Nama: Muhammad Danu Firjatullah Rachman

Kelas: IF-45-12

NIM: 1301213439

Tree.h

```h
#ifndef TREE_H_INCLUDED
#define TREE_H_INCLUDED
#include <iostream>
using namespace std;
#define left(p) (p)->left
#define info(p) (p)->info
#define right(p) (p)->right
#define root(T) (T).root

typedef int infotype;
typedef struct Node *adrNode;

struct Node{
    adrNode left;
    infotype info;
    adrNode right;
};

adrNode newNode_1301213439(infotype x);
adrNode findNode_1301213439(adrNode root, infotype x);
adrNode insertNode_1301213439(adrNode root, adrNode p);
void printPreOrder_1301213439(adrNode root);
void printDescendant_1301213439(adrNode root, infotype x);
int sumNode_1301213439(adrNode root);
int countLeaves_1301213439(adrNode root);
int heightTree_1301213439(adrNode root);

#endif // TREE_H_INCLUDED

```

Tree.cpp

```cpp
#include "Tree.h"

adrNode newNode_1301213439(infotype x){
    adrNode p = new Node;
    left(p) = NULL;
    info(p) = x;
    right(p) = NULL;
    return p;
}

adrNode findNode_1301213439(adrNode root, infotype x){
    if (root == NULL){
        return NULL;
    }
    if (info(root) == x){
        return root;
    }
    adrNode p = findNode_1301213439(left(root), x);
    if (p != NULL){
        return p;
    } else {
        return findNode_1301213439(right(root), x);
    }
}

adrNode insertNode_1301213439(adrNode root, adrNode p){
    if (root == NULL){
        return p;
    } else if (info(p) < info(root)){
        left(root) = insertNode_1301213439(left(root), p);
    } else {
        right(root) = insertNode_1301213439(right(root), p);
    }
    return root;
}
```

```
37  void printPreOrder_1301213439(adrNode root){
38      if (root == NULL){
39          return;
40      }
41      cout << info(root) << " ";
42      printPreOrder_1301213439(left(root));
43      printPreOrder_1301213439(right(root));
44  }
45
46  void printDescendant_1301213439(adrNode root, infotype x){
47      adrNode p = findNode_1301213439(root, x);
48      if (p == NULL){
49          cout << "Node tidak ada." << endl;
50      }
51      printPreOrder_1301213439(left(p));
52      printPreOrder_1301213439(right(p));
53  }
54
55  int sumNode_1301213439(adrNode root){
56      if (root == NULL){
57          return 0;
58      }
59      return info(root) + sumNode_1301213439(left(root)) + sumNode_1301213439(right(root));
60  }
61
62  int countLeaves_1301213439(adrNode root){
63      if (root == NULL){
64          return 0;
65      } else if (left(root) == NULL && right(root) == NULL){
66          return 1;
67      }
68      return countLeaves_1301213439(left(root)) + countLeaves_1301213439(right(root));
69  }
70
71  int heightTree_1301213439(adrNode root){
72      if (root == NULL){
73          return 0;
```

```
71  int heightTree_1301213439(adrNode root){
72      if (root == NULL){
73          return 0;
74      }
75      int left = heightTree_1301213439(left(root));
76      int right = heightTree_1301213439(right(root));
77      return max(left, right)+1;
78  }
79
```

Main.cpp

```cpp
#include <iostream>
#include "Tree.h"

using namespace std;

int main()
{
    adrNode root = NULL;
    int x[9] = {5,3,9,10,4,7,1,8,6};
    for (int i=0; i<9; i++){
        adrNode p = newNode_1301213439(x[i]);
        root = insertNode_1301213439(root, p);
    }

    cout << "============================Tugas Pendahuluan Modul 15============================" << endl;
    string nama = "Muhammad Danu Firjatullah Rachman";
    string nim = "1301213439";
    string kelas = "IF-45-12";

    cout << "Nama: " << nama << endl;
    cout << "NIM: " << nim << endl;
    cout << "Kelas: " << kelas << endl;

    for (int i=0; i<9; i++){
        cout << x[i] << " ";
    }

    cout << endl << endl;
    printf("Pre Order\t\t: ");
    printPreOrder_1301213439(root);

    cout << endl << endl;
    printf("Descendent of Node 9\t: ");
    printDescendant_1301213439(root, 9);

    cout << endl << endl;
    printf("Sum of BST Info\t\t: ");
```

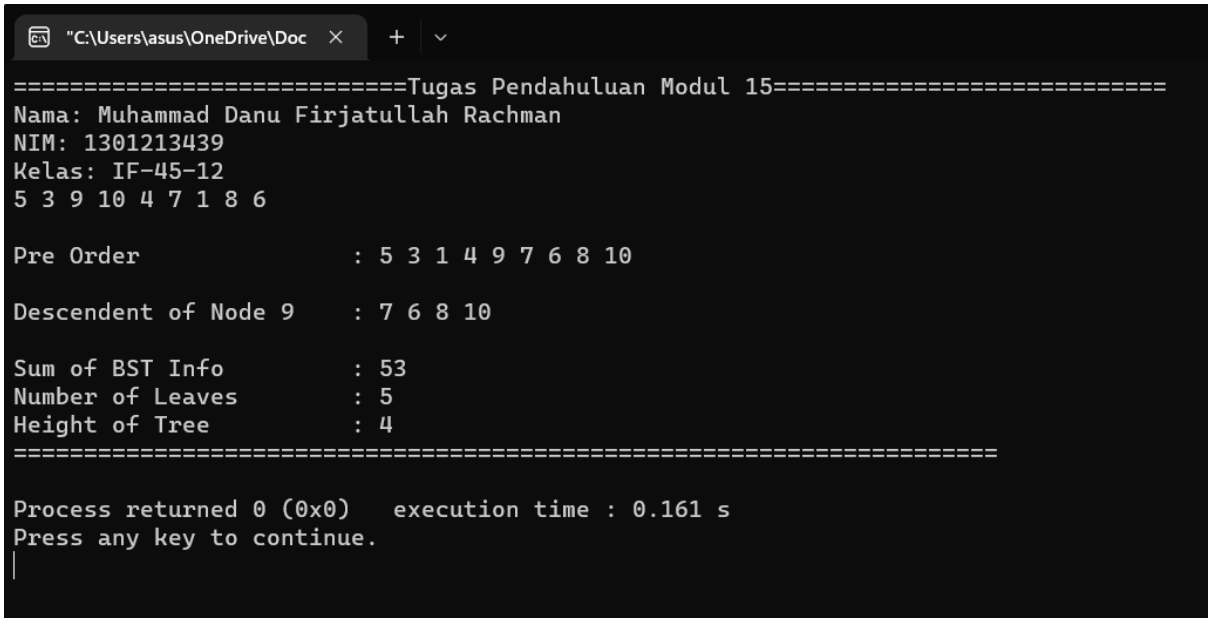
```cpp
    cout << endl << endl;
    printf("Sum of BST Info\t\t: ");
    cout << sumNode_1301213439(root);

    cout << endl;
    printf("Number of Leaves\t: ");
    cout << countLeaves_1301213439(root);

    cout << endl;
    printf("Height of Tree\t\t: ");
    cout << heightTree_1301213439(root) << endl;

    cout << "================================================================================" << endl;
    return 0;
}
```

Output


"C:\Users\asus\OneDrive\Doc
==========Tugas Pendahuluan Modul 15==========
Nama: Muhammad Danu Firjatullah Rachman
NIM: 1301213439
Kelas: IF-45-12
5 3 9 10 4 7 1 8 6
Pre Order : 5 3 1 4 9 7 6 8 10
Descendent of Node 9 : 7 6 8 10
Sum of BST Info : 53
Number of Leaves : 5
Height of Tree : 4
Process returned 0 (0x0) execution time : 0.161 s
Press any key to continue.