**Class Diagram**

**Explanation:**

* Book contains book information and stock.
* Member manages borrowing and returning.
* BorrowRecord contains information about which member borrowed which book, and the date.
* The library is in charge of library collections, library members, and borrowing activities.
* A fine is charged for returning overdue books..

A diagram of a data flow

AI-generated content may be incorrect.

**2. Use Case Diagram**

**Actors:**

* **Librarian** → Adds new books, manages members.
* **Member** → Borrows and returns books.

**Explanation:**  
Identifies interactions between the system functionality and actors.

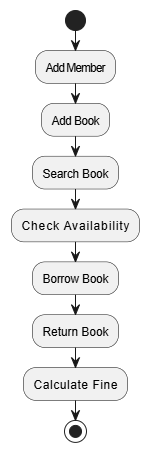
A diagram of a library system

AI-generated content may be incorrect.

3. **Activity Diagram Explanation**

This activity diagram illustrates the main workflow of the Library Management System, both Librarian and Member activities are integrated within one linear flow. Any given activity is a direct reflection of a system defined use case.

**🔍 Step-by-Step Breakdown:**

1. **Add Member** A new member is registered by the librarian into the system. This is according to the use case of Add Member.
2. **Add Book** The librarian enters a new book to the catalog. This satisfies the Add Book use case.
3. **Search Book** A member can search a book by title or a category. This is the initial process of verification of availability.
4. **Check Availability** The system is used to check whether the requested book can be borrowed. This is equivalent to the Check Availability use case.
5. **Borrow Book** In case the book is present, then it gets borrowed by the member. This is associated directly with the use case of Borrow Book.
6. **Return Book** The member reads the book and returns the book to the library. This step is an example of the Return Book use case.
7. **Calculate Fine** On the second visit the system will verify the due date and charge a fine (where possible). That is the end of the calculate fine use case.

**Sequence Diagram Explanation**

The following sequence diagram shows how the Member and the LibrarySystem communicate in the process of Borrow Book and Return Book. It is linear with no conditional branches and optional paths, making the design as simple as possible and in accordance with the requirements of the assignment.

**Design Decisions:**

* Member and LibrarySystem are both represented as participants to prevent the use of actor icons and keep the layout clean.
* There are only the necessary messages: searchBook, checkAvailability, borrowBook, returnBook, and calculateFine..
* To indicate background processing, internal system actions such as checkDueDate and calculateFine are indicated as a self-message.
* There are no visual ornamentations, repetitions, or side streams to keep things simple.

**Requirement Fulfillment:**

* **Borrow Book**: The user browses, sees the availability, and begins to borrow a book - corresponding to the steps of the use case.
* **Return Book**: The member sends the book back, and the system verifies the due date and calculates any fine, which is directly based on the use case of return and calculation of fine.
* **Check Availability**: Borrowing is operated separately as an interaction.
* **Calculate Fine**: Automatically activated in the process of returning..

