Problem

Show that every graph with two or more nodes contains two nodes that have equal degrees.

Step-by-step solution

Step 1 of 1

Let us consider a graph G which has at least one edge and without having any loops or cycles in the graph. In graph G we would prove that there are at least two nodes with degree 1 i.e. with equal degree. This conclusion would be taken forward for a graph with 2 or more nodes.

In a graph G we must get a node, say V_1 at which only one edge is incident, i.e. $\text{degree}(\text{V1})=1$. Let E_1 be this edge which is incident at V_1. Since *G* has no cycles other end of E_1 is not V_1. Let it be V_2. If there exists no other edges which is incident at V_2 then $\text{degree}(\text{V2})=1$.

Otherwise let E_2 be the edge which is incident at V_2. Arguing similar way and proceeding in this way we get a node V_k having degree 1 and is equal to degree of V_1. Thus we get that graph G has at least two nodes of degree 1. Thus two nodes have the same degrees in a graph with two or more nodes.

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