#1 Solutions

Algorthim findSmallerHelper(T,key,T.root(),seq)

If(T. isExternal()) return 0; n

If(key>=p.element()) n

Seq.inserLast(p) n

findSmallerHelper(T,key,T.leftChiled(p),seq). n

findSmallerHelper(T,key,T.rightChiled(p),seq). n

Algorthim findSmallerKeys(T,key)

Seq:=new Sequnce() 1

findSmallerHelper(T,key,T.root()) n

return seq 1

Time complexity is O(n)

function findSmallerKeys(T, key) {

let seq = new Seq.Sequence();

findSmallerHelper(T, key, T.root(), seq);

console.log("findSmallerKeys key=" + key + " " + seq.toString());

return seq;

}

function findSmallerHelper(T, key, p, seq) {

if(T.isExternal(p))

return 0;

if(key>=p.element())

seq.insertLast(p)

findSmallerHelper(T,key,T.leftChild(p),seq)

findSmallerHelper(T,key,T.rightChild(p),seq)

}

Step 1 Add all the values of odd 1 up to 49 and finally add 32 the tree will be the following

A picture containing accessory, necklet

Description automatically generated

A picture containing accessory, necklet

Description automatically generated

A picture containing accessory, necklet

Description automatically generated

A picture containing accessory, necklet

Description automatically generated

Diagram

Description automatically generated

A picture containing necklet, accessory

Description automatically generated

Diagram

Description automatically generated

Finally will be this

A picture containing accessory, necklet

Description automatically generated

Level 2 Solution

Algorthim findSmallerHelper(T,key,p,seq)

If(T.isExteran(p) ||key<p.element()) return; k

Seq.insertLast(p.element()). k

findSmallerHelper(T,key,T.leftChiled(p),seq) k

findSmallerHelper(T,key,T.rightChiled(p),seq). k

Algorthim findSmallerKeys(T,key)

Seq:=new Sequnce() 1

findSmallerHelper(T,key,T.root()) k

return seq 1

Time complexity is O(k)

function findSmallerKeys(T, key) {

let seq = new Seq.Sequence();

findSmallerHelper(T, key, T.root(), seq);

console.log("findSmallerKeys key=" + key + " " + seq.toString());

return seq;

}

function findSmallerHelper(T, key, p, seq) {

if(T.isExternal(p)||key<p.element())

return

seq.insertLast(p.element())

findSmallerHelper(T,key,T.leftChild(p),seq)

findSmallerHelper(T,key,T.rightChild(p),seq)

}