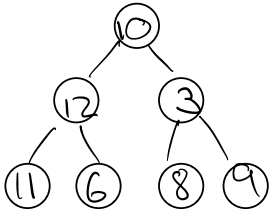4a.   [10,12,3,11,6,8,9]

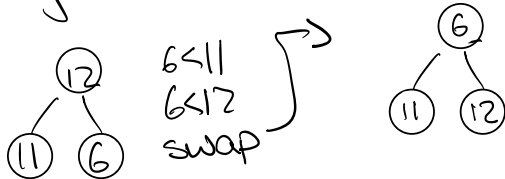Original Heap

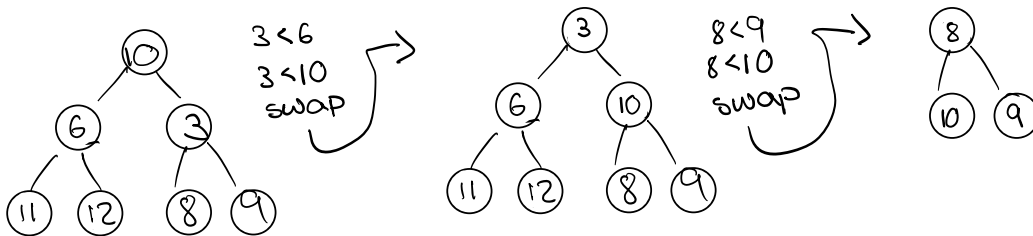Heapify (1)

3 < 9
3 < 8

Heapify (2)

6 < 11
6 < 12
swap

Heapify (3)

3 < 6
3 < 10
swap

8 < 9
8 < 10
swap
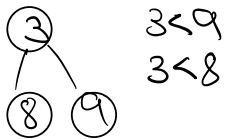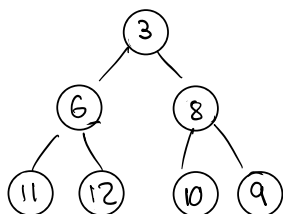
Final Heap

= [3,6,8,11,12,10,9]

4b. [2,4,6,8,10,12,14,16]

Original Heap

Insert (3)

3<16
3<8
swap

3<16
3<4
swap

3>2
keep

Result

Pop()

remove 2 and
replace with 8

3<6
3<8
swap with 8
4<10
4<8
swap with 8
16>8

Result

Pop()

remove 3 and
replace with 16

4<6
4<16
swap with 16
8<10
8<16
swap with 16

Result

Insert (5)

5<16
swap

5<10
5<8
swap

Result
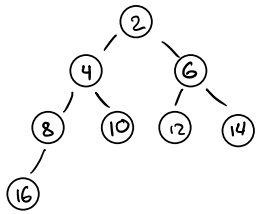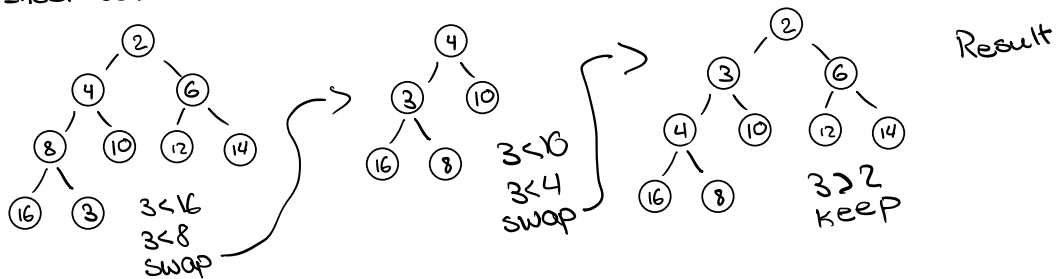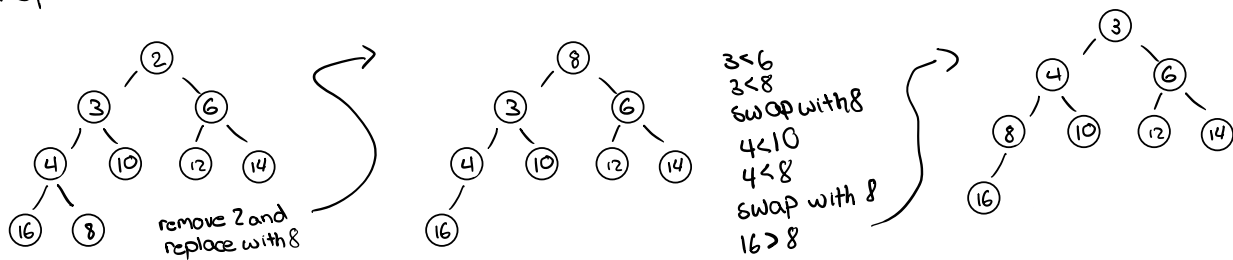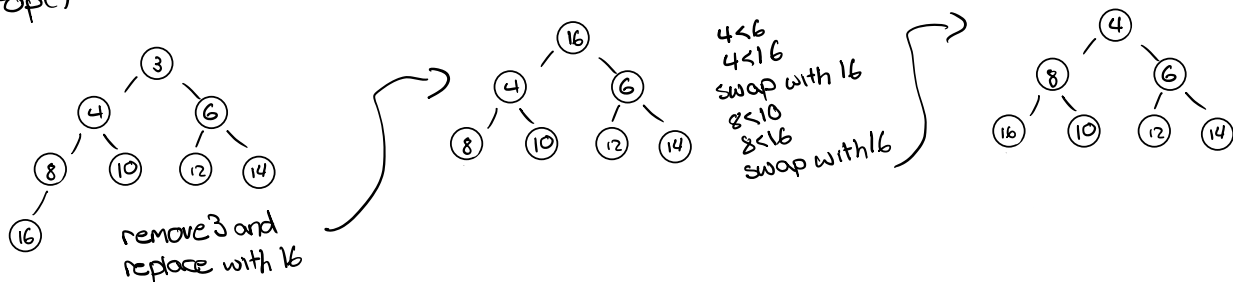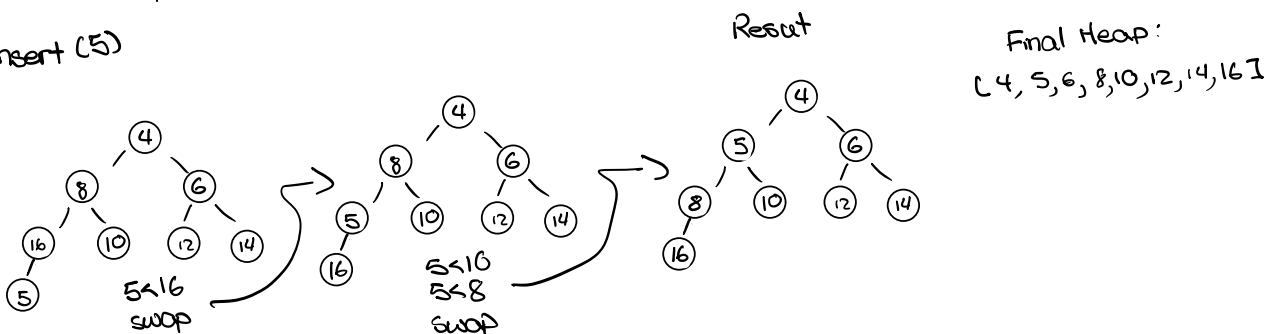
Final Heap:
[4, 5, 6, 8, 10, 12, 14, 16]