**Exercise 6 : Library Management System**

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

**Linear Search:**

* Linear search involves scanning each element in a list sequentially until the desired element is found or the list ends.
* The time complexity is O(n), where n is the number of elements in the list. It is suitable for small or unsorted datasets.

**Binary Search:**

* Binary search is an efficient algorithm for finding an element in a sorted list. It repeatedly divides the search interval in half, comparing the target value to the middle element and narrowing the search range based on the comparison.
* The time Complexity is O(log n), where n is the number of elements in the list. It requires the list to be sorted and is suitable for larger datasets due to its logarithmic time complexity.

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

 **Linear Search:** O(n)

* This time complexity means that the search time grows linearly with the size of the dataset.
* Linear search does not require the list to be sorted and can be used in any unsorted collection of items.

 **Binary Search:** O(log n)

* The logarithmic time complexity of binary search indicates that the search time increases logarithmically as the dataset grows.
* This is significantly faster than linear search, especially for large datasets, but it requires the dataset to be sorted.

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

* We can use the linear search when the dataset is small or unsorted as linear search does not require any prior sorting of data.
* We use binary search when the dataset is large and sorted, as it significantly reduces the number of comparisons needed to find the target.