Day 8 Assignment

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Assignment 1: Analyze a given business scenario and create an ER diagram that includes entities, relationships, attributes, and cardinality. Ensure that the diagram reflects proper normalization up to the third normal form.

Ans:

Business Scenario: A library keeps track of information about books, authors, and members. Members can borrow books, and each book can be borrowed by multiple members over time.

Entities:

Book: ISBN (PK), Title, AuthorID (FK ref Author), Publication Year
Author: AuthorID (PK), Name
Member: Member Id (PK), Name, Address
Borrowing: BorrowingID (PK), BookISBN (FK ref Book), Member Id (FK ref Member), BorrowedDate, ReturnedDate.

Relationships:

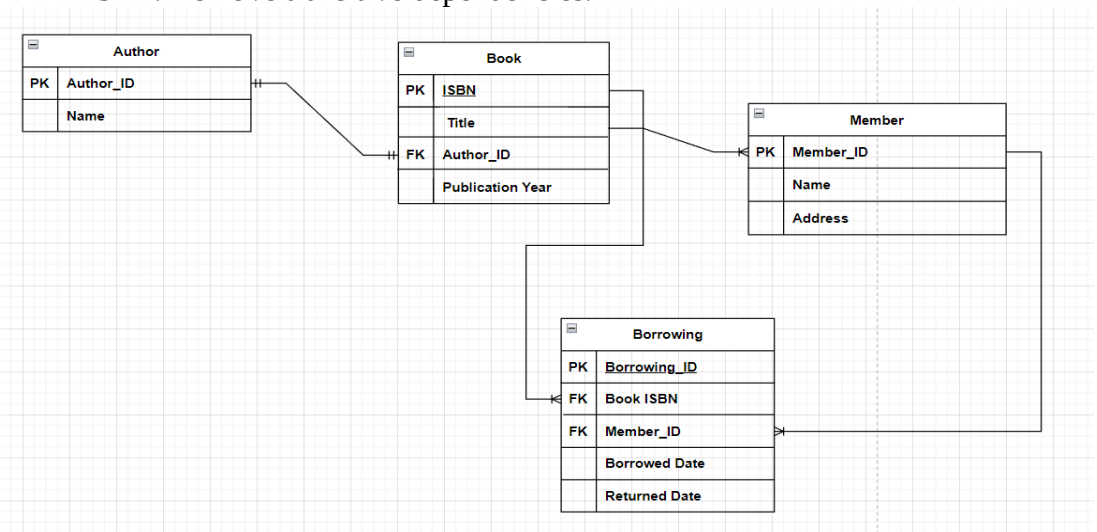
Book is written by Author.
A Member can borrow many Books.
Member can resolve the new Borrowing entity.

Cardinality:

Book.ISBN -> Author.AuthorID: One Book to One Author (1:1)
Member.MemeberID -> Borrowing.MemberID: One Student to Many Borrowings (1:M)
Book.ISBN -> Borrowing.BookISBN: One Book to Many Borrowings (1:M)

Normalization:

- 1NF: Ensure atomicity of attributes.
- 2NF: Remove partial dependencies.
- 3NF: Remove transitive dependencies.



Assignment 2: Design a database schema for a library system, including tables, fields, and constraints like NOT NULL, UNIQUE, and CHECK. Include primary and foreign keys to establish relationships between tables.

Library System Database Schema

Tables and Fields:

→ **Books:** BookID (PK), Title, Author, Publisher, YearPublished, ISBN (UNIQUE)
→ **Members:** MemberID (PK), Name, Address, Phone, Email (UNIQUE)
→ **Loans:** LoanID (PK), BookID (FK), MemberID (FK), LoanDate, ReturnDate
→ **Authors:** AuthorID (PK), Name, Bio
→ **BookAuthors:** BookID (FK), AuthorID (FK)

Constraints:

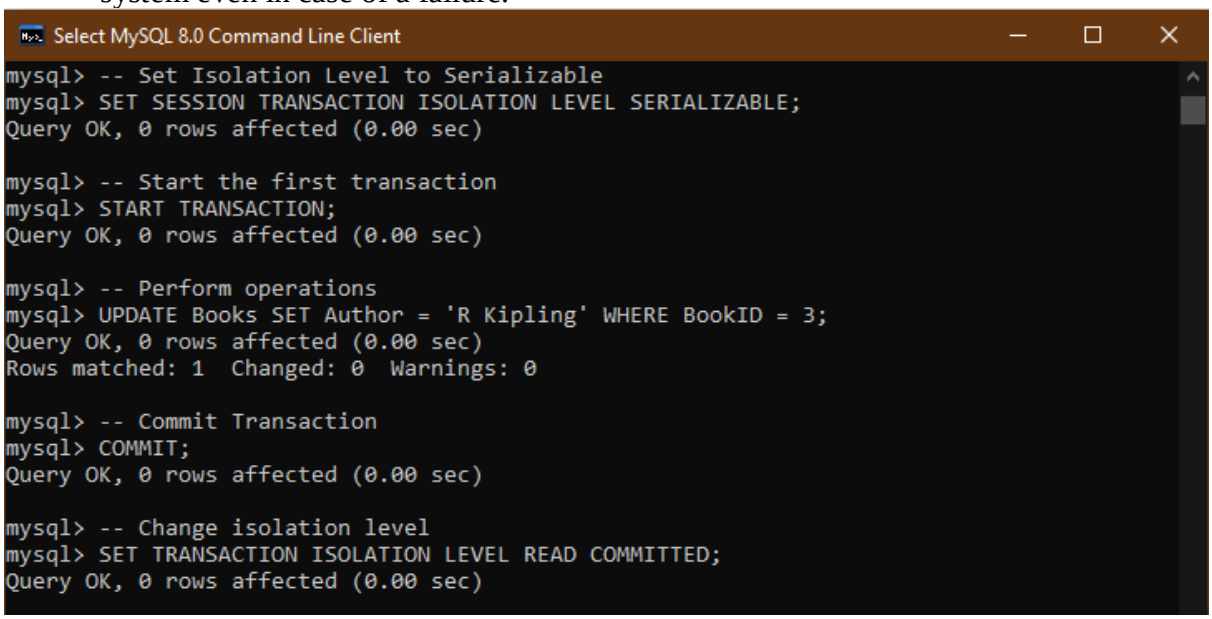
- **NOT NULL:** Ensure necessary fields are not left empty.
- **UNIQUE:** Ensure uniqueness where necessary.
- **CHECK:** Enforce rules (e.g., CHECK (YearPublished > 1900)).

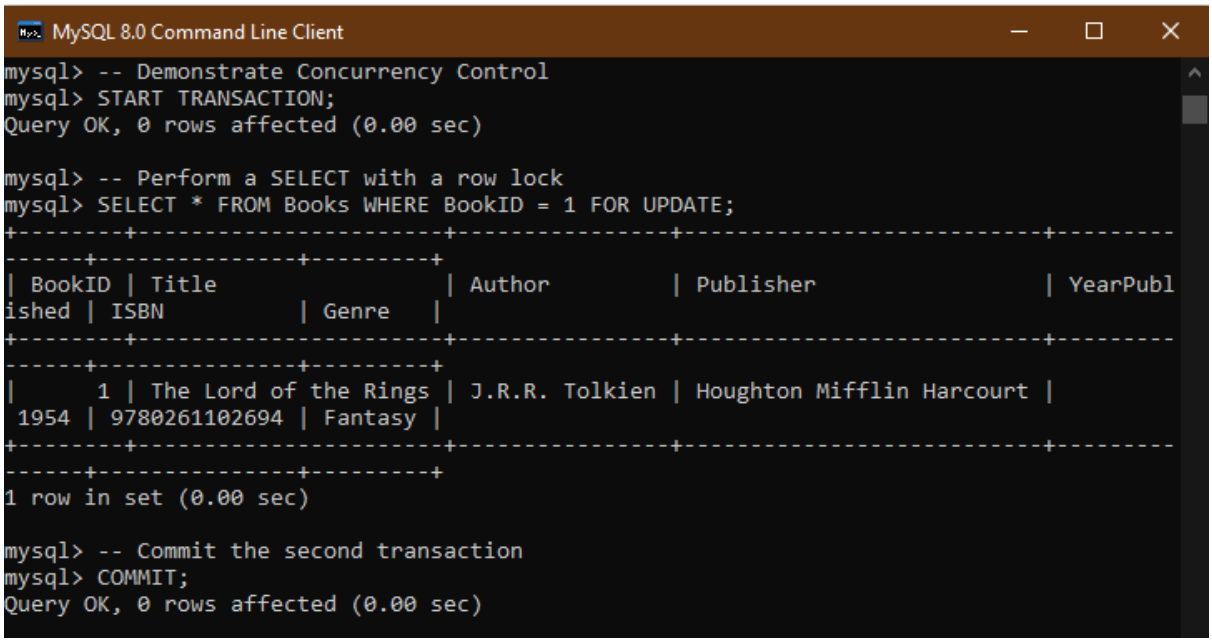
Assignment 3: Explain the ACID properties of a transaction in your own words. Write SQL statements to simulate a transaction that includes locking and demonstrate different isolation levels to show concurrency control.

ACID Properties and Transaction Simulation

ACID Properties:

→ **Atomicity:** Ensures that all operations in a transaction are completed; if not, the transaction is aborted.
→ **Consistency:** Ensures the database remains in a consistent state before and after the transaction.
→ **Isolation:** Ensures that transactions are executed independently.
→ **Durability:** Ensures that once a transaction is committed, it remains in the system even in case of a failure.

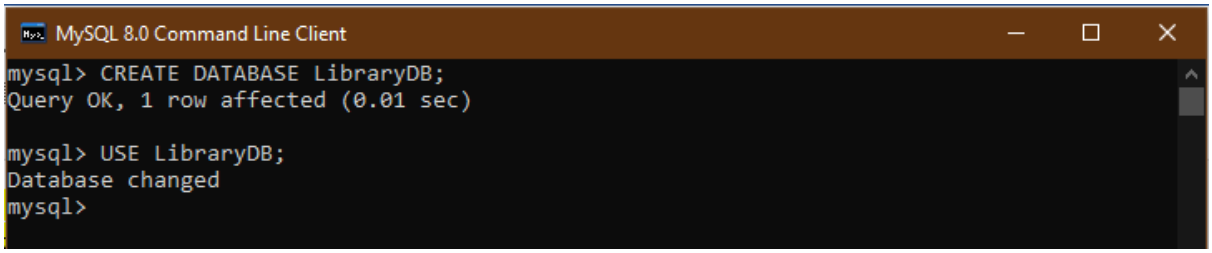




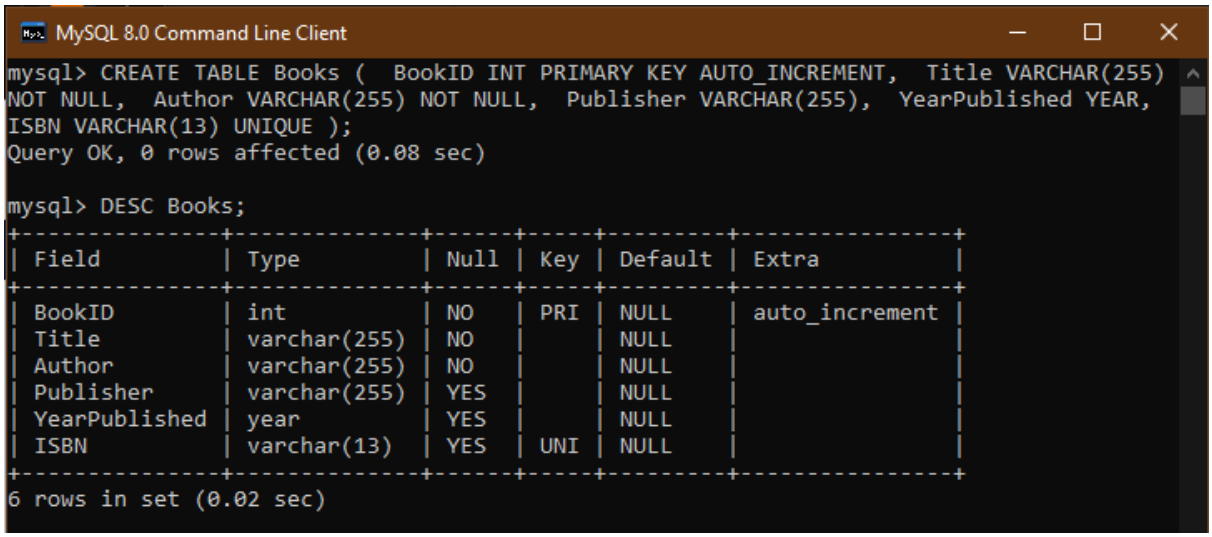
Assignment 4: Write SQL statements to CREATE a new database and tables that reflect the library schema you designed earlier. Use ALTER statements to modify the table structures and DROP statements to remove a redundant table.

SQL Statements for Database and Table Creation

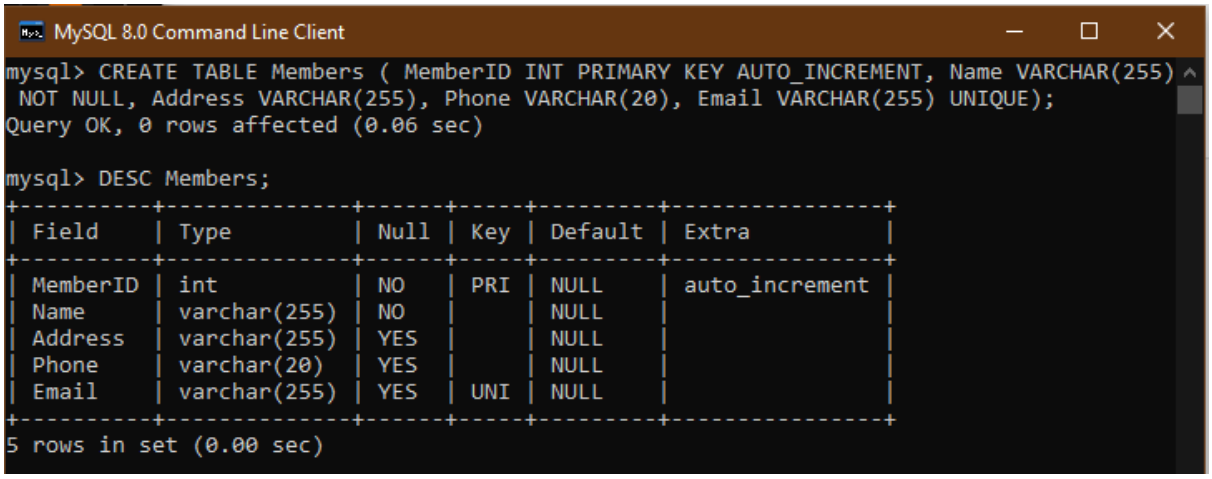
-- Create Database



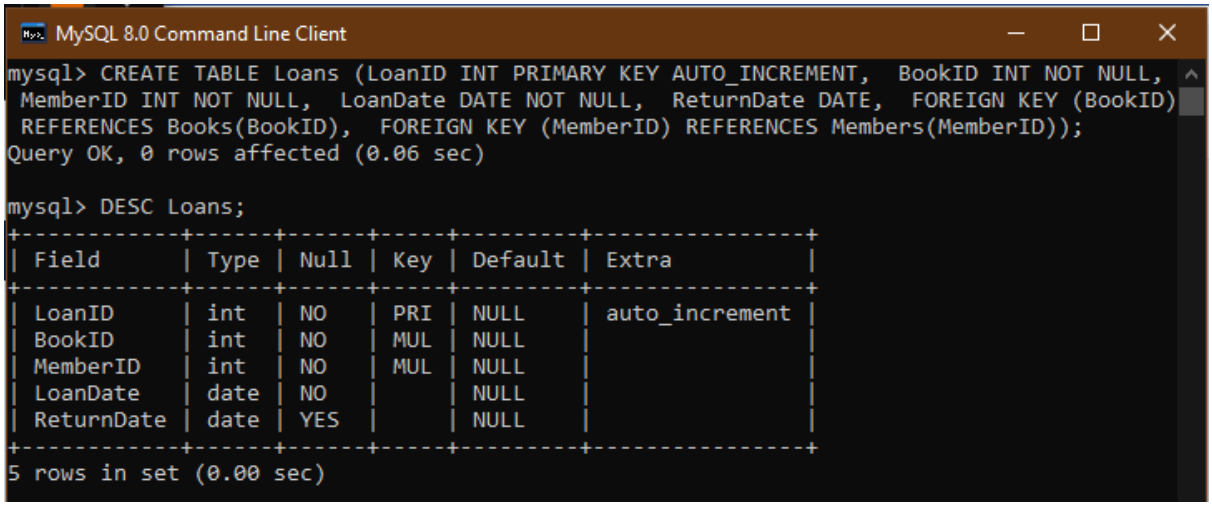
--Create Table Books



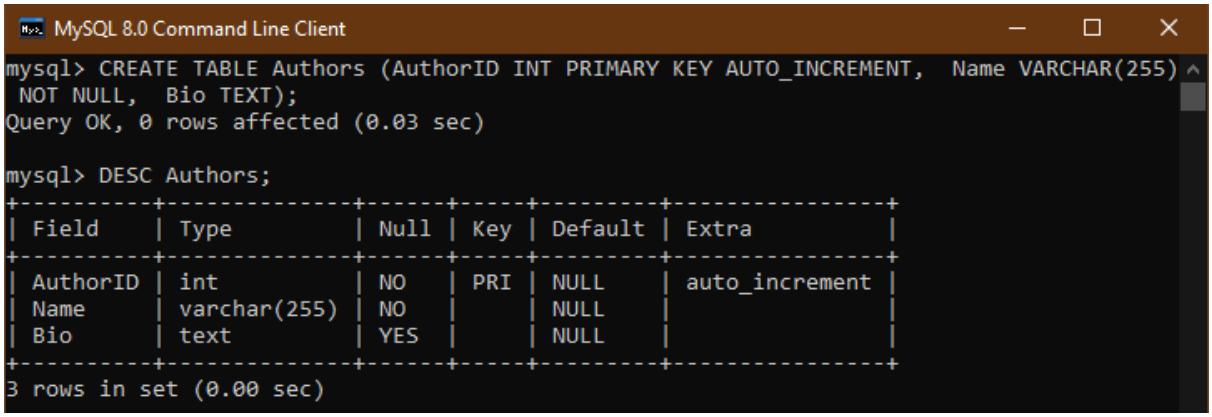
--Create Table Members



--Create Table Loans

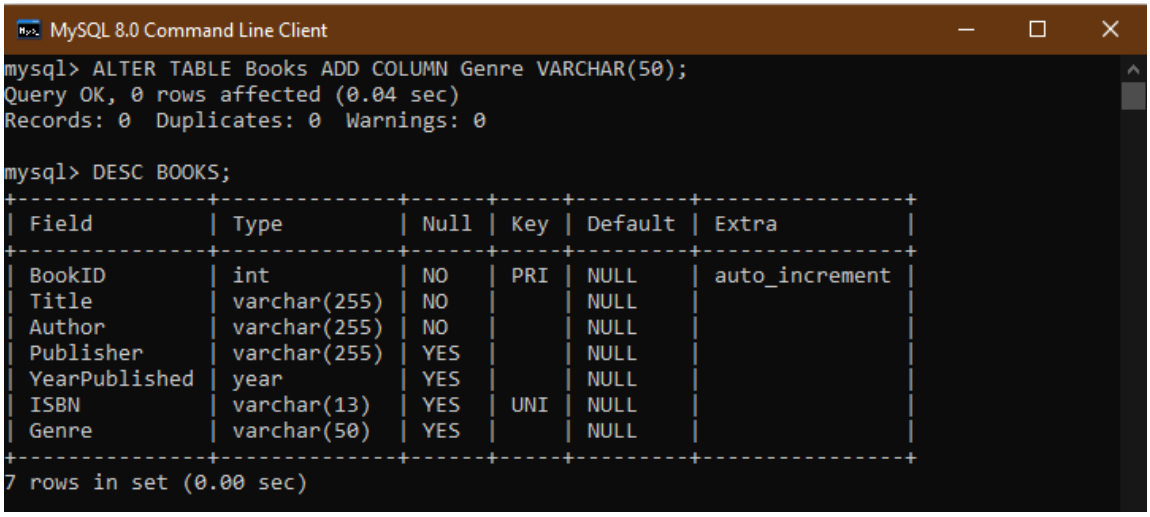


--Create Table Authors



--Create Table BookAuthors

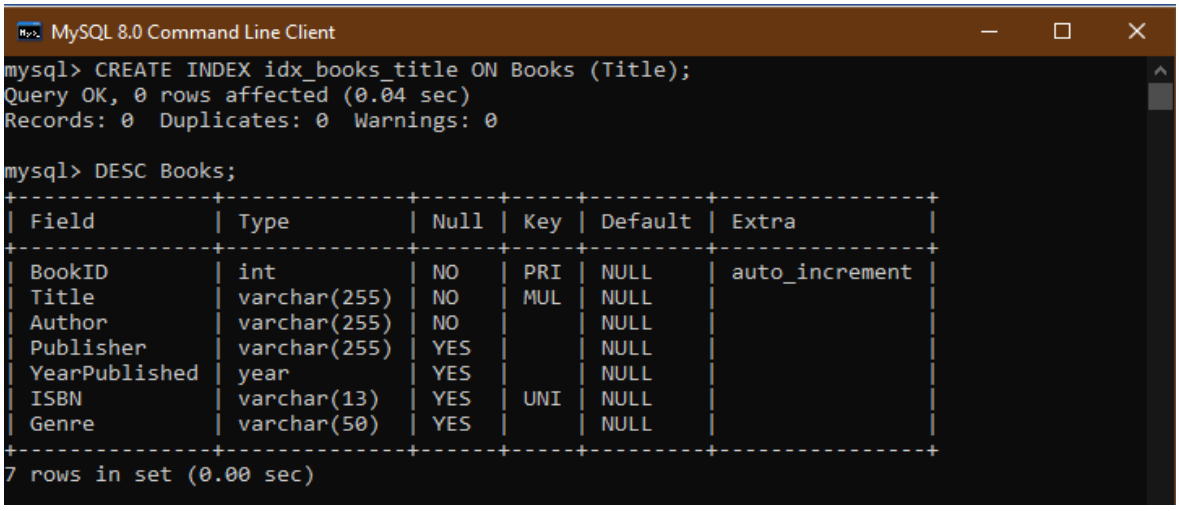
-- Alter Table



Assignment 5: Demonstrate the creation of an index on a table and discuss how it improves query performance. Use a DROP INDEX statement to remove the index and analyse the impact on query execution.

Creating and Dropping Index

-- Create Index

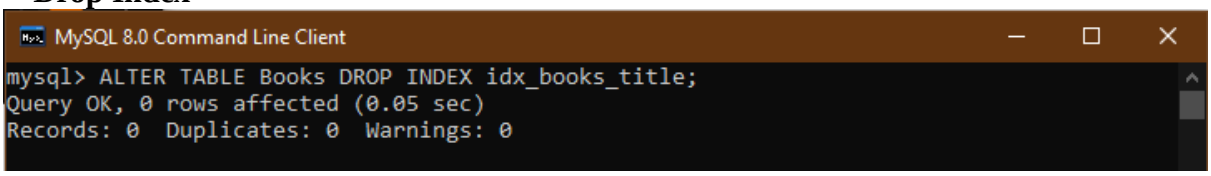


-- Query to search for a book by title
SELECT * FROM Books WHERE Title = 'Sample Book';

Query without Index:
Without an index, the database performs a full table scan to find rows where Title matches 'Sample Book'. This is inefficient, especially for large tables, because each row must be checked.

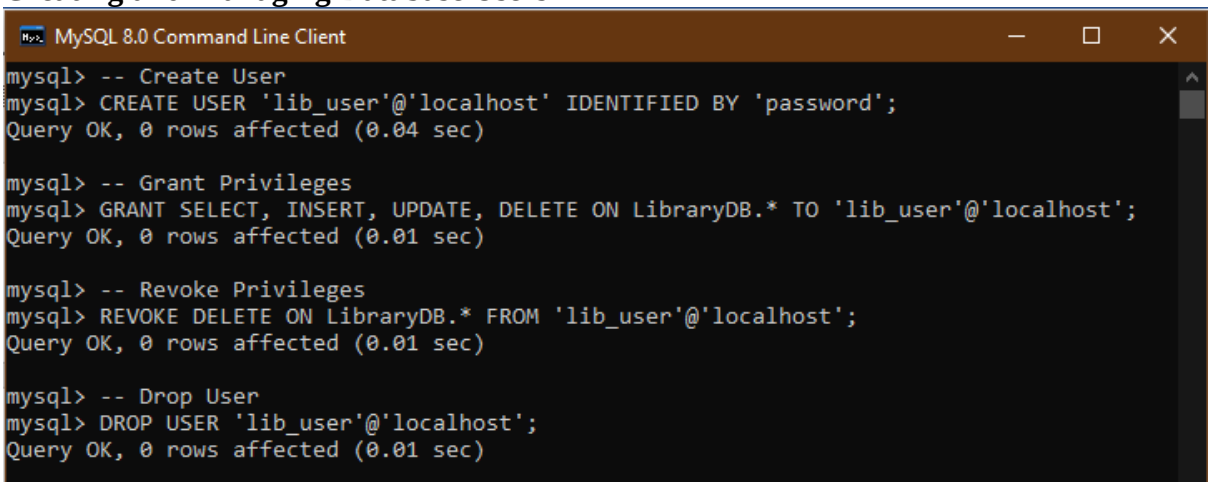
Query with Index:
With the index idx_books_title in place, the database uses the index to directly locate the rows where Title matches 'Sample Book'. This drastically reduces the number of rows that need to be examined and speeds up the query execution.

-- Drop Index



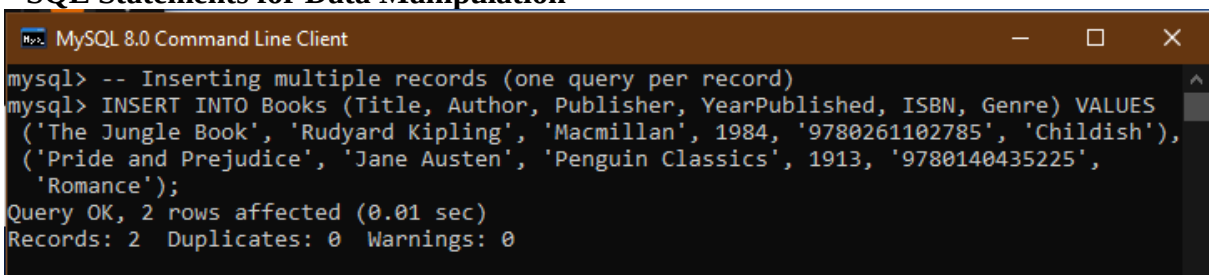
Assignment 6: Create a new database user with specific privileges using the CREATE USER and GRANT commands. Then, write a script to REVOKE certain privileges and DROP the user.

Creating and Managing Database Users



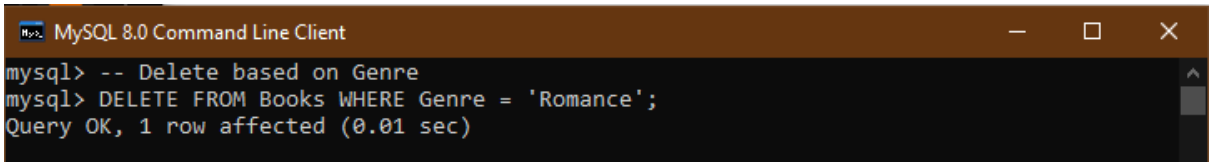
Assignment 7: Prepare a series of SQL statements to INSERT new records into the library tables, UPDATE existing records with new information, and DELETE records based on specific criteria. Include BULK INSERT operations to load data from an external source.

--SQL Statements for Data Manipulation



-- Update Existing Records

-- Delete Records



-- Books.csv File

	A	B	C	D	E	F
1	Title	Author	Publisher	YearPublished	ISBN	Genre
2	The Hitchhiker's Guide to the Galaxy	Douglas Adams	Pan Books	1979	9.78E+12	Science Fiction
3	The Three-Body Problem	Cixin Liu	Tor Books	2006	9.78E+12	Science Fiction
4	One Hundred Years of Solitude	Gabriel Garcia Marquez	Penguin Random House	1967	9.78E+12	Magical Realism
5	Invisible Man	Ralph Ellison	Random House	1952	9.78E+12	Fiction
6	Beloved	Toni Morrison	Alfred A. Knopf	1987	9.78E+12	Historical Fiction
7	Pride and Prejudice	Jane Austen	Penguin Classics	1813	9.78E+12	Romance
8	The Lord of the Rings	J.R.R. Tolkien	Allen & Unwin	1954	9.78E+12	Fantasy
9	Dune	Frank Herbert	Chilton Books	1965	9.78E+12	Science Fiction
10	The Great Gatsby	F. Scott Fitzgerald	Charles Scribner's Sons	1925	9.78E+12	Fiction
11	To Kill a Mockingbird	Harper Lee	J.B. Lippincott & Co.	1960	9.78E+12	Fiction
12						

-- Bulk Insert

```
mysql>LOAD DATA LOCAL INFILE
'C:\Users\anjik\OneDrive\Desktop\Books.csv'
        INTO TABLE Books
        FIELDS TERMINATED BY ','
        LINES TERMINATED BY '\n'
        IGNORE 1 LINES;
```