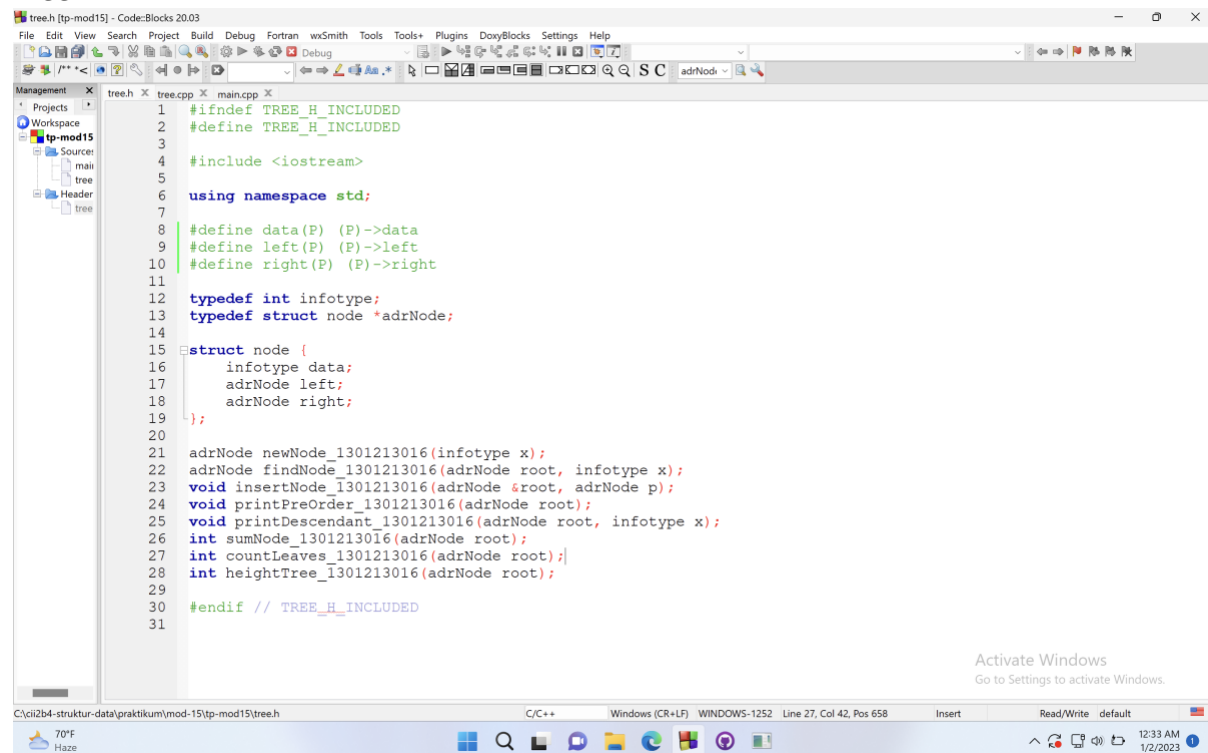


Nama : Fawaz Al Rasyid

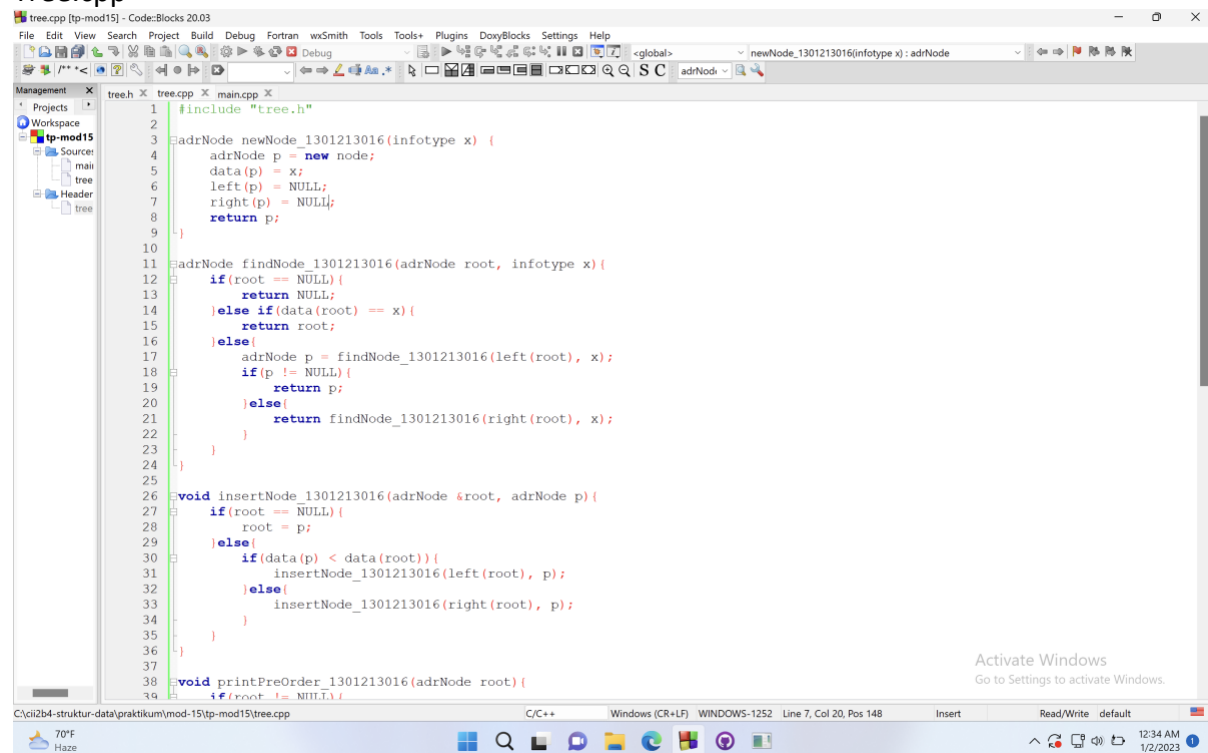
NIM : 1301213016

Tree.h



```
1  #ifndef TREE_H_INCLUDED
2  #define TREE_H_INCLUDED
3
4  #include <iostream>
5
6  using namespace std;
7
8  #define data(P) (P)->data
9  #define left(P) (P)->left
10 #define right(P) (P)->right
11
12 typedef int infotype;
13 typedef struct node *adrNode;
14
15 struct node {
16     infotype data;
17     adrNode left;
18     adrNode right;
19 };
20
21 adrNode newNode_1301213016(infotype x);
22 adrNode findNode_1301213016(adrNode root, infotype x);
23 void insertNode_1301213016(adrNode &root, adrNode p);
24 void printPreOrder_1301213016(adrNode root);
25 void printDescendant_1301213016(adrNode root, infotype x);
26 int sumNode_1301213016(adrNode root);
27 int countLeaves_1301213016(adrNode root);
28 int heightTree_1301213016(adrNode root);
29
30 #endif // TREE_H_INCLUDED
```

Tree.cpp



```
1  #include "tree.h"
2
3  adrNode newNode_1301213016(infotype x) {
4      adrNode p = new node;
5      data(p) = x;
6      left(p) = NULL;
7      right(p) = NULL;
8      return p;
9  }
10
11 adrNode findNode_1301213016(adrNode root, infotype x) {
12     if (root == NULL) {
13         return NULL;
14     } else if (data(root) == x) {
15         return root;
16     } else {
17         adrNode p = findNode_1301213016(left(root), x);
18         if (p != NULL) {
19             return p;
20         } else {
21             return findNode_1301213016(right(root), x);
22         }
23     }
24 }
25
26 void insertNode_1301213016(adrNode &root, adrNode p) {
27     if (root == NULL) {
28         root = p;
29     } else {
30         if (data(p) < data(root)) {
31             insertNode_1301213016(left(root), p);
32         } else {
33             insertNode_1301213016(right(root), p);
34         }
35     }
36 }
37
38 void printPreOrder_1301213016(adrNode root) {
39     if (root != NULL) {
```

tree.cpp [tp-mod15] - Code::Blocks 20.03

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newNode_1301213016(intotype x) : adrNode

tree.h tree.cpp main.cpp

```
37
38 void printPreOrder_1301213016(adNode root){
39     if(root != NULL){
40         cout << data(root) << " ";
41         printPreOrder_1301213016(left(root));
42         printPreOrder_1301213016(right(root));
43     }
44 }
45
46 void printDescendant_1301213016(adNode root, intotype x){
47     adNode p = findNode_1301213016(root, x);
48     if(p != NULL){
49         printPreOrder_1301213016(p);
50     }
51 }
52
53 int sumNode_1301213016(adNode root){
54     if(root == NULL){
55         return 0;
56     }else{
57         return data(root) + sumNode_1301213016(left(root)) + sumNode_1301213016(right(root));
58     }
59 }
60
61 int countLeaves_1301213016(adNode root){
62     if(root == NULL){
63         return 0;
64     }else if(left(root) == NULL && right(root) == NULL){
65         return 1;
66     }else{
67         return countLeaves_1301213016(left(root)) + countLeaves_1301213016(right(root));
68     }
69 }
70
71 int heightTree_1301213016(adNode root){
72     if(root == NULL){
73         return 0;
74     }else{
75         int leftHeight = heightTree_1301213016(left(root));
```

Activate Windows
Go to Settings to activate Windows.

C:\ci2b4-struktur-data\praktikum\mod-15\tp-mod15\tree.cpp C/C++ Windows (CR+LF) WINDOWS-1252 Line 7, Col 20, Pos 148 Insert Read/Write default 12:34 AM 1/2/2023

tree.cpp [tp-mod15] - Code::Blocks 20.03

File Edit View Search Project Build Debug Fortran wxSmith Tools Tools+ Plugins DoxyBlocks Settings Help

heightTree_1301213016(adNode root) : int

tree.h tree.cpp main.cpp

```
43 }
44 }
45
46 void printDescendant_1301213016(adNode root, intotype x){
47     adNode p = findNode_1301213016(root, x);
48     if(p != NULL){
49         printPreOrder_1301213016(p);
50     }
51 }
52
53 int sumNode_1301213016(adNode root){
54     if(root == NULL){
55         return 0;
56     }else{
57         return data(root) + sumNode_1301213016(left(root)) + sumNode_1301213016(right(root));
58     }
59 }
60
61 int countLeaves_1301213016(adNode root){
62     if(root == NULL){
63         return 0;
64     }else if(left(root) == NULL && right(root) == NULL){
65         return 1;
66     }else{
67         return countLeaves_1301213016(left(root)) + countLeaves_1301213016(right(root));
68     }
69 }
70
71 int heightTree_1301213016(adNode root){
72     if(root == NULL){
73         return 0;
74     }else{
75         int leftHeight = heightTree_1301213016(left(root));
76         int rightHeight = heightTree_1301213016(right(root));
77         return max(leftHeight, rightHeight) + 1;
78     }
79 }
80 }
```

Activate Windows
Go to Settings to activate Windows.

C:\ci2b4-struktur-data\praktikum\mod-15\tp-mod15\tree.cpp C/C++ Windows (CR+LF) WINDOWS-1252 Line 74, Col 11, Pos 1783 Insert Read/Write default 12:34 AM 1/2/2023

Main.cpp

```
main.cpp [tp-mod15] - Code::Blocks 20.03
File Edit View Search Project Build Debug Fortran wxSmith Tools Tools+ Plugins DoryBlocks Settings Help
tree.h tree.cpp main.cpp X
1 #include "tree.h"
2 #include <iostream>
3
4 using namespace std;
5
6 int main()
7 {
8     adrNode root = NULL;
9     int x[9] = {5,3,9,10,4,7,1,8,6};
10
11     /* Tampilkan isi dari array */
12     printf("\nIsi Array\t\t: ");
13     for (int i = 0; i < 9; i++){
14         cout << x[i] << " ";
15     }
16
17     /* 1. Tambahkan setiap elemen array x kedalam BST secara berurutan */
18     /* sehingga dihasilkan BST seperti Gambar 1, gunakan looping */
19     for (int i = 0; i < 9; i++){
20         adrNode p = newNode_1301213016(x[i]);
21         insertNode_1301213016(root, p);
22     }
23
24     /* 2. Tampilkan node dari BST secara Pre-Order */
25     printf("\n");
26     printf("\nPre Order\t\t: ");
27     printPreOrder_1301213016(root);
28
29     /* 3. Tampilkan keturunan dari node 9 */
30     printf("\n");
31     printf("\nDescendent of Node 9\t: ");
32     printDescendant_1301213016(root, 9);
33
34     /* 4. Tampilkan total info semua node pada BST */
35     printf("\n");
36 }
```

```
main.cpp [tp-mod15] - Code::Blocks 20.03
File Edit View Search Project Build Debug Fortran wxSmith Tools Tools+ Plugins DoryBlocks Settings Help
tree.h tree.cpp main.cpp X
16
17 /* 1. Tambahkan setiap elemen array x kedalam BST secara berurutan */
18 /* sehingga dihasilkan BST seperti Gambar 1, gunakan looping */
19 for (int i = 0; i < 9; i++){
20     adrNode p = newNode_1301213016(x[i]);
21     insertNode_1301213016(root, p);
22 }
23
24 /* 2. Tampilkan node dari BST secara Pre-Order */
25 printf("\n");
26 printf("\nPre Order\t\t: ");
27 printPreOrder_1301213016(root);
28
29 /* 3. Tampilkan keturunan dari node 9 */
30 printf("\n");
31 printf("\nDescendent of Node 9\t: ");
32 printDescendant_1301213016(root, 9);
33
34 /* 4. Tampilkan total info semua node pada BST */
35 printf("\n");
36 printf("\nSum of BST Info\t\t: ");
37 cout << sumNode_1301213016(root);
38
39 /* 5. Tampilkan banyaknya daun dari BST */
40 printf("\nNumber of Leaves\t: ");
41 cout << countLeaves_1301213016(root);
42
43 /* 6. Tampilkan Tinggi dari Tree */
44 printf("\nHeight of Tree\t\t: ");
45 cout << heightTree_1301213016(root) - 1;
46
47 return 0;
48 }
49 }
```

Output

```
C:\cii2b4-struktur-data\praktikum\mod-15\tp-mod15\bin\Debug\tp-mod15.exe
Isi Array      : 5 3 9 10 4 7 1 8 6
Pre Order      : 5 3 1 4 9 7 6 8 10
Descendent of Node 9 : 9 7 6 8 10
Sum of BST Info : 53
Number of Leaves : 5
Height of Tree  : 3
Process returned 0 (0x0)   execution time : 0.078 s
Press any key to continue.
```