H – Radar

Time limit: 2 s *Memory limit: 256 MiB*

We are using a special radar to scan an area. The radar accepts a list of distances, e.g. $2, 4, 1$, and a list of angles, e.g. $100°, 270°, 180°, 10°, 300°$, and scans the points across all the given distances and angles. How close to some other points of interest will we be able to scan?

Input data

The first line of the input gives three space-separated integers: R, F, N, representing the number of radii, the number of angles, and the number of points of interest, respectively. Then R lines follow, i-th of which contains an integer r_i, representing the distance from the radar that will be scanned. Then, F lines follow, each containing two space-separated integers $(f_x)_i$, $(f_y)_i$, that represent Cartesian coordinates of a point, defining the i-th angle. Then, N lines follow, each containing two space-separated integers x_i, y_i, that represent the Cartesian coordinates of the i-th point.

The angle, defined by the point $(f_x)_i$, $(f_y)_i$ is the angle from the x-axis to the ray from the origin through $(f_x)_i$, $(f_y)_i$.

Input limits

- $1 \leq R, F, N \leq 10^5$
- $|x_i|, |y_i|, |(f_x)_i|, |(f_y)_i|, r_i < 10^6$
- $(f_x)_i^2 + (f_y)_i^2, r_i > 0$
- All r_i are pairwise distinct.
- Rays, defined by $(f_x)_i, (f_y)_i$, are pairwise distinct.

Output data

Output N lines, i-th of which should contain the distance from the point (x_i, y_i) to the closest scanned point. The result will be considered correct if it is within the 10^{-6} of absolute or relative precision.

Example

Input

```
3 7 5
2
4
7
8 4
2 8
-1 5
-7 2
-4 -4
1 -8
6 -3
3 -1
8 1
2 6
-5 2
-1 -1
```

Output

```
0.977772290466
2.750120773895
0.846777708005
1.464071052924
0.585786437627
```

Comment

Illustration of sample case: