Problem H. MountainCraft

Input file:	`standard input`
Output file:	`standard output`
Time limit:	5 seconds
Memory limit:	2048 megabytes

It's a glorious day in the video game meta-world of MountainCraft! True to its name, MountainCraft boasts an expansive open world full of mountains to explore. Your avatar in the game wakes up on a remote island, and stares at the mountains on the horizon.

The view of the horizon can be modeled as a Cartesian plane, with the x-axis ($y = 0$) separating land from sea. Each mountain peak is represented by a point (x, y), and the mountain's sides have slope $+1$ and -1, forming a triangle with that peak at the top.

Your avatar can only see the parts of the mountains which are in a viewport. The visible edges of the mountains, where they do not overlap other mountains, are rendered in bold. If mountains overlap, the overlapping parts are not rendered in bold. Edges do not have to intersect for mountains to overlap.

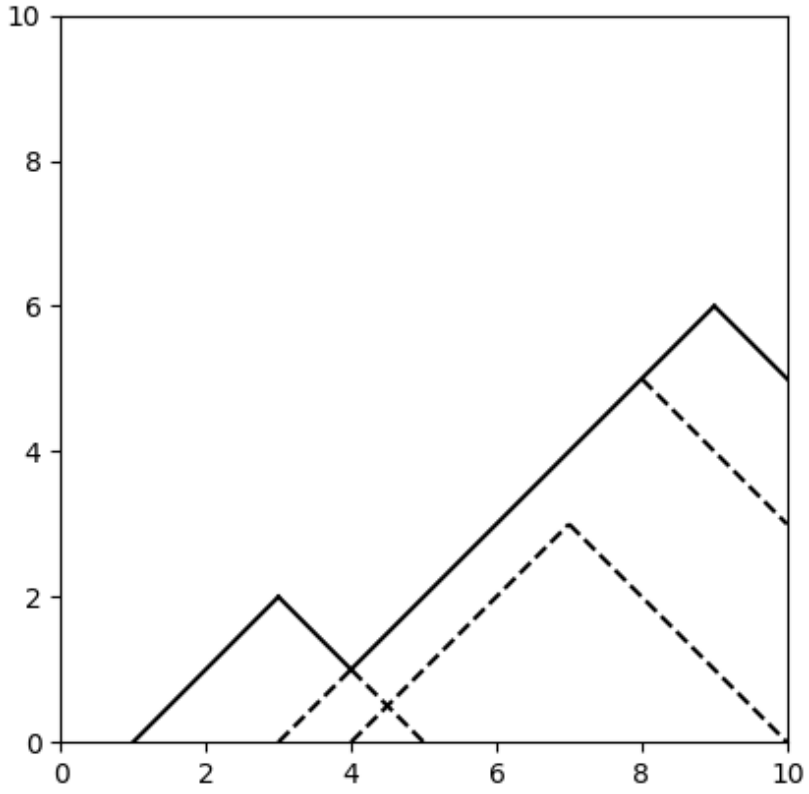


Рис. 3: The first sample input after all mountains appear.

Unfortunately, due to graphical glitches, mountains can appear and disappear. After each change, you want to know the total length of all the bold lines currently visible in the viewport.

Input

The first line of input contains two integers q ($1 \le q \le 2 \cdot 10^5$) and w ($1 \le w \le 10^9$), where q is the number of queries and w is the width of the viewport. The width of the viewport stretches from 0 to w. The viewport is unbounded on the top.

Each of the next q lines contains two integers x ($0 \le x \le w$) and y ($0 < y \le 10^9$), the peak of some mountain. If (x, y) is the peak of a mountain that is visible, that mountain will disappear. Otherwise, that mountain will become visible.

Output

Output q lines. For each query in order, output a single line with a single number, which is the total length of the bold lines rendered. Your answer will be accepted if the absolute or relative error is within 10^{-6} of the judge's answer.

Examples

standard input	standard output
3 10 3 2 7 3 9 6	5.656854 12.727922 12.727922
5 100 31 41 59 26 31 41 59 26 31 41	101.823376 120.208153 73.539105 0.000000 101.823376

Note

In the first sample, the first two mountains intersect at the point $(4.5, 0.5)$ The parts of the mountains below that point are not rendered in bold.

In the second sample, the left mountain appears, then disappears, then appears again. The right mountain appears and then disappears.