CMPS 12M

Introduction to Data Structures

Lab Assignment 8

Objective

The purpose of this assignment is to learn how to implement heaps.

Overview

Your task is to write a C program that implements a heap of integers. Your program will read numbers from a file and insert them into the heap, removing elements from the heap when the heap gets too big. When the end of the file is reached, your program will remove all the items remaining in the heap and print them out.

You are given a skeleton program in C and a test file with numbers. Files for this lab can be found in:

`/afs/cats.ucsc.edu/users/r/nwhitehe/cmps12/lab8/`

Heap

Your program must accept two arguments. The first is a number that represents how big the heap should be at maximum size. The second is a filename to be read.

Your program must read lines from the input file and interpret them as integers. Each number must be inserted into the heap. If the heap is full, first remove an element from the heap then insert the number read from the file. Recall that remove always removes the largest element in the heap.

When your program reaches the end of the input file, it must print out the contents of the heap in order by repeatedly calling remove and printing the value until the heap is empty.

You need to implement the following functions:

```
isFullHeap
isEmptyHeap
insertHeap
```

What to Turn In

All files you turn in for every assignment and lab should begin with a comment block that includes your name, CruzID, class, date, filename, short description of the file's role in the assignment, and any special instructions related to the file. Also create a file called README. The README file should have the normal comment block, then list all the files being submitted (including itself) along with any special notes to the graders. If you do pair programming, both names and CruzIDs should appear as author and in the README file.

For this lab, submit the following files:

```
README
Makefile
heap.c
```

To submit, use the submit command.

```
submit cmps12b-nojw.f14 lab8 ...
```

Your makefile should have a default target that builds an executable called "heap", along with phony targets "clean" that removes compiled object files, "spotless" that cleans up all built files, and "test" which runs the executable with a test file.