IOI Training Camp 2014 – Final 3

1 Hyperspace paths

The Crazy Way is a galaxy in k-dimensional hyperspace, infinite in all k dimensions. A city is located at each k-dimensional point in the Crazy Way with integer coordinates. Crazyman is currently in city A and he wishes to travel to city B.

The Crazy Way has quantities $\{d_1, d_2, \ldots, d_k\}$ associated with the k coordinates $\{1, 2, \ldots, k\}$. There is a link between two cities if, for each coordinate i, the absolute difference between coordinate i of the two cities is d_i.

Each city that Crazyman visits (including A and B) changes his sanity by a certain value. This value is defined for each city as the sum of the coordinate values for that city.

Initially Crazyman's sanity is zero. He would like to reach B by using a path with the shortest possible length and, among those with the shortest length, the path at the end of which his sanity is maximum. Your task is to help him compute the length of the shortest path that he is looking for.

Input format

- The first line contains a single integer k, the number of dimensions.
- The second line contains k space separated integers, the coordinates of A, the city where Crazyman is located initially.
- The third line contains k space separated integers, the coordinates of B, the city that Crazyman wants to visit.
- The fourth line contains k space separated integers, the quantities $\{d_1, d_2, \ldots, d_k\}$.

Output format

- On the first line output 0 if there is no path from A to B and 1 if there is a path.
- If there is a path, output two more lines: The length of the shortest path on the second line and maximum sanity value at the end of path on the third line.

Test Data

In all testcases, the coordinate values lie in the range $[-1 \times 10^4, 1 \times 10^4]$, $0 \leq d_i \leq 10^4$, and $k \leq 10^3$.

- **Subtask 1 (20 marks)** Only the first line of output is checked.
- **Subtask 2 (30 marks)** The first and second lines of output are checked.
- **Subtask 3 (50 marks)** All lines of output are checked.

Sample Input 1

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

Sample output 1

```
1
2
1
```

Sample Input 2

```
1
0
2
3
```

Sample output 2

```
0
```

Limits

- *Time limit:* 1 s
- *Memory limit:* 256 MB