**Exercise 6: Library Management System**

**Understanding Search Algorithms**

When you’re looking for a book, you can use two main search methods:

**Linear Search**

**Linear Search** is like flipping through a stack of books one by one until you find the right one.

* **How It Works**: Imagine you have a pile of books. You pick each book up and check if it’s the one you want, starting from the top.
* **Speed**:
  + **Best Case**: O(1) (You find the book right away)
  + **Average Case**: O(n) (You check about half of the books)
  + **Worst Case**: O(n) (You have to check every book)

**Binary Search**

**Binary Search** is faster but works only if the books are sorted. It’s like starting in the middle of a neatly arranged shelf and deciding which direction to search next.

* **How It Works**: Imagine the books are in order. You open the book in the middle and decide whether to look on the left or the right, cutting the number of books you need to check in half each time.
* **Speed**:
  + **Best Case**: O(1) (You find the book right in the middle)
  + **Average Case**: O(log n) (You quickly narrow down the search)
  + **Worst Case**: O(log n) (You go through all the splits, but it’s still fast)

In summary, linear search is simple but can be slow with many books. Binary search is much quicker but requires the books to be sorted.

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