

HW #2 Chapter 2 Exercises:

Due: Th, 2/10

2. Suppose that, even unrealistically, we are to search a list of 700 million items using Binary Search, Recursive (Algorithm 2.1). What is the maximum number of comparisons that this algorithm must perform before finding a given item or concluding that it is not in the list?

7. Use the divide-and-conquer approach to write an algorithm that finds the largest item in a list of n items. Analyze your algorithm, and show the results in order notation.

← (Write program and analyze)

Section 2.2

8. Use Mergesort (Algorithms 2.2 and 2.4) to sort the following list. Show the actions step by step.

123 34 189 56 150 12 9 240

← (trace)

16. Suppose that, in a divide-and-conquer algorithm, we always divide an instance of size n of a problem into 10 subinstances of size $n/3$, and the dividing and combining steps take a time in $\Theta(n^2)$. Write a recurrence equation for the running time $T(n)$, and solve the equation for $T(n)$.

← (Use Master Thm B.5 pp. 587-588)

19. Use Quicksort (Algorithm 2.6) to sort the following list. Show the actions step by step.

123 34 189 56 150 12 9 240

← (trace)

24. Assuming that Quicksort uses the first item in the list as the pivot item:

- (a) Give a list of n items (for example, an array of 10 integers) representing the worst-case scenario.
- (b) Give a list of n items (for example, an array of 10 integers) representing the best-case scenario.

40. Write an efficient algorithm that searches for a value in an $n \times m$ table (two-dimensional array). This table is sorted along the rows and columns—that is,

$$Table[i][j] \leq Table[i][j+1]$$

$$Table[i][j] \leq Table[i+1][j]$$

← (Program and Analyze)

Problem 45. is EXTRA CREDIT

45. Use the divide-and-conquer approach to write a recursive algorithm that finds the maximum sum in any contiguous sublist of a given list of n real values. Analyze your algorithm, and show the results in order notation.

← (Program and Analyze)