Problem F: Impacts

Advanced Algorithms for Programming Contests

Restrictions

Time: 2 seconds
Memory: 512 MB

Problem description

Impacts of objects on the moon are of high scientific interest. There are several sensor stations on the moon surface that measure the vibrations caused by such impacts. You get better data, the closer the impact is to a sensor station. We already know, when and where impacts occurred and want to find out for given time windows, what the minimal distance of an impact in that window to any of the sensor stations is.

Input

The input consists of

- one line containing k, n, q ($1 \leq k \leq 20$, $0 \leq n \leq 10^5$, $1 \leq q \leq 10^5$) – the numbers of sensor stations, impacts and time window queries

- k lines each containing two integers $x_i^{\text{sta}}, y_i^{\text{sta}}$ ($|x_i^{\text{sta}}|, |y_i^{\text{sta}}| \leq 1000$) – the coordinates of the i-th sensor station

- n lines each containing three integers $x_i^{\text{imp}}, y_i^{\text{imp}}, t_i^{\text{imp}}$ ($0 \leq t_i^{\text{imp}} \leq 10^8$, $|x_i^{\text{imp}}|, |y_i^{\text{imp}}| \leq 1000$), the coordinates and time of the i-th impact. The impacts are given in correct time order. The next q lines each contain two integers b_i and e_i ($0 \leq b_i \leq e_i \leq 10^8$) – beginning and end of the i-th time window.

Output

For every query "b_i, e_i" output the closest distance of any impact not earlier than b_i and not later than e_i (in $[b_i, e_i]$) with a precision of at least 10^{-6}. If there was no impact in that time window, output "INF".

Sample input and output

Input	Output
2 3 4	INF
0 0	2.0000000
5 2	4.0000000
5 4 2	1.41421356
0 4 4	
-1 -1 5	
0 1	
2 3	
3 4	
1 6	