

Problem K. King Of Zombies

Input file: *standard input*
Output file: *standard output*
Time limit: 2 seconds
Memory limit: 1024 mebibytes

Tatsumi, the King of Zombies, planned to form a zombie rock band named Gray Faces in the ICPC-city, and still plans to do so.

But unfortunately, once again, there is only one zombie in ICPC-city. So Tatsumi decided to release the zombie into the city after enhancing the zombie's infectious power, to produce a sufficient number of zombies. The infectious zombie changes a human into a new infectious zombie when the distance between the human and the zombie is less than or equal to D . Note that a zombie that was a human also changes a human into a zombie.

The ICPC-city is represented by an infinitely large two-dimensional plane, and Tatsumi will release the zombie at a point with a coordinate (x_0, y_0) . After the release, the zombie will start walking at a speed of $(v_{x,0}, v_{y,0})$ per second. There are also N humans on the two-dimensional plane. When Tatsumi releases the zombie, the i -th human will be at a point with a coordinate (x_i, y_i) and will start walking at a speed of $(v_{x,i}, v_{y,i})$ per second. Humans will not change their walking direction or speed when they become zombies.

For each human, Tatsumi wants to know when the human becomes a zombie. Please help him by writing a program that calculates a time when each human becomes a zombie.

Input

The first line of the input contains two integers N and D ($1 \leq N \leq 10^3$, $0 \leq D \leq 10^4$) separated by a space, which represent the number of humans and the distance to be infected. The following line contains four integers x_0 y_0 $v_{x,0}$ and $v_{y,0}$ ($-10^4 \leq x_0, y_0, v_{x,0}, v_{y,0} \leq 10^4$) separated by a space, which represent the initial position and direction of the zombie. Each of the next N lines contains four integers x_i , y_i , $v_{x,i}$ and $v_{y,i}$ ($-10^4 \leq x_i, y_i, v_{x,i}, v_{y,i} \leq 10^4$) separated by a space, which represent the initial position and direction of the i -th human.

Output

The output consists of N lines. In the i -th line, print the time when the i -th human becomes a zombie. If the i -th human will never become a zombie, print -1 instead. The answer will be considered as correct if the values output have an absolute or relative error less than 10^{-7} .

Examples

standard input	standard output
5 3 0 0 3 0 10 10 0 -3 1 1 -1 -1 16 1 -1 0 100 100 100 100 -100 -3 10 0	2.62622655215 0 3 -1 14.2857142857
4 10 0 0 0 0 10 0 0 0 20 0 0 0 30 0 0 0 41 0 0 0	0 0 0 -1