CS 631 - Project Deliverable 3
Library Database and User Interface Implementation

Introduction

The purpose of this report is to document the development process and outcomes of creating a library database and user interface system. The project aimed to provide a comprehensive solution for managing library resources and facilitating user interactions through an intuitive interface.

The project involved the creation of a relational database to store information about library documents, readers, transactions, and branches. Additionally, a user interface was developed to allow administrators and readers to perform various functions such as document search, checkout, return, and administrative tasks.

1. Description of implementation, and problems faced.

Connecting Tables: One of the main challenges encountered was ensuring the proper linkage between different tables in the database. Establishing correct relationships through primary and foreign keys required meticulous planning and validation to avoid data integrity issues.

User Interface Design: Designing an intuitive user interface posed another challenge. Aligning buttons, layouts, and navigation paths to provide a seamless user experience required careful consideration of user needs and interface design principles.

Collaboration Constraints: Collaboration among team members proved challenging due to code dependencies and sequential work processes. Coordinating efforts and managing code changes necessitated effective communication and project management strategies.

Approach and Solutions for the problems solved:

Thorough Planning: Detailed planning sessions were conducted to map out database schema and user interface wireframes, ensuring clarity and alignment of project objectives.

Continuous Communication: Regular team meetings and communication channels were established to facilitate collaboration, share progress updates, and address any issues promptly.

Iterative Development: The development process followed an iterative approach, allowing for incremental improvements and feedback incorporation at each stage.

2. User guide and a printout of the use of the program

This user guide provides instructions on how to use the library database and user interface system developed using Python and Tkinter. The system allows users to perform various functions related to library management, including document search, checkout, return, administrative tasks, and data analysis.

System Requirements:

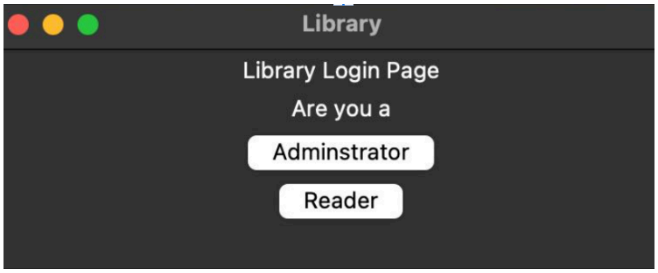
- Python installed on your system (version 3.x recommended).
- Tkinter library installed (usually included with Python).
- SQLite database management system.

There are the important attributes included in the project

Main Menu:

Upon launching the application, we will be presented with the main menu, which includes the following options:

- Reader Functions
- Administrative Functions



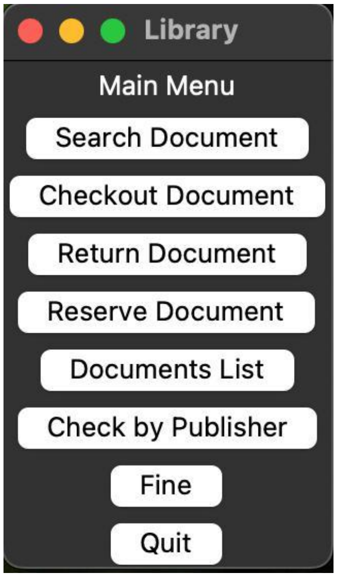
Library Login Page

Are you a

Reader Functions:

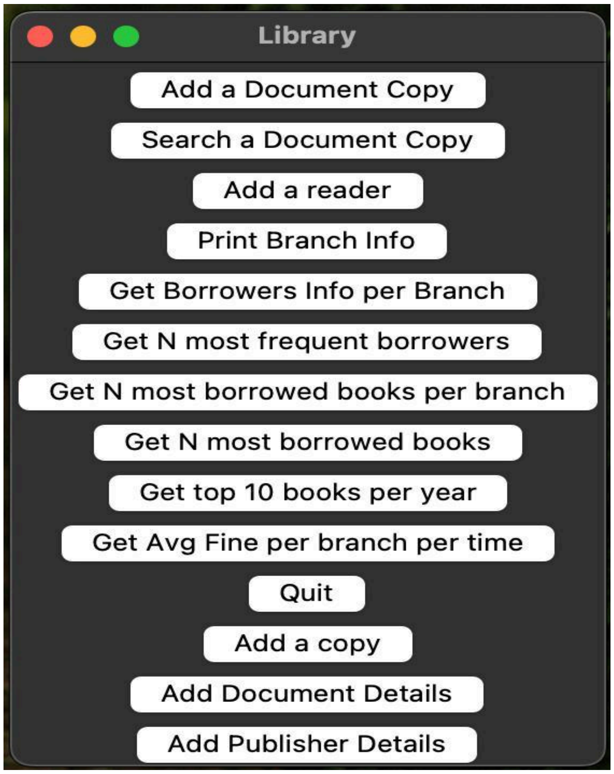
- Search for a Document: Enter the document ID, title, or publisher name to search for a document in the library.
- Document Checkout: Borrow a document from the library by entering the document ID and your reader card number.
- Document Return: Return a borrowed document by entering the document ID and your reader card number.
- Document Reserve: Reserve a document for future checkout by entering the document ID and your reader card number.
- Compute Fine: Calculate the fine for a borrowed document based on the current date and return date.
- Print Reserved Documents: View a list of documents reserved by you and their status.

- Print Publisher Documents: Enter the publisher name to view a list of documents published by that publisher.
- Quit: Return to the main menu.

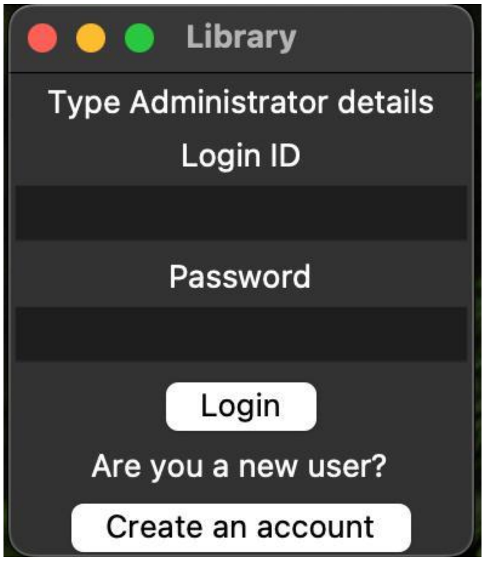


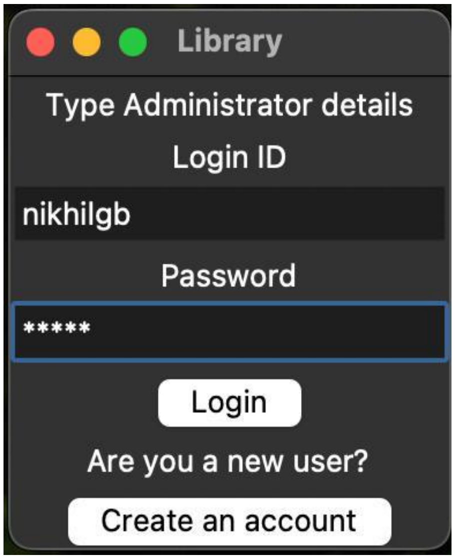
Administrative Functions:

- Add Document Copy: Add a new copy of a document to the library by entering relevant information.
- Search Document Copy: Check the status of a document copy by entering its ID.
- Add New Reader: Register a new reader by providing the necessary personal information.
- Print Branch Information: View information about library branches, including name and location.
- Print Top N Frequent Borrowers: Enter the number N and branch number I to view the top N borrowers in branch I.
- Print Top N Borrowers in Library: Enter the number N to view the top N borrowers in the entire library.
- Print N Most Borrowed Books in Branch: Enter the number N and branch number I to view the N most borrowed books in branch I.
- Print N Most Borrowed Books in Library: Enter the number N to view the N most borrowed books in the entire library.
- Print Top 10 Books by Year: Enter a year to view the 10 most popular books published in that year.
- Print Average Fine per Branch: Enter a start date S and an end date E to view the average fine paid by borrowers per branch during that period.
- Quit: Return to the main menu.


Library
Add a Document Copy
Search a Document Copy
Add a reader
Print Branch Info
Get Borrowers Info per Branch
Get N most frequent borrowers
Get N most borrowed books per branch
Get N most borrowed books
Get top 10 books per year
Get Avg Fine per branch per time
Quit
Add a copy
Add Document Details
Add Publisher Details

In order to access the admin menu, we need to have an admin account.





nikhilgb

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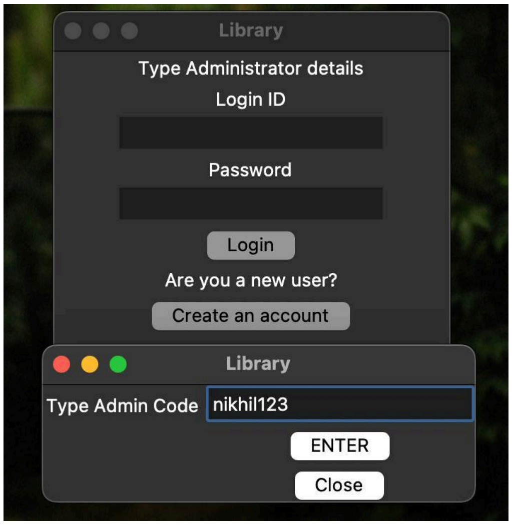
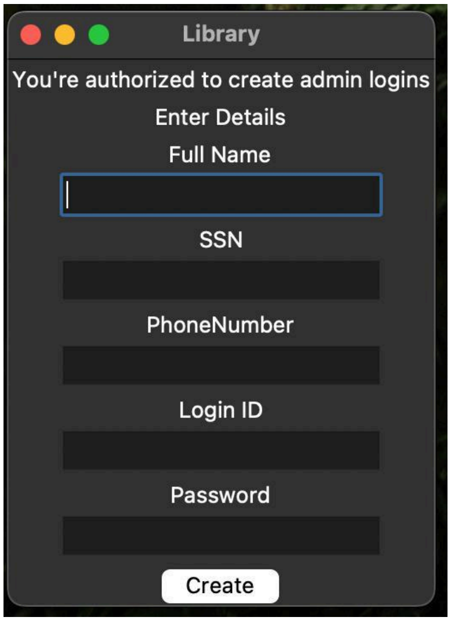
We have created a window to add an admin account, once we click on the button, the command gets triggered and we have to type the admin code to get access to create a new admin



Type Admin Code nikhil123

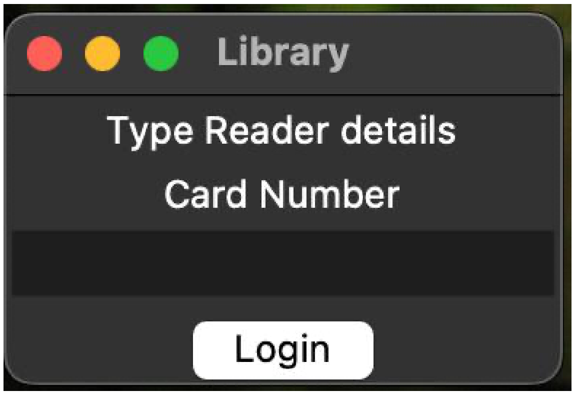
Here we need to add details, the SSN is the primary key here



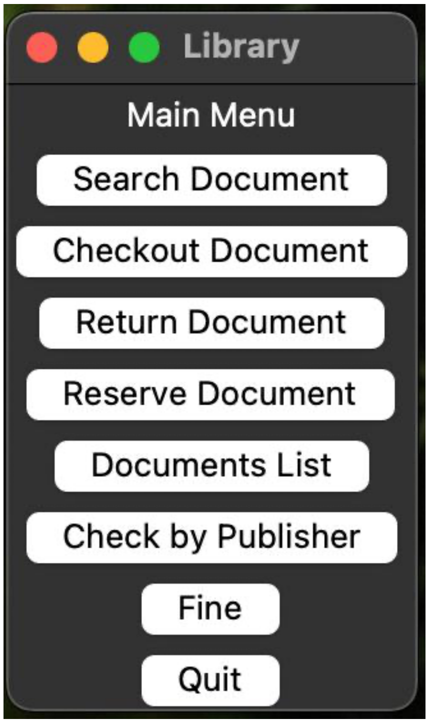
You're authorized to create admin logins

Enter Details

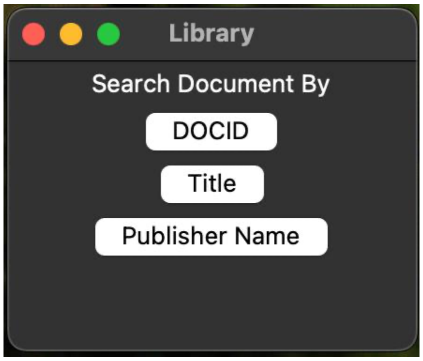
Readers menu:
The reader have to enter their unique login details(card number) to access the readers submenu

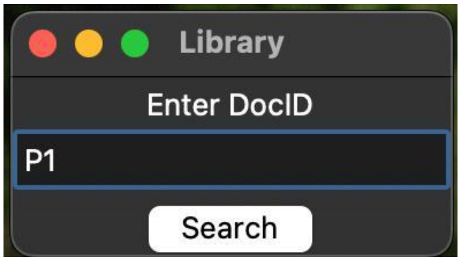


Below is the submenu:



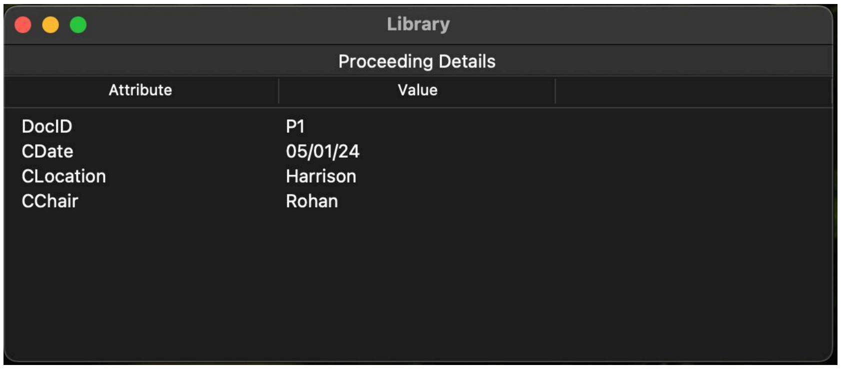
The first button in the readers submenu is to search for a document.





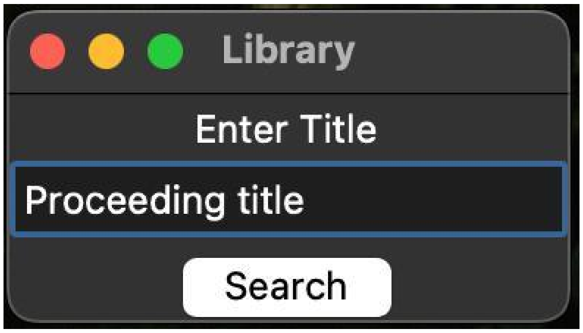
Enter DocID

P1



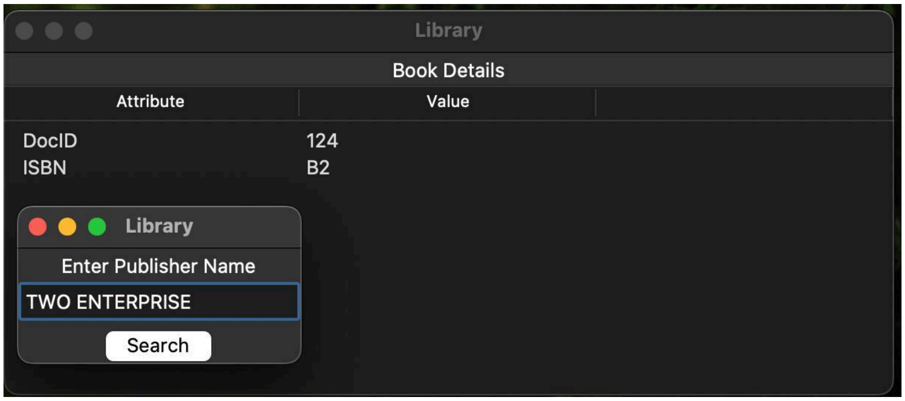
Proceeding Details

Attribute	Value
DocID	P1
CDate	05/01/24
CLocation	Harrison
CChair	Rohan



Enter Title

Proceeding title



Book Details

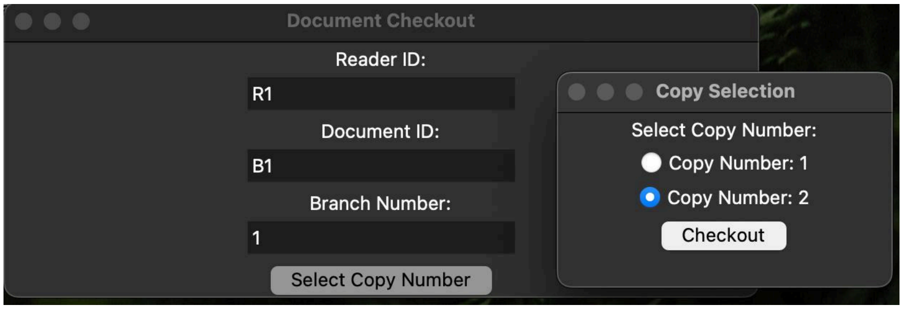
Attribute	Value
DocID	124
ISBN	B2

Enter Publisher Name

TWO ENTERPRISE

As you can see in the above screencaps, the gui prompts the reader to either search the document by DocID, Title and Publisher name. After entering the respective input, through the logic , it'll retrieve the document details.

Next comes the Document checkout. Below are the referencing screenshots and the prompts which are arranged sequentially.



Reader ID: R1

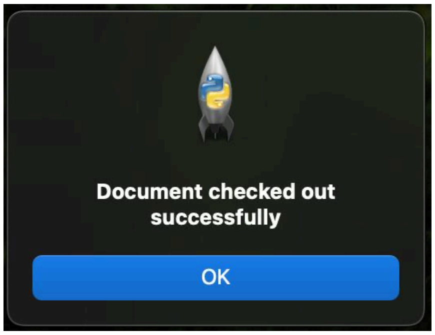
Document ID: B1

Branch Number: 1

Select Copy Number:

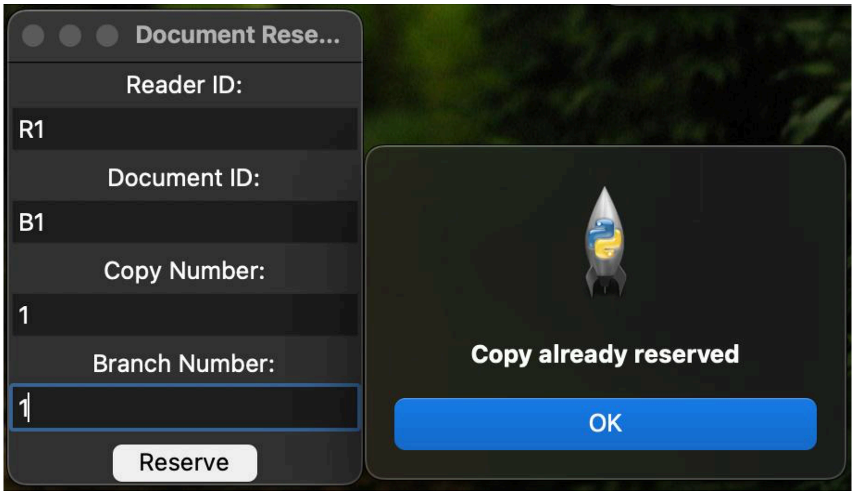
○ Copy Number: 1

● Copy Number: 2



Document checked out successfully

Next we have the button to reserve a document.



Reader ID: R1

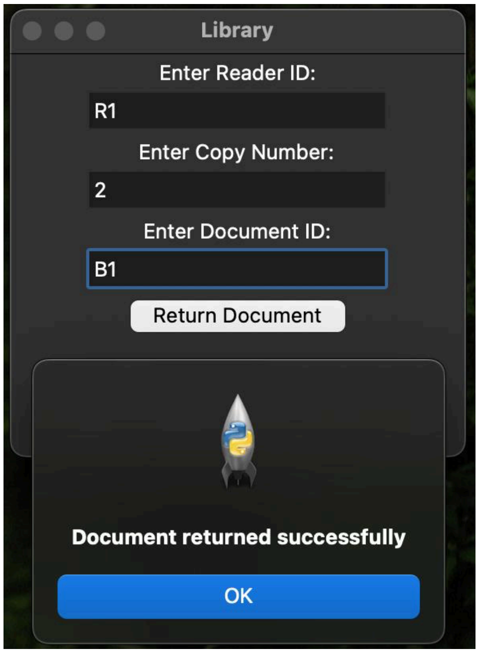
Document ID: B1

Copy Number: 1

Branch Number: 1

Copy already reserved

Next, we have the button to return a document.



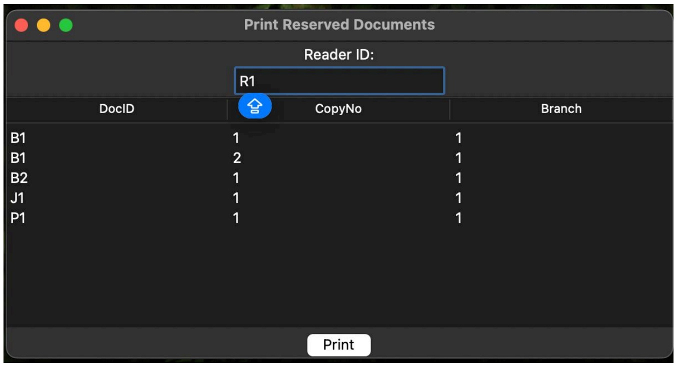
Enter Reader ID: R1

Enter Copy Number: 2

Enter Document ID: B1

Document returned successfully

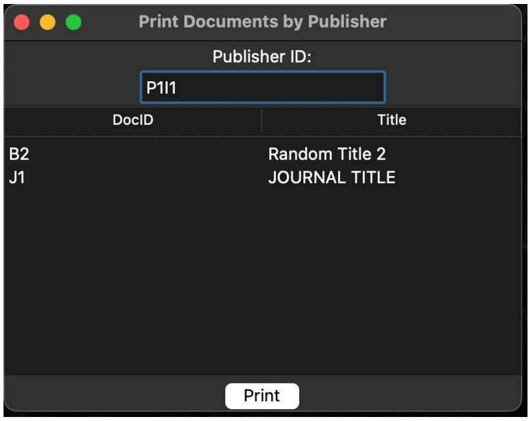
Next comes the button to print reserved documents:, we have to enter the reader id and it will query us the documents which are reserved by the respective reader.



Reader ID: R1

DocID	CopyNo	Branch
B1	1	1
B1	2	1
B2	1	1
J1	1	1
P1	1	1

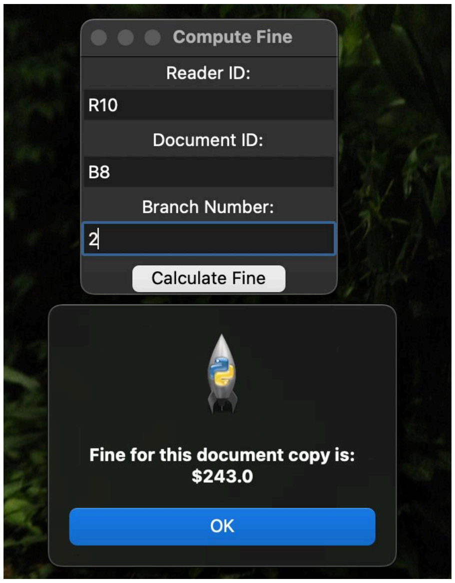
Now to print documents based on the publisher id:



Publisher ID: P1I1

DocID	Title
B2	Random Title 2
J1	JOURNAL TITLE

In order to calculate fine:



Compute Fine

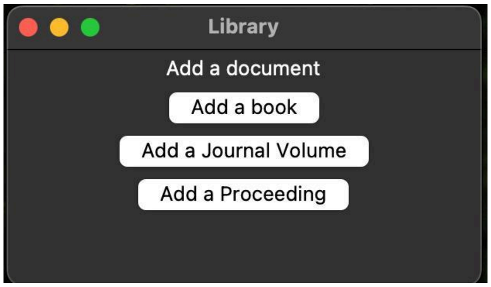
Reader ID: R10

Document ID: B8

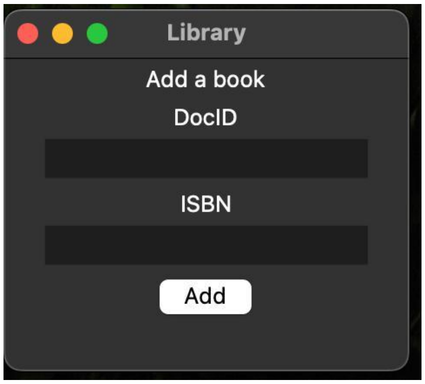
Branch Number: 2

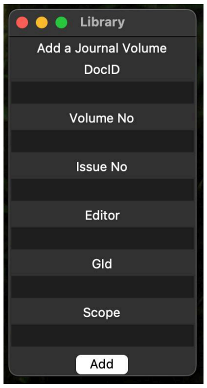
Fine for this document copy is: $243.0

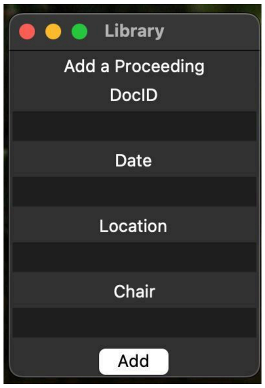
For the admin, we learnt about how we can login/create as an admin.
We will check the buttons in the admin submenu
Firstly, to add a document of different kinds



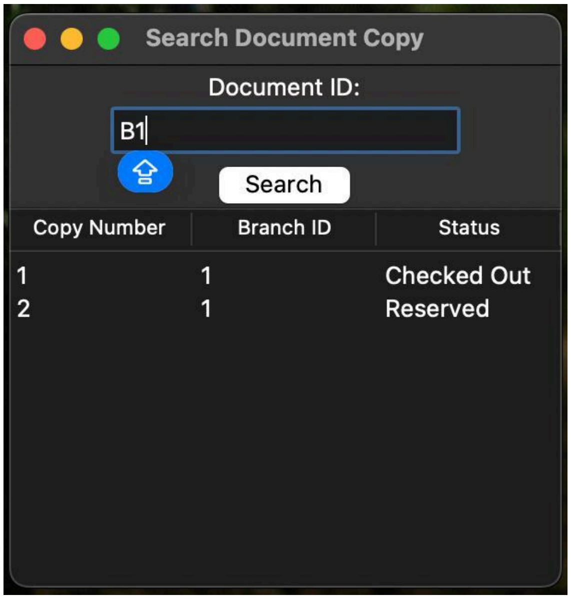
To add a book, journal volume and proceeding:





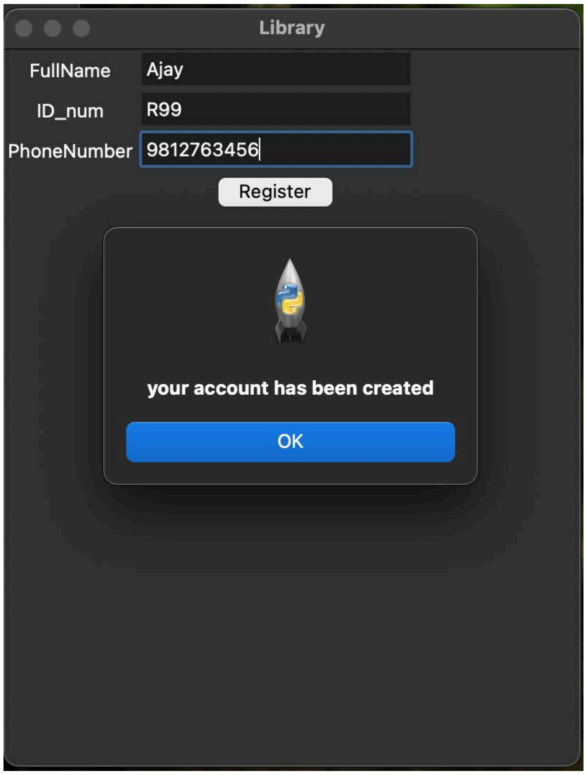


Now in order to check the status of the document id with all the branch information, we have another window lined up:



Copy Number	Branch ID	Status
1	1	Checked Out
2	1	Reserved

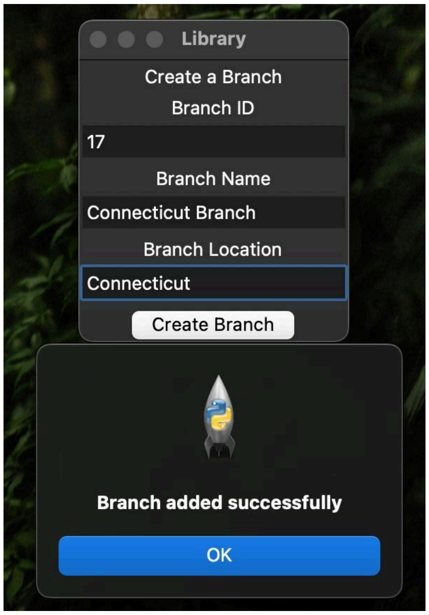
To add a reader:



FullName Ajay
ID_num R99
PhoneNumber 9812763456

your account has been created

To create a branch:



Library

Create a Branch

Branch ID

17

Branch Name

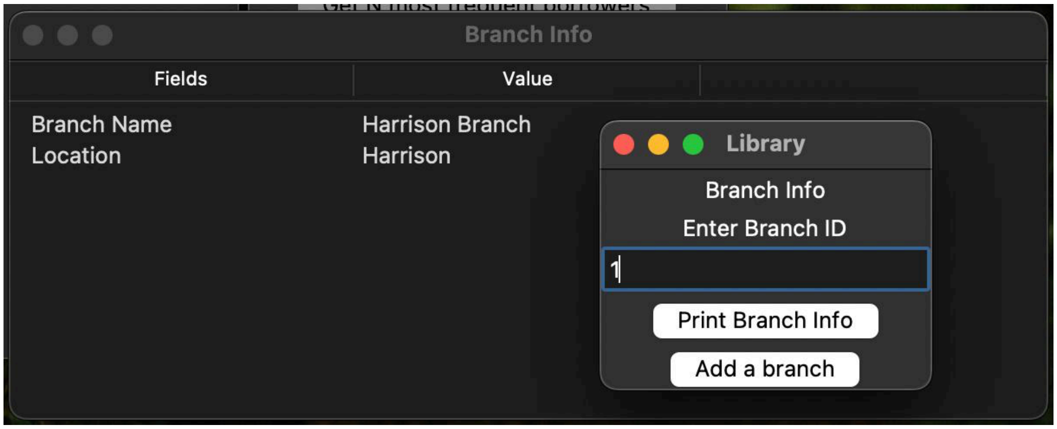
Connecticut Branch

Branch Location

Connecticut

Branch added successfully

To get branch info:



Branch Info

Fields	Value
Branch Name	Harrison Branch
Location	Harrison

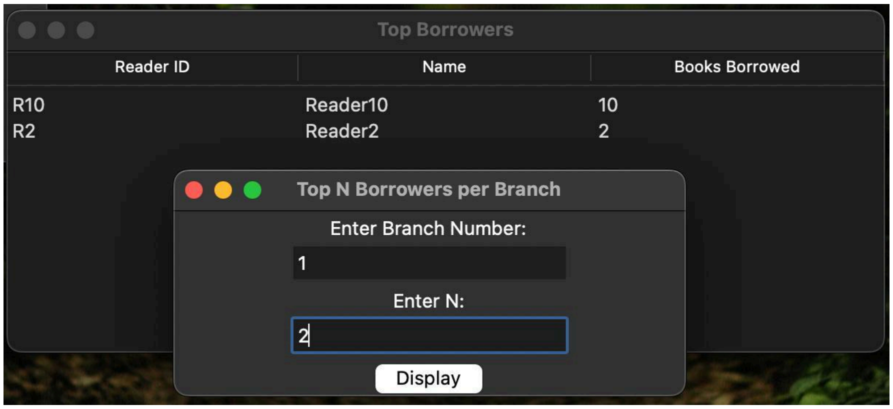
Library

Branch Info

Enter Branch ID

1

To get top N borrowers per



Top Borrowers

Reader ID	Name	Books Borrowed
R10	Reader10	10
R2	Reader2	2

Top N Borrowers per Branch

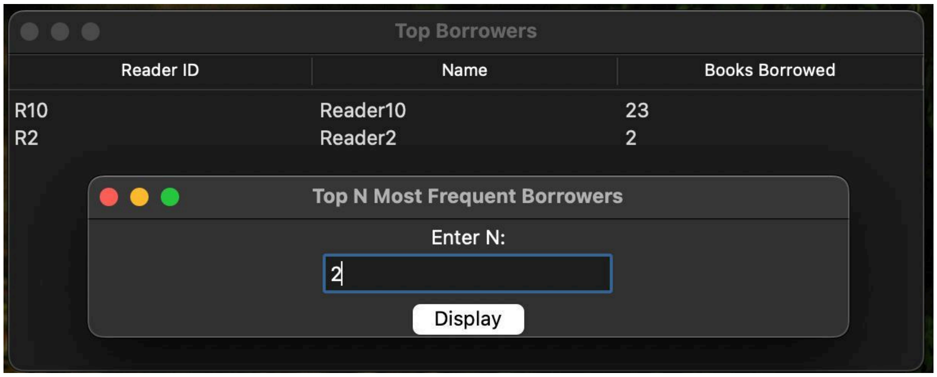
Enter Branch Number:

1

Enter N:

2

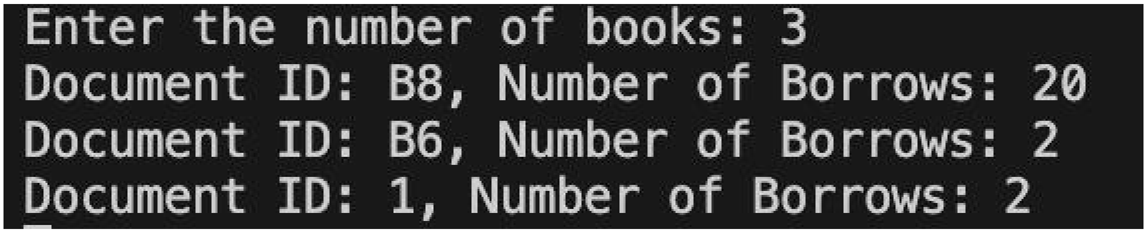
To get N most borrowed books per branch:



Reader ID	Name	Books Borrowed
R10	Reader10	23
R2	Reader2	2

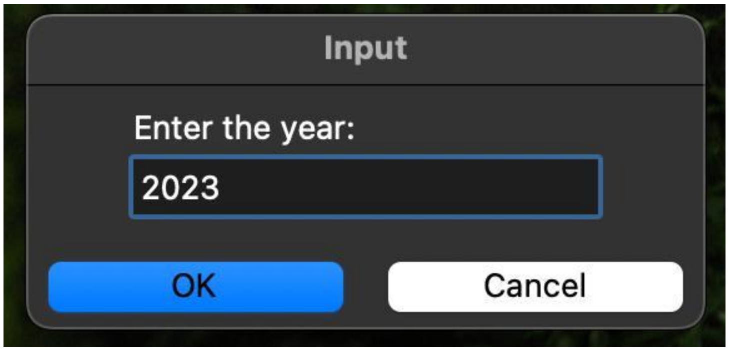
Enter N: 2

To get N most borrowed books in the library:

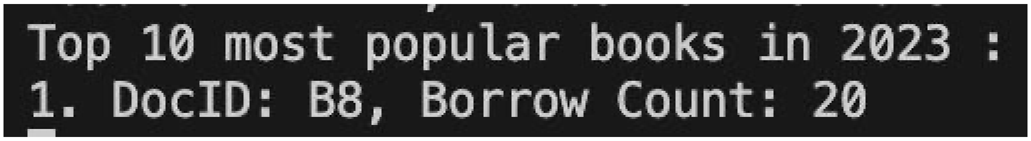


```
Enter the number of books: 3
Document ID: B8, Number of Borrows: 20
Document ID: B6, Number of Borrows: 2
Document ID: 1, Number of Borrows: 2
```

Get top 10 books per year

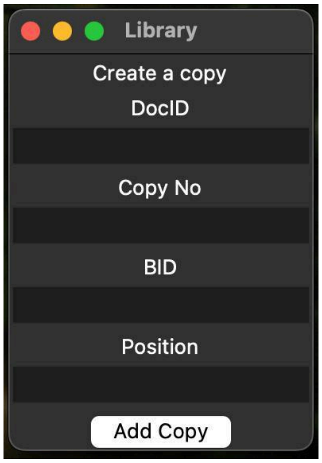


Enter the year: 2023

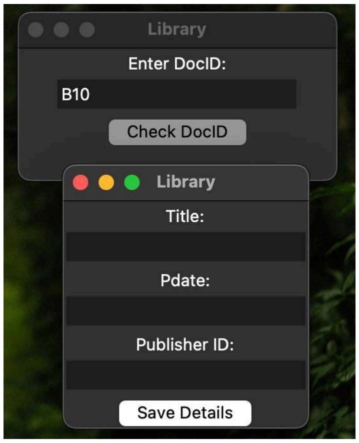


```
Top 10 most popular books in 2023 :
1. DocID: B8, Borrow Count: 20
```

To create a copy for a document:

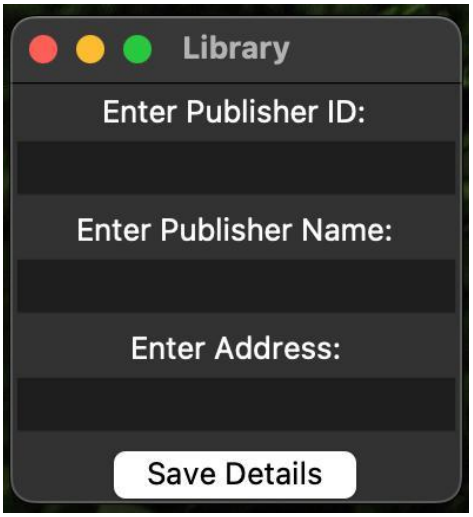


To add document details:



Enter DocID: B10

To add publish details:



3. The SQL commands that create your tables

```
cursor.execute("""CREATE TABLE if not exists logins_readers (Fullname,ID,orgphonenumber)""")
cursor.execute("""CREATE TABLE if not exists logins_admin
(Fullname,SSN,orgphonenumber,emailid,password)""")
cursor.execute("""CREATE TABLE if not exists Book (DocID,ISBN)""")
cursor.execute(''' CREATE TABLE IF NOT EXISTS Branch (BID,LName,Location)''')
cursor.execute(''' CREATE TABLE IF NOT EXISTS JournalVolume (DocID, VolumeNo, IssueNo, Editor, GId,
Scope)''')
cursor.execute(''' CREATE TABLE IF NOT EXISTS Proceeding  (DocID, CDate , CLocation, CChair)''')
cursor.execute(''' CREATE TABLE IF NOT EXISTS Publisher (PublisherID, PubName, Address)''')
cursor.execute('''CREATE TABLE IF NOT EXISTS admin(Admin_Code)''')

cursor.execute("""CREATE TABLE IF NOT EXISTS Reservation2 (
            RID TEXT,
            BID TEXT,
            DocID TEXT,
            CopyNo TEXT,
            RTime DATETIME,
            PRIMARY KEY (RID, DocID, CopyNo, BID),
            FOREIGN KEY (RID) REFERENCES Reader (RID),
            FOREIGN KEY (DocID, CopyNo, BID) REFERENCES Copy (DocID, CopyNo, BID)
        )""")

cursor.execute('''CREATE TABLE IF NOT EXISTS Borrowing2 (
  RID TEXT,
  BID INTEGER,
  DocID TEXT,
  CopyNo INTEGER,
  BDTime DATETIME,
  PRIMARY KEY (RID, BID, DocID, CopyNo),
  FOREIGN KEY (RID) REFERENCES logins_readers(ID),
  FOREIGN KEY (BID) REFERENCES Branch(BID),
  FOREIGN KEY (DocID, CopyNo) REFERENCES Copy(DocID, CopyNo)
);
''')

cursor.execute('''CREATE TABLE IF NOT EXISTS Returning2 (
  RID TEXT,
  CopyNo INTEGER,
  DocID TEXT,
  BID INTEGER,
  RDateTime TEXT,
  PRIMARY KEY (RID, CopyNo, DocID, BID),
  FOREIGN KEY (RID) REFERENCES logins_readers(ID),
  FOREIGN KEY (DocID, CopyNo, BID) REFERENCES Copy(DocID, CopyNo, BID)
);
''')

cursor.execute(''' CREATE TABLE IF NOT EXISTS Document (DOCId, Title , PDate , PublisherID)''')
cursor.execute(''' CREATE TABLE IF NOT EXISTS Publisher (PublisherID, PubName, Address)''')
cursor.execute(''' CREATE TABLE IF NOT EXISTS Book (ISBN,DocID)''')
cursor.execute(''' CREATE TABLE IF NOT EXISTS Authors (PID, DocID)''')
cursor.execute(''' CREATE TABLE IF NOT EXISTS Journal_Issue (DocID,IssueNo,Scope)''')
cursor.execute(''' CREATE TABLE IF NOT EXISTS Journal_Volume (DocID,VolumeNo,Editor)''')
cursor.execute(''' CREATE TABLE IF NOT EXISTS GEdits (PID,DocID,IssueNo)''')
cursor.execute(''' CREATE TABLE IF NOT EXISTS Proceedings (DocID,CDate,CLocation,CEditor)''')
cursor.execute(''' CREATE TABLE IF NOT EXISTS Chairs (PID,DocID)''')
cursor.execute(''' CREATE TABLE IF NOT EXISTS Person (PID,PName)''')
cursor.execute(''' CREATE TABLE IF NOT EXISTS Copy (BID,DocID,CopyNo,Position)''')
cursor.execute(''' CREATE TABLE IF NOT EXISTS Branch (BID,LName,Location)''')
cursor.execute(''' CREATE TABLE IF NOT EXISTS Reserves (RID,DocID,ReservationNo,CopyNo,BID)''')
cursor.execute(''' CREATE TABLE IF NOT EXISTS Reservation (ResNo,DTime)''')
cursor.execute(''' CREATE TABLE IF NOT EXISTS Borrows (RID,BID,DocID,BorNo,CopyNo)''')
cursor.execute(''' CREATE TABLE IF NOT EXISTS Borrowing1 (RDTime,BDTime,BorNo)''')
cursor.execute(''' CREATE TABLE IF NOT EXISTS Reader (RID,RType,RName,RAddress,PhoneNo)''')
```

4. The SQL commands that populate your tables

```
cursor.execute("INSERT INTO copy (docid,copyno,bid,position) VALUES ('B6',1, 1, '001A03')")
cursor.execute("INSERT INTO copy (docid,copyno,bid,position) VALUES ('B6',2, 1, '001A03')")
cursor.execute("INSERT INTO copy (docid,copyno,bid,position) VALUES ('B6',3, 1, '001A03')")
cursor.execute("INSERT INTO copy (docid,copyno,bid,position) VALUES ('B6',3, 2, '001A03')")
cursor.execute("INSERT INTO copy (docid,copyno,bid,position) VALUES ('B6',2, 1, '001A03')")
cursor.execute("INSERT INTO copy (docid,copyno,bid,position) VALUES ('B6',6, 1, '001A03')")
cursor.execute("INSERT INTO copy (docid,copyno,bid,position) VALUES ('B7',1, 4, '001A04')")
cursor.execute("INSERT INTO copy (docid,copyno,bid,position) VALUES ('B7',2, 4, '001A04')")
cursor.execute("INSERT INTO copy (docid,copyno,bid,position) VALUES ('B7',1, 5, '001A04')")
cursor.execute("INSERT INTO copy (docid,copyno,bid,position) VALUES ('B7',2, 5, '001A04')")
cursor.execute("INSERT INTO copy (docid,copyno,bid,position) VALUES ('B7',3, 5, '001B01')")
cursor.execute("INSERT INTO copy (docid,copyno,bid,position) VALUES ('B7',1, 1, '001B01')")
cursor.execute("INSERT INTO copy (docid,copyno,bid,position) VALUES ('B7',1, 3, '001B02')")
cursor.execute("INSERT INTO copy (docid,copyno,bid,position) VALUES ('B8',1, 1, '501A32')")
cursor.execute("INSERT INTO copy (docid,copyno,bid,position) VALUES ('B8',2, 1, '124A79')")
cursor.execute("INSERT INTO copy (docid,copyno,bid,position) VALUES ('B8',3, 1, '760A15')")
cursor.execute("INSERT INTO copy (docid,copyno,bid,position) VALUES ('B8',4, 1, '302A44')")
cursor.execute("INSERT INTO copy (docid,copyno,bid,position) VALUES ('B8',5, 1, '618A81')")
cursor.execute("INSERT INTO copy (docid,copyno,bid,position) VALUES ('B8',6, 1, '905A23')")
cursor.execute("INSERT INTO copy (docid,copyno,bid,position) VALUES ('B8',7, 1, '432A60')")
cursor.execute("INSERT INTO copy (docid,copyno,bid,position) VALUES ('B8',8, 1, '215A99')")
cursor.execute("INSERT INTO copy (docid,copyno,bid,position) VALUES ('B8',9, 1, '701A12')")
cursor.execute("INSERT INTO copy (docid,copyno,bid,position) VALUES ('B8',10, 1, '843A67')")
```

```
cursor.execute("INSERT INTO proceedings (docid,cdate,clocation,cchair) VALUES (21, '10/21/2015',
'California ', 'David Alan');")
cursor.execute("INSERT INTO proceedings (docid,cdate,clocation,cchair) VALUES (22, '05/18/2018',
'Florida ', 'Ann Aubrey');")
cursor.execute("INSERT INTO proceedings (docid,cdate,clocation,cchair) VALUES (23, '08/12/2019',
'Maryland', 'Amy Bennett');")
cursor.execute("INSERT INTO proceedings (docid,cdate,clocation,cchair) VALUES (24, '02/20/2014',
'Mississippi ', 'James N. Bond');")
cursor.execute("INSERT INTO proceedings (docid,cdate,clocation,cchair) VALUES (25, '11/28/2016', '
Ohio ', 'Lauren Brenzy');")
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cursor.execute("INSERT INTO proceedings (docid,cdate,clocation,cchair) VALUES (26, '01/11/2011',
'Arizona ', 'Theodora Bryant');")
cursor.execute("INSERT INTO proceedings (docid,cdate,clocation,cchair) VALUES (27, '06/12/2018',
'Tennessee ', 'Peggy Campbell');")
cursor.execute("INSERT INTO proceedings (docid,cdate,clocation,cchair) VALUES (28, '03/30/2003',
'New Jersey', 'Carrie Cantor');")
cursor.execute("INSERT INTO proceedings (docid,cdate,clocation,cchair) VALUES (29, '09/22/2020',
'Washington', 'Henry Denard');")
cursor.execute("INSERT INTO proceedings (docid,cdate,clocation,cchair) VALUES (30, '04/08/2012',
'Ohio ', 'Ana Howard');")

cursor.execute("INSERT INTO publisher (publisherid,pubname,address) VALUES (71205,'Donall
Linskey', '85 Crownhardt Place');")
cursor.execute("INSERT INTO publisher (publisherid,pubname,address) VALUES (87373,'Maddi Leah',
'55 Sauthoff Street');")
cursor.execute("INSERT INTO publisher (publisherid,pubname,address) VALUES (26915,'Ernest
Poulsom', '4421 Morningstar Hill');")
cursor.execute("INSERT INTO publisher (publisherid,pubname,address) VALUES (47438,'Eleonora
Ruthen', '9 Gina Trail');")
cursor.execute("INSERT INTO publisher (publisherid,pubname,address) VALUES (25064,'Buck
Gunstone', '21916 Sutteridge Place');")
cursor.execute("INSERT INTO publisher (publisherid,pubname,address) VALUES (21148,'Averil
Harroll', '90615 Truax Way');")
cursor.execute("INSERT INTO publisher (publisherid,pubname,address) VALUES (68241,'Randene
Thow', '302 Towne Plaza');")
cursor.execute("INSERT INTO publisher (publisherid,pubname,address) VALUES (79166,'Marcela
Beddow', '66 Upham Circle');")
cursor.execute("INSERT INTO publisher (publisherid,pubname,address) VALUES (75158,'Westleigh
Filyakov', '9679 6th Trail');")
cursor.execute("INSERT INTO publisher (publisherid,pubname,address) VALUES (21515,'Ruddy
Yeskov', '4326 Marquette Avenue');")
cursor.execute("INSERT INTO publisher (publisherid,pubname,address) VALUES (29511,'Verla Spada',
'9 5th Pass');")
cursor.execute("INSERT INTO publisher (publisherid,pubname,address) VALUES (41257,'Calv
Fearnside', '898 Northwestern Point');")
cursor.execute("INSERT INTO publisher (publisherid,pubname,address) VALUES (22217,'Christie
Pretious', '72 Lighthouse Bay Alley');")
cursor.execute("INSERT INTO publisher (publisherid,pubname,address) VALUES (37433,'Beverie
Budgen', '6 Gulseth Circle');")
cursor.execute("INSERT INTO publisher (publisherid,pubname,address) VALUES (94273,'Biron
Carslake', '9692 Menomonie Trail');")
cursor.execute("INSERT INTO publisher (publisherid,pubname,address) VALUES (12275,'Dacie Ridge',
'6 Waxwing Point');")

cursor.execute("INSERT INTO branch (bid,lname,location) VALUES (1,Harrison Library', Harrison);")
cursor.execute("INSERT INTO branch (bid,lname,location) VALUES (2,'Bloomfield Library',
'Bloomfield');")
cursor.execute("INSERT INTO branch (bid,lname,location) VALUES (3,'Parsippany Library',
'Parsippany');")
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cursor.execute("INSERT INTO branch (bid,lname,location) VALUES (4,'Newark Library', 'Newark');")
cursor.execute("INSERT INTO branch (bid,lname,location) VALUES (5,’New York Library',’NY’);")
cursor.execute("INSERT INTO branch (bid,lname,location) VALUES (6,'Clifton Library', 'Clifton');")

cursor.execute("INSERT INTO Borrowing2 (RID, BID, DocID, CopyNo, BDTime) VALUES ('R10', 1, 'B8', 1, '2023-01-01 13:45:00')")
cursor.execute("INSERT INTO Borrowing2 (RID, BID, DocID, CopyNo, BDTime) VALUES ('R10', 1, 'B8', 2, '2023-02-01 13:45:00')")
cursor.execute("INSERT INTO Borrowing2 (RID, BID, DocID, CopyNo, BDTime) VALUES ('R10', 1, 'B8', 3, '2023-03-01 13:45:00')")
cursor.execute("INSERT INTO Borrowing2 (RID, BID, DocID, CopyNo, BDTime) VALUES ('R10', 1, 'B8', 4, '2023-04-01 13:45:00')")
cursor.execute("INSERT INTO Borrowing2 (RID, BID, DocID, CopyNo, BDTime) VALUES ('R10', 1, 'B8', 5, '2023-05-01 13:45:00')")
cursor.execute("INSERT INTO Borrowing2 (RID, BID, DocID, CopyNo, BDTime) VALUES ('R10', 1, 'B8', 6, '2023-06-01 13:45:00')")
cursor.execute("INSERT INTO Borrowing2 (RID, BID, DocID, CopyNo, BDTime) VALUES ('R10', 1, 'B8', 7, '2023-07-01 13:45:00')")
cursor.execute("INSERT INTO Borrowing2 (RID, BID, DocID, CopyNo, BDTime) VALUES ('R10', 1, 'B8', 8, '2023-08-01 13:45:00')")
cursor.execute("INSERT INTO Borrowing2 (RID, BID, DocID, CopyNo, BDTime) VALUES ('R10', 1, 'B8', 9, '2023-09-01 13:45:00')")
cursor.execute("INSERT INTO Borrowing2 (RID, BID, DocID, CopyNo, BDTime) VALUES ('R10', 1, 'B8', 10, '2023-10-01 13:45:00')")
cursor.execute("INSERT INTO Borrowing2 (RID, BID, DocID, CopyNo, BDTime) VALUES ('R10', 2, 'B8', 1, '2023-01-01 13:45:00')")
cursor.execute("INSERT INTO Borrowing2 (RID, BID, DocID, CopyNo, BDTime) VALUES ('R10', 2, 'B8', 2, '2023-02-01 13:45:00')")
cursor.execute("INSERT INTO Borrowing2 (RID, BID, DocID, CopyNo, BDTime) VALUES ('R10', 2, 'B8', 3, '2023-03-01 13:45:00')")
cursor.execute("INSERT INTO Borrowing2 (RID, BID, DocID, CopyNo, BDTime) VALUES ('R10', 2, 'B8', 4, '2023-04-01 13:45:00')")
cursor.execute("INSERT INTO Borrowing2 (RID, BID, DocID, CopyNo, BDTime) VALUES ('R10', 2, 'B8', 5, '2023-05-01 13:45:00')")
cursor.execute("INSERT INTO Borrowing2 (RID, BID, DocID, CopyNo, BDTime) VALUES ('R10', 2, 'B8', 6, '2023-06-01 13:45:00')")
cursor.execute("INSERT INTO Borrowing2 (RID, BID, DocID, CopyNo, BDTime) VALUES ('R10', 2, 'B8', 7, '2023-07-01 13:45:00')")
cursor.execute("INSERT INTO Borrowing2 (RID, BID, DocID, CopyNo, BDTime) VALUES ('R10', 2, 'B8', 8, '2023-08-01 13:45:00')")
cursor.execute("INSERT INTO Borrowing2 (RID, BID, DocID, CopyNo, BDTime) VALUES ('R10', 2, 'B8', 9, '2023-09-01 13:45:00')")
cursor.execute("INSERT INTO Borrowing2 (RID, BID, DocID, CopyNo, BDTime) VALUES ('R10', 2, 'B8', 10, '2023-10-01 13:45:00')")
```