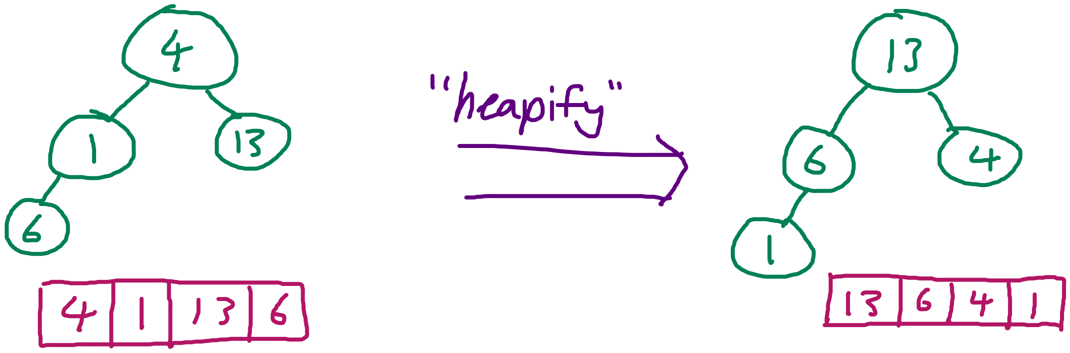
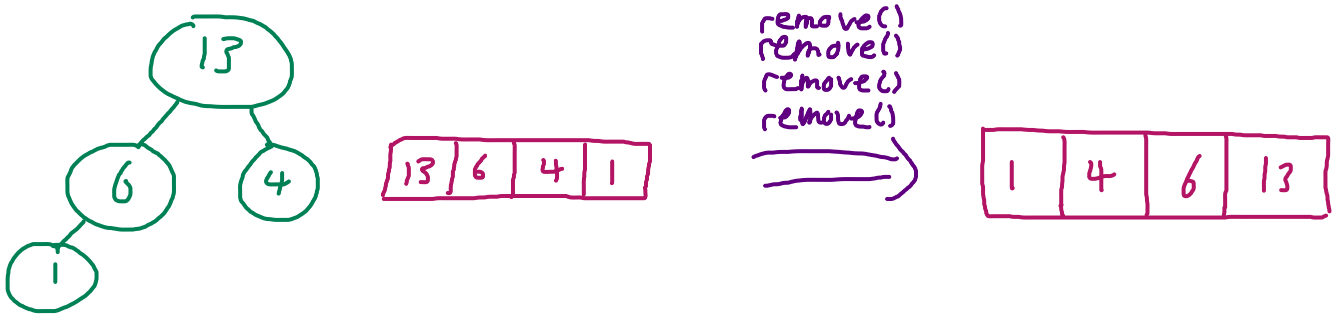
Heap Sort

1. Transform input array into a complete tree (later converted into a max-heap).

2. Starting from right → left, do "bottom-up heapification" (sink each node w/ max-heap priority); this organizes tree into max-heap.



3. Repeat N times: remove highest priority item and place item at end of heap array (sorting in place).



Memory? $\Theta(1)$ ← in place

Runtime?

Best case: $\Theta(N)$ ← if all elements same, sink and remove are constant operations.

Avg: $\Theta(N \log N)$ ← heapify = N "sinks" = $N \cdot O(\log N) = O(N \log N)$

N removes = $N \cdot O(\log N) = O(N \log N)$