# h4 AVL Rotations, Red Black Trees, & Git

Started: Feb 25 at 12:15pm

# Quiz Instructions

1. **This is an individual assignment. Do not compare or share your answers until after the due date and time of the quiz. Do not post your work or questions publicly to Piazza or other forums.**
2. **You must complete (and submit) the quiz BEFORE the due date and time, NOT AT the exact time due.**
3. **Be sure to save answers as you complete each question so that answers are not lost.**
4. **Every time you open the quiz, it counts as an attempt. You have 120 minutes per attempt.**
5. **This quiz is MUTED, which means that in Canvas, you will not be able to see your scores until after the quiz deadline. Consider these quizzes like a cross between an in-class quiz and a problem set. We would like you to think carefully about your answers before you submit.**
6. **You have 3 attempts, to handle any possible technical issues or unexpected interruptions to your quiz. We will count the highest-scoring attempt.**

---

## Question 1 — 3 pts

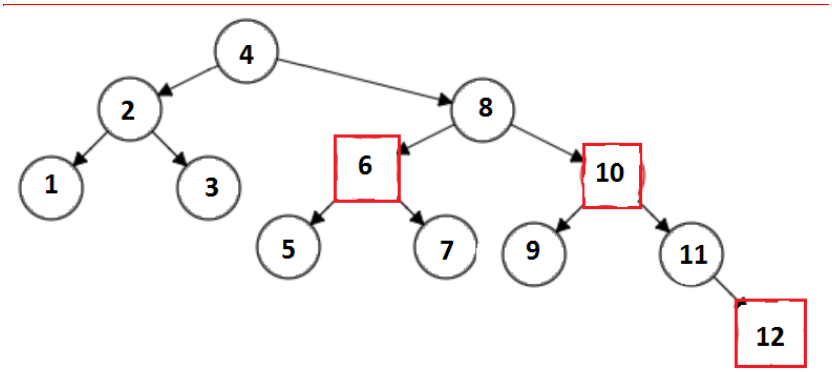
Which of the following are properties of a Red-Black Tree?

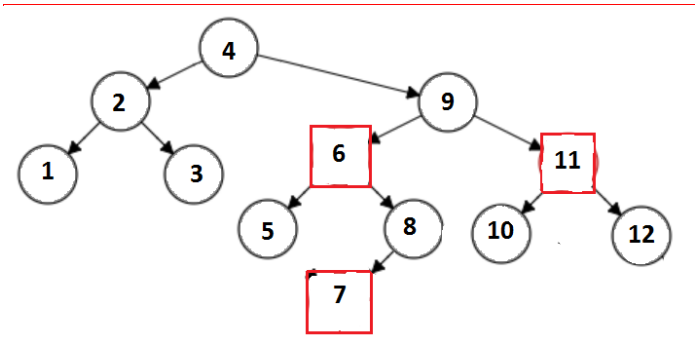
Check all that apply.

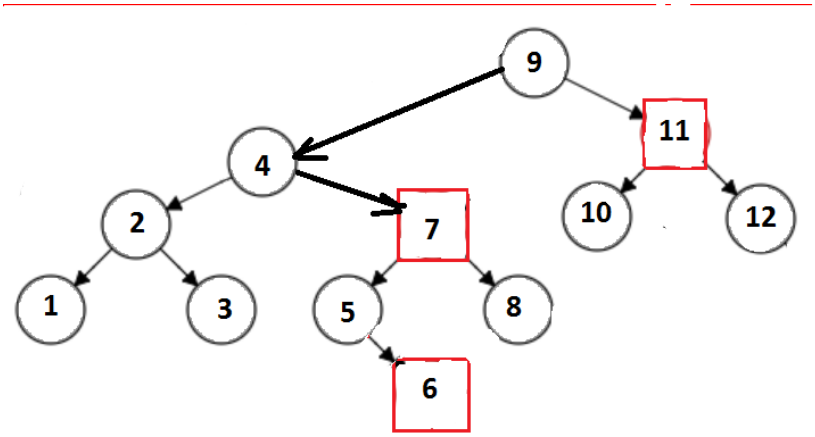
- [x] the root node is black
- [x] red nodes must have black children
- [x] there must be the same number of black nodes along every path from root to null child
- [ ] there must be the same number of red nodes along every path from root to null child
- [ ] black nodes must have red children
- [ ] all nodes must be height-balanced (Balance Factor of -1, 0, or 1)

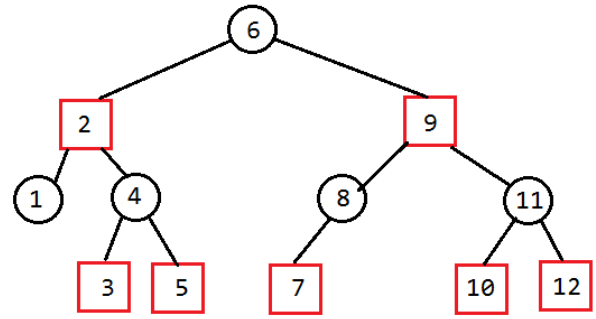
## Question 2 — 2 pts

What is the Red Black tree that results when the values 6,3,9,2,1,11,5,8,7,4,12,10 in that order? Circles indicate black nodes and squares indicate red nodes.



## Question 3

1 pts

When inserting into a Red Black Tree:

A Red Property Violation (RPV) that requires a re-coloring fix **may cause a new RPV that must also be fixed.**

- (•) True
- ( ) False

## Question 4

1 pts

When inserting into a Red Black Tree:

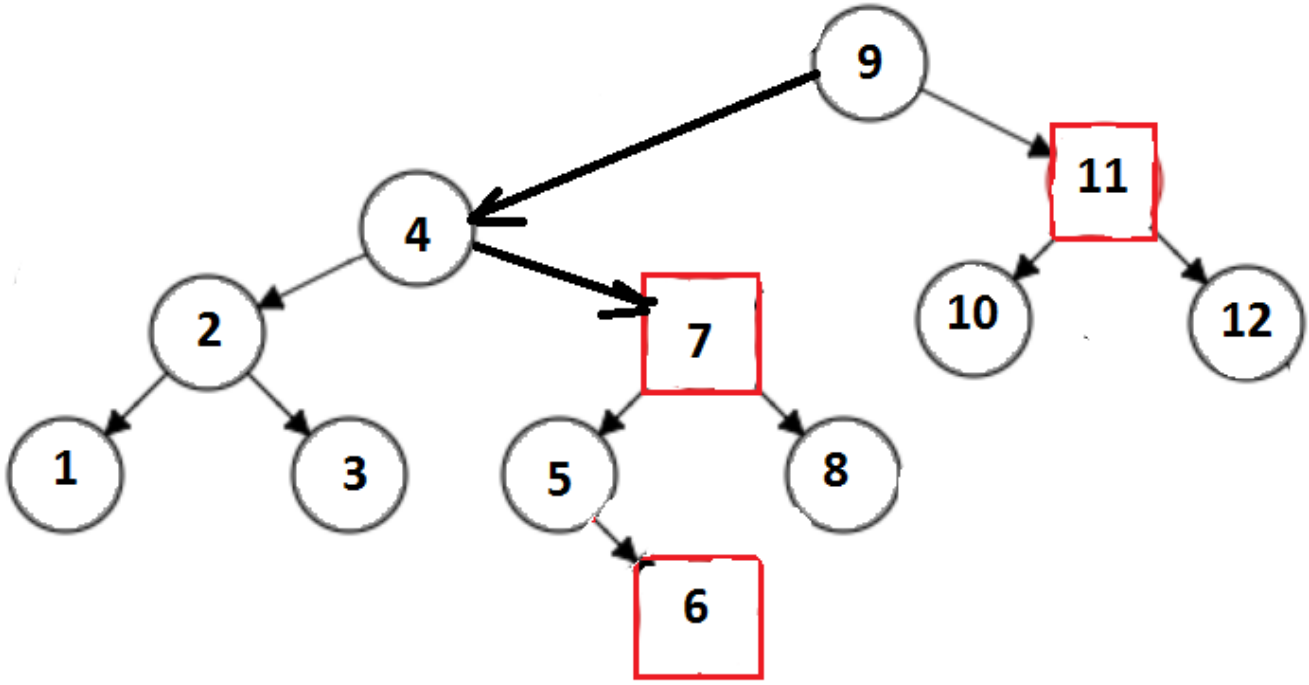
A Red Property Violation (RPV) that requires a Tri-Node Restructuring fix **may cause a new RPV that must also be fixed.**

- ( ) True
- (•) False

## Question 5

2 pts

Which properties of Red-Black Trees does this tree violate? Select all that apply.




- [x] the black property
- [ ] the height property
- [ ] the root property
- [ ] the red property

## Question 6

3 pts

Match each tree with the approximate bound (upper limit) on its height

| | |
|---|---|
| Binary Search Tree | height is approximately bound b |
| AVL Tree | height is approximately bound b |
| Red Black Tree | height is approximately bound b |

## Question 7

2 pts

Check all that apply:

A Red-Black Tree always satisfies the conditions for:

- [ ] an AVL Tree
- [x] a Binary Search Tree

## Question 8

2 pts

You have cloned a teammates git repository to your CS lab account, made changes, and pushed those changes.

The next day, you log into your CS lab account and want to get the latest version of the remote repository to reflect any changes your teammates made.

Which command should you use?

- ( ) git commit
- (•) git pull
- ( ) git log
- ( ) git status
- ( ) git clone
- ( ) git init
- ( ) git add

## Question 9

4 pts

Given the following method headers:

```
// rotates nodes to the left, counter-clockwise about the right child of node
// making its right child into its parent
private Treenode<T> leftRotate (Treenode<T> node) {......}
```

and

```
// rotates nodes to the right, clockwise about the left child of node
// making its left child into its parent
private Treenode<T> rightRotate (Treenode<T> node) {......}
```

The Integers 10, 30, 20 are inserted in that order, into an AVL Tree. Which sequence of commands will make the correct method calls to rebalance the tree?

first: root.right = rightRotate(root.righ

then: root.left = rotateLeft(root);

Quiz saved at 12:24pm Submit Quiz