Trees

Trees are a special type of graphs with some properties.

Properties :

1 - Trees are a connected graph with undirected edges.

2 - In trees every node is connected by exactly one unique path.

3 - It has no cycles.

4 - Tree of n nodes have n-1 edges.

5 - If you remove any edge from tree it becomes disconnected

Binary trees :

Binary trees is a special type of trees where every node have at most two childs (left , right)

Ways to represent trees :

1 - Give edges pairs (u , v).

2 - For each node give parent.

3 - In binary trees give left and right childs.

4 - Give all childs of the current node.

Tree Traversing :

If we trying to traverse a tree we only need to make sure to go back up from the current node (Moves from node u to it’s parent is not allowed because to will cause infinite loops) so while traversing a tree we just need to keep track of the number of the current node and its parent.

Tree numbering:

Task 1: Given node u , v check if v is in the subtree of u

Task 2: Given node u find the sum of values in subtree u;

Tree numbering technique is used by giving each node a new value based in the time we enter it and the time we leave it.

\* If a node’s v enter and leave values are inside node u enter and leave values thats mean that v is inside u subtree

Problems :

<https://codeforces.com/contest/913/problem/B> // Easy - Tree - Implemeination

<https://www.hackerrank.com/challenges/tree-preorder-traversal/problem> // Preorder

<https://www.hackerrank.com/challenges/tree-postorder-traversal/problem> // Postorder

<https://www.spoj.com/problems/TREEDEGREE/> // Restore tree using euler array

<https://www.hackerrank.com/domains/data-structures?filters%5Bsubdomains%5D%5B%5D=trees> // Nice Tree problems

<https://codeforces.com/contest/796/problem/C>

<https://codeforces.com/contest/828/problem/D>

<https://www.spoj.com/problems/UCV2013J/>

<https://www.spoj.com/problems/GCPC11J/>

<https://codeforces.com/contest/34/problem/D>

More Resources :

<https://www.youtube.com/watch?v=zEQZpTizgLo>

<https://www.youtube.com/watch?v=p8MFuDxvnuo>

<https://en.wikipedia.org/wiki/Tree_(graph_theory)>

<https://www.geeksforgeeks.org/difference-between-graph-and-tree/>