Handwriting Assignment #1 2018l6912 컴퓨터과학과 김연호.

(1) (B)

(2) $O(\log N)$

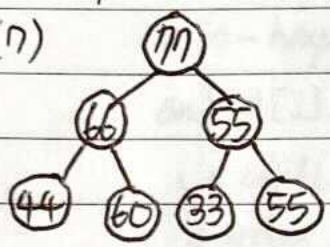
(3) $O(N \log N)$

(4) $O(\log N)$

(5) $O(N \log N)$

(6) check the leaf nodes. Divide the heap in half, check the down part nodes. worst case : $O(\frac{N}{2}) \Rightarrow O(N)$

(7)



(8) Minimum : Only one node in last level

In a heap of height h: $2^0+2^1+2^2+\cdots+2^{h-2}+2^{h-1}+1$

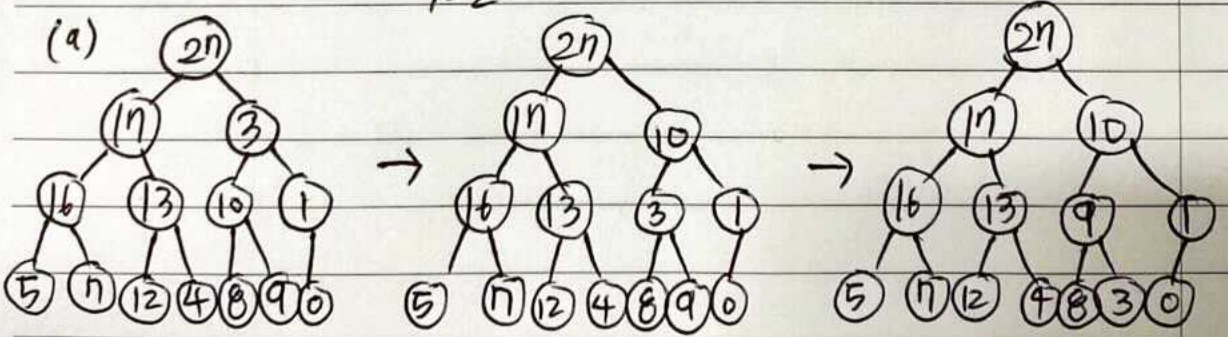
Use Σ, $\frac{1-2^h}{1-2}+1 = 2^h-1+1 = 2^h$

Maximum : All node in last level

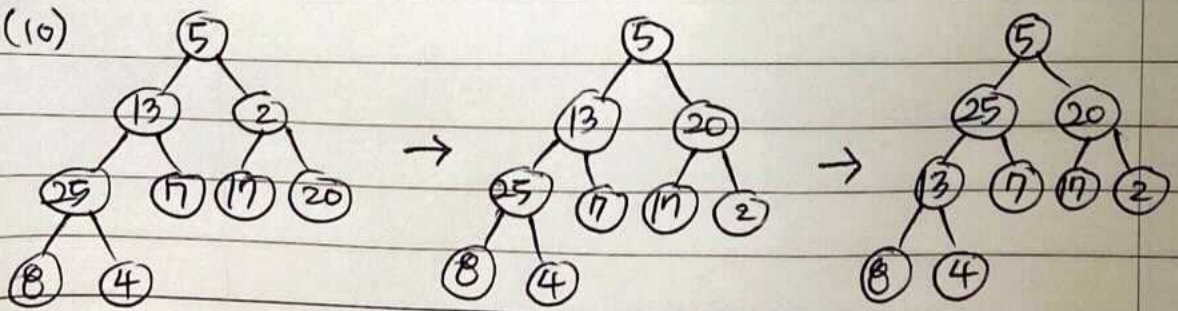
In a heap of height h : $2^0+2^1+2^2+\cdots+2^{h-1}+2^h$

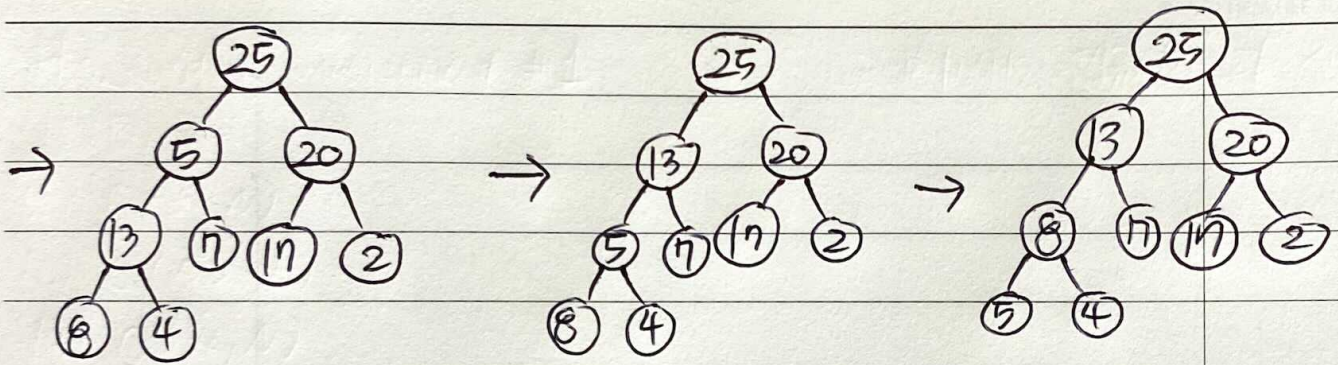
Use Σ, $\frac{1-2^{h+1}}{1-2} = 2^{h+1}-1$

(9)



(10)





11. Yes. An array sorted in ascending order has the property that $A[i] \leq A[j]$ $(i<j)$

Min-heap has property that for all node i $A[i] \leq A[\text{child\_left}(i)]$ and $A[i] \leq A[\text{child\_right}(i)]$, when $i < \text{child\_left}(i)$ and $i < \text{child\_right}(i)$.

Therefore, A sorted in ascending order array is Min-heap.

12. (a). root is always the maximum or minimum.