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Prac- 10 : Write a program to find the chromatic number of a given graph.

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

int n,e,i,j;
vector<vector<int> > graph;
vector<int> color;
set<int> colorset;
bool vis[100011];

void chromatic_number()
{
    color[0] = 0;
    for (i=1;i<n;i++)
        color[i] = -1;

    bool unused[n];

    for (i=0;i<n;i++)
        unused[i]=0;

    for (i = 1; i < n; i++)
    {
        for (j=0;j<graph[i].size();j++)
            if (color[graph[i][j]] != -1)
                unused[color[graph[i][j]]] = true;
        int cr;
        for (cr=0;cr<n;cr++)
            if (unused[cr] == false)
                break;

        color[i] = cr;

        for (j=0;j<graph[i].size();j++)
            if (color[graph[i][j]] != -1)
                unused[color[graph[i][j]]] = false;
    }
}

int main()
{
    int x,y;
    cout << "\n==== Enter inputs ==== \n";
```

```

    cin>>n>>e;
    graph.resize(n);
    color.resize(n);
    memset(vis,0,sizeof(vis));

    for(i=0; i<e; i++)
    {
        cin>>x>>y;
        x--; y--;
        graph[x].push_back(y);
        graph[y].push_back(x);
    }
    chromatic_number();
    set<int> colorset(color.begin(), color.end());

    cout<<"\nChromatic number of a given graph is : "<<colorset.size()<<"\n\n";

    for(i=0;i<n;i++)
    {
        cout<<"Vertex "<<i+1<<" is coloured "<<color[i]+1<<"\n";
    }
}

```

OUTPUT :

==== Enter inputs ====

```

4 3
1 2
2 3
3 4
1 4

```

Chromatic number of a given graph is : 2

```

Vertex 1 is coloured 1
Vertex 2 is coloured 2
Vertex 3 is coloured 1
Vertex 4 is coloured 2

```

==== Enter inputs ====

```

5 10
1 2
2 3
3 4
4 5
1 5
1 3
1 4
2 5

```

2 4

3 5

Chromatic number of a given graph is : 5

Vertex 1 is coloured 1

Vertex 2 is coloured 2

Vertex 3 is coloured 3

Vertex 4 is coloured 4

Vertex 5 is coloured 5