Question: A m-ary tree has 78 leaves and a height of 4. What could m be?

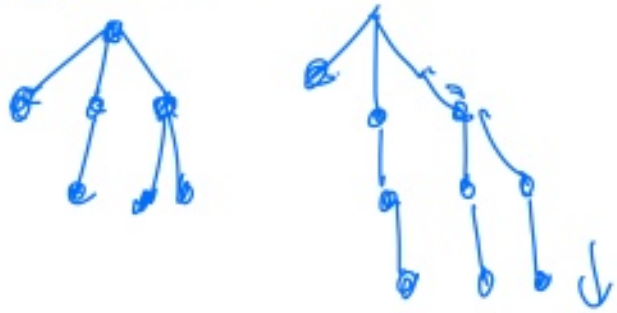
$$h \geq \lceil \log_m l \rceil$$

$$l \leq m^h \iff l^{1/h} \leq (m^h)^{1/h} = m$$

$$m \geq \lceil l^{1/h} \rceil = \lceil 78^{1/4} \rceil = \lceil 2.\ldots \rceil = 3$$

m could be $3, 4, 5, 6, \ldots$ (an integer ≥ 3).

(eg 4 leaves, $m=3$, height 2



)

Binary Search – search for data) into a binary tree.
OR input data

Binary Search Algorithm – a way to take ordered data & put into a binary tree (or to place new data in a binary tree).

Example of Binary Search. Our first names can be used to give an order on names. Let's make a tree out of our class.

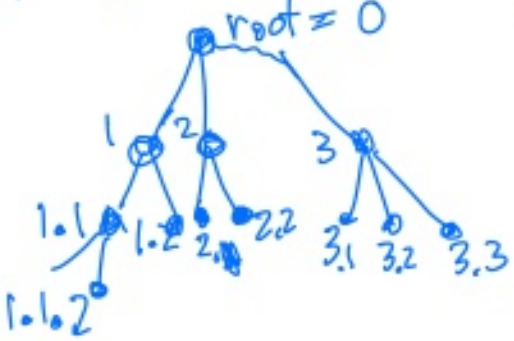
height of graph = # of steps required to find a piece of data

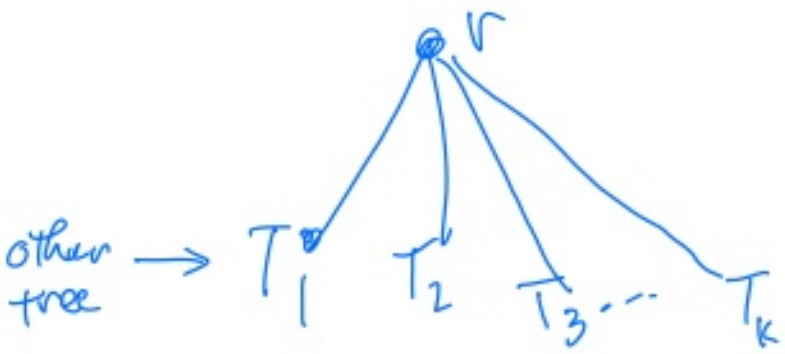
Using $h \geq \lceil \log_2 l \rceil$

↑ determines length of time required as l increases.

Tree Traversal - Algorithm for visiting every vertex of a tree in an organized way.

Tool: Universal Address system





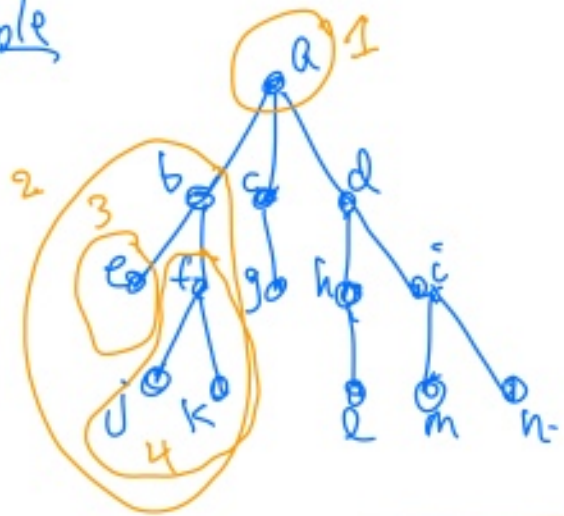
preorder traversal algorithm

$r \rightarrow (T_1) \rightarrow (T_2) \rightarrow \ldots (T_k)$

preorder preorder

(recursively defined algorithm)

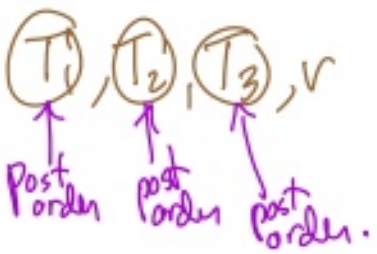
Example

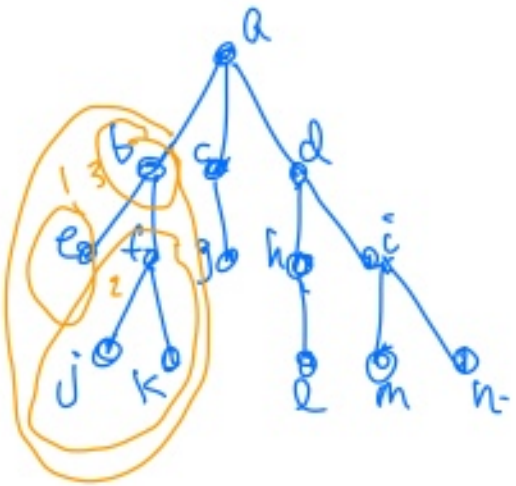


Pre-order algorithm:

a, b, e, f, j, k, c, g, d, h, l, i, m, n

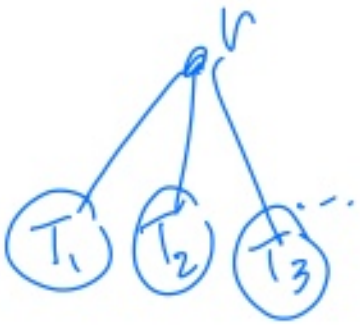
Post-order algorithm for traversing a tree





Post order traversal:

e, j, k, f, b, g, c, l, h, m, n, i, d, a

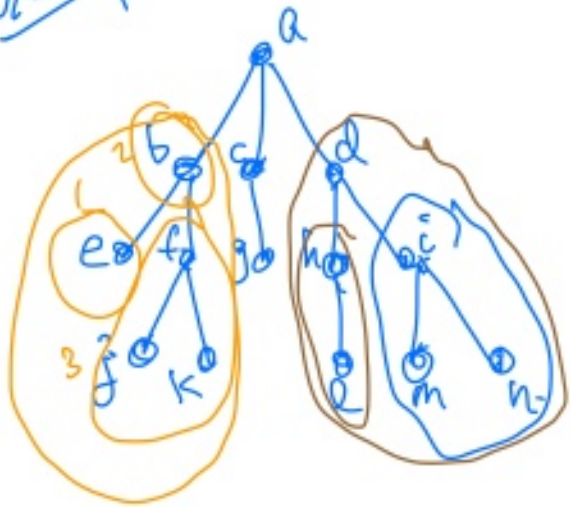


inorder traversal algorithm

$T_1 \rightarrow r \rightarrow T_2 \rightarrow T_3 \rightarrow \ldots$

again, recursive!

example



e, b, j, f, k, a, g, c, l, h, d, m, i, n

Next time: Spanning Trees in Graphs.

Quiz!

1. Favorite Song + Artist Right Now
2. Definition of Tree
3. Definition of m-ary tree
4. # of leaves on a full m-ary tree of height h = _____.