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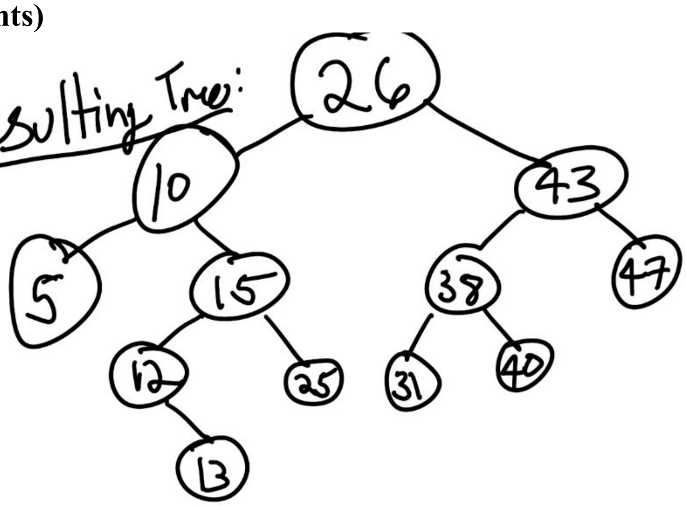
METCS 526

Module 5 Homework (Problems 1 through 6)

Problem 1 (10 points)

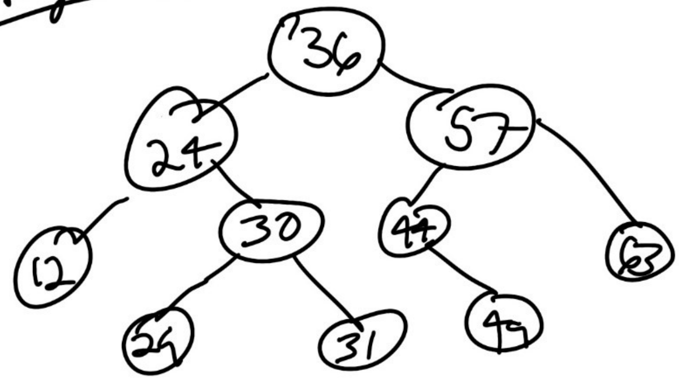
1 Resulting Tree:



The value 13 is iteratively checked, and if it is > a node, it goes to that node's right subtree, left otherwise. So: since 13 < 26, it goes to the 10 node, then to 15 from there, since 13 < 15, it goes left to 12, then becomes that nodes right child because 13 > 12.

Problem 2 (10 points).

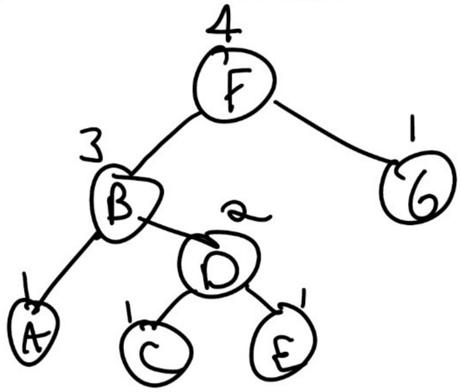
2) Resulting Tree:



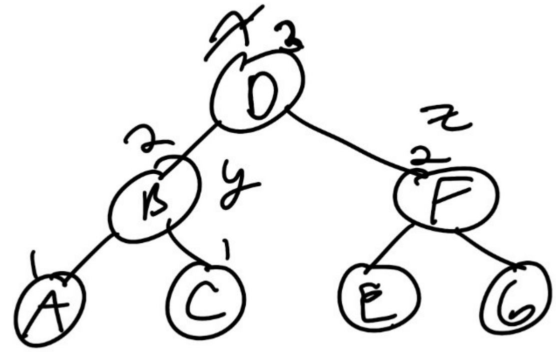
Using the method from our textbook, we search to find the largest value in the deleted node's (the root in this case) left subtree, which replaces the deleted node. Since the 36 node has a left child (31), that moves up in the BST & replaces the 36 node's original position, all while the rules of a BST are maintained.

Problems 3 (10 points each).

3) Original:

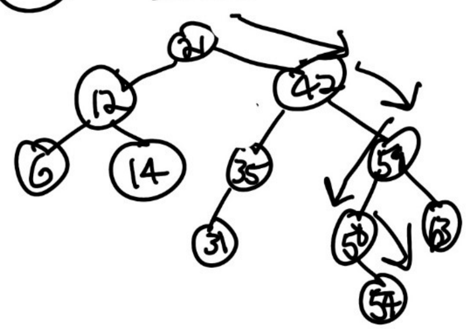


Restructured:



Problem 4 (10 points).

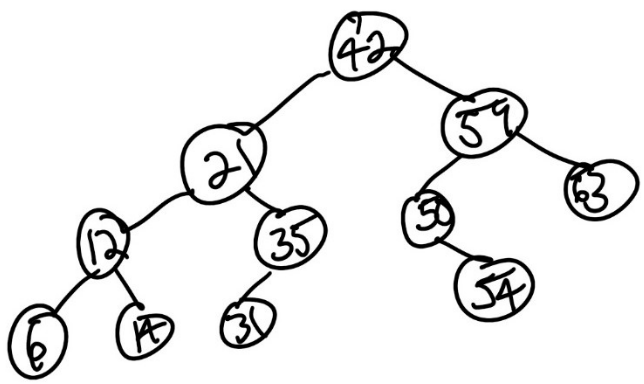
(4) After insertion:



Restructured

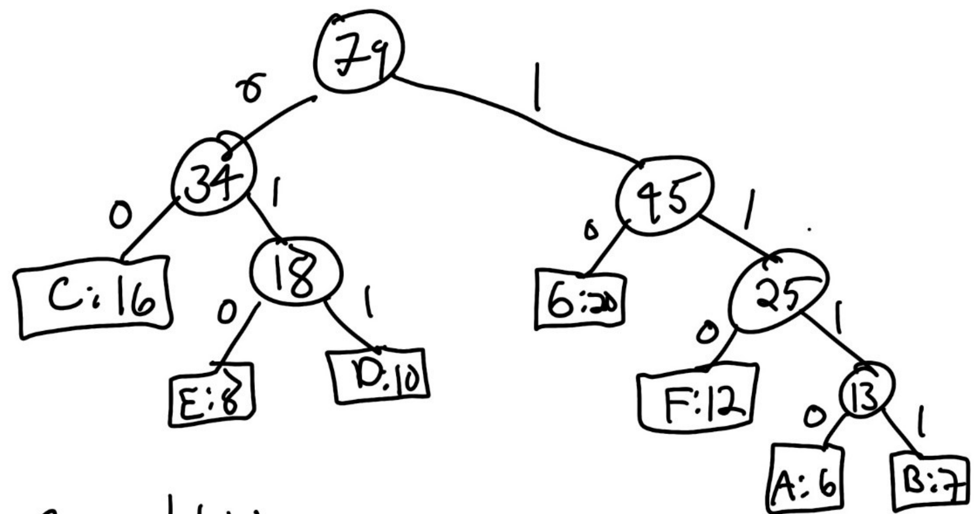
35 becomes right child of 21, 42 become root.

Use it xyz restructure.



Problem 5 (10 points).

5



(1) B = 1111

D = 011

E = 010

G = 10

C = 00

1111 011 010 10 00

(2) 010 1110 10 011

E A G D

Problem 6 (10 points).

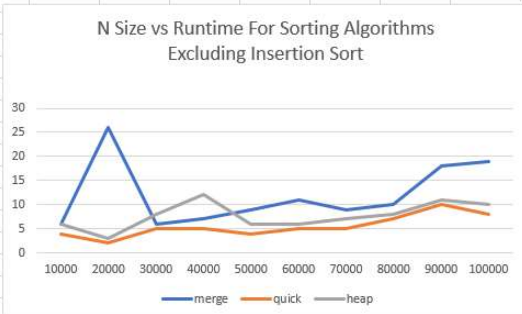
World Series Problem solution for P(4,1) and P(2,4).

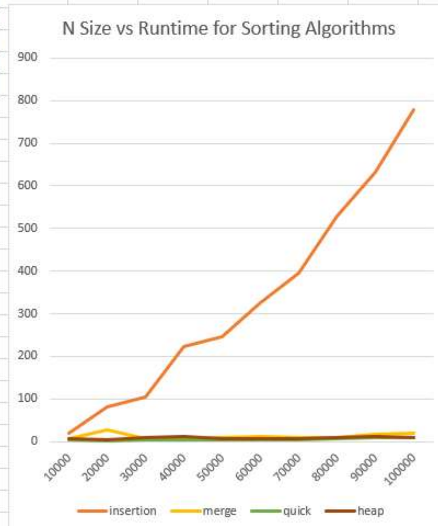
P(4,1): = (P(3,1)+P(4,0))/2 = (1/8 + 0)/2 = 1/16

P(2,4) = (P(1,4)+P(2,3))/2 = (15/16 + 11/16)/2 = 26/32.

Problem 7 (10 points).

	10000	20000	30000	40000	50000	60000	70000	80000	90000	100000
insertion	19	82	104	224	247	327	395	530	633	780
merge	6	26	6	7	9	11	9	10	18	19
quick	4	2	5	5	4	5	5	7	10	8
heap	6	3	8	12	6	6	7	8	11	10





I ran the program several times, specifically to confirm some of my observations, with various sizes – going as high as sorting 1 million integers.

One thing that I observed almost instantly was that insertion sort scaled upwards in runtime the fastest by far, and the other three all roughly scaled together. However, despite runtimes not increasing heavily with these smaller Ns, merge, quick, and heapsorts all definitely increased with N as well.