

18.310 Assignment 2: Due Wednesday, Sept. 17, 2008

Weekly assignments are due at 4PM in the Undergraduate Math Office (UMO).

You can also turn in your homework in class to the Instructor or TA.

If you are submitting electronic copy, please e-mail to <dorian@math.mit.edu>

and cc to: <djk@math.mit.edu>

Problem 1

Choose one of the sorting methods described in class (but not insertion sort) and write a one page essay explaining it. There should be a brief introduction. The sorting method should be described in enough detail to let an intelligent reader implement it. You need not give a rigorous proof of its efficiency, but you should explain, at least informally, why it works well. This should be typeset or word processed.

Problem 2

1. A procedure for sorting five keys using seven comparisons was given in class. Give a procedure for finding the median of five keys using fewer comparisons.
2. In the median finding procedure, if instead of sorting each of the blocks of five keys, we find the median of each of these blocks, construct a procedure analogous to the one given in class. Find a bound of the form cN on the number of comparisons this procedure requires (here N is the number of keys).

Problem 3

Suppose you want to find the largest ten keys out of a set of N keys. Describe how you would adapt quick sort, heap sort, and tournament sort to perform this task efficiently. Roughly how many comparisons would it take for each one?

Problem 4

Set up a spreadsheet that implements Batcher's sorting network for 32 keys.

Test it to make sure it works with random inputs.

How many comparisons did you need? How many would you need for 64 and 128? OK, now give the general formula for 2^k keys. For 1024 keys, what is the ratio of the number of comparisons needed here to the lower bound for any method?