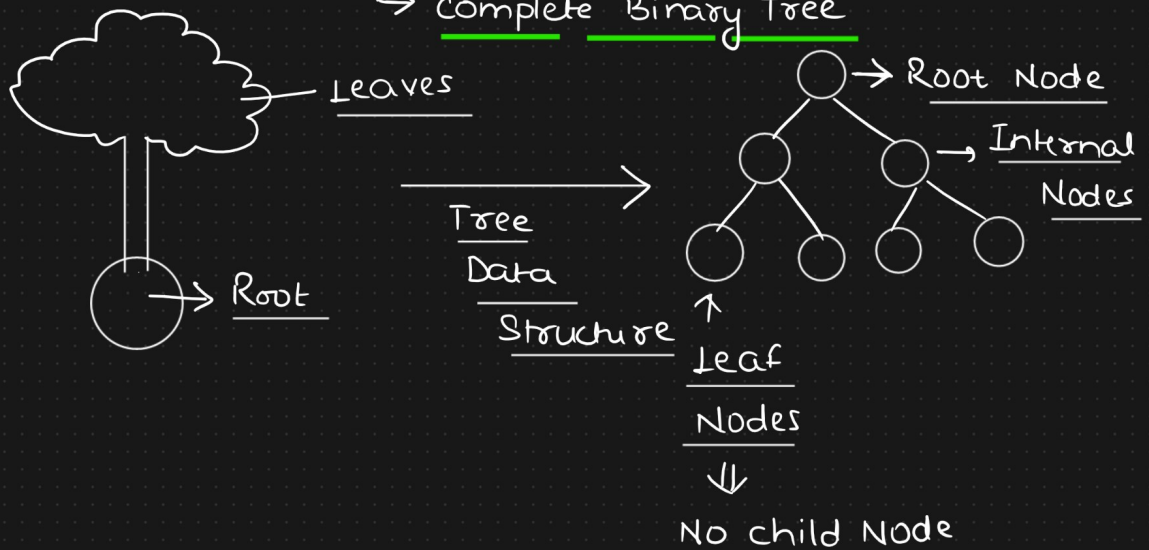


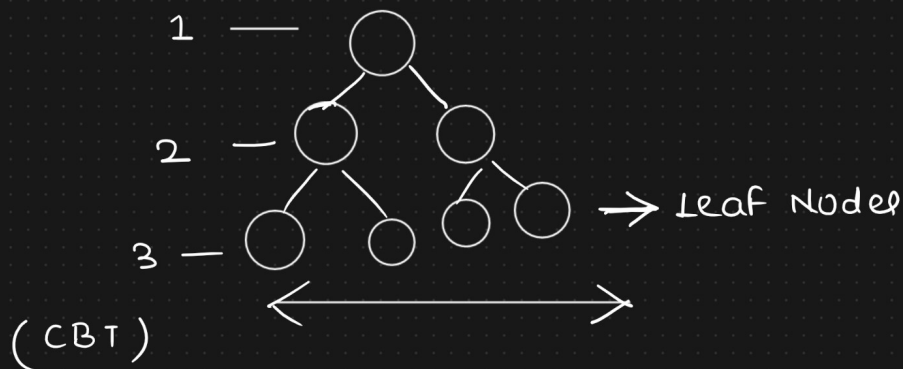
Heap Data Structure

↳ Complete Binary Tree



Binary Tree → # child Node → 0, 1, 2
↳ Atmost the mode → 2 child nodes

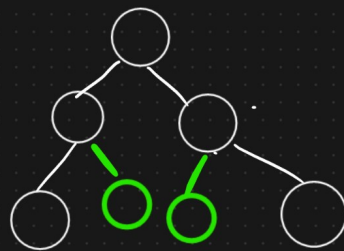
Full Binary Tree → Every mode has 2 child nodes apart from the leaf nodes.



Complete binary tree → 1) After completion of first level, then only move towards filling of next level.

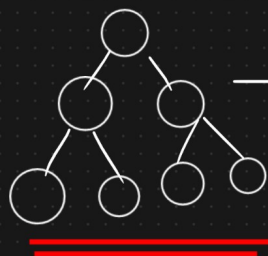
2) After completion of left side mode, then only go for the completion of right side mode.

Not
CBT

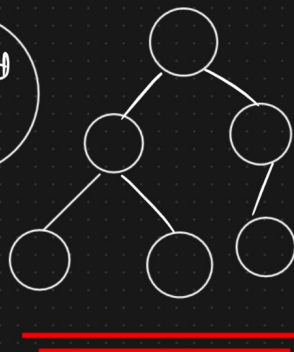


→ Not CBT

Full Binary Tree



Valid
CBT



Valid CBT



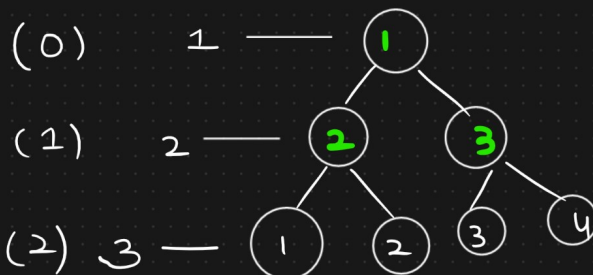
Almost Complete
Binary
Tree

Almost complete Binary Tree

↳ always node → single child at
the leaf node

$$\underline{\text{CBT}} = \underline{\text{fBT}} + \underline{\text{ACBT}}$$

flexible



nodes



n = 7

k = 3

Levels

Leaf Node = 4

Non-Leaf Node = 3

Properties of Full Binary Tree (Complete Binary Tree)

1. $n = 2^k - 1 = 2^3 - 1$

$$\underline{\underline{n = 7}}$$

$$n = 2^k - 1$$

$$2^k = n + 1$$

$$\underline{\underline{k = \log_2(n+1)}}$$

Levels

$$\underline{\underline{n = 63}}$$

$$k = \log_2(63+1)$$

$$k = \log_2 64$$

$$k = \log_2 2^6$$

$$k = 6 \log_2 2$$

$$k = 6$$

2. $\left\lceil \frac{n}{2} \right\rceil = \text{Number of Leaf Nodes}$

$$\left\lceil \frac{7}{2} \right\rceil = 4 = \underline{\underline{\# \text{ Leaf Node}}}$$

$$\left\lfloor \frac{n}{2} \right\rfloor = \text{Number of non-leaf Nodes}$$

$$\left\lfloor \frac{7}{2} \right\rfloor = 3 = \underline{\underline{\# \text{ Non-Leaf Node}}}$$