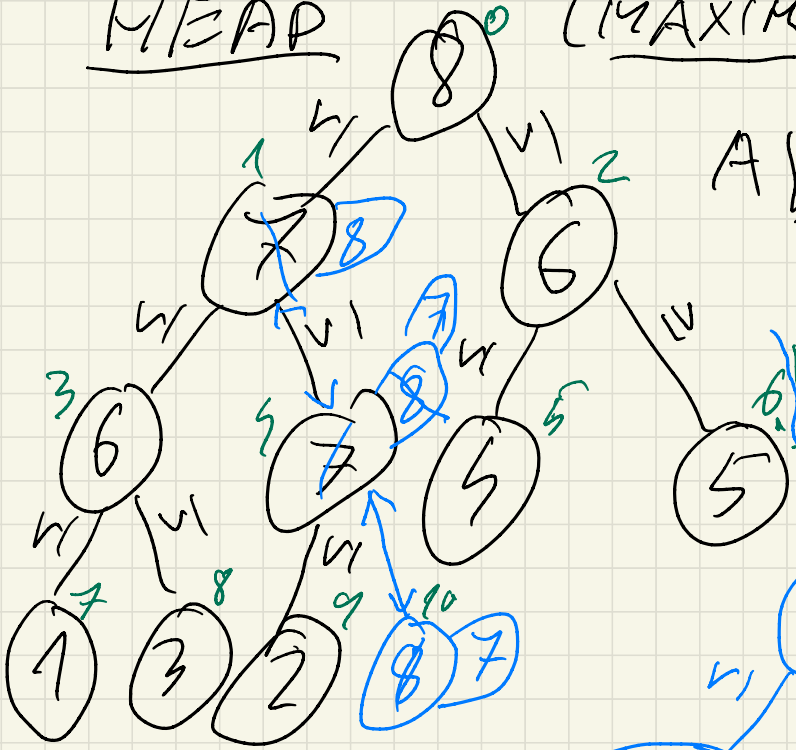
HEAPS

Priority Queues

HEAPSORT

Apr 20
2021

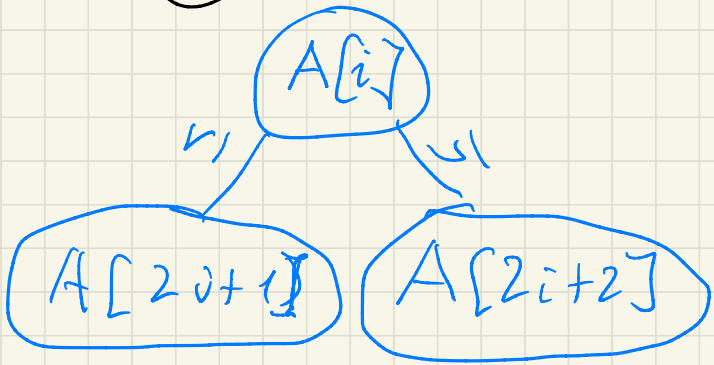
HEAP (MAXIMUM HEAP)

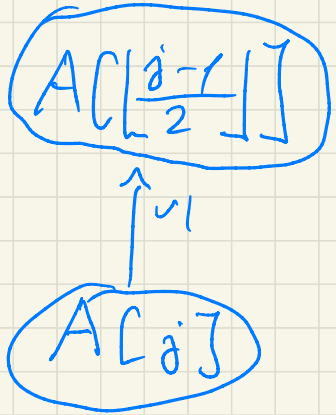


	0	1	2	3	4	5	6	7	8	9	10
A	8	7	6	6	7	5	1	3	2	8	

2. 1.

A											
	8	8	6	6	7	5	5	1	3	2	7





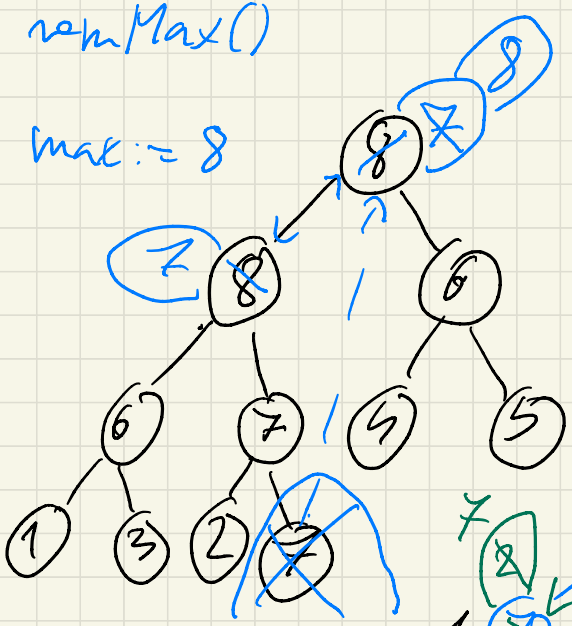
add(8)

$MT_{add}(n) \in \Theta(\log n)$

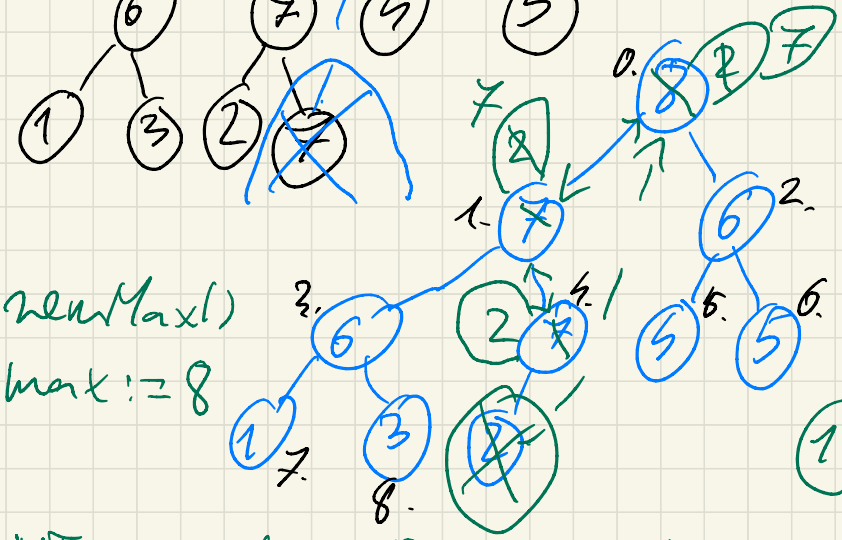
$mT_{add}(n) \in \Theta(1)$

remMax()

max := 8

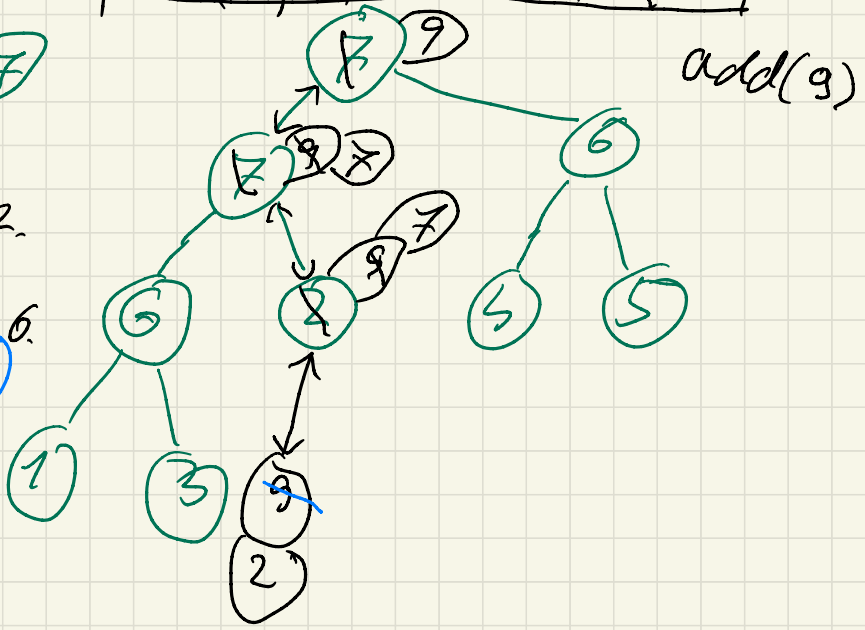


	0	1	2	3	4	5	6	7	8	9
A	8	6	6	6	7	4	5	1	3	2
	7	7	6	6	7	4	5	1	3	2
	7	7	6	6	2	4	5	1	3	
	9	7	6	6	7	4	5	1	3	2



remMax()

max := 8



add(9)

$MT_{remMax}(n) \in \Theta(\log_2 n)$

Priority Queues

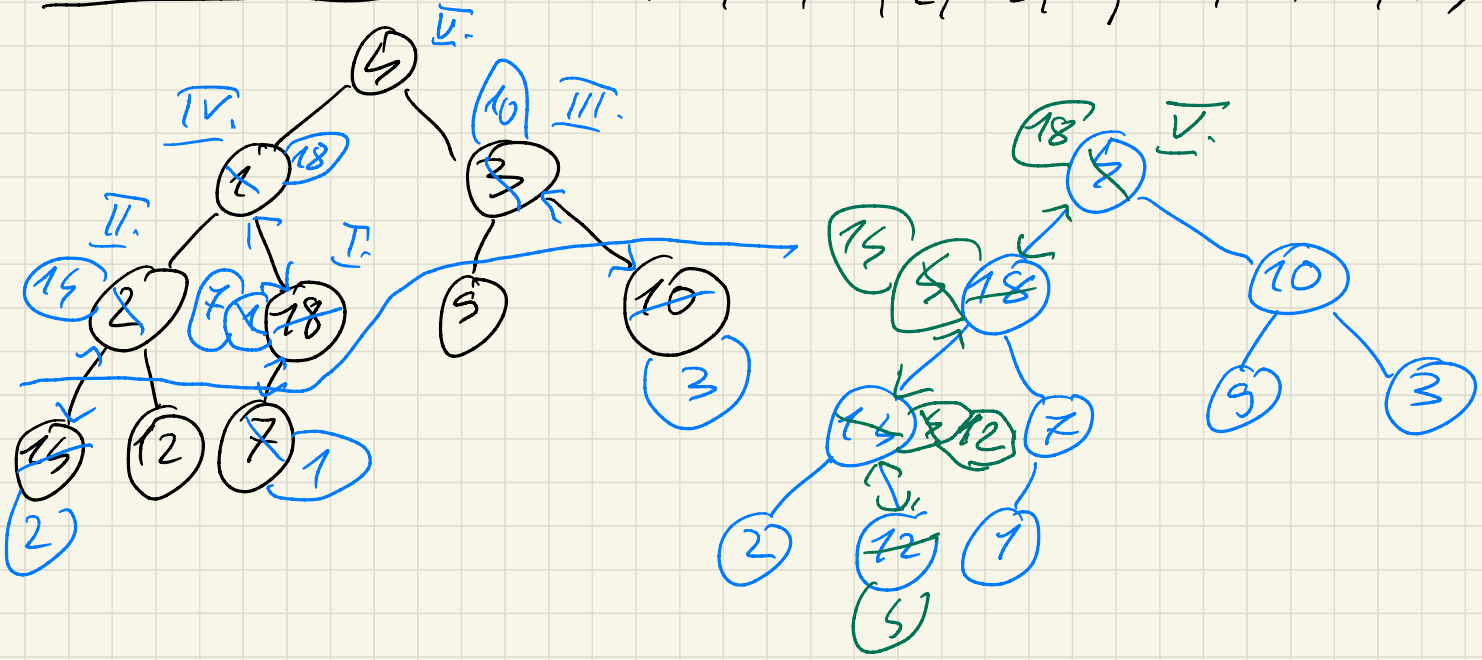
PrQueue

- $-A : \mathcal{T}[\,]$ ...
- $-n : \mathbb{N}$

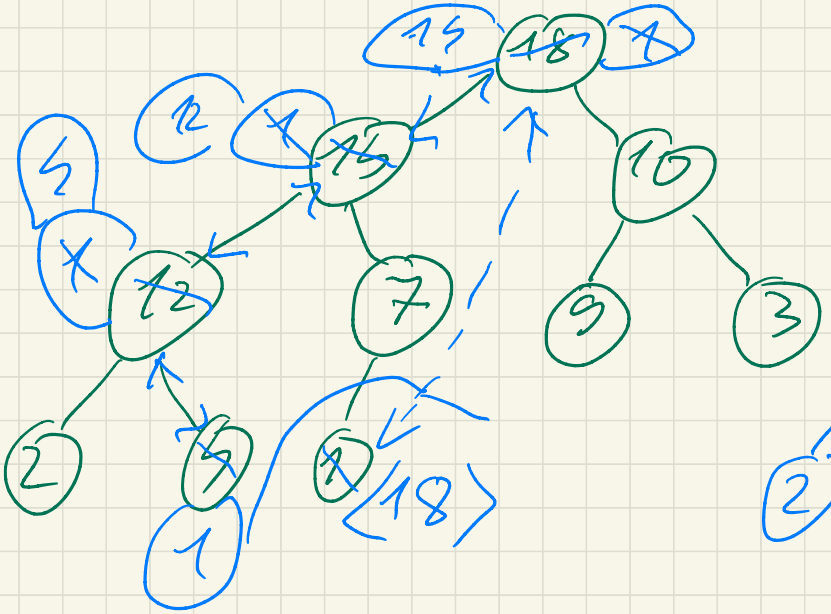
	RUNTIME:
$+\text{PrQueue}(m : \mathbb{N})$	$\Theta(1)$
$+\text{add}(x : \mathcal{T})$	$\Theta(\log n)$
$+\text{remMax}() : \mathcal{T}$	$\Theta(\log n)$
$+\text{max}() : \mathcal{T}$	$\Theta(1)$
$+\text{isEmpty}() : \mathbb{B}$	$\Theta(1)$
$+\text{isFull}() : \mathbb{B}$	
$+\text{setEmpty}()\{n := 0\}$	
$+\sim\text{PrQueue}()$	

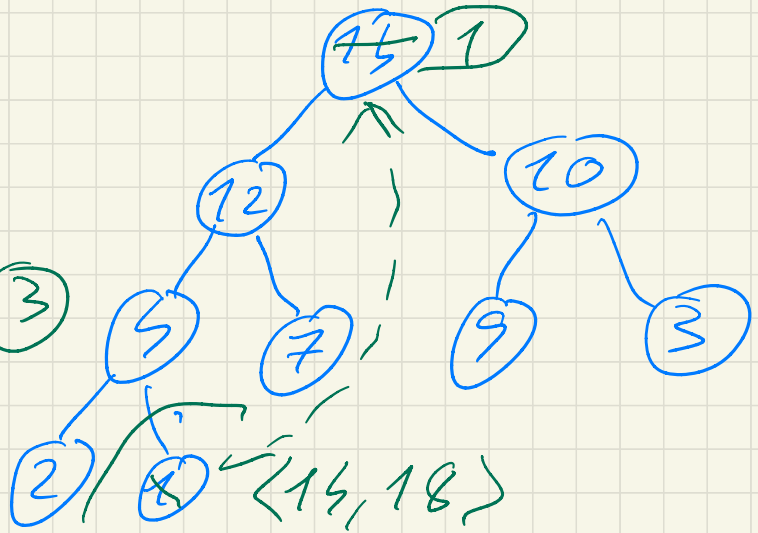
HEAP SORT

$A = \langle 4, 1, 3, 2, 18, 9, 10, 14, 12, 7 \rangle$



HEAP: $\{A = \langle 18, 14, 10, 12, 7, 9, 3, 2, 4, 1 \rangle$





$MT(n) \in \Theta(n \cdot \log n)$

HeapSort

We go on until the heap consists of a single item. Then the array is sorted.