

Question 1

a) Preorder Traversal : $*$, $+$, 11 , \wedge , 4 , 2 , $-$, $/$, 9 , 3 , 8

Inorder Traversal : 11 , $+$, 4 , \wedge , 2 , $*$, 9 , $/$, 3 , $-$, 8

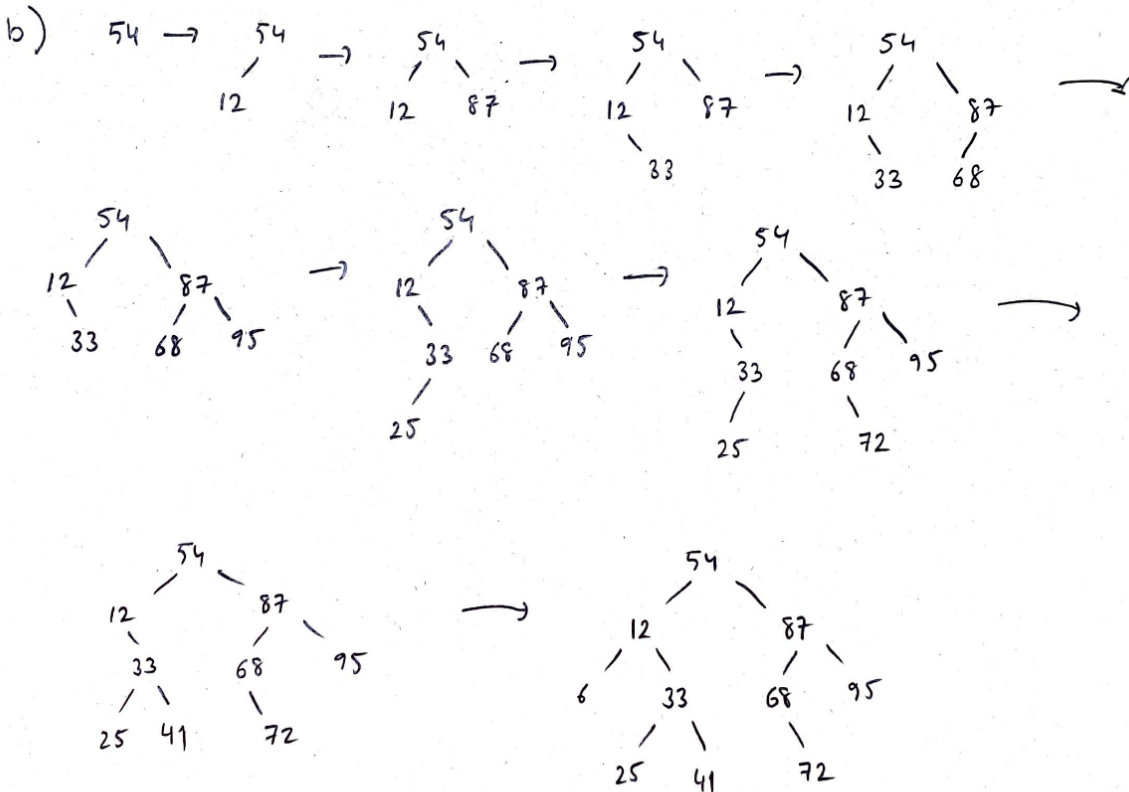
Postorder Traversal : 11 , 4 , 2 , \wedge , $+$, 9 , 3 , $/$, 8 , $-$, $*$

Solution of the Expression :

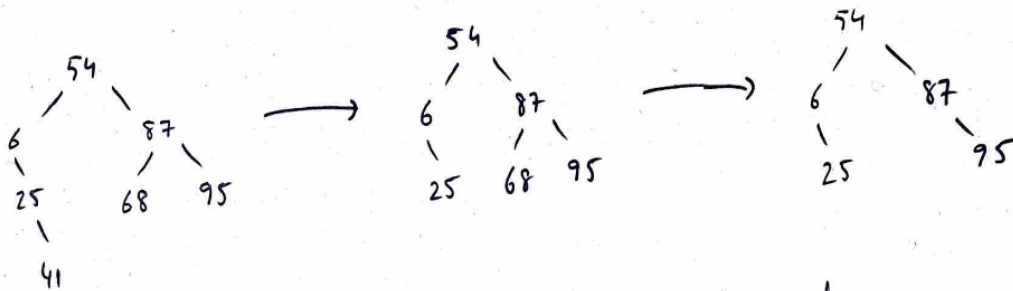
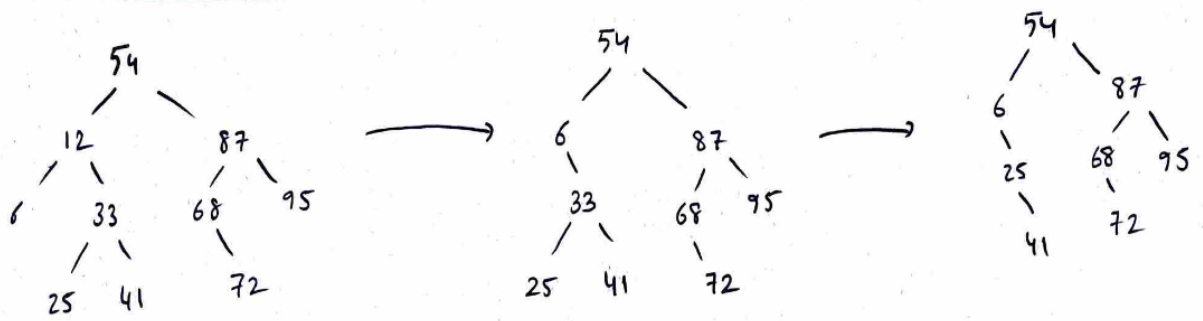
$$[11 + (4^2)] * [(9/3) - 8]$$

$$= (11 + 16) * (-5)$$

$$= -135$$

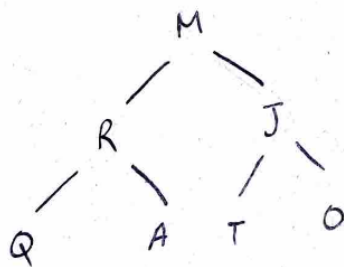


Insertions are done. Deletions are on the next page.



Deletions are done.

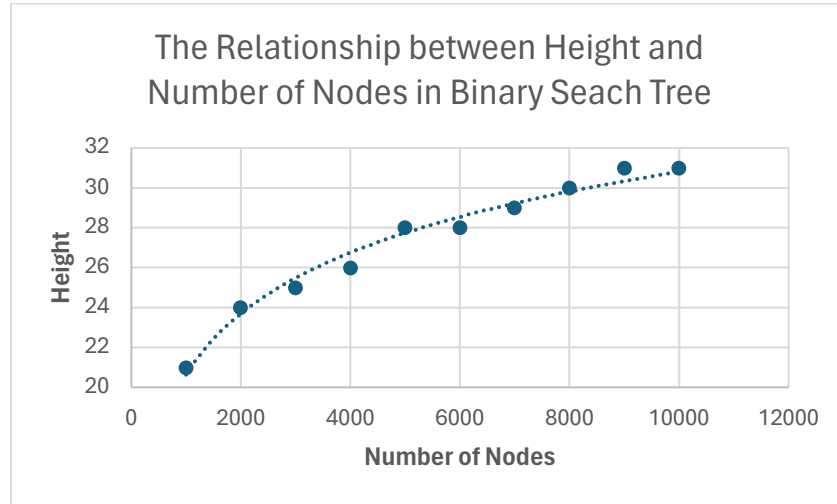
c)



Inorder Traversal : QRAMTJO

Question 3:

1)

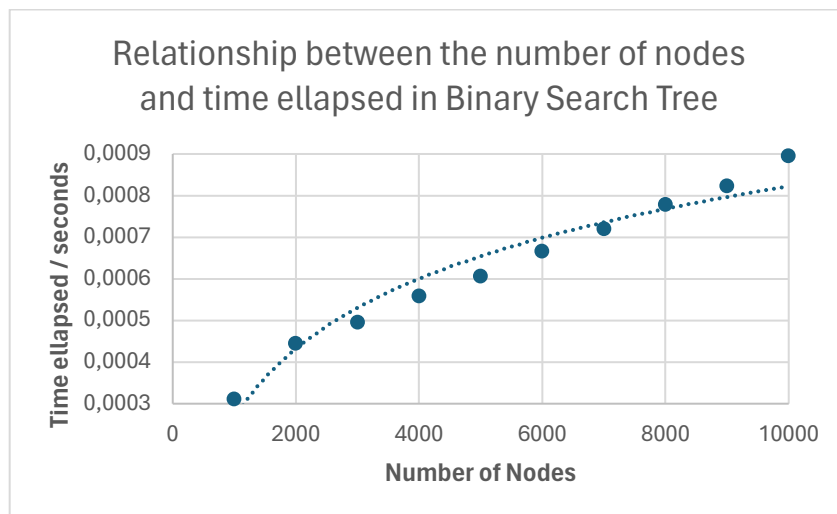


From the graph, it can be seen that there is a logarithmic relationship between the height of the binary search tree and the number of nodes inserted in the tree. When random (unsorted) numbers are inserted into the binary search tree, the growth of the tree is having a logarithmic function. This behaviour is expected and can be explained with the mathematical relationship between height and node inserted on the binary search tree:

$$N(h) = 2^h - 1 \quad (N: \text{the maximum number of nodes in tree, } h: \text{height})$$

The inverse of this function is a logarithmic function: $h(N) = \log_2(N + 1)$

2)



Inserting sorted integer instead of randomly generated ones would cause the time complexity of the algorithm shift from $O(\log n)$ to $O(N)$ due to the insertion on the right child of the nodes consecutively.