Jinkela

Description

Shik has IQ 400 after using Jinkela, which is the smart drugs made in China. Now Shik is simply good at graph theory. Here's a problem he solved himself. Given a connected graph. We define the cost of the node is the sum of minimum distances to other nodes. Shik can find out the cost for each node. What a genius!

For interest, Shik studies lots of graph and found an interesting graph which named **regular graph**. A regular graph is a graph where each vertex has the same number of neighbors; i.e. every vertex has the same degree or valency. Shik recalls that there is another interesting graph which named **cactus graph**. A cactus (sometimes called a cactus tree) is a connected graph in which any two simple cycles have at most one vertex in common.

Shik is really excited. He wants to put his previous work on the undirected graph which is both cactus and regular graph, but it's too easy for him. Based on the same problem, Shik add the weight w_i for each node. The cost of the node will be the sum of minimum distances times w_i to other nodes. Can you help him to find out the cost for each node?

Input

The first line contains an integer T indicating the total number of test cases. Each test case starts with one line containing two integers n, m, denoting the number of nodes and the number of edges in the undirected graph. There is no edge may connect a node with itself. Then the second line contains n integers w_i, denoting the weight of each node. Then m lines, each contains 3 integers a_i, b_i, c_i, denoting an edge (a_i, b_i) in the graph with distance c_i.

- $1 \leq T \leq 1000$
- $3 \leq n, m \leq 10^5$
- $1 \leq a_i, b_i \leq n$
- $1 \leq c_i, w_i \leq 10^4$
- There are at most 5 test cases with $n > 1000$

Output

For each test case, output n integers in a single line, where the i-th integer indicates the answer of i-th node.

Sample Input

```
2
4 4
2 3 2 3
1 2 5
2 3 1
3 4 4
4 1 7
5 5
1 1 1 1 1
1 2 1
2 3 1
3 4 1
4 5 1
5 1 1
```

Sample Output

```
48 27 27 37
6 6 6 6 6
```