### **Task 1: Tree Traversals**

**Problem Statement:**

You are given a binary tree as an adjacency list. Perform in-order, pre-order, and post-order traversal of the tree.

**Input:**

n

val left right

... (n lines)

Each line contains:

* val – the node's value
* left – index of the left child (-1 if null)
* right – index of the right child (-1 if null)

Assume index 0 is always the root.

**Output:** Print three lines:

1. In-order traversal
2. Pre-order traversal
3. Post-order traversal

**Example Input:**

5

4 1 2

2 -1 -1

5 3 4

1 -1 -1

3 -1 -1

This represents the tree:

4

/ \

2 5

/ \

1 3

**Example Output:**

2 4 1 5 3

4 2 5 1 3

2 1 3 5 4

### **Task 2: Height of a Tree**

**Problem Statement:** Given a tree in the form of a parent array where -1 represents the root, compute the height of the tree.

**Input:**

n

p₀ p₁ p₂ ... pₙ₋₁

Each pᵢ is the parent of node i. The height of a tree is the number of nodes in the longest path from root to leaf.

**Output** Print the height of the tree.

**Example Input:**

5

5 -1 5 2 2

**Example Output:**

3

## 

## **Tree Quiz**

**1. What is the time complexity of tree traversal algorithms (in-order, pre-order, post-order)?** A) O(n²)  
 B) O(log n)  
 C) O(n) ✅  
 D) O(1)

**2. What data structure is used in level-order traversal of a binary tree?** A) Stack  
 B) Queue ✅  
 C) Array  
 D) Linked List

**3. What is the height of a tree with only the root node?** A) 0 ✅  
 B) 1  
 C) -1  
 D) Undefined

**4. How many edges are there in a tree with n nodes?** A) n - 1 ✅  
 B) n  
 C) n + 1  
 D) Depends on the tree

**5. In the following tree, what is the in-order traversal?**

A

/ \

B C

/ \

D E

A) B A D C E ✅  
 B) B D E C A  
 C) A B C D E  
 D) D E C B A

**6. What is the Pre-order traversal of the previous tree?** A) A B C D E ✅  
 B) B A D C E  
 C) A C D E B  
 D) D C E A B

**7. What is the Post-order traversal of the previous tree?** A) B D E C A ✅  
 B) D E C B A  
 C) A B D E C  
 D) B A E D C

**8. What is the primary difference between a binary tree and a general tree?** A) Binary trees cannot have children  
 B) Binary trees have at most two children ✅  
 C) General trees are always balanced  
 D) Binary trees must be complete

**9. A tree where every node has either 0 or 2 children is called a:** A) Full Binary Tree ✅  
 B) Complete Binary Tree  
 C) Balanced Tree  
 D) Skewed Tree

**10. Level-order traversal is also known as:** A) DFS  
 B) BFS ✅  
 C) In-order  
 D) Depth-first traversal