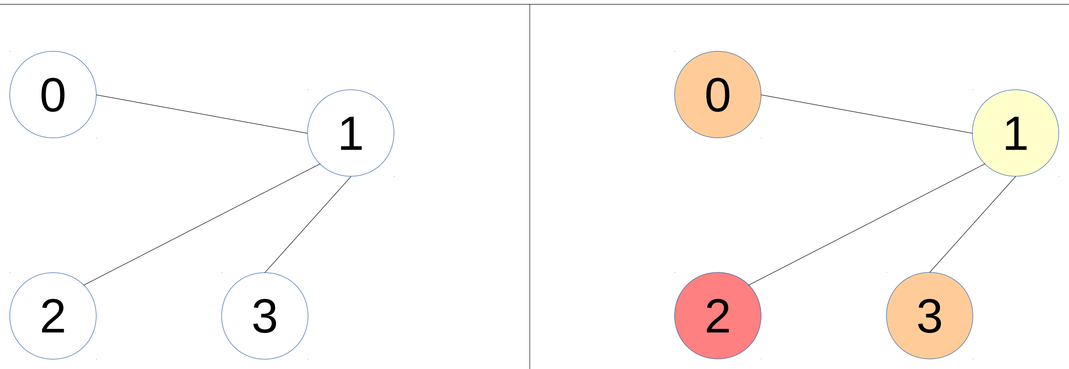
Programming Assignment Extra

Due 9 Dec @ 11:59pm

Write a program that finds the minimum number of colors for a given graph. You are provided with a graph (read in from a file specified on the command line). Your task is to label the graph's vertices with as few colors as possible such that no two adjacent vertices have the same color. You should only modify the Coloring.java file.



a) Graph **b) Graph 3-coloring**

Figure 1 Graph Coloring ("Color Map") Example

The problem is to find a coloring that uses the minimum number of colors to properly color the graph. The problem can mathematically be formulated as follows:

Given a graph $G(V, E)$, let $c_i \in \mathbb{N}$ denote the color of vertex i. Let C denote the set of colors.

$$\min\ |C|$$

$$\text{s.t. } c_i \neq c_j \ \ (i, j \in E)$$

Grading Notes

You must:

- Use the template provided for you
- Have a style (indentation, good variable names, etc.)
- Comment your code well (no need to over do it, just do it well)

You may not:

- Make your program part of a package.
- Use *code* from anywhere except your own brain.

Submission Instructions:

- Name a folder with your gmu username
- Put your java files in the folder (but not your .class)
- Zip the folder (not just the files) and name the zip “username-pa2.zip”
- Submit to blackboard

Grading Rubric

Calculation:

- Points are not cumulative (you will receive either 0, 1 or 4 points)
- The value will be added to the average of your assignments. For example, if you have an average of 92 and produce a valid solution of 600, your final assignment grade will be 93.
- The maximum assignment grade will not exceed 100. For example, if you have an average assignment grade of 98 and produce a valid solution with 295 colors, you will receive 100.

0pts	Does not produce a valid solution
1pt	Produces a valid solution
4pts	Produces a valid solution below 300
*	If you devise an algorithm that always finds the fewest colors possible (i.e. is optimal) and it finishes processing before the due date, please inform your instructor first before letting anyone else know.

Example input file “tiny.txt”:

First line is number of vertices and edges, subsequent lines are the edges

```
8 16
5 4
5 1
1 3
3 6
4 6
5 7
4 7
4 0
7 1
7 0
7 2
1 2
0 2
0 6
2 3
2 6
```

Example running “tiny.txt”:

```
> java Coloring tiny.txt
Took(ms): 0.46692
valid? true #colors=8
0 1 2 3 4 5 6 7
```

Example running “huge.txt”:

```
>  java Coloring huge.txt
Took(ms): 35.291795
valid? false #colors=1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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