

A. Flipping Game

time limit per test: 1 second

memory limit per test: 256 megabytes

input: standard input

output: standard output

lahub got bored, so he invented a game to be played on paper.

He writes n integers $a_1, a_2, \dots, a_n$. Each of those integers can be either 0 or 1. He's allowed to do exactly one move: he chooses two indices i and j ($1 \leq i \leq j \leq n$) and flips all values a_k for which their positions are in range $[i, j]$ (that is $i \leq k \leq j$). Flip the value of X means to apply operation $X = 1 - X$.

The goal of the game is that after **exactly** one move to obtain the maximum number of ones. Write a program to solve the little game of lahub.

Input

The first line of the input contains an integer n ($1 \leq n \leq 100$). In the second line of the input there are n integers: $a_1, a_2, \dots, a_n$. It is guaranteed that each of those n values is either 0 or 1.

Output

Print an integer — the maximal number of 1s that can be obtained after exactly one move.

Sample test(s)

input
5 1 0 0 1 0
output
4

input
4 1 0 0 1
output
4

Note

In the first case, flip the segment from 2 to 5 ($i = 2, j = 5$). That flip changes the sequence, it becomes: [1 1 1 0 1]. So, it contains four ones. There is no way to make the whole sequence equal to [1 1 1 1 1].

In the second case, flipping only the second and the third element ($i = 2, j = 3$) will turn all numbers into 1.

B. Puzzles

time limit per test: 1 second

memory limit per test: 256 megabytes

input: standard input

output: standard output

The end of the school year is near and Ms. Manana, the teacher, will soon have to say goodbye to a yet another class. She decided to prepare a goodbye present for her n students and give each of them a jigsaw puzzle (which, as wikipedia states, is a tiling puzzle that requires the assembly of numerous small, often oddly shaped, interlocking and tessellating pieces).

The shop assistant told the teacher that there are m puzzles in the shop, but they might differ in difficulty and size. Specifically, the first jigsaw puzzle consists of f_1 pieces, the second one consists of f_2 pieces and so on.

Ms. Manana doesn't want to upset the children, so she decided that the difference between the numbers of pieces in her presents must be as small as possible. Let A be the number of pieces in the largest puzzle that the teacher buys and B be the number of pieces in the smallest such puzzle. She wants to choose such n puzzles that $A - B$ is minimum possible. Help the teacher and find the least possible value of $A - B$.

Input

The first line contains space-separated integers n and m ($2 \leq n \leq m \leq 50$). The second line contains m space-separated integers $f_1, f_2, \dots, f_m$ ($4 \leq f_i \leq 1000$) — the quantities of pieces in the puzzles sold in the shop.

Output

Print a single integer — the least possible difference the teacher can obtain.

Sample test(s)

input
4 6 10 12 10 7 5 22
output
5

Note

Sample 1. The class has 4 students. The shop sells 6 puzzles. If Ms. Manana buys the first four puzzles consisting of 10, 12, 10 and 7 pieces correspondingly, then the difference between the sizes of the largest and the smallest puzzle will be equal to 5. It is impossible to obtain a smaller difference. Note that the teacher can also buy puzzles 1, 3, 4 and 5 to obtain the difference 5.

C. Permutations

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

Yaroslav has an array that consists of n integers. In one second Yaroslav can swap two neighboring array elements. Now Yaroslav is wondering if he can obtain an array where any two neighboring elements would be distinct in a finite time.

Help Yaroslav.

Input

The first line contains integer n ($1 \leq n \leq 100$) — the number of elements in the array. The second line contains n integers $a_1, a_2, \dots, a_n$ ($1 \leq a_i \leq 1000$) — the array elements.

Output

In the single line print "YES" (without the quotes) if Yaroslav can obtain the array he needs, and "NO" (without the quotes) otherwise.

Sample test(s)

input
1 1
output
YES

input
3 1 1 2
output
YES

input
4 7 7 7 7
output
NO

Note

In the first sample the initial array fits well.

In the second sample Yaroslav can get array: 1, 2, 1. He can swap the last and the second last elements to obtain it.

In the third sample Yaroslav can't get the array he needs.

D. Eight Point Sets

time limit per test: 1 second

memory limit per test: 256 megabytes

input: standard input

output: standard output

Gerald is very particular to eight point sets. He thinks that any decent eight point set must consist of all pairwise intersections of three distinct integer vertical straight lines and three distinct integer horizontal straight lines, except for the average of these nine points. In other words, there must be three integers X_1, X_2, X_3 and three more integers Y_1, Y_2, Y_3 , such that $X_1 < X_2 < X_3$, $Y_1 < Y_2 < Y_3$ and the eight point set consists of all points (X_i, Y_j) ($1 \leq i, j \leq 3$), except for point (X_2, Y_2) .

You have a set of eight points. Find out if Gerald can use this set?

Input

The input consists of eight lines, the i -th line contains two space-separated integers X_i and Y_i ($0 \leq X_i, Y_i \leq 10^6$). You do not have any other conditions for these points.

Output

In a single line print word "respectable", if the given set of points corresponds to Gerald's decency rules, and "ugly" otherwise.

Sample test(s)

input
0 0 0 1 0 2 1 0 1 2 2 0 2 1 2 2
output
respectable

input
0 0 1 0 2 0 3 0 4 0 5 0 6 0 7 0
output
ugly

input
1 1 1 2 1 3 2 1 2 2 2 3 3 1 3 2
output
ugly

E. Archer

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

SmallR is an archer. SmallR is taking a match of archer with Zanoes. They try to shoot in the target in turns, and SmallR shoots first. The probability of shooting the target each time is $\frac{a}{b}$ for SmallR while $\frac{c}{d}$ for Zanoes. The one who shoots in the target first should be the winner.

Output the probability that SmallR will win the match.

Input

A single line contains four integers a, b, c, d ($1 \leq a, b, c, d \leq 1000, 0 < \frac{a}{b} < 1, 0 < \frac{c}{d} < 1$).

Output

Print a single real number, the probability that SmallR will win the match.

The answer will be considered correct if the absolute or relative error doesn't exceed 10^{-6} .

Sample test(s)

input
1 2 1 2
output
0.666666666667

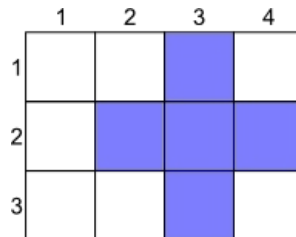
F. Crosses

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

There is a board with a grid consisting of n rows and m columns, the rows are numbered from 1 from top to bottom and the columns are numbered from 1 from left to right. In this grid we will denote the cell that lies on row number i and column number j as (i, j) .

A group of six numbers (a, b, c, d, x_0, y_0) , where $0 \leq a, b, c, d$, is a *cross*, and there is a set of cells that are assigned to it. Cell (x, y) belongs to this set if **at least one** of two conditions are fulfilled:

- $|x_0 - x| \leq a$ and $|y_0 - y| \leq b$
- $|x_0 - x| \leq c$ and $|y_0 - y| \leq d$



The picture shows the cross $(0, 1, 1, 0, 2, 3)$ on the grid 3×4 .

Your task is to find the number of different groups of six numbers, (a, b, c, d, x_0, y_0) that determine the crosses of an area equal to S , which are placed entirely on the grid. The cross is placed entirely on the grid, if any of its cells is in the range of the grid (that is for each cell (x, y) of the cross $1 \leq x \leq n$; $1 \leq y \leq m$ holds). The area of the cross is the number of cells it has.

Note that two crosses are considered distinct if the ordered groups of six numbers that denote them are distinct, even if these crosses coincide as sets of points.

Input

The input consists of a single line containing three integers n, m and S ($1 \leq n, m \leq 500$, $1 \leq S \leq n \cdot m$). The integers are separated by a space.

Output

Print a single integer — the number of distinct groups of six integers that denote crosses with area S and that are fully placed on the $n \times m$ grid.

Please, do not use the `%lld` specifier to read or write 64-bit integers in C++. It is preferred to use the `cin`, `cout` streams or the `%I64d` specifier.

Sample test(s)

input
2 2 1
output
4

input
3 4 5
output
4

Note

In the first sample the sought groups of six numbers are: $(0, 0, 0, 0, 1, 1)$, $(0, 0, 0, 0, 1, 2)$, $(0, 0, 0, 0, 2, 1)$, $(0, 0, 0, 0, 2, 2)$.

In the second sample the sought groups of six numbers are: $(0, 1, 1, 0, 2, 2)$, $(0, 1, 1, 0, 2, 3)$, $(1, 0, 0, 1, 2, 2)$, $(1, 0, 0, 1, 2, 3)$.

G. Point on Spiral

time limit per test: 2 seconds

memory limit per test: 256 megabytes

input: standard input

output: standard output

Valera the horse lives on a plane. The Cartesian coordinate system is defined on this plane. Also an infinite spiral is painted on the plane. The spiral consists of segments: $[(0, 0), (1, 0)]$, $[(1, 0), (1, 1)]$, $[(1, 1), (-1, 1)]$, $[(-1, 1), (-1, -1)]$, $[(-1, -1), (2, -1)]$, $[(2, -1), (2, 2)]$ and so on. Thus, this infinite spiral passes through each integer point of the plane.

Valera the horse lives on the plane at coordinates $(0, 0)$. He wants to walk along the spiral to point (x, y) . Valera the horse has four legs, so he finds turning very difficult. Count how many times he will have to turn if he goes along a spiral from point $(0, 0)$ to point (x, y) .

Input

The first line contains two space-separated integers x and y ($|x|, |y| \leq 100$).

Output

Print a single integer, showing how many times Valera has to turn.

Sample test(s)

input
0 0
output
0

input
1 0
output
0

input
0 1
output
2

input
-1 -1
output
3

H. Hexadecimal's Numbers

time limit per test: 1 second

memory limit per test: 64 megabytes

input: standard input

output: standard output

One beautiful July morning a terrible thing happened in Mainframe: a mean virus Megabyte somehow got access to the memory of his not less mean sister Hexadecimal. He loaded there a huge amount of n different natural numbers from 1 to n to obtain total control over her energy.

But his plan failed. The reason for this was very simple: Hexadecimal didn't perceive any information, apart from numbers written in binary format. This means that if a number in a decimal representation contained characters apart from 0 and 1, it was not stored in the memory. Now Megabyte wants to know, how many numbers were loaded successfully.

Input

Input data contains the only number n ($1 \leq n \leq 10^9$).

Output

Output the only number — answer to the problem.

Sample test(s)

input
10
output
2

Note

For $n = 10$ the answer includes numbers 1 and 10.

I. Primes on Interval

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

You've decided to carry out a survey in the theory of prime numbers. Let us remind you that a prime number is a positive integer that has exactly two distinct positive integer divisors.

Consider positive integers $a, a + 1, \dots, b$ ($a \leq b$). You want to find the minimum integer l ($1 \leq l \leq b - a + 1$) such that for any integer x ($a \leq x \leq b - l + 1$) among l integers $x, x + 1, \dots, x + l - 1$ there are at least k prime numbers.

Find and print the required minimum l . If no value l meets the described limitations, print -1.

Input

A single line contains three space-separated integers a, b, k ($1 \leq a, b, k \leq 10^6$; $a \leq b$).

Output

In a single line print a single integer — the required minimum l . If there's no solution, print -1.

Sample test(s)

input
2 4 2
output
3
input
6 13 1
output
4
input
1 4 3
output
-1

J. Pairs of Numbers

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

Let's assume that we have a pair of numbers (a, b) . We can get a new pair $(a + b, b)$ or $(a, a + b)$ from the given pair in a single step.

Let the initial pair of numbers be $(1, 1)$. Your task is to find number k , that is, the least number of steps needed to transform $(1, 1)$ into the pair where at least one number equals n .

Input

The input contains the only integer n ($1 \leq n \leq 10^6$).

Output

Print the only integer k .

Sample test(s)

input
5
output
3

input
1
output
0

Note

The pair $(1, 1)$ can be transformed into a pair containing 5 in three moves: $(1, 1) \rightarrow (1, 2) \rightarrow (3, 2) \rightarrow (5, 2)$.