Problem A: Tired Shepherd

Saleh, who has just finished his first semester, decided to return to his hometown to relax after the stress of exams. To find some peace, he agrees to take his uncle's flock of sheep out to graze. Saleh, feeling very tired, falls asleep for a few hours. Now that he has woken up, he wants to count the sheep, but since he is still very tired, he doesnt want to get up. Instead, he counts the number of legs of the sheep. Since Saleh is still too tired and cannot use his brain properly, he asks for your help. Given the number of legs of the sheep, determine how many sheep there are.

Input

The only line of the input consists of n ($0 \leq n \leq 10^9$), which represents the total number of legs of the sheep. It is guaranteed that each sheep has exactly 4 legs, and the given number is correct.

Output

In the only line of output, print the number of sheep.

Example

Standard Input	Standard Output
4	1

Standard Input	Standard Output
12	3

Problem B: Mahdis' Birthday

For Mahdis' birthday, Zahra baked a circular cake. To decorate, she placed n cherries at equal distances around the cake, numbered from 1 to n in a clockwise direction. During the birthday, Mahdis makes two distinct cuts on the cake. In each cut, she selects two different cherries and then cuts along the line connecting the two selected cherries. Given the cherries Mahdis selects for her two cuts, calculate the number of pieces the cake is divided into after both cuts.

Input

The first line contains an integer n ($3 \leq n \leq 100$), the number of cherries on the cake.

The second line contains two integers a and b ($1 \leq a, b \leq n$), which represent the cherries selected for the first cut.

The third line contains two integers c and d ($1 \leq c, d \leq n$), which represent the cherries selected for the second cut.

It is guaranteed that the two cherries selected for each cut are different and the two cuts are different from each other.

Output

In the only line of output, print the number of pieces the cake is divided into after both cuts.

Standard Input	Standard Output
4 1 3 2 4	4

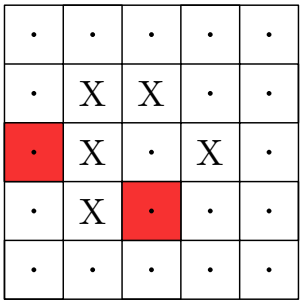
Standard Input	Standard Output
4 1 3 2 3	3

Problem C: Barareh

Reza, who is tired of the city of Barareh, has decided to build a new city. He wants this city to be in the form of a grid of houses, where each house is adjacent to its neighboring cells horizontally, vertically, and diagonally (each house can have at most 8 neighbors). Initially, each house can either have its light on or off, and the state of each house is represented as:

- Off: Represented by ”.”
- On: Represented by ”X”

Saleh, a mysterious and mischievous resident of Barareh, wants to disturb the residents of the new city. He plans to do so by marking each off-house that is exactly adjacent to three on-houses. Then, at night, he will scare the residents of these marked houses with his terrifying voice. For example, in the following grid, the red-colored houses would be marked.



Help brave Reza design the initial grid of the city and determine the light statuses such that Saleh marks exactly n houses. Note that, due to a shortage of materials, the grid should have at most 50 rows and 50 columns.

Input

The input consists of a single integer n ($1 \leq n \leq 500$), which represents the number of houses that Saleh should mark.

Output

In the first line of output, print two integers: the number of rows and columns of the grid, respectively. Each number should be at most 50.

In the following lines, print a rectangular grid made of ”X” and ”.” such that the conditions of the problem are satisfied. If multiple grids can meet the requirements, any valid solution is acceptable.

Standard Input	Standard Output
2	5 5 ..... .XX.. .X.X. .X... .....

Standard Input	Standard Output
6	6 8 .... .XXX..X. ..X..X.. ..X..X.. ..X...X. ....

Standard Input	Standard Output
1	2 4 XXXX XXXX .XXX

Problem D: File Transfer

In the Sardade Data Center, there are n servers, numbered from 1 to n, that store users' files. Each file is stored on multiple servers so that if one server fails, the data can still be accessed from the others, ensuring high availability of users' files at all times.

You, as the infrastructure manager and system designer, are responsible for designing a data structure that meets the system's needs and responds appropriately to incoming requests. Throughout the day, q requests arrive sequentially at the data center, and each request is of one of two types:

- "add x": A new file of size x megabytes is added to the end of the queue of files on server 1.
- "sync": Simultaneously, for each $1 \leq i < n$, the oldest file in the queue of server i that is not already in the queue of server $(i+1)$ (if such a file exists) is copied to the end of the queue of server $(i+1)$.

All files are considered distinct, even if they have the same size. The goal is to calculate the total size of all the files in the queues of the servers after each request is processed. Note that, at the beginning, there are no files in the servers' queues, and once a file is added, it will never be deleted.

Input

The first line of input contains two integers n and q ($1 \leq n, q \leq 10^6$), representing the number of servers and the number of incoming requests, respectively.

The next q lines contain one of the two types of requests, formatted as described.

the size of each file is a natural number between 1 and 10^9 (including 1 and 10^9).

Output

Print q lines, where the i-th line should contain the total size of all files in the queues of the servers after the i-th request is processed.

Example

Standard Input	Standard Output
3 7 add 1 add 2 sync add 1 add 2 sync sync	1 3 4 5 7 10 13

Problem E: The Best Plumber

Mahdi, the best plumber, has several water wells connected to outputs marked with "X". He wants to connect these outputs to a main pipeline using two types of connectors:

- Type "A": Takes two outputs and produces a new output equal to the sum of their water flow.
- Type "B": Takes two outputs and produces a new output equal to the maximum water flow of the two.

For example, if "Y" and "Z" are two outputs, two pipe systems "AYZ" and "BYZ" can be created using these connectors.

You are given a pipeline system represented by a string containing the characters "X", "A", and "B". The "X"s represent the outputs, and the number of "X"s in the string is n. There are n wells in the system, each with a specific water capacity provided as input. Your task is to connect each well to exactly one "X" (output) in order to maximize the water output of the pipeline system.

Input

The first line contains an integer n ($1 \leq n \leq 2 \times 10^5$), representing the number of water wells.

The second line contains a string made up of the characters "X", "A", and "B", which represents a valid pipeline system. The number of "X"s in this string is equal to n.

The third line contains n integers $A_1, A_2, \ldots, A_n$ ($0 \leq A_i \leq 10^9$), representing the capacities of the wells.

Output

In the only line of output, print the maximum water output possible for the given pipeline system.

Standard Input	Standard Output
3 BXBXX 8 2 3	8

Standard Input	Standard Output
5 AAXXAXAXX 1 1 10 2 8	22

Standard Input	Standard Output
3 AXBXX 8 2 3	11

Problem F: Zahra's Tasks

Zahra has taken on the responsibility of overseeing the renovation of the Computer Engineering department due to her great interest in beautifying the department. She has n volunteers, and each volunteer will be assigned at most one task. Completing each task makes Zahra happy, but if she does the task herself, she will be even happier.

Since Zahra cannot perform more than m tasks herself, she needs to decide wisely which tasks to do herself. If a volunteer completes task i, Zahra gains b_i happiness units, but if Zahra herself completes task i, she gains a_i happiness units.

Your task is to find the maximum happiness Zahra can achieve.

Input

The first line contains two integers n and m, representing the number of tasks and the maximum number of tasks Zahra can do herself, respectively.

For each $1 \leq i \leq n$, the $(i+1)$-th input line contains two integers, a_i and b_i: the happiness Zahra gains if she does the task herself, and the happiness she gains if the volunteer does it, respectively.

Output

Print a single integer: the maximum happiness Zahra can achieve.

Standard Input	Standard Output
4 1 6 3 6 4 101 51 6 2	110

Standard Input	Standard Output
5 2 6 3 101 51 6 4 6 2 101 4	211

Standard Input	Standard Output
4 5 321 1 654 2 987 3 1000 4	2962

Problem G: Wrestling Tournament

A wrestling tournament is to be held with n participants, labeled from 1 to n. In this tournament, each pair of participants plays exactly one match (in total, $\frac{n(n-1)}{2}$ matches will be played), and each participant can play at most one match per day. The participants believe that if they play against their opponents in a specific order, they will have a higher chance of winning. Specifically, participant i prefers to play against others in the following order:

$$P_{i,1}, P_{i,2}, \ldots, P_{i,n-2}, P_{i,n-1}$$

The organizer, who wants to satisfy all participants, asks you to determine if it is possible to schedule the matches in such a way that all participants play in their preferred order. If it is possible, also determine the minimum number of days required to complete the tournament.

Input

The first line contains an integer n ($3 \leq n \leq 1000$), representing the number of participants.

For each $1 \leq i \leq n$, the $(i+1)$-th line contains a permutation of the $n-1$ other participants, representing the preferred order of matches for participant i.

Output

Print a single integer: the minimum number of days required to hold the tournament, or -1 if it is impossible to schedule the matches in such a way that all participants are satisfied.

Standard Input	Standard Output
3 2 3 1 3 1 2	3

Standard Input	Standard Output
4 4 2 3 3 4 1 2 4 1 1 2 3	4

Standard Input	Standard Output
3 3 2 1 3 2 1	-1

Problem H: Nightmare

Saleh falls asleep after a heavy dinner. In his dream, he gets trapped in a nightmare with a demon, and the only way to escape is to answer the demon's question. In this nightmare, Saleh is the king of a neighborhood with n houses. The houses are labeled from 1 to n, from left to right. In house i, there are a_i soldiers. The demon gives Saleh a positive integer S and defines a function $f(l, r)$ for each pair (l, r), where $1 \leq l \leq r \leq n$. The function $f(l, r)$ counts the number of subsequences of the sequence $a_l, a_{l+1}, \ldots, a_r$ whose sum equals S. Note that a subsequence can be derived from the sequence by deleting some or no elements without changing the order of the remaining elements.

The demon asks Saleh to calculate the sum of all $f(l, r)$ values for all valid pairs (l, r) and give its remainder modulo 998244353. Since Saleh cannot solve this problem, help him calculate the answer so he can escape his nightmare.

Input

The first line contains two integers n and S $(1 \leq n, S \leq 3000)$.

The second line contains n integers representing the sequence $a_1, a_2, ..., a_n$ $(1 \leq a_i \leq 3000)$.

Output

In the only line of output, print the answer to the demon's question.

Standard Input	Standard Output
3 6 3 3 6	5

Standard Input	Standard Output
5 3 4 5 6 7 8	0

Standard Input	Standard Output
10 10 3 2 5 2 3 5 2 1 8 1	273

Problem I: Inheritance

A wealthy merchant named Sina owns a row of n consecutive houses, numbered from 1 to n. The value of house i is a_i. Sina wants to partition this row into 4 consecutive sections and give each of his 4 children one section as an inheritance. He wants to do this fairly. To help him, you need to determine the smallest possible difference between the most valuable section inherited by a child and the least valuable section inherited by another. Help Sina write his will.

Input

The first line contains an integer n ($4 \leq n \leq 2 \times 10^5$), representing the number of houses.

The second line contains n integers, representing the values of the houses: $a_1, a_2, ..., a_n$ ($1 \leq a_i \leq 10^9$).

Output

In the only line of output, print the smallest possible difference in the inheritance values between the child who inherits the most valuable section and the child who inherits the least valuable section.

Standard Input	Standard Output
5 6 4 8 2 4	4

Standard Input	Standard Output
10 20 142 168 66 12 94 46 50 104 128	72

Standard Input	Standard Output
7 3 8 2 1000000000 9 2 1	999999997

Problem J: Greedy Table

Ali has a $2 \times n$ table, where each row is a permutation of numbers from 1 to n. He wants to delete some of the cells in the table such that two conditions are satisfied:

- At least k distinct numbers remain in the table.
- At most one number remains in each column.

Additionally, Ali wants to maximize the sum of the remaining numbers in the table. Help him find this maximum sum.

Input

The first line contains two integers n and k ($1 \leq k \leq n \leq 5000$).

The second line contains n integers representing the first row of the table.

The third line contains n integers representing the second row of the table.

Output

In the only line of output, print the maximum possible sum of the remaining numbers in the table.

Standard Input	Standard Output
2 2 1 2 2 1	3

Standard Input	Standard Output
2 1 1 2 2 1	4

Standard Input	Standard Output
4 2 1 2 3 4 4 3 2 1	14