Doubt Clearing Session

Course on C-Programming & Data Structures: GATE - 2024 & 2025

Vishvadeep Gothi • Lesson 45 • Jan 23, 2023

Data Structure
Doubts, DPP & Quiz Discussion

By: Vishvadeep Gothi

DPP

Question

Draw the tree for:

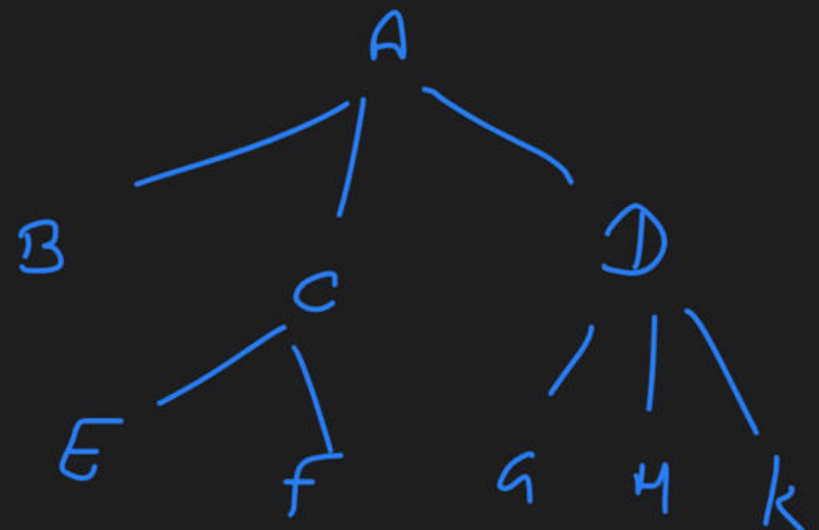
I. A(B, C(E, F), D(G, H, K))

II. A(C(B, F), D ,E(X, Y(P, Q), Z))

III. a(b, c(e, g(x, y, z), h(p, q, r)), d (i, j, k), f)

IV. 1(2, 3(7, 8, 9), 4, 5(10, 11, 12, 13, 14), 6(21, 23, 34, 35))

1)

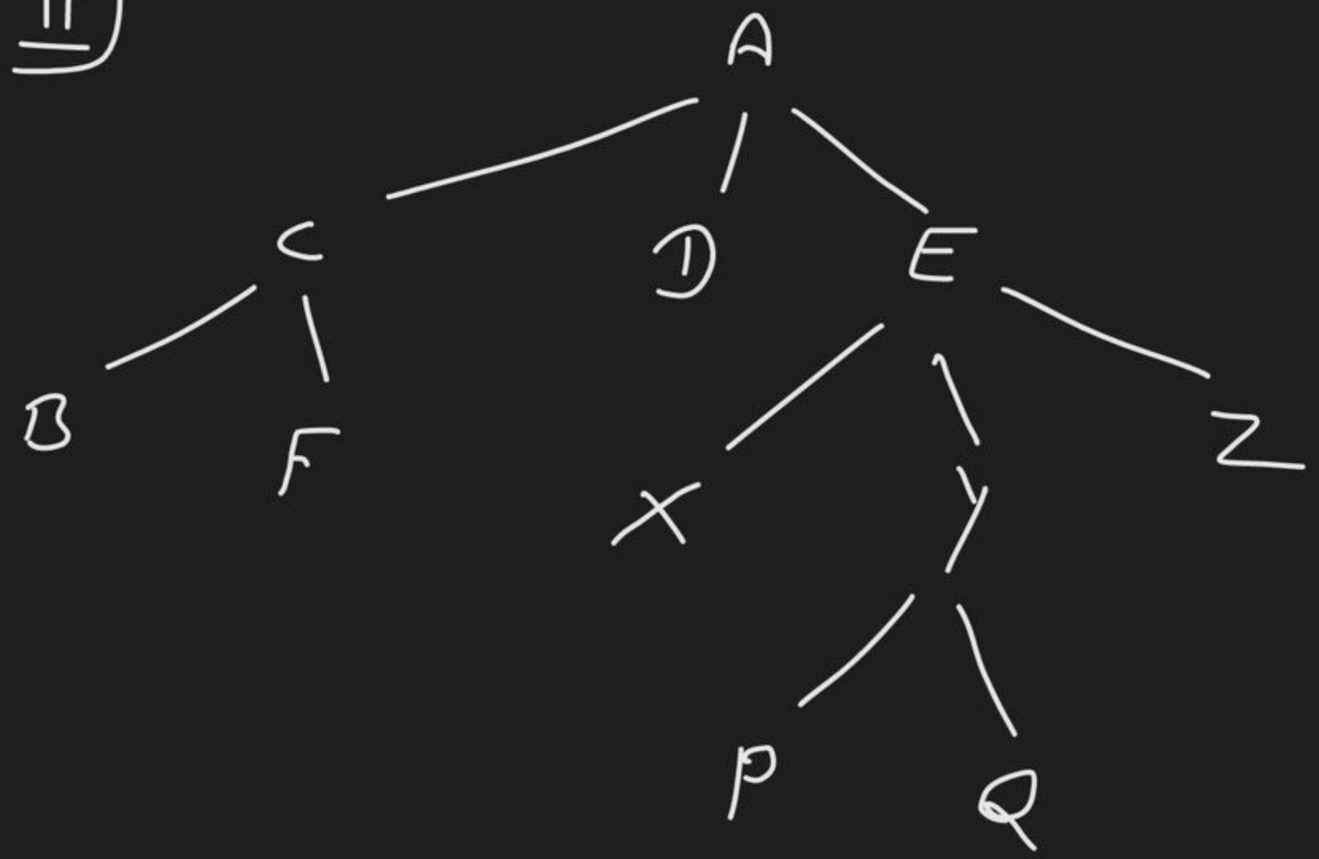


$H = 2$

$L = 6$

$\underline{I} = 3$

11)

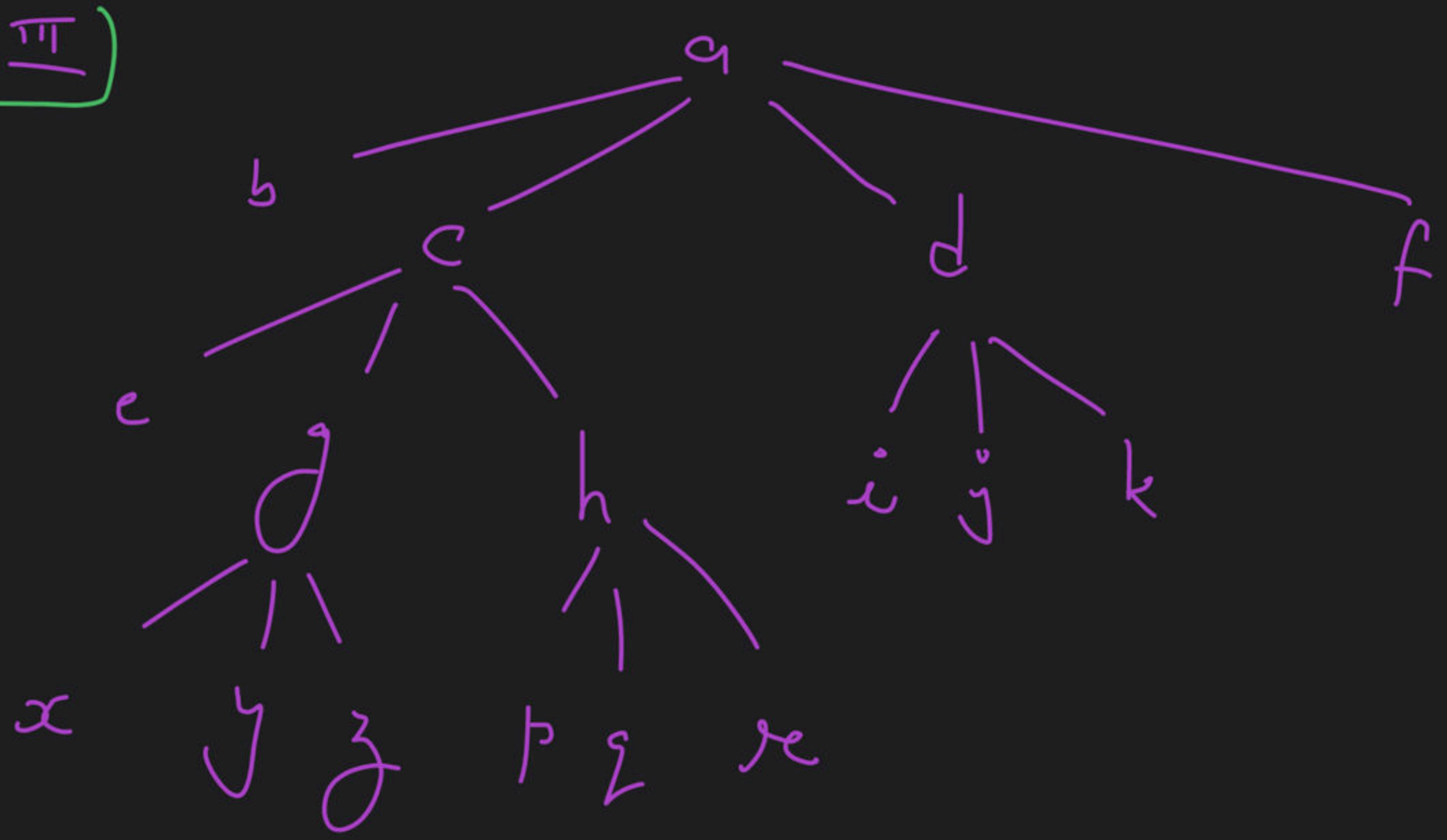


H = 3

L = 7

I = 4

III)

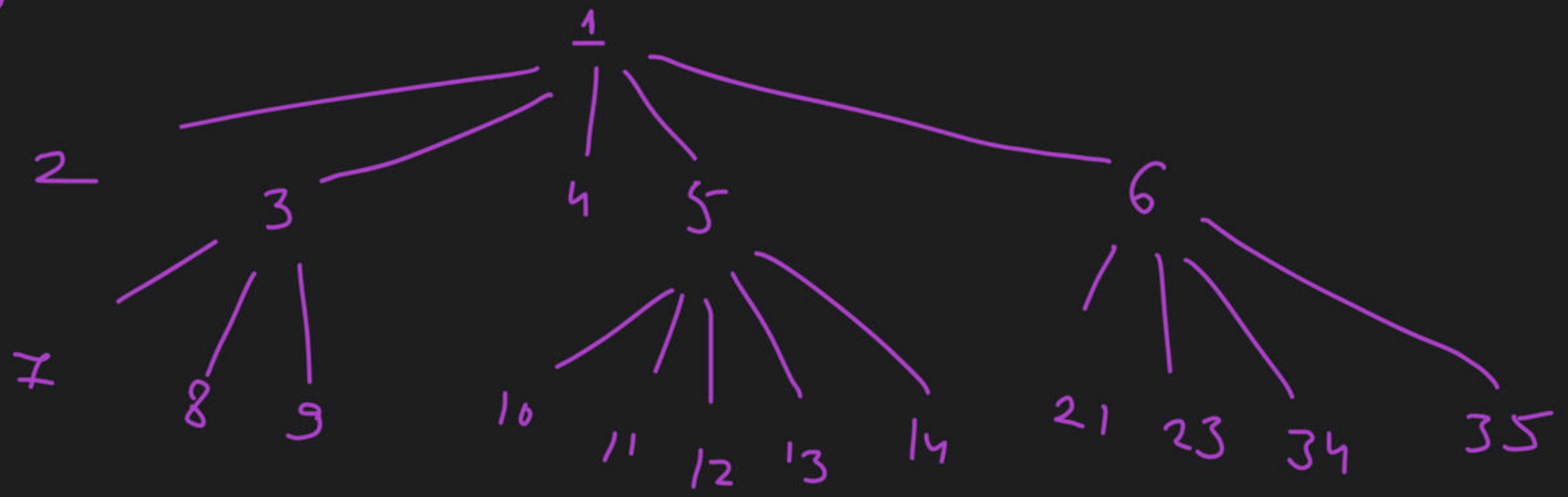


H = 3

L = 12

I = 5

4)



H = 2

L = 14

I = 9

Question

Calculate following for above all tree in previous question:

1. Get the height of the trees
2. Total number of leaf nodes
3. Total number of non-leaf nodes

Please check prev slides for ans.

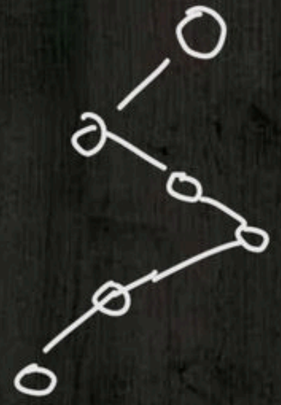
Question

binary

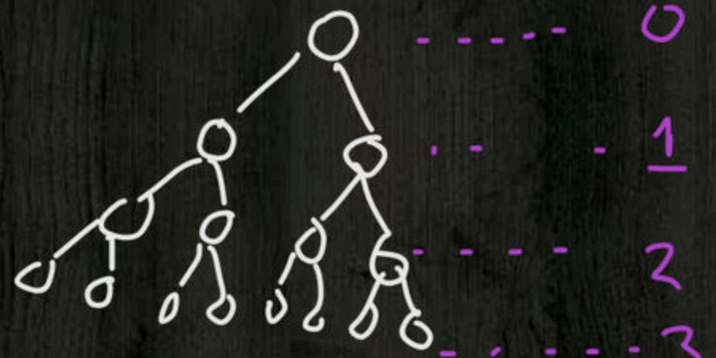
Maximum and minimum nodes in a tree at a level L?

Minimum :-

1



Maximum :-



L	0	1	2	3
N	1	2	4	8

2^L Ans:

Question

Consider a binary tree with n nodes. If it has L leaf nodes then:

1. Calculate number of internal nodes with 2 children I_2? => $I_2 = L - 1$
2. Calculate total number of internal nodes?

$I_1 + I_2$

$I_1 + L - 1$

Question

Consider a binary tree which has 50 nodes with degree 1 and total 80 leaf nodes. Calculate:

1. Number of internal nodes with 2 children L2 ⇒ 79
2. Total number of internal nodes? ⇒ 129
3. Total number of nodes in tree? ⇒ 209

$I_1 = 50$

$L = 80$

2. $I = 50 + 79$

$= 129$

1. $I_2 = 80 - 1 = 79$

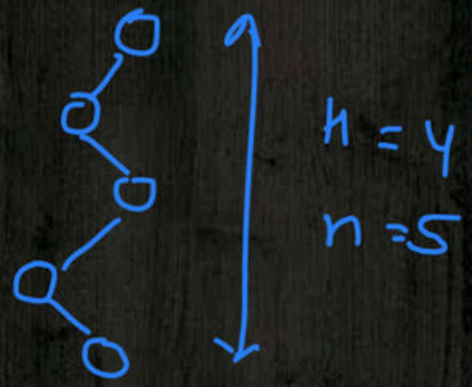
3. $N = 129 + 80$

$= 209$

Question

Minimum and maximum possible height of a tree with n nodes?
Note: H(tree) with single node is 0

Maximum :-



h = 4
n = 5

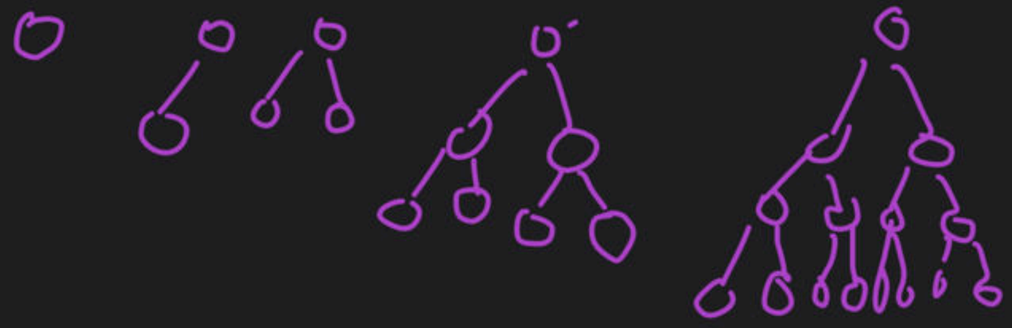
$H_{max}(n) = n - 1$

Min.

$H_{min}(n) = \lfloor \log_2 n \rfloor$

min :-

n	1	2	3	4	5	6	7	8	..	15	16	... 31
H	0	1	1	2	2	2	2	3	---	3	4	4

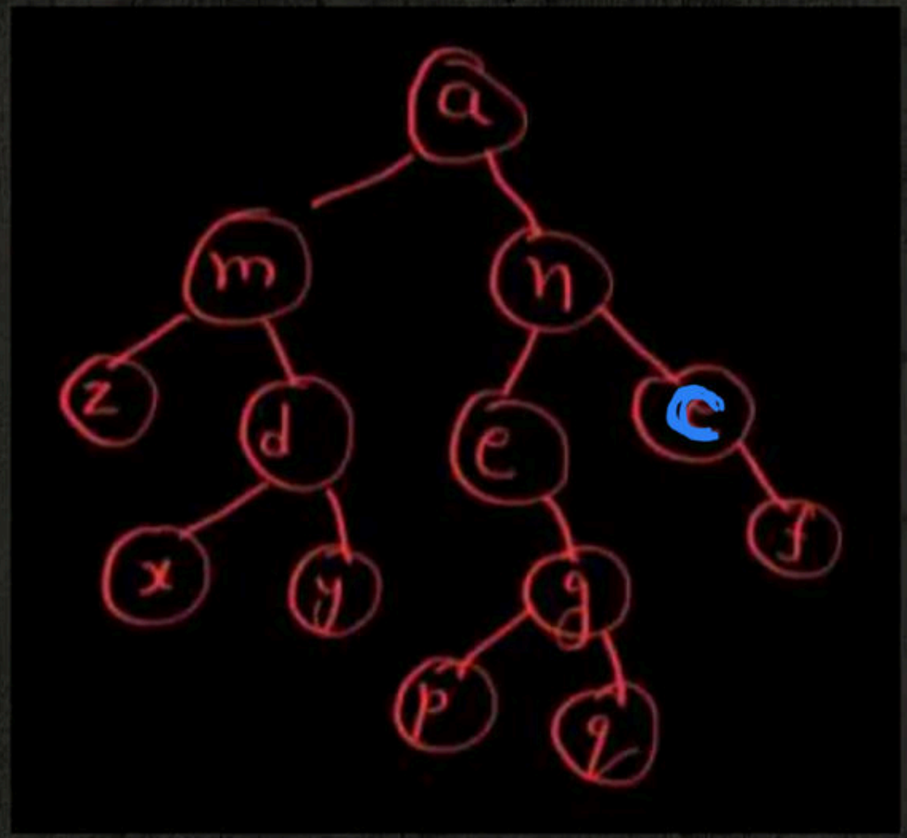


$$H = \lfloor \log_2 n \rfloor$$

Question

Find Traversals

1. Preorder
2. Inorder
3. Postorder



Pre:-

a m z d x y n e g p q c f

In:-

z m x d y a e p g q n c f

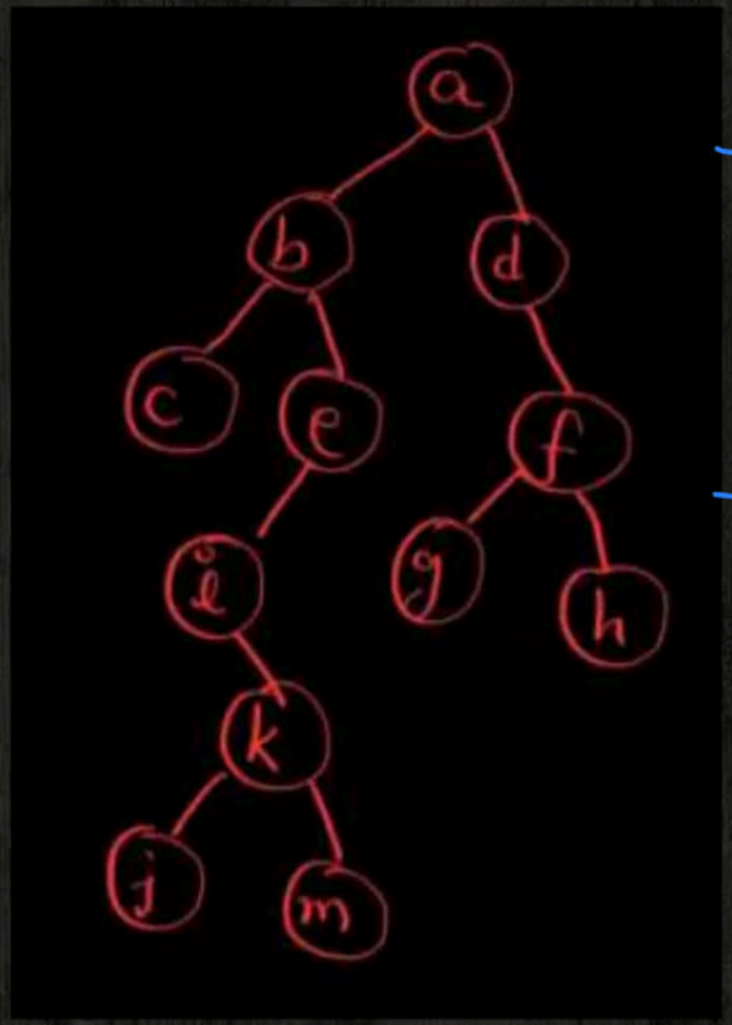
Post:-

z x y d m p q g e f c n a

Question

Find Traversals

1. Preorder
2. Inorder
3. Postorder



Pre:-

abceikjmdfgh

In:-

cbijkmeadgfh

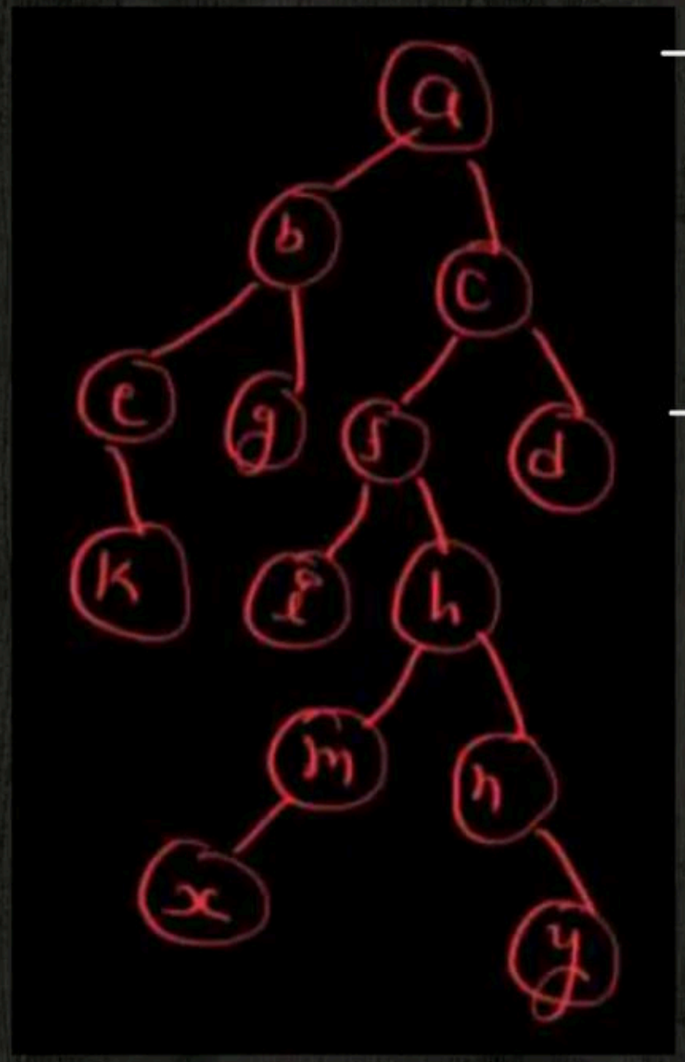
Post:-

cjmkiebghfda

Question

Find Traversals

1. Converse Preorder
2. Converse Inorder
3. Converse Postorder



Converse pre:-

acdfhnymxibgek

Converse in:-

dcjnhmxfiagbke

Converse post:-

djnxmhifcgkebα

unacademy

▲ 1 • Asked by Srishti

Please help me with this doubt

DPP

Ques (1) write a recursive algo to calculate division of 2 positive integers using successive subtraction ?

(2) write a recursive approach to calculate factorial of a given positive integer ?

```
int count = 0
int div (a, b)
{
  if (a == 0 || b == 0)
      return 0;

  if (a < b)
      return 0;

  count = div(a-b, b) + 1;

  return count;

}
```

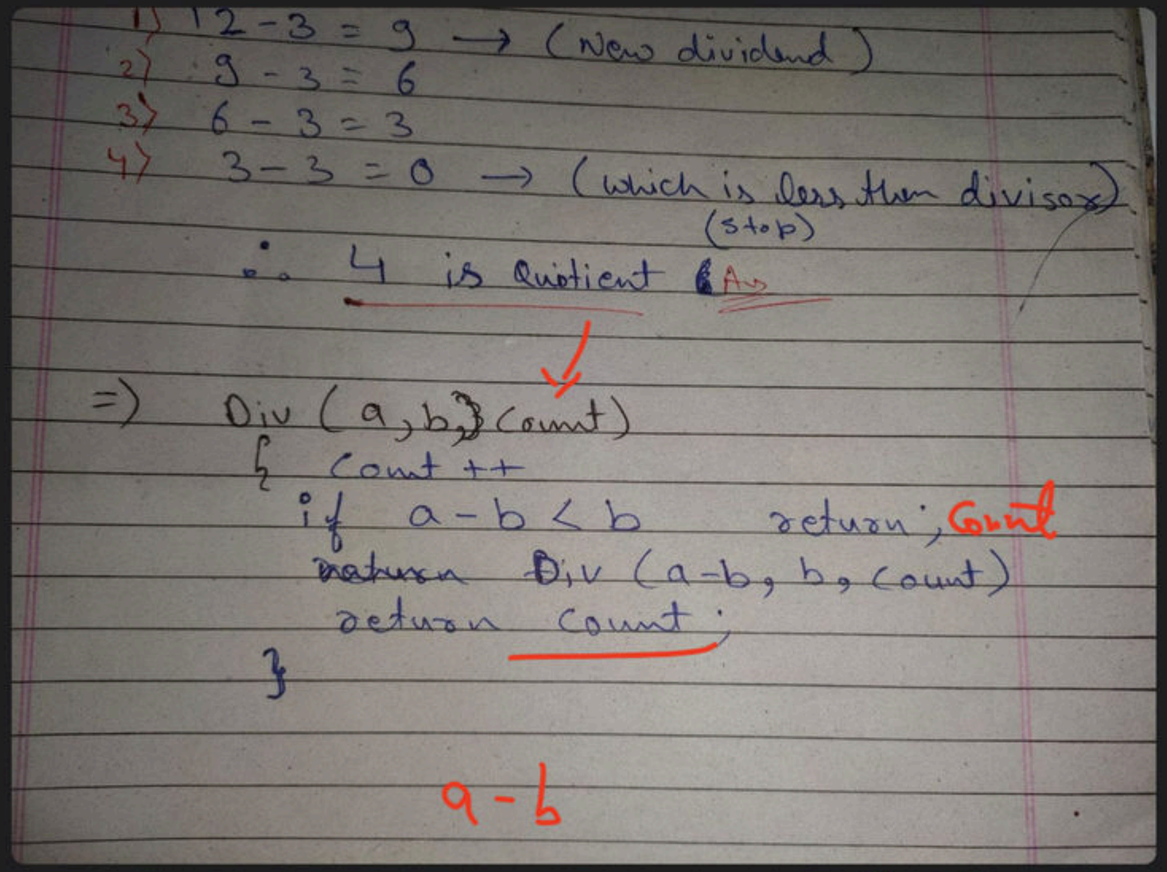
factorial :-

```
int fact (int n)
{
  if (n < 0) return -1;
  if (n == 0 || n == 1)
      return 1;
  return n * fac(n-1);
}
```

unacademy

▲ 1 • Asked by Srishti

count will initially be 0



12 / 3

a = 12

b = 3

a - b < b

a = 5

b = 6

Quiz 5

Question

Consider a stack S which is implemented using 2 queue Q1 and Q2. Queue Q1 is used to store the elements; which means always the elements are present in the Queue Q1 only and Queue Q2 is used as temporary queue for just supporting PUSH & POP operations; which mean whenever required to support operations the elements are brought to Queue Q2 for just temporary basis.

Assuming the Queue Q1 already has 15 elements. For one POP operation minimum how many Enqueue() and Dequeue() operations are performed in total?

- Enqueue: 29, Dequeue:30
- Enqueue: 29, Dequeue:29
- Enqueue: 28, Dequeue:28
- ✓ Enqueue: 28, Dequeue:29

29

DeQ = 14 + 1 + 14

EnQ = 14 + 14

28

Q1 :- ~~15~~ 14 elements

Q2 :- ~~1~~ element

Question

Which of the following statements is/are true?

- It can take constant time to enqueue in a Queue, if the best possible algorithm with a best possible implementation is used

  CORRECT ANSWER

- In stack, insertion and deletion both are performed from same end

  CORRECT ANSWER

- If input sequence for a queue is 1,2,3,4,5 in the given order then number of possible sequences in which the values are dequeued from queue is more than 1

- It takes linear time complexity to reverse a queue

  CORRECT ANSWER

Question

Consider a postfix notation P evaluated using stack as follows:

1. Add right parenthesis) at the end of P
2. Scan P from left to right until) is encountered:
   I. If an Operand is encountered, PUSH it onto stack
   II. If an operator is encountered:
      A. POP first two elements from stack , a is top element and b is next to top element
      B. Evaluate b operator a and push the result onto stack

The notation P has n number of binary operators only. Total number of Push and Pop Operations required for the evaluation are?

PUSH: n
POP: n

PUSH: 2n
POP: 2n

PUSH: 2n
POP: 2n+1

PUSH: 2n+1
POP: 2n

n

n - 1 operands

n+1

2n pop

n push

Question

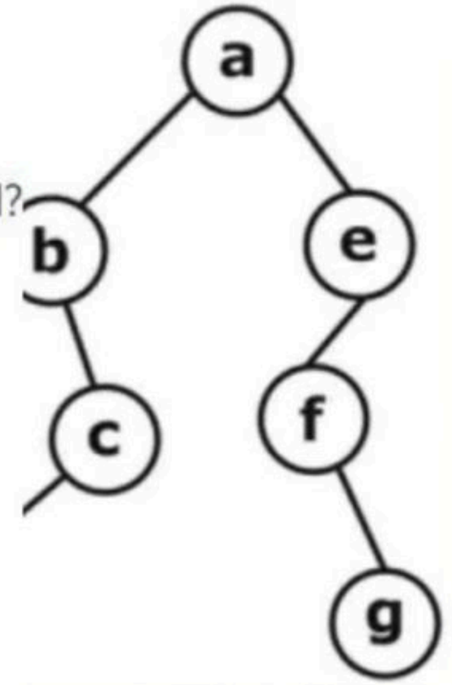
Consider following two functions over a binary tree:

```
void m(struct BTNode *t)
{
  if(t)
  {
      n(t → Right
      printf("%c"
      n(t → Leftcl
  }
}
```

```
void n(struct BTNode *t)
{
```

Which of the following option is correct for each invocation and its traversal?

Function Call	Traversal
(P) m(t1)	(1) b d c g f e a
(Q) m(t2)	(2) d c b a f g e
(R) n(t1)	(3) g f e a c d b
(S) n(t2)	(4) e g f d c b a



Consider 2 trees, one is given tree which is having root pointed by a pointer t1 and one is its mirror image which is having root pointed by a pointer t2.

Consider following two functions over a binary tree:

```
void m(struct BTNode *t)
{
   if(t)
   {
        n(t → Rightchild);
        printf("%c", t → data);
        n(t → Leftchild);
   }
}
```

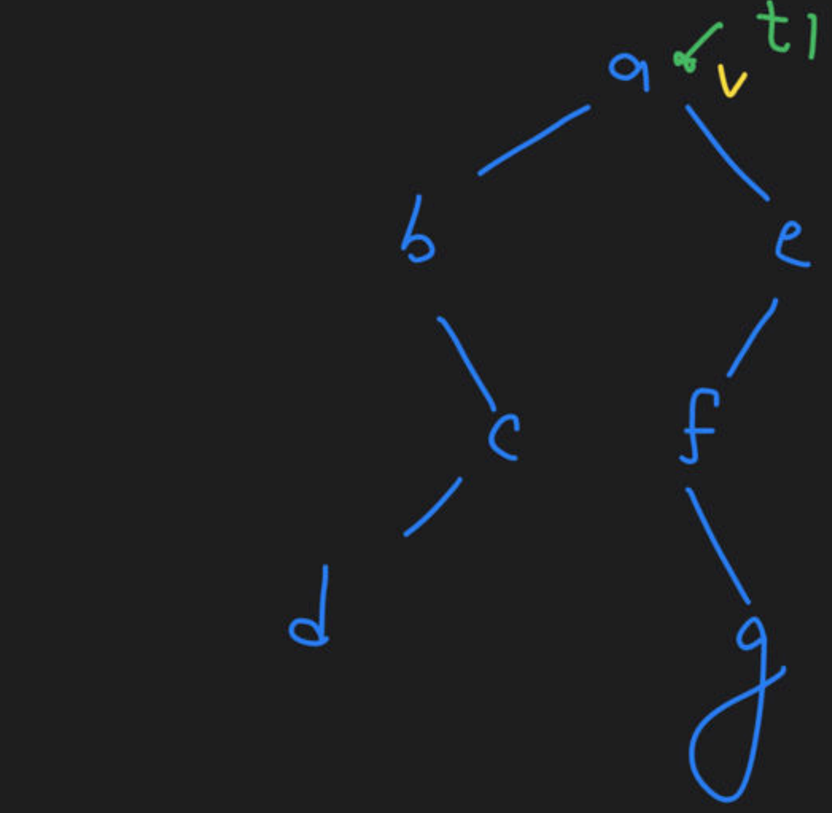
```
void n(struct BTNode *t)
{
   if(t)
   {
        m(t → Rightchild);
        m(t → Leftchild);
        printf("%c", t → data);

   }
}
```

Consider 2 trees, one is given tree which is having root pointed by a pointer t1 and one is its mirror image which is having root pointed by a pointer t2.

Question Continue

Which of the following option is correct for each invocation and its traversal?

Function Call	Traversal
(P) m(t1)	(1) b d c g f e a
(Q) m(t2)	(2) d c b a f g e
(R) n(t1)	(3) g f e a c d b
(S) n(t2)	(4) e g f d c b a



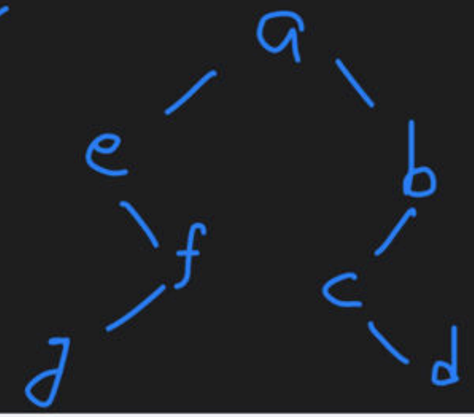
m => Converse Inorder

η => Converse postorder

m (t1) => g f e a c d b

η (t1) => e g f d c b a

t2 ≅



m(a)

m(b) | m(a) | m(e)

Question

What is the run time complexity to traverse a binary tree with n nodes using preorder traversal?

O(log n)	O(n) ✓ CORRECT ANSWER
O(n log n)	$O(n^2)$

Constructing the Tree Using Traversals

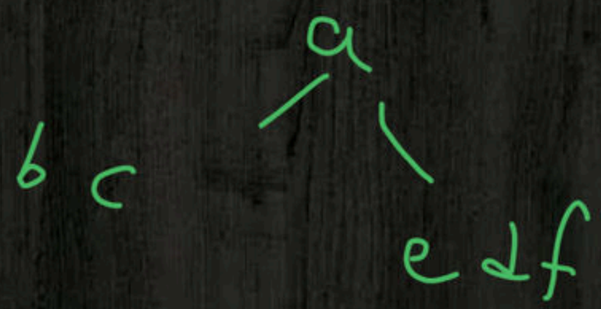
Pre or post ⇒ Root

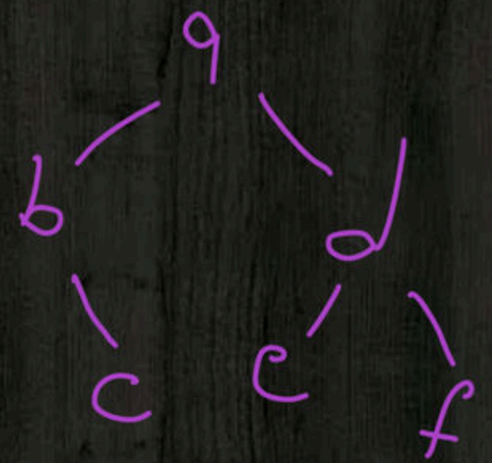
In ⇒ Left & Right subtree

Question

PRE: abcdef

IN: bcaedf

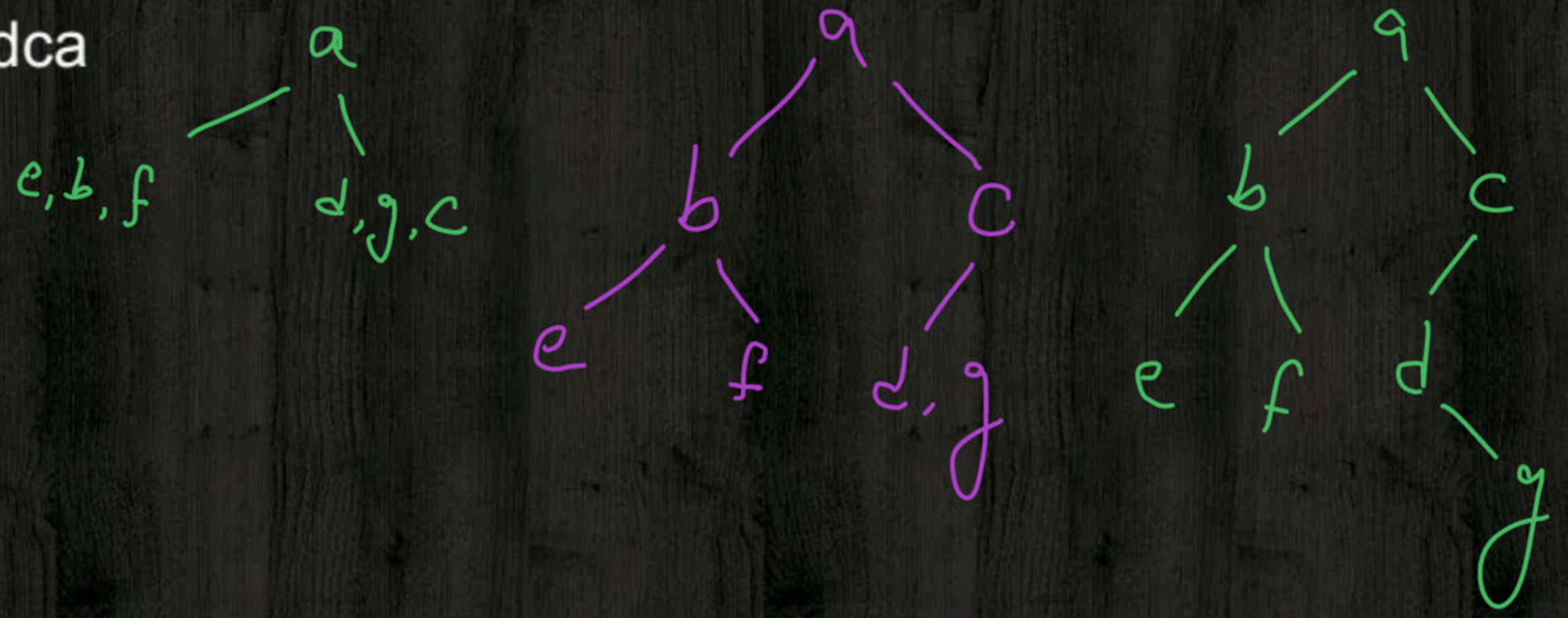




Question

POST: efbgdca

IN: ebfadgc



Question

PRE: mnopxyz

IN: npomyzx

why inorder is needed mendatorily ?

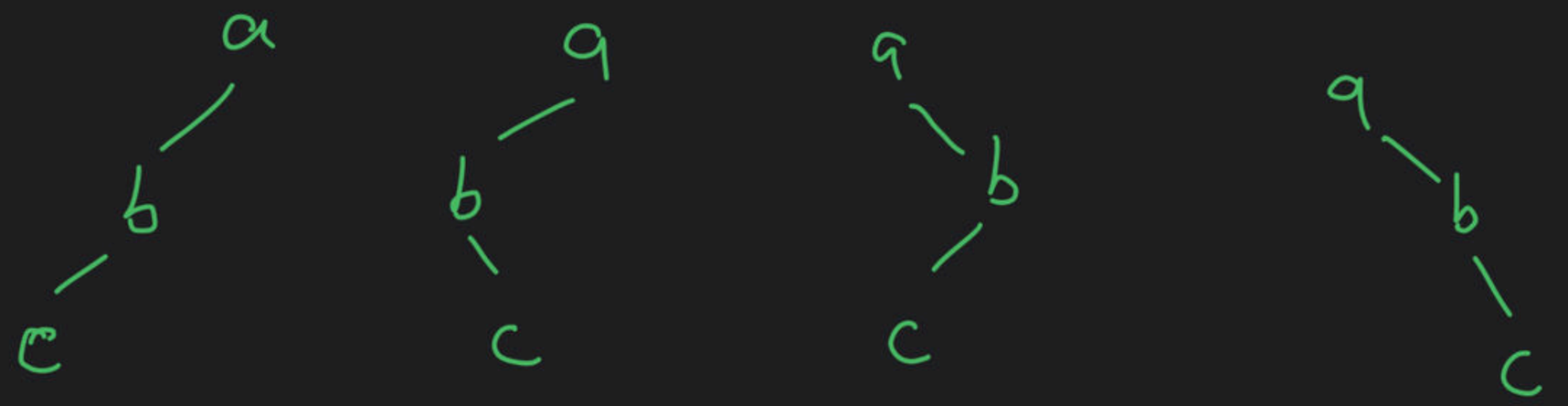
why not only pre or post can give => unique B.T.

Ans:- Preorder & post both can not identify left subtree and right subtree uniquely.

Note:- If any tree has one node with single child then preorder and postorder can not provide a unique tree.

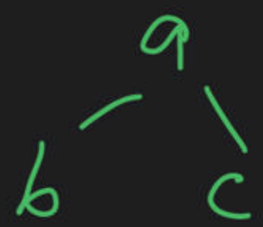
Pre:- a, b, c

Post:- c, b, a



Inc:- a, b, c

Posti- b, c, a

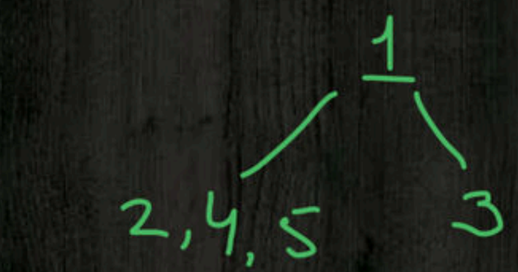


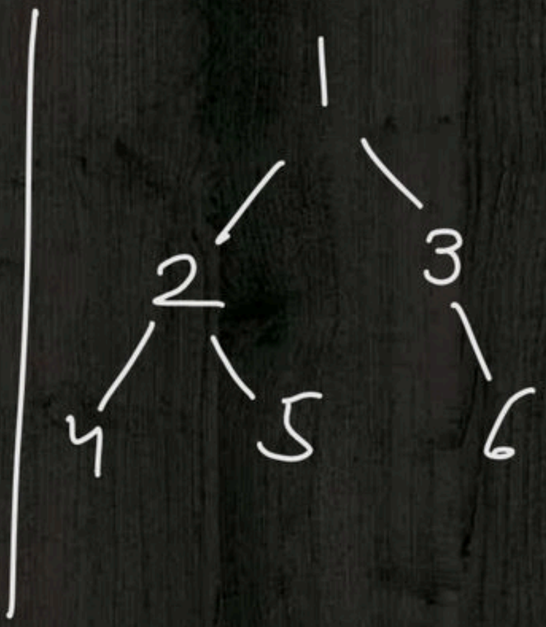
Question

Preorder: 1, 2, 4, 5, 3, 6

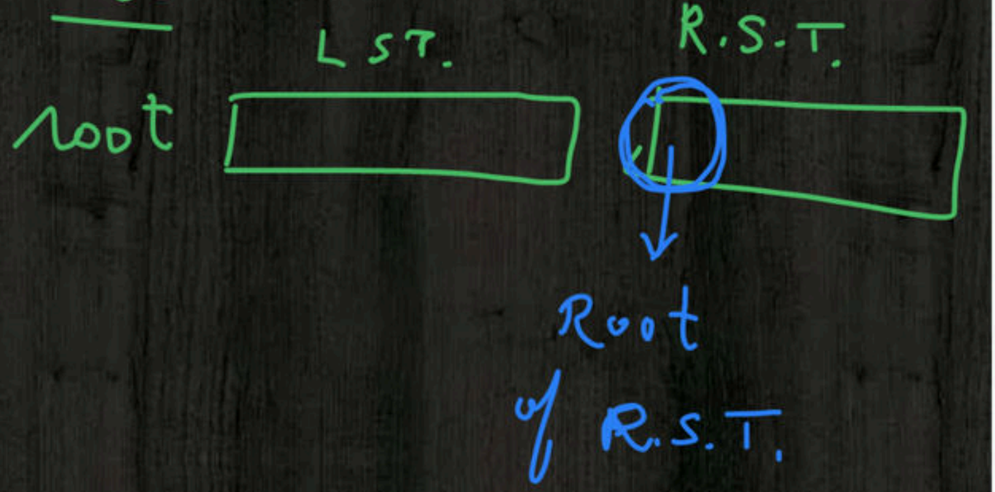
RightPointer:

right child pointer





Ex:-



Question

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

LeftPointer:

Question

Postorder: d e b f g c a
Degree: 0 0 2 0 0 2 2

Get the Tree and Inorder/Preorder traversal

Conversion of General Tree to Binary

Happy Learning