

HW 3

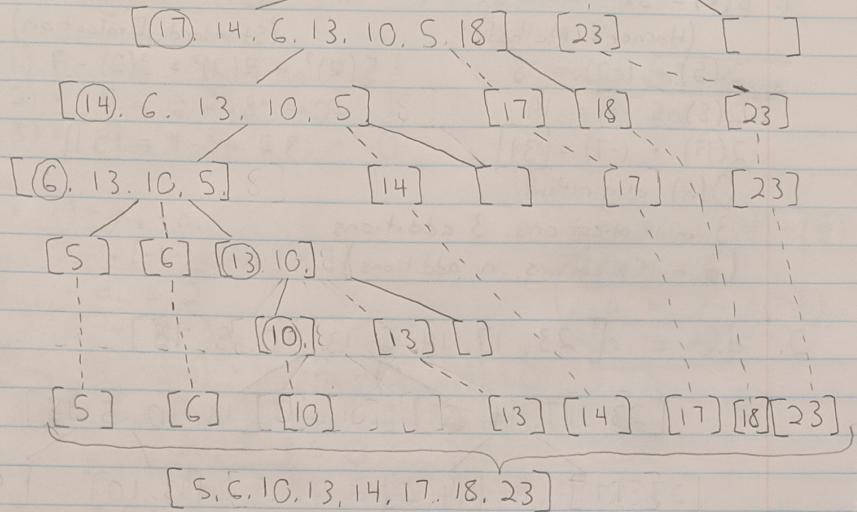
2. a.

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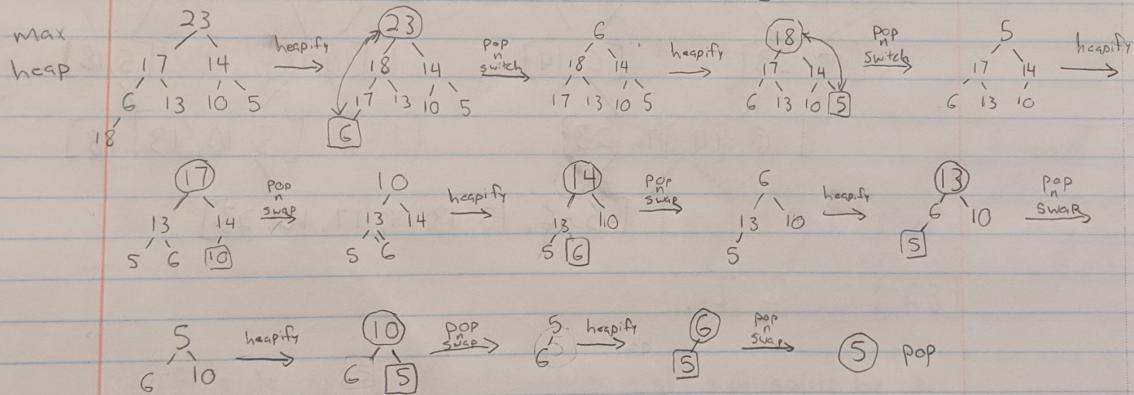
graph TD
    Root["[23, 17, 14, 6, 13, 10, 5, 18]"] --> L1L["[23, 17]"]
    Root --> L1R["[14, 6, 13, 10, 5, 18]"]
    L1L --> L2L1["[23]"]
    L1L --> L2L2["[17]"]
    L2L1 --- L2L2
    L2L2 --> L3L1["[17, 23]"]
    L1R --> L2R1["[14]"]
    L1R --> L2R2["[6, 13, 10, 5, 18]"]
    L2R1 --> L3R1["[C, 14]"]
    L2R2 --> L3R2["[10, 13]"]
    L2R2 --> L3R3["[5, 18]"]
    L3R2 --- L3R3
    L3R2 --> L4R1["[5, 10, 13, 18]"]
    L3R3 --> L4R2["[5, 6, 10, 13, 14, 17, 18, 23]"]

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b. choosing first element as pivot  $[23, 17, 14, 6, 13, 10, 5, 18]$



c. build max heap  $[23, 17, 14, 6, 13, 10, 5, 18]$



sorted list:  $[5, 6, 10, 13, 14, 17, 18, 23]$

$$3. T(n) = 2T\left(\frac{n}{2}\right) + \log n$$

$$T\left(\frac{n}{2}\right) = 2 \left[ 2T\left(\frac{n}{4}\right) + \log \frac{n}{2} \right] + \log n$$

$$\text{so } T(n) = 2^i \left(\frac{n}{2^i}\right) + 2^{i-1} \sum_{k=1}^i \log \left(\frac{n}{2^k}\right) + \log n$$
$$= n + 2^{i-1} \sum_{k=1}^i \log \left(\frac{n}{2^k}\right) + \log n$$

and  $n$  dominates  $\log n$

$$\text{so } T(n) = \Theta(n)$$