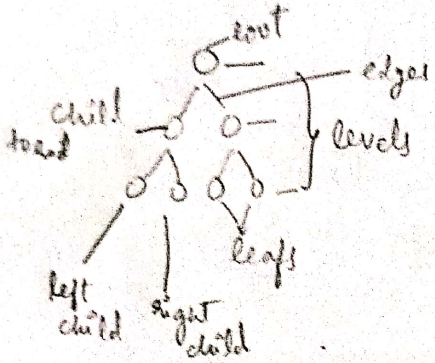
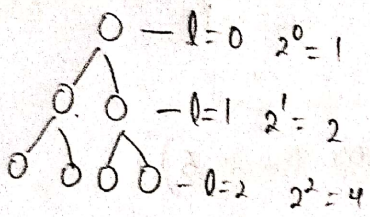
Binary tree

Binary tree is a non linear data structure

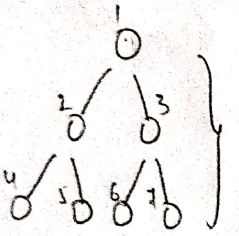


Properties of Binary trees

(i) Max nodes at level $l = 2^l$



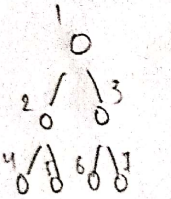
(ii) Max nodes in a tree of height H is $2^H - 1$



Height = 3 = H

$2^h - 1 = 2^3 - 1 = 8 - 1 = 7$. Hence proved.!

(iii) For n nodes, minimum possible height or minimum no. of levels are $\log_2(N+1)$



no. of nodes = 7

height = no. of levels = $\log_2(N+1) = \log_2(7+1)$

$= \log_2(8) = \log_2 2^3 = 3 \log_2 2$

$= 3.1$

$= 3$

height = 3

no. of levels = 3

(iv) A binary tree with L leaves has at least $\log_2(N+1)+1$ no. of levels

no. of leaves = 4

levels = $\log_2(N+1)+1 = \log_2(4+1)+1 = \log_2(5)+1$

$= \log_2(2^2+1) = \log_2 2^2 + \log_2 1 = 2\log_2 2 + \log_2 1$

$= 2 + \log_2 1 + 1 = 2+0+1 = 3$