

Homework #4
Introduction to Algorithms/Algorithms 1
600.363/463
Spring 2013

Due on: Tuesday, February 26th, 5pm

Late submissions: will NOT be accepted

Format: Please start each problem on a new page.

Where to submit: On blackboard, under student assessment

Please type your answers; handwritten assignments will not be accepted.

To get full credit, your answers must be explained clearly,
with enough details and rigorous proofs.

January 23, 2013

1 Problem 1 (20 points)

Let A be an array of numbers, where the size of the array is N . The numbers represent winners in different rounds of game G . We say that there is an undisputed champion if one element occupies more than half of entries. For example, if $A = \{1, 2, 2, 3, 2\}$ then 2 is the undisputed champion. Design an algorithm that checks if there is a undisputed champion in A . Full credit will be given if your algorithm works in $O(N)$ time.

Partial credit will be given if your algorithm works in $O(N \log(N))$ time.

2 Problem 2 (20 points)

2.1 (10 points)

Let A be an array of size n of integers with the property that the number of distinct integers is $O(\log(n))$. Design an efficient $O(n \log \log(n))$ algorithm to sort A .

2.2 (10 points)

Let A be an array of size n of integers with the property that the first $n - \sqrt{n}$ integers are sorted. Design an efficient $o(n \log(n))$ algorithm to sort A .

3 Optional Exercises

Solve the following problems and exercises from CLRS: 8.2, 9.2, 2.2, 2.3-5, 2.3-7.