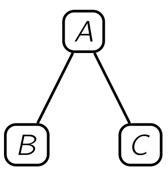
Binary Search Trees

Reset Progress Reveal Solutions

1 Definitions

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

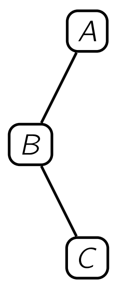


Which of the following describes the relationship between A, B, C?

○ $A \leq B, C$
○ $A \geq B, C$
○ $A \leq B \leq C$
● $B \leq A \leq C$

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?

○ $B \leq A \leq C$
● $B \leq C \leq A$
○ $C \leq B \leq A$
○ $C \leq A \leq B$

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

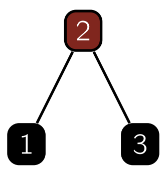
Which of the following describes the height of a binary search tree on n nodes?

○ $O(\log n)$
● $\Omega(\log n)$
○ $\Theta(\log n)$
○ All of the above.

Correct

2 Red-Black Trees

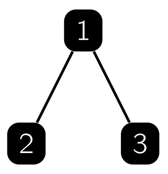
Is the following a valid red-black tree? We are not drawing the implicit NIL nodes.



○ Yes
● No

Correct

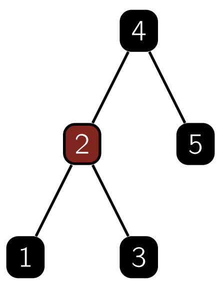
Is the following a valid red-black tree?



○ 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?

○ $O(\log n)$
○ $\Omega(\log n)$
○ $\Theta(\log n)$
● 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?

○ $i \geq \Omega(n)$
● $i \geq \Omega(\sqrt{n})$
○ $i \leq 0.99n$

Correct

What is the worst-case runtime of operations INSERT/DELETE/SEARCH on a red-black tree storing n nodes?

○ $\Theta(n)$
○ $\Theta(\sqrt{n})$
● $\Theta(\log n)$

Correct