

1. Write a program to check whether a tree is a Red-Black tree or not. Red-Black Tree is a self-balancing Binary Search Tree (BST) where every node obeys the following rules.

- 1) Every node is colored either red or black.
- 2) Root of the tree is always black.
- 3) There are no two adjacent red nodes (A red node cannot have a red parent or red child).
- 4) For each node, the number of black nodes from itself to any leaf in the subtree rooted at that node is the same.

Your program should include the following functions and should run in linear time.

**isRedBlack(struct node\* root)** : returns 1 if the tree is an Red-Black tree otherwise 0.

### Input format:

A single line containing a string containing the parenthesis representation of a tree. Note that, in addition to the normal parenthesis representation, the *key* is followed by one of the characters R/B specifying the color of the node specified after the key, followed by a single space.

### Output Format:

Print 1 if the tree is a Red-Black tree; otherwise, print 0.

### Sample Input and Output

#### Input1:

```
( 33 B ( 13 R ( 11 B ( ) ( ) ) ( 21 B ( 15 R ( ) ( ) ) ( 31 R (
) ( ) ) ) ) ( 53 B ( 41 B ( ) ( ) ) ( 61 R ( ) ( ) ) ) )
```

#### Output1:

0

#### Input2:

```
( 33 B ( 13 R ( 11 B ( ) ( ) ) ( 21 B ( 15 R ( ) ( ) ) ( 31 R (
) ( ) ) ) ) ( 53 B ( 41 R ( ) ( ) ) ( 61 R ( ) ( ) ) ) )
```

#### Output2:

1

2. Write a program to create a Red Black Tree from the given input. Your program should include the following function (should not contain parent pointer).

**insertRedBlack(struct node\* root, key)** : Inserts a new node with the 'key' into the tree and prints parenthesized representation (with corresponding colors) of the created red-black tree.

**Input format:**

Every line of the input contains a positive integer "key" : Call function insertRedBlack(root, key)

**Output Format:**

For each line of the input, the corresponding line of the output should contain the parenthesis representation (key value followed by color) of the current tree.

**Sample Input**

25

18

34

30

36

28

29

**Output**

( 25 B ( ) ( ) )

( 25 B ( 18 R ( ) ( ) ) ( ) )

( 25 B ( 18 R ( ) ( ) ) ( 34 R ( ) ( ) ) )

( 25 B ( 18 B ( ) ( ) ) ( 34 B ( 30 R ( ) ( ) ) ( ) ) )

( 25 B ( 18 B ( ) ( ) ) ( 34 B ( 30 R ( ) ( ) ) ( 36 R ( ) ( ) ) ) )

( 25 B ( 18 B ( ) ( ) ) ( 34 R ( 30 B ( 28 R ( ) ( ) ) ( ) ) ( 36 B ( ) ( ) ) ) )

( 25 B ( 18 B ( ) ( ) ) ( 34 R ( 29 B ( 28 R ( ) ( ) ) ( 30 R ( ) ( ) ) ) ( 36 B ( ) ( ) ) ) )