

- (1) Suppose you have two houses near each other and you need to provide electricity, water, and internet to these two houses. In the diagram below, can each utility can be connected to each house without having any of the internet/water/electric lines/pipes pass over any other?

House 1

House 2

Water

Electricity

Internet

- (2) What if we have three houses?

House 1

House 2

House 3

Water

Electricity

Internet

- (2) What if we have three houses? In this case you can no longer link all houses to all utilities without creating a crossing.

House 1

House 2

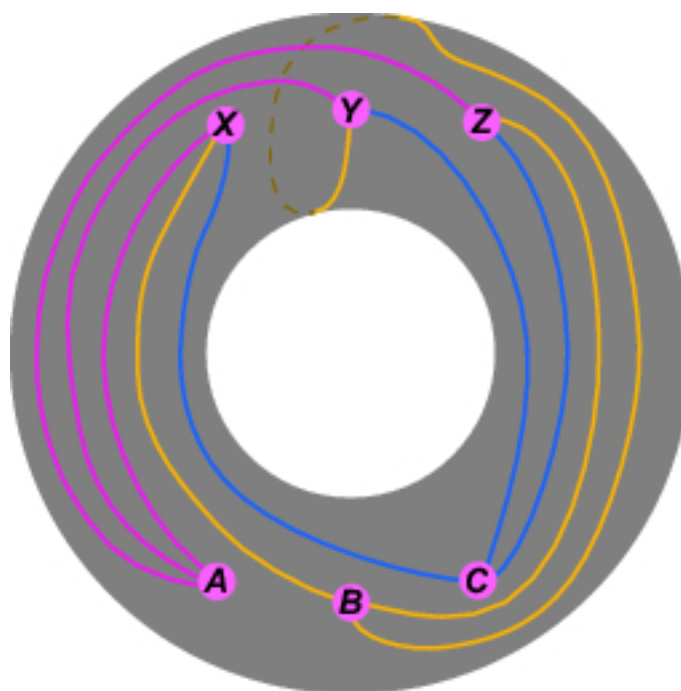
House 3

Water

Electricity

Internet

- (3) What if the houses were placed in a donut shape surface? It turns out that you can connect all utilities to all houses now! (See picture below).



(4) Below is a list of chemicals together with a list of other chemicals with which each cannot be stored.

Chemicals	Cannot Be Stored With
1	2,5,7
2	1,3,5,4
3	2,4,6
4	2,3,7
5	1,2,6,7
6	5,3
7	1,4,5

How many different storage facilities are necessary in order to be able to store all seven chemicals safely?

- (5) What is the minimum amount of colors you need to use to color this map such that no two countries that share a border have the same color?

