

Problem set for the Algoritmica 2 class (2015/16)

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Abstract

This is the problem set assigned during class. What is relevant during the resolution of the problems is the reasoning path that leads to their solutions, thus offering the opportunity to learn from mistakes. This is why they are discussed by students in groups, one class per week, under the supervision of the teacher to guide the brainstorming process behind the solutions. The *wrong* way to use this problem set: accumulate the problems and start solving them alone, a couple of weeks before the exam. The correct way: solve them each week in groups, discussing them with classmates and teacher.

1. [Randomized selection] Consider the randomized quicksort, analyzed with the indicator variables, discussed in class (also, paragraph 7.3 in the textbook CLRS - Cormen, Leiserson, Rivest, Stein, *Introduction to Algorithms*, 3rd edition, MIT Press). Show how to modify the randomized quicksort so that, given an array A and an integer $1 \leq i \leq |A|$, it finds the i th largest element in A without fully sorting A . Consider the analysis with indicator variables seen in class, and adapt it to show that the selection algorithm thus obtained requires linear expected time.