Binary Trees...

Learn Vid Fun...

Question:

How many binary trees are possible having preorder traversal A B C where A, B and C are the three nodes of the binary tree?

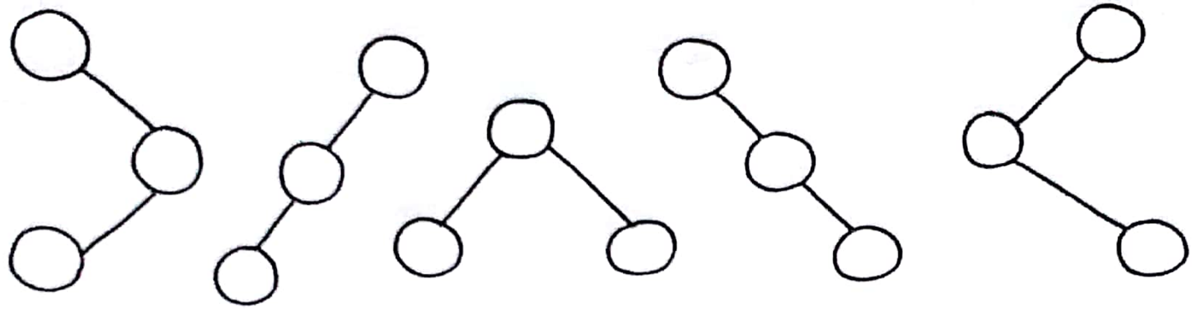
Solution:

We know, with n unlabelled nodes, no. of binary trees possible

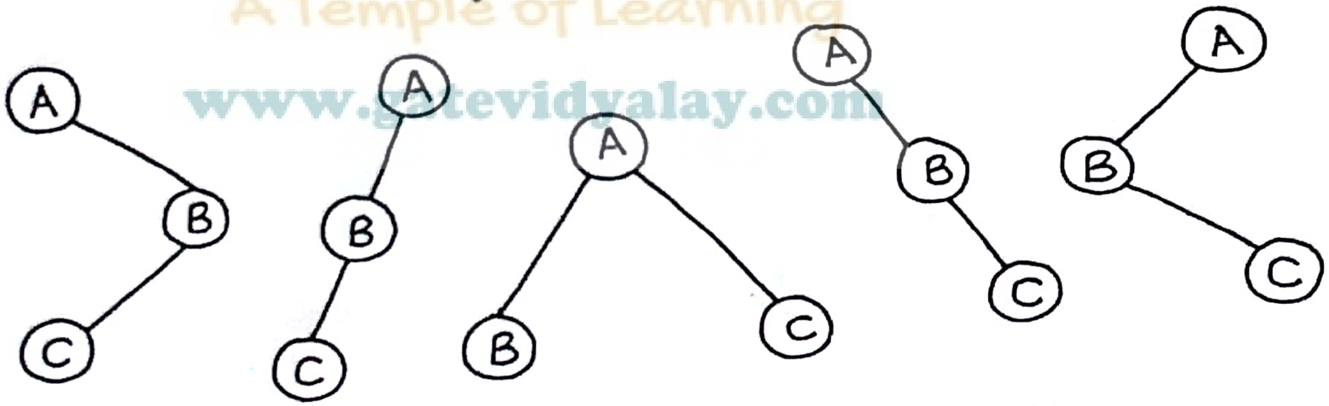
$$= \frac{{}^{2n}C_n}{n+1}$$

So, for 3 nodes which are unlabelled, no. of different binary trees possible

$$= \frac{{}^{2\times 3}C_3}{3+1} = 5$$



Now, there exist only one particular way in which the nodes of above trees can be labelled so that the tree has a given preorder traversal result A, B, C



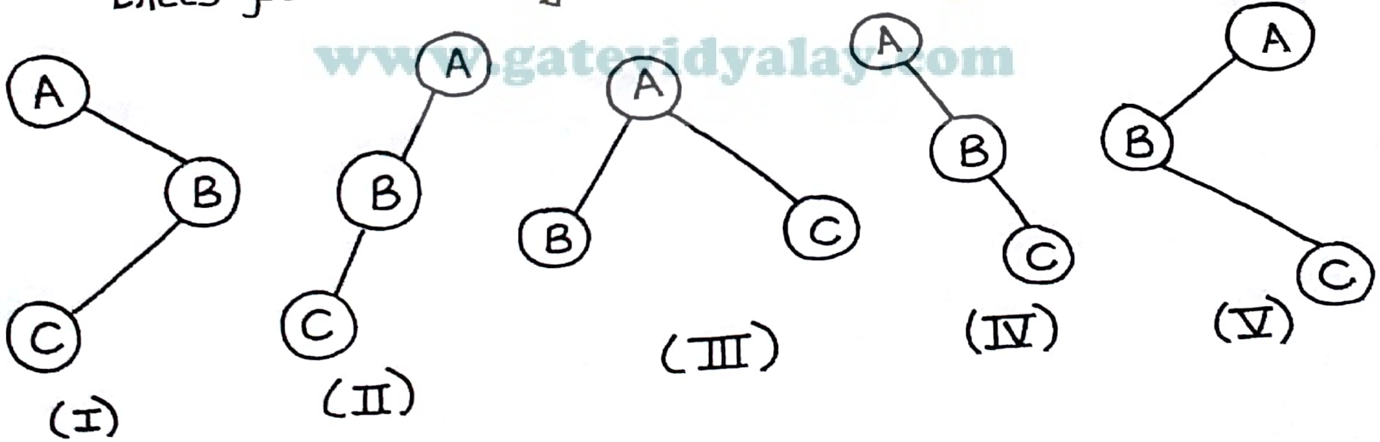
$\therefore$ Number of different binary trees possible = 5

Question:

How many different binary trees are possible with 3 distinct nodes A, B, C such that preorder traversal = A B C and postorder traversal = C B A ?

Solution:

From the previous question, number of different binary trees possible having preorder traversal = A B C is 5.



Postorder Traversal Results of above Binary trees-

(I) C B A ✓

(II) C B A ✓

(III) B C A ✗

(IV) C B A ✓

(V) C B A ✓

Thus, only (III) binary tree does not have postorder traversal result = C B A. Rest of the binary trees have the required postorder traversal result = C B A

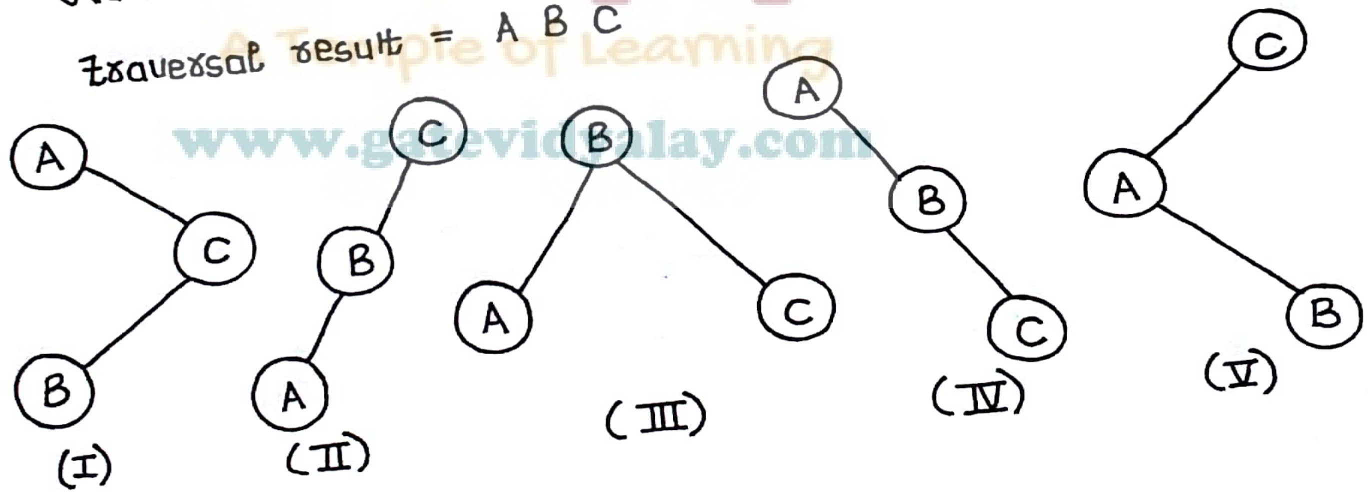
∴ Number of different binary trees possible = 4

Question:

How many different binary trees are possible with 3 distinct nodes A, B and C such that the inorder traversal = A B C and postorder traversal = C B A ?

Solution:

Number of different binary trees possible having inorder traversal result = A B C



Postorder Traversal results of above Binary trees -

(I) B C A ✗

(II) A B C ✗

(III) A C B ✗

(IV) C B A ✓

(V) B A C ✗

Only (IV) Binary tree has postorder traversal result

= C B A

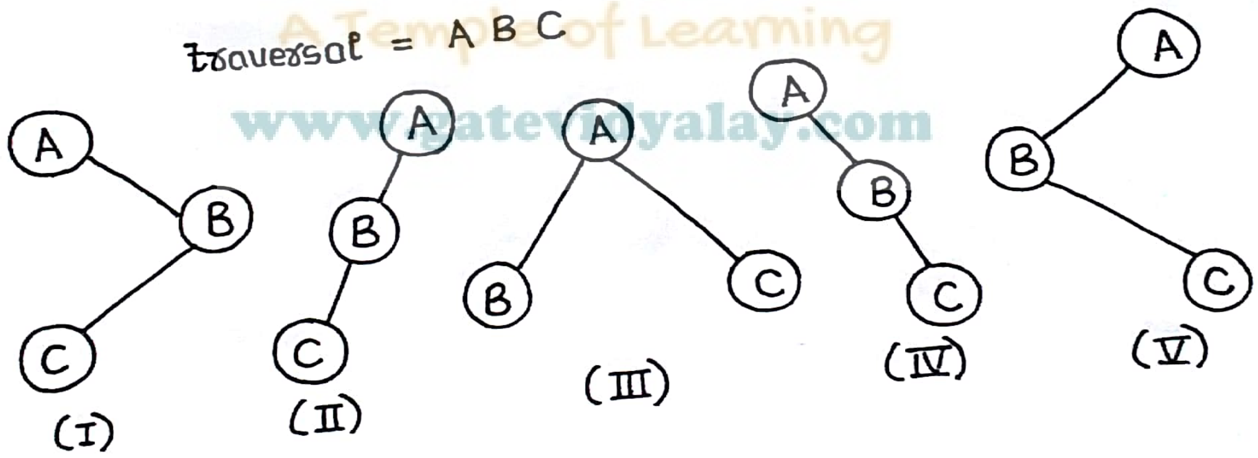
∴ Number of different Binary trees possible = 1

Question:

How many different binary trees are possible with 3 distinct nodes A, B, C having preorder traversal = A B C, postorder traversal = C B A and inorder traversal = B C A ?

Solution:

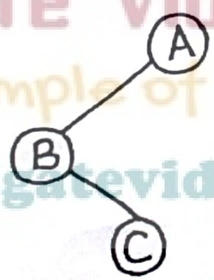
Number of binary trees possible having preorder traversal = A B C



(I), (II), (IV) and (V) binary trees only have postorder traversal result = C B A.

Out of (I), (II), (IV) and (V), only (V) binary tree has inorder traversal result = B C A

Thus, there is only one binary tree which satisfies all the 3 given traversal results which is-



Question:

We are given a preorder traversal result 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 of elements so that it has the given preorder traversal?

(a) 0

(b) 1

(c) $n!$

(d) $\frac{^{2n}C_n}{n+1}$

Solution:

Correct option is (b)

Question:

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

(GATE-2004)

1. Preorder and Postorder
2. Inorder and Postorder
3. Preorder and Inorder
4. Level Order and Postorder

(a) 1 only

(b) 2 and 3

(c) 3 only

(d) 4 only

Solution:

Correct option is (b)