A. Aramic script

time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output

In Aramic language words can only represent objects.

Words in Aramic have special properties:

- A word is a *root* if it does not contain the same letter more than once.
- A *root* and all its permutations represent the same object.
- The *root* x of a word y is the word that contains all letters that appear in y in a way that each letter appears once. For example, the *root* of "aaaa", "aa", "aaa" is "a", the *root* of "aabb", "bab", "baabb", "ab" is "ab".
- Any word in Aramic represents the same object as its *root*.

You have an ancient script in Aramic. What is the number of **different objects** mentioned in the script?

Input

The first line contains one integer n $(1 \le n \le 10^3)$ — the number of words in the script.

The second line contains n words $s_1, s_2, \ldots, s_n$ — the script itself. The length of each string does not exceed 10^3.

It is guaranteed that all characters of the strings are small latin letters.

Output

Output one integer — the number of different objects mentioned in the given ancient Aramic script.

Examples

```
5
a aa aaa ab abb
```

```
2
```

```
3
amer arem mrea
```

```
1
```

Note

In the first test, there are two objects mentioned. The roots that represent them are "a","ab".

In the second test, there is only one object, its root is "amer", the other strings are just permutations of "amer".

B. Mancala

time limit per test: 1 second

memory limit per test: 256 megabytes

input: standard input

output: standard output

Mancala is a game famous in the Middle East. It is played on a board that consists of 14 holes.

Initially, each hole has a_i stones. When a player makes a move, he chooses a hole which contains a **positive** number of stones. He takes all the stones inside it and then redistributes these stones one by one in the next holes in a counter-clockwise direction.

Note that the counter-clockwise order means if the player takes the stones from hole i, he will put one stone in the $(i+1)$-th hole, then in the $(i+2)$-th, etc. If he puts a stone in the 14-th hole, the next one will be put in the first hole.

After the move, the player collects all the stones from holes that contain even number of stones. The number of stones collected by player is the score, according to Resli.

Resli is a famous Mancala player. He wants to know the maximum score he can obtain after one move.

Input
The only line contains 14 integers $a_1, a_2, \ldots, a_{14}$ $(0 \le a_i \le 10^9)$ — the number of stones in each hole.

It is guaranteed that for any i $(1 \le i \le 14)$ a_i is either zero or odd, and there is at least one stone in the board.

Output
Output one integer, the maximum possible score after one move.

Examples

Note

In the first test case the board after the move from the hole with 7 stones will look like 1 2 2 0 0 0 0 0 0 0 1 1 1 1. Then the player collects the even numbers and ends up with a score equal to 4.

C. Valhalla Siege

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Ivar the Boneless is a great leader. He is trying to capture Kattegat from Lagertha. The war has begun and wave after wave Ivar's warriors are falling in battle.

Ivar has n warriors, he places them on a straight line in front of the main gate, in a way that the i-th warrior stands right after $(i - 1)$-th warrior. The first warrior leads the attack.

Each attacker can take up to a_i arrows before he falls to the ground, where a_i is the i-th warrior's strength.

Lagertha orders her warriors to shoot k_i arrows during the i-th minute, the arrows one by one hit the first still standing warrior. After all Ivar's warriors fall and all the currently flying arrows fly by, Thor smashes his hammer and all Ivar's warriors get their previous strengths back and stand up to fight again. In other words, if all warriors die in minute t, they will all be standing to fight at the end of minute t.

The battle will last for q minutes, after each minute you should tell Ivar what is the number of his standing warriors.

Input

The first line contains two integers n and q ($1 \le n, q \le 200\,000$) — the number of warriors and the number of minutes in the battle.

The second line contains n integers $a_1, a_2, \ldots, a_n$ ($1 \le a_i \le 10^9$) that represent the warriors' strengths.

The third line contains q integers $k_1, k_2, \ldots, k_q$ ($1 \le k_i \le 10^{14}$), the i-th of them represents Lagertha's order at the i-th minute: k_i arrows will attack the warriors.

Output

Output q lines, the i-th of them is the number of standing warriors after the i-th minute.

Examples

input

```
5 5
1 2 1 2 1
3 10 1 1 1
```

output

```
3
5
4
4
3
```

input

```
4 4
1 2 3 4
9 1 10 6
```

output

```
1
4
4
1
```

Note

In the first example:

- after the 1-st minute, the 1-st and 2-nd warriors die.
- after the 2-nd minute all warriors die (and all arrows left over are wasted), then they will be revived thus answer is 5 — all warriors are alive.
- after the 3-rd minute, the 1-st warrior dies.
- after the 4-th minute, the 2-nd warrior takes a hit and his strength decreases by 1.
- after the 5-th minute, the 2-nd warrior dies.

D. Ghosts

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Ghosts live in harmony and peace, they travel the space without any purpose other than scare whoever stands in their way.

There are n ghosts in the universe, they move in the OXY plane, each one of them has its own velocity that does not change in time: $\overrightarrow{V} = V_x \overrightarrow{i} + V_y \overrightarrow{j}$ where V_x is its speed on the x-axis and V_y is on the y-axis.

A ghost i has experience value EX_i, which represent how many ghosts tried to scare him in his past. Two ghosts scare each other if they were in the same cartesian point at a moment of time.

As the ghosts move with constant speed, after some moment of time there will be no further scaring (*what a relief!*) and the experience of ghost kind $GX = \sum_{i=1}^{n} EX_i$ will never increase.

Tameem is a red giant, he took a picture of the cartesian plane at a certain moment of time T, and magically all the ghosts were aligned on a line of the form $y = a \cdot x + b$. You have to compute what will be the experience index of the ghost kind GX in the indefinite future, this is your task for today.

Note that when Tameem took the picture, GX may already be greater than 0, because many ghosts may have scared one another at any moment between $[-\infty, T]$.

Input

The first line contains three integers n, a and b ($1 \le n \le 200000$, $1 \le |a| \le 10^9$, $0 \le |b| \le 10^9$) — the number of ghosts in the universe and the parameters of the straight line.

Each of the next n lines contains three integers x_i, V_{xi}, V_{yi} ($-10^9 \le x_i \le 10^9$, $-10^9 \le V_{xi}, V_{yi} \le 10^9$), where x_i is the current x-coordinate of the i-th ghost (and $y_i = a \cdot x_i + b$).

It is guaranteed that no two ghosts share the same initial position, in other words, it is guaranteed that for all (i, j) $x_i \ne x_j$ for $i \ne j$.

Output

Output one line: experience index of the ghost kind GX in the indefinite future.

Examples

input
```
4 1 1
1 -1 -1
2 1 1
3 1 1
4 -1 -1
```

output
```
8
```

input
```
3 1 0
-1 1 0
0 0 -1
1 -1 -2
```
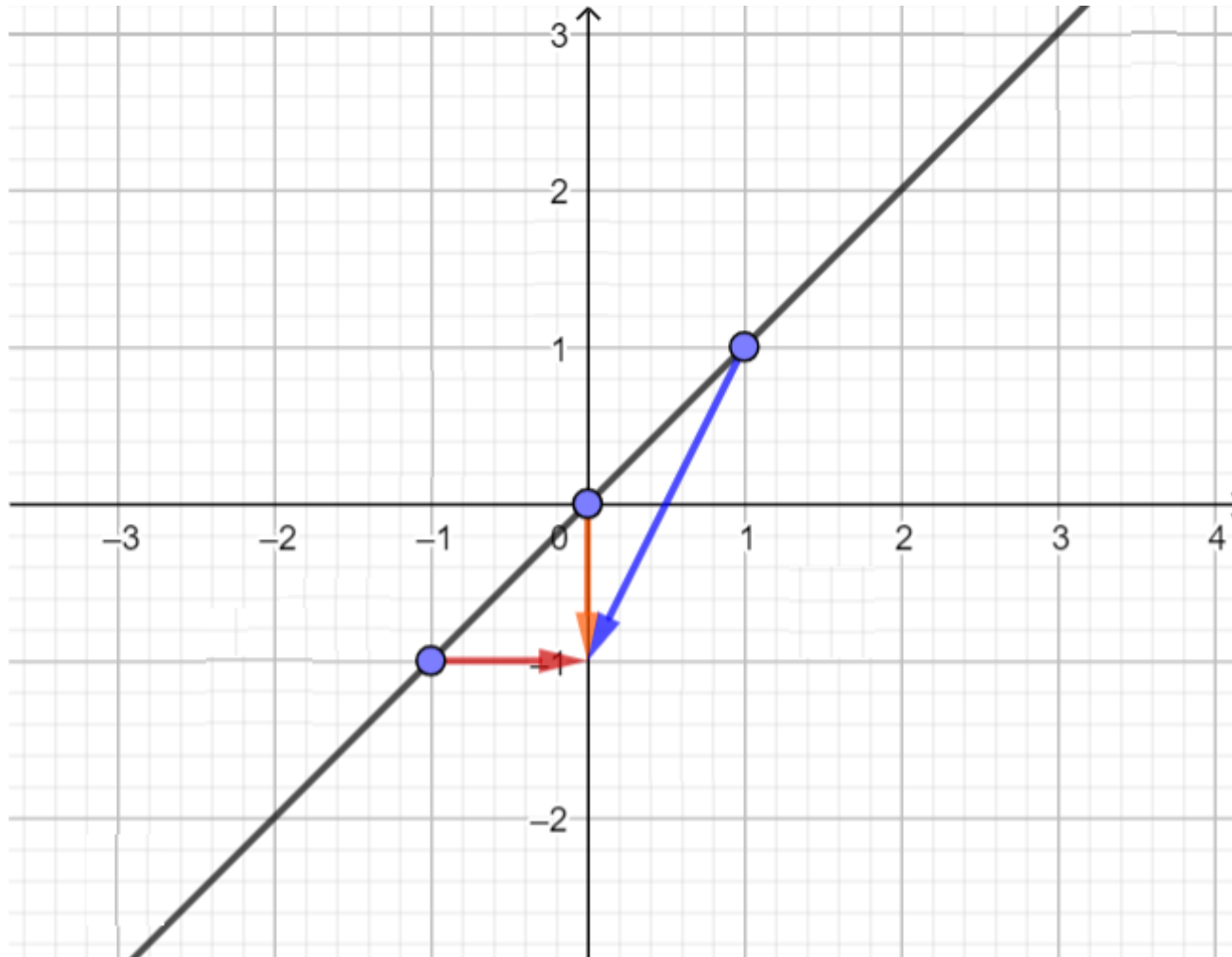
output
```
6
```

input
```
3 1 0
0 0 0
1 0 0
2 0 0
```

Note

There are four collisions $(1, 2, T - 0.5)$, $(1, 3, T - 1)$, $(2, 4, T + 1)$, $(3, 4, T + 0.5)$, where (u, v, t) means a collision happened between ghosts u and v at moment t. At each collision, each ghost gained one experience point, this means that $GX = 4 \cdot 2 = 8$.

In the second test, all points will collide when $t = T + 1$.

The red arrow represents the 1-st ghost velocity, orange represents the 2-nd ghost velocity, and blue represents the 3-rd ghost velocity.

E. Hag's Khashba

time limit per test: 3 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Hag is a very talented person. He has always had an artist inside him but his father forced him to study mechanical engineering.

Yesterday he spent all of his time cutting a giant piece of wood trying to make it look like a goose. Anyway, his dad found out that he was doing arts rather than studying mechanics and other boring subjects. He confronted Hag with the fact that he is a spoiled son that does not care about his future, and if he continues to do arts he will cut his 25 Lira monthly allowance.

Hag is trying to prove to his dad that the wooden piece is a project for mechanics subject. He also told his dad that the wooden piece is a **strictly convex** polygon with n vertices.

Hag brought two pins and pinned the polygon with them in the 1-st and 2-nd vertices to the wall. His dad has q queries to Hag of two types.

- $1\ f\ t$: pull a pin from the vertex f, wait for the wooden polygon to rotate under the gravity force (if it will rotate) and stabilize. And then put the pin in vertex t.
- $2\ v$: answer what are the coordinates of the vertex v.

Please help Hag to answer his father's queries.

You can assume that the wood that forms the polygon has uniform density and the polygon has a positive thickness, same in all points. After every query of the 1-st type Hag's dad tries to move the polygon a bit and watches it stabilize again.

Input
The first line contains two integers n and q ($3 \le n \le 10\,000, 1 \le q \le 200000$) — the number of vertices in the polygon and the number of queries.

The next n lines describe the wooden polygon, the i-th line contains two integers x_i and y_i ($|x_i|, |y_i| \le 10^8$) — the coordinates of the i-th vertex of the polygon. It is guaranteed that polygon is strictly convex and the vertices are given in the counter-clockwise order and all vertices are distinct.

The next q lines describe the queries, one per line. Each query starts with its type 1 or 2. Each query of the first type continues with two integers f and t ($1 \leq f, t \leq n$) — the vertex the pin is taken from, and the vertex the pin is put to and the polygon finishes rotating. It is guaranteed that the vertex f contains a pin. Each query of the second type continues with a single integer v ($1 \leq v \leq n$) — the vertex the coordinates of which Hag should tell his father.

It is guaranteed that there is at least one query of the second type.

Output

The output should contain the answer to each query of second type — two numbers in a separate line. Your answer is considered correct, if its absolute or relative error does not exceed 10^{-4}.

Formally, let your answer be a, and the jury's answer be b. Your answer is considered correct if $\frac{|a-b|}{\max(1,|b|)} \leq 10^{-4}$

Examples

input   Copy

```
3 4
0 0
2 0
2 2
1 1 2
2 1
2 2
2 3
```

output   Copy

```
3.4142135624 -1.4142135624
2.0000000000 0.0000000000
0.5857864376 -1.4142135624
```
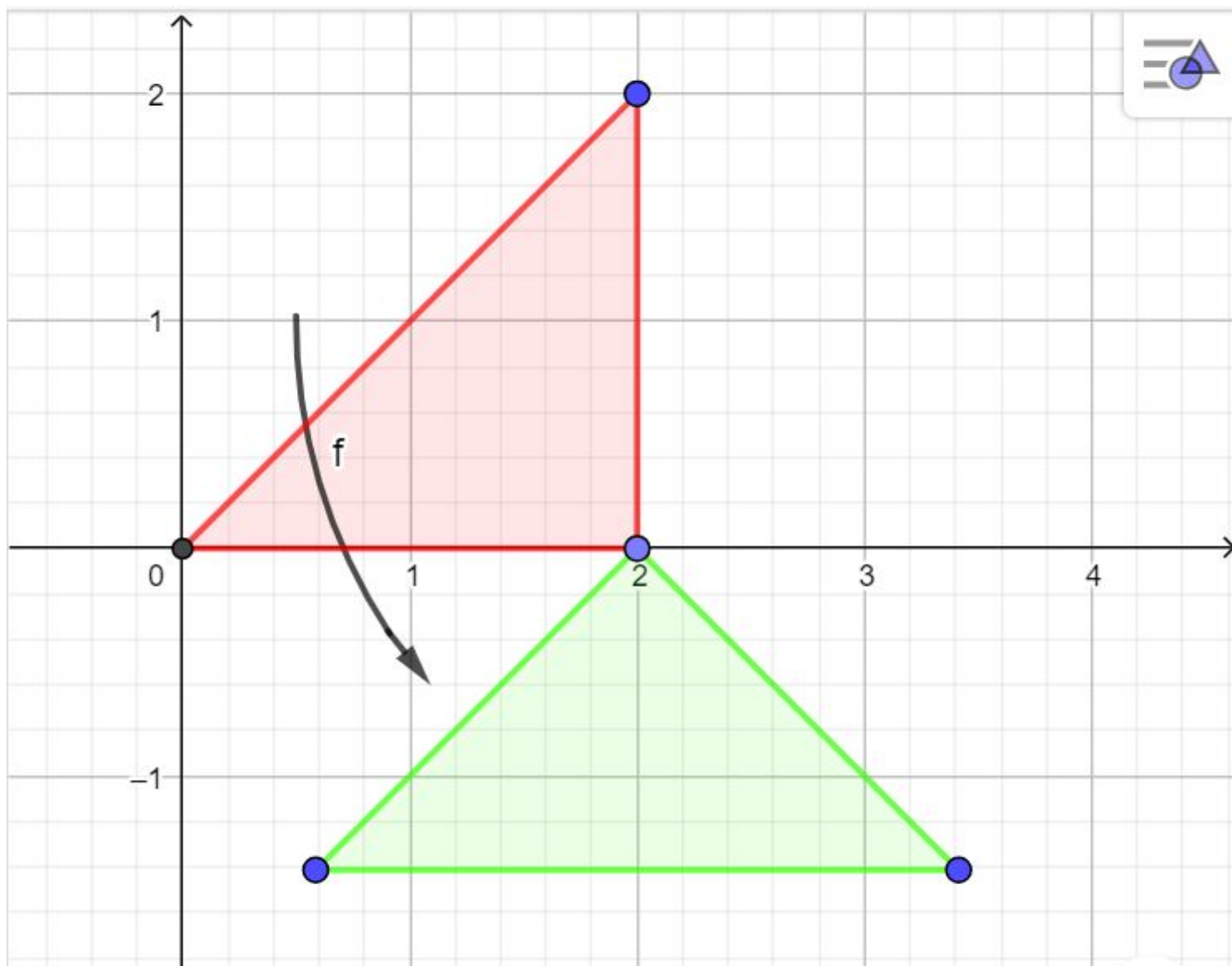
input   Copy

```
3 2
-1 1
0 0
1 1
1 1 2
2 1
```

```
output
1.0000000000 -1.0000000000
```

Note

In the first test note the initial and the final state of the wooden polygon.

Red Triangle is the initial state and the green one is the triangle after rotation around $(2, 0)$.

In the second sample note that the polygon rotates 180 degrees counter-clockwise or clockwise direction (it does not matter), because Hag's father makes sure that the polygon is stable and his son does not trick him.