Documentation for Library Management System

Overview

This project is a simple Library Management System that allows users to borrow and return books. It consists of three main classes:

- Book: Represents a book with a title, author, and availability status.
- User: Represents a library user who can borrow and return books.
- Library: Manages a catalog of books and allows users to borrow and return books.

Additionally, the project includes unit tests for each class to ensure correctness.

This project follows clean coding principles to enhance readability, maintainability, and efficiency.

The title, author, and available fields are private, ensuring encapsulation.

```java
public class Book {
    private String title;
    private String author;
    private boolean available;
            com.library.Book.Book(String title, String author)

    public Book(String title, String author) {
        this.title = title;
        this.author = author;
        this.available = true;
    }
```

The library class manages books and users separately, preventing a single class from handling too many responsibilities.

```java
6   public class Library {
7       private List<Book> catalog;
8       private List<User> users;
9
10      public Library() {
11          catalog = new ArrayList<>();
12          users = new ArrayList<>();
13      }
```

The test follows the Arrange-Act-Assert pattern, ensuring clarity

```
15      @Test
16      void testBorrowBook() {
17          Book book = new Book(title:"1984", author:"George Orwell");
18          book.borrowBook();
19          assertFalse(book.isAvailable());
20      }
21
```

Project Explanation

This project simulates a library system where users can borrow and return books.

Library Initialization: The library class contains a catalog of books.
Book Management: Books can be added and removed using addBook() and removeBook().
User Actions:

- A User can borrow a book if it's available.
- A User can return a book to the library.
- Search Functionality: Users can search for books by title or author.
- Constraints: Users cannot borrow more than 5 books.

Test Cases Implemented

Test Class	Test Case	Purpose
BookTest	testBookCreation	Checks correct book initialization
	testBorrowBook	Ensures borrowing updates availability
	testReturnBook	Ensures returning restores availability
LibraryTest	testIssueBook	Ensures book can be issued successfully
	testReturnBook	Ensures book can be returned successfully
	testSearchCatalog	Tests search functionality
	testIssueBookFailsForNonExistingBook	Prevents issuing non-existent books
	testReturnBookFailsForNonBorrowedBook	Prevents returning books that were not borrowed
UserTest	testUserCreation	Ensures user is initialized correctly
	testBorrowBook	Tests book borrowing logic
	testReturnBook	Tests book returning logic

Dependency in pom.xml (Maven)

JUnit 5 JUnit 5 for writing and executing unit tests.
Maven Compiler Plugin for Compiling code with Java 17