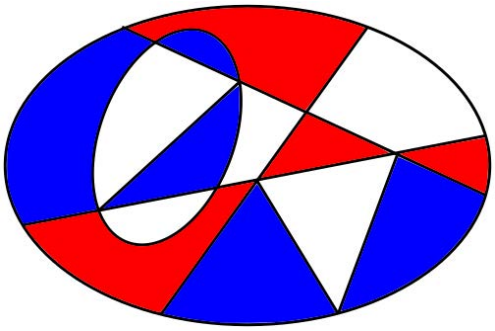
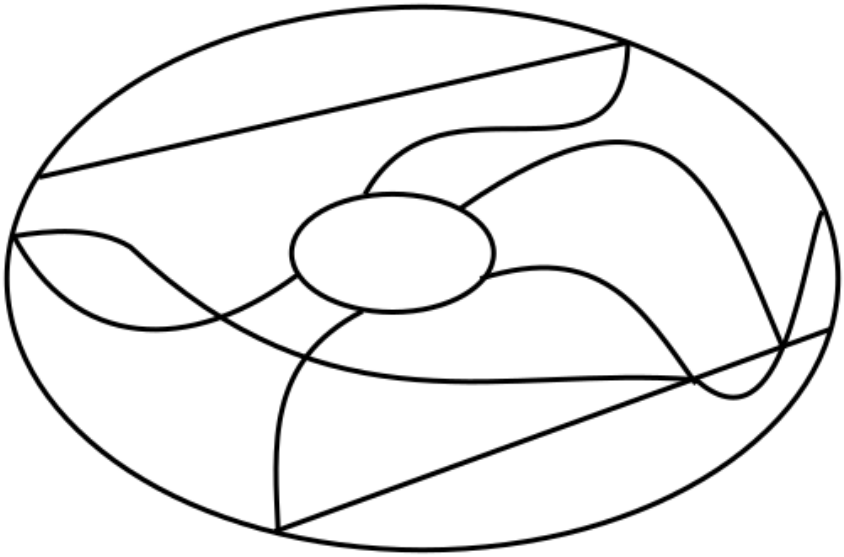
Puzzle of the Week
Map Coloring with 4 Colors

Map makers color maps so regions sharing a border have different colors. Mathematicians have shown that every map that has connected regions can be colored with four or fewer colors. In a previous puzzle, we saw that if there is a place on a map that has an odd number of lines coming out from it, then the map will need at least three colors. Here is an example of such a map.



THE CHALLENGE: Color this map using as few colors as you can.

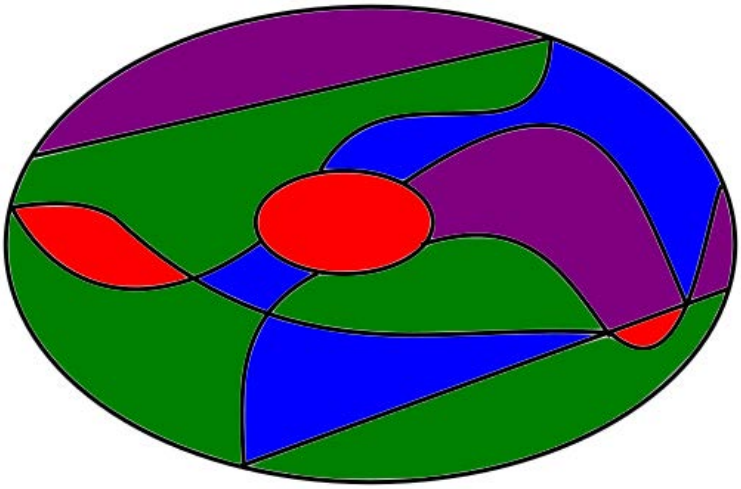


EXPLORATION: Create the simplest map you can that requires four colors. What happens if you have a map with some "regions" made up of completely separate pieces. These multi-piece regions still must be a single color. Make a map with some multi-piece regions that needs more than four colors to color.

Puzzle of the Week
Map Coloring with 4 Colors – Notes

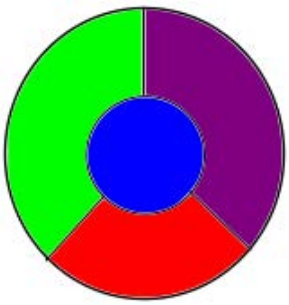
THE CHALLENGE: In “Map Coloring with 2 Colors - 2” we saw that a single corner that has an odd number of regions around it will require three colors to color those regions.

Well, if we have a single region with an odd number of regions around it, that will force the use of four colors. If you look at the oval at the center of the second map on the previous page, that oval has an odd number of regions around it and that will force the use of four distinct colors to color everything.



This happens on the map of the United States. The state of Nevada has five states surrounding it, so those six states (including Nevada) will always require at least four colors.

EXPLORATION: The following map forces the use of four colors and is as simple as you can get.



If you allow disconnected regions, you can force as many colors as there are regions - you just construct it so that every region touches every other region. Because every region can be disconnected, there aren’t any true physical limitations.