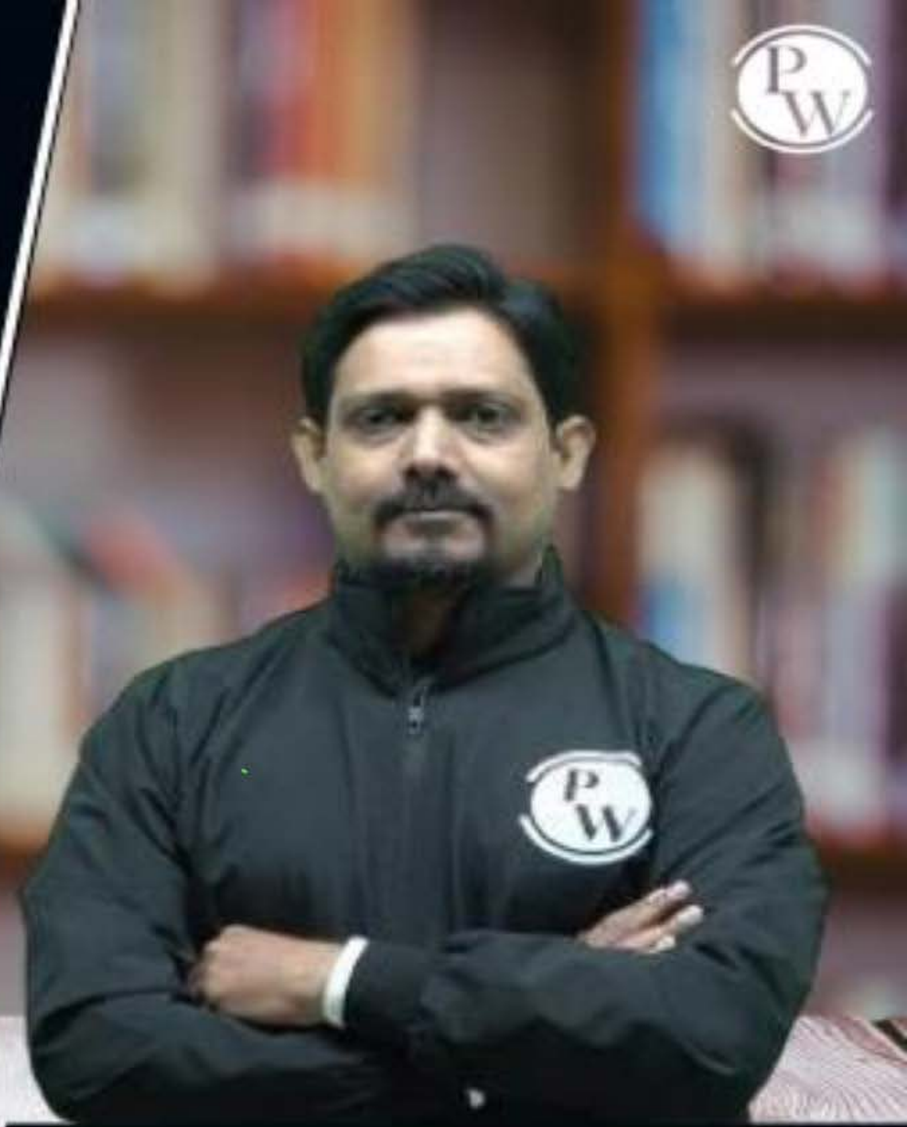
Computer Science & IT

Data Structure & Programming

Tree

Lecture No. 04



By- Abhishek Sir

Recap of Previous Lecture

Topic — No. of labelled & unlabelled tree

Topic — Tree representation

Topic — Traversal

Topic

Topic

Slide

Topics to be Covered

- Topic
- Topic
- Topic
- Topic
- Topic

Construction of tree using traversal

Binary Search Tree.

Slide

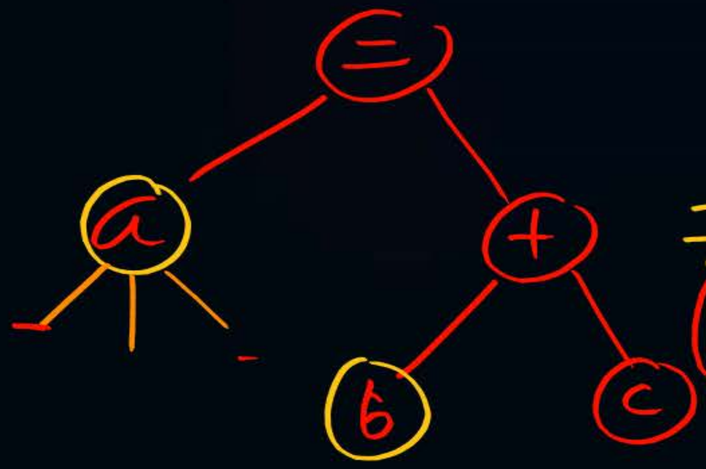
Topic : Tree

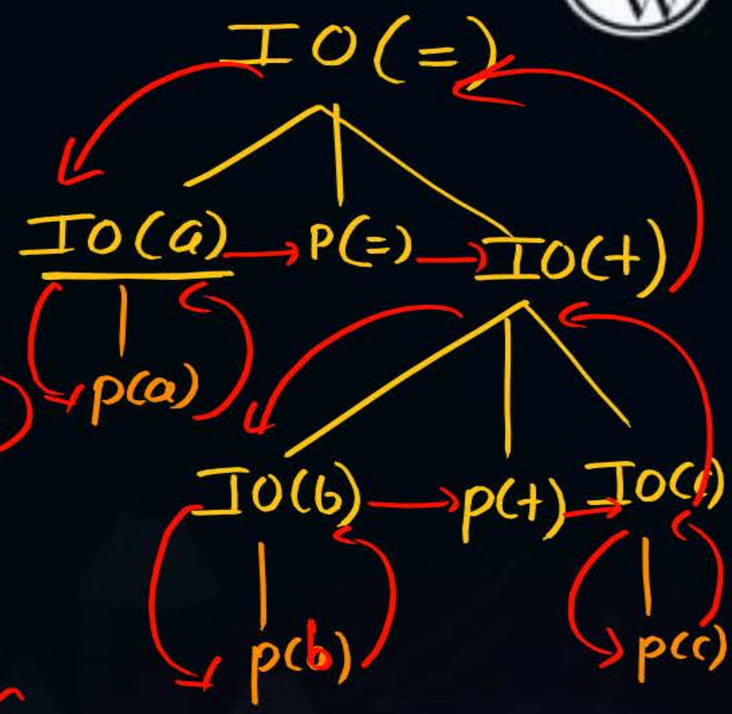
Traversal
Construction of Binary tree from traversal
Tree Recursive problem

Slide

Topic : Tree

```
void Inorder (Inode* t) {
    if (t) {
        Inorder (t→left);
        printf ("%d", t→data);
        Inorder (t→right);
    }
}
```





$a = b + c$

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Topic : Tree

Construction of tree using preorder & Inorder

preorder: a b c d f g e

Inorder: c b f d g a e

preorder: Root left Right

Inorder left Root Right

preorder: b c d f g

Inorder: c b f d g

preorder: d f g

Inorder: f d g

Slide

Topic : Tree

1. Identify the Root (first element of preorder is root)
2. we use the root element to Identify Node in left & right Substree using Inorder
3. repeat the above process

Slide

Topic : Question

#Q.

For given preorder : ABCDEFG
inorder : BDCAFGE
What is the postorder of a *Binary Tree*?
(a) CDBGFEA (b) DBCGFEA
(c) DCBGFEA (d) None of these

[c]

preorder : A B C D E F G

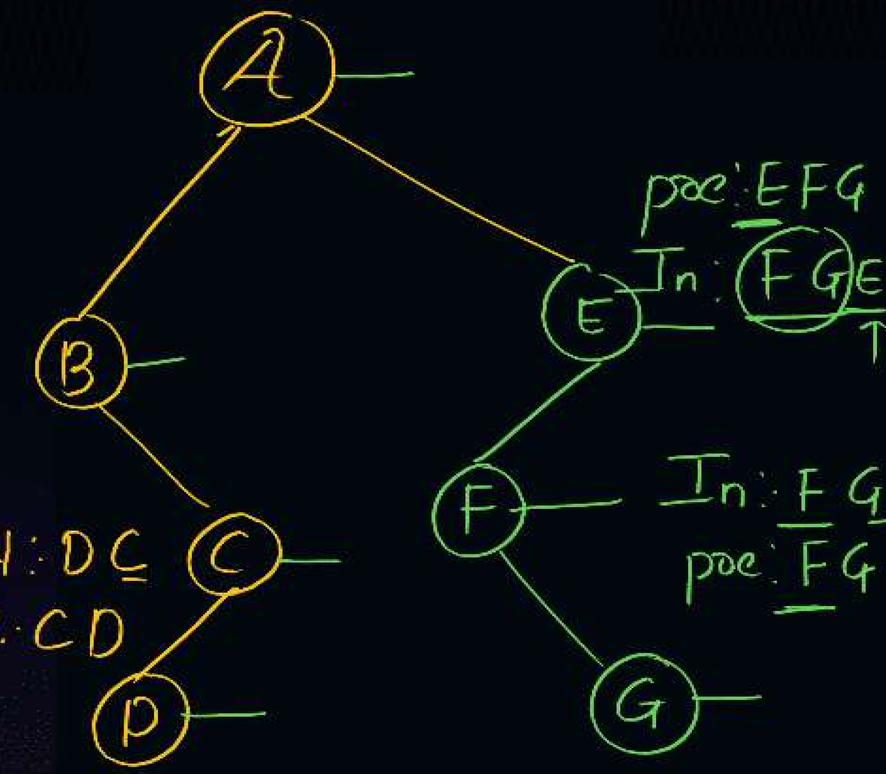
Inorder B D C A F G E

Root Left right ✓

Left Root Right ✓

In: B D C
pre: B C D

IN: D C
pre: C D



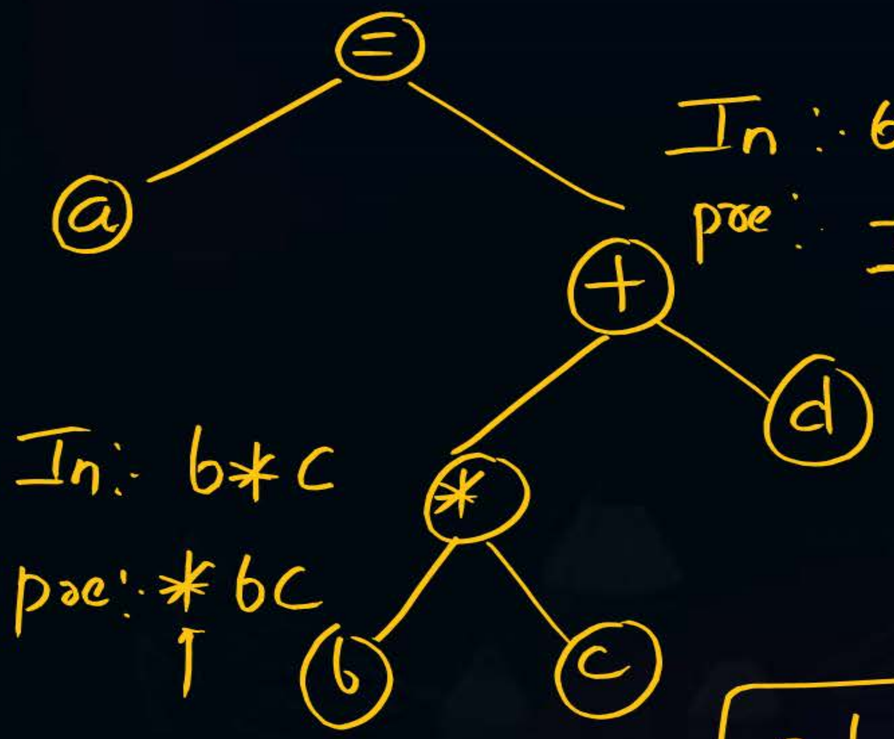
post : D C B G F E A

Topic : Tree

Inorder : a = b * c + d

preorder : = a + * b c d

postorder traversal.



a b c * d + =

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Topic : Tree

postorder: c f g d b e a

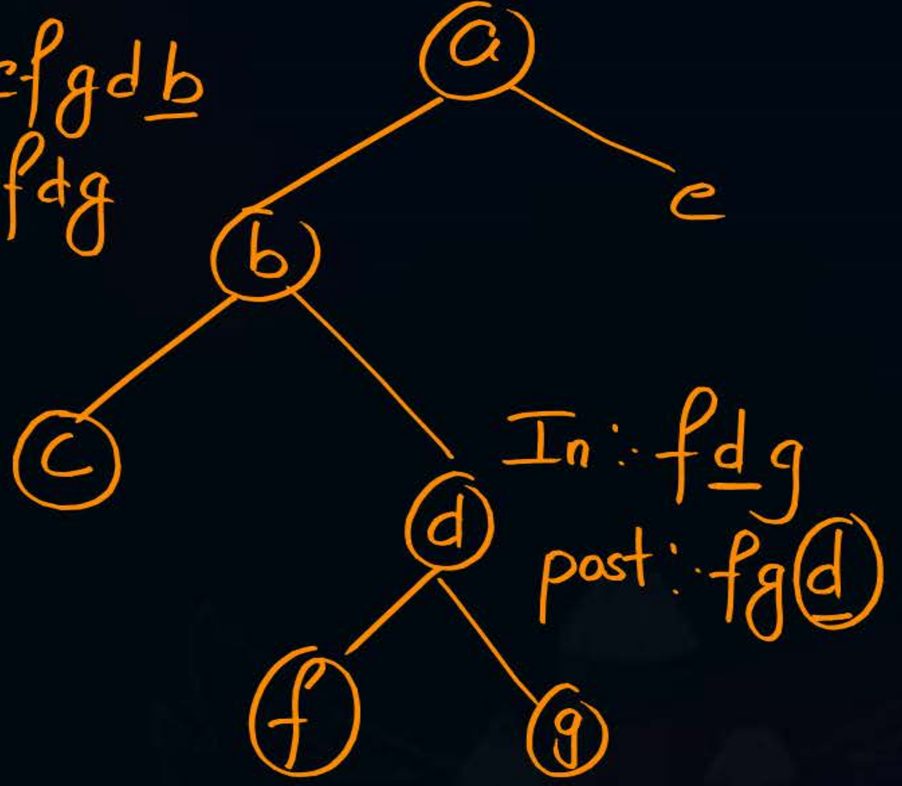
Inorder: c b f d g a e

Left Right Root

Left Root Right

post: c f g d b

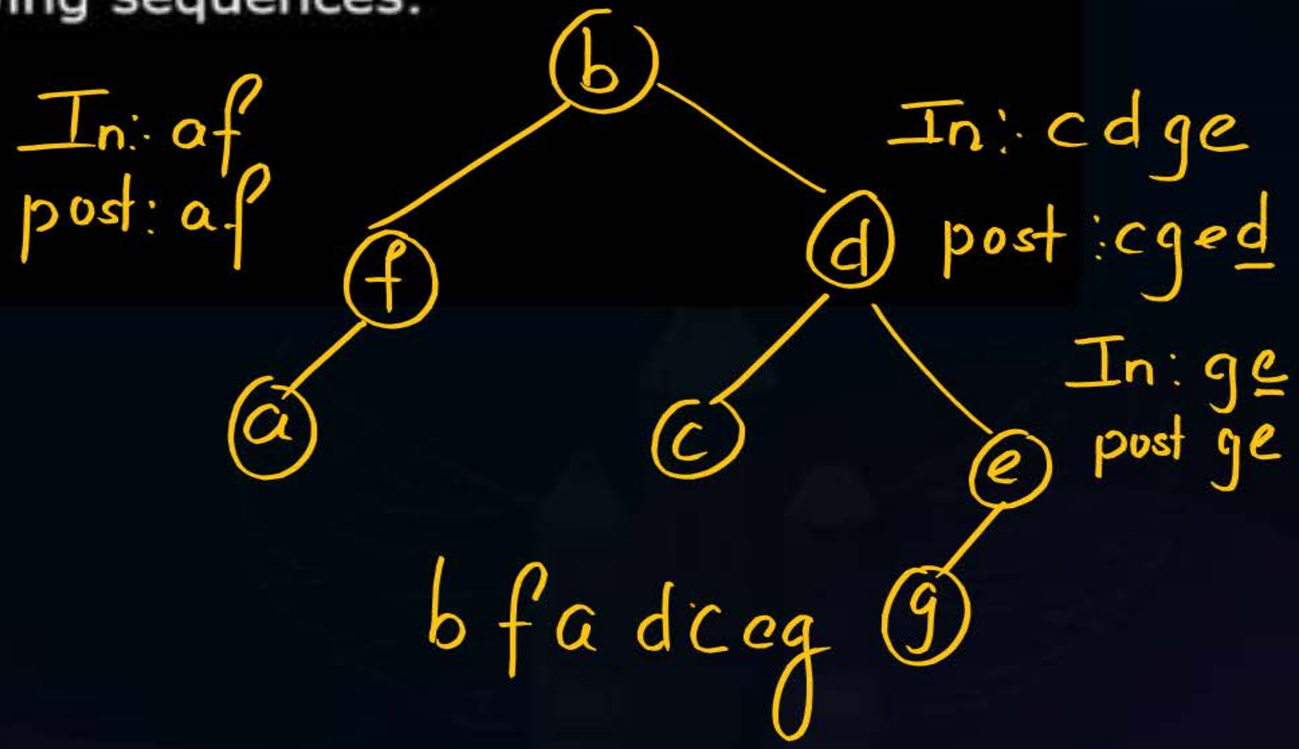
In: c b f d g



Topic : Question

Draw the binary tree with node labels a, b, c, d, e, f and g for which the inorder and postorder traversals result in the following sequences.

Inorder	a f b c d g e
Postorder	a f c g e d b



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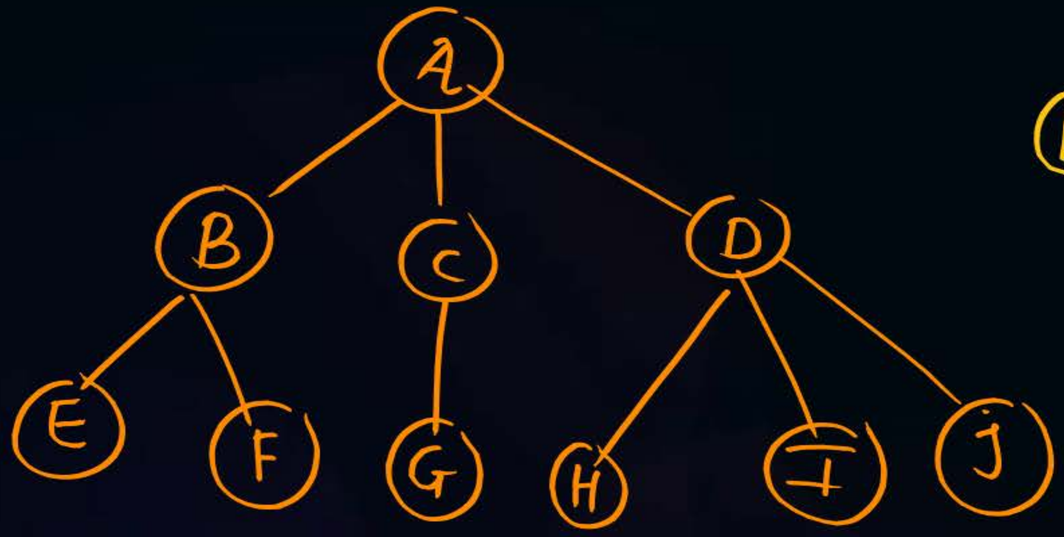
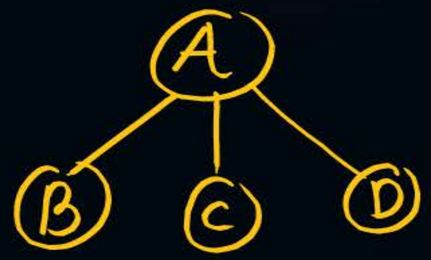
Topic : Tree

General tree representation



1. Nested Representation



A (B, C, D)

Root (List of children)

A (B(E, F), C(G), D(H, I, J))

if children is subtree then repeat the process.

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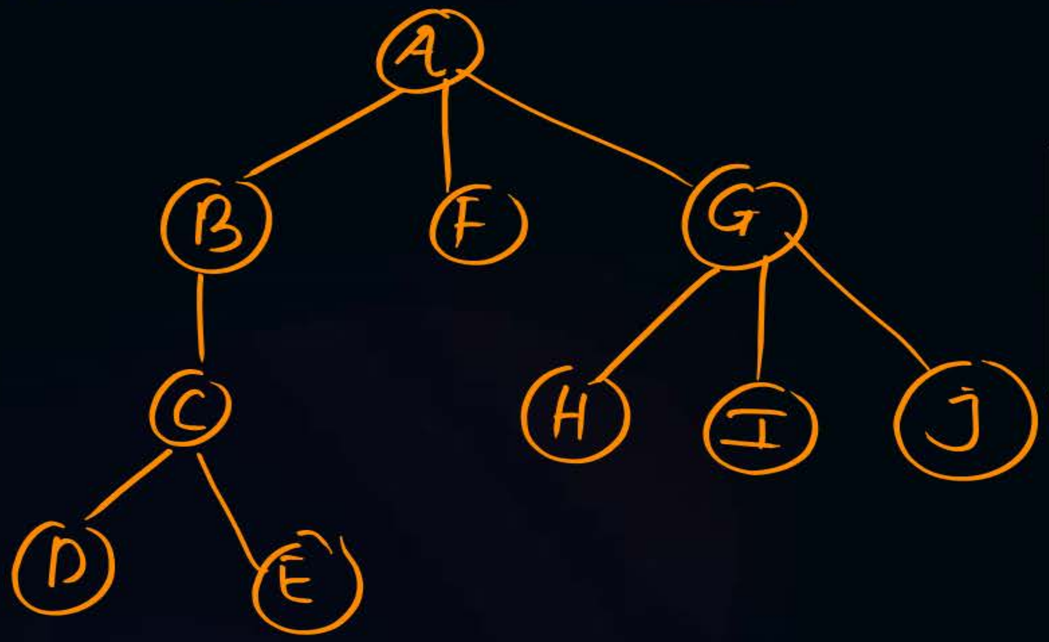
Topic : Tree



Nested Representation

$$A(B(C(D,E)),F,G(H,I,J))$$

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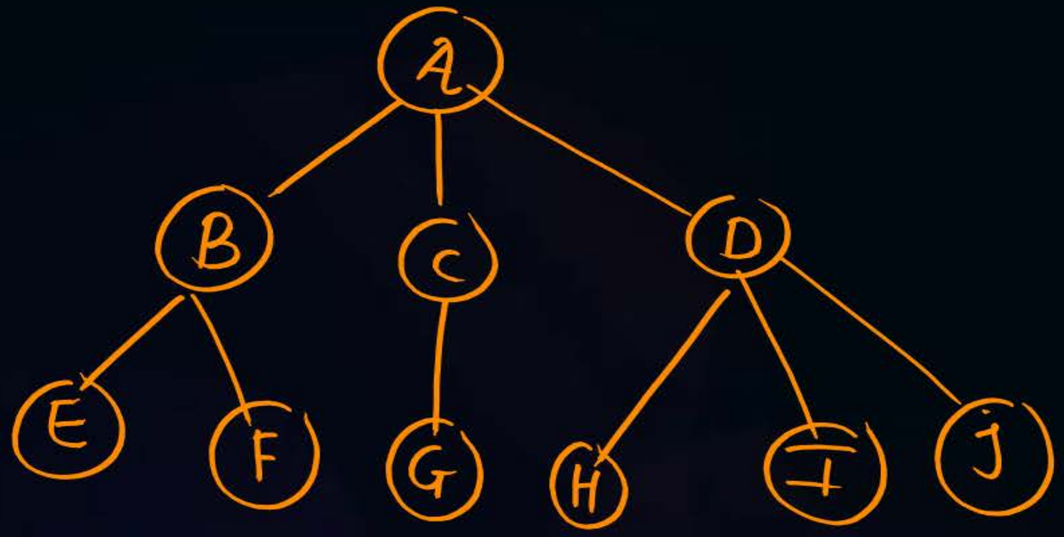
Topic : Tree

General tree representation



Leftmost child & right sibling representation

A leftmost child - B

A is right sibling is NULL

C leftmost child g

C right sibling d

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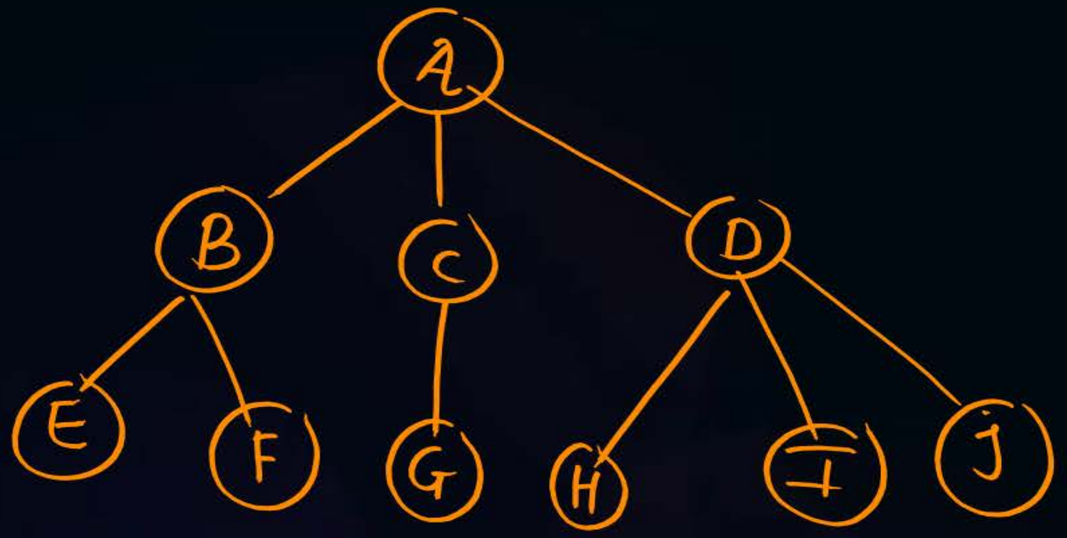
Topic : Tree

General tree representation



Leftmost child & right sibling representation

```
struct gtnode {
    char data;
    struct gtnode * Lmchild;
    struct gtnode * rsibling;
};
```

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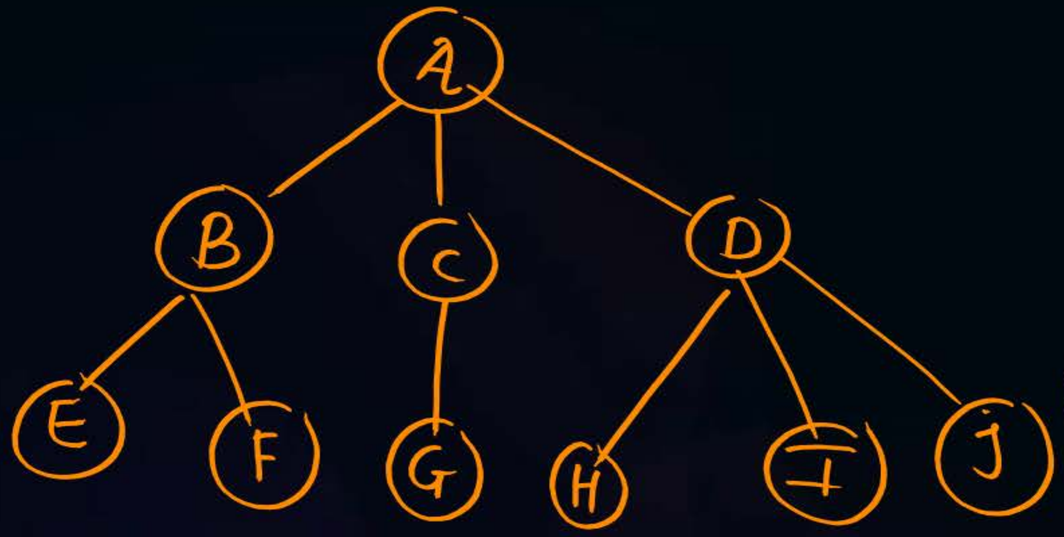
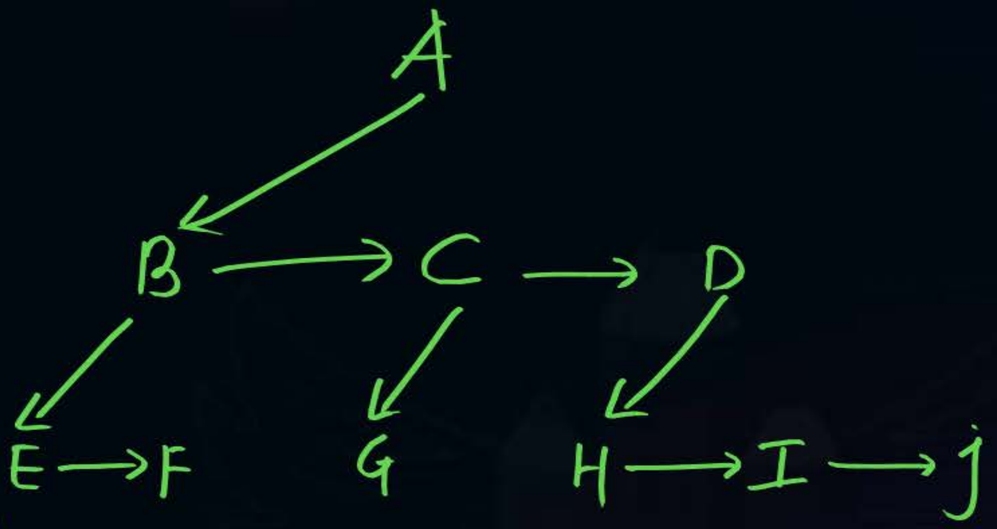
Topic : Tree

General tree representation



Leftmost child & right sibling representation



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Topic : Tree

Binay Search Tree

key value is a attribute for unique Indentification

Binay Search is a tree in which all key value lesser than the key value of goes in left subtree & all keys greater than the key value of Root goes in Right subtree (This definition is true for subtree also, for distinct keys)

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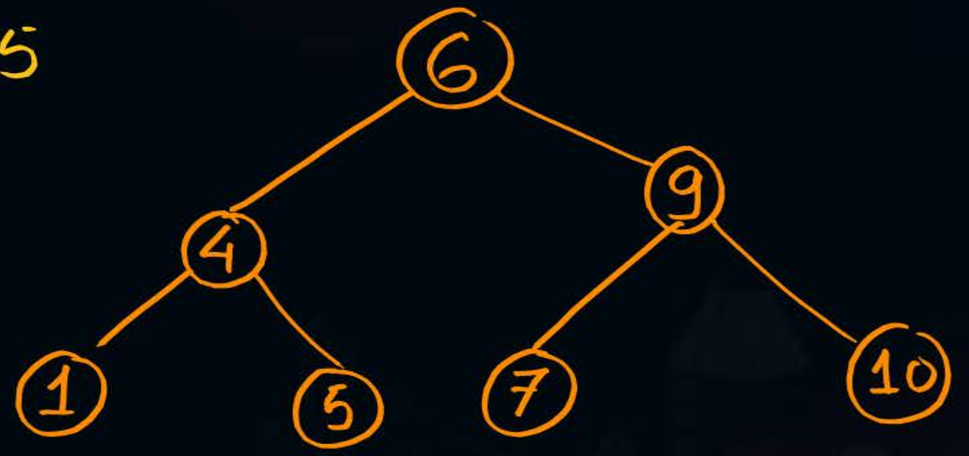
Topic : Tree

Construct the BST with following key value

6, 9, 4, 1, 10, 7, 5



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Topic : Tree

Construct Binary Search Tree by Inserting following elements

9, 4, 2, 10, 15, 8, 7, 21, 14

if No. of leaves in BST is x and Height of tree is y then $2^x - y$ is ____

Slide

Topic : Tree

Construct Binay Seaoch Pree by Inseating following elements

9, 4, 2, 10, 15, 8, 7, 21, 14

x = 4 leaves

y = 3

$2^x - y$

$= 16 - 3 = 13$

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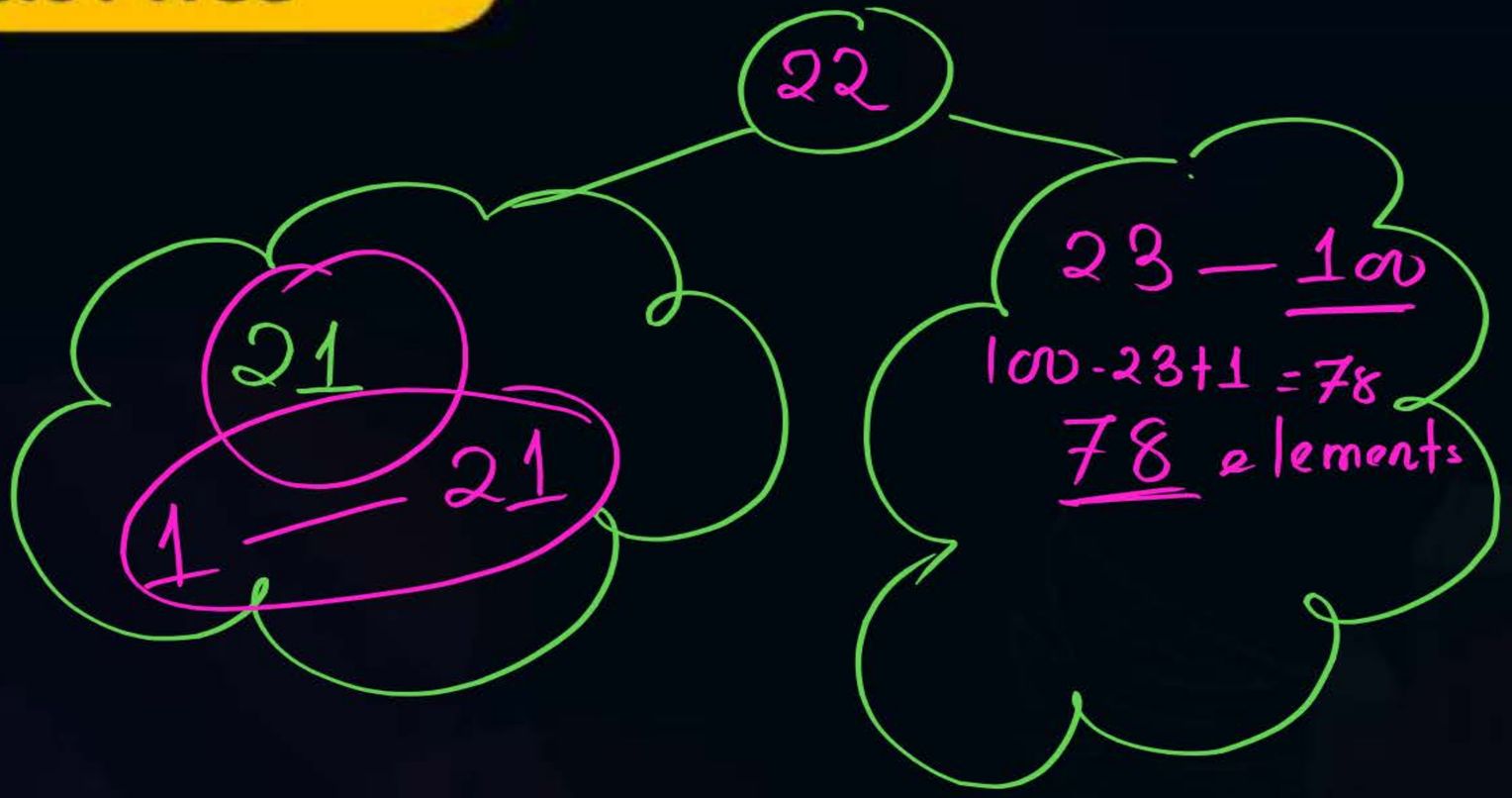
Topic : Tree

BARC

if No. 1 – 100 is inserted in Empty Binary Search tree. If there are 21 elements in left subtree then if x is Root of BST and y is No. of Nodes in Right subtree then $x+y$ is $22+78=100$?

Slide

Topic : Tree



100

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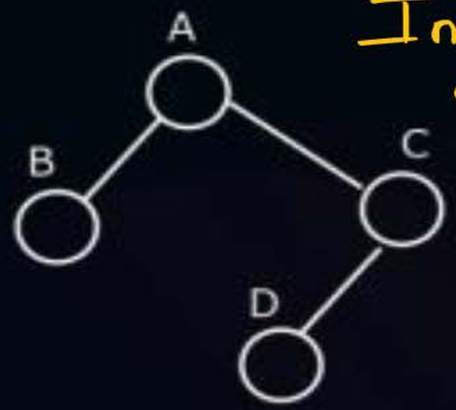
Topic : Question

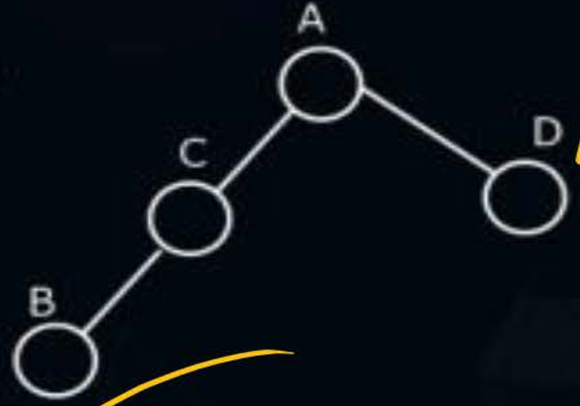
#Q. Which one of the following binary trees has its in-order and preorder traversals as BCAD and ABCD, respectively?

(A)



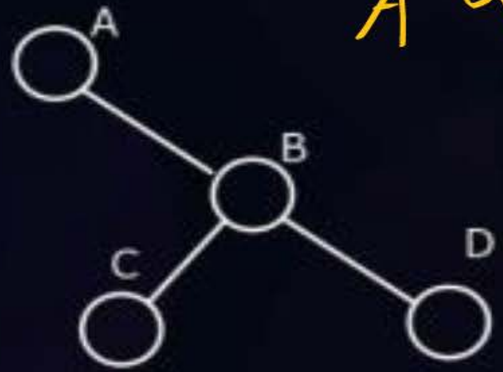
In: B A D C
q

(B)



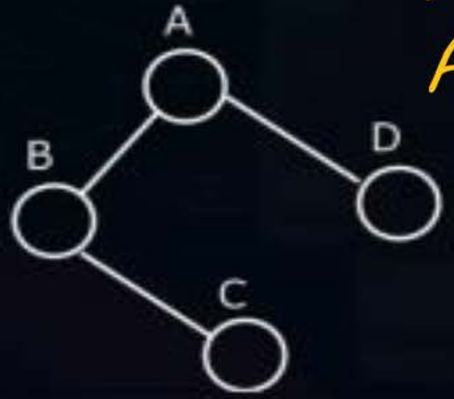
BCAD
pre A C B D q

(C)



A q

(D)



BCAD
ABCD

Slide

Topic : Question

Draw the binary tree with node labels a, b, c, d, e, f and g for which the inorder and postorder traversals result in the following sequences.

Inorder	a f b c d g e
Postorder	a f c g e d b

Slide

Consider the following program the takes a tree root & and integer element as an argument

```
int count (struct node * node, int element) {
if (node == null)
    return 0;
else {
    int result = 0;
    if (node - > data == element)
        result = 1;
    return result + count(node-> left, element)
        + count (node - > right, element);
    }
```

if(node)

result = 1

Count the No. of occurence of element in tree.

What is the value return

✗ (A) No. of Nodes in the tree

✗ (B) No. of Nodes in Left Subtree

✗ (C) No. of Nodes in right subtree

✓ (D) frequency of parameter element

Topic : Tree

#Q. The above function on will return

(A) Count the number of nodes in the tree

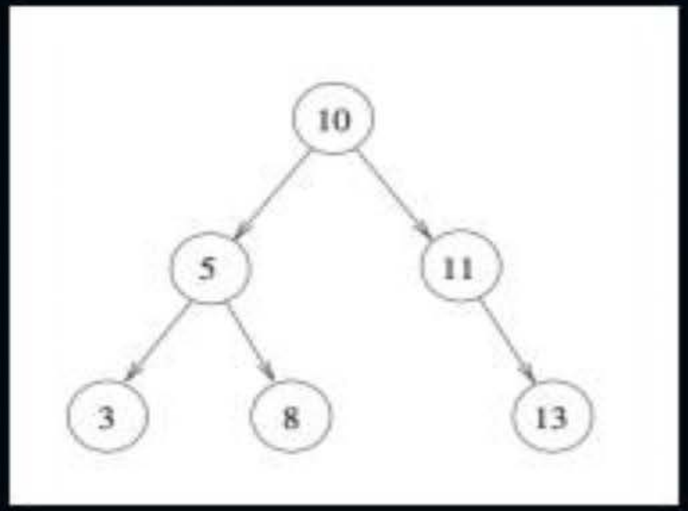
(B) Count the number of modes in the left subtree

(C) Count the number of nodes in the right subtree

(D) Count the occurrence of the number in the given tree

Slide

Topic : Question



HW

Consider the function and the binary tree shown.

```
int foo(node *p) {
    int retval;
    if (p == NULL)
        return 0;
    else {
        retval = p->val + foo(p->left) + foo(p->right);
        printf("%d ", retval);
        return retval;
    }
}
```

A. 3 8 5 13 11 10
B. 3 5 8 10 11 13
C. 3 8 16 13 24 50
D. 3 16 8 50 24 13

Slide

2 mins Summary

Topic — Construction of tree using traversal

Topic — Inorder - preorder

Topic — Inorder - postorder

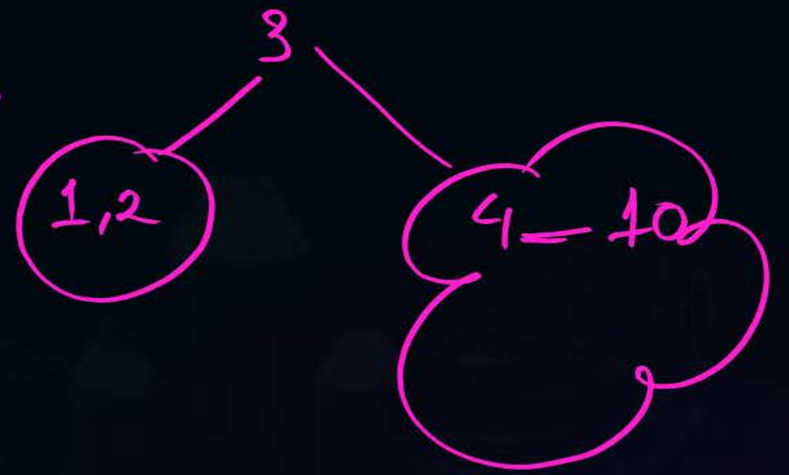
Topic — Binary Search Tree

Topic

Slide

1 — 10

THANK - YOU°



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