1 Definitions

Suppose that the nodes A, B, C in a binary search tree are arranged as follows.

Which of the following describes the relationship between A, B, C?

- A ≤ B, C
- A < B, C
- A < B ≤ C
- B ≤ A ≤ C

Correct

Now suppose that nodes A, B, C are arranged as follows in the binary search tree.

What is the relationship between A, B, C?

- B ≤ A ≤ C
- B ≤ C ≤ A
- C ≤ B ≤ A
- C < A < B

Correct

If two different binary search trees contain the same set of values, which of the following is common between them?

- Their pre-order traversals.
- Their in-order traversals.
- Their post-order traversals.
- Their root nodes.

Correct

Which of the following describes the height of a binary search tree on n nodes?

- \(O(\log n)\)
- \(\Omega(\log n)\)
- \(\Theta(\log n)\)
- All of the above.

Correct

If the length of a path from the root of a red-black tree to one of the leaf nil nodes is 100, what could be the length of another path from the root to some other nil node?

- 45
- 180
- 30
- All of the above.

Correct

Suppose that \(r\) is the root of a red-black tree on \(n\) nodes. Assume all nodes have distinct values. If we sort the values stored in the tree to get \(x_1 < x_2 < \cdots < x_n\), and find the index \(i\) where \(r = x_i\), what can be said about \(i\)?

- \(i \geq \Omega(n)\)
- \(i \geq \Omega(\sqrt{n})\)
- \(i \leq 0.01n\)

Correct

What is the worst-case runtime of operations insert/delete/search on a red-black tree storing \(n\) nodes?

- \(O(n)\)
- \(O(\log n)\)
- \(O(\log^2 n)\)

Correct

2 Red-Black Trees

Is the following a valid red-black tree? We are not drawing the implicit nil nodes.

- Yes
- No

Correct

Is the following a valid red-black tree?

- Yes
- No

Correct

Is the following a valid red-black tree?

- Yes
- No

Correct

Which of the following describes the height of a red-black tree on \(n\) nodes?

- \(O(\log n)\)
- \(O(\log^2 n)\)
- \(O(\log n)\)
- All of the above.

Correct

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Correct