Codeforces Round #280 (Div. 2)

A. Vanya and Cubes

time limit per test: 1 second

memory limit per test: 256 megabytes

input: standard input

output: standard output

Vanya got n cubes. He decided to build a pyramid from them. Vanya wants to build the pyramid as follows: the top level of the pyramid must consist of 1 cube, the second level must consist of $1 + 2 = 3$ cubes, the third level must have $1 + 2 + 3 = 6$ cubes, and so on. Thus, the i-th level of the pyramid must have $1 + 2 + ... + (i - 1) + i$ cubes.

Vanya wants to know what is the maximum height of the pyramid that he can make using the given cubes.

Input

The first line contains integer n ($1 \le n \le 10^4$) — the number of cubes given to Vanya.

Output

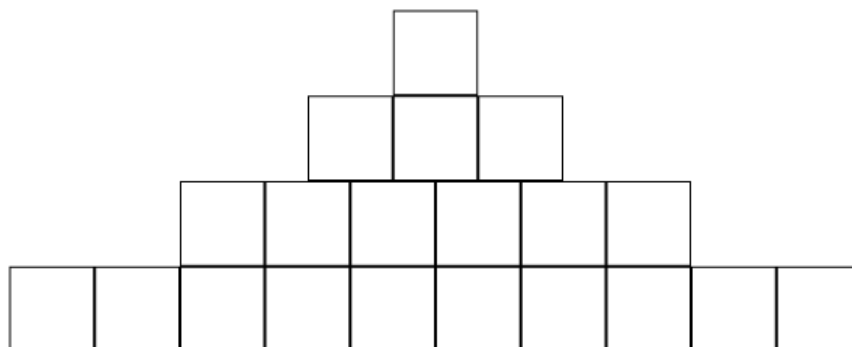Print the maximum possible height of the pyramid in the single line.

Sample test(s)

input
1
output
1

input
25
output
4

Note

Illustration to the second sample:

B. Vanya and Lanterns

Vanya walks late at night along a straight street of length l, lit by n lanterns. Consider the coordinate system with the beginning of the street corresponding to the point 0, and its end corresponding to the point l. Then the i-th lantern is at the point a_i. The lantern lights all points of the street that are at the distance of at most d from it, where d is some positive number, common for all lanterns.

Vanya wonders: what is the minimum light radius d should the lanterns have to light the whole street?

Input

The first line contains two integers n, l ($1 \le n \le 1000$, $1 \le l \le 10^9$) — the number of lanterns and the length of the street respectively.

The next line contains n integers a_i ($0 \le a_i \le l$). Multiple lanterns can be located at the same point. The lanterns may be located at the ends of the street.

Output

Print the minimum light radius d, needed to light the whole street. The answer will be considered correct if its absolute or relative error doesn't exceed 10^{-9}.

Sample test(s)

input
7 15
15 5 3 7 9 14 0
output
2.5000000000

input
2 5
2 5
output
2.0000000000

Note

Consider the second sample. At $d = 2$ the first lantern will light the segment $[0, 4]$ of the street, and the second lantern will light segment $[3, 5]$. Thus, the whole street will be lit.

C. Vanya and Exams

Vanya wants to pass n exams and get the academic scholarship. He will get the scholarship if the average grade mark for all the exams is at least avg. The exam grade cannot exceed r. Vanya has passed the exams and got grade a_i for the i-th exam. To increase the grade for the i-th exam by 1 point, Vanya must write b_i essays. He can raise the exam grade multiple times.

What is the minimum number of essays that Vanya needs to write to get scholarship?

Input

The first line contains three integers n, r, avg ($1 \leq n \leq 10^5$, $1 \leq r \leq 10^9$, $1 \leq avg \leq min(r, 10^6)$) — the number of exams, the maximum grade and the required grade point average, respectively.

Each of the following n lines contains space-separated integers a_i and b_i ($1 \leq a_i \leq r$, $1 \leq b_i \leq 10^6$).

Output

In the first line print the minimum number of essays.

Sample test(s)

input
5 5 4 5 2 4 7 3 1 3 2 2 5

output
4

input
2 5 4 5 2 5 2

output
0

Note

In the first sample Vanya can write 2 essays for the 3rd exam to raise his grade by 2 points and 2 essays for the 4th exam to raise his grade by 1 point.

In the second sample, Vanya doesn't need to write any essays as his general point average already is above average.

D. Vanya and Computer Game

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

Vanya and his friend Vova play a computer game where they need to destroy n monsters to pass a level. Vanya's character performs attack with frequency x hits per second and Vova's character performs attack with frequency y hits per second. Each character spends fixed time to raise a weapon and then he hits (the time to raise the weapon is $1/x$ seconds for the first character and $1/y$ seconds for the second one). The i-th monster dies after he receives a_i hits.

Vanya and Vova wonder who makes the last hit on each monster. If Vanya and Vova make the last hit at the same time, we assume that both of them have made the last hit.

Input

The first line contains three integers n,x,y ($1 \leq n \leq 10^5$, $1 \leq x, y \leq 10^6$) — the number of monsters, the frequency of Vanya's and Vova's attack, correspondingly.

Next n lines contain integers a_i ($1 \leq a_i \leq 10^9$) — the number of hits needed do destroy the i-th monster.

Output

Print n lines. In the i-th line print word `"Vanya"`, if the last hit on the i-th monster was performed by Vanya, `"Vova"`, if Vova performed the last hit, or `"Both"`, if both boys performed it at the same time.

Sample test(s)

input
4 3 2 1 2 3 4

output
Vanya Vova Vanya Both

input
2 1 1 1 2

output
Both Both

Note

In the first sample Vanya makes the first hit at time $1/3$, Vova makes the second hit at time $1/2$, Vanya makes the third hit at time $2/3$, and both boys make the fourth and fifth hit simultaneously at the time 1.

In the second sample Vanya and Vova make the first and second hit simultaneously at time 1.

E. Vanya and Field

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

Vanya decided to walk in the field of size $n \times n$ cells. The field contains m apple trees, the i-th apple tree is at the cell with coordinates (x_i, y_i). Vanya moves towards vector (dx, dy). That means that if Vanya is now at the cell (x, y), then in a second he will be at cell $((x + dx) \bmod n, (y + dy) \bmod n)$. The following condition is satisfied for the vector: $\gcd(n, dx) = \gcd(n, dy) = 1$, where $\gcd(a, b)$ is the largest integer that divides both a and b. Vanya ends his path when he reaches the square he has already visited.

Vanya wonders, from what square of the field he should start his path to see as many apple trees as possible.

Input

The first line contains integers $n, m, dx, dy (1 \le n \le 10^6, 1 \le m \le 10^5, 1 \le dx, dy \le n)$ — the size of the field, the number of apple trees and the vector of Vanya's movement. Next m lines contain integers $x_i, y_i (0 \le x_i, y_i \le n$ - $1)$ — the coordinates of apples. One cell may contain multiple apple trees.

Output

Print two space-separated numbers — the coordinates of the cell from which you should start your path.

Sample test(s)

input
```
5 5 2 3
0 0
1 2
1 3
2 4
3 1
```
output
```
1 3
```

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

Note

In the first sample Vanya's path will look like: $(1, 3) - (3, 1) - (0, 4) - (2, 2) - (4, 0) - (1, 3)$

In the second sample: $(0, 0) - (1, 1) - (0, 0)$