

Problem Set 2

*Lecturer: Michael A. Bender**Due: Monday, 3/5/07*

1. Prove a lower bound of $\log_B N$ memory transfers for searching in the DAM model.
Hint: Use an information-theoretic argument. How many bits of information can we learn about the rank of our target element per memory transfer?
Another hint: For practice prove a lower bound of $\lg N$ for binary search.
2. In this problem we examine competitive analysis with resource augmentation.
 - (a) Suppose that online algorithm A has cache size k but that the optimal algorithm OPT only has cache size $k/2$. What is the competitive ratio?
 - (b) Suppose that the online algorithm A has cache size k but that the optimal algorithm OPT only has cache size αk , ($0 < \alpha \leq 1$). What is the competitive ratio?