



Hands-on Lab : Keys and Constraints in MySQL

Estimated time needed: 20 minutes

In this lab, you will learn how to add keys to create relationships between the tables and how to 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 efficiently store, manipulate, and retrieve data.

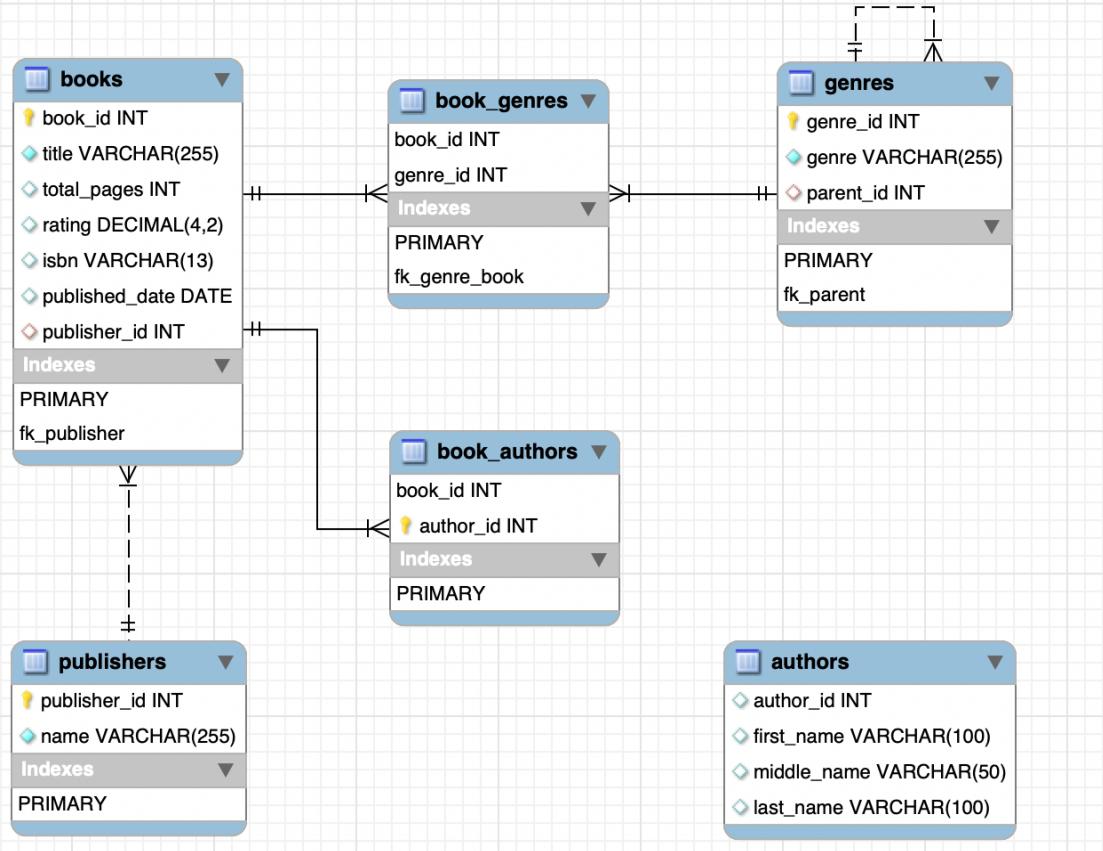


To complete this lab you will utilize MySQL relational database service available as part of IBM Skills Network Labs (SN Labs) Cloud IDE. SN Labs is a virtual lab environment used in this course.

Database Used in this Lab

The eBooks database has been used in this lab.

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 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 and how to use constraints to enforce rules on the data entry in the MySQL database service using the phpMyAdmin graphical user interface (GUI) tool.

1. To start, download the the **eBooks** mysql dump file (containing the eBooks database table definitions and data) below to your local computer storage. A dump file is a text file that contains the data from a database in the form of SQL statements. This file can then be imported in phpMyAdmin.

- o [eBooks_mysql_dump.sql](#)

2. Go to **Terminal > New Terminal** to open a terminal from the side by side launched Cloud IDE.



◀ Step 6 of 7 ▶



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3. Start the MySQL service session in the Cloud IDE using the command below in the terminal. Find your MySQL service session password from the highlighted location of the terminal shown in the image below. Note down your MySQL service session password because you may need to use it later in

the lab.

```
1. 1  
1. start_mysql
```

Copied!

```
theia@theiadocker-sandipsahajo:/home/project$ start_mysql
```

Starting your MySQL database....

This process can take up to a minute.

MySQL database started, waiting for all services to be ready....

Your MySQL database is now ready to use and available with username: root p

You can access your MySQL database via:

- The browser at: <https://sandipsahajo-8080.theiadocker-27.proxy.cognitive>
- CommandLine: mysql --host=127.0.0.1 --port=3306 --user=root --password=M

```
theia@theiadocker-sandipsahajo:/home/project$ █
```

4. Copy your phpMyAdmin weblink from the highlighted location of the terminal shown in the image below and paste it to a new tab of your web browser.

```
theia@theiadocker-sandipsahajo:/home/project$ start_mysql
```

Starting your MySQL database....

This process can take up to a minute.

MySQL database started, waiting for all services to be ready....

Your MySQL database is now ready to use and available with username: root p

You can access your MySQL database via:

- The browser at: <https://sandipsahajo-8080.theiadocker-27.proxy.cognitive>
- CommandLine: mysql --host=127.0.0.1 --port=3306 --user=root --password=M

```
theia@theiadocker-sandipsahajo:/home/project$ █
```

5. You will see the phpMyAdmin GUI tool.

phpMyAdmin



Recent Favorites

- New
- information_schema
- mysql
- performance_schema
- sakila
- sys



Server: mysql:3306



Databases



SQL



Status



User

General settings

Server connection collation:



utf8mb4_unicode_ci

More settings

Appearance settings

Language

English



Theme:

pmahomme ▾

6. Go to the **Import** tab. Click **Choose File** and load the **eBooks_mysql_dump.sql** file you downloaded earlier to your local computer storage. Next, uncheck **Enable foreign key checks** and select SQL as **Format**. Then click **Go**.



1

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**

2

Browse your computer: eBooks_mysql_dump.sql (Max: 2,048KiB)

You may also drag and drop a file on any page.

Character set of the file:



Partial import:



Allow the interruption of an import in case the script detects it is close to the PHP timeout limit

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

0

Other options:

Enable foreign key checks

3

Format:

SQL



4

Format-specific options:

SQL compatibility mode:

NONE

Do not use AUTO_INCREMENT for zero values

7. You will be notified that the import has successfully finished. Click the database **eBooks** as shown below to expand (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, there's a tree view of databases: New, eBooks (which is selected and highlighted with a red box and a red circle around its plus sign), information_schema, mysql, performance_schema, and sys. The 'eBooks' database is expanded, showing its structure. On the right, the main panel displays a success message: 'Import has been successfully finished, 81 queries ex...'. The top navigation bar shows 'Server: mysql:3306' and tabs for Databases, SQL, Status, and User.

8. **Primary Keys:** A primary key is a column or group of columns that uniquely identify every row in a table. They constrain the table by only accepting unique, non-NULL values for that column. Non-NULL data is data where the values exist.

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 uniquely identify every row in the table. 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 **Table structure** subtab.
- Check the **author_id** column.
- Click the **Primary** option.

phpMyAdmin



Recent Favorites

- +/- New
- +/- eBooks
- +/- New
- +/- authors **1**
- +/- books
- +/- book_authors
- +/- book_genres
- +/- genres
- +/- publishers
- +/- information_schema
- +/- mysql
- +/- performance_schema
- +/- sys

← Server: mysql:3306 » Database: eBooks » Table

Browse **Structure** **SQL** **Search**

Table structure **Relation view**

#	Name	Type	Collation
<input checked="" type="checkbox"/> 1	author_id	int	
<input type="checkbox"/> 2	first_name	varchar(100)	utf8mb4_0900_ai
<input type="checkbox"/> 3	middle_name	varchar(50)	utf8mb4_0900_ai
<input type="checkbox"/> 4	last_name	varchar(100)	utf8mb4_0900_ai

With selected: [Browse](#)

[Print](#) [Move columns](#) [Normalize](#)

[Add](#) column(s) ▾

Indexes [?](#)



No index defined!

9. **Auto-increment:** Auto-increment enables a unique number to be generated automatically when a new record is inserted into a table. Often this is used for the primary key field to be created automatically every time a new record is inserted. 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



Recent Favorites

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

← Server: mysql:3306 » Database: eBooks » Table structure

Browse Structure SQL Search

Table structure Relation view

#	Name	Type	Collation
<input checked="" type="checkbox"/> 1	author_id	int	
<input type="checkbox"/> 2	first_name	varchar(100)	utf8mb4_0900_ai
<input type="checkbox"/> 3	middle_name	varchar(50)	utf8mb4_0900_ai
<input type="checkbox"/> 4	last_name	varchar(100)	utf8mb4_0900_ai

Check all With selected: Browse

Print Move columns Normalize

Add 1 column(s) after last_name

Indexes

Action Keyname Type Unique Packed

Edit Drop PRIMARY BTREE Yes No

Server: mysql:3306 » Database: eBooks » Table: authors

Browse Structure SQL Search Insert Export In

Name	Type	Length/Values	Default
author_id	INT		None

Structure

10. **Null constraints:** By default, a column can hold NULL values. If you do not want a column to have a NULL value, you can restrict the column from having a NULL value. 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



Recent Favorites

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

← Server: mysql:3306 » Database: eBooks » Table structure

Browse Structure SQL Search

Table structure Relation view

	#	Name	Type	Collation
<input type="checkbox"/>	1	author_id	int	utf8mb4_0900_ai
<input checked="" type="checkbox"/>	2	first_name	varchar(100)	utf8mb4_0900_ai
<input type="checkbox"/>	3	middle_name	varchar(50)	utf8mb4_0900_ai
<input type="checkbox"/>	4	last_name	varchar(100)	utf8mb4_0900_ai

Check all With selected: Browse

Print Move columns Normalize

Add 1 column(s) after last_name

Indexes

Action	Keyname	Type	Unique	Packed
Edit	Drop	PRIMARY	BTREE	Yes

Server: mysql:3306 » Database: eBooks » Table: authors

[Browse](#) [Structure](#) [SQL](#) [Search](#) [Insert](#) [Export](#) [Import](#)

Name	Type	Length/Values	Default
first_name	VARCHAR	100	None

Structure

11. **Foreign keys:** A foreign key is a column that establishes a relationship between two tables. It acts as a cross-reference between two tables as it points to the primary key of one table (the parent table), constraining the data in another table (the child table) by the data in the parent table. 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 the placeholders as shown in a image below.
- Click **Save**.

phpMyAdmin



Recent Favorites

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

← Server: mysql:3306 » Database: eBooks » Table

Browse Structure SQL Search

Table structure Relation view

#	Name	Type	Collation	Attributes	N
1	book_id	int			No
2	author_id	int			No

Check all With selected: Browse

Print Move columns Normalize

Add 1 column(s) after author_id

Indexes

Action	Keyname	Type	Unique	Packed	
Edit	Drop	PRIMARY	BTREE	Yes	No

phpMyAdmin



Recent Favorites

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

← Server: mysql:3306 » Database: eBooks » Table

Browse **Structure** **SQL** **Search**

Table structure **Relation view**

Foreign key constraints

Actions **Constraint properties**

Drop fk_book ON DELETE C.

fk_author ON DELETE C.

+ Add constraint

Your SQL query has been executed successfully.

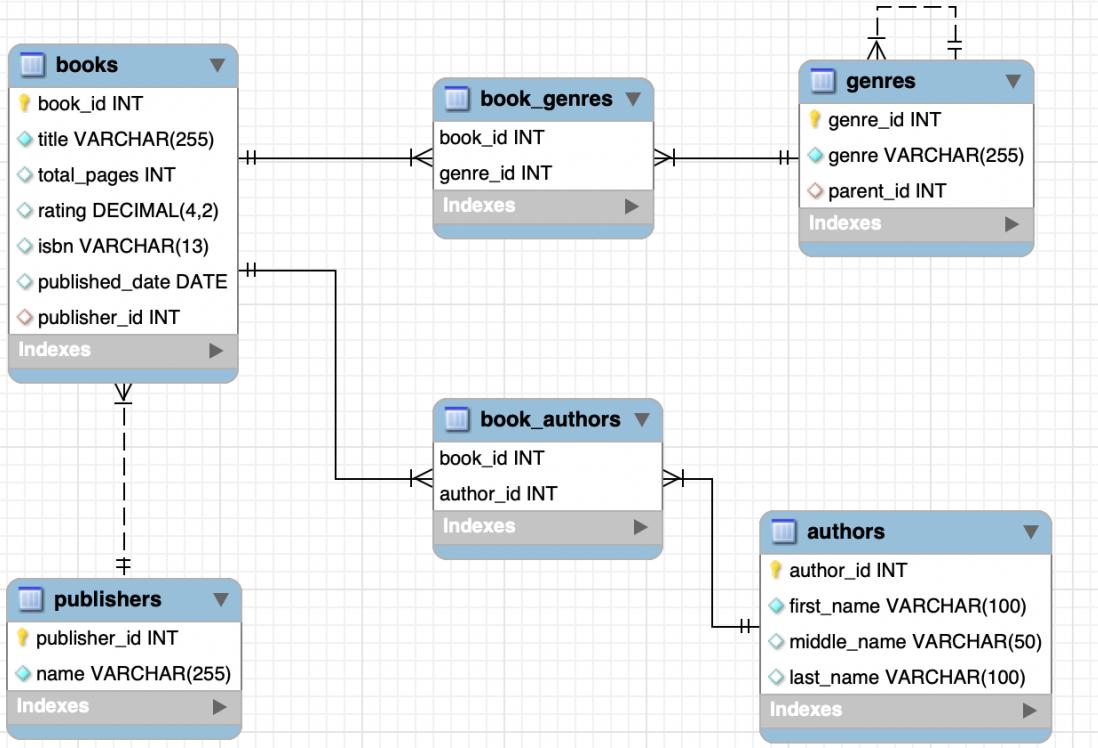
```
ALTER TABLE `book_authors` ADD CONSTRAINT `fk_author` FOREIGN KEY (`author_id`) REFERENCES
```

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.

12. 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(s)

- [Sandip Saha Joy](#)

Other Contributor(s)

- Kathy An

Changelog

Date Version Changed by Change Description

2021-03-22	1.0	Sandip Saha Joy	Created initial version
2021-10-18	1.1	Kathy An	Updated lab instructions

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