

Hands-on Lab: Keys and Constraints in MySQL using phpMyAdmin



Estimated time needed: 20 minutes

Introduction

In this lab, you will learn how to add keys to create relationships between the tables and use constraints to enforce rules on the data entry in the MySQL database service using the phpMyAdmin graphical user interface (GUI) tool.

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.

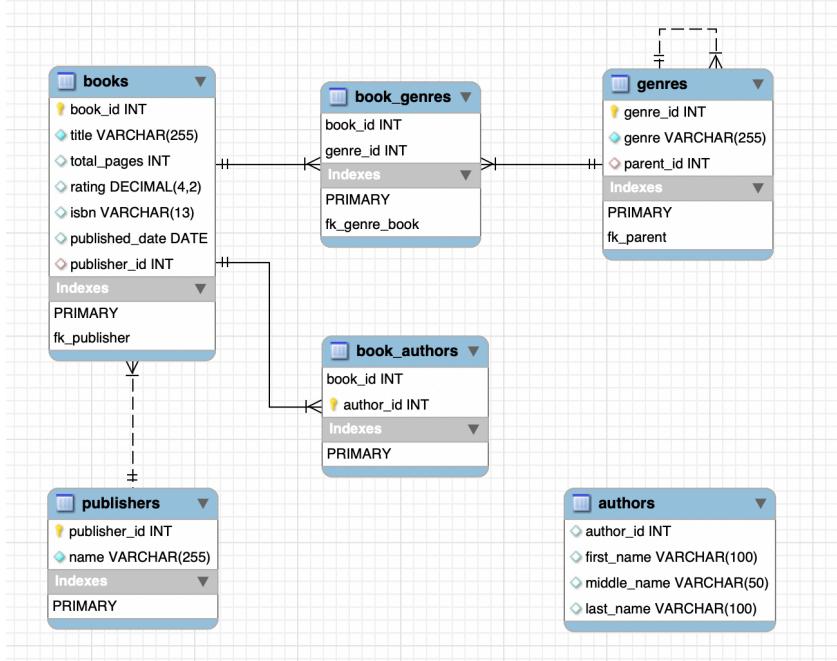


To complete this lab, you will utilize the MySQL relational database service available as part of IBM Skills Network Labs' (SN Labs) Cloud IDE. SN Labs is a virtual lab environment used in this course.

Database used in this lab

For this lab, you will use the eBooks database.

The following entity relationship diagram (ERD) shows the current status of the schema of the eBooks database used in this lab:



Objectives

After completing this lab, you will be able to use the MySQL phpMyAdmin to:

- Create primary and foreign keys
- Add constraints to data columns

Exercise

In this exercise, you will learn how to add keys to create relationships between the tables. You will use constraints to enforce rules on the data entry in the MySQL database service using the phpMyAdmin graphical user interface (GUI) tool.

1. Click the Skills Network extension button on the left side of the window.
2. Open the DATABASES menu and click MySQL.
3. Click Create. MySQL may take a few moments to start.

The screenshot shows the Skills Network Toolbox interface. On the left, there's a sidebar with various icons and sections like 'DATA BASES', 'BIG DATA', 'CLOUD', 'EMBEDDABLE AI', and 'OTHER'. Under 'OTHER', there's a 'Launch Application' button with a red circle containing the number 1. The main area is titled 'MySQL' with a status of 'INACTIVE'. It shows version information: 8.0.22, 5.0.4, and 2.0.2. There are 'Create' and 'Delete' buttons, and tabs for 'Summary' (with a red circle containing the number 3), 'Connection Information', and 'Details'. A note at the bottom says: 'Get started with MySQL in a faster, easier way. To launch your database, hit the Start button.'

4. Open the phpMyAdmin tool in a new tab in your browser.

The screenshot shows the MySQL page with the status now changed to 'ACTIVE'. It displays the same version information: 8.0.22, 5.0.4, and 2.0.2. Below the status, it says: 'Connect to MySQL and phpMyAdmin directly in your Skills Network Labs environment.' There are 'Create' and 'Delete' buttons, and tabs for 'Summary', 'Connection Information', and 'Details'. A note at the bottom says: 'Your database and phpMyAdmin server are now ready to use and available with the following login credentials. To navigate MySQL, please check out the Details section.' It also says: 'You can manage MySQL via:' followed by a 'phpMyAdmin' button with a red arrow pointing to it. At the bottom, it says: 'Or to interact with the database in the terminal, select one of these options:' followed by 'MySQL CLI' and 'New Terminal' buttons.

5. You will see the phpMyAdmin GUI tool.

The screenshot shows the phpMyAdmin interface for a MySQL server at port 3306. The left sidebar displays a tree view of databases: New, information_schema, mysql, performance_schema, sakila, and sys. The main content area is divided into two sections: 'General settings' and 'Appearance settings'. In 'General settings', the 'Server connection collation' is set to utf8r. In 'Appearance settings', the 'Language' is English and the 'Theme' is pmahomme.

phpMyAdmin

Server: mysql:3306

Databases SQL Status

General settings

Server connection collation: utf8r

More settings

Appearance settings

Language English

Theme: pmahomme

6. Download the eBooks MySQL dump file (containing the eBooks database table, definitions, and data) to your local computer storage.

- [eBooks_mysql_dump.sql](#)

7. Go to the **Import** tab. Click **Choose File** and load the **eBooks_mysql_dump.sql** file. Next, uncheck **Enable foreign key checks** and select SQL as the **Format**. Then click **Go**.

The screenshot shows the MySQL Workbench interface with the 'SQL' tab selected. The top navigation bar includes tabs for 'Databases', 'SQL', 'Status', 'User accounts', and 'Export'. A red box highlights the 'Export' tab on the right.

Importing into the current server

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: **2 Choose File** eBooks_mysql_dump.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

Skip this number of queries (for SQL) starting from the first one: **0**

Other options:

3 Enable foreign key checks

Format:

4 **SQL**

Format-specific options:

SQL compatibility mode: **N**

Do not use AUTO_INCREMENT for zero values

8. The system will notify you that the import has successfully finished. Select the database **eBooks** to expand the image (if necessary, click the + icon beside **eBooks**). You will see the list of tables from the eBooks database.

The screenshot shows the phpMyAdmin interface. At the top, there's a banner with the text "Do not use AUTO_INCREMENT for zero values" and a checked checkbox. Below the banner, the server information is shown as "Server: mysql:3306". There are three tabs: "Databases", "SQL", and "Status", with "Databases" selected. A green message box displays the text "Import has been successfully finished, 8". On the left, there's a sidebar with "Recent" and "Favorites" buttons. The main area shows a tree view of databases: "New", "+ eBooks", "information_schema", "mysql", "performance_schema", and "sys". The "+ eBooks" node is highlighted with a red box and a red circle around its plus sign. A mouse cursor is hovering over the "Structure" tab of the "eBooks" database. The entire screenshot is framed by a thin black border.

9. **Primary Keys:** Creating a primary key on a table automatically creates an index on the key. You will create a primary key for the **author** table to identify every row in the table uniquely. You will set the **author_id** column of the **author** table as a primary key.

- In the tree view, click the **authors** table.
- Switch to the **Structure** tab and make sure you are inside the **Table structure** subtab.
- Check the **author_id** column.
- Click the **Primary** option.

The screenshot shows the phpMyAdmin interface. On the left, a tree view of databases and tables is displayed. The 'authors' table under the 'eBooks' database is selected, indicated by a red box labeled '1'. The top navigation bar shows 'Server: mysql:3306 » Database: eBooks'. Below the navigation, there are tabs: 'Browse' (disabled), 'Structure' (selected, highlighted with a red box and labeled '2'), and 'SQL'. Under 'Structure', there are sub-tabs: 'Table structure' (selected, highlighted with a red box and labeled '3') and 'Relation view'. The main area shows the table structure for 'authors':

#	Name	Type	Collation
<input checked="" type="checkbox"/> 1	author_id	int	
<input type="checkbox"/> 2	first_name	varchar(100)	utf8mb4_general_ci
<input type="checkbox"/> 3	middle_name	varchar(50)	utf8mb4_general_ci
<input type="checkbox"/> 4	last_name	varchar(100)	utf8mb4_general_ci

Below the table structure, there are buttons for 'Check all' and 'With selected:'. Further down, there are buttons for 'Print', 'Move columns', 'Normalize', 'Add', and 'Indexes'. A message box at the bottom says 'No index defined!'.

10. **Auto-increment:** You will set the auto-increment feature for the primary key of the **author** table.

- In the tree view, click the **authors** table. Switch to the **Structure** tab and make sure you are inside the **Table structure** subtab.
- Check the **author_id** column.
- Click the **Change** option.
- Check the **A_I** option (**A_I = Auto_Increment**).
- Click **Save**.

phpMyAdmin

Server: mysql:3306 » Database: eBooks

Recent Favorites

New
eBooks
New
authors
books
book_authors
book_genres
genres
publishers
information_schema
mysql
performance_schema
sys

Browse Structure SQL

Table structure Relation view

#	Name	Type	Collation
<input checked="" type="checkbox"/> 1	author_id	int	
<input type="checkbox"/> 2	first_name	varchar(100)	utf8mb4_general_ci
<input type="checkbox"/> 3	middle_name	varchar(50)	utf8mb4_general_ci
<input type="checkbox"/> 4	last_name	varchar(100)	utf8mb4_general_ci

Check all With selected: |

Print Move columns Normalization

Add 1 column(s) after last_name

Indexes

Action	Keyname	Type	Unique
Edit	Drop	PRIMARY	BTREE Yes

Server: mysql:3306 » eBooks » Table: authors

Browse Structure SQL Search Insert Export

Name	Type	Length/Values	Default
author_id	INT		None

Structure

11. **Null constraints:** You will restrict the `first_name` column of the `authors` table from having a NULL value.

- o In the tree view, click the `authors` table. Switch to the **Structure** tab and make sure you are inside the **Table structure** subtab.
- o Check the `first_name` column.

- Click the **Change** option.
- Uncheck the **Null** option.
- Click **Save**.

phpMyAdmin

Server: mysql:3306 » Database: eBooks

Browse Structure SQL

Table structure Relation view

New eBooks New authors books book_authors book_genres genres publishers information_schema mysql performance_schema sys

#	Name	Type	Collation
<input type="checkbox"/> 1	author_id	int	
<input checked="" type="checkbox"/> 2	first_name	varchar(100)	utf8mb4
<input type="checkbox"/> 3	middle_name	varchar(50)	utf8mb4
<input type="checkbox"/> 4	last_name	varchar(100)	utf8mb4

Check all With selected: |

Print Move columns Normalize

Add 1 column(s) after last_name

Indexes

Action	Keyname	Type	Unique
	Edit	Drop PRIMARY	BTREE Yes

Server: mysql:3306 » eBooks » Table: authors

Browse Structure SQL Search Insert Export

Name	Type	Length/Values	Default
first_name	VARCHAR	100	None

Structure

12. **Foreign keys:** You will create a foreign key for the **book_authors** table by setting its **author_id** column as a foreign key to establish a relationship between the **book_authors** and **authors** tables.

- In the tree view, click the **book_authors** table. Switch to the **Structure** tab and make sure you are inside the **Relation view** subtab.
- If necessary, click **Add constraint** to create a new foreign key constraint placeholder.
- Fill in the placeholders as shown in the following image.
- Click **Save**.

The screenshot shows the phpMyAdmin interface. On the left, the database tree is visible with the 'book_authors' table selected and highlighted with a red box. The main area shows the 'Structure' tab selected (also highlighted with a red box), and the 'Relation view' subtab is active (also highlighted with a red box). The 'Table structure' section displays the following schema:

#	Name	Type	Collation	A
1	book_id	int		
2	author_id	int		

Below the table structure, there are buttons for 'Print', 'Move columns', 'Normalize', 'Add', and 'Indexes'. The 'Indexes' section shows one index named 'PRIMARY' of type BTREE. A note at the bottom right says 'With selected:' followed by a dropdown menu.

The screenshot shows the phpMyAdmin interface for the eBooks database. On the left, the database structure is displayed as a tree view:

- New
- eBooks
 - New
 - authors
 - books
 - book_authors
 - book_genres
 - genres
 - publishers
- information_schema
- mysql
- performance_schema
- sys

On the right, the "Foreign key constraints" section is open. It shows two existing constraints and a button to add a new one:

Action	Constraint Name	ON
Drop	fk_book	ON
	fk_author	ON
+ Add constraint		

A red box highlights the "fk_author" constraint.

Your SQL query has been executed successfully.

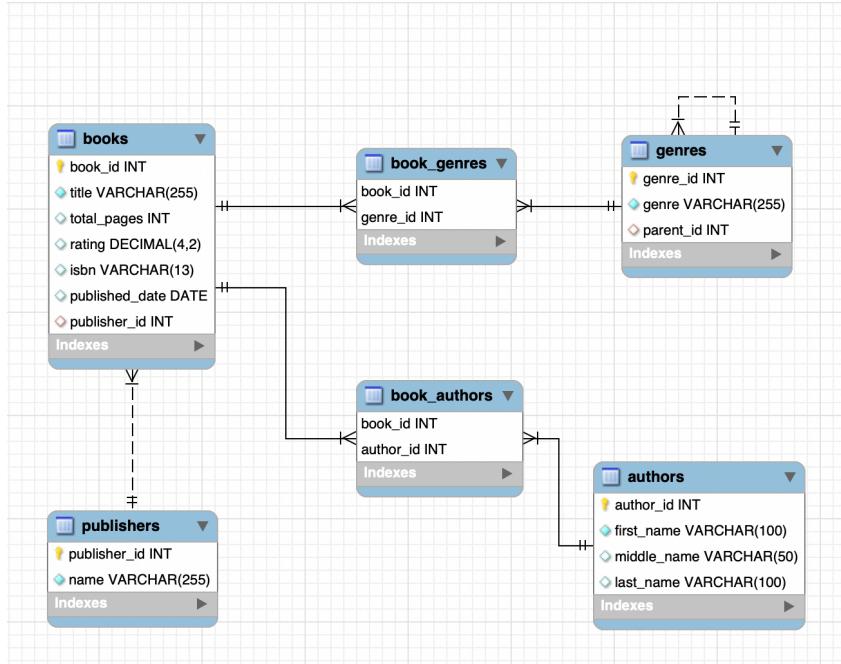
```
ALTER TABLE `book_authors` ADD CONSTRAINT `fk_author` FOREIGN KEY (`author_id`)
```

CASCADE means that when rows are deleted or updated in the parent table, the corresponding rows in the child table will also be deleted or updated.

RESTRICT means that rows cannot be deleted or updated in the parent table if there are corresponding rows in the child table.

13. After creating/adding all the above necessary primary keys, foreign keys, and constraints, the schema of the complete eBooks database will look like the following ERD diagram:

Note: You don't need to generate any ERD diagram like below for this lab. By comparing the earlier eBooks schema ERD (shown in the section "Database Used in this Lab") and this complete eBooks schema ERD, just try to understand how all the operations you did above made the eBooks database complete.



Congratulations! You have completed this lab, and you are ready for the next topic.

Author: [Sandip Saha Joy](#)



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Other Contributor(s)

- Kathy An

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