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22203683

Section : 1

Question 1 Answers

Part A

Pre-Order

*-8/54^+396

In-Order

8-5/4*3+9^6

Post-Order

854/-39+6^*

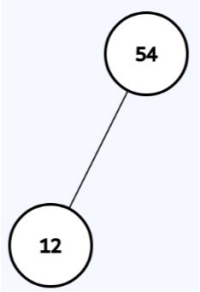
Result Of The Algebraic Expression:

[8 - (5 / 4)] * [(3+9) ^ 6] = 20,155,392

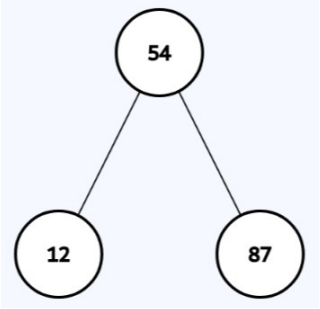
Part B

Insert 54:

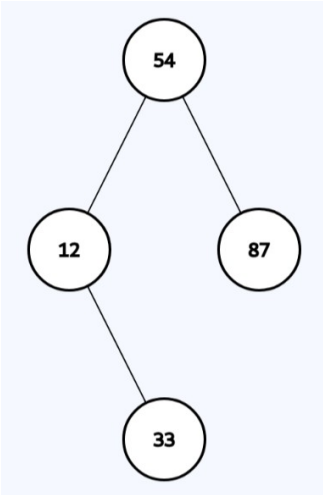
Insert 12:



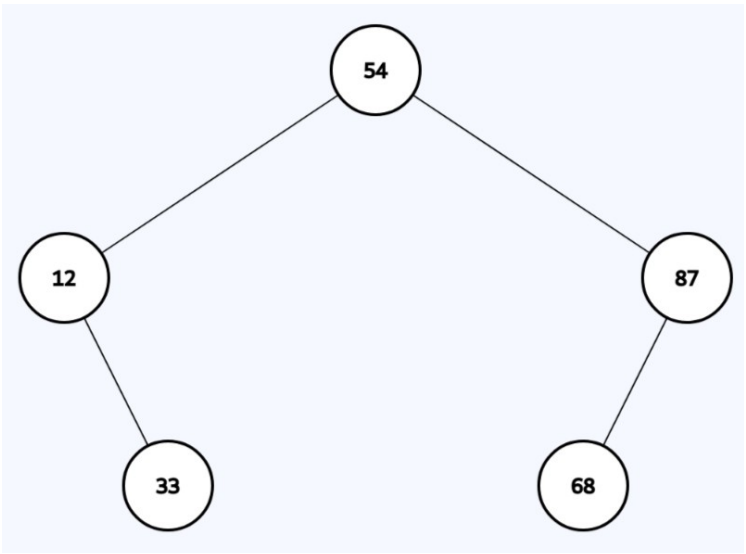
Insert 87:



Insert 33:



Insert 68:



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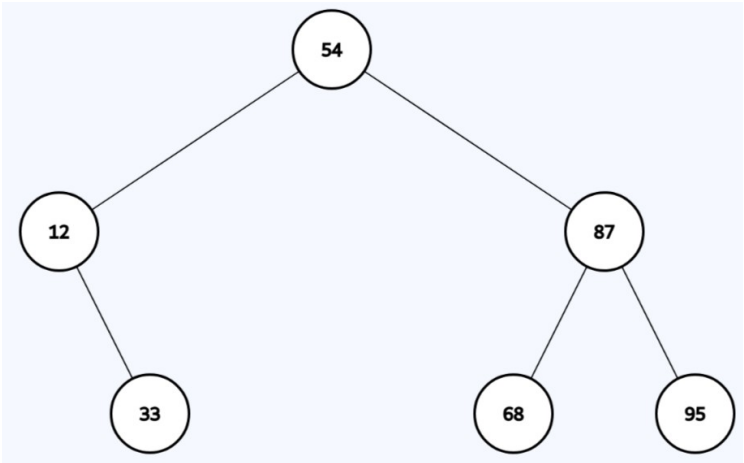

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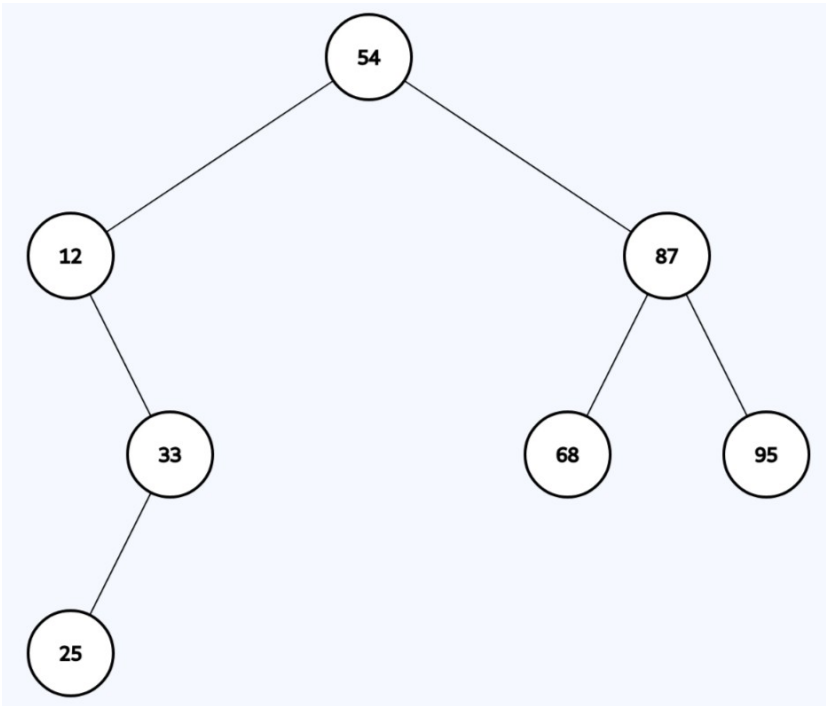
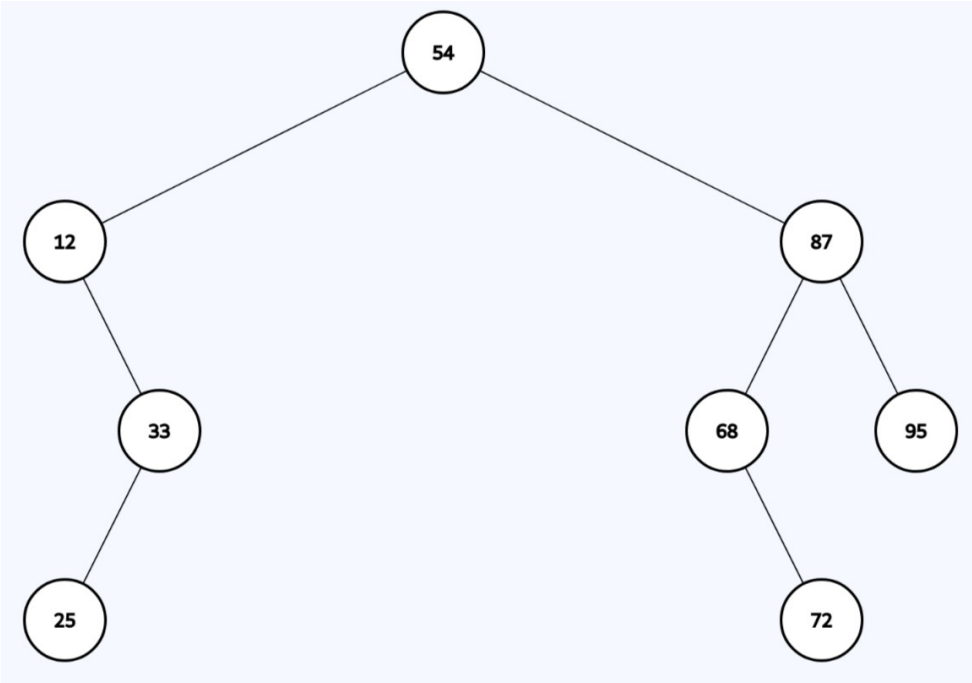
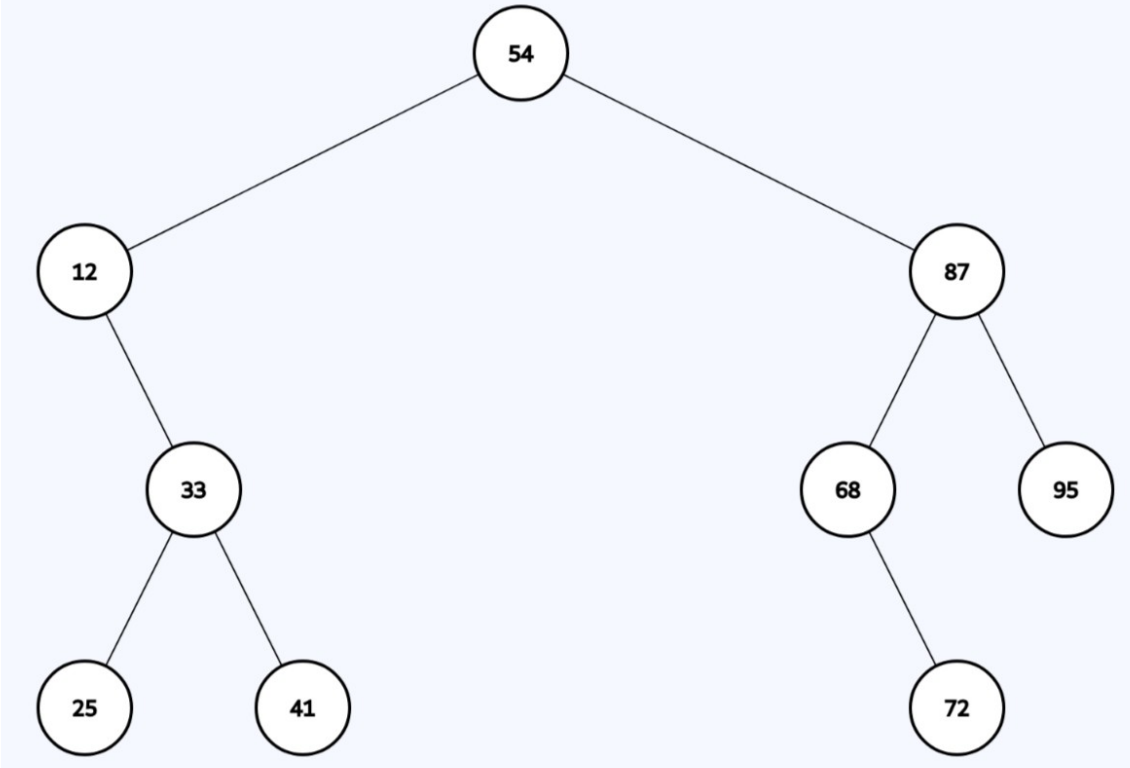


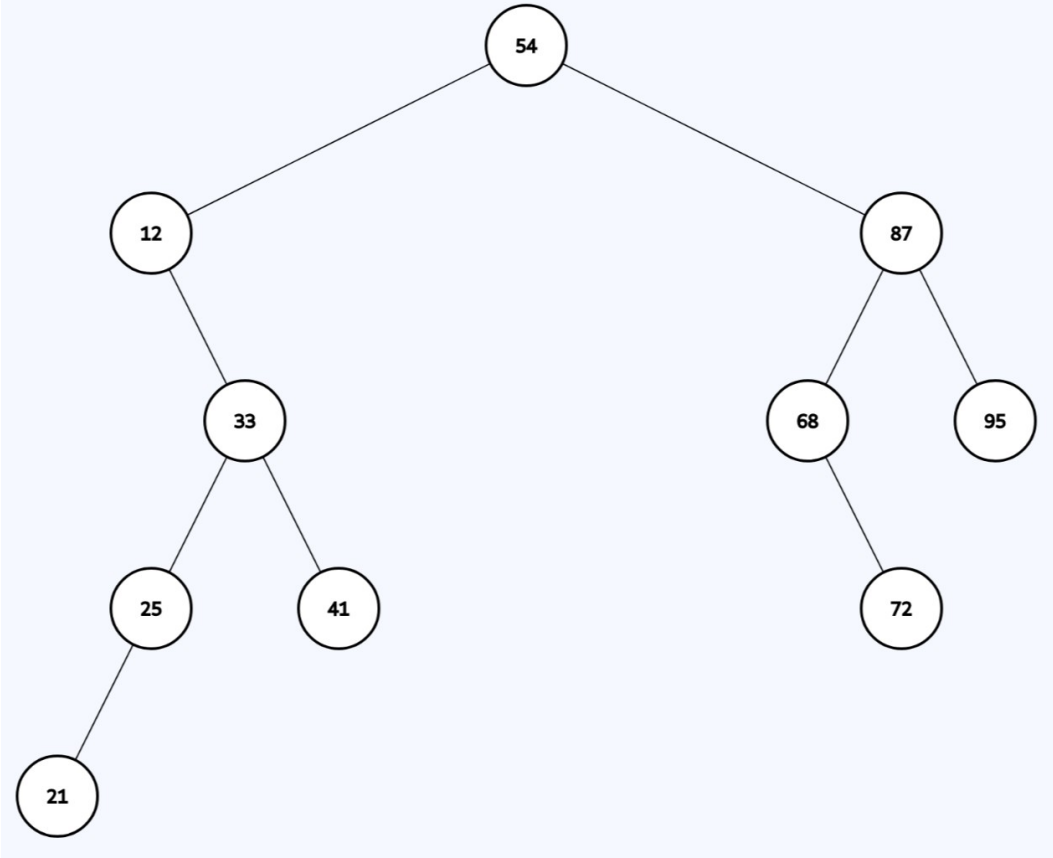
Insert 72:



Insert 41:



Insert 21:



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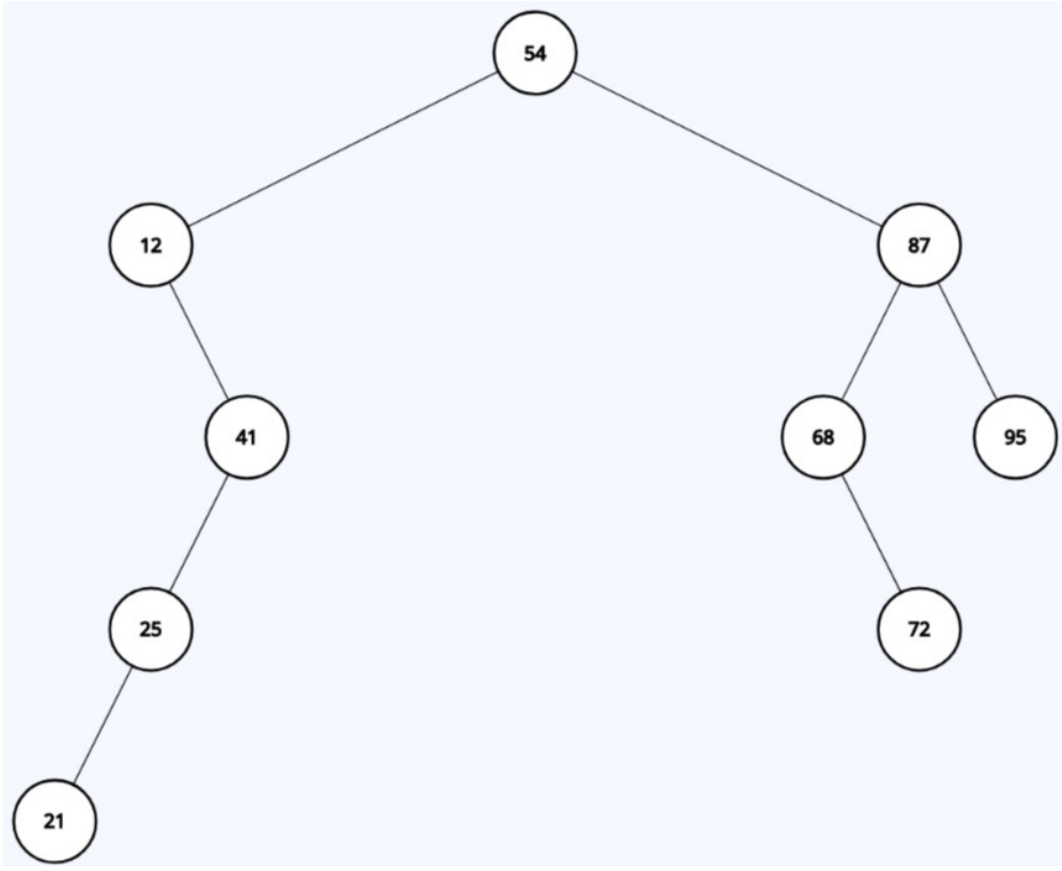

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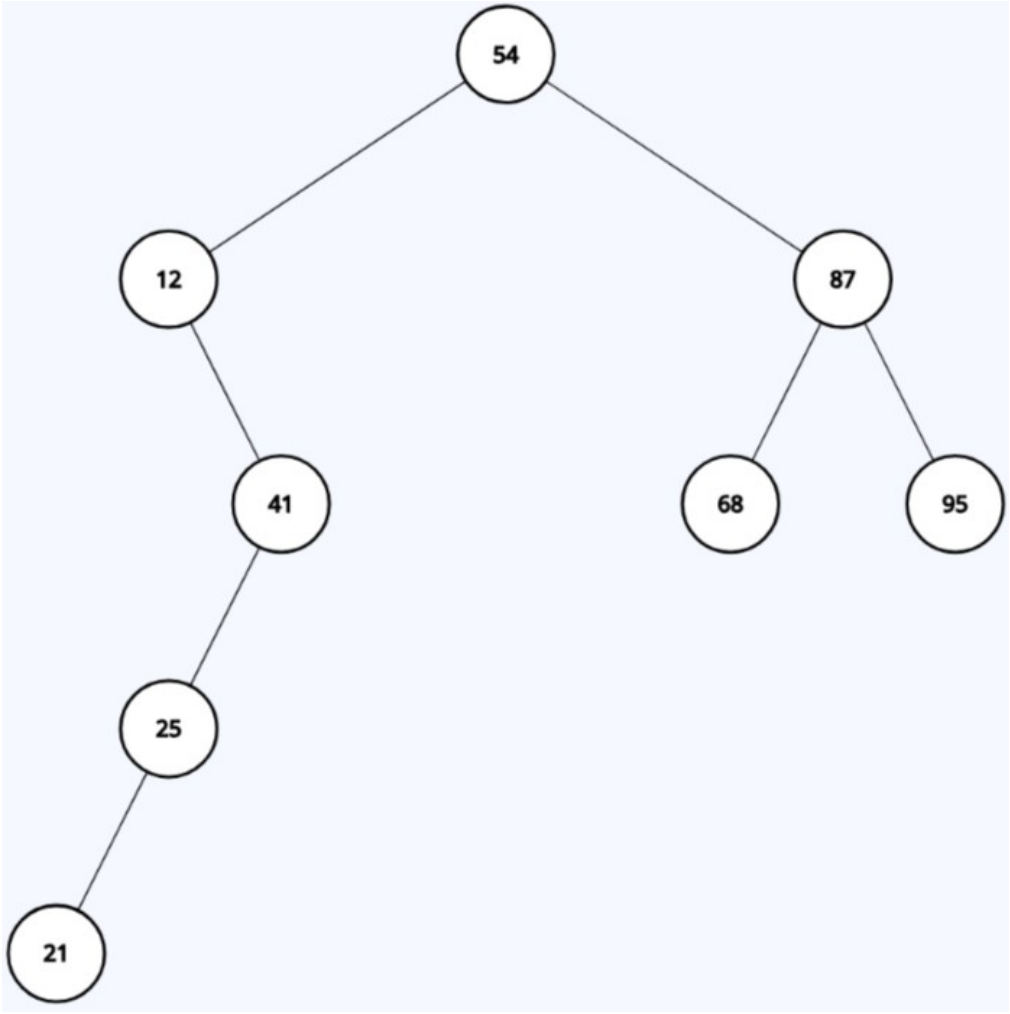

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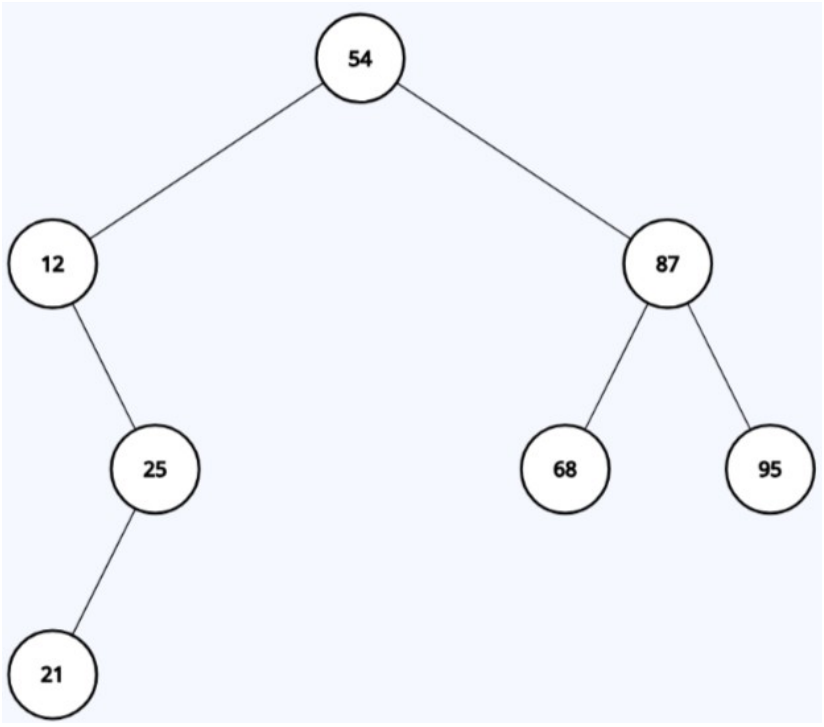

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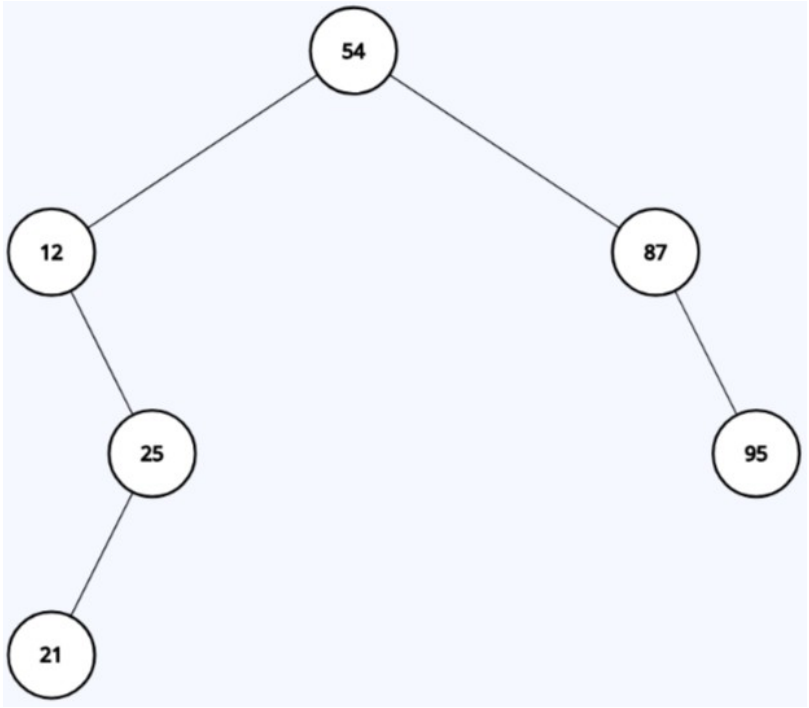

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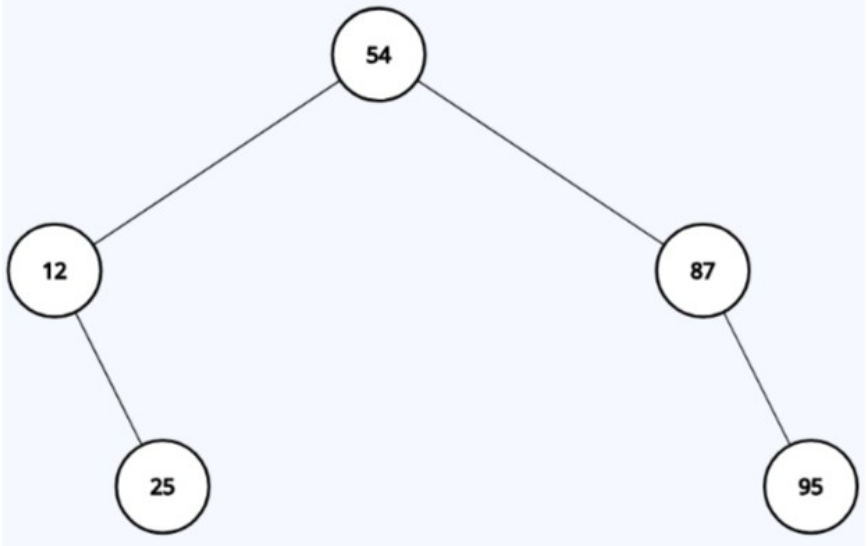
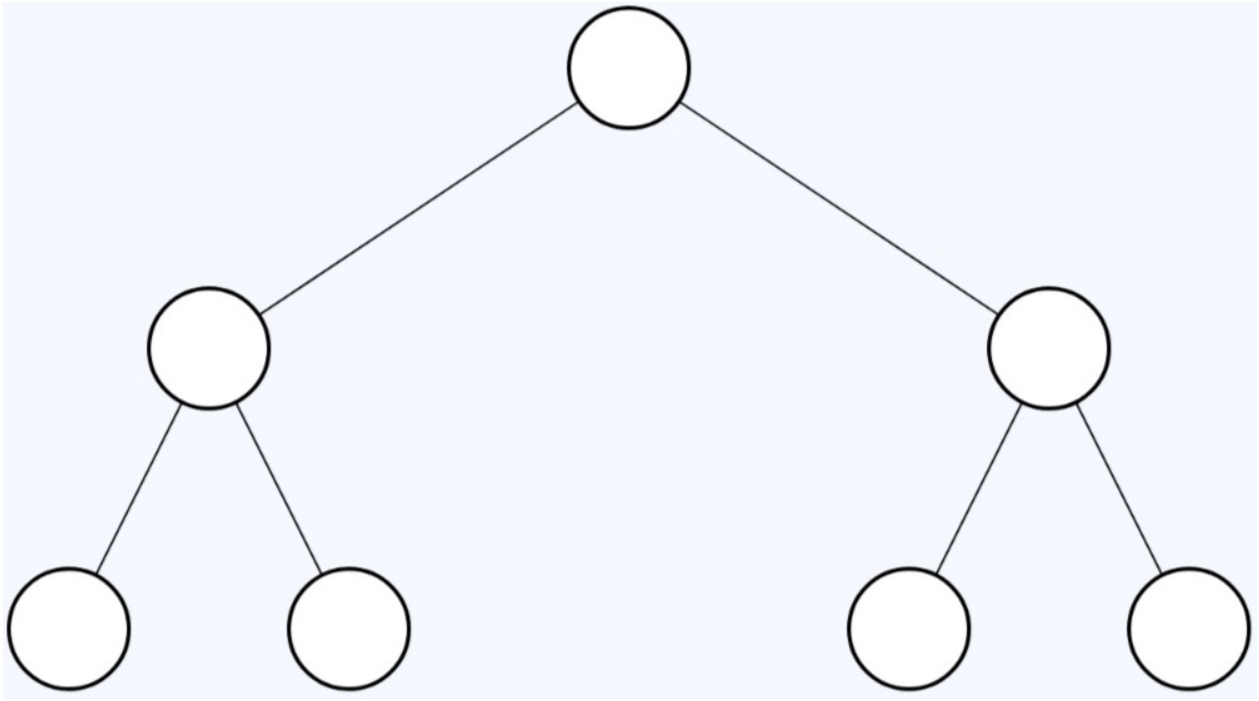
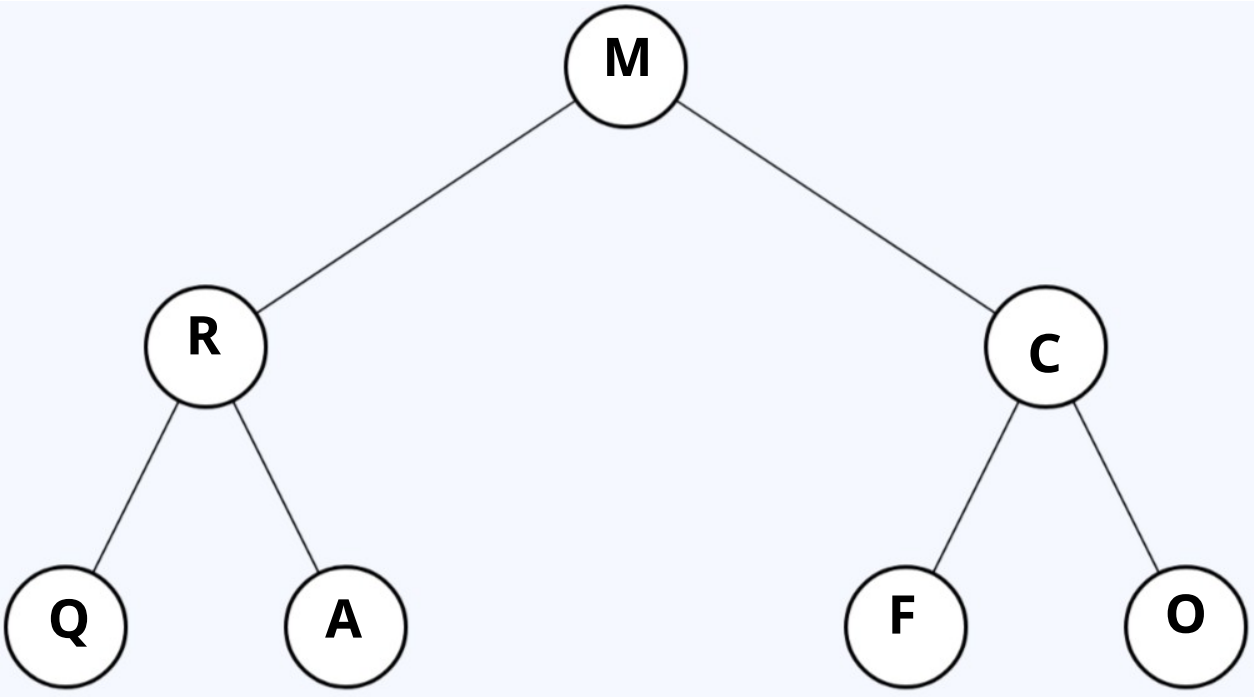


Part C

A full binary tree with 7 nodes should be in the following form:



A post-order traversal means a node is visited after its both children. Therefore, described tree is the following:



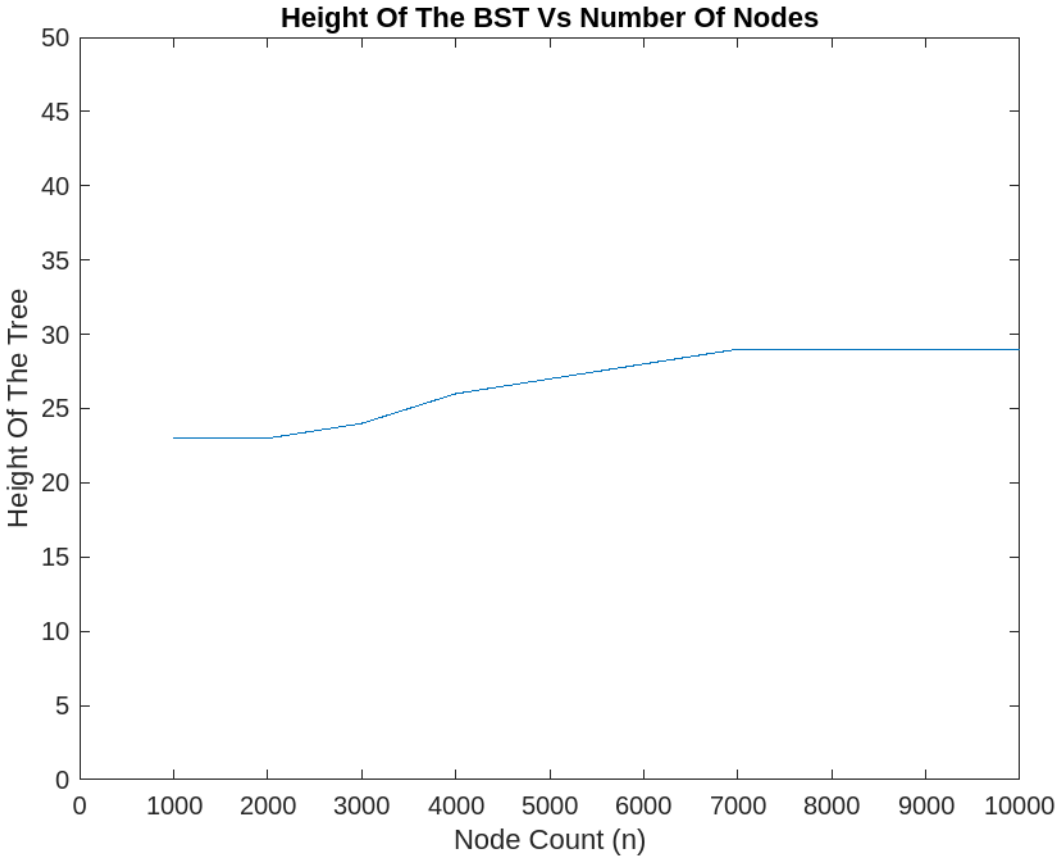
In-Order Traversal

Q-R-A-M-F-C-O

Question 3 Answers

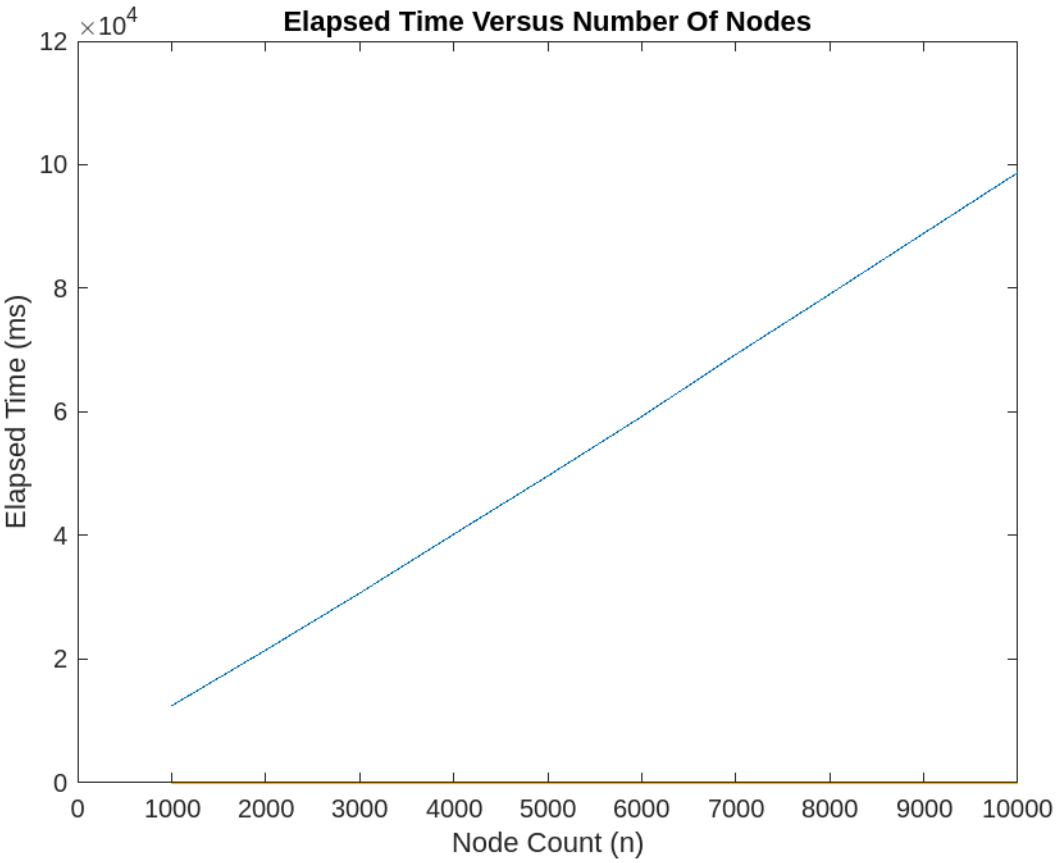
Nodes	Height	Insertion Time (ms)	Elapsed Time (ms)
1000	23	12477	12477
2000	23	9003.84	21480.84
3000	24	9208.53	30689.37
4000	26	9531.52	40220.89
5000	27	9420.14	49641.03
6000	28	9613.18	59254.21
7000	29	10047	69301.21
8000	29	9750.23	79051.44
9000	29	9849.72	88901.16
10000	29	9819.49	98720.65

Part 1



Height versus number of nodes function looks like a **logarithmic function** which is the expected behaviour since every time a node is inserted, its correct place needs to be searched firstly and average time complexity of search operation in BST is log(n). Average case applies here because of random numbers.

Part 2



If sorted integers were inserted, it would be like inserting at the end of a linked list, whose complexity is $O(n)$. Since we insert n integers, graph would be quadratic. ($n \times O(n) = O(n^2)$)