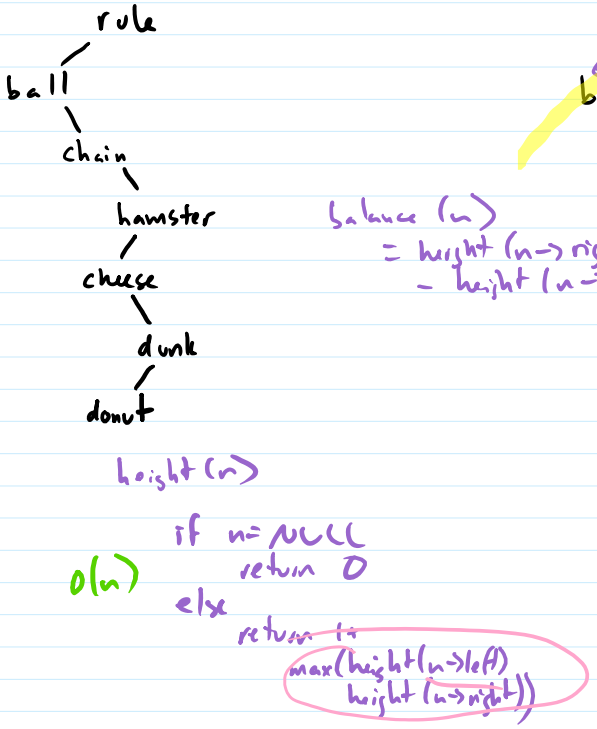
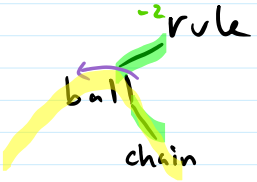
Unshapely Trees

rule ball chain hamster cheese dunk donut

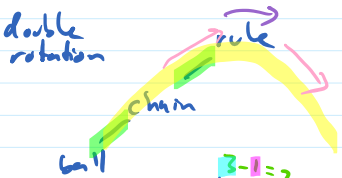


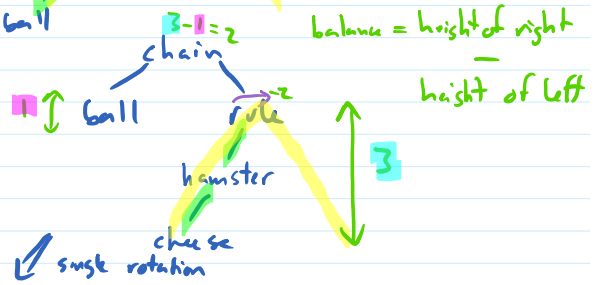

```
height(n)
    if n=NULL
        return 0
    else
        return 1+
            max(height(n->left)
                height(n->right))
```

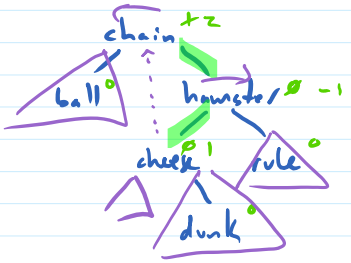
O(n)

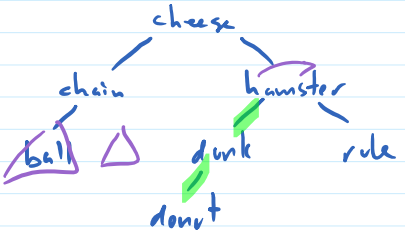


balance(n)
= height(n->right)
- height(n->left)

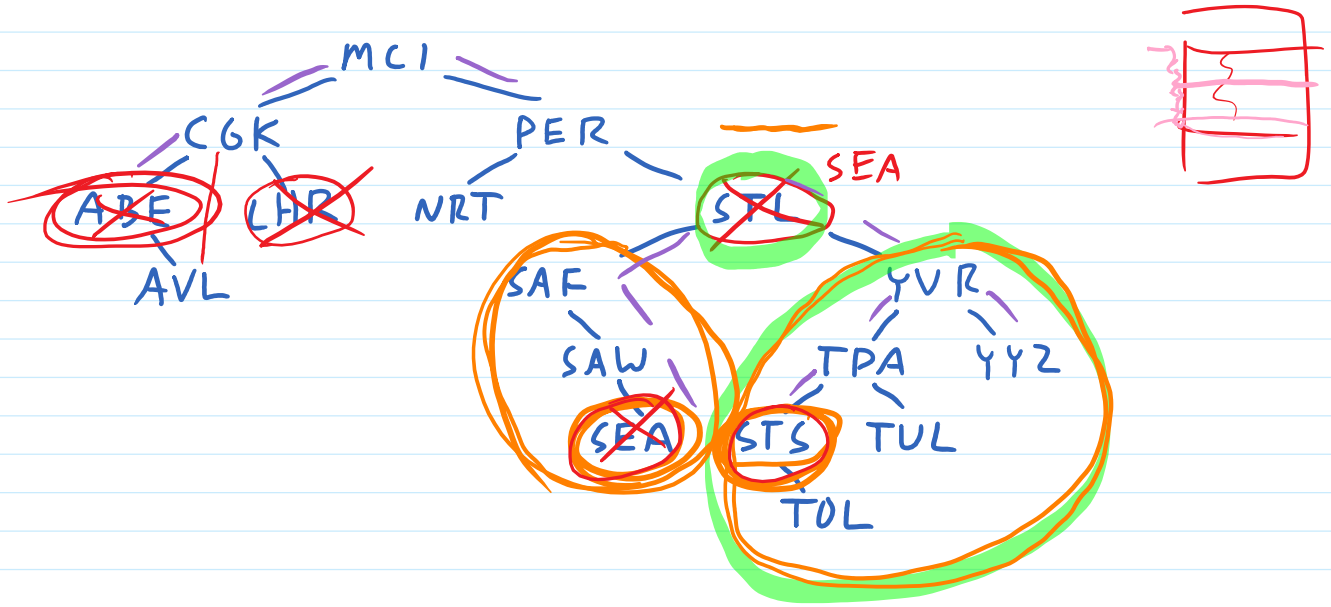






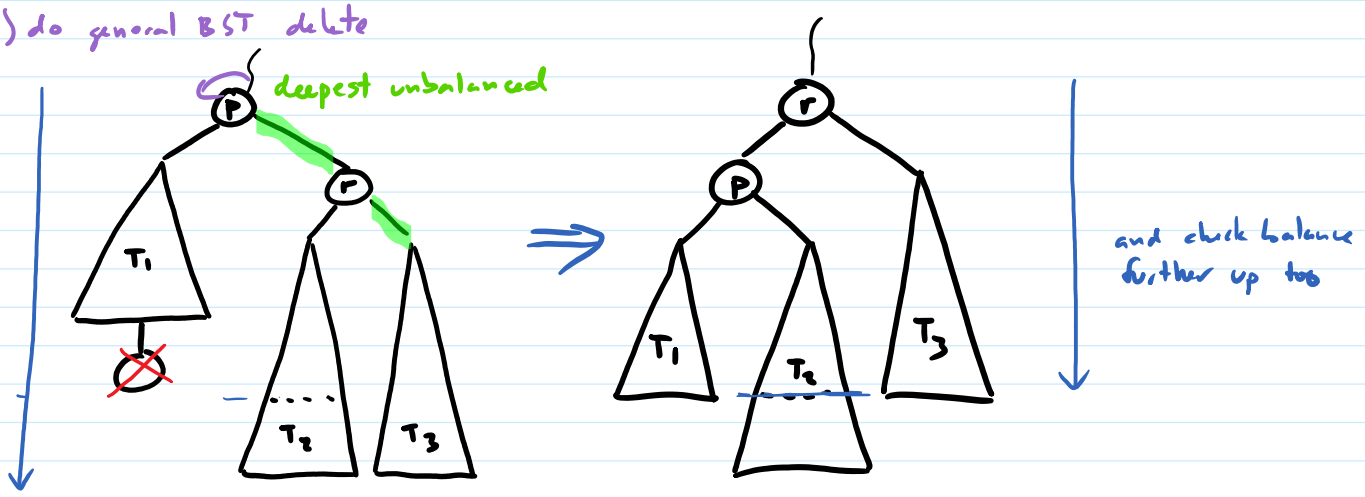


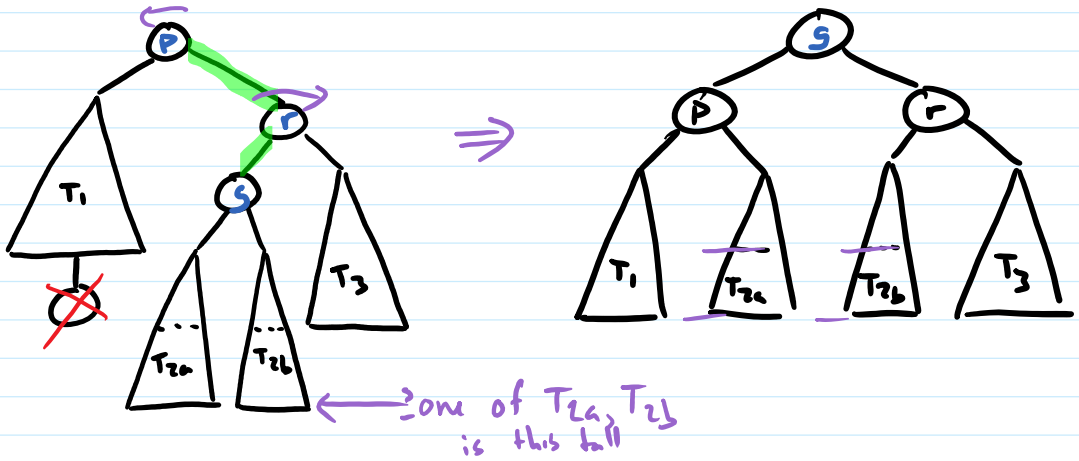
Removing from a BST



from an AVL tree

1) do general BST delete





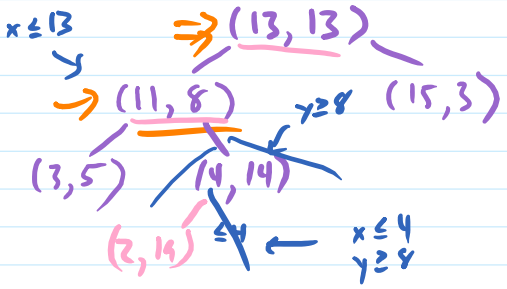
kd-Trees

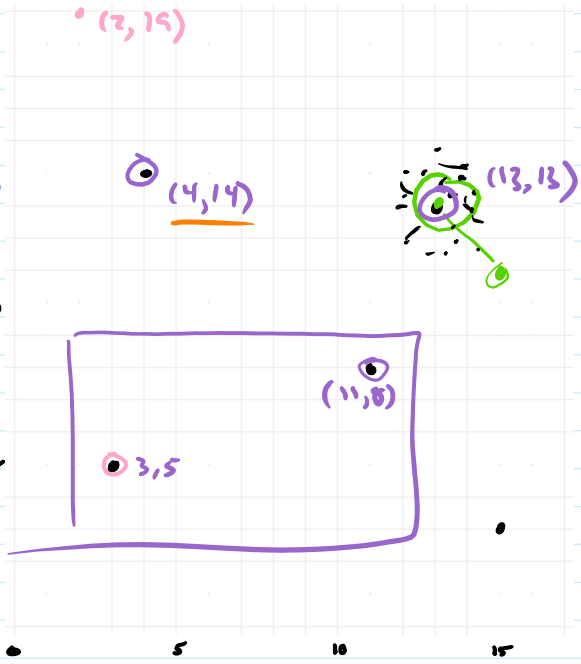
Binary tree with order property

levels 0, k, 2k, ... left subtree has lower coord 0
right has greater

levels 1, k+1, ... left subtree has lower coord 1
right subtree has greater

levels 2, k+2, ... coord 2





add

remove

Build balanced

preprocessing sort by x → Lx
sort by y → Ly

choose median x coordinate

split Lx into 1st half / 2nd half
split Ly into left (by x), right (by x)
sorted by y sorted by y

O(n)

recursively build left / right subtrees

O(n log n) overall