Reference Material: Dasgupta-Papadimitriou-Vazirani.pdf

Problem 1. Problem 2.3 in Reference Material

Problem 2. Problem 2.4 in Reference Material

Problem 3.   Problem 2.5   in Reference Material (Hint use recurrence tree or substitution when **masters does not apply** to find the answer)

Problem 4a. In the select algorithm that finds the median we divide the input elements into groups of 5. Will the algorithm work in linear time if we divide it into groups of 7? How about 3? Explain your answer--- the asymptotic run time in either case.

4b.) Generate 25 random numbers using a random number generator, show the first level of recursion and recursive calls if looking for the 6th smallest number.

Problem 5.

You are interested in analyzing some hard-to-obtain data from two separate

databases.

Each database contains n numerical values–so there are

2n values total–and you may assume that no two values are the same.

You'd like to determine the median of this set of 2n values, which we will

define here to be the nth smallest value.

However, the only way you can access these values is through queries

to the databases. In a single query, you can specify a value k to one of the

two databases, and the chosen database will return the kth smallest value that it contains. Since queries are expensive, you would like to compute the median using as few queries as possible.

5a.)Give an algorithm that finds the median value using at most O(log n) queries.

5b.)Give a proof that this algorithm works.