

## Analysis of the code logs:

Based on the provided logs, we can analyze the code flow and identify the following key actions:

- 1. Book item addition:** \* A librarian adds a book item using the `Librarian.add_book_item` method. \* The provided logs show two instances of book item addition.
- 2. Member object creation:** \* A Member object is created with the provided information. \* The logs show one instance of member object creation.
- 3. Book item reservation:** \* A member reserves a book item using the `Member.reserve_book_item` method. \* The logs show one instance of book item reservation with no existing reservation.
- 4. Book item checkout:** \* A member attempts to checkout a book item using the `Member.checkout_book_item` method. \* The first attempt is successful, and the book item is checked out. \* The second attempt fails because the maximum number of books has been checked out.
- 5. Book item renewal:** \* A member attempts to renew a book item using the `Member.renew_book_item` method. \* The first attempt is successful because the book item hasn't been reserved by another member. \* The second attempt fails because the book item has been reserved by another member. \* The third attempt is successful because the book item reservation has been resolved.
- 6. Book item return:** \* A member returns a book item using the `Member.return_book_item` method. \* The logs show two instances of book item return.

## PlantUML sequence diagram:

### Root cause analysis:

From the analysis of the logs and the sequence diagram, we can identify the following root causes for the failures:

- **Maximum number of books checked out:** The member cannot checkout a book item when they have already checked out the maximum allowed number of books.
- **Book item reserved by another member:** The member cannot renew a book item if it has been reserved by another member.

### Future improvements:

- Implement a notification system to inform members when they are approaching the maximum number of allowed book checkouts.
- Implement a system to notify members when a reserved book item becomes available.
- Implement a system to allow members to place a hold on a reserved book item.

### Conclusion:

The provided logs and plantUML sequence diagram provide a clear understanding of the code flow and the potential failures in the Book Management System. By analyzing the root causes, we can identify areas for improvement and implement solutions to enhance the system's functionality and user experience.

**Plant UML image was not generated due to server error - use [planttext.com](https://planttext.com)**

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@startuml
!theme monochrome
title Book Management System Sequence Diagram

actor Librarian
participant Member
participant BookItem
participant Reservation
participant BookLending

Librarian->>BookItem: Add book item
activate BookItem
BookItem->>Librarian: Book item added
deactivate BookItem
Member->>Member: Create member object
activate Member
Member->>Member: Member object created
deactivate Member
Member->>BookItem: Reserve book item
activate BookItem
BookItem->>Reservation: Fetch reservation details
Reservation->>BookItem: No reservation details found
BookItem->>BookLending: Lend book
activate BookLending
BookLending->>BookItem: Check if book is already lent out
BookLending->>BookItem: Add new lending record
BookLending->>BookItem: Book lent successfully
deactivate BookLending
Member->>BookItem: Checkout book item
activate BookItem
BookItem->>BookLending: Fetch lending details
BookLending->>BookItem: Return fetched lending details
deactivate BookLending
Member->>Member: Renew book item
activate BookItem
BookItem->>Reservation: Fetch reservation details
Reservation->>BookItem: No reservation details found
BookItem->>BookLending: Lend book
activate BookLending
BookLending->>BookItem: Check if book is already lent out
BookLending->>BookItem: Book is already lent out
deactivate BookLending
Member->>Member: Renew book item
activate BookItem
BookItem->>Reservation: Fetch reservation details
Reservation->>BookItem: No reservation details found
BookItem->>BookLending: Lend book
activate BookLending
BookLending->>BookItem: Check if book is already lent out
BookLending->>BookItem: Add new lending record
BookLending->>BookItem: Book lent successfully
deactivate BookLending
Member->>BookItem: Return book item
deactivate BookItem
Member->>BookItem: Checkout book item
activate BookItem
BookItem->>BookLending: Fetch lending details
BookLending->>BookItem: Return fetched lending details
deactivate BookLending
Member->>Member: Renew book item
activate BookItem
BookItem->>Reservation: Fetch reservation details
Reservation->>BookItem: No reservation details found
BookItem->>BookLending: Lend book
activate BookLending
BookLending->>BookItem: Check if book is already lent out
BookLending->>BookItem: Book is already lent out
deactivate BookLending
Member->>BookItem: Return book item
deactivate BookItem
@enduml

```

## Logs:

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2025-01-25 02:32:47,351 - root - INFO - class: Member, module: __init__, file:
member.py, log: Member object created., line: 19
2025-01-25 02:32:47,353 - root - INFO - class: Librarian, module:
code.library_administration.librarian, file: librarian.py, log: Book item added
successfully., line: 21
2025-01-25 02:32:47,354 - root - INFO - class: Librarian, module:
code.library_administration.librarian, file: librarian.py, log: Book item added
successfully., line: 21
2025-01-25 02:32:47,354 - root - INFO - class: Member, module: reserve_book_item,
file: member.py, log: Book item reserved successfully., line: 34
2025-01-25 02:32:47,354 - root - INFO - class: Member, module:
get_total_books_checkedout, file: member.py, log: Fetching total books checked out.,
line: 22
2025-01-25 02:32:47,355 - root - INFO - class: BookReservation, module:
fetch_reservation_details, file: book_reservation.py, log: Fetching reservation
details., line: 14
2025-01-25 02:32:47,355 - root - INFO - class: BookReservation, module:
fetch_reservation_details, file: book_reservation.py, log: No reservation details
found., line: 24
2025-01-25 02:32:47,355 - root - INFO - class: BookLending, module:
code.book_management.book_lending, file: book_lending.py, log: Lending a book, line:
17
2025-01-25 02:32:47,355 - root - INFO - class: BookLending, module:
code.book_management.book_lending, file: book_lending.py, log: Checking if the book is
already lent out, line: 21
2025-01-25 02:32:47,356 - root - INFO - class: BookLending, module:
code.book_management.book_lending, file: book_lending.py, log: Adding a new lending
record, line: 28
2025-01-25 02:32:47,356 - root - INFO - class: BookLending, module:
code.book_management.book_lending, file: book_lending.py, log: Book lent successfully,
line: 37
2025-01-25 02:32:47,356 - root - INFO - class: Member, module:
increment_total_books_checkedout, file: member.py, log: Incremented total books
checked out., line: 38
2025-01-25 02:32:47,356 - root - INFO - class: Member, module: checkout_book_item,
file: member.py, log: Book item checked out successfully., line: 75
2025-01-25 02:32:47,356 - root - INFO - class: BookLending, module:
code.book_management.book_lending, file: book_lending.py, log: Fetching lending
details, line: 42
2025-01-25 02:32:47,356 - root - INFO - class: BookLending, module:
code.book_management.book_lending, file: book_lending.py, log: Returning fetched
lending details, line: 49
2025-01-25 02:32:47,356 - root - INFO - class: Member, module: renew_book_item, file:
member.py, log: Due date is 2025-02-04, line: 81
2025-01-25 02:32:47,358 - root - INFO - class: BookReservation, module:
fetch_reservation_details, file: book_reservation.py, log: Fetching reservation
details., line: 14
2025-01-25 02:32:47,359 - root - INFO - class: BookReservation, module:
fetch_reservation_details, file: book_reservation.py, log: No reservation details
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code.book_management.book_lending, file: book_lending.py, log: Book is already lent
out, line: 24
2025-01-25 02:32:47,359 - root - INFO - class: Member, module: renew_book_item, file:
member.py, log: Book item renewed successfully., line: 121
2025-01-25 02:32:47,359 - root - INFO - class: BookLending, module:
code.book_management.book_lending, file: book_lending.py, log: Fetching lending
details, line: 42
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member.py, log: Book item returned successfully., line: 103
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2025-01-25 02:32:47,360 - root - INFO - class: Member, module: checkout_book_item,
file: member.py, log: Book item checked out successfully., line: 75
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2025-01-25 02:32:47,360 - root - INFO - class: Member, module: checkout_book_item,
file: member.py, log: Failed to checkout book item., line: 71
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