6.18 A **min-max heap** is a data structure that supports both `deleteMin` and `deleteMax` in $O(\log N)$ per operation. The structure is identical to a binary heap, but the heap-order property is that for any node, X, at even depth, the element stored at X is smaller than the parent but larger than the grandparent (where this makes sense), and for any node X at odd depth, the element stored at X is larger than the parent but smaller than the grandparent. See Figure 6.57.

a. How do we find the minimum and maximum elements?

*b. Give an algorithm to insert a new node into the min-max heap.

*c. Give an algorithm to perform `deleteMin` and `deleteMax`.

*d. Can you build a min-max heap in linear time?

**e. Suppose we would like to support `deleteMin`, `deleteMax`, and `merge`. Propose a data structure to support all operations in $O(\log N)$ time.