Experimenting with Assortativity

1. Characterising a simple network
   (a) Using `networkx`, load the second version of the airport dataset (graphml)
   (b) Compute the assortativity of the `country` attribute, using `attribute_assortativity_coefficient` function. What does it mean?
   (c) Compute the degree assortativity using the `degree_assortativity_coefficient` function. What does it mean?
   (d) Compare the degree assortativity with a randomized version of the graph, to check if it is similar or significantly different
   (e) Compute the average degrees of neighbors using `average_degree_connectivity`. You can plot it, for instance as a scatter plot.
   (f) Do the same analyis of degree assortativity and correlation on other networks, for instance those included in networkx such as `nx.karate_club_graph()` or `nx.les_miserables_graph()`
   (g) In a previous experiment, you computed communities on the airport graph and saved these communities as an attribute. Compute the assortativity coefficient of the community structure, and compare it with the one obtained for countries. What do you think of the results?

2. Going further : Network→Assortativity→Network
   (a) Using the `attribute_mixing_dict` function, you can compute the number of edges between nodes of a given attribute. Use this to create a network in which nodes correspond to countries. (tip: the `Graph()` constructor function of networkx accept dictionaries.)
   (b) Try to plot and characterize quickly this network.
   (c) To obtain a more interesting network, we should keep only links between countries which are not expected by chance, given the degree of countries. Using formula of the assortativity coefficient as an inspiration, propose a way to create such a network. Beware negative values...
   (d) Plot this network and compare it with the one obtained with the naive approach.