map coloring problem

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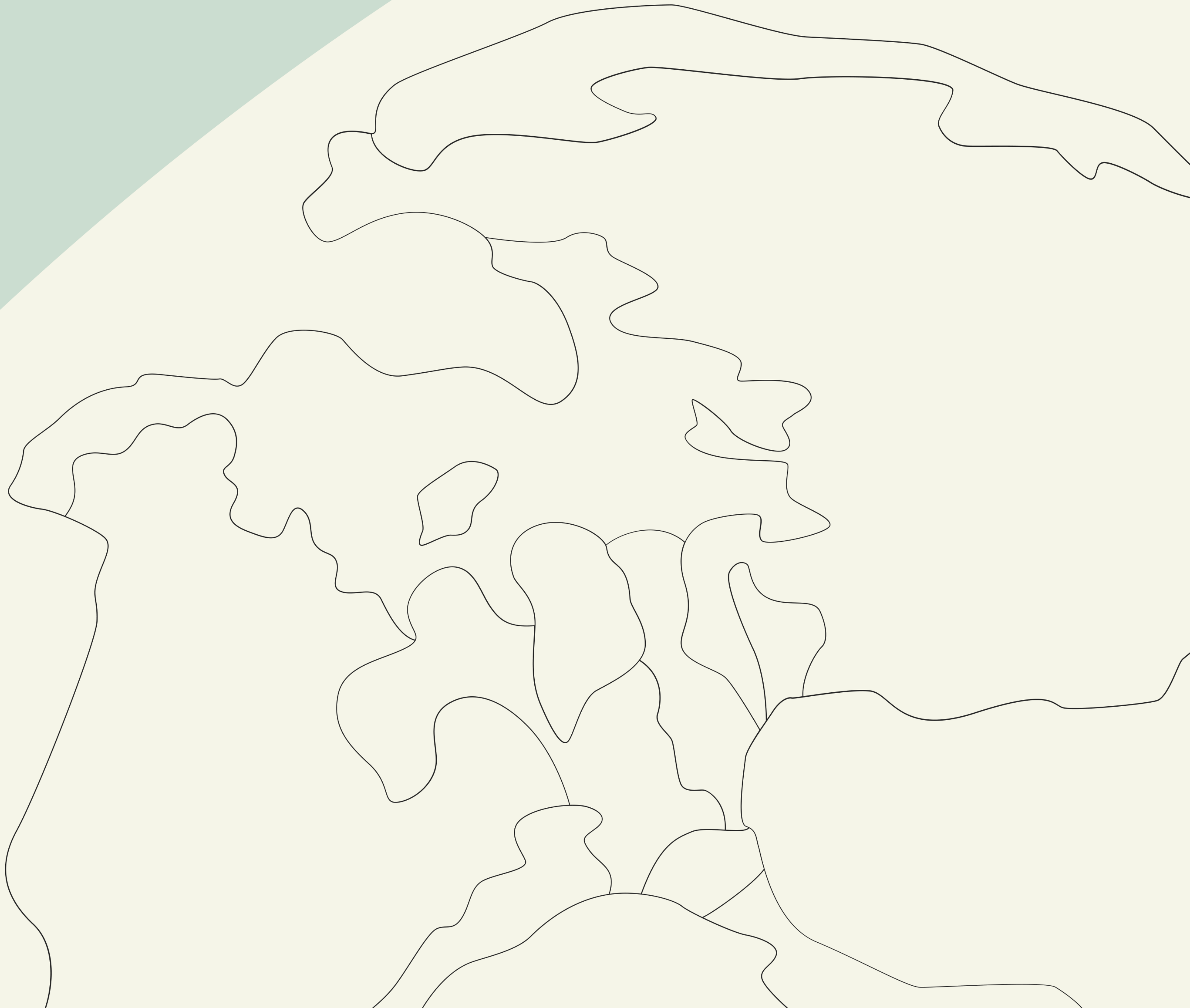
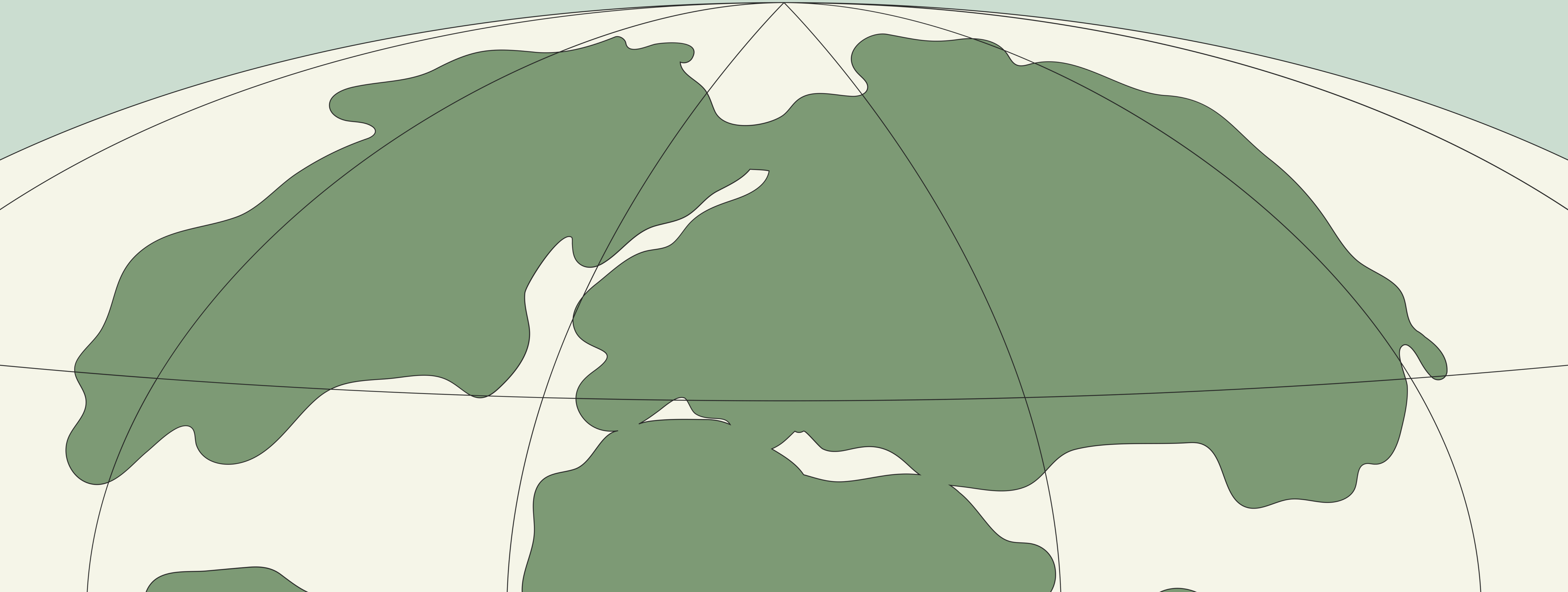
Agenda:

- introduction
- what is graph coloring
- Chromatic number
- group activity
- map coloring
- backtracking

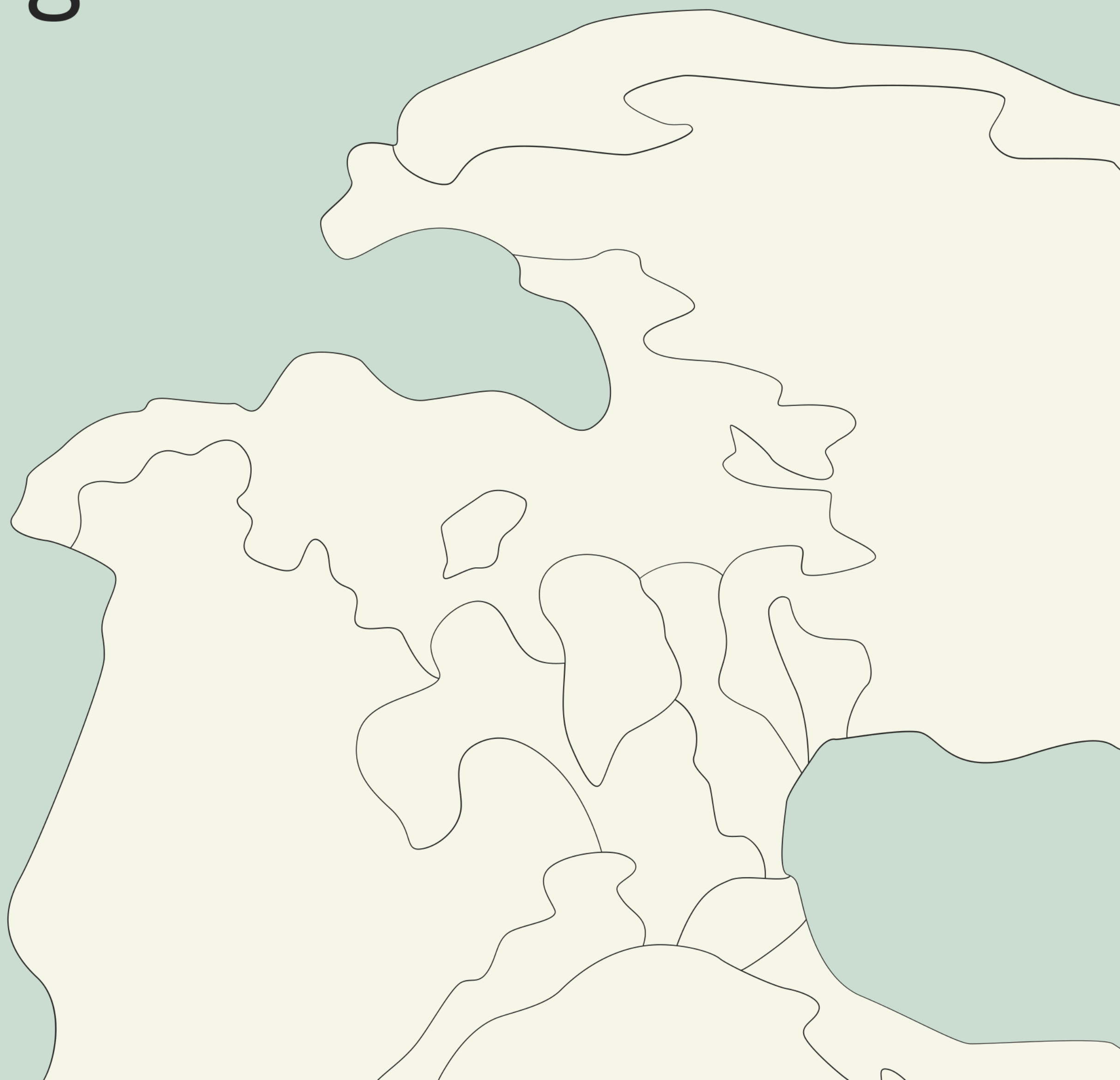


group activity

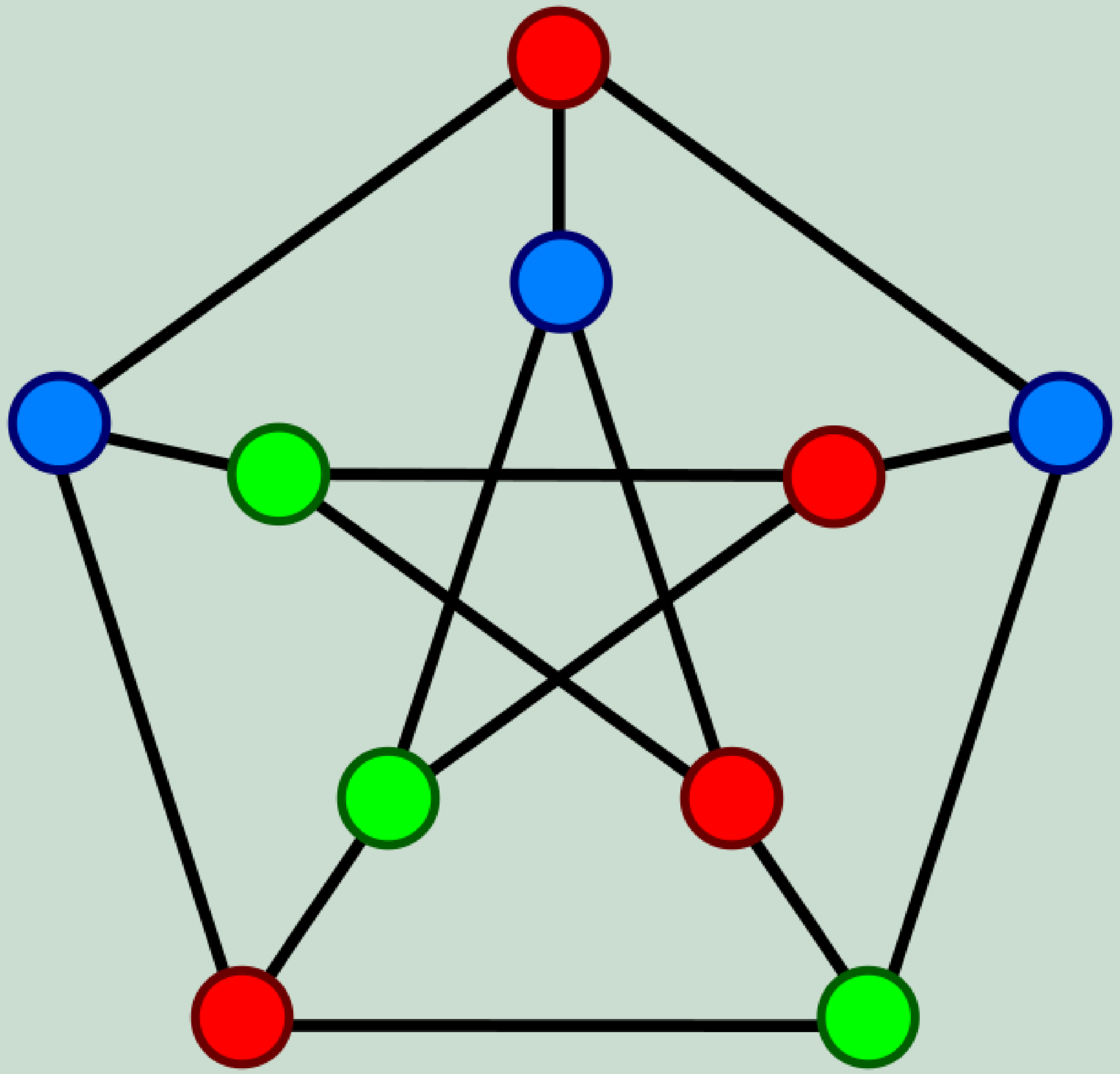


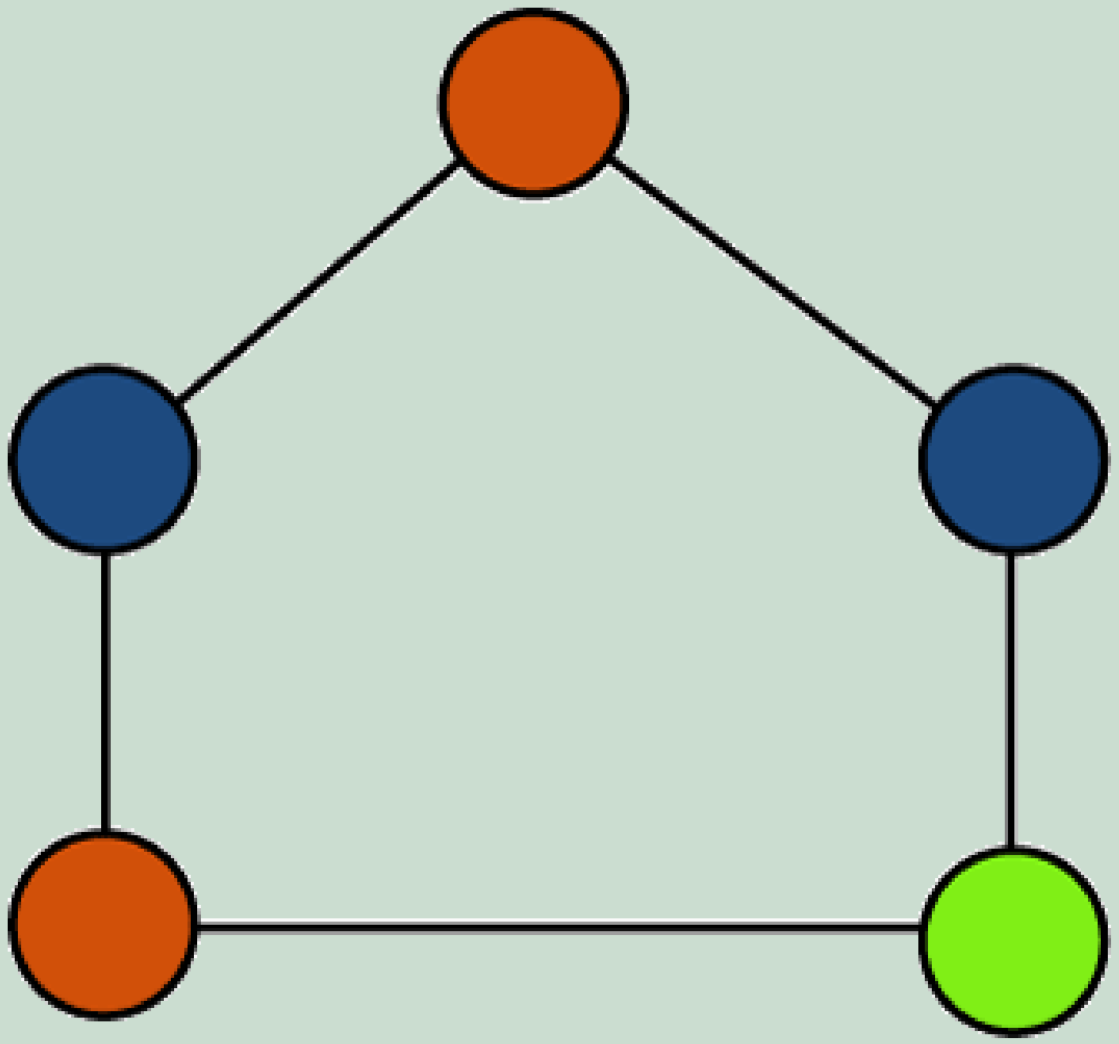
what is graph coloring

Graph coloring refers to the problem of coloring vertices of a graph in such a way **that *no two adjacent vertices have the same color***. This is also called the **vertex coloring problem**. If coloring is done using at most m colors, it is called m-coloring.



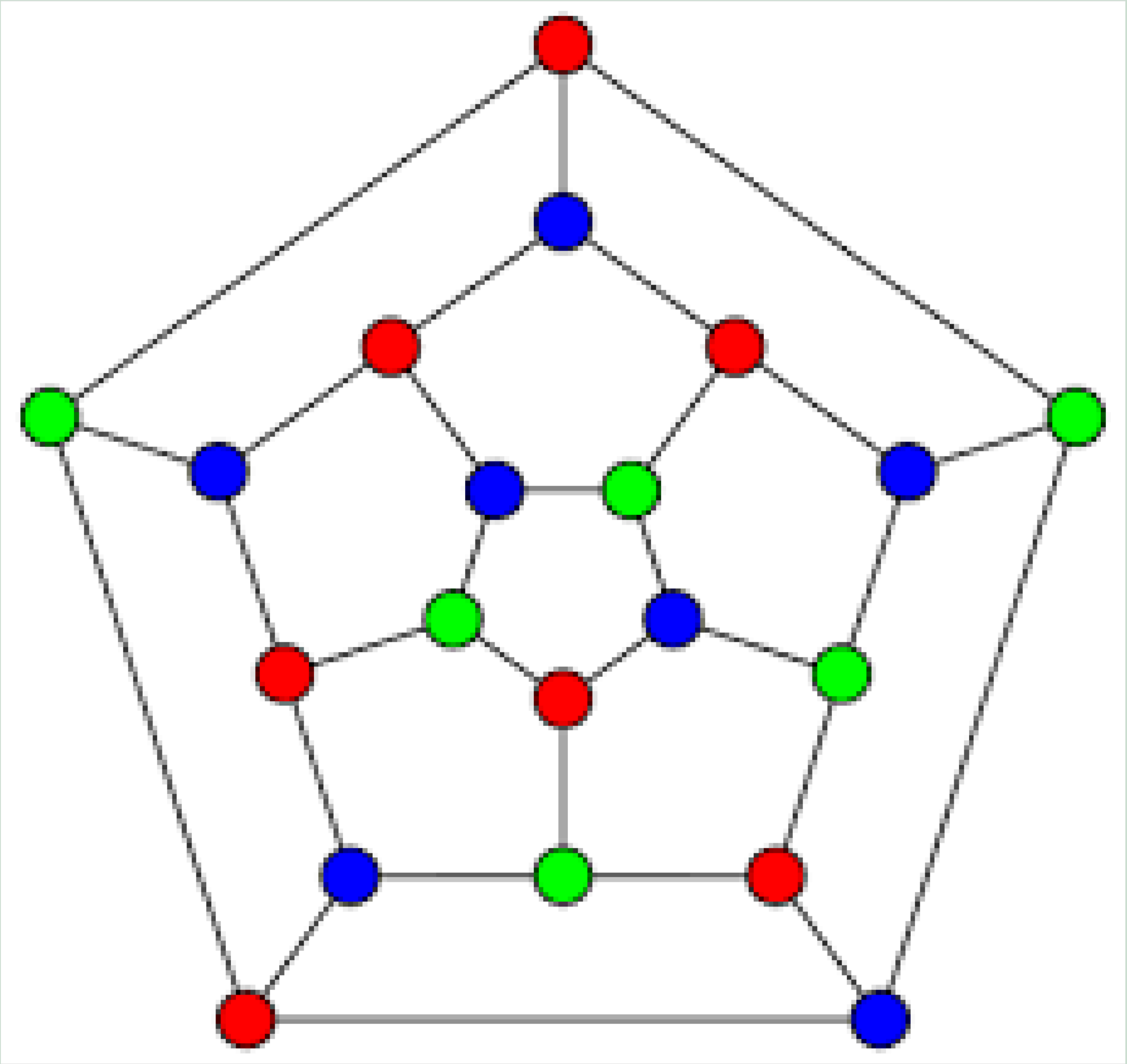
the following graphs are exapmles of a **properly colored graph**



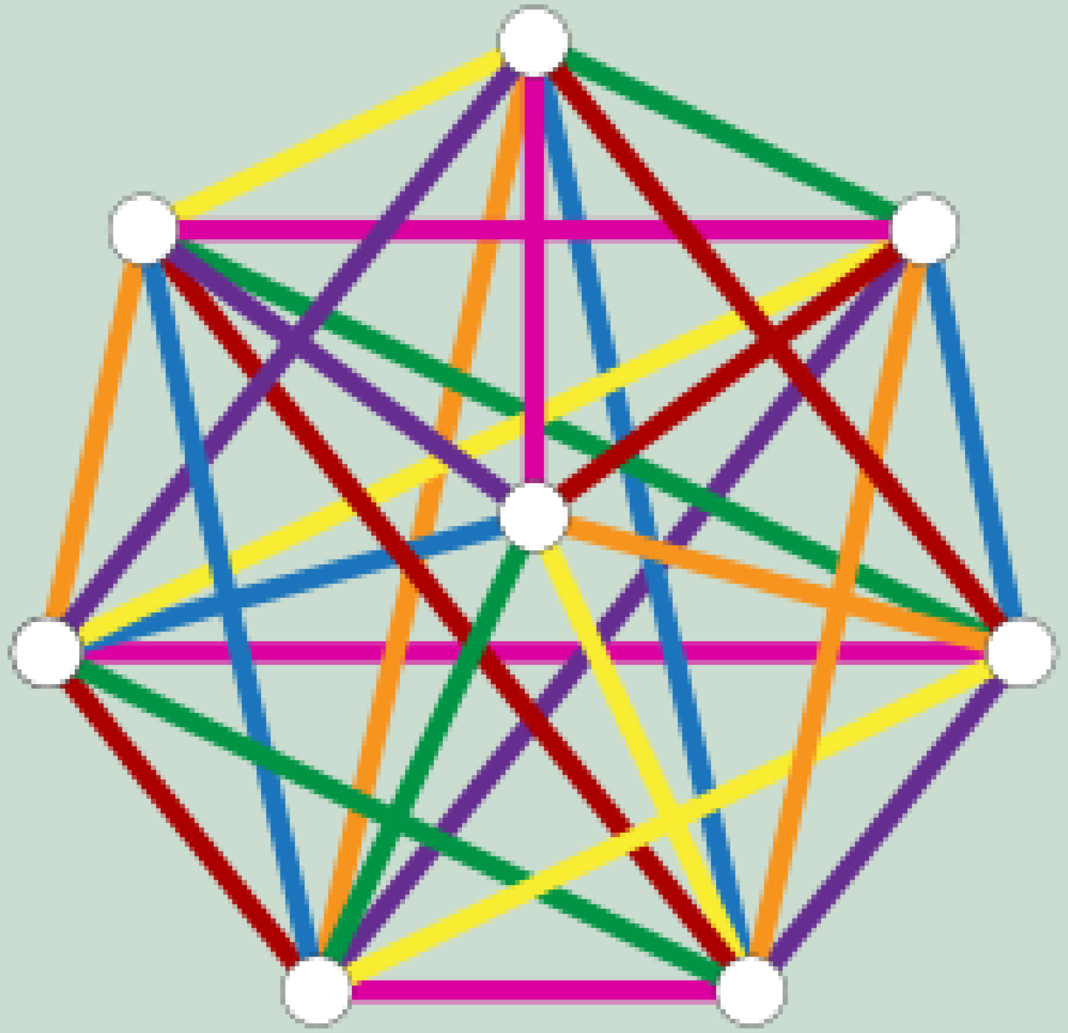


vertex colring vs edge coloring

vertex coloring is an assignment of colors to each vertex such that no edges connects two idenatically colored vertices



edge coloring similar to vertex coloring except edges are colored and adjacent edges have different colors



graph coloring

decision problem

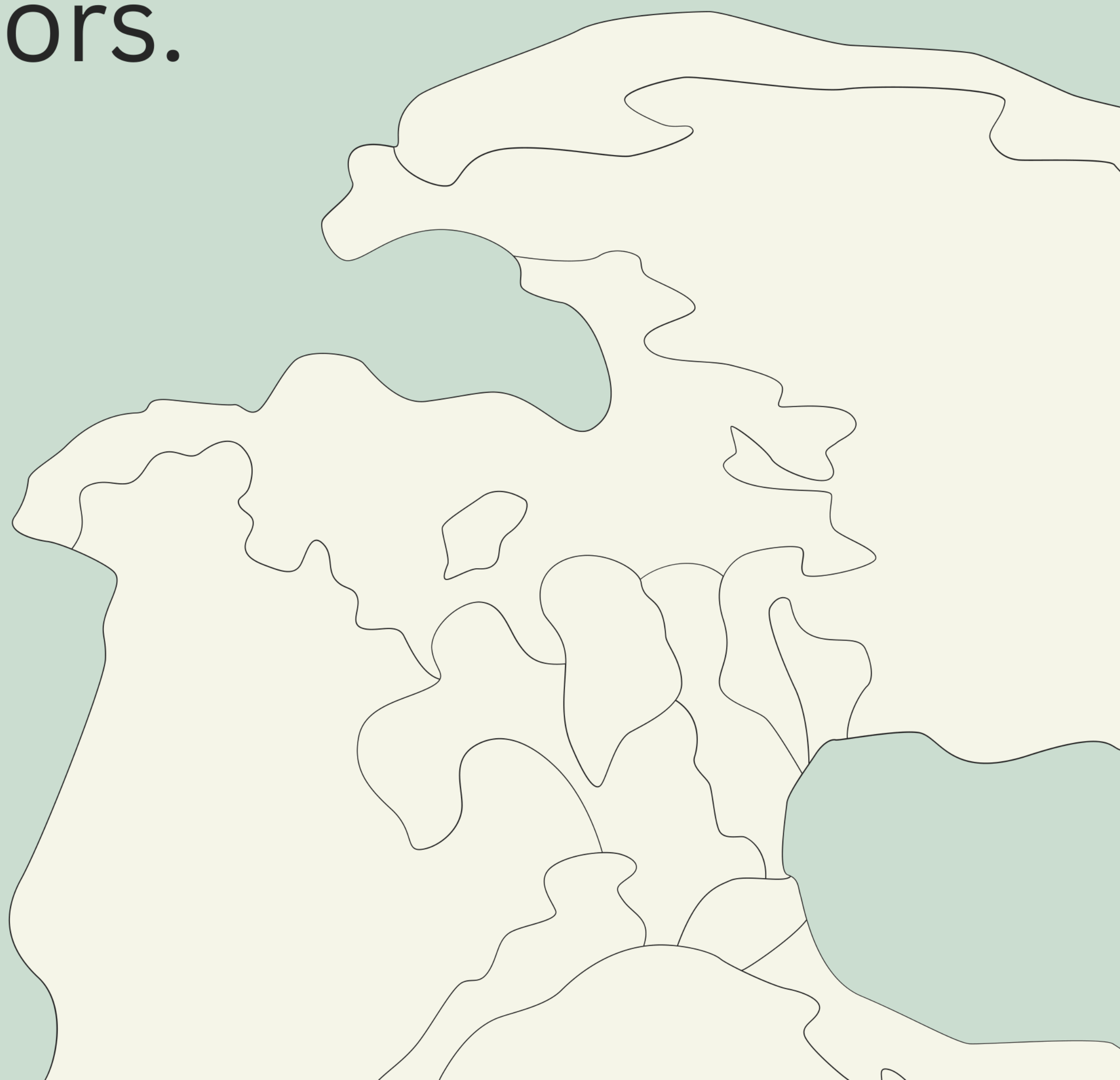
"With given M colors and graph G, whether a such color scheme is possible or not?".

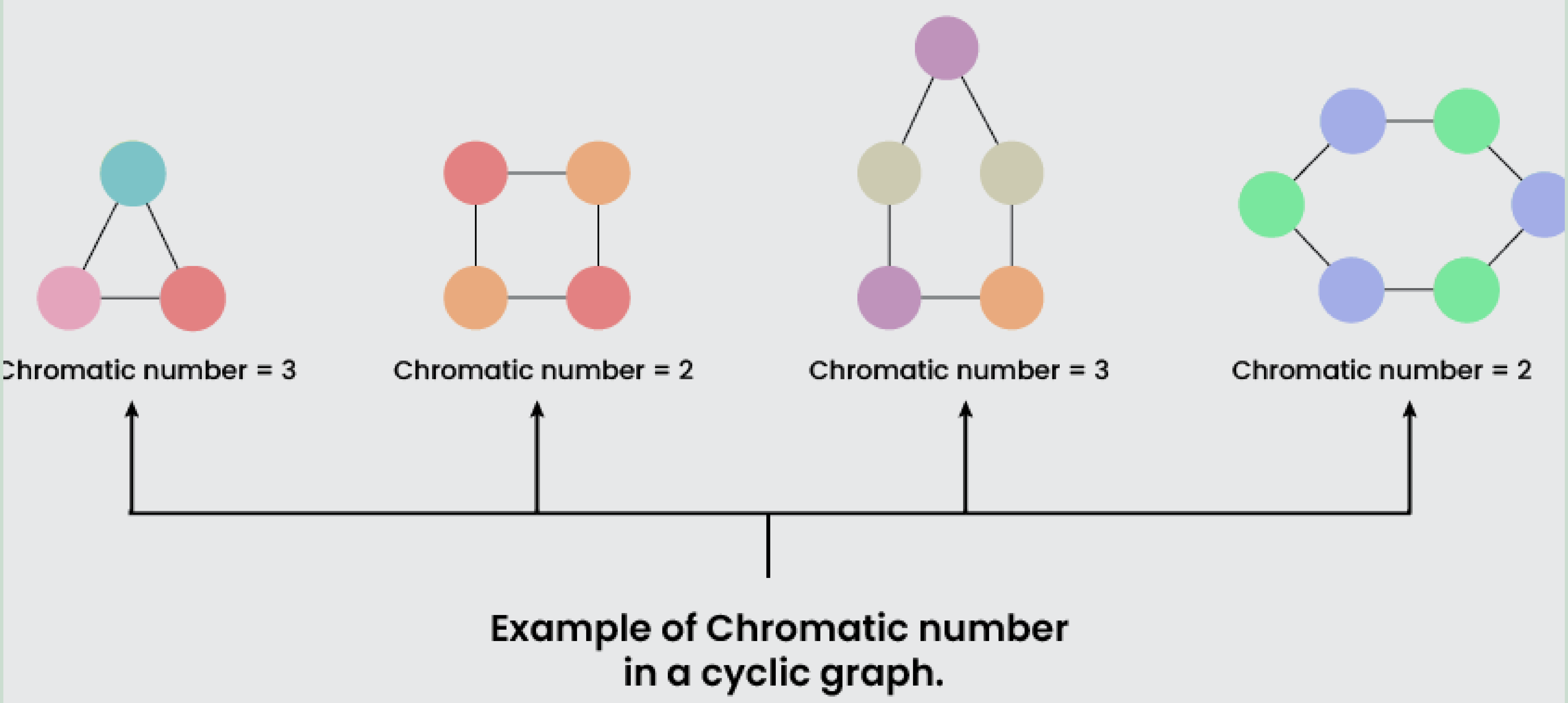
optimization problem

"Given M colors and graph G, find the minimum number of colors required for graph coloring.

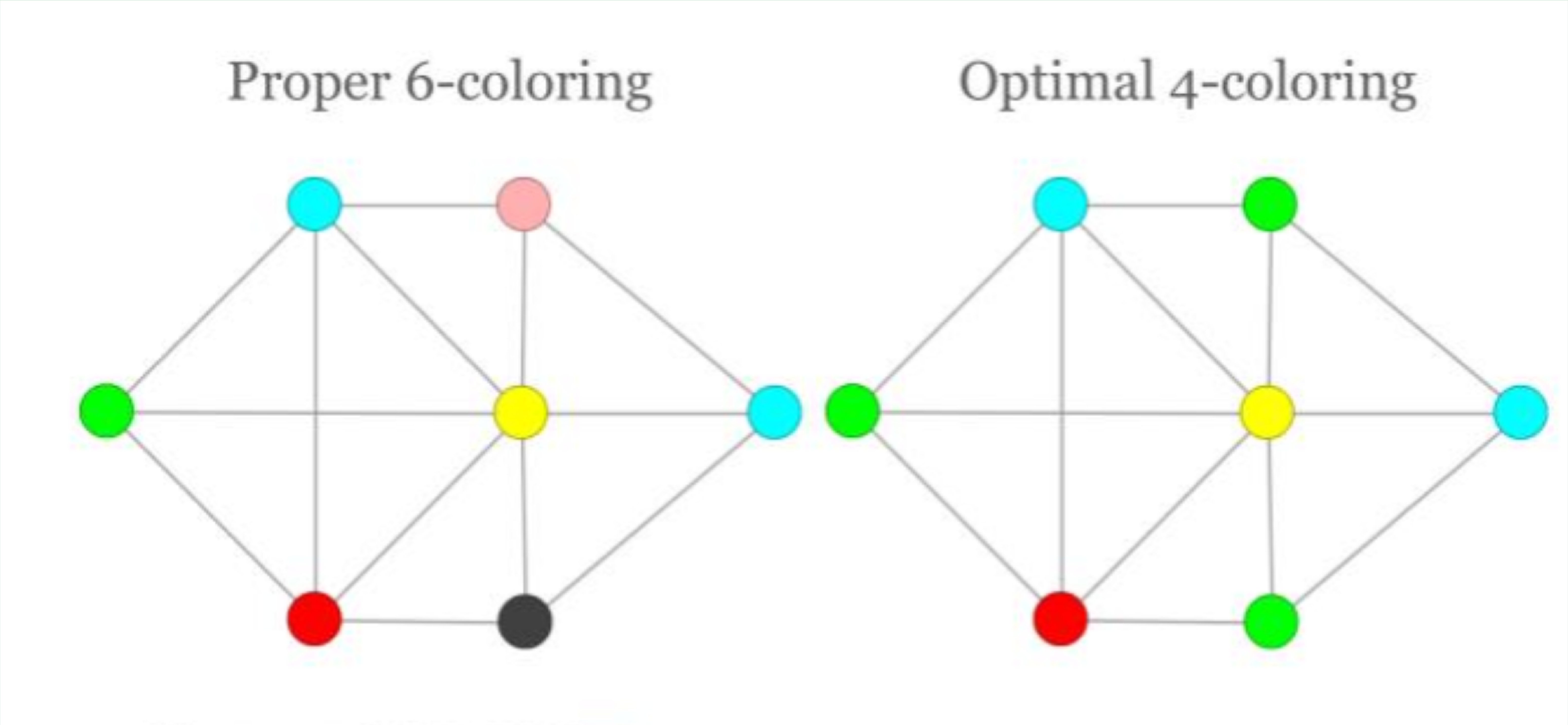
Chromatic Number:

The minimum number of colors needed to color a graph is called its chromatic number. For example, the following can be colored a minimum of 2 colors.





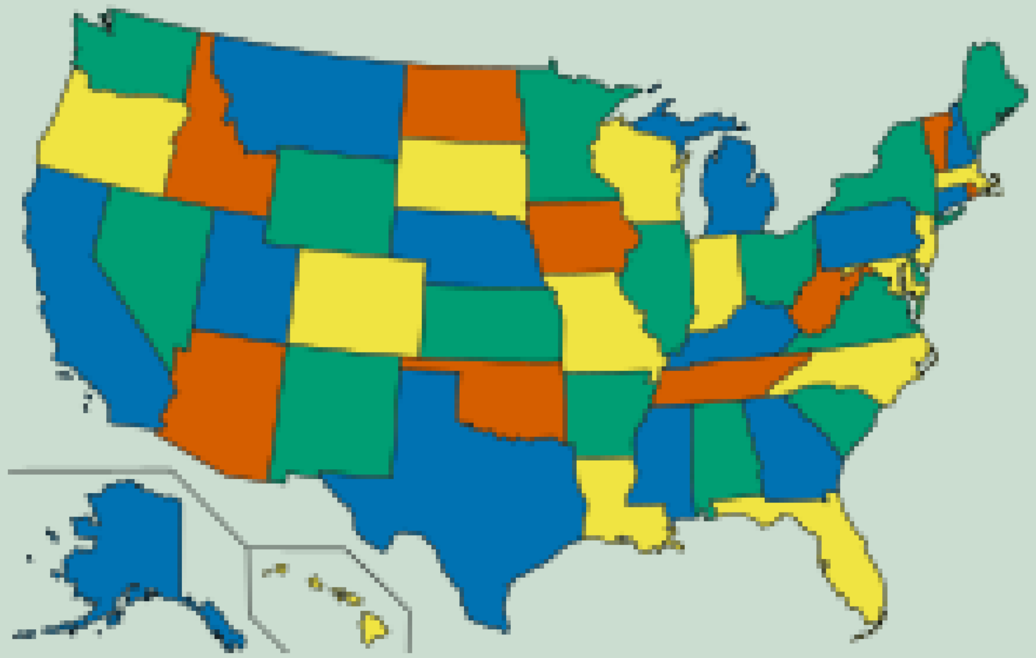
Chromatic Number



chromatic number<=k<=number of vertices

applications of graph coloring

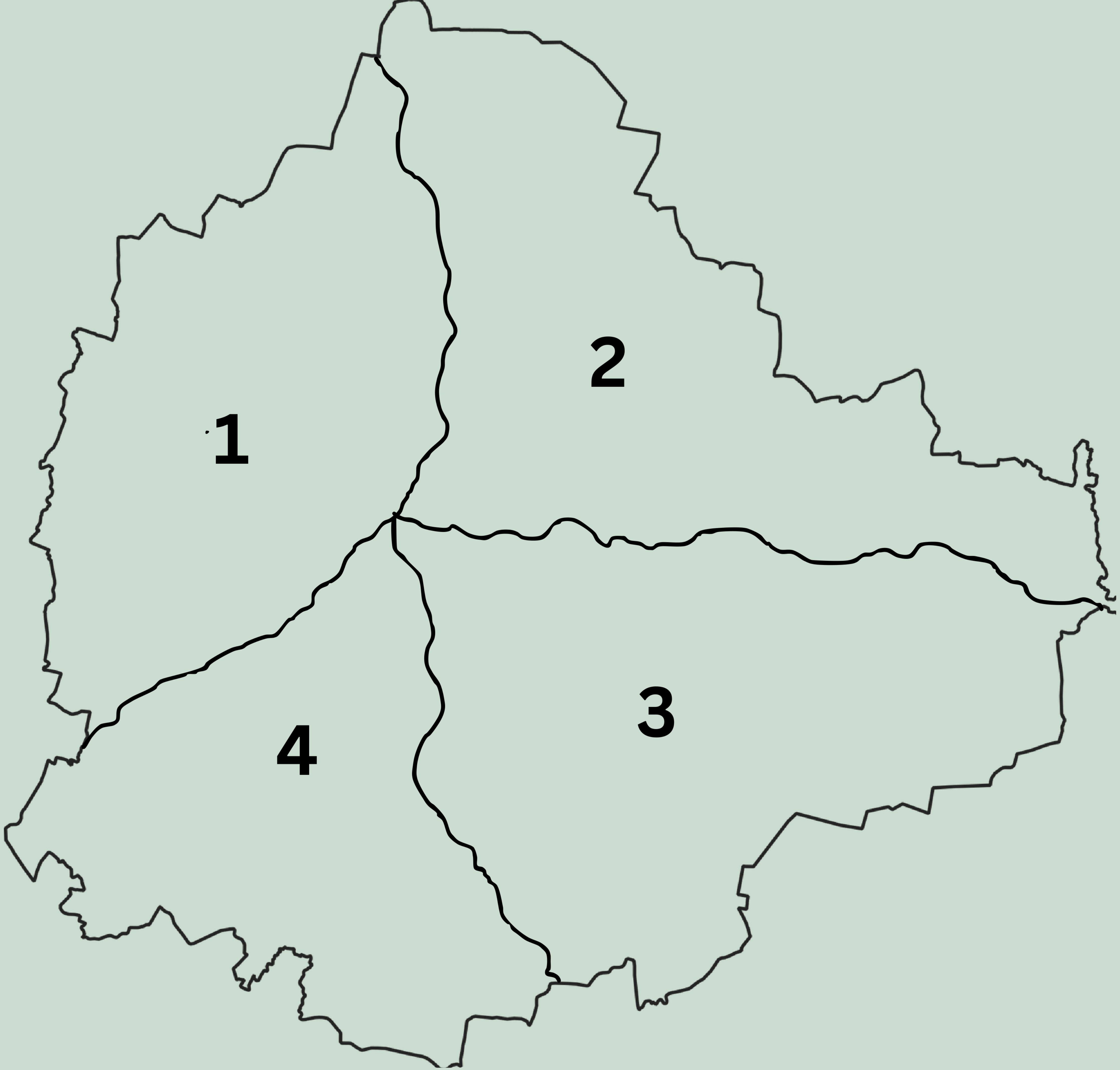
map coloring



sudoku

time table scheduling

Finding Chromatic Numbers using Backtracking Algorithm:



1
2
3
4

pros and cons

pros

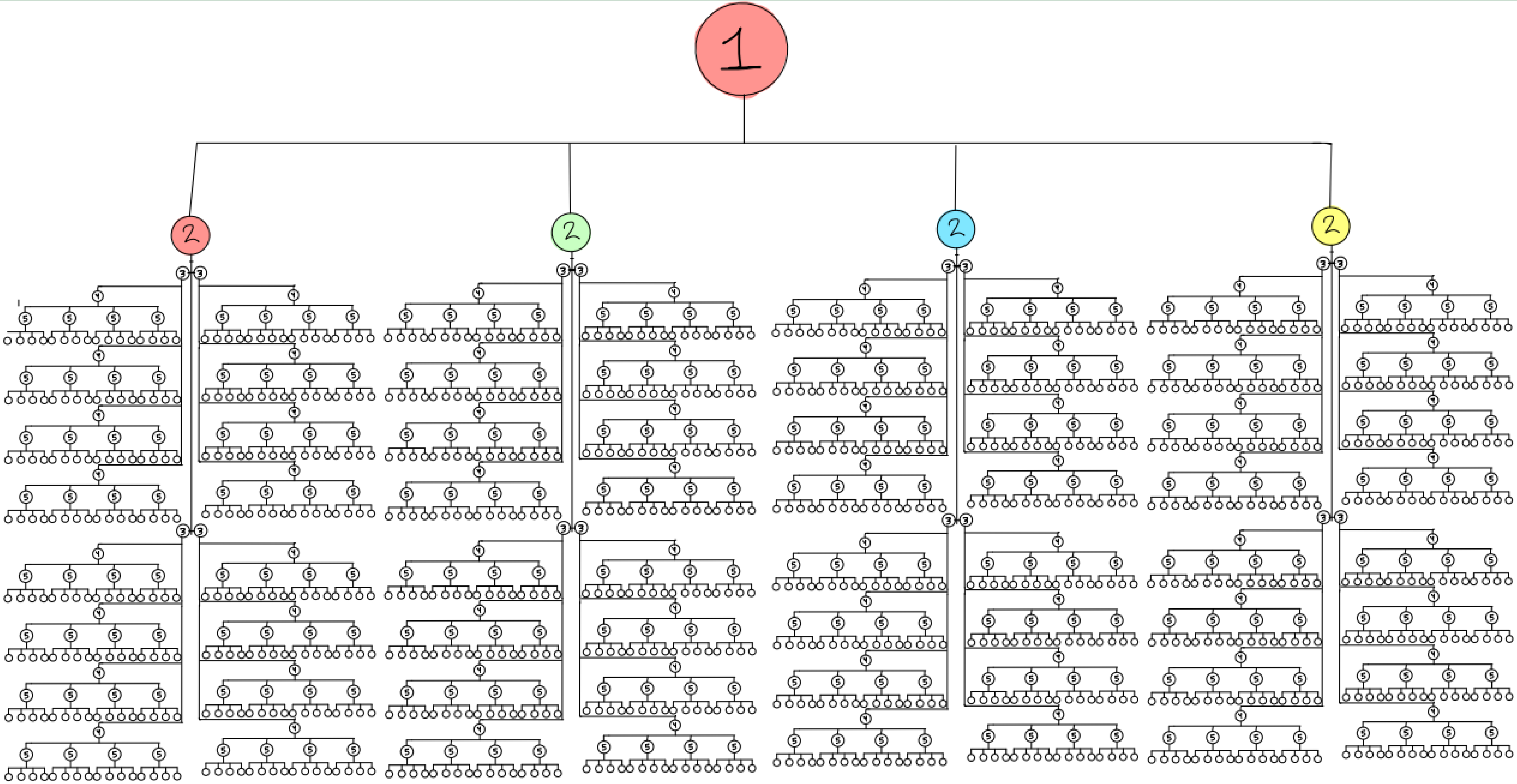
Guarantees optimal solution, can be modified for specific constraints.

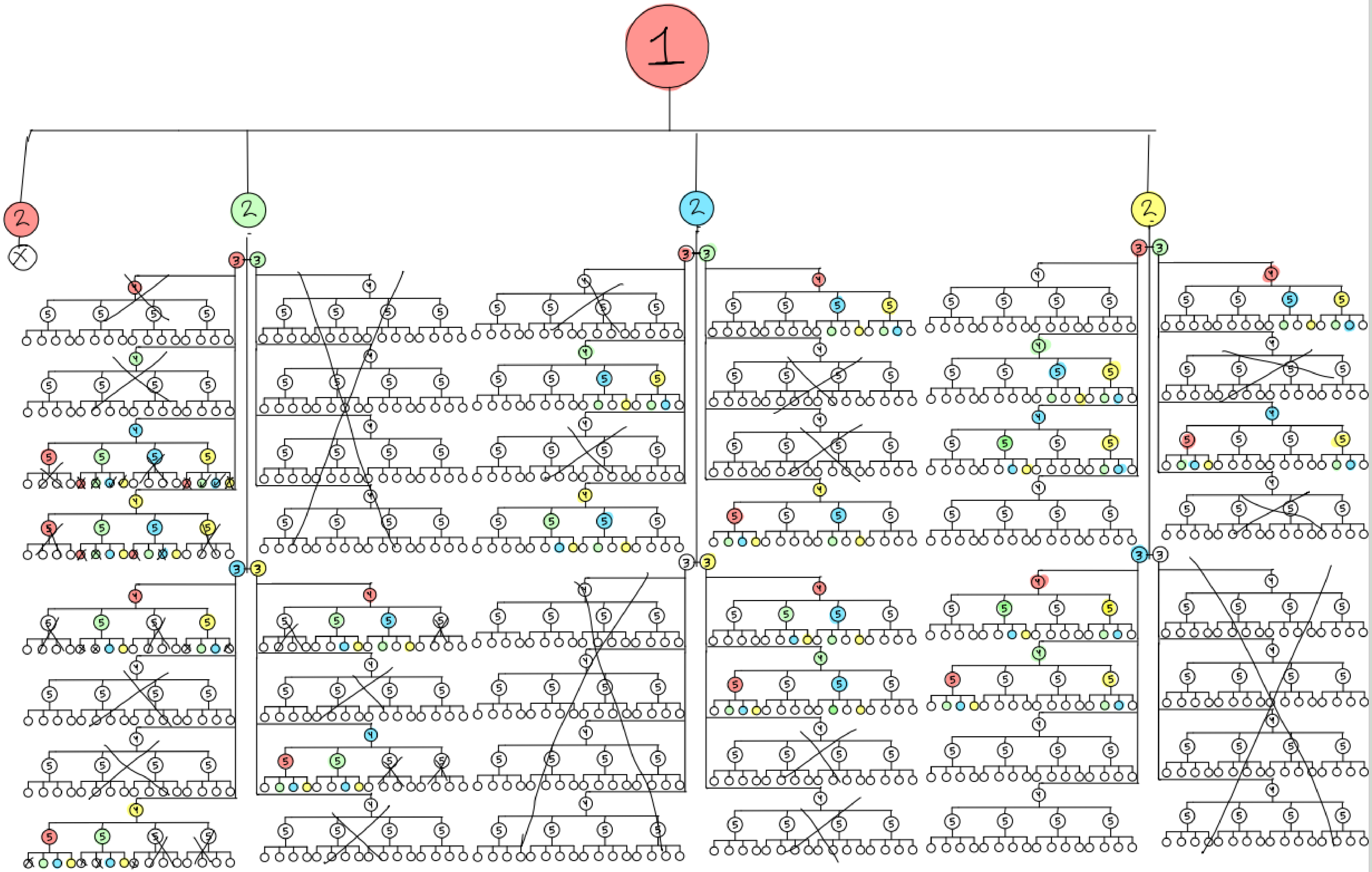
cons

Very slow for large graphs, impractical for real-world scenarios.

time comlpixity
O(V! * K^V)


1
2
3
4
5
6


1
2
2
2
2



any questions?

THANK YOU