1. The chromatic number of a graph is the minimum number of colors needed to color each vertex in such a way that any two vertices sharing an edge are a different color. Provide examples of graphs that have chromatic numbers of 3 and 4.

2. Give an example of a graph with 20 vertices that has a chromatic number of 2. Does your graph have any cycles? (Recall: A cycle is a path through the graph that starts and ends at the same vertex and does not reuse any edges.)
Scheduling Problem

Mrs. Jacobs, the new principal at Riverdale High School, wants to make a good impression by offering a lot of new exciting classes for her students. The principal plans to use her knowledge of graph theory to determine when each class will be offered.

Since she is trying to make the students happy, Mrs. Jacobs does not want to offer two different classes at the same time if there are students wanting to take both. She decides to construct a graph in the following way: Each class is represented by a vertex and if there is a student interested in two classes, those two vertices are connected by an edge.

3. Suppose there are five classes (A, B, C, D, and E) and only five students wishing to take the following classes:
   - Jason wants to take Classes A and E.
   - Emory wants to take Classes B, C, and E.
   - Felicity wants to take Classes A and D.
   - Geoff wants to take Classes B and C.
   - Hilary wants to take Classes D and E.

Construct the graph for the principal.
Networks and Graphs: Graph Coloring
VIII.C.3 Student Activity Sheet 9: Scheduling

4. Find the chromatic number of your graph, and color the graph using the least number of colors.

5. How can the graph coloring solution help the principal with her scheduling problem?