



# Binary Trees Properties - Proofs



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100 points

Due Jan 9, 11:59 PM



1 class comment

Dear all,

Submit the hand-written copy of the proofs (Proof by Mathematical Induction) of the following theorems on or before 9/01/2023.

1.

The height of a complete, balanced tree of  $n$  nodes is  $\log(n+1)$

2. The number of leaves in a full binary tree is number of internal nodes + 1

3. The number of nodes in a perfect binary tree  $n = 2^{(h+1)} - 1$ , where  $h$  is the height

4. A binary tree  
with  $n$  internal nodes  
has  $n + 1$  external  
nodes

5. For any non-empty binary tree with  $n_0$  leaf nodes  
and  $n_2$  nodes of  
degree 2,  $n_0 = n_2 + 1$ .

6. The height of a binary tree with  $n$  internal nodes is  
at least  $\log_2(n + 1)$  and at  
most  $n - 1$ .

7. The number of leaves in a binary tree of  
height  $h$  is at most  $2^h$ .

8.

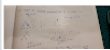
Any rooted tree with  $n$  nodes has  $n - 1$  edges



A binary tree of depth  $d$  has at most  $2^d - 1$  vertices.

2021-AIML 3SEM DSDA Theory & Lab

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