Handshaking Puzzles by F. T. Boesch

A popular example of using graphs as models is to create the "Handshaking Graph" where n nodes represent people and the edges represent the fact that the two people who are its endpoints have shaken hands. One shakes hands neither with themselves nor with the same person more than once. The number of times a person shook hands would be the degree of the corresponding node. A simple proof establishes the fact that it is impossible for all the degrees to be distinct. Chartrand introduced a variant of this as a puzzle where you and your husband attend a party with 3 other married couples and the restriction now is that one shakes hands neither with themselves, their spouse, nor with the same person more than once. Now you ask everyone how many hands did you shake and get 7 different answers. How many hands did your husband shake? An interesting generalization of this was given by Spresser who also gave a complete solution. Here we introduce a different generalization where we assume these handshaking diagrams represent seniors who may shake hands with the same person more than once. Thus we now have "Handshaking Multigraphs", and a new question as to whether or not there can be n distinct degrees. We answer this completely. (Received January 03, 2007)

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