Problem J. Bubble Belt Frenzy

Input file:	`standard input`
Output file:	`standard output`
Time limit:	5 seconds
Memory limit:	1024 mebibytes

In the vast world of Bubble Kingdom, the most advanced transportation method is the Bubble Belt system: a collection of N magical conveyor belts that can whisk objects across the air in no time. The Kingdom's engineers have long perfected the art of using these belts to transport goods and people across various platforms floating high above the ground.

However, a new challenge arises: the ancient Bubble Cup competition! A total of Q competitors are tasked with finding the fastest way to drop magical orbs from platforms suspended above the ground to the ground itself. Each competitor must carefully plan how to optimize the use of existing Bubble Belts and augment the system with old, slower belts to minimize the time it takes for the orb to fall.

Here's how the Bubble Belt system works:

- Bubble Belts are straight horizontal segments, positioned at various heights above the ground, parallel to the x-axis. Each belt stretches between two points on the x-axis (while not including the two points themselves), and if an orb lands on a belt, it will be transported either to its leftmost or rightmost point.
- None of the existing Bubble Belts overlap, but they can share the same endpoints. If two Bubble Belts share the same endpoint, the orb will fall between the two Bubble Belts at that shared endpoint.
- Some belts are faster, while others are slower. Each belt has a pace (inverse to speed), denoted in seconds per meter.
- The ground layer is at $y = 0$, while Bubble Belts float at positive y coordinates.
- Once an orb leaves the belt, it enters free fall and descends at a pace of 1 second per meter. Any horizontal momentum that the orb may have had while traveling on a belt vanishes instantly, and the orb falls directly downward.
- You, as the competitor, have access to an infinite number of older Bubble Belts of any imaginable size, which move at a fixed pace of 1 meter per K seconds. These belts can be placed at any real x and y coordinates, can have any length, can move in either direction, and you can strategically use them to speed up the orb's descent.
- It is guaranteed that any already existing Bubble Belts will be faster than the older Bubble Belts you can place.
- The new Bubble Belts you place cannot overlap with any already existing or other newly placed Bubble Belts but can share endpoints and can be arbitrarily close vertically since the Bubble Belts have no thickness.

The goal? Each competitor is given a starting position of an orb (X, Y), and they have the task to figure out the fastest time for the orb to drop from a given point in the air to the ground, using both the existing and the new belts wisely. Each competitor can place the new belts independently of their rivals. In other words, newly placed belts vanish before the next competitor begins their turn.

Input

The first line contains three integers N, Q, and K: the number of initially placed Bubble Belts, the number of competitors, and the pace of the older Bubble Belts measured in seconds per meter, respectively ($1 \le N, Q \le 2 \cdot 10^5$, $5 \le K \le 10^6$).

Each of the next N lines contains four integers Y, X_1, X_2, and T: the height of the belt above the ground, the left and right endpoints of the belt on the x-axis, and the time it takes for the belt to move the orb one meter, respectively ($1 \le Y \le 10^6$, $1 \le X_1 < X_2 \le 2 \cdot 10^5$, $-K < T < K$, $T \ne 0$). A negative T means the belt moves to the left, and a positive T means it moves to the right. None of the N existing Bubble Belts will overlap, but they can have the same endpoints.

Each of the next Q lines contains two values X and Y: the starting x-coordinate of the orb which is an integer and the starting y-coordinate of the orb which is an integer plus 0.5 (in other words, the orb starts between two levels of belts). The constraints are: $1 \le X \le 2 \cdot 10^5$, $0.5 \le Y \le 1\,000\,000.5$.

Output

For each competitor, output a single real number: the minimum time it takes for the orb to fall from the starting point (X, Y) to the ground at $y = 0$. Your answer will be considered correct if its absolute or relative error does not exceed 10^{-12}.

Example

standard input	*standard output*
5 3 100 1 1 100 99 10 1 50 -1 3 1000 1005 -1 3 1005 1008 -1 2 1000 1100 99 40 1.5 55 10.5 1007 3.5	3901.5 559.5 208.5

Note

In the example, the three competitors can use the following constructions (note that they are not the only optimal ones):

- The first competitor can place an additional Bubble Belt from point $(1, 1.1)$ to $(41, 1.1)$ going to the left (with pace $-K$). This will make the orb fall to this new belt, travel along it from $X = 40$ to $X = 1$ and then drop straight down to the floor, taking a total time of $0.4 + (40 - 1) \cdot K + 1.1 = 3901.5$ seconds.
- The second competitor can place a new Bubble Belt from point $(49.999\ldots, 10.1)$ to $(56, 10.1)$ going to the left (with pace $-K$). This will make the orb fall to this new belt, travel along it from $X = 55$ to $X = 49.999\ldots$ and fall down to the belt at $Y = 10$. This belt will take the orb from $X = 49.999\ldots$ to $X = 1$ with pace -1, after which it will fall down to the ground. The total time is $0.4 + (55 - 49.999\ldots) \cdot K + 0.1 + (49.999\ldots - 1) \cdot 1 + 10 = 559.5$ seconds.
- The third competitor wants to avoid the orb falling to the Bubble Belt at $Y = 2$, as it is a very long and slow belt, so he should use the Bubble Belts at $Y = 3$ and newly placed Bubble Belts to get the orb to $X = 1000$. The problem is that he cannot use both Bubble Belts at $Y = 3$ since Bubble Belts cannot overlap, and the orb will fall through the gap at $X = 1005$. The best strategy he has is to place a new Bubble Belt at $Y = 3.1$ from $X = 1004.999\ldots$ to $X = 1008$ going to the left, let the orb fall to the Bubble Belt at $Y = 3$ from $X = 1005$ to $X = 1000$, travel along it, and then fall to the ground at $X = 1000$. This would take a total of $0.4 + (1007 - 1004.999\ldots) \cdot K + 0.1 + (1004.999\ldots - 1000) \cdot 1 + 3 = 208.5$ seconds.