/**

* Title: Trees

* Author: Melis Atun

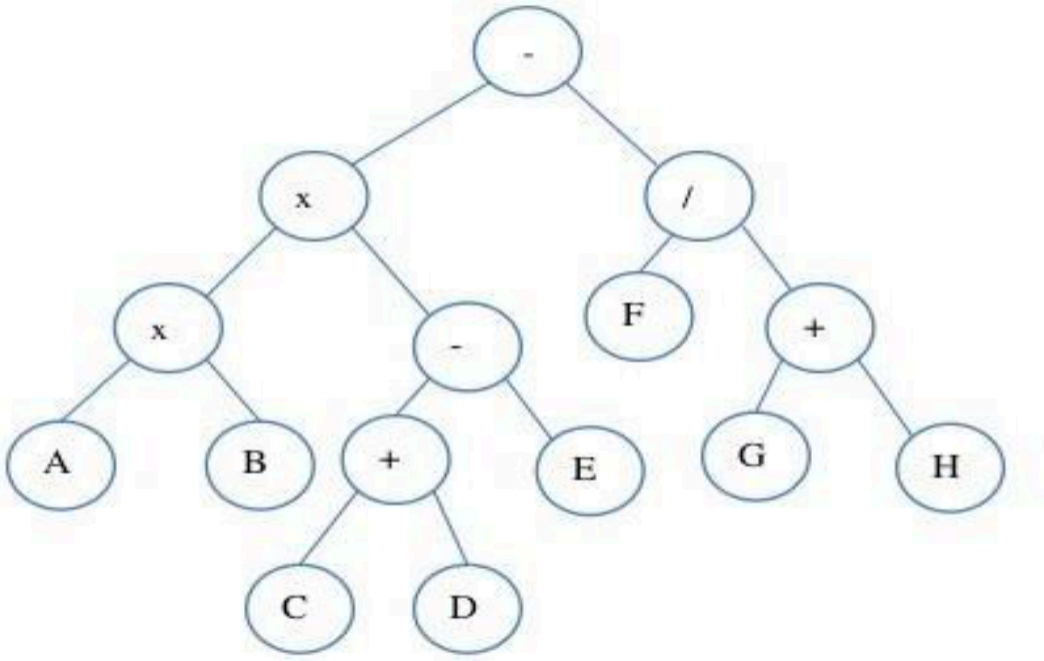
* ID: 21901865

* Assignment: 2

* Description: Answers to questions 1, 2 and 4

*/

Question 1:



Expression of this tree: [(A x B) x (C + D - E)] - [F / (G + H)]

Prefix expression: - x x A B - + C D E / F + G H

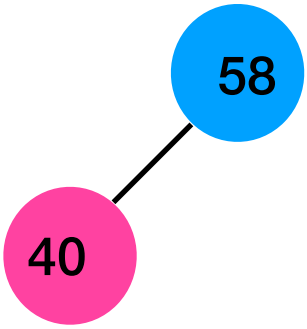
Infix expression: A x B x C + D - E - F / G + H

Postfix expression: A B x C D + E - x F G H + / -

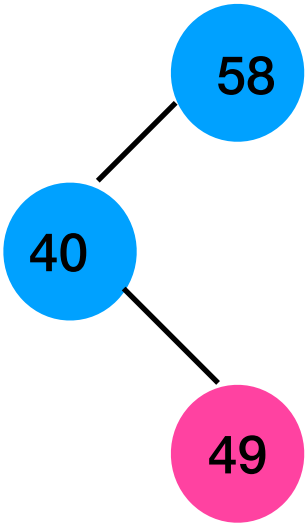
Question 2:

1st step: Insert 58 to the empty binary search tree

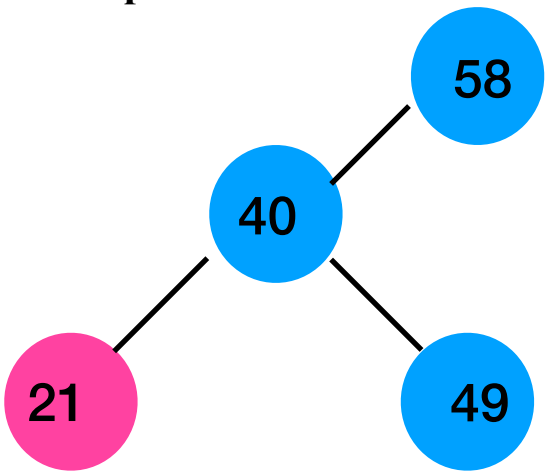
2nd step: Insert 40



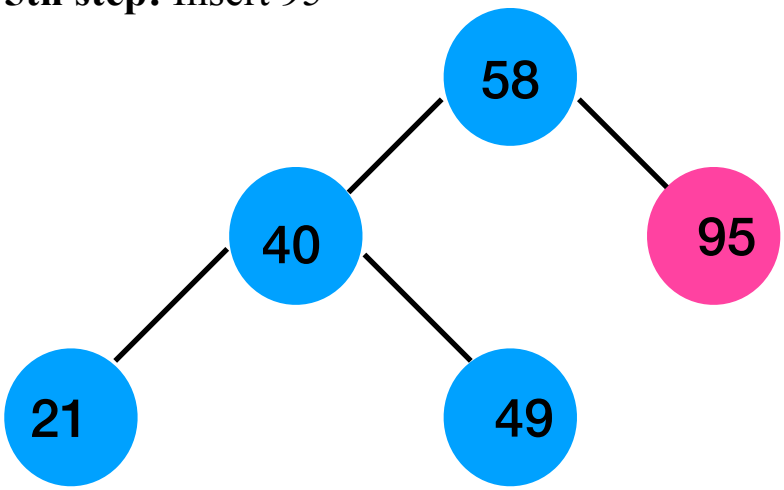
3rd step: Insert 49



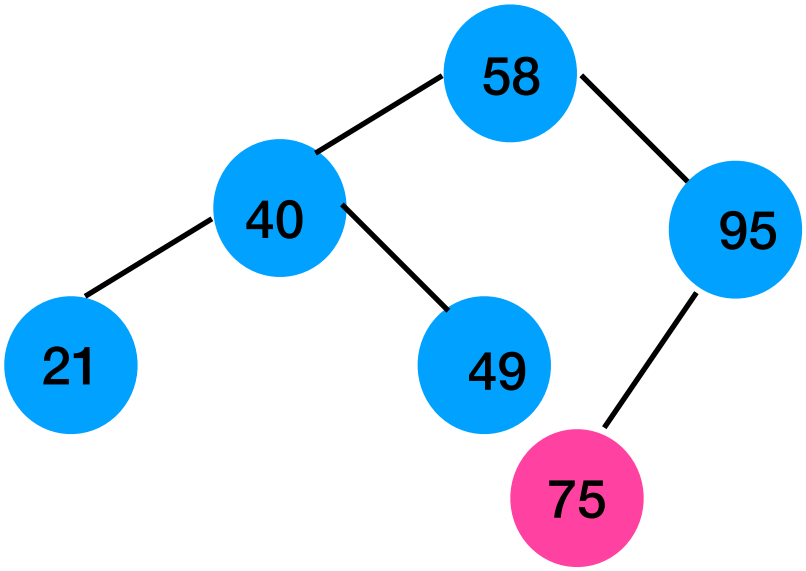
4th step: Insert 21



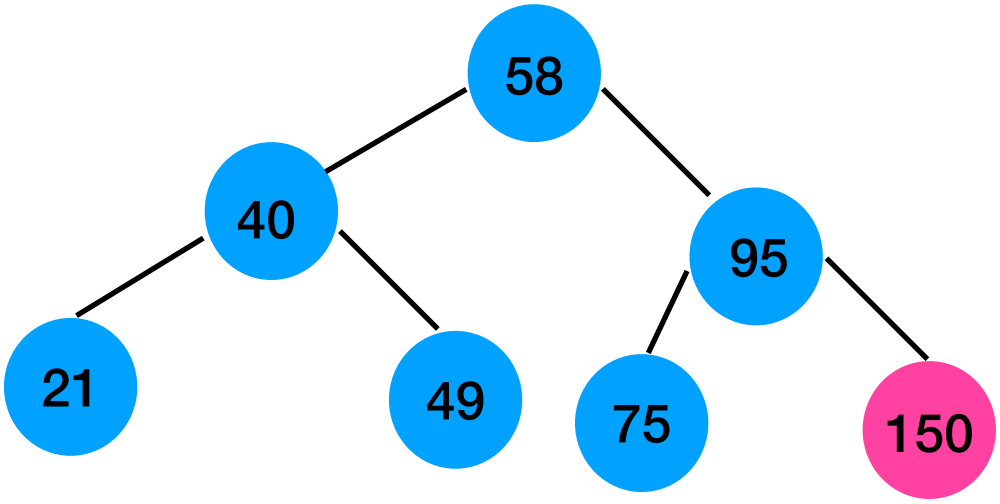
5th step: Insert 95



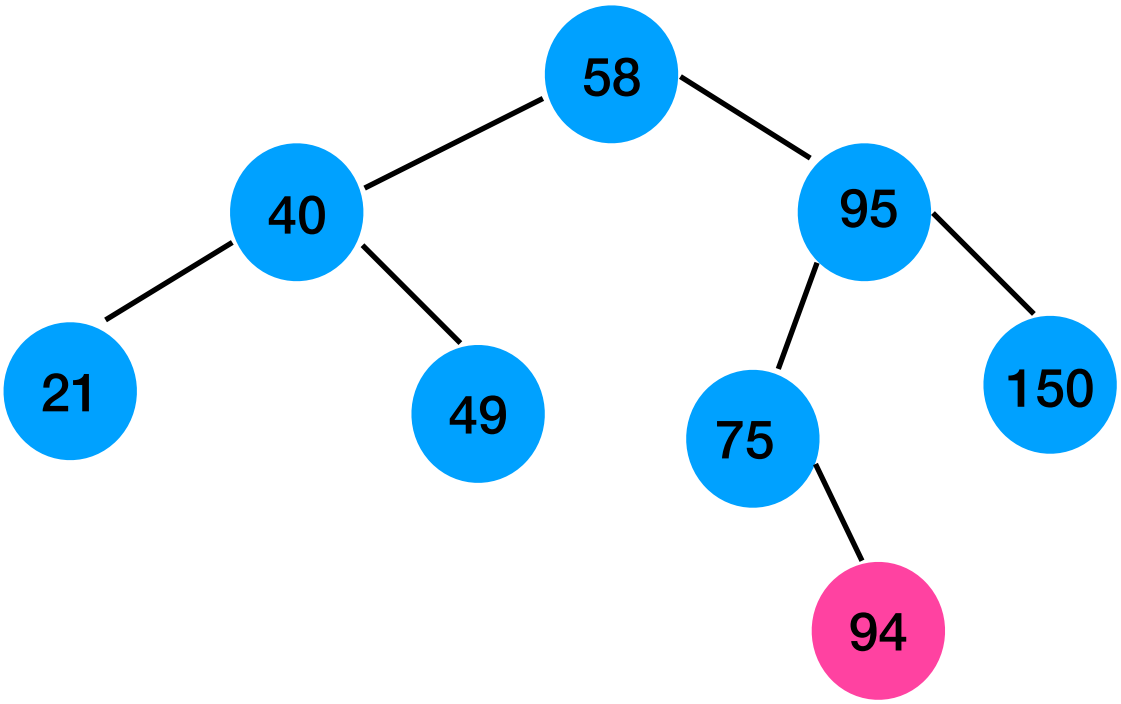
6th step: Insert 75



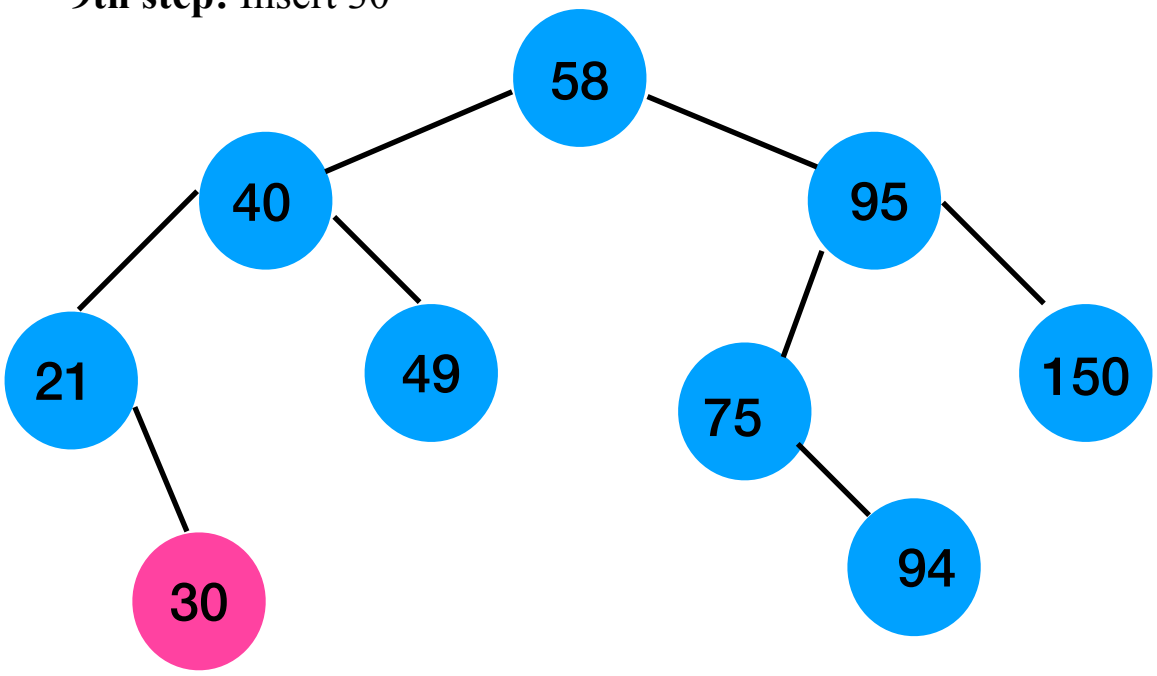
7th step: Insert 150



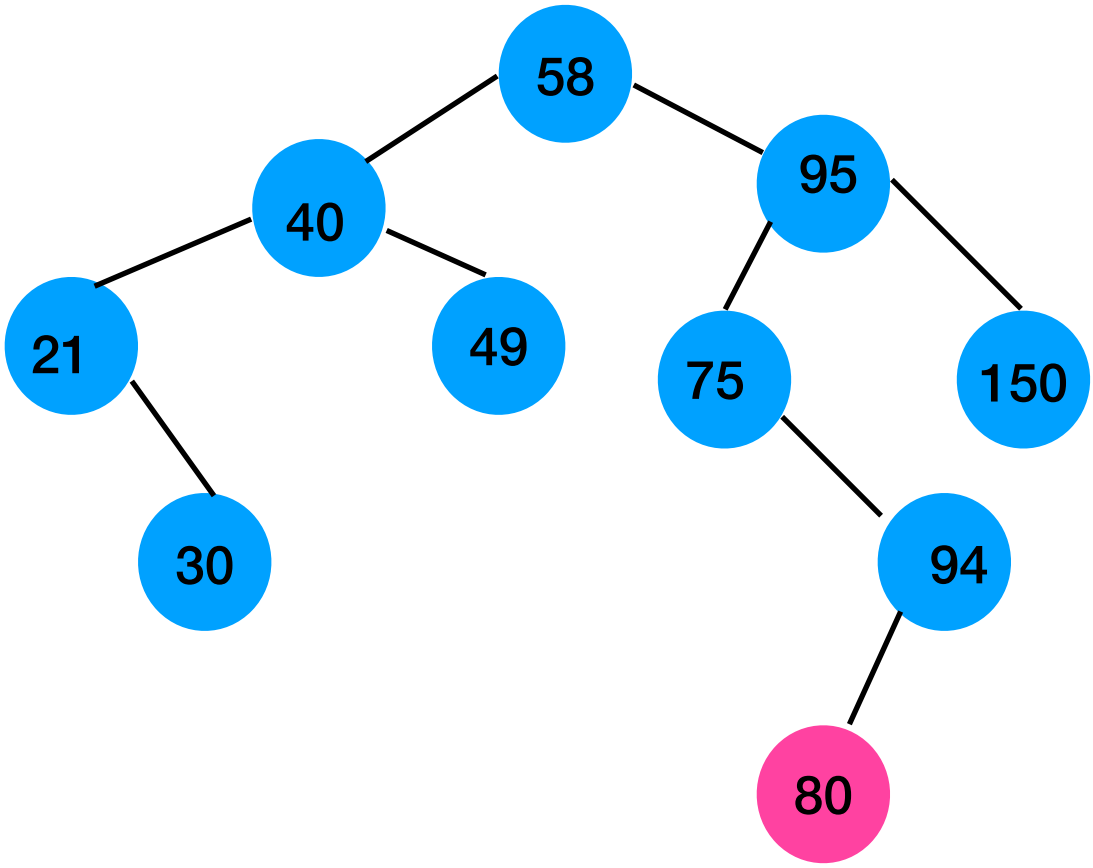
8th step: Insert 94



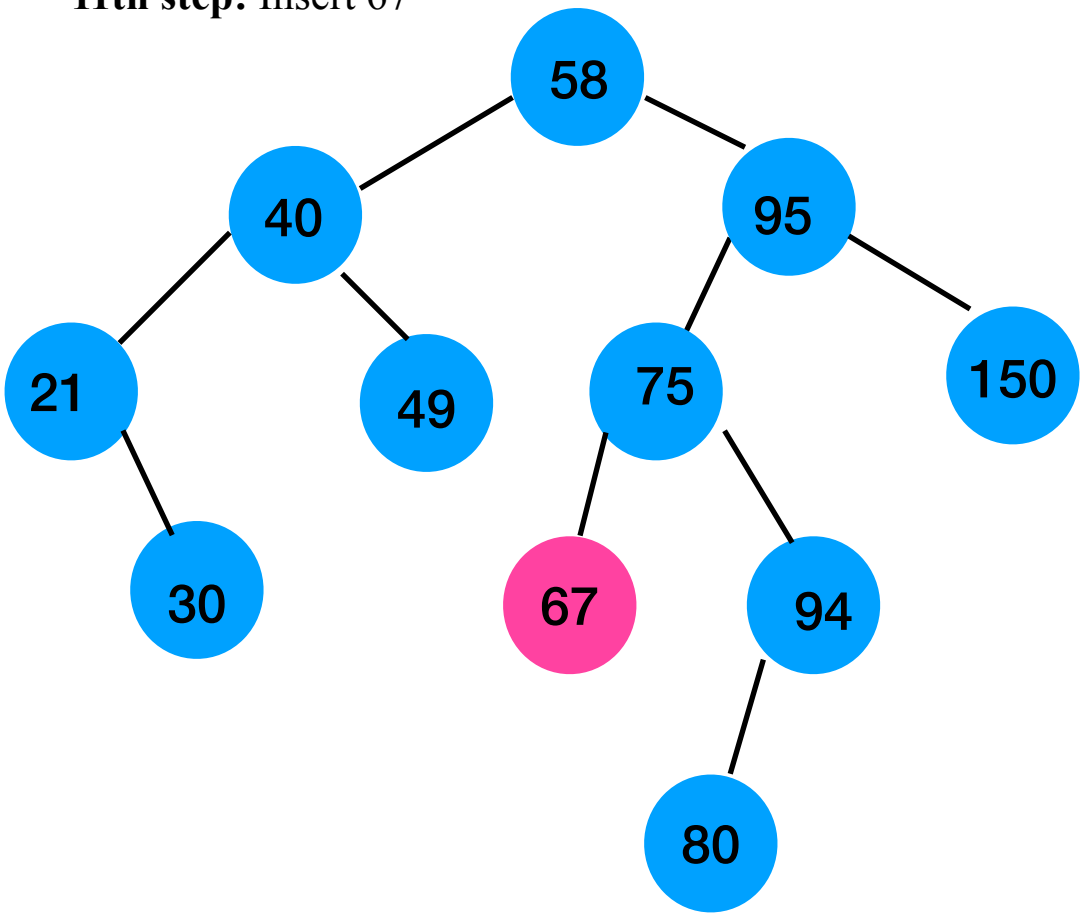
9th step: Insert 30



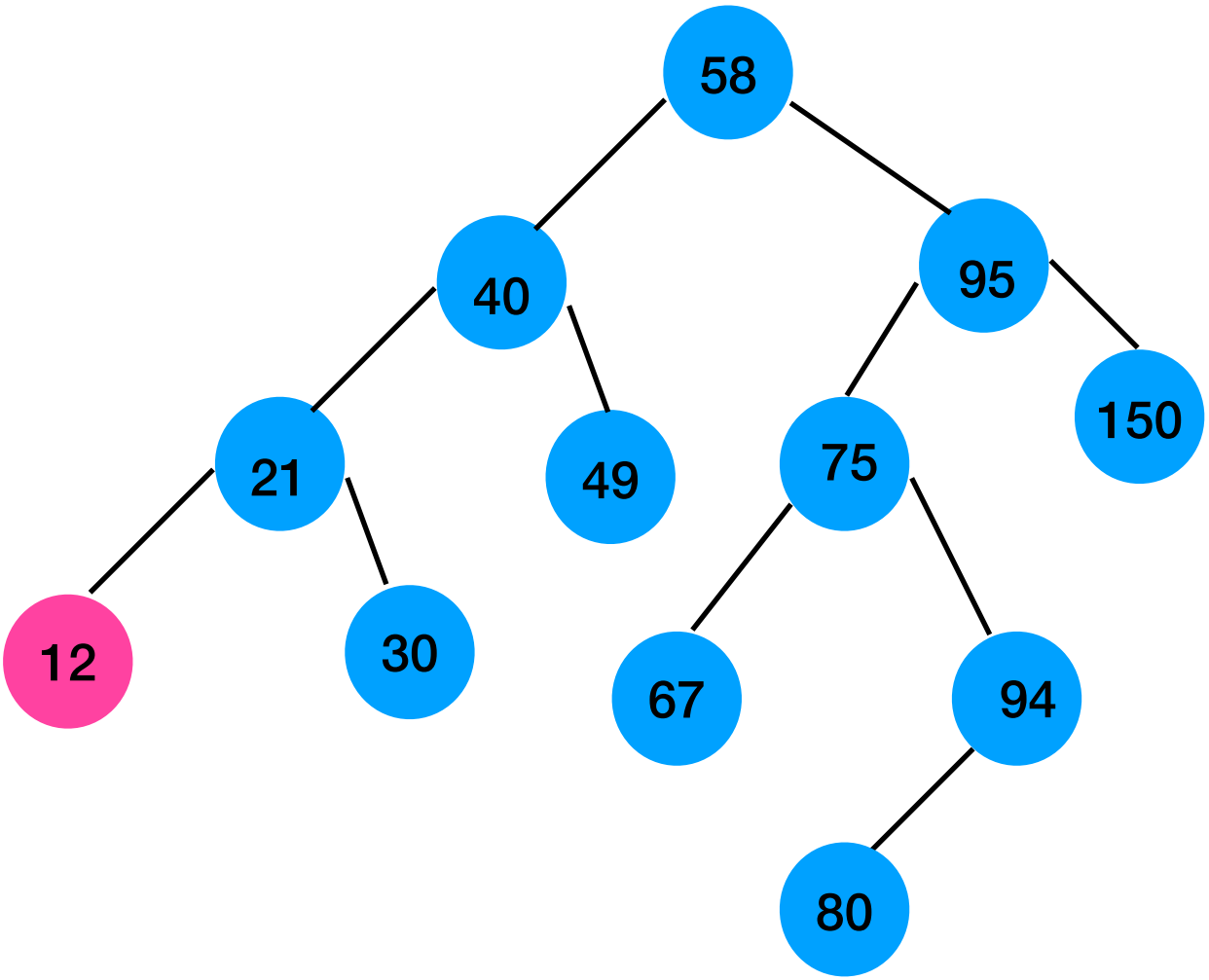
10th step: Insert 80



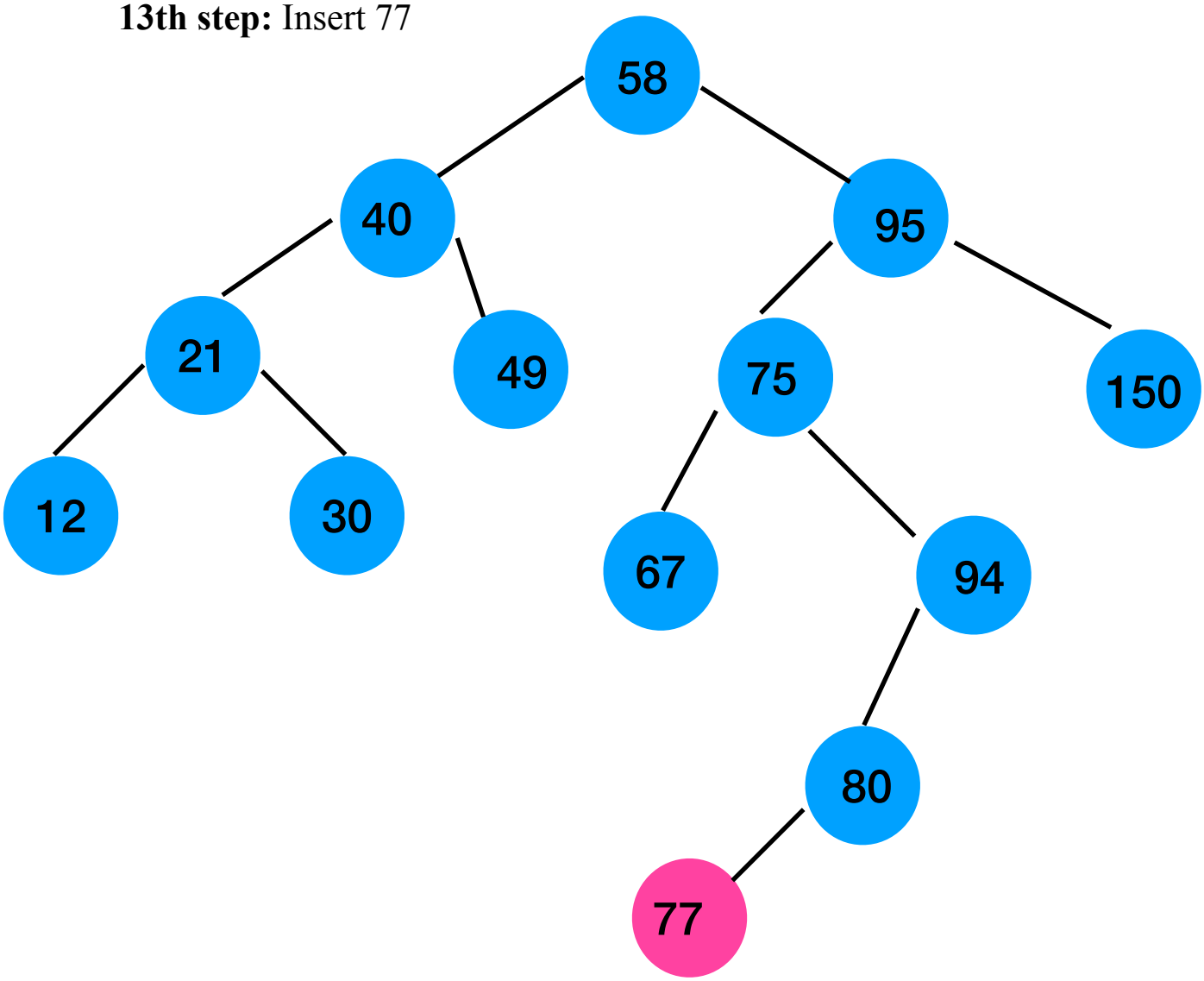
11th step: Insert 67



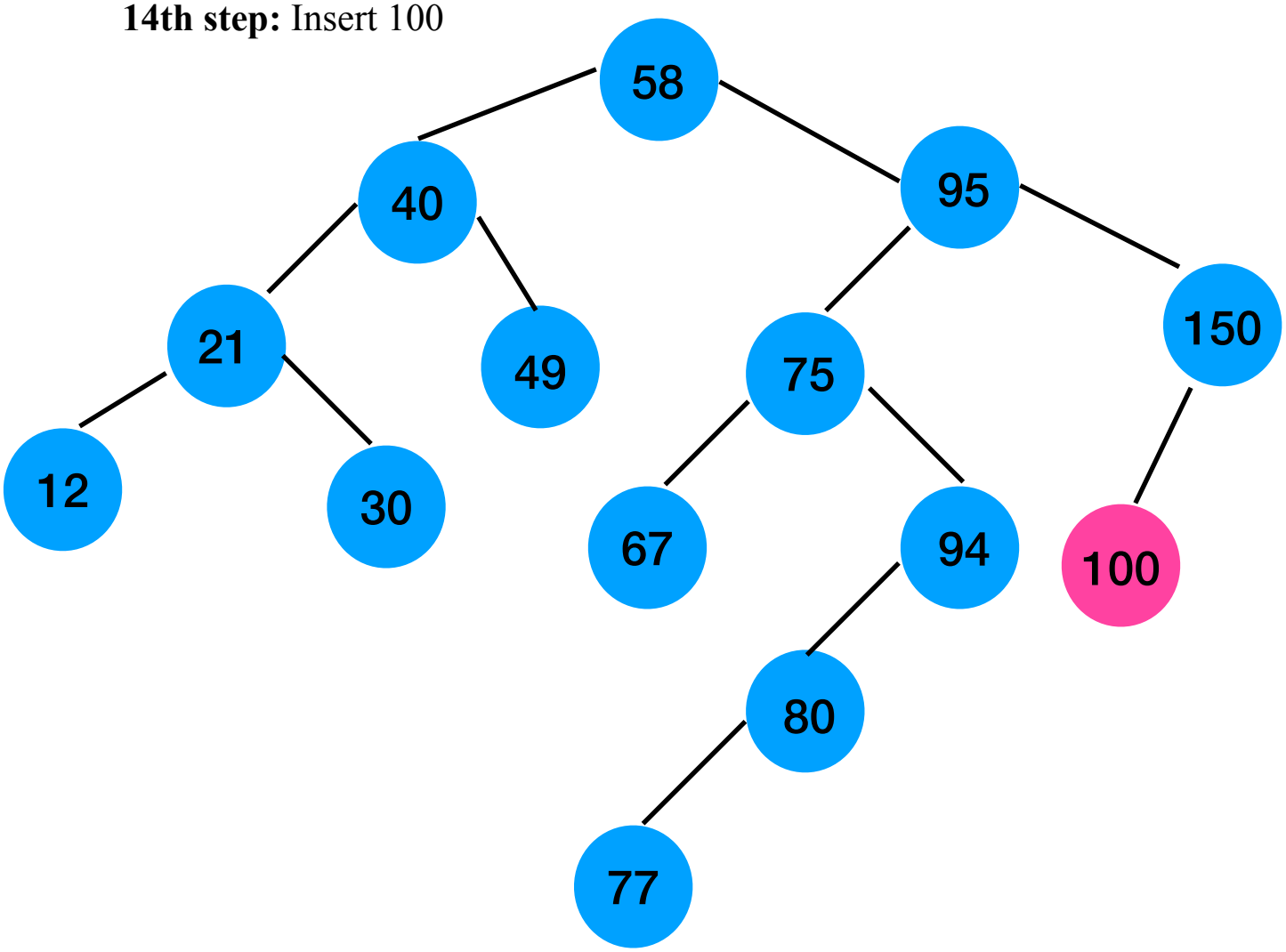
12th step: Insert 12



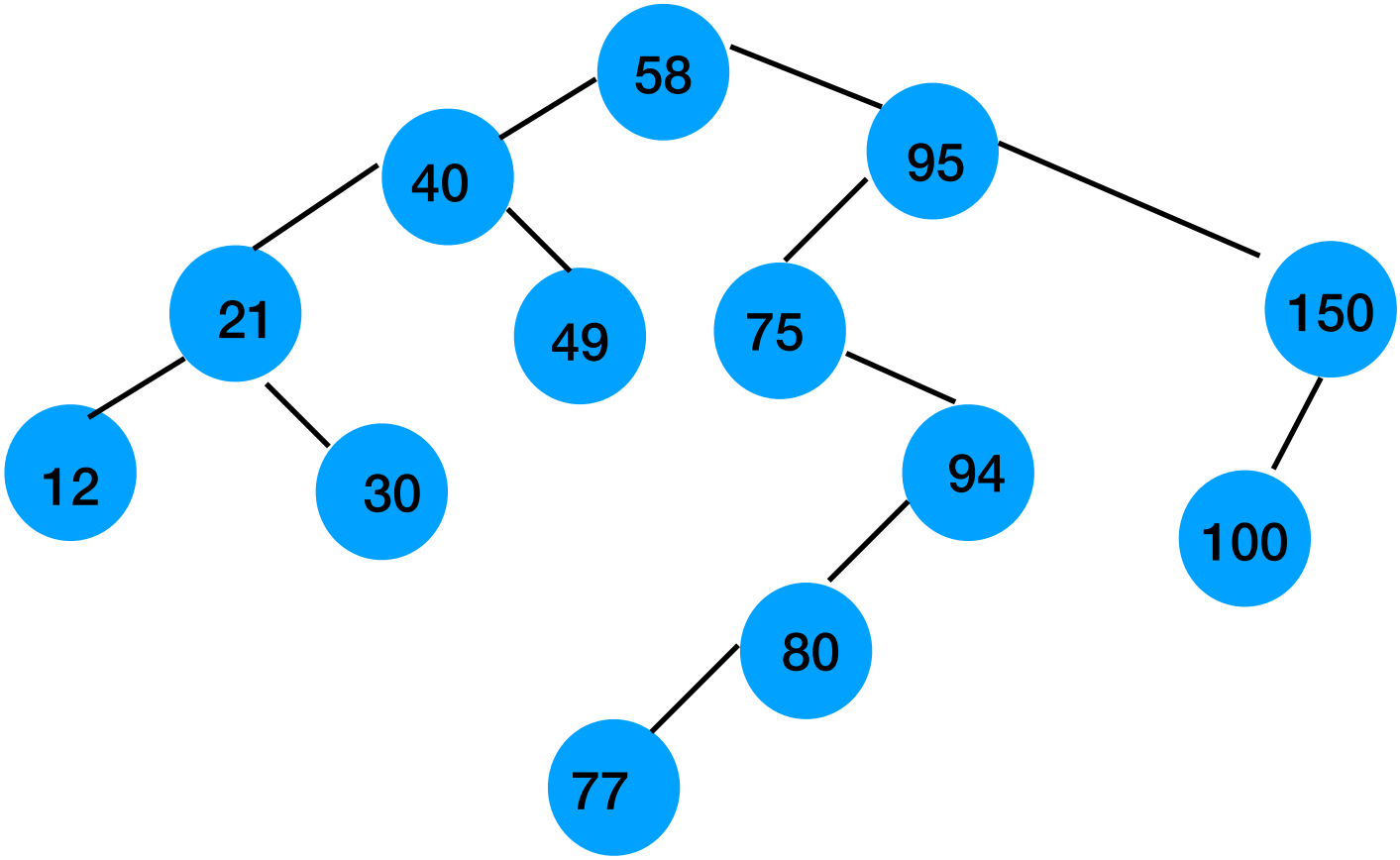
13th step: Insert 77



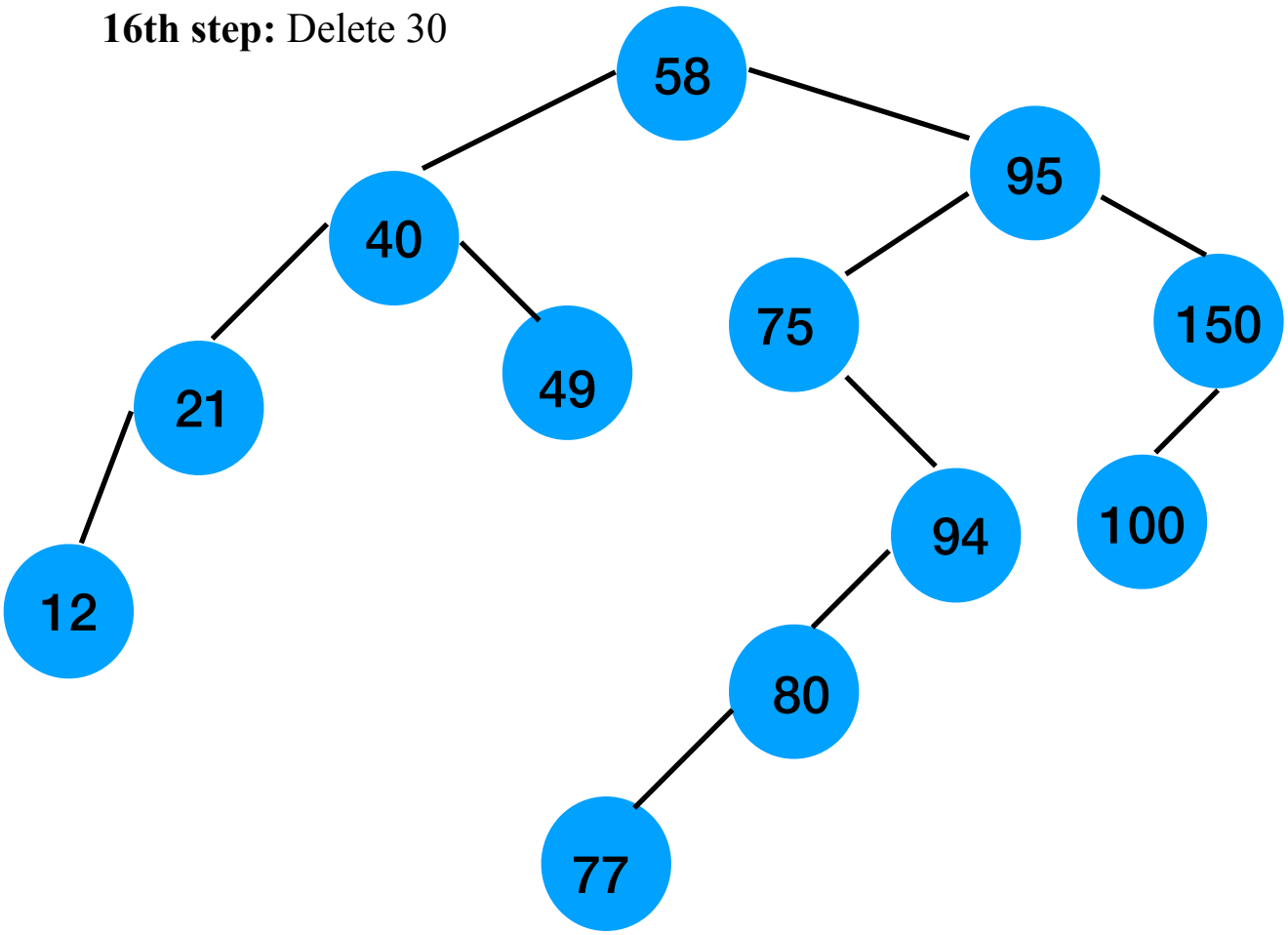
14th step: Insert 100



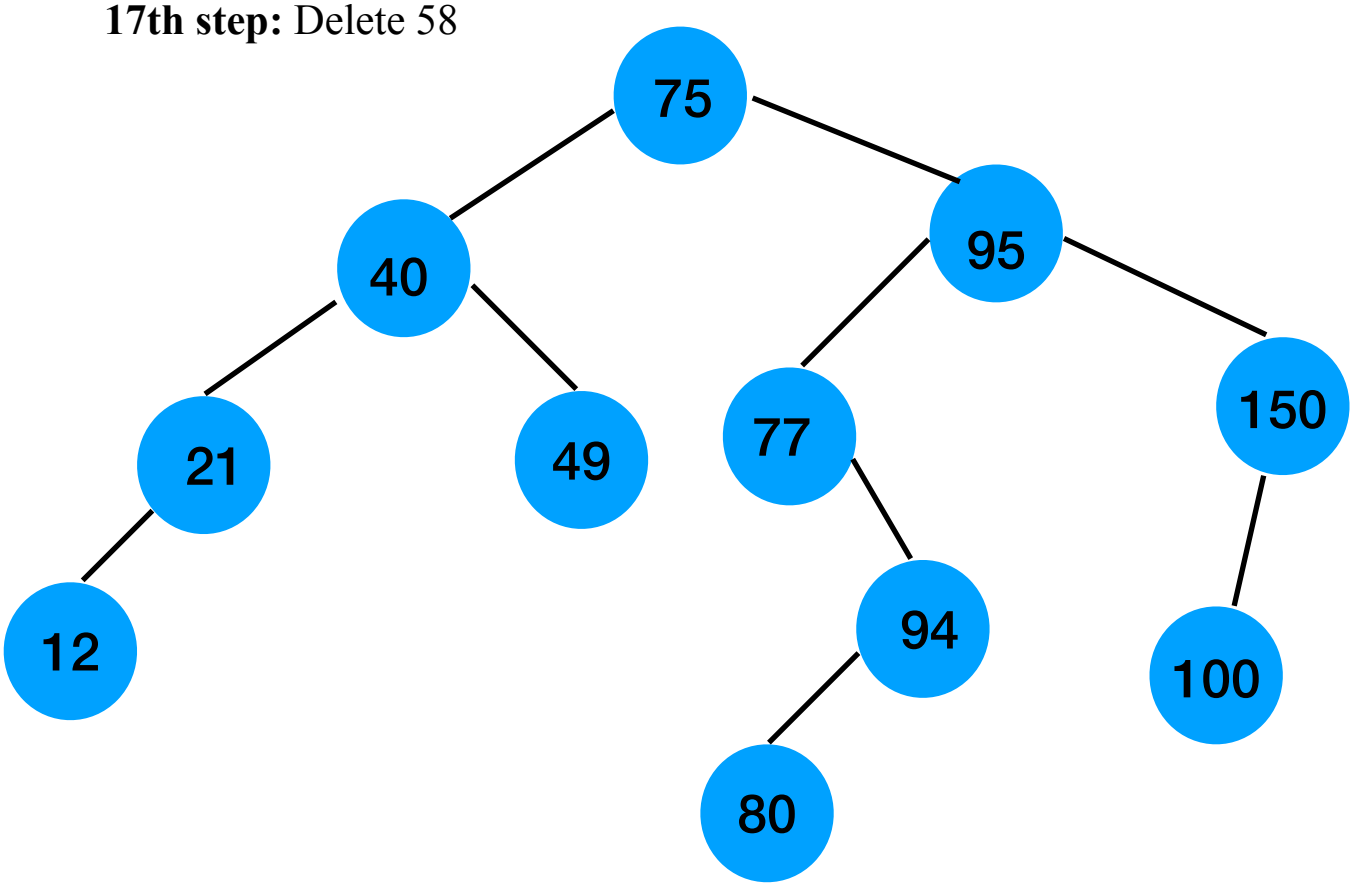
15th step: Delete 67



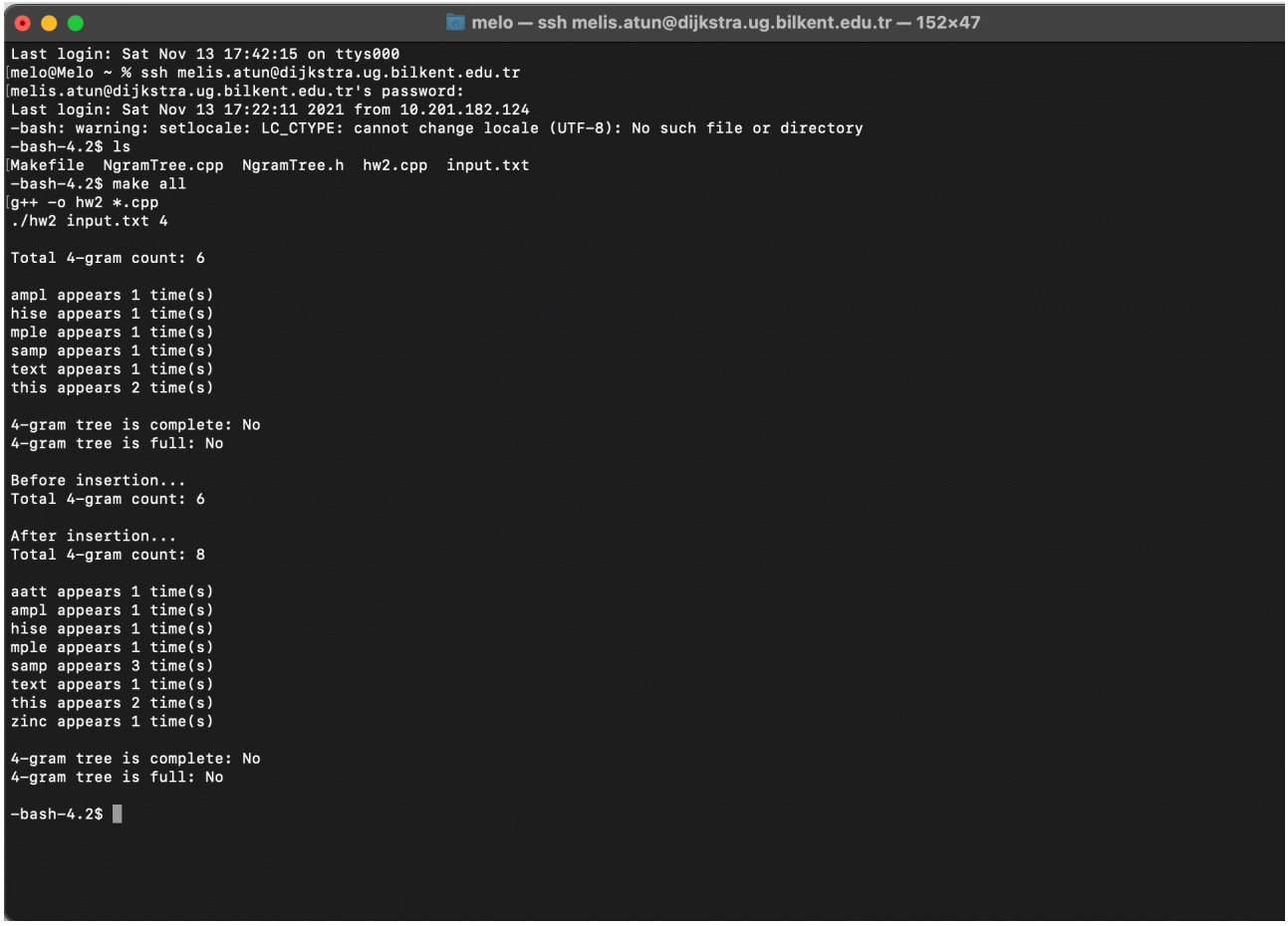
16th step: Delete 30



17th step: Delete 58



Question 3 (sample output):



Question 4:

- **addNgram function worst-case running time complexity -**

  The worst-case running time complexity of addNgram function is O(N) because in worst-case condition, the root of the tree has only one child (right or left), and the children of the root also have only one child (right or left). Since adding to the tree is O(1) and traversal of the tree is O(N), the complexity is O(N) consequently.

- **operator<< function worst-case running time complexity -**

  The worst-case running time complexity of operator<< function is O(N) because in worst-case condition, the root of the tree has only one child (right or left), and the children of the root also have only one child (right or left). Since adding to the tree is O(1) and traversal

of the tree is O(N), the complexity is O(N) consequently (same as addNgram function).