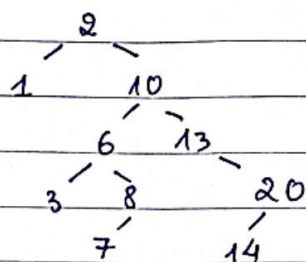
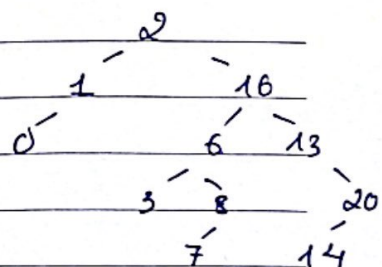


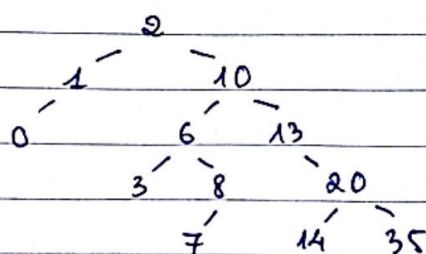
- Insert 14:



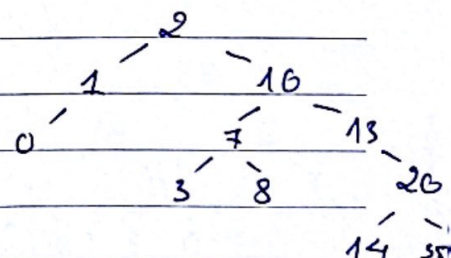
- Insert 0:



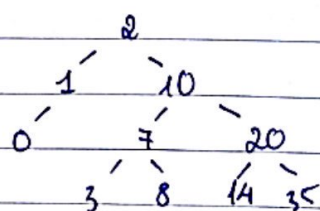
- Insert 35:



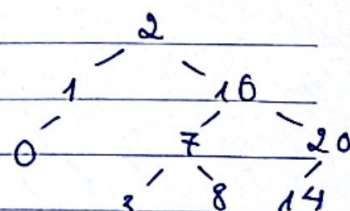
- Delete 6



- Delete 13:

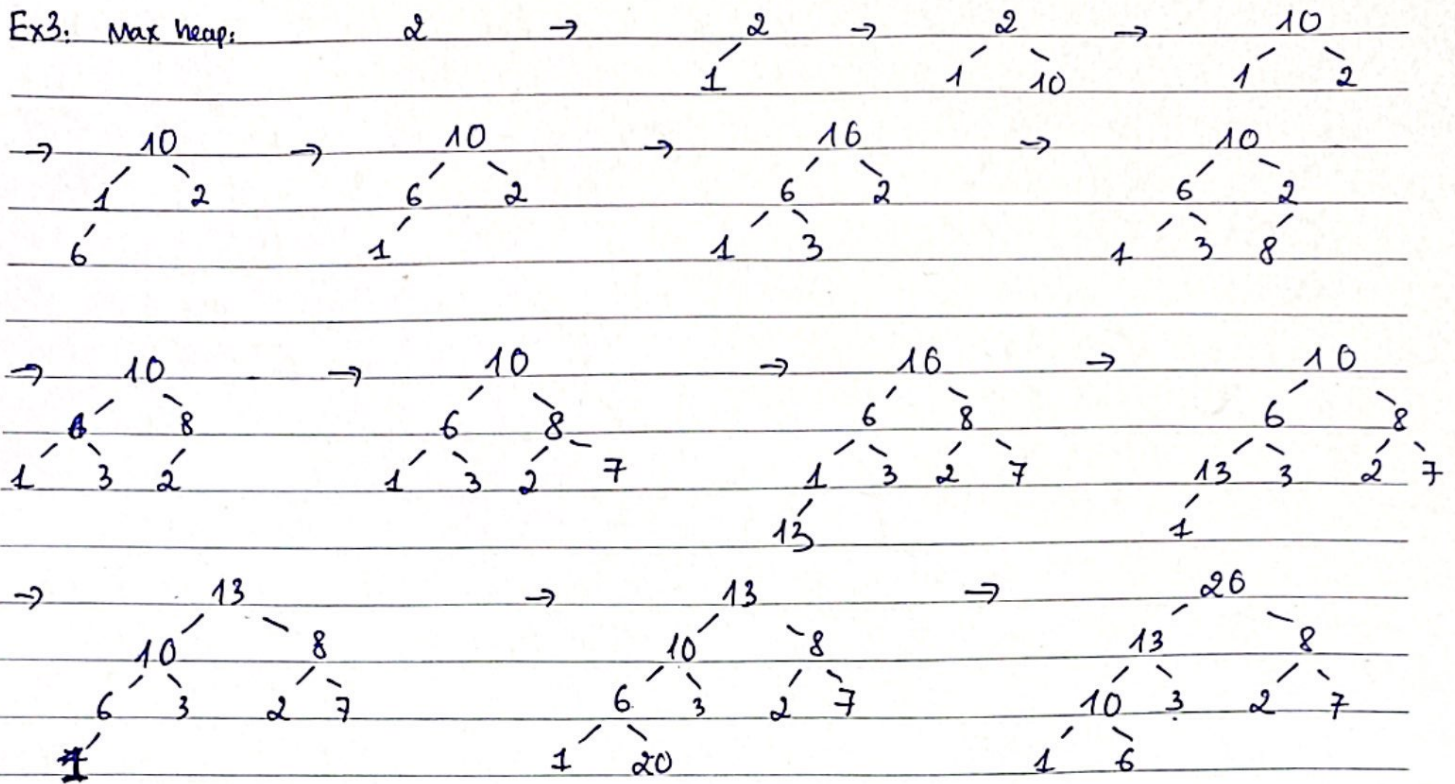


- Delete 35

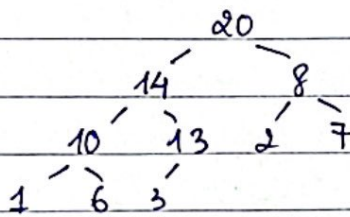


Memo No. \_\_\_\_\_

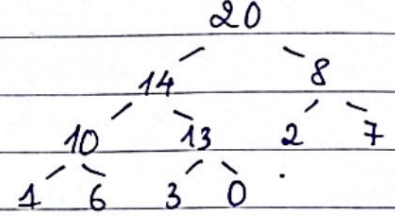
Date / /



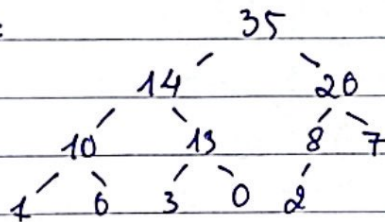
- Insert 14:



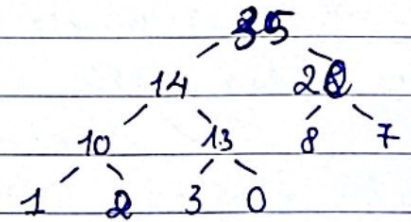
- Insert 0:



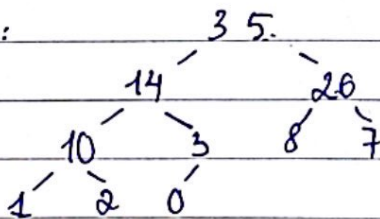
- Insert 35:



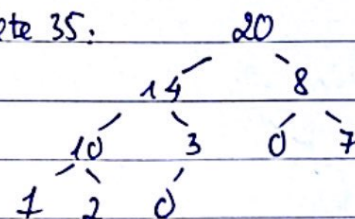
- Delete 6:



- Delete 13:



- Delete 35:



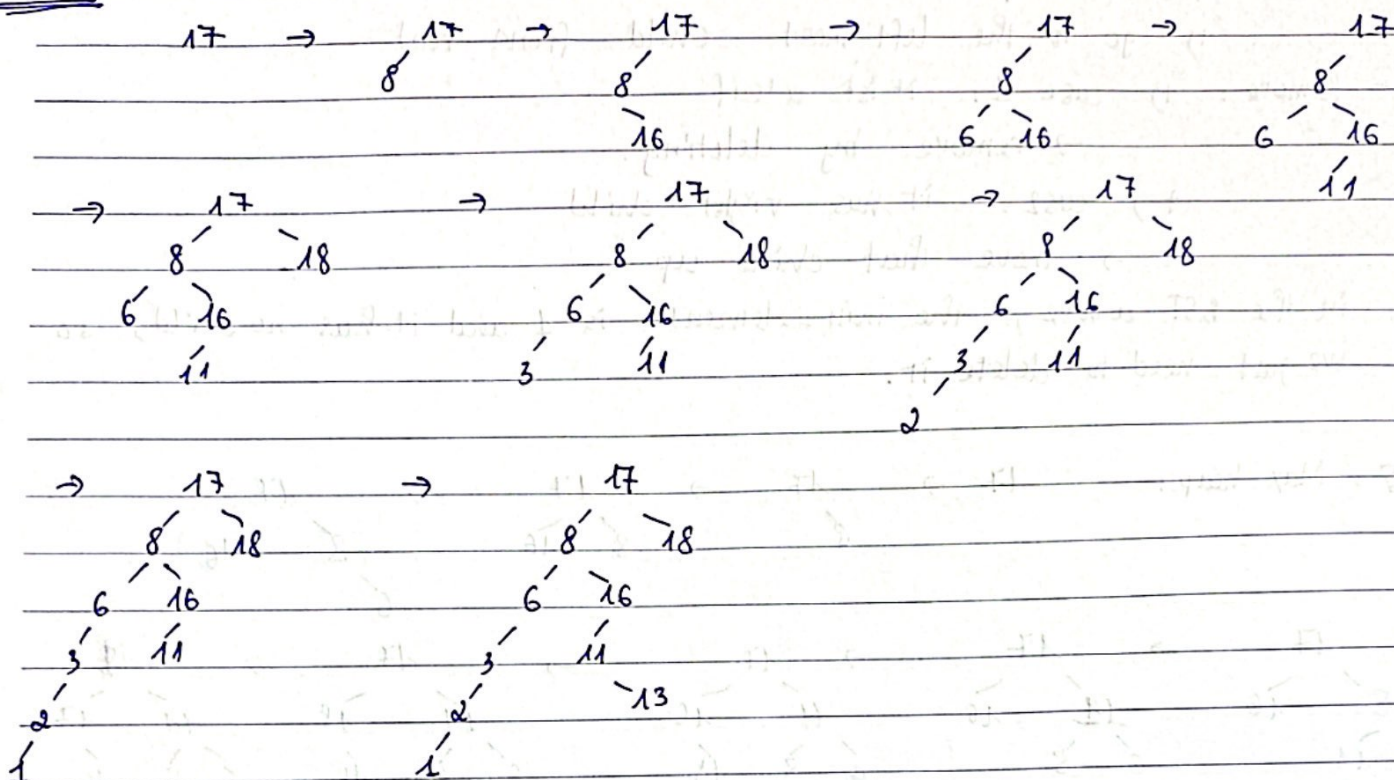


Memo No. \_\_\_\_\_

Date / /

List: 17, 8, 16, 6, 11, 18, 3, 2, 4, 13

Ex 8.4:



\* Find and remove the maximum element

- Find:  $\rightarrow$  start from root

$\rightarrow$  if right = null then root is biggest

$\rightarrow$  recursive to root  $\rightarrow$  right

- Remove:  $\rightarrow$  start from the maximum element (node)

$\rightarrow$  case 1: max-node = leaf (left = right = null)

$\rightarrow$  delete; set its parent to null.

$\rightarrow$  case 2: max-node has 1 child (of course the child is left)

$\rightarrow$  move its child up.

$\rightarrow$  case 3: it has 2 children

$\rightarrow$  go to its left child then find the most-right child of it

$\rightarrow$  replace it

- in the BST above, we can see the max-node is 18 and it has no child (a leaf), so we just have to delete it from the BST



\* Find and remove the minimum element

- Find: +) start from root

+ ) go to the left most child from root

- Remove: +) case 1: it is a leaf

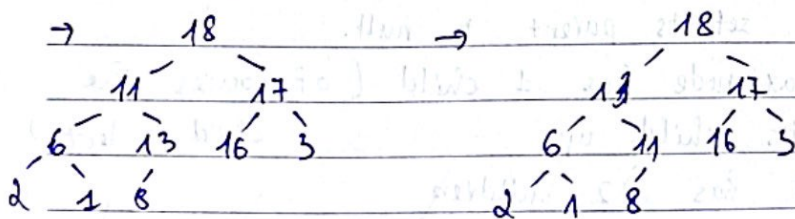
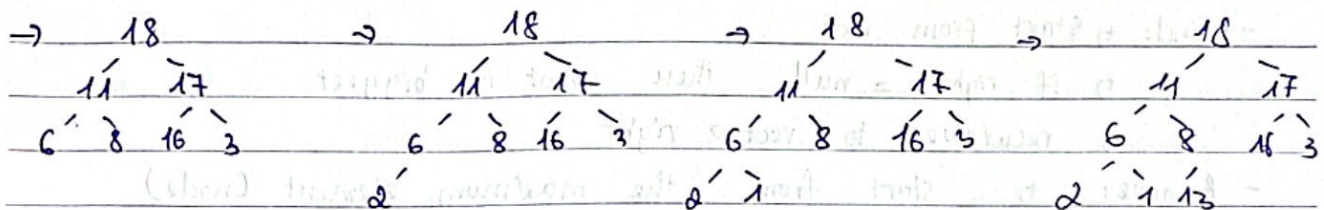
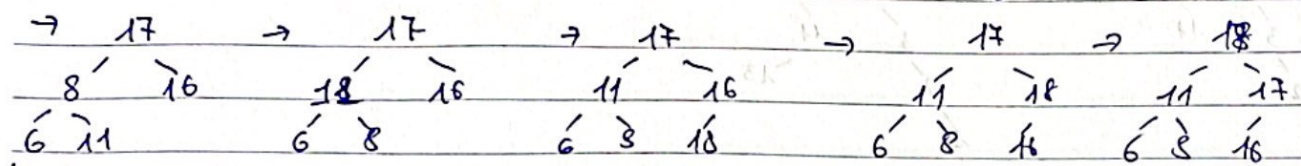
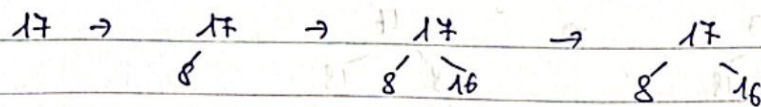
→ remove by deleting.

+ ) case 2: it has right child

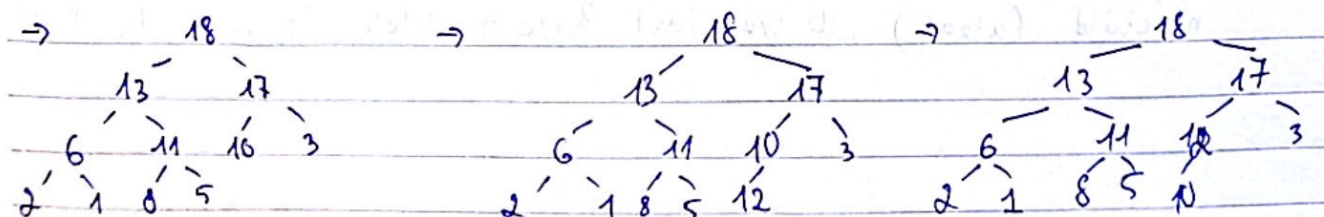
→ move that child up

- in the BST above, the min-element is 1 and it has no child, so we just need to delete it.

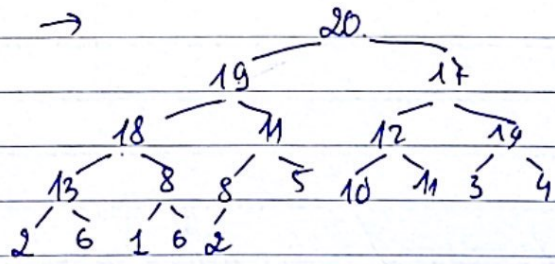
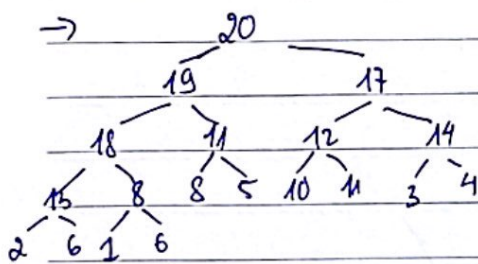
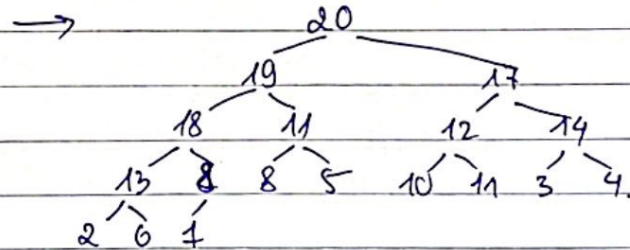
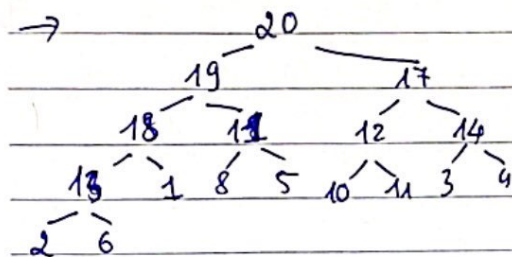
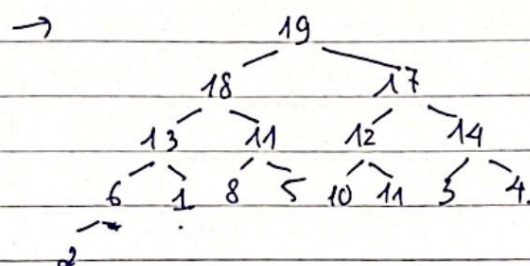
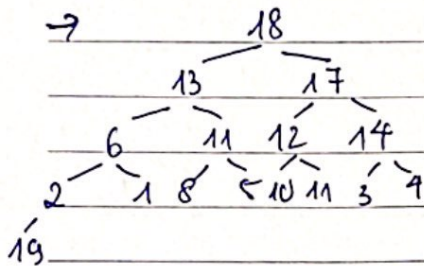
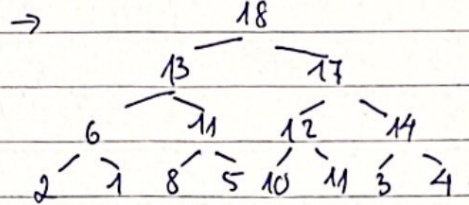
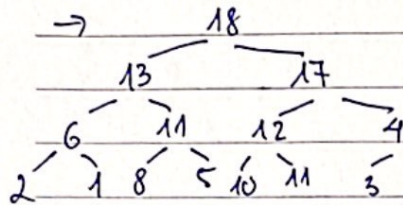
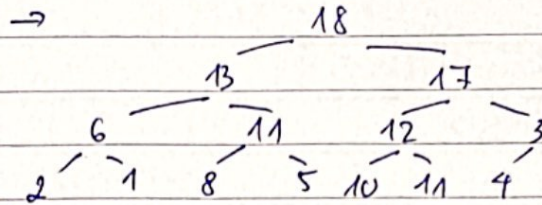
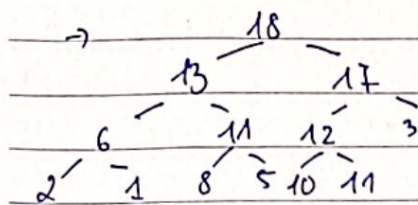
Ex 5: Max heap:



- another set of 10 int: 5, 12, 11, 4, 14, 19, 20, 8, 6, 2







\*) Find and remove maximum element.

- Always the root of the tree, particularly (20).

- Remove it and replace with the very last node of the tree: (2)

- Sink that node down so that it once again becomes a heap tree.

