CSC-361: Priority Queues (Binary Heaps)

Please work in a pair. Only one group members needs to submit; however, make sure all names are listed.

1. Suppose we wish to avoid wasting one position in a max-heap array `pg[]`, putting the largest value in `pg[0]` (instead of `pg[1]`), its children in `pg[1]` and `pg[2]`, and so forth, proceeding in levelorder. Give expressions for the index of the parent, left child, and right child of a node at index `k` where `pq[k]` is valid?

2. Build a max-heap using the input sequence of values $4, 5, 8, 2, 1, 4, 9, 7, 3$. Show all steps.

3. Draw all of the unique binary min-heaps with the keys $1, 2, 3, 4$.

4. For a min-heap implemented as a complete binary tree array, give an algorithm (in pseudocode) that implements a *find maximum* function which returns (but does not remove) the maximum value from a min-heap. State the *exact* number of elements that must be analyzed in an n-size heap with this operation; we are not seeking the complexity of this operation.