

Priority Queue - II



Connect n ropes with minimum cost

$a[] = \{4, 1, 2, 5, 3, 7\} \rightarrow$
 $\uparrow \quad \uparrow \quad \downarrow$
connect

Cost = $4+1 \rightarrow 5$ $[5, 2, 5, 3, 7]$
 $5+2 \rightarrow 7$ $[7, 5, 3, 7]$
 $7+5 \rightarrow 12$ $[12, 3, 7]$
 $12+3 \rightarrow 15$ $[15, 7]$
 $15+7 \rightarrow 22$ $[22]$

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$a[] = \{ 4, 1, 2, 5, 3, 7 \}$

$$\text{Cost} = 1+2 = 3 \quad [4, 3, 5, 3, 7]$$

$$3+3 = 6 \quad [4, 6, 5, 7]$$

$$4+5 = 9 \quad [9, 6, 7]$$

$$6+7 = 13 \quad [9, 13]$$

$$9+13 = 22 \quad [22]$$

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$$a > b > c$$

$$a+b$$

$$(a+b, c)$$

$$a+b+c$$

$$(a+b+c)$$

$$\underline{2a+2b+c} = c_1$$

$$b+c$$

$$(b+c, a)$$

$$a+b+c$$

$$(a+b+c)$$

$$\underline{a+2b+2c} = c_2$$

$$\underline{2a+\cancel{2b}+c} = \frac{c_2}{a+2b+2c}$$

$$\boxed{\begin{array}{c} a > c \\ c_1 > c_2 \end{array}}$$

cost = 3

$3+3=6$

$n \log n + n(\log n + n) =$

$\boxed{O(n^2)}$

$a[] = [4, 1, 2, 5, 3, 7]$

↓ sort

$[1, 2, 3, 4, 5, 7]$

$[3, 3, 4, 5, 7]$

$[4, 5, 6, 7]$

\equiv

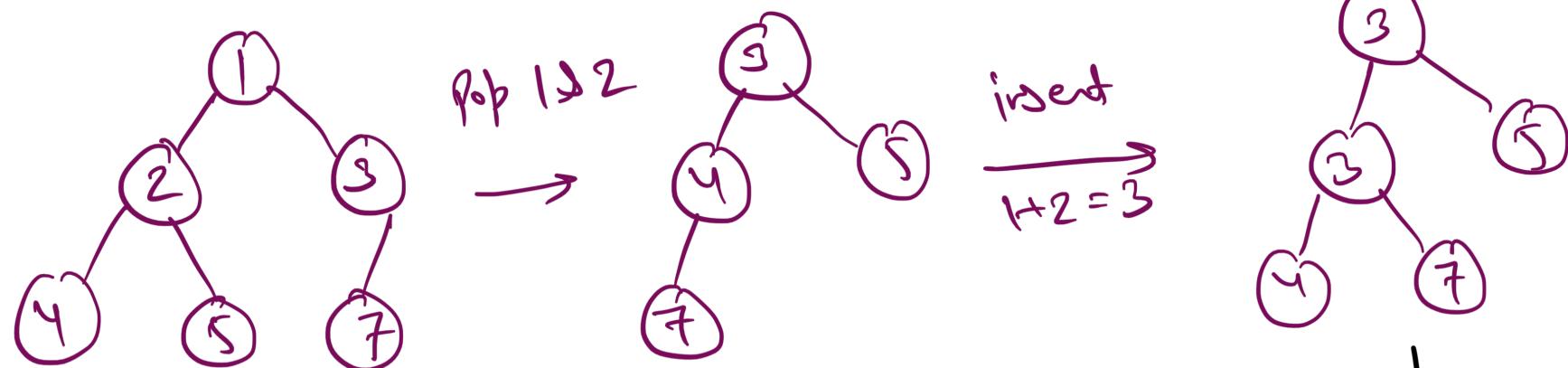
$O(n^2)$

Brute force

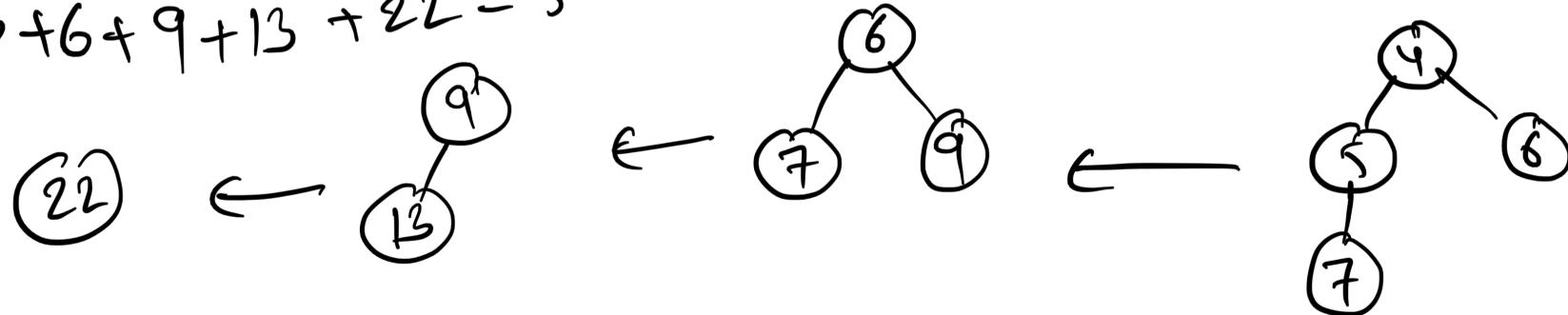
min heap

$n \log n$

$a[] = \{4, 1, 2, 5, 3, 7\} \rightarrow$



$$Cost = 3 + 6 + 9 + 13 + 22 = 53$$



Split Array in k subarrays where the maximum sum is minimum

$a[] = \{ 1, 4, 2, 3, 7, 2, 4, 5, 6, 3 \}$
 $k = 3$

$1+2+3$
 $+7$
13
→

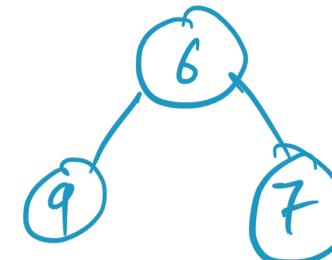
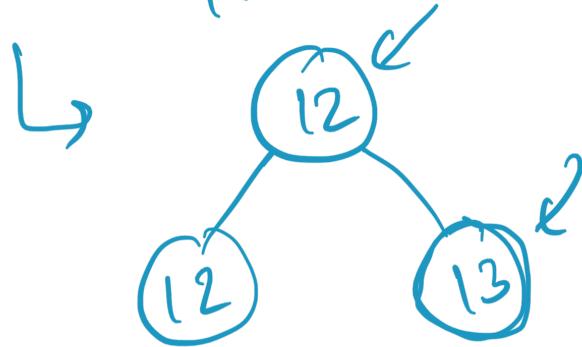
$4+2$
 $+6$
12

$4+5$
 $+3$
12

Sort the array

$a[] = \{1, 2, 2, 3, 3, 4, 4, 5, 6, 7\}$

$k = 3$



$$5 + 7 = 9$$

minheap

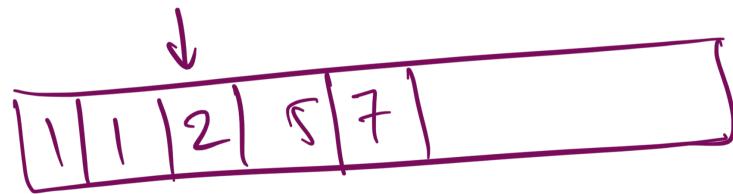
$\begin{bmatrix} 7, 3 \\ 2 \end{bmatrix}$
12

$\begin{bmatrix} 6, 4 \\ 2, 1 \end{bmatrix}$
12

$\begin{bmatrix} 5, 4 \\ 3 \end{bmatrix}$
12

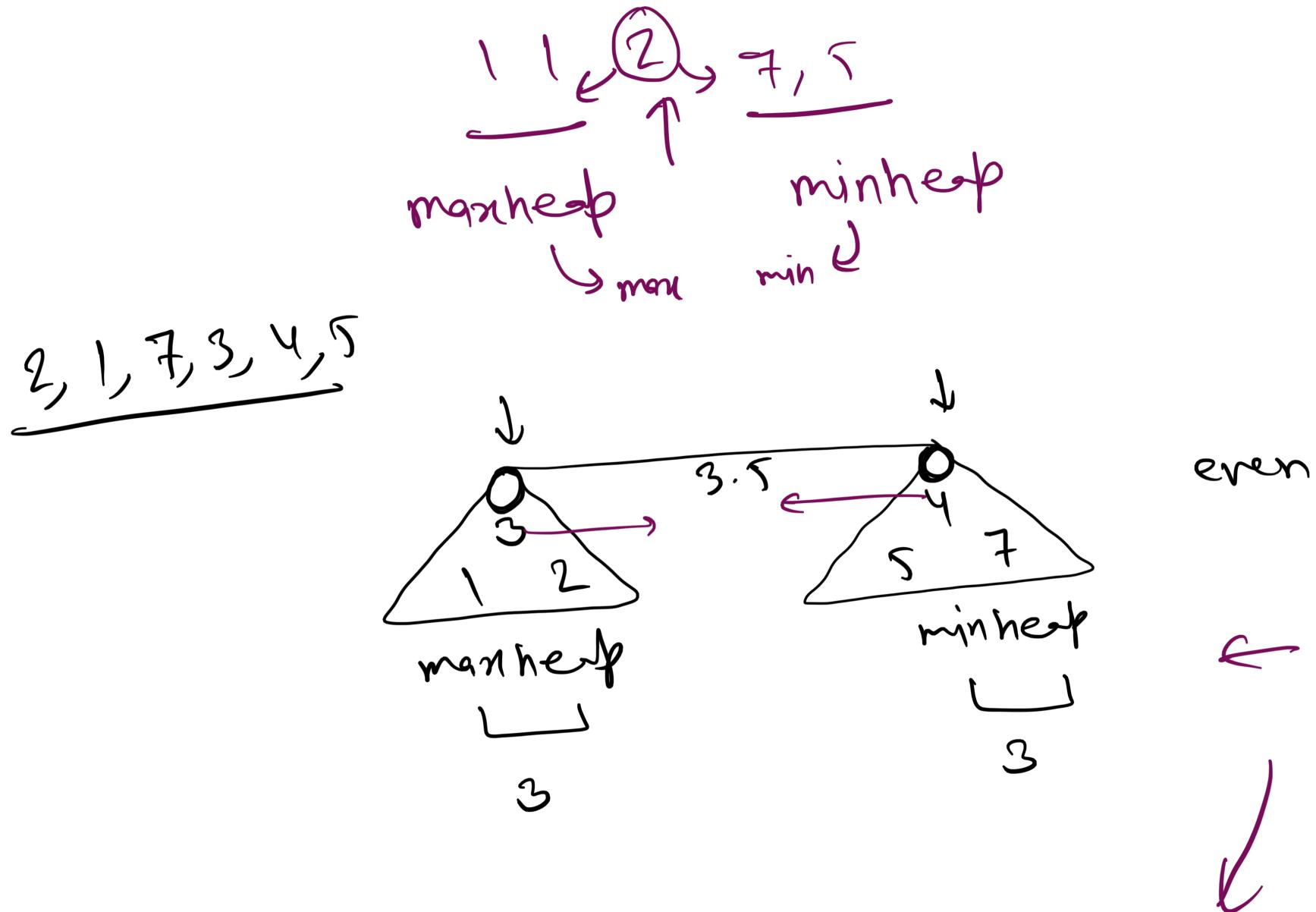
Find the median in a running stream of numbers.

$$a[] = \{ 5, 1, 2, 7, 1 \}$$

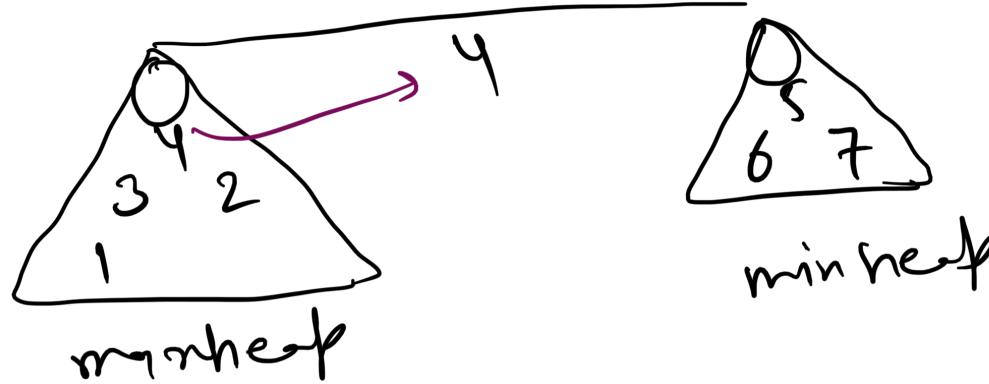


insert $\rightarrow O(n)$
median $\rightarrow O(1)$

main () {
 → insert (20);
 → insert (10)
 → median()
 → insert (20)
 → median()
 }
 y



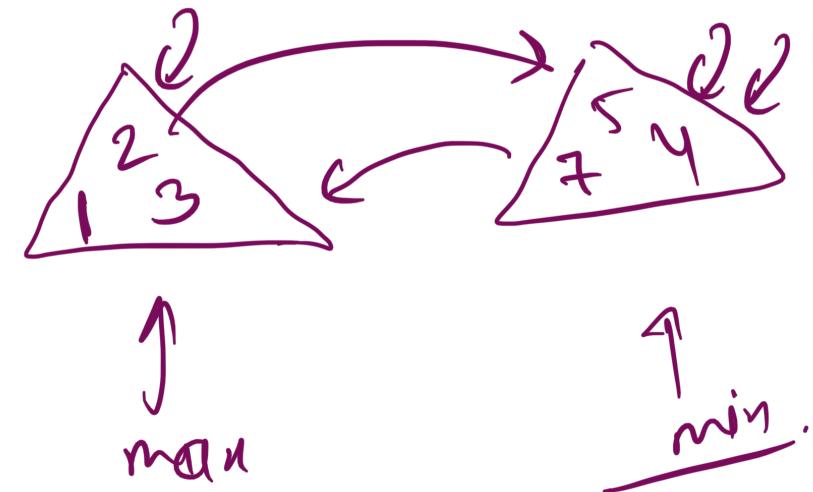
1, 2, 3, 4, 5, 6, 7



odd

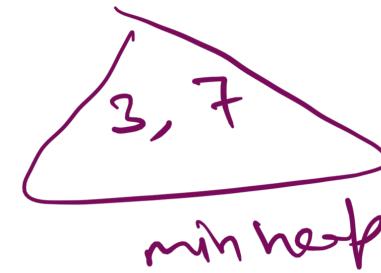
boolean even = false

2, 1, 7, 3, 4, 5



even = f

3, 1, 7, 3, 4, 5



Practice Problems

1. Merge k sorted lists
2. Check if a given array represents a binary heap
3. [Magician and chocolates](#)
4. [N max pair combinations](#)
5. <https://www.interviewbit.com/courses/programming/heaps-and-maps>