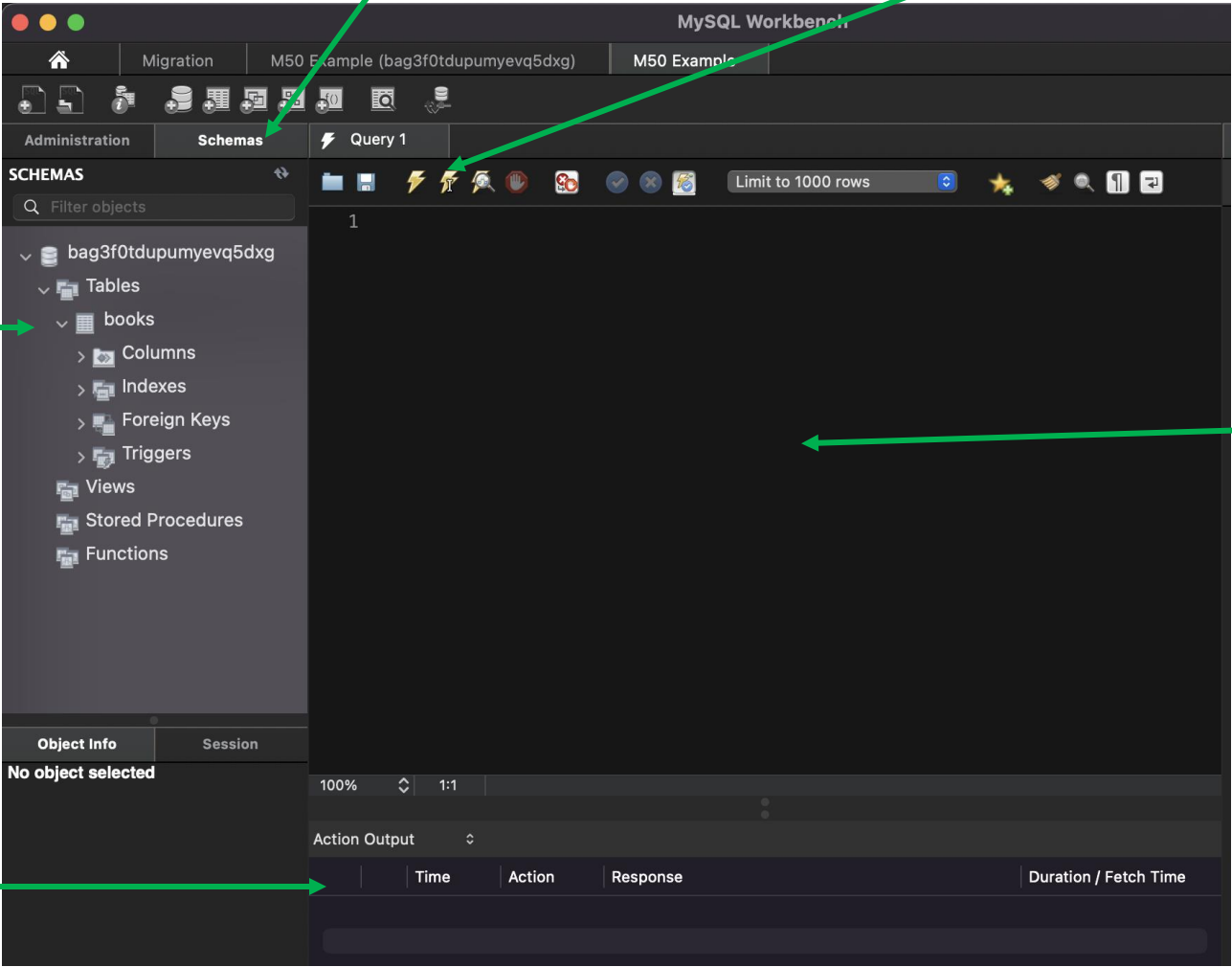
View your Schema
(database)

Run your query!

Your tables, etc

Query
Window

Query
Output Window



Great!

We have connected our database up to our Workbench and we can now do things with this empty database ...

But, what is a database?

What is a database?

It is a collection of organised data, information and records.

- A bank needs to store the information relating to customer accounts
- A hospital needs to keep data about patients and the medication dispensed
- A university needs to maintain records of its students
- A library needs to keep its book stock updated
- A business website must store its user's credentials and purchase history

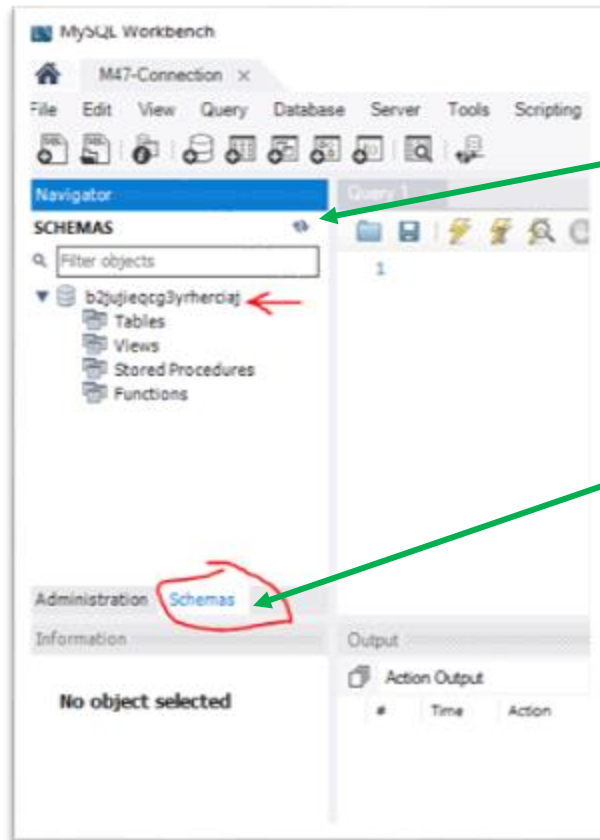
What is a database?

It needs a database tool like MySQL Workbench to help organise and maintain the data in it.

As a full-stack junior developer, you should know how to use the tools in order to make the database efficient and accurate.

MySQL Workbench

Click on the **Connection** to Open the SQL Editor.



If you don't see the database, then try the **Refresh** button.

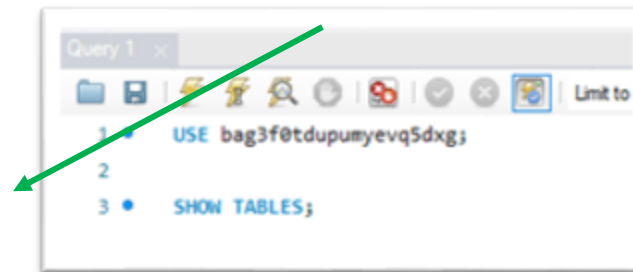
Select **Schemas** to see your database listed above.

The Output window at the bottom tells you things about the success/failure/status of things to do with your SQL query or connection, etc:

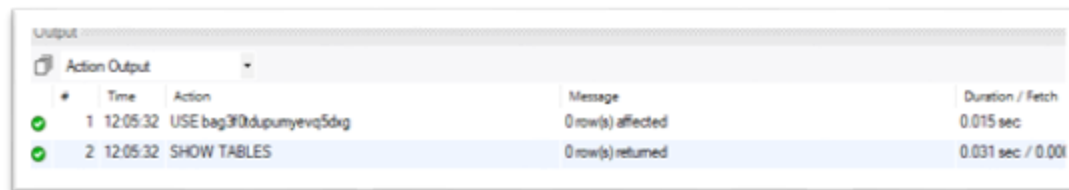
MySQL Workbench

Let's write our first query in the top 'Query' window, to show all tables in our database.

Execute the query



The results should look like this

A screenshot of the MySQL Workbench Output window. The window has a title bar 'Output' and a dropdown menu set to 'Action Output'. It displays a table with the following data:

#	Time	Action	Message	Duration / Fetch
✓ 1	12:05:32	USE bag3f0tdupumyevq5dxg	0 row(s) affected	0.015 sec
✓ 2	12:05:32	SHOW TABLES	0 row(s) returned	0.031 sec / 0.001

We write all SQL code in uppercase letters. SQL was developed in the 1970s when the popular programming languages like COBOL used ALL CAPS, and the convention must have stuck. It does make all commands easier to spot!



```
3  -- SHOW TABLES;
```

You can use 2 dashes for comments

SQL has data types, too ...

Strings

CHAR()
VARCHAR()
TEXT()
TINYTEXT
LONGTEXT
etc

Numbers

BIT()
INT()
TINYINT()
BIGINT()
FLOAT()
DECIMAL()
etc

Other

DATE
TIME
DATETIME()
IMAGE
etc

More info...

https://www.w3schools.com/sql/sql_datatypes.asp

Let's create a new database table...

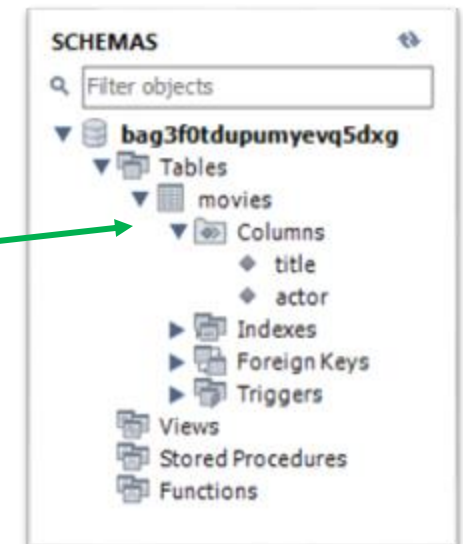
```
Query 1 x
1 • USE bag3f0tdupumyevq5dxg;
2
3 • CREATE TABLE movies (
4     title VARCHAR(255) NOT NULL UNIQUE,
5     actor VARCHAR(255) DEFAULT 'Not specified'
6 );
```

UNIQUE = No similar string in another cell for this field

DEFAULT = If nothing exists then use this... (This is helpful for the user)



Run the query to see your new table with its columns.



Let's insert some data...

INSERT is the CREATE aspect of the CRUD operations

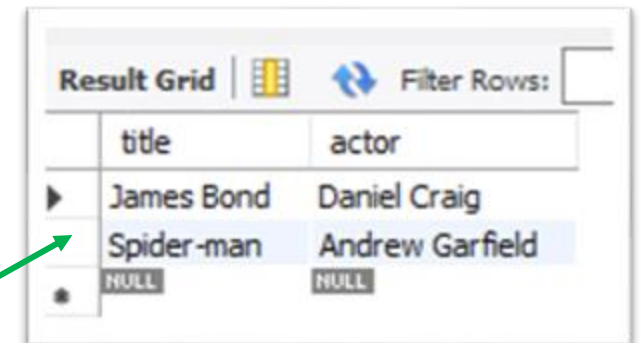
These two separate SQL commands will add two rows to the movies table:

```
1  
8 • INSERT INTO movies VALUES ('Spider-man', 'Andrew Garfield');  
9 • INSERT INTO movies VALUES ('James Bond', 'Daniel Craig');
```

We can check to see the new rows by SELECTING the table:

```
10  
11 • SELECT * FROM movies;
```

SELECT is the READ aspect of the CRUD operations



	title	actor
▶	James Bond	Daniel Craig
▶	Spider-man	Andrew Garfield
•	NULL	NULL



Run the query to see two new rows in the movies table.
(Remember to comment out the previous lines)

Let's insert some data...

Now, if we want to see the DEFAULT response to a SQL statement then try this:

```
14 • INSERT INTO movies (title) VALUES ('John Wick');
```

title	actor
▶ Andy Dufresne	Tim Robbins
Dr Strange	Benedict Cumberbatch
James Bond	Daniel Craig
John Wick	Not specified
Neo	Keanu Reeves
Spider-man	Andrew Garfield
NULL	NULL

We are telling it to insert the text value into the column, but without an actor value. (It will use the default value)



Default values are very user-friendly!

All sorted ?

```
10  
11 • SELECT * FROM movies;
```

This SELECT statement, showed us the data in our table. It auto-sorted the rows by the PRIMARY KEY (title) but we can order results in different ways...



	title	actor
▶	Andy Dufresne	Tim Robbins
	Dr Strange	Benedict Cumberbatch
	James Bond	Daniel Craig
	Neo	Keanu Reeves
	Spider-man	Andrew Garfield
•	NULL	NULL

```
12  
14 • SELECT * FROM movies ORDER BY actor DESC;
```



	title	actor
▶	Andy Dufresne	Tim Robbins
	Neo	Keanu Reeves
	James Bond	Daniel Craig
	Dr Strange	Benedict Cumberbatch
	Spider-man	Andrew Garfield
•	NULL	NULL

Try this:

```
14 • SELECT * FROM movies WHERE title = 'Neo';
```

Activity



Add 5 more films and actors into your movies table. Check that they were successfully added by displaying the table with a SELECT statement..

Add relevant comments to your SQL statements.

Stretch

Do some research and implement the **UPDATE** and **DELETE** statements into your simple movie table. I recommend that you visit [w3schools.com](https://www.w3schools.com) for documentation on syntax, etc, but of course other website tutorials are available.

(Can you bypass the safety feature within Workbench that prevents DELETE?)

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