

Problem H. Biathlon 2.0

Input file: *standard input*
Output file: *standard output*
Time limit: 2 seconds
Memory limit: 256 mebibytes

The Biathlon 2.0 World Championship is held in Petrozavodsk in 2016.

Biathlon 2.0 has different rules than the classic one. The racing track consists of n segments. The i -th segment consists of a_i kilometers to travel and b_i targets to hit. To pass a segment, an athlete must travel all a_i kilometers and hit all b_i targets. Athletes pass segments in the order from 1 to n . Each athlete must carry a rifle with him. It is allowed to change rifles between segments.

The national team of Berland has m different rifle types at its disposal. Each rifle type is described by two numbers: c_i and d_i , where c_i is the number of seconds needed to travel one kilometer with a rifle of this type and d_i is the number of seconds needed to hit one target with a rifle of this type. The team has an unlimited supply of rifles of any type.

Your task is to ensure Berland victory and find a rifle for each track segment to minimize the number of seconds needed to pass the segment.

Input

The first line contains one integer n ($1 \leq n \leq 5 \cdot 10^5$), the number of segments in the track. Each of the next n lines contains two integers a_i and b_i ($0 \leq a_i, b_i \leq 10^9$, $a_i + b_i > 0$), the number of kilometers and targets on the i -th track segment.

The next line contains one integer m ($1 \leq m \leq 5 \cdot 10^5$), the number of rifle types used by the national team of Berland.

The next m lines contain two integers c_i and d_i ($1 \leq c_i, d_i \leq 10^9$), the number of seconds needed to travel one kilometer with the i -th rifle type and the number of seconds needed to hit one target with the i -th rifle type.

Output

Print n space-separated integers. The i -th integer must be the number of seconds needed to pass the i -th segment if an optimal rifle is used.

Examples

standard input	standard output
3 1 4 4 1 3 3 3 1 3 3 1 2 2	7 7 12
1 1000000000 1000000000 1 1000000000 1000000000	2000000000000000000