

Hand in a hardcopy of your answers (printed or handwritten). Include your name, and be sure to clearly identify which problems you are answering and which homework the problems are from since problems from multiple homeworks will be collected at the same time. These problems will be collected on Monday 9/14 and Monday 9/21.

You may use the MySQL database to develop and test your queries, but be sure to still think through what each query is doing for yourself in order to practice and build your skills at reading and understanding SQL. Being able to reason through SQL is important for building up complex queries, and is essential for verifying that your queries are correct — they need to work in any case and not just for a particular instance of the database. (The example database provided is not guaranteed to be sufficient to catch all edge cases or reveal common logic bugs.) Instructions for accessing MySQL can be found on Canvas.

Use the following schema for these problems.

```
BOOK(Book_id, Title, Publisher_name)
BOOK_AUTHORS(Book_id, Author_name)
BOOK_COPIES(Book_id, Branch_id, No_of_copies)
BOOK_LOANS(Book_id, Branch_id, Card_no, Date_out, Due_date)
BORROWER(Card_no, Name, Address, Phone)
LIBRARY_BRANCH(Branch_id, Branch_name, Address)
PUBLISHER(Name, Address, Phone)
```

The foreign keys: ($\rightarrow$ reads as “refers to”)

- BOOK.Publisher_name $\rightarrow$ PUBLISHER.Name
- BOOK_AUTHORS.Book_id $\rightarrow$ BOOK.Book_id
- BOOK_COPIES.Book_id $\rightarrow$ BOOK.Book_id
- BOOK_COPIES.Branch_id $\rightarrow$ LIBRARY_BRANCH.Branch_id
- BOOK_LOANS.Book_id $\rightarrow$ BOOK.Book_id
- BOOK_LOANS.Branch_id $\rightarrow$ LIBRARY_BRANCH.Branch_id
- BOOK_LOANS.Card_no $\rightarrow$ BORROWER.Card_no

The next page has sample data to use for questions 1–13.

Sample data for testing other queries is available in the `ex_library` database in MySQL. Keep in mind, however, that what’s in the database not be sufficient to reveal every subtlety.

BOOK_AUTHORS

Book_id	Author_name
101	C.J. Cherryh
103	C.J. Cherryh
103	Jane Fancher
105	Maureen F. McHugh

LIBRARY_BRANCH

Branch_id	Branch_name	Address
1	Geneva Public Library	Geneva
2	Wood Library	Canandaigua
3	Central Library	Rochester

BOOK_COPIES

Book_id	Branch_id	No_of_copies
101	1	3
102	1	2
103	2	5

BORROWER

Card_no	Name	Address	Phone
001	Bren Cameron	Shejidan	456-555-1111
002	Danny Fisher	Finisterre	789-555-2222
003	Arthur Dent	Islington	630-555-3333

BOOK

Book_id	Title	Publisher_name
101	Foreigner	DAW
102	Invader	DAW
103	Defiance	NULL
104	Hammerfall	Eos
105	Mission Child	Eos

BOOK_LOANS

Book_id	Branch_id	Card_no	Date_out	Due_date
101	1	001	2026-01-01	2026-01-15
102	1	001	2026-01-05	2026-01-19
103	2	002	2026-01-10	2026-01-24
103	2	001	2026-02-01	2026-02-15

PUBLISHER

Name	Address	Phone
DAW	375 Hudson St, New York, NY 10014	123-456-7890
Eos	10 East 53rd St, New York, NY 10022	212-207-7000

(questions start on the next page)

For each of the queries in this section, give the actual results (the table) that would be returned by the query (not an English description). **Use the sample data given above for these exercises, not what is in ex_library!**

1.

```
SELECT BR.Branch_name, B.Title
FROM LIBRARY_BRANCH BR
CROSS JOIN BOOK B
```
2.

```
SELECT Title, Publisher_name, Phone
FROM BOOK
JOIN PUBLISHER ON BOOK.Publisher_name = PUBLISHER.Name
```
3.

```
SELECT Title, No_of_copies
FROM BOOK
JOIN BOOK_COPIES USING (Book_id)
```
4.

```
SELECT BORROWER.Name, Book_id, Date_out
FROM BORROWER
LEFT JOIN BOOK_LOANS USING (Card_no)
```
5.

```
SELECT Title, Branch_name
FROM BOOK
JOIN BOOK_COPIES USING (Book_id)
JOIN LIBRARY_BRANCH USING (Branch_id)
```
6.

```
SELECT *
FROM BOOK
JOIN BOOK_AUTHORS ON BOOK.Book_id = BOOK_AUTHORS.Book_id
```
7.

```
SELECT *
FROM BOOK
JOIN BOOK_AUTHORS USING (Book_id)
```
8.

```
SELECT Title, Author_name
FROM BOOK
LEFT JOIN BOOK_AUTHORS USING (Book_id)
```
9.

```
SELECT Title, Author_name
FROM BOOK_AUTHORS
LEFT JOIN BOOK USING (Book_id)
```
10.

```
SELECT Title, Branch_name
FROM BOOK
LEFT JOIN BOOK_COPIES USING (Book_id)
JOIN LIBRARY_BRANCH USING (Branch_id)
```

11.

```
SELECT Branch_name, Book_id
FROM LIBRARY_BRANCH
JOIN BOOK_COPIES
```
 12.

```
SELECT BORROWER.Name, Book_id
FROM BORROWER
LEFT JOIN BOOK_LOANS USING (Card_no)
WHERE Book_id = 101
```
 13.

```
SELECT BOOK.Title, BOOK_AUTHORS.Author_name, BOOK_LOANS.Card_no
FROM BOOK
JOIN BOOK_AUTHORS USING (Book_id)
JOIN BOOK_LOANS USING (Book_id)
WHERE BOOK.Book_id = 103
```
-

Write SQL for each of the following. Use only the constructs discussed in class on 9/4 and 9/7 (SQL basics and joins) and follow best practices for the use of those constructs even if you could write the query another way.

14. The library has a “Read Your Way Through the Alphabet!” challenge where, when a borrower returns a book, a book whose title comes alphabetically after is recommended next. List the recommendation pairs, with the result columns titled “if you have read...” and “...read this next”.
15. List each branch name together with the due date of every loan checked out from that branch.
16. List the publishers that currently have no books listed in the catalog.
17. List the names of branches that have multiple copies of at least one book.
18. List the publisher’s contact information (name, address, phone) for each book that the Geneva Public Library has copies of. Every book should appear, even ones with no publisher on file — show NULLs for the publisher information in that case.
19. List the borrower name and book title for every checked-out book that is due after November 1, 2006.