

6.2 a) Min-heap implementation

① 10

② 10
12

③ 10
12 1 → 12 10

④ 10
12 14

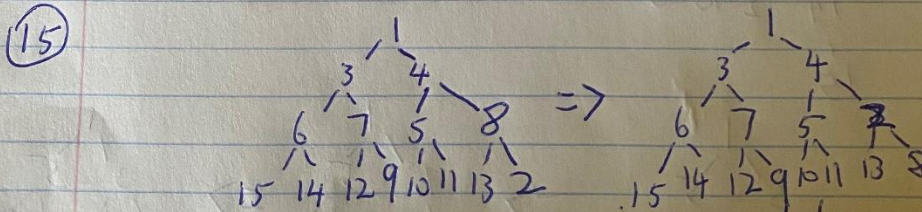
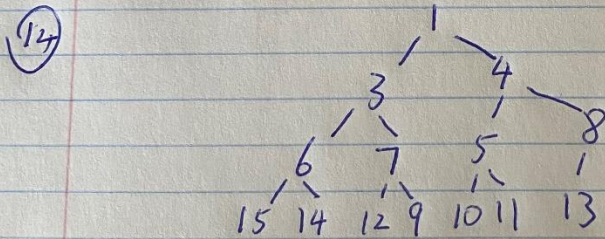
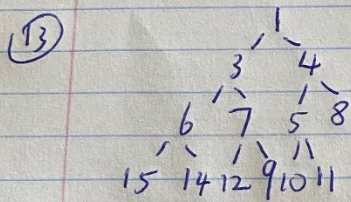
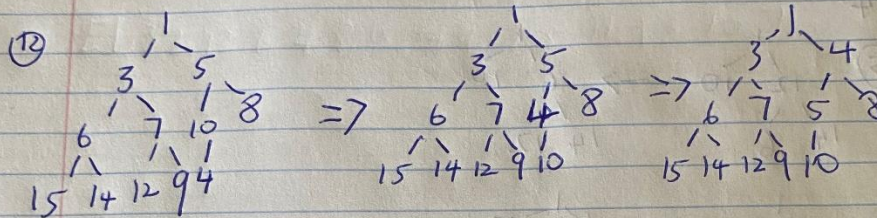
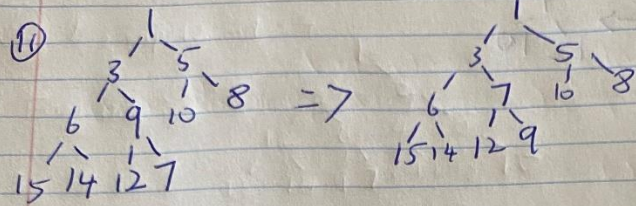
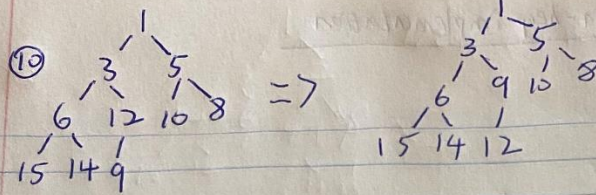
⑤ 10
12 14 → 6 10
14 6 12

⑥ 10
6 14 → 6 5
14 12 10

⑦ 5
6 14
12 10 8

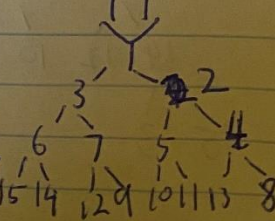
⑧ 5
6 14
12 10 8
15

⑨ 5
6 14
12 10 8
15 3 ⇒ 3 12 10 8 ⇒ 3 5
15 14 12 10 8

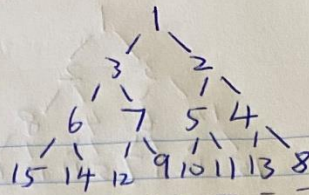


final after insert =

[1, 3, 2, 6, 7, 5, 4, 15, 14, 12, 9, 10, 11, 13, 8]

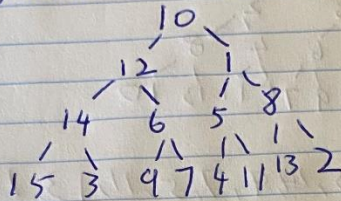


6.2a
Final tree min-heap:

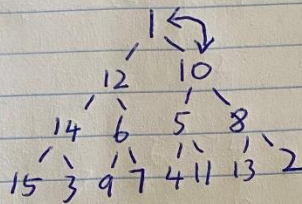


6.2b) linear time algorithm:

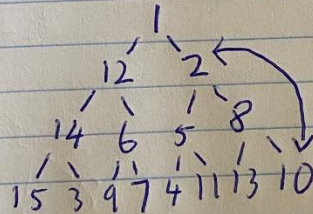
①



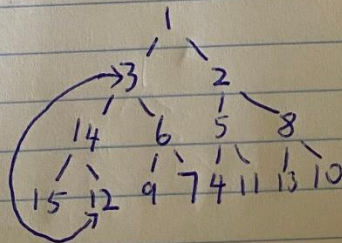
②



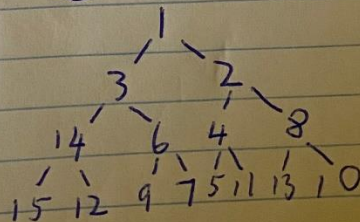
③



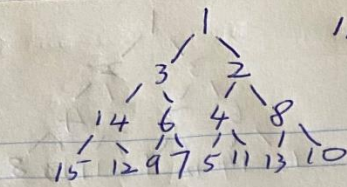
④



⑤

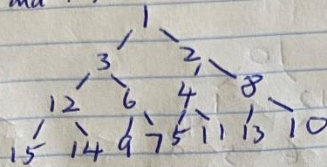


// swap 4 and 5



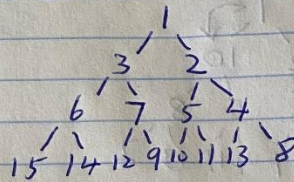
⑥ // swap 12 and 14

Final tree:

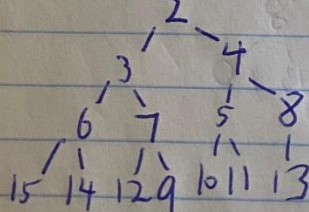
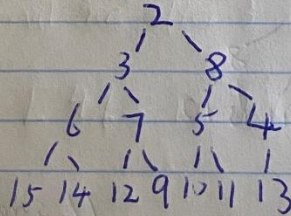
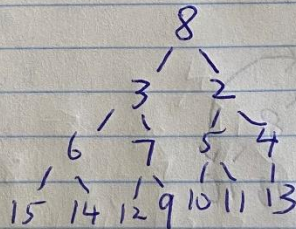


[1, 3, 2, 12, 6, 4, 8, 15, 14, 9, 7, 5, 11, 13, 10]

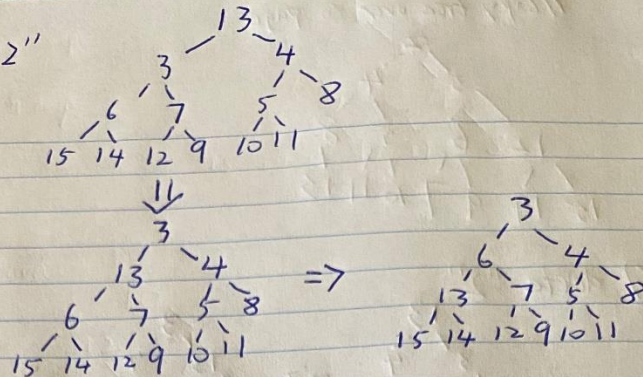
6.3
Part 1 a) original tree:



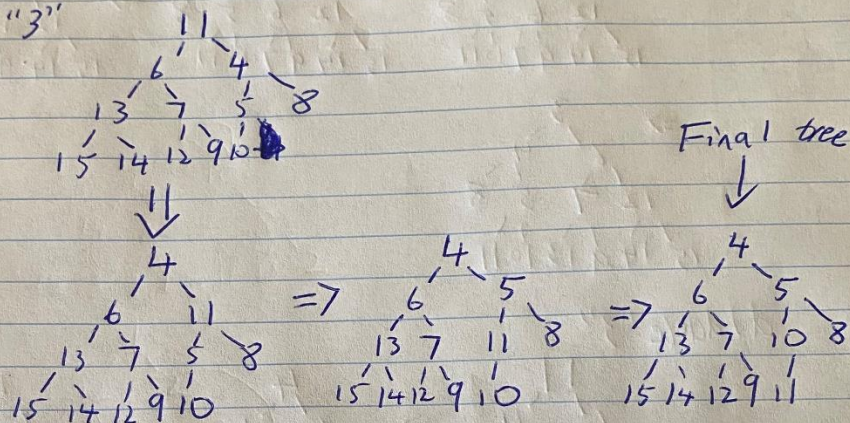
b) delete "1"



c) delete "2"

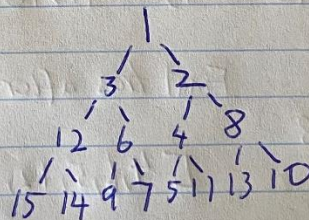


d) delete "3"

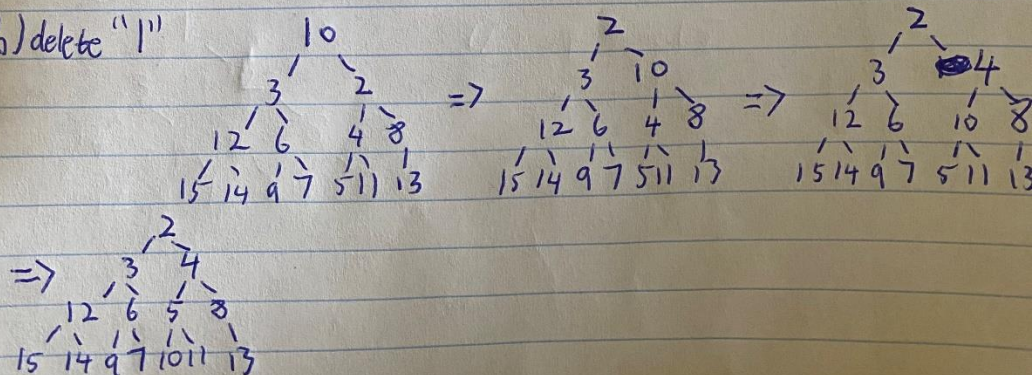


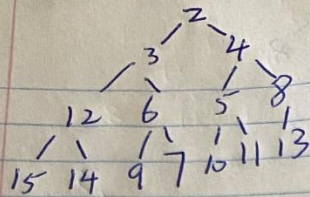
Min-heap after 3 delete min = [4, 6, 5, 13, 7, 10, 8, 15, 14, 12, 9, 11]

6.3 a) original tree:
Part 2

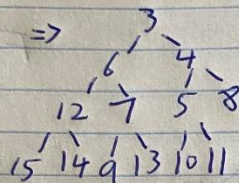
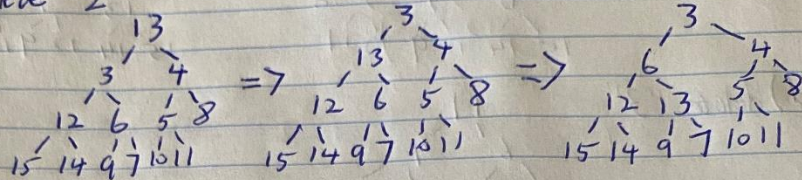


b) delete "1"

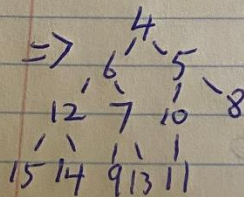
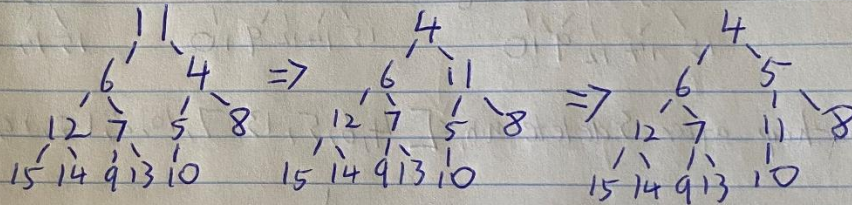




c) delete "2"



d) delete "3"



Final tree after 3 deletions.

[4, 6, 5, 12, 7, 10, 8, 15, 14, 9, 13, 11]