CS & IT ENGINEERING

Data Structure

Tree
Chapter-05
Lec-11

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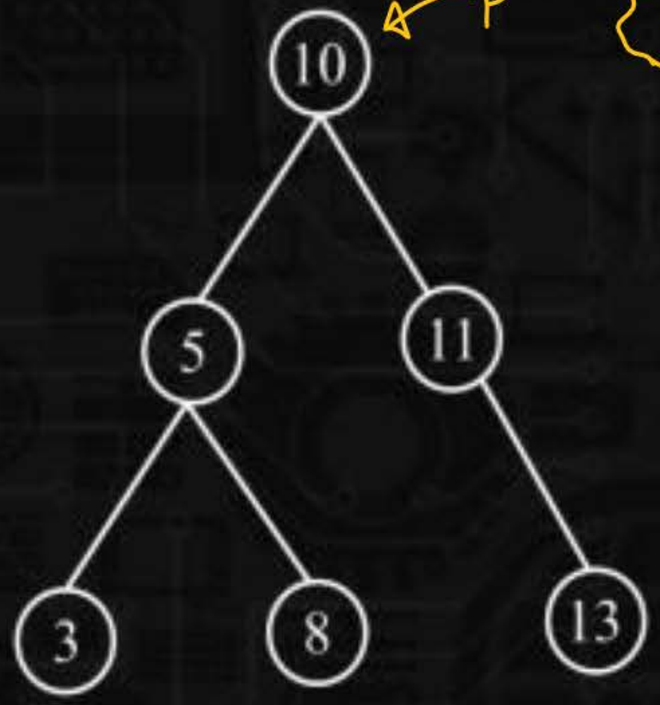
01 Question

02 Discussion

Consider the following function:

```
struct node {
struct node * left
int data;
struct node * right;
} node;
int foo (struct node * p){
int retval;
if (p = = Null) return 0,
else {
retval  = p→ val + foo (p→left)
 + foo(p→right);
printf ("%d", retval);
return retval;
}
```

The output printed by the above program-

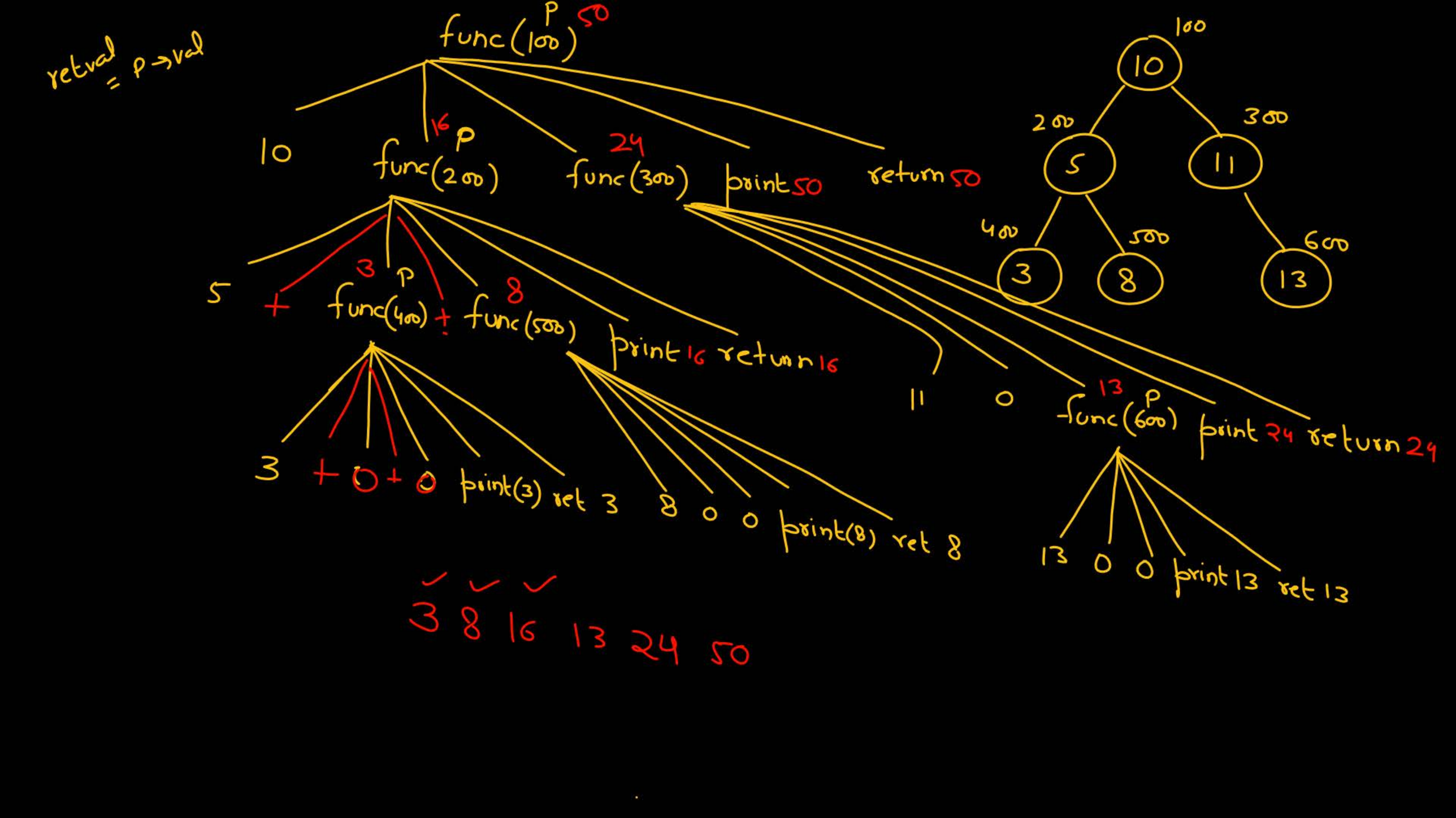


A. 3 8 24 13 16 50

B. 3 8 16 13 24 50

C. 3 13 16 8 50 24

D. 3 8 24 16 13 50


retval = p->val
func(100)
p
50
10
16
p
func(200)
24
func(300)
print 50
return 50
100
10
200
5
300
11
400
3
500
8
600
13
5
+
3
p
func(400)
+
8
func(500)
print 16
return 16
11
0
13
p
func(600)
print 24
return 24
3
+
0
+
0
print(3)
ret 3
8
0
0
print(8)
ret 8
13
0
0
print 13
ret 13
3 8 16 13 24 50

Which one of the following sequences when stored in an array at locations A[1] to A[10] result a max-heap?

A. 23, 14, 19, 1, 10, 13, 16, 12, 7, 5

B. 23, 17, 14, 7, 13, 10, 1, 5, 6, 12

C. 23, 17, 10, 6, 13, 14, 1, 5, 9, 12

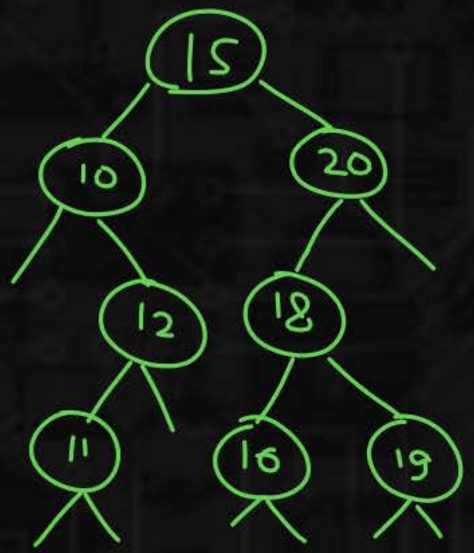
D. 23, 17, 14, 6, 13, 10, 1, 5, 7, 15

The preorder traversal of a binary search tree is 15, 10, 12, 11, 20, 18, 16, 19. The postorder traversal of the tree-

In : 10 11 12 15 16 18 19 20

Pre : 15 10 12 11 20 18 16 19

11 12 10 16 19 18 20 15



The postorder traversal of a binary tree is 8,9,6,7,4,5,2,3,1. The inorder traversal of the same tree is 8,6,9,4,7,2,5,1,3. The height of a tree is the length of the longest path from the root to any leaf. The height of the binary tree above is _____.

Post :

In :

↘

tree

While inserting the elements 71,65,84,69,67,83 in an empty binary search tree in the sequence shown, the element in the lowest level is-

67

Consider the following nested representation of binary trees: (X Y Z) indicates Y and Z are the left and right sub stress, respectively, of node X. Note that Y and Z may be NULL, or further nested. Which of the following represents a valid binary tree?

(X Y Z)

( )

A. (1 2 (4 5 6 7))

B. (1 (2 3 4) 5 6) 7)

(( )))

C. (1 (2 3 4)(5 6 7))

D. (1 (2 3 NULL) (4 5))

Consider the following statements.

S_1: The sequence of procedure calls corresponds to a preorder traversal of the activation tree.

S_2: The sequence of procedure returns corresponds to a postorder traversal of the activation tree.

Which one of the following options is correct?

A. S_1 is true and S_2 is false

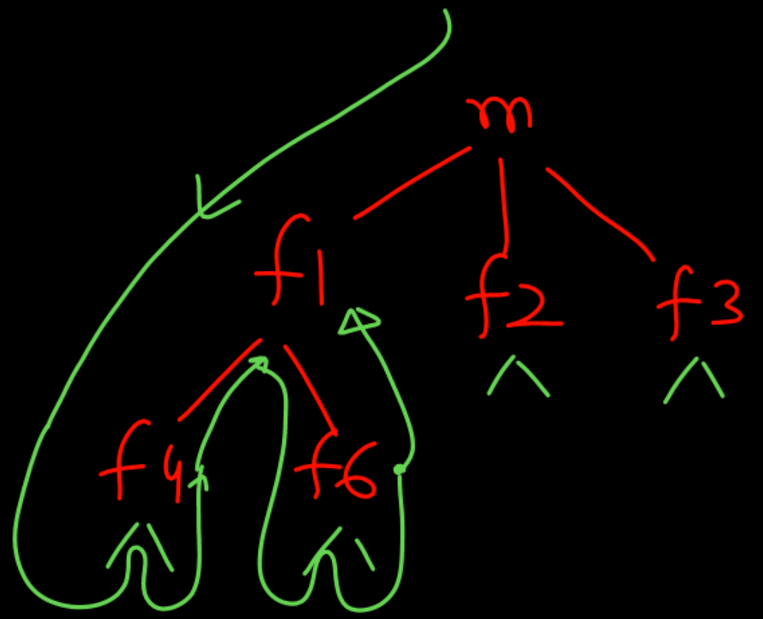
B. S_1 is false and S_2 is true

C. S_1 is true and S_2 is true

D. S_1 is false and S_2 is false


```
f1(){
  f4()
  f5()
}
```

```
main(){
  f1();
  f2();
  f3();
}
```


m
f1
f2
f3
f4
f6


f1

Consider the array representation of a binary min-heap containing 1023 elements. The minimum number of comparisons required to find the maximum in the heap is 511.

min-heap : ① max ⇒ can be only in a leaf node

$$\#\text{ leaf node} = \left\lceil \frac{n}{2} \right\rceil = \left\lceil \frac{1023}{2} \right\rceil = 512$$

No. of comp = 512 - 1

= 511

Let T be a full binary tree with 8 leaves. (A full binary tree has every level full). Suppose two leaves a and b of T are chosen uniformly and independently at random. The expected value of the distance between a and b in T (i.e., the number of edges in the unique path between a and b) is (rounded off to 2 decimal places) ____.

Math.

Consider the following New-order strategy for traversing a binary tree:

Visit the root;
Visit the right subtree using New-order
Visit the left subtree using New-order

The New-order traversal of the expression tree corresponding to the reverse polish expression 3 4 * 5 – 2 ^ 6 7 * 1 + – is given by:

A. + – 1 6 7 * 2 ^ 5 – 3 4 *

B. – + 1 * 6 7 ^ 2 – 5 * 3 4

C. – + 1 * 7 6 ^ 2 – 5 * 4 3

D. 1 7 6 * + 2 5 4 3 * – ^ –

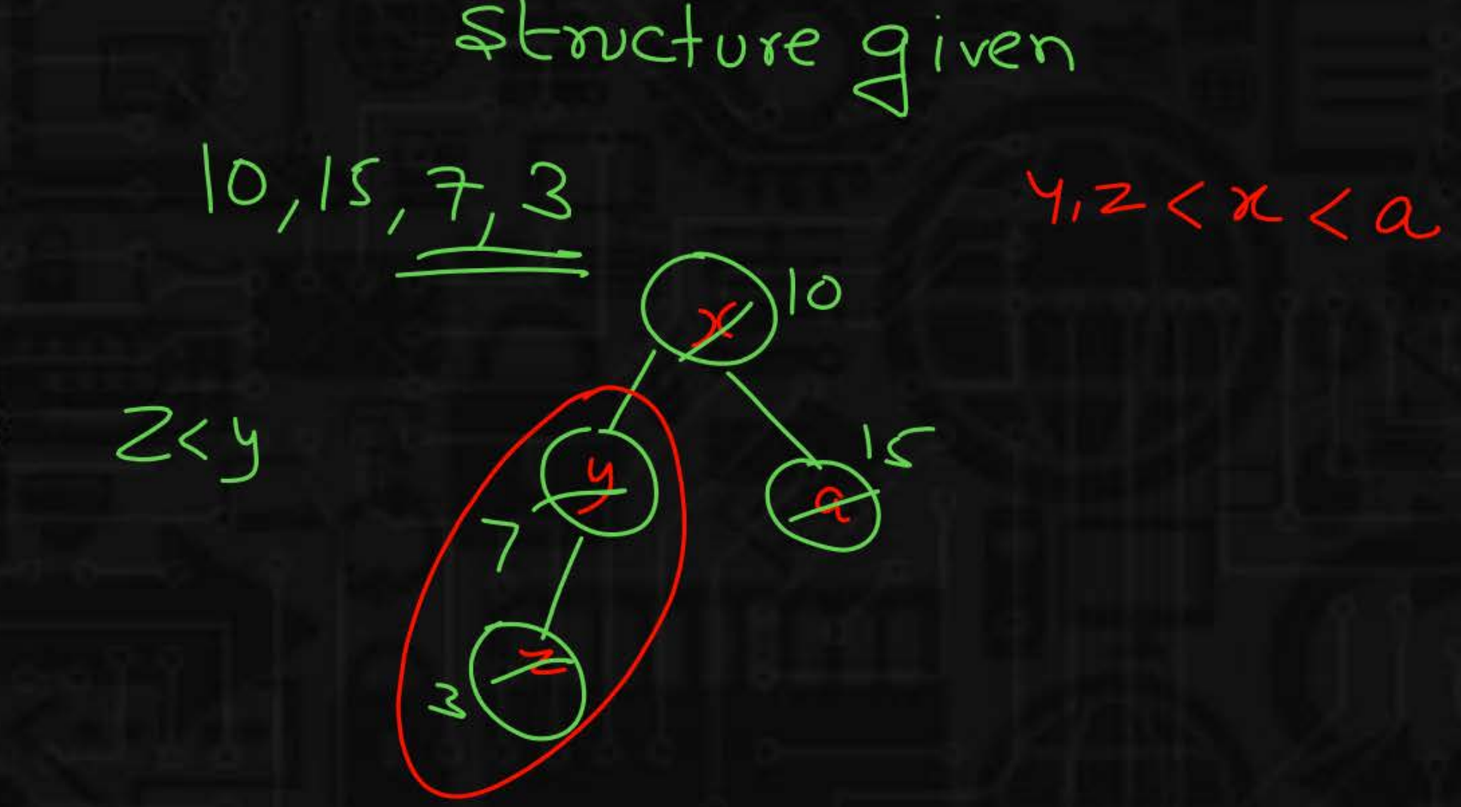
We are given a set of n distinct elements and an unlabelled binary tree with n nodes. In how many ways can we populate the tree with the given set so that it becomes a binary search tree?

A. 0

B. 1

C. n!

D. $(1/(n+1)).^{2n}C_n$



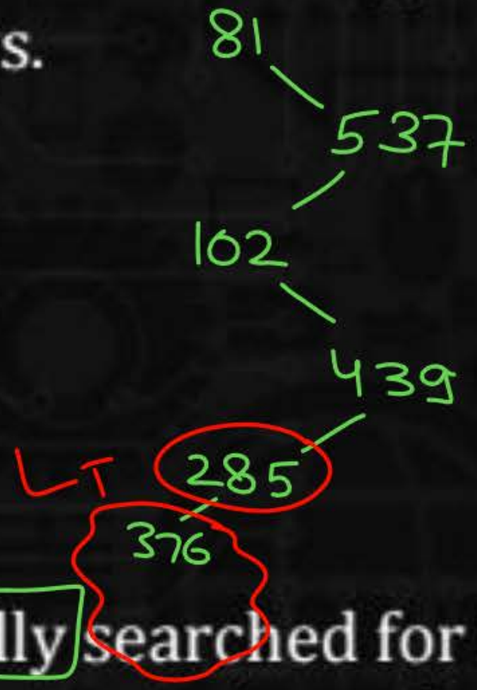
A Binary Search Tree (BST) stores values in the range 37 to 573. Consider the following sequence of keys.

I. 81, 537, 102, 439, 285, 376, 305

II. 52, 97, 121, 195, 242, 381, 472

III. 142, 248, 520, 386, 345, 270, 307

IV. 550, 149, 507, 395, 463, 402, 270



Suppose the BST has been unsuccessfully searched for key 273. Which all of the above sequences list nodes in the order in which we could have encountered them in the search?

A. II and III only

B. I and III only

C. III and IV only

D. III only

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Suppose the BST has been unsuccessfully searched for key 273. Which all of the above sequences list nodes in the order in which we could have encountered them in the search?

A. II and III only

B. I and III only

C. III and IV only

D. III only

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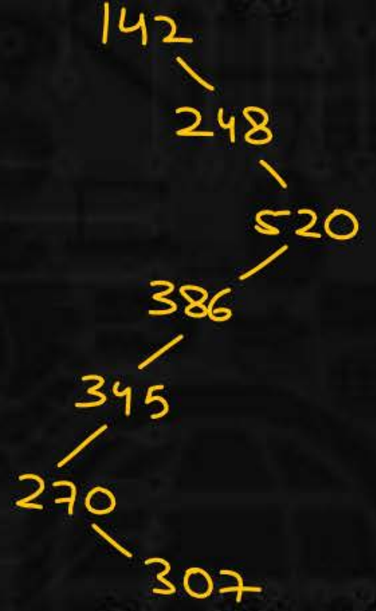

Suppose the BST has been unsuccessfully searched for key 273. Which all of the above sequences list nodes in the order in which we could have encountered them in the search?

A. II and III only

B. I and III only

C. III and IV only

D. III only

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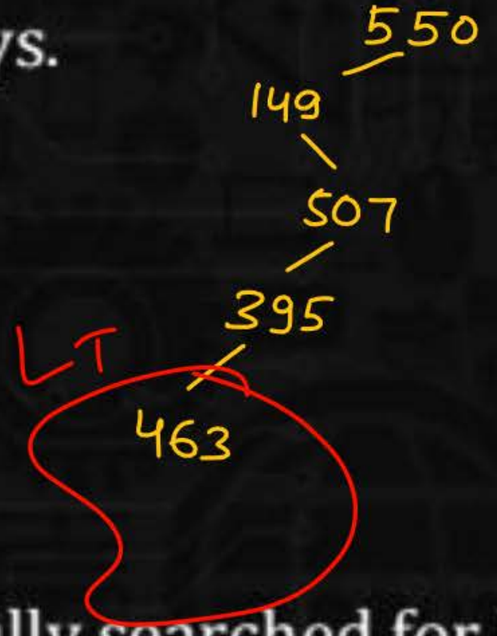


Suppose the BST has been unsuccessfully searched for key 273. Which all of the above sequences list nodes in the order in which we could have encountered them in the search?

A. II and III only

B. I and III only

C. III and IV only

D. III only

The inorder and preorder traversal of a binary tree are d b e a f c g and a b d e c f g, respectively. The postorder traversal of the binary tree is:

A. d e b f g c a

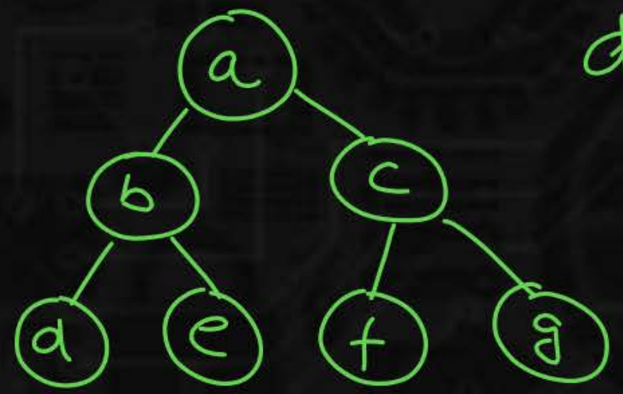
B. e d b g f c a

C. e d b f g c a

D. d e f g b c a

in: d b e a f c g

Pre: a b d e c f g



d e b f g c a

Consider the following C program segment where CellNode represents a node in a binary tree:

```
struct CellNode
{
    struct CellNOde *leftChild;
    int element;
    struct CellNode *rightChild;
};

int GetValue(struct CellNode *ptr)
{
    int value = 0;
    if (ptr != NULL)
    {
        if ((ptr->leftChild == NULL) &&
         (ptr->rightChild == NULL))
            value = 1;
        else
            value = value + GetValue(ptr->leftChild)
                + GetValue(ptr->rightChild);
    }
    return(value);
}
```

1

value = 0 +

The value returned by GetValue() when a pointer to the root of a binary tree is passed as its argument is:

A. Number of nodes ✗

B. Number of internal nodes

C. Number of leaf nodes ✓

D. Height of the tree

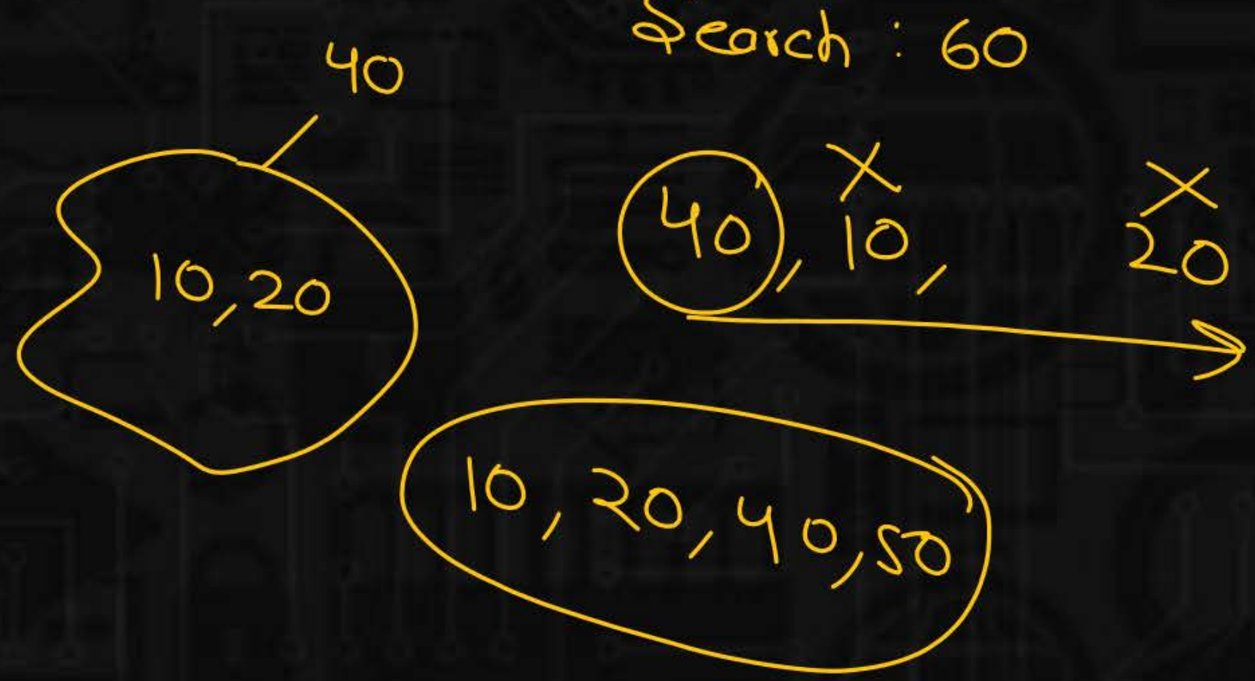
When searching for the key value 60 in a binary search tree, nodes containing the key values 10, 20, 40, 50, 70 80, 90 are traversed, not necessarily in the order given. How many different orders are possible in which these key values can occur on the search path from the root to the node containing the value 60?

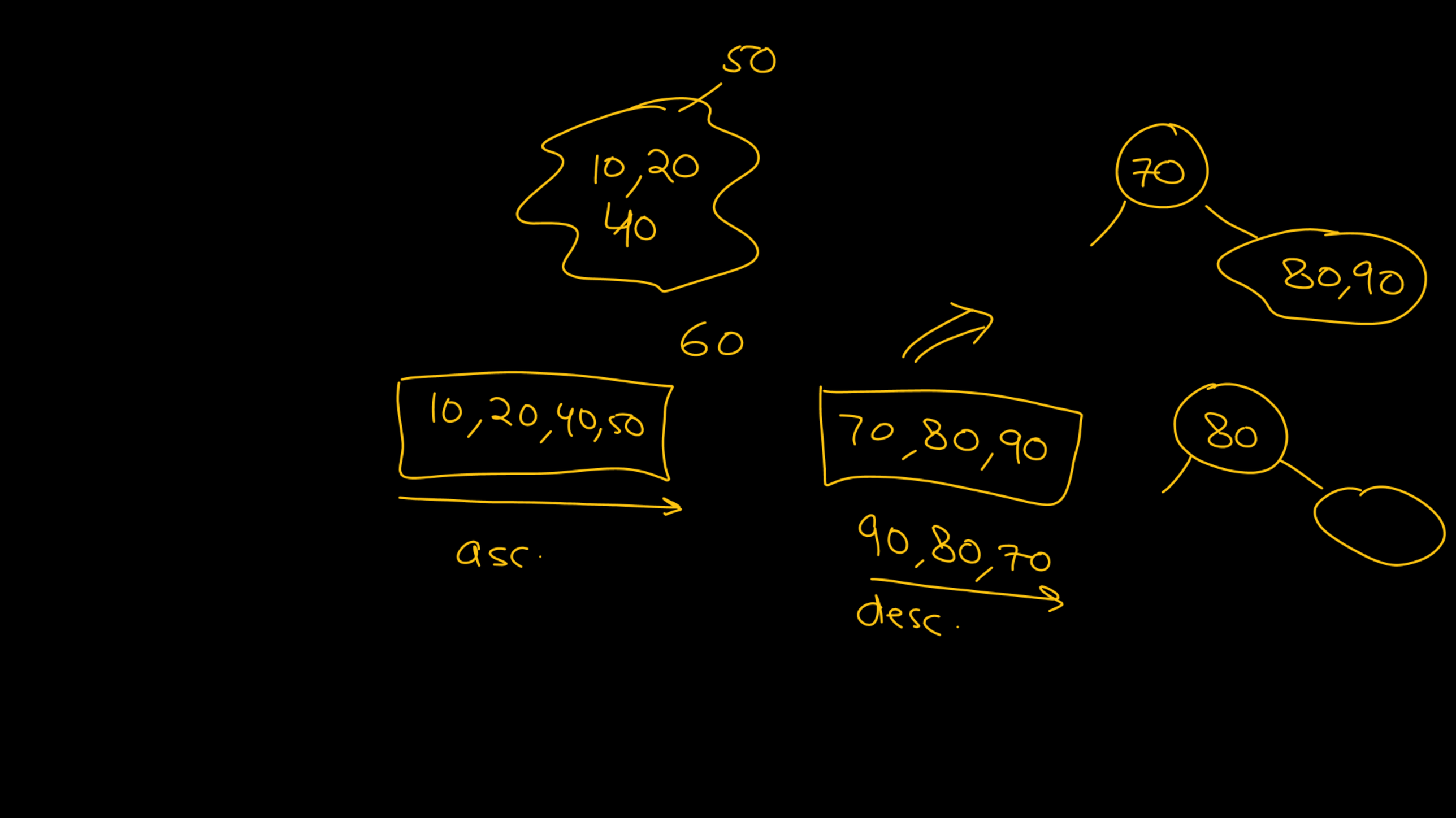
A. 35

B. 64

C. 128

D. 5040




50
10,20
40
60
10,20,40,50
asc.
70
80,90
70,80,90
90,80,70
desc.
80

10 90 20 80 40 50 70

10 20 90 80 70 40 50

10, 20, 40, 50

$^{7}C_{4} \times 1$

70, 80, 90

$$^{7}C_{4} = \frac{7!}{4!3!}$$

$$= \frac{7 \times 6 \times 5}{3!}$$

$$= 35$$

Suppose that we have numbers between 1 and 100 in a binary search tree and want to search for the number 55. Which of the following sequences CANNOT be the sequence of nodes examined?

A. {10, 75, 64, 43, 60, 57, 55}

B. {90, 12, 68, 34, 62, 45, 55}

C. {9, 85, 47, 68, 43, 57, 55}

D. {79, 14, 72, 56, 16, 53, 55}

Postorder traversal of a given binary search tree, T produces the following sequence of keys

10, 9, 23, 22, 27, 25, 15, 50, 95, 60, 40, 29

Which one of the following sequences of keys can be the result of an in-order traversal of the tree T? (GATE CS 2005)

A. 9, 10, 15, 22, 23, 25, 27, 29, 40, 50, 60, 95

B. 9, 10, 15, 22, 40, 50, 60, 95, 23, 25, 27, 29

C. 29, 15, 9, 10, 25, 22, 23, 27, 40, 60, 50, 95

D. 95, 50, 60, 40, 27, 23, 22, 25, 10, 9, 15, 29

How many distinct binary search trees can be created out of 4 distinct keys?

A. 5

B. 14

C. 24

D. 42

$$\frac{{}^{2n}C_n}{n+1} \Rightarrow \frac{{}^{8}C_4}{5} = 14$$

In a binary tree, for every node the difference between the number of nodes in the left and right subtrees is at most 2. If the height of the tree is $h > 0$, then the minimum number of nodes in the tree is:

A. 2^{h-1}

B. $2^{h-1} + 1$

C. $2^h - 1$

D. 2^h

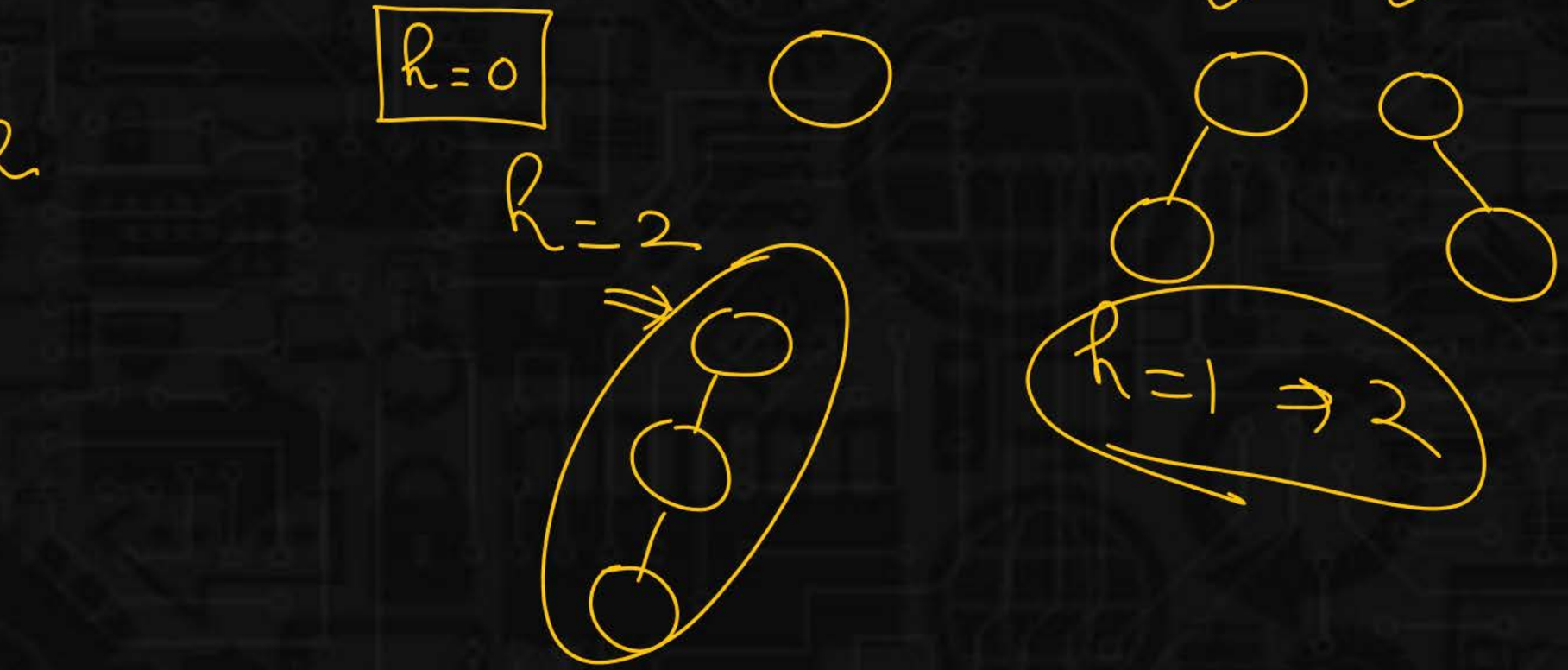
20 sec

-2, -1 0, 1, 2

h = 0

h = 2

h = 1 ⇒ 2



Consider the label sequences obtained by the following pairs of traversals on a labeled binary tree. Which of these pairs identify a tree uniquely?

A. preorder and postorder

B. inorder and postorder

C. preorder and inorder

D. level order and postorder

B, C


THANK YOU GW
SOLDIERS !