Started on	Monday, 25 March 2024, 6:20 PM
State	Finished
Completed on	Monday, 25 March 2024, 6:42 PM
Time taken	21 mins 59 secs
Grade	**10.00** out of 10.00 (**100**%)

Question 1

Correct

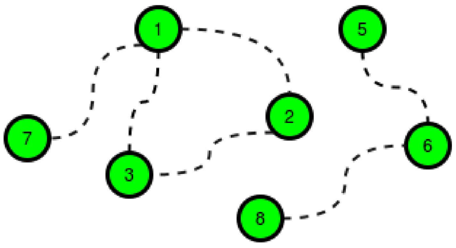
Mark 10.00 out of 10.00

Determine the minimum cost to provide library access to all citizens of HackerLand. There are n cities numbered from 1 to n. Currently there are no libraries and the cities are not connected. Bidirectional roads may be built between any city pair listed in $cities$. A citizen has access to a library if:

- Their city contains a library.
- They can travel by road from their city to a city containing a library.

Example

The following figure is a sample map of HackerLand where the dotted lines denote possible roads:



$c\_road = 2$
$c\_lib = 3$
$cities = [[1,7],[1,3],[1,2],[2,3],[5,6],[6,8]]$

The cost of building any road is $cc\_road = 2$, and the cost to build a library in any city is $c\_lib = 3$. Build 5 roads at a cost of $5 \times 2 = 10$ and 2 libraries for a cost of 6. One of the available roads in the cycle $1 \to 2 \to 3 \to 1$ is not necessary.

There are q queries, where each query consists of a map of HackerLand and value of c_lib and c_road. For each query, find the minimum cost to make libraries accessible to all the citizens.

Function Description

Complete the function *roadsAndLibraries* in the editor below.
roadsAndLibraries has the following parameters:

- *int n*: integer, the number of cities
- *int c_lib*: integer, the cost to build a library
- *int c_road*: integer, the cost to repair a road
- *int cities[m][2]*: each $cities[i]$ contains two integers that represent cities that can be connected by a new road

Returns
- *int*: the minimal cost

Input Format

The first line contains a single integer q, that denotes the number of queries.

The subsequent lines describe each query in the following format:
- The first line contains four space-separated integers that describe the respective values of n, m, c_lib and c_road, the number of cities, number of roads, cost of a library and cost of a road.
- Each of the next m lines contains two space-separated integers, $u[i]$ and $v[i]$, that describe a bidirectional road that can be built to connect cities $u[i]$ and $v[i]$.

Constraints

- $1 \leq q \leq 10$
- $1 \leq n \leq 10^5$
- $0 \leq m \leq min(10^5, \frac{n \cdot (n-1)}{2})$
- $1 \leq c\_road, c\_lib \leq 10^5$
- $1 \leq u[i], v[i] \leq n$

- Each road connects two distinct cities.

For example:

Input	Result

2
3 3 2 1
1 2
3 1
2 3
6 6 2 5
1 3
3 4
2 4
1 2
2 3
5 6
	4
	12

Answer: (penalty regime: 0 %)

Reset answer

```
#include <bits/stdc++.h>

using namespace std;

string ltrim(const string &);
string rtrim(const string &);
vector<string> split(const string &);

/*
 * Complete the 'roadsAndLibraries' function below.
 *
 * The function is expected to return a LONG_INTEGER.
 * The function accepts following parameters:
 *  1. INTEGER n
 *  2. INTEGER c_lib
 *  3. INTEGER c_road
 *  4. 2D_INTEGER_ARRAY cities
 */

void dfs(int node, vector<bool>& visited, const vector<vector
    visited[node] = true;
    for (int neighbor : graph[node]) {
        if (!visited[neighbor]) {
            dfs(neighbor, visited, graph);
        }
    }
}

long roadsAndLibraries(int n, int c_lib, int c_road, vector<ve
    if (c_lib <= c_road) {
        return static_cast<long>(n) * static_cast<long>(c_lib
    }

    vector<vector<int>> graph(n + 1);
    for (const auto& road : cities) {
        int city1 = road[0];
        int city2 = road[1];
        graph[city1].push_back(city2);
        graph[city2].push_back(city1);
    }

    vector<bool> visited(n + 1, false);
    long total_cost = 0;

    // Count the number of connected components
    int num_components = 0;
    for (int i = 1; i <= n; ++i) {
        if (!visited[i]) {
            ++num_components;
            dfs(i, visited, graph);
        }
    }
```

	Input	Expected	Got	
✓	2	4	4	✓
	3 3 2 1	12	12	
	1 2			
	3 1			
	2 3			
	6 6 2 5			
	1 3			
	3 4			
	2 4			
	1 2			
	2 3			
	5 6			
✓	5	805	805	✓
	9 2 91 84	184	184	
	8 2	80	80	
	2 9	5	5	
	5 9 92 23	204	204	
	2 1			
	5 3			
	5 1			
	3 4			
	3 1			
	5 4			
	4 1			
	5 2			
	4 2			
	8 3 10 55			
	6 4			
	3 2			
	7 1			
	1 0 5 3			
	2 0 102 1			
✓	1	15	15	✓
	5 3 6 1			
	1 2			
	1 3			
	1 4			

Passed all tests! ✓

▸ **Show/hide question author's solution (Cpp)**

Correct

Marks for this submission: 10.00/10.00.