CS 4750 Assignment 5

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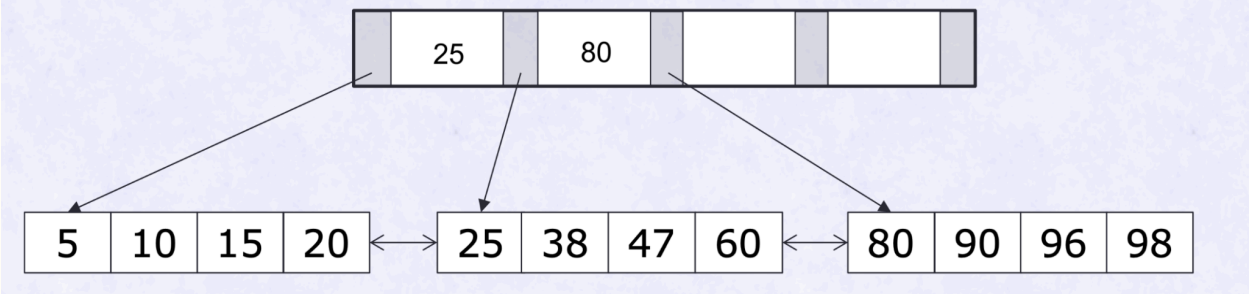
1.

1.1)



1.2) **Insert 21, 61, and 99.**

First, insert 21. Since the first leaf node is full, it will split into (5, 10) and (15, 20, 21). The appropriate key will then be placed in the root.

Second, insert 61. Since (25, 38, 47, 60) is full, this will require splitting the node into (25, 38) and (47, 60, 61). Again, place the appropriate key in the root, filling it up.

Finally, insert 99. Since (80, 90, 96, 98) is full, we will have to split this node into (80, 90), and (96, 98, 99). However, we now have 6 nodes, and the root node is full. Thus, we'll have to split the root node.

2.

2.1) The tree with the bigger n.

2.2) When using a low n, there is high overhead for inserting and deleting. This is because you have a tall and thin B+ tree, so it increases the likelihood that re-organization will be needed when inserting or deleting. Additionally, the re-organization itself is more costly since it's more likely that you'll need to propagate changes up the tree. Thus, using a higher n reduces the overhead for inserting and deleting and thus is more efficient for DBs where there is a lot of insertion and deletion.

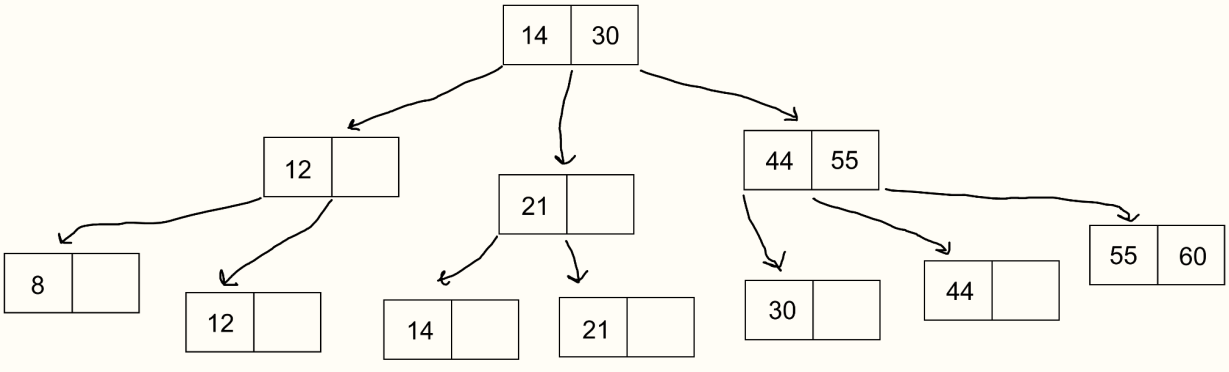
3.

3.1) 5 pointers.

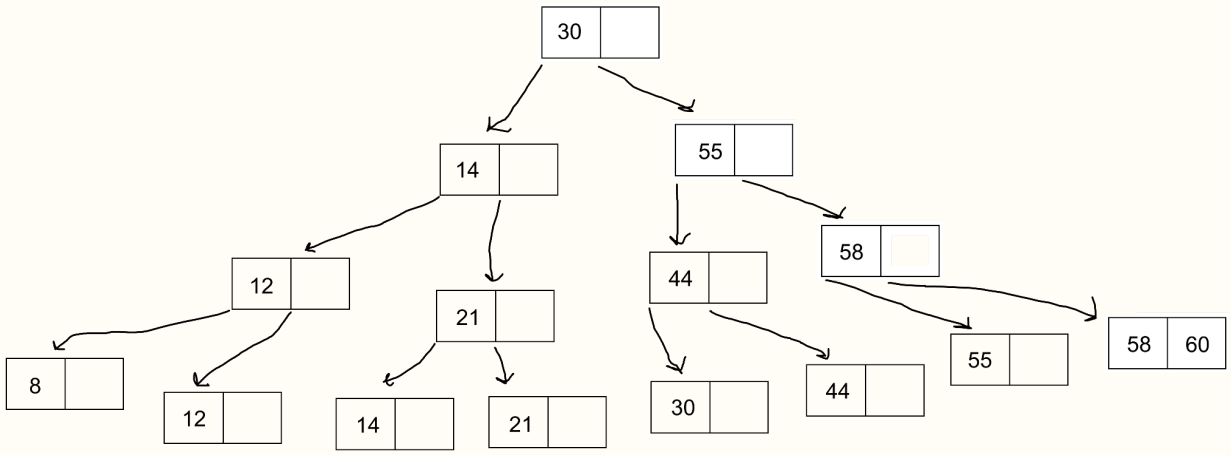
3.2) It first requires two pointers to get from the root to the appropriate leaf node, the one with 14. You do this by taking the middle pointer from the root node (since $14 < 15 < 30$) and then the left pointer down to the leaf node (since $15 < 21$). Then, it takes 3 more pointers to move between siblings until you get to the last leaf node, where the 56 range ends, since 60 is greater than 56.

4.

4.1)



4.2)


30
14
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12
21
44
58
8
12
14
21
30
44
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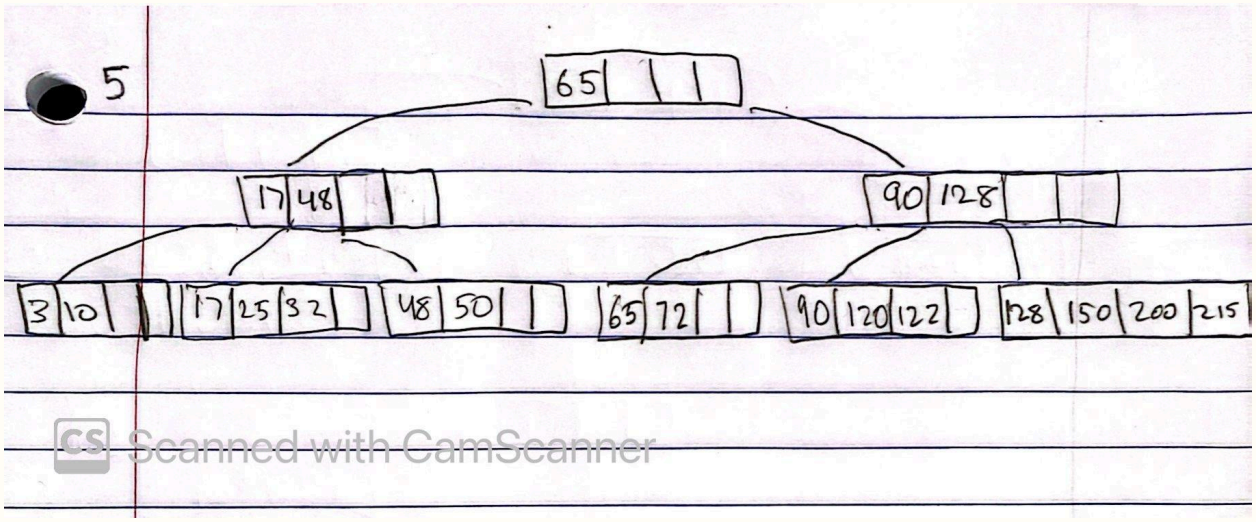
58
60

5.


5
65
17
48
90
128
3
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25
32
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72
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120
122
128
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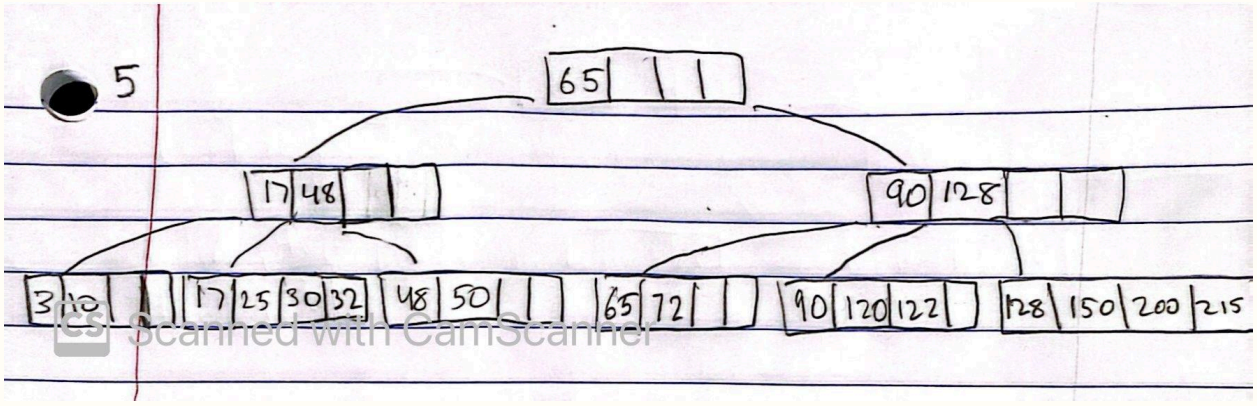
200
215
Scanned with CamScanner

6.1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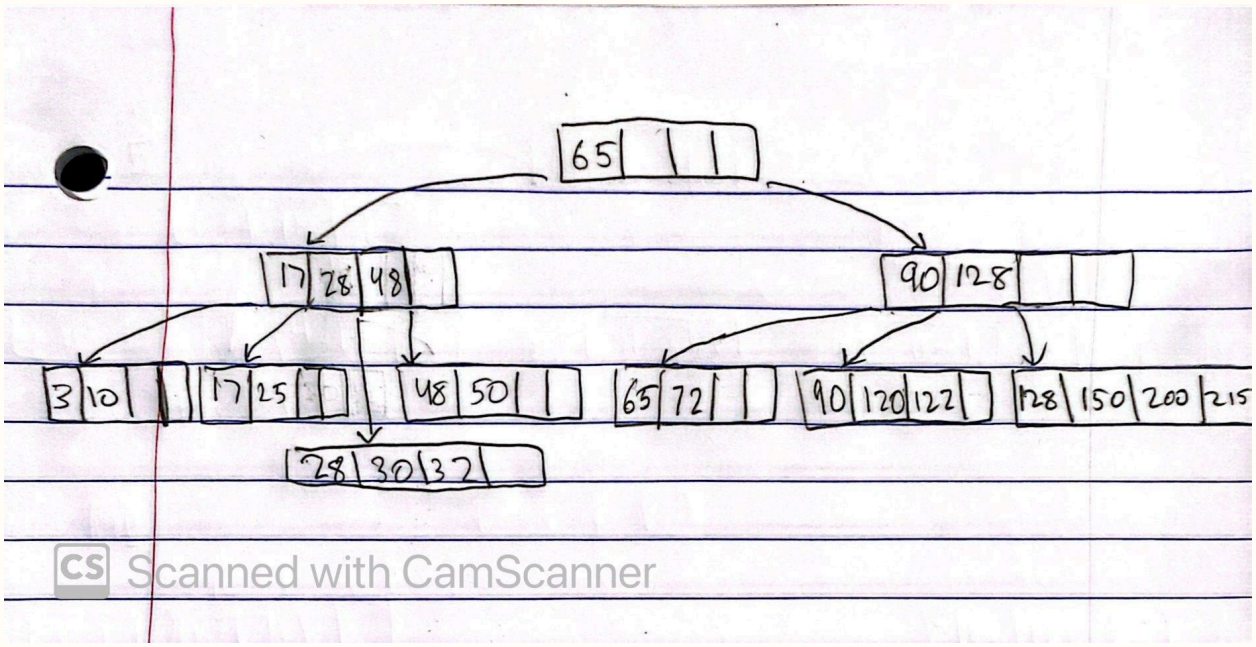
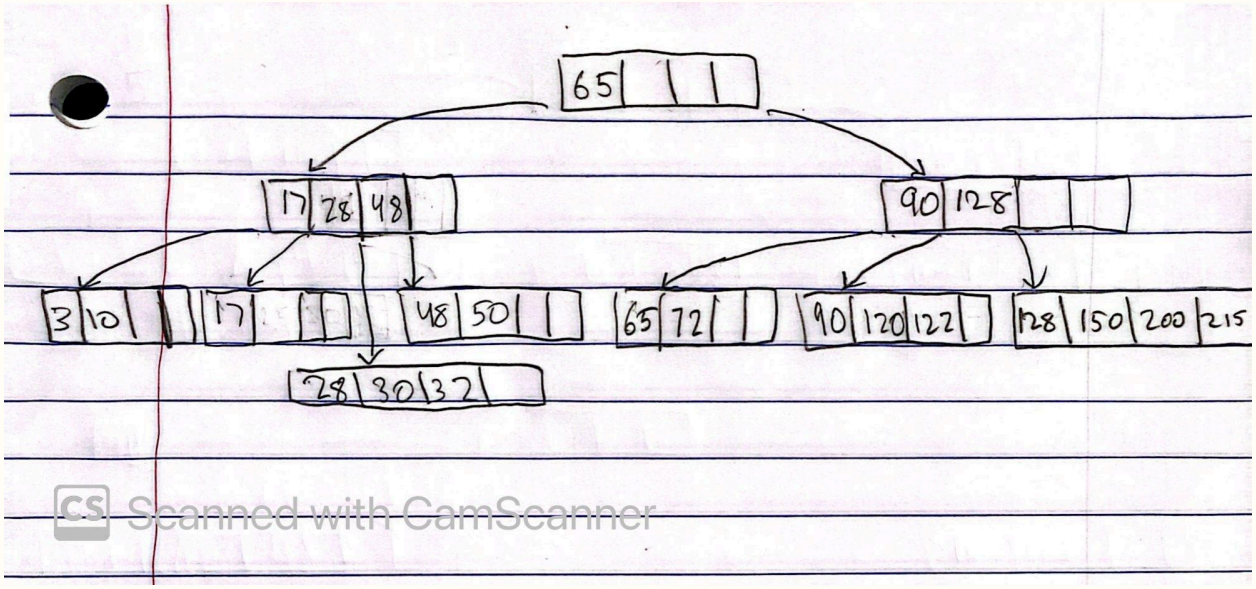
Scanned with CamScanner

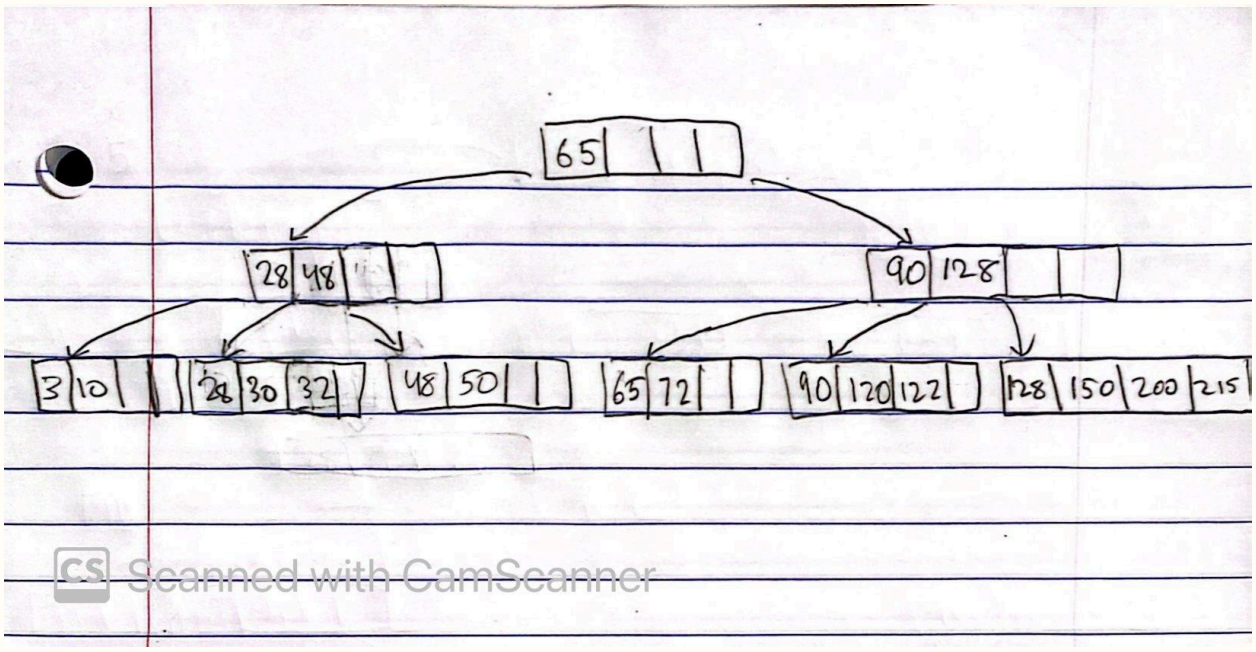
6.2



6.3



6.4



6.5