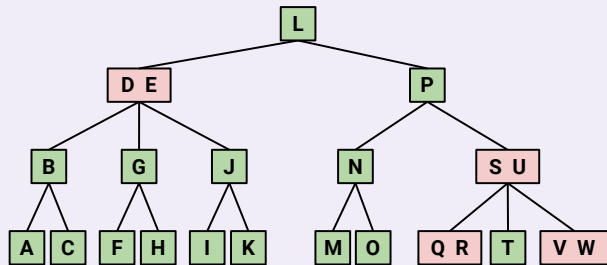


Q Give the exact height of the corresponding LLRB tree.



2

?: How are 3-nodes (nodes with 2 keys) represented in the corresponding LLRB tree?

Q1: Give the exact height of the corresponding LLRB tree.

Q Maximum Possible Height

Given a 2-3 tree of height H, give the exact worst-case height of the corresponding LLRB tree.

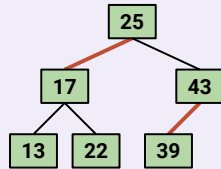
4

Q1: Given a 2-3 tree of height H, give the exact worst-case height of the corresponding LLRB tree.

**Q** Single Insertion

If we add 15, which operation(s), if any, will we need to perform to maintain LLRB invariants?

- rotateLeft(\_\_\_\_)
- rotateRight(\_\_\_\_)
- flip(\_\_\_\_)



?: Draw the corresponding 2-3 tree. Then, insert 15 in to the 2-3 tree.

**Q1:** If we add 15, which operation(s), if any, will we need to perform to maintain LLRB invariants?

**Q** Batch Insertion

Draw the LLRB that results from inserting these items in the given order: 1, 2, 3, 7, 8, 9, 5.

?: Draw the 2-3 tree that results from inserting these items in the given order: 1, 2, 3, 7, 8, 9 5.

**Q1:** Draw the LLRB that results from inserting these items in the given order: 1, 2, 3, 7, 8, 9, 5.