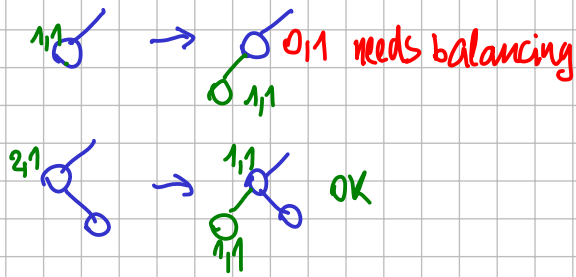
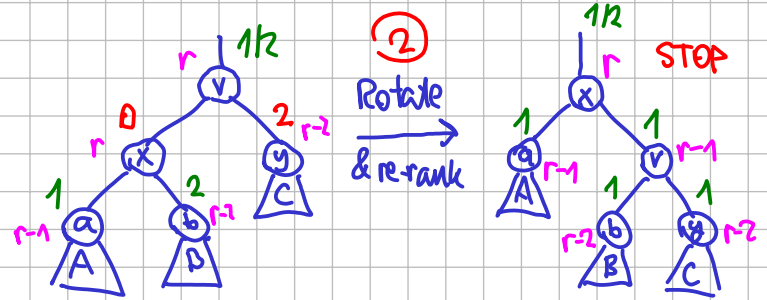


WAVL Trees - Balancing

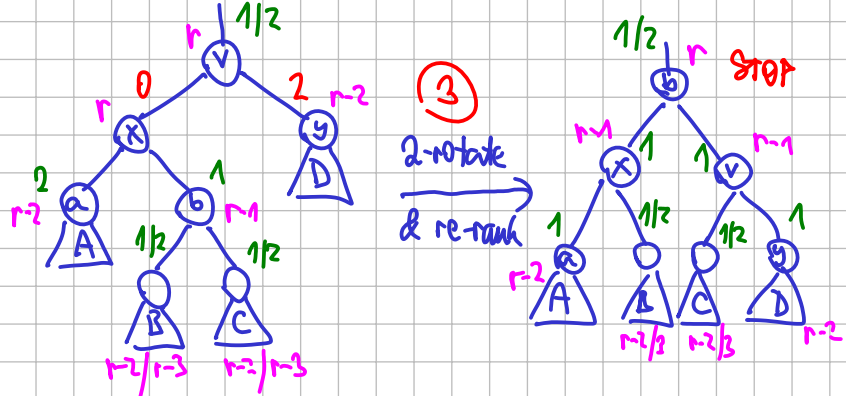
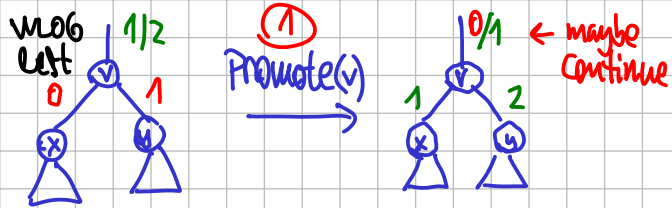
Insert



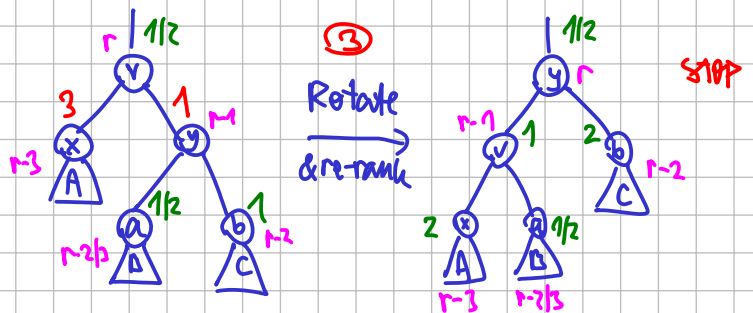
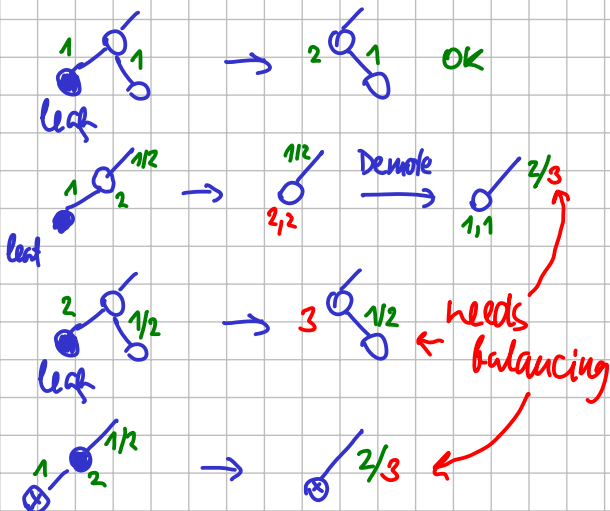
Allowed nodes: $\begin{matrix} \swarrow & \searrow \\ 1 & 1 \end{matrix}$ $\begin{matrix} \swarrow & \searrow \\ 1 & 2 \end{matrix}$ $\begin{matrix} \swarrow & \searrow \\ 2 & 2 \end{matrix}$ $\leftarrow$ if not leaf
 $\nwarrow$ all unary nodes must be this



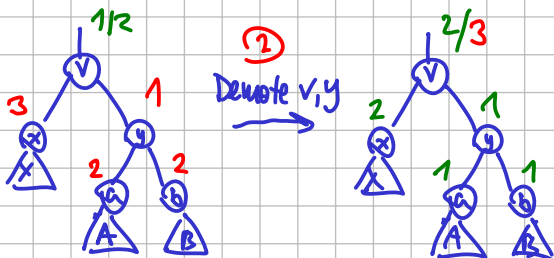
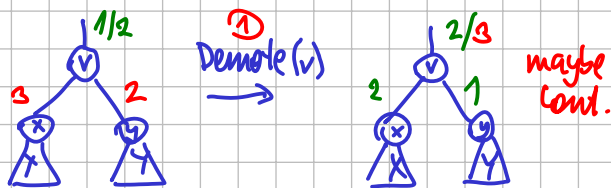
Balancing to get rid of 0-child:



Delete



Balancing to get rid of 3-child:



Thm 4.1: # Demotes $\leq d$

Thm 4.2: # Promotes $\leq 3m + 2d$

Thm 4.3: height $\leq \log_p n$