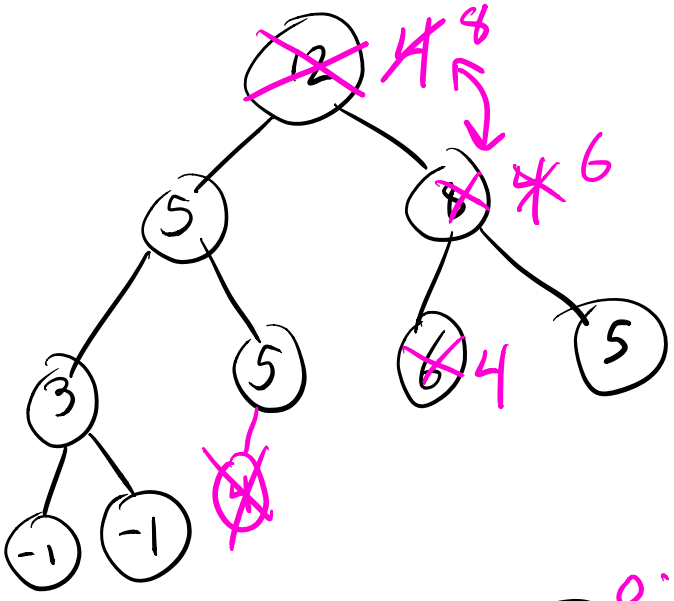


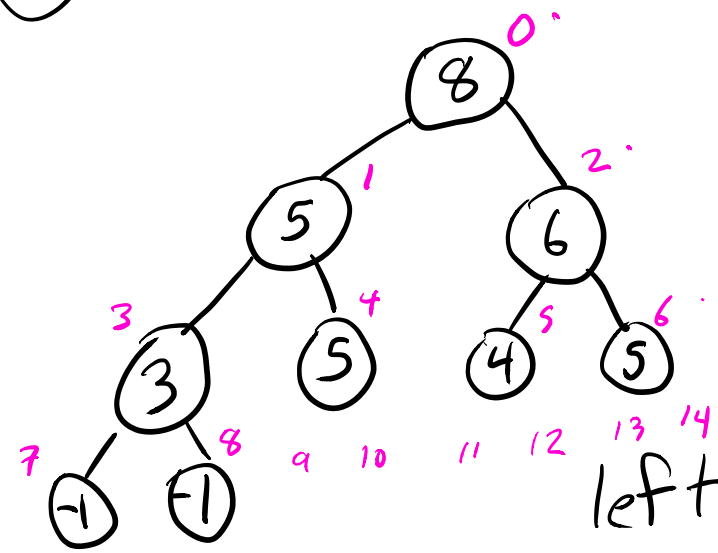
insert 4

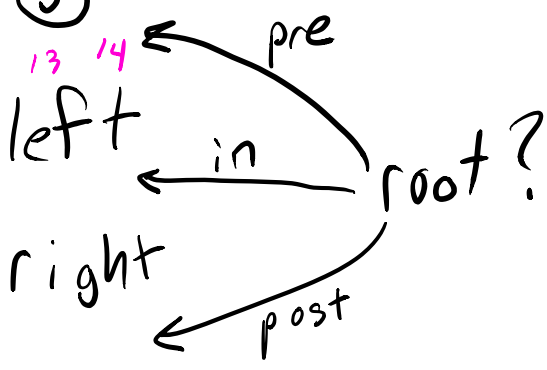
remove

in order

pre order

post order

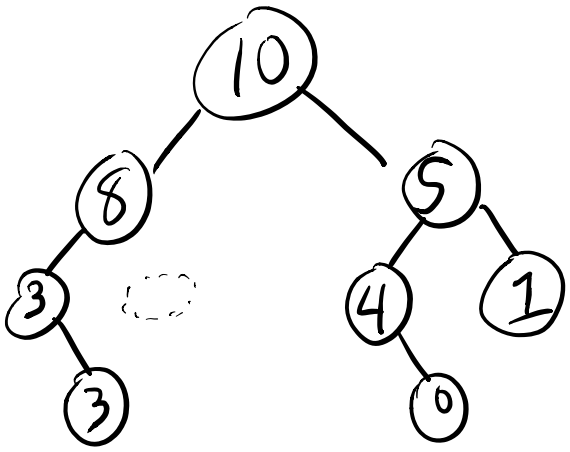




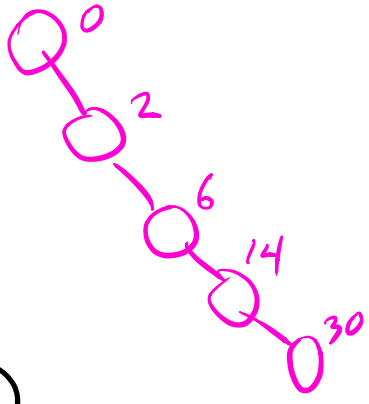
8, 5, 3, -1, -1, 5, 6, 4, 5 pre

-1, 3, -1, 5, 5, 8, 4, 6, 5 in

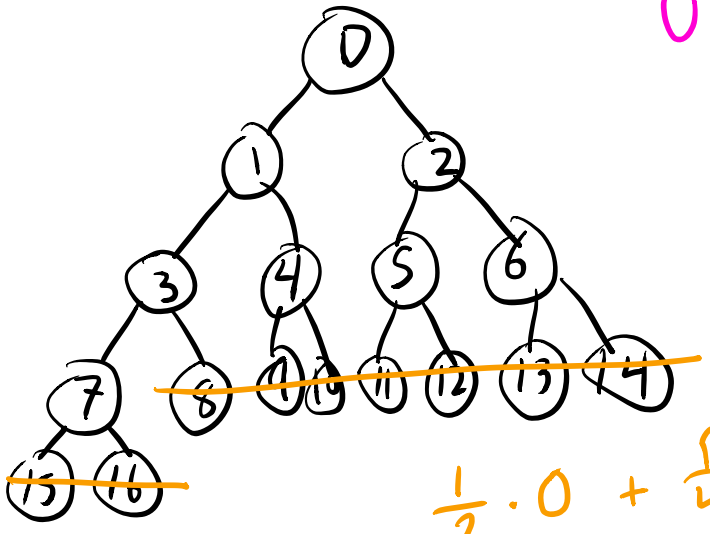
8	5	6	3	5	4	5	-1	-1



10, 8, 5, 3, ␣, 4, 1, ␣, 3, ␣, ␣, 4, 0



62 . . .



$\frac{1}{2} \cdot 0 + \frac{1}{4} \cdot 1 + \frac{1}{8} \cdot 2 + \frac{1}{16} \cdot 3$

parentIndex(index)

leftChildIndex(index)

rightChildIndex(index)

BubbleUP is $O(h) = O(\log n)$

buildHeap(list) $O(n \cdot \log n)$

```
for (p, v) in list:
    H.insert(p, v)
```

heapify (list) $O(n \log n)$

```
H.contents = list
for index in reversed(list):
    bubbleDown(index)
```