A. Nastya and an Array

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

Nastya owns too many arrays now, so she wants to delete the least important of them. However, she discovered that this array is magic! Nastya now knows that the array has the following properties:

- In one second we can add an arbitrary (possibly negative) integer to all elements of the array that are not equal to zero.
- When all elements of the array become equal to zero, the array explodes.

Nastya is always busy, so she wants to explode the array as fast as possible. Compute the minimum time in which the array can be exploded.

Input

The first line contains a single integer n $(1 \le n \le 10^5)$ — the size of the array.

The second line contains n integers $a_1, a_2, \ldots, a_n$ $(-10^5 \le a_i \le 10^5)$ — the elements of the array.

Output

Print a single integer — the minimum number of seconds needed to make all elements of the array equal to zero.

Examples

input

```
5
1 1 1 1 1
```

output

```
1
```

input

```
3
2 0 -1
```

output

```
2
```

input

```
4
5 -6 -5 1
```

output

```
4
```

Note

In the first example you can add -1 to all non-zero elements in one second and make them equal to zero.

In the second example you can add -2 on the first second, then the array becomes equal to $[0, 0, -3]$. On the second second you can add 3 to the third (the only non-zero) element.

B. Nastya Studies Informatics

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

Today on Informatics class Nastya learned about GCD and LCM (see links below). Nastya is very intelligent, so she solved all the tasks momentarily and now suggests you to solve one of them as well.

We define a pair of integers (a, b) *good*, if $GCD(a, b) = x$ and $LCM(a, b) = y$, where $GCD(a, b)$ denotes the greatest common divisor of a and b, and $LCM(a, b)$ denotes the least common multiple of a and b.

You are given two integers x and y. You are to find the number of *good* pairs of integers (a, b) such that $l \le a, b \le r$. Note that pairs (a, b) and (b, a) are considered different if $a \ne b$.

Input

The only line contains four integers l, r, x, y ($1 \le l \le r \le 10^9$, $1 \le x \le y \le 10^9$).

Output

In the only line print the only integer — the answer for the problem.

Examples

input
```
1 2 1 2
```
output
```
2
```

input
```
1 12 1 12
```
output
```
4
```

input
```
50 100 3 30
```
output
```
0
```

Note

In the first example there are two suitable *good* pairs of integers (a, b): $(1, 2)$ and $(2, 1)$.

In the second example there are four suitable *good* pairs of integers (a, b): $(1, 12)$, $(12, 1)$, $(3, 4)$ and $(4, 3)$.

In the third example there are *good* pairs of integers, for example, $(3, 30)$, but none of them fits the condition $l \le a, b \le r$.

C. Nastya and a Wardrobe

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

Nastya received a gift on New Year — a magic wardrobe. It is magic because in the end of each month the number of dresses in it doubles (i.e. the number of dresses becomes twice as large as it is in the beginning of the month).

Unfortunately, right after the doubling the wardrobe eats one of the dresses (if any) with the 50% probability. It happens every month except the last one in the year.

Nastya owns x dresses now, so she became interested in the expected number of dresses she will have in one year. Nastya lives in Byteland, so the year lasts for $k + 1$ months.

Nastya is really busy, so she wants you to solve this problem. You are the programmer, after all. Also, you should find the answer modulo $10^9 + 7$, because it is easy to see that it is always integer.

Input

The only line contains two integers x and k ($0 \le x, k \le 10^{18}$), where x is the initial number of dresses and $k + 1$ is the number of months in a year in Byteland.

Output

In the only line print a single integer — the expected number of dresses Nastya will own one year later modulo $10^9 + 7$.

Examples

input
```
2 0
```
output
```
4
```

input
```
2 1
```
output
```
7
```

input

```
3 2
```

output

```
21
```

Note

In the first example a year consists on only one month, so the wardrobe does not eat dresses at all.

In the second example after the first month there are 3 dresses with 50% probability and 4 dresses with 50% probability. Thus, in the end of the year there are 6 dresses with 50% probability and 8 dresses with 50% probability. This way the answer for this test is $(6 + 8) / 2 = 7$.

D. Nastya and a Game

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

Nastya received one more array on her birthday, this array can be used to play a traditional Byteland game on it. However, to play the game the players should first select such a subsegment of the array that $\frac{p}{s} = k$, where p is the product of all integers on the given array, s is their sum, and k is a given constant for all subsegments.

Nastya wonders how many subsegments of the array fit the described conditions. A subsegment of an array is several consecutive integers of the array.

Input

The first line contains two integers n and k ($1 \le n \le 2 \cdot 10^5$, $1 \le k \le 10^5$), where n is the length of the array and k is the constant described above.

The second line contains n integers $a_1, a_2, \ldots, a_n$ ($1 \le a_i \le 10^8$) — the elements of the array.

Output

In the only line print the number of subsegments such that the ratio between the product and the sum on them is equal to k.

Examples

input

```
1 1
1
```

output

```
1
```

input

```
4 2
6 3 8 1
```

output

```
2
```

Note

In the first example the only subsegment is $[1]$. The sum equals 1, the product equals 1, so it suits us because $\frac{1}{1} = 1$.

There are two suitable subsegments in the second example — $[6, 3]$ and $[3, 8, 1]$. Subsegment $[6, 3]$ has sum 9 and product 18, so it suits us because $\frac{18}{9} = 2$. Subsegment $[3, 8, 1]$ has sum 12 and product 24, so it suits us because $\frac{24}{12} = 2$.

E. Nastya and King-Shamans

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

Nastya likes reading and even spends whole days in a library sometimes. Today she found a chronicle of Byteland in the library, and it stated that there lived shamans long time ago. It is known that at every moment there was exactly one shaman in Byteland, and there were n shamans in total enumerated with integers from 1 to n in the order they lived. Also, each shaman had a magic power which can now be expressed as an integer.

The chronicle includes a list of powers of the n shamans. Also, some shamans can be king-shamans, if they gathered all the power of their predecessors, i.e. their power is exactly the sum of powers of all previous shamans. Nastya is interested in whether there was at least one king-shaman in Byteland.

Unfortunately many of the powers are unreadable in the list, so Nastya is doing the following:

- Initially she supposes some power for each shaman.
- After that she changes the power of some shaman q times (the shamans can differ) and after that wants to check if there is at least one king-

shaman in the list. If yes, she wants to know the index of any king-shaman.

Unfortunately the list is too large and Nastya wants you to help her.

Input

The first line contains two integers n and q $(1 \le n, q \le 2 \cdot 10^5)$.

The second line contains n integers $a_1, \ldots, a_n$ $(0 \le a_i \le 10^9)$, where a_i is the magic power of the i-th shaman.

After that q lines follow, the i-th of them contains two integers p_i and x_i $(1 \le p_i \le n, 0 \le x_i \le 10^9)$ that mean that the new power of the p_i-th shaman is x_i.

Output

Print q lines, the i-th of them should contain -1, if after the i-th change there are no shaman-kings, and otherwise a single integer j, where j is an index of some king-shaman after the i-th change.

If there are multiple king-shamans after each change, print the index of any of them.

Examples

input

```
2 1
1 3
1 2
```

output

```
-1
```

input

```
3 4
2 2 3
1 1
1 2
2 4
3 6
```

output

```
3
2
-1
3
```

input

```
10 7
0 3 1 4 6 2 7 8 10 1
2 5
1 3
9 36
4 10
4 9
1 2
1 0
```

output

```
1
-1
9
-1
4
-1
1
```

Note

In the first example powers of shamans after the first change are equal to $(2, 3)$. The answer equals -1, because the sum of powers of shamans before the first shaman is equal to 0, and before the second is equal to 2.

In the second example after the first change the powers are equal to $(1, 2, 3)$. The answer is equal to 3, because the power of the third shaman is equal to 3, and the sum of powers of the first and the second shaman is also $1 + 2 = 3$. After the second change the powers become equal to $(2, 2, 3)$, where the answer equals 2. After the third change the powers become equal to $(2, 4, 3)$, where the answer equals -1. After the fourth change the powers become equal to $(2, 4, 6)$, where the answer equals 3.