CS 223
Laboratory Assignment #2
Due: at the end of the lab in Week 7 (Mar 2, 07)

The Problems

1. Prove that a heap with n nodes has height $\lfloor \log n \rfloor$.

2. Given an array of integers $A[0..n-1]$, implement the heapsort algorithm, use it to find the median of A[0..n-1]. Also, implement the linear median selection algorithm to find the median of A[0..n-1].

Compare the actual running times of the two programs, using $n = 32000$. If the difference is not obvious, increase n, until the difference becomes noticeable. You can initiate A with random integers, say, with the following loop in Java

```
for(i=0;i<n;i++) {
     A[i]=rand()%n;
     }.
```

3. In class, we covered Max-key Priority Queue. In this lab assignment you need to implement a Min-key Priority Queue. Given an array of integers $A[0..n-1]$, say $n = 32$, implement the min-key priority queue which supports the following 4 functions:

insert(A,x) — insert a node with key x into the priority queue.
min(A) — return, from the priority queue, the element with the minimum key.
delete-min(A) — delete, from the priority queue, the element with the minimum key.
decrease-key(A,x,k) — decrease the key x's value to k.

Run each function at least twice, show the output each time.