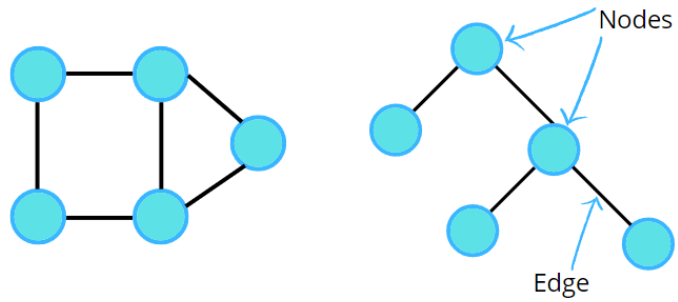
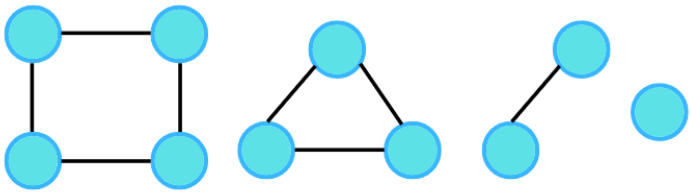
August 6, 2022 ▪ Graph

Connected Components in Graphs

So far we've seen different types of graphs. Graphs can be connected or can be like a binary tree (as we know all trees are graphs with some restrictions) as shown in the following figure.



But what would you call the following figure?



The most common answer would be these are 4 different graphs as they are not connected.

But is it possible to call them a single graph? To answer this, let us consider the question given:

Given an undirected graph with 10 nodes and 8 edges. The edges are (1,2), (1,3), (2,4), (4,3), (5,6), (5,7), (6,7),

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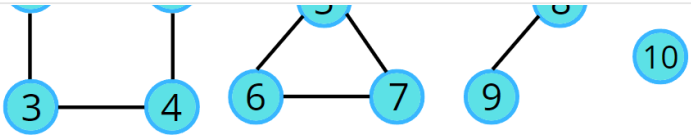

Apparently, it's a graph, which is in 4 pieces, the last one being a single node. In this case, we can say, the graph has been broken down into 4 different **connected components**. So next time if you see two different parts of a graph and they are not connected, then do not say that it cannot be a single graph. In the above example, they can be 4 different graphs but according to the given question and the input, we can call them parts of a single graph.

Graph Traversal

In the upcoming topics, we'll be learning about a lot of algorithms. Now, assume a traversal algorithm. Any traversal algorithm will always use a **visited array**.

0	1	2	3	4	5	6	7	8	9	10
0	0	0	0	0	0	0	0	0	0	0

For the same example, we will create an array of size 11 (n+1) starting with the zeroth index. Initialize this visited array to zero, indicating that all the nodes are unvisited. Then follow the following algorithm. If a node is not visited, then call the traversal algorithm.

```
for i:= 1 to 10
    if( !visitied[ i ] )
        traversal( i );
```

Why can't we just call traversal(1)?

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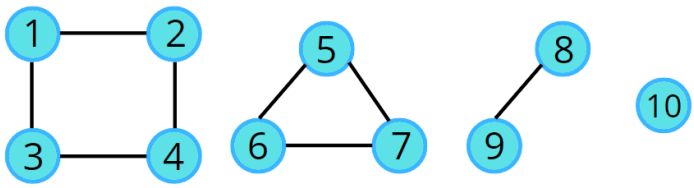
traversal(1) will traverse only the connected nodes, i.e., nodes 2, 3, and 4, but not the connected components.

Consider the following illustration to understand how a traversal algorithm will traverse the connected components.



0	1	2	3	4	5	6	7	8	9	10
0	0	0	0	0	0	0	0	0	0	0

```
for i:= 1 to 10                    i = 1
    if( !visitied[ i ] )
        traversal( i );
```

> Special thanks to **Vanshika Singh Gour** for contributing to this article on takeUforward. If you also wish to share your knowledge with the takeUforward fam, please check out this article. If you want to suggest any improvement/correction in this article please mail us at write4tuf@gmail.com

G-4. What are Connected Components ?

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