CS & IT ENGINEERING

Data Structure & Programming

Trees

DPP-05 Discussion Notes

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01 Question

02 Discussion

Q.1 The minimum number of nodes in AVL tree of height 6 is 20.
(Assume that the height of the root node is 1)

[NAT]

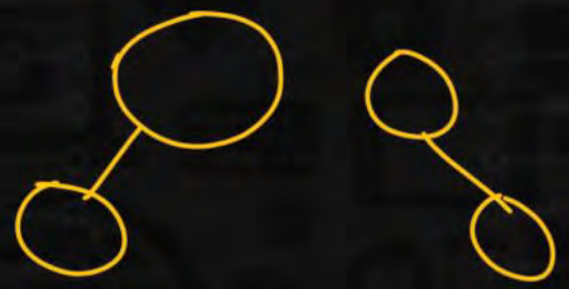
$n_{max} = 2^{h+1} - 1$

$n(h) = 1 + n(h-1) + n(h-2)$

$n(1) = 1$

$n(2) = 2$

$n(h)$: min. no. of nodes in an AVL tree of height h.



$n(1) = 1$
$n(2) = 2$
$n(3) = 1+2+1 = 4$
$n(4) = 1+4+2 = 7$
$n(5) = 1+7+4 = 12$
$n(6) = 1+12+7 = 20$

Q.2

Consider the following statements:

P: An AVL tree is a height-balanced complete binary tree.

Q: A heap is necessarily a complete binary tree.

Which of the following statement(s) is/are CORRECT?

[MCQ]

A. P only

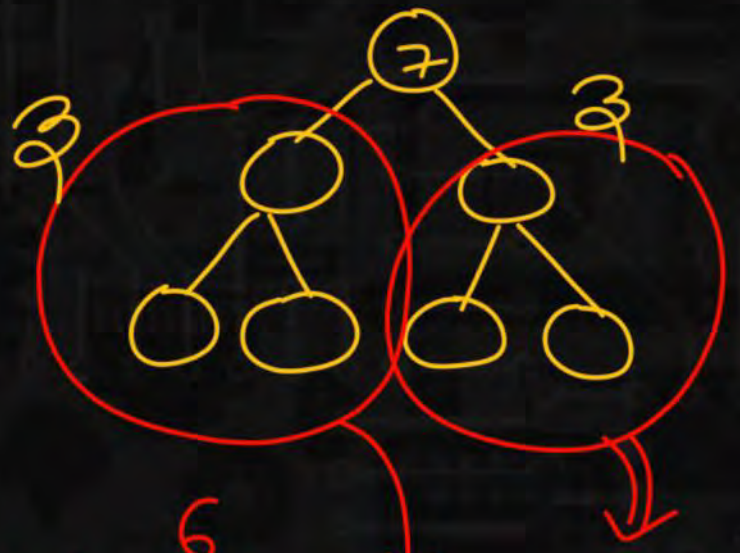
B. Q only

C. Both P and Q

D. Neither P nor Q

Q.3 The total number of ways in which a max-heap can be constructed with the keys-7, 6, 1, 4, 5, 2, 3 is 80.

[NAT]



$$F(7) = 1 \times {}^{6}C_3 \times F(3) \times F(3)$$

$$= \frac{6!}{3!3!} \quad 2 \times 2$$

$$= \frac{6 \times 5 \times 4 \times 3!}{3! \times 3!} \times 4 = 80$$

No. of max. heap with 7 keys $= {}^{6}C_3 \times x \times y$

x (No. of max. heap with selected 3 keys)

y (No. of max heap possible with rem. 3 keys)

$$F(n) = 1 \times {}^{n-1}C_k \times F(k) \times F(n-1-k)$$

10, 20, 30

$F(1) = 1$

$F(2) = 1$

$F(3) = 2$

$1 \times {}^{2}C_1 \times F(1) \times F(1)$

$= 2 \times 1 \times 1$

$= 2$

Q.4

Consider the following statements:

P: If the root node of a BST is deleted, it can be replaced by inorder predecessor. Correct

Q: If the root node of a BST is deleted, it can be replaced by preorder successor. ✗

Which of the following is/are CORRECT

Root → leaf

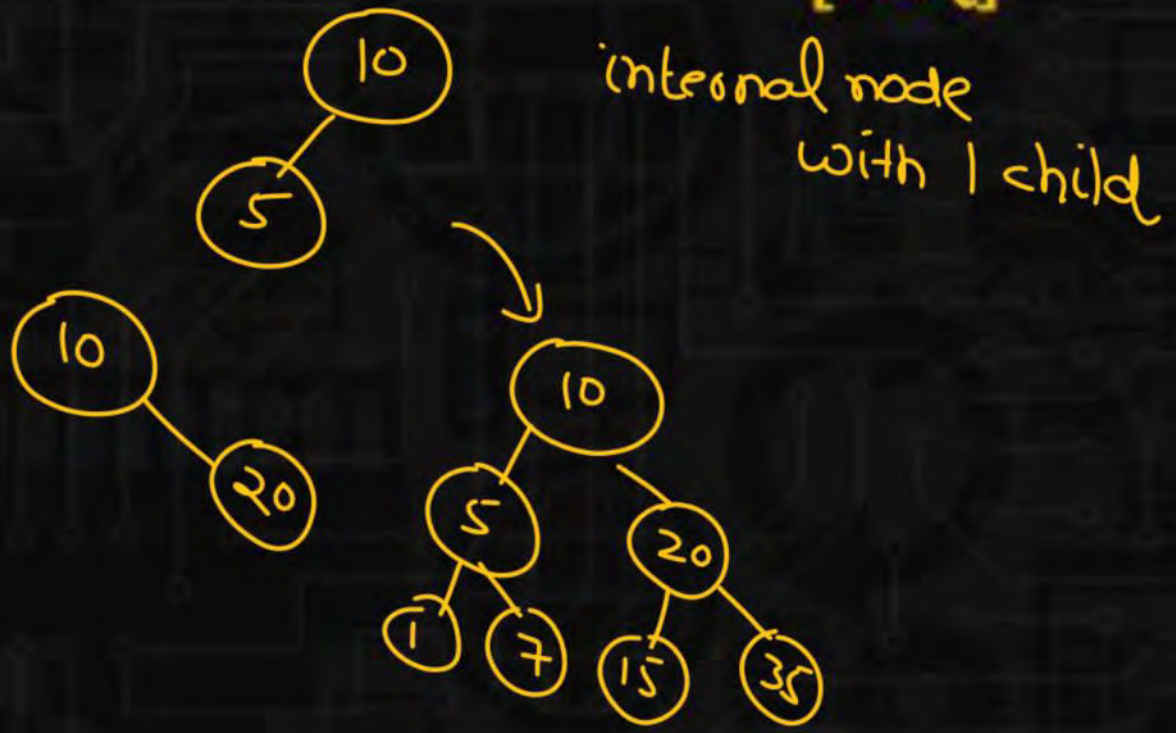
[MCQ]

A. P only

B. Q only

C. Both P and Q

D. Neither P nor Q



Q.5

Consider the following operations in a BST-
INSERT(23), INSERT(17), INSERT(25), INSERT(4), INSERT(21), INSERT(1), INSERT(7), DELETE(17), DELETE(23).
The post-order traversal of the resultant BST is-

[MSQ]

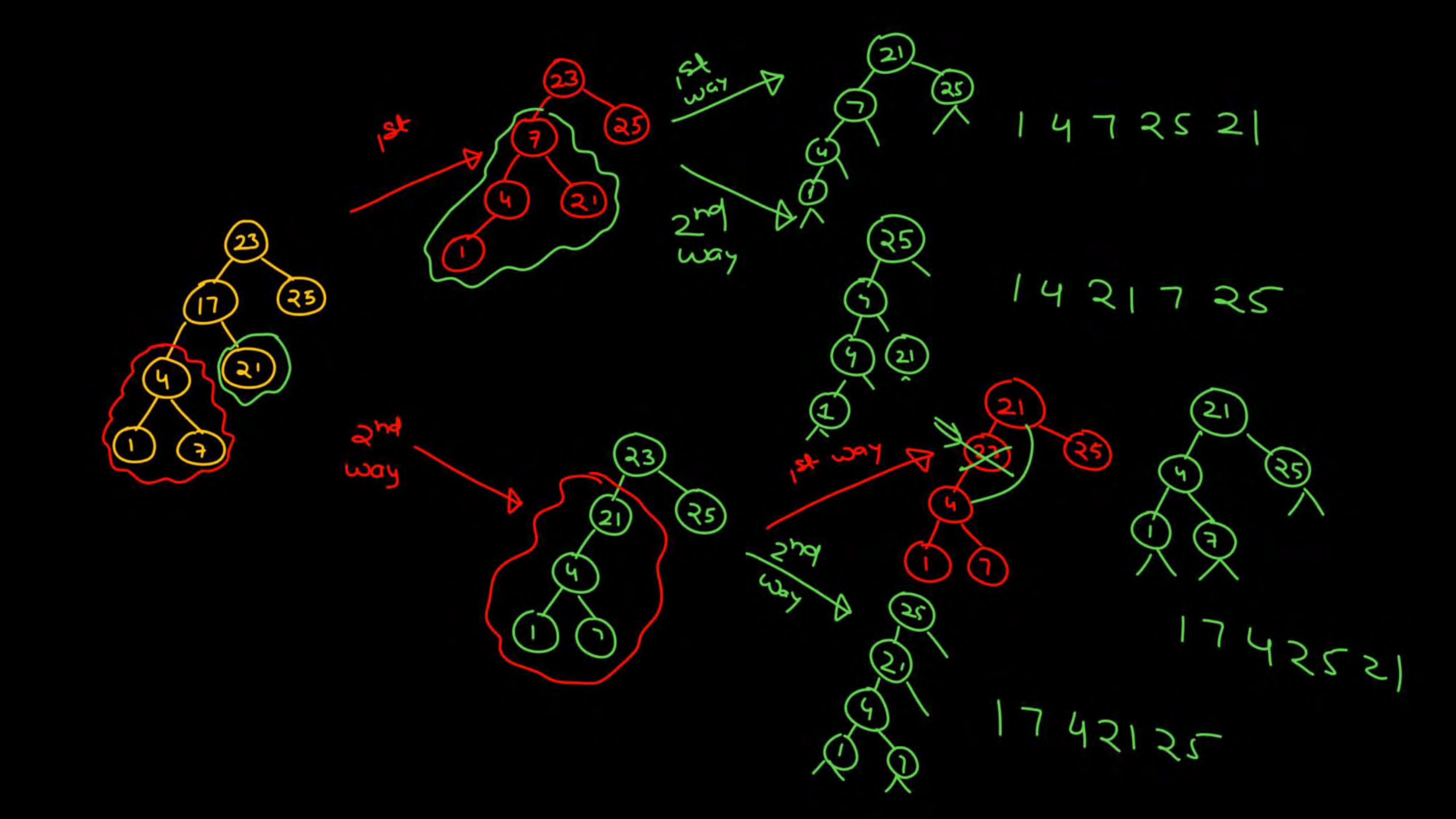
A, B, C

A. 1, 7, 4, 21, 25

B. 1, 4, 7, 25, 21

C. 1, 4, 21, 7, 25

D. None of the above


1st
2nd
1st way
2nd way
1 4 7 25 21
1 4 21 7 25
1 7 4 25 21
1 7 4 21 25

Q.6

Which of the following sequence(s) of array form a heap?

[MSQ]

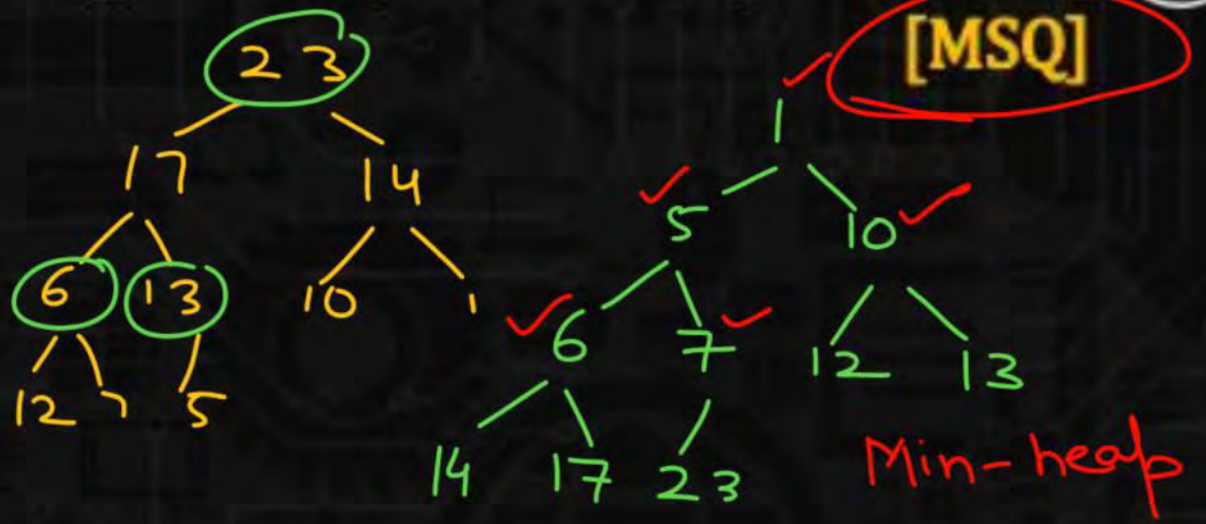
B, C

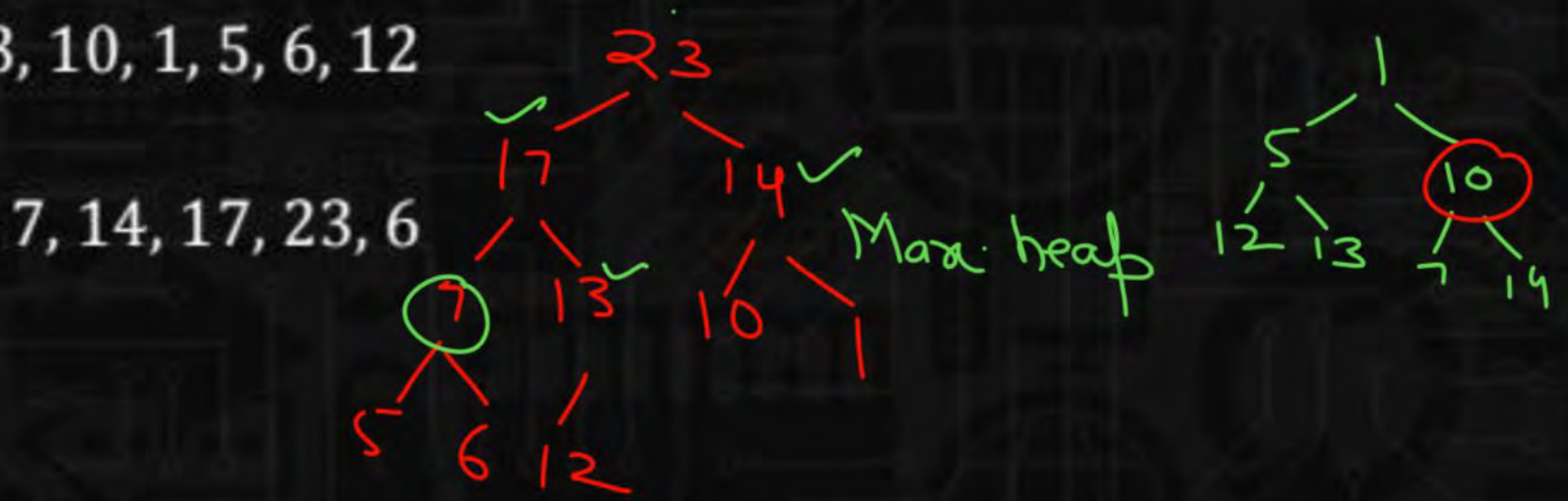
A. 23, 17, 14, 6, 13, 10, 1, 12, 7, 5

B. 1, 5, 10, 6, 7, 12, 13, 14, 17, 23

C. 23, 17, 14, 7, 13, 10, 1, 5, 6, 12

D. 1, 5, 10, 12, 13, 7, 14, 17, 23, 6





Q.7

Consider the following statements:

P: The accepted balanced factor in an AVL tree are –1, 0 and +1.

Q: The height of an AVL tree with n nodes is given as $\lceil \log_2 n \rceil$.

The number of INCORRECT statements is ____.

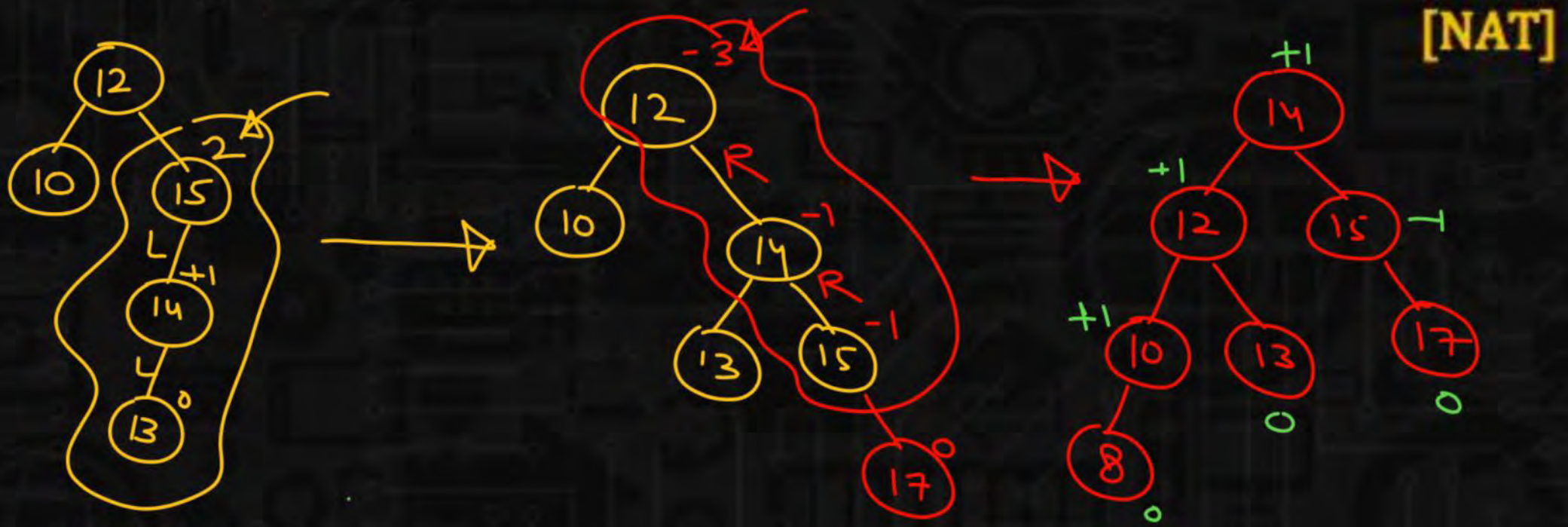
[NAT]

Q.8

Construct an AVL tree with the following keys:
12, 10, 15, 14, 13, 17, 8

The immediate left child key value of the root node of the AVL tree is 12.

[NAT]




THANK YOU GW
SOLDIERS !