
# ACM Local Collegiate Programming Contest

Isfahan University of Technology

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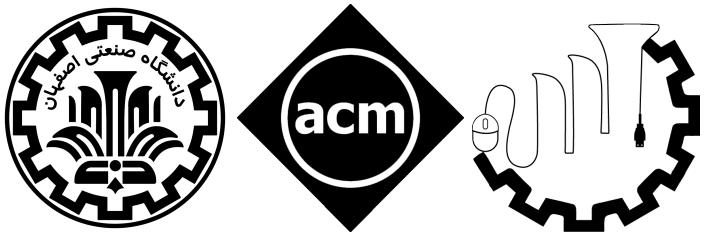
Organizers:



# A. Settlers of Catan

***Settlers of Catan*** is the most famous board game in the world! Everyone is buying it so it's becoming really rare. Mehran has a LOT of money. He wants to buy *Settlers of Catan* with all of his money as soon as possible (before it's too late) but he needs cash to do that. He has $n$ dollars in the bank. The denominations for dollar bills are 1, 5, 10, 20, 100. What is the minimum number of bills Mehran could receive after withdrawing his entire balance?
For example, if he has 110 dollars in the bank the best way to get it in cash is with one 100 and one 10 dollar bills so the answer is 2.

## Input

The first and only line of input contains a single integer $n$ ($1 \leq n \leq 10^9$).

## Output

Output the minimum number of bills that Mehran could receive.

## Example

| Standard Input | Standard Output |
|---|---|
| 125 | 3 |

| Standard Input | Standard Output |
|---|---|
| 43 | 5 |

| Standard Input | Standard Output |
|---|---|
| 1000000000 | 10000000 |

# B. IUTier

MahdioF has allways been a student at IUT. He knows that if his rank in university is not good enough he'll get into trouble with his advisor professor. Due to this problem, he can not sleep at nights.

There are $n$ students, each of them has a unique id (from 1 to $n$). MahdioF's id is 1. Every student has four scores correspond to his or her *Database5*, *Very Advanced OS*, *Applications of Blockchain in Kale-Pache Pazi*, and *Not Really Applicable Algorithms*. The students are given in order of increasing of their ids. In the rank table, the students will be sorted by decreasing the sum of their scores. So, a student with the largest sum will get the first place. If two or more students have the same sum, these students will be sorted by increasing their ids.

We know MahdioF and we are sure that he won't get into trouble. Let's calculate MahdioF's rank and show to him so he can sleep at peace!

## Input

The first line contains a single integer n ($1 \leq n \leq 1000$) the number of students.
Each of the next n lines contains four integers $ai$, $bi$, $ci$, and $di$ ($0 \leq ai, bi, ci, di \leq 100$) the grades of the i-th student on *Database5*, *Very Advanced OS*, *Applications of Blockchain in Kale-Pache Pazi*, and *Not Really Applicable Algorithms*. The id of the $i-th$ student is equal to $i$.

## Output

Print the rank of MahdioF. MahdioF's id is 1.

## Example

| **Standard Input** | **Standard Output** |
|---|---|
| 5<br>100 98 100 100<br>100 100 100 100<br>100 100 99 99<br>90 99 90 100<br>100 98 60 99 | 2 |

| **Standard Input** | **Standard Output** |
|---|---|
| 6<br>100 80 90 99<br>60 60 60 60<br>90 60 100 60<br>60 100 60 80<br>100 100 0 100<br>0 0 0 0 | 1 |

# C. A Little Bit!

Alireza has an integer $a$, written in the binary notation. He wants to write this number on a piece of paper. To make sure that the number $a$ fits on the piece of paper, Alireza wants to delete exactly one any digit from number $a$ in the binary record. At that a new number appears. It consists of the remaining binary digits, written in the corresponding order (possible, with leading zeroes).

Alireza wants the number he is going to write on the paper to be as large as possible. Help him find the maximum number that he can obtain after deleting exactly one binary digit and print it in the binary notation.

## Input

The single line contains integer $a$, written in the binary notation without leading zeroes. This number contains more than 1 and at most $10^5$ digits.

## Output

In the single line print the number that is written without leading zeroes in the binary notation, the answer to the problem.

## Example

| **Standard Input** | **Standard Output** |
|---|---|
| 1100 | 110 |

| **Standard Input** | **Standard Output** |
|---|---|
| 101 | 11 |

| **Standard Input** | **Standard Output** |
|---|---|
| 110010 | 11010 |

# D. Dr. Khorzoo and Researchers

Dr. Khorzoo is a mischievous researcher. He wants to know other research groups information, but researchers usually share their data only with their friends during their projects. He also knows that once a researcher reaches to a new informaiton, he shares it with all of his friends. Dr. Khorzoo wants to use this opportunity and by paying as little as possible, accesses to all information, but the problem is that Dr. Khorzoo isn't friend with anyone.

There are $n$ researchers and $i$-th researcher wants $ci$ gold in exchange for sharing his data with Dr. Khorzoo. What is the minimum amount of gold Dr. Khorzoo needs to spend to obtain all the information?

For example, there are 5 researchers and they want 2, 5, 3, 4, 8 gold for sharing information respectively. The first researcher is friend with the fourth one and the fourth researcher is friend with the fifth one. Dr. Khorzoo has to bribe the first, the second and the third researchers (10 gold) to reach all the information. (The first one has the information of the fourth and the fifth one and his request is minimum so it is better to bribe him and not the fourth or fifth one.)

## Input

The first line contains two integer numbers n and m ($1 \leq n \leq 10^5, 0 \leq m \leq 10^5$) the number of researchers and the number of pairs of friends.
The second line contains $n$ integer numbers $ci$ ($0 \leq ci \leq 10^9$) the amount of gold $i$-th researcher asks for sharing all his information with Dr. Khorzoo.
Then $m$ lines follow, each containing a pair of numbers $(xi, yi)$ which represent that researchers $xi$ and $yi$ are friends ($1 \leq xi, yi \leq n, xi \neq yi$). It is guaranteed that each pair is listed at most once.

## Output

Print one number the minimum amount of gold Dr. Khorzoo has to spend in order to reach his goal.

## Example

| **Standard Input** | **Standard Output** |
|---|---|
| 5 2<br>2 5 3 4 8<br>1 4<br>4 5 | 10 |

| **Standard Input** | **Standard Output** |
|---|---|
| 10 0<br>1 2 3 4 5 6 7 8 9 10 | 55 |

| **Standard Input** | **Standard Output** |
|---|---|
| 10 5<br>1 6 2 7 3 8 4 9 5 10<br>1 2<br>3 4<br>5 6<br>7 8<br>9 10 | 15 |

# E. Chess

Zahra and Maryam are playing chess on a huge chessboard with dimensions $(n \times n)$. Zahra has a single piece left - a queen, located at $(a_x, a_y)$, while Maryam has only the king standing at $(b_x, b_y)$. Zahra thinks that as her queen is dominating the chessboard, victory is hers.

But Maryam has made a devious plan to seize the victory for himself she needs to march her king to $(c_x, c_y)$ in order to claim the victory for himself. As Zahra is distracted by her sense of superiority, **she no longer moves any pieces around, and it is only Maryam who makes any turns**.

Maryam will win if she can move her king from $(b_x, b_y)$ to $(c_x, c_y)$ **without ever getting in check**. Remember that a king can move to any of the 8 adjacent squares. A king is in check if it is on the same row, column, or diagonal as the enemy queen.
Find whether Maryam can win or not.

## Input

The first line contains a single integer $n$ $(3 \leq n \leq 1000)$ - the dimensions of the chessboard.
The second line contains two integers $a_x$ and $a_y$ $(1 \leq a_x, q_y \leq n)$ - the coordinates of Zahra's queen.
The third line contains two integers $b_x$ and $b_y$ $(1 \leq b_x, b_y \leq n)$ - the coordinates of Maryam's king.
The fourth line contains two integers $c_x$ and $c_y$ $(1 \leq c_x, c_y \leq n)$ - the coordinates of the location that Maryam wants to get to.

## Output

Print "YES" (without quotes) if Maryam can get from $(b_x, b_y)$ to $(c_x, c_y)$ without ever getting in check, otherwise print "NO".

## Example

| **Standard Input** | **Standard Output** |
|---|---|
| 8<br>4 4<br>1 3<br>3 1 | YES |

| **Standard Input** | **Standard Output** |
|---|---|
| 8<br>4 4<br>2 3<br>1 6 | NO |

| **Standard Input** | **Standard Output** |
|---|---|
| 8<br>3 5<br>1 2<br>6 1 | NO |

# F. Rotational Transitivity

$N$ people are sitting around a circular table, numbered from 1 to $n$ in the order in which they are seated. Person number 1 has a ball initially. They pick a positive integer $k \leq n$ and pass the ball their $k$-th neighbor in the direction of increasing person-numbers, that person will again pass the ball to their $k$-th neighbor in the same direction, and so on until the person number 1 gets the ball again at which point the ball is not passed anymore.

For example, assume $n = 6$ and $k = 4$, then the ball is passed in order $1 \to 5 \to 3 \to 1$.

Consider the set of all the people that touched the ball. The game value is defined as the sum of the numbers of all the people that have touched the ball. In the example above, the game value would be $1 + 5 + 3 = 9$.
Your task is to find and print all possible values of the game for all positive integer choices of $k$. It can be proven that the ball always gets back to the first player after finitely many steps.

## Input

The only line of input consists of a single integer $n$ ($2 \leq n \leq 10^9$), which denotes the number of people around the table.

## Output

Assume $g_1, g_2, g_3, ..., g_x$ to be all possible game values. Output a single line containing $x$ space-separated integers $g_1$ through $g_x$ in increasing order.

## Example

| **Standard Input** | **Standard Output** |
|---|---|
| 6 | 1 5 9 21 |

| **Standard Input** | **Standard Output** |
|---|---|
| 16 | 1 10 28 64 136 |

| **Standard Input** | **Standard Output** |
|---|---|
| 25 | 1 55 325 |

# G. Minimum Capacity

Zahra has a little brother Mammad, he is weak in math problems. So the task of helping Sam is on Zahra's shoulder. Today Mammad's math teacher gave a problem to their class, the problem is as follow:
You have a glass with size $s$, find the size of the smallest pitcher that you could fill it completely with this glass without any water left in the glass (Every time you want to spill water in pitcher the glass is full of water, you aren't allowed to use a part of glass capacity). The size of pitcher shouldn't be in rage $[l, r]$.

## Input

The only line of input contains $l$ , $r$ and $s$ ($1 \leq l \leq r \leq 10^9, 1 \leq s \leq 10^9$). $l$, $r$ and $s$ are integers.

## Output

Print one number, the size of smallest pitcher as described in problem statement.

## Example

| **Standard Input** | **Standard Output** |
|---|---|
| 2 4 2 | 6 |

| **Standard Input** | **Standard Output** |
|---|---|
| 5 10 4 | 4 |

| **Standard Input** | **Standard Output** |
|---|---|
| 3 10 1 | 1 |

| **Standard Input** | **Standard Output** |
|---|---|
| 1 2 3 | 3 |

| **Standard Input** | **Standard Output** |
|---|---|
| 4 6 5 | 10 |

# H. Painting

You are given a grid, consisting of 2 rows and $n$ columns. Each cell of this grid should be colored either black or white.

Two cells are considered neighbours if they have a common border and share the same color. Two cells $A$ and $B$ belong to the same component if they are neighbours, or if there is a neighbour of $A$ that belongs to the same component with $B$.
For example in the following picture there are four components.

Figure 1: Valid painting for sample input 1

Let's call some painting *beautiful* if it has exactly $k$ components. Count the number of *beautiful* painting. The number can be big enough, so print the answer modulo 998244353.

## Input

The only line contains two integers $n$ and $k$ ($1 \le n \le 1000, 1 \le k \le 2n$) - the number of columns in a grid and the number of components required.

## Output

Print a single integer - the number of *beautiful* painting modulo 998244353.

## Example

| **Standard Input** | **Standard Output** |
|---|---|
| 3 4 | 12 |

| **Standard Input** | **Standard Output** |
|---|---|
| 4 1 | 2 |

| **Standard Input** | **Standard Output** |
|---|---|
| 1 2 | 2 |

# I. ZiziGulus school adventures

This year Zizigulu went to second grade. He has a strict math teacher that was a witch (he didnt know that!). One day she realizes Zizigulu uses abracadabra to solve the problems, that means he just says: Zizigulu Aasi Paasi Deraakutaa Taa-be-Taa and the problem solve. So she enchants him! She asks him to solve this problem in order to disenchant him:

There is a number system which is based on roman digits. There are digits $I, V, X, L$ which correspond to the numbers 1, 5, 10, 50 respectively. There are no other roman digits. Numbers in this system are written as a sequence of one or more digits. The value of the sequence simply defines as the sum of digits in it. For example, the number $LXX$ evaluates to 70 and the number $ILVI$ to 57. Pay attention to the difference to the traditional roman system, on this system any sequence of digits is valid, moreover, the order of digits doesn't matter, for example $IV$ means 6 not 4. One can notice that this system is ambiguous, and some numbers can be written in many different ways. Determine how many distinct integers can be represented by exactly $n$ roman digits.

## Input

The only line of the input file contains a single integer $n$ ($1 \leq n \leq 10^9$), the number of roman digits to use.

## Output

Output a single integer, the number of distinct integers which can be represented using $n$ roman digits exactly.

## Example

| **Standard Input** | **Standard Output** |
|---|---|
| 1 | 4 |

| **Standard Input** | **Standard Output** |
|---|---|
| 2 | 10 |

| **Standard Input** | **Standard Output** |
|---|---|
| 10 | 244 |

# J. Queue at the School

During the break the schoolchildren, boys and girls, formed a queue of $n$ people in the canteen. Initially the children stood in the order they entered the canteen. However, after a while the boys started feeling awkward for standing in front of the girls in the queue and they started letting the girls move forward each second.

Let's describe the process more precisely. Let's say that the positions in the queue are sequentially numbered by integers from 1 to $n$, at that the person in the position number 1 is served first. Then, if a time $x$ a boy stands on the $ith$ position and a girl stands on the $(i+1)th$ position, then at time $x+1$ the $ith$ position will have a girl and the $(i+1)th$ position will have a boy. The time is given in seconds. You've got the initial position of the children, at the initial moment of time.
Determine the way the queue is going to look after $t$ seconds.

## Input

The first line contains two integers $n$ and $t$ $(1 \leq n, t \leq 50)$, which represent the number of children in the queue and the time after which the queue will transform into the arrangement you need to find.
The next line contains string $s$, which represents the schoolchildren's initial arrangement. If the $ith$ position in the queue contains a boy, then the $ith$ character of string s equals "B", otherwise the $ith$ character equals "G".

## Output

Print string $a$, which describes the arrangement after $t$ seconds. If the $ith$ position has a boy after the needed time, then the $ith$ character of $a$ must equal "B", otherwise it must equal "G".

## Example

| **Standard Input** | **Standard Output** |
|---|---|
| 5 1<br>BGGBG | GBGGB |

| **Standard Input** | **Standard Output** |
|---|---|
| 5 2<br>BGGBG | GGBGB |

| **Standard Input** | **Standard Output** |
|---|---|
| 4 1<br>GGGB | GGGB |

# K. Translation

A group of students from IUT wants to go to a summer internship program in a strange country. In that country, people spell words reversely. For example, the spell of the word "hello" corresponds to "olleh" in their language. Adel wants to send a letter to one of the professors in that country, but he doesn't want to have a spelling problem in her letter. So he wants to check his letter with their equivalent in English to be sure there is no problem. Help him to do that

## Input

The first line contains $E$, a word in English.
The second line contains $S$, its equivalent in strange language.
The words consist of lowercase Latin letters. There is no space in the words. The words are not empty and their lengths do not exceed $10^6$ symbols.

## Output

If the word $S$ is equivalent of word $E$ in the strange language, print "YES" (without quotes), otherwise print "NO".

## Example

| **Standard Input** | **Standard Output** |
|---|---|
| code<br>edoc | YES |

| **Standard Input** | **Standard Output** |
|---|---|
| abb<br>aba | NO |

| **Standard Input** | **Standard Output** |
|---|---|
| code<br>code | NO |