CSC 311-01 PROGRAMMING ASSIGNMENT

1 3-heap

A 3-heap is like a heap defined in class, except that:

1. if it has more than 1 node then it consists of 2 separate trees, and
2. each node may have up to 3 children.

An example of 3-heap is visualized on Figure 1 page 2.

That heap is represented in an array as shown on Figure 2 page 2.

Here are some useful properties of 3-heaps.

- Roots of a 3-heap are stored at indicies 1 and 2 (the latter if the 3-heap has more than 1 node).
- The first child of a node stored at index i (if that node has a child) has an index $3 * i$.
- The second child of a node stored at index i (if that node has at least 2 children) has an index $3 * i + 1$.
- The third child of a node stored at index i (if that node has three children) has an index $3 * i + 2$.
- In particular, a node stored at index i is a leaf iff $3 * i > N$, where N is the number of nodes in the heap.
- As a result, the parent of a node stored at index i, where $i > 2$, has an index $i/3$ (the division in the foregoing formula is integer).

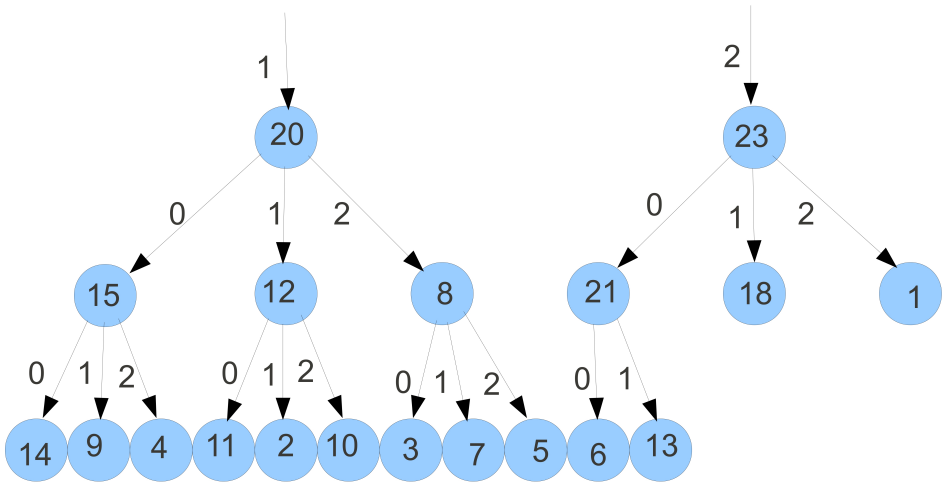

Figure 1: An example of 3-heap with 19 nodes.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
20	23	15	12	8	21	18	1	14	9	4	11	2	10	3	7	5	6	13

Figure 2: Array representation of the heap of Figure 1.

2 Your assignment

Modify the programs posted on the class website at

`http://csc.csudh.edu/suchenek/CSC311/Tree/PriorityQueueTest.java`

and

`http://csc.csudh.edu/suchenek/CSC311/Tree/PriorityQueue.java`

(include the `cnt...` classes as needed) so that they implement any integer priority queue as a 3-heap instead of a heap. In particular, the first of the two programs should properly sort any array of integers.

In order to earn any credit, your programs must be actual working modifications of the programs posted at the class website, as indicated above.