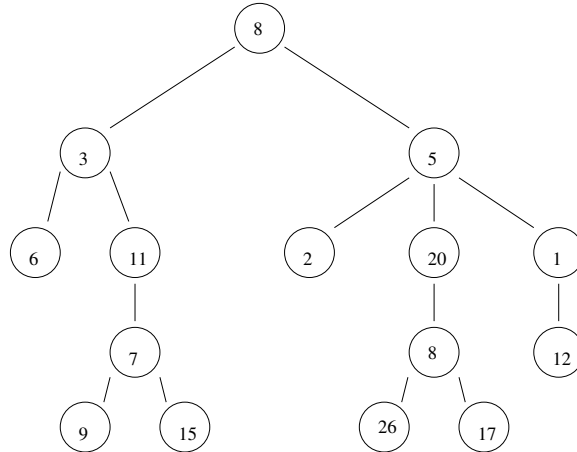


CS 140A - Homework 3
Due Wednesday, October 29



1. Answer the following questions about the tree shown.
 - (a) Which nodes are leaves?
 - (b) Which node is the root?
 - (c) What is the parent of node 5?
 - (d) Which nodes are children of 5?
 - (e) Which nodes are ancestors of 11?
 - (f) Which nodes are descendants of 11?
 - (g) What are the siblings of 6 and 11?
 - (h) What is the depth of node 5?
 - (i) What is the height of node 5?
2. List the nodes of the above tree in preorder traversal?
3. List the nodes of the above tree in inorder traversal?
4. List the nodes of the above tree in postorder traversal?
5. Convert the expression $((a + b) + c * (d + e) + f) * (g + h)$ to a
 - (a) prefix expression
 - (b) postfix expression
6. Draw tree representations for the postfix expressions.

(a) $ab + cde + *f + g**$

(b) $abc* + d*ef + gh + **$

7. Show that the maximum number of nodes in a binary tree of height h is $2^{h+1} - 1$. A binary tree of height h with the maximum number of nodes is called a full binary tree.
8. A full node in a binary tree is a node with two children. Prove that the number of full nodes plus one is equal to the number of leaves in a full binary tree.
9. Show that in a binary tree containing N nodes, there are $N + 1$ NULL pointers representing children.
10. Show the result of inserting the following items in an initially empty binary search tree. Note, the items should be entered in the given order.
4, 2, 9, 7, 1, 5, 6, 3, 8