CSCE 350
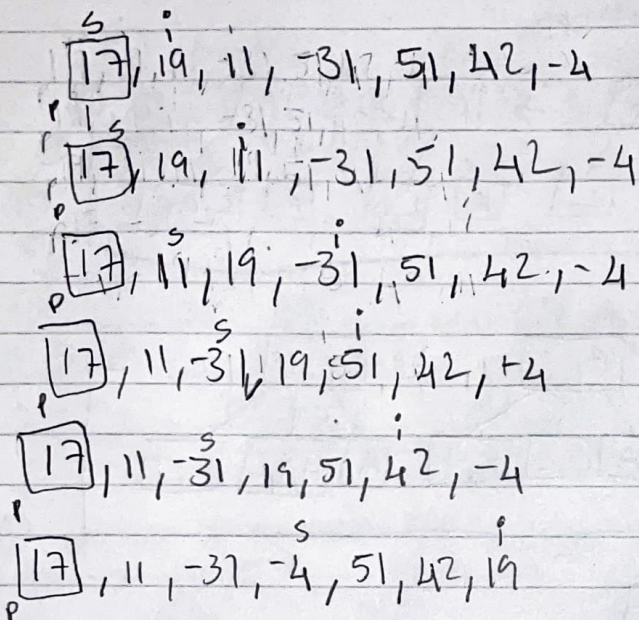
Homework #4

n = Total Elements = 7

1. $K = \lceil \frac{n}{2} \rceil = 4$

$\boxed{17}, 19, 11, -31, 51, 42, -4$

$\boxed{17}, 19, 11, -31, 51, 42, -4$

$\boxed{17}, 11, 19, -31, 51, 42, -4$

$\boxed{17}, 11, -31, 19, 51, 42, -4$
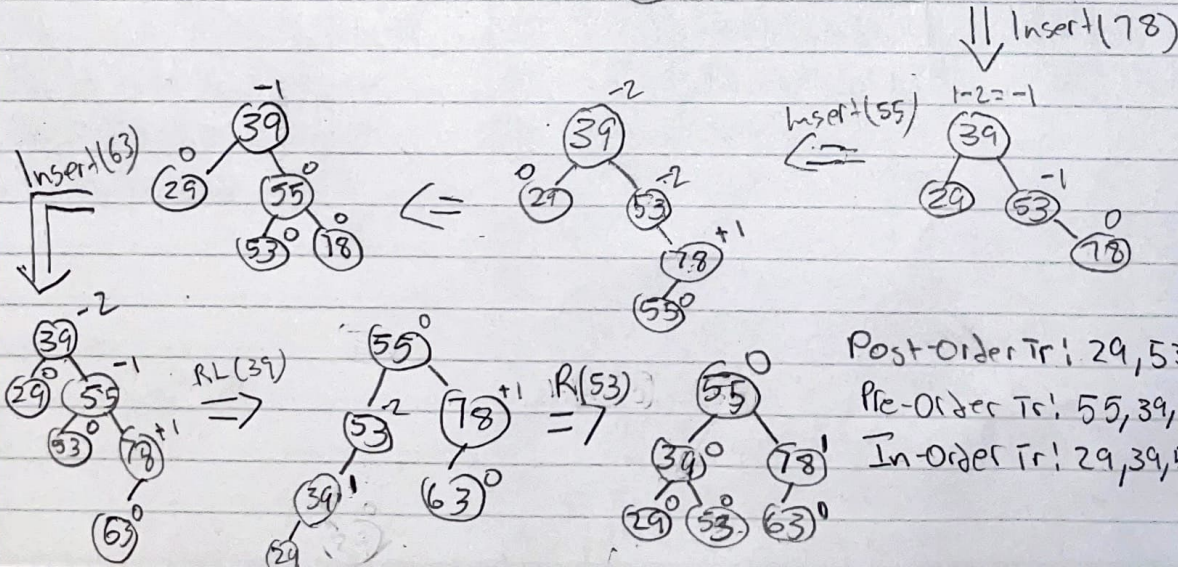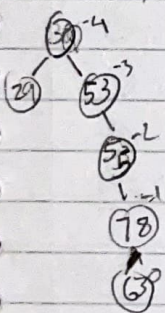
$\boxed{17}, 11, -31, 19, 51, 42, -4$

$\boxed{17}, 11, -31, -4, 51, 42, 19$

$-4, 11, -37, \boxed{17}, 51, 42, 19$, $S = 3 = K-1 = 3$, so the Median is 17

2. AVL Trees: Insert Nodes 53, 39, 29, 78, 55, 63

Insert(39)

(53) ⇒   (53) Insert(29) ⇒ (53) R(53) ⇒ (39)
         (39)   (39)   (29) (53)
                           (29)

|| Insert(78)

sit Nots!
(39)
(29) (53)
(53)
(78)
(63)

Insert(63)

(39)
(29) (55)
(53) (18)

⟸

(39)
(29) (53)
(78)
(55)

Insert(55) ⟸

(39)
(29) (53)
(78)

(39)
(29) (55)
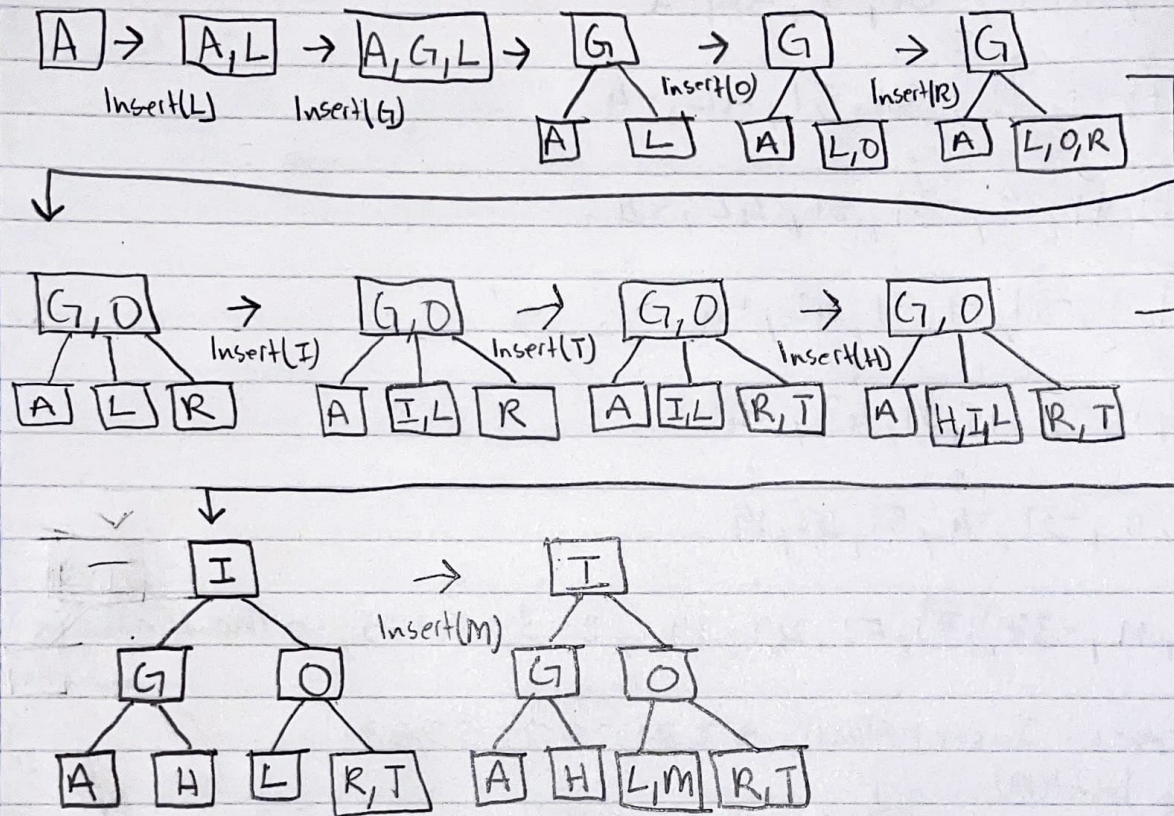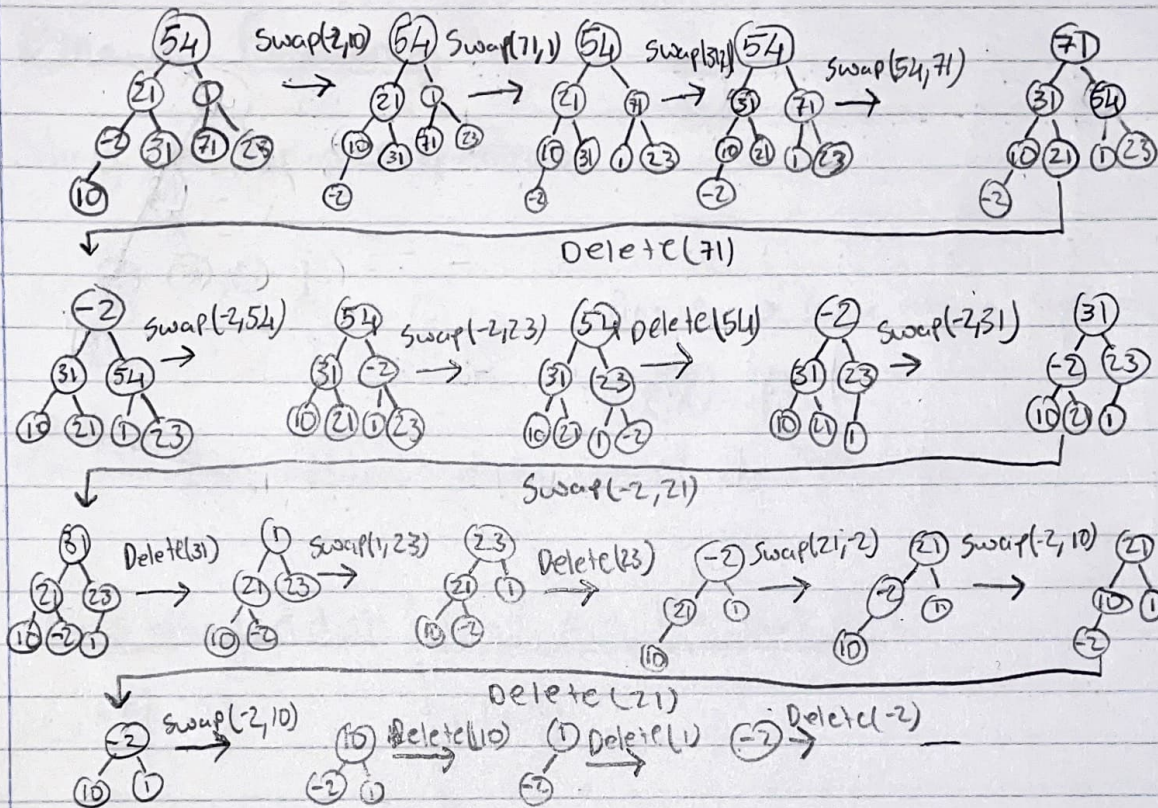(63) (78)

RL(39) ⇒

(55)
(53) (78)
(39) (63)
(29)

R(53) ⇒

(55)
(39) (78)
(29) (53) (63)
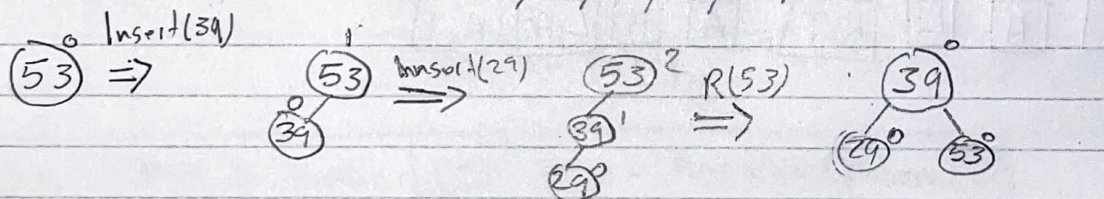
Post-Order Tr: 29, 53, 39, 63, 78, 55
Pre-Order Tr: 55, 39, 29, 53, 78, 63
In-Order Tr: 29, 39, 53, 55, 63, 78

3. Insert the following key values: A, L, G, O, R, I, T, H, M and construct a 2-3 tree, show all intermediate steps.

$\boxed{A} \rightarrow \boxed{A,L} \rightarrow \boxed{A,G,L} \rightarrow \boxed{G} \rightarrow \boxed{G} \rightarrow \boxed{G}$

Insert(L)   Insert(G)   Insert(O)   Insert(R)

$\boxed{A}$ $\boxed{L}$ $\boxed{A}$ $\boxed{L,O}$ $\boxed{A}$ $\boxed{L,O,R}$

$\boxed{G,O} \rightarrow \boxed{G,O} \rightarrow \boxed{G,O} \rightarrow \boxed{G,O}$

Insert(I)   Insert(T)   Insert(H)

$\boxed{A}$ $\boxed{L}$ $\boxed{R}$ $\boxed{A}$ $\boxed{I,L}$ $\boxed{R}$ $\boxed{A}$ $\boxed{I,L}$ $\boxed{R,T}$ $\boxed{A}$ $\boxed{H,I,L}$ $\boxed{R,T}$

$\boxed{I} \rightarrow \boxed{I}$

Insert(M)

$\boxed{G}$ $\boxed{O}$ $\boxed{G}$ $\boxed{O}$

$\boxed{A}$ $\boxed{H}$ $\boxed{L}$ $\boxed{R,T}$ $\boxed{A}$ $\boxed{H}$ $\boxed{L,M}$ $\boxed{R,T}$

4. 54, 21, 1, -2, 31, 71, 23, 10

Swap(2,10) Swap(71,1) Swap(31,?) Swap(54,71)

Delete(71)

Swap(-2,54) Swap(-2,23) Delete(54) Swap(-2,31)

Swap(-2,21)

Delete(31) Swap(1,23) Delete(23) Swap(21,-2) Swap(-2,10)

Delete(21)

Swap(-2,10) Delete(10) Delete(1) Delete(-2)

Sorted Array : -2, 1, 10, 21, 23, 31, 54, 71

Steps	Stage 1: Heap Construction	Steps	Stage 2: Max delete Operation	Steps	
①	54, 21, 1, -2, 31, 71, 23, 10	①	71, 31, 54, 10, 21, 1, 23, -2 | -2	⑫	21, 10, 1, -2 | 23, 31, 54, 71
②	54, 21, 1, 10, 31, 71, 23, -2	②	-2, 31, 54, 10, 21, 1, 23 | 71	⑬	-2, 10, 1 | 21, 23, 31, 54, 71
③	54, 31, 71, 10, 21, 1, 23, -2	③	54, 31, -2, 10, 21, 1, 23 | 71	⑭	10, -2, 1 | 21, 23, 31, 54, 71
④	71, 31, 54, 10, 21, 1, 23, -2	④	54, 31, 23, 10, 21, 1, -2 | 71	⑮	1, -2 | 10, 21, 23, 31, 54, 71
		⑤	-2, 31, 23, 10, 21, 1 | 54, 71	⑯	-2 | 1, 10, 21, 23, 31, 54, 71
		⑥	31, -2, 23, 10, 21, 1 | 54, 71	⑰	1 -2, 1, 10, 21, 23, 31, 54, 71
		⑦	31, 21, 23, 10, -2, 1 | 54, 71		↑
		⑧	1, 21, 23, 10, -2 | 31, 54, 71		
		⑨	23, 21, 1, 10, -2 | 31, 54, 71		Fully Sorted Array
		⑩	-2, 21, 1, 10 | 23, 31, 54, 71		
		⑪	21, -2, 1, 10 | 23, 31, 54, 71		

4. Stage 1: Heap Construction

<u>Steps</u>

① 54, 21, 1, -2, 31, 71, 23, 10
② 54, 21, 1, 10, 31, 71, 23, -2
③ 54, 31, 71, 10, 21, 1, 23, -2
④ 71, 31, 54, 10, 21, 1, 23, -2

Stage 2: Max delete Opration   Array

Steps.

① 71, 31, 54, 10, 21, 1, 23, -2
② -2, 31, 54, 10, 21, 1, 23 |71
③ 54, 31, -2, 10, 21, 1, 23
④ 54, 31, 23, 10, 21, 1, -2
⑤ -2, 31, 23, 10, 21, 1 | 54
⑥ 31, -2, 23, 10, 21, 1
⑦ 31, 21, 23, 10, -2, 1
⑧ 1, 21, 23, 10, -2 | 31
⑨ 23, 21, 1, 10, -2
⑩ -2, 21, 1, 10 | 23
⑪ 21, -2, 1, 10.
⑫ 21, 10, 1, -2
⑬ -2, 10, 1 | 21
⑭ 10, -2, 1
⑮ 1, -2 | 10
⑯ -2 | 1
⑰ -1 -2

Final Array