PA 7 Part 1: Heap Worksheet

DSC 30 Winter 2021 - Marina Langlois

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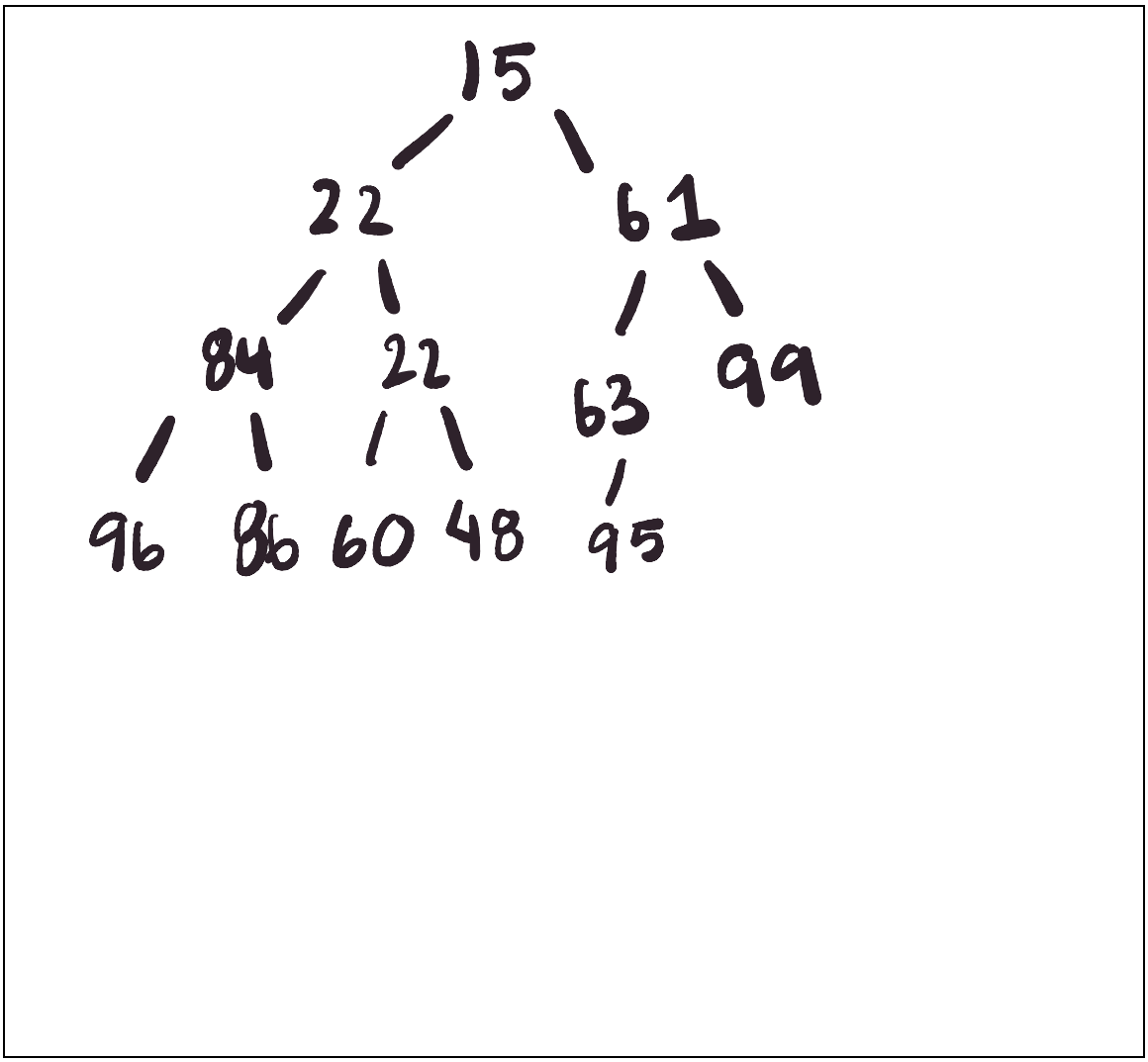
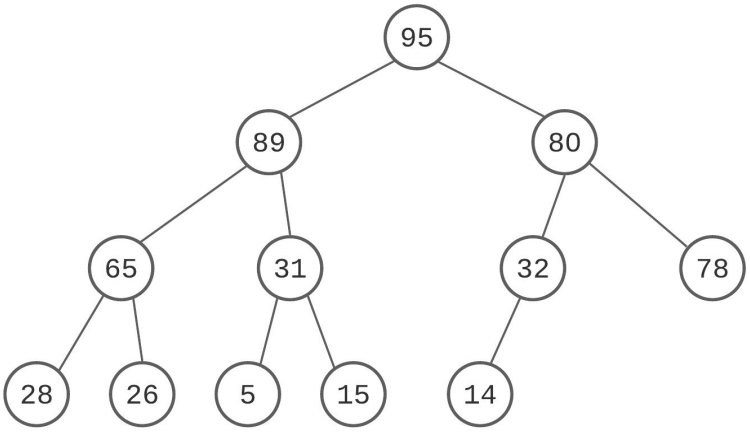
1. Insert the following elements in the given order to an empty binary (d = 2) min-heap. Draw the tree representation of the heap after all insertions.

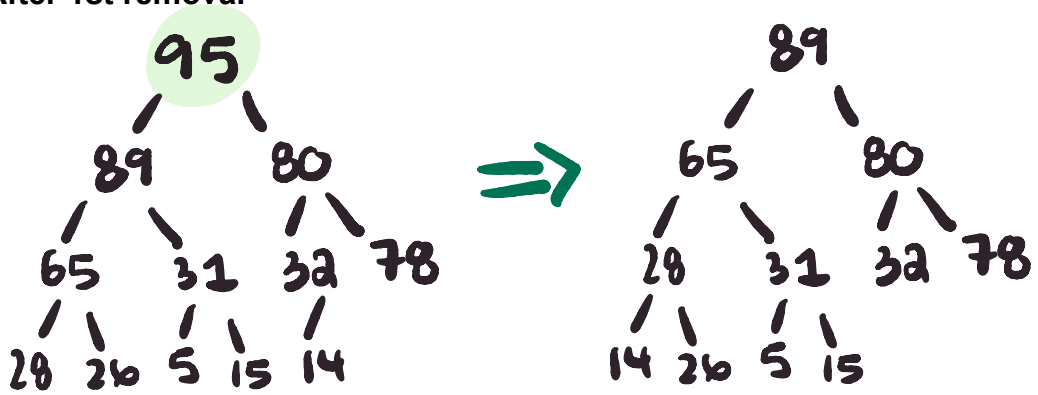
   Elements to insert: [60, 96, 61, 15, 22, 63, 99, 84, 86, 22, 48, 95]



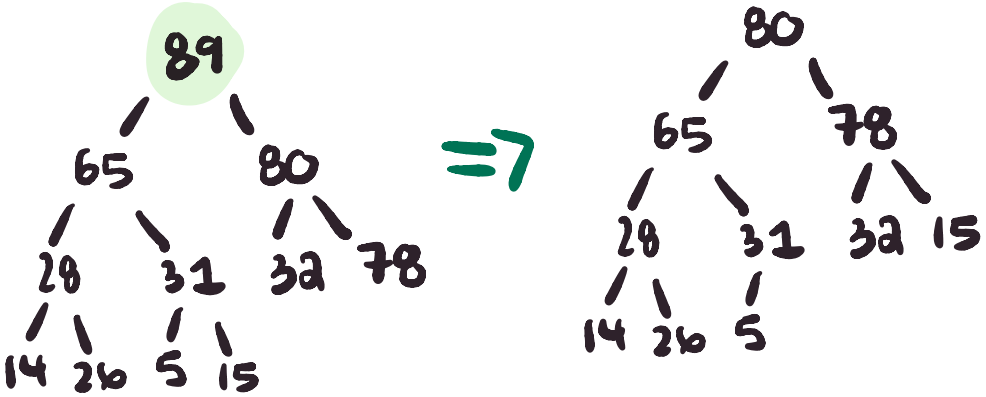
2. Remove the top element 5 times from the given heap and draw the tree representations of the heap after **each** removal.



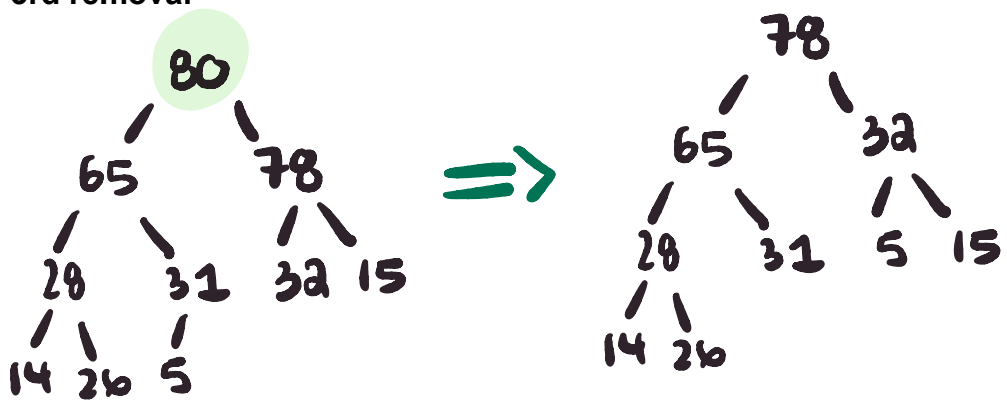
After 1st removal



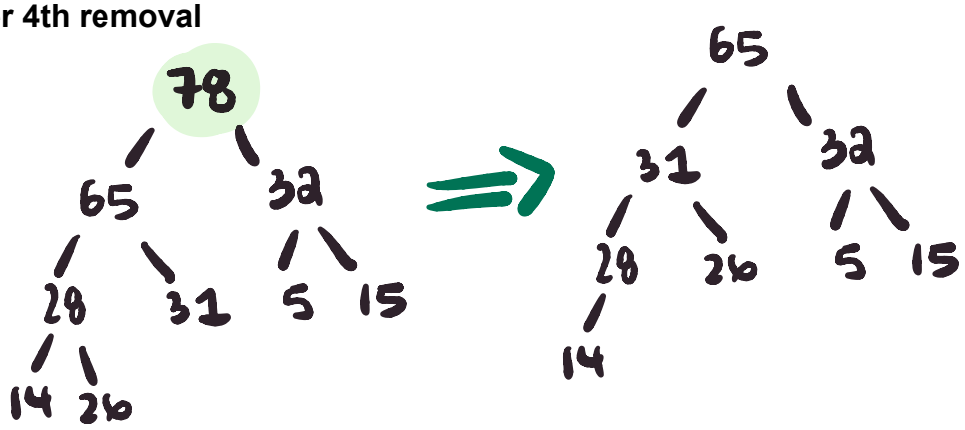
After 2nd removal



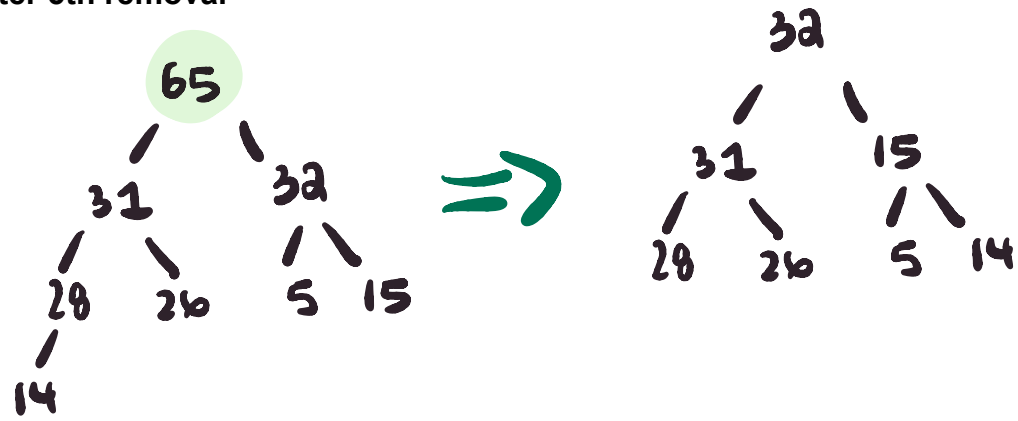
After 3rd removal



After 4th removal



After 5th removal

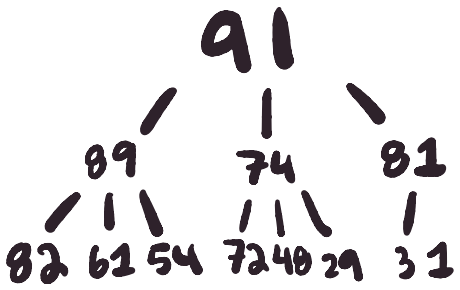


non-leaf nodes have d children instead of 2

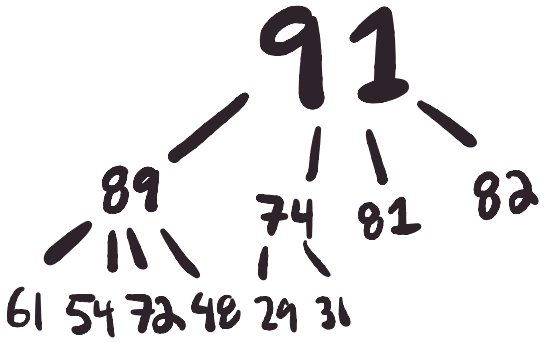
3. Draw the tree representations of the d-ary max-heaps from the following array representation. Choose d = {3, 4}.

   Array representation: [91, 89, 74, 81, 82, 61, 54, 72, 48, 29, 31]

3-ary

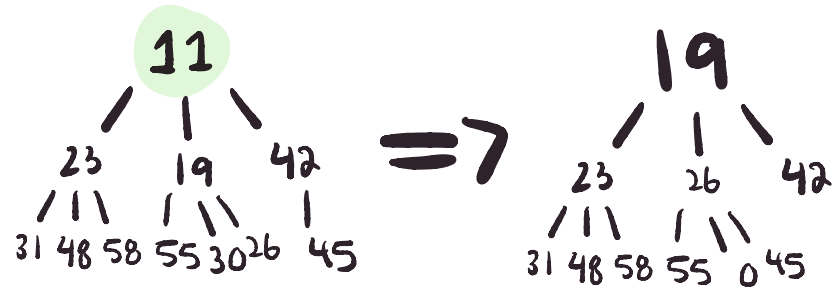


4-ary

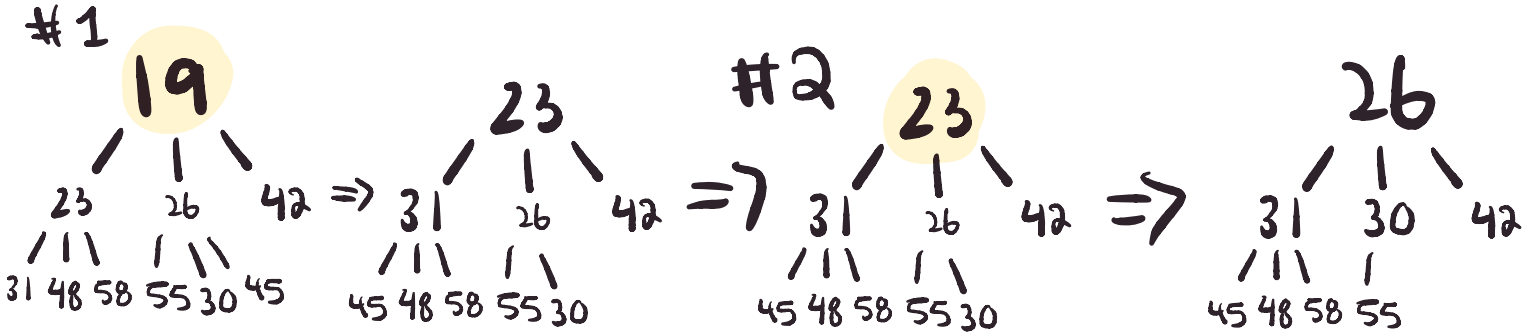


4. Write down the array representations of the given **3-ary min-heap** after each specified operation.

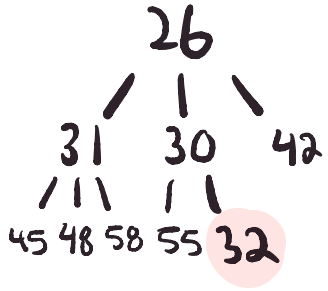
Original											
11	23	19	42	31	48	58	55	30	26	45	
After **removing the minimum once**											
19	23	26	42	31	48	58	55	30	45		
After **removing the minimum twice**											
26	31	30	42	45	48	58	55				
After **inserting 32 and 18**											
18	31	26	42	45	48	58	55	32	30		
After **inserting 15 and 12**											
12	31	26	15	45	48	58	55	32	30	42	18
After **removing the minimum 10 times**											
55	58										



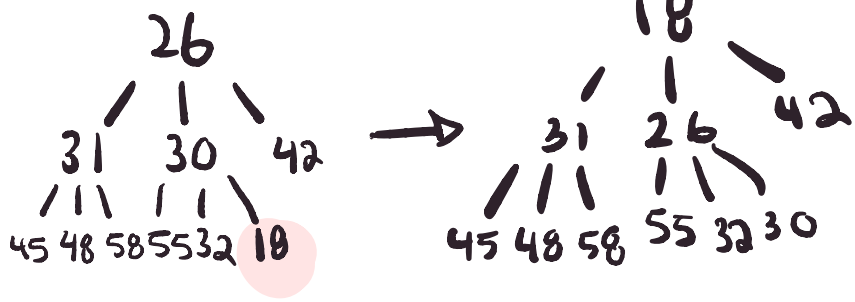
#1



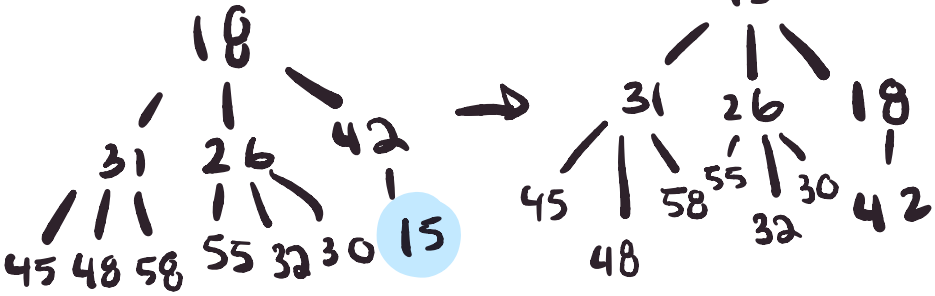
insert 32



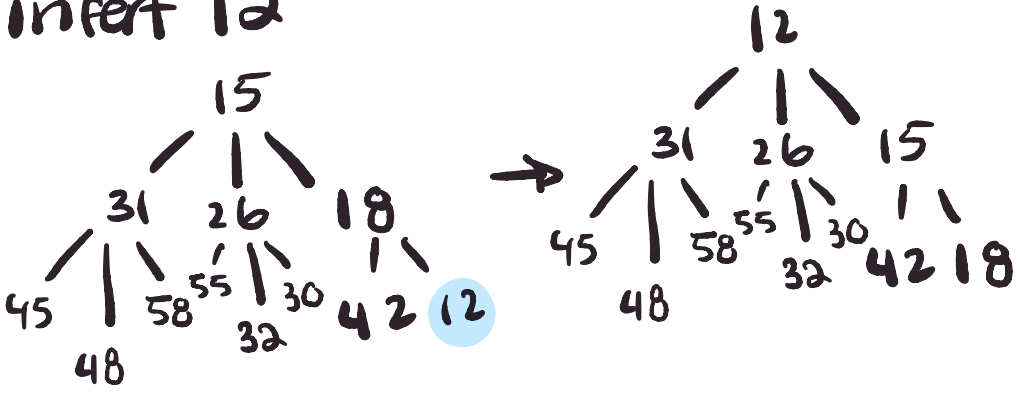
insert 18



insert 15



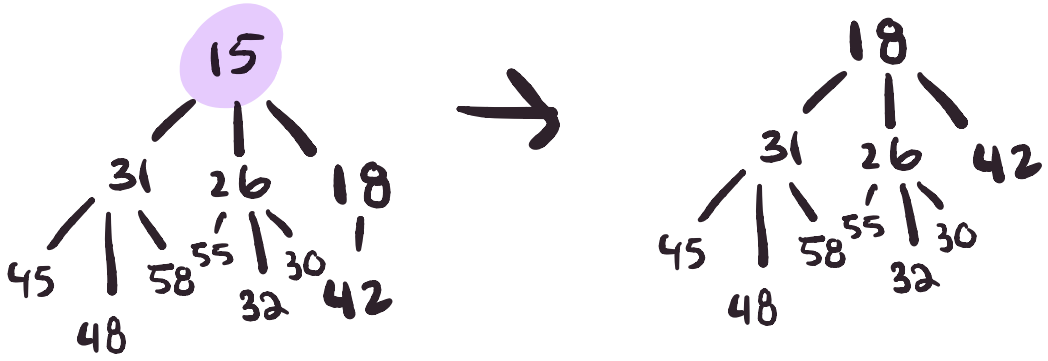
insert 12



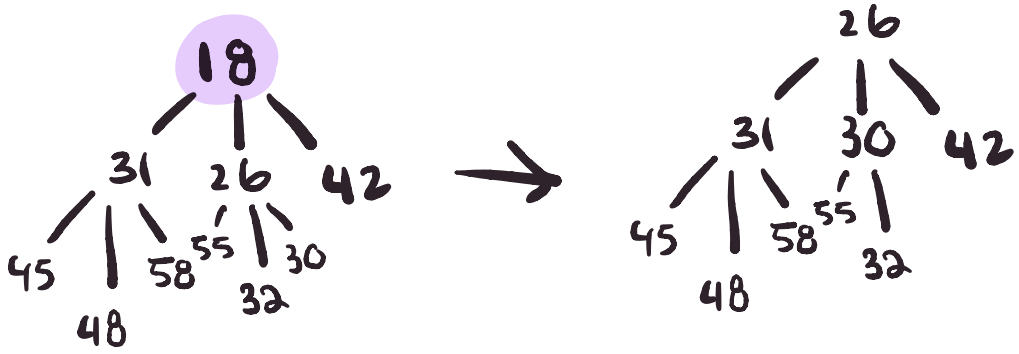
#1


12
31 26 15
45 58 55 30 32 42 18
48
15
31 26 18
45 58 55 30 32 42
48

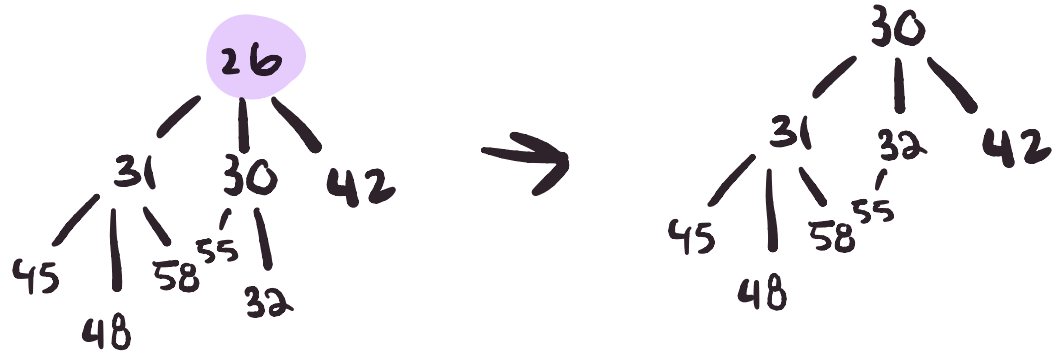
#2


15
31 26 18
45 58 55 30 32 42
48
18
31 26 42
45 58 55 30 32
48

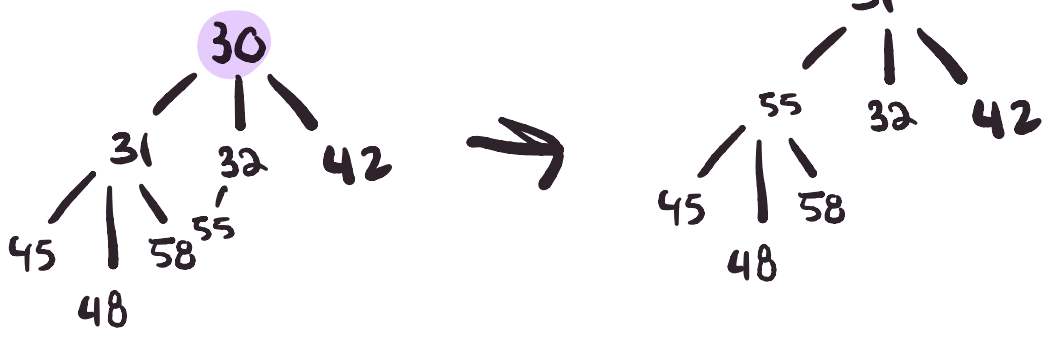
#3


18
31 26 42
45 58 55 30 32
48
26
31 30 42
45 58 55 32
48

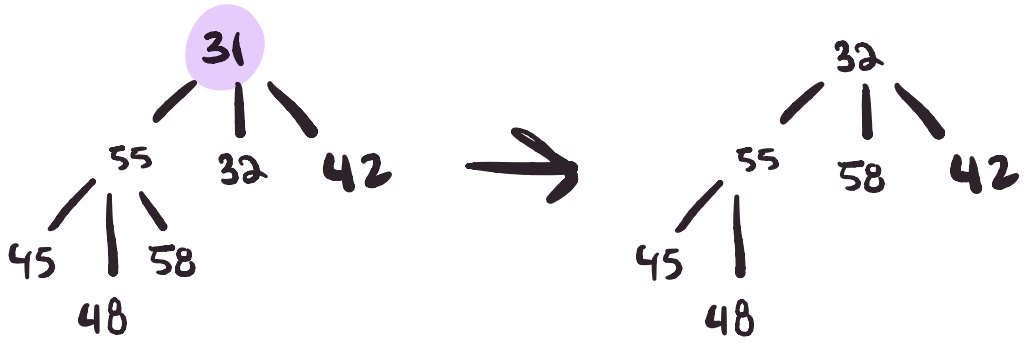
#4


26
31 30 42
45 58 55 32
48
30
31 32 42
45 58 55
48

#5


30
31 32 42
45 58 55
48
31
55 32 42
45 58
48

#6


31
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32
42
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58
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32
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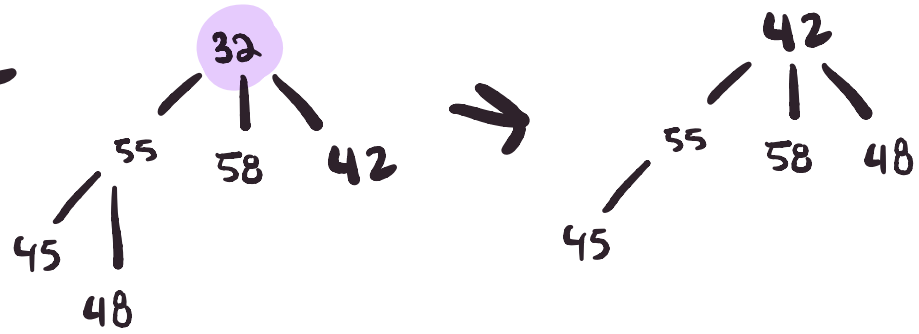
58
42
45
48

#7


32
55
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42
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58
48
45

#8


42
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58
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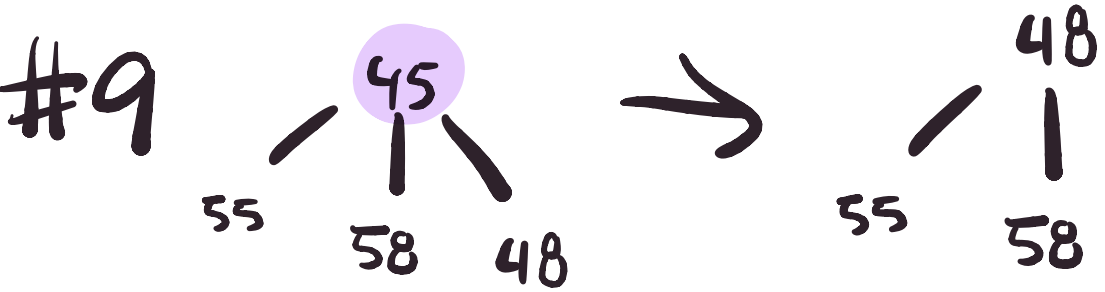
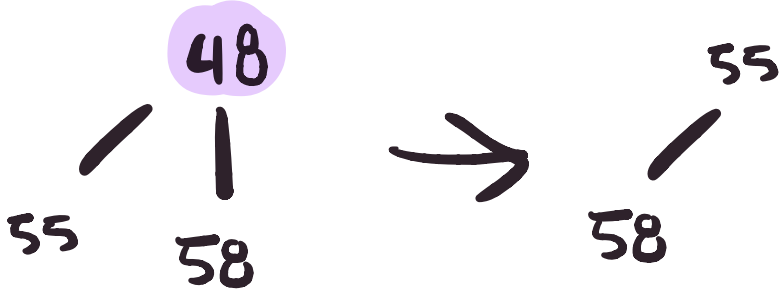
45
45
55
58
48

#9


45
55
58
48
48
55
58

#10


48
55
58
55
58