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DISCRETE STRUCTURE

TOPIC : GRAPH THEORY

(INTRODUCTION TO TREES , PROPERTIES , APPLICATION OF TREES)

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PRESENTATION BY:

Fahad Afzal baig : Introduction to tree

Damini A V : Properties of tree

Deepak kumar Thakur : Rooted tree

Dhanya P R : M-ary tree

Dileep Kumar : Binary search tree

Erick Solomon J : Decision tree

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INTRODUCTION TO TREE

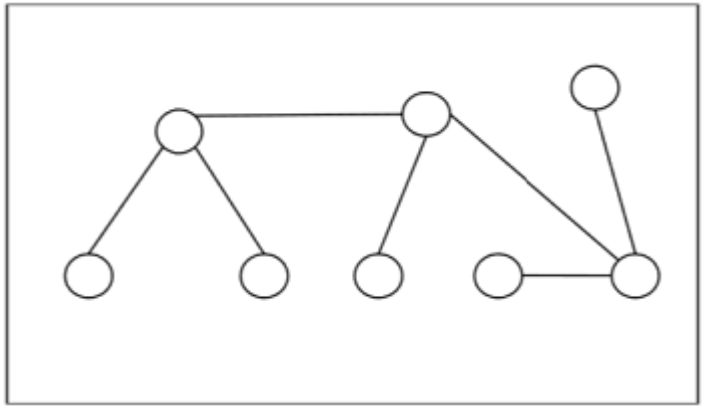
Trees were introduced long ago in the year 1857 in order to count certain types of chemical compounds. Since then trees have been employed to solve problems.

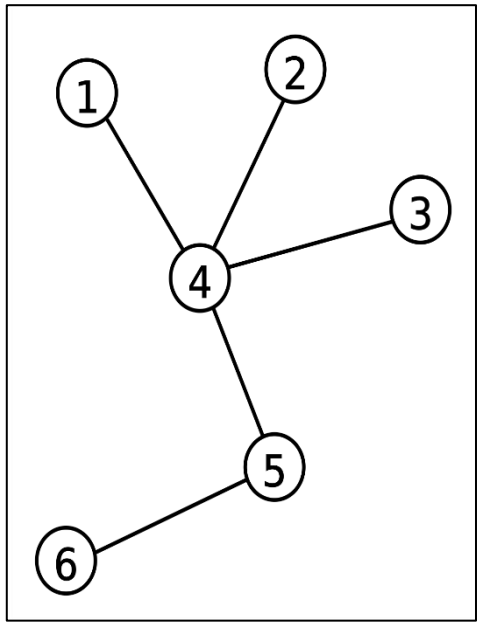
A Tree is a connected graph that contains no simple circuit.

It is denoted by **T.**

A graph is said to be connected if there exists a path between every pair of vertices

EXAMPLES:





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PROPERTIES OF TREES :

1. There is only one path between every pair of vertices in a tree.
2. Every edge in a tree is a bridge.
3. A tree with n vertices have n-1 edges.
4. Every tree is a graph but every graph is not a tree.

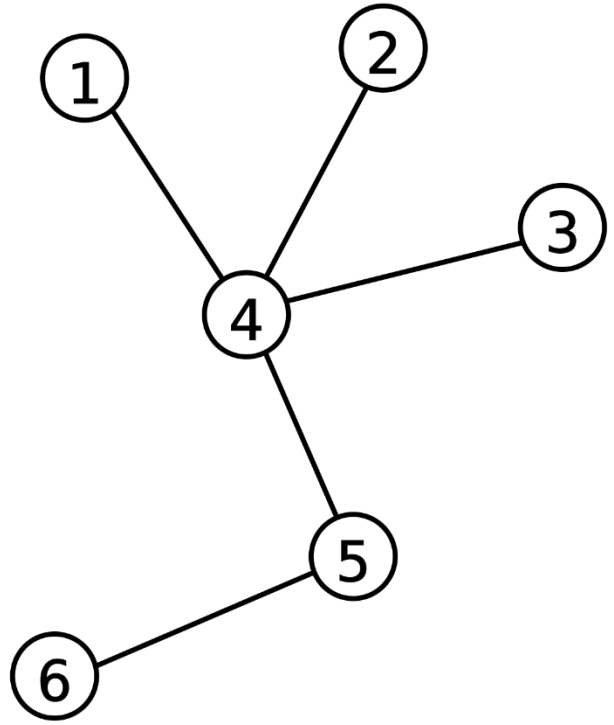
THEOREM :

STATEMENT : There is only one path between every pair of vertices in a tree.

PROOF: Since T is a connected graph ,there must exist atleast 1 path between every pair of vertices.

Now , suppose that between Two vertices 1 and 6 there are 2 distinct paths.

The union of these 2 paths Will contain a circuit .Hence T Cannot be a Tree.



Rooted Tree

A rooted tree is a connected acyclic graph with a special node that is called the root of the tree and every edge directly or indirectly originates from the root.

Ordered rooted tree:
An ordered rooted tree is a rooted tree where the children of each internal vertex are ordered.

Left child:
The node to the left of the root is called its left child.

Right child:
The node to the right of the root is called its right child .

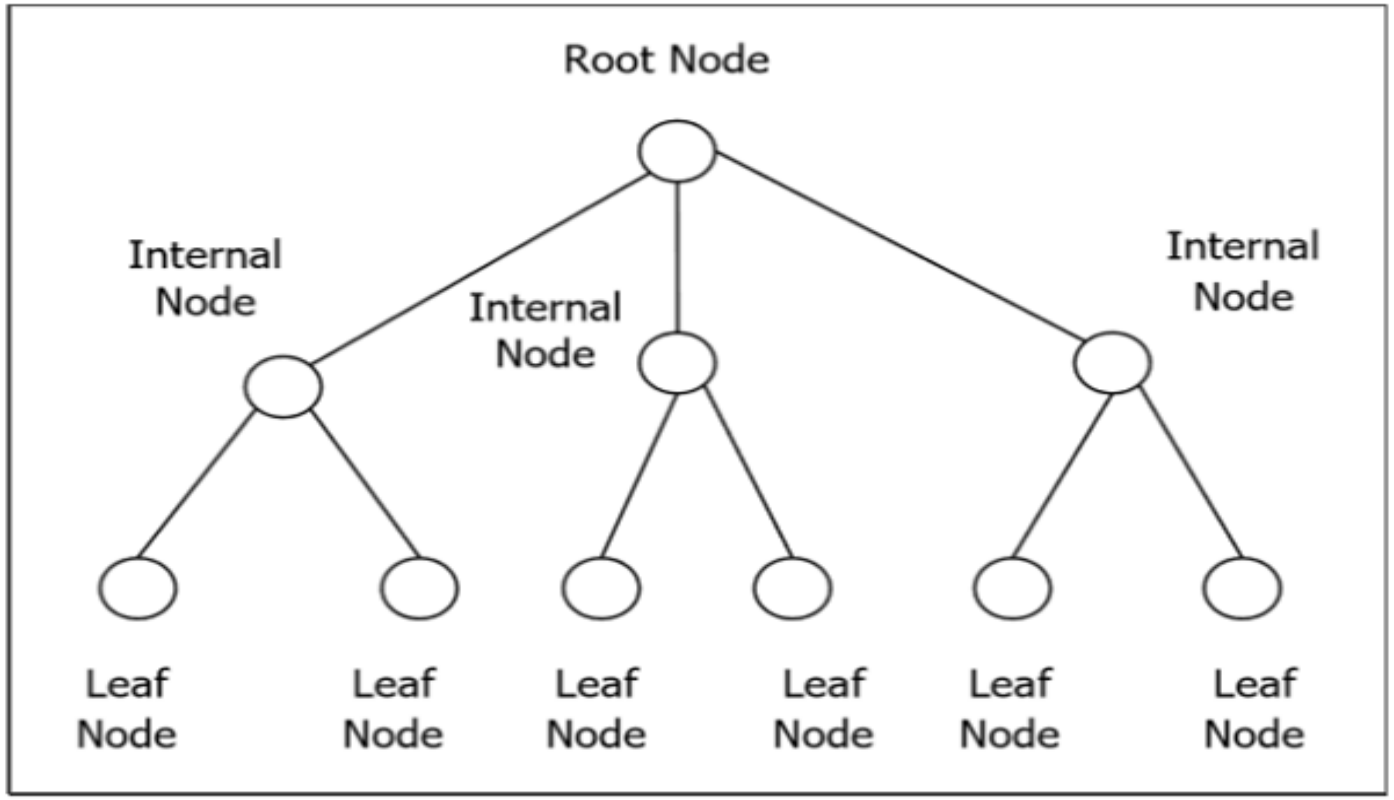
Parent node:
A node having both left and right child are called parent node.

Siblings: Two nodes having the same parent are called siblings.

Descendant: A node is called descendant of another node if it is the child of the node or child of some other descendant of that node.

Internal node: It is a node which carries atleast one child.

Leaf node: A node with no children is called a leaf node



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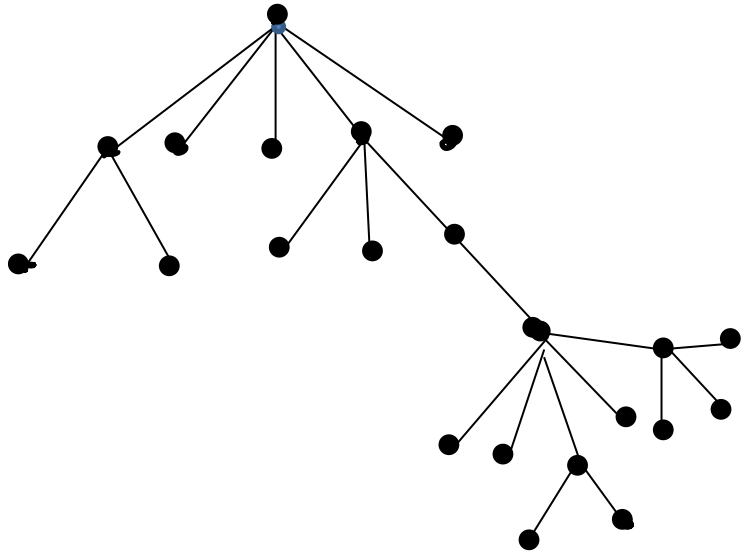
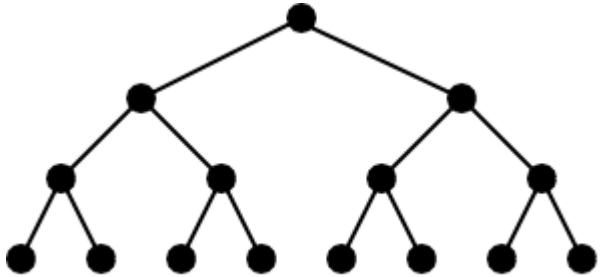
M-ARY TREES

- A rooted tree is called an m ary tree if every internal vertex has no more than m children
- The tree is called a full m-ary tree if every internal vertex has exactly m children

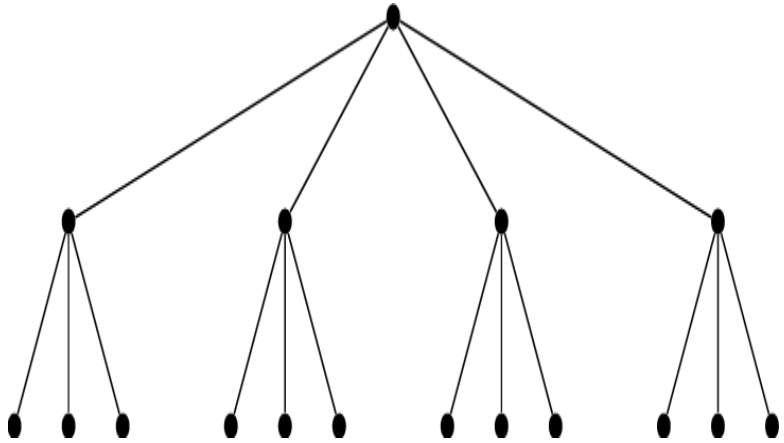


m-ary tree for m=5

it is 5 ary tree but is not a full 5 ary tree



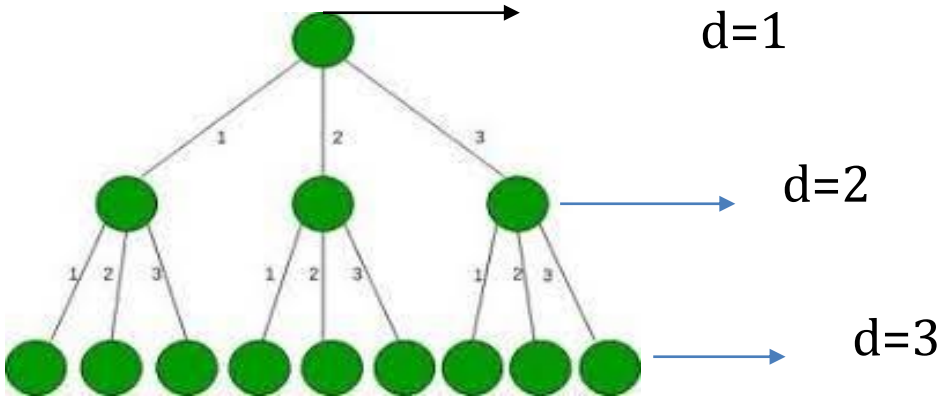
This is a full 3 ary tree



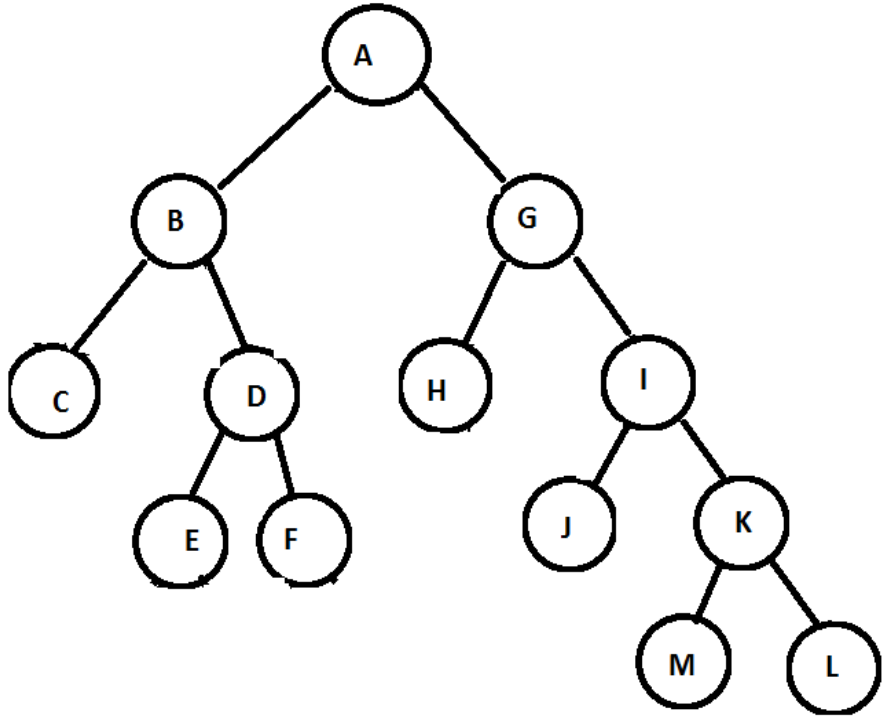
not a full m ary tree

COMPLETE M-ARY TREE

A complete m ary tree is an m-ary tree in which every internal vertex has exactly m children and all leaves have same depth



complete 3 aray tree because all leaves have same depth



This is a full 2 ary tree but not complete 2 ary tree because all leaves are not having same depth

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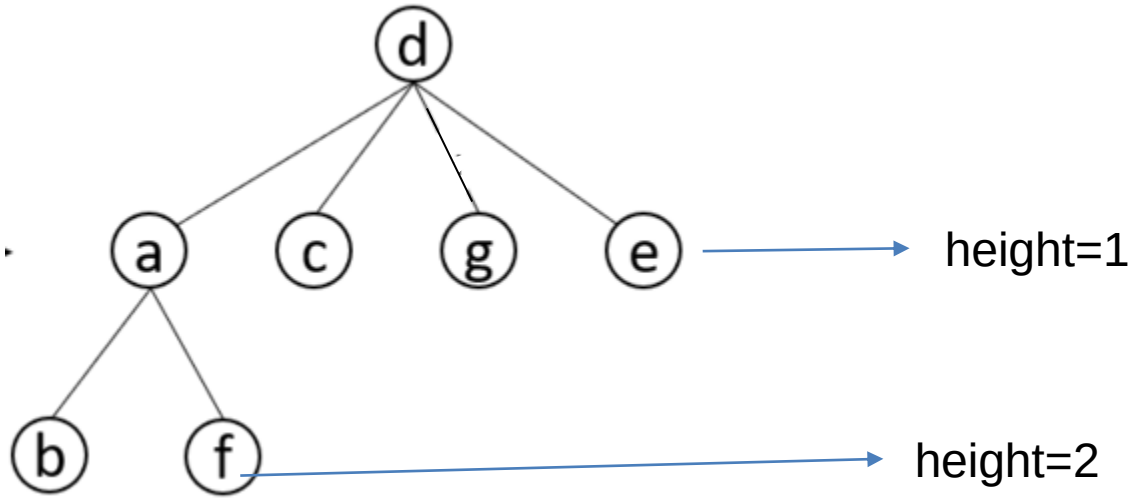
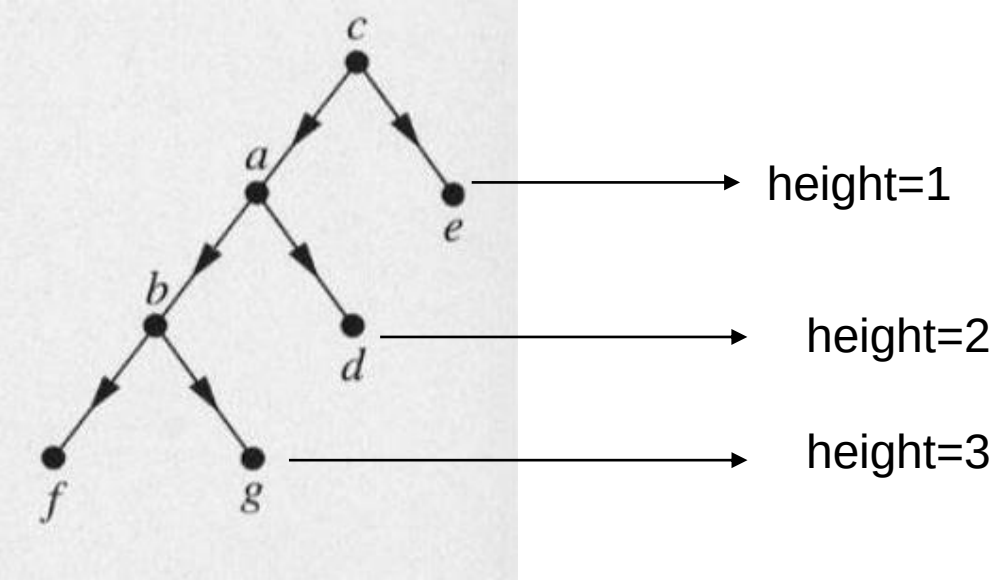
BALANCED M-ARY TREE

A rooted m-ary tree of height h is balanced if all leaves are at level h or h-1.



height is took based on the number of internal vertex that edge has

here h=2
h-1=1
hence it is a balance m ary tree



Here, h=3

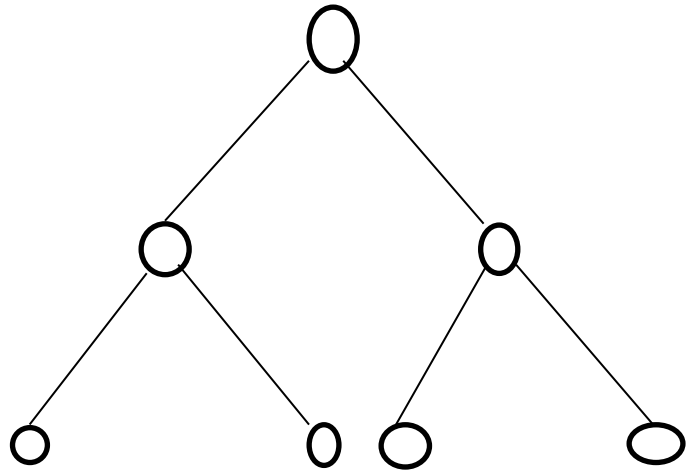
h-1=2

But there is one more leave at height 1 which does not satisfy the condition of balanced m-ary tree that all leaves should be at the level h or h-1, so this is not a balanced m-ary tree.

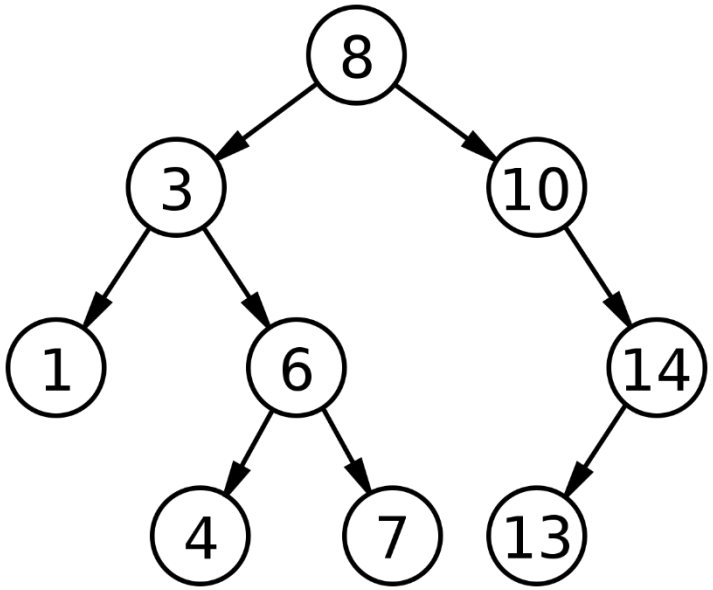
APPLICATION OF TREES:

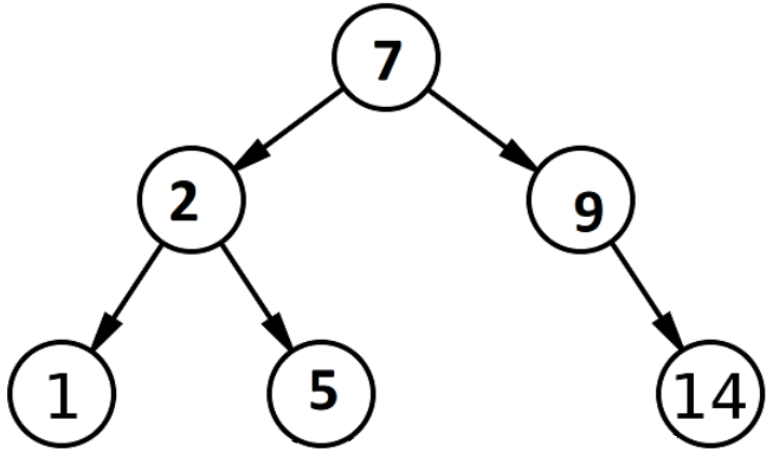
1. BINARY SEARCH TREES:

A binary tree is defined as a tree in which there is exactly one vertex of degree 2 and each of the remaining vertices of degree 1 or 3.



EXAMPLES :





2. Decision trees

Decision trees

A rooted tree in which every internal vertexcorresponds to a decision, with a subtree atthese vertices for each possible outcome of adecision, is called a 'decision tree'.

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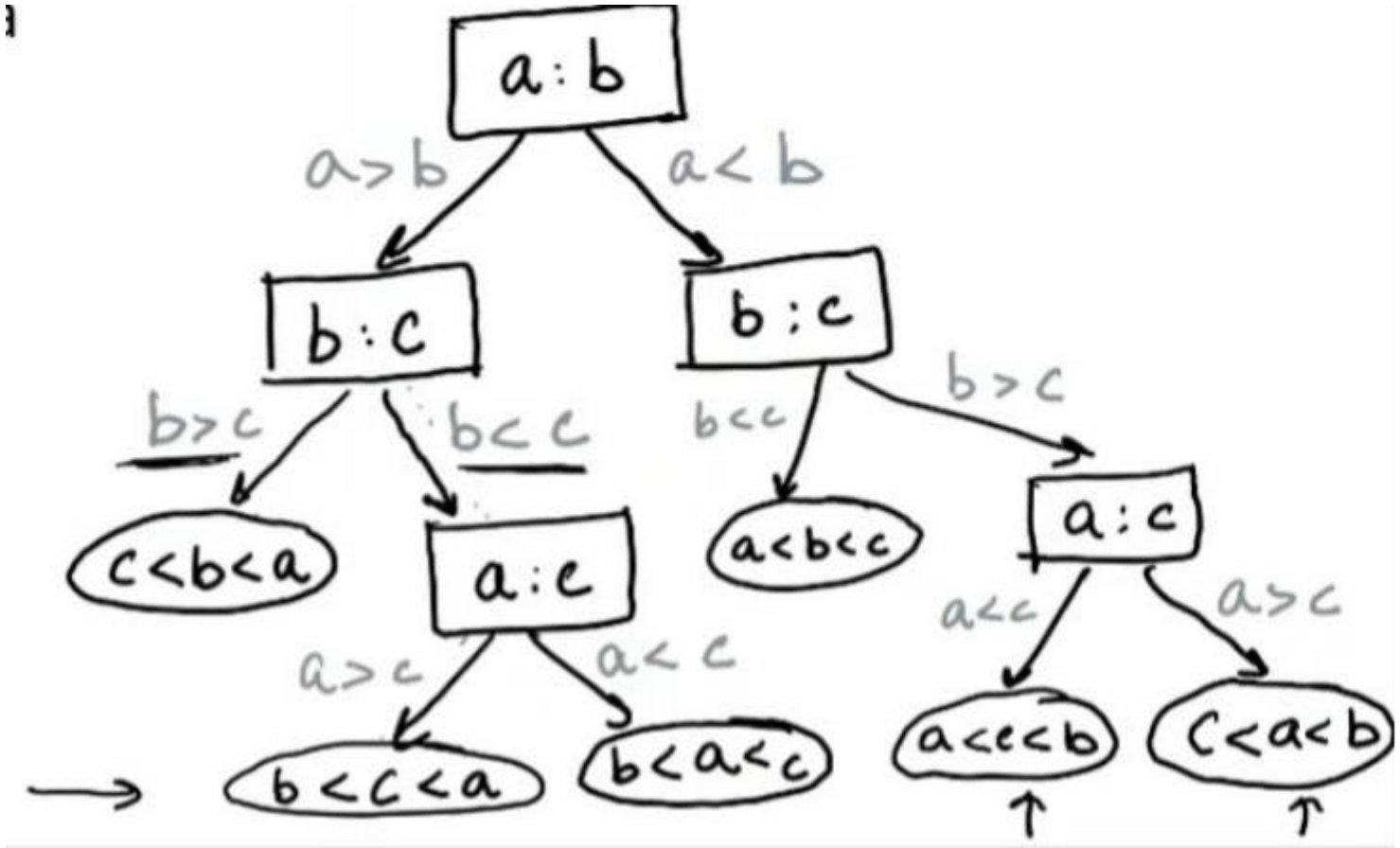
Example 1



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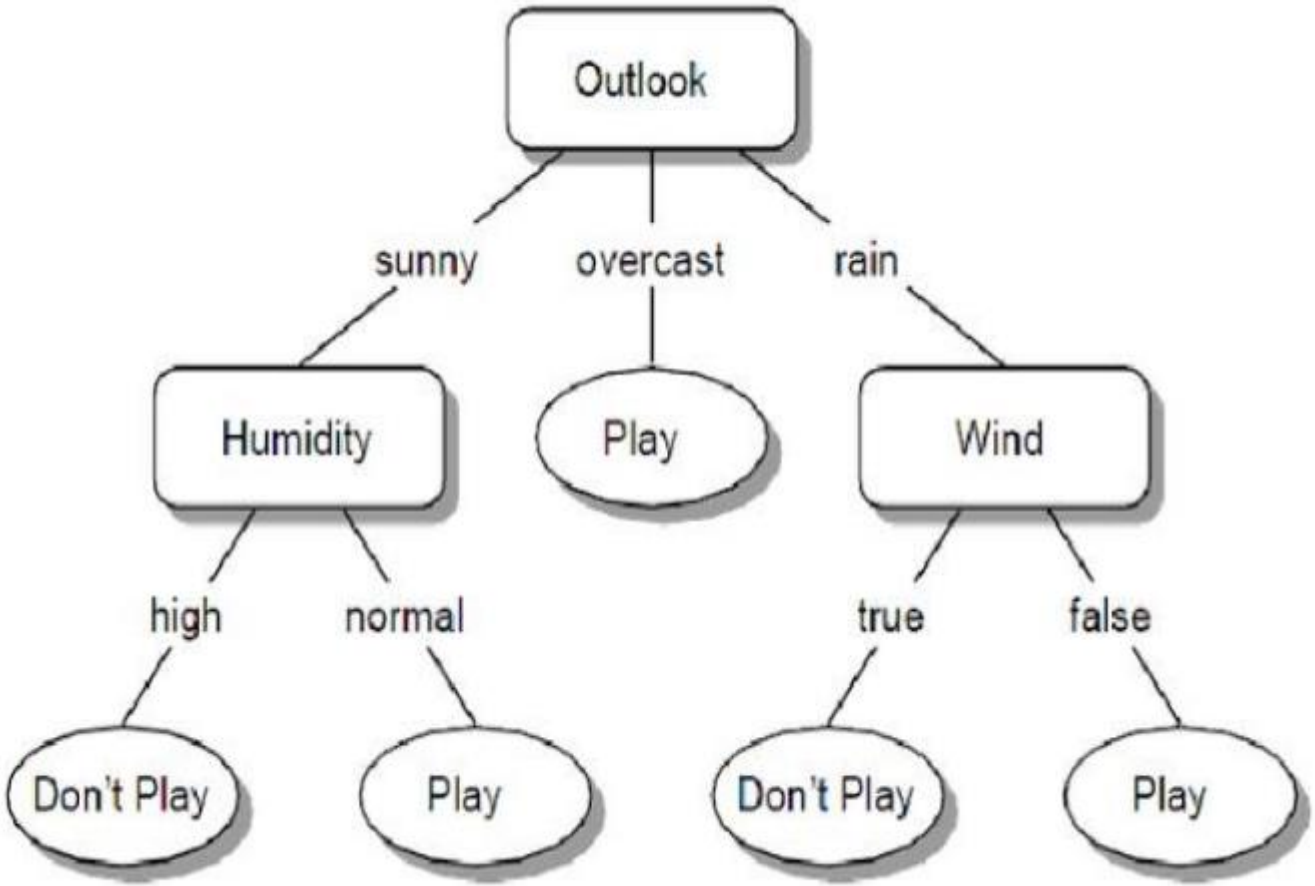
Example 2



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THANK YOU