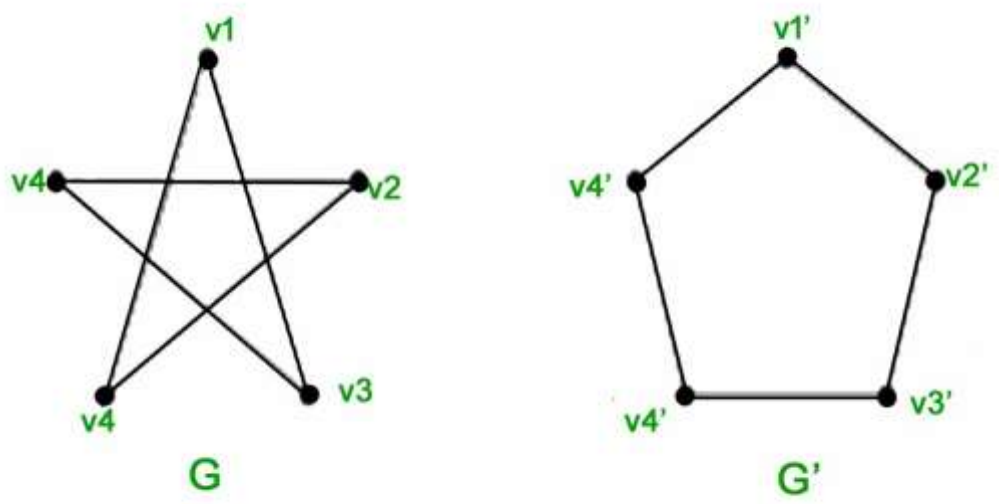
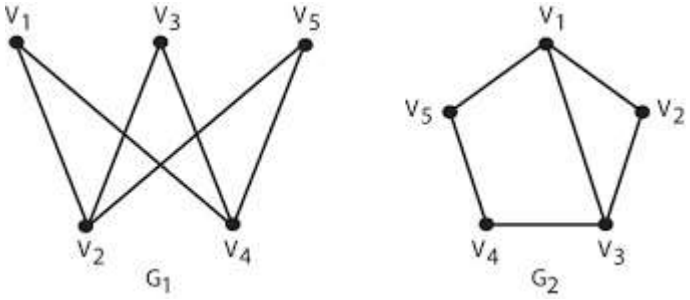
Graph isomorphism problem

The term “isomorphic” is applied to two graphs when they are a “bijection that preserves adjacency”. This means that the number of components (vertices and edges) are the same and their edge connectivity is relatively the same. In the following example below, we will explain in detail what this means.



In the diagram above there are two graphs, G (the star) and G1(the pentagon). While they appear to look different, they’re the same in terms of isomorphism. First thing to point out is whether or not they have the same number of vertices (black dots) and edges(lines), in this case, they do with five vertices and five edges. The next the thing to point out is the degree of the vertices. The degree of a vertex is the number of edges attached to each vertices. We have two degrees for each vertices in both diagrams where v1 in G for example, has two edges connected to v4 and v3. V1 in G1 also has two edges connected to v4 and v2.

Now suppose we were to look at a graph that isn’t isomorphic like the one below. G1 (the crown) and G2 (pentagon) aren’t isomorphic because the number of edges are different. Although they have the same number of vertices, it still doesn’t make it isomorphic. In G2, v2 has two edges connected to v3 and v1 while in G1, v2 has three edges connected to v1, v3 and v5.



This overall proves how the graphs can be the same in terms of isomorphism because it's a bijection that preserves adjacency.

Sources:

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images:

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