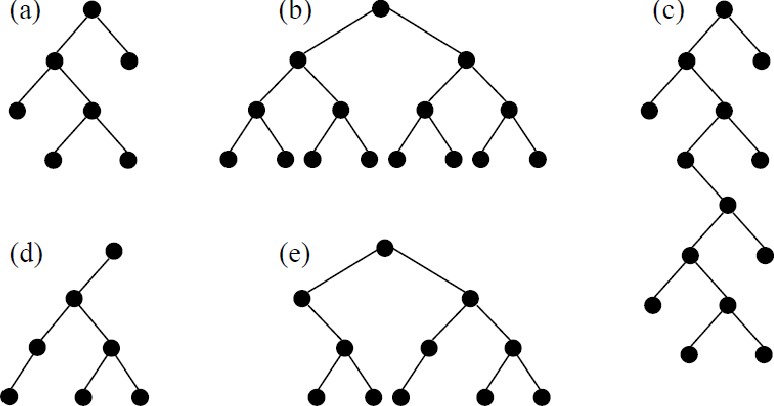
Tutorial 12 & 13

# Trees

1 . Given a binary tree of size 76, what is the minimum number of levels it can contain? What is the maximum number of levels?

NOTE: Size of a binary tree is the number of nodes in the tree.]

1. What is the maximum number of nodes possible in a binary tree with 5 levels?
2. Given the following binary trees:



(Content from Reference Text: Data Structures & Algorithms using Python. Rance D. Necaise, Wiley, 1st Edition, 2011)

1. Indicate all the structure properties that apply to each tree: full, perfect and complete.
2. Determine the size of each tree.

[NOTE: Size of a binary tree is the number of nodes in the tree.]

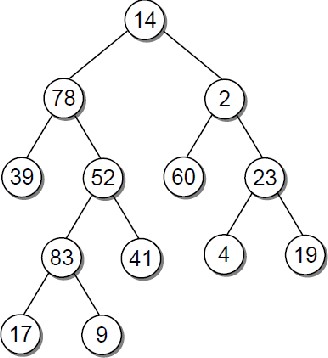
1. Determine the height of each tree.

[NOTE: Height of a binary tree is the maximum depth of any node in the tree.]

1. Determine the width of each tree.

[NOTE: Width of a binary tree is the number of nodes on the level containing the most nodes.]

4. Consider the following binary tree:



(Content from Reference Text: Data Structures & Algorithms using Python. Rance O Necaise, Wiley, 1st Edition, 2011)

1. Show the order that the nodes will be visited in the following tree traversal methods:

Pre-order traversal

* 1. In-order traversal
  2. Post-order traversal
  3. Breadth-first traversal

1. Identify all of the leaf nodes.
2. Identify all of the interior nodes.
3. List all of the nodes on level 4.
4. List all of the nodes in the path to each of the following nodes:

 83

* 1. 39

## (iii) 4 (iv) 9

f. Consider node 52 and list the node's: descendants

(ii) ancestors

## (iii) siblings

g. Identify the depth of each of the following nodes:

 78

(ii)

(iii) 60

## (iv) 19

5. A binary search tree is created when the numbers are inserted in the following order:

30, 63, 2, 89, 16, 24, 19, 52, 27, 9, 4, 45

Draw the binary search tree.

 End of Tutorial