Java Programming Assignment: OOP Fundamentals

Objective:

To develop a comprehensive understanding of Object-Oriented Programming (OOP) concepts in Java, including classes, objects, inheritance, polymorphism, encapsulation, and abstraction.

Assignment Description:

creating a simple Java application for managing a library system. The system should allow users to add books, manage members, and process borrowing and returning of books.

Requirements:

1. **Classes and Objects:**
    - Create a `Book` class with the following attributes:
        - `title` (String)
        - `author` (String)
        - `isbn` (String)
        - `available` (boolean, indicates if the book is available for borrowing)
    - Create a `Member` class with the following attributes:
        - `name` (String)
        - `memberId` (String)
        - `borrowedBooks` (ArrayList<Book>)
    - Create a `Library` class to manage the books and members. This class should have:
        - A list of books
        - A list of members
        - Methods to add books and members
        - Methods to borrow and return books
2. **Inheritance and Polymorphism:**
    - Create a `PremiumMember` class that extends the `Member` class. A premium member can borrow up to 10 books, while a regular member can borrow up to 5 books.
    - Override the method for borrowing books in `PremiumMember` to reflect this difference.
3. **Encapsulation and Abstraction:**
    - Ensure that the attributes of each class are properly encapsulated, i.e., they should be private, with public getter and setter methods where appropriate.
    - Use abstraction to define common behaviors between `Member` and `PremiumMember`.

Submission:

- Submit the complete source code files.
- Include comments in your code to explain the logic where necessary.

- Prepare a short report (1-2 pages) explaining the design choices and how OOP principles are applied in your implementation.

Evaluation Criteria:

- Correctness and completeness of the implementation.
- Proper use of OOP principles (encapsulation, inheritance, polymorphism, abstraction).
- Code readability and documentation.
- Creativity and efficiency in solving the problem.

Good luck with your assignment!