Problem A. After The Dot

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	1024 mebibytes

Given two integers a and b ($1 \le a, b \le 1000$). Find the first digit after the decimal dot in the decimal notation of a/b (if a is divisible by b, consider all the digits after decimal dot equal to zero).

Input

The first line of the input contains one integer a ($1 \le a \le 1000$). The second line of the input contains one integer b ($1 \le b \le 1000$).

Output

Print one integer — first decimal digit after dot in the decimal representation of a/b.

Examples

standard input	standard output
1 7	1
8 2	0

Problem B. Big Database Of Calls

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	1024 mebibytes

In the mobile operator's database, the time of a call is specified in seconds from the beginning of the day (for example, at midnight the value is 0, at noon it is 43200). When providing the details, the time must be output in the format `hh:mm:ss`, with exactly two digits allocated for hours, minutes, and seconds (that is, midnight is represented as 00:00:00, noon as 12:00:00, and the last second of the day as 23:59:59, and so on).

Your task is to convert data between formats: given a time from the database, output the time in the format required for the details, and given a format from the details, output a single integer — the time from the database.

Input

The first line of the input contains either a single integer t ($0 \le t \le 86399$) — the time from the database, or a record in the format $hh : mm : ss$ ($0 \le hh \le 23$, $0 \le mm \le 59$, $0 \le ss \le 59$).

Output

Output the answer — the time t in the format `hh:mm:ss` if the input is the time from the database, or the number of seconds from the beginning of the day if the input is in the format `hh:mm:ss`.

Examples

standard input	standard output
2107	00:35:07
21:07:21	76041

Problem C. CPU

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	1024 mebibytes

New supervector CPU "Mashuk" got N types of registers — one-byte two-byte, three-byte, ... N-byte. So the CPU can natively support $2 \cdot N$ integer data types — signed and unsigned $8N$-bit.

Unsigned integers are just remainders of division by 2^{8N}, and for the signed types integers between 0 and $2^{8N-1} - 1$ inclusively are represented in same way as for unsigned ones, and negative x between -2^{8N-1} and -1 is represented as integer $2^{8N} + x$ in similar unsigned data type.

The programming language B++ implements all integer data types, but there is no data type control: you may assign any constant to any variable with possible overflow: if the constant does not fit to the register, the high bytes are dropped, and low bytes are copied into the variable. For example, if you want to assign value 257 to variable x, and x is the unsigned 8-bit variable, then x will be set to 1.

So if we do not know the type of variable (sometimes it is possible in B++), we can do next trick: try to assign some constant value to the variable and then read what actually is written there and then precisely recognize the variable type.

We will call non-negative integer *the detector*, if after such action we can recognize all $2N$ variable types.

Given N, build the hexadecimal representation of minimum possible detector for given N.

Input

Input contains one integer N — number of possible register lengths ($1 \le N \le 10^4$).

Output

Print hexadecimal representation of minimum possible detector. Do not print leading zeroes; digits, greater, than 9, shall be denoted by capital English letters between '`A`' and '`F`' inclusively.

Example

standard input	standard output
1	80

Problem D. Digital Street Art

Input file:	*standard input*
Output file:	*stanard output*
Time limit:	2 seconds
Memory limit:	1024 mebibytes

Famous street artist Ask Nyb. tonight painted the coordinate plane, so now it is an art object. The axis are painted in black, the first quarter in red, second quarter in blue, third quarter in green and fourth quarter in yellow.

For the give circle count number of distinct colors of its points. The circle contains the internal points as well as border (circumference).

Input

First line of the input contains three integers x, y and r — coordinates of the center of the circle and radius, respectively ($-10^4 \le x, y \le 10^4$, $1 \le r \le 10^4$).

Output

Print one integer — number of distinct colors of points inside or on the border of the given circle.

Examples

standard input	stanard output
0 0 5	5
20 20 20	2
2020 12 6	1

Problem E. Equations

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	1024 mebibytes

Given N variables $a_1, a_2, \ldots a_N$.

On the math lesson the kids were asked to write on the paper M equations in form $a_k = a_l$ such as in each equation $k < l$ and all the written equations are pairwise distinct.

Consider the *diversity* d of the set of variables with M written equations as maximal number of distinct values those variables can have simultaneously.

For example, if we have 5 variables and two equations $a_1 = a_2$ and $a_3 = a_4$ written on the board, then we can have at most 3 distinct values (a_1, a_3 and a_5), so in that case $d = 3$.

Svetlana stands for diversity, so she wants to choose the equations such as d will be as big as possible. Alex stands for equality, so he wants to choose the equations such as d will be as small as possible.

For given values of N and M print value d_{min}, achieved by Alex and value d_{max} achieved by Svetlana in case when each will select the equations optimally for self.

Input

First line of the input contains two integers N and M ($1 \le N, M \le 10^5$) — number of variables and number of equations, respectively.

Output

If it is impossible to write the M equations as it was asked, print -1. Otherwise print two integers — minimum and maximum values of d which can be reached by selecting of equations to write.

Examples

standard input	standard output
12 6	6 9
20 20	1 14

Problem F. Fast Operating System

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	1024 mebibytes

In modern systems, when generating passwords, there is often an attempt to achieve memorability. One way to do this is to make the password read like a word, that is, sound natural.

In the ultra-fast operating system "Xinul" being developed, all passwords are in Cyrillic. There are 33 letters in Cyrillic, of which 10 are vowels and 21 are consonants; two more letters are considered special.

A password is considered to sound natural if:

- The special letters must be preceded by consonants only (except for one consonant equivalent to "j"); these letters cannot precede a consonant nor stay as the first letter.
- There should be no other vowels next to vowels, and no other consonants next to consonants.

Calculate how many passwords of length n are naturally sounding.

Input

The input contains one integer n ($6 \le n \le 10^6$) — the length of the password.

Output

Print one integer — the number of the naturally sounding passwords of length n modulo $10^9 + 7$.

Examples

standard input	standard output
6	25814000

Problem G. Generate New Logo!

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	1024 mebibytes

Your company is planning to present the innovative product in the marked. As the part of the advertising campaign some sequence of non-negative integers was invented. Integers in this sequence are written one by one, separated by exactly one space and does not contain leading zeroes.

But the lawyers noticed that this sequence sometimes contain the integer Z, registered as the trademark of the another company. So any appearance of Z as the continuous substring — or even if the digits of its representation are separated by spaces — is illegal.

For example, if $Z = 2080$, then both sequences "2**2080**2 1234" or "3**20 80**3" are considered illegal.

When your boss is received the note from lawyers, then he just crossed out **all** places, where he found digits, used in continuous or space-containing appearing of Z in the sequence (for example if $Z = 2020$ and the sequence was "1202020 320 2 0 4", then after the crossing it will look as "1XXXXXX 3XX X X 4") and sends to you to further processing.

Yoy may replace any **crossed** digit with some other digit (but not with the space!), or does not replace it at all. You cannot do any other changes in the text like changing of non-crossed digits or moving the spaces.

Your task is to obtain the new sequence for logo, with following properties:

1. The sequence is formally correct (i.e. no integers have the leading zeroes).
2. The sequence does not contain the decimal representation of Z, neither as continuous substring nor with spaces between the digits.
3. The sequence shall be lexicographically minimal.

Note that if we have two sequences of equal length a_i and b_i, the lexicographically minimal is one where leftmost element, distinct for those sequences if lesser.

Input

First line of the input contains one integer Z — the registered trademark. Z is non-negative and does not exceeds 10^9.

Second line of the input contains the starting version of the sequence, consisting of one or several non-negative space-separated integers, written in decimal notation without extra leading zeroes (so if the integer starts with zero, its a zero written exactly as 0). Summary length of the text does not exceed 1000 characters (including the spaces).

Output

Print lexicographically minimal text, conformig the problem statements.

Examples

standard input	standard output
2021 6 12 2020	6 12 2020
2021 2020 213 0	2000 103 0

Problem H. Hidden Integer

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	1024 mebibytes

This is an interactive problem.

The owl wrote down a non-negative integer n ($0 \le n \le 10^9$) and assigned the value n to a 32-bit unsigned variable x.

The lark wants to guess this number by asking the owl no more than 32 questions.

For each question, he can ask the owl to add any positive integer t ($1 \le t \le 10^9$) to the current value of x and inform him of the difference between the number of bits equal to one in the new and old values of x (that is, $b((x + t) \bmod 2^{32}) - b(x)$, where b is the function that computes the number of ones in the binary representation of the number x).

Note that after the query, the owl changes the current value of the number x to $(x + t) \bmod 2^{32}$, and each new query starts working with the value of x modified by previous queries.

Write a program that plays this game for the lark and guesses the value of n in no more than 32 queries.

Interaction Protocol

The interaction is initiated by the participant, who suggests to the jury program to add an integer t to the current value of x and report the difference between the number of bits equal to 1 in the new and old values. For this, he uses the query "`?` t" ($1 \le t \le 10^9$).

The jury program then outputs a response — an integer d, representing the difference between the number of ones in the binary representation of the old and new values of x ($-32 \le d \le 32$).

To indicate that your program is ready to announce the number n (which is also the initial value of x), output "`!` n" instead of a query. This action must be done exactly once and is not considered a query.

Do not forget to output a newline after each query or response and flush the input-output buffer using the function `flush` of the programming language you are using.

Example

standard input	standard output
1 -2 -1	? 3 ? 3 ? 16 ! 42

Problem I. Integer Array

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	1024 megabytes

Given array a, consisting of n non-negative integers. The following operations are allowed:

- decrease arbitrary positive integer in array ($a_i > 0$) by 1;
- increase arbitrary integer in array by 1.

Find the minimal number of the operations to make bitwise AND of the array non-zero and bitwise XOR of the array non-zero.

Input

The first line of the input contains one integer n — the length of the array ($2 \le n \le 5 \cdot 10^5$).

The second line contains n integers a_i — the array ($0 \le a_i \le 10^{18}$).

Output

Print one integer — minimal number of the operations needed to transform the array such that bitwise AND of all a_i is non-zero and bitwise XOR of all a_i is non-zero.

Example

standard input	standard output
4 5 2 3 3	1

Problem J. Joyful Submatrices

Input file:	*standard input*
Output file:	*standard output*
Time limit:	4 seconds
Memory limit:	1024 mebibytes

We say some binary matrix (matrix where each cell is 0 or 1) is *joyful* if we can transform it to the matrix with all 0s with arbitrary amount of next opearations: take submatrix of size 2×2 (the elements (i, j), $(i + 1, j)$, $(i + 1, j + 1)$ and $(i, j + 1)$) and flip all the bits.

You are given binary matrix A of size $N \times M$, count the amount of joyful submatrices.

Input

First line of the input contains two integers N and M ($1 \le N, M \le 500$) — number of the rows and columns in the martix A.

Each of the following N lines contains exactly M characters. j-th character in the i-th line represents the element A_{ij} in i-th row and j-th column of matrix A and is '1' if $A_{ij} = 1$ and '0' otherwise.

Output

Print one integer — number of the joyful submatrices in the given matrix.

Example

standard input	standard output
2 3 0 1 1 0 1 1	5

Problem K. Kangaroo Quest

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	1024 mebibytes

The Kangaroo lives on the land that can be represented as the board $n \times m$ cells. Some cells are occupied by trees, and kangaroo can not visit those cells. Other cells are considered empty.

Kangaroo plans the following quest: to start in some cell (where is no tree), visit each cell that is not occupied by tree exactly once, and then return to the starting cell.

Kangaroo can move from one cell to another, if both cells are empty and share a common edge.

Given the board configuration, find if kangaroo can complete the quest.

Input

The first line of the input contains one integer t ($1 \le t \le 100$) — the number of the test cases.

The first line of each test case contains two integers n and m ($2 \le n, m \le 7$). Each of the following n lines contains exactly m numbers. j-th integer in i-th line is equal to 1, if the cell on the intersection of the n-th row and m-th column is occupied by a tree, and 0 otherwise.

Output

For each test case, print «`Yes`», if kangaroo can complete the quest, and «`No`» otherwise.

Example

standard input	standard output
2 4 5 0 0 0 0 0 0 0 1 1 0 1 0 1 0 0 1 0 0 0 1 4 5 0 0 0 0 0 0 0 1 1 0 1 0 0 0 0 1 0 0 0 1	Yes No

Problem L. LightFlight

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	1024 mebibytes

The LightFlight discounter company controlled the Bytesburg II airport, that is placed at the start of the coordinates. The airplanes may go up following the arbitrary ray placed in the subplane $y \geq 0$, i.e. the angle of the starting airplane can be counted as the random value, uniformly distributed at the range 0, π.

There are N transmitters near the airport, each transmitter have coordinates x_i, y_i and radius r_i. The LightFligt budget allows the company to control K out of those N transmitters. If the airplane (represented as point) is covered by for atleast one transmitter radius of the control, then airplane can get the message from LightFlight manager.

The LightFlight plans to select the transmitters in such a way that the probability that airplane receives the message from the LightFlight manager (atleast from one transmitter) will be maximal. Your task is to calculate that probability.

Input

First line of the input contains two integers N and K ($1 \leq N \leq 1500$, $1 \leq K \leq N$) — total number of transmitters and number of transmitters that can be controlled by LightFlight, respectively.

Each of the following N lines contain three integers x_i, y_i и r_i ($-1000 \leq x_i, y_i \leq 1000$, $1 \leq r_i < \sqrt{x_i^2 + y_i^2}$.

Output

Print the probability that the message will be successfully delivered to the airplane in case of optimal selection of transmitters with absolute or relative error 10^{-6} or better.

Example

standard input	standard output
2 1 20 20 20 -20 20 20	0.5

Problem M. Magical Space Quest

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	1024 mebibytes

There is an teleporting race for jedi in the galaxy far far away! The participant are given M checkpoints in 3D-space and the magical wand. The i-th checkpoint C_i have the integer coordinates (x_i, y_i, z_i).

The participants may use have N spells, i-th spell is given by the integer parameter j_i and may transfer the owner from point A (x, y, z) with the integer coordinates to any point B (x_1, y_1, z_1) with the integer coordinates such that $|x - x_1| + |y - y_1| + |z - z_1| = j_i$ within one second.

The participants may move only using those spells. Each spell may be cast arbitrary number of times; starting and target points are not necessarily the checkpoints.

Luke Skywalker starts the race at the point with coordinates (0,0,0). Check if he can visit all the checkpoints using the given spells and if he can, find minimum time Luke need to complete this task. Note that Harry may finish at any checkpoint he wants to and can visit the checkpoints in any order (including visiting some checkpoint more than once).

Input

First line of the input contains two integer N and M $(1 \le N, M \le 15)$ — number of the spells the participants may use and number of checkpoints, respectively.

Second line contains N pairwise distinct integers j_i — parameters of the given spells $(1 \le d_i \le 3 \cdot 10^5)$.

i-th of the following M lines contains three integers x_i, y_i and z_i — coordinates of the i-th checkpoint $(-10^5 \le x_i, y_i, z_i \le 10^5)$. You may assume that no two checkpoints coincide.

Output

If it is possible to visit all the checkpoints using the given spells and starting from $(0, 0, 0)$, print minimum time needed to do that. Otherwise print -1.

Examples

standard input	standard output
2 1 1 2 5 0 0	3
2 2 9 3 3 0 0 3 9 0	2
1 1 4 3 0 0	-1