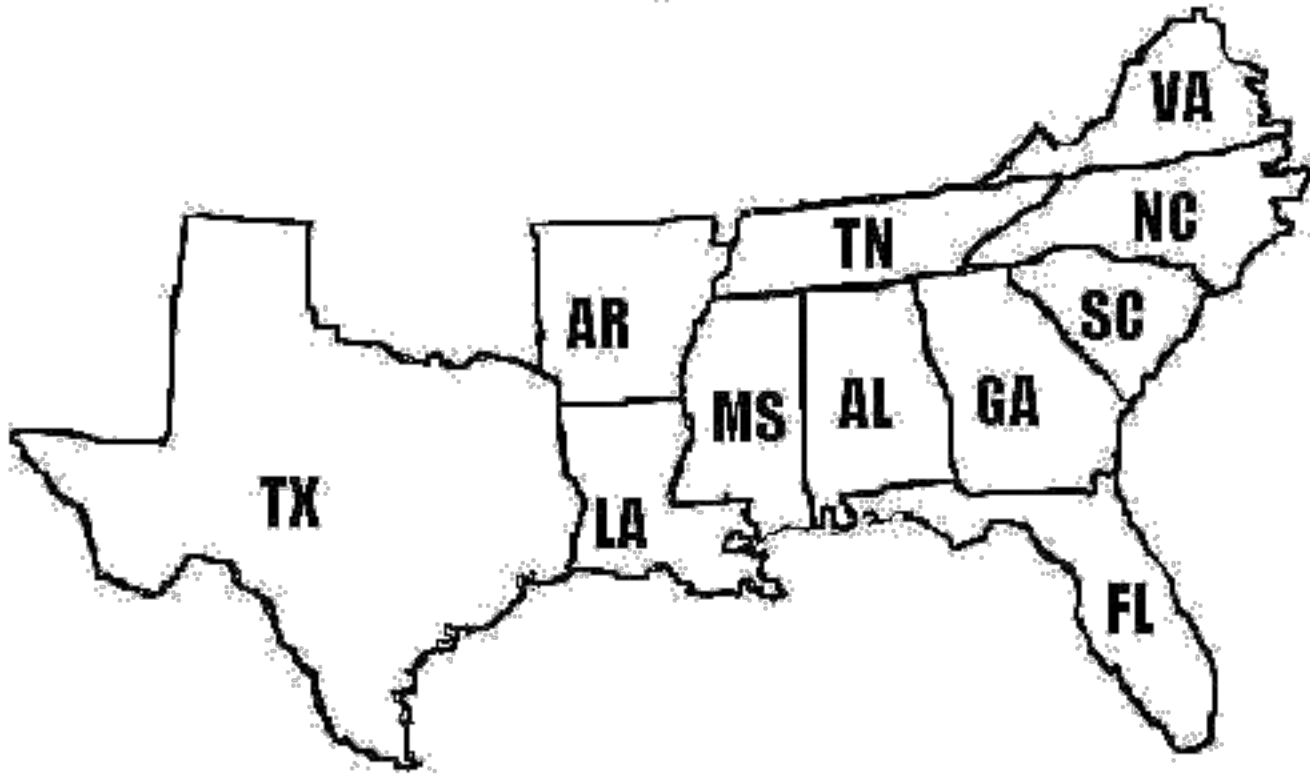


1) Below is a map of the South Eastern part of the United States.

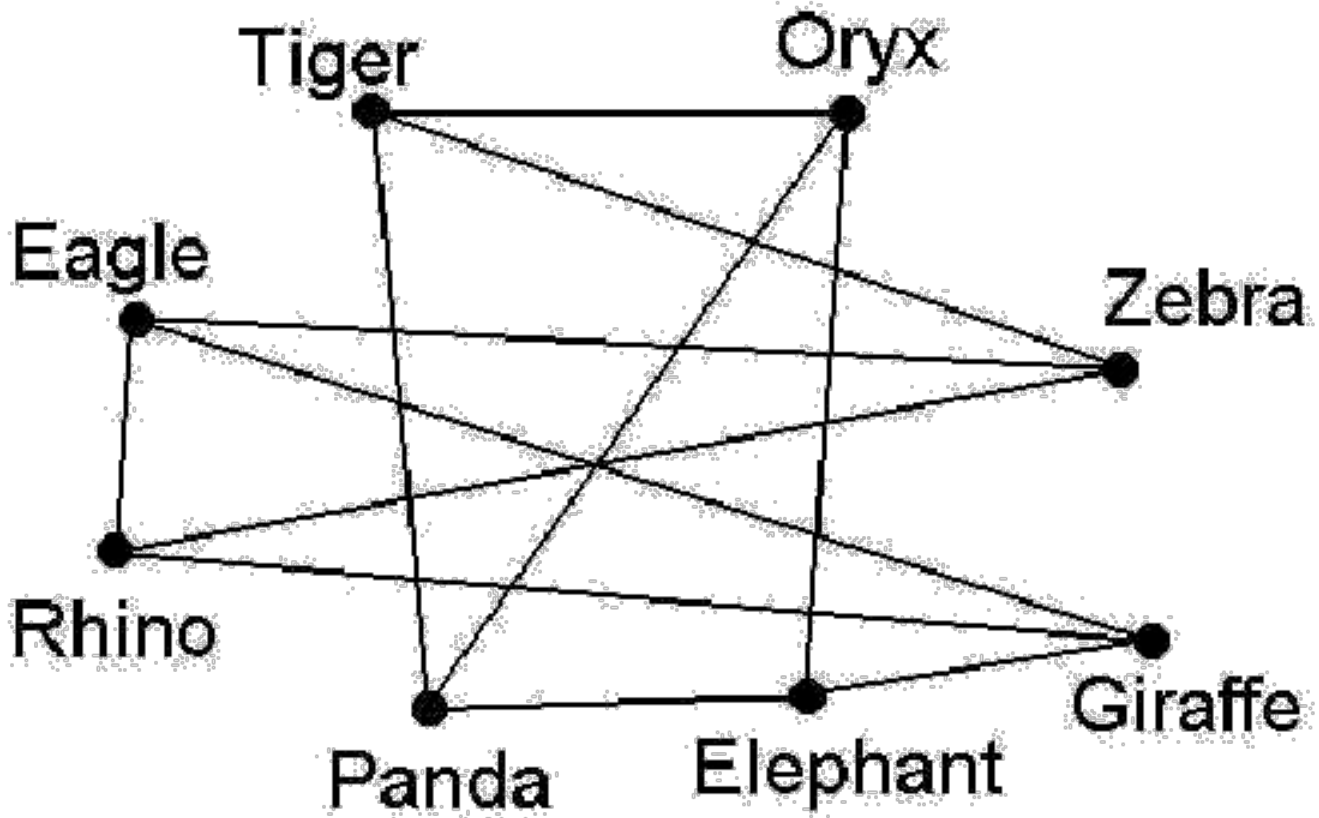


(A) Color the map above using the least number of colors possible so that no two states with the same color share a border.

(B) The **chromatic number** is the least number of colors needed - what is the chromatic number?

(C) Draw a graph representation of the map.

(2) Animals on an arc need to be housed in certain rooms, but certain animals do not get along. Animals that are connected by edges do NOT like each other.

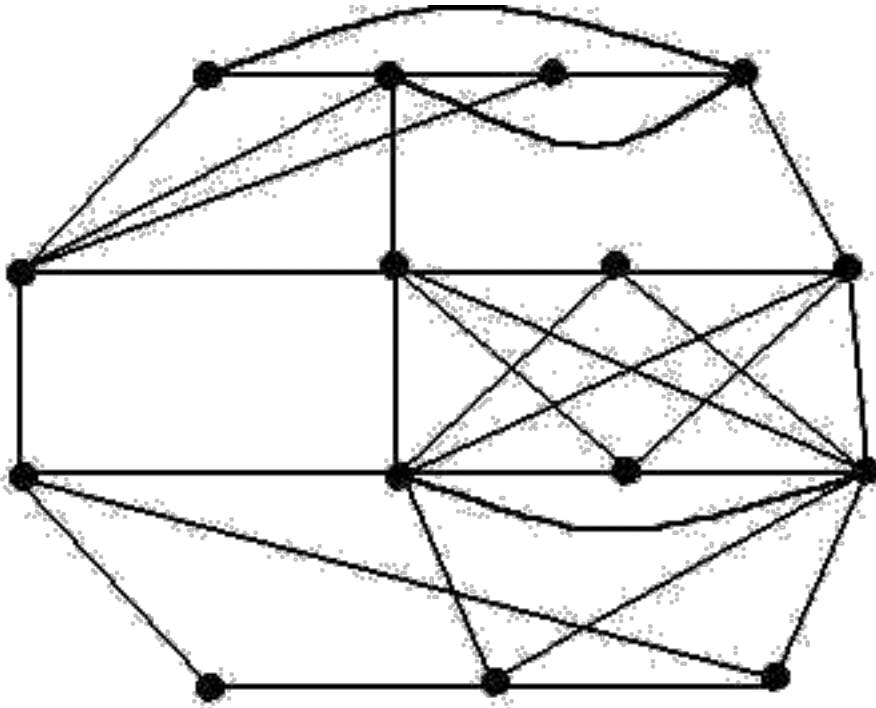


How could you place the animals in rooms so the least number of rooms is needed?

(3) A scoutmaster is organizing a trip to a nearby lake. From past experience, he knows that certain boys will cause problems if they are together in the same car during the trip. If a car can hold no more than 5 boys, how many cars will be needed to transport the boys? The relevant information is shown in the table below. An X indicates that the boys must not travel together in the same car. **SHOW ALL YOUR WORK!**

BOYS	Joe	Pete	Al	Vic	Sal	Rick	Dill	Bill	Carl	Tim
Joe		X								
Pete	X		X		X					
Al		X				X				
Vic	X				X					
Sal		X		X		X	X			
Rick			X		X			X		
Dill					X			X	X	
Bill						X	X			X
Carl							X			X
Tim								X	X	

(4) The graph below shows the courses that students take during a summer session at a small college. The vertices represent courses and an edge between two vertices indicates that the courses represented by the two vertices have at least one student that is enrolled in both courses.



Find the minimum number of time slots needed to schedule final exams for these courses so that no student is scheduled to take two or more exams at the same time. **SHOW YOUR WORK!**