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Experiment - 3

Constraint Satisfaction Problem (Map Coloring Problem)

Aim: To solve the Map coloring problem.

- Steps:
- 1) Define 2 lists - colors & states
 - 2) Declare the neighboring states for each state
 - 3) Define a function to ensure that no two neighboring states have same color
 - 4) Define a function to return a color for each state
 - 5) Print all states with their colors

Result: This program has been successfully executed in Python language.

Experiment 3 - Constraint Satisfaction Problem (Map Coloring Problem)

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Code -

```
colors = ['red','blue','green','yellow']
countries = ['India','Pakistan','Nepal','Bhutan','Bangladesh','Myanmar','China','Afghanistan','Iran','Tajikistan','Thailand','Laos']
neighbors = {}
```

```
neighbors['India']=['Pakistan','China','Nepal','Bhutan','Bangladesh','Myanmar']
neighbors['Pakistan']=['India','Afghanistan','China','Iran']
neighbors['Nepal']=['India','China']
neighbors['Bhutan']=['India','China']
neighbors['Bangladesh']=['India','Myanmar']
neighbors['Myanmar'] = ['India','Bangladesh','China','Laos','Thailand']
neighbors['China'] = ['Laos','Myanmar','India','Bhutan','Nepal','Pakistan','Afghanistan','Tajikistan']
neighbors['Afghanistan'] = ['Iran','Pakistan','Tajikistan','China']
neighbors['Iran'] = ['Afghanistan','Pakistan']
neighbors['Tajikistan'] = ['Afghanistan','China']
neighbors['Thailand'] = ['Myanmar','Laos']
neighbors['Laos'] = ['Thailand','Myanmar','China']
```

```
colors_of_countries = {}
```

```
def same(country, color):
    for neighbor in neighbors.get(country):
        color_of_neighbor = colors_of_countries.get(neighbor)
        if color_of_neighbor == color:
            return False
    return True
```

```
def get_color(country):
    for color in colors:
        if same(country,color):
            return color
```

```
for country in countries:
    colors_of_countries[country] = get_color(country)
print(colors_of_countries)
```

Screenshot -

Code -

```
1  colors = ['red','blue','green','yellow']
2  countries = ['India','Pakistan','Nepal','Bhutan','Bangladesh','Myanmar','China','Afghanistan','Iran','Tajikistan','Thailand','Laos']
3  neighbors = {}
4
5  neighbors['India']=['Pakistan','China','Nepal','Bhutan','Bangladesh','Myanmar']
6  neighbors['Pakistan']=['India','Afghanistan','China','Iran']
7  neighbors['Nepal']=['India','China']
8  neighbors['Bhutan']=['India','China']
9  neighbors['Bangladesh']=['India','Myanmar']
10 neighbors['Myanmar'] = ['India','Bangladesh','China','Laos','Thailand']
11 neighbors['China'] = ['Laos','Myanmar','India','Bhutan','Nepal','Pakistan','Afghanistan','Tajikistan']
12 neighbors['Afghanistan'] = ['Iran','Pakistan','Tajikistan','China']
13 neighbors['Iran'] = ['Afghanistan','Pakistan']
14 neighbors['Tajikistan'] = ['Afghanistan','China']
15 neighbors['Thailand'] = ['Myanmar','Laos']
16 neighbors['Laos'] = ['Thailand','Myanmar','China']
17
18 colors_of_countries = {}
19
20 def same(country, color):
21     for neighbor in neighbors.get(country):
22         color_of_neighbor = colors_of_countries.get(neighbor)
23         if color_of_neighbor == color:
24             return False
25     return True
26
27 def get_color(country):
28     for color in colors:
29         if same(country,color):
30             return color
31
32 for country in countries:
33     colors_of_countries[country] = get_color(country)
34 print(colors_of_countries)
```

Output

```
{'India': 'red', 'Pakistan': 'blue', 'Nepal': 'blue', 'Bhutan': 'blue', 'Bangladesh': 'blue', 'Myanmar': 'green', 'China': 'yellow', 'Afghanistan': 'red', 'Iran': 'green', 'Tajikistan': 'blue', 'Thailand': 'red', 'Laos': 'blue'}
```

Map -

