Data Structures (CS 1520) Lab 5 Name:__________________

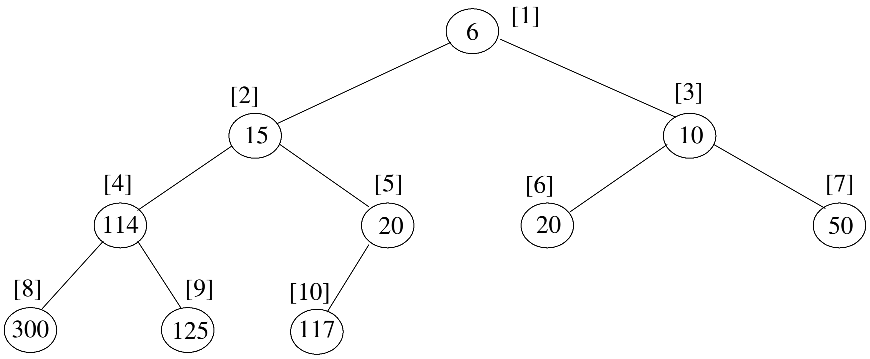
Objective: To understand recursion by writing simple recursive solutions.

To start the lab: Download and unzip the file at: www.cs.uni.edu/~fienup/cs1520s13/labs/lab5.zip

Part A: Complete the recursive `searchHelper` function in the `search` method of our `OrderedList` class in `ordered_linked_list.py`. Test it with the `listTester.py` program.

Raise your hand when done. Demonstrate and explain your code to an instructor or TA.

Part B: Recall that Lecture 7 and Section 6.6 discussed a very “non-intuitive”, but powerful list/array-based approach to implement a priority queue, call a binary heap. The list/array is used to store a *complete binary tree* (a full tree with any additional leaves as far left as possible) with the items being arranges by *heap-order property*, i.e., each node is ≤ either of its children. An example of a *min* heap “viewed” an a complete binary tree would be:



Python List actually used to store heap items	0	1	2	3	4	5	6	7	8	9	10
	not used	6	15	10	114	20	20	50	300	125	117

Recall the General Idea of `insert(newItem)`:

- append newItem to the end of the list (easy to do, but violates heap-order property)
- restore the heap-order property by repeatedly swapping the newItem with its parent until it *percolates up* to the correct spot

Recall the General Idea of `delMin()`:

- remember the minimum value so it can be returned later (easy to find - at index 1)
- copy the last item in the list to the root, delete it from the right end, decrement size
- restore the heap-order property by repeatedly swapping this item with its smallest child until it *percolates down* to the correct spot
- return the minimum value

Originally, we used iteration (i.e., a loop) to percolate up (see `percUp`) and percolate down (see `percDown`) the tree. Now I want you to complete the recursive `percUpRec` and recursive `percDownRec` methods in `binHeap.py`. Run this file to test your code.

Raise your hand when done. Demonstrate and explain your code to an instructor or TA.

If you have extra time, work on homework #3!