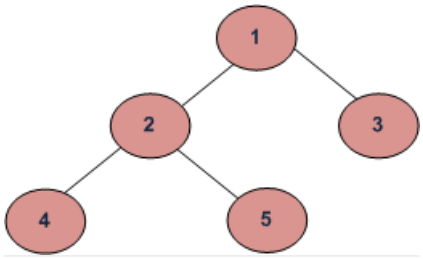
Write a program to Calculate Size of a tree

Size of a tree is the number of elements present in the tree. Size of the below tree is 5.



Example Tree

Size() function recursively calculates the size of a tree. It works as follows:

Size of a tree = Size of left subtree + 1 + Size of right subtree

Algorithm:

```
size(tree)
1. If tree is empty then return 0
2. Else
     (a) Get the size of left subtree recursively  i.e., call
          size( tree->left-subtree)
     (a) Get the size of right subtree recursively  i.e., call
          size( tree->right-subtree)
     (c) Calculate size of the tree as following:
            tree_size  =  size(left-subtree) + size(right-
                                subtree) + 1
     (d) Return tree_size
```

C

```
#include <stdio.h>
#include <stdlib.h>

/* A binary tree node has data, pointer to left child
   and a pointer to right child */
struct node
{
    int data;
    struct node* left;
    struct node* right;
};

/* Helper function that allocates a new node with the
   given data and NULL left and right pointers. */
struct node* newNode(int data)
{
  struct node* node = (struct node*)
                       malloc(sizeof(struct node));
  node->data = data;
  node->left = NULL;
  node->right = NULL;

  return(node);
}

/* Computes the number of nodes in a tree. */
int size(struct node* node)
{
  if (node==NULL)
    return 0;
  else
    return(size(node->left) + 1 + size(node->right));
}

/* Driver program to test size function*/
int main()
{
  struct node *root = newNode(1);
  root->left        = newNode(2);
  root->right       = newNode(3);
  root->left->left  = newNode(4);
  root->left->right = newNode(5);

  printf("Size of the tree is %d", size(root));
  getchar();
  return 0;
}
```

Java

```
// A recursive Java program to calculate the size of the tree

/* Class containing left and right child of current
   node and key value*/
class Node
{
    int data;
    Node left, right;

    public Node(int item)
    {
        data = item;
        left = right = null;
    }
}

/* Class to find size of Binary Tree */
class BinaryTree
{
    Node root;

    /* Given a binary tree. Print its nodes in level order
       using array for implementing queue */
    int size()
    {
        return size(root);
    }

    /* computes number of nodes in tree */
    int size(Node node)
    {
        if (node == null)
            return 0;
        else
            return(size(node.left) + 1 + size(node.right));
    }

    public static void main(String args[])
    {
        /* creating a binary tree and entering the nodes */
        BinaryTree tree = new BinaryTree();
        tree.root = new Node(1);
        tree.root.left = new Node(2);
        tree.root.right = new Node(3);
        tree.root.left.left = new Node(4);
        tree.root.left.right = new Node(5);

        System.out.println("The size of binary tree is : "
                           + tree.size());
    }
}
```

Python

```
# Python Program to find the size of binary tree

# A binary tree node
class Node:

    # Constructor to create a new node
    def __init__(self, data):
        self.data = data
        self.left = None
        self.right = None

# Computes the number of nodes in tree
def size(node):
    if node is None:
        return 0
    else:
        return (size(node.left)+ 1 + size(node.right))


# Driver program to test above function
root = Node(1)
root.left = Node(2)
root.right = Node(3)
root.left.left  = Node(4)
root.left.right = Node(5)

print "Size of the tree is %d" %(size(root))

# This code is contributed by Nikhil Kumar Singh(nickzuck_007)
```

Output:

```
Size of the tree is 5
```

Time & Space Complexities: Since this program is similar to traversal of tree, time and space complexities will be same as Tree traversal (Please see our Tree Traversal post for details)