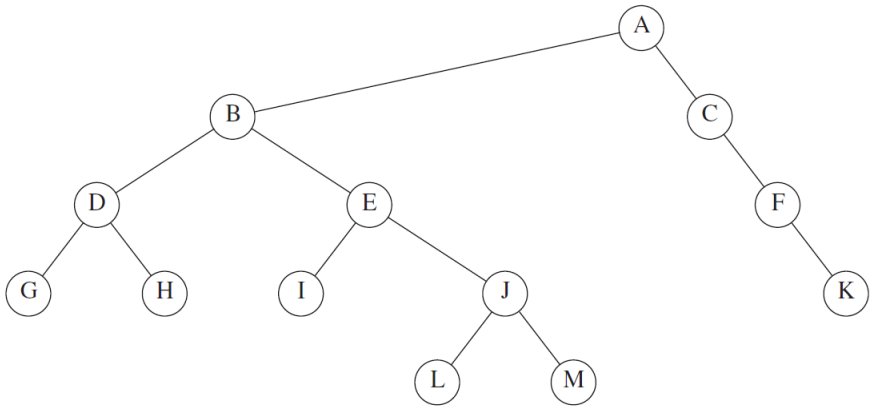
Exercises: Introduction to Trees - Solutions

Exercise 1

a. A

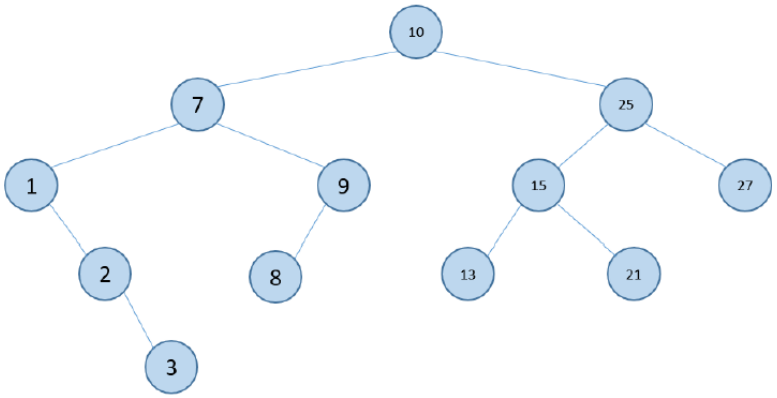
b. G, H, I, L, M, K

c. 4



Exercise 2

Consider the binary tree below. Write the sequences of numbers resulting from doing a:



a. Pre-order traversal: 10, 7, 1, 2, 3, 9, 8, 25, 15, 13, 21, 27

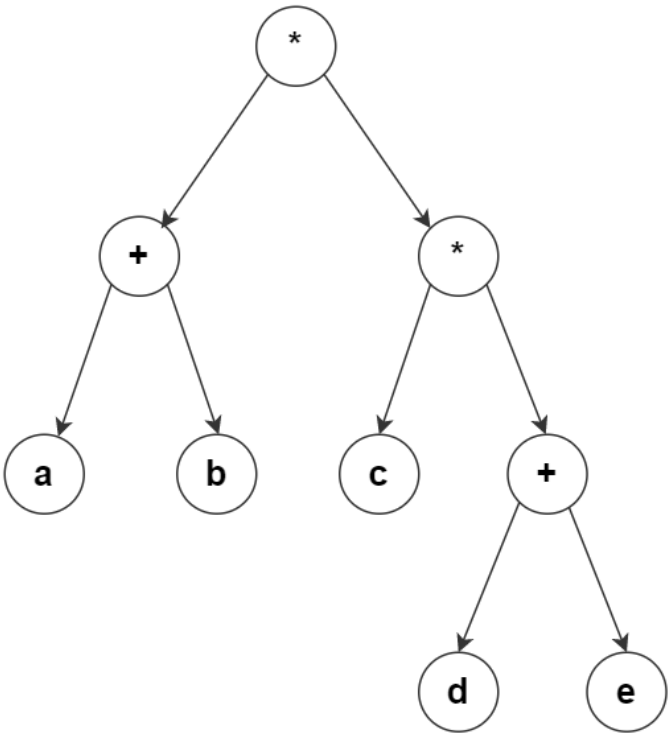
b. In-order traversal: 1, 2, 3, 7, 8, 9, 10, 13, 15, 21, 25, 27

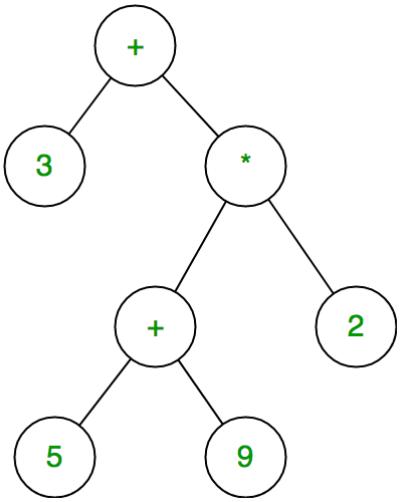
c. Post-order traversal: 3, 2, 1, 8, 9, 7, 13, 21, 15, 27, 25, 10

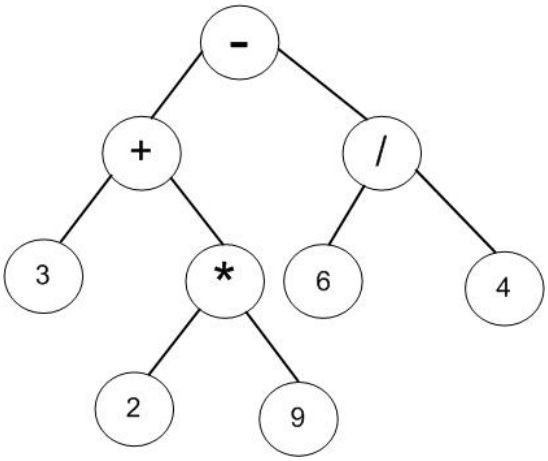
d. Level order traversal (BFT): 10, 7, 25, 1, 9, 15, 27, 2, 8, 13, 21, 3

Exercise 3

Below are shown 3 expression trees. For each of these, write the result from doing an in-order traversal. For the trees whose nodes are numbers, calculate the resulting number (be aware that the order of operations are determined by the tree!)





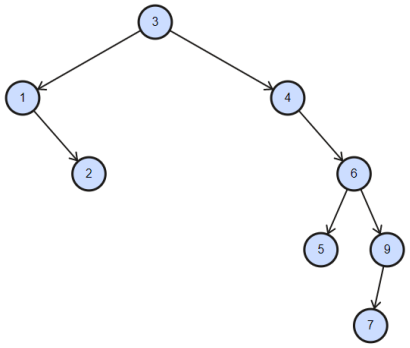


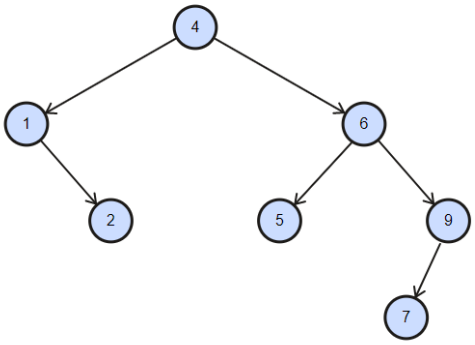
Top tree: (a+b)*(c*(d+e))
Bottom left: 3+((5+9)*2) = 31
Bottom right: (3+(2*9))-(6/4) = 39/2

Exercise 4

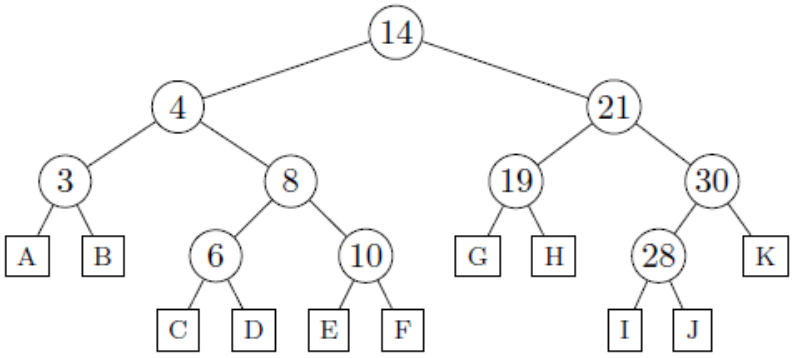
a. Show the result of inserting 3, 1, 4, 6, 9, 2, 5, 7 into an initially empty binary search tree.

b. Show the result of deleting the root.

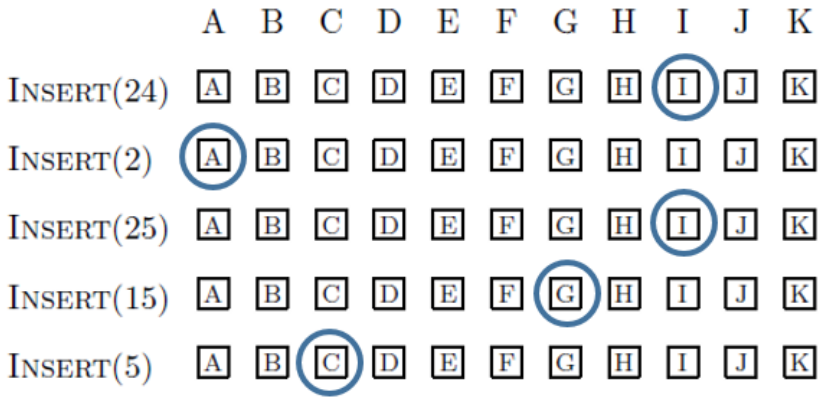




Exercise 5

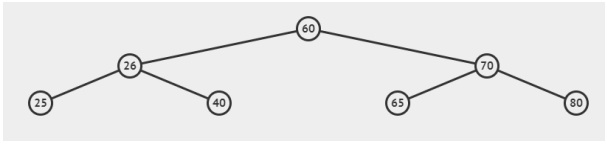


State in which leaf A-K the elements 24, 2, 25, 15 and 5 must be inserted in the above unbalanced binary search tree. Assume that the tree only contains the ten elements above before each insertion (i.e. the elements to be inserted are not present in the tree at a new insertion).

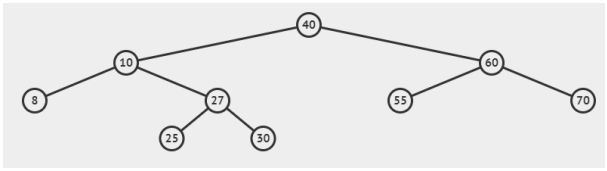


Exercise 6

a. If you insert 26 into the following binary search tree using the algorithm that keeps the tree height-balanced by doing rotations, what tree do you get?



b. If you insert 27 into the following binary search tree using the algorithm that keeps the tree height-balanced by doing rotations, what tree do you get?



c. If you remove 40 from the following binary search tree using the algorithm that keeps the tree height-balanced by doing rotations, what tree do you get (solution uses right sub-tree)?