CS 61B Spring 2018

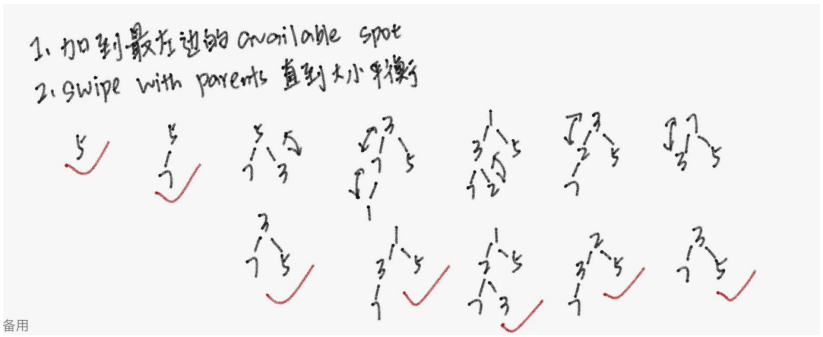
Heaps, Traversals & Trees

Discussion 10: March 20, 2018

1 Heaps of Fun

1.1 Assume that we have a binary min-heap (smallest value on top) data structure called `Heap` that stores integers, and has properly implemented `insert` and `removeMin` methods. Draw the heap and its corresponding array representation after each of the operations below:

```
1 Heap h = new Heap();
2 h.insert(5);
3 h.insert(7);
4 h.insert(3);
5 h.insert(1);
6 h.insert(2);
7 h.removeMin();
8 h.removeMin();
```



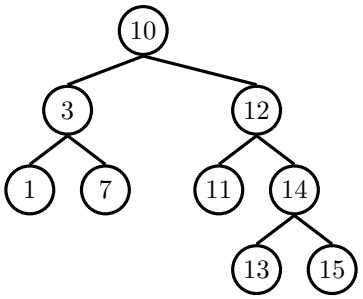
1.2 Your friend Sahil Finn-Garng challenges you to quickly implement an integer max-heap data structure. "Hah! I'll just use my min-heap implementation as a template to write MaxHeap.java," you think to yourself. Unfortunately, two Destroyer Penguins manage to delete your `MinHeap.java` file. You notice that you still have `MinHeap.class`. Can you still complete the challenge before time runs out?

Hint: You can still use methods from `MinHeap`.

I just redefine the comparator of "smaller than" to be "greater than"

we can achieve this by negating the integer during insertion, as well as negating them again when removing and returning

2 Tree Traversals



2.1 Write the pre-order, in-order, post-order, and level-order traversals of the above binary search tree.

pre-order: 10-3-1-7-12-11-14-13-15
in-order: 1-3-7-10-11-12-13-14-15
post-order: 1-7-3-11-13-15-14-12-10
level-order: 10-3-12-1-7-11-14-13-15

3 Quadtrees

3.1 Draw the quadtree built by inserting the following nodes with the given coordinates.

```
insert A (2, 3);
insert B (-1, 1);
insert C (3, 2);
insert D (0, 0);
insert E (4, 4);
insert F (-3, 2);
```