

COMP 312
Assignment 7
Due at 9:00 am, Tuesday, November 27, 2007
All problems are of equal value.

Reading

Brassard & Bratley, Chapter 12, with emphasis on sections 12.1, 12.2, 12.3 and 12.5.

Practice

Brassard & Bratley, 12.1, 12.2, 12.3, 12.4, 12.5, 12.6, 12.7, 12.11, 12.13, 12.16, 12.17, 12.36, 12.37, 12.41, 12.42, 12.43, 12.44, 12.46, 12.47, 12.48, 12.53, 12.55, 12.56, 12.57, 12.58.

To Be Handed In

1. Brassard & Bratley 12.10.
2. Brassard & Bratley 12.15.
3. Brassard & Bratley 12.45.
4. Brassard & Bratley 12.54.
5. Consider the following decision problem:
 - SUBSETSUM: Given $S = \{x_1, \dots, x_n\}$ a set of n integers, and an integer k , is there $S' \subseteq S$ such that $\sum_{x_i \in S'} x_i = k$?
 - (a) Show that SUBSETSUM is decision-reducible, i.e., given an polynomial time algorithm for the decision problem it is possible to find a subset of the elements that sum to k if such a subset exists.
 - (b) Recall the knapsack problem from section 8.4 of the book. Formulate this problem as a decision problem called KNAPSACK, i.e., clearly define the input and a corresponding question concerning the input which has a yes or no answer.
 - (c) Assuming your version of KNAPSACK is NP-complete, show that SUBSETSUM is also NP-complete.

Bonus

Show that $n - 2 + \lceil \log n \rceil$ comparisons are necessary and sufficient to find the second largest item among n distinct items.