

Library Management System

1. Explain linear search and binary search algorithms.

Linear Search:

- Searches sequentially through the list.
- No need for sorted data.
- Best for small or unsorted datasets.

Time Complexity:

- Best Case: $O(1)$ (if found at the start)
- Average/Worst Case: $O(n)$

Binary Search:

- Works on sorted arrays/lists.
- Repeatedly divides the list into halves.

Time Complexity:

- Best Case: $O(1)$
- Average/Worst Case: $O(\log n)$
- Cannot be used on unsorted data.

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

Linear Search :

Best Case : $O(1)$

Average Case : $O(n)$

Worst Case : $O(n)$

Binary Search :

Best Case : $O(1)$

Average Case : $O(\log n)$

Worst Case : $O(\log n)$

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

- Small dataset, unsorted : Linear Search
- Large dataset, unsorted : Linear Search
- Large dataset, already sorted : Binary Search
- Search performance is critical : Binary Search