Computer Science & IT

Data Structure

Tree

Lecture No. 05

By- Abhishek Sir

Recap of Previous Lecture

- Topic
- Topic
- Topic
- Topic
- Topic

Binary tree construction using traversal

Binary Search Tree

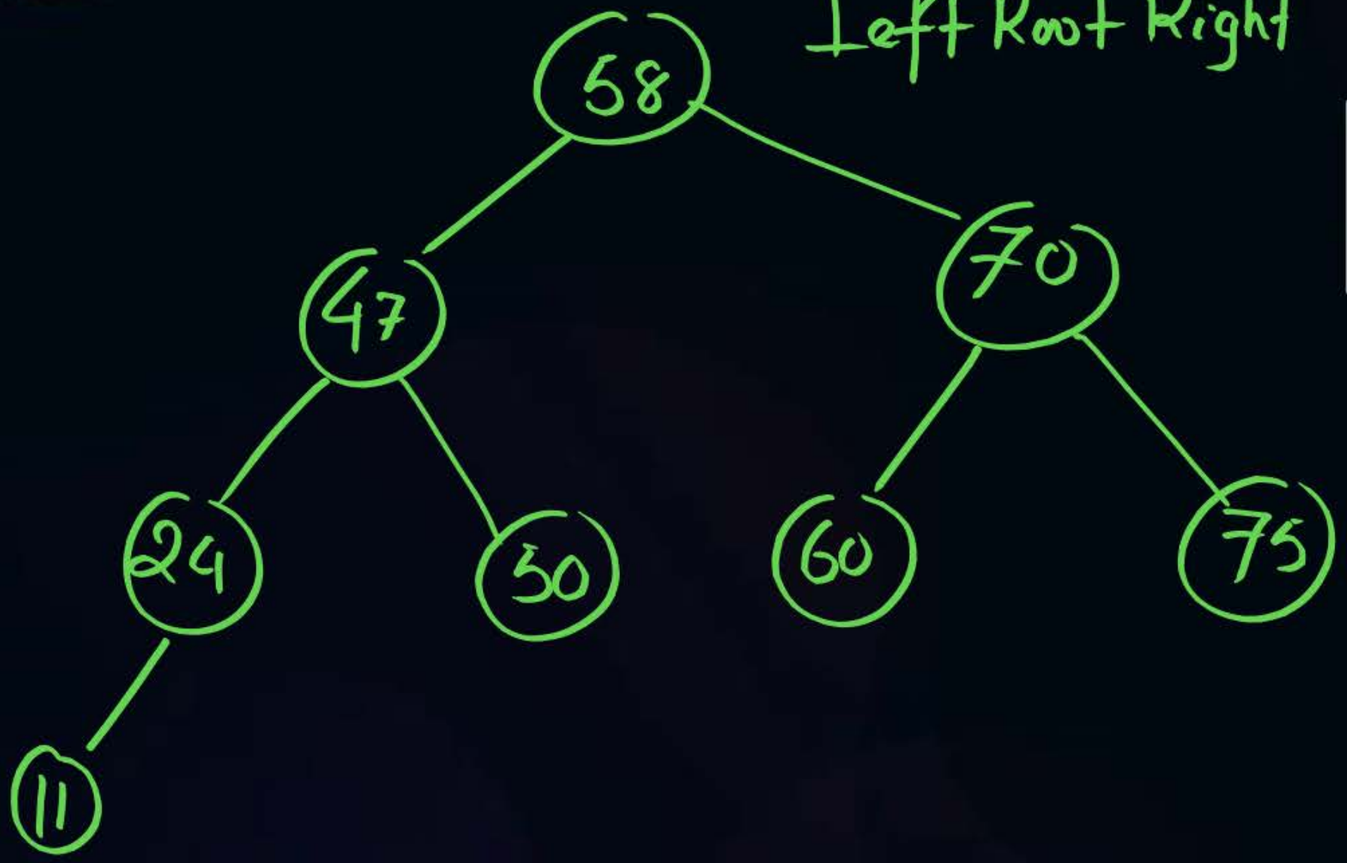
Slide

Topics to be Covered

- Topic — BST - traversal
- Topic — Special care for traversal
- Topic — Search
- Topic — Min, Max
- Topic — Counting

Slide

Topic : Binary Search Tree



Left Root Right Inorder traversal

11, 24, 47, 50, 58, 60, 70, 75

Distinct key values

Increasing order Sequence

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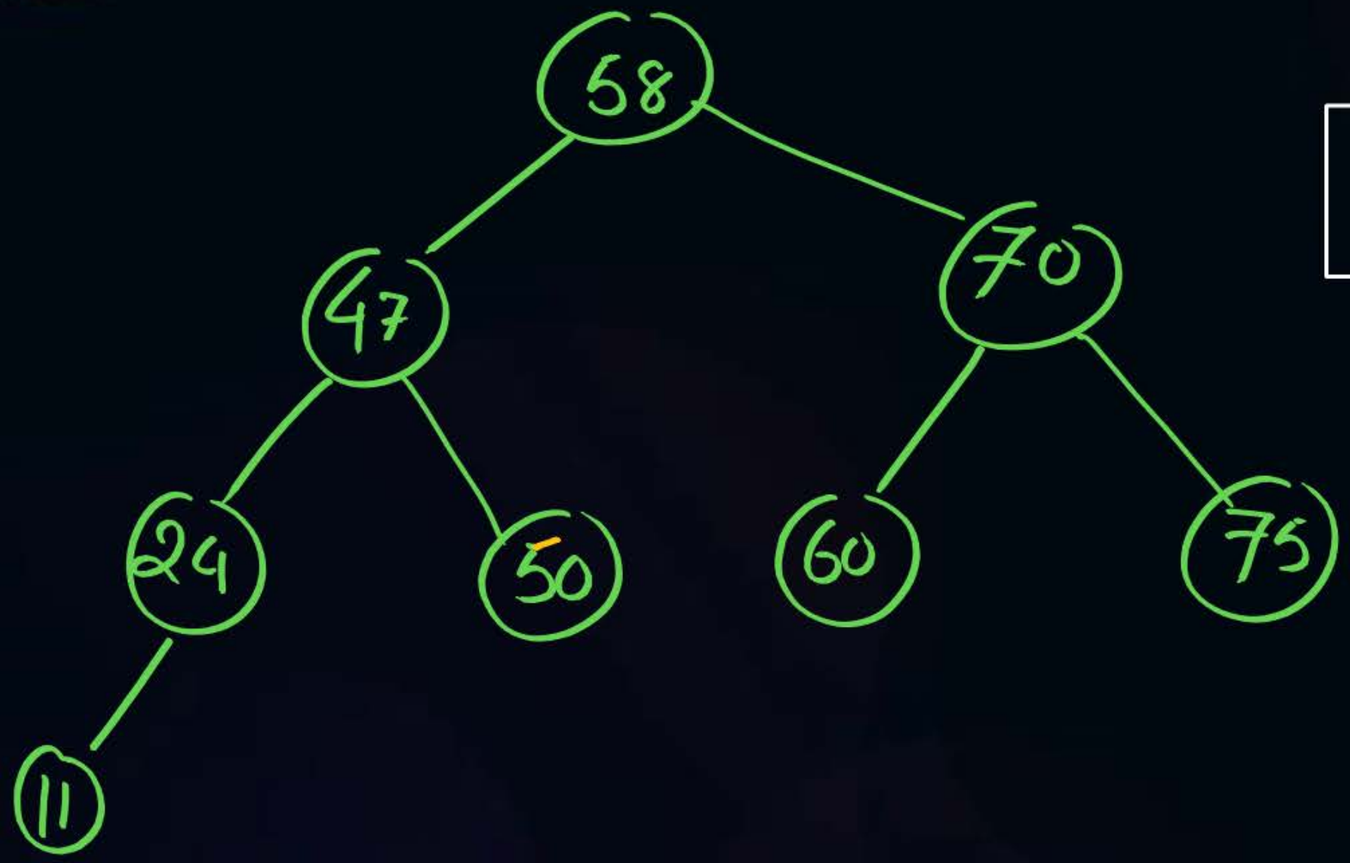
Topic : Binary Search Tree



preorder (Root left Right)

58, 47, 24, 11, 50, 70 60, 75

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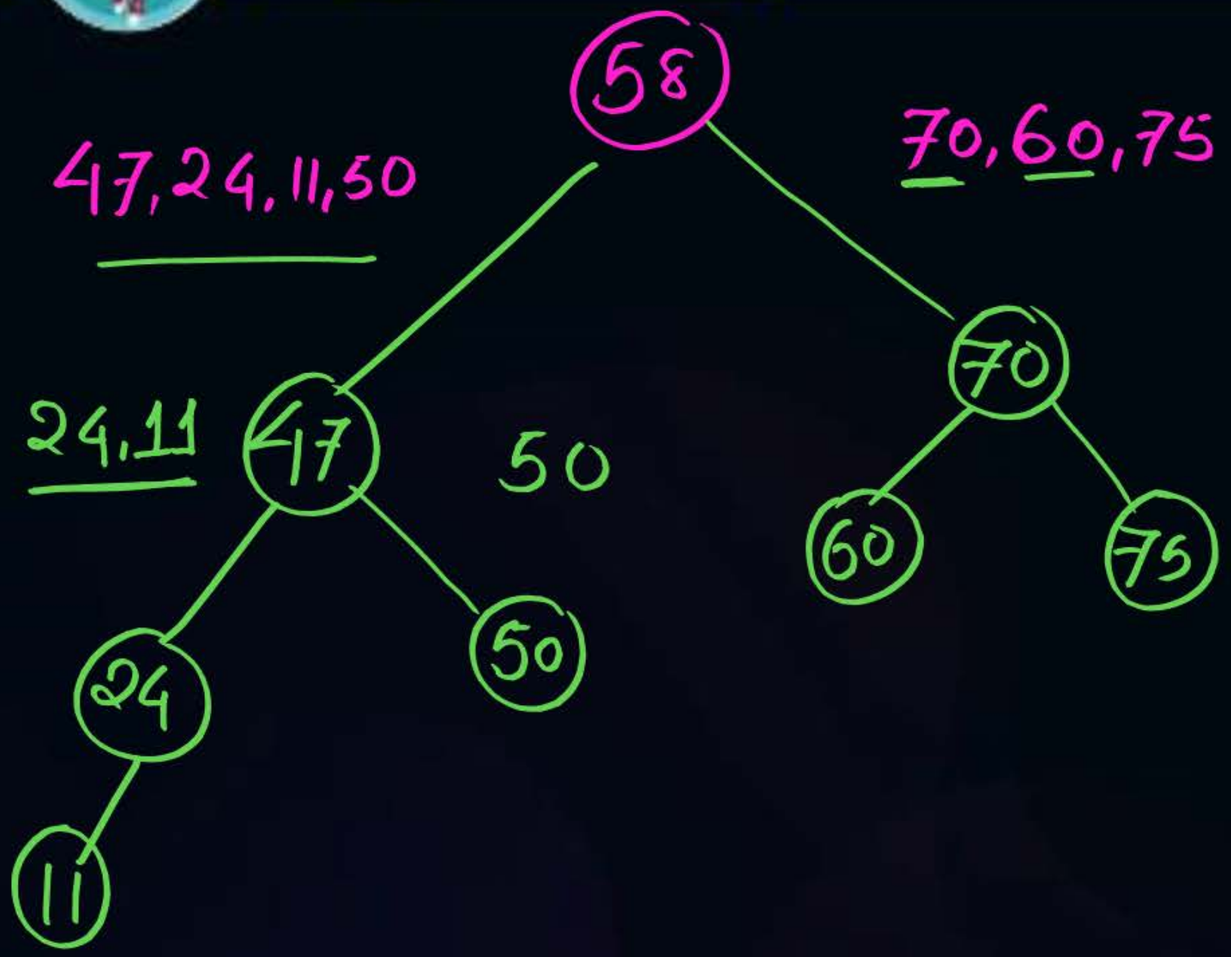
Topic : Binary Search Tree



preorder (Root left Right)

58, 47, 24, 11, 50, 70 60, 75

lesser key

greater

BST

only preorder we reconstruct the tree

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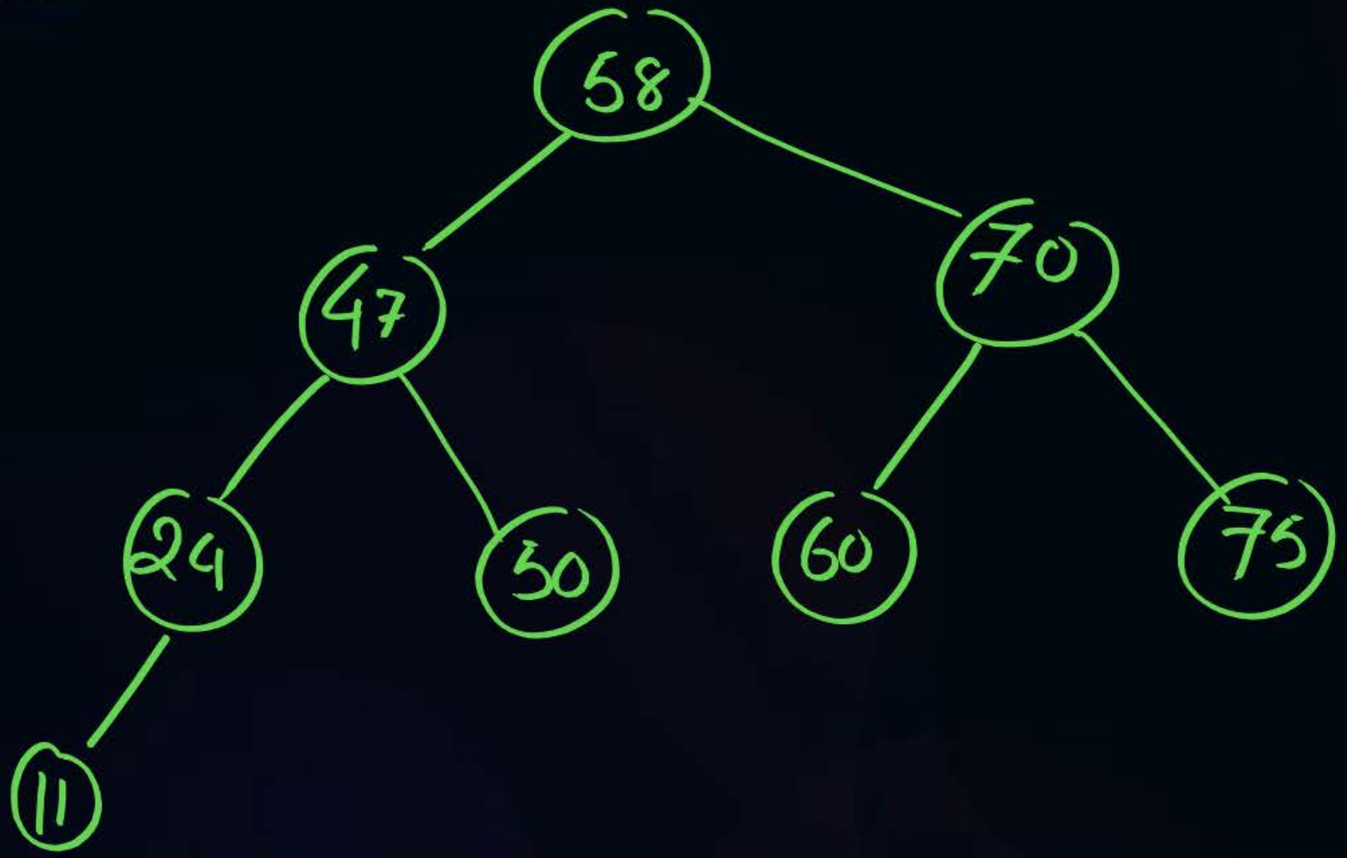
Topic : Binary Search Tree



Postorder (Left Right Root)

11, 24, 50, 47, 60, 75, 70, 58

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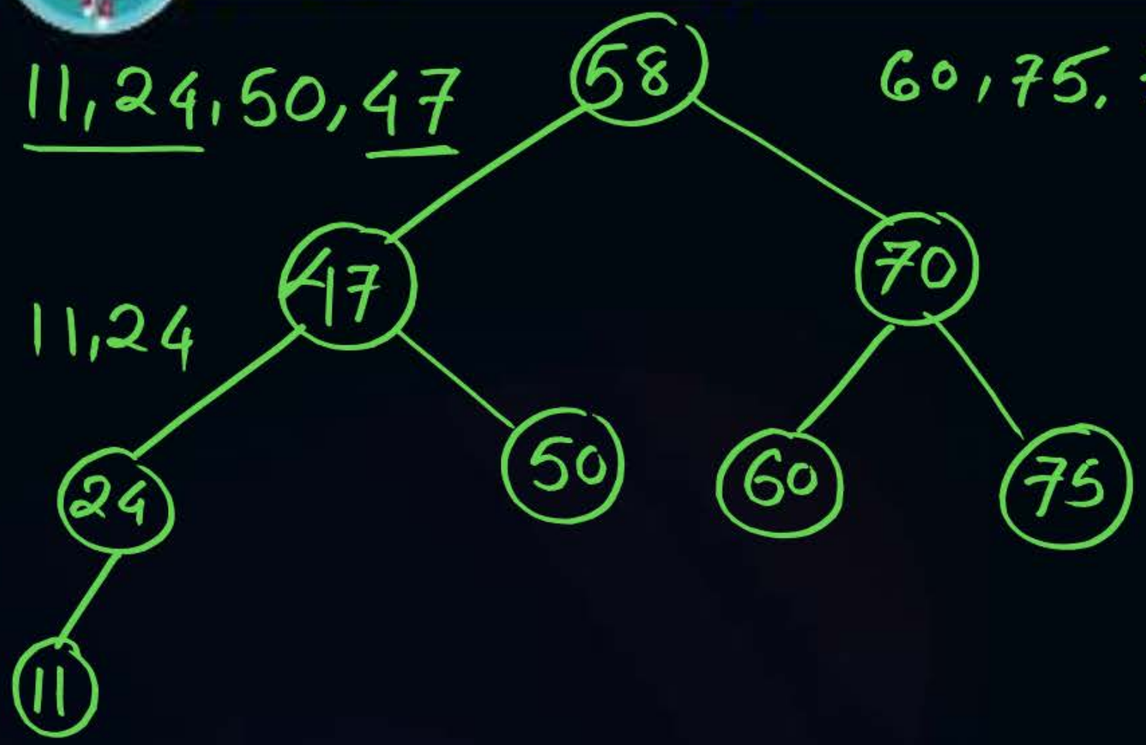
Topic : Binary Search Tree



Postorder (Left Right Root)

11,24,50,47, 60,75,70,58

lesser key value

greater key value

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Topic : Binary Search Tree

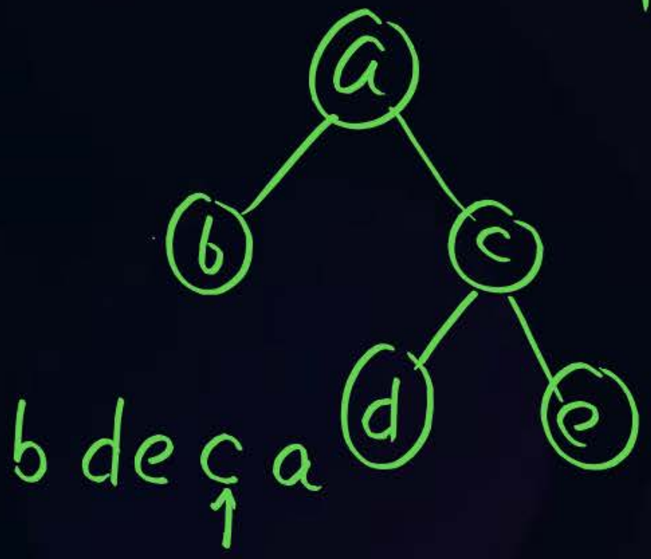
Using only preorder & postorder we can uniquely construct the BST

Root Left Right

preorder: a | b c d f g | e

postorder: c f g d b | e | a

Left Right Root

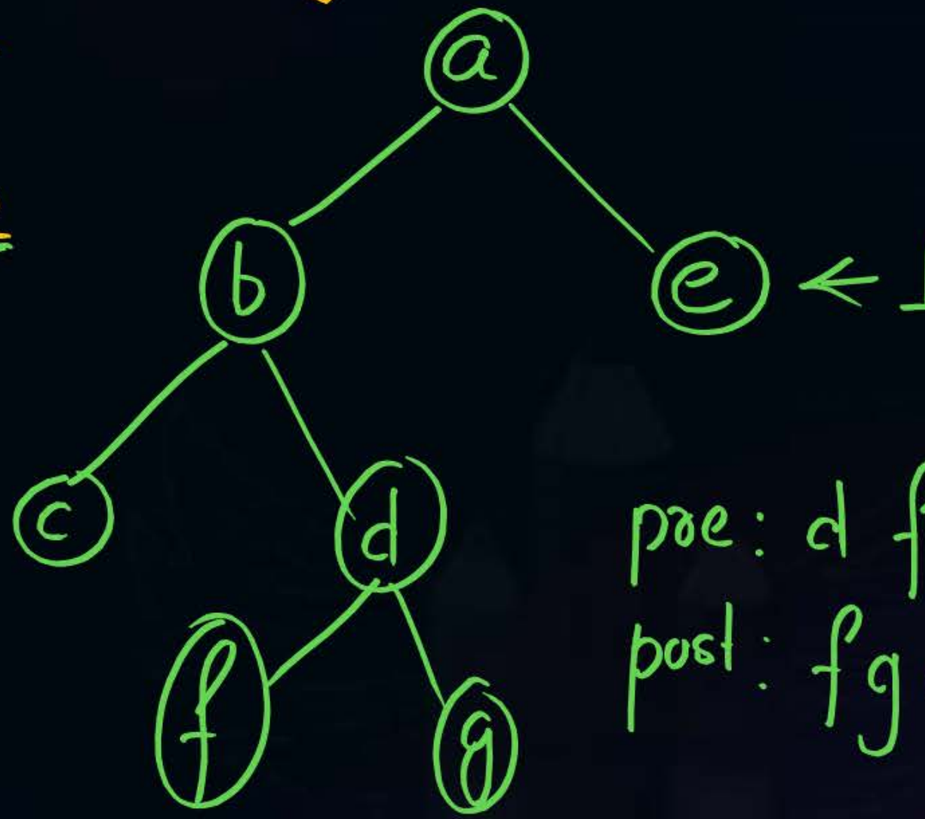


b d e c a

pre: b c d f g

post: c f g d b

2-ary tree (each Node having 0 or 2 children)



leaf Node

pre: d f g

post: f g d

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1 Identify the Root

2. The Node after root in preorder is Root of left subtree

3. The Node before root in postorder is root of right subtree

4. Identify the Node in left and right Subtree using preorder

Start with root Node in left Subtree and Skip all element till Root of right Subtree is reached.

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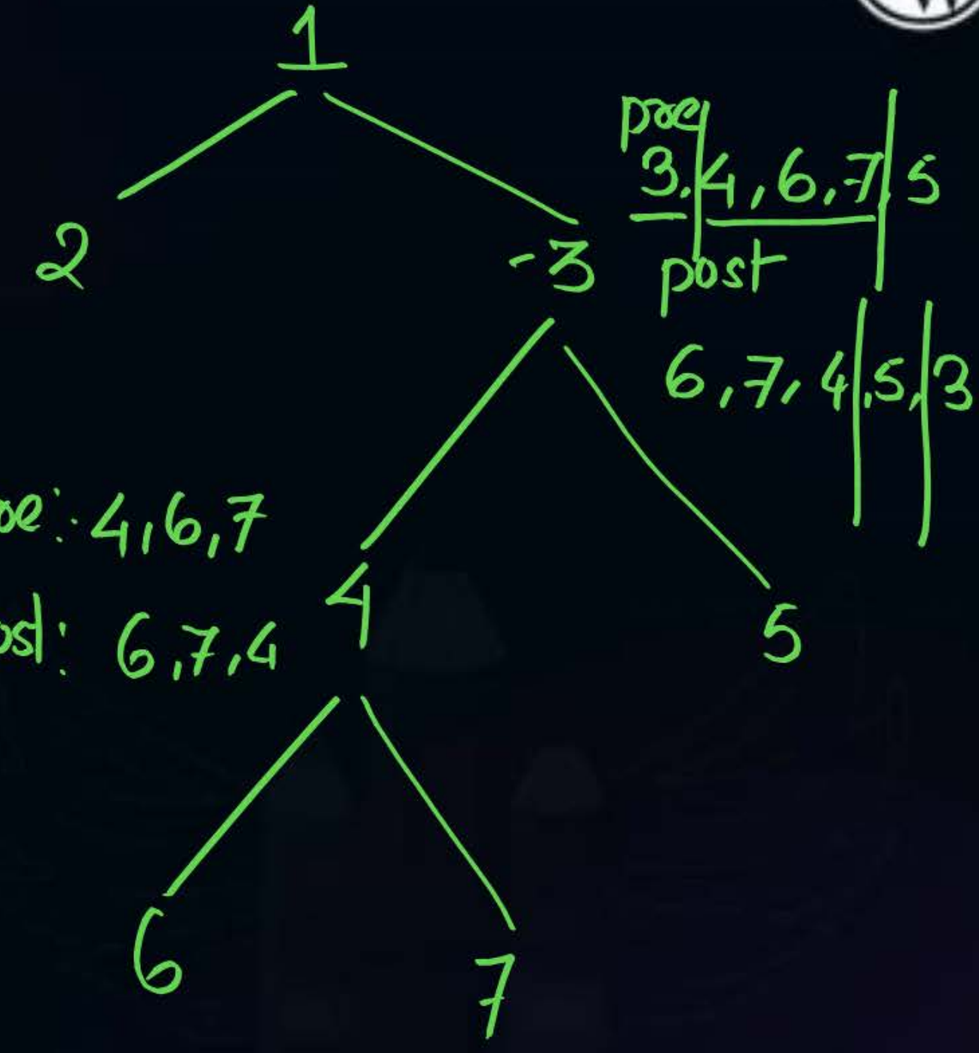
pre : 1 | 2, | 3, 4, 6, 7, 5

post : 2, | 6, 7, 4, 5, 3 | 1



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pre :

1, 2, 3, 4, 6, 7, 5

post :

2, 6, 7, 4, 5, 3, 1

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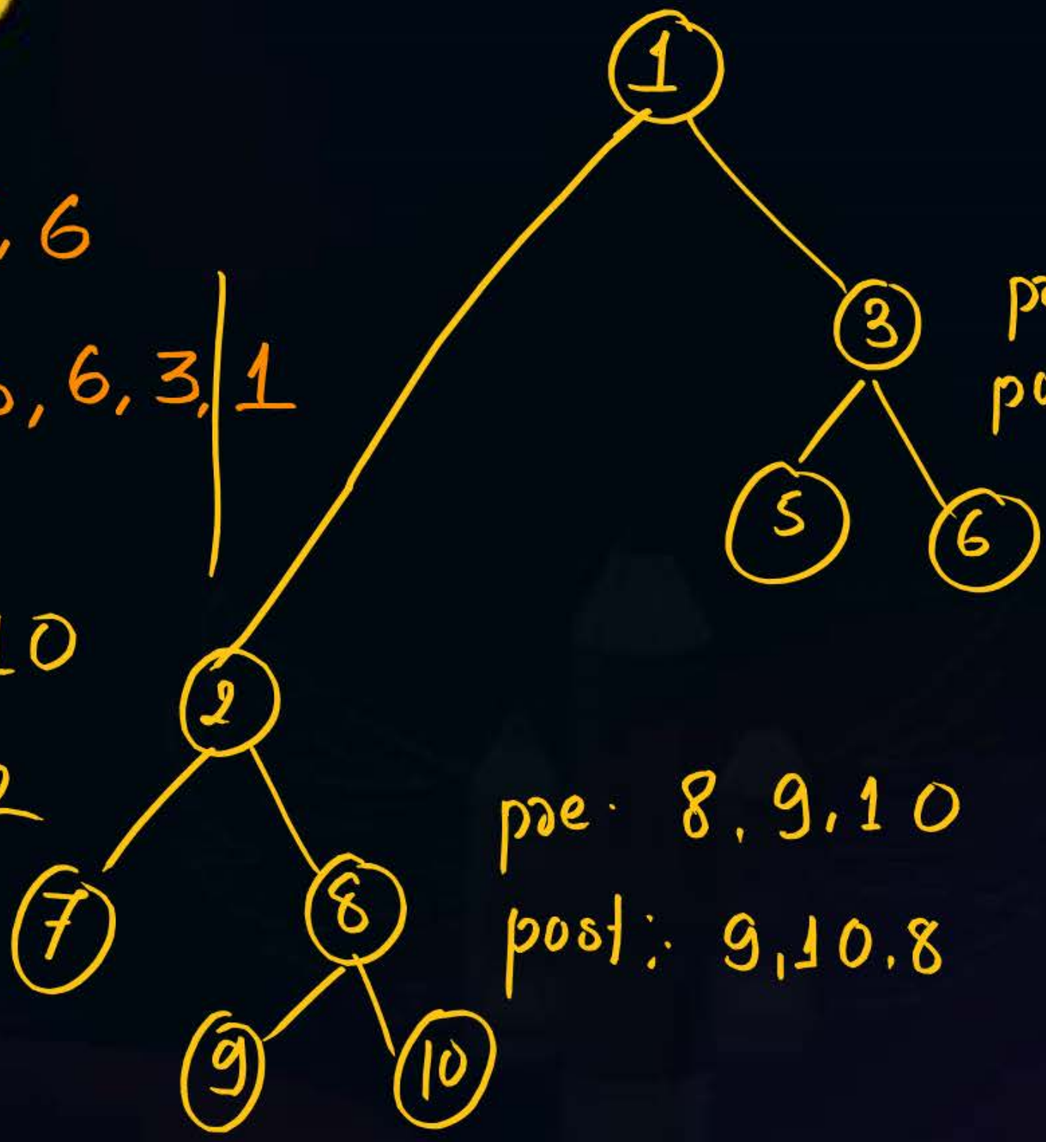
pre
1, 2, 7, 8, 9, 10, 3, 5, 6

post
7, 9, 10, 8, 2, 5, 6, 3, 1

2, 7, 8, 9, 10

7, 9, 10, 8, 2



pre: 3,5,6
post: 5,6,3

pre: 8, 9, 10
post: 9, 10, 8

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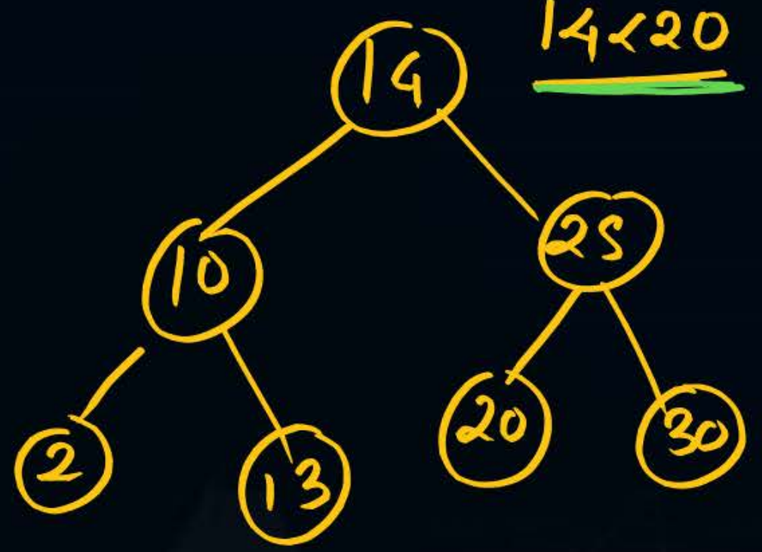
Topic : Binary Search Tree

```
int search(Tnode* t, int x){
    if(t){
        if(t->data == x)
            return 1;
        else if(t->data < x)
            return search(t->right, x);
        else
            return search(t->Left, x);
    }else
        return -1;
}
```



14<20

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Topic : Binary Search Tree

```
int search(Tnode* t, int x){
    if(t){
        if(t->data==x)
            return 1;
        else if(t->data<x)
            return search(t->right, x);
        else
            return search(t->Left, x);
    }else
        return -1;
}
```

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Topic : Binary Search Tree

```
int min(Tnode *t){
```

Slide

Topic : Binary Search Tree

```
int min(Tnode *t){
    if (t){
        while(t->left != NULL)
            t = t->left;
        return t->data;
    }
    else{
        printf("Empty tree).
        return -1;
    }
}
```

Slide

Topic : Binary Search Tree

```
int max (Tnode* t) {
  if (t) {
      while (t->right != NULL)
          t = t->right;

      return t->data;
  }
  else {
      printf ("empty tree")
      return -1;
  }
}
```

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Topic : Binary Search Tree

Operation performed on Linked List depends upon length

Operation performed on BST depends upon

= Height = $O(h)$

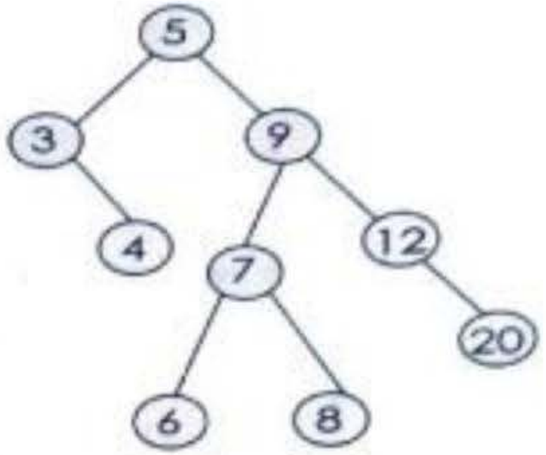
balanced BST

$O(\log_2 n)$

Slide

Topic : Binary Search Tree

32. The binary search tree shown below was constructed by inserting a sequence of items into an empty tree.



Which of the following input sequences will produce this binary search tree?

(a) 5 3 4 9 12 7 8 6 20
(b) 5 9 3 7 6 8 4 12 20
(c) 5 9 7 3 8 12 6 4 20
(d) 5 9 3 6 7 8 4 12 20

MSQ

Which of the following input sequence will produce this binay tree

(A) 5, 3, 4, 9, 12, 7, 8, 6, 20

(B) 5, 9, 3, 7, 6, 8, 4, 12, 20

(C) 5, 9, 7, 3, 8, 12, 6, 4, 20

(D) 5, 9, 3, 6, 7, 8, 4, 12, 20

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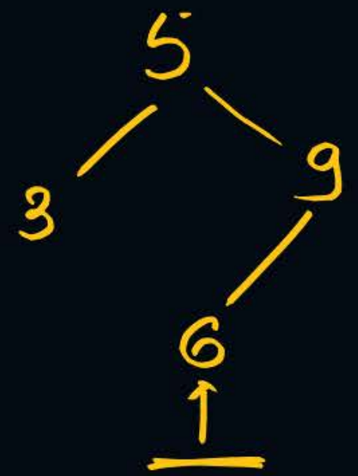
Topic : Binary Search Tree



MSQ

Which of the following input sequence will produce this binary tree

(A) 5, 3, 4, 9, 12, 7, 8, 6, 20

(B) 5, 9, 3, 7, 6, 8, 4, 12, 20

(C) 5, 9, 7, 3, 8, 12, 6, 4, 20

(D) 5, 9, 3, 6, 7, 8, 4, 12, 20

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Topic : Binary Search Tree

MSQ

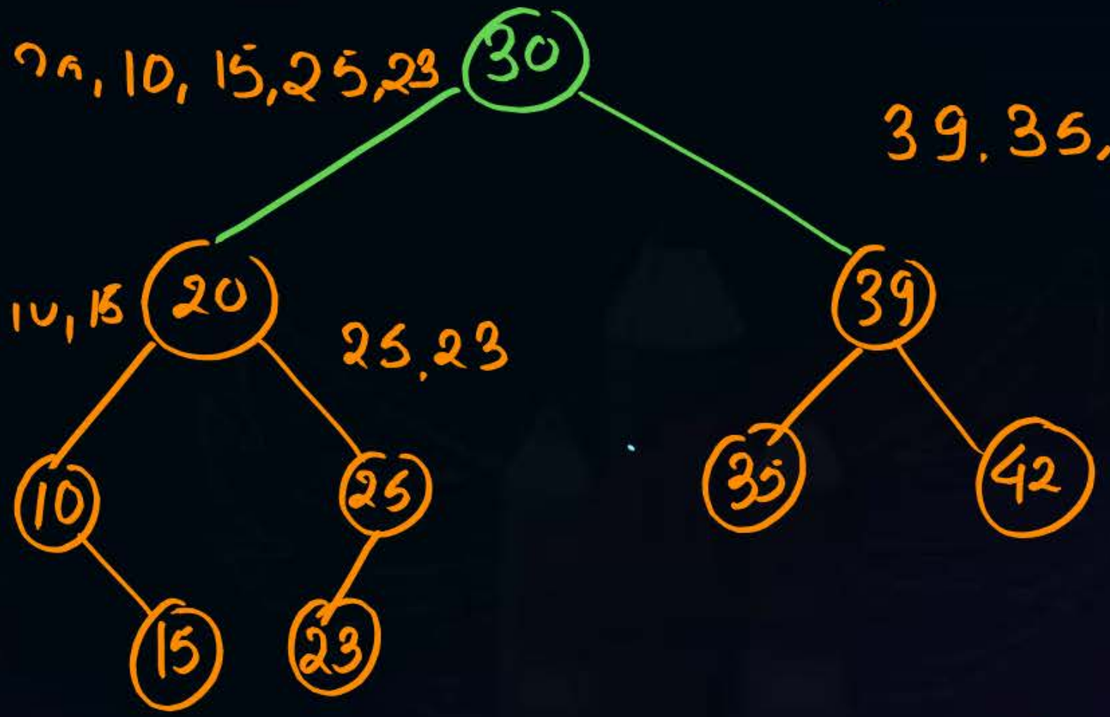
31. The Preorder traversal sequence of a binary search tree is 30, 20, 10, 15, 25, 23, 39, 35, 42.

Which one of the following is the not Post order traversal sequence of the same tree?

(a) 10, 20, 15, 23, 25, 35, 42, 39, 30
(b) 15, 10, 25, 23, 20, 42, 35, 39, 30
(c) 15, 20, 10, 23, 25, 42, 35, 39, 30
(d) 15, 10, 23, 25, 20, 35, 42, 39, 30 ←

preorder

30, 20, 10, 15, 25, 23, 39, 35, 42



15, 10, 23, 25, 20, 35, 42, 39, 30

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2 mins Summary

Topic — BST traversal

Topic — Special case

Topic — Search, Min, Max

Topic — Complexity (Height)

Topic

Slide

THANK - YOU