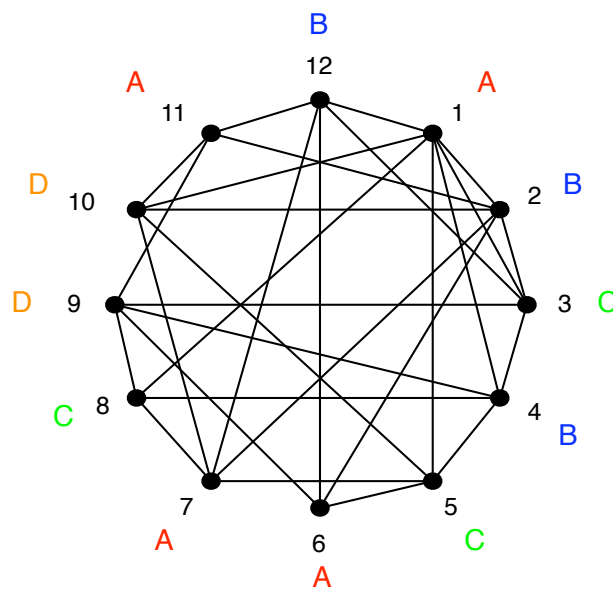


► **Problem 13.2-22** Hubert Noseworthy loves snakes and keeps a dozen different varieties in his apartment (contrary to regulations). Since some varieties of snake attack other varieties, as shown in the following tables, Hubert needs several boxes in which to keep his snakes to separate antagonists. What is the minimum number of boxes he needs?

Variety	attacks Variety
1	3, 4, 5, 8, 10, 12
2	1, 3, 6, 7, 10, 11
3	4, 9, 12
4	5, 8, 9
5	6, 7, 10
6	9, 12
7	10, 12
8	7
9	8, 11
10	11
11	12

Solution. Put two varieties into different boxes if one attacks the other. Make a graph G shown below whose vertices are varieties and where an edge indicated that the variety represented by one end vertex attacks the other. Since $\chi(G) = 4$, as shown, four is the minimum number of boxes required.



□