

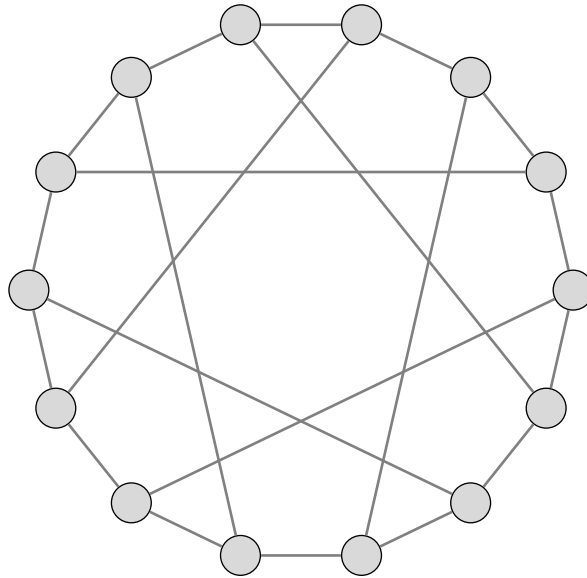
GRAPH COLORING HOMEWORK

TEXT: 12.4, AUX. TEXT: COLORING

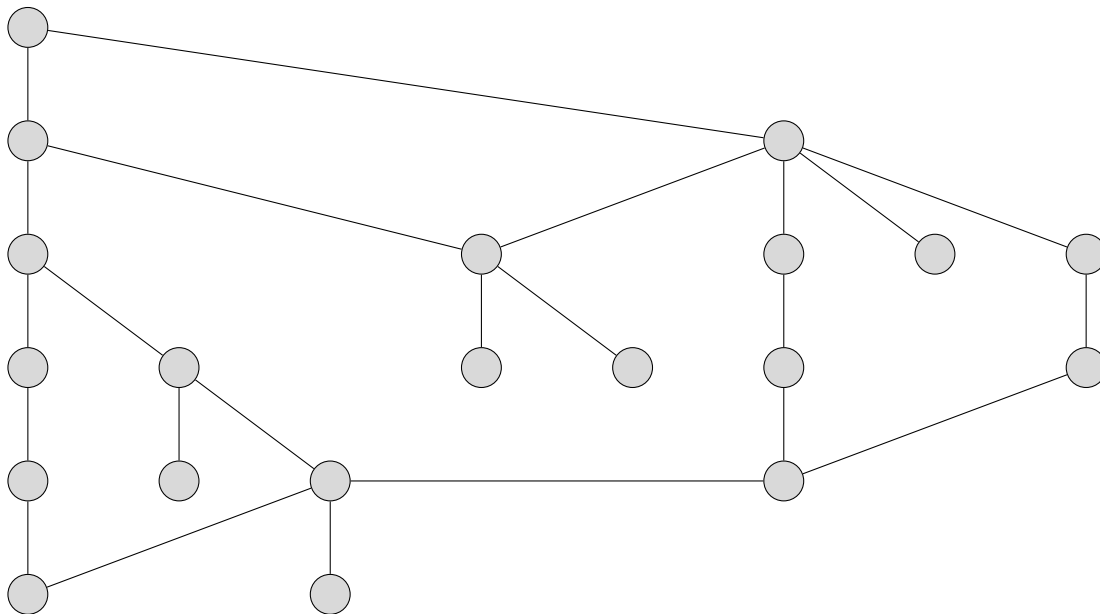
LAST NAME	FIRST NAME	DATE
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For each of the following graphs either find a coloring using only 2 colors, or prove that more than 2 colors are needed by finding and highlighting a cycle of odd length.

1. Heawood graph



2.



3. Use the following blank page to represent the map by a graph, find an optimal graph coloring, and determine the chromatic number of the graph.

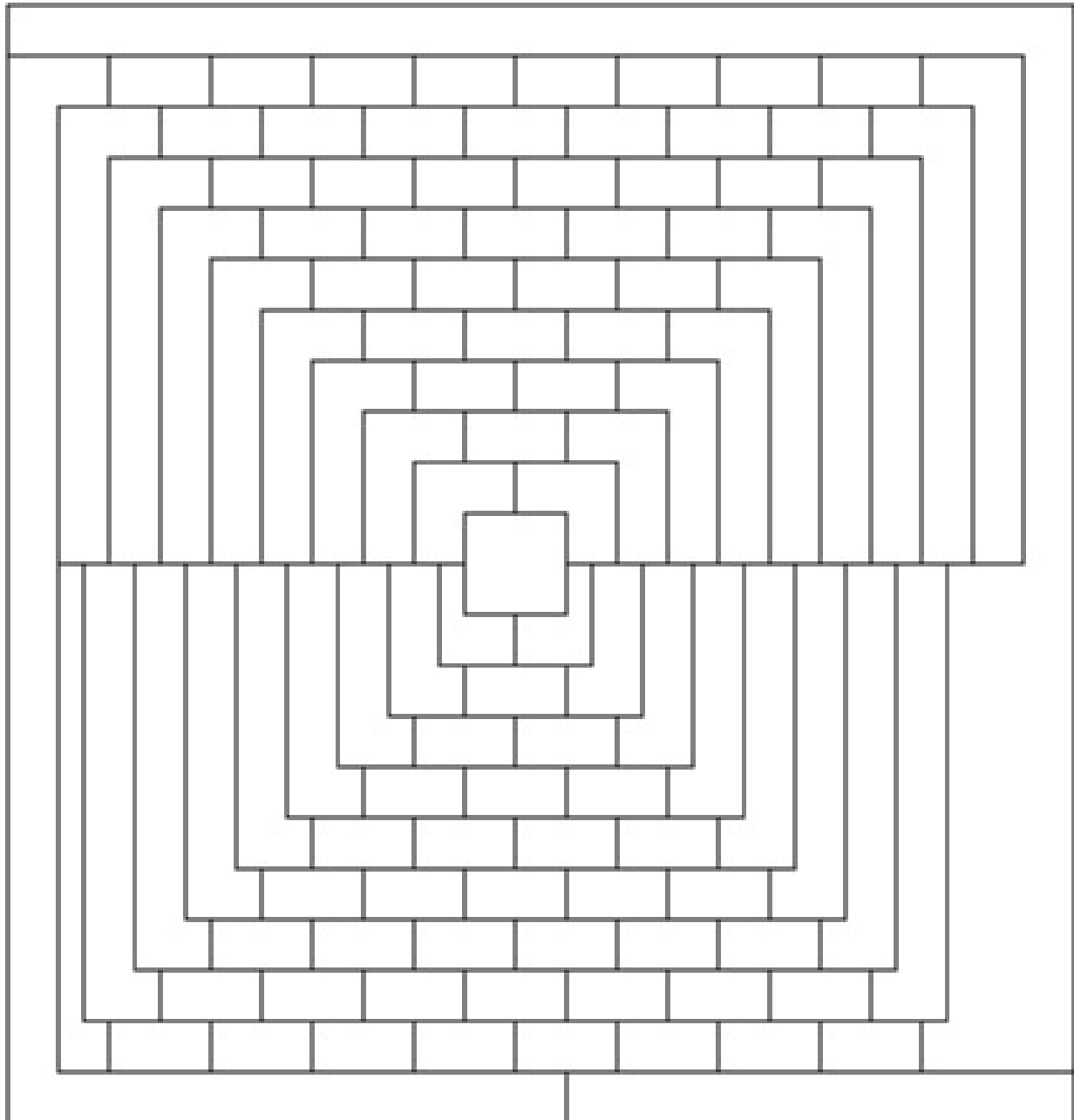


- (a) Represent the map by a graph: label each vertex to identify which country it represents, and draw the edges corresponding to common land borders.
- (b) Find and show an optimal graph coloring.
- (c) State the chromatic number of the graph and offer a logical argument for why it cannot be anything else.

4. Martin Gardner played an April Fool's joke in April 1st, 1975 edition of Scientific American by asserting that the map of 110 regions illustrated below requires five colors and constitutes a counterexample to the Four Color theorem. Gardner wrote:

“William McGregor, a graph theorist of Wappingers Falls, N.Y., constructed a map of 110 regions that cannot be colored with fewer than five colors. McGregor's technical report will appear in 1978 in the Journal of Combinatorial Theory, Series B.”

William McGregor is a real mathematician who created the map and gave Gardner permission to use it as an April Fool's prank. Try to color the McGregor map with as few colors as possible.



ANSWERS