**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:**

**(i) Explain linear search and binary search algorithms.**

**Answer:**

**Linear Search**

Linear search is a simple search algorithm that iterates through each element in a list to find a specific value. It checks each element one by one until it finds a match or reaches the end of the list.

**Binary Search**

Binary search is a more efficient search algorithm that works on sorted lists. It divides the list in half and compares the middle element to the target value. If the target value is less than the middle element, it repeats the process on the left half of the list. If the target value is greater than the middle element, it repeats the process on the right half of the list.

**4. Analysis:**

**(i) Compare the time complexity of linear and binary search.**

**Answer:**

| **Algorithm** | **Time Complexity** |
| --- | --- |
| Linear Search | O(n) |
| Binary Search | O(log n) |

**(ii) Discuss when to use each algorithm based on the data set size and order.**

**Answer:**

* Use linear search when:
  + The data set is small.
  + The data set is not sorted.
* Use binary search when:
  + The data set is large.
  + The data set is sorted.