

# heaps

heap = yiqin (priority queues)

find\_min  $\rightarrow O(1)$

other operations  $O(\log N)$

complete binary tree,  
represented as an array

(we start  
with index 1)

insertion (move the to  
the root) (parent) moving up

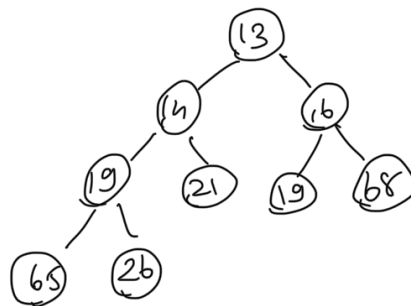
parent < children (min heap)

parent > children (max heap)

deletion  $\rightarrow$  moving down

$\hookrightarrow$  delete the root value  
move the last leaf to the root  
move it down with comparing  
check the balancing of the tree

$\frac{ind}{2} \rightarrow$  parent



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normally  $N \log N$   
build heap  $O(N)$

search element } BST  $\rightarrow \log N$   
Heap  $\rightarrow N$  (min  $O(1)$ )







