CS210 Discussion

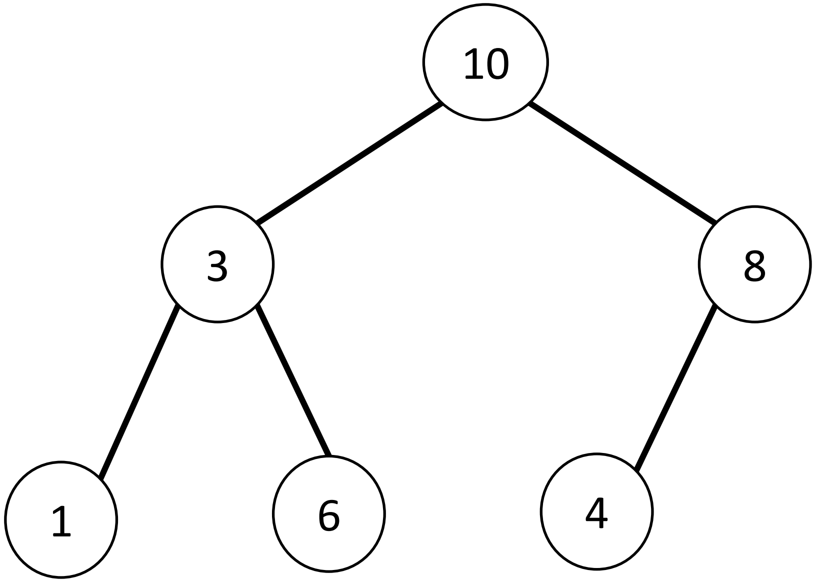
Week 8

Attendance

Today

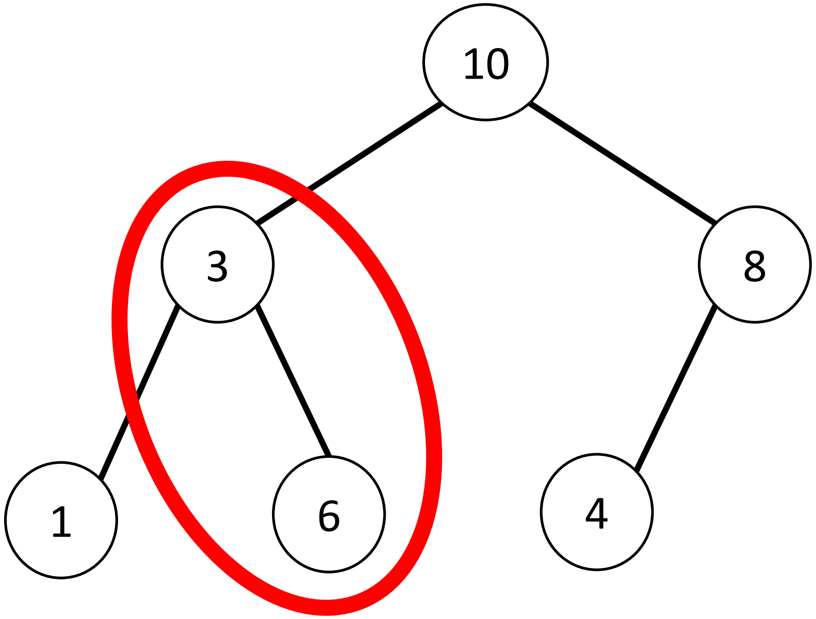
- Certify heap
- Ramanujan’s taxi
- Exercise hints
- Finish through exercise 3
    - Show us passing Gradescope tests to leave early

Certify Heap



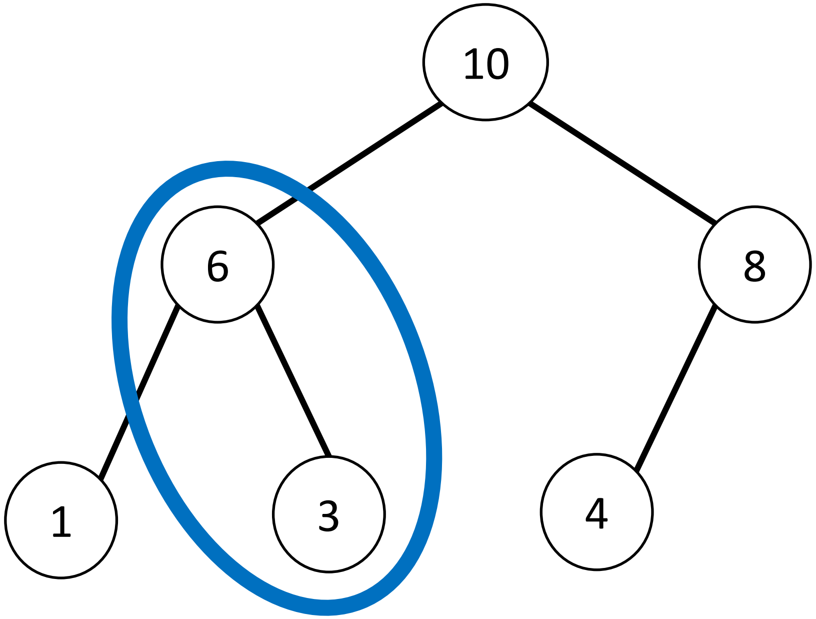
Is this a Max-Heap?

Certify Heap

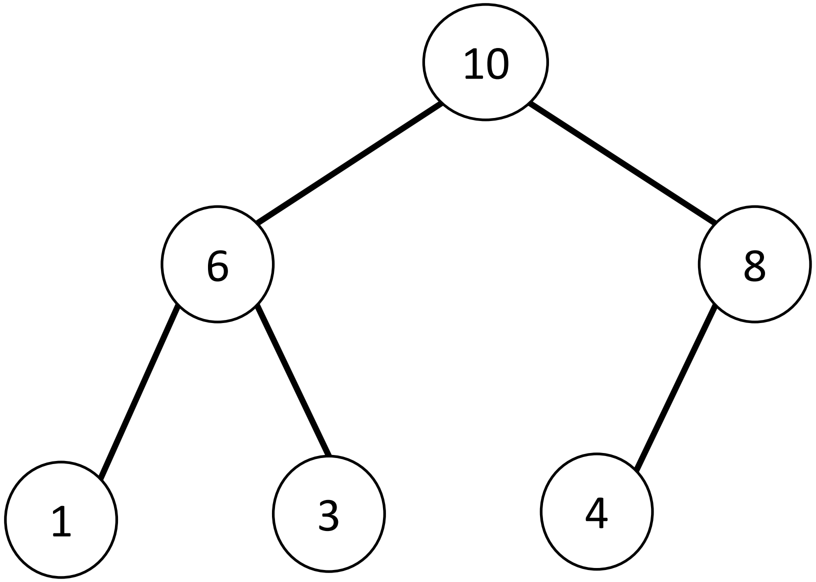


Is this a Max-Heap?

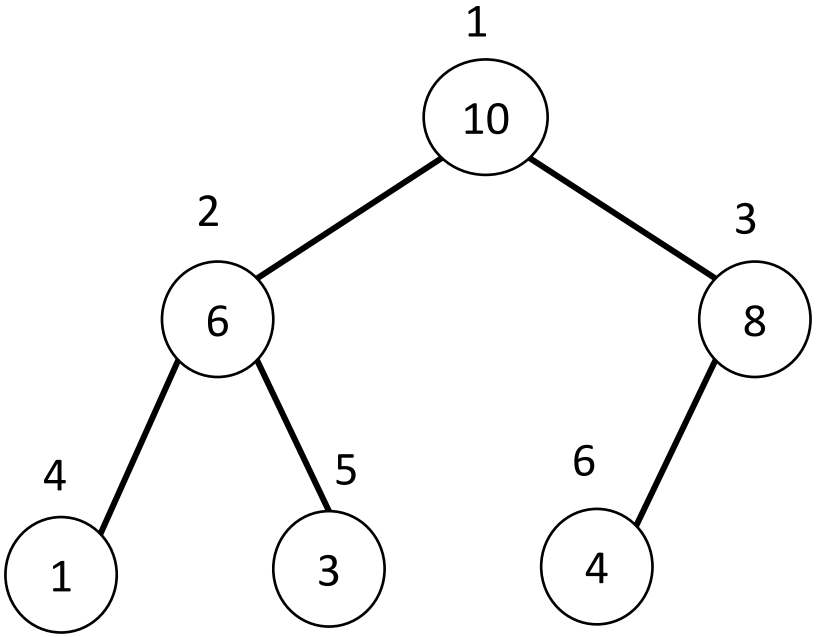
Certify Heap



Certify Heap



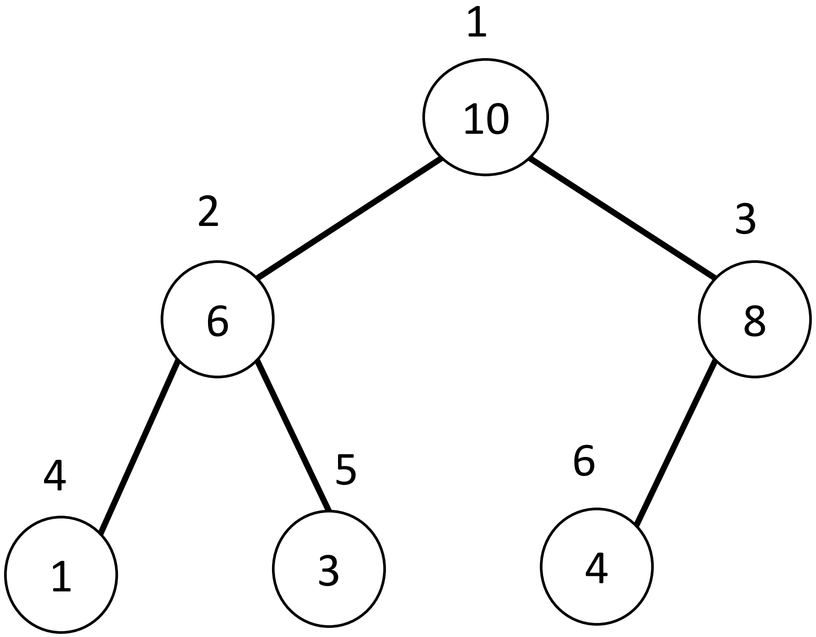
Certify Heap



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

Certify Heap

Index of left child
= 2 * i

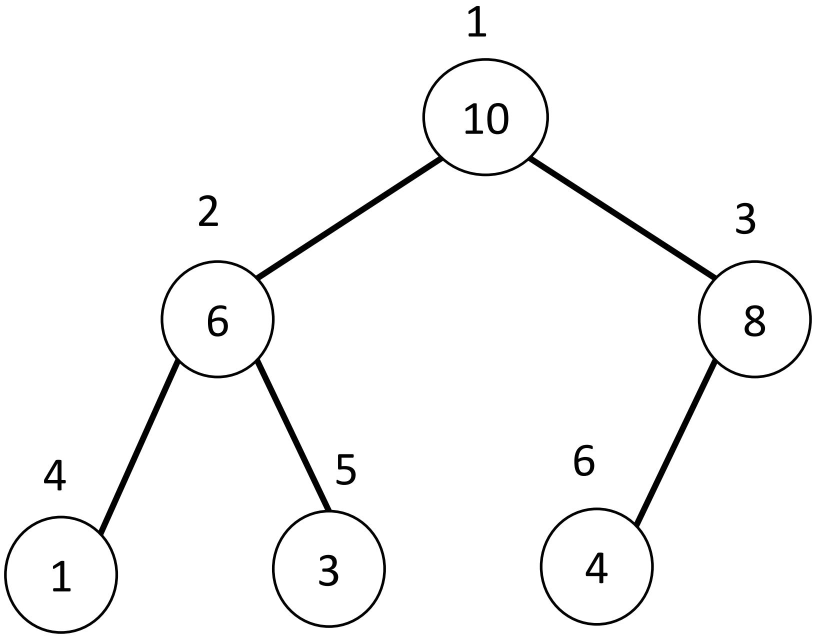


Index of right child
= (2 * i) + 1

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

Certify Heap

Index of left child
= 2 * i



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

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

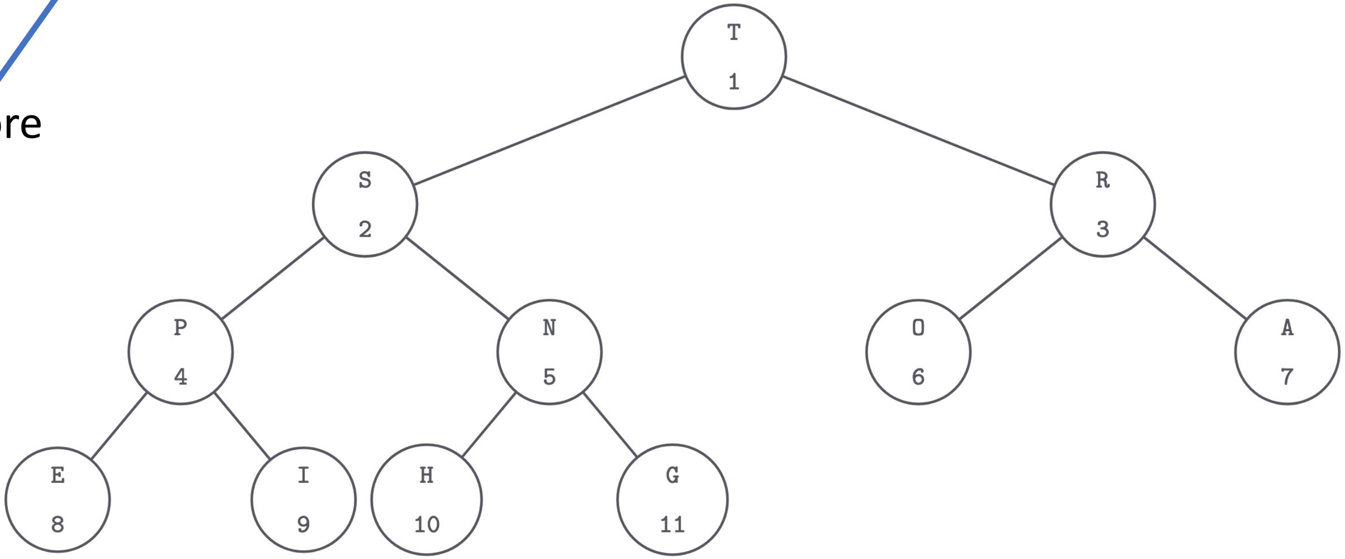
2 * 2 = 4, so index 4 & 5 are the children of 2

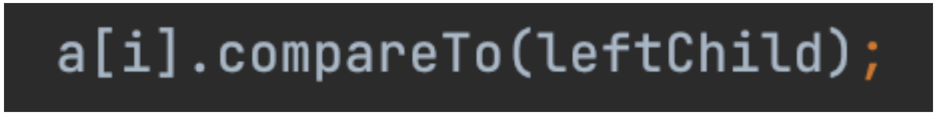
Certify Heap

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)

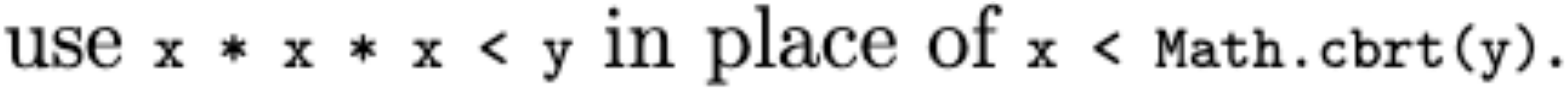
$$a^3 + b^3 = c^3 + d^3 \leq n$$

```
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 < Math.cbrt(y)`.

- For Ramanujan’s Taxi Redux
  - The reason you start the min-PQ with `Pair`s (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`