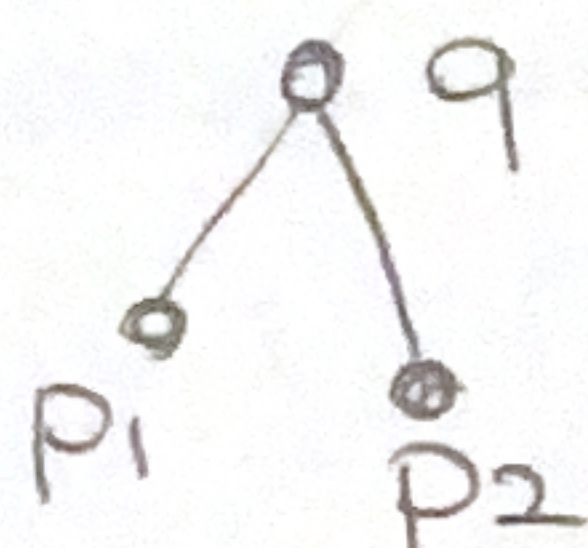
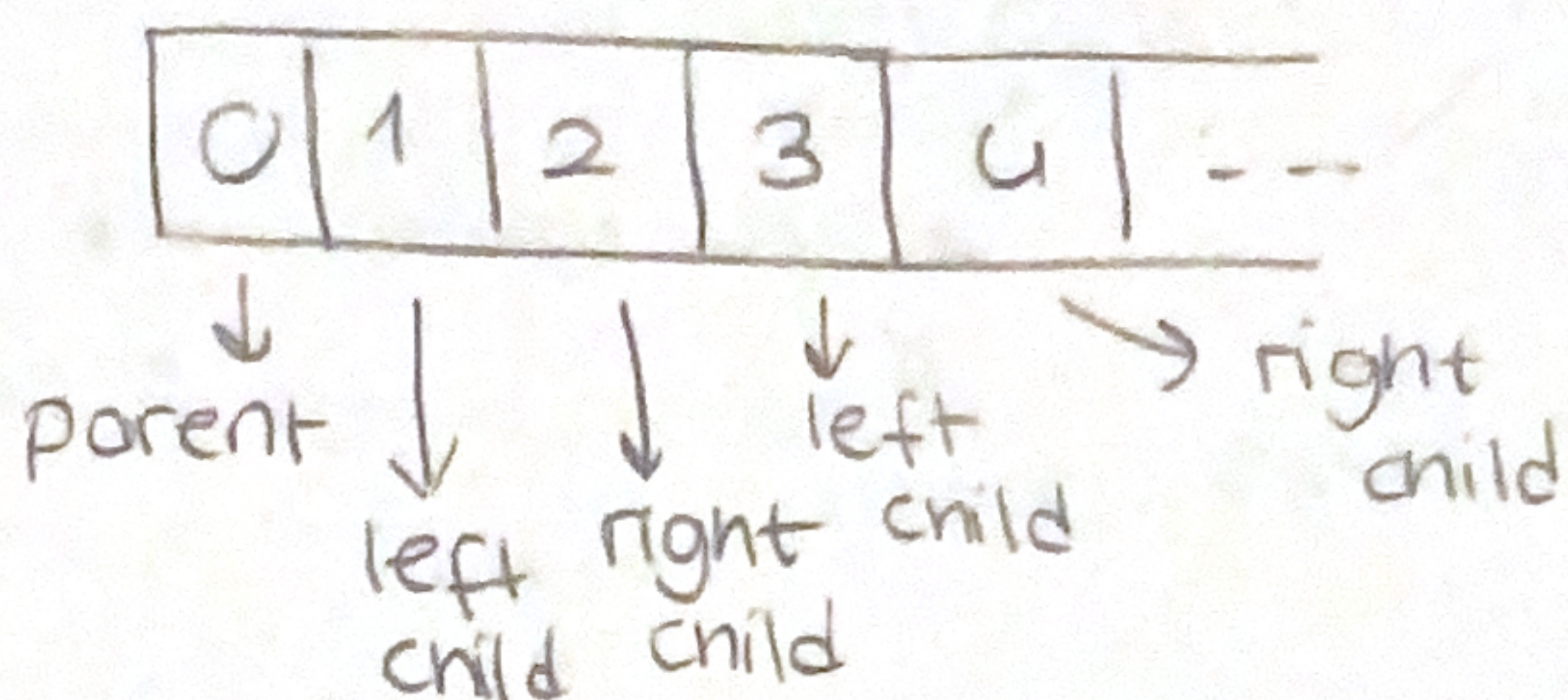
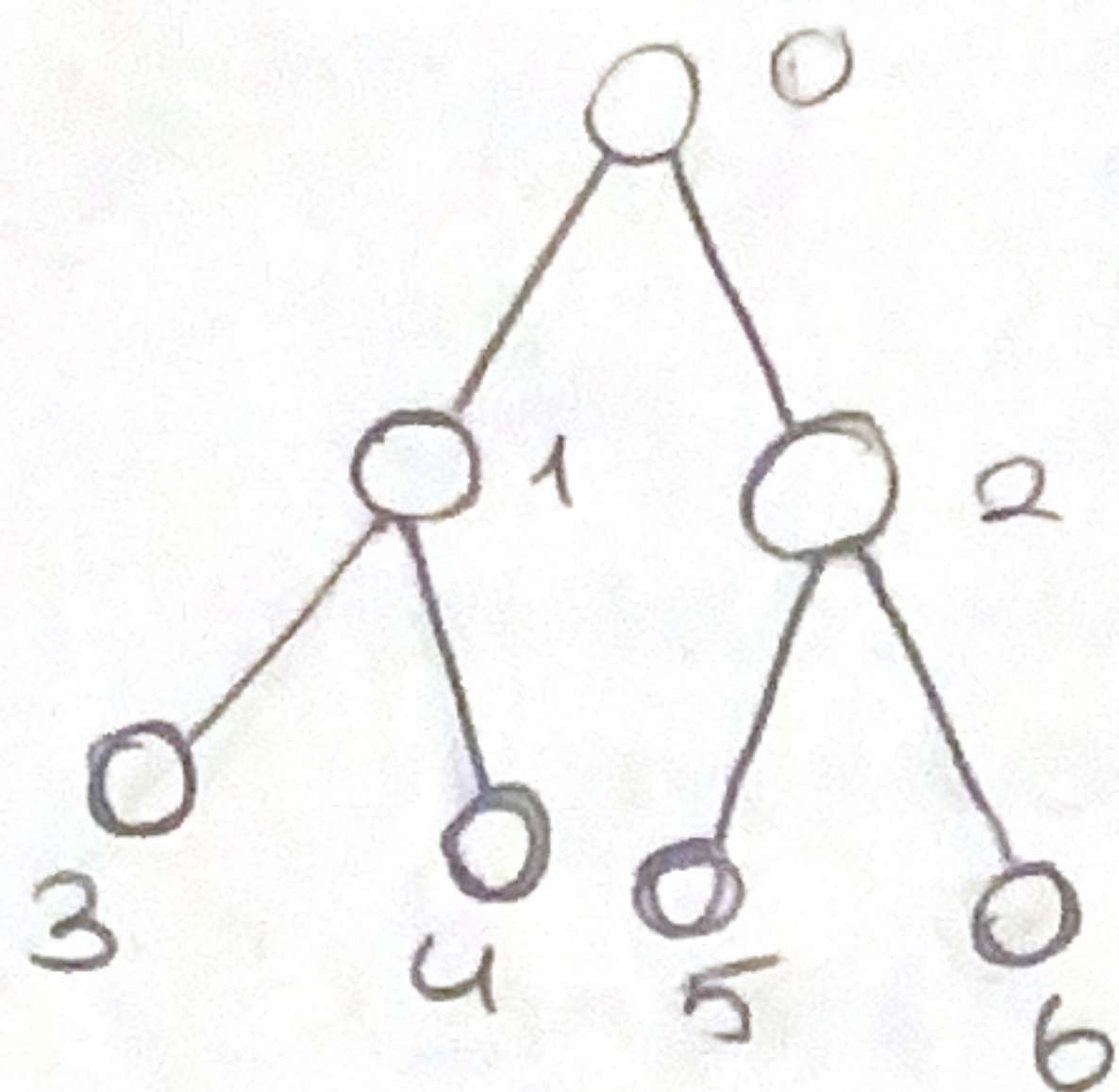


Array Based Binary Tree



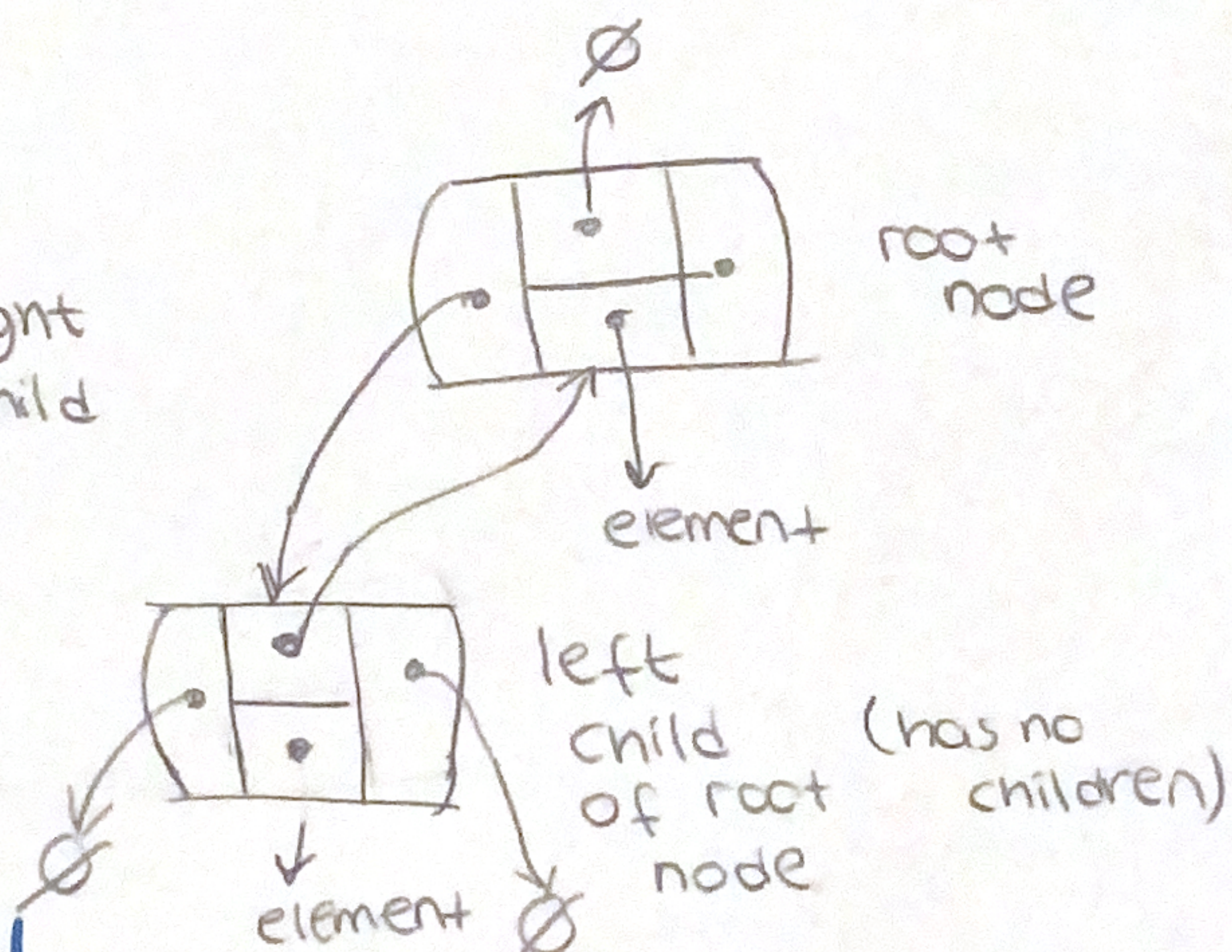
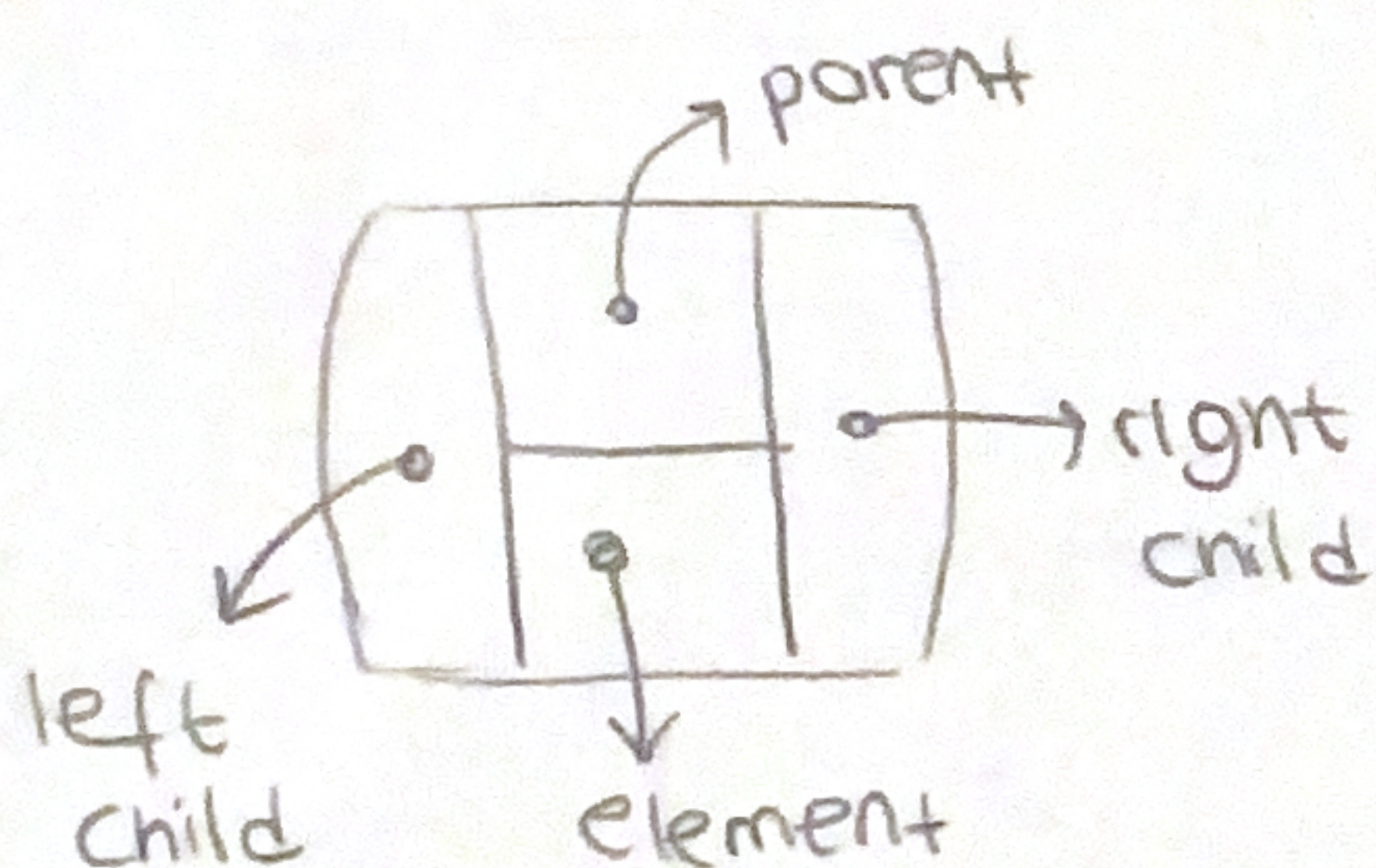
$$f(p_1) = 2f(q) + 1$$

$$f(p_2) = 2f(q) + 2$$

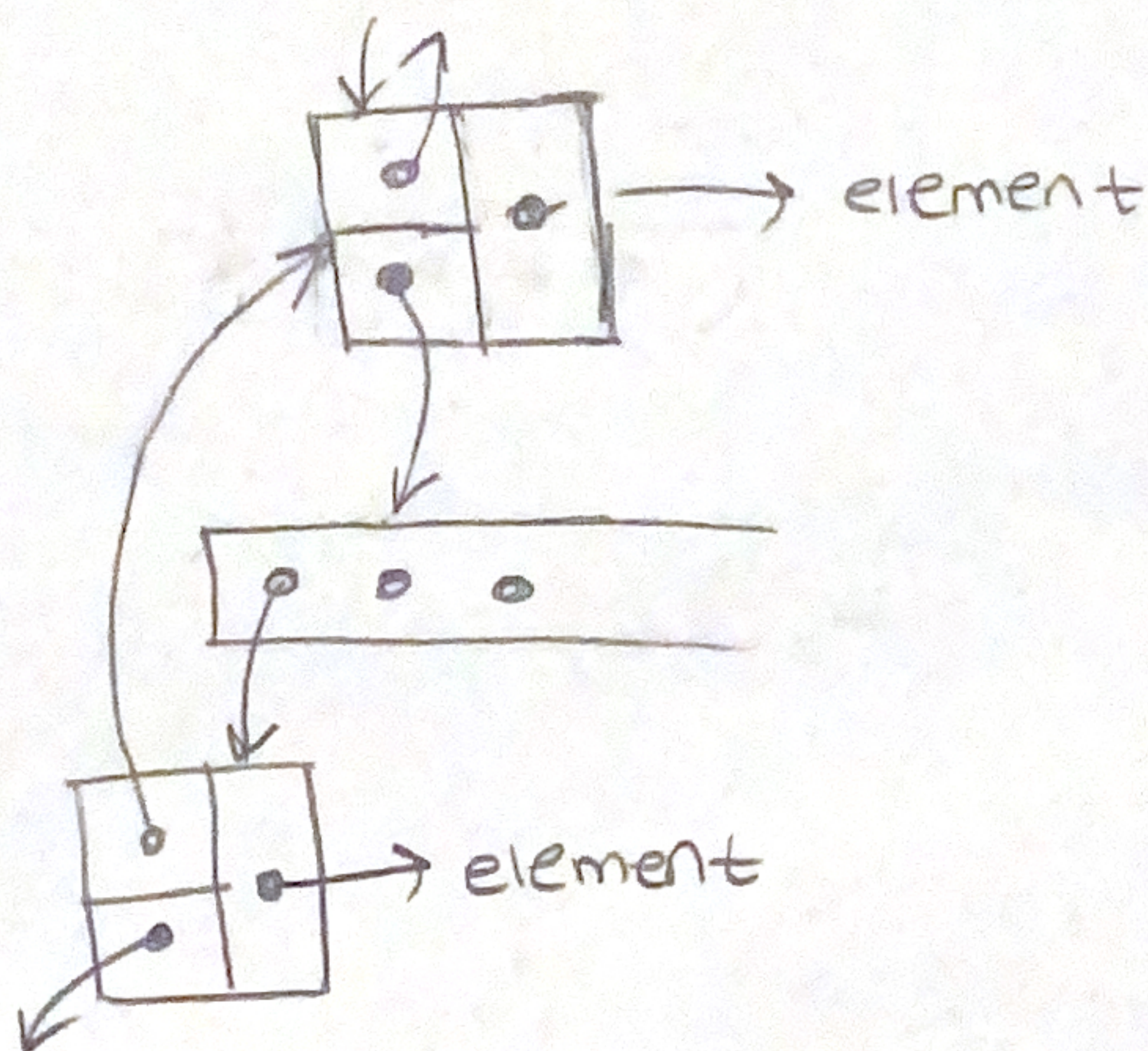
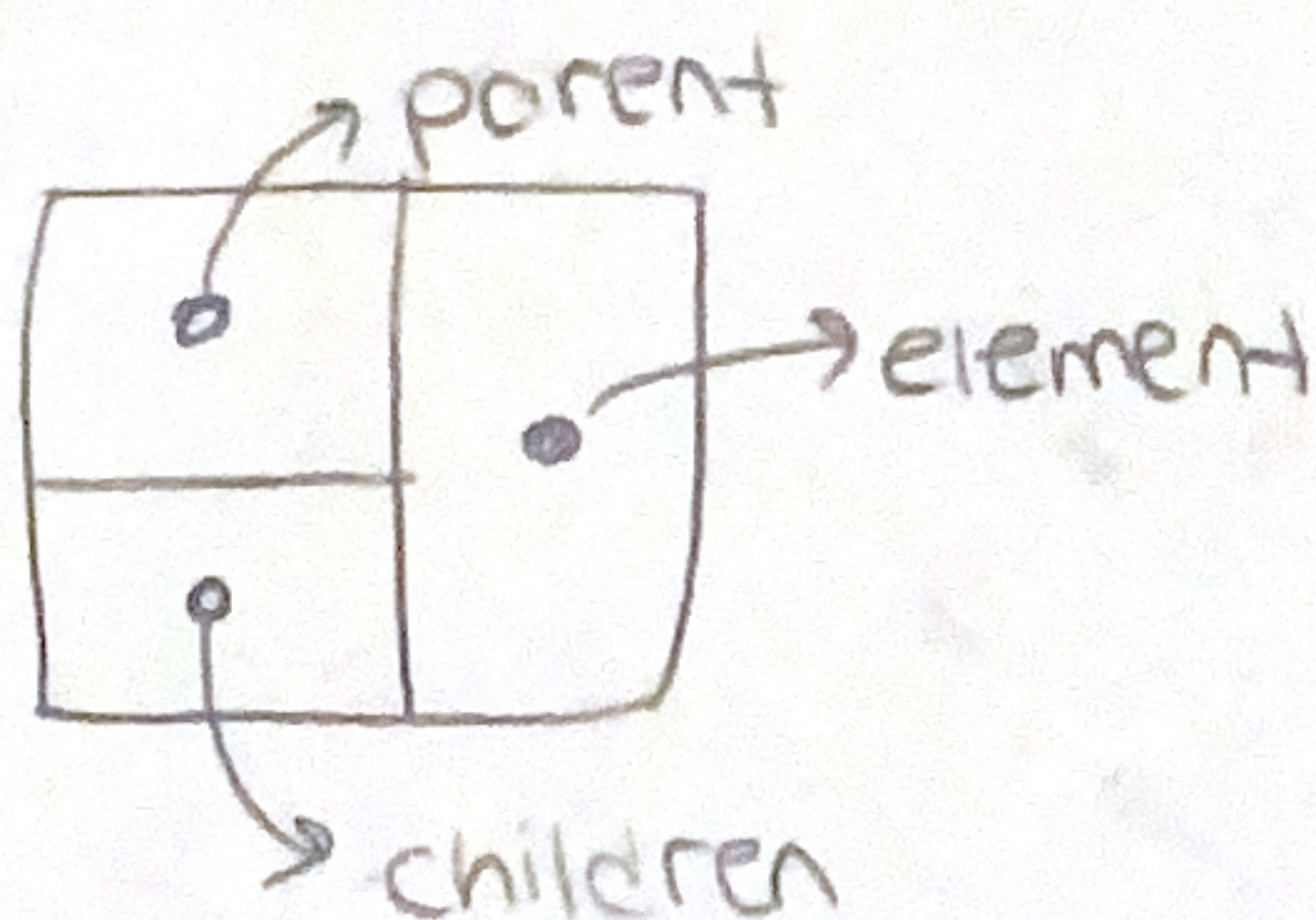
$$f(q) = \lfloor (f(p) - 1) / 2 \rfloor$$

→ asagi yuvarla

Link Based Binary Tree



Link Based General Tree



Complexity of Linked Binary Tree

len
is_empty
root
parent

left
right
sibling
children

add_root
is_root
is_leaf
num_children

add_left
add_right
replace
delete

attach } $O(1)$

depth(p) $\rightarrow O(dp+1)$

height $\rightarrow O(n)$

$\rightarrow$ space usage : $O(n)$

Complexity of Linked General Tree

same with children(p) = $O(cp+1)$
space usage = $O(n)$