

Title: HW4

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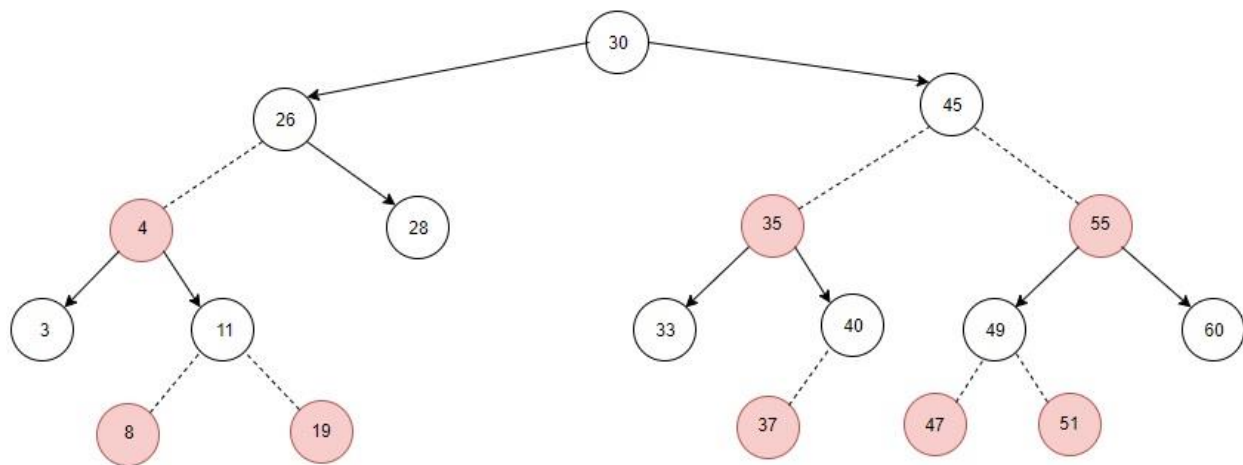
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Section: 2

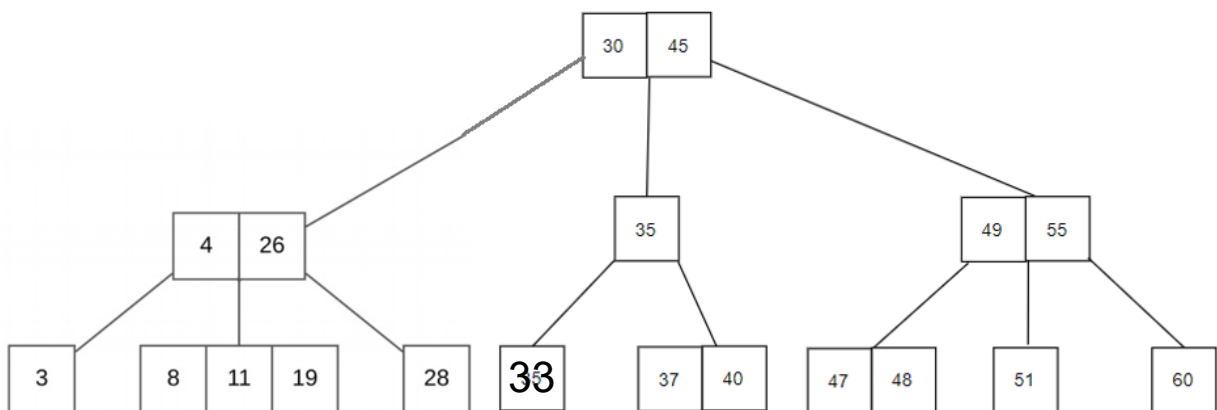
Description: Solutions to questions 1, 2, and 3

Question 1:

a)



b)



Question 2:

Data Structure	insert	extractMin
unsorted array	$O(1)$	$O(n)$
red-black tree	$O(\log(n))$	$O(\log(n))$
hashing	$O(1)$	$O(n)$
min-heap	$O(\log(n))$	$O(\log(n))$
sorted linked list	$O(n)$	$O(1)$

Question 3:

- a) *Max no. of keys* = $3^h - 1$
- b) No, because the root can't be a red node.
- c) Create a map to store the entries of the array. While traversing the array check if the complement of the current entry (target-value of the current entry) is in the map. If yes, then the pair is found. Otherwise, add the value of the current entry to the map.