Tree

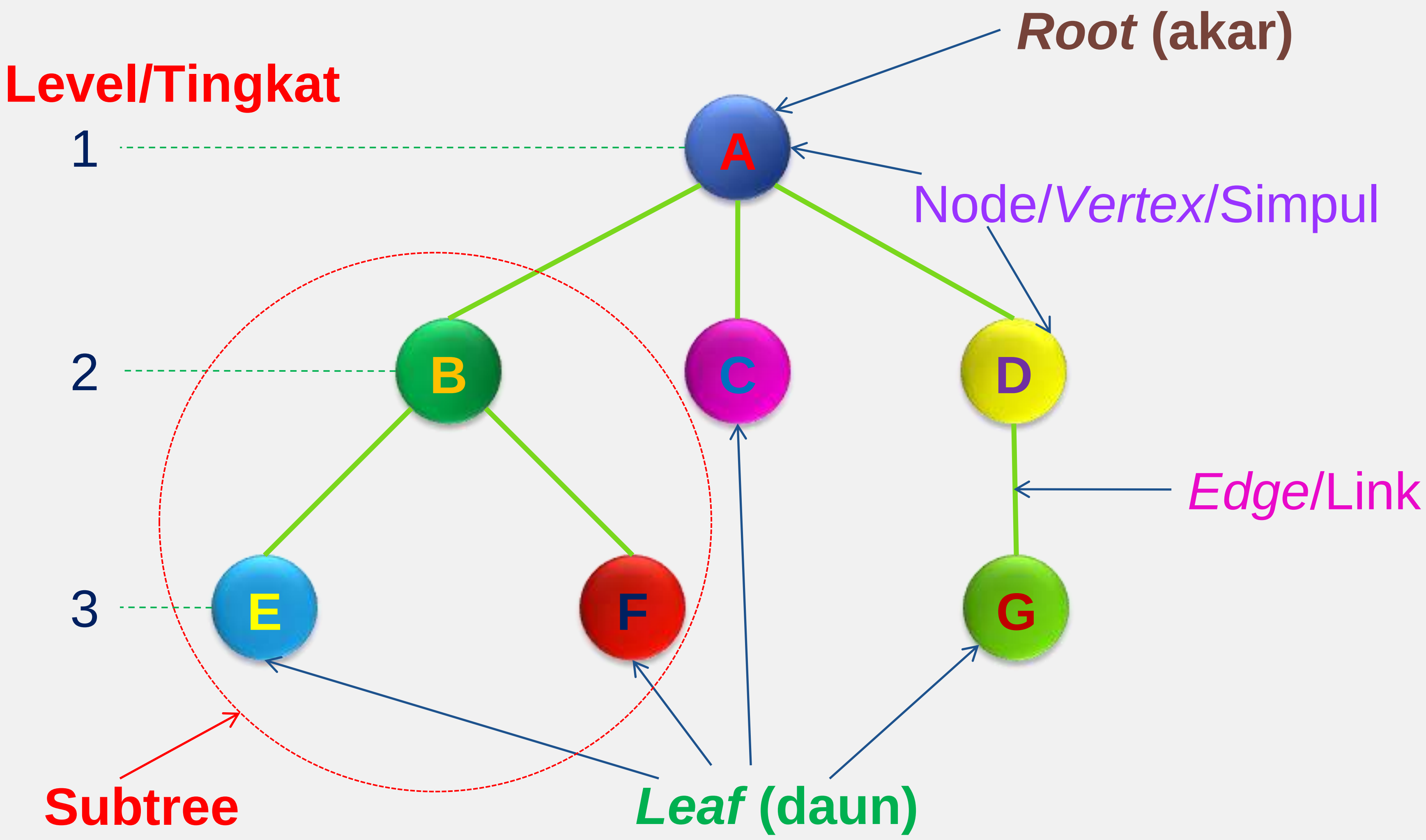
[redacted]

DEFINITION

Tree

Tree is data structure that is non linear and can be used to represents data in **hierarchy** between those elements. For example: organization structure, family tree, and the tournament.

Components of Tree



Level/Tingkat

***Root* (akar)**

Node/*Vertex*/Simpul

Edge/Link

Subtree

***Leaf* (daun)**

TERMINOLOGY

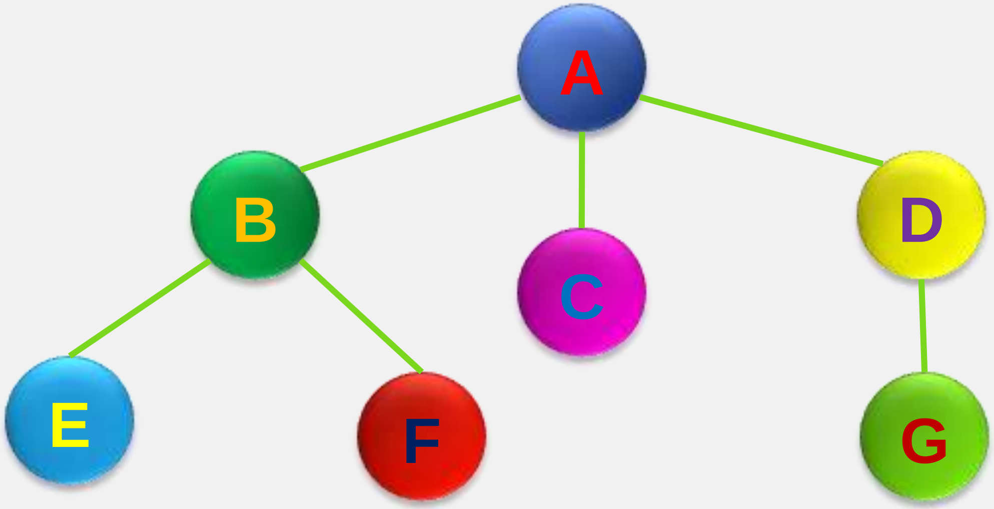
Terminology of Tree

- **Predecessor** node that is above certain node.
- **Successor** node that is below certain node
- **Ancestor** all nodes that is before certain node and in the same path.
- **Descendant** all nodes that is after certain node and in the same path.

Terminology of Tree

- **Parent** predecessor that is one level above certain node.
- **Sibling** nodes that have same parent
- **Degree** number of child in one node.

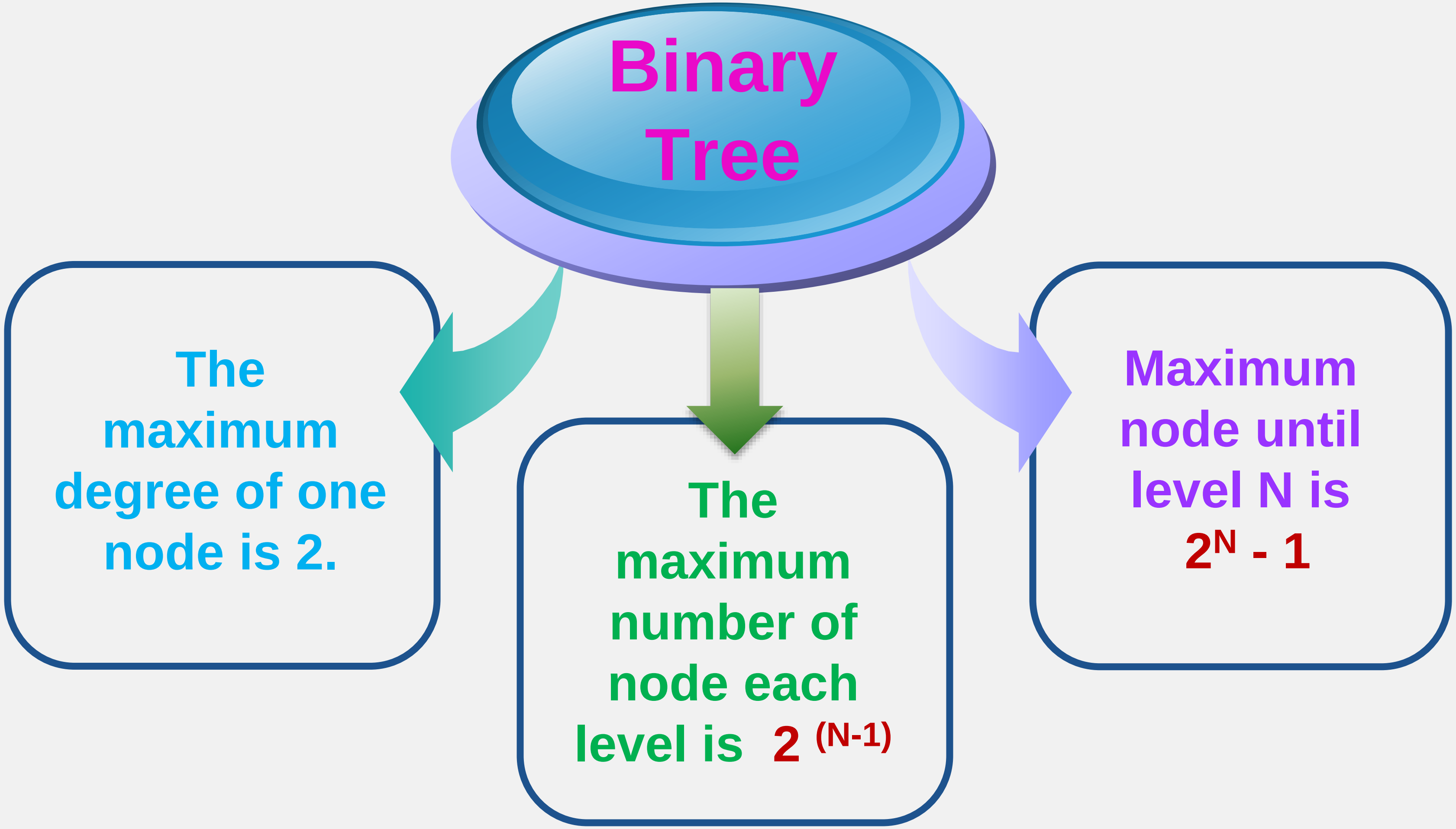
Ilustration



Predecessor(B)	**: A**
Successor(A)	**: B,C,D**
Ancestor(E)	**: B,A**
Descendant(B)	**: E,F**

Parent(E)	: B
Sibling(E)	: F
Degree(A)	: 3

Binary Tree



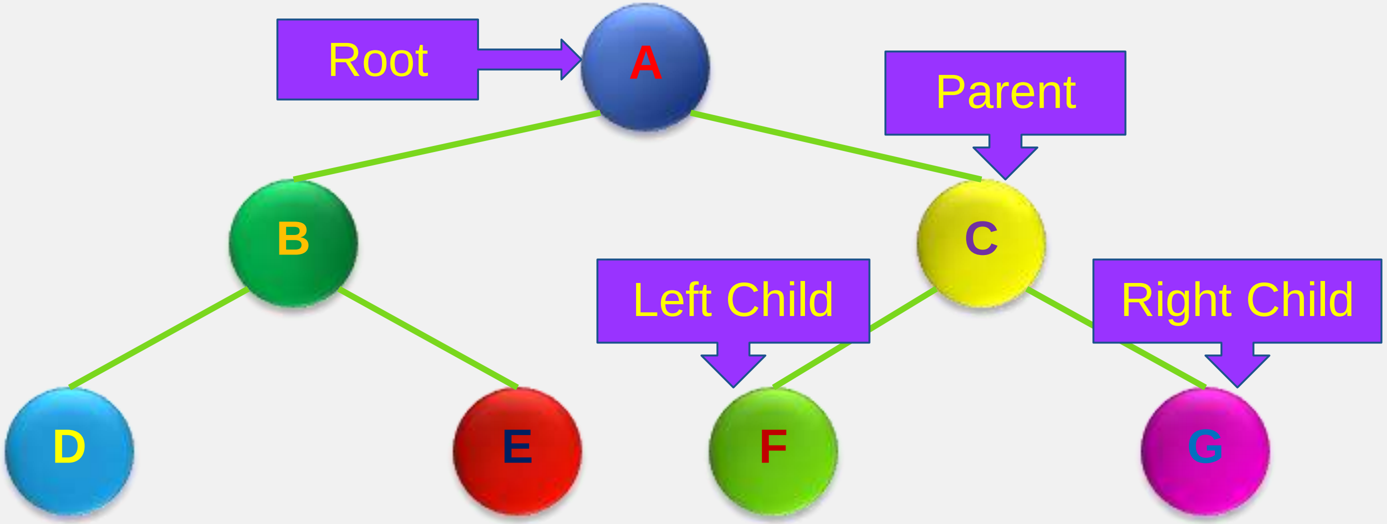
Binary Tree

The maximum degree of one node is 2.

The maximum number of node each level is $2^{(N-1)}$

Maximum node until level N is $2^N - 1$

Binary Tree



Maximum node on 3rd level $= 2^{(N-1)}$

$= 2^{(3-1)}$

$= 2^2$

$= 4$

Maximum node until 3rd level $= 2^N - 1$

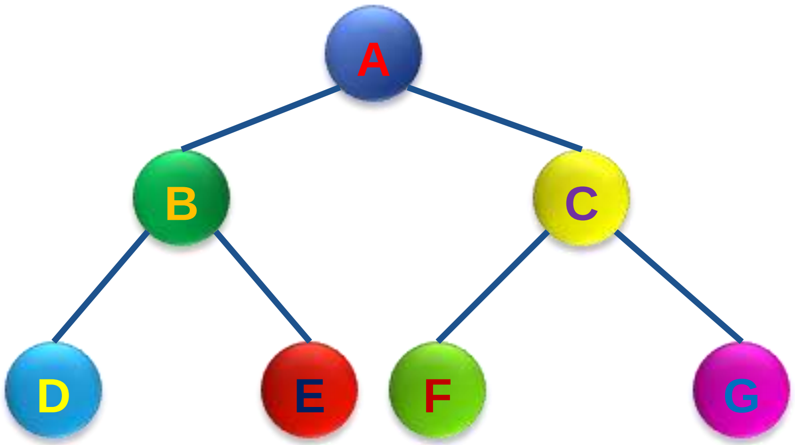
$= 2^3 - 1$

$= 8 - 1$

$= 7$

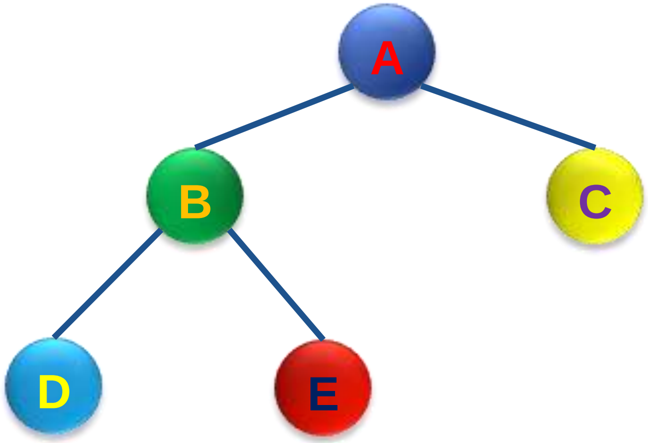
Types of Binary Tree

Full Binary Tree



- All nodes (except leaf) have two children.
- Each subtree has same length of path.

Complete Binary Tree



- All nodes (except leaf) have two children.
- Each subtree can has different length of path.

MAKING OF BINARY TREE

Making of Binary Tree

- From input data
- From general tree
- From result of traversal process

From Input Data

- If value of inserted node is bigger than parent then it will be right subtree.
- If value of inserted node is smaller than parent then it will be left subtree.
- This tree is known as binary search tree.

From Input Data

Example:HAKCBLJ

H will be root

A < H :

A will be left child of H

K > H :

K will be right child of H

C < H → C > A :

C will be right child of A

B < H → B > A → B < C :

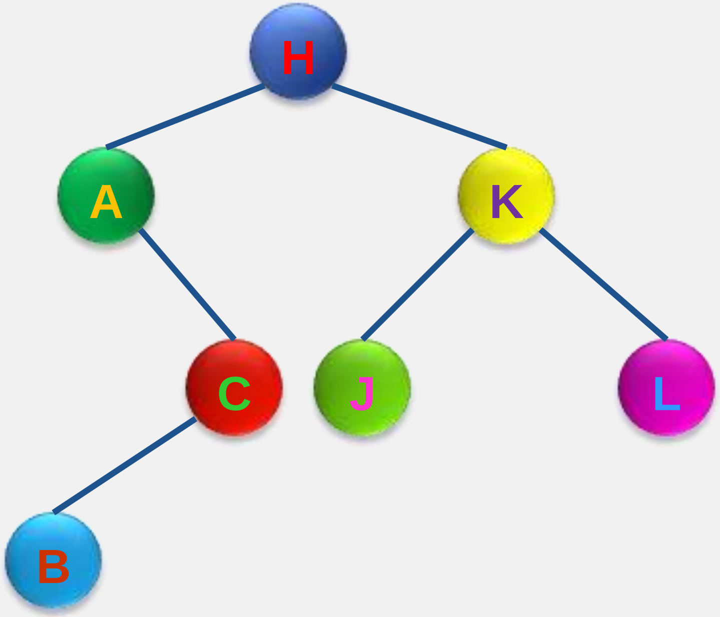
B will be left child of C

L > H → L > K :

L will be right child of K

J < H → J < K :

J will be left child of K



Exercise

Make binary tree from these input data:

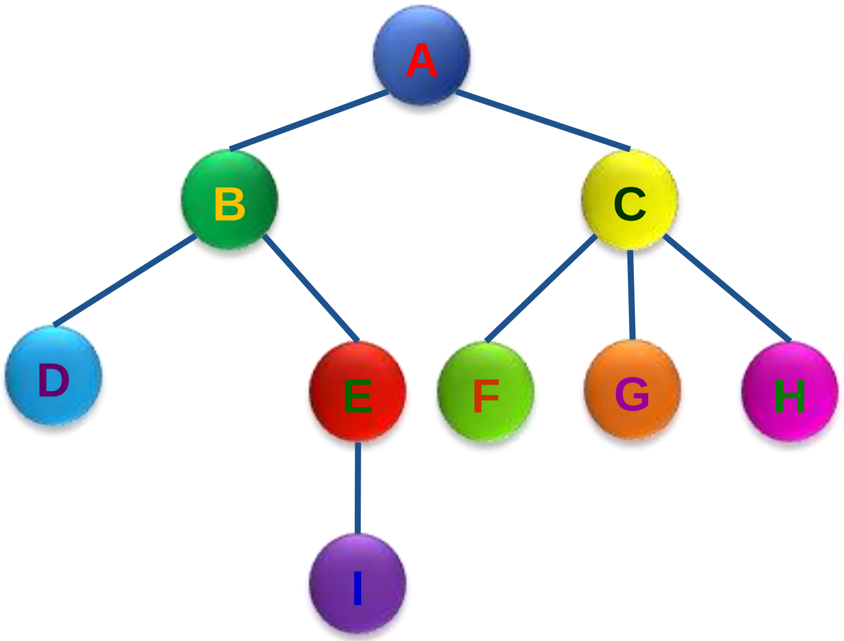
- GHCKJALBEFD
- KGMDLSBRJP

From General Tree

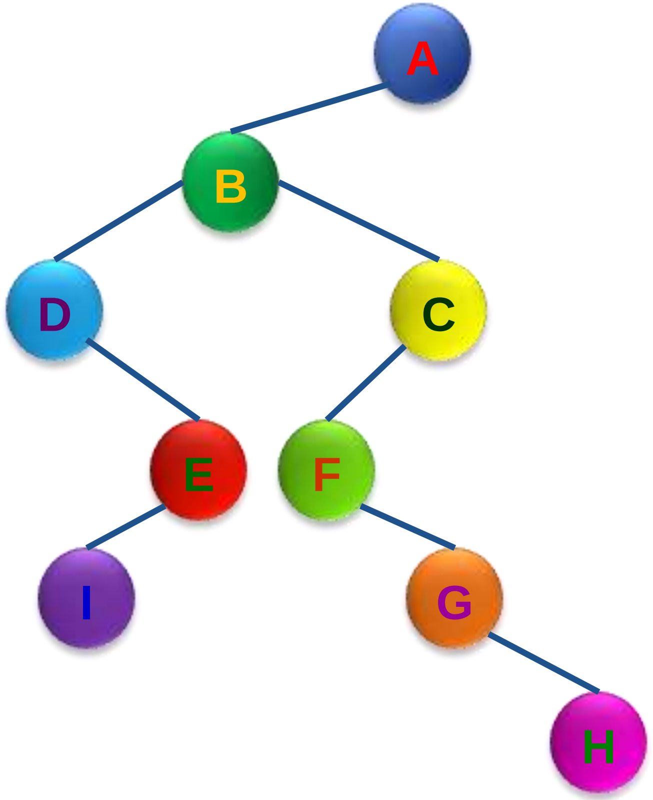
- First son in general tree will be left son in binary tree
- Next brother of first son in general tree will be right son in binary tree.

From General Tree

General Tree

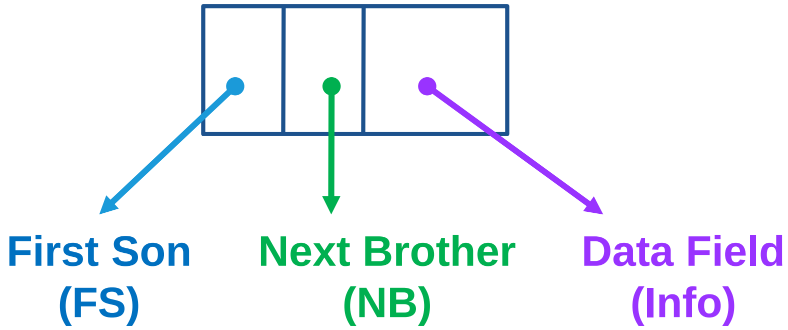


Binary Tree



From General Tree (Program)

One node in general tree

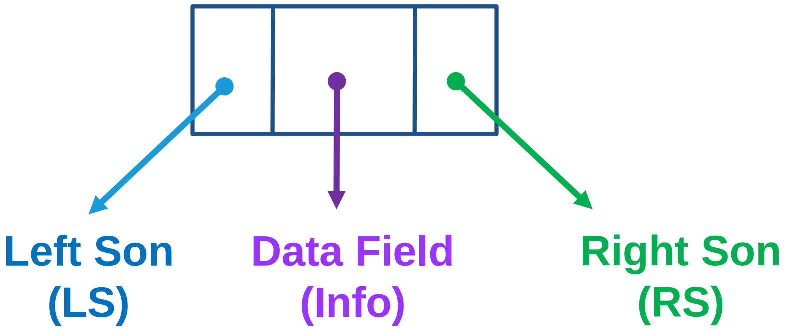


First Son (FS)

Next Brother (NB)

Data Field (Info)

One node in binary tree



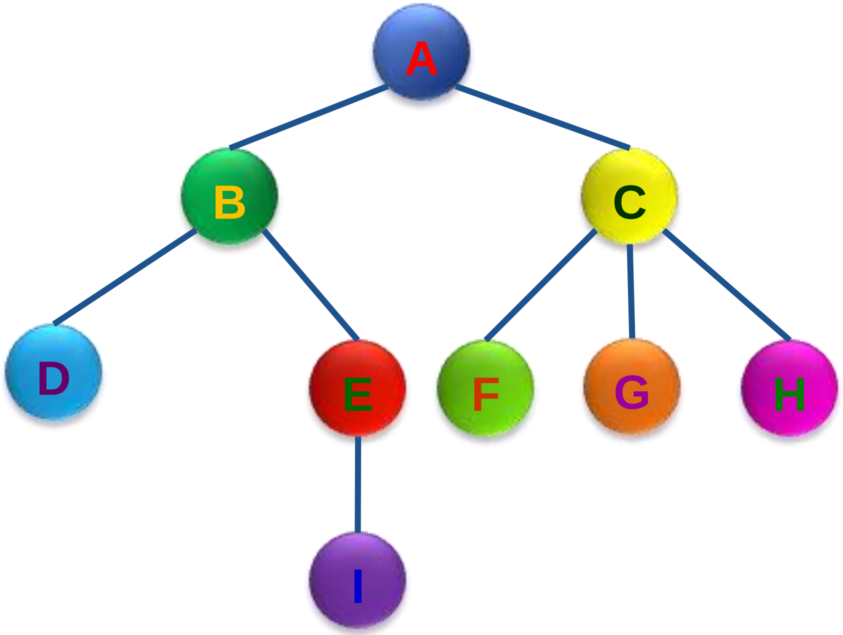
Left Son (LS)

Data Field (Info)

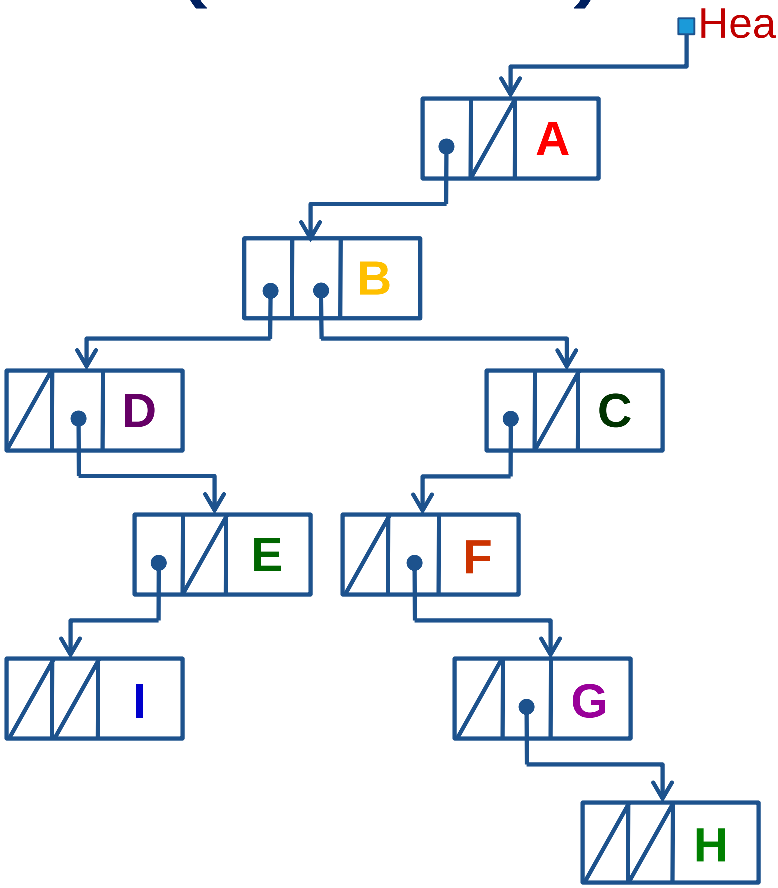
Right Son (RS)

From General Tree (Program)

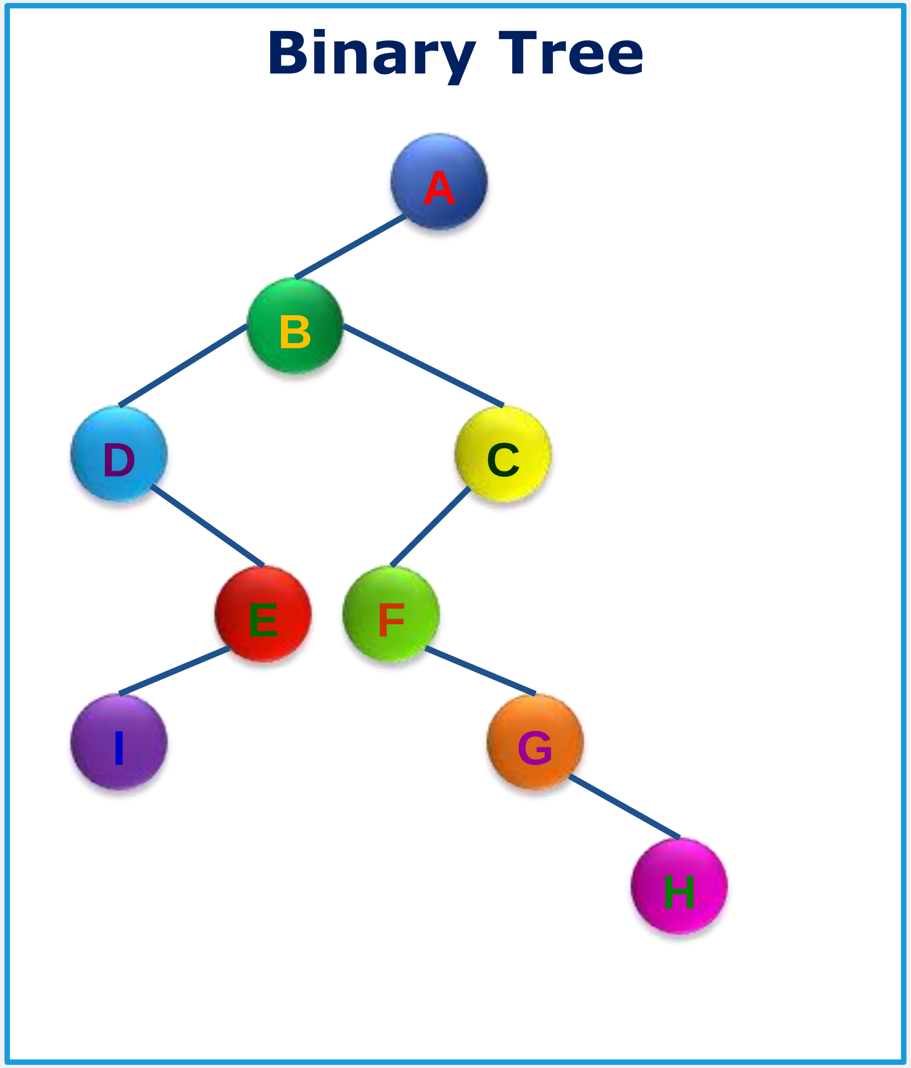
General Tree

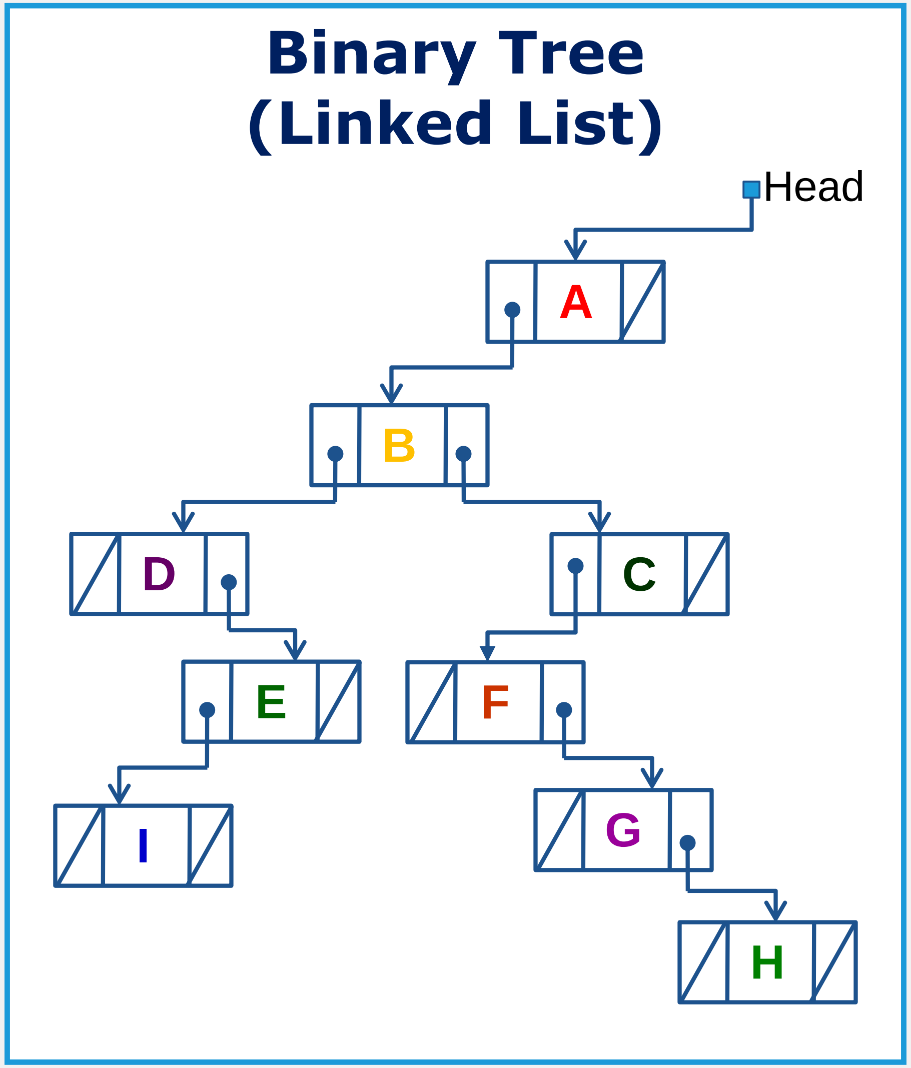


General Tree (Linked List)



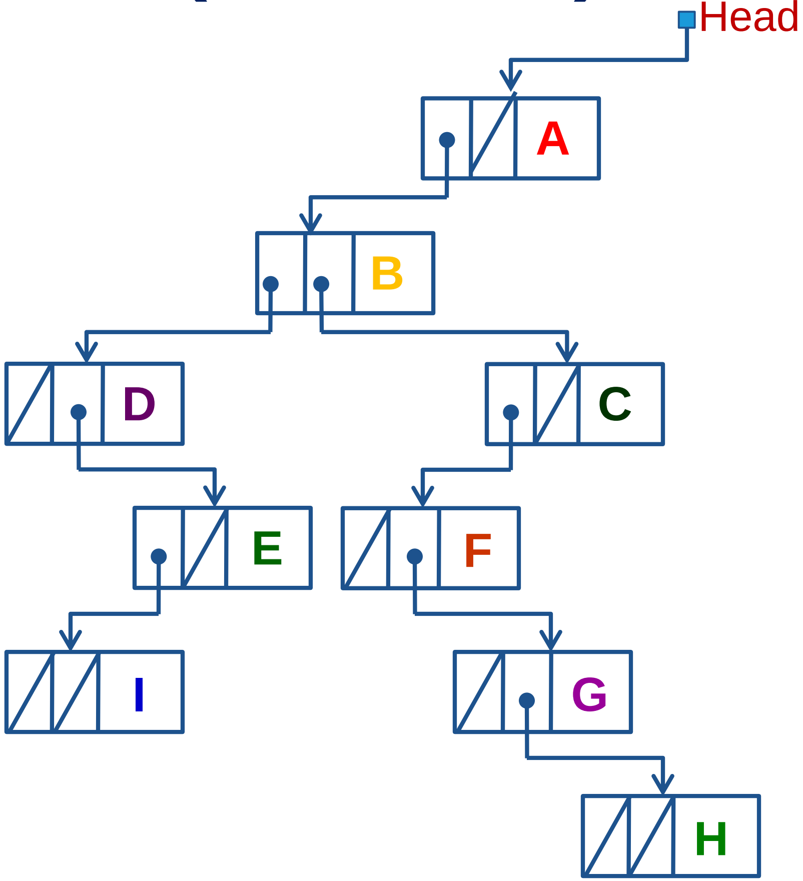
From General Tree (Program)



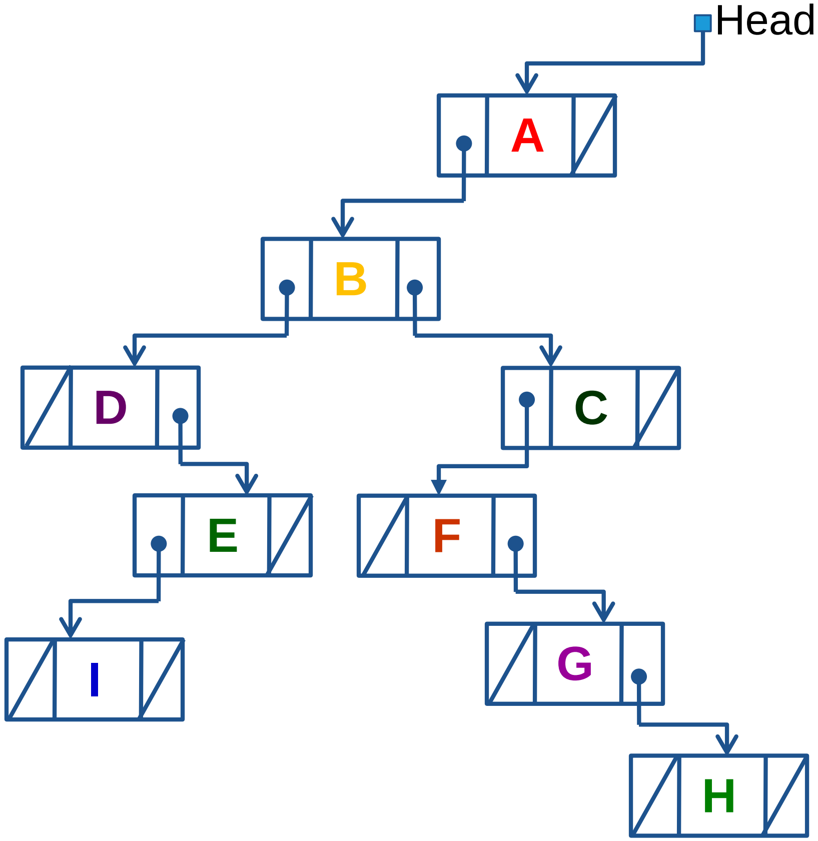


From General Tree (Program)

General Tree (Linked List)

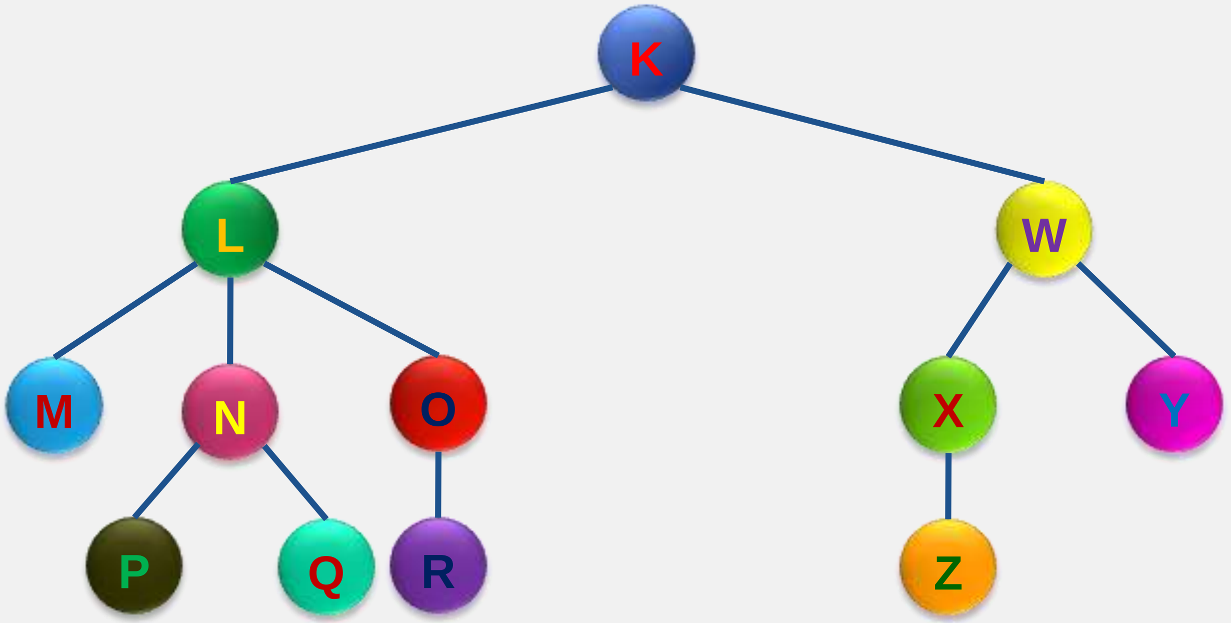


Binary Tree (Linked List)

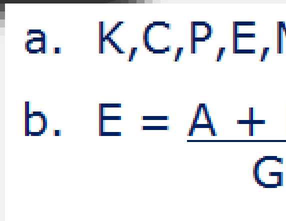


Exercise

Make binary tree from this general tree:



Exercise



a. K,C,P,E,M

b. E = A +

G

Make binary tree from this statement:

- K, C, P, E, M, B, R, G, Q, F, W

- $$E = \frac{A + BD^{H} – F}{G - K}$$