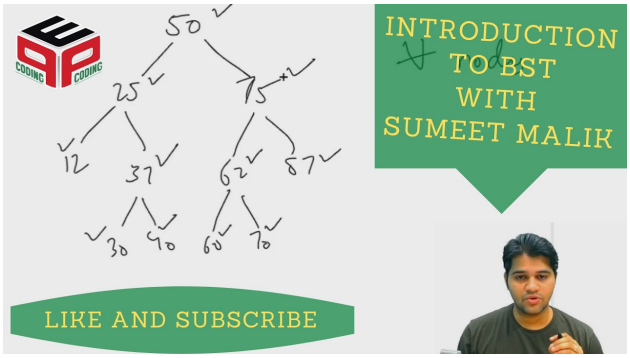
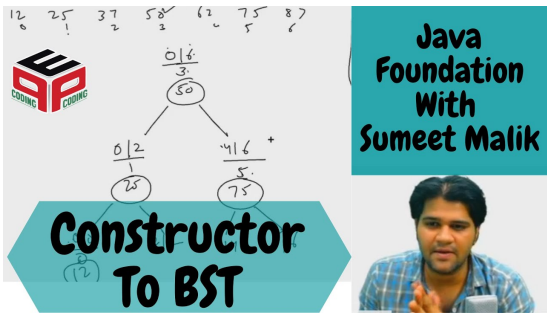
Introduction To Binary Search Tree



Constructor Of Binary Search Tree



Size, Sum, Max, Min, Find In Bst

Easy

1. You are given a partially written BST class.
2. You are required to complete the body of size, sum, max, min and find function. The functions are expected to:
   2.1. size - return the number of nodes in BST
   2.2. sum - return the sum of nodes in BST
   2.3. max - return the value of node with greatest value in BST
   2.4. min - return the value of node with smallest value in BST
   2.5. find - return true if there is node in the tree equal to "data"
3. Input and Output is managed for you.

Constraints

None

Format

Input

Input is managed for you

Output

Output is managed for you

Example

Sample Input

```
19
50 25 12 n n 37 30 n n n 75 62 n 70 n n 87 n n
70
```

Sample Output

```
9
448
87
12
true
```

```
#include<bits/stdc++.h>
using namespace std;

struct Node {
  int data;
  Node* left;
  Node* right;
  Node(int val) {
    data = val;
    left = nullptr;
    right = nullptr;
  }
};

Node* construct(vector<int>& arr) {
  Node* root = new Node(arr[0]);
  pair<Node*, int> p = {root, 1};

  stack<pair<Node*, int>> st;
  st.push(p);
```

```
  int idx = 1;
  while (!st.empty()) {

    if (st.top().second == 1) {
      st.top().second++;
      if (arr[idx] != -1) {
        st.top().first->left = new Node(arr[idx]);
        pair<Node*, int> lp = {st.top().first->left, 1};
        st.push(lp);
      }
      else {
        st.top().first->left = nullptr;
      }
      idx++;
    }
    else if (st.top().second == 2) {
      st.top().second++;
      if (arr[idx] != -1) {
        st.top().first->right = new Node(arr[idx]);
        pair<Node*, int> rp = {st.top().first->right, 1};
        st.push(rp);
      } else {
        st.top().first->right = nullptr;
      }
      idx++;
    }
    else {
      st.pop();
    }

  }
  return root;
}


int min(Node *node){
//     Write your code here
    if(node == NULL) {
      return INT_MAX;
    }

    if(node->left != NULL){
      return min(node->left);
    }else{
      return node->data;
    }
}

int max(Node *node){
//     Write your code here
    if(node == NULL) {
```

```
      return INT_MIN;
    }

    if(node->right != NULL){
      return max(node->right);
    }else{
      return node->data;
    }
}

int sum(Node * node){

//     Write your code here
  if(node == NULL ){
    return 0;
  }
  int a = sum(node->left);
  int b = sum(node->right);

  return a+b+node->data;
}


int size(Node * node){

//     Write your code here
  if(node == NULL ){
    return 0;
  }
  int a = size(node->left);
  int b = size(node->right);

  return a+b+1;
}


bool find(Node * node, int data){

//     Write your code here
    if(node == NULL){
      return false;
    }
    if(data == node ->data){
      return true;
    }
    if(data < node->data){
      bool l = find (node->left , data);
      return l;
    }else{
      bool r = find (node->right , data);
      return r;
    }
```

```
    // if(l || r){
    //   return true;
    // }
    // return false;
}


int main() {
  int n;
  cin >> n;
  vector<int> arr(n, 0);
  for (int i = 0; i < n; i++) {
    string x;
    cin >> x;
    if (x == "n") {
      arr[i] = -1;

    }
    else {
      arr[i] = stoi(x);
    }
  }
  int data;
  cin >> data;
  Node* root = construct(arr);
  cout << size(root) << "\n" << sum (root) << "\n" << max(root) <<
"\n" << min(root) <<  "\n";
  if (find(root, data)) {
    cout << "true" << endl;
  }
  else {
    cout << "false" << endl;
  }
}
```

Add Node To Bst

Easy

1. You are given a partially written BST class.
2. You are required to complete the body of add function. "add" function is expected to add a new node with given data to the tree and return the new root.
3. Input and Output is managed for you.

Constraints

None

Format

Input

Input is managed for you

Output

Output is managed for you

Example

Sample Input

```
23
50 25 12 n n 37 30 n n 40 n n 75 62 60 n n 70 n n 87 n n
61
```

Sample Output

```
25
```

```
#include<bits/stdc++.h>
using namespace std;
using namespace std;

struct Node {
  int data;
  Node* left;
  Node* right;
  Node(int val) {
    data = val;
    left = nullptr;
    right = nullptr;
  }
};


Node* construct(vector<int> & arr) {
  Node* root = new Node(arr[0]);
  pair<Node*, int> p = {root, 1};

  stack<pair<Node*, int>> st;
  st.push(p);

  int idx = 1;
  while (!st.empty()) {
    if (st.top().second == 1) {
      st.top().second++;
      if (arr[idx] != -1) {
```

```
        st.top().first->left = new Node(arr[idx]);
        pair<Node*, int> lp = {st.top().first->left, 1};
        st.push(lp);
      }
      else {
        st.top().first->left = nullptr;
      }
      idx++;
    }
    else if (st.top().second == 2) {
      st.top().second++;
      if (arr[idx] != -1) {
        st.top().first->right = new Node(arr[idx]);
        pair<Node*, int> rp = {st.top().first->right, 1};
        st.push(rp);
      } else {
        st.top().first->right = nullptr;
      }
      idx++;
    }
    else {
      st.pop();
    }

  }
  return root;
}
void display(Node* node) {
  if (node == nullptr) {
    return;
  }

  string str = " <- " + to_string(node->data) + " -> ";

  string left = (node->left == nullptr) ? "." :  "" +
to_string(node->left->data);
  string right = (node->right == nullptr) ? "." : "" +
to_string(node->right->data);

  str = left + str + right;
  cout << str << endl;

  display(node->left);
  display(node->right);
}



Node* add(Node * node, int val){

//     Write your code here
```

```
  if(node == NULL){
    Node* newnode = new Node(val);
    return newnode;
  }
  if(node->data == val){
    // cout<<"Can't add dupicates"<<endl;
    //here in the case of duplicates
    //we are not any node  and returning the node
    return node;
  }

  if(val < node ->data){
    node ->left = add(node->left,val);
  }else{
    node->right = add(node->right,val);
  }

  return node ;
}


int main() {
  int n;
  cin >> n;
  vector<int> a(n,0);
  for (int i = 0; i < n; i++) {
    string x;
    cin >> x;
    if (x == "n") {
      a[i] = -1;

    }
    else {
      a[i] = stoi(x);
    }
  }
  int data;
  cin >> data;
  Node* root = construct(a);
  // display(root);
  root = add(root, data);

  display(root);
}
```

Remove Node From Bst

Medium

1. You are given a partially written BST class.
2. You are required to complete the body of remove function. "remove" function is expected to remove a new node with given data to the tree and return the new root.
3. Input and Output is managed for you.

Note -> Please watch the question video to figure out the algorithm required for deletion. It specifies some requirements of the question as well.

Constraints

None

Format

Input

Input is managed for you

Output

Output is managed for you

Example

Sample Input

```
15
50 25 12 n n 37 n n 75 62 n n 87 n n
62
```

Sample Output

```
25
```

```
#include<bits/stdc++.h>
using namespace std;

struct Node{
    int data;
    Node* left;
    Node* right;
    Node(int val){
        data=val;
        left=nullptr;
        right=nullptr;
    }
};

Node* construct(vector<int> & arr){
    Node* root=new Node(arr[0]);
    pair<Node*,int> p={root,1};

    stack<pair<Node*,int>> st;
    st.push(p);

    int idx=1;
    while(!st.empty()){

        if(st.top().second==1){
```

```
            st.top().second++;
            if(arr[idx]!=-1){
                st.top().first->left=new Node(arr[idx]);
                pair<Node*,int> lp={st.top().first->left,1};
                st.push(lp);
            }
            else{
                st.top().first->left=nullptr;
            }
            idx++;
        }
        else if (st.top().second == 2) {
            st.top().second++;
            if (arr[idx] != -1) {
                st.top().first->right = new Node(arr[idx]);
                pair<Node*,int> rp={st.top().first->right,1};
                st.push(rp);
            } else {
                st.top().first->right = nullptr;
            }
            idx++;
        }
        else {
            st.pop();
        }

    }
    return root;
}
void display(Node* node) {
    if (node == nullptr) {
        return;
    }

    string str = " <- " + to_string(node->data) + " -> ";

    string left = (node->left == nullptr) ? "." :  "" +
to_string(node->left->data);
    string right = (node->right == nullptr) ? "." : "" +
to_string(node->right->data);

    str = left + str + right;
    cout << str << endl;

    display(node->left);
    display(node->right);
}

int max(Node* root){
    if(root->right== nullptr){
        return root->data;
    }
```

```
    return max(root->right);
}


Node* remove(Node* root,int data){
//     Write your code here
    if(root == NULL){
        cout<<"couldn't found that element"<<endl;
        return NULL;
    }
    if(root->data == data){
        if(root -> left == NULL && root ->right == NULL ){
            //no child
            Node *to_delete = root ;
            delete to_delete;
            return NULL;

        }else if(root -> left != NULL && root ->right == NULL ){
            //only left child
            Node * left_of_root = root ->left;
            delete root;

            return left_of_root;

        }else if(root -> left == NULL && root ->right != NULL ){
            //only right child
            Node * right_of_root = root ->right;
            delete root;

            return right_of_root;

        }else{
            //two children
            int max_from_left = max(root->left);
            root->data = max_from_left;
            root ->left = remove(root->left, max_from_left);
            return root;
        }
    }else if (data < root ->data){
        root ->left = remove(root->left,data);
    }else{
        root ->right = remove(root->right,data);
    }
    return root;
}
int main(){
    int n;
    cin >> n;
    vector<int> arr(n,0);
    for(int i=0;i<n;i++){
        string x;
        cin >> x;
```

```
        if(x=="n"){
            arr[i]=-1;

        }
        else{
            arr[i]=stoi(x);
        }
    }
    int data;
    cin >> data;
    Node* root= construct(arr);

    root=remove(root,data);

    display(root);
}
```

Replace With Sum Of Larger

Easy

1. You are given a partially written BST class.
2. You are required to complete the body of rwsol function. "rwsol" function is expected to replace a node's value with sum of all nodes greater than it.
3. Input and Output is managed for you.

Note -> Please watch the question video for clarity. Use the statis sum data member to complete your code.

Constraints

None

Format

Input

Input is managed for you

Output

Output is managed for you

Example

Sample Input

```
15
50 25 12 n n 37 n n 75 62 n n 87 n n
```

Sample Output

```
311
```

```
#include<bits/stdc++.h>
using namespace std;

struct Node{
    int data;
    Node* left;
    Node* right;
    Node(int val){
        data=val;
        left=nullptr;
        right=nullptr;
    }
};


Node* construct(vector<int> & arr){
    Node* root=new Node(arr[0]);
    pair<Node*,int> p={root,1};

    stack<pair<Node*,int>> st;
    st.push(p);

    int idx=1;
    while(!st.empty()){

        if(st.top().second==1){
            st.top().second++;
```

```
            if(arr[idx]!=-1){
                st.top().first->left=new Node(arr[idx]);
                pair<Node*,int> lp={st.top().first->left,1};
                st.push(lp);
            }
            else{
                st.top().first->left=nullptr;
            }
            idx++;
        }
        else if (st.top().second == 2) {
            st.top().second++;
            if (arr[idx] != -1) {
                st.top().first->right = new Node(arr[idx]);
                pair<Node*,int> rp={st.top().first->right,1};
                st.push(rp);
            } else {
                st.top().first->right = nullptr;
            }
            idx++;
        }
        else {
            st.pop();
        }

    }
    return root;
}
void display(Node* node) {
    if (node == nullptr) {
        return;
    }

    string str = " <- " + to_string(node->data) + " -> ";

    string left = (node->left == nullptr) ? "." :  "" +
to_string(node->left->data);
    string right = (node->right == nullptr) ? "." : "" +
to_string(node->right->data);

    str = left + str + right;
    cout << str << endl;

    display(node->left);
    display(node->right);
}
//my ans ------------------------------------------------
int curr_sum = 0;
void replacewithsum_worker(Node* &root){
    if (root == NULL){
        // curr_sum = 0;
        return ;
```

```
    }
    replacewithsum_worker(root->right);
    int temp = curr_sum;
    curr_sum += root->data;
    root->data = temp;

    replacewithsum_worker(root->left);
}
void replacewithsum(Node* &root){
//     Write your code here
    curr_sum = 0;
    replacewithsum_worker(root);

}

int main(){
    int n;
    cin >> n;
    vector<int> arr(n,0);
    for(int i=0;i<n;i++){
        string x;
        cin >> x;
        if(x=="n"){
            arr[i]=-1;

        }
        else{
            arr[i]=stoi(x);
        }
    }

    Node* root= construct(arr);

    replacewithsum(root);

    display(root);
}
```

Lca Of Bst

Easy

1. You are given a partially written BST class.
2. You are required to complete the body of lca function. "lca" function is expected to find the lowest commong ancestor of d1 and d2.
3. Input and Output is managed for you.

Note -> Please watch the question video for clarity.

Constraints

None

Format

Input

Input is managed for you

Output

Output is managed for you

Example

Sample Input

```
21
50 25 12 n n 37 30 n n n 75 62 60 n n 70 n n 87 n n
12
30
```

Sample Output

```
25
```

```
#include<bits/stdc++.h>
using namespace std;
struct Node{
    int data;
    Node* left;
    Node* right;
    Node(int val){
        data=val;
        left=nullptr;
        right=nullptr;
    }
};


Node* construct(vector<int> & arr){
    Node* root=new Node(arr[0]);
    pair<Node*,int> p={root,1};

    stack<pair<Node*,int>> st;
    st.push(p);

    int idx=1;
    while(!st.empty()){
```

```
        if(st.top().second==1){
            st.top().second++;
            if(arr[idx]!=-1){
                st.top().first->left=new Node(arr[idx]);
                pair<Node*,int> lp={st.top().first->left,1};
                st.push(lp);
            }
            else{
                st.top().first->left=nullptr;
            }
            idx++;
        }
        else if (st.top().second == 2) {
            st.top().second++;
            if (arr[idx] != -1) {
                st.top().first->right = new Node(arr[idx]);
                pair<Node*,int> rp={st.top().first->right,1};
                st.push(rp);
            } else {
                st.top().first->right = nullptr;
            }
            idx++;
        }
        else {
            st.pop();
        }

    }
    return root;
}

// int ans;
int lca(Node* root,int a,int b){
//     Write your code here
    // if(root == NULL){
    //     return 0;
    // }
    int ans;
    if(a < root->data && b < root->data){
        ans = lca(root->left ,a,b);
    }else if(a > root->data && b > root->data){
        ans = lca(root->right  ,a,b);
    }else {
        ans = root->data;
    }
    return ans;
```

```
}
/*
int lca(Node* root,int a,int b){
//     Write your code here
    if(root == nullptr){
        return 0;
    }
    int x{};
    int y{};
    if(root ->data == a){
        x = 1;
    }else if(root ->data == b){
        y = 1;
    }
    if(a < root->data && b < root->data){
        x += lca(root->left,a,b);
    }else if(a > root->data && b > root->data){
        y += lca(root->right,a,b);
    }else{
        x += lca(root->left,a,b);
        y += lca(root->right,a,b);
    }
    if(x != 0 && y != 0){
        ans = root->data;
        return 0;
    }else if (x != 0){
        return x;
    }else if(y != 0){
        return y;
    }else{
        return 0;
    }

}
*/
int main(){
    int n;
    cin >> n;
    vector<int> arr(n,0);
    for(int i=0;i<n;i++){
        string x;
        cin >> x;
        if(x=="n"){
            arr[i]=-1;

        }
        else{
            arr[i]=stoi(x);
        }
    }
    int a,b;
    cin >> a >> b;
```

```
    Node* root= construct(arr);
    // ans=root->data;
    // lca(root,a,b);
    cout << lca(root,a,b) << endl;

}
```

Print In Range

Easy

1. You are given a partially written BST class.
2. You are required to complete the body of pir function. "pir" function is expected to print all nodes between d1 and d2 (inclusive and in increasing order).
3. Input and Output is managed for you.

Note -> Please watch the question video for clarity.

Constraints

None

Format

Input

Input is managed for you

Output

Output is managed for you

Example

Sample Input

```
21
50 25 12 n n 37 30 n n n 75 62 60 n n 70 n n 87 n n
12
65
```

Sample Output

```
12
25
30
37
50
60
62
```

```
#include <iostream>
#include <vector>
#include <stack>
#include <string>

using namespace std;

class Node{
public:
  int data;
  Node* left = nullptr;
  Node* right = nullptr;
  Node (int data)
  {
      this->data=data;
  }
};

class Pair{
```

```
    Node* node = nullptr;
    int state=0;

    Pair(Node* node, int state) {
      this->node = node;
      this->state = state;
    }
};

void pir(Node* node, int d1, int d2)
{
    // write your code here
    if(node == NULL){
      return;
    }
    if(d1 < node->data && d2 < node->data){
      pir(node->left ,d1,d2);
    }else if(d1 > node->data && d2 > node->data){
      pir(node-> right,d1,d2);
    }else{
      pir(node->left ,d1,d2);
      cout<<node ->data<<endl;
      pir(node-> right,d1,d2);
    }

}

Node* construct(vector<int> & arr) {
  Node* root = new Node(arr[0]);
  pair<Node*, int> p = {root, 1};

  stack<pair<Node*, int>> st;
  st.push(p);

  int idx = 1;
  while (!st.empty()) {
    if (st.top().second == 1) {
      st.top().second++;
      if (arr[idx] != -1) {
        st.top().first->left = new Node(arr[idx]);
        pair<Node*, int> lp = {st.top().first->left, 1};
        st.push(lp);
      }
      else {
        st.top().first->left = nullptr;
      }
      idx++;
    }
    else if (st.top().second == 2) {
      st.top().second++;
      if (arr[idx] != -1) {
        st.top().first->right = new Node(arr[idx]);
```

```
        pair<Node*, int> rp = {st.top().first->right, 1};
        st.push(rp);
      } else {
        st.top().first->right = nullptr;
      }
      idx++;
    }
    else {
      st.pop();
    }

  }
  return root;
}

int main() {
    int n;
    cin>>n;
    vector<int> arr(n,0);

    for(int i = 0; i < n; i++) {
        string tmp;
        cin>>tmp;
      if (tmp=="n") {
        arr[i] = -1;
      } else {
        arr[i] = stoi(tmp);
      }
    }

    int k1;
    cin>>k1;
    int k2;
    cin>>k2;

    Node* root = construct(arr);
    pir(root,k1,k2);
 }
```

Target Sum Pair In Bst

Easy

1. You are given a partially written BST class. 2. You are given a value. You are required to print all pair of nodes which add up to the given value. Make sure all pairs print the smaller value first and avoid duplicacies. Make sure to print the pairs in increasing order. Use the question video to gain clarity. 3. Input and Output is managed for you.

Constraints

None

Format

Input

Input is managed for you

Output

"smaller node" "larger node"
.. all pairs that add to target on separate lines

Example

Sample Input

```
21
50 25 12 n n 37 30 n n n 75 62 60 n n 70 n n 87 n n
100
```

Sample Output

```
25 75
30 70
```

```
#include <iostream>
#include <vector>
#include <stack>
#include <string>

using namespace std;

class Node{
public:
  int data;
  Node * left = nullptr;
  Node * right = nullptr;
  Node (int data)
  {
      this->data=data;
  }
};

class Pair{
    Node *node = nullptr;
    int state=0;

    Pair(Node *node, int state) {
```

```
      this->node = node;
      this->state = state;
    }
};

Node* construct(vector<int> & arr) {
  Node* root = new Node(arr[0]);
  pair<Node*, int> p = {root, 1};

  stack<pair<Node*, int>> st;
  st.push(p);

  int idx = 1;
  while (!st.empty()) {
    if (st.top().second == 1) {
      st.top().second++;
      if (arr[idx] != -1) {
        st.top().first->left = new Node(arr[idx]);
        pair<Node*, int> lp = {st.top().first->left, 1};
        st.push(lp);
      }
      else {
        st.top().first->left = nullptr;
      }
      idx++;
    }
    else if (st.top().second == 2) {
      st.top().second++;
      if (arr[idx] != -1) {
        st.top().first->right = new Node(arr[idx]);
        pair<Node*, int> rp = {st.top().first->right, 1};
        st.push(rp);
      } else {
        st.top().first->right = nullptr;
      }
      idx++;
    }
    else {
      st.pop();
    }

  }
  return root;
}

// //SOLUTION 1

//time complexity = n*height
//space complexity = height

// bool find(Node * node, int data){
```

```
// //     Write your code here
//     if(node == NULL){
//       return false;
//     }
//     if(data == node ->data){
//       return true;
//     }
//     if(data < node->data){
//       bool l = find (node->left , data);
//       return l;
//     }else{
//       bool r = find (node->right , data);
//       return r;
//     }
// }

// void travelAndPrint(Node * root , Node * node , int tar){

//       //write your code here

//

//       if(root == NULL || node == NULL){
//         return ;
//       }
//       travelAndPrint(root, node->left, tar);

//       int compliment = tar - node ->data;
//       if(compliment > node->data && find(root,compliment)){
//         cout<<node-> data<<" "<<compliment<<endl;
//       }

//       travelAndPrint(root, node->right, tar);


//   }


//SOLUTION 2

//time complexity = n
//space complexity = n

// void inorderfiller(vector<int> &vec , Node * node ) {
//     if(node == NULL){
//       return ;
//     }

//     inorderfiller(vec ,node->left);
//     vec.push_back(node->data);
//     inorderfiller(vec ,node->right);
// }
```

```
// void travelAndPrint(Node * node , int tar){

//       //write your code here
//       vector<int> vec;
//       inorderfiller(vec,node);

//       // for(auto a :vec){
//       //   cout<<a;
//       // }
//       int s = 0;
//       int b = vec.size() -1;
//       while(s < b){
//         if(vec[s] + vec[b] == tar){
//           cout<<vec[s]<<" "<<vec[b]<<endl;
//           s++;
//           b--;
//         }else if(vec[s] + vec[b] < tar) {
//           s++;
//         }else {
//           b--;
//         }
//       }

// }


//SOLUTION 3

//TIME COMPLEXITY =
//SPACE COMPLEXITY =

class ItPair{
  public:
    Node * node;
    int state;
    ItPair(Node* node ,int state){
        this->node = node ;
        this->state = state;
    }
};
Node *nextNodeFromInorder (stack<ItPair> & ls){
    while(ls.empty() == false){
        // ItPair top = ls.top();ls.pop();
        if(ls.top().state == 0){
            // cout<<ls.top().node->data<<"   1----------"<<endl;
            ls.top().state++;
            if(ls.top().node->left != NULL){
                // ls.push(top);
                ls.push(ItPair(ls.top().node->left,0));
            }
        }else if(ls.top().state == 1){
            ls.top().state++;
```

```
            Node * a = ls.top().node;
            if(ls.top().node->right != NULL){
                // ls.push(top);
                ls.push(ItPair(ls.top().node->right,0));
            }
            return a;
        }else{
            ls.pop();
        }
    }
    return NULL;
}
Node *nextNodeFromReverseInorder (stack<ItPair> & rs){

    while(rs.empty() == false){
        if(rs.top().state == 0){
            rs.top().state++;
            if(rs.top().node->right != NULL){
                rs.push(ItPair(rs.top().node->right,0));
            }
        }else if(rs.top().state == 1){
            rs.top().state++;
            Node *a = rs.top().node;
            if(rs.top().node->left != NULL){
                rs.push(ItPair(rs.top().node->left,0));
            }
            return a;
        }else{
            rs.pop();
        }
    }
    return NULL;
}
void bestApproach(Node * node , int tar){

    //write your code here
    stack<ItPair> ls;//for inorder traversal (iterative)
    stack<ItPair> rs;//for reverse inorder traversal (iterative)

    ls.push(ItPair(node,0));
    rs.push(ItPair(node,0));

    Node * left = nextNodeFromInorder(ls);
    Node * right = nextNodeFromReverseInorder(rs);


    while(left->data < right ->data) {
        if(left->data + right ->data < tar){
            left = nextNodeFromInorder(ls);
        }else if(left->data + right ->data > tar){
            right = nextNodeFromReverseInorder(rs);
        }else{
```

```
            cout<<left->data <<" "<< right ->data << endl;
            left = nextNodeFromInorder(ls);
            right = nextNodeFromReverseInorder(rs);
        }
    }

}

  int main() {
    int n;
    cin>>n;
    vector<int> arr(n,0);

    for(int i = 0; i < n; i++) {
        string tmp;
        cin>>tmp;
      if (tmp=="n") {
        arr[i] = -1;
      } else {
        arr[i] = stoi(tmp);
      }
    }

    int k1;
    cin>>k1;

    Node* root = construct(arr);
    bestApproach(root,k1);
 }
```

Target Sum Pair - BST - Alternate Approaches