# Problem C: Colorful Polygon

## Advanced Algorithms for Programming Contests

## Restrictions

Time: 2 seconds
Memory: 512 MB

## Problem description

You recently bought a 3D printer of the fused filament fabrication type and, naturally, started printing lots of useless stuff. One of the things you printed was a very large simple polygon consisting of only one layer of filament. At first you really liked it and even hung it up on your room's wall, but by now you have gotten kind of bored with it, especially because it is entirely white (your colored filaments hadn't been delivered yet) and you like things to be colorful. Also, you are not really satisfied with its ragged shape anymore and have decided that you prefer convex polygons.

Thus you decided to modify it by attaching a bunch of smaller polygons to it in such a way that no two of them have the same color, no two share a side with one another and the new polygon's shape exactly matches the convex hull of the current polygon (note that for technical reasons the polygons you attach cannot have width 0 anywhere (except at their corners of course), so you can't just print one large polygon that slings around the entire old one and completes it to its convex hull). However, you're not sure whether you still have enough of the colored filaments to do this. So let's find out!

## Input

The input consists of

- one line containing $n$ ($3 \leq n \leq 10^5$) – the number of vertices in the polygon

- $n$ lines giving the vertices in either clockwise or counter-clockwise order, with the $i$-th line containing integers $x_i$ and $y_i$ ($-10^4 \leq x_i, y_i \leq 10^4$) – signaling that the $i$-th vertex has coordinates $(x_i, y_i)$

- one line containing $m$ ($0 \leq m \leq 30$) – the number of colors of which you still have some filament

- one line containing $m$ numbers $a_1, ..., a_m$ $(1 \leq a_i \leq 10^9)$ – with $a_i$ being the remaining amount of the $i$-th color in "area units that can still be printed with it".

## Output

Output YES if you can print additional polygons as planned and NO otherwise.

## Sample input and output

| Input | Output |
|---|---|
| 5<br>0 0<br>4 0<br>4 2<br>2 1<br>0 2<br>3<br>1 1 1 | NO |
| 5<br>0 0<br>4 0<br>4 2<br>2 1<br>0 2<br>1<br>3 | YES |
| 7<br>0 0<br>0 2<br>1 1<br>2 2<br>3 1<br>4 2<br>4 0<br>3<br>1 1 1 | YES |