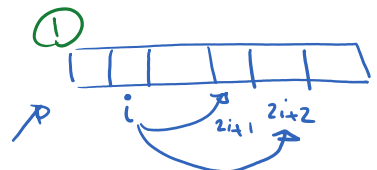
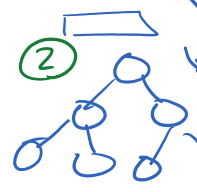
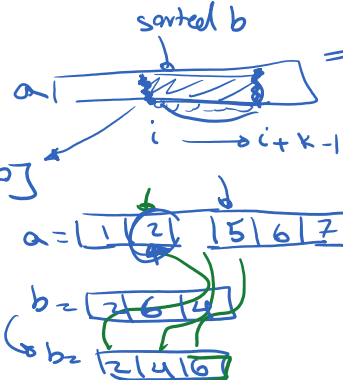


Reminder: HW 8 and lab 6 are due this Sunday.

- Q1
- ①   $\Rightarrow O(n)$
- ②   $b = \text{Build-maxheap}(a)$   
compare b & a  
 $O(n) + O(n)$
- ③ heap sort (a)  
look at output  $O(n \log n)$
- ④ Bjorn's answer go from the end to top and check the parent value  $O(n)$  like ①

- Q2/  $a = [\text{sorted}]$   $|a| = n$   $k < n$   
 $b = [\text{random}]$   $|b| = k$   
for  $i = 0: k-1$
- ①  $\text{LS}(a, b[i]) \rightarrow \text{exit} \checkmark \Rightarrow O(kn) \times$   
end

- ② for  $i = 0: k-1$   
 $\text{BS}(a, b[i]) \Rightarrow O(k \log n)$   
end

- ③ sort  $b \Rightarrow \text{quickSort}(b)$   
for  $i = 0: n-1$   
look for  $b[i]$   
end
-   $\Rightarrow O(k \log k + n)$

- start at
- ④ Counting Sort  $\rightarrow a$   $c = [1, 0, 1, 1, 1, 0, 1] \Rightarrow O(n)$   
look into  $b = [x, y, z, 1]$  if  $b[i] > m_x$   $\Rightarrow O(k)$   
return false  $O(n+k) = O(n)$   
 $k < n$
- ⑤ hash tables  $\rightarrow O(n)$

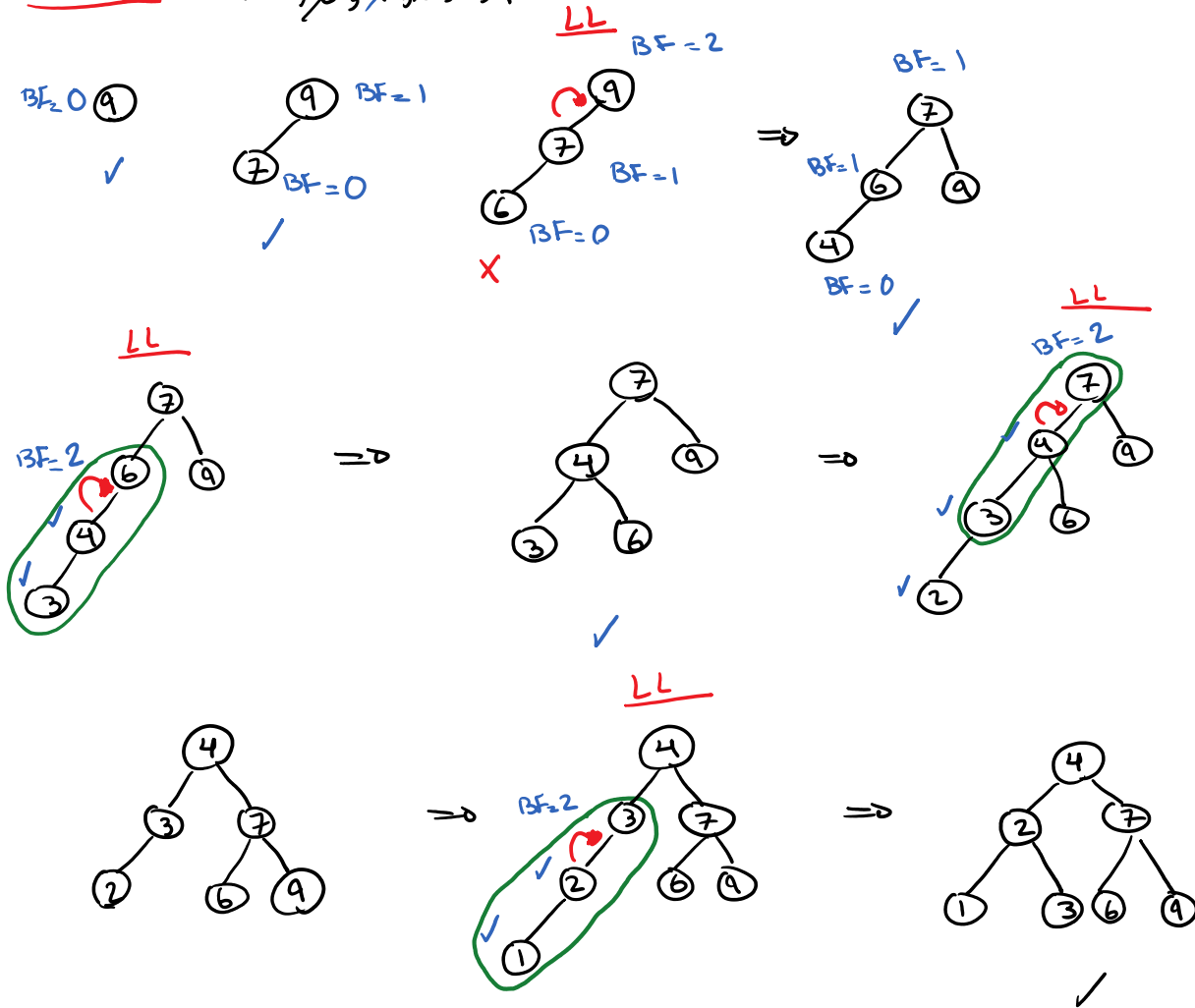
Review  $\downarrow$  From last Tuesday (L23)

T...

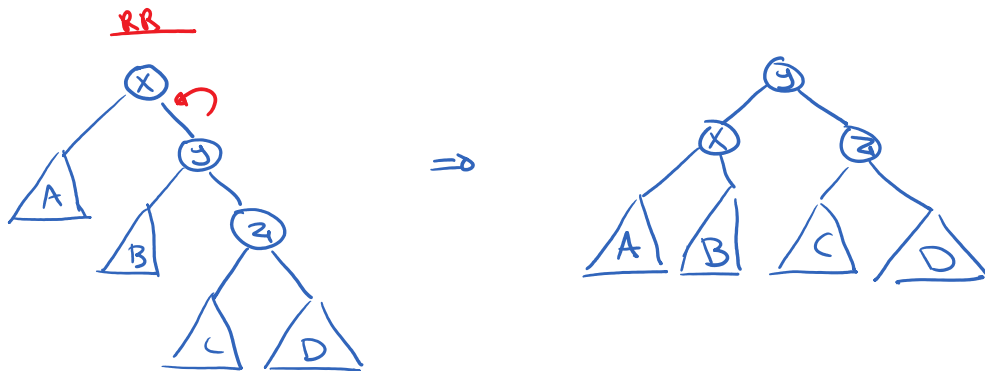
Review ↓ From last Tuesday (L23)

### Insertion:

Example: 1, 7, 6, 4, 3, 2, 1

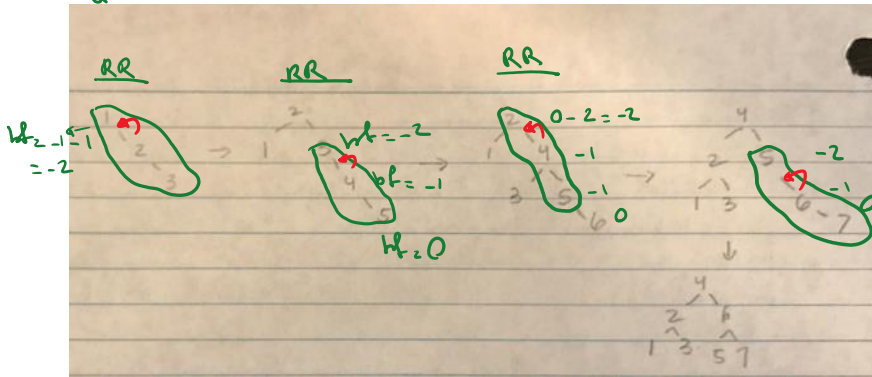


Example: Insert 1/2/3/4/5/6/7 into an AVL tree.

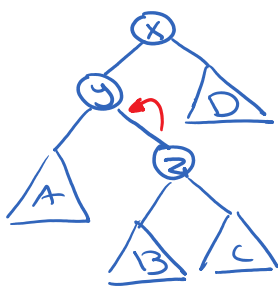


✓ Dorothy :)

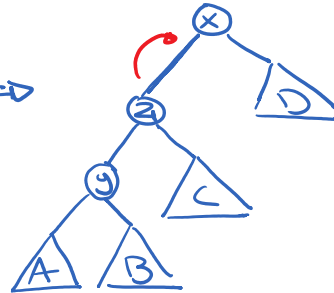
✓ Dorothy :)



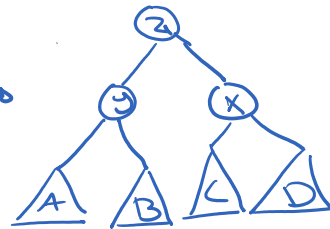
LR



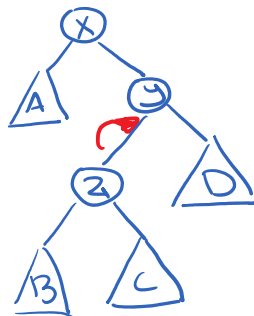
$\Rightarrow$



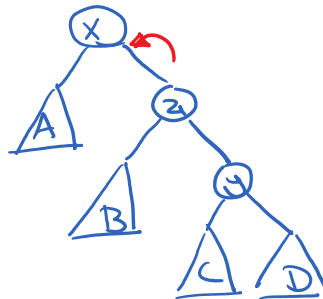
$\Rightarrow$



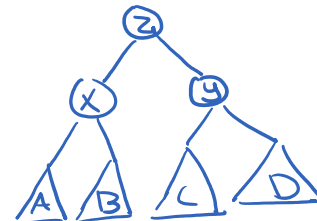
RL



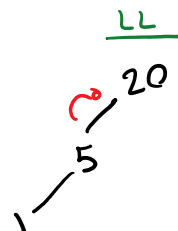
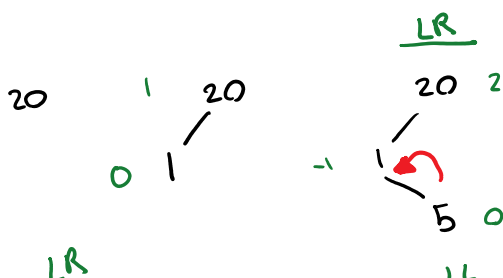
$\Rightarrow$



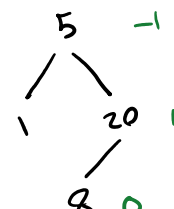
$\Rightarrow$

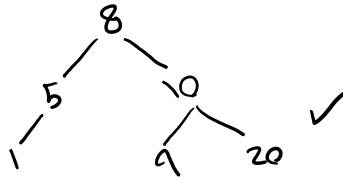
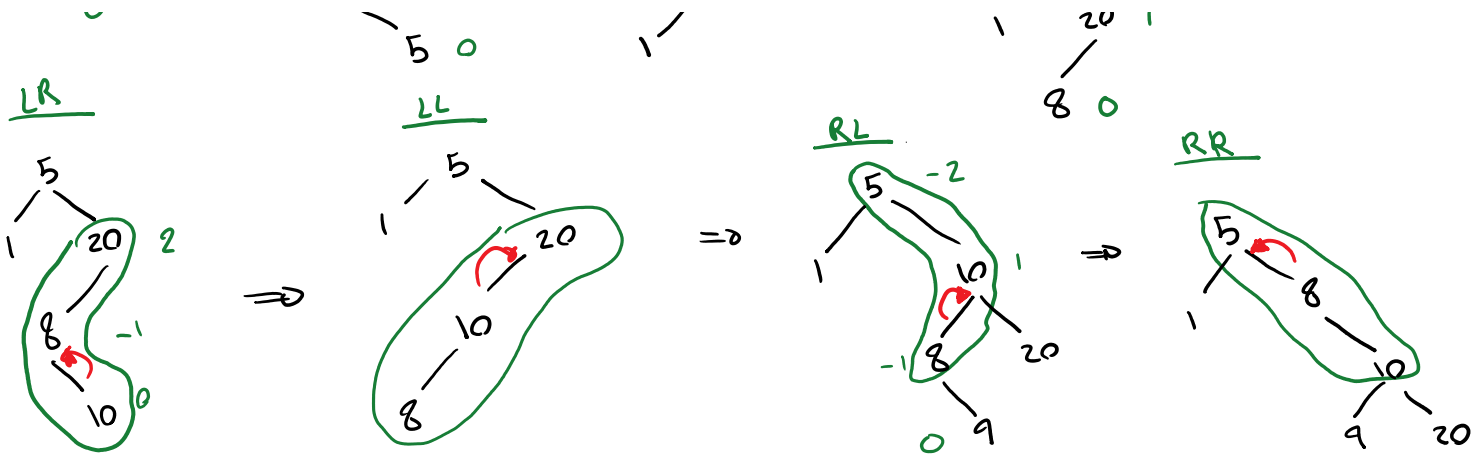


Example: 20/1/5/8/10/9



$\Rightarrow$





lab 6

$$a = [1.2 \quad -2 \quad 2.5 \quad 1] \rightarrow \begin{matrix} 1.2 / .5 / 1.5 / -.8 \\ 3.5 / 1.7 / 2.7 \end{matrix}$$

$$MPSS = .5$$

$MPSS(a, s, e)$

if  $|a| \geq 2$

$MPSS-L = MPSS(a, s, mid)$

$MPSS-R = MPSS(a, mid+1, e)$

$MPSS-M = MPSS-middle(a, s, e)$

return  $\min$

else if  $|a| = 1$

return 0

MPSS-middle

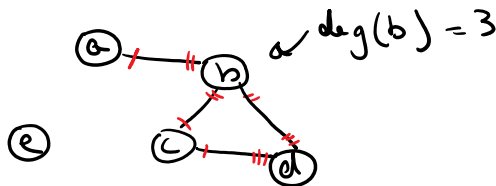
## Graphs

$$G = (V, E, \omega)$$

$V$ : set of vertices

$E$ : set of edges

$$V = \{a, b, c, d, e\}$$



$$\text{order} = |V| = 5$$

$$\text{size} = |E| = 4$$

vertex	deg(v)
a	1
b	3
c	2

$$V = \{a, b, c, d, e\}$$

$$\text{order} = |V| = 5$$

$$E = \{\{a, b\}, \{b, c\}, \{c, d\}, \{b, d\}\}$$

$$\text{size} = |E| = 4$$

b	3
c	2
d	2
e	0
	8

$\deg(v)$  = nr of edges adjacent to  $v$ .

undirected  
graph

$$\sum_{i=1}^{|V|} \deg(v_i) = 2|E|$$

Example:  $\sum \deg(v_i) = 16$

$$\Rightarrow |E| = ? \Rightarrow |E| = 8$$