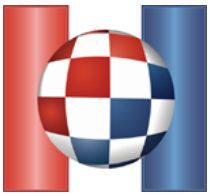


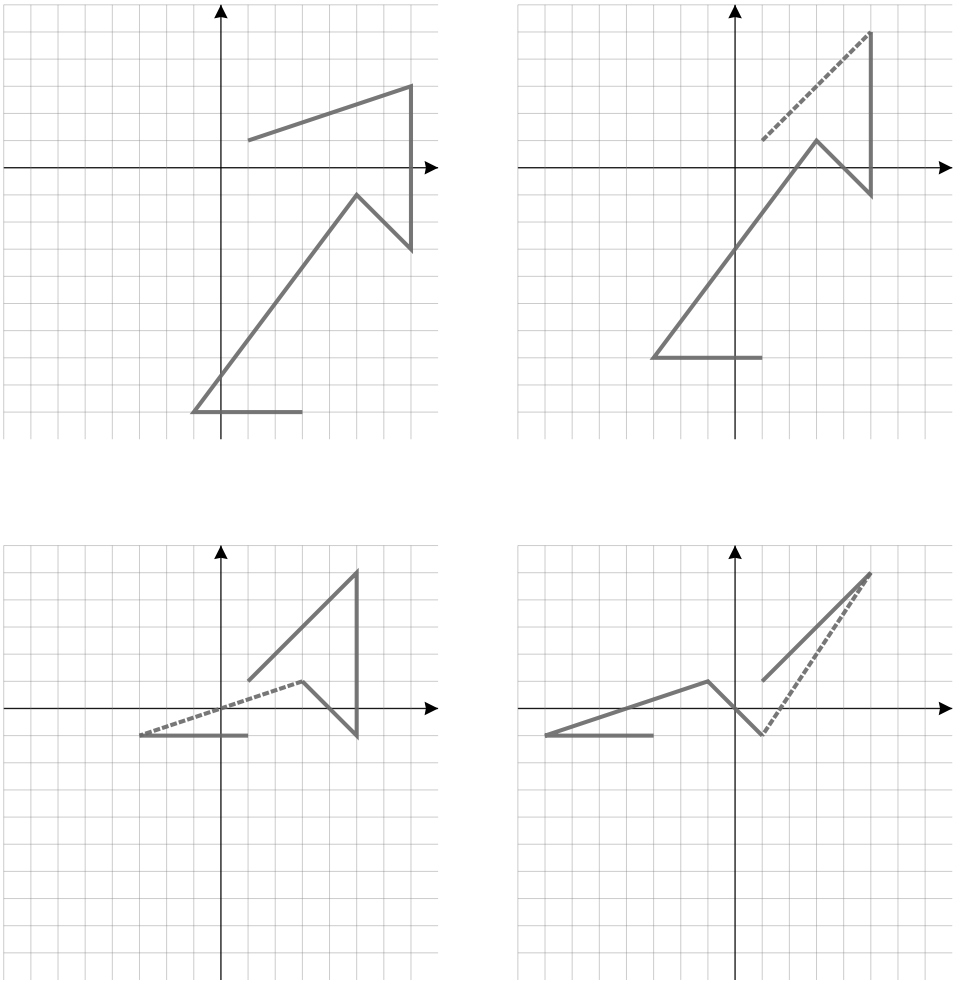
FINAL EXAM #1
April 14th, 2015
Task overview

TASK	RUKA	ŽARULJE
input	standard input (*stdio*)	
output	standard output (*stdout*)	
time limit	2 seconds	1 second
memory limit	512 MB	512 MB
points	**100**	**100**
	total 200	

Stjepan is programming a robot arm that can use a chalk to draw on a blackboard located in a standard coordinate plane (x coordinate increases to the right, y coordinate increases upwards).

The robot arm's plan is an array of precisely N vectors $(x_1, x_2), \ldots, (x_N, y_N)$ where each x_i and y_i are even integers. The plan is executed by the robot arm starting from point $(1, 1)$ and making N steps: in the i^{th} step, the arm moves the chalk from the current point (x, y) straight to the point $(x + x_i, y + y_i)$. Therefore, the robot arm is drawing a kind of a broken line in the coordinate plane, and the segments of that broken line are the given vectors.

While Stjepan is devising and changing his plan, sometimes he wants to know how many times the chalk will **go over the coordinate axes**. Write a programme that will simulate the process of changing the plan and that will give answers to Stjepan's queries.



The layout of the plan on each 'Q' command in the second test case. The dotted line marks the segment that was most recently changed.

Let us assume that Stjepan wrote down his plan in a text file that consists of N lines – the i^{th} line contains the vector (x_i, y_i). Initially, Stjepan's cursor is located at the first line of the file. Your programme should simulate the following commands:

- 'B' – the cursor moves to the previous line (if it's already located at the first line, nothing happens).
- 'F' – the cursor moves to the next line (if it's already located at the last line, nothing happens).
- 'C nx ny' – where nx and ny are even integers. The row of the file where the cursor is located at changes in a way that the current vector is replaced with the vector (nx, ny).
- 'Q' – you need to output how many times the dotted line which is described by the current plan went over the coordinate axes. If the dotted line goes through the starting point, then we count that as two times going over the coordinate axes.

Input

The first line of input contains the integer N – the number of vectors in the plan. The i^{th} of the following N lines contains two even integers x_i and y_i separated by a single space – the coordinates of the i^{th} vector in the initial plan.

The following line contains the integer M – the number of commands which execution you need to simulate. Each of the following M lines contains a single command. A command is either one of the uppercase letters 'B', 'F' or 'Q' or an expression in the form 'C nx ny' where nx and ny are even integers described in the task.

Output

For each 'Q' command from the input, you must output its result in a single line. The results need to be printed in the order which the commands appear in the input.

Scoring

subtask	points	constraints
1	9	$1 \leqslant N \leqslant 1\,000$, $1 \leqslant M \leqslant 1\,000$
2	35	$1 \leqslant N \leqslant 50\,000$, $1 \leqslant M \leqslant 100\,000$
3	56	$1 \leqslant N \leqslant 100\,000$, $1 \leqslant M \leqslant 300\,000$

The following holds for all the initial vectors and all the new vectors in 'C' commands in each subtask: $-500 \leqslant x_i,\ y_i,\ nx,\ ny \leqslant 500$.

Sample tests

input

```
6
2 2
2 -6
-2 -4
-6 4
10 -10
-8 12
16
Q
C -4 -4
F
F
Q
F
C 6 -2
B
B
B
Q
C 0 6
Q
F
C -8 4
Q
```

output

```
4
4
3
1
5
```

input

```
5
6 2
0 -6
-2 2
-6 -8
4 0
12
Q
C 4 4
Q
F
F
F
C -6 -2
Q
B
B
C -4 -6
Q
```

output

```
3
5
5
4
```

Each morning, when the first rays of sun appear, Ivan has to turn off all the light bulbs in the street lights in his village. His village consists of only one straight road of certain length, and the street lights are located only at one side of the road, denoted with numbers from 1 to N from left to right.

Ivan chooses an initial street light p each day, turns off its light bulb and keeps turning off the light bulbs using a greedy algorithm trying to save electricity. In each step, he looks at the next working light bulb on the left (if there is one) and the next working light bulb on the right (if there is one) and turns off the one with the bigger power. If there isn't a working light bulb to the left (or the right), he turns off the next light bulb to the right (or the left). If the light bulbs are of equal power, Ivan can choose and turn off any of them. That is why there can be multiple schedules of turning off the light bulbs for an initial position p.

Let us denote the number of different schedules of turning off the light bulbs with $M(p)$ if Ivan's initial position is p. Write a programme that will, for each of K given initial positions p_i determine the modulo of $M(p_i)$ when dividing by $10^9 + 7$.

Input

The first line of input contains the integers N and K – the number of street lights and the number of given initial positions.
The second line of input contains N integers $A_1, A_2, \ldots A_N$ separated by a single space – the powers of the light bulbs.
The third line of input contains K integers $P_1, \ldots, P_K$ separated by a single space – the initial positions that we're interested in.

Output

The first and only line of output must contain K integers separated by a single space – the i^{th} integer must be equal to the modulo of $M(p_i)$ when dividing by $10^9 + 7$.

Scoring

In each of the subtasks, it holds $1 \leqslant p_i \leqslant N$ and $1 \leqslant A_i \leqslant 200\,000$.

subtask	points	constraints
1	22	$1 \leqslant N, K \leqslant 2\,000$
2	38	$1 \leqslant N \leqslant 200\,000$, $1 \leqslant K \leqslant 5$
3	40	$1 \leqslant N, K \leqslant 200\,000$

Sample tests

input	input
5 2 3 5 1 4 3 3 5	7 7 7 7 7 7 7 7 7 7 6 5 4 3 2 1
output	**output**
2 1	1 6 15 20 15 6 1

Clarification of the first example:

If Ivan starts with the third street light, he turns off the light bulb on it – (3, 4, X, 4, 3).
The left light bulb has greater power so he turns it off – (3, X, X, 4, 3).
Now the right light bulb has greater power so he turns it off – (3, X, X, X, 3).
Ivan has two options for the last step because light bulbs #1 and #5 are of equal power.

If Ivan begins from the fifth street lamp, the only way he can turn all the light bulbs off is by moving from right to left and turning them off sequentially.