Hacking

Time limit: 1 sec

There are **n** servers in our university network, numbered 0 to n-1. These servers are connected by **m** network cables. There are some hacker trying to gain access of our network. The hacker launch a virus that trying to hack **k** servers immediately. Each server has different defensive system. It takes **c**[i] seconds for the virus to hack into server #i. Once infected, the virus will use the server as a base and it will try to hack all neighbor servers. Two servers are neighbor when they have a network cable directly connecting them together.

Your task is to find the earliest time that all servers in the network has been hacked.

Input

- The first line of input contains three integers **n**, **m** and **k** which are the number of servers, the number of network cable, and the number of server being attacked first ($1 \le n \le 10{,}000$; $n-1 \le m \le 40{,}000$; $k \le n$)
- The next line contains k integers which indicate the server that are being attacked first.
- The next line contains n integers that indicates c[0] to c[n-1]. ($1 \le c[i] \le 1000$)
- The next n-1 line gives information about the cables. Each line contains two integer a, b indicating that there is a bidirectional network cable connecting server a and b. ($0 \le a < b < n$)

Output

The output must contain exactly n lines. Each line gives the important of each choke point, starting from choke point 0 to n-1.

Example

Input	Output

3 2 1
1
3 5 1
0 1
1 2
	8
	
	// at 5 secs, server #1 is hacked.
	// at 6 secs, server #2 is hacked via #1
	// at 8 secs, server #0 is hacked via #1

4 4 1
0
2 5 3 1
0 1
0 2
1 3
2 3
	7
	
	// at 2 secs, server #0 is hacked
	// at 5 secs, server #2 is hacked via #0
	// at 6 secs, server #3 is hacked via #2
	// at 7 secs, server #1 is hacked via #0

4 3 2 0 3 4 3 2 1 0 1 1 2 2 3	6 //the earliest time is 6 secs when #1 is hacked via #2 which is hacked via #3

Subtask

- 30% of test case has k = 1