

Problem 5 - Mega Knights (100 pts)

Problem Description

There are n mega knights initially located at n distinct positions. Each mega knight K_i ($1 \leq i \leq n$) can cause damage a_i (i.e., his attack points) if he attacks, and has h_i health points, representing the maximum damage the knight can bear.

When a mega knight K_a receives an instruction to attack another mega knight K_s (i.e., the target), he will gather *all knights at the same position as K_a* to move to the position of K_s to perform the attack. Because the attack has an area of effect, all knights at the same position as K_s suffer the attack, after which their health points are all reduced by the sum of the attack points of all attacking knights. Any mega knight whose health points is less or equal to 0 after the attack is considered dead. After the attack, the attacking mega knights stay at the position where K_s is located.

A dead mega knight cannot perform an attack, nor can it be targeted, even when an instruction is given to do so. When such an instruction is given, no attack or movement will happen. That is, in the above example, if either K_a or K_s is dead, nothing happens subsequently. In addition, when the attacking mega knight is located at the same position as the target, even when such an instruction is given, no attack or movement will happen either. That is, in the above example, if K_a and K_s are located at the same position before the attack, nothing happens subsequently.

You will be given m attacking instructions. Calculate how many times each mega knight successfully attacks, including those that the knight is on the instruction, and those that the knight is following others.

Input

The first line contains two positive integers n and m separated by a space – the number of mega knights and the number of attack rounds.

The second line contains n positive integers h_1, h_2, \dots, h_n separated by spaces – the health points of each mega knight.

The third line contains n positive integers a_1, a_2, \dots, a_n , separated by spaces – the attack points of each mega knight.

The next m lines each contain two positive integers K_a and K_s separated by a space – the indices of attacking and the target mega knight.

Output

Output a line containing n integers separated by spaces. The i -th integer represents the total number of successful attacks made by the i -th mega knight.

Constraints

- $1 \leq n, m \leq 2 \times 10^5$
- $1 \leq a_i, h_i \leq 10^9$
- $1 \leq K_a, K_s \leq n$
- $K_a \neq K_s$

Subtask 1 (15 pts)

- $1 \leq n, m \leq 10^3$

Subtask 2 (20 pts)

- It is guaranteed that no mega knight will die.

Subtask 3 (65 pts)

- No other constraints

Sample Testcases

Sample Input 1

```
6 5
7 7 7 7 7 14
3 1 4 1 5 9
2 3
2 1
4 3
1 6
6 3
```

Sample Output 1

```
1 3 2 2 0 0
```

Sample Input 2

```
6 5
7 7 7 7 7 14
3 1 4 1 5 9
1 6
3 2
4 5
5 3
2 6
```

Sample Output 2

```
1 0 1 2 1 0
```