**Library Management System**

**Linear Search**

**How it works:**

* Linear search checks each element in the array one by one until it finds the target value or reaches the end.
* The linearSearch(int id) method loops through each Book and compares the id.

**Binary Search**

**How it works:**

Binary search works on sorted arrays. It repeatedly divides the search interval in half:

* Compare the target value to the middle element.
* If equal, return the element.
* If less, search the left half; if greater, search the right half.
* The binarySearch(int id) method assumes the books array is sorted by id.

**Time Complexity Comparison**

| Algorithm | Best Case | Average Case | Worst Case |
| --- | --- | --- | --- |
| Linear Search | O(1) | O(n) | O(n) |
| Binary Search | O(1) | O(log n) | O(log n) |

**Linear Search:** Time increases linearly with the number of elements.

**Binary Search:** Time increases logarithmically, much faster for large sorted arrays.

**When to Use Each Algorithm**

**Linear Search:**

* Use when the array is unsorted or small.
* Simple to implement, no sorting required.

**Binary Search:**

* Use when the array is sorted.
* Much faster for large datasets.
* Not suitable for unsorted data.