A. Two Bases

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

After seeing the "ALL YOUR BASE ARE BELONG TO US" meme for the first time, numbers X and Y realised that they have different bases, which complicated their relations.

You're given a number X represented in base b_x and a number Y represented in base b_y. Compare those two numbers.

Input

The first line of the input contains two space-separated integers n and b_x ($1 \le n \le 10$, $2 \le b_x \le 40$), where n is the number of digits in the b_x-based representation of X.

The second line contains n space-separated integers $x_1, x_2, ..., x_n$ ($0 \le x_i < b_x$) — the digits of X. They are given in the order from the most significant digit to the least significant one.

The following two lines describe Y in the same way: the third line contains two space-separated integers m and b_y ($1 \le m \le 10$, $2 \le b_y \le 40$, $b_x \ne b_y$), where m is the number of digits in the b_y-based representation of Y, and the fourth line contains m space-separated integers $y_1, y_2, ..., y_m$ ($0 \le y_i < b_y$) — the digits of Y.

There will be no leading zeroes. Both X and Y will be positive. All digits of both numbers are given in the standard decimal numeral system.

Output

Output a single character (quotes for clarity):

- '<' if $X < Y$
- '>' if $X > Y$
- '=' if $X = Y$

Sample test(s)

input

```
6 2
1 0 1 1 1 1
2 10
4 7
```

output

```
=
```

input

```
3 3
1 0 2
2 5
2 4
```

output

```
<
```

input

```
7 16
15 15 4 0 0 7 10
7 9
4 8 0 3 1 5 0
```

output

```
>
```

Note

In the first sample, $X = 101111_2 = 47_{10} = Y$.

In the second sample, $X = 102_3 = 21_5$ and $Y = 24_5 = 112_3$, thus $X < Y$.

In the third sample, $X = \mathrm{FF4007A}_{16}$ and $Y = 4803150_9$. We may notice that X starts with much larger digits and b_x is much larger than b_y, so X is clearly larger than Y.

B. Approximating a Constant Range

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

When Xellos was doing a practice course in university, he once had to measure the intensity of an effect that slowly approached equilibrium. A good way to determine the equilibrium intensity would be choosing a sufficiently large number of consecutive data points that seems as constant as possible and taking their average. Of course, with the usual sizes of data, it's nothing challenging — but why not make a similar programming contest problem while we're at it?

You're given a sequence of n data points $a_1, ..., a_n$. There aren't any big jumps between consecutive data points — for each $1 \le i < n$, it's guaranteed that $|a_{i+1} - a_i| \le 1$.

A range $[l, r]$ of data points is said to be *almost constant* if the difference between the largest and the smallest value in that range is at most 1. Formally, let M be the maximum and m the minimum value of a_i for $l \le i \le r$; the range $[l, r]$ is almost constant if $M - m \le 1$.

Find the length of the longest almost constant range.

Input

The first line of the input contains a single integer n ($2 \le n \le 100\,000$) — the number of data points.

The second line contains n integers $a_1, a_2, ..., a_n$ ($1 \le a_i \le 100\,000$).

Output

Print a single number — the maximum length of an almost constant range of the given sequence.

Sample test(s)

input

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

output

```
4
```

input

```
11
5 4 5 5 6 7 8 8 8 7 6
```

output

```
5
```

Note

In the first sample, the longest almost constant range is $[2, 5]$; its length (the number of data points in it) is 4.

In the second sample, there are three almost constant ranges of length 4: $[1, 4]$, $[6, 9]$ and $[7, 10]$; the only almost constant range of the maximum length 5 is $[6, 10]$.

C. The Two Routes

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

In Absurdistan, there are n towns (numbered 1 through n) and m bidirectional railways. There is also an absurdly simple road network — for each pair of different towns x and y, there is a bidirectional road between towns x and y **if and only if** there is no railway between them. Travelling to a different town using one railway or one road always takes exactly one hour.

A train and a bus leave town 1 at the same time. They both have the same destination, town n, and don't make any stops on the way (but they can wait in town n). The train can move only along railways and the bus can move only along roads.

You've been asked to plan out routes for the vehicles; each route can use any road/railway multiple times. One of the most important aspects to consider is safety — in order to avoid accidents at railway crossings, the train and the bus must not arrive at the same town (except town n) simultaneously.

Under these constraints, what is the minimum number of hours needed for both vehicles to reach town n (the maximum of arrival times of the bus and the train)? Note, that bus and train are not required to arrive to the town n at the same moment of time, but are allowed to do so.

Input

The first line of the input contains two integers n and m ($2 \le n \le 400$, $0 \le m \le n(n - 1) / 2$) — the number of towns and the number of railways respectively.

Each of the next m lines contains two integers u and v, denoting a railway between towns u and v ($1 \le u, v \le n$, $u \ne v$).

You may assume that there is at most one railway connecting any two towns.

Output

Output one integer — the smallest possible time of the later vehicle's arrival in town n. If it's impossible for at least one of the vehicles to reach town n, output -1.

Sample test(s)

input

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

output

```
2
```

input

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

output

```
-1
```

input

```
5 5
4 2
3 5
4 5
5 1
1 2
```

output

```
3
```

Note

In the first sample, the train can take the route $1 \rightarrow 3 \rightarrow 4$ and the bus can take the route $1 \rightarrow 2 \rightarrow 4$. Note that they can arrive at town 4 at the same time.

In the second sample, Absurdistan is ruled by railwaymen. There are no roads, so there's no way for the bus to reach town 4.

D. Lipshitz Sequence

time limit per test: 1 second

memory limit per test: 256 megabytes

input: standard input

output: standard output

A function $f:\mathbb{R}\to\mathbb{R}$ is called Lipschitz continuous if there is a real constant K such that the inequality $|f(x) - f(y)| \le K\cdot|x - y|$ holds for all $x, y\in\mathbb{R}$. We'll deal with a more... discrete version of this term.

For an array $\mathrm{h}[1..n]$, we define it's Lipschitz constant $L(\mathrm{h})$ as follows:

- if $n < 2$, $L(\mathrm{h}) = 0$
- if $n \ge 2$, $L(\mathrm{h}) = \max\left\lceil\frac{|\mathrm{h}[j]-\mathrm{h}[i]|}{j-i}\right\rceil$ over all $1 \le i < j \le n$

In other words, $L = L(\mathrm{h})$ is the smallest non-negative integer such that $|h[i] - h[j]| \le L\cdot|i - j|$ holds for all $1 \le i, j \le n$.

You are given an array a of size n and q queries of the form $[l, r]$. For each query, consider the subarray $s = \mathrm{a}[l..r]$; determine the sum of Lipschitz constants of **all subarrays** of s.

Input

The first line of the input contains two space-separated integers n and q ($2 \le n \le 100\,000$ and $1 \le q \le 100$) — the number of elements in array a and the number of queries respectively.

The second line contains n space-separated integers $\mathrm{a}[1..n]$ ($0 \le \mathrm{a}[i] \le 10^8$).

The following q lines describe queries. The i-th of those lines contains two space-separated integers l_i and r_i ($1 \le l_i < r_i \le n$).

Output

Print the answers to all queries in the order in which they are given in the input. For the i-th query, print one line containing a single integer — the sum of Lipschitz constants of all subarrays of $\mathrm{a}[l_i..r_i]$.

Sample test(s)

input

```
10 4
1 5 2 9 1 3 4 2 1 7
2 4
3 8
7 10
1 9
```

output

```
17
82
23
210
```

input

```
7 6
5 7 7 4 6 6 2
1 2
2 3
2 6
1 7
4 7
3 5
```

output

```
2
0
22
59
16
8
```

Note

In the first query of the first sample, the Lipschitz constants of subarrays of `[5,2,9]` with length at least 2 are:

- $L(\texttt{[5,2]}) = 3$
- $L(\texttt{[2,9]}) = 7$
- $L(\texttt{[5,2,9]}) = 7$

The answer to the query is their sum.

E. Kleofáš and the n-thlon

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

Kleofáš is participating in an n-thlon - a tournament consisting of n different competitions in n different disciplines (numbered 1 through n). There are m participants in the n-thlon and each of them participates in all competitions.

In each of these n competitions, the participants are given *ranks* from 1 to m in such a way that no two participants are given the same rank - in other words, the ranks in each competition form a permutation of numbers from 1 to m. The *score* of a participant in a competition is equal to his/her rank in it.

The *overall score* of each participant is computed as the sum of that participant's scores in all competitions.

The *overall rank* of each participant is equal to $1 + k$, where k is the number of participants with **strictly smaller** overall score.

The n-thlon is over now, but the results haven't been published yet. Kleofáš still remembers his ranks in each particular competition; however, he doesn't remember anything about how well the other participants did. Therefore, Kleofáš would like to know his expected overall rank.

All competitors are equally good at each discipline, so all rankings (permutations of ranks of everyone except Kleofáš) in each competition are equiprobable.

Input

The first line of the input contains two space-separated integers n ($1 \le n \le 100$) and m ($1 \le m \le 1000$) — the number of competitions and the number of participants respectively.

Then, n lines follow. The i-th of them contains one integer x_i ($1 \le x_i \le m$) — the rank of Kleofáš in the i-th competition.

Output

Output a single real number – the expected overall rank of Kleofáš. Your answer will be considered correct if its relative or absolute error doesn't exceed 10^{-9}.

Namely: let's assume that your answer is a, and the answer of the jury is b. The checker program will consider your answer correct, if $\frac{|a-b|}{\max(1,b)} \le 10^{-9}$.

Sample test(s)

input
```
4 10
2
1
2
1
```
output
```
1.0000000000000000
```

input
```
5 5
1
2
3
4
5
```
output
```
2.7500000000000000
```

input
```
3 6
2
4
2
```
output
```
1.6799999999999999
```

Note

In the first sample, Kleofáš has overall score 6. Nobody else can have overall score less than 6 (but it's possible for one other person to have overall score 6 as well), so his overall rank must be 1.