

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.

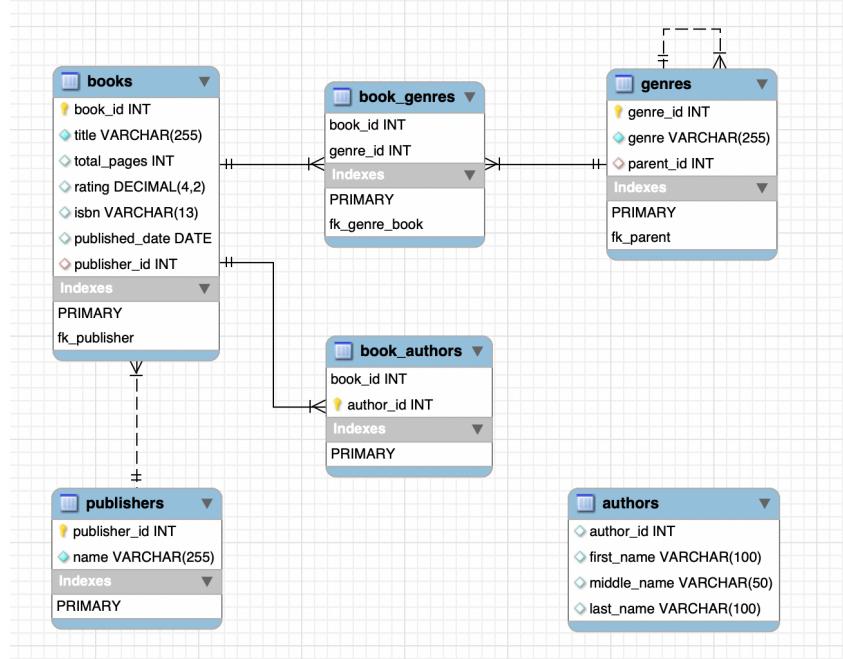


To complete this lab, you will utilize the MySQL relational database service available as part of IBM Skills Network Labs' (SN Labs) Cloud IDE. SN Labs is a virtual lab environment used in this course.

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 'SKILLS NETWORK TOOLBOX', 'Databases' (with MySQL INACTIVE selected), 'PostgreSQL INACTIVE', 'Cassandra INACTIVE', 'MongoDB INACTIVE', 'BIG DATA', 'CLOUD', 'EMBEDDABLE AI', and 'OTHER' (with 'Launch Application' under it). A red box highlights the 'MySQL INACTIVE' entry, and a red circle with the number '1' is on the 'OTHER' icon. On the right, the main panel is titled 'MySQL' (status: INACTIVE) and shows version information: 8.0.22, 5.0.4, and 2.0.2. It includes a 'Create' button (highlighted with a red box and red circle with '2'), a 'Delete' button, and tabs for 'Summary' (selected), 'Connection Information', and 'Details'. Below the tabs, a note 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.

This screenshot shows the MySQL summary page. At the top, it says 'MySQL ACTIVE' with version 8.0.22, 5.0.4, and 2.0.2. Below that is a note: 'Connect to MySQL and phpMyAdmin directly in your Skills Network Labs environment.' There are 'Create' and 'Delete' buttons. The 'Summary' tab is selected. A red arrow points to the 'phpMyAdmin' link, which is highlighted with a red box and red circle with '1'. Below it, a note 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 lists management options: 'You can manage MySQL via:' followed by 'phpMyAdmin' (with a red box and red circle with '1') and a terminal icon (also highlighted with a red box and red circle with '1'). Other options include 'MySQL CLI' and 'New Terminal'.

5. You will see the phpMyAdmin GUI tool.

The screenshot shows the phpMyAdmin interface with the following details:

- Left Panel:** A sidebar with a tree view of databases. The root node is "New". Other nodes include "information_schema", "mysql", "performance_schema", "sakila", and "sys".
- Top Bar:** Shows the URL as "sandipsahajo-8080.theiadocker-27.proxy.cognitivee...".
- Header:** "Server: mysql:3306" with tabs for "Databases", "SQL", and "Status".
- General settings:** Server connection collation is set to "utf8r". There is a "More settings" link.
- Appearance settings:** Language is set to "English". Theme is set to "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**.

← Server: mysql:3306

Databases SQL Status User accounts Export []

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: **3 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: **4 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. On the left, the database tree view displays several databases: New, eBooks, information_schema, mysql, performance_schema, and sys. The 'eBooks' database is selected, indicated by a red box around its name. A red circle highlights the '+' icon next to the 'New' database. On the right, the main workspace shows a success message: 'Import has been successfully finished, 8'. The top navigation bar includes tabs for Databases, SQL, and Status, with 'Databases' currently selected.

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 lists databases and tables. A red box labeled '1' highlights the 'authors' table under the 'eBooks' database. On the right, the 'Structure' tab is selected (red box labeled '2'). Within the 'Structure' tab, the 'Table structure' subtab is active (red box labeled '3'). The table definition is shown in a grid:

#	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 definition are several buttons: 'Check all' (unchecked), 'With selected:', 'Print', 'Move columns', 'Normalize', 'Add', 'Indexes', and a warning message '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 **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
<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	Uniq
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.

- 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 `first_name` column.

- Click the **Change** option.
- Uncheck the **Null** option.
- 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 type="checkbox"/> 1	author_id	int	
<input checked="" 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 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 selected (also highlighted with a red box). The 'Table structure' section displays two columns: 'book_id' (type int, primary key) and 'author_id' (type int, primary key). Below the table structure, there are buttons for 'Print', 'Move columns', 'Normalize', 'Add', and 'Indexes'. The 'Indexes' section shows one index named 'PRIMARY' (BTREE, Yes). The 'Action' section includes 'Edit' and 'Drop' buttons.

#	Name	Type	Collation	A
1	book_id	int		
2	author_id	int		

Action	Keyname	Type	Uniq
Edit	Drop	PRIMARY	BTREE Yes

phpMyAdmin

Server: mysql:3306 » Database: eB

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

Foreign key constraints

Actions	Constraint properties
<input type="button" value="Drop"/>	fk_book ON D
	fk_author ON D
+ Add constraint	

Your SQL query has been executed successfully.

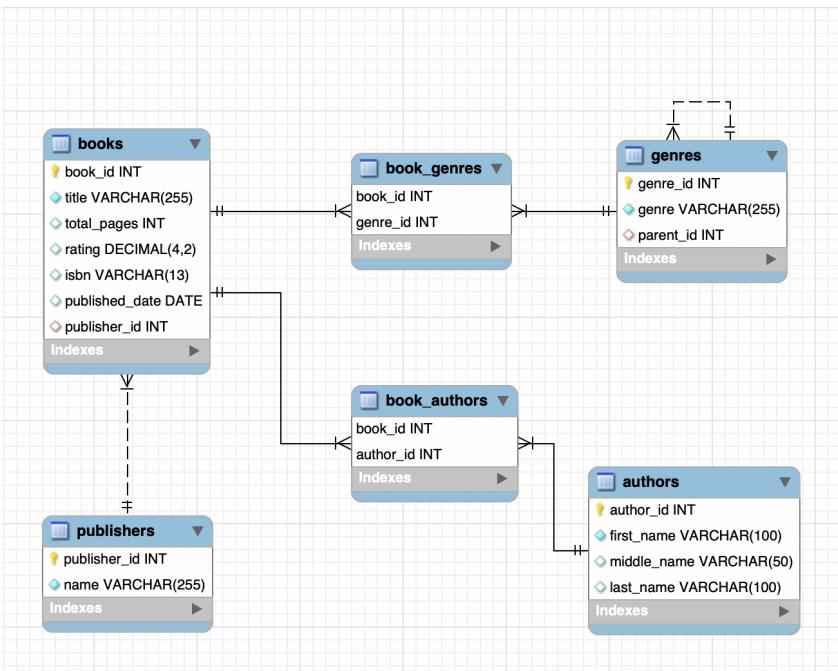
```
ALTER TABLE `book_authors` ADD CONSTRAINT `fk_author` FOREIGN KEY (`author_id`)
```

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.

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