Lab10

100 Points

Due date:
11:59pm, Monday 04/22/2019 for Tuesday labs.
11:59pm, Wednesday 04/24/2019 for Thursday labs.

Purpose:
The purpose of this lab is to implement a max-leftist heap class and a max-skew heap class in C++.

General Requirements:
For this assignment, **you will work on a pointer-based implementation** of max-leftist heap and a max-skew heap. (Please refer to slide 7 in note packet 6 for the node structure for leftist trees.) You are to read in the numbers from a data file of integers and insert each number into a max-leftist heap (and a max-skew heap). **Max-leftist heaps and max-skew heaps can have duplicate numbers**.

For this lab, you should build the heap using the samples which are in the data.txt. After that, your program should have a simple menu like this:

Please choose one of the following commands:
1- Insert
2- Deletemax
3- Findmax
4- Preorder
5- Inorder
6- Postorder
7- Levelorder
8- Exit

Max-leftist heap:
The max-leftist heap methods should be implemented as follows:

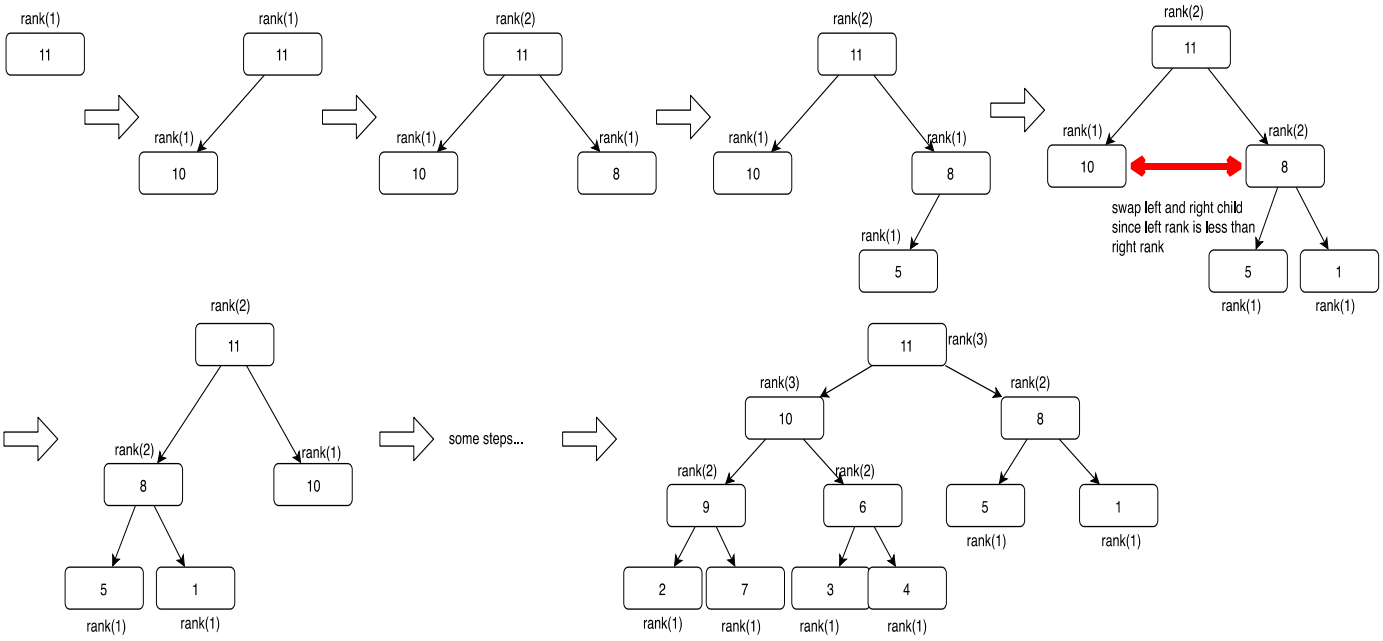
- Buildheap() - should build the max-leftist heap using the insert function.
- Insert(x) - should insert x into the max-leftist heap using the merge function.
- Deletemax() - should delete the maximum value from the max-leftist heap and use the merge function to merge the remaining two sub heaps.
- Findmax() - should return maximum value from the max-leftist heap.
- Merge(H1,H2) – merge two max-leftist heaps.
- Preorder() should print the preorder traversal of the max-leftist heap.
- Inorder() -– should print the inorder traversal of the max-leftist heap.
- Postorder() – should print the postorder traversal of the max-leftist heap.
- Levelorder() – should print the level order traversal of the max-leftist heap.

Max-skew heap:
The max-skew heap methods should be implemented as follows:

- Buildheap() - should build the max-skew heap using the insert function.
- Insert(x) - should insert x into the max-skew heap using the merge function.
- Deletemax() - should delete the maximum value from the max-skew heap and use the merge function to merge the remaining two sub heaps.
- Findmax() - should return maximum value from the max-skew heap.
- Merge(H1,H2) – should merge two max-skew heaps.
- Preorder() - should print the preorder traversal of the max-skew heap.
- Inorder() – should print the inorder traversal of the max-skew heap.
- Postorder() – should print the postorder traversal of the max-skew heap.
- Levelorder() – should print the level order traversal of the max-skew heap.

Data file:
data.txt: 11 10 8 5 1 6 2 9 7 3 4

We will insert these values, in the given order, into the max-leftist heap. **Note the following graphical output covers only the max-leftist heap**:



Expected output for the max-leftist heap:

Please choose one of the following commands:
1- Insert

2- Deletemax
3- Findmax
4- Preorder
5- Inorder
6- Postorder
7- Levelorder
8- Exit
> 7
11
10 8
9 6 5 1
2 7 3 4

Please choose one of the following commands:
1- Insert
2- Deletemax
3- Findmax
4- Preorder
5- Inorder
6- Postorder
7- Levelorder
8- Exit
> 3
11

Please choose one of the following commands:
1- Insert
2- Deletemax
3- Findmax
4- Preorder
5- Inorder
6- Postorder
7- Levelorder
8- Exit
> 2
Delete max successful

Please choose one of the following commands:
1- Insert
2- Deletemax
3- Findmax
4- Preorder

5- Inorder
6- Postorder
7- Levelorder
8- Exit
> 7
10
9 8
2 7 6 5
3 4
1

Please choose one of the following commands:
1- Insert
2- Deletemax
3- Findmax
4- Preorder
5- Inorder
6- Postorder
7- Levelorder
8- Exit
> 4
10 9 2 7 8 6 3 4 1 5

Please choose one of the following commands:
1- Insert
2- Deletemax
3- Findmax
4- Preorder
5- Inorder
6- Postorder
7- Levelorder
8- Exit
> 1
Integer to Insert: 10
Insert successful

Please choose one of the following commands:
1- Insert
2- Deletemax
3- Findmax

4- Preorder
5- Inorder
6- Postorder
7- Levelorder
8- Exit
> 5
2 9 7 10 3 6 1 4 8 5 10

Please choose one of the following commands:
1- Insert
2- Deletemax
3- Findmax
4- Preorder
5- Inorder
6- Postorder
7- Levelorder
8- Exit
> 2
Delete max successful

Please choose one of the following commands:
1- Insert
2- Deletemax
3- Findmax
4- Preorder
5- Inorder
6- Postorder
7- Levelorder
8- Exit
> 7
10
8 9
6 5 2 7
3 4
1

Please choose one of the following commands:
1- Insert
2- Deletemax
3- Findmax
4- Preorder
5- Inorder

6- Postorder
7- Levelorder
8- Exit
> 6
3 1 4 6 5 8 2 7 9 10

Please choose one of the following commands:
1- Insert
2- Deletemax
3- Findmax
4- Preorder
5- Inorder
6- Postorder
7- Levelorder
8- Exit
> 8
Byebye!

Expected output for max-skew heap:

Please choose one of the following commands:
1- Insert
2- Deletemax
3- Findmax
4- Preorder
5- Inorder
6- Postorder
7- Levelorder
8- Exit
> 7
11
8 10
4 7 6 9
2 1 3 5

Please choose one of the following commands:
1- Insert
2- Deletemax
3- Findmax
4- Preorder
5- Inorder

6- Postorder
7- Levelorder
8- Exit
> 2
Delete max successful

Please choose one of the following commands:
1- Insert
2- Deletemax
3- Findmax
4- Preorder
5- Inorder
6- Postorder
7- Levelorder
8- Exit
> 3
10

Please choose one of the following commands:
1- Insert
2- Deletemax
3- Findmax
4- Preorder
5- Inorder
6- Postorder
7- Levelorder
8- Exit
> 4
10 9 8 4 2 7 1 5 6 3

Please choose one of the following commands:
1- Insert
2- Deletemax
3- Findmax
4- Preorder
5- Inorder
6- Postorder
7- Levelorder
8- Exit
> 1
Integer to insert: 10
Insert successful

Please choose one of the following commands:
1- Insert
2- Deletemax
3- Findmax
4- Preorder
5- Inorder
6- Postorder
7- Levelorder
8- Exit
> 5
3 6 10 10 2 4 8 1 7 9 5

Please choose one of the following commands:
1- Insert
2- Deletemax
3- Findmax
4- Preorder
5- Inorder
6- Postorder
7- Levelorder
8- Exit
> 2
10
9 6
8 5 3
4 7
2 1

Please choose one of the following commands:
1- Insert
2- Deletemax
3- Findmax
4- Preorder
5- Inorder
6- Postorder
7- Levelorder
8- Exit
> 6
2 4 1 7 8 5 9 3 6 10

Please choose one of the following commands:
1- Insert
2- Deletemax
3- Findmax
4- Preorder
5- Inorder
6- Postorder
7- Levelorder
8- Exit
> 8
Byebye!

Submission:
Follow the conventions below to facilitate grading:

Source Code
Place all your source files (*.cpp, *.hpp) and input files in a single folder with no subfolders.

- Name your folder using the convention Lastname_LabX (e.g., Smith_Lab010).
- Include a functioning Makefile inside the folder. (The makefile should also include the clean command.)
- **Verify that your code runs on the lab Linux machines before submission.**

Compressed File

- Compress using .zip, .rar, or .tar.gz.
- Name your file using the convention Lastname_LabX (e.g., Smith_Lab010.zip).

Email

- Use the following subject for your email: Lastname_LabX (e.g., Smith_Lab010).
- Send your code to l290w868@ku.edu if you are in one of Lei's sections or to dhwanipandya1401@ku.edu if you are in one of Dhwani's sections.
- Anytime you have a question about the lab, put the word question in the subject of the email.