

n th Smallest

This is a **regular task**. You must submit a PDF, which can be produced using the L^AT_EX template on Moodle, exported from a word processor, hand-written or any other method.

Let $A[1..n]$ and $B[1..n]$ be two sorted arrays each containing n distinct integers, and A and B have no elements in common. You may assume that n is a power of two, say 2^ℓ . Describe a $O(\log n)$ algorithm that finds the n th smallest element of $A \cup B$ (where $A \cup B$ is the array obtained by merging A and B together).

Advice. If you are searching for a particular element, your proof should indicate why that element is always in your proposed search space at every iteration, and why when your algorithm terminates, you output the element.

Expected length: Up to a page.