

CS210

Discussion

Week 8

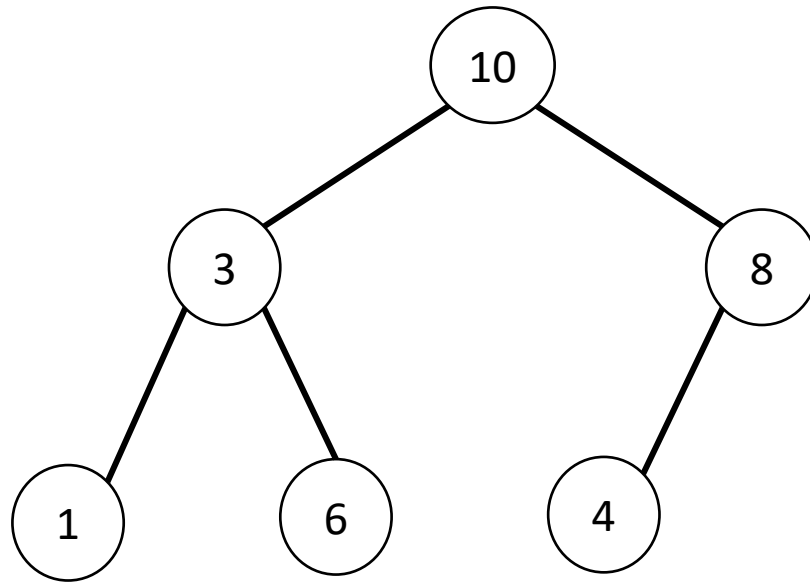
Attendance



Today

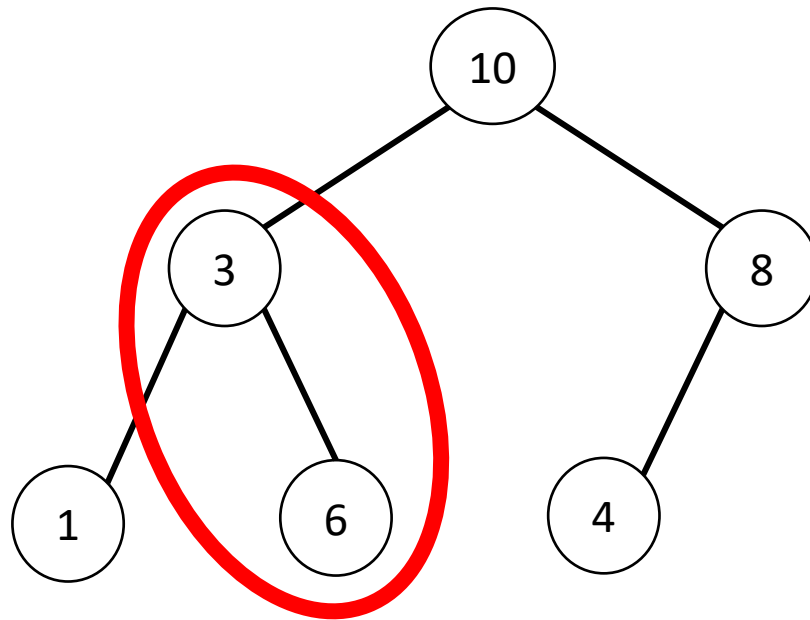
- Certify heap
- Ramanujan's taxi
- Exercise hints
- Finish through exercise 3
 - Show us passing Gradescope tests to leave early

Certify Heap



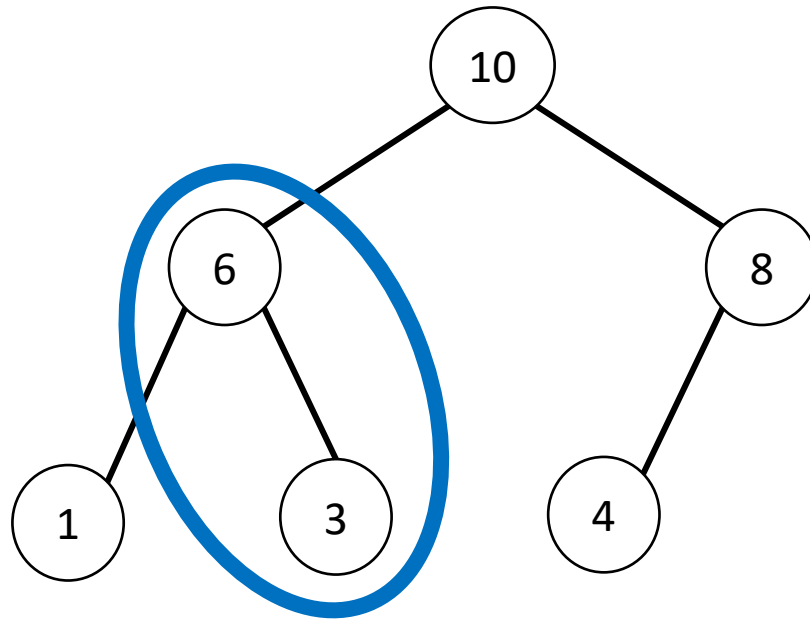
Is this a Max-Heap?

Certify Heap

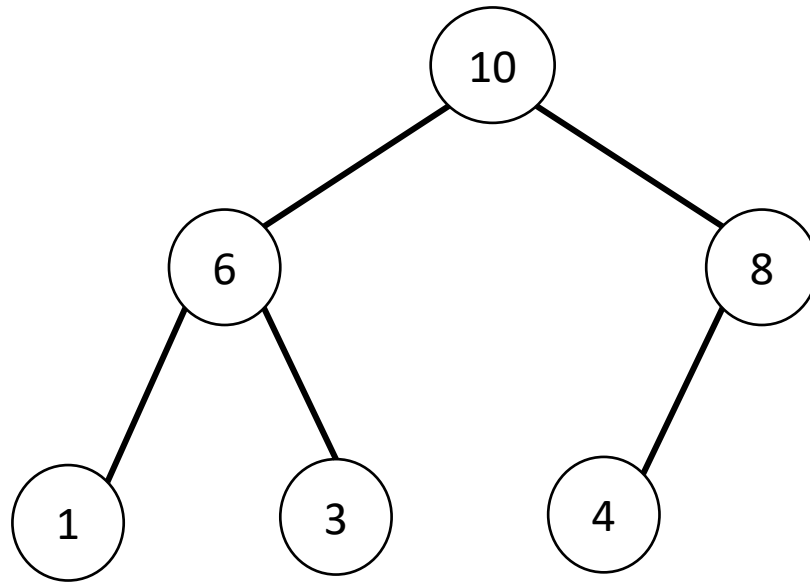


Is this a Max-Heap?

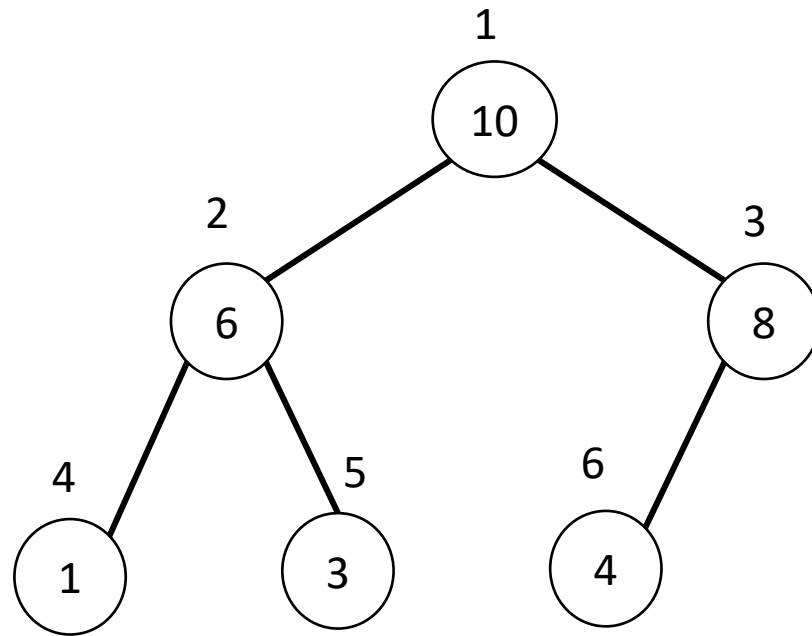
Certify Heap



Certify Heap

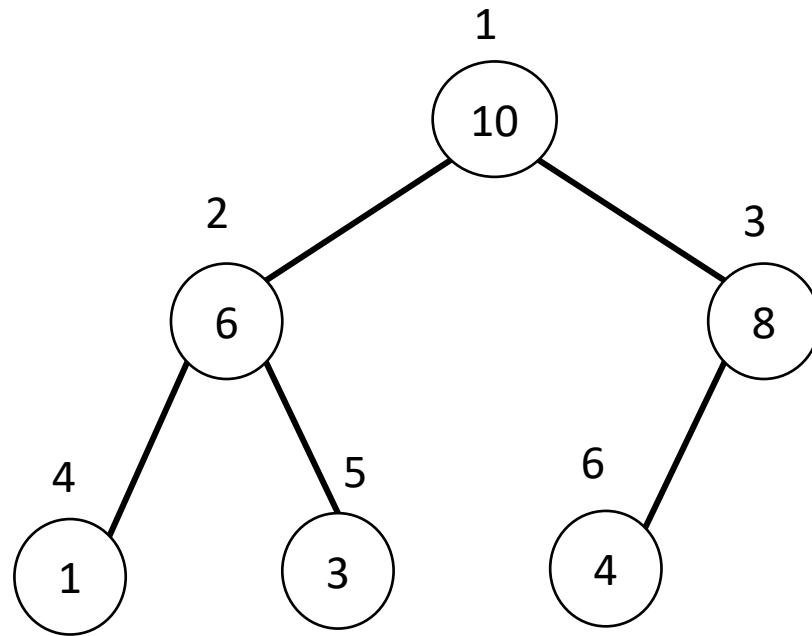


Certify Heap



[-, 10, 3, 8, 1, 6, 4]

Certify Heap

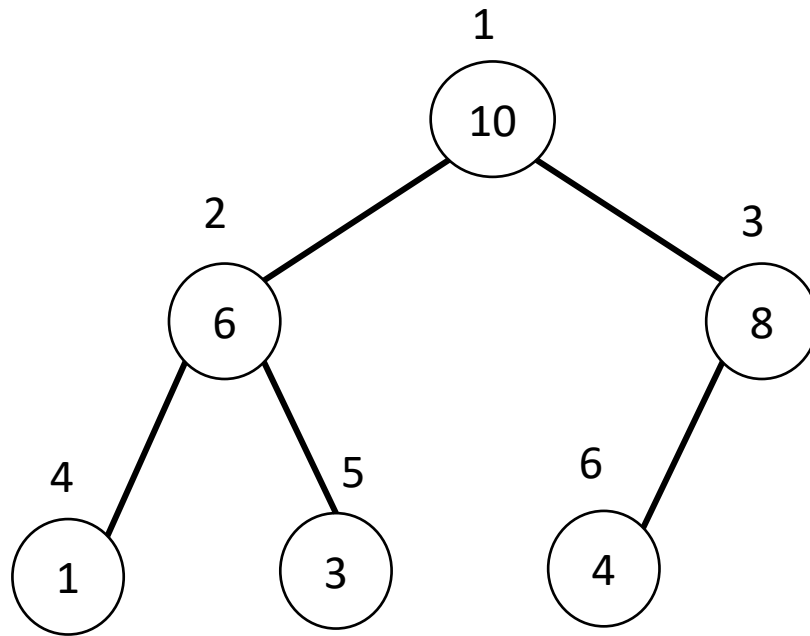


Index of left child
 $= 2 * i$

Index of right child
 $= (2 * i) + 1$

[-, 10, 3, 8, 1, 6, 4]

Certify Heap



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 $= 2 * i$

Index of right child
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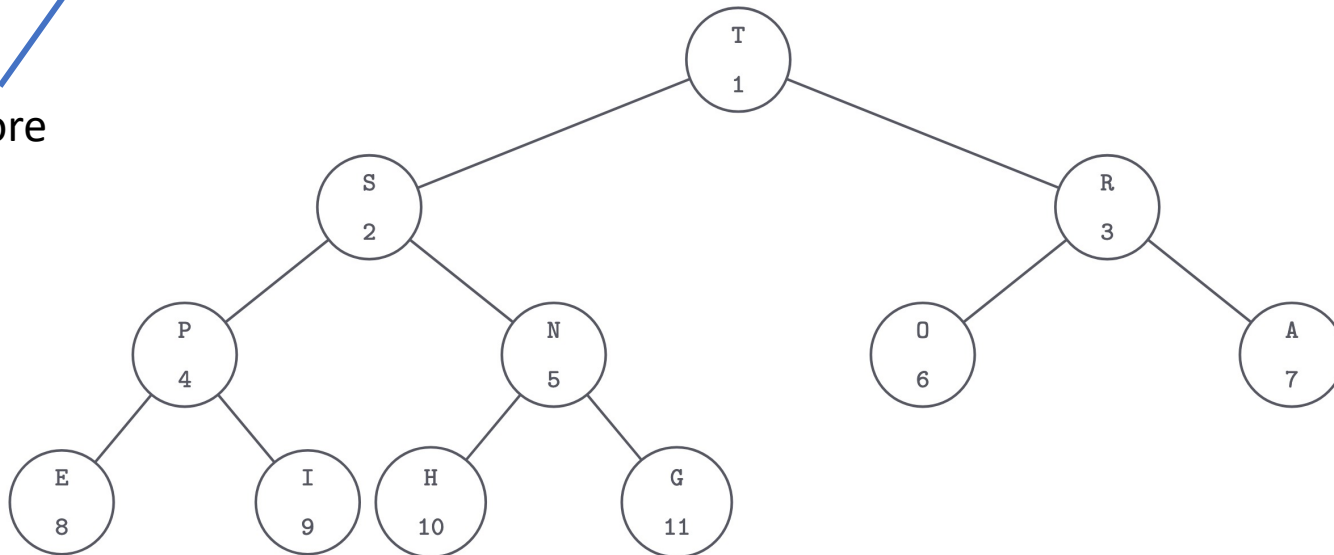
[-, 10, 3, 8, 1, 6, 4]

$2 * 2 = 4$, so index 4 & 5 are the children of 2

Certify Heap

a[]											
0	1	2	3	4	5	6	7	8	9	10	11
-	T	S	R	P	N	O	A	E	I	H	G

ignore



```
a[i].compareTo(leftChild);
```

Ramanujan's Taxi(s)

- Finding numbers below n which satisfy a certain property
- We'll do it an inefficient way first, then a more efficient way
 - Exercise 2 – Use a bunch of nested loops
 - Exercise 3 – Use a priority queue (a min heap)

$$a^3 + b^3 = c^3 + d^3 \leq n$$

$$1729 = 1^3 + 12^3 = 9^3 + 10^3$$

Questions?

Exercise Hints

- For index i in a heap's array:

- Left child index = $2 * i$
- Right child index = $(2 * i) + 1$

- For the Ramanujan's Taxi exercises:

use $x * x * x < y$ in place of $x < \text{Math.cbrt}(y)$.

- For Ramanujan's Taxi Redux

- The reason you start the min-PQ with `Pair (1,2)`, `(2,3)` ... etc, is because the `Pair (1,2)` is effectively the same as `(2,1)`
- Creating a new `Pair` object: `new Pair(i, j);`
- Remember you can access the `Pair`'s `sumOfCubes` instance variable by doing `curr.sumOfCubes`