

LIBRARY MANAGEMENT SYSTEM

SQL PROJECT

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1. Description:

Following database schema is designed to function as a backend storage database for a web

application built to manage a library.

By storing information in a relational database, all the tasks related to daily functioning of the

library can be performed easily and much more efficiently. Some of the benefits of using this system to

store data over traditional paper registers are as follows:

- Updating and modifying booklist in the library is much easier and efficient
- Maintaining customer details and their account is easy and efficient.
- Calculations like due payments can be done automatically by DBMS, thus eliminating human

error

- RDBMS provides many ways to analyze available data, thus helping in making more informed

decisions about inventory management and other aspects of library management

This database contains 5 tables:

1. Author

2. Type (Genre of book)

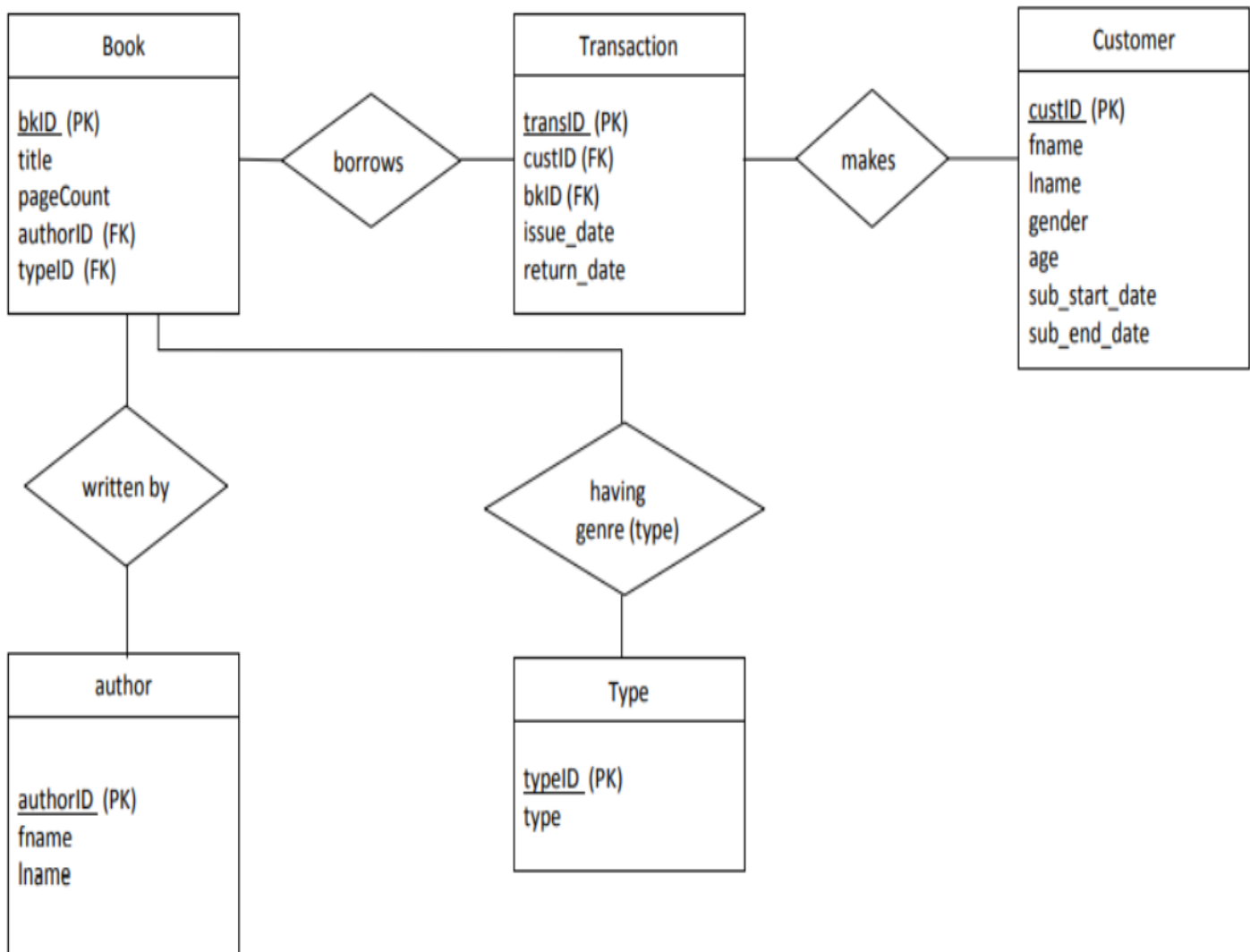
3. Book

4. Customer

5. Transaction

How these tables/entities are related to each other is shown pictorially on next page through ER diagram, i.e., Entity Relationship Diagram.

2. ER-Diagram (Entity Relation - Diagram) for Library Management System:



4. Commands:

- Create Database: lms
- Select Database: lms;
- Create table named author:
- Create table named type:
- Create table named book:

PRIMARY KEY (bkID),

CONSTRAINT fk_bk_author FOREIGN KEY (authorID) REFERENCES
author(authorID),

CONSTRAINT fk_bk_type FOREIGN KEY (typeID) REFERENCES type(typeID);

- Create table named customer:

Create table named transaction:

CONSTRAINT fk_trans_cust

FOREIGN KEY (custID)

REFERENCES customer(custID),

CONSTRAINT fk_trans_bk

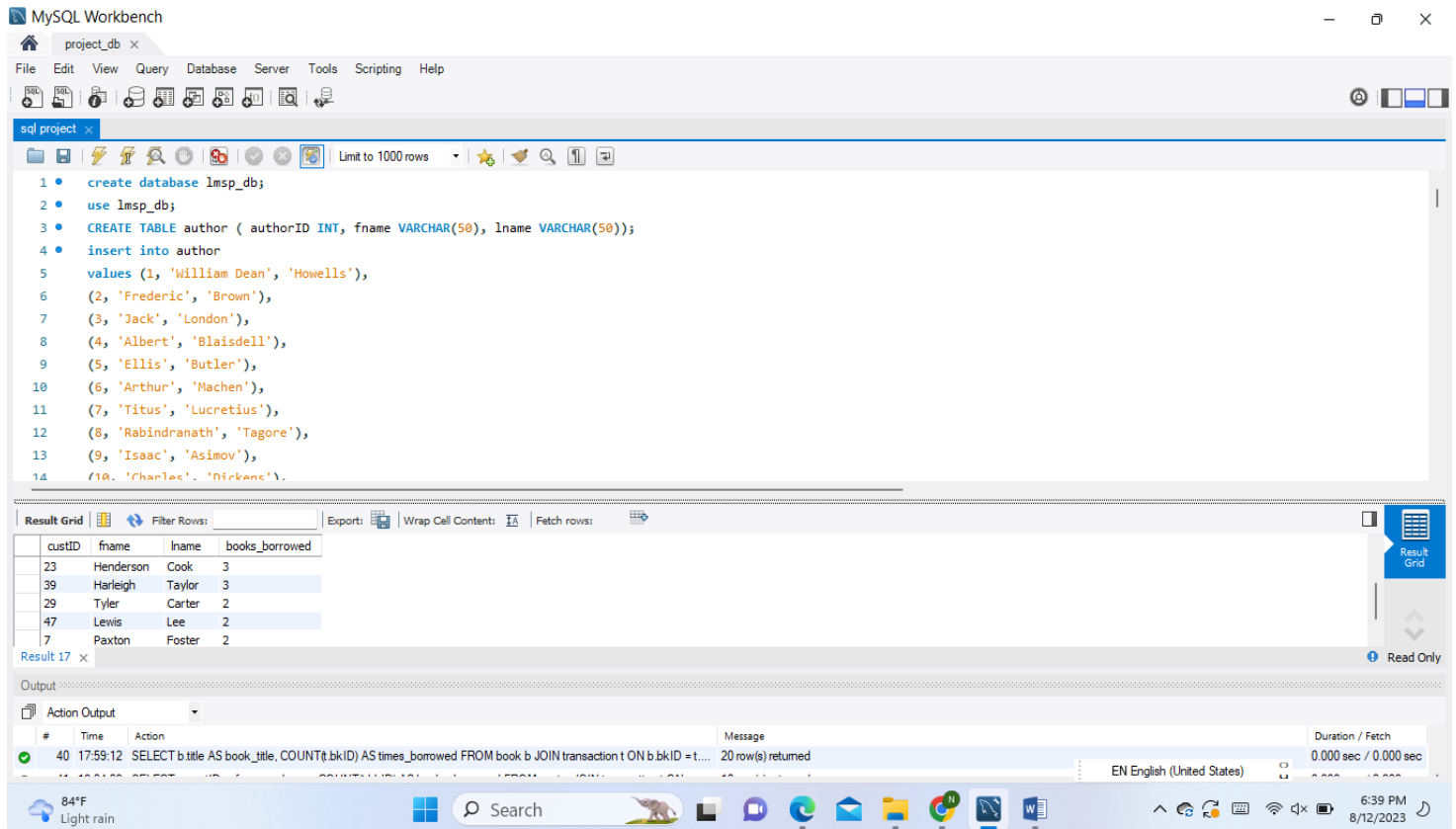
FOREIGN KEY (bkID) REFERENCES

book(bkID));

There are few steps when creating a project they are as follows :-

1.creating a database :-

The following picture shows how to create a database



The screenshot displays the MySQL Workbench interface. The top toolbar includes icons for file operations, database management, and query execution. The main editor window contains the following SQL script:

```
1 • create database lmsp_db;
2 • use lmsp_db;
3 • CREATE TABLE author ( authorID INT, fname VARCHAR(50), lname VARCHAR(50));
4 • insert into author
5 values (1, 'William Dean', 'Howells'),
6 (2, 'Frederic', 'Brown'),
7 (3, 'Jack', 'London'),
8 (4, 'Albert', 'Blaisdell'),
9 (5, 'Ellis', 'Butler'),
10 (6, 'Arthur', 'Machen'),
11 (7, 'Titus', 'Lucretius'),
12 (8, 'Rabindranath', 'Tagore'),
13 (9, 'Isaac', 'Asimov'),
14 (10, 'Charles', 'Dickens');
```

Below the editor, the 'Result Grid' tab is active, showing a table with the following data:

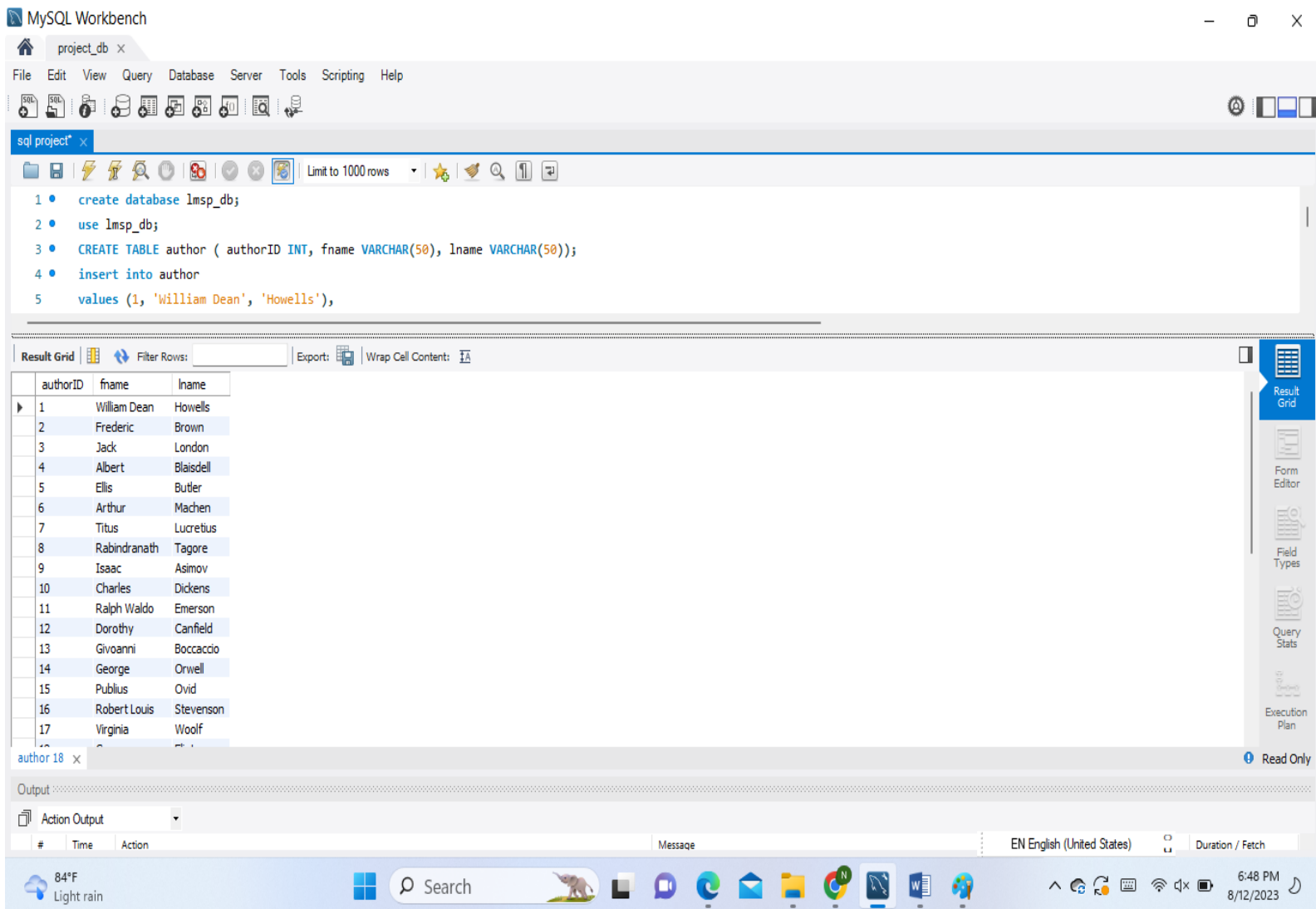
custID	fname	lname	books_borrowed
23	Henderson	Cook	3
39	Harleigh	Taylor	3
29	Tyler	Carter	2
47	Lewis	Lee	2
7	Paxton	Foster	2

The 'Output' tab at the bottom shows a successful query execution with the message: 'SELECT b.title AS book_title, COUNT(t.bkID) AS times_borrowed FROM book b JOIN transaction t ON b.bkID = t.bkID; 20 row(s) returned'. The system tray at the bottom indicates a temperature of 84°F, light rain, and the time 6:39 PM on 8/12/2023.

2. create table :-

In next step we will create table of different entities which is shown below:-

A] table author:-



The screenshot displays the MySQL Workbench interface. The top toolbar includes icons for file operations, editing, and database management. The main editor window shows a SQL script with the following commands:

```
1 • create database lmsp_db;
2 • use lmsp_db;
3 • CREATE TABLE author ( authorID INT, fname VARCHAR(50), lname VARCHAR(50));
4 • insert into author
5   values (1, 'William Dean', 'Howells');
```

Below the editor, the 'Result Grid' tab is active, displaying the results of the query execution. The results are shown in a table with three columns: authorID, fname, and lname. The data includes 17 rows of author information.

authorID	fname	lname
1	William Dean	Howells
2	Frederic	Brown
3	Jack	London
4	Albert	Blaisdell
5	Ellis	Butler
6	Arthur	Machen
7	Titus	Lucretius
8	Rabindranath	Tagore
9	Isaac	Asimov
10	Charles	Dickens
11	Ralph Waldo	Emerson
12	Dorothy	Canfield
13	Givoanni	Boccaccio
14	George	Orwell
15	Publius	Ovid
16	Robert Louis	Stevenson
17	Virginia	Woolf

The bottom status bar shows the system temperature as 84°F with light rain, and the time as 6:48 PM on 8/12/2023.

B] Table type:-

MySQL Workbench

project_db x

File Edit View Query Database Server Tools Scripting Help

sql project x

Limit to 1000 rows

```
44 • CREATE TABLE type ( typeID INT, type VARCHAR(50), PRIMARY KEY (typeID) );
45 • INSERT into type VALUES
46 (1, 'Science fiction'),
47 (2, 'Satire'),
48 (3, 'Drama');
```

Result Grid

	typeID	type
▶	1	Science fiction
	2	Satire
	3	Drama
	4	Action and Adventure
	5	Romance
	6	Mystery
	7	Horror
	8	Health
	9	Guide
	10	Diaries
	11	Comics
	12	Diaries
	13	Journals
	14	Biographies
	15	Fantasy
	16	History
	17	Science
	18	...

type 19 x

Apply Revert

Output

Action Output

#	Time	Action	Message
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EN English (United States)

Duration / Fetch

84°F Light rain

Search

6:52 PM 8/12/2023

C) table book :-

MySQL Workbench

project_db x

File Edit View Query Database Server Tools Scripting Help

sql project x

Limit to 1000 rows

```
65
66
67 • CREATE TABLE book ( bkID INT, title VARCHAR(50), pageCount INT, authorID INT, typeID INT);
68 • insert into book
69 values (1, 'A Daughter of the Snows', 199, 3, 9),
```

Result Grid

	bkID	title	pageCount	authorID	typeID
▶	1	A Daughter of the Snows	199	3	9
	2	The Near East: 10,000 Years of History	298	9	13
	3	The Cocoon: A Rest-Cure Comedy	90	25	12
	4	The Freakshow Murders	321	2	3
	5	Pharaohs, Fellahs and Explorers	367	19	9
	6	Hard Times	293	10	1
	7	A Modern Instance	222	1	12
	8	The Real Mother Goose	88	35	1
	9	A Thousand Miles Up the Nile	110	19	18
	10	Children of Blood and Bone	137	7	13
	11	A pushcart at the curb	95	24	1
	12	The Desert and the Sown	126	29	10
	13	Three Soldiers	223	24	16
	14	The End of Eternity	168	9	1
	15	Annie Kilburn	291	1	12
	16	A Touch of Sun and Other Stories	141	29	9
	17	Show Boat	151	22	18

book 20 x

Output

Action Output

Time Action Message EN English (United States) Duration / Fetch

84°F Light rain

Search

6:55 PM 8/12/2023

D) table customer :-

MySQL Workbench

project_db x

File Edit View Query Database Server Tools Scripting Help

sql project x

Limit to 1000 rows

```
122 • CREATE TABLE cust (custID INT, fname VARCHAR(30), lname VARCHAR(30), gender varchar(10), age INT, sub_start_date DATE, sub_end_date DATE);
123 • INSERT INTO cust VALUES
124 (1, 'Hazel', 'Green', 'F', 28, '2020-05-15', '2023-05-15'),
125 (2, 'Ashley', 'Marshall', 'F', 20, '2020-10-28', '2023-10-28'),
126 (3, 'Ansley', 'Green', 'F', 22, '2021-07-12', '2024-07-12');
```

Result Grid

	custID	fname	lname	gender	age	sub_start_date	sub_end_date
▶	1	Hazel	Green	F	28	2020-05-15	2023-05-15
	2	Ashley	Marshall	F	20	2020-10-28	2023-10-28
	3	Ansley	Green	F	22	2021-07-12	2024-07-12
	4	Alcock	Chapman	F	22	2020-01-25	2023-01-25
	5	Meadow	Taylor	F	23	2020-12-30	2023-12-30
	6	Green	Wright	M	32	2020-03-09	2023-03-09
	7	Paxton	Foster	M	34	2020-03-03	2023-03-03
	8	Gray	King	M	62	2020-06-26	2023-06-26
	9	Jones	Collins	M	25	2020-01-26	2023-01-26
	10	Leslie	Young	F	42	2020-02-10	2023-02-10
	11	Hailey	Hill	F	27	2021-01-16	2024-01-16
	12	Washin...	Martin	M	24	2021-05-23	2024-05-23
	13	Ramirez	Green	M	33	2020-08-28	2023-08-28
	14	Morgan	Smith	M	29	2021-05-15	2024-05-15
	15	Perez	Baker	M	53	2020-10-27	2023-10-27
	16	Alfie	Watson	M	26	2021-04-05	2024-04-05
	17	Madison	Jackson	F	35	2021-02-15	2024-02-15

cust 21 x

Output

Action Output

#	Time	Action	Message
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EN English (United States)

Duration / Fetch

84°F Light rain

Search

6:58 PM 8/12/2023

E] table transaction:-

MySQL Workbench

project_db x

File Edit View Query Database Server Tools Scripting Help

sql project x

Limit to 1000 rows

```
173 (50, 'Sterling', 'Shaw', 'M', 26, '2021-06-24', '2024-06-24');
174 select*from cust;
175 CREATE TABLE transaction ( transID INT, custID INT, bkID INT, issue_date DATETIME, return_date DATETIME);
176 INSERT INTO transaction VALUES
177 (1, 37, 24, '2021-08-31 04:30:00', '2021-09-17 00:15:00'),
```

Result Grid

	transID	custID	bkID	issue_date	return_date
1	37	24		2021-08-31 04:30:00	2021-09-17 00:15:00
2	32	17		2021-10-01 14:28:00	2021-10-07 11:22:00
3	40	29		2021-10-02 10:45:00	2021-10-10 17:16:00
4	36	44		2021-10-03 15:57:00	2021-10-09 10:43:00
5	11	16		2021-10-07 13:19:00	2021-10-15 18:55:00
6	29	34		2021-10-09 08:32:00	2021-10-14 08:17:00
7	23	26		2021-10-09 15:48:00	2021-10-21 10:51:00
8	3	34		2021-10-10 19:55:00	2021-10-15 09:20:00
9	37	50		2021-10-14 10:25:00	2021-10-14 12:52:00
10	36	39		2021-10-16 08:53:00	2021-10-29 18:47:00
11	47	14		2021-10-24 10:50:00	2021-11-05 18:19:00
12	32	30		2021-10-24 13:48:00	2021-10-28 19:33:00
13	7	33		2021-10-27 08:10:00	2021-11-10 14:34:00
14	32	12		2021-10-27 09:27:00	2021-11-13 18:23:00
15	44	19		2021-10-29 14:39:00	2021-11-07 18:34:00
16	11	1		2021-11-03 15:11:00	2021-11-04 19:42:00
17	15	3		2021-11-06 11:51:00	2021-11-12 11:49:00

transaction 22 x

Output

Action Output

Time Action Message

EN English (United States) Duration / Fetch

84°F Light rain

Search

7:00 PM 8/12/2023

3. working on queries:-

- SUBQUERIES :-

1. Select customers who have not borrowed any book from library

The screenshot shows the MySQL Workbench interface. The query editor contains the following SQL code:

```
243
244 /*Select customers who have not borrowed any book from library*/
245 • SELECT custid, fname, lname
246 FROM cust
247 WHERE custid NOT IN (SELECT DISTINCT custid FROM transaction);
```

The Result Grid shows the following data:

	custid	fname	lname
2	Ashley	Marshall	
9	Jones	Collins	
12	Washington	Martin	
16	Alfie	Watson	
17	Madison	Jackson	
18	Beverly	Moore	
19	Kaden	Anderson	
26	Wren	Chapman	
28	Wes	Bell	
30	Edwin	Cook	

The Action Output pane shows the following log:

#	Time	Action	Message	Duration / Fetch
✓ 48	18:58:21	select from cust LIMIT 0, 1000	50 row(s) returned	0.000 sec / 0.000 sec
✓ 49	19:00:06	select from transaction LIMIT 0, 1000	60 row(s) returned	0.000 sec / 0.000 sec
✗ 50	19:04:16	SELECT custid, fname, lname FROM cust WHERE custid NOT IN (SELECT DISTINCT custidFROM transaction) ...	Error Code: 1054. Unknown column 'custidFROM' in field list	0.000 sec
✓ 51	19:04:37	SELECT custid, fname, lname FROM cust WHERE custid NOT IN (SELECT DISTINCT custid FROM transaction) ...	15 row(s) returned	0.000 sec / 0.000 sec

The Windows taskbar at the bottom shows the date and time as 7:05 PM on 8/12/2023, and the temperature as 84°F.

2. Select book with highest page count

MySQL Workbench

project_db x

File Edit View Query Database Server Tools Scripting Help

sql project x

Limit to 1000 rows

```
248
249 /*Select book with highest page count*/
250 • SELECT bkID,title
251 FROM book
252 WHERE pageCount = (SELECT max(pageCount) FROM book);
---
```

Result Grid

	bkID	title
▶ 5		Pharaohs, Fellahs and Explorers

book 24 x

Read Only

Output

Action Output

#	Time	Action	Message	Duration / Fetch
✓ 49	19:00:06	select from transaction LIMIT 0, 1000	60 row(s) returned	0.000 sec / 0.000 sec
✗ 50	19:04:16	SELECT custid, fname, lname FROM cust WHERE custid NOT IN (SELECT DISTINCT custidFROM transaction) ...	Error Code: 1054. Unknown column 'custidFROM' in 'field list'	0.000 sec
✓ 51	19:04:37	SELECT custid, fname, lname FROM cust WHERE custid NOT IN (SELECT DISTINCT custid FROM transaction) ...	15 row(s) returned	0.000 sec / 0.000 sec
✓ 52	19:08:27	SELECT bkID,title FROM book WHERE pageCount = (SELECT max(pageCount) FROM book) LIMIT 0, 1000	1 row(s) returned	0.000 sec / 0.000 sec

EN English (United States)

84°F
Light rain

Search

7:09 PM
8/12/2023

3. Select customer who has borrowed some book for longest period

MySQL Workbench

project_db

File Edit View Query Database Server Tools Scripting Help

sql project

Limit to 1000 rows

```
254 /*Select customer who has borrowed some book for longest period*/
255 • SELECT c.custID, c.fname, c.lname,
256       MAX(DATEDIFF(t.return_date, t.issue_date)) AS max_borrow_duration
257 FROM cust c
258 JOIN transaction t ON c.custID = t.custID
259 GROUP BY c.custID, c.fname, c.lname
260 ORDER BY max_borrow_duration DESC
261 LIMIT 1;
```

Result Grid

custID	fname	lname	max_borrow_duration
50	Sterling	Shaw	18

Result 25

Output

Action Output

#	Time	Action	Message	Duration / Fetch
50	19:04:16	SELECT custid, fname, lname FROM cust WHERE custid NOT IN (SELECT DISTINCT custidFROM transaction) ...	Error Code: 1054. Unknown column 'custidFROM' in field list'	0.000 sec
51	19:04:37	SELECT custid, fname, lname FROM cust WHERE custid NOT IN (SELECT DISTINCT custid FROM transaction) ...	15 row(s) returned	0.000 sec / 0.000 sec
52	19:08:27	SELECT bkID,title FROM book WHERE pageCount = (SELECT max(pageCount) FROM book) LIMIT 0, 1000	1 row(s) returned	0.000 sec / 0.000 sec
53	19:11:29	SELECT c.custID, c.fname, c.lname, MAX(DATEDIFF(t.return_date, t.issue_date)) AS max_borrow_duration ...	1 row(s) returned	0.000 sec / 0.000 sec

EN English (United States)

84°F Light rain

Search

7:11 PM 8/12/2023

- **JOINS :-**

1. Display list of all books along with their authors

The screenshot shows the MySQL Workbench interface. The SQL editor contains the following query:

```
/*Display list of all books along with their authors*/  
SELECT bkID, b.title AS book_title, CONCAT(a.fname, ' ', a.lname) AS author_name  
FROM book b  
JOIN author a ON b.authorID = a.authorID;
```

The results are displayed in a table with the following columns: bkID, book_title, and author_name. The table contains 20 rows of data.

bkID	book_title	author_name
1	A Daughter of the Snows	Jack London
2	The Near East: 10,000 Years of History	Isaac Asimov
3	The Cocoon:A Rest-Cure Comedy	Ruth Stuart
4	The Freakshow Murders	Frederic Brown
5	Pharaohs, Fellahs and Explorers	Amelia B. Edwards
6	Hard Times	Charles Dickens
7	A Modern Instance	William Dean Howells
8	The Real Mother Goose	Mother Goose
9	A Thousand Miles Up the Nile	Amelia B. Edwards
10	Children of Blood and Bone	Titus Lucretius
11	A pushcart at the curb	John DosPassos
12	The Desert and the Sown	Mary Hallock Foote
13	Three Soldiers	John DosPassos
14	The End of Eternity	Isaac Asimov
15	Annie Kilburn	William Dean Howells
16	A Touch of Sun and Other Stories	Mary Hallock Foote
17	Show Boat	Edna Ferber
18	The Call of the Wild	Jack London
19	My Mark Twain	William Dean Howells
20	Broken Time	Richard Matheson

2. Display list of top 20 most borrowed books

MySQL Workbench

project_db

File Edit View Query Database Server Tools Scripting Help

sql project

Limit to 1000 rows

```
269 /*Display list of top 20 most borrowed books*/
270 • SELECT b.title AS book_title, COUNT(t.bkID) AS times_borrowed
271 FROM book b
272 JOIN transaction t ON b.bkID = t.bkID
273 GROUP BY b.bkID, b.title
274 ORDER BY times_borrowed DESC
275 LIMIT 20;
```

Result Grid

book_title	times_borrowed
A Daughter of the Snows	4
Show Boat	3
The Unlived Life of Little Mary Ellen	3
The Cocoon: A Rest-Cure Comedy	3
Broken Ties	3
Rainy Week	3
Monsieur Maurice	2
Maybe Mother Goose	2
The Hill of Dreams	2
A Touch of Sun and Other Stories	2
Nature	2
Rejection, The Ruling Spirit	2
The Desert and the Sown	2
A Tale of Two Cities	2

Result 27

Output

Action Output

EN English (United States)

84°F Light rain

Search

7:21 PM 8/12/2023

3. Display list of top 10 customers who have borrowed most books

MySQL Workbench

project_db x

File Edit View Query Database Server Tools Scripting Help

sql project* x

Limit to 1000 rows

```
277 /*Display list of top 10 customers who have borrowed most books*/
278 • SELECT c.custID, c.fname, c.lname, COUNT(t.bkID) AS books_borrowed
279 FROM cust c
280 JOIN transaction t ON c.custID = t.custID
281 GROUP BY c.custID, c.fname, c.lname
282 ORDER BY books_borrowed DESC
283 LIMIT 10;
```

Result Grid

	custID	fname	lname	books_borrowed
▶	11	Hailey	Hill	5
	37	Remington	Wright	4
	32	Nelson	Smith	3
	36	Cherish	Cooper	3
	23	Henderson	Cook	3
	39	Harleigh	Taylor	3
	29	Tyler	Carter	2
	47	Lewis	Lee	2
	7	Paxton	Foster	2
	15	Perez	Baker	2

Result 28 x

Read Only

Output

Action Output

#	Time	Action	Message	Duration / Fetch
55	19:17:33	SELECT b.title AS book_title, COUNT(t.bkID) AS times_borrowed FROM book b JOIN transaction t ON b.bkID = t...	20 row(s) returned	0.000 sec / 0.000 sec
56	19:26:42	SELECT c.custID, c.fname, c.lname, COUNT(t.bkID) AS books_borrowed FROM cust c JOIN transaction t ON c.c...	10 row(s) returned	0.016 sec / 0.000 sec

84°F Light rain

Search

7:27 PM 8/12/2023

THANK YOU !

