

Lightspeed Salesman

Problem Code	hw07c_salesman
Running Time Limit	2 sec
Memory Limit	16 mb

Objective

- Be able to solve a problem by greedy approach.

Introduction

You are a salesman needing to visit all associated companies every day for N consecutive days. Being well-aware that travelling salesman problem is too hard for you, your boss tells you to visit each company in a specific order every day. You have to visit according to this order only.

However, the city that these companies located is very strange. The road in this city connects into a circle and each company is located on this circle. So, if you wish to go from company A to company B, you either go clockwise or counter-clockwise along this circular road. There is no other road.

For simplicities, the companies are labeled by number 0 to $M - 1$ according to their position along the road, i.e., company 0 is to the left of company 1 which is also located to the left of company 2. Finally, company $M - 1$ is located to the left of company 0, forming a circle.

This circular road is not the strangest thing in this city. This city has natural phenomenon. Each day, two portals connecting two points in the road appear. These portals allow a person from point A to travel to point B in an instant, i.e., there is no distance between point A and B. Strange enough, these portals coincidentally appear at the doorstep of two different companies. At the end of the day (definitely after you visit all companies), these portal disappears. They will reappear again tomorrow, maybe at different companies.

You are trying to take advantage of this portal. You wish to know the minimum travel time you need to visit all companies on each of these N days, providing that when you take the portal, no time is counted. The scientist in the city gives you the location that the portal appears for these N days that you will stay in the city.

Task

Your task is to compute the shortest distance for every day.

Input

The first line of each test case contains N ($1 \leq N \leq 10,000$) and M ($2 \leq M \leq 1,000$), giving the number of days and the number of companies in the city you have to visit every day. This is followed by a line containing M integer giving the sequence of companies to visit. It is assume that, in the morning, you always start at the first company in the sequence and after you visit the last company in the sequence, you have to go back to the first company in the sequence.

The next line contains n positive integer $t_0 t_1 t_2 t_3 \dots t_{M-1}$ where t_i gives the time to travel from company i to company $i + 1$ and t_{M-1} gives the time to travel from company $M - 1$ to company 0. This is followed by N lines, each gives two integers A and B ($0 \leq A < B < N$) indicating the indices of the companies that the portals appear on that particular day.

Output

The output must contains N lines, each prints the minimum time on the road in order to visit all companies on each day, starting from the first day.

Example

Ex1

Input	Output
1 4 0 1 2 3 5 3 3 3 0 1	9

Ex2

Input	Output
2 4 0 2 1 3 5 6 7 3 0 1 2 3	18 18