PROBLEM 4

Shoptimality

Input file: `shopin.txt`
Output file: `shopout.txt`

Time and memory limits: 1 second, 1 GB

Congratulations, you've just been hired by Shoptimality! Your first task is to write a program that helps households find the best supermarket for them.

There are N houses, all situated along the same road. The ith house is positioned H_i metres from the left end of the road. There are also M supermarkets along the road, the ith of which is positioned S_i metres from the left end of the road.

For each house, you must determine the best supermarket. There are two things to consider:

- The prices. The jth supermarket has a *price factor* of P_j. A lower price factor is better.
- The distance. The *distance* from the ith house to the jth supermarket is $|H_i - S_j|$.[1] A smaller distance is better.

The *badness* of a supermarket is the sum of the price factor and distance: $P_j + |H_i - S_j|$. The best supermarket is the one with the lowest badness.

For each house, what is the badness of the best supermarket?

Input

- The first line of input contains the integers N and M.
- The second line of input contains N integers describing the positions of the houses. They are $H_1, H_2, \ldots, H_N$.
- The third line of input contains M integers describing the positions of the supermarkets. They are $S_1, S_2, \ldots, S_M$.
- The fourth line of input contains M integers describing the price factors of the supermarkets. They are $P_1, P_2, \ldots, P_M$.

Output

Your program must output a single line containing N integers, the ith of which is the badness of the best supermarket for the ith house.

[1]The notation $|x|$ denotes the absolute value of x. The absolute value of a number is equivalent to its distance from 0. For example, $|2| = |-2| = 2$. The absolute difference between two numbers is equivalent to the distance between them. For example, $|5 - 10| = |-5| = 5$.

Sample input 1

```
4 3
1 7 8 9
4 6 10
0 0 0
```

Sample output 1

```
3 1 2 1
```

Sample input 2

```
5 2
10 20 75 80 90
30 85
10 50
```

Sample output 2

```
30 20 55 55 55
```

Sample input 3

```
3 2
1 3 4
2 9
10 1
```

Sample output 3

```
9 7 6
```

Explanation

In the first sample case:

- The best supermarket for house 1 is the first one, which has a badness of $0 + |1 - 4| = 3$.
- The best supermarket for house 2 is the second one, which has a badness of $0 + |7 - 6| = 1$.
- The best supermarket for house 3 is the second one, which has a badness of $0 + |8 - 6| = 2$.
- The best supermarket for house 4 is the third one, which has a badness of $0 + |9 - 10| = 1$.

In the second sample case:

- The best supermarket for house 1 is the first one, which has a badness of $10 + |10 - 30| = 30$.
- The best supermarket for house 2 is the first one, which has a badness of $10 + |20 - 30| = 20$.
- The best supermarket for house 3 is the first one, which has a badness of $10 + |75 - 30| = 55$.
- The best supermarket for house 4 is the second one, which has a badness of $50 + |80 - 85| = 55$.
- The best supermarket for house 5 is the second one, which has a badness of $50 + |90 - 85| = 55$.

In the third sample case:

- The best supermarket for house 1 is the second one, which has a badness of $1 + |1 - 9| = 9$.
- The best supermarket for house 2 is the second one, which has a badness of $1 + |3 - 9| = 7$.
- The best supermarket for house 3 is the second one, which has a badness of $1 + |4 - 9| = 6$.

Subtasks and constraints

For all subtasks:

- $1 \leq N \leq 100\,000$.
- $1 \leq M \leq 100\,000$.
- $1 \leq H_i, S_i \leq 1\,000\,000\,000$ for all i.
- $0 \leq P_i \leq 1\,000\,000\,000$ for all i.
- $H_1 < H_2 < \cdots < H_N$. That is, the houses are ordered from left to right.
- $S_1 < S_2 < \cdots < S_M$. That is, the supermarkets are ordered from left to right.
- No position on the road is occupied by both a house and a supermarket.

Additionally:

- For Subtask 1 (15 marks), $N \leq 1000$ and $M \leq 1000$.
- For Subtask 2 (25 marks), $P_i = 0$ for all i.
- For Subtask 3 (30 marks), $H_N < S_1$. That is, all houses are positioned to the left of all supermarkets.
- For Subtask 4 (30 marks), no special constraints apply.