Searching Algorithms

Linear Search

Linear Search

- The Lineary Search algorithm allows the user to search for a specific value in a list of values.
- The searching starts at the beginning.
- Stops when the item is found OR when the search reaches the end of the list.
- The worst-cast performance: O(N)

Linear Search Challenge

1. Create a method called LinearSearch that takes a list of ints as a parameter and 1 int as the search number.
2. In the method, use the linear search algorithm to find the item.
3. Return the index of the item. Return -1 if the item is not found.
4. Call LinearSearch from Main.

LINKS

VIDEOS

Binary Search

Binary Search

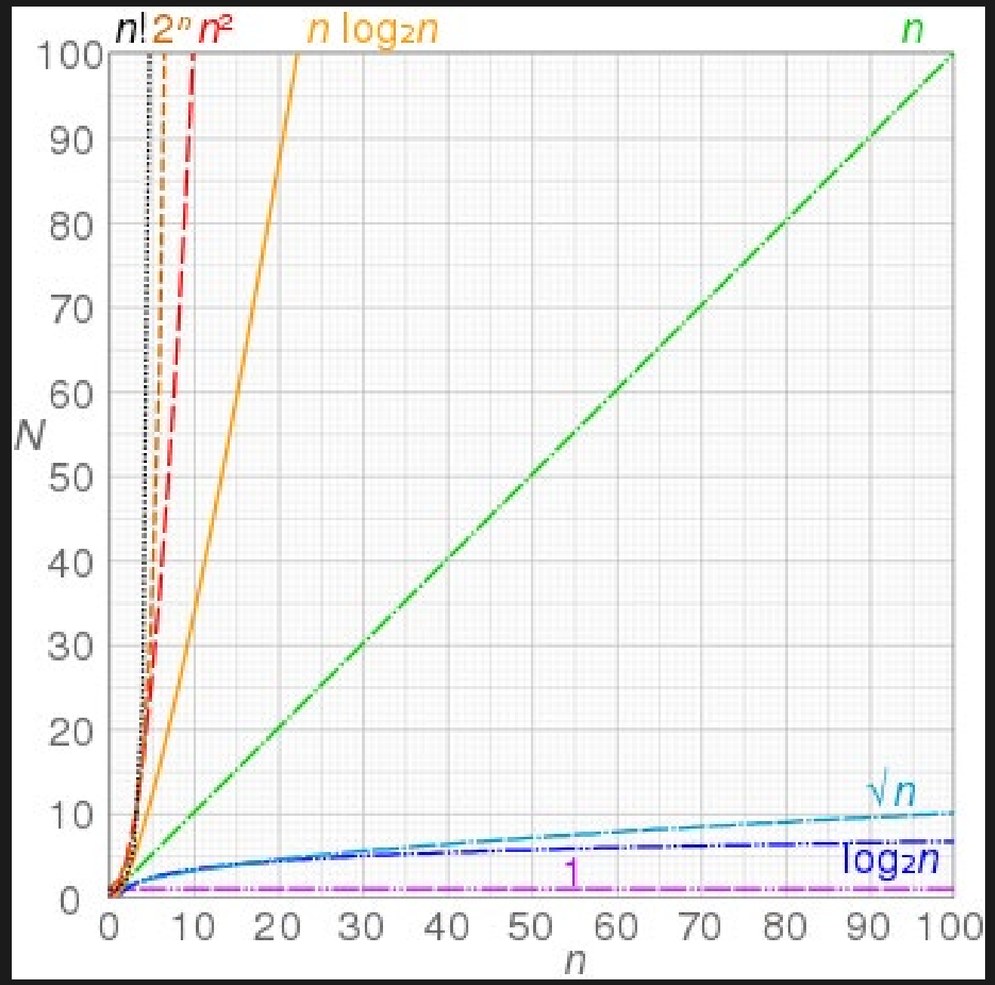
- The Binary Search algorithm is a very efficient search: **O(log n)**
- **ONLY** works on sorted data
- Divides-and-conquers!

Computational Complexity

Best

O(1)	constant
O(log n)	logarithmic
O(n)	linear
O(n log n)	loglinear
$O(n^2)$	quadratic
$O(2^n)$	exponential
O(n!)	factorial

Worst



Binary Search

- The Binary Search algorithm:
  - If the middle item is your search term, quit! You found it!
    - Return the index of the middle item
  - Else if the search term is LESS than the middle item
    - repeat the search with the left half
  - Else if the search term is GREATER than the middle item
    - repeat the search with the right half
  - If the min index > max index, return -1 (this is an exit condition)

Binary Search pseudocode

```
// initially called with low = 0, high = N-1
BinarySearch(A[0..N-1], searchTerm, low, high)
{

    if (high < low)
        return -1 // -1 means not found

    mid = (low + high) / 2

    if (searchTerm < A[mid])
        return BinarySearch(A, searchTerm, low, mid-1)

    else if (searchTerm > A[mid])
        return BinarySearch(A, searchTerm, mid+1, high)

    else
        return mid //the searchTerm was found so return its index

}
```