**Exercise 6: Library Management System**

**Explain linear search and binary search algorithms.**

Linear Search

Linear search is a straightforward algorithm where each element in the list is checked sequentially until the desired element is found or the end of the list is reached.

Binary Search

Binary search is an efficient algorithm that works on sorted lists. It repeatedly divides the search interval in half. If the value of the target is less than the midpoint, the interval is narrowed to the lower half. Otherwise, it is narrowed to the upper half.

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

 Linear Search:

* Best Case: O(1)O(1)O(1) - The element is at the first position.
* Average Case: O(n)O(n)O(n) - The element is somewhere in the middle.
* Worst Case: O(n)O(n)O(n) - The element is at the last position or not present.

 Binary Search:

* Best Case: O(1)O(1)O(1) - The element is at the midpoint.
* Average Case: O(log⁡n)O(\log n)O(logn) - The element is found after several divisions.
* Worst Case: O(log⁡n)O(\log n)O(logn) - The element is not present.

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

**** Linear Search: Use when the dataset is small or unsorted. It's simple to implement and works well for small lists.

 Binary Search: Use when the dataset is large and sorted. It's much more efficient than linear search for large lists due to its logarithmic time complexity.