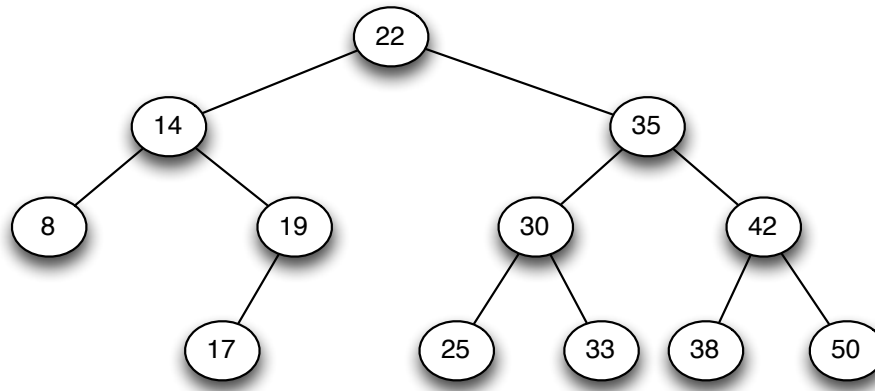


CMPT 202 - Tree Exercises - Solutions

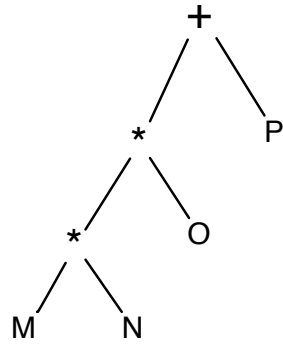
Most of the following questions refer to the tree shown below:



1. What node is at the root of the tree? **22**
2. What are the leaf nodes? **8, 17, 25, 33, 38, 50**
3. What node is the parent of 42? **35**
4. Are nodes 19 and 30 siblings? **No, they do not have the same parent.**
5. What is the height of this tree? **3**
6. What level is node 19? **2**
7. Is this a binary or general tree? **It is a binary tree because each node has no more than two children.**
8. If it is a binary tree, is it
 - (a) a binary search tree? **Yes, for each non-leaf node, the left child is $<$ the parent, and the right node is $>$ the parent.**
 - (b) a full binary tree? **No, nodes 8 and 19 do not have two children.**
 - (c) a complete binary tree? **No, the bottom level is not filled in from left to right.**
9. What are the pre-order, in-order, and post-order traversals of this tree?
 - (a) Pre-order: **22, 14, 8, 19, 17, 35, 30, 25, 33, 42, 38, 50**
 - (b) In-order: **8, 14, 17, 19, 22, 25, 30, 33, 35, 38, 42, 50**
 - (c) Post-order: **8, 17, 19, 14, 25, 33, 30, 38, 50, 42, 35, 22**

10. Write the expression tree for the following expressions:

$$m * n * o + p$$



$$a * (b + c) * d$$

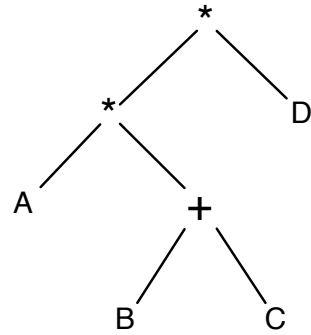


Figure 1: Solution

11. What is the height of the shortest binary tree that contains 21 nodes? $\lfloor \lg 21 \rfloor = 4$

12. Draw the shortest possible binary search tree from the following set of strings

$\{ Ann, Ben, Charles, David, Elizabeth, Fred, Gary, Harold, Isabel, Jay, Kelly \}$

There are a few different ways, here is one such approach:

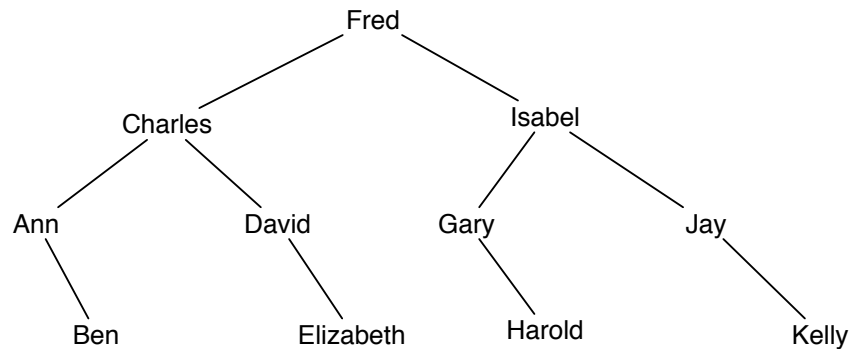


Figure 2: Solution

13. At most how many nodes can a binary tree have at level n ? 2^n

14. Insert the following values into a binary search tree:

{ 26, 12, 2, 3, 4, 5, 15, 35, 1 }

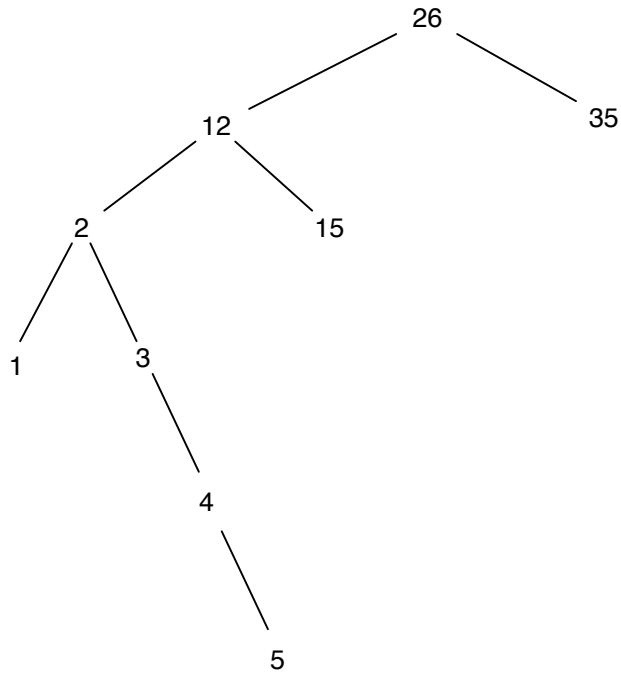


Figure 3: Solution

15. Provide three examples from everyday life where a decision tree can be used?

- (a) Medical diagnosis tool.
- (b) Stock picking algorithm.
- (c) Game playing software (i.e. chess.)