ITEC 324: Programming Assignment 5

Problem Specification (50 points)

Write a Java program that does the following:

1. Reads 0 or more integers from standard input.
2. Writes these integers, in ascending order (or more precisely, non-descending order), to standard output.

Each line of the input will contain a single integer. Each integer will be within the range of a Java int. Each line of the output will contain a single integer. Use System.out.println to write to standard output.

Store and sort the integers using a public class called Heap that implements a heap data structure. Your heap class should have the following public operations:

- Heap() - creates a new, empty heap
- void add(int i) - adds the int i to the heap
- int smallest() - returns the smallest value in the heap (without changing the heap)
- void remove() - removes the smallest value from the heap
- int size() - returns the number of elements currently in the heap

Note that the heap can contain duplicates. Preconditions for the heap operations are as follows:

- smallest: the heap is not empty
- remove: the heap is not empty

Your heap should be a binary tree implemented with linked nodes. Each node should have a parent link in addition to its two child links. You will want to read the section on tree-based heaps on page 600 of your text. In particular, this section discusses how to use the size of a heap to locate the heap's last element or its first open location.

When testing, you can either supply test data at the keyboard (remembering to end the input with a ^D at the beginning of a line), or by feeding the contents of a file to it (e.g. HeapSorter < test_data) where the use of the redirection symbol < causes the contents of the file test_data to be fed into the program as if they had been typed in from the keyboard.

Put your main program in a class called HeapSorter in file HeapSorter.java. Your Heap class should be the file Heap.java.

What to submit

- Source code ... // please include javadoc as a comment in your source code
- All the softcopy should be submitted at a dropbox in D2L