WCE Codepals
Challenge 1 Solution

Name: Ganesh Kasar
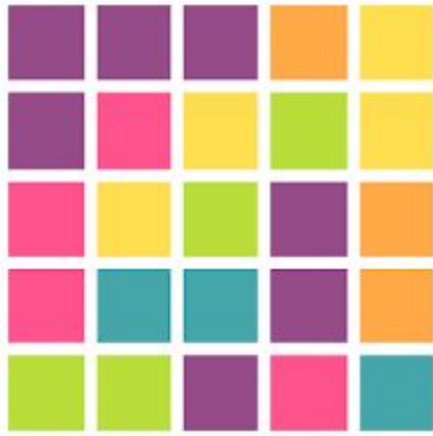**Email: ganekasar@gmail.com**
Github: https://github.com/ganekasar/

- **Representation**
  We can represent the states of the puzzle in a 2D Matrix, where each
  cell will store the value of the color that it has.
  Values of colors can be numbers 1, 2, 3... and so on.

Example

Purple - 1
Orange - 2
Yellow -3
Green - 4
Blue - 5
Pink - 6

The matrix representation of above diagram is,

1	1	1	2	3
1	6	3	4	3
6	6	4	1	2
6	5	5	1	2

4	4	1	6	5

Terms used:

1. **Island:** It is formed by the connected cells having the same color. Connected can be in four directions viz. Left, right, up and down.
2. **N:** Total number of different colors present in the matrix.
3. **Adjacent:** Cells in the all four directions(if exists), left, right, top pr down.

Approach:

- We can use the "Flood Fill Algorithm" at each move, to color an island with a different color.
- Our goal is to minimize the number of moves to make the whole matrix of a single color.

Step 1:
Count the number of islands of each color.

Step 2:

Possible Solutions:
1. Choose the color that is having the maximum number of islands, and convert all other islands to that color.
   In worst case, it will cost is
   Total islands - Number of islands of selected color

   This solution works in some simpler cases, but usually fails.

2.
   a. For all the islands, find all the adjacent islands of all islands, count the frequency of each color of islands

   Say an island having color "Red" is surrounded by
   - 3 Yellow island
   - 2 Blue island

- 1 Green island

**Surrounded means adjacent to all the cells in the chosen island.

    b. Choose an island such that it is having the maximum of all islands surrounded by single color.

In above example, say out of all the islands Red island is having "maximum number of islands surrounded by a color" i.e. 3 islands of yellow colors,
We will fill Red island with the color Yellow.
Now, Red + 3 islands of yellow will form a single island.

    c. Update the number of islands of each color and adjacent islands to each island and Repeat step a & b.

This is a Greedy approach where we are making the best choice to "reduce the number of islands" so that ultimately we will have a single island(That is our solution).