**Database Creation and Data Population**

**Objective:** Create a database schema for a library management system and populate it with sample data.

**Tasks:**

1. **Table Creation:** Write SQL statements to create the following tables in the **db\_LibraryManagement** database:
   * **tbl\_publisher**
   * **tbl\_book**
   * **tbl\_library\_branch**
   * **tbl\_borrower**
   * **tbl\_book\_loans**
   * **tbl\_book\_copies**
   * **tbl\_book\_authors**
2. **Data Population:** Insert sample data into the tables using appropriate SQL **INSERT** statements.

A screenshot of a computer

Description automatically generated

* 1. Find the titles of all books published by "Bloomsbury."
  2. List the names of borrowers whose phone numbers start with the area code "212."
  3. Retrieve the titles of books with more than 10 copies available.
  4. Display the names of borrowers who have borrowed books from the "Central" branch.
  5. List the titles of books borrowed by borrower "Joe Smith."
  6. Find the names of publishers for the books authored by "J.K. Rowling."
  7. Count the total number of books available in the library.
  8. Calculate the average number of copies available per book across all branches.
  9. Find the branch with the highest number of books loaned out.
  10. Insert a new book titled "The Catcher in the Rye" by "J.D. Salinger" into the database.
  11. Update the address of the "Sharpstown" library branch to "45 West Side Avenue, New York, NY 10012."
  12. Remove all books published by "Pan Books" from the database.
  13. Retrieve the names of borrowers who have borrowed the same book more than once.
  14. Find the title of the book with the earliest due date.
  15. List the names of borrowers who have borrowed books authored by both "Stephen King" and "J.K. Rowling."
  16. Find the names of borrowers who have borrowed books published by "Bloomsbury.
  17. Retrieve the titles of books borrowed by borrowers located in New York.
  18. Calculate the average number of books borrowed per borrower.
  19. Find the branch with the highest average number of books borrowed per borrower.
  20. Rank library branches based on the total number of books borrowed, without grouping
  21. Calculate the percentage of books borrowed from each branch relative to the total number of books borrowed across all branches.
  22. Find the names of borrowers who have borrowed books authored by "Stephen King" and "J.K. Rowling" from the same library branch.
  23. Retrieve the names of borrowers who have borrowed books from branches located in New York and have more than 5 books checked out.
  24. How many copies of the book titled "The Lost Tribe" are owned by the library branch whose name is "Sharpstown"?
  25. How many copies of the book titled "The Lost Tribe" are owned by each library branch?
  26. Retrieve the names of all borrowers who do not have any books checked out.
  27. For each book that is loaned out from the "Sharpstown" branch and whose DueDate is today, retrieve the book title, the borrower's name, and the borrower's address.
  28. For each library branch, retrieve the branch name and the total number of books loaned out from that branch.

-- Create database if it does not exist

CREATE DATABASE IF NOT EXISTS db\_LibraryManagement;

-- Use the database

USE db\_LibraryManagement;

-- Create table for publishers

CREATE TABLE tbl\_publisher (

PublisherID INT PRIMARY KEY,

PublisherName VARCHAR(255) NOT NULL,

Address VARCHAR(255) NOT NULL,

City VARCHAR(100) NOT NULL,

State VARCHAR(100) NOT NULL,

Country VARCHAR(100) NOT NULL

);

-- Create table for books

CREATE TABLE tbl\_book (

BookID INT PRIMARY KEY,

Title VARCHAR(255) NOT NULL,

PublisherID INT NOT NULL,

PublicationDate DATE NOT NULL,

FOREIGN KEY (PublisherID) REFERENCES tbl\_publisher(PublisherID)

);

-- Create table for library branches

CREATE TABLE tbl\_library\_branch (

BranchID INT PRIMARY KEY,

BranchName VARCHAR(255) NOT NULL,

Address VARCHAR(255) NOT NULL,

City VARCHAR(100) NOT NULL,

State VARCHAR(100) NOT NULL,

Country VARCHAR(100) NOT NULL

);

-- Create table for borrowers

CREATE TABLE tbl\_borrower (

CardNo INT PRIMARY KEY,

Name VARCHAR(255) NOT NULL,

Address VARCHAR(255) NOT NULL,

City VARCHAR(100) NOT NULL,

State VARCHAR(100) NOT NULL,

Country VARCHAR(100) NOT NULL,

Phone VARCHAR(20) NOT NULL

);

-- Create table for book loans

CREATE TABLE tbl\_book\_loans (

LoanID INT PRIMARY KEY,

BookID INT NOT NULL,

BranchID INT NOT NULL,

CardNo INT NOT NULL,

DateOut DATE NOT NULL,

DueDate DATE NOT NULL,

DateIn DATE,

FOREIGN KEY (BookID) REFERENCES tbl\_book(BookID),

FOREIGN KEY (BranchID) REFERENCES tbl\_library\_branch(BranchID),

FOREIGN KEY (CardNo) REFERENCES tbl\_borrower(CardNo)

);

-- Create table for book copies

CREATE TABLE tbl\_book\_copies (

BookID INT NOT NULL,

BranchID INT NOT NULL,

NoOfCopies INT NOT NULL,

PRIMARY KEY (BookID, BranchID),

FOREIGN KEY (BookID) REFERENCES tbl\_book(BookID),

FOREIGN KEY (BranchID) REFERENCES tbl\_library\_branch(BranchID)

);

-- Create table for book authors

CREATE TABLE tbl\_book\_authors (

BookID INT NOT NULL,

AuthorName VARCHAR(255) NOT NULL,

PRIMARY KEY (BookID, AuthorName),

FOREIGN KEY (BookID) REFERENCES tbl\_book(BookID)

);

-- Insert data into tbl\_publisher table

INSERT INTO tbl\_publisher (PublisherID, PublisherName, Address, City, State, Country)

VALUES

(1, 'Penguin Random House', '123 Main St', 'New York', 'NY', 'USA'),

(2, 'HarperCollins', '456 Broadway', 'New York', 'NY', 'USA'),

(3, 'Simon & Schuster', '789 5th Ave', 'New York', 'NY', 'USA');

-- Insert data into tbl\_book table

INSERT INTO tbl\_book (BookID, Title, PublisherID, PublicationDate)

VALUES

(1, 'To Kill a Mockingbird', 1, '1960-07-11'),

(2, 'The Great Gatsby', 2, '1925-04-10'),

(3, 'Pride and Prejudice', 3, '1813-01-28');

-- Insert data into tbl\_library\_branch table

INSERT INTO tbl\_library\_branch (BranchID, BranchName, Address, City, State, Country)

VALUES

(1, 'Main Branch', '123 Main St', 'New York', 'NY', 'USA'),

(2, 'Downtown Branch', '456 Broadway', 'New York', 'NY', 'USA'),

(3, 'Uptown Branch', '789 5th Ave', 'New York', 'NY', 'USA');

-- Insert data into tbl\_borrower table

INSERT INTO tbl\_borrower (CardNo, Name, Address, City, State, Country, Phone)

VALUES

(1, 'John Doe', '123 Main St', 'New York', 'NY', 'USA', '123-456-7890'),

(2, 'Jane Smith', '456 Broadway', 'New York', 'NY', 'USA', '987-654-3210'),

(3, 'Bob Johnson', '789 5th Ave', 'New York', 'NY', 'USA', '555-123-4567');

-- Insert data into tbl\_book\_loans table

INSERT INTO tbl\_book\_loans (LoanID, BookID, BranchID, CardNo, DateOut, DueDate, DateIn)

VALUES

(1, 1, 1, 1, '2022-01-01', '2022-01-15', NULL),

(2, 2, 2, 2, '2022-01-05', '2022-01-20', NULL),

(3, 3, 3, 3, '2022-01-10', '2022-01-25', NULL);

-- Insert data into tbl\_book\_copies table

INSERT INTO tbl\_book\_copies (BookID, BranchID, NoOfCopies)

VALUES

(1, 1, 5),

(1, 2, 3),

(1, 3, 2),

(2, 1, 4),

(2, 2, 2),

(2, 3, 1),

(3, 1, 3),

(3, 2, 2),

(3, 3, 1);

-- Insert data into tbl\_book\_authors table

INSERT INTO tbl\_book\_authors (BookID, AuthorName)

VALUES

(1, 'Harper Lee'),

(2, 'F. Scott Fitzgerald'),

(3, 'Jane Austen');

-- Find all books by a specific author

SELECT b.Title, ba.AuthorName

FROM tbl\_book b

JOIN tbl\_book\_authors ba ON b.BookID = ba.BookID

WHERE ba.AuthorName = 'Harper Lee';

-- Find all borrowers who have borrowed a specific book

SELECT bo.Name, bl.BookID, bl.DateOut, bl.DueDate

FROM tbl\_borrower bo

JOIN tbl\_book\_loans bl ON bo.CardNo = bl.CardNo

WHERE bl.BookID = 1;

-- Find all books borrowed by a specific borrower

SELECT b.Title, bl.DateOut, bl.DueDate

FROM tbl\_book b

JOIN tbl\_book\_loans bl ON b.BookID = bl.BookID

WHERE bl.CardNo = 1;

-- Find all books available at a specific library branch

SELECT b.Title, bc.NoOfCopies

FROM tbl\_book b

JOIN tbl\_book\_copies bc ON b.BookID = bc.BookID

WHERE bc.BranchID = 1;

-- Find all borrowers who have borrowed books from a specific publisher

SELECT bo.Name, b.Title, p.PublisherName

FROM tbl\_borrower bo

JOIN tbl\_book\_loans bl ON bo.CardNo = bl.CardNo

JOIN tbl\_book b ON bl.BookID = b.BookID

JOIN tbl\_publisher p ON b.PublisherID = p.PublisherID

WHERE p.PublisherName = 'Penguin Random House';

-- Find all books that are currently borrowed

SELECT b.Title, bl.DateOut, bl.DueDate

FROM tbl\_book b

JOIN tbl\_book\_loans bl ON b.BookID = bl.BookID

WHERE bl.DateIn IS NULL;

-- Find all books that are overdue

SELECT b.Title, bl.DateOut, bl.DueDate

FROM tbl\_book b

JOIN tbl\_book\_loans bl ON b.BookID = bl.BookID

WHERE bl.DateIn IS NULL AND bl.DueDate < CURRENT\_DATE;

Here are the SQL queries for each of the 28 tasks:

1. Find the titles of all books published by "Bloomsbury."

**sql**

SELECT Title

FROM tbl\_book

WHERE PublisherID = (SELECT PublisherID FROM tbl\_publisher WHERE PublisherName = 'Bloomsbury');

1. List the names of borrowers whose phone numbers start with the area code "212."

**sql**

SELECT Name

FROM tbl\_borrower

WHERE Phone LIKE '212%';

1. Retrieve the titles of books with more than 10 copies available.

**sql**

SELECT Title

FROM tbl\_book

WHERE BookID IN (SELECT BookID FROM tbl\_book\_copies WHERE NoOfCopies > 10);

1. Display the names of borrowers who have borrowed books from the "Central" branch.

**sql**

SELECT bo.Name

FROM tbl\_borrower bo

JOIN tbl\_book\_loans bl ON bo.CardNo = bl.CardNo

JOIN tbl\_library\_branch lb ON bl.BranchID = lb.BranchID

WHERE lb.BranchName = 'Central';

1. List the titles of books borrowed by borrower "Joe Smith."

**sql**

SELECT b.Title

FROM tbl\_book b

JOIN tbl\_book\_loans bl ON b.BookID = bl.BookID

JOIN tbl\_borrower bo ON bl.CardNo = bo.CardNo

WHERE bo.Name = 'Joe Smith';

1. Find the names of publishers for the books authored by "J.K. Rowling."

**sql**

SELECT p.PublisherName

FROM tbl\_publisher p

JOIN tbl\_book b ON p.PublisherID = b.PublisherID

JOIN tbl\_book\_authors ba ON b.BookID = ba.BookID

WHERE ba.AuthorName = 'J.K. Rowling';

1. Count the total number of books available in the library.

**sql**

SELECT SUM(NoOfCopies)

FROM tbl\_book\_copies;

1. Calculate the average number of copies available per book across all branches.

**sql**

SELECT AVG(NoOfCopies)

FROM tbl\_book\_copies;

1. Find the branch with the highest number of books loaned out.

**sql**

SELECT lb.BranchName, COUNT(bl.BookID) AS NumBooksLoaned

FROM tbl\_library\_branch lb

JOIN tbl\_book\_loans bl ON lb.BranchID = bl.BranchID

GROUP BY lb.BranchName

ORDER BY NumBooksLoaned DESC

LIMIT 1;

1. Insert a new book titled "The Catcher in the Rye" by "J.D. Salinger" into the database.

**sql**

INSERT INTO tbl\_book (Title, PublisherID, PublicationDate)

VALUES ('The Catcher in the Rye', (SELECT PublisherID FROM tbl\_publisher WHERE PublisherName = 'Penguin Random House'), '1951-07-16');

INSERT INTO tbl\_book\_authors (BookID, AuthorName)

VALUES ((SELECT BookID FROM tbl\_book WHERE Title = 'The Catcher in the Rye'), 'J.D. Salinger');

1. Update the address of the "Sharpstown" library branch to "45 West Side Avenue, New York, NY 10012."

**sql**

UPDATE tbl\_library\_branch

SET Address = '45 West Side Avenue, New York, NY 10012'

WHERE BranchName = 'Sharpstown';

1. Remove all books published by "Pan Books" from the database.

**sql**

DELETE FROM tbl\_book

WHERE PublisherID = (SELECT PublisherID FROM tbl\_publisher WHERE PublisherName = 'Pan Books');

1. Retrieve the names of borrowers who have borrowed the same book more than once.

**sql**

SELECT bo.Name

FROM tbl\_borrower bo

JOIN tbl\_book\_loans bl ON bo.CardNo = bl.CardNo

GROUP BY bo.Name, bl.BookID

HAVING COUNT(bl.BookID) > 1;

1. Find the title of the book with the earliest due date.

**sql**

SELECT b.Title

FROM tbl\_book b

JOIN tbl\_book\_loans bl ON b.BookID = bl.BookID

WHERE bl.DueDate = (SELECT MIN(DueDate) FROM tbl\_book\_loans);

1. List the names of borrowers who have borrowed books authored by both "Stephen King" and "J.K. Rowling."

**sql**

SELECT bo.Name

FROM tbl\_borrower bo

JOIN tbl\_book\_loans bl ON bo.CardNo = bl.CardNo

JOIN tbl\_book b ON bl.BookID = b.BookID

JOIN tbl\_book\_authors ba ON b.BookID = ba.BookID

WHERE ba.AuthorName IN ('Stephen King', 'J.K. Rowling')

GROUP BY bo.Name

HAVING COUNT(DISTINCT ba.AuthorName) = 2;

1. Find the names of borrowers who have borrowed books published by "Bloomsbury."

**sql**

SELECT bo.Name

FROM tbl\_borrower bo

JOIN tbl\_book\_loans bl ON bo.CardNo = bl.CardNo

JOIN tbl\_book b ON bl.BookID = b.BookID

JOIN tbl\_publisher p ON b.PublisherID = p.PublisherID

WHERE p.PublisherName = 'Bloomsbury';

1. Retrieve the titles of books borrowed by borrowers located in New York.

**sql**

SELECT b.Title

FROM tbl\_book b

JOIN tbl\_book\_loans bl ON b.BookID = bl.BookID

JOIN tbl\_borrower bo ON bl.CardNo = bo.CardNo

WHERE bo.City = 'New York';

1. Calculate the average number of books borrowed per borrower.

**sql**

SELECT AVG(NumBooksBorrowed)

FROM (

SELECT bo.CardNo, COUNT(bl.BookID) AS NumBooksBorrowed

FROM tbl\_borrower bo

JOIN tbl\_book\_loans bl ON bo.CardNo = bl.CardNo

GROUP BY bo.CardNo

) AS subquery;

1. Find the branch with the highest average number of books borrowed per borrower.

**sql**

SELECT lb.BranchName, AVG(NumBooksBorrowed) AS AvgBooksBorrowed

FROM (

SELECT bo.CardNo, COUNT(bl.BookID) AS NumBooksBorrowed, bl.BranchID

FROM tbl\_borrower bo

JOIN tbl\_book\_loans bl ON bo.CardNo = bl.CardNo