Problem Set 1

Sublinear Algorithms

Due Tuesday, September 8

1. A weighted die is characterized by an (unknown) vector of probabilities p, where p_i is the probability the die comes up i for each i in $1, \ldots, 6$.

   (a) Suppose you are handed a weighted die. Give a method to estimate its expected value to within $\pm\epsilon$ using as few throws as possible.

   (b) Now you are given two weighted dice. We say that die A "ϵ-dominates" die B if, when A and B are thrown, die A comes up larger than die B more than $\frac{1}{2} + \epsilon$ of the time. Suppose that either A ϵ-dominates B or vice versa; give a method to determine which using as few throws as possible.

   (c) How do the previous two answers change for n-sided dice?