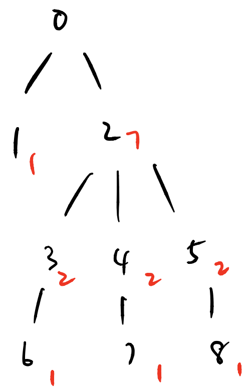


$dist[0] = \text{sum}\{$ contribution from every nodes $\}$

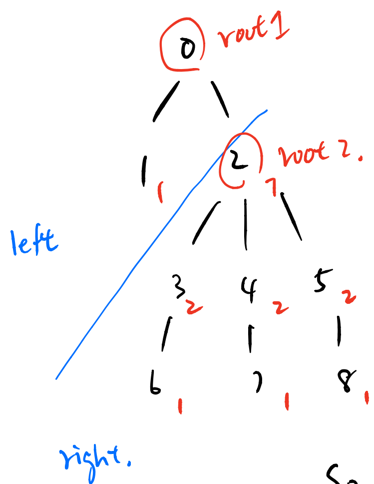
contribution from node i

$=$ number of nodes of subtree rooted at i

$\Rightarrow dist[0] = 1 + 7 + 2 + 2 + 2 + 1 + 1 + 1 = 17$

Use this relationship we can derive $dist[i]$ for every i.

But time complexity is $O(n^2)$. improvement

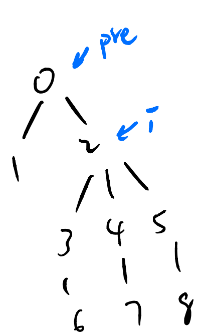


When root comes from root 1 to root 2.

every node in the right is 1 step closer to root 2 than to root 1.

every node in the left is 1 step farther to root 2 than to root 1.

So if we know $dist[0]$, we can derive $dist[1]$:



$dist[1] = dist[0]$ − number of nodes in right

+ number of nodes in left.

$$dist[i] = dist[pre] - count[i] + (N - count[i])$$