

# Doubt Clearing Session

Course on C-Programming & Data Structures: GATE - 2024 & 2025

# Data Structure DPP & Doubts

By: Vishvadeep Gothi



*DPP*

# Question

A Binary search Tree (BST) store value in the range 37 to 573.  
Consider the following sequences of keys.

- I. 81, 537, 102, 439, 285, 376, 305
- II. 52, 97, 121, 195, 242, 381, 472
- III. 142, 248, 520, 386, 345, 270, 307
- IV. 550, 149, 507, 395, 463, 402, 270

only III

Suppose the BST has been unsuccessfully searched for key 273.  
Which all of the above sequences list nodes in the order in which we  
could have encountered them in the search

# Question

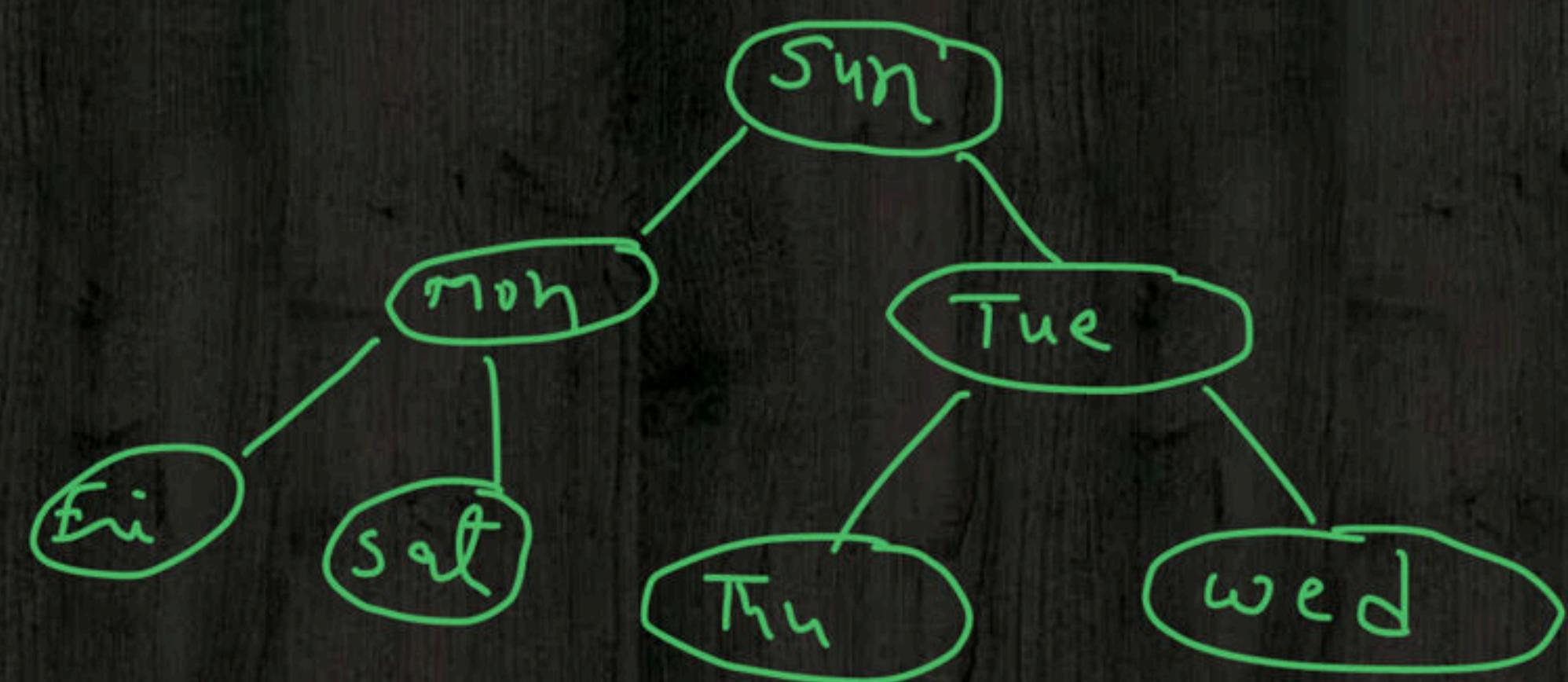
Identify correct or wrong searching sequence for searching 50.

- 1. 80, 73, 65, 45, 57, 49, 71, 82, 50
- 2. 40, 45, 90, 80, 70, 60, 63, 36, 50
- 3. 24, 33, 46, 98, 47, 80, 75, 61, 48, 50
- 4. 28, 95, 29, 94, 37, 85, 39, 71, 43, 50
- 5. 36, 39, 84, 81, 73, 67, 45, 59, 35, 50

# Question

Construct BST using keys: Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday

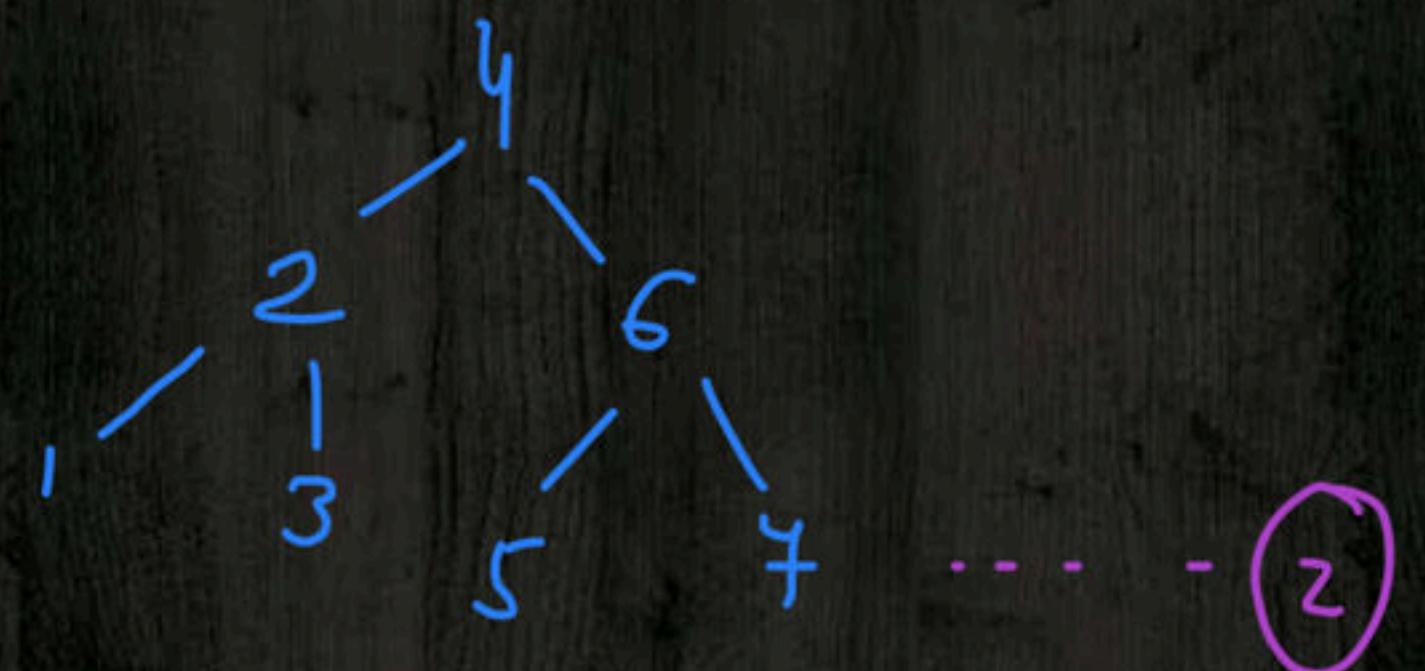
Number of leaf nodes in the tree are? 4



# Question

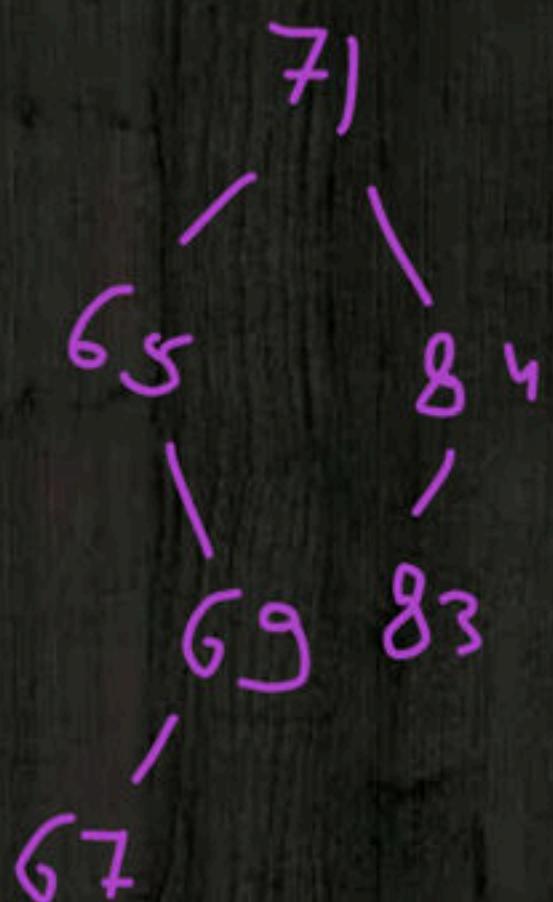
Construct BST using keys: 4, 2, 6, 5, 1, 3, 7

What is the maximum level number in tree? *Ans = 2*



# Question GATE-2015

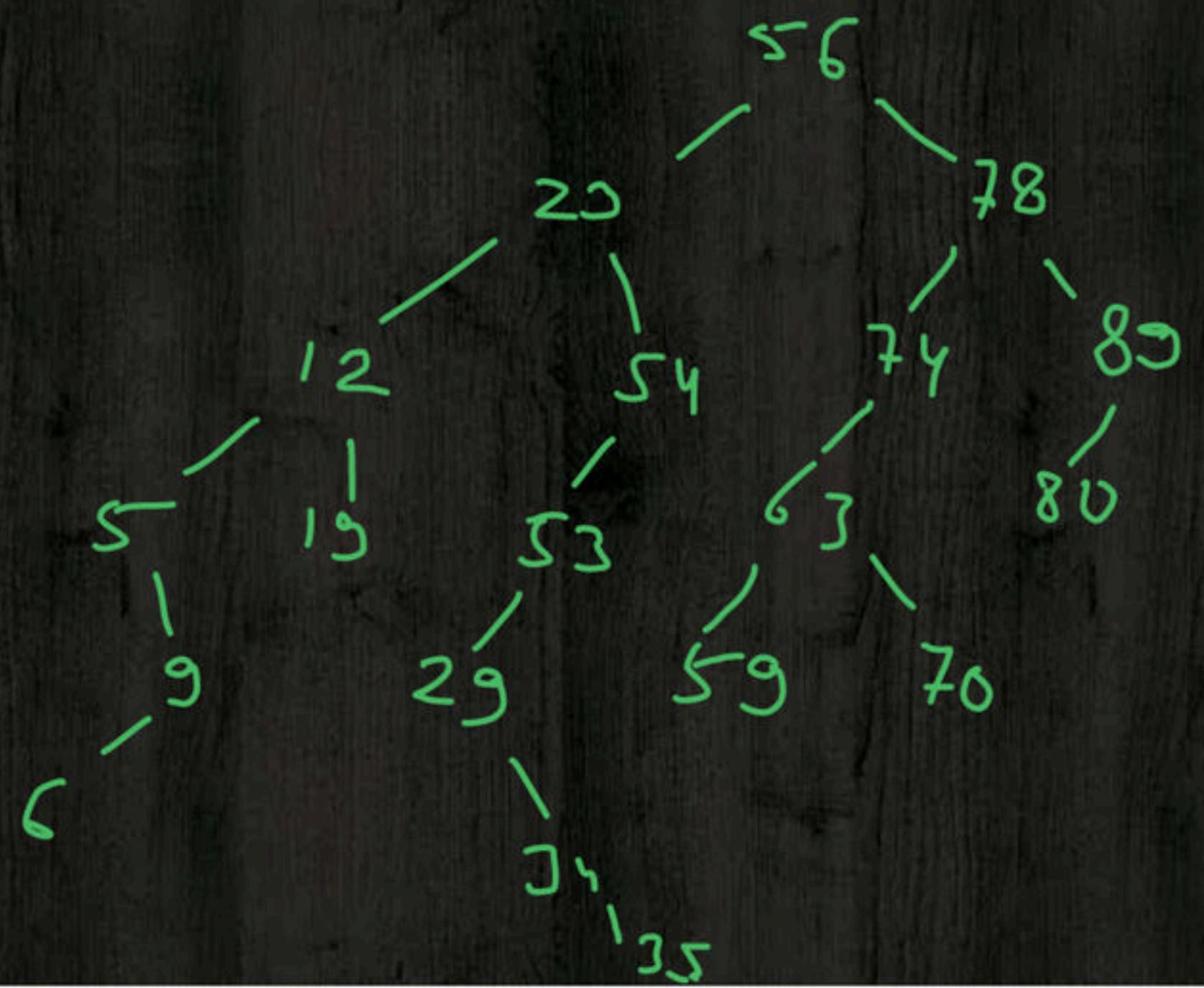
While inserting the elements 71, 65, 84, 69, 67, 83 in an empty binary search tree (BST) in the sequence shown, the element in the lowest level is



Ans = 67

# Question

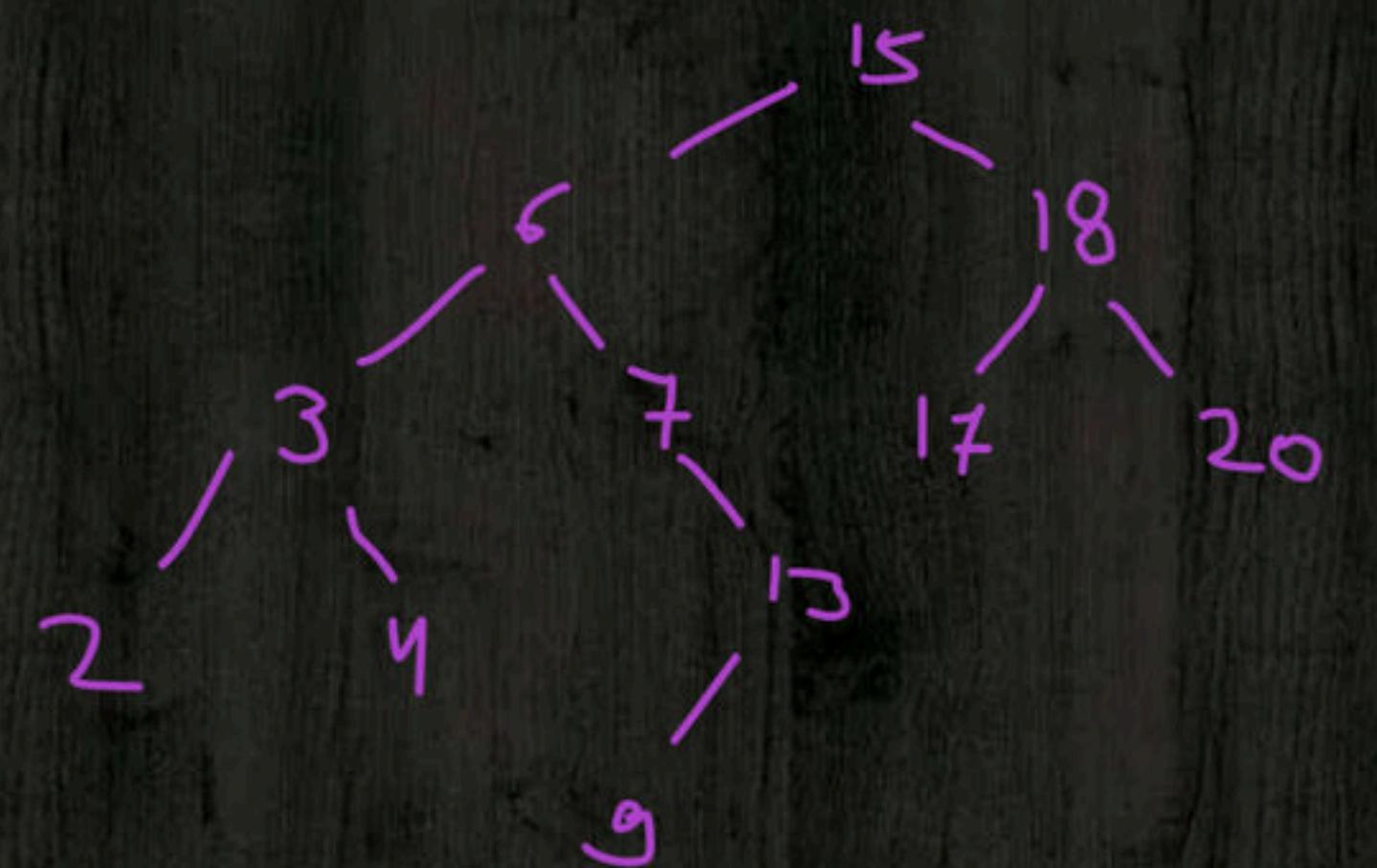
While inserting the elements 56, 23, 78, 54, 53, 89, 74, 12, 5, 29, 34, 9, 6, 63, 70, 59, 80, 19, 35 in an empty binary search tree (BST) in the sequence shown, the maximum level number in the tree is?



Ans = 6

# Question

The Postorder traversal of a binary search tree is 2, 4, 3, 9, 13, 7, 6, 17, 20, 18,. Which one of the following is the preorder traversal of the tree ?

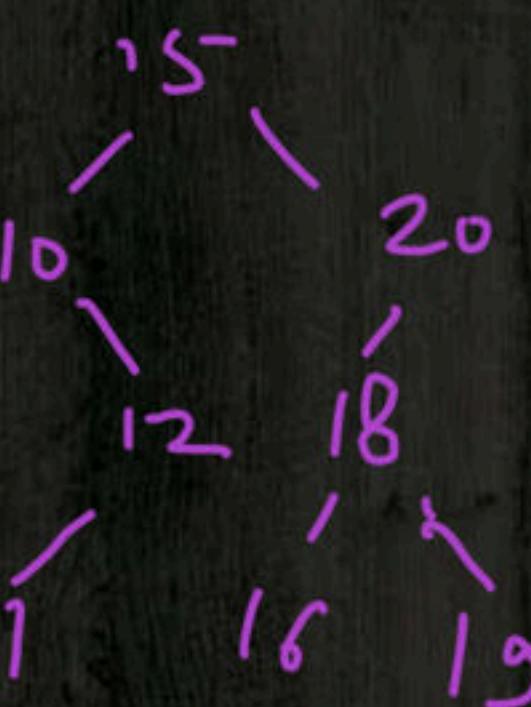


Pre:- 15, 6, 3, 2, 4, 7, 13, 9, 18, 17, 20

# Question GATE-2020

The preorder traversal of a binary search tree is 15, 10, 12, 11, 20, 18, 16, 19. Which one of the following is the postorder traversal of the tree ?

- (A) 10, 11, 12, 15, 16, 18, 19, 20
- (B) 11, 12, 10, 16, 19, 18, 20, 15
- (C) 20, 19, 18, 16, 15, 12, 11, 10
- (D) 19, 16, 18, 20, 11, 12, 10, 15

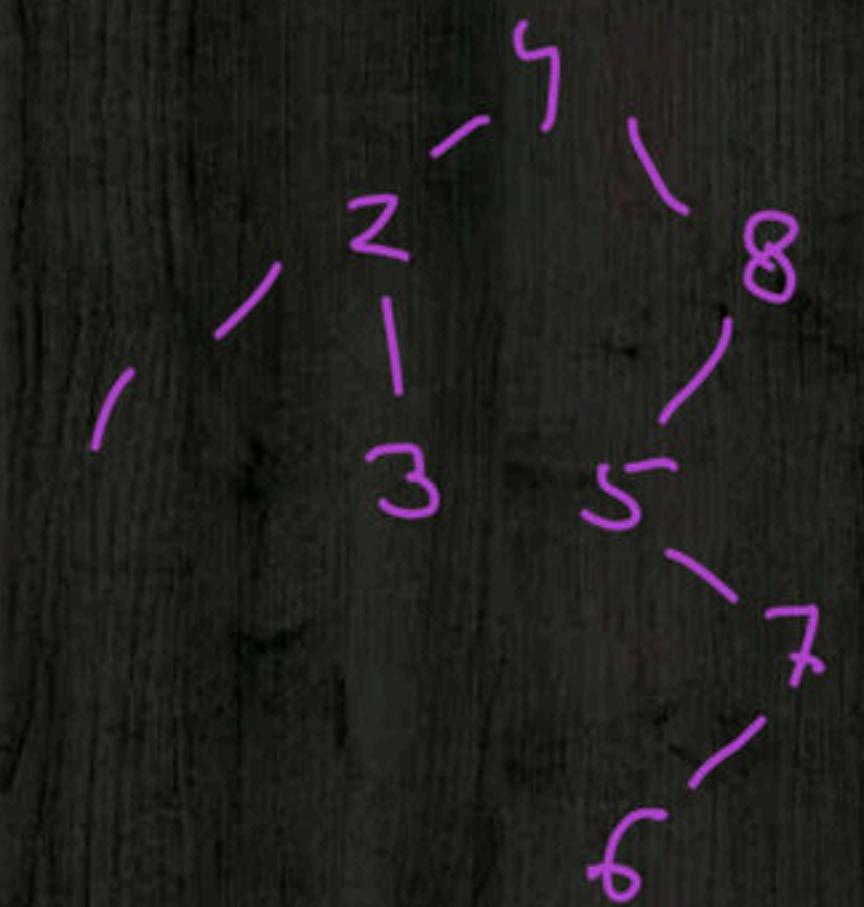


11, 12, 10, 16, 15, 18, 19, 20, 15

# Question

A binary search tree contains the value 1,2,3,4,5,6,7,8. The tree is traversed in pre-order and the values are printed out. Which of the following sequences is a valid output?

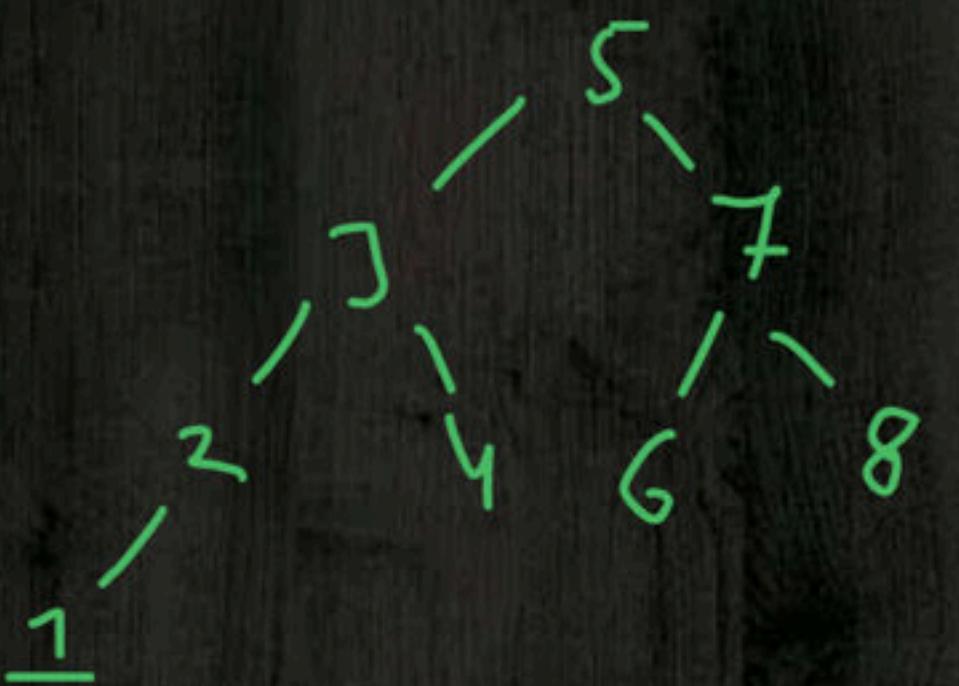
- A 4 2 1 3 8 6 7 5
- B 4 2 3 1 8 5 7 6
- C 4 2 1 3 7 6 8 5
- D 4 2 1 3 8 5 7 6



# Question

A binary search tree contains the value 1,2,3,4,5,6,7,8. The tree is traversed in post-order and the values are printed out. Which of the following sequences is a valid output?

- A. 1 2 4 3 8 6 7 5
- B. 1 4 2 3 6 8 7 5
- C. 1 2 4 6 3 8 7 5
- D. 1 2 4 3 6 8 7 5





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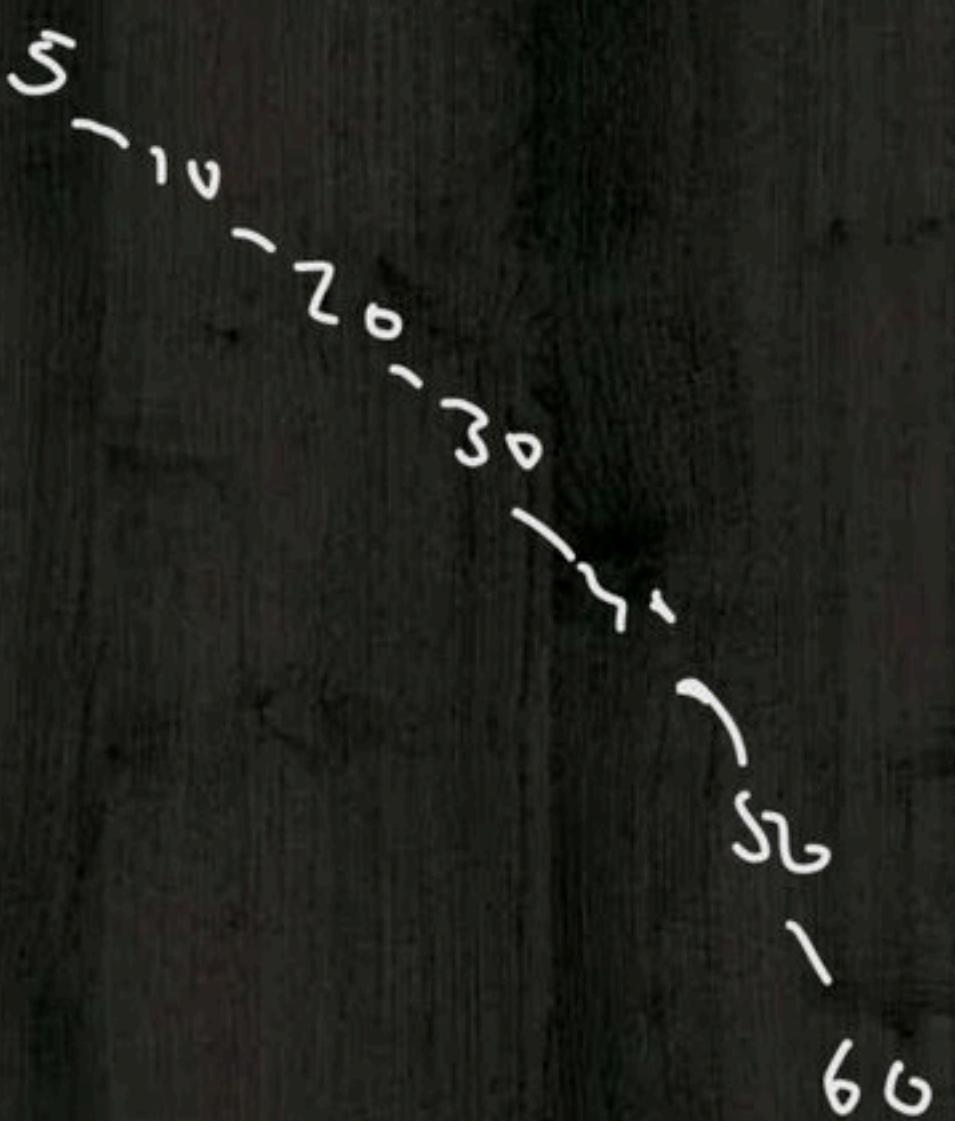
Ans = 1

# Question 1

When searching for a key value 60 in a BST, nodes containing the key values 5, 10, 20, 30, 40, 50 are traversed, not necessarily in the same order given. How many different orders are possible in which these key values can occur on the search path from the root to the node containing the value 60?

$$\begin{array}{c} \overline{5, 10, 20, 30, 40, 50} \\ | \\ \overline{6} \\ | \\ \overline{0} \end{array}$$

$$= \frac{6!}{6! * 0!} = 1$$



$A_m = 70$

## Question 2

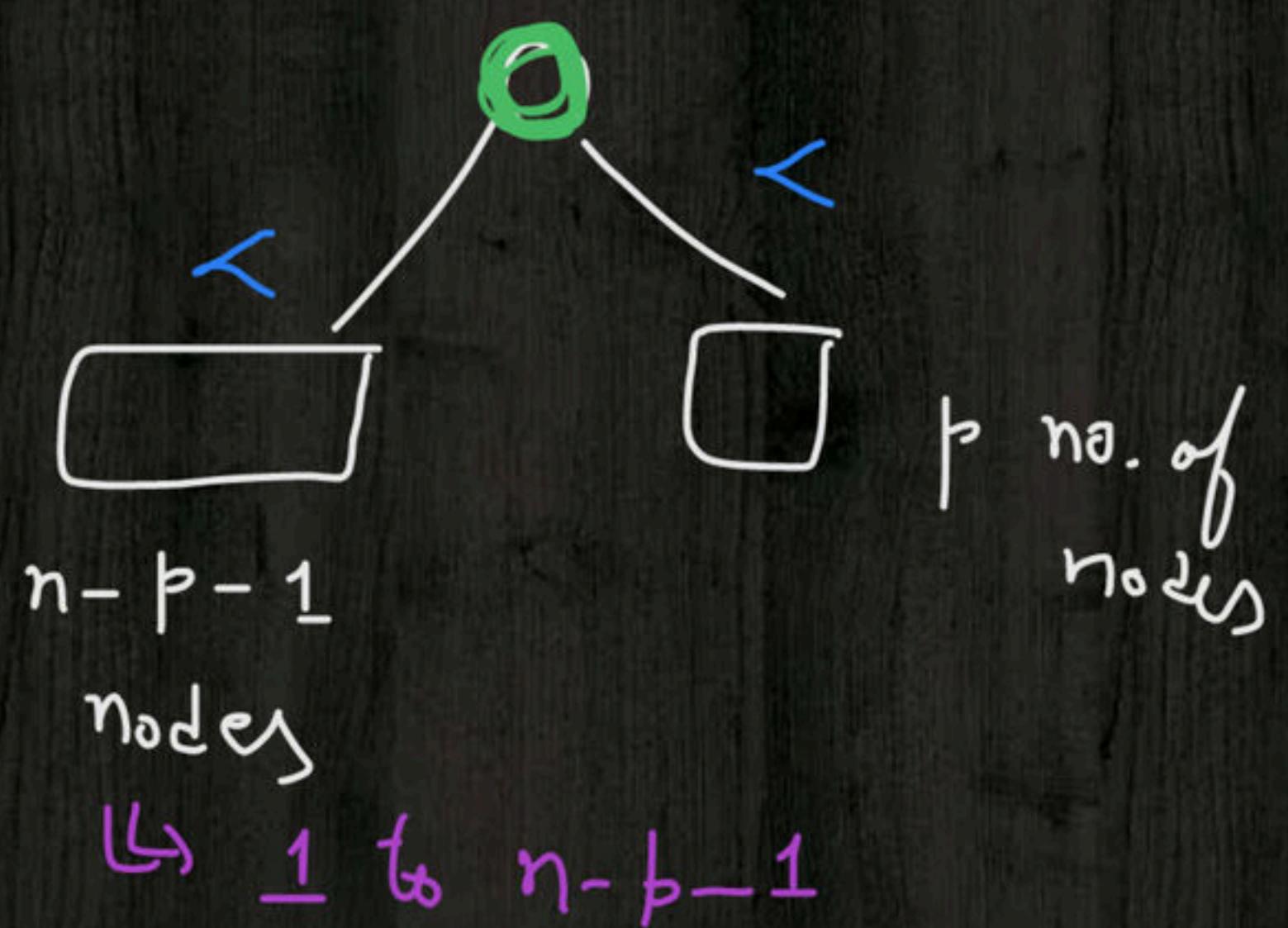
When searching for a key value 50 in a BST, nodes containing the key values ~~12, 18, 27, 43, 64, 78, 81, 90~~ are traversed, not necessarily in the same order given. How many different orders are possible in which these key values can occur on the search path from the root to the node containing the value 50?

$$\frac{8!}{4! \times 4!} = \frac{8^2 \times 7^2 \times 6^2 \times 5^2}{4^2 \times 3^2 \times 2^2 \times 1^2} = 70$$

# Question 3 GATE-2005

The numbers  $1, 2, \dots, n$  are inserted in a binary search tree in some order. In the resulting tree, the right subtree of the root contains  $p$  nodes. The first number to be inserted in the tree must be

- A.  $p$       B.  $p + 1$       C.  ~~$n - p$~~       D.  $n - p + 1$



$$\frac{n - p - 1 + 1}{2} = n - p$$

$n = 50$   
 $p = 20$

Diagram of a binary search tree with root node 30. The left child is node 29 and the right child is node 26. Both nodes 29 and 26 are labeled "nodes".

# Question 4 GATE-2008

You are given the postorder traversal,  $P$ , of a binary search tree on the  $n$  elements  $1, 2, \dots, n$ . You have to determine the unique binary search tree that has  $P$  as its postorder traversal. What is the time complexity of the most efficient algorithm for doing this?

- A.  $\Theta(\log n)$
- B.  $\Theta(n)$
- C.  $\Theta(n \log n)$
- D. None of the above, as the tree cannot be uniquely determined

## Question 5 GATE-2003

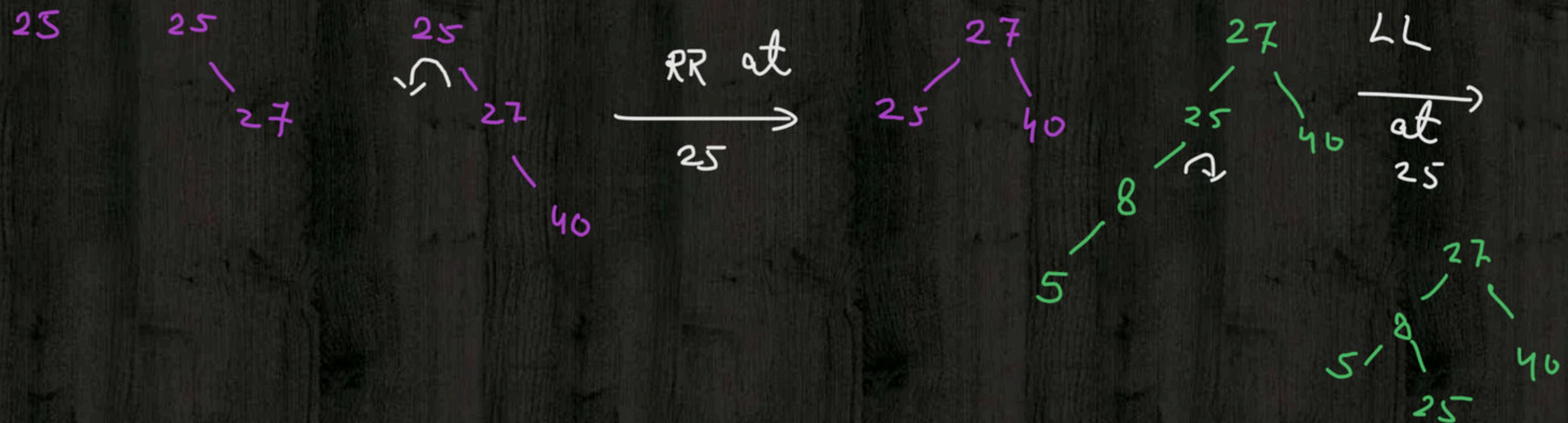
Let  $T(n)$  be the number of different binary search trees on  $n$  distinct elements.

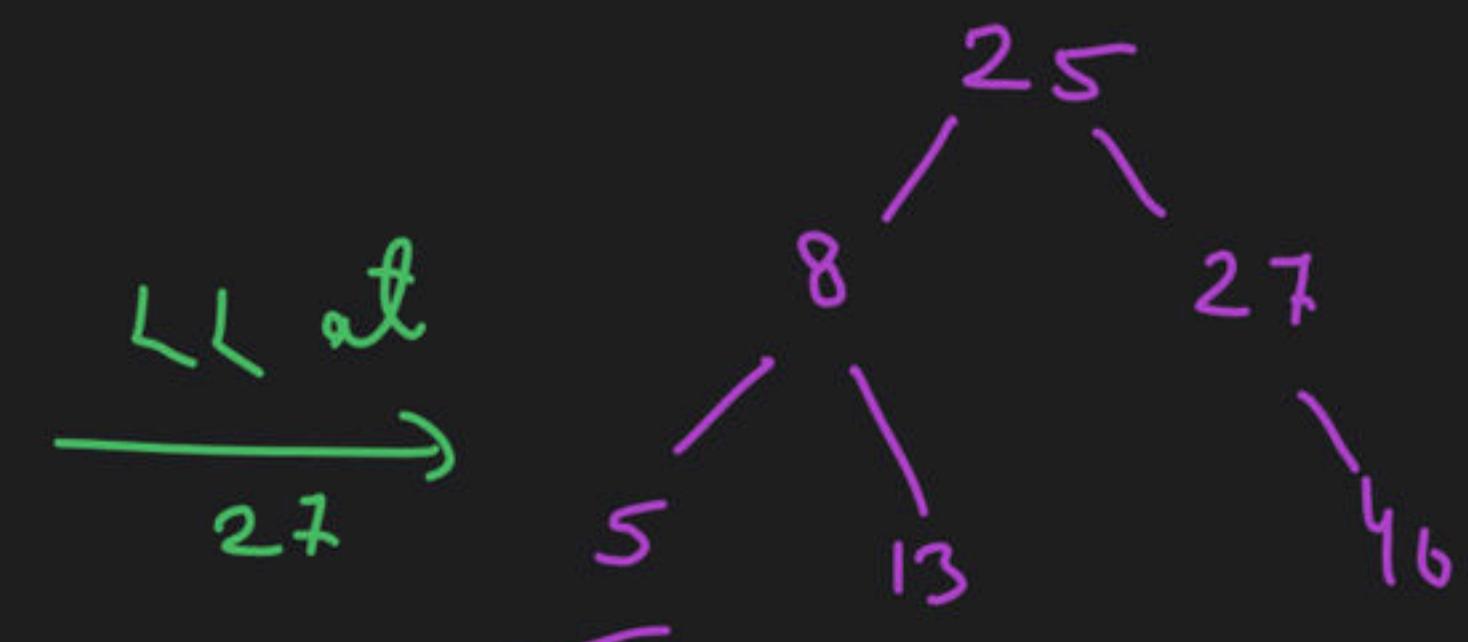
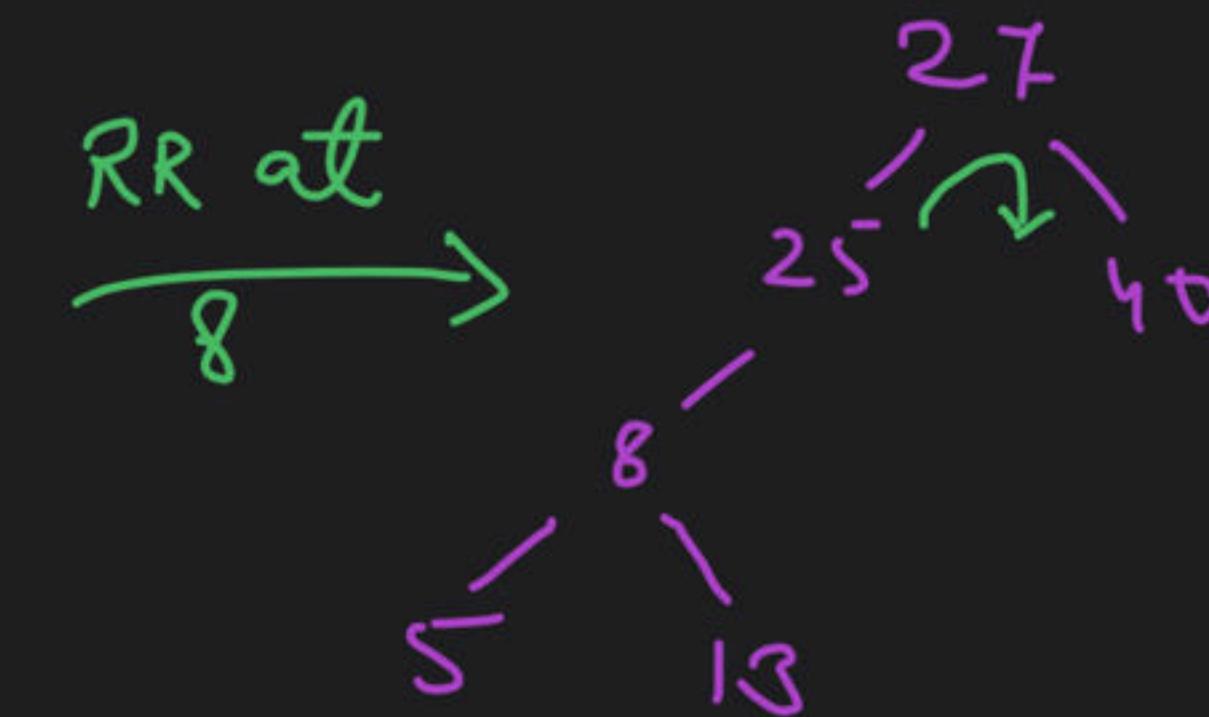
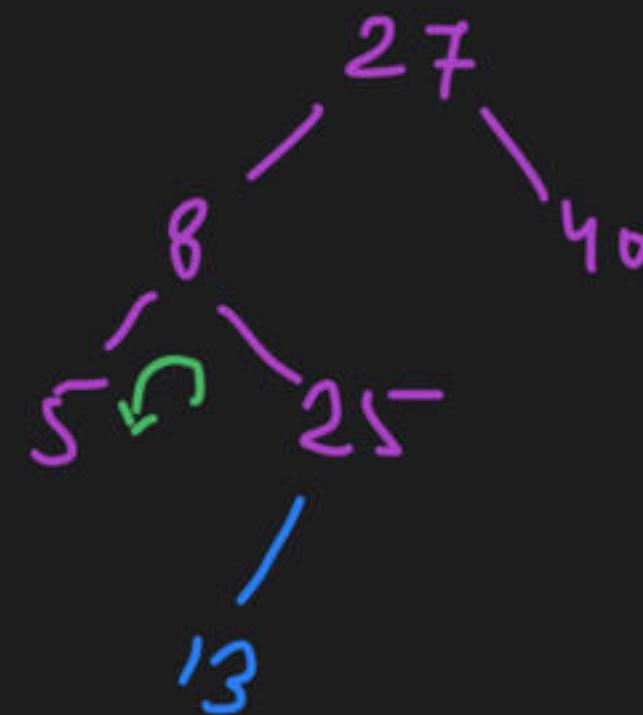
Then  $T(n) = \sum_{k=1}^n T(k-1)T(x)$ , where  $x$  is

- A.  $n - k + 1$
- B.  $n - k$
- C.  $n - k - 1$
- D.  $n - k - 2$

# AVL Tree Insertion 2

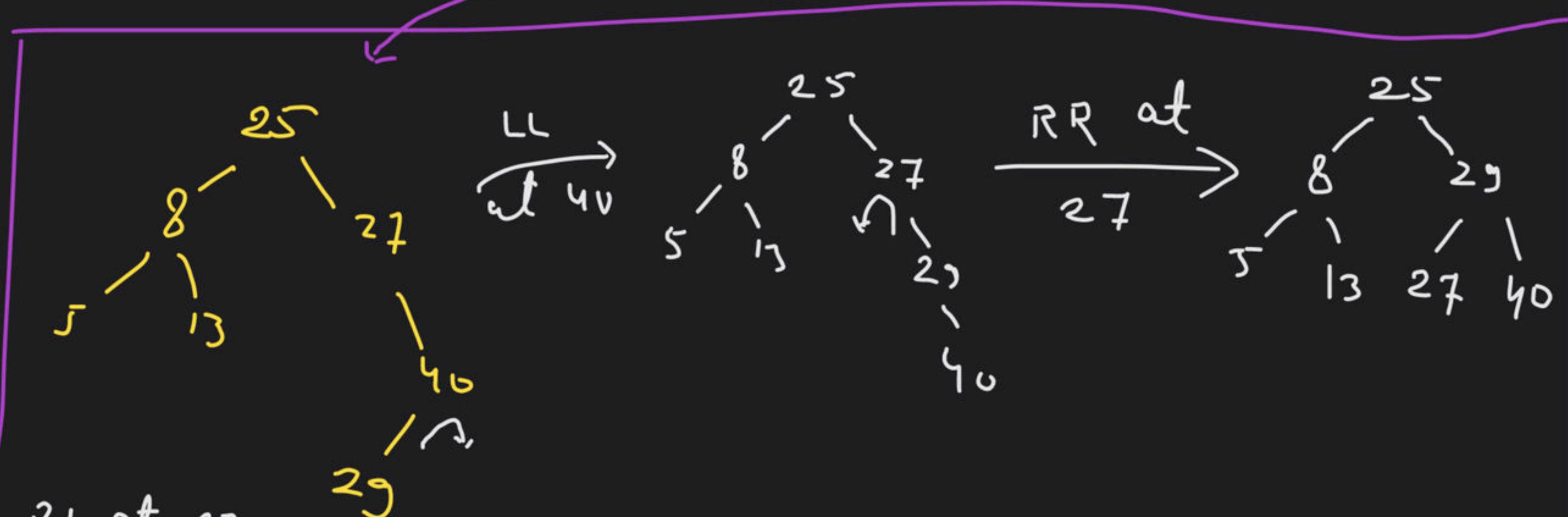
Create AVL tree using keys: ~~25, 27, 40, 8, 5, 13, 29, 17, 15, 11, 12, 6~~



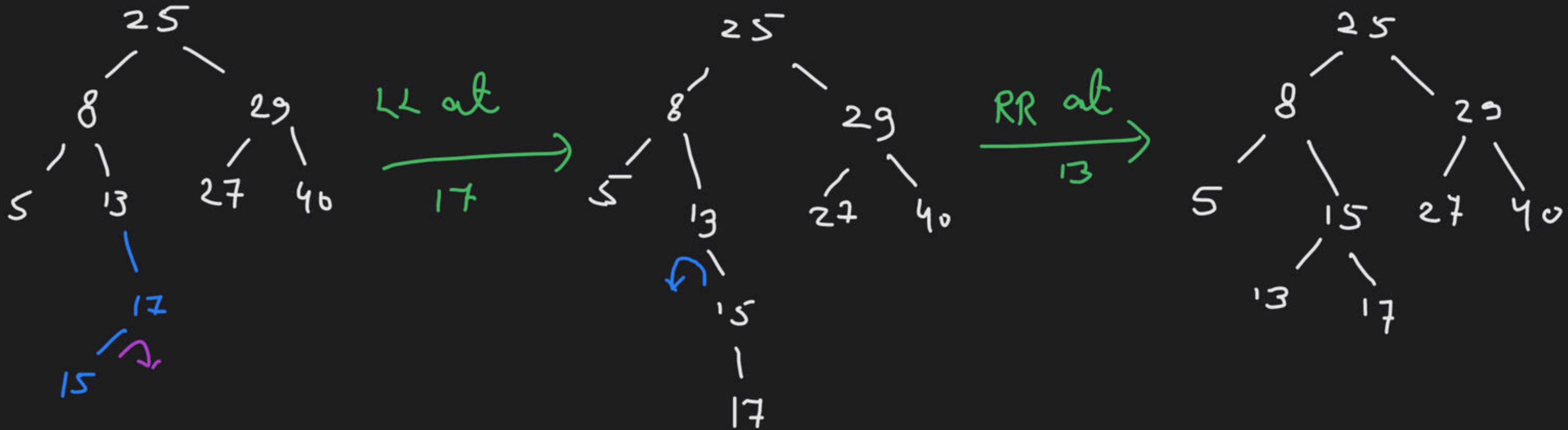


LR at 27 :-

- ① RR at 8
- ② LL at 27



RL at 27  
LL at 40  
RR at 27



RL at 13

① LL at 17

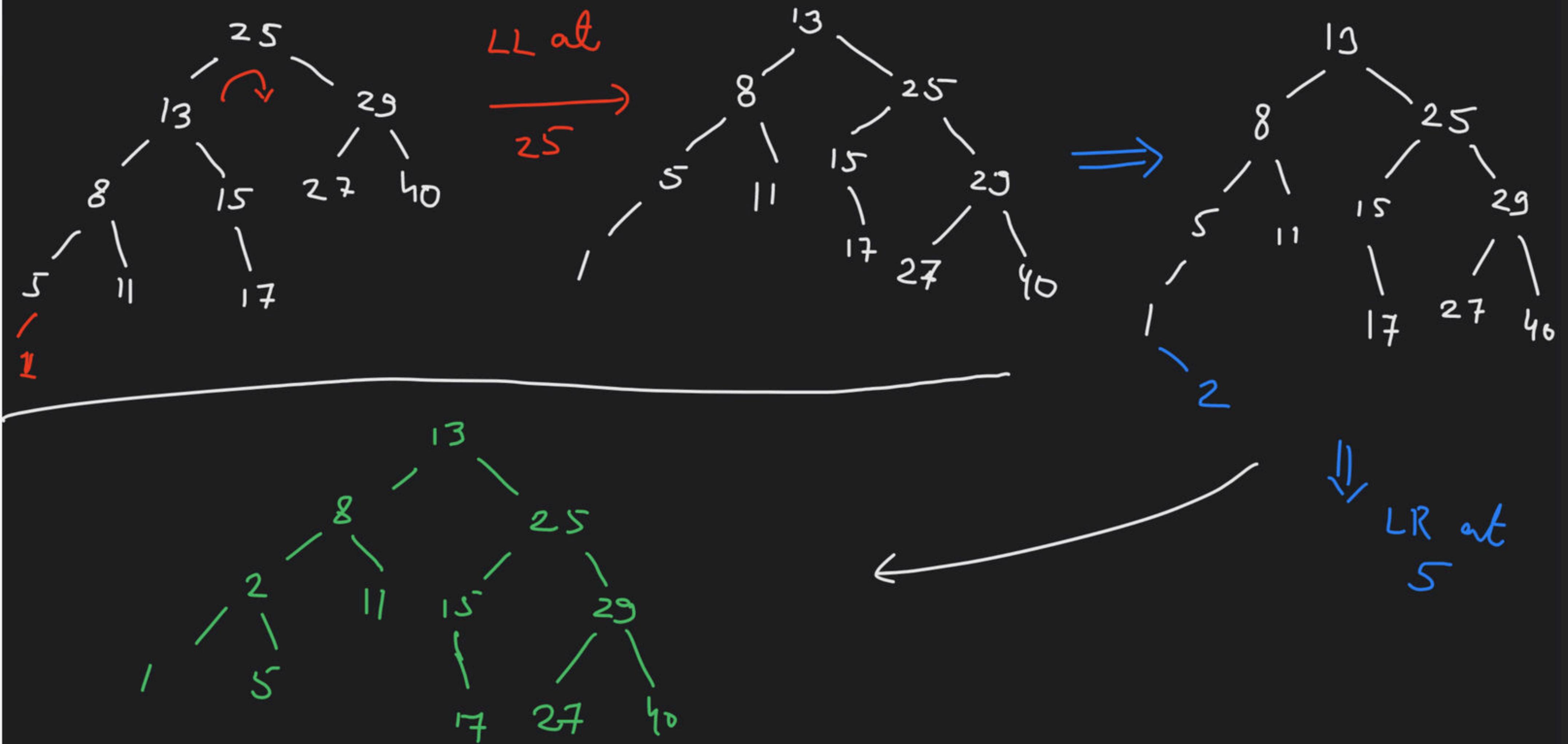
② RR at 13

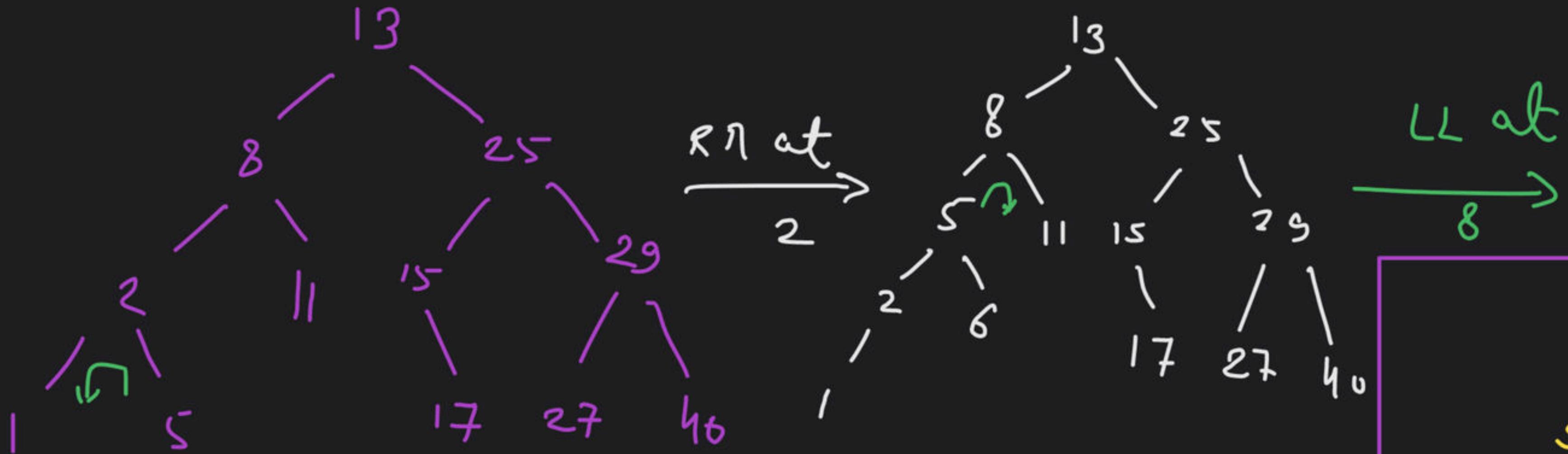


RL at 8 :-

① LL at 15

② RR at 8

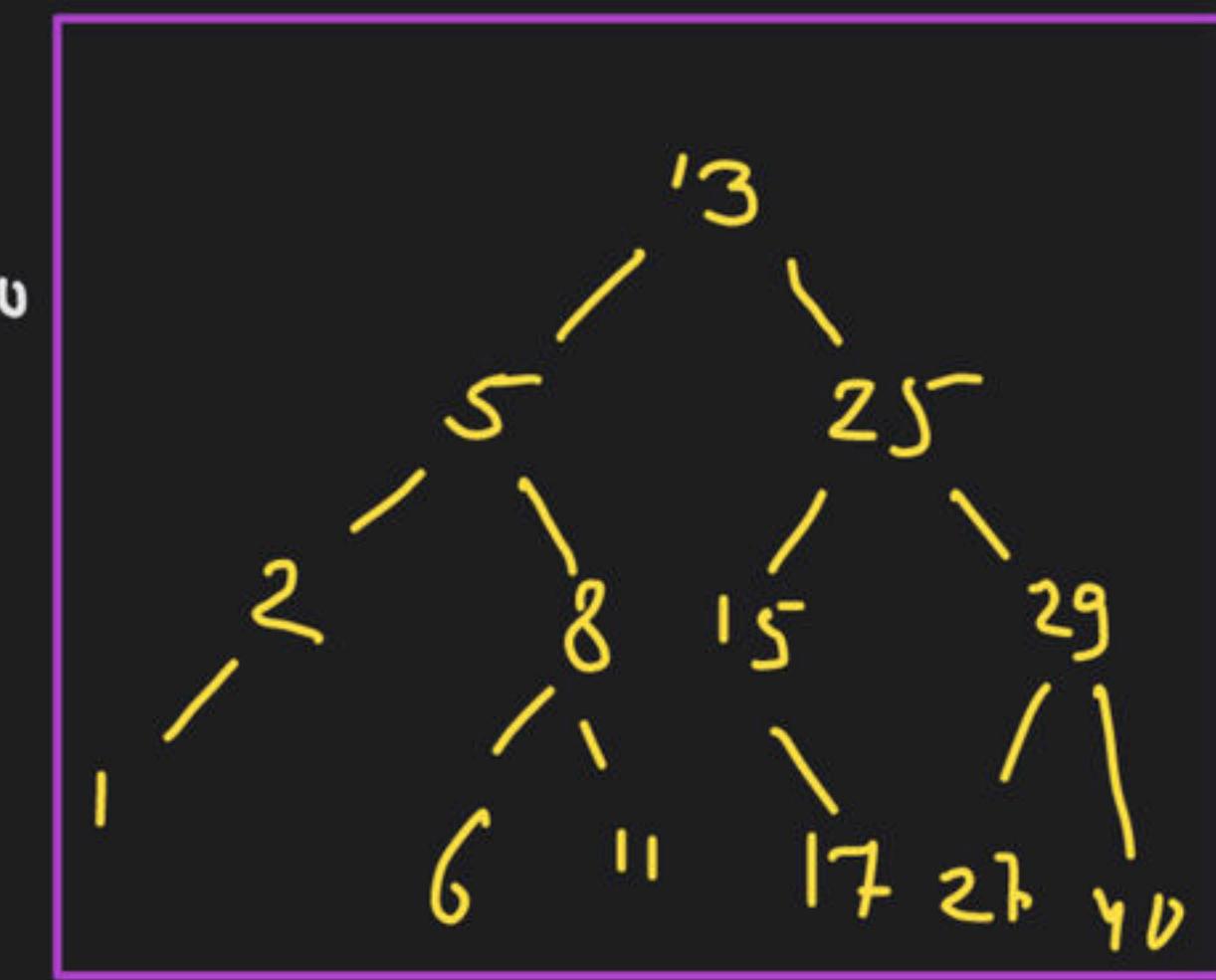




**LR at 8 :-**

**RR at 2**

**LL at 8**

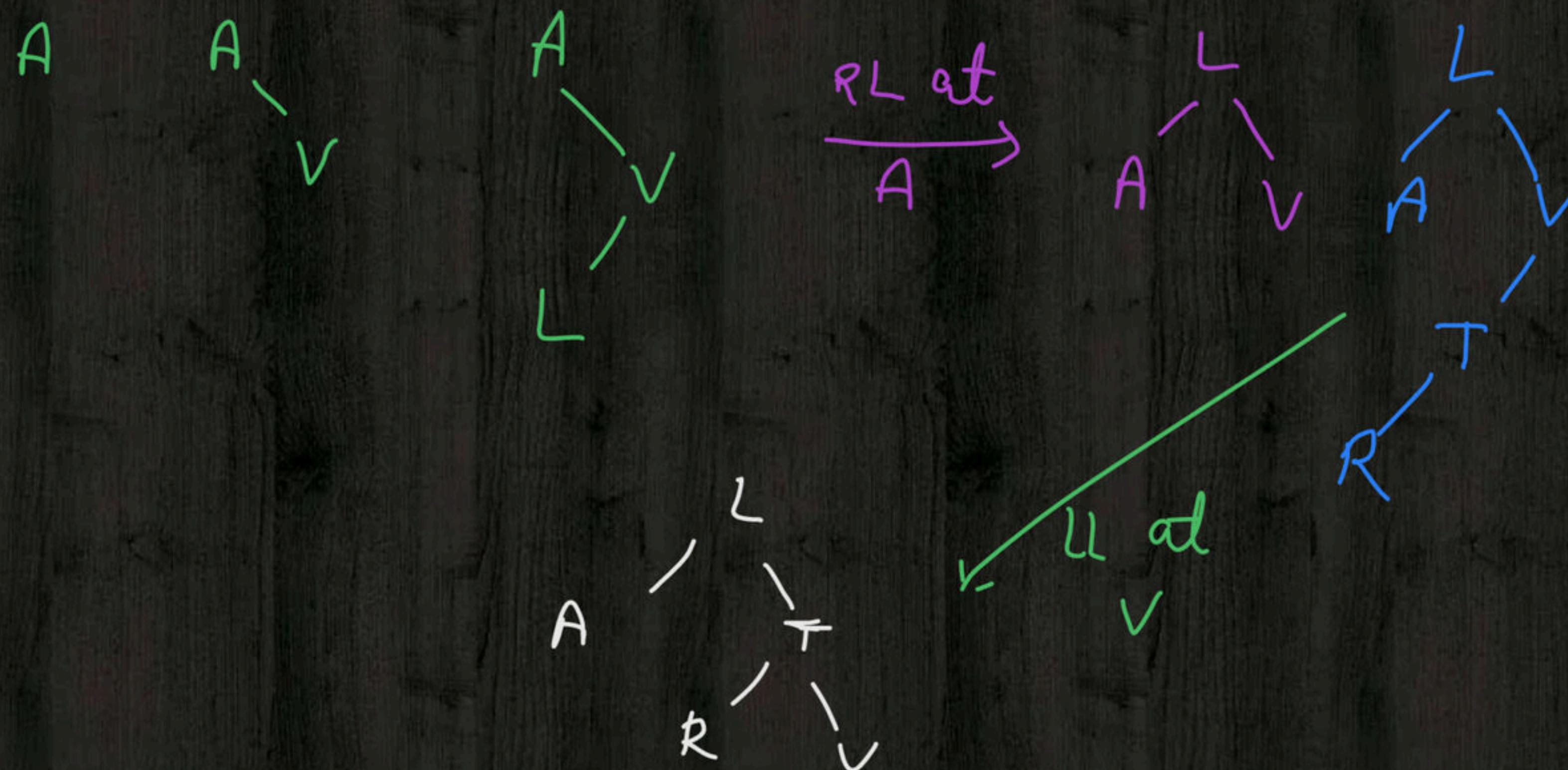




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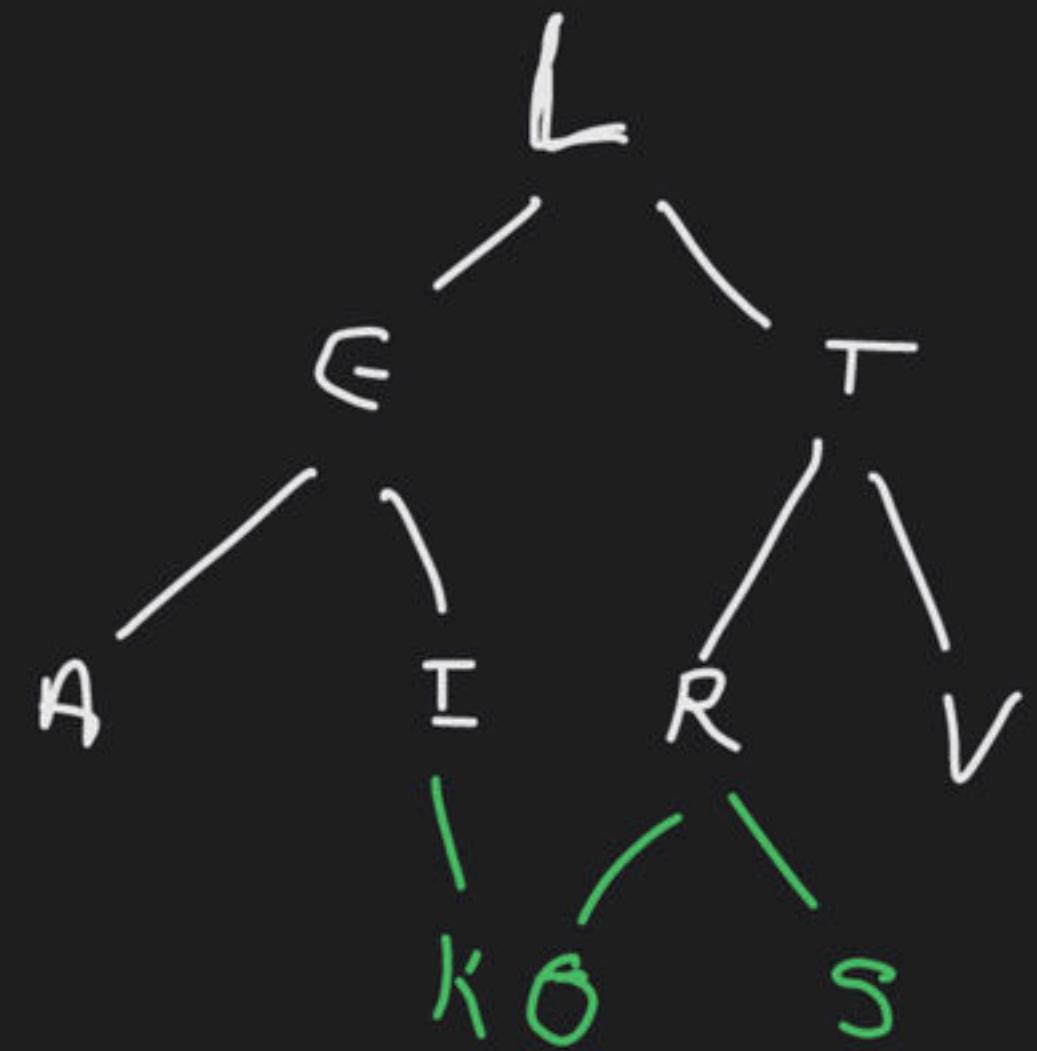
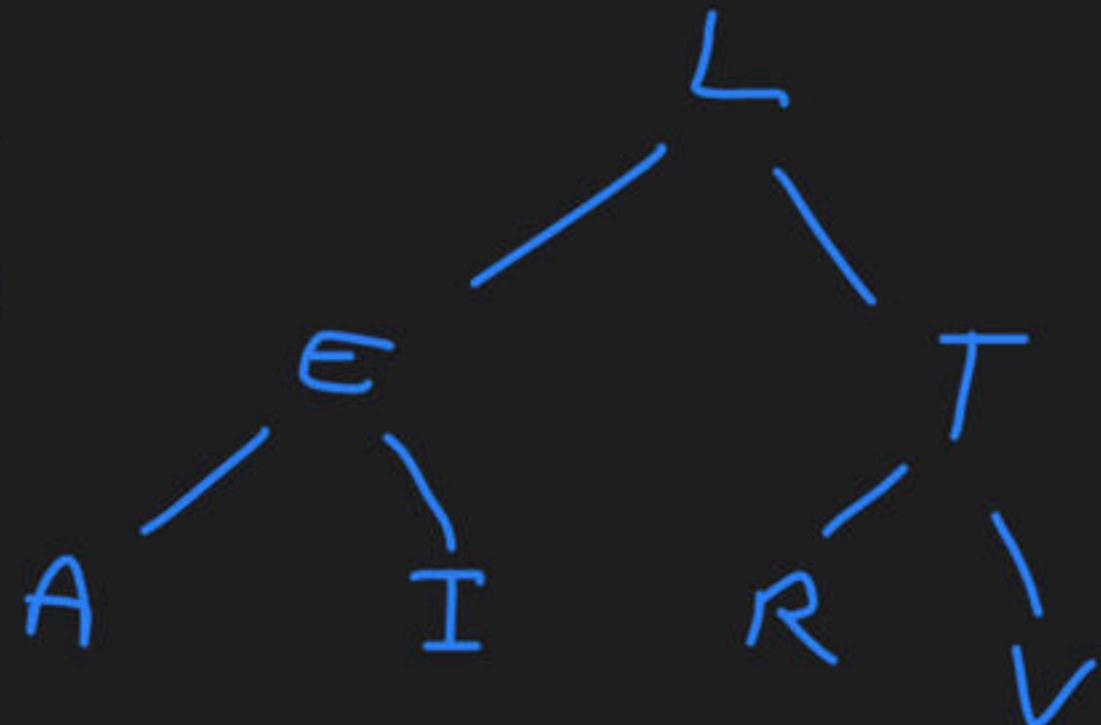
# Question 1

Create AVL tree using keys: A, V, L, T, R, E, I, S, O, K



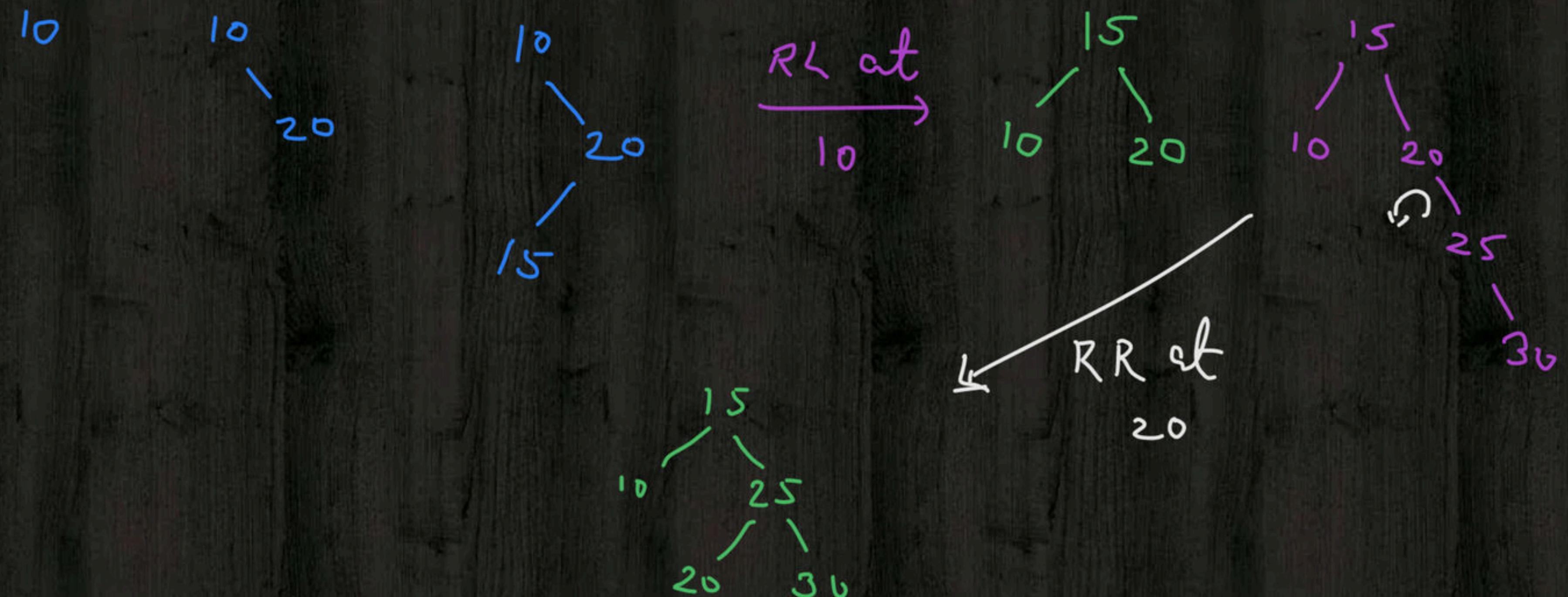


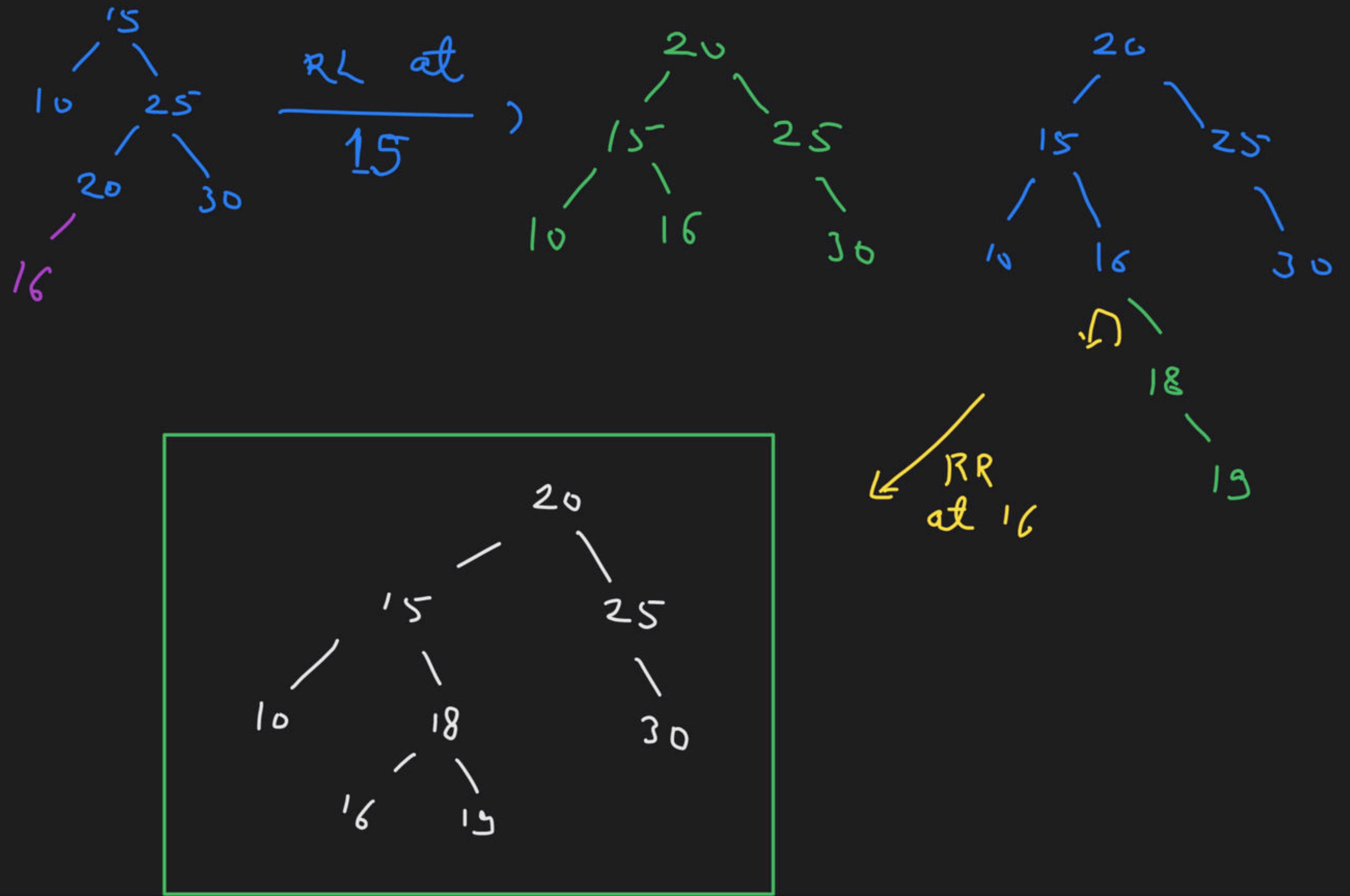
$RR$  at  
 $A$



# Question 2

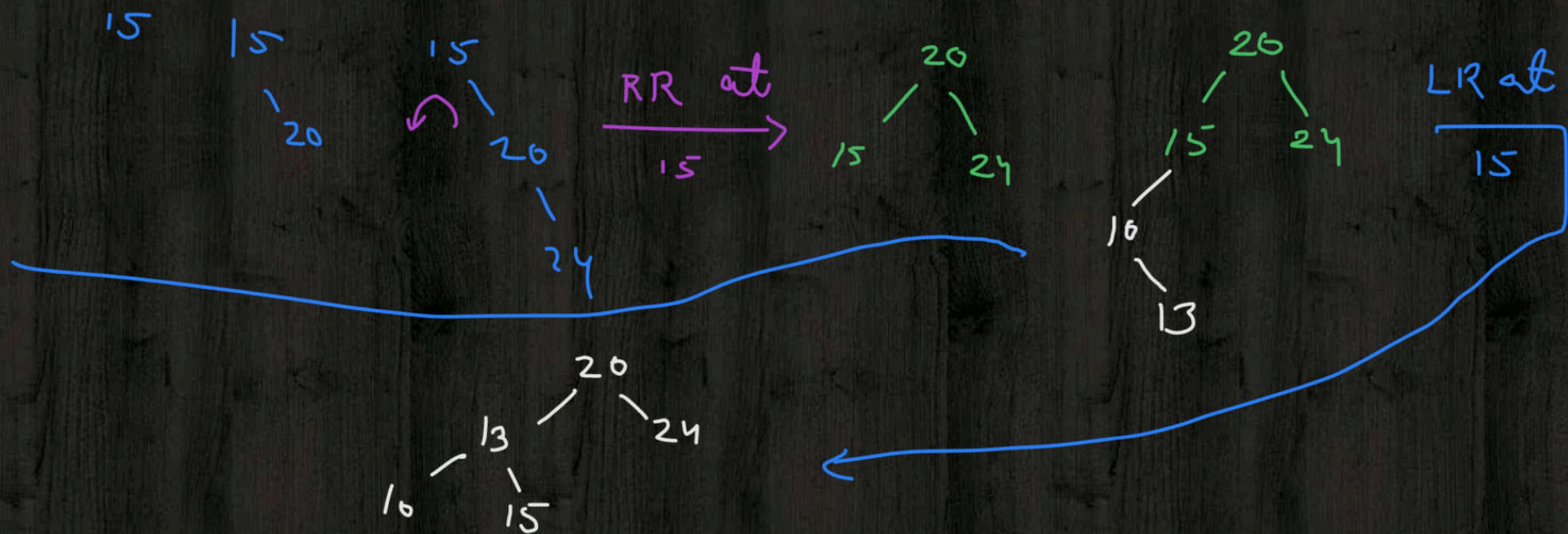
Insert the following sequence of elements into an AVL tree, starting with an empty tree: 10, 20, 15, 25, 30, 16, 18, 19

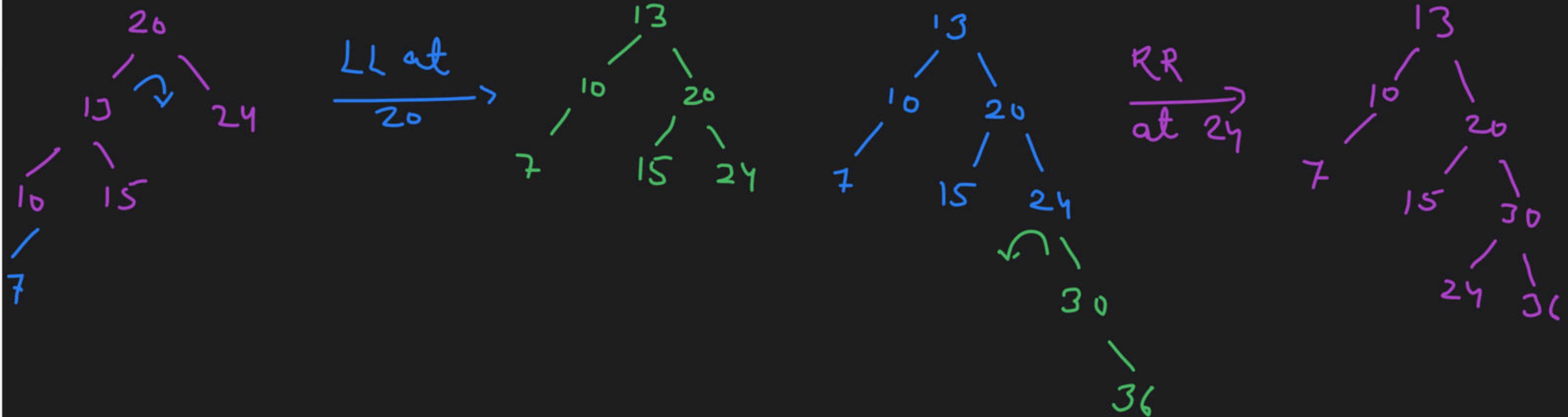


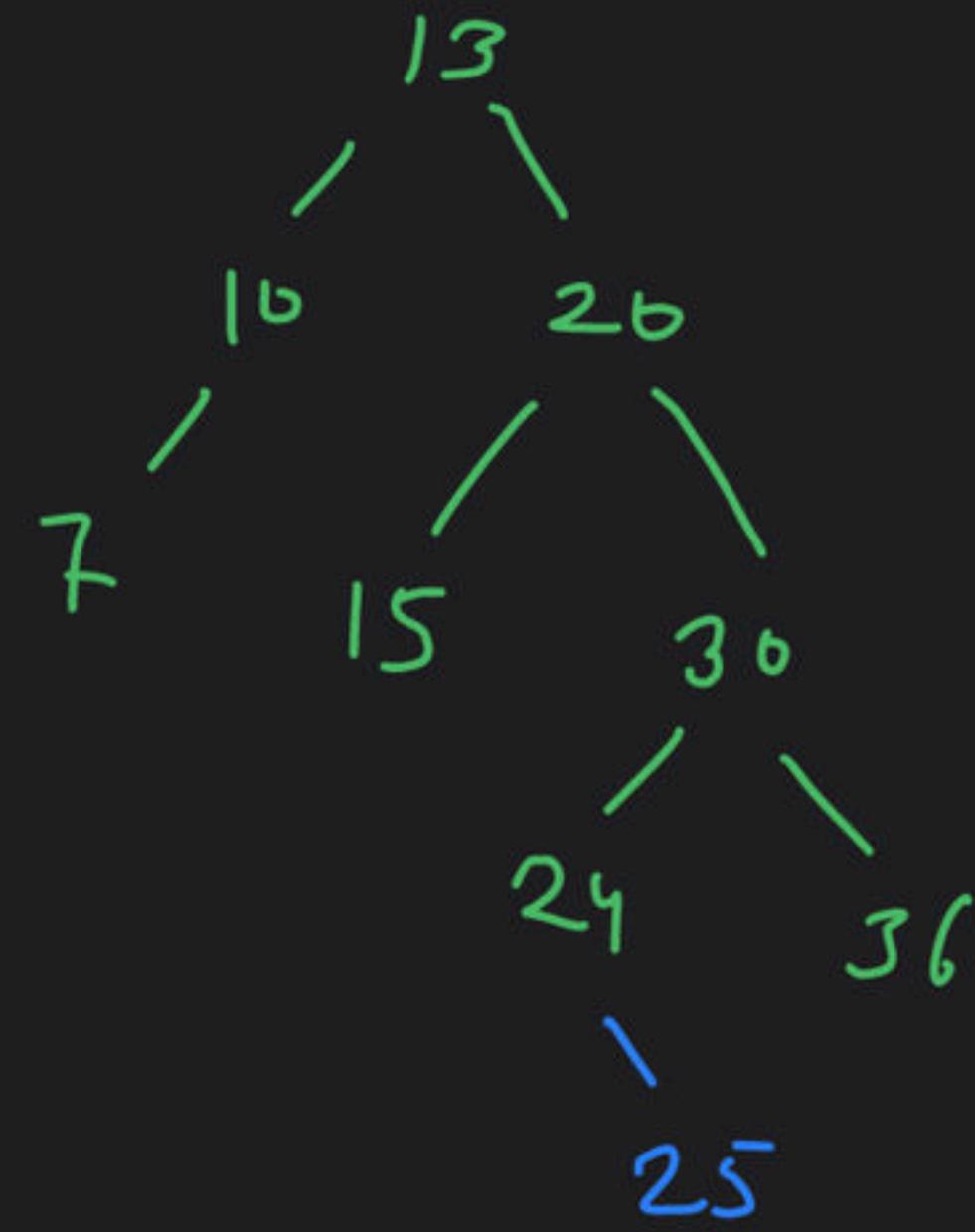


# Question 3

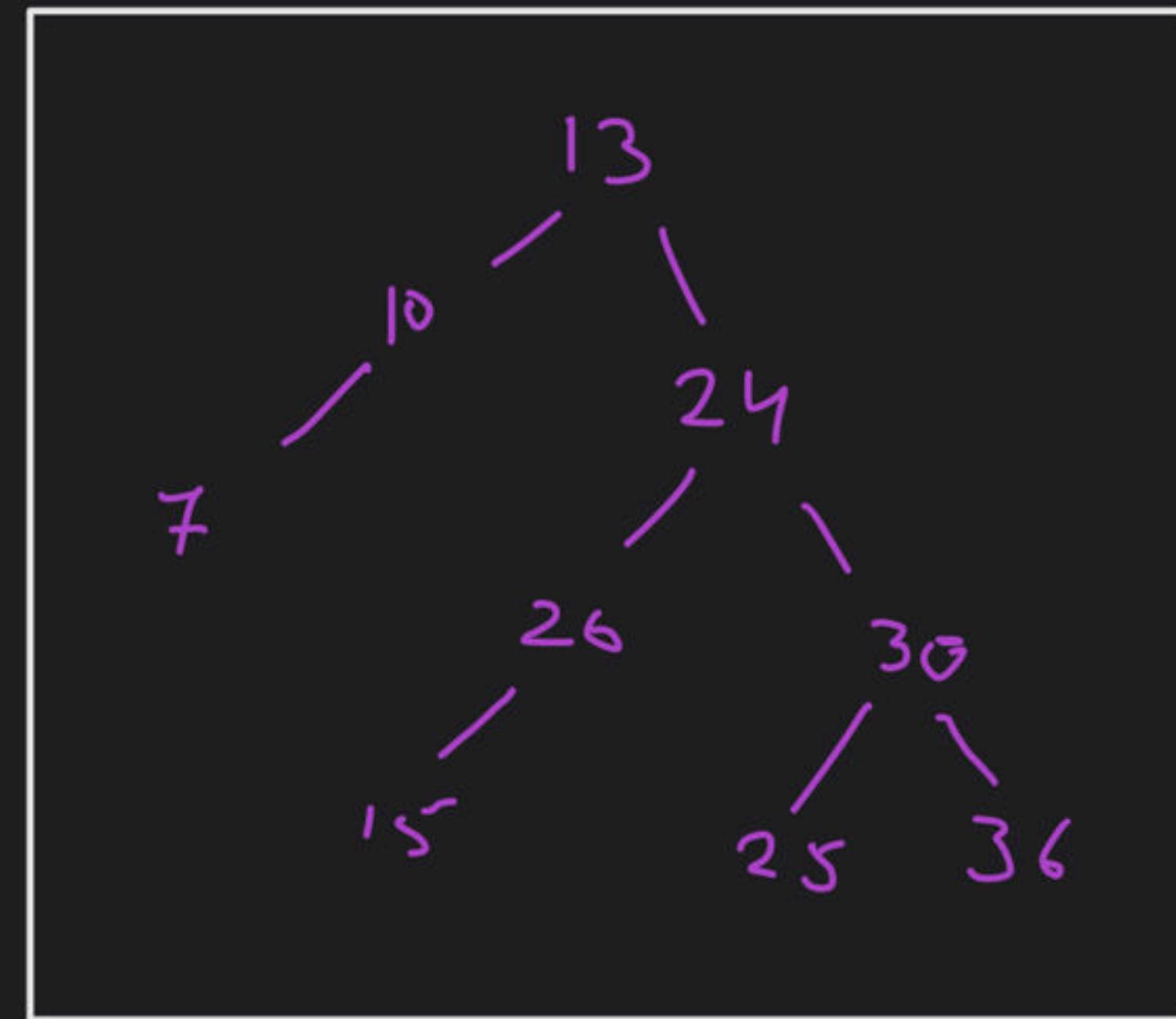
Insert the following sequence of elements into an AVL tree, starting with an empty tree: 15, 20, 24, 10, 13, 7, 30, 36, 25





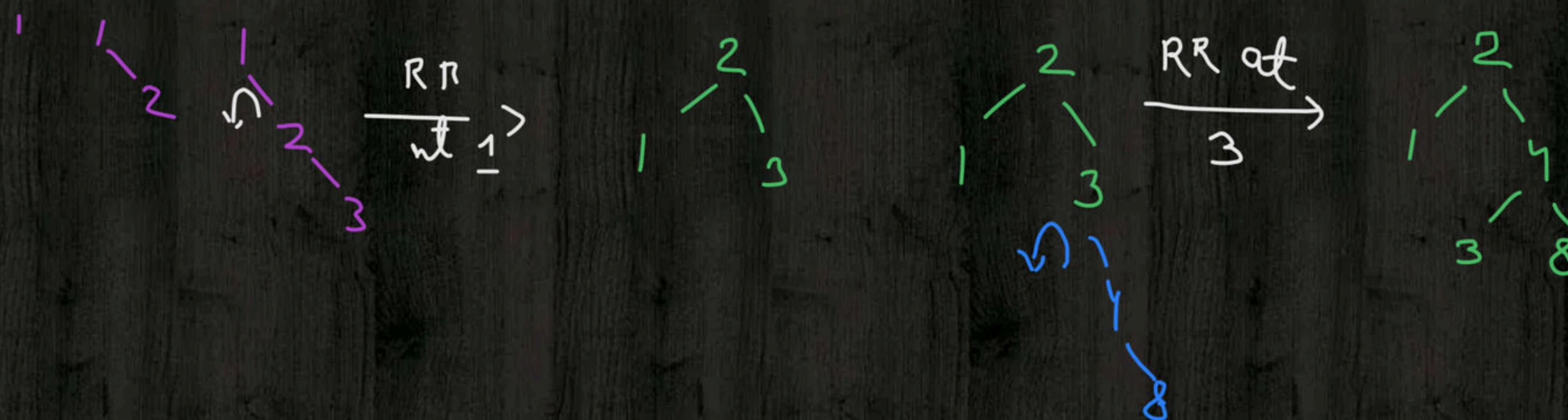


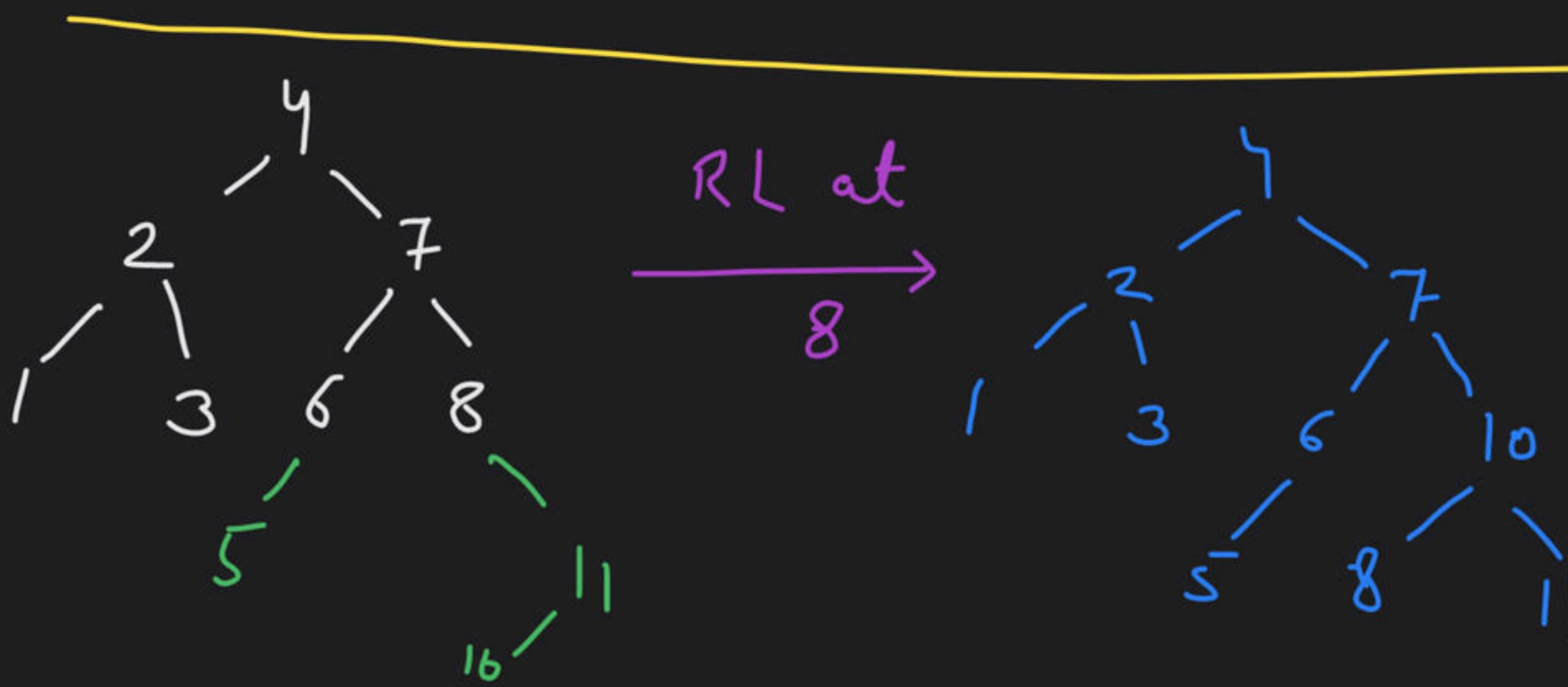
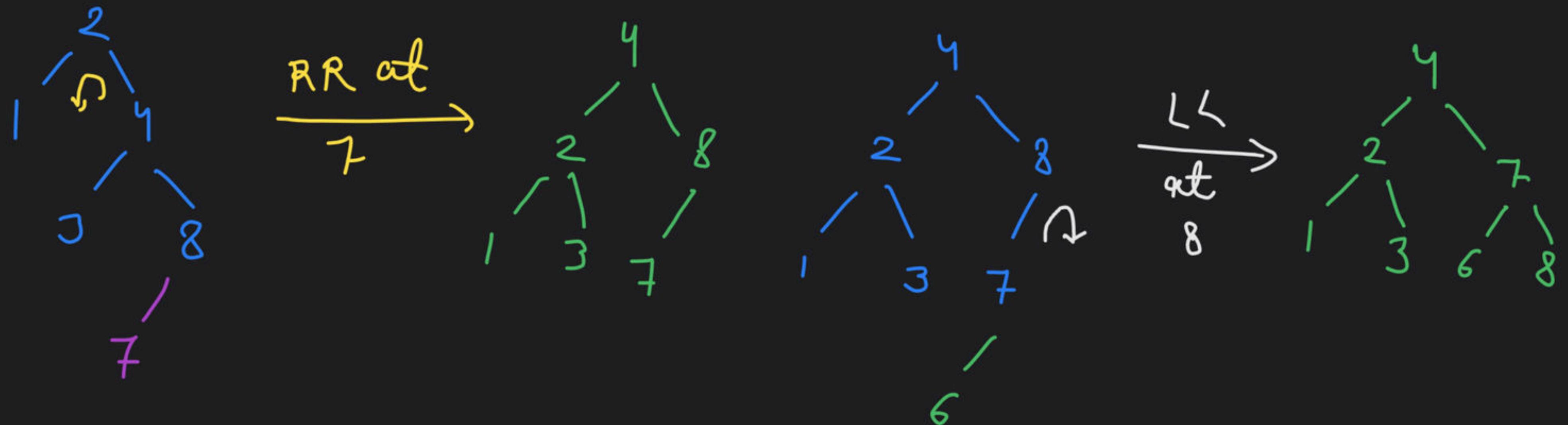
RL rot  
20

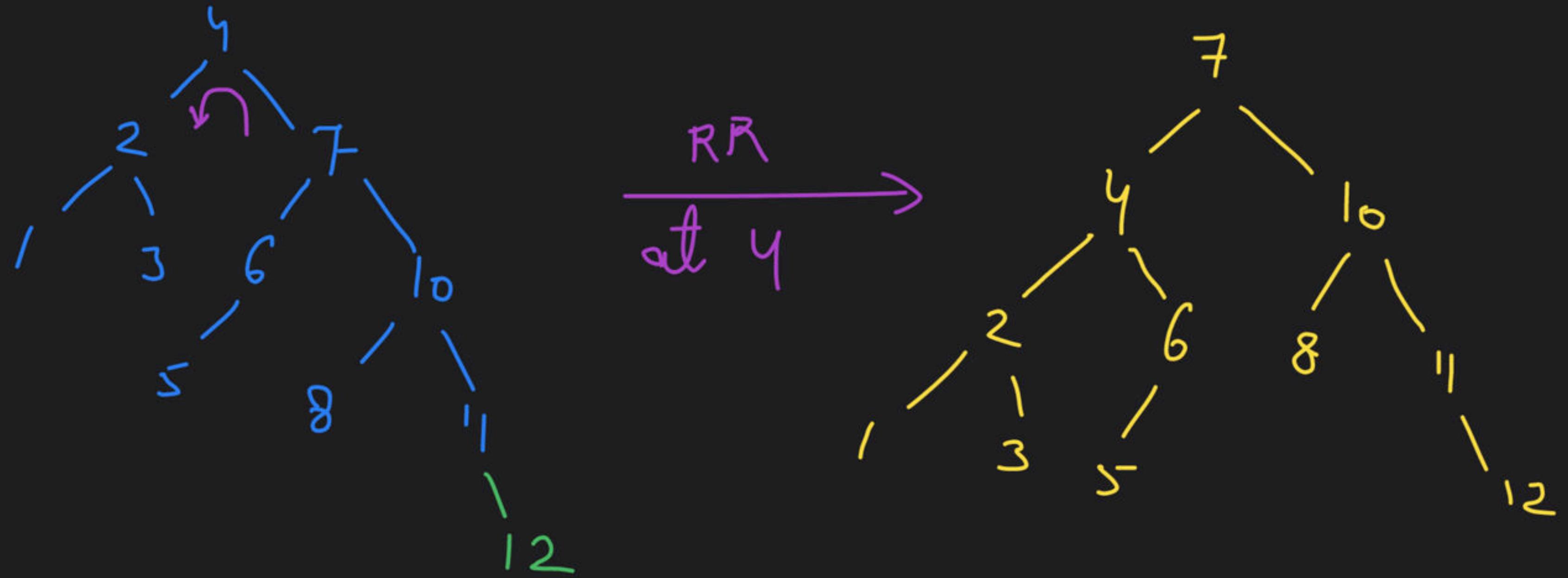


# Question 4

Insert the following sequence of elements into an AVL tree, starting with an empty tree: ~~1,2,3,4,8,7,6,5,11,10,12~~



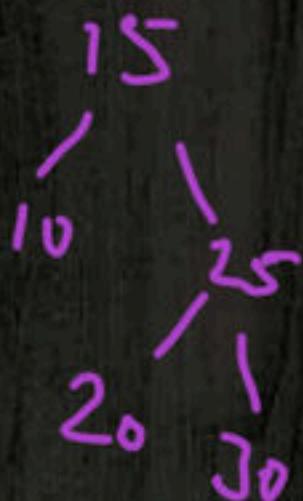
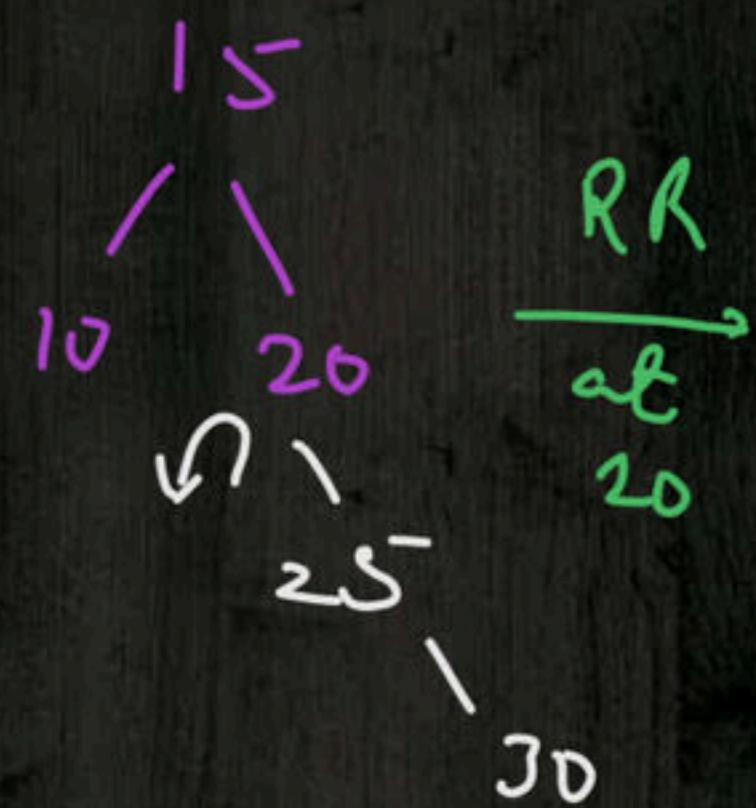
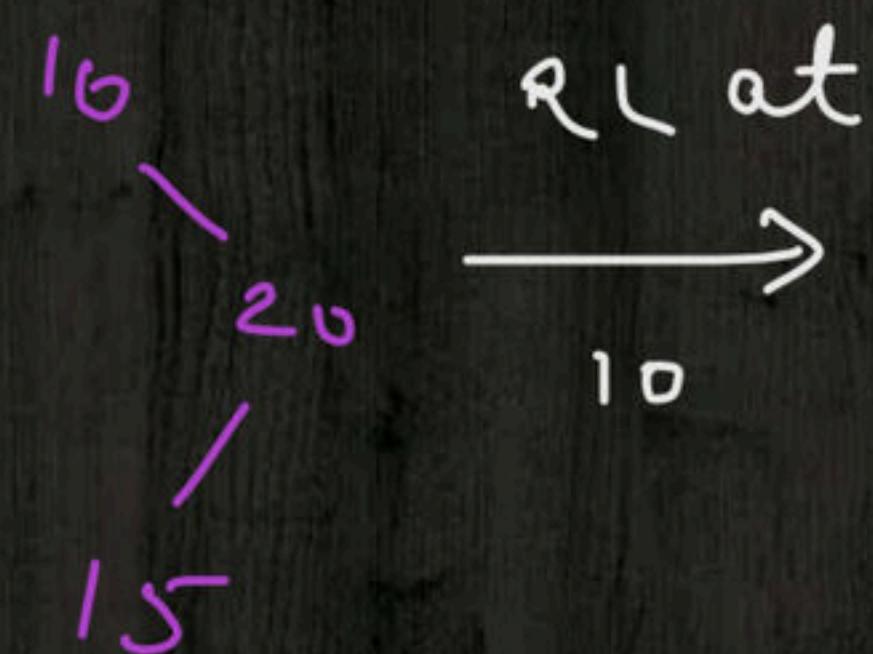


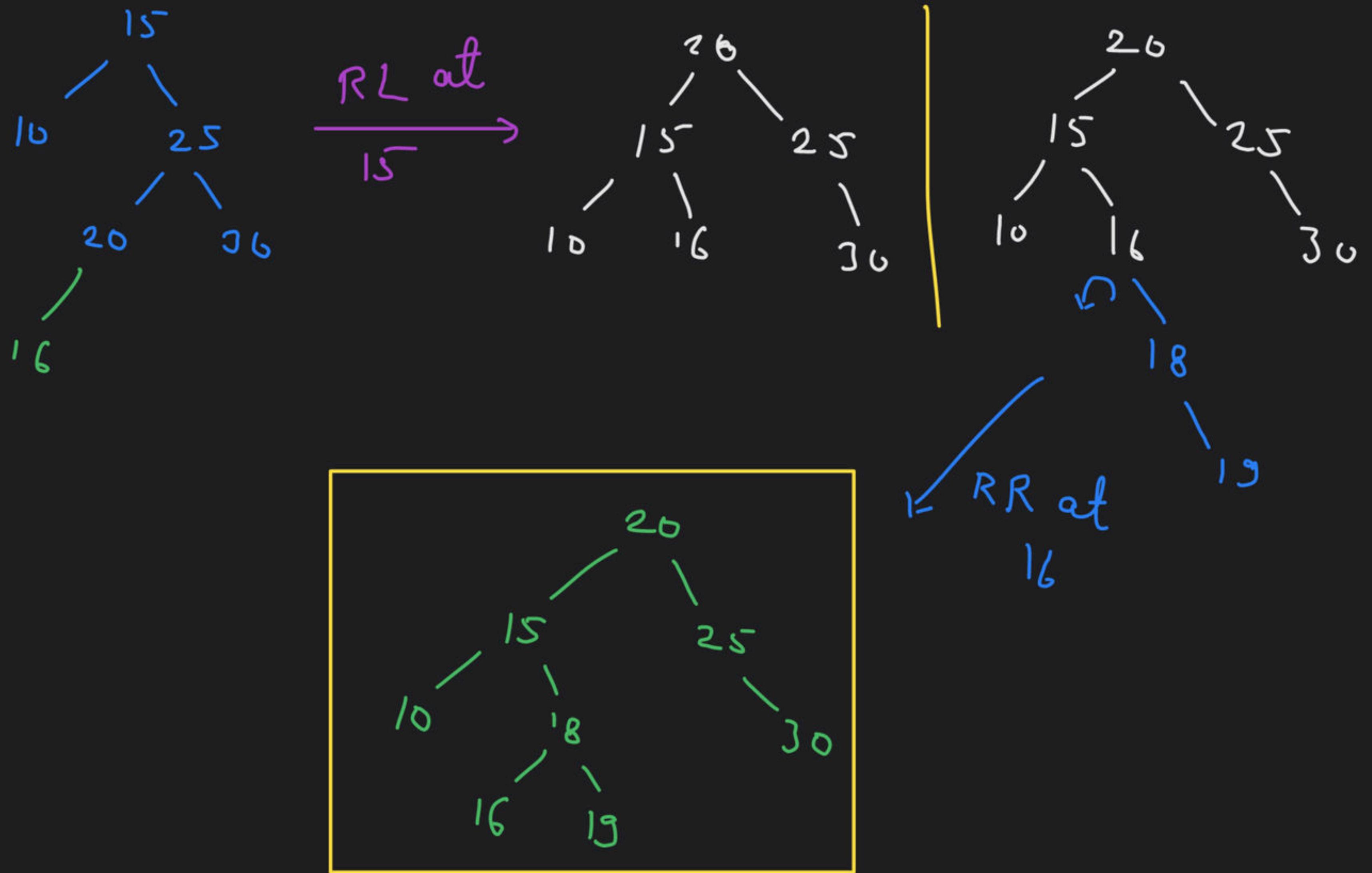


# Question 5

Insert the following sequence of elements into an AVL tree, starting with an empty tree: 10, 20, 15, 25, 30, 16, 18, 19

Then delete the keys: 30, 25, 16, 19, 20





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# Happy Learning



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▲ 1 • Asked by Syed  
sir yeh wala firse samjha dije

Question

Consider the following C-language program:

```
#include <stdio.h>
int main()
{
    int x = -5, y = 8;
    x = x + y - (y = x);
    printf("%d", x * y);
    return 0;
}
```

The value printed by the above program is \_\_\_\_\_ ?

$$a = \cancel{x}, b = 6$$

$$-y = (a - b);$$

$$\cancel{+} \quad (y); 6$$

$$y = a + b - (a - b);$$

$$\underline{5 + 6 - 6}$$

$$-5 + 8 \quad +5^-$$

$$x = 8$$

$$y = -5$$

$$-46$$

$$a + b + c$$

$$a + b$$

$$+ c$$

$$x = -5, \quad y = 8 - 5$$

$$\underline{x + y} - ( )$$

$$x = -5 + 8 - (-5)$$

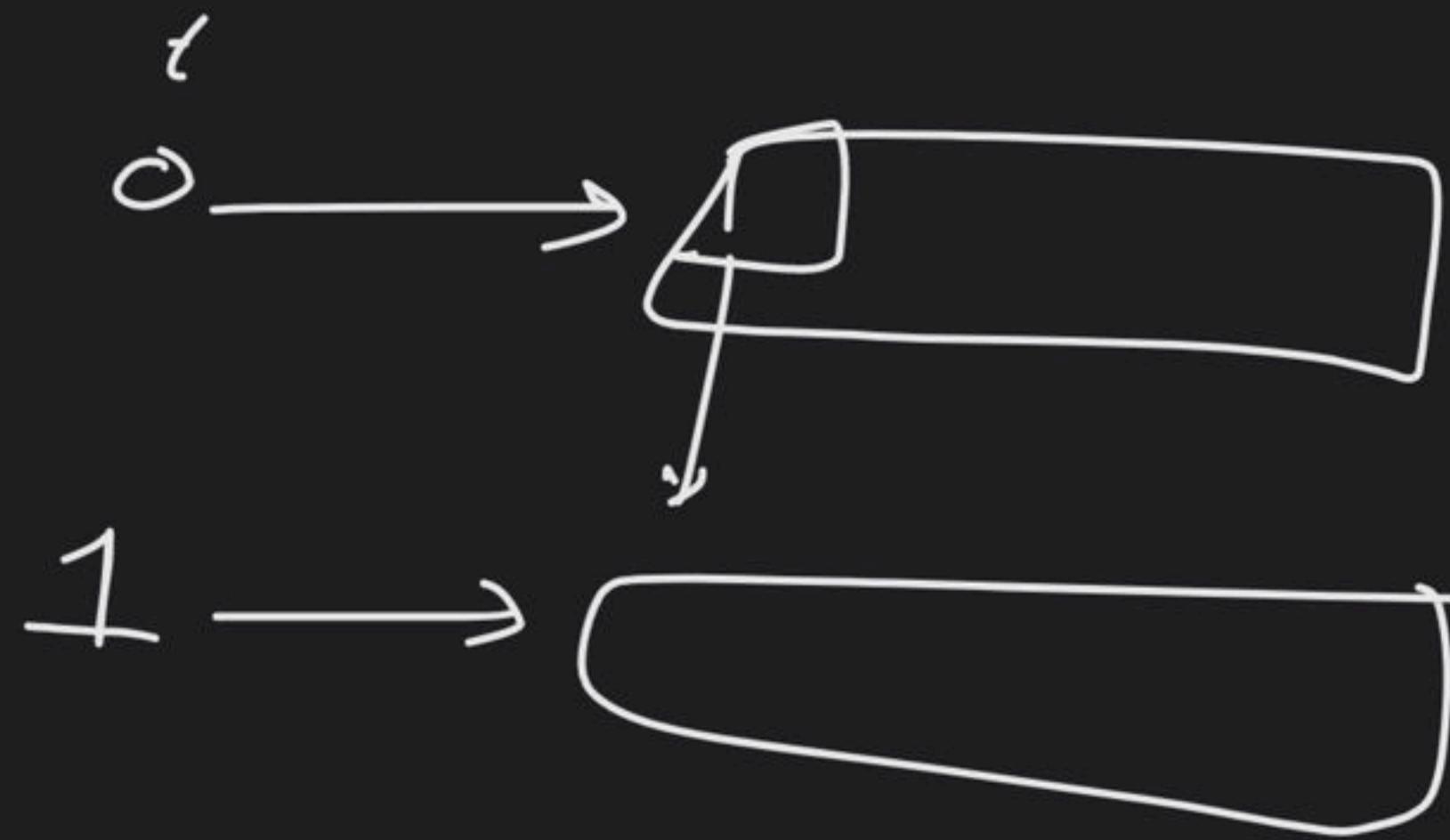
$$x = 8$$

▲ 1 • Asked by Syed

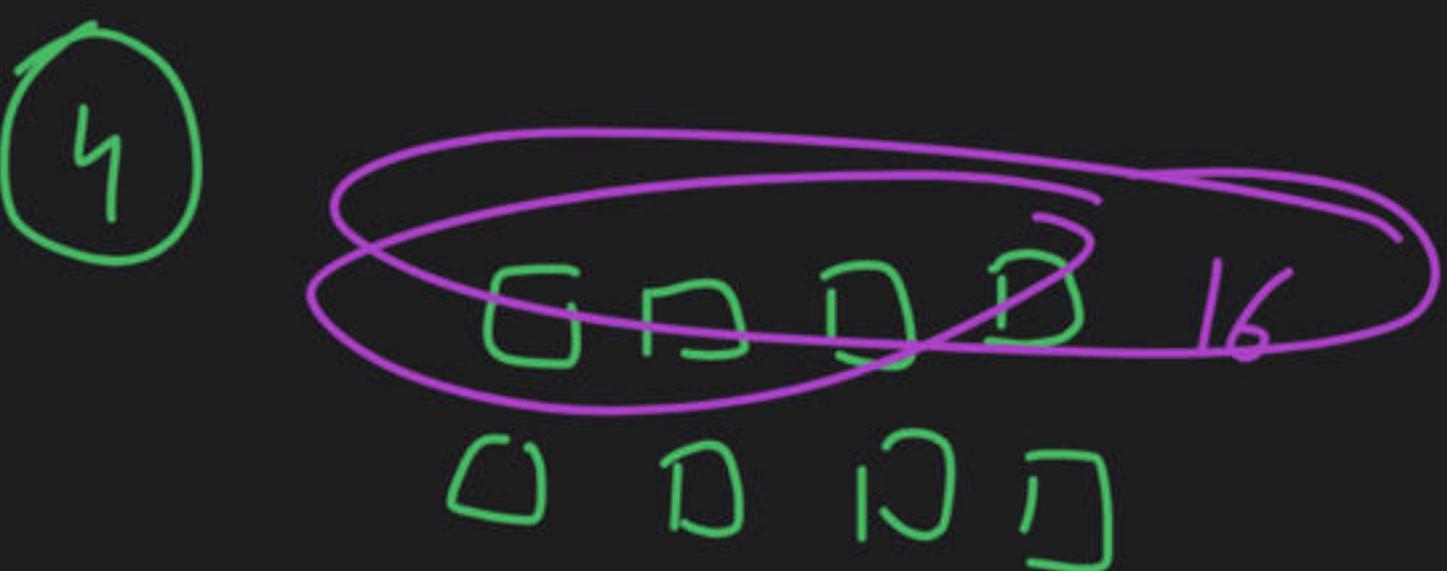
In 2D array  $A[m][n]$ , how can  $\&A[0]+1$  represent row 1?

$A[m][n]$

$\&A[0]+1$



int A [5] [4];



$$\&A \Rightarrow 224 \leftarrow \text{base address}$$

$$\&A[0] \Rightarrow 224$$

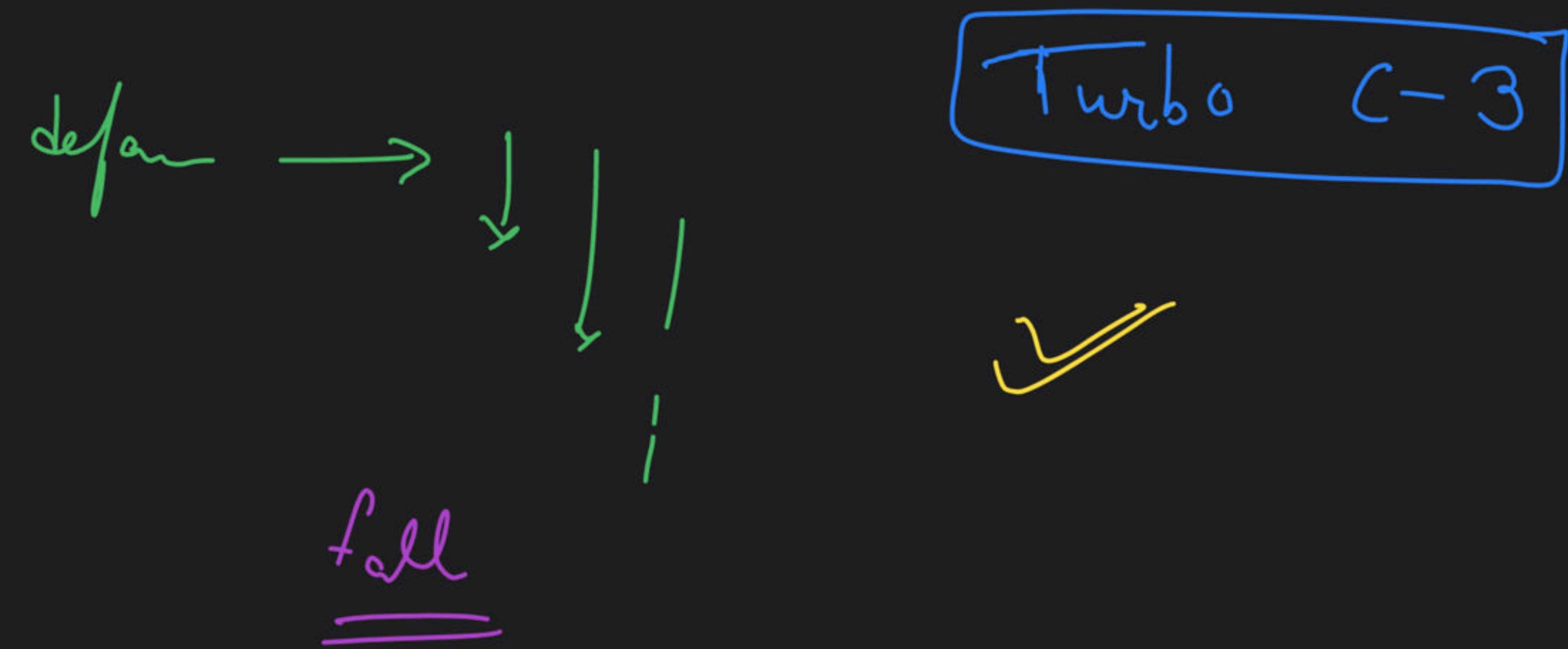
$$\&A[0] + 1 \Rightarrow 240$$

$$\&A[0][0] + 1$$

$$\&A + 1$$

▲ 1 • Asked by Syed

Sir what happens if we use default as the first case without break? and why?



**483550224**

**483550224**

**483550240**