

CSI2110 (Fall 2021)
Assignment 7 (3%) – 12 points
CSI2110/CSI2510 (Fall 2021)

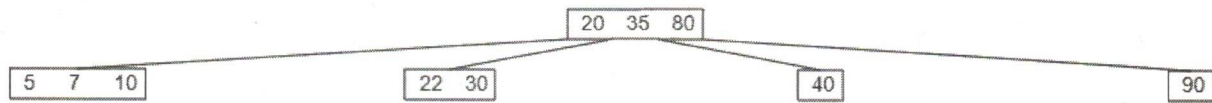
Due: Thursday Nov 11, 11:59PM

Late assignment policy: 1 min-24hs late are accepted with 30% off; no assignments accepted after 24hs late.

Note: It is copyrighted content. You are not allowed to post any of content in public.

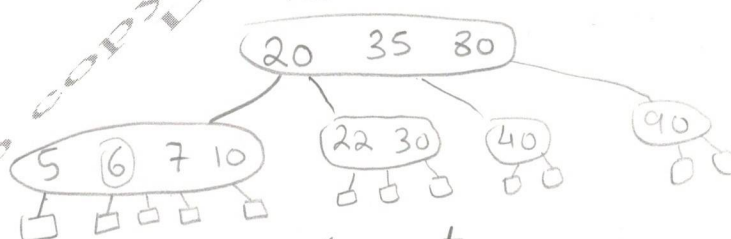
Question 1. The following trees are 2-4 trees with positive integer keys.

(a) (3 points) By inserting a key, we can increase the height of the tree below by one. Specify all possible keys that do this job. Show the tree after the insertion of one such key.

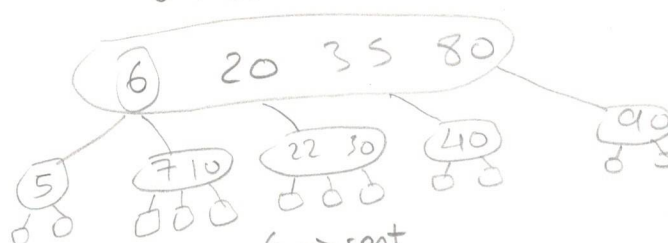


Possible Keys: $\{11, 12, 13, 14, 15, 16, 17, 18, 19\} \cup \{0, 1, 2, 3, 4\} \cup \{6, 8, 9\}$

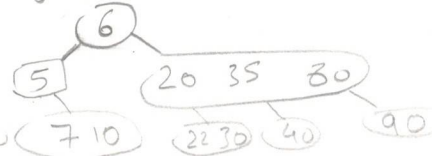
insertion of 6



6 → Parent

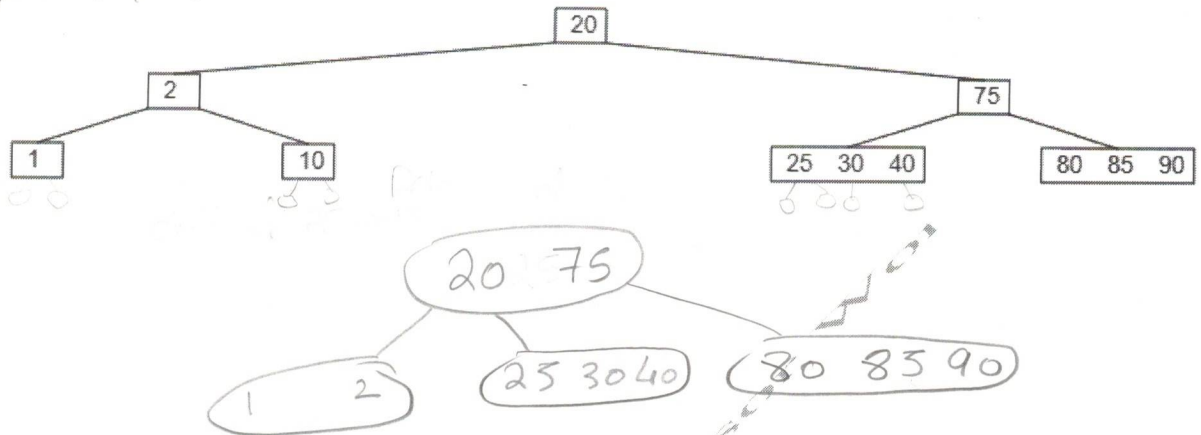


6 → root



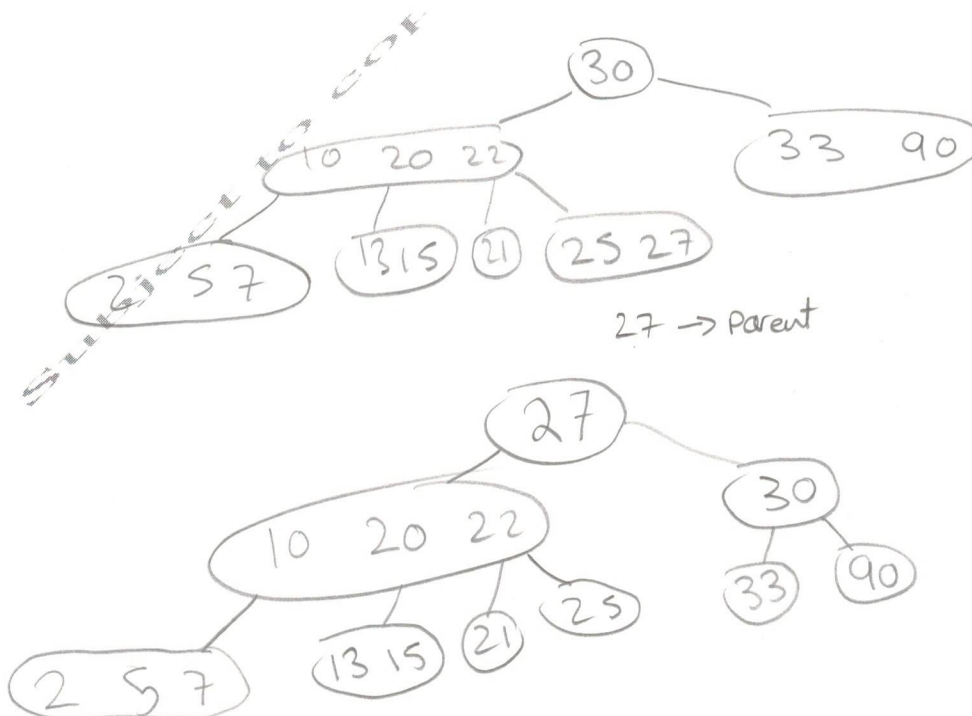
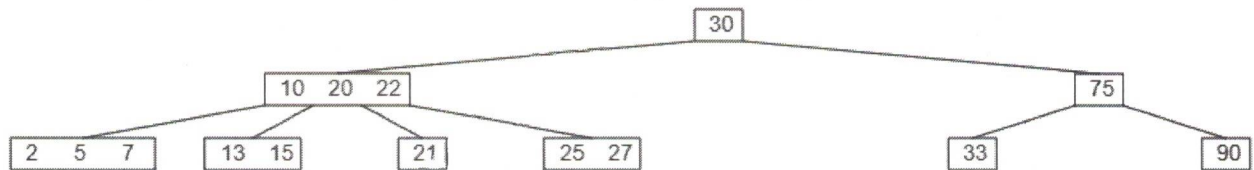
- (b) (3 points) By deleting a key, we can decrease the height of the tree below by one. Specify all possible keys that do this job. Show the tree after the deletion of one such key. Use the successor node in in-order traversal when we delete an internal node.

Possible Keys: $\{1, 10\}$

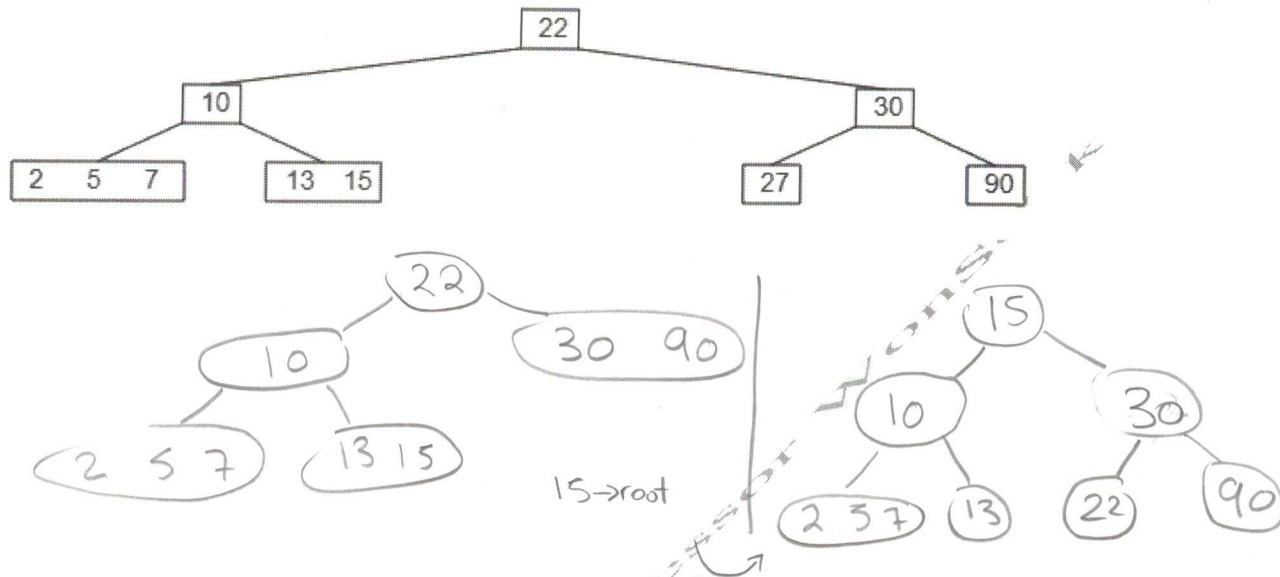


Question 2. The following trees are 2-4 trees with positive integer keys.

- (a) (2 points) Delete 75 from the 2-4 tree below and show the resulting tree.

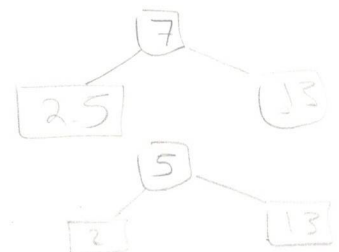
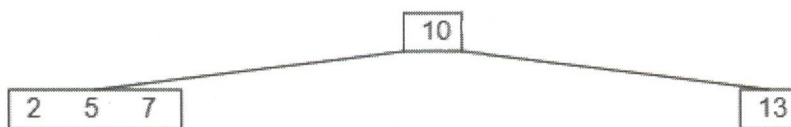


(b) (2 points) Delete 27 from the 2-4 tree below and show the resulting tree.

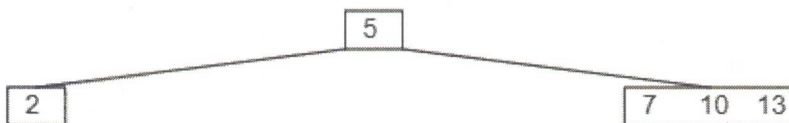


Question 3.

(2 points) The following trees are 2-4 trees with positive integer keys.



Give a sequence of delete and/or insert operations that transforms the 2-4 tree above to the 2-4 tree below.



- ① delete 10
- ② delete 7
- ③ Insert 10
- ④ Insert 7