Practical 8

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Subject: DAA Lab

Problem Statement:

The four-color theorem states that every planar map can be colored using only four colors so that no region is colored using the same color as a neighbor. After being open for over 100 years, the theorem was proven in 1976 with the assistance of a computer. Here you are asked to solve a more straightforward problem. Decide whether a given connected graph can be bicolored, i.e., can the vertices be painted red and black such that no two adjacent vertices have the same color? To simplify the problem, you can assume the graph will be connected, undirected, and not contain self-loops (i.e., edges from a vertex to itself).

Input:
The input consists of several test cases. Each test case starts with a line containing the number of vertices n, where 1 <n< 200. Each vertex is labeled by a number from 0 to n − 1. The second line contains the number of edges l. After this, l lines follow, each containing two vertex numbers specifying an edge.
An input with n = 0 marks the end of the information and is not to be processed.

Output:
Decide whether the input graph can be bi-colored, and print the result as shown below

Code:

```cpp
#include <bits/stdc++.h>
using namespace std;

int main()
{

    int t = 1;
    int ans = 0;
    int i = 0;
    vector<int> result;
```

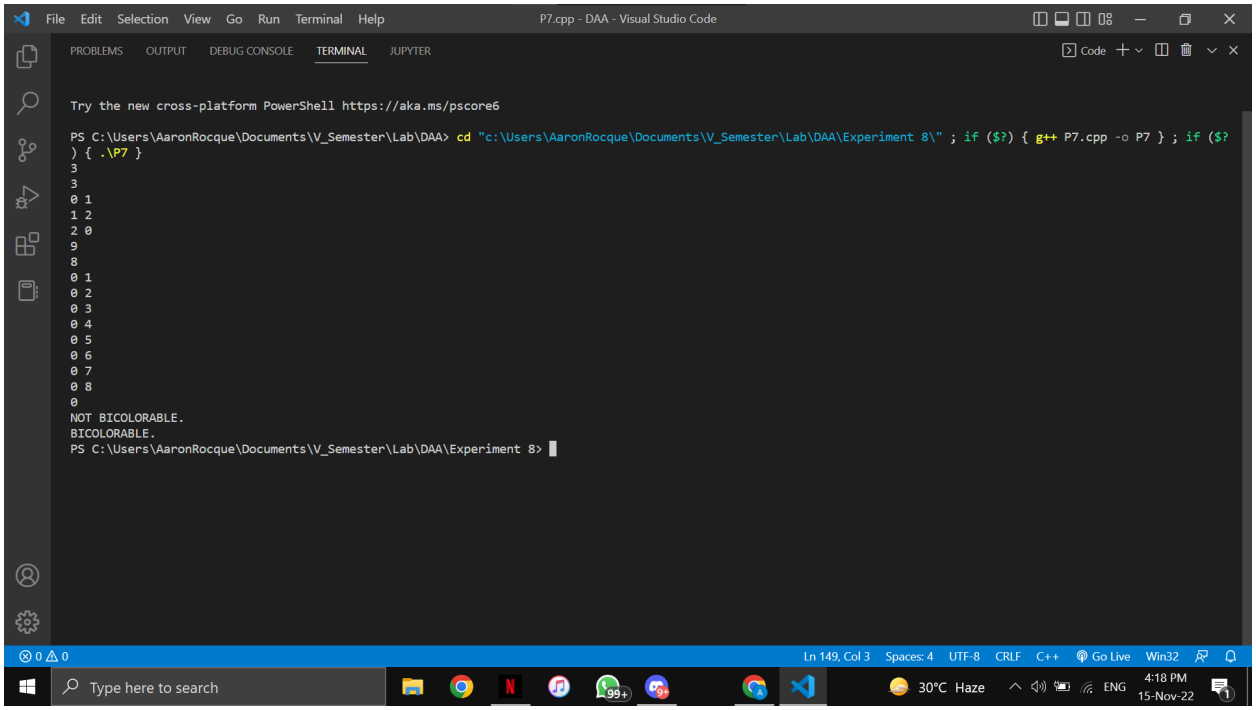
```
while (t != 0)
{

    //V for Vertices, E for Edges
    int V, E;

    cin >> V;

    //If 0, that means end of input
    if (V == 0)
    {
        break;
    }

    cin >> E;

    map<int, vector<int>> graph;
    /*We have to use Map in combination with Vector
    * because for every node say 0, there can be
    * multiple nodes attached to it, say 0-1, 0-2, 0-5 etc.
    * This is just like the Family name being the key and
    * the family members being memebers of that family.
    * Say, "Stark" is the family name and "Jon", "Rob",
    * "Sansa", "Arya", "Bran" are its members.
    *
    * families["Stark"];
    * families["Stark"].push_back( "Jon" );
    * families["Stark"].push_back( "Robb" );
    */

    for (int a = 0; a < E; a++)
    {
        int x, y;

        //Cause the inputs are two and in a single line
        cin >> x >> y;

        //Using the smaller value as key
        if (x > y)
```

```
        {
            graph[y].push_back(x);
        }
        else
        {
            graph[x].push_back(y);
        }
    }

    map<int, int> color;

    ans = 0;

    //auto, automatically detects the type of the variable
    for (auto x : graph)
    {
        if (color[x.first] == 0)
        {
            color[x.first] = 1;
        }

        for (int a = 0; a < x.second.size(); a++)
        {
            if (color[x.first] == color[x.second[a]])
            {
                // cout<<"Breaking at "<<x.first<<"-"<<x.second[a]<<endl;
                ans = 1;
                break;
            }
            if (color[x.second[a]] == 0)
            {
                if (color[x.first] == 1)
                {
                    color[x.second[a]] = 2;
                }

                if (color[x.first] == 2)
                {
                    color[x.second[a]] = 1;
```

```
                }
            }
        }

        if (ans == 1)
        {
            break;
        }
    }



    if (ans == 1)
    {
        result.push_back(1);
    }
    else
    {
        result.push_back(0);
    }

    i++;

}

for(auto j = result.begin(); j != result.end(); j ++)
{
    if (*j == 1)
    {
        cout << "NOT BICOLORABLE." << endl;
    }
    else
    {
        cout << "BICOLORABLE." << endl;
    }
}


return 0;
```

```
}

//INPUT:
/*
3
3
0 1
1 2
2 0
9
8
0 1
0 2
0 3
0 4
0 5
0 6
0 7
0 8
0
*/
```

Output:


File Edit Selection View Go Run Terminal Help
P7.cpp - DAA - Visual Studio Code
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL JUPYTER
Code
Try the new cross-platform PowerShell https://aka.ms/pscore6
PS C:\Users\AaronRocque\Documents\V_Semester\Lab\DAA> cd "c:\Users\AaronRocque\Documents\V_Semester\Lab\DAA\Experiment 8\" ; if ($?) { g++ P7.cpp -o P7 } ; if ($?) { .\P7 }
3
3
0 1
1 2
2 0
9
8
0 1
0 2
0 3
0 4
0 5
0 6
0 7
0 8
0
NOT BICOLORABLE.
BICOLORABLE.
PS C:\Users\AaronRocque\Documents\V_Semester\Lab\DAA\Experiment 8>
Ln 149, Col 3 Spaces: 4 UTF-8 CRLF C++ Go Live Win32
Type here to search
30°C Haze
ENG
4:18 PM
15-Nov-22