An Experiment in Optics Lab

Input file:	*standard input*
Output file:	*standard output*
Time limit:	4 seconds
Memory limit:	1024 mebibytes

Maria is a scientist in a laboratory. At the moment, she conducts experiments with lasers and the refraction of different materials. She assembled n materials in a single line. Each material has length ℓ_i and refractive index r_i. Now Maria wants to perform the following operations q times:

- She substitutes the i-th material with another one.
- She shines the laser from some point of the line. The initial angle between the ground and the laser beam is given.

For the purpose of our problem, we can model all materials as vertical strips. The laser starts at $y = 0$ and some given x.

Maria is interested in the y-coordinate of the point at which the laser beam will escape from the last material.

Recall that if a laser beam passes the boundary between two materials with refractive indices r_1 and r_2, then the relation between the angles θ_1 and θ_2 between the laser beam and the horizontal line is $r_1 \sin\theta_1 = r_2 \sin\theta_2$.

Input

The first line contains one integer n ($1 \le n \le 10^5$). The next n lines contain the description of initial materials. Each material is described by two integers — its length ℓ_i and its refractive index r_i ($1 \le \ell_i \le 1000$, $10^4 \le r_i \le 1.6 \cdot 10^4$).

The next line contains one integer q ($1 \le q \le 10^5$). The following q lines contain the description of the experiment. Each line starts with an integer t ($1 \le t \le 2$).

If $t = 1$, then it is followed by three more integers, id, ℓ, r ($1 \le id \le n$, $1 \le \ell \le 1000$, $10^4 \le r \le 1.6 \cdot 10^4$). This means that Maria wants to replace the id-th material with another material with length ℓ and refractive index r.

If $t = 2$, then it is followed by two integers, x and ang. This means that Maria wants to shine the laser from point $(x, 0)$ with angle ang and wants to know the y-coordinate of the laser beam when it escapes the last material in the line. It is guaranteed that x is non-negative and is strictly less than the sum of all lengths of materials. If the starting point lies on the border of two materials, we assume that the laser starts in the material with a bigger index. The angle ang is given in seconds, that is, to convert it to degrees one should divide it by 3 600. It is guaranteed that $0 \le ang \le 1.08 \cdot 10^5$.

Output

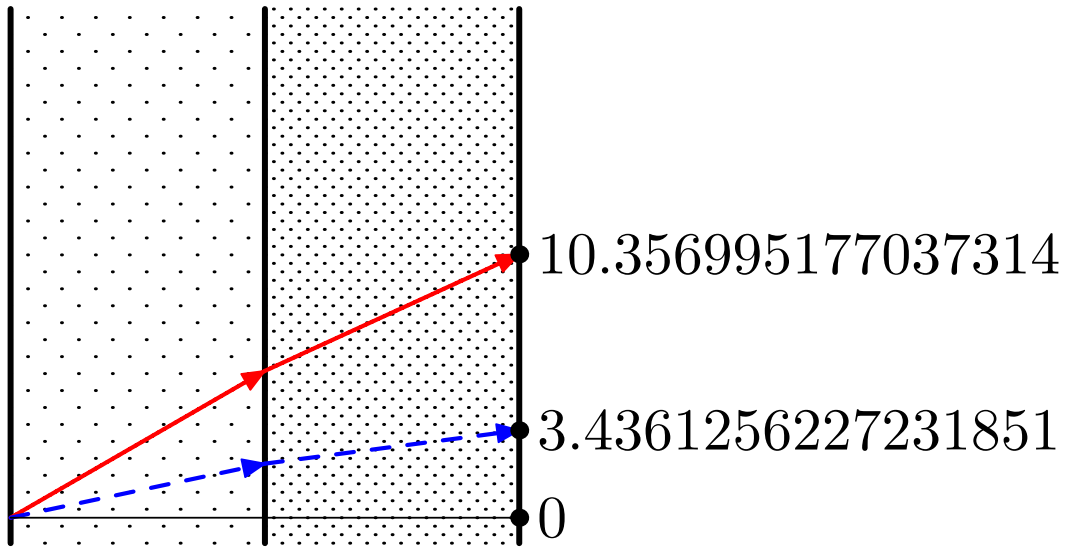
For each event with $t = 2$, print one real number — the answer to the problem. The answer will be considered correct if and only if the absolute or relative error does not exceed 10^{-6}.

It can be proved that under the constraints of the problem the beam will never reflect from the boundary between two materials (i.e. $|\sin\theta|$ will never exceed 1).

Examples

standard input	*standard output*
2 1 10000 2 10000 3 2 0 108000 1 2 5 10000 2 0 108000	1.73205080756887729390 3.46410161513775458845
2 10 10000 10 12000 3 2 0 108000 1 2 10 16000 2 0 43200	10.35699517703731412002 3.43612562272318509829

Note



The picture above illustrates the second example. The red (thick solid) line shows the trajectory of the laser beam from the first event, the blue (thick dashed) line shows the trajectory of the laser beam from the third event.