Problem A
Area Query

You are given a convex polygon with n vertices on the Cartesian plane. Its vertices are numbered from 1 to n in clockwise order. The i-th vertex has coordinates (x_i, y_i).

At the beginning, no diagonals of this polygon exist.

Your task is to process q queries of three following types:

- `A i j`: draw a new diagonal connecting the i-th vertex to the j-th vertex. It is guaranteed that the i-th vertex is not adjacent to the j-th vertex, the diagonal connecting these two vertices does not exist right before this query, and this diagonal does not intersect with any existing diagonals except at endpoints.
- `R i j`: erase the diagonal connecting the i-th vertex to the j-th vertex. It is guaranteed that this diagonal exists right before this query.
- `? i j`: The exisiting diagonals divide the given polygons into smaller pieces. You need to solve the following subproblem: choose to remove some (possibly none) of these pieces so that:
  - The piece containing both the i-th vertex and the $(i \mod n+1)$-th vertex is not removed.
  - The piece containing both the j-th vertex and the $(j \mod n+1)$-th vertex is not removed.
  - The two above pieces remain connected.
  - The total area of removed pieces is as large as possible.

Two pieces A and B are considered connected iff they are not removed, and any of the following conditions holds:

- A and B have a common edge.
- There exists a piece C such that C is not removed and C is considered connected to both A and B.

Please note that, during queries of the third type, no pieces of the polygon are actually removed. You just solve the subproblem and print the largest possible total area of removed pieces. The vertices and edges of the given polygon stay the same at all time.

Input

The input consists of multiple test cases. Each test case is presented as below:

- The first line contains a single integer n $(3 \le n \le 2 \times 10^5)$ – the number of vertices of the given polygon.
- In the next n lines, the i-th one contains two integers x_i and y_i $(0 \le |x_i|, |y_i| \le 10^9)$ – the coordinate of the i-th vertex.
- The next line contains a single integer q $(1 \le q \le 2 \times 10^5)$ – the number of queries.
- In the next q lines, each contains a query in any of the above formats.

The input is terminated by a line containing a single 0 which does not represent a test case.

It is guaranteed that:

- The sum of n over all test cases does not exceed 2×10^5.
- The sum of q over all test cases does not exceed 2×10^5.

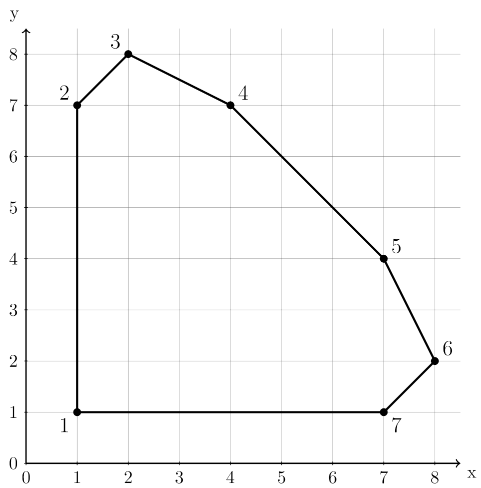
Output

For each query of the third type, print a single number – the largest possible total the area of removed pieces.

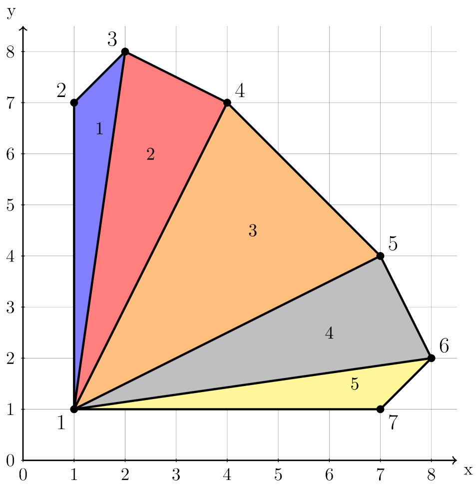
Your answer will be considered correct if its relative or absolute error doesn't exceed 10^{-6}.

Formally: let C be your answer, and J be the jury's answer. The checker program will consider your answer correct, if $\frac{|C-J|}{max(1,|J|)} \leq 10^{-6}$.

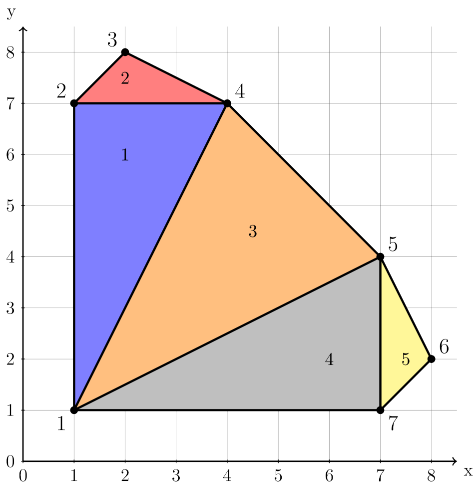
Sample Explanation



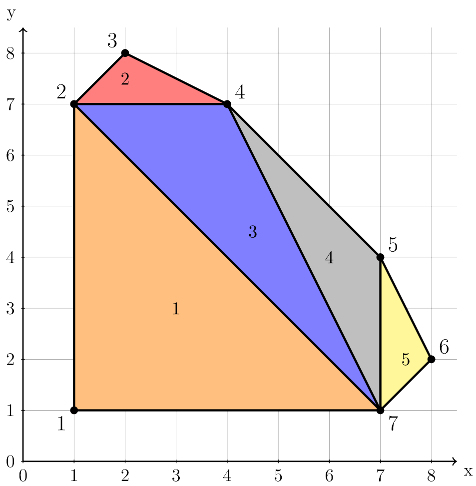
This is the given convex polygon. Initially, no diagonal exists.



This is the polygon with all exisiting diagonals right before the fifth query. The piece containing both the first and the second vertices is numbered 1. The piece containing both the third and the forth vertices is numbered 2. After removing all pieces numbered 3, 4 and 5, the two above pieces stay connected.



This is the polygon with all existing diagonals right before the tenth query. The piece containing both the second and the third vertices is numbered 2. The piece containing both the fifth and the sixth vertices is numbered 5. In order to keep the two above pieces connected, we can not remove any pieces.



This is the polygon with all existing diagonals right before the fifteenth query. The piece containing both the seventh and the first vertices is numbered 1. The piece containing both the forth and the fifth vertices is numbered 4. After removing pieces numbered 2 and 5, the two above pieces stay connected.

Sample Input 1	Sample Output 1
7 1 1 1 7 2 8 4 7 7 4 8 2 7 1 15 A 1 3 A 1 4 A 1 5 A 1 6 ? 1 3 R 1 3 A 2 4 R 1 6 A 5 7 ? 2 5 R 1 5 R 1 4 A 4 7 A 2 7 ? 7 4 0	24.0 0.0 3.0