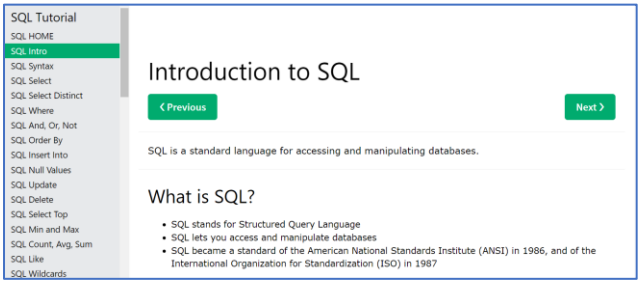
Exercise: Databases

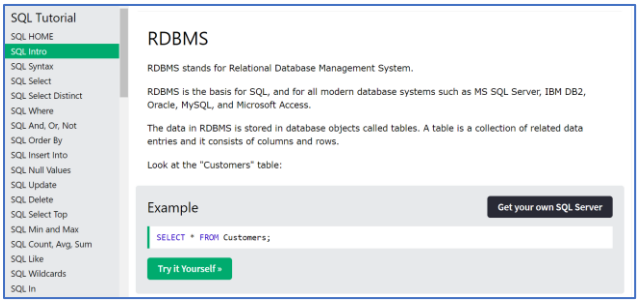
Problems for exercises and homework for the "Software Technologies" course @ Software University.

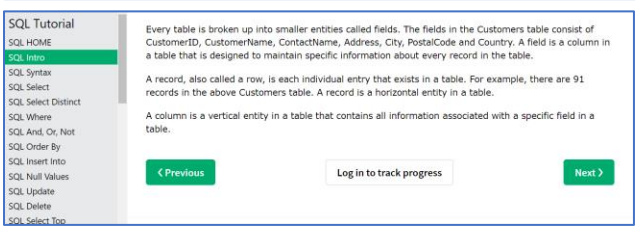
1. Follow a SQL Tutorial

Practice and learn SQL skills, following a simple SQL tutorial:

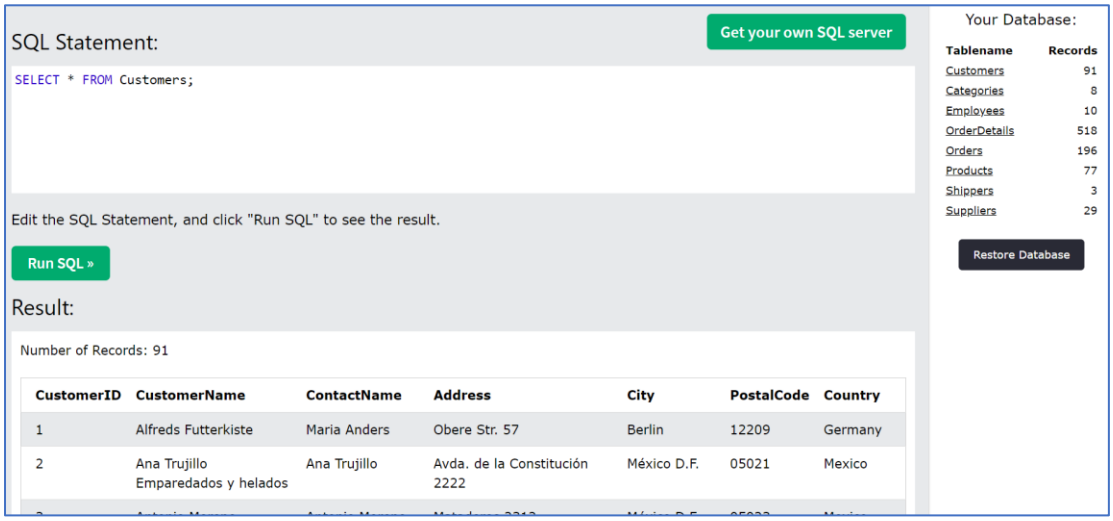
1. **Open the following Tutorial in W3Shools:**
   - Create your own profile in W3Shools and Login to track your progress.
   - Take the first 10 topics from the Tutorial.
   - Read the theory paragraph in every topic.
   - Example – Intro Topic:



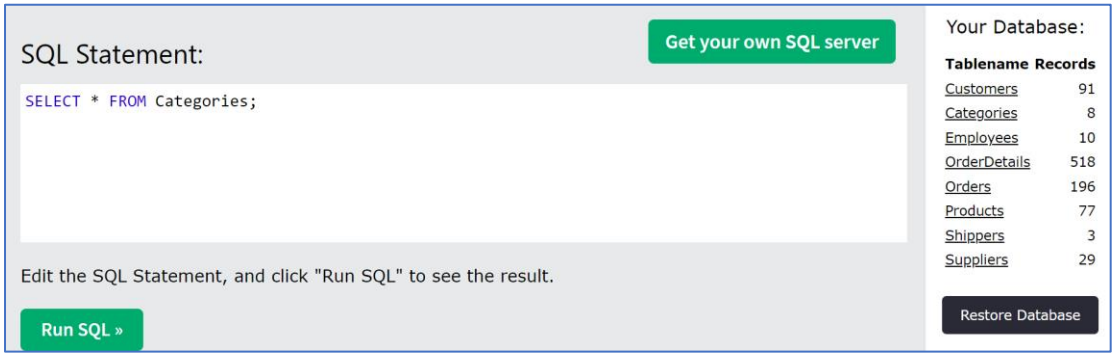




2. **In every topic you can try to write SQL by yourself:**



- On the right side of the screen, you will be able to see all the tables that are created for you for the example:



- Click on "**Run SQL**" and see the selected table appeared in the "**Result**" box:

- You can try to **SELECT** another table from the Database:

SQL Statement:

```
SELECT * FROM Employees;
```

Result:

Number of Records: 10

EmployeeID	LastName	FirstName	BirthDate	Photo	Notes
1	Davolio	Nancy	1968-12-08	EmpID1.pic	Education includes a BA in psychology from Colorado State University. She also completed (The Art of the Cold Call). Nancy is a member of 'Toastmasters International'.
2	Fuller	Andrew	1952-02-19	EmpID2.pic	Andrew received his BTS commercial and a Ph.D. in international marketing from the University of Dallas. He is fluent in French and Italian and reads German. He joined the company as a sales representative, was promoted to sales manager and was then named vice president of sales. Andrew is a member of the Sales Management Roundtable, the Seattle Chamber of Commerce, and the Pacific Rim Importers Association.
3	Leverling	Janet	1963-08-	EmpID3.pic	Janet has a BS degree in chemistry from Boston College). She

- Try to **SELECT** the **OrderDetails** table:

SQL Statement: Get your own S

```
SELECT * FROM OrderDetails;
```

Edit the SQL Statement, and click "Run SQL" to see the result.

Run SQL »

Result:

Number of Records: 518

OrderDetailID	OrderID	ProductID	Quantity
1	10248	11	12
2	10248	42	10
3	10248	72	5

- Now try to **SELECT only those entries**, that **refer to a product with ID 11**:

SQL Statement:

```
SELECT * FROM OrderDetails WHERE ProductID = 11;
```

Result:

Number of Records: 9

OrderDetailID	OrderID	ProductID	Quantity
1	10248	11	12
130	10296	11	12
211	10327	11	50
281	10353	11	12
314	10365	11	24
426	10407	11	30
492	10434	11	6
514	10442	11	30

- Now try to **SELECT** only those entries, that have **ProductID = 11** and **Quantity not less than 12**:

SQL Statement:

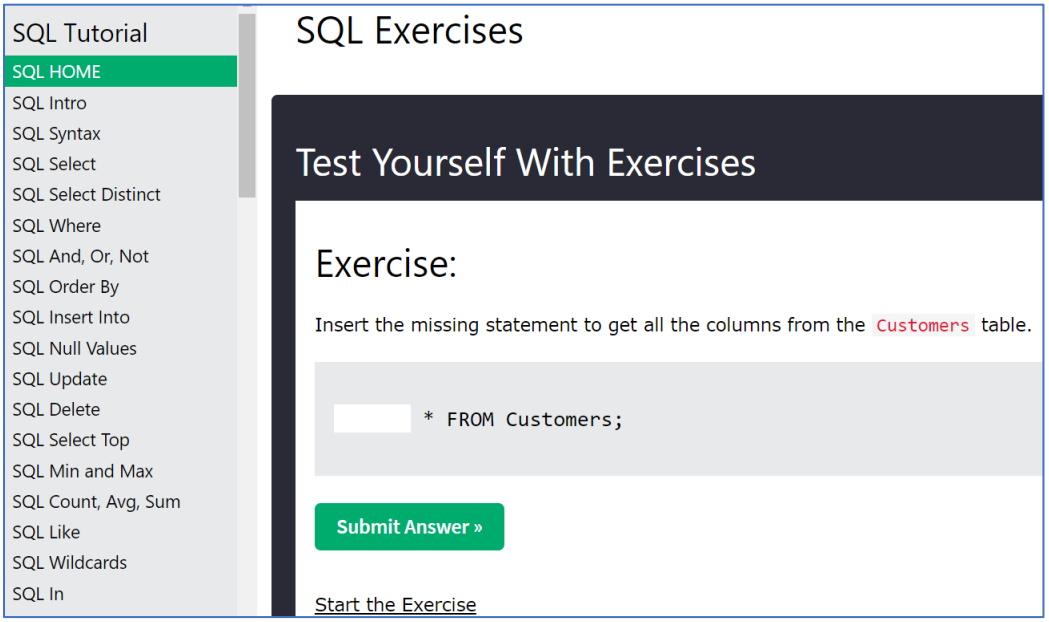
```
SELECT * FROM OrderDetails WHERE ProductID = 11 AND Quantity >= 12;
```

Result:

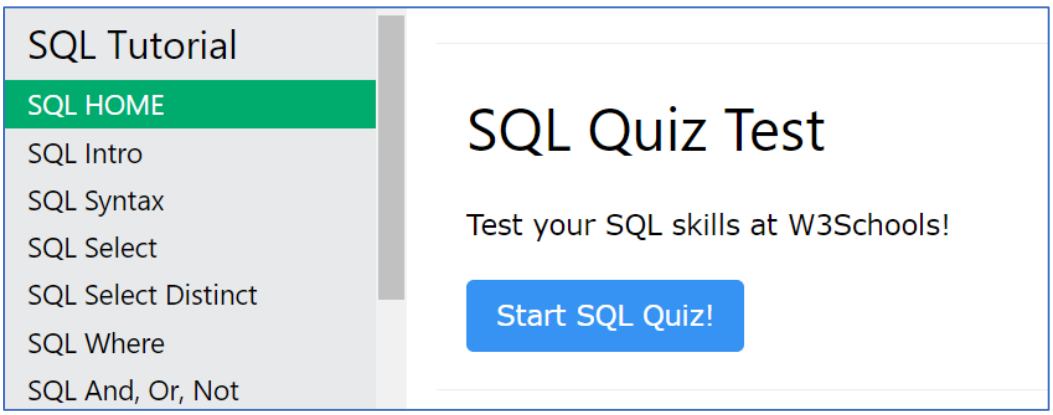
Number of Records: 7

OrderDetailID	OrderID	ProductID	Quantity
1	10248	11	12
130	10296	11	12
211	10327	11	50
281	10353	11	12
314	10365	11	24
426	10407	11	30
514	10442	11	30

3. **In the end, test what you have learned by passing through the exercise, from the [HOME topic]:**



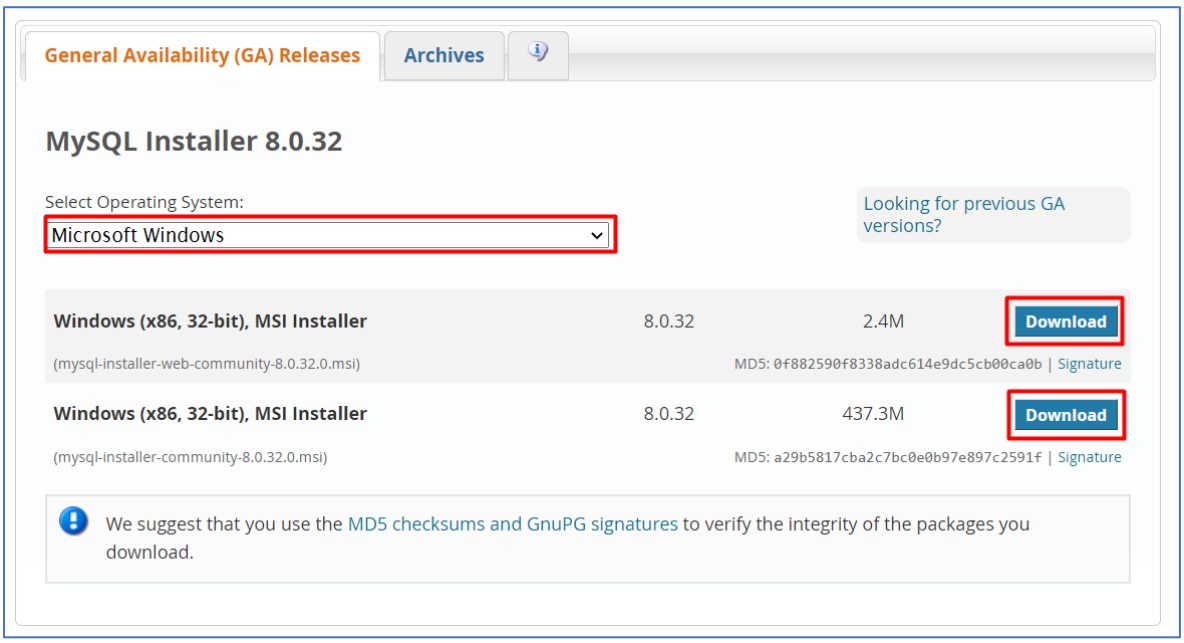
4. **You can try the SQL Quiz Test also:**



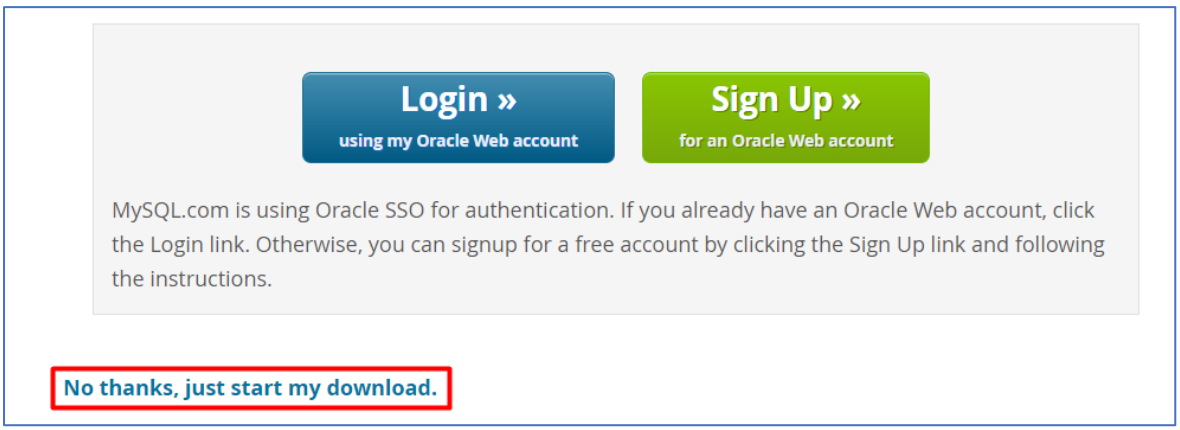
2. MySQL and Workbench Installation

1. **MySQL Workbench:**
   - A **visual tool for database design, management, and administration**, while **MySQL Server is the actual database management system** that **stores, manages, and retrieves data**. QA engineers need these tools to create, manipulate, and verify databases during testing, ensuring that the application's data-related functionalities work correctly and meet requirements.

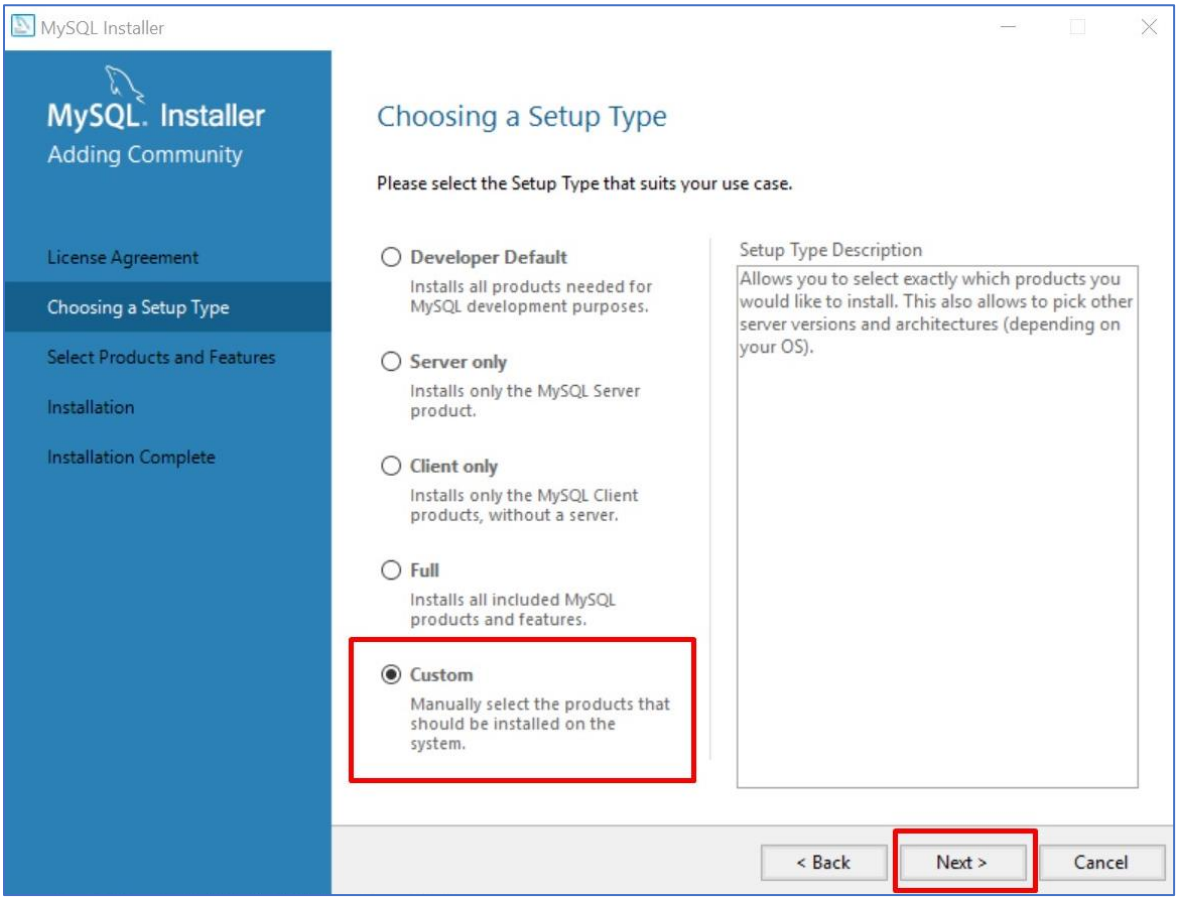
2. **Download MySQL Installer:**
   - Navigate to the official MySQL download site at https://dev.mysql.com/downloads/installer/
   - Choose your operating system and click one of the two download buttons. It doesn't if you choose mysql-installer-web-community or mysql-installer-community. They are quite the same. The first one downloads the files needed while installing them, the other pre downloads the files needed and then installs them.



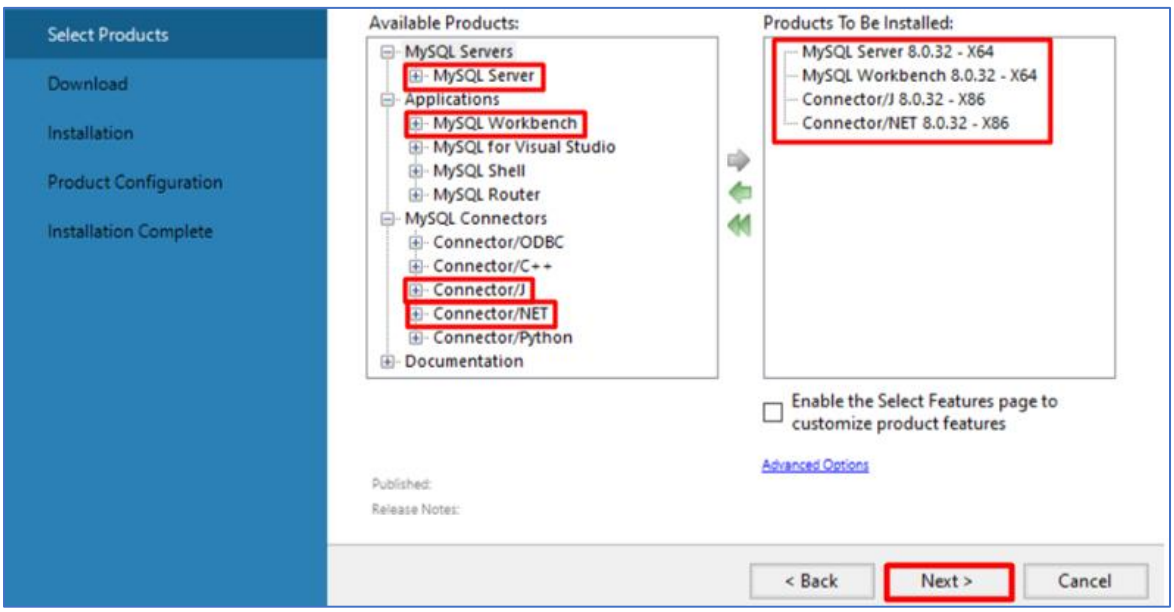
   - On the next page you will be prompted to Login or Sign up. Just skip this step.



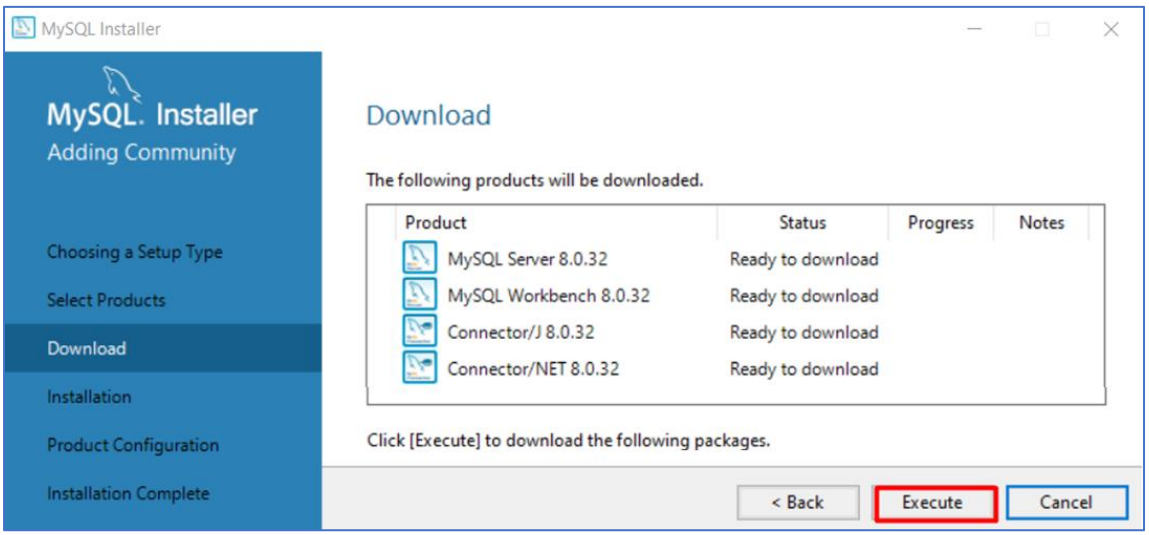
3. **Run MySQL Installer:**
    - Once the installer is downloaded, run the executable file.
    - Choose "Custom" installation type. Then click next.



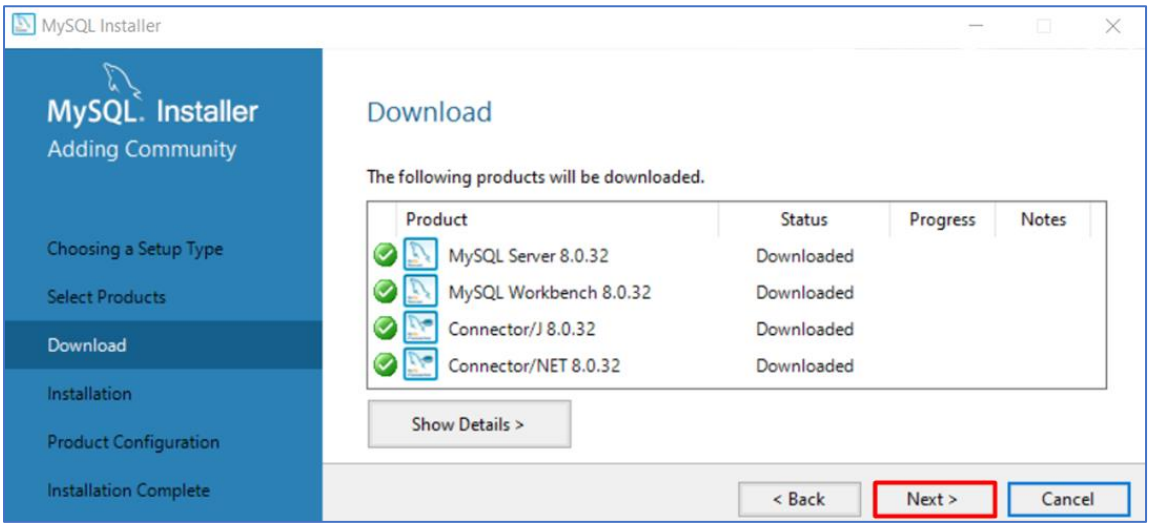
- All the features we need are **MySQL Server**, **MySQL Workbench**, **Connector/J**, **Connector/NET** and **MySQL Workbench**. All other features are optional and won't be needed for now.



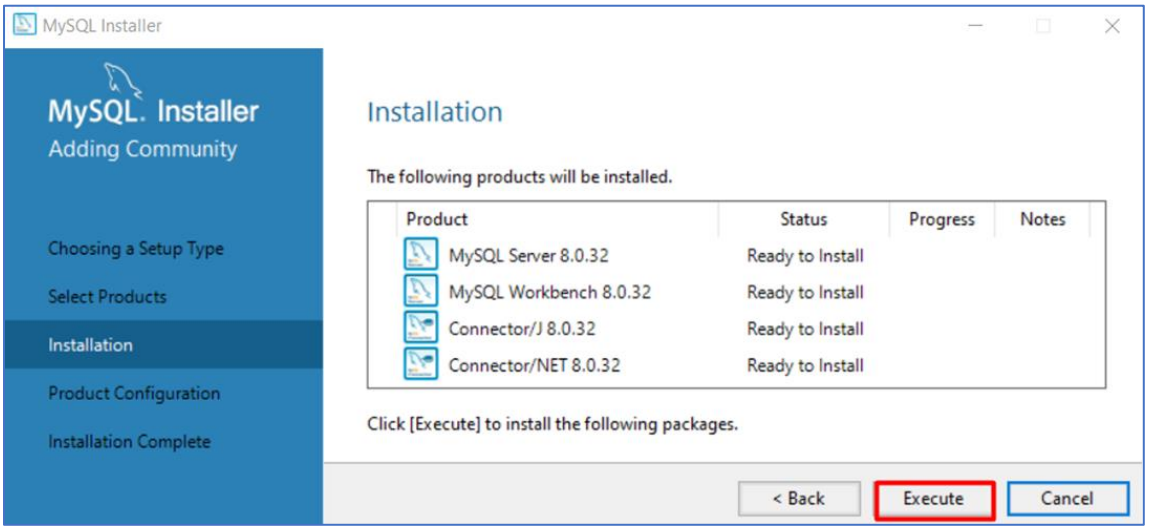
- Click **Execute** and the setup will download the selected features.



- **Wait** for the files to download and **click Next:**

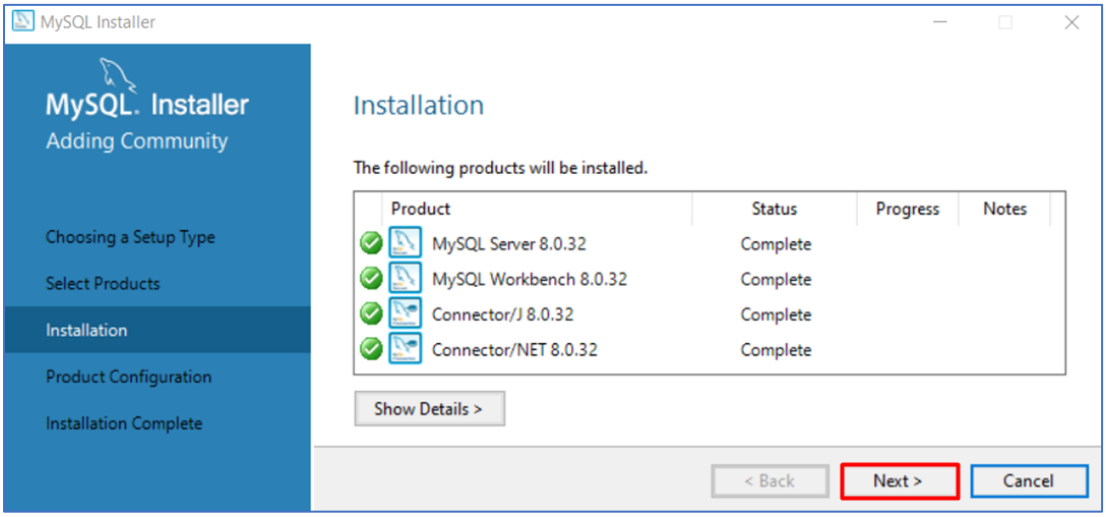


- **Click Execute** to install the files:

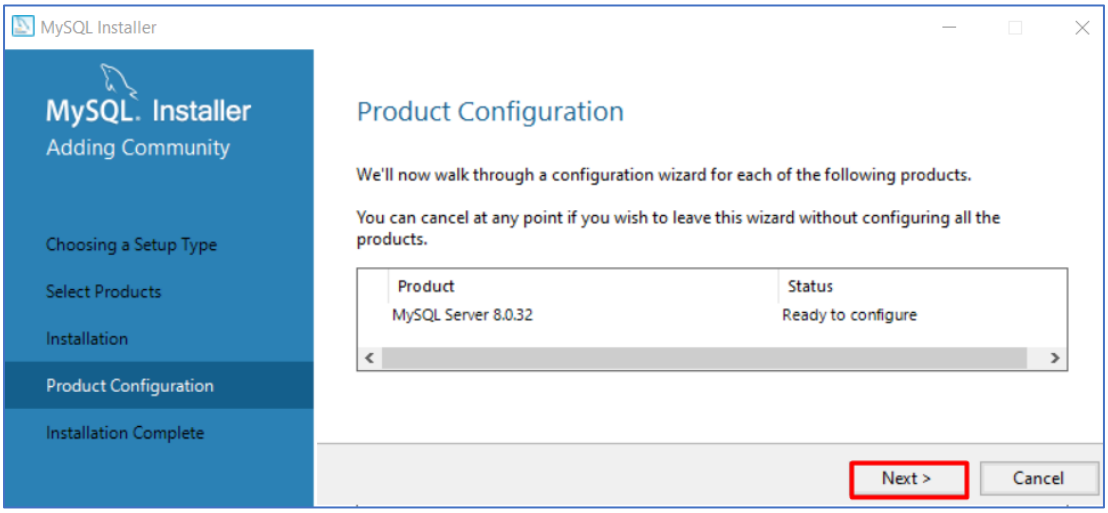


Connector/J and Connector/NET (client libraries for Java and .NET) are optional. We shall not need them.

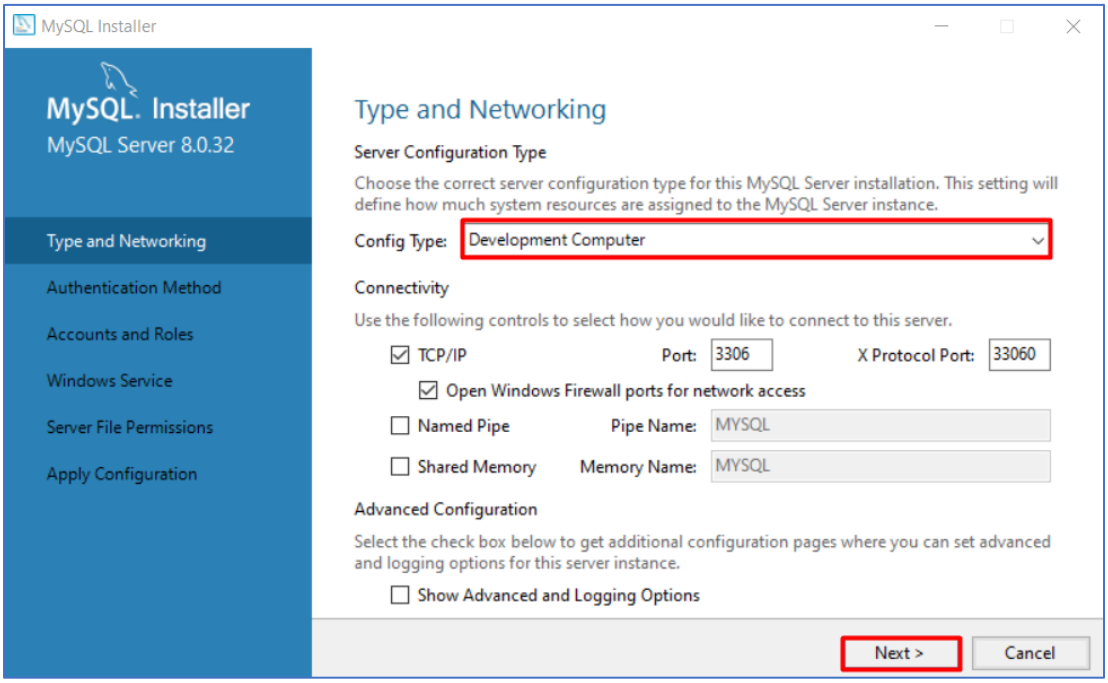
- **Wait** for the **installation to complete and click Next** to start configuration wizard:



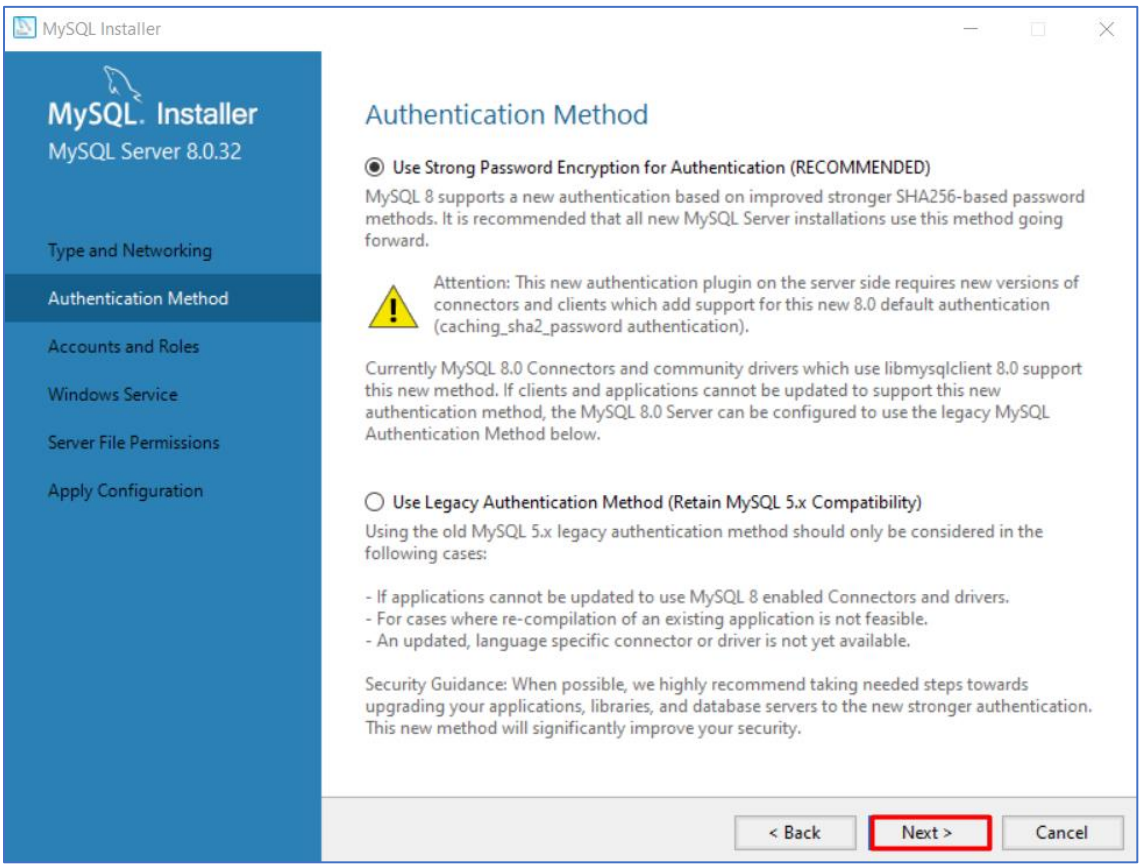
4. **Now, you have to configure your product.**
   - Click Next:



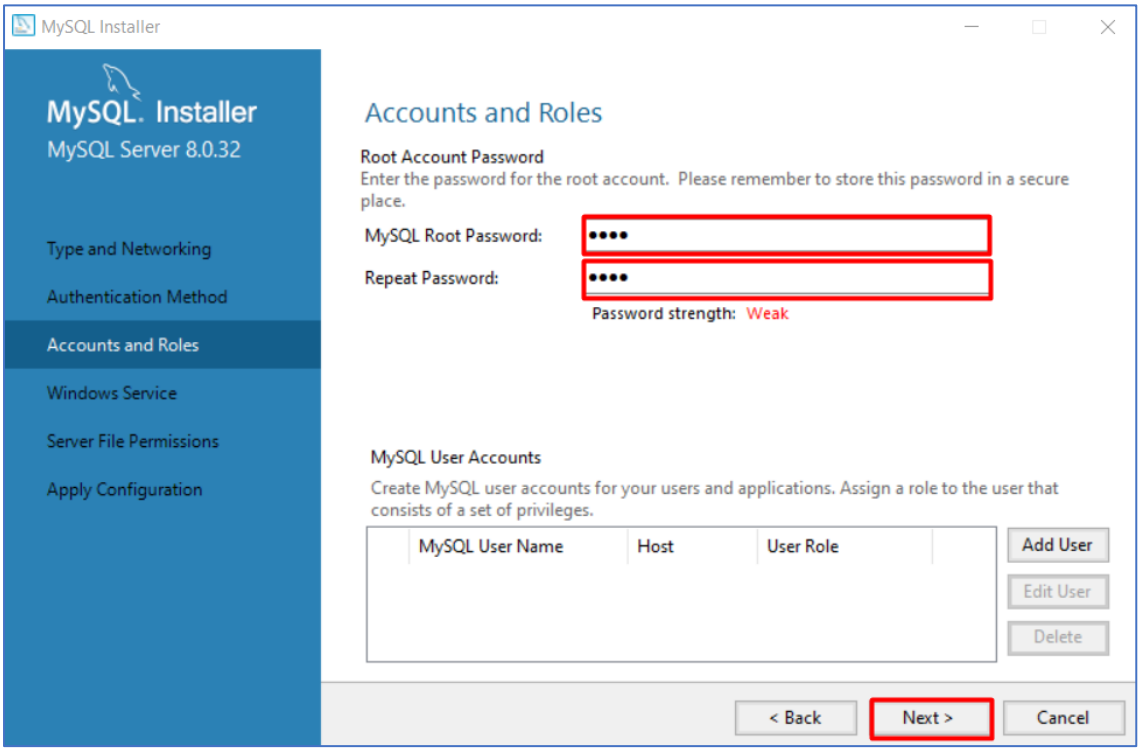
   - Choose the configuration type to be a **Development Computer** and click on Next**:**



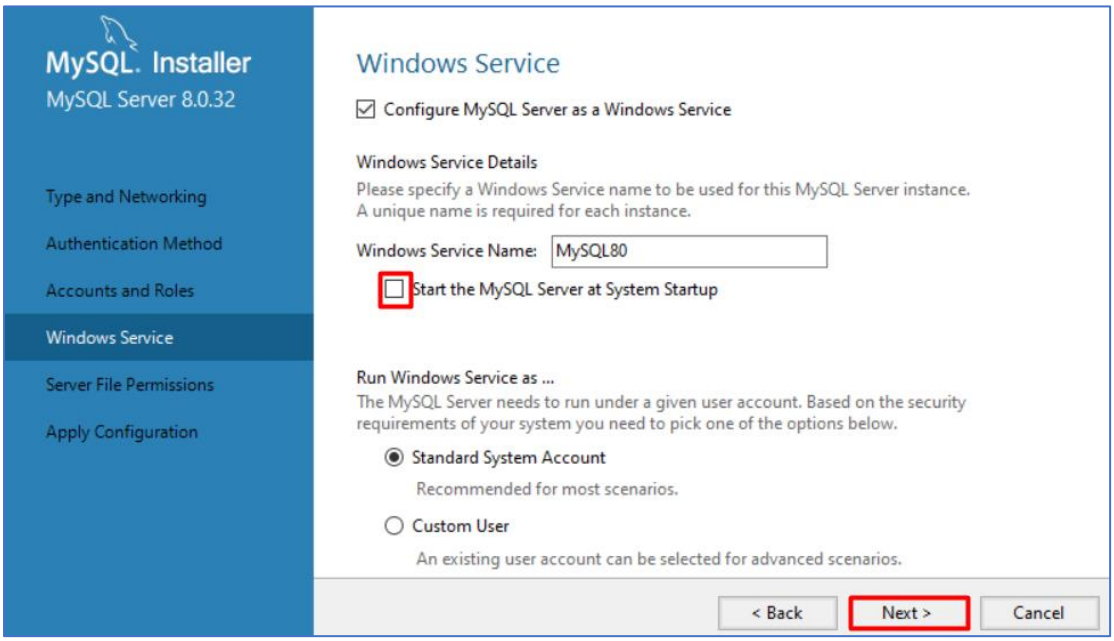
- **Choose Authentication method** and click **Next**:



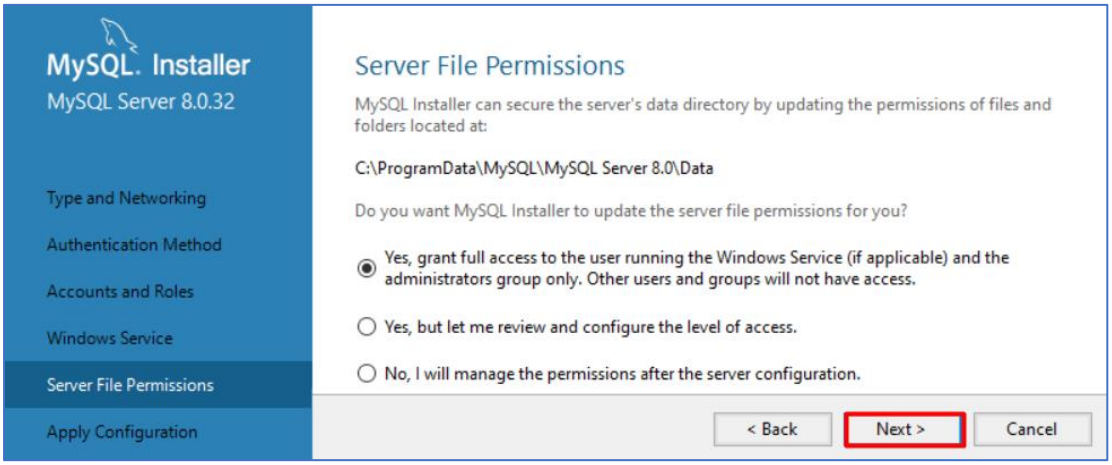
- **Set password** to the Root account and click **Next**:



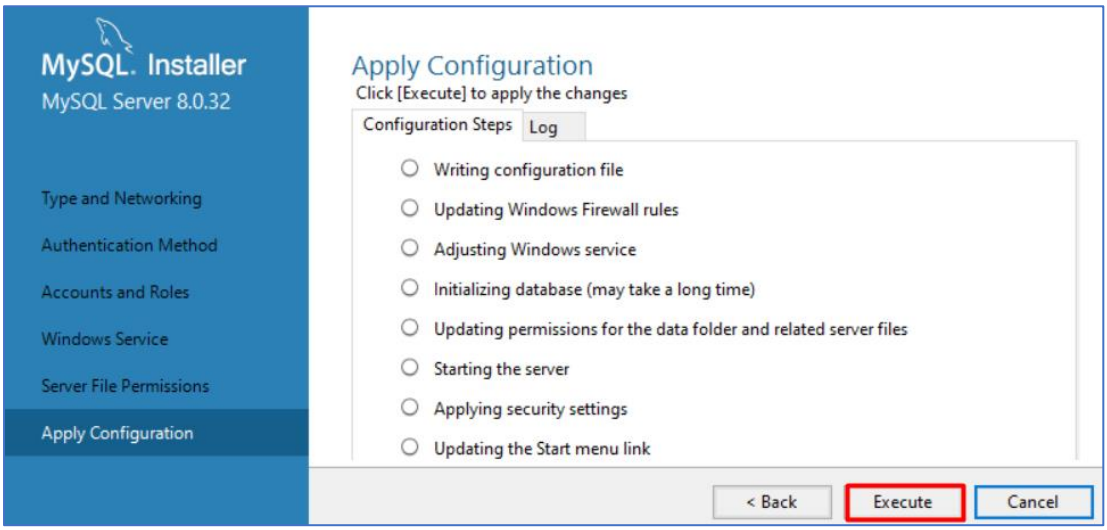
- Here you can set the **MySQL Server** to run as **Windows Service and to start automatically at Windows start up.** Otherwise, **you must start up MySQL every time before working with a database.** Decide whichever suits you best.



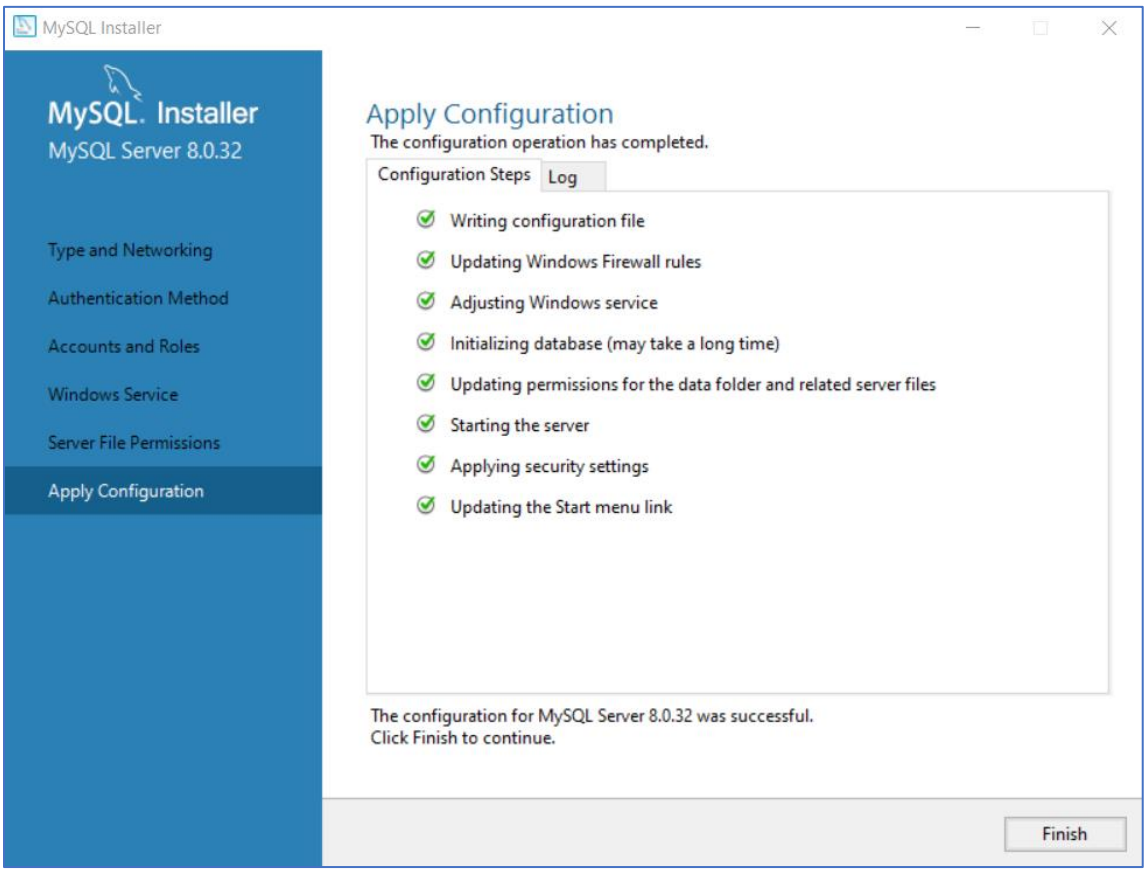
- **Server File Permission –** Leave the chosen option as it as it is. Next:



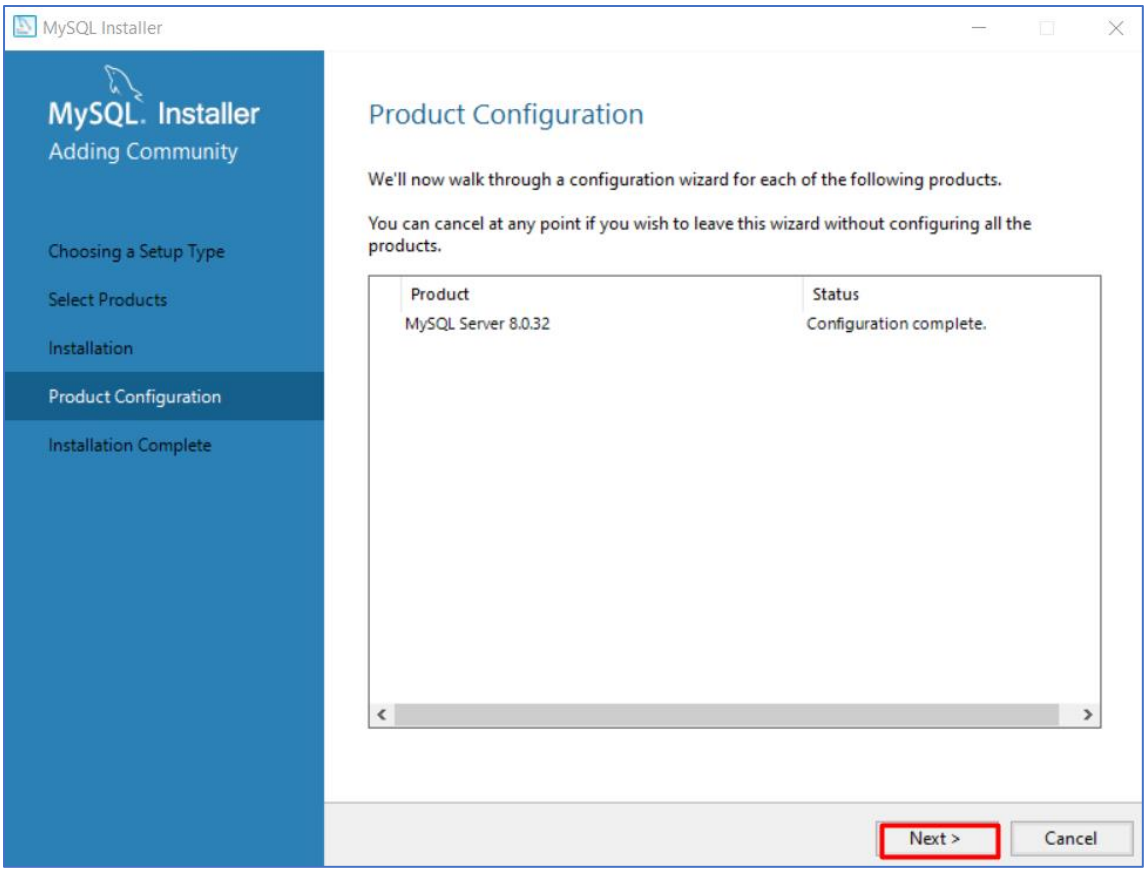
- **Hit Execute** and wait for the **Configuration to be applied**:



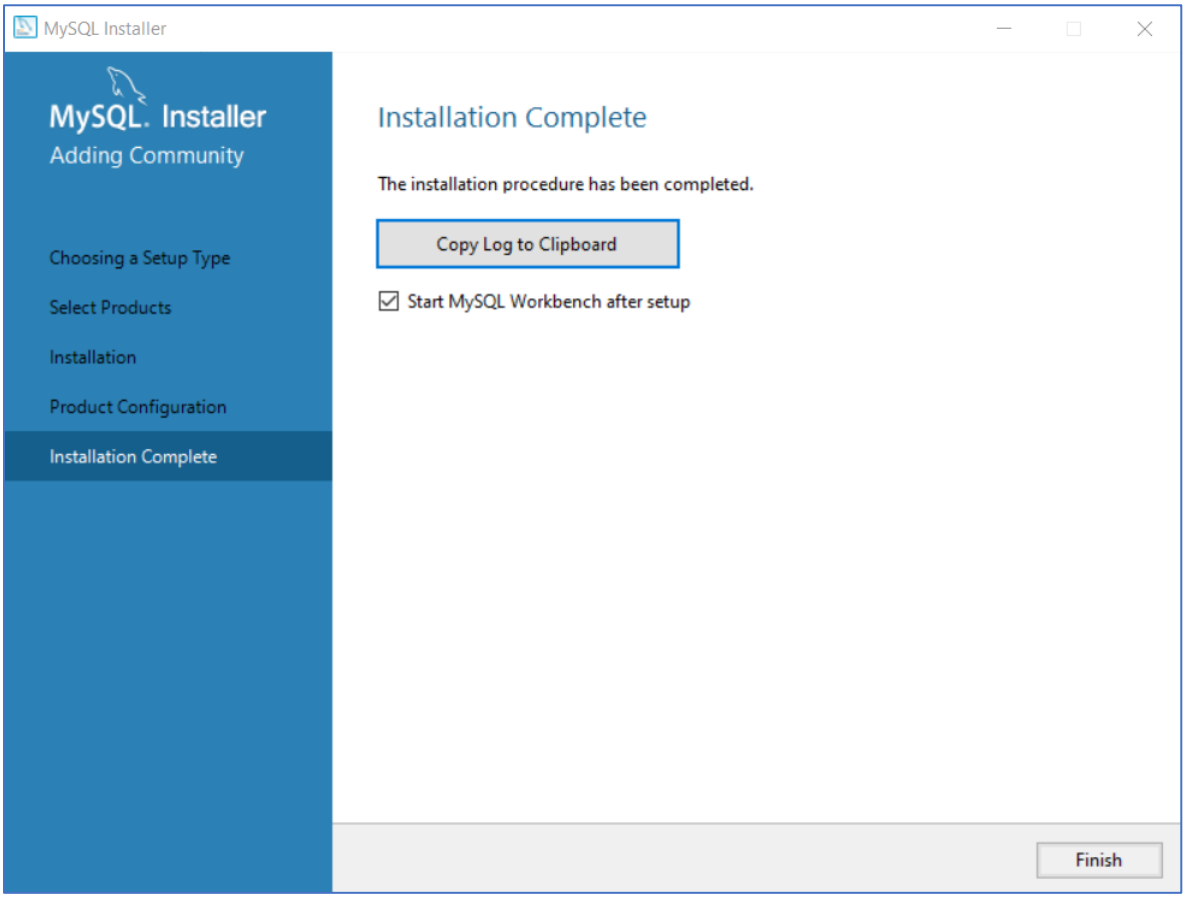
- Click **Finish:**



- Another **Next**: 😊

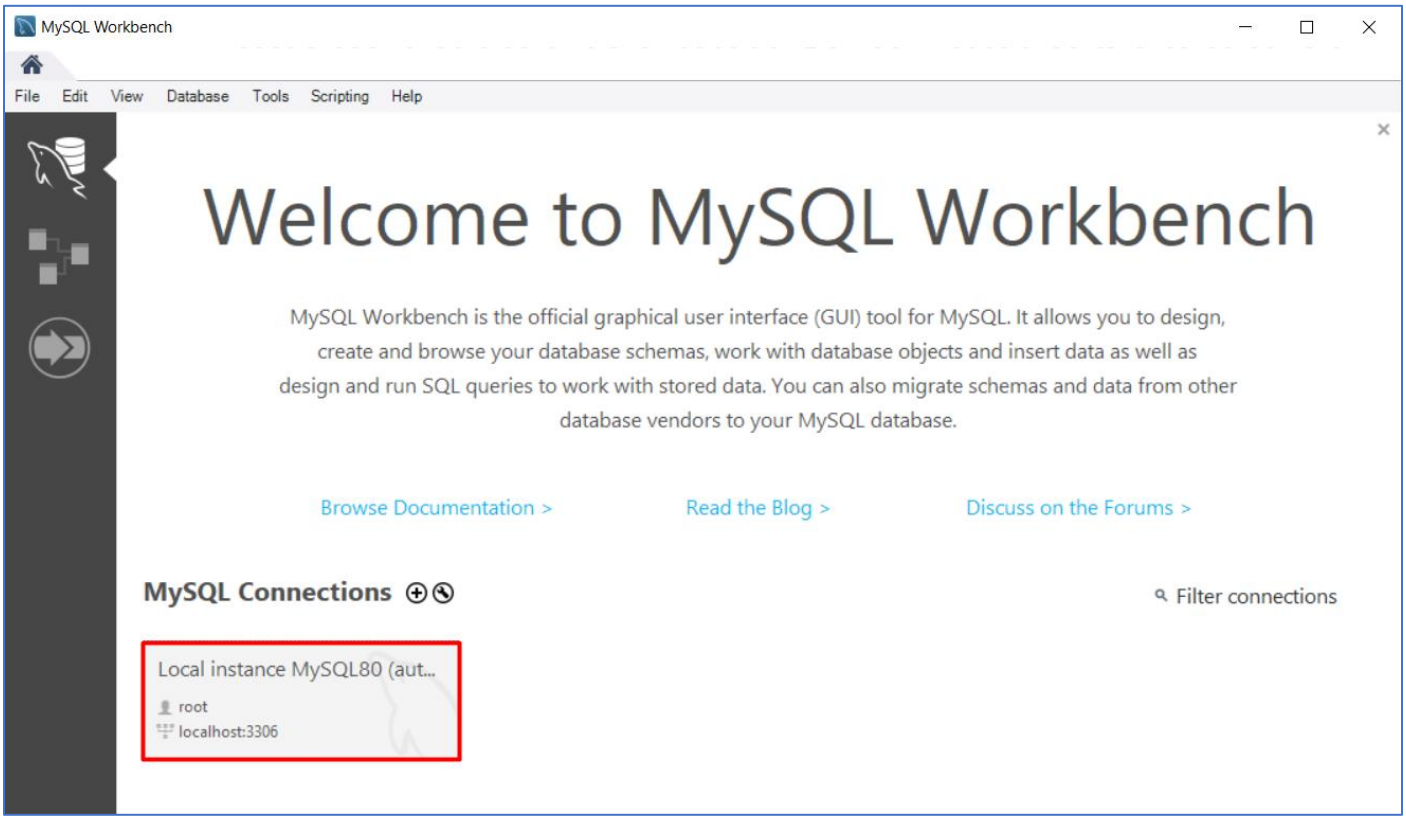


1. And one final **Finish:**

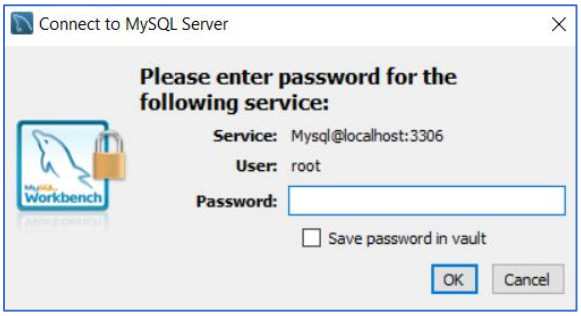


3. Simple Database and Queries

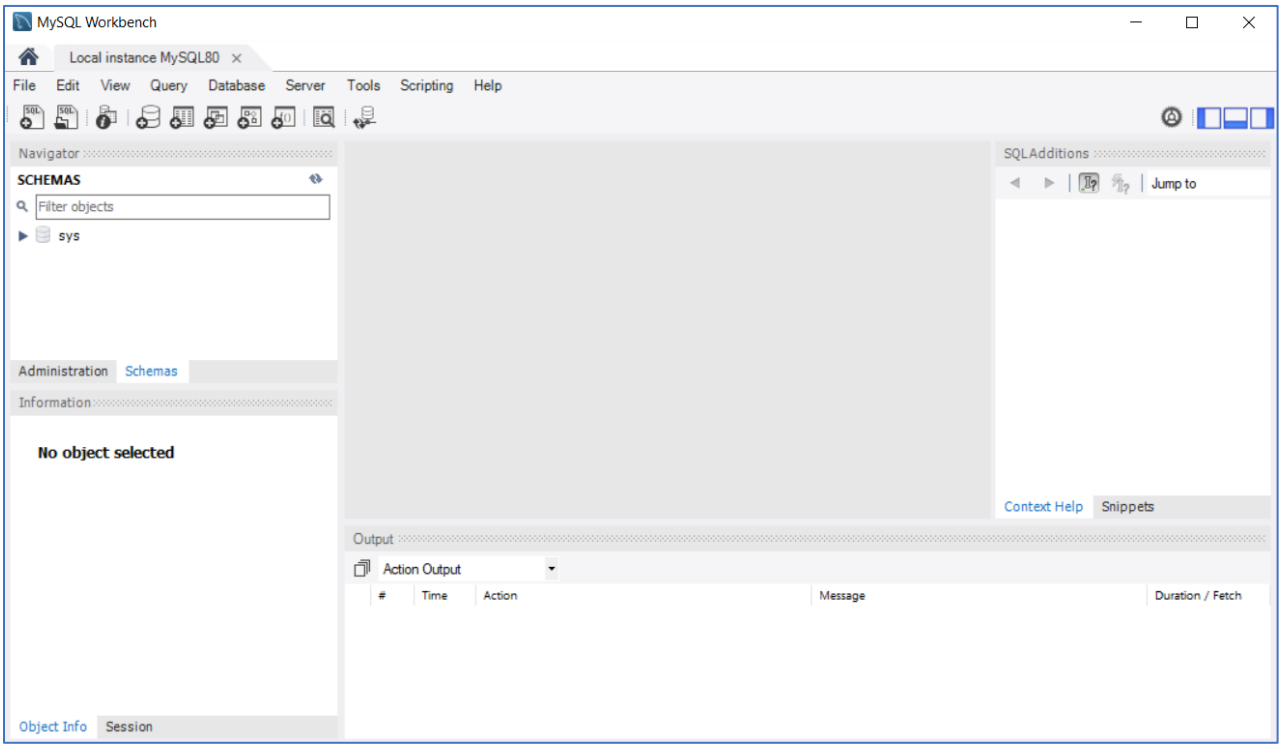
1. Open Workbench and connect to the local server.



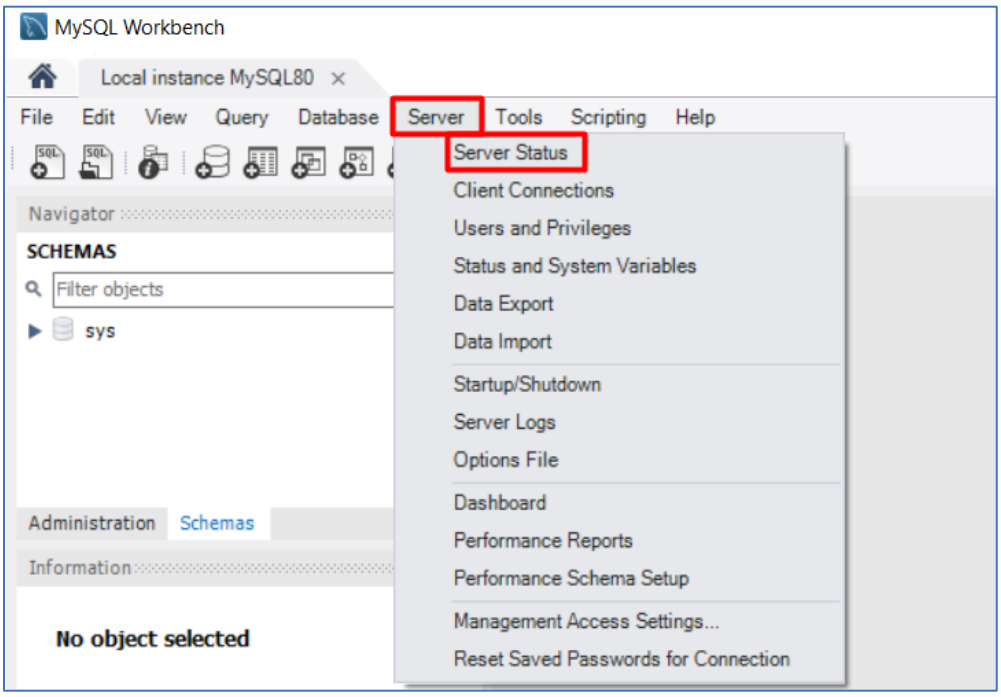
2. Enter the **password** you previously created.

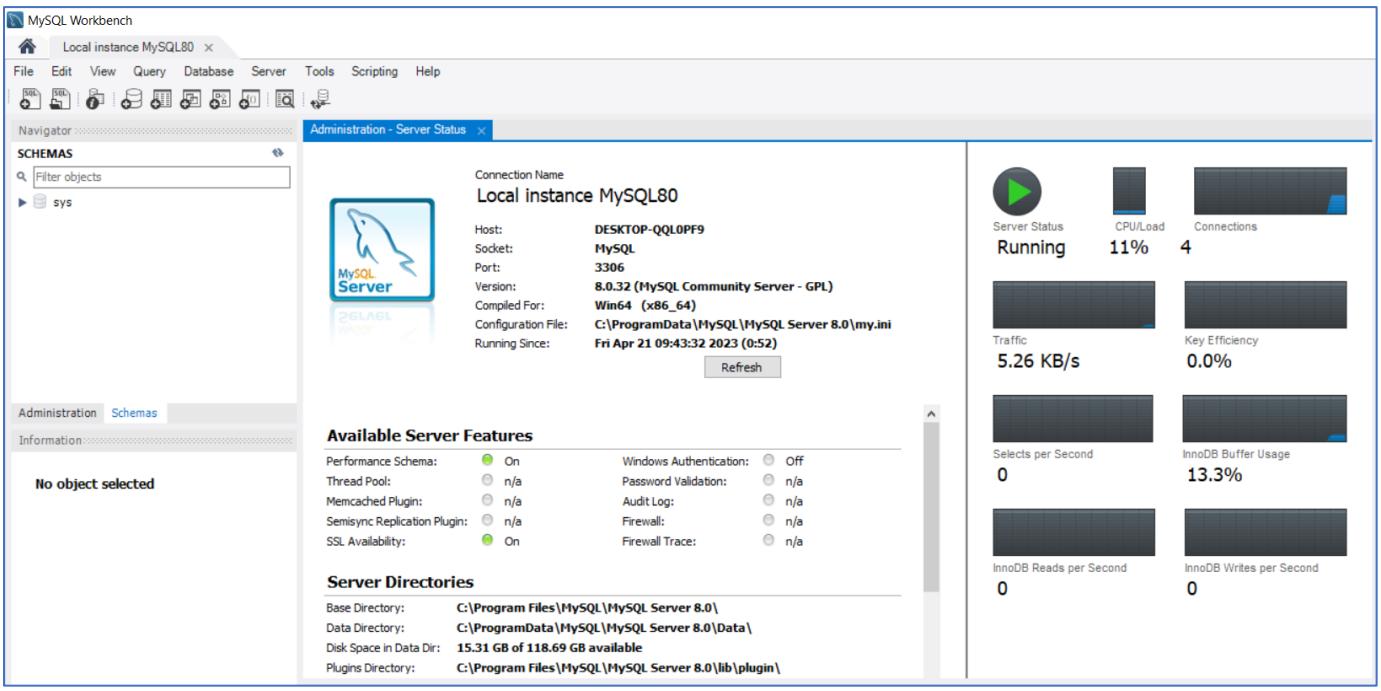


3. This is how **Workbench looks like**.

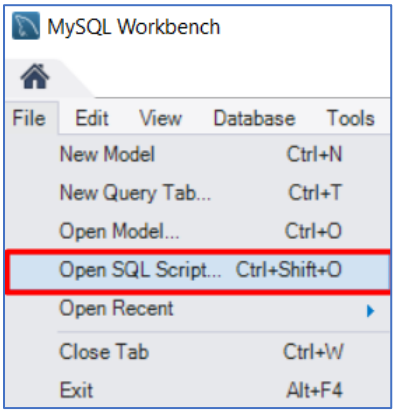


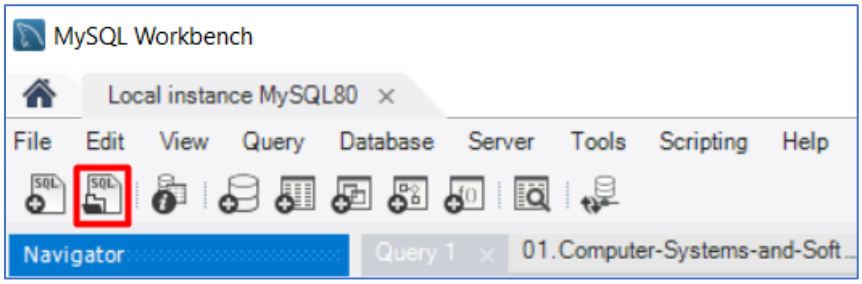
4. You can check the **status of your server** if you'd like.



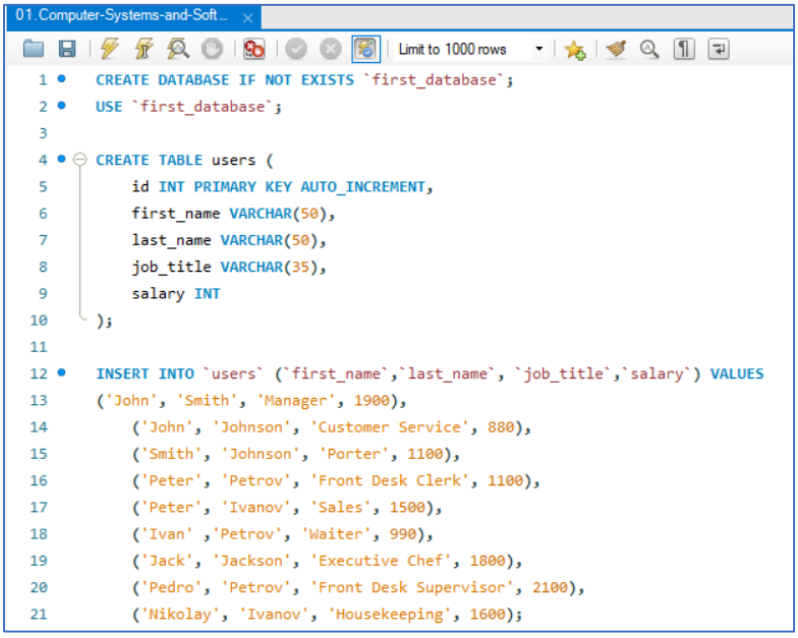


5. Now, we will open an existing SQL script, which will create a simple database, containing just one table and populate it with records. You are provided with the file "**01.Computer-Systems-and-Software-Exercise-MySQL-Database.sql**". You can open it in two ways:





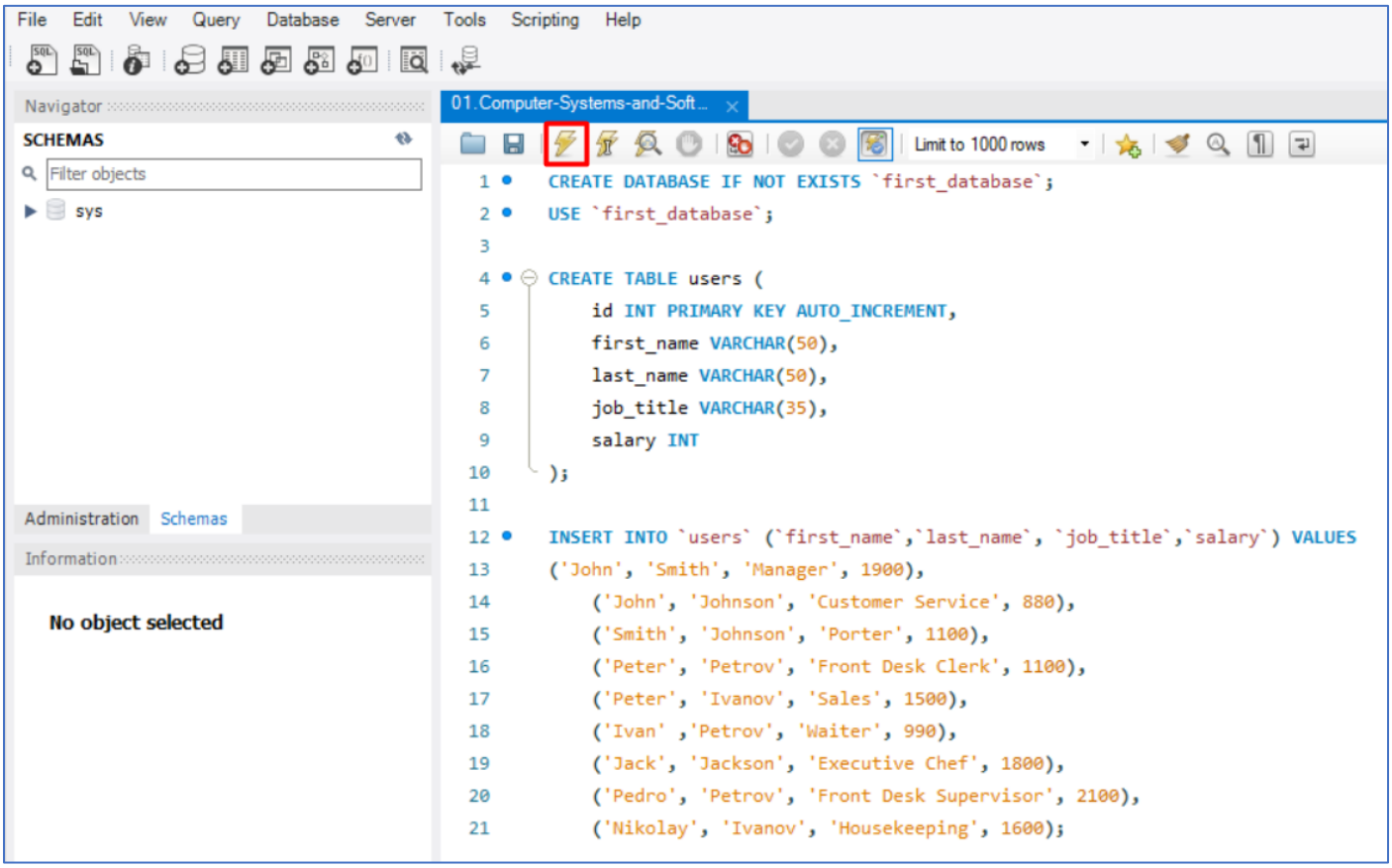
6. This is how the file **would look like** when you open it.



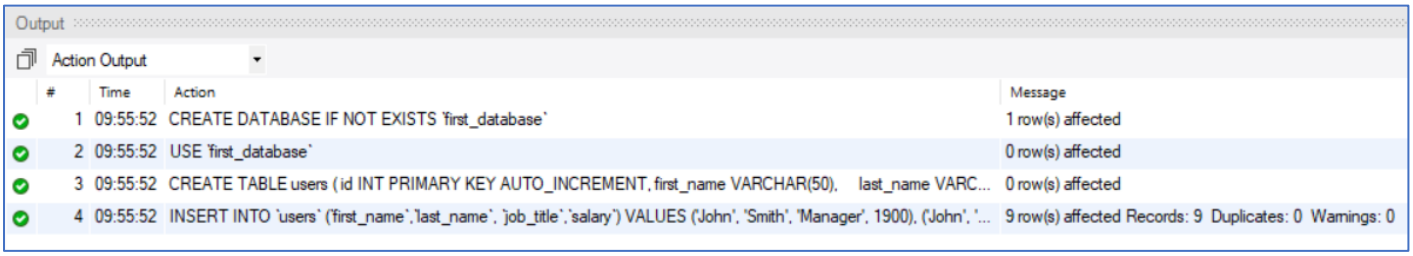

```
1  CREATE DATABASE IF NOT EXISTS `first_database`;
2  USE `first_database`;
3
4  CREATE TABLE users (
5      id INT PRIMARY KEY AUTO_INCREMENT,
6      first_name VARCHAR(50),
7      last_name VARCHAR(50),
8      job_title VARCHAR(35),
9      salary INT
10 );
11
12 INSERT INTO `users` (`first_name`,`last_name`, `job_title`,`salary`) VALUES
13 ('John', 'Smith', 'Manager', 1900),
14     ('John', 'Johnson', 'Customer Service', 880),
15     ('Smith', 'Johnson', 'Porter', 1100),
16     ('Peter', 'Petrov', 'Front Desk Clerk', 1100),
17     ('Peter', 'Ivanov', 'Sales', 1500),
18     ('Ivan' ,'Petrov', 'Waiter', 990),
19     ('Jack', 'Jackson', 'Executive Chef', 1800),
20     ('Pedro', 'Petrov', 'Front Desk Supervisor', 2100),
21     ('Nikolay', 'Ivanov', 'Housekeeping', 1600);
```

7. As you can see SQL is very logical and user friendly. The given script will create a database called "first_database" (if such database doesn't already exist), then it will use the database to create a table "users" in it. Each user will have an id, first_name, last_name, job_title and salary fields. After creating the table, it will populate it with values.

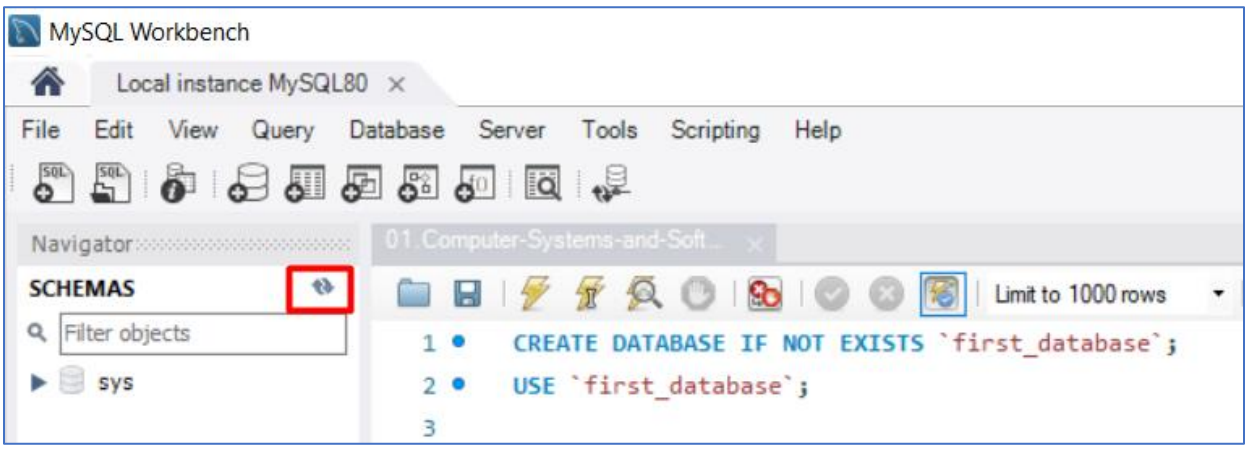
In order to **run the script, hit the yellow bolt button**.



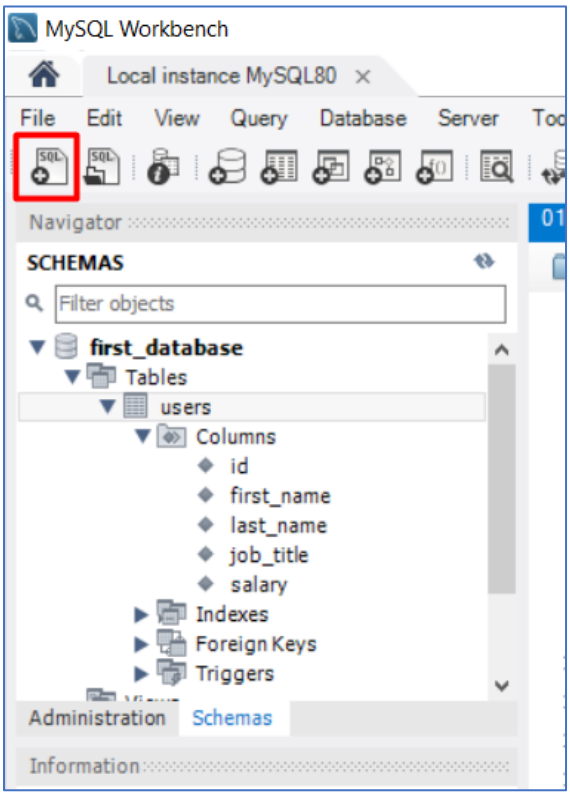
8. In the output section you should see the **commands executed.**



9. Hit the refresh button to **see** the **newly created database**.



10. As you can see, the database was created with all it's attributes. Now, let's see how it looks like and write a few queries. **Click on the "Create a new SQL tab…" button.**



11. Now, we will **select all the records** from "users" table. Write the following query:

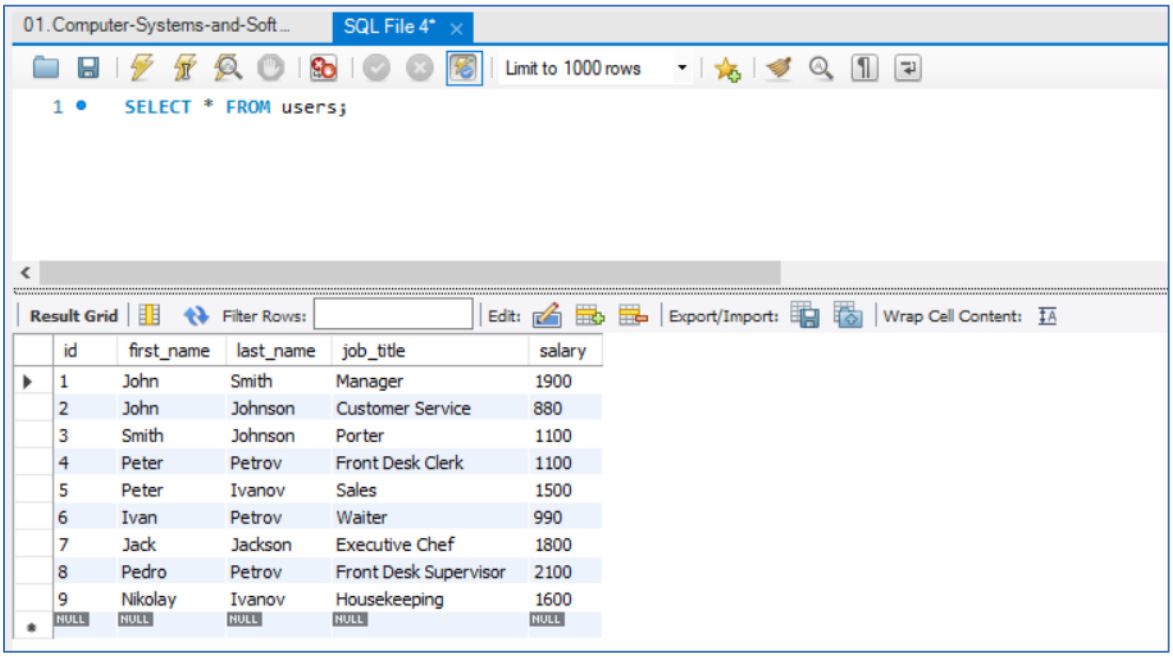
```
SELECT * FROM users;
```

Now hit the other bolt button, which has something like an "I" sing on it.

Note: The difference between those two buttons is, as follows:

 - Executes the selected portion of the script or everything, if there's no selection

 - Executes the statement under the keyboard cursor



id	first_name	last_name	job_title	salary
1	John	Smith	Manager	1900
2	John	Johnson	Customer Service	880
3	Smith	Johnson	Porter	1100
4	Peter	Petrov	Front Desk Clerk	1100
5	Peter	Ivanov	Sales	1500
6	Ivan	Petrov	Waiter	990
7	Jack	Jackson	Executive Chef	1800
8	Pedro	Petrov	Front Desk Supervisor	2100
9	Nikolay	Ivanov	Housekeeping	1600
NULL	NULL	NULL	NULL	NULL

12. Now, that we know how all records looks like, let's execute a second **query**, which will select all records, where **salary is equal or more than 1500**.

```
2
3 •   SELECT * FROM users WHERE salary >=1500;
4
```

13. Try a few queries by yourself.

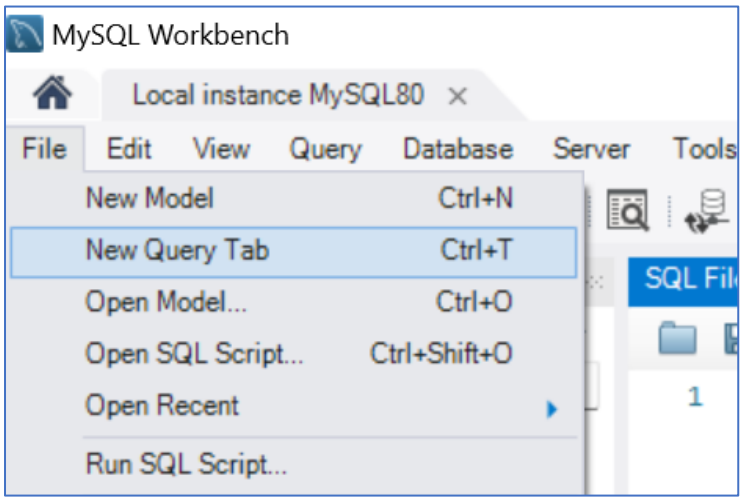
- Try to select all with last name "Petrov".

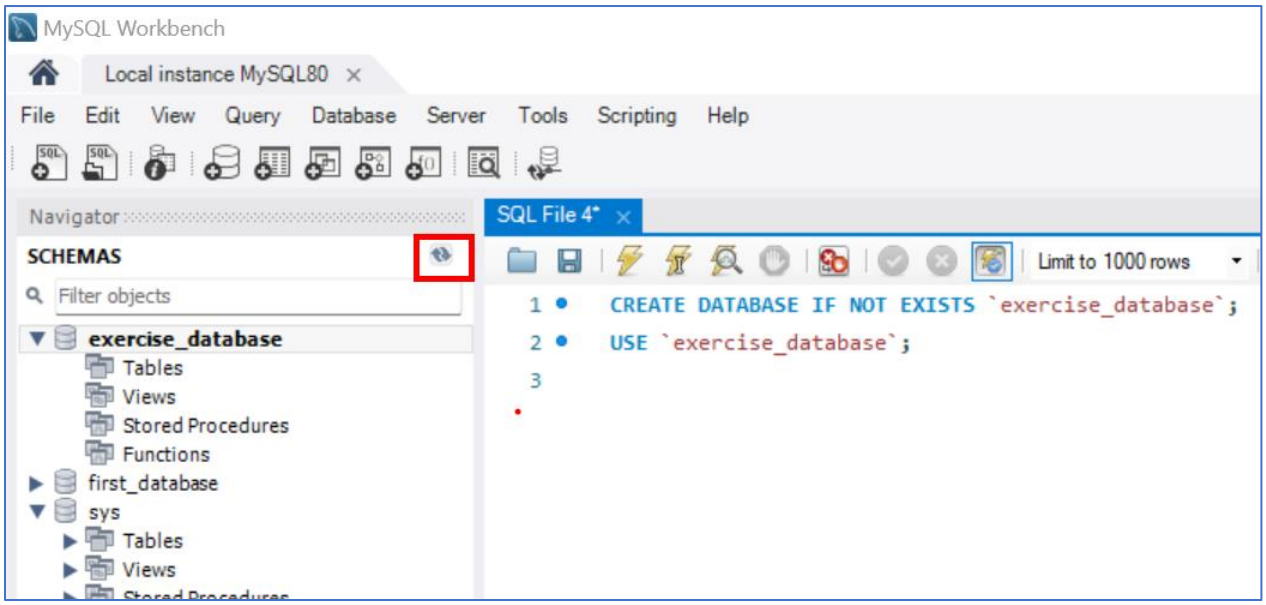
- Try to select all with first name "Peter".

- Try to select all with salary below 1800.

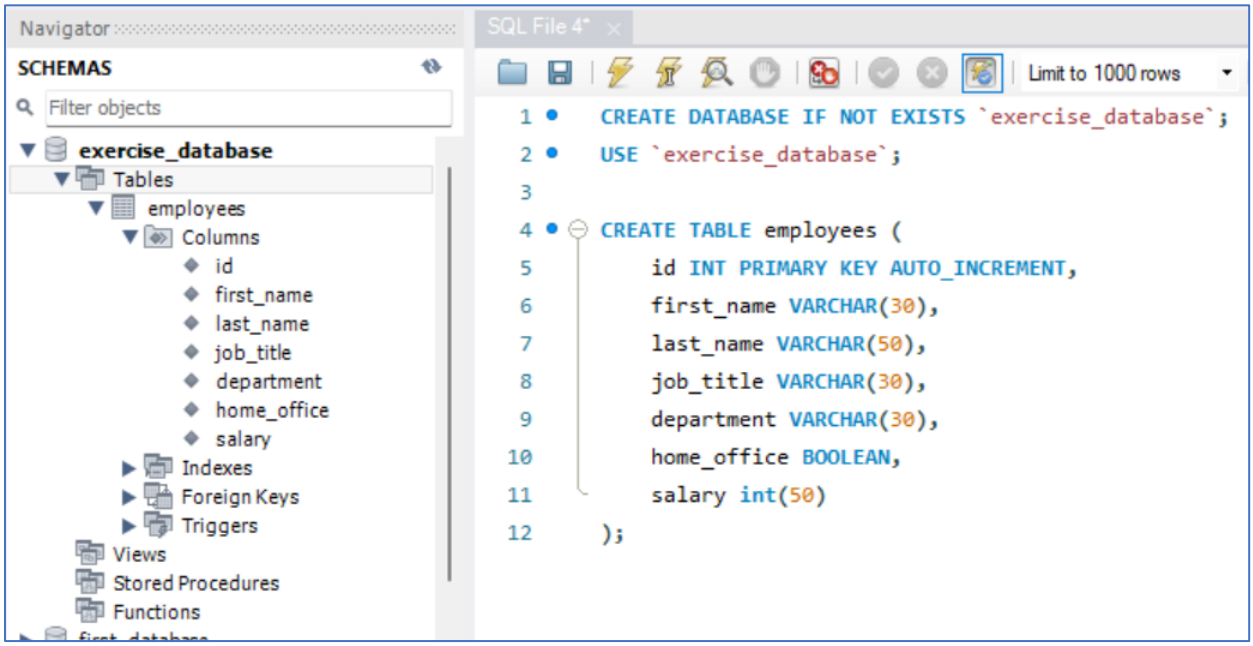
4. Create a Database and Execute Basic Operations

1. Open a **New Query Tab** and **Create a new Database** named "**`exercise_database`**":
    - Do not forget to **refresh in order to see the newly created database**:

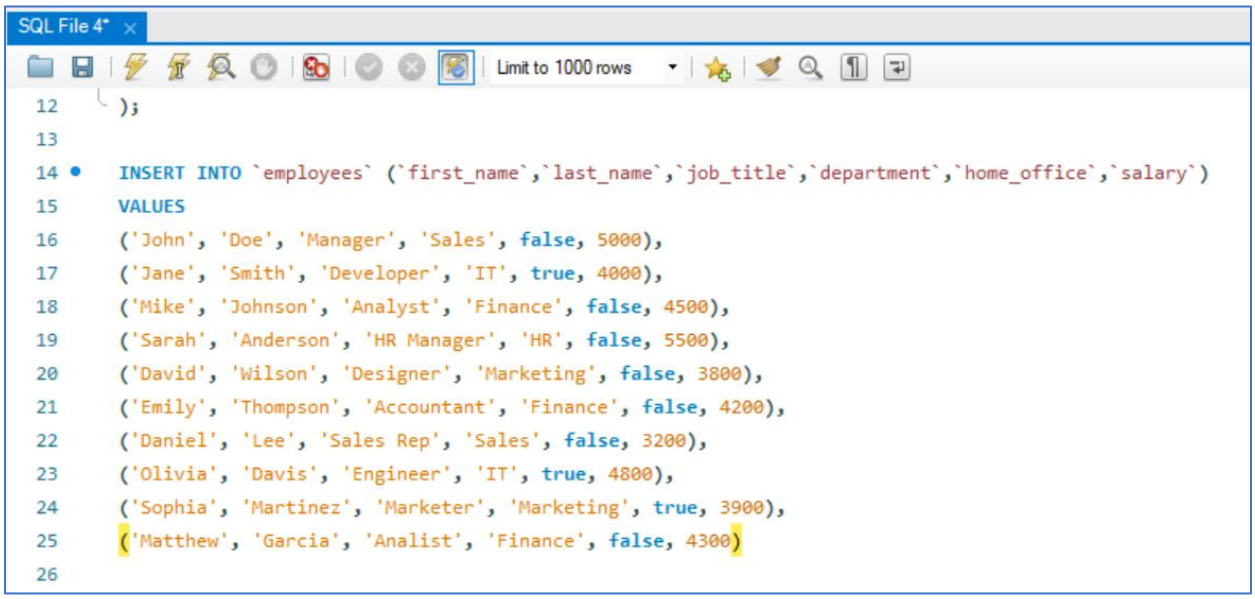




2. **Create a New Table** named "**employees**" with the following columns:
   - **id, first_name, last_name, job_title, department, home_office, salary**



3. Insert some records in the "**employees**" table:



4. Now try **several basic queries** in order to **select** the inserted **records from the table**:

```
26
27 •  SELECT * FROM `employees`
```

Result Grid | Filter Rows: | Edit: | Export/Import:

id	first_name	last_name	job_title	department	home_office	salary
1	John	Doe	Manager	Sales	0	5000
2	Jane	Smith	Developer	IT	1	4000
3	Mike	Johnson	Analyst	Finance	0	4500
4	Sarah	Anderson	HR Manager	HR	0	5500
5	David	Wilson	Designer	Marketing	0	3800
6	Emily	Thompson	Accountant	Finance	0	4200
7	Daniel	Lee	Sales Rep	Sales	0	3200
8	Olivia	Davis	Engineer	IT	1	4800
9	Sophia	Martinez	Marketer	Marketing	1	3900
10	Matthew	Garcia	Analist	Finance	0	4300
NULL	NULL	NULL	NULL	NULL	NULL	NULL

```
28 •  SELECT * FROM `employees` WHERE `department` = 'IT';
```

Result Grid | Filter Rows: | Edit: | Export/Import:

id	first_name	last_name	job_title	department	home_office	salary
2	Jane	Smith	Developer	IT	1	4000
8	Olivia	Davis	Engineer	IT	1	4800
NULL	NULL	NULL	NULL	NULL	NULL	NULL

```
29 •  SELECT * FROM `employees` WHERE `department` = 'Marketing' AND `home_office` = TRUE;
```

Result Grid | Filter Rows: | Edit: | Export/Import: | Wrap Cell Content:

id	first_name	last_name	job_title	department	home_office	salary
9	Sophia	Martinez	Marketer	Marketing	1	3900
NULL	NULL	NULL	NULL	NULL	NULL	NULL