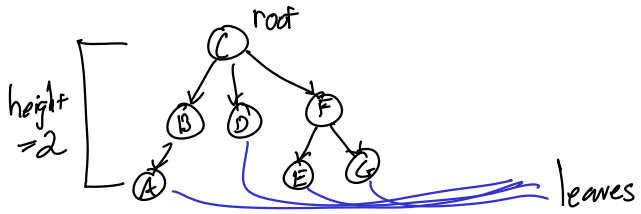
Trees



Node — an information container

Child — a node pointed to

Parent — a node pointing

Descendants — children, their children, etc.

Ancestors — parents, their parents, etc.

Tree — a collection of nodes s.t.
1. all nodes have a common ancestor
2. all nodes have at most one parent

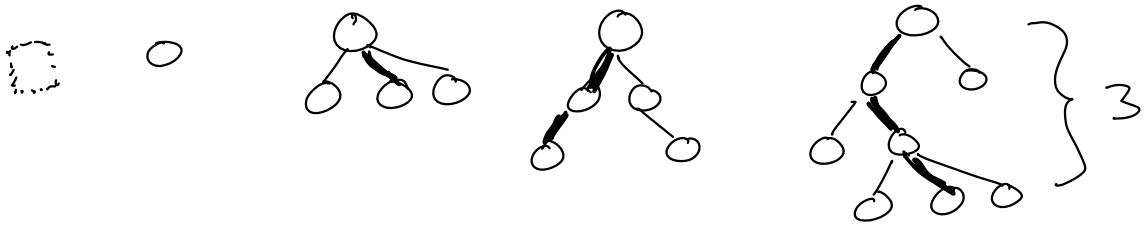
B is the parent of A
E is the child of F
C is an ancestor of E

Root — the unique node w/ no parent

Leaves — the nodes w/ no children

Size — # of nodes

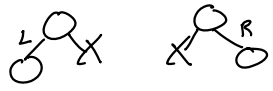
Height — # of steps between root & farthest leaf

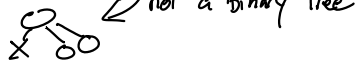


height	-1	0	1	2	3
size	0	1	4	5	8

Binary tree is a tree where each node has at most one left child and one right child

binary trees →

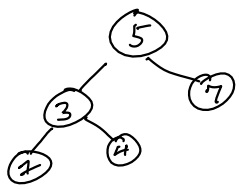




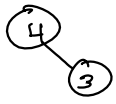
Binary Search Tree is a binary tree where,

Binary Search Invariant

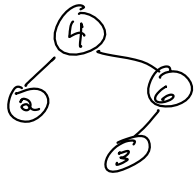
for each node N in the tree, the key of all left descendants is less than the key of N and the key of all right descendants is greater than the key of N



This is a BST



This is not a BST

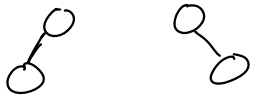


This is also not a BST

1. How many shapes of binary tree exist s.t. the tree has size 4?

size 1

size 2



2. What are some other problems that we can use a dictionary to solve?