

CS 140: Intro to Computer Science, Fall 2011

Homework 6

Due (in class or via email) by 1pm on Wednesday, October 26, 2011

1. What is the difference between a concrete step and an abstract step?
2. What is the difference between an array and a record (which we sometimes call an object), as they are discussed in the book?
3. Consider the following sorted array, with length 16 (where the number above is the index of that element in the array):

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	3	4	9	15	16	21	23	45	48	51	54	55	56	88	92

- (a) How many comparisons does linear search make while checking to see if the value 5 is in the array?
 - (b) How many comparisons does binary search make while checking to see if the value 5 is in the array?
 - (c) How many comparisons does linear search make while checking to see if the value 51 is present in the array?
 - (d) How many comparisons does binary search make while checking to see if the value 51 is present in the array?
4. Consider the following array of length 8 (where the number above is again the index of that element).

0	1	2	3	4	5	6	7
7	-1	31	9	11	2	29	3

- (a) Simulate bubble sort on this list. Show each step (similar to showing the list at the end of each iteration, in 7.12(b) on page 221 of the textbook), and count the total number of comparisons that the algorithm does as it sorts the list.
- (b) Simulate quicksort on this list, where the pivot element is chosen to be the first element in the list each time. How many comparisons does quicksort take on this list? (Recall that the pivot is compared to every other element in the current list, so as you simulate quicksort, track each time that one of those comparisons happens.)
- (c) Now simulate mergesort on the list. How many comparisons happen this time while sorting? (Recall that mergesort compares elements when "merging" the two sorted sublists, so simulate the algorithm subdividing and recursing here also.)