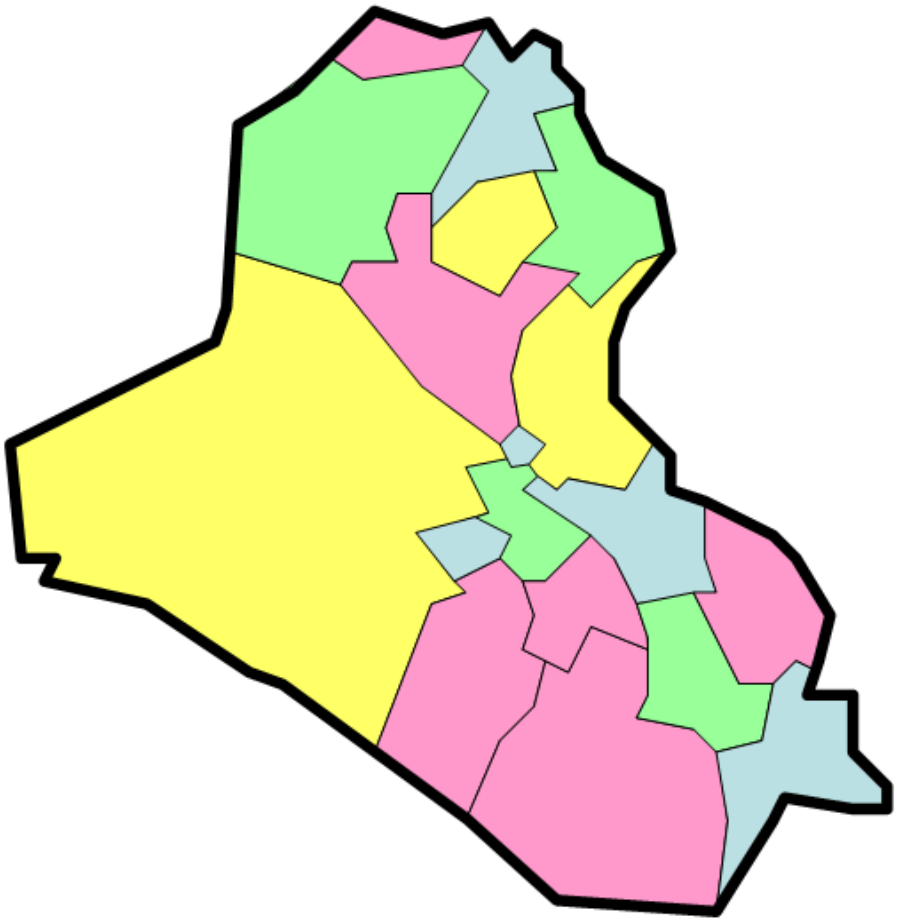
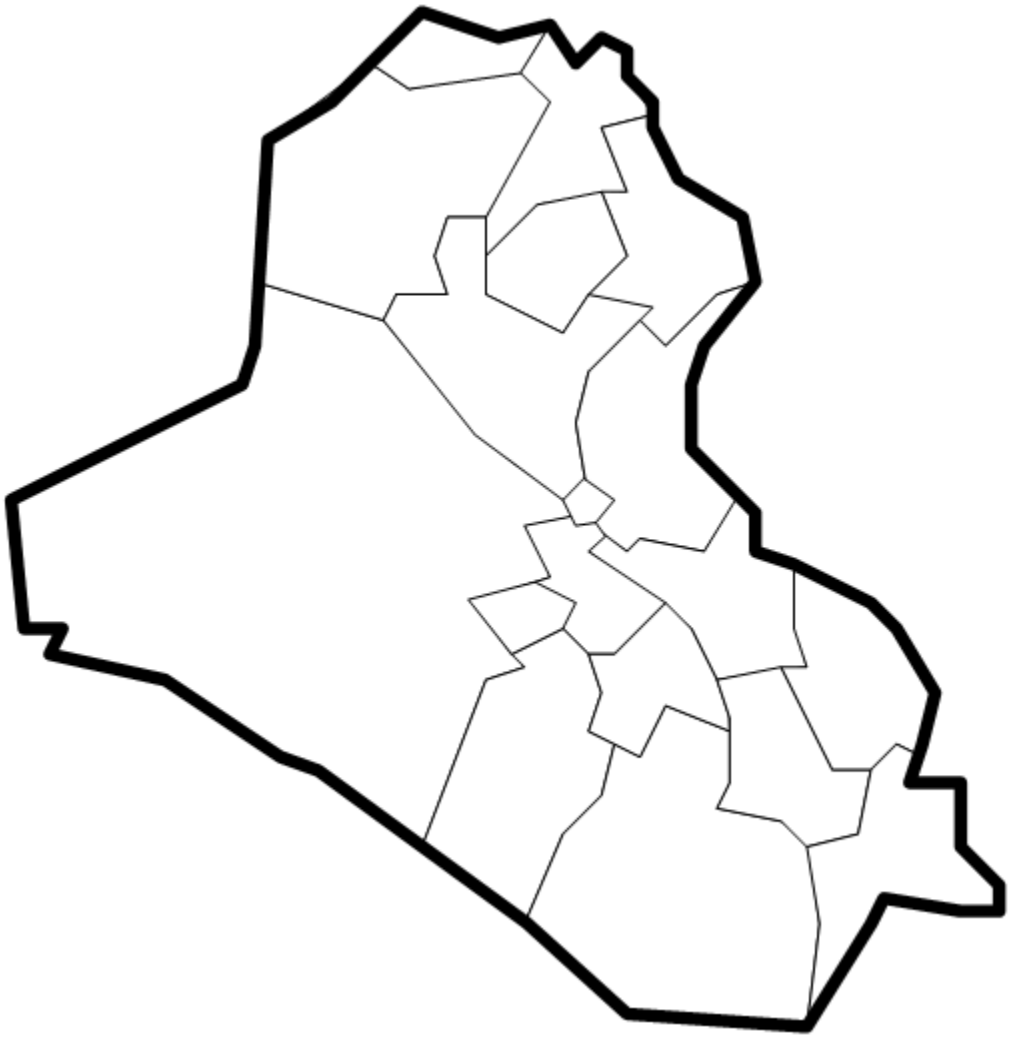
Colour Iraq

One of the greatest unsolved problems in mathematics was whether any map needed more than 4 colours assuming that no regions which shared an edge could be painted the same colour.

This map below is of the 18 Iraqi provinces, but it is not painted correctly because some pink regions share an edge.



Colour this map of Iraq with only 4 colours so that no two neighbouring spaces share the same colour?



Unfortunately, your blue pen has just enough ink to colour 2 regions. Can Iraq still be coloured successfully with just three other colours?

Extensions:

- A balanced colouring is one where the number of provinces coloured with each colour differs by at most 1. Does Iraq have a balanced colouring using 4 colours? Does Iraq have an unbalanced 4-colouring?
- Create a country with 10 provinces which does not have a balanced 4-colouring.
- What is the smallest number of square provinces which require 4 colours? (Hint: the squares are not all of equal size)
- Can you colour Iraq with just three colours? If not, prove that it cannot be done. If it can be done, do it. (of course, no neighbouring regions may share the same colour)

A Two Player Game:

MINI & MAXIMILLION COLOUR IRAQ

The two players are called MINI and MAXIMILLION. MINI tries to use the least number of colours. MAXIMILLION tries to use the most colours. Starting with MINI, the players alternate turns.

On MINI's turn she chooses a colour and colours a province of Iraq.

On MAXIMILLION's turn he chooses a colour that MINI has already chosen and colours a province of Iraq. MAXIMILLION can also pass if he wants. (of course, no neighbouring regions may share the same colour)

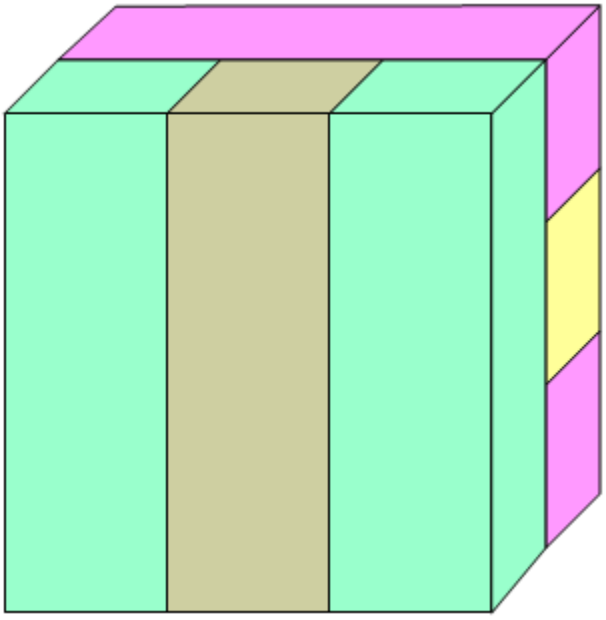
MAXIMILLION gets 10 points for each colour used in the map. MAXIMILLION also gets 1 point for each province which could not be coloured using only 4 colours.

Whoever scores highest when they are MAXIMILLION wins.

The 18 Provinces:

3D Extensions:

How many colours are required to colour any set of three dimensional shapes so that no two with the same colour touch?



Prove it.

The Math in This Problem

Colouring is a profound mathematical topic with many industrial applications. This math puzzle involves strategic planning in the process of colouring maps. Given a specified number of colours, students are challenged with the constraint of regions sharing an edge not being filled with the same colour. Progressing through this brainteaser, students find themselves tackling the same problem that many mathematicians currently face.