**Exercise 6: Library Management System**

**Scenario:**

You are developing a library management system where users can search for books by title or author.

***Steps:***

1. Understand Search Algorithms:Explain linear search and binary search algorithms.

***Ans:*** Linear search checks each element in the list sequentially until it finds the target element or reaches the end of the list. Binary search works by repeatedly dividing the search interval in half. It requires the list to be sorted.

***Setup:***

Create a class Book with attributes like bookId, title, and author.

Code: Library.java

***Implementation:***

Implement linear search to find books by title.

Implement binary search to find books by title (assuming the list is sorted).

Code: Library.java

***Analysis:***

1. Compare the time complexity of linear and binary search.

***Ans:*** **Linear Search:** O(n) in the worst case, where n is the number of products.

**Binary Search:** O(log n) in the worst case, where n is the number of products.

1. Discuss when to use each algorithm based on the data set size and order.

***Ans:*** Linear search is useful for small data sets or when the data is not sorted.For small lists, the overhead of sorting or maintaining a sorted list may not be justified.

Binary search is highly efficient for large data sets but requires the data to be sorted. Binary search is much faster than linear search for large lists because it reduces the search space by half in each step, resulting in a time complexity of O(log⁡n)O(\log n)O(logn).