Algorithms — Homework 1

Binary Search

Due: September 8.

1) Use Binary Search to search for the numbers 2, 43, and 70 in the sequence

2 5 11 17 19 21 26 33 39 43 51 65 79 88 99.

Show for each iteration which item is selected and which part of the sequence remains.

2) Suppose you are given an array $A$ of $n$ distinct and sorted numbers that has been circularly shifted $k$ positions to the right. For example, \{35, 42, 5, 15, 27, 29\} is a sorted array that has been circularly shifted $k = 2$ positions, while \{27, 29, 35, 42, 5, 15\} has been shifted $k = 4$ positions.

- Suppose you know what $k$ is. Give an $O(1)$ time algorithm to find the largest number in $A$.
- Suppose you do not know what $k$ is. Give an $O(\log n)$ time algorithm to find the largest number in $A$.

3) You have given two sorted arrays $A$ and $B$ of size $n$, respectively. Find the median of the two sorted arrays, i.e., of $A \cup B$. The overall run time complexity should be $O(\log n)$. 