Introduction to Algorithms Assignment2

Due Date: 2018/05/25 23:59:59

Language: C、C++、Python

Score:

If you pass the given data(d1), you get 30% each problem

Another 20% will be gotten if you pass the hidden data(d2, d3)

Report 5%

if you pass d1, you'll get 60(30 + 30)

if you pass d1 and (d2 or d3) you'll get 80

if you all pass, you'll get 100

Red-black tree(p.308)

Rule:

1. Every node is either red or black.
2. The root is black.
3. Every leaf (NIL) is black.
4. If a node is red, then both its children are black.
5. For each node, all simple paths from the node to descendant leaves contain the same number of black nodes.

Display:

Display the tree use Inorder traversal(p.288)

Output the (1)node value (2)parent of node (3) node color

P.S.

(1) Do not output the and NIL, parent of root is empty

(2) May not specify consider the space of output, but the order should be right.

(3) Linux user can modify \r\n to \n for testing by yourself.

1. Insert node:

Input:

2 (number of works)

1(insert)

5 11 9 7 6 12 5 4 1

1

2 3

Output:

Insert: 5, 11, 9, 7, 6, 12, 5, 4, 1

key: 1 parent: 4 color: red
key: 4 parent: 5 color: black
key: 5 parent: 6 color: red
key: 5 parent: 5 color: black
key: 6 parent: color: black
key: 7 parent: 9 color: black
key: 9 parent: 6 color: red
key: 11 parent: 9 color: black
key: 12 parent: 11 color: red
Insert: 2, 3
key: 1 parent: 2 color: black
key: 2 parent: 5 color: red
key: 3 parent: 4 color: red
key: 4 parent: 2 color: black
key: 5 parent: 6 color: black
key: 5 parent: 5 color: black
key: 6 parent: color: black
key: 7 parent: 9 color: black
key: 9 parent: 6 color: black
key: 11 parent: 9 color: black
key: 12 parent: 11 color: red

2. Delete node:

Input:

2 (number of works)
1
5 11 9 7 6 12 5 4 1
2 (delete)
11 5

Output:

Insert: 5, 11, 9, 7, 6, 12, 5, 4, 1
key: 1 parent: 4 color: red
key: 4 parent: 5 color: black
key: 5 parent: 6 color: red
key: 5 parent: 5 color: black
key: 6 parent: color: black
key: 7 parent: 9 color: black
key: 9 parent: 6 color: red

key: 11 parent: 9 color: black
key: 12 parent: 11 color: red
Delete: 11, 5
key: 1 parent: 4 color: black
key: 4 parent: 6 color: red
key: 5 parent: 4 color: black
key: 6 parent: color: black
key: 7 parent: 9 color: black
key: 9 parent: 6 color: red
key: 12 parent: 9 color: black

Rule of programing and the dataset:

(1) Dataset will always insert first.
(2) Dataset will not delete not exist number.
(3) All element type is Integer.
(4) Output do not break the rule will be right.
(5) Cannot use not standard header file or you should attach on your zip
(6) Auto input and output, the relative path is beside the main program