part 1 a), build heap : min heap

*heaps arent ordered L/R only ↑↓

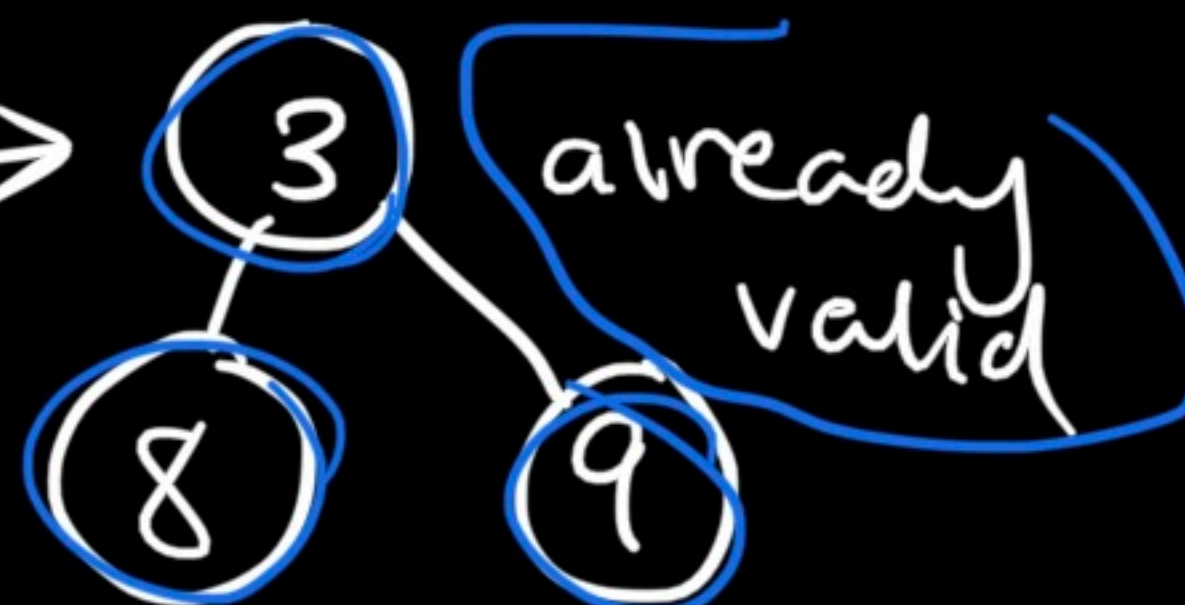| 0	1	2	3	4	5	6
10	12	3	11	6	8	9
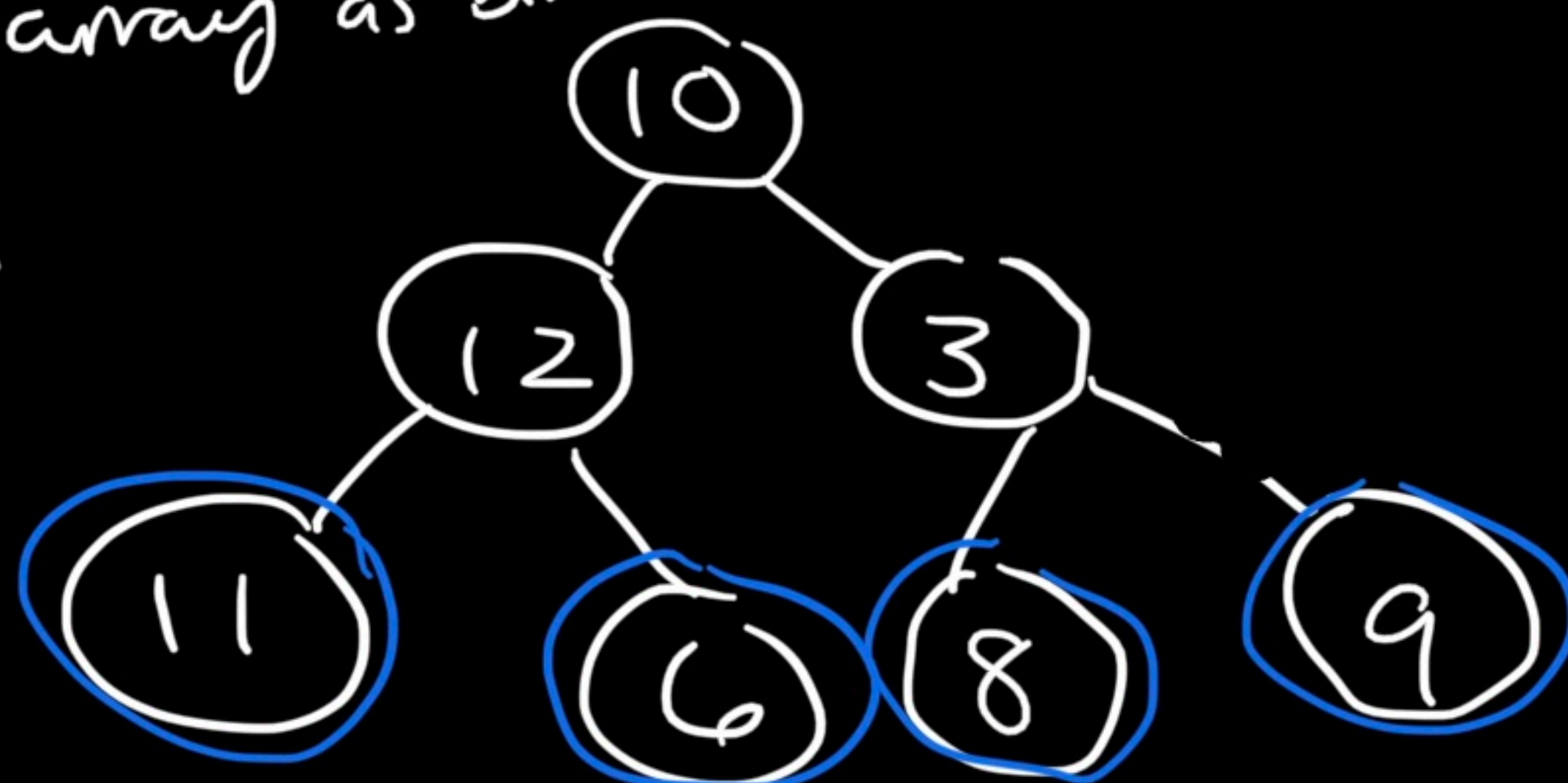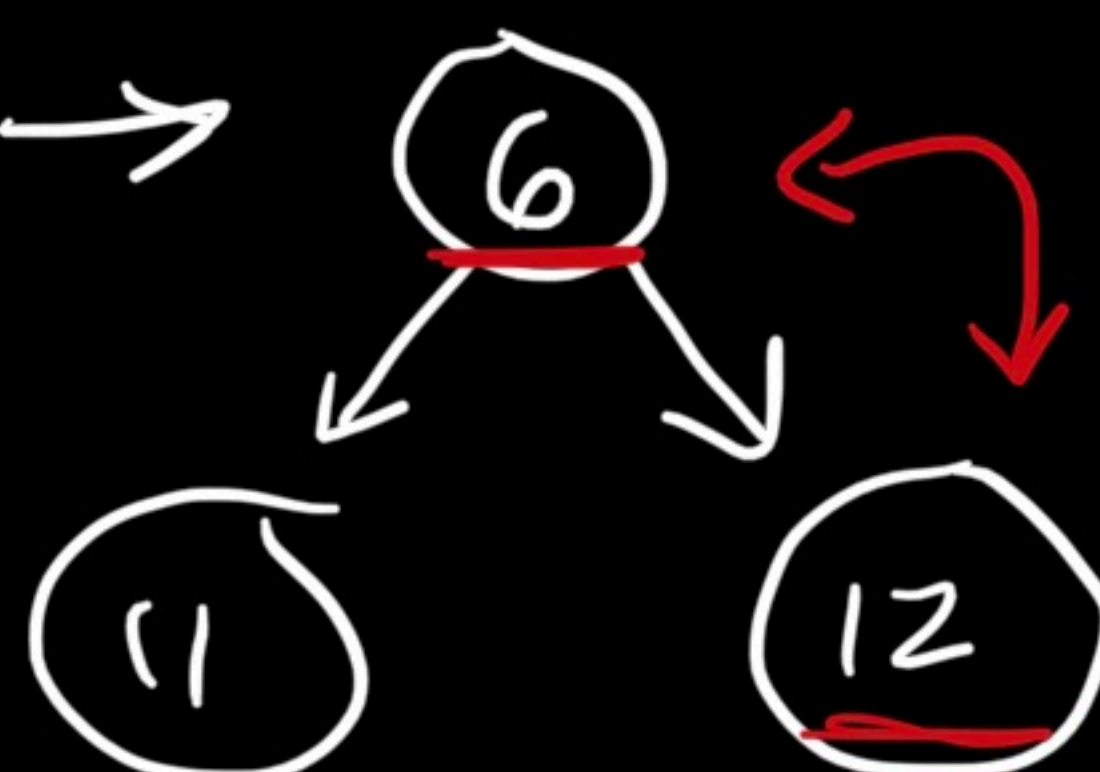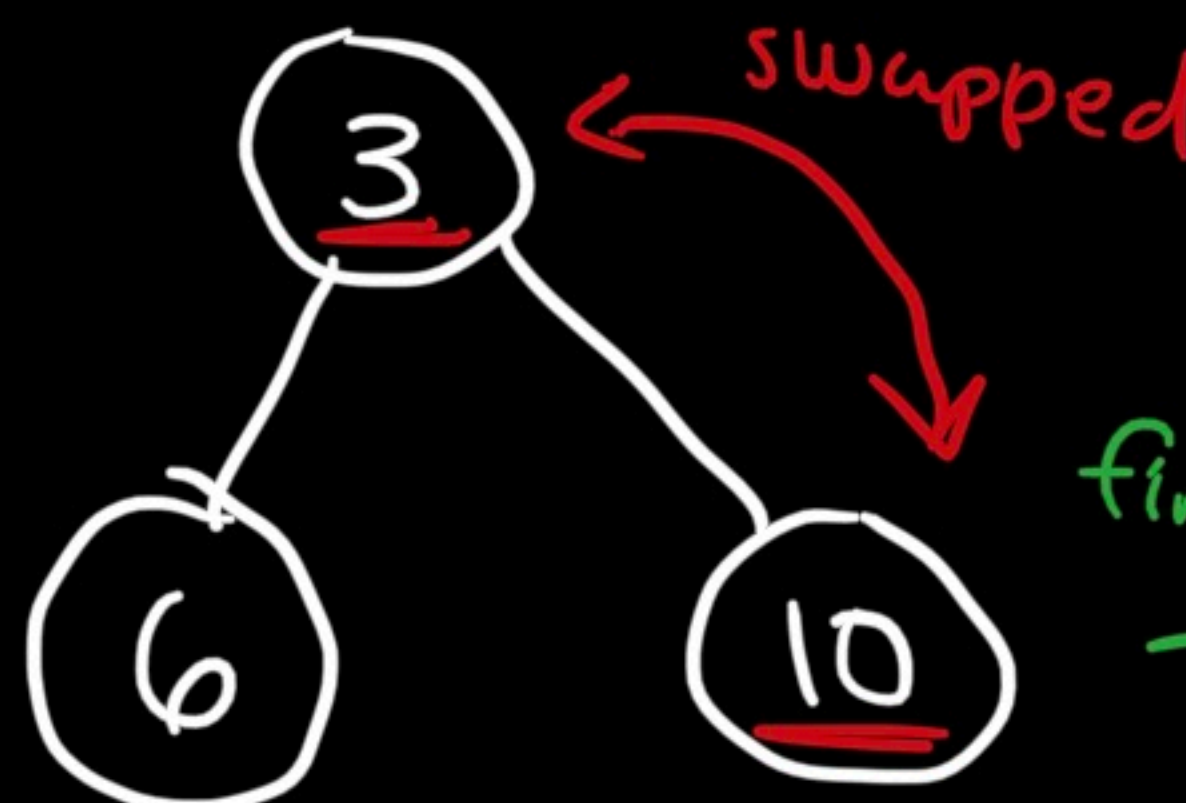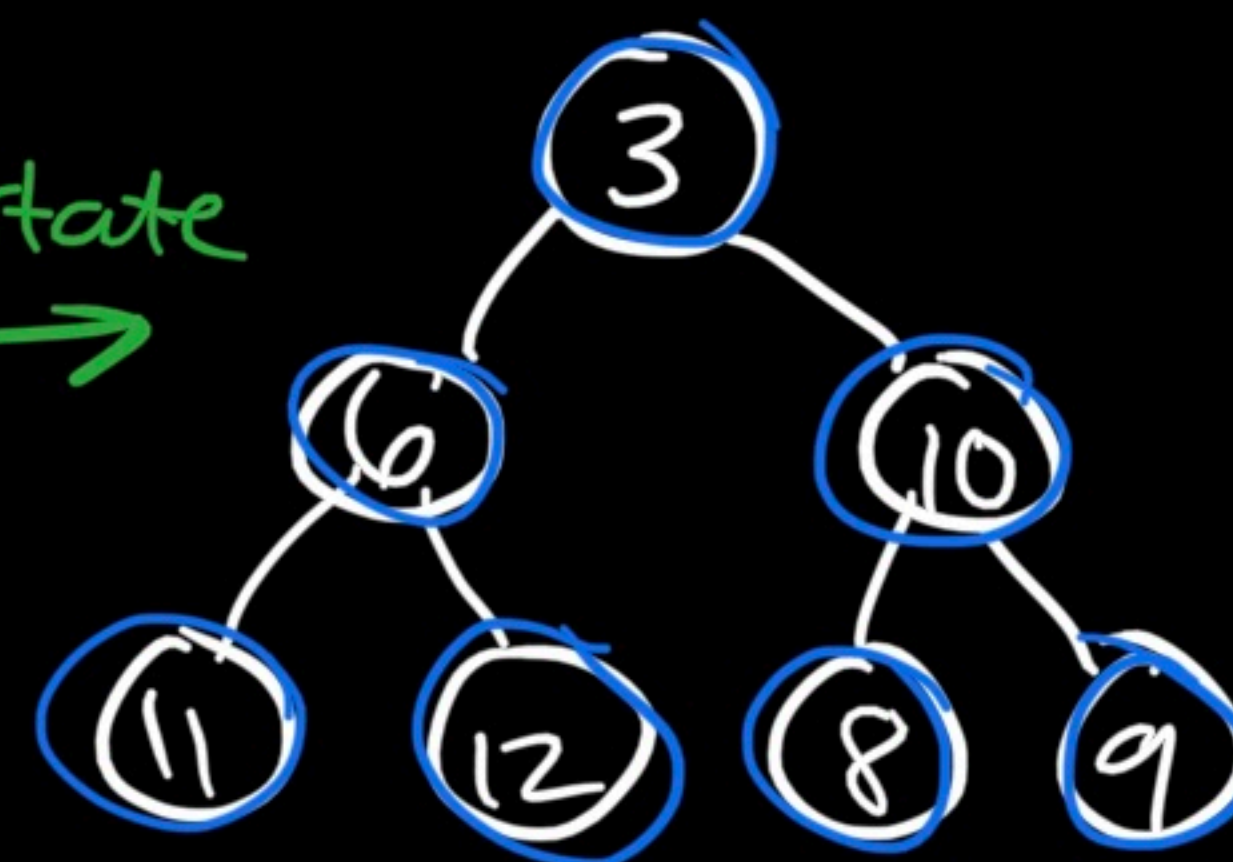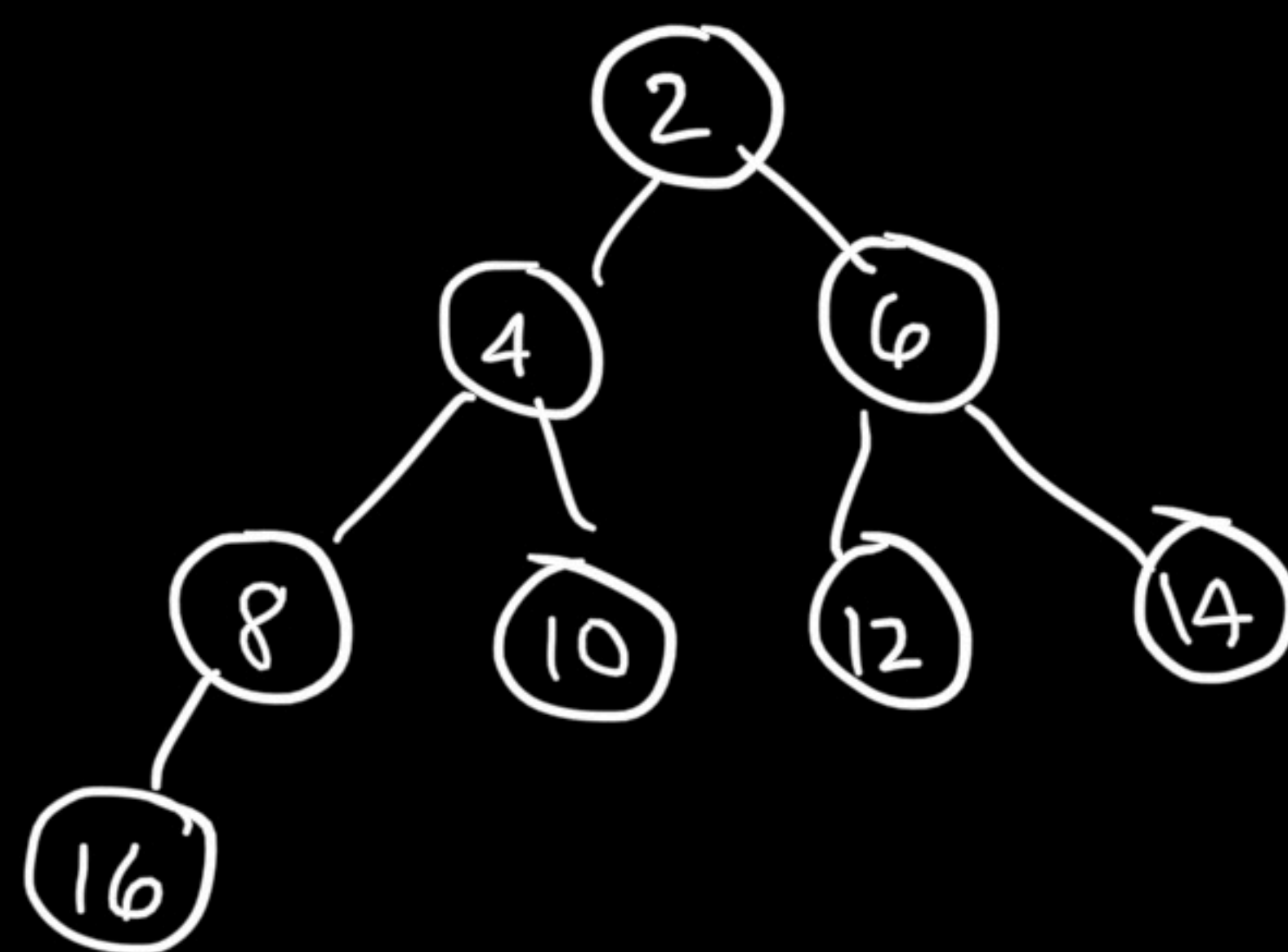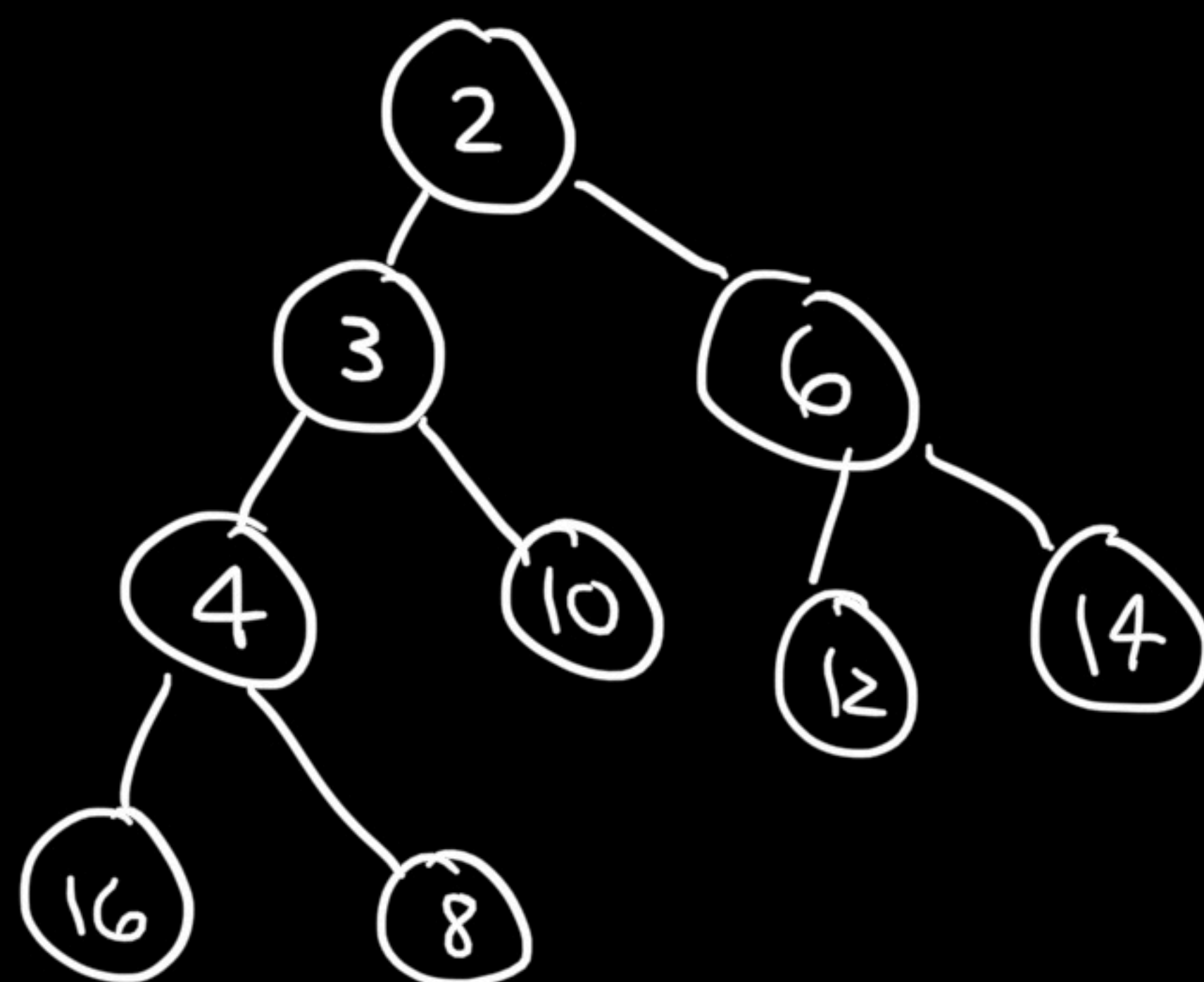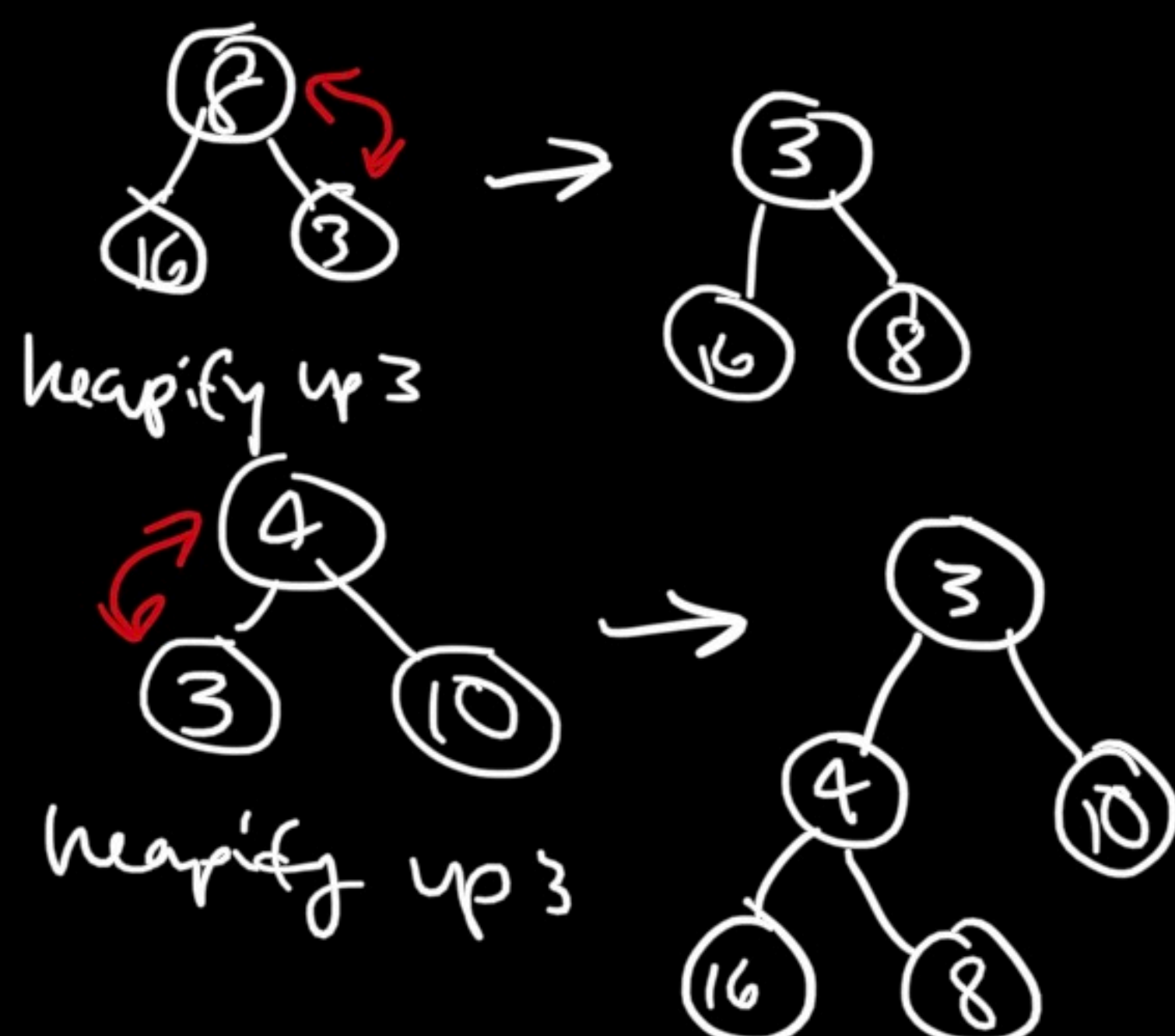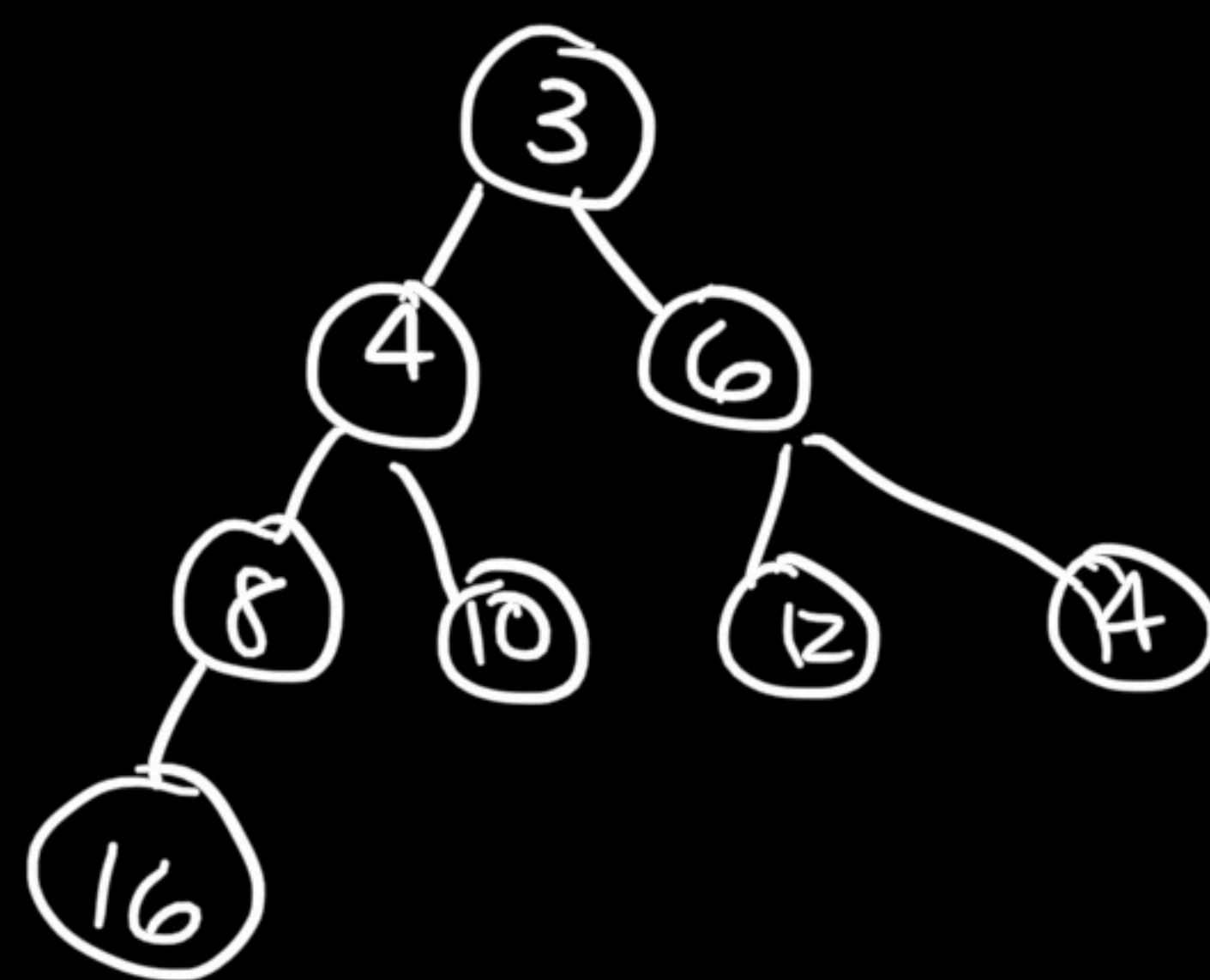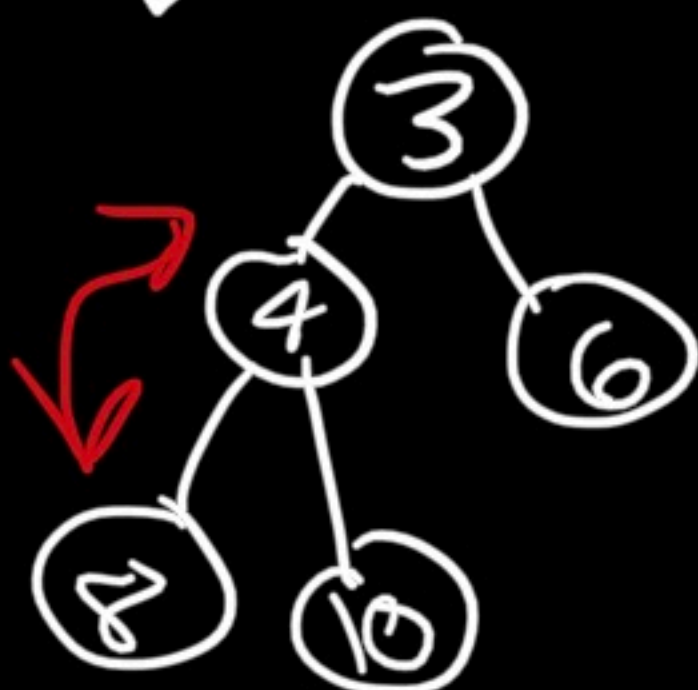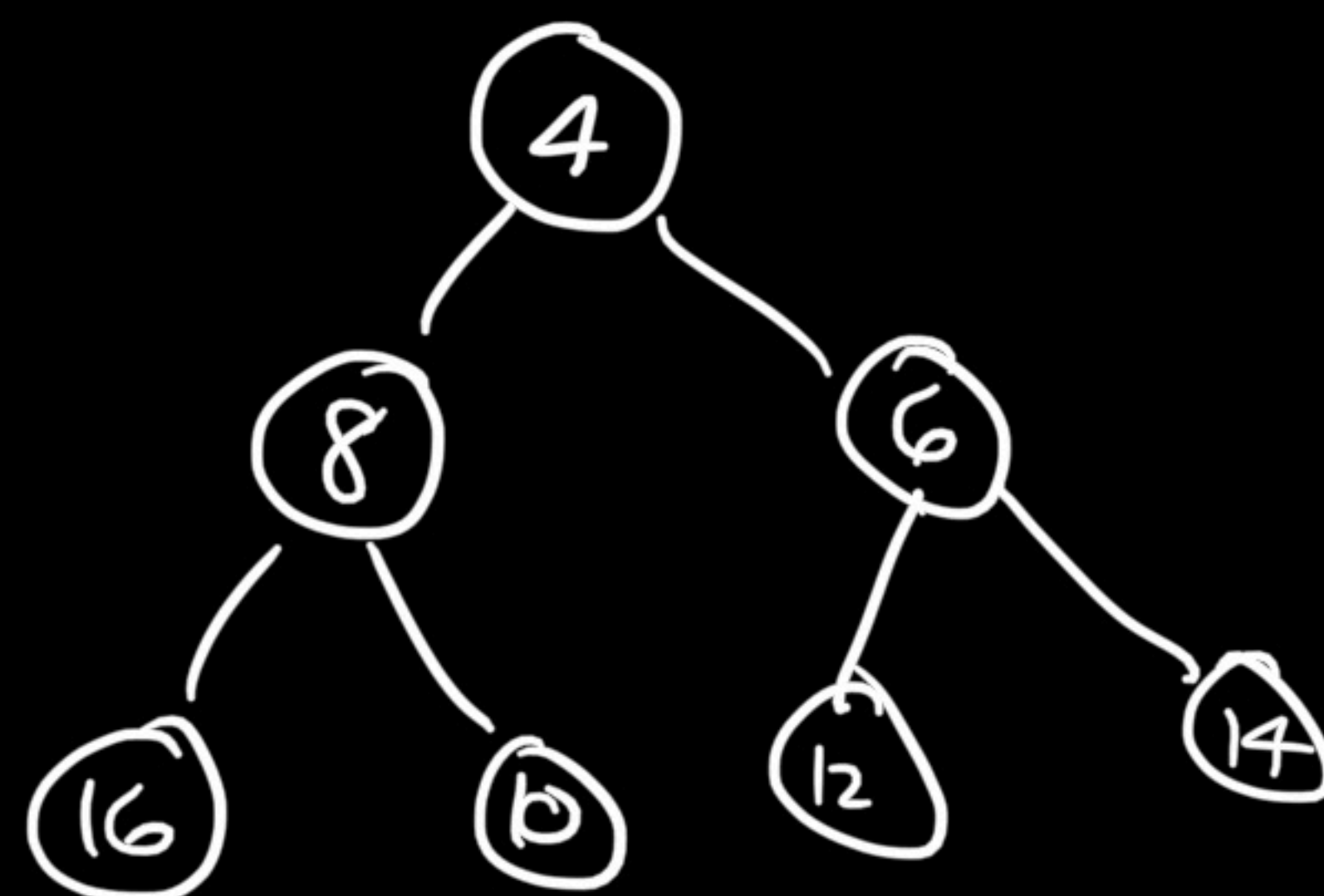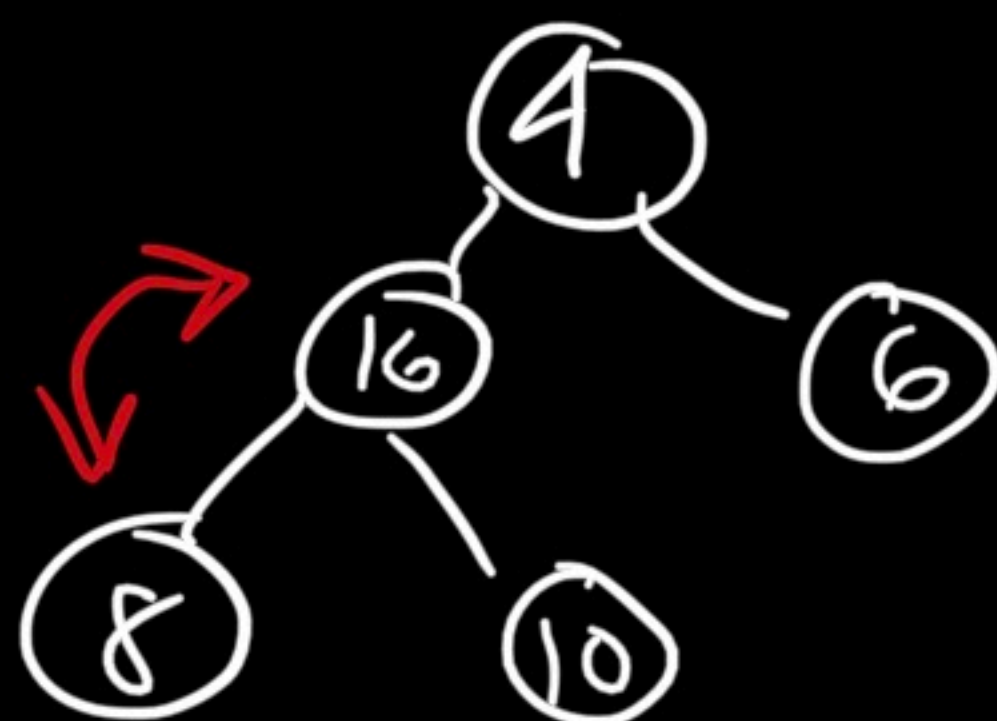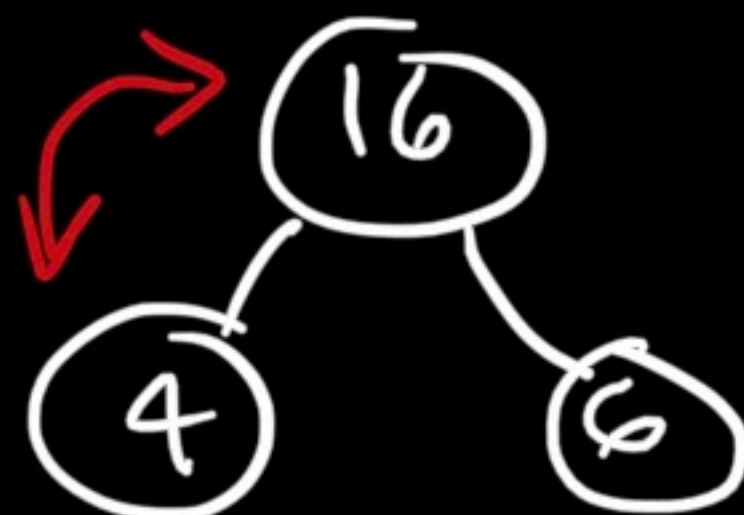
~~~~ all valid

initial array as bin tree

— assume leaf nodes are valid min heaps

first non-leaf

heapify (2) → 3 already valid unchanged //

8 9

heapify (1) → 6 ← swapped new state

11 12

heapify (0) → 3 ← swapped final state

6 10

final array

0						
3	6	10	11	12	8	9

part 1 a) build heap : min heap

0	1	2	3	4	5	6
10	12	3	11	6	8	9

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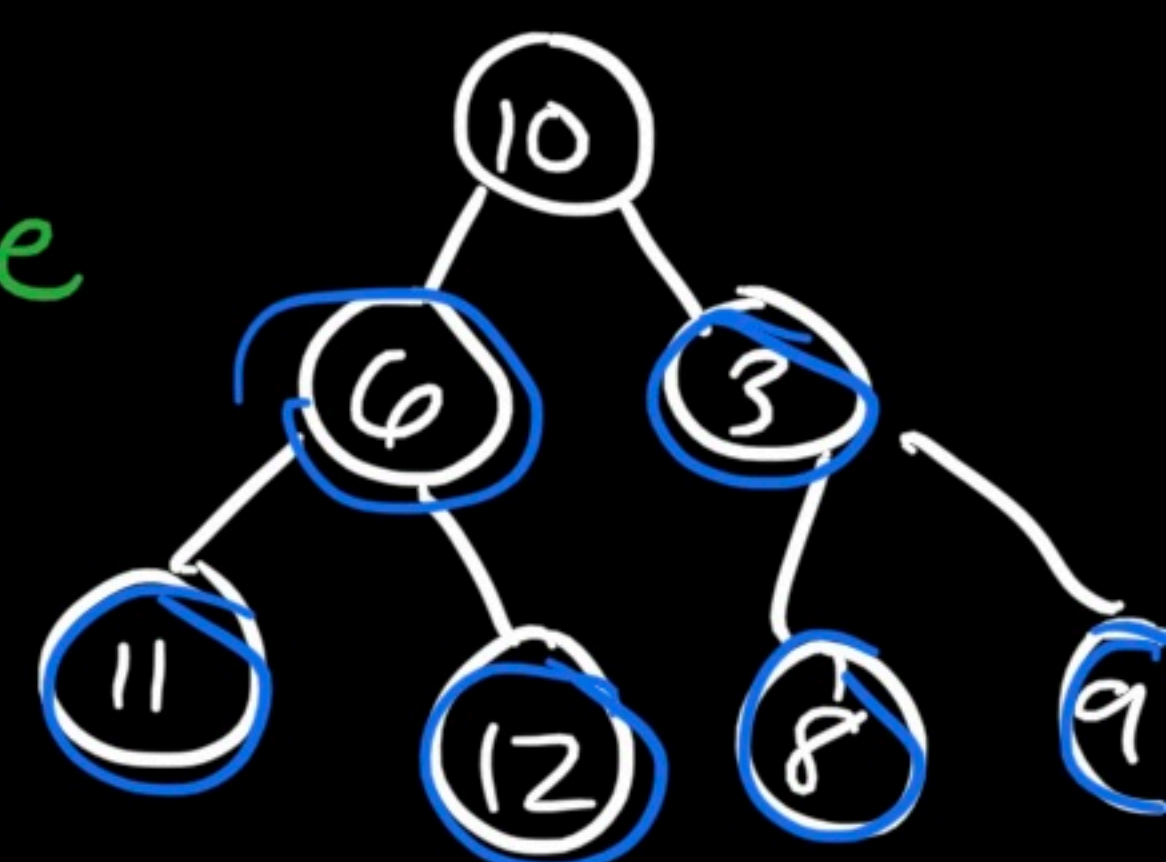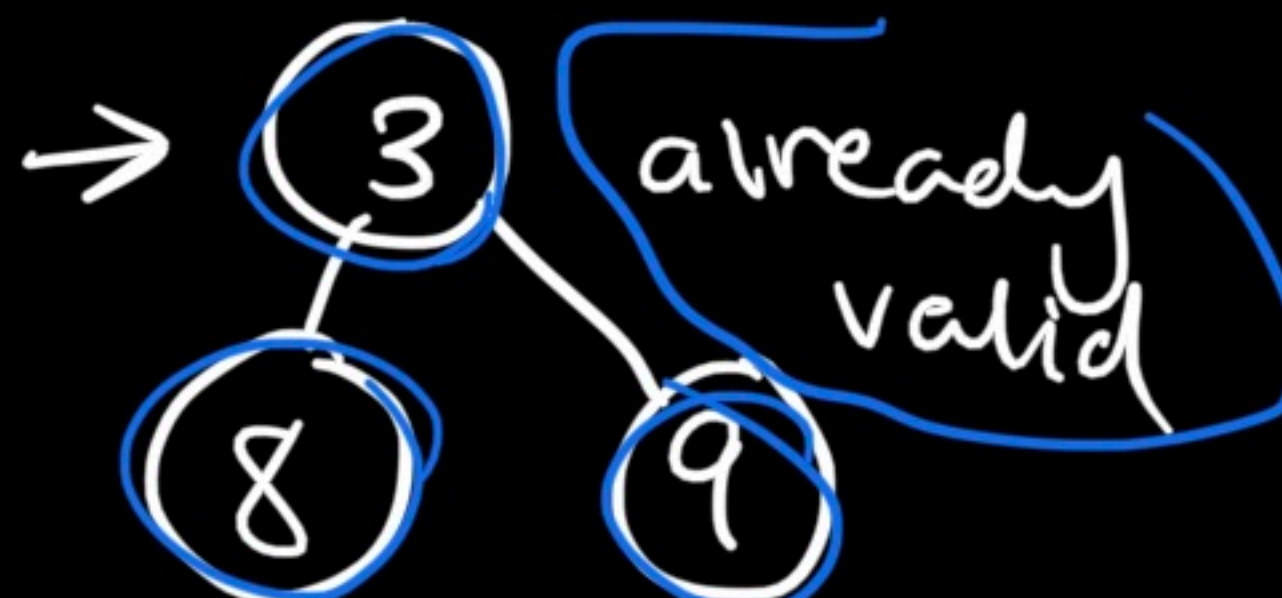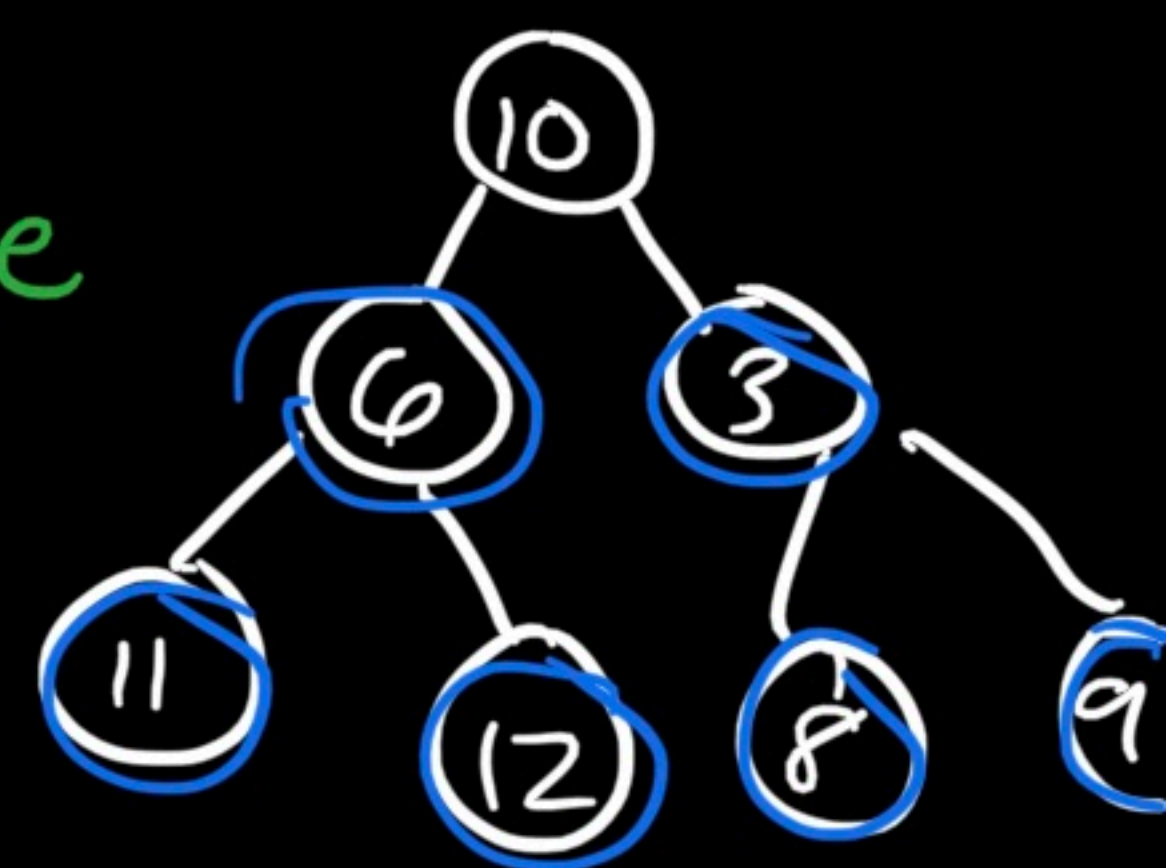heapify (2) → 3 already valid unchanged //

heapify (1) → 6 swapped new state

11   12

heapify (0) → 3 swapped final state

6   10

final array

0

final array

0

| 3 | 6 | 10 | 11 | 12 | 8 | 9 |

↑
min (aka top)
or root

part 1 b)

initial config:

0	1	2	3	4	5	6	7
2	4	6	8	10	12	14	16

insert : 3

↳ adds 3 to end then heapifies up

heapify up 3

heapify up 3
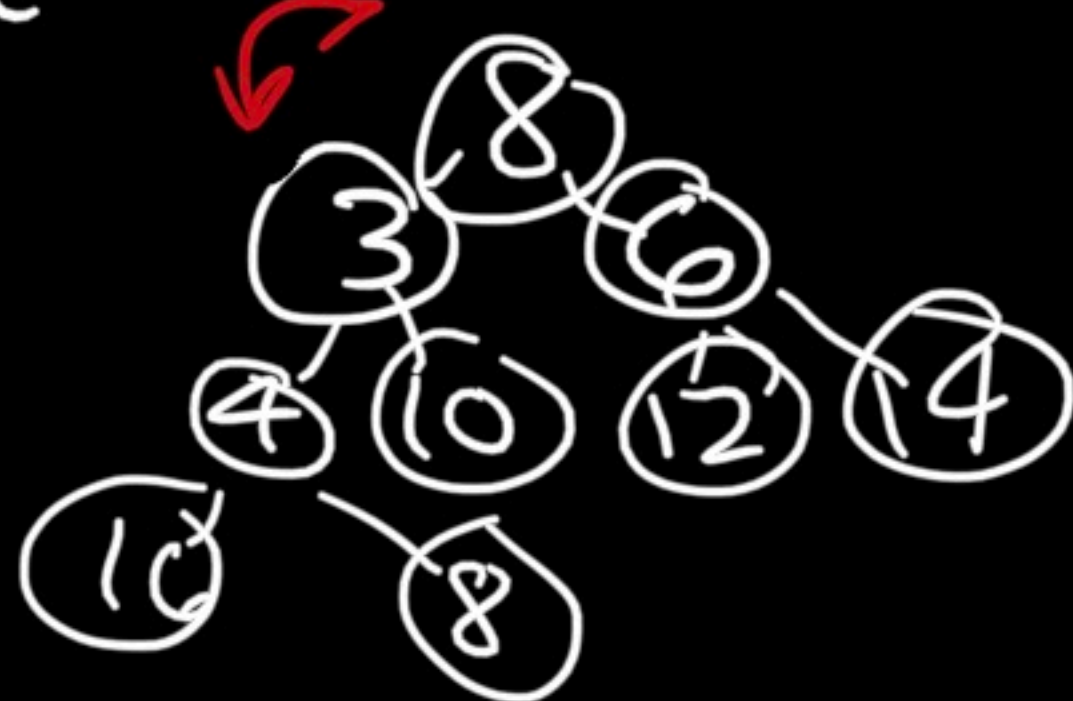
pop top

- swap first and last   2 2 8

pop top

- swap first and last   2 & 8
- pop last   ✗
- heapify down ✗

pop top

- swap top & last   3 & 16

- pop last   ✗

- heapify down

insert 5

- add to end
- heapify up