COI '17 #3 Svjetlost

Time limit: 3.0s **Memory limit:** 1G

In a plane, if we have a convex polygon P, and we place a source of light at a point T located outside the polygon, it lights up some edges of P — if A and B are two consecutive polygon vertices, then the edge $\overline{AB}$ is *lit up* if the area of the triangle $\triangle TAB$ is not zero, and if it doesn't intersect the inside of the polygon. The *brightness* of the polygon is the sum of the lengths of lit up edges, and the *maximal brightness* of a polygon is the maximal possible brightness we can achieve if we select an optimal point T. The distance between point T and the polygon can be arbitrary, and the coordinates of point T don't necessarily need to be integers.

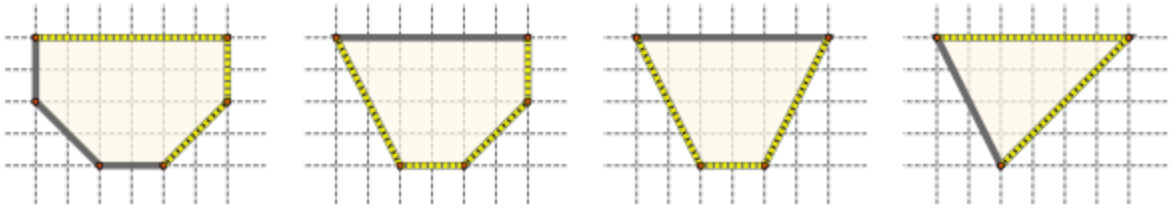

Figure 4: Polygons P, P_1, P_2 and P_3 from the second test case, the optimal brightness is marked.

You are given a convex polygon P whose vertices are, respectively, points $A_1, A_2, \ldots, A_n$. The polygon is changed in q steps — in the j^{th} step, we delete an existing polygon vertex, and obtain a new polygon P_j. More precisely, the vertices of polygon P_j are the vertices of P that haven't been deleted yet, and their order is the same as in polygon P. It is easy to see that each polygon P_j is convex too.

Determine the maximal brightness of the polygon P and each of the obtained polygons $P_1, P_2, \ldots, P_q$.

Input Specification

The first line of input contains the positive integer n — the number of vertices of the initial polygon P.

The j^{th} of the following n lines contains two integers x_j and y_j $(-10^9 \leq x_j, y_j \leq 10^9)$ — the coordinates of vertex A_j. The following line contains the integer q $(0 \leq q \leq n-3)$ — the number of steps. The j^{th} of the following q lines contains the integer k_j $(1 \leq k_j \leq n)$ that denotes that in the j^{th} step we delete the vertex A_{k_j}. You can assume that the vertices A_j in polygon P are given counter-clockwise, that two consecutive parallel lines do not exist, and that all indices k_j are mutually distinct.

Output Specification

You must output $q+1$ lines. The first line must contain the maximal brightness of the initial polygon P, and the j^{th} of the following q lines must contain the maximal brightness of polygon P_j obtained after j steps. For each line of output, an absolute and relative deviation from the official solution by 10^{-5} will be tolerated.

Constraints

Subtask	Points	Constraints
1	12	$n \leq 100$
2	14	$n \leq 2\,000$
3	14	$n \leq 100\,000$, $q = 0$
4	29	$n \leq 100\,000$, for each $j = 1, \ldots, q-1$ it holds $k_j < k_{j+1}$
5	31	$n \leq 100\,000$

Sample Input 1

```
4
0 0
10 0
10 10
0 10
1
2
```

Sample Output 1

```
20.000000
24.142136
```

Sample Input 2

```
6
2 2
4 0
6 0
8 2
8 4
2 4
3
1
4
3
```

Sample Output 2

```
10.828427
11.300563
10.944272
11.656854
```