Problem A. $3x + 1$

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 second
Memory limit:	64 mbytes
Feedback:	

«3x+1» problem is well known among mathematicians, and even any schoolboy can understand it. Suppose, that a natural number is given. If it is even, divide it by 2. If it is odd, multiply it by 3 and add 1. Then do the same with the result. And so on...

For example, if 5 is given, we get a chain:

$5(*3+1)16(/2)8(/2)4(/2)2(/2)1(*3+1)4$

and the chain has a loop (4-2-1).

So, if we take any natural number as a head, at last we get 1. This is proven for all natural numbers not exceeding 10^{19}.

You are to count how many natural numbers, being used as a head for the chain, will give the chain of length N numbers exactly. The trailing 1 is not counted.

Chain 5-16-8-4-2-1, mentioned above, has length of 5.

Also, the 1-4-2-1 loop must not be taken in count. For example, consider 1-4-2-1 an incorrect chain of length 3.

Input

The only line contains natural number N ($1 \le N \le 62$).

Output

The only line should contain one natural number — the answer to the problem.

Example

standard input	standard output
1	1
2	1
5	2

Problem B. Omicronian Domino

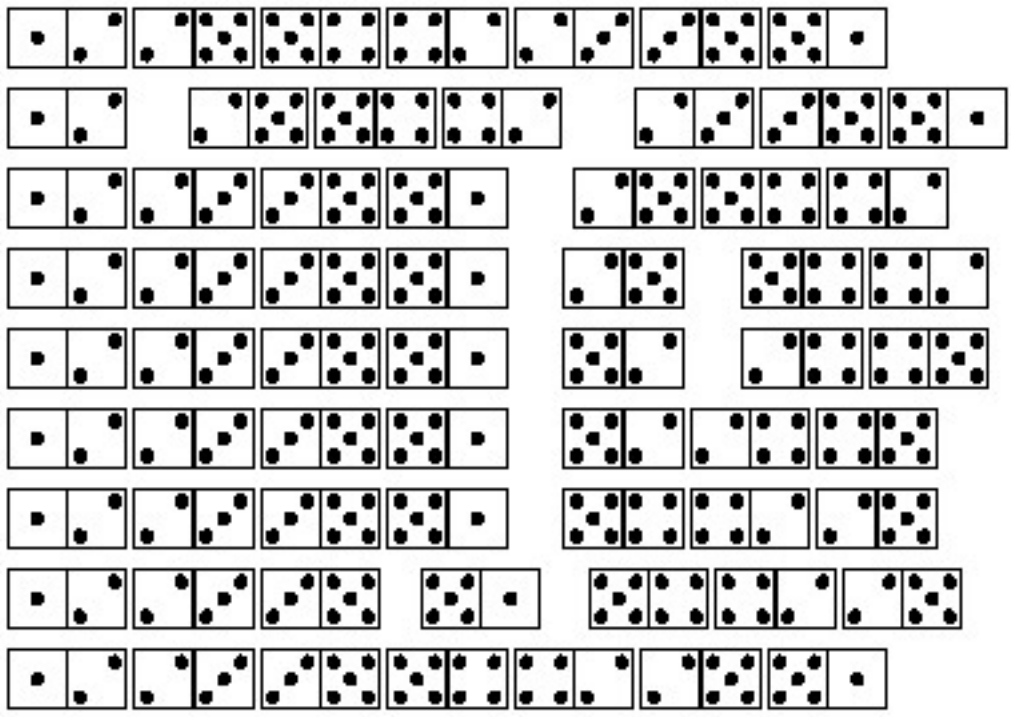
Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 second
Memory limit:	64 mbytes
Feedback:	

On the planet Omicron Persei 8, Domino is the second popular entertainment after Earth television broadcasts. Omicronian Domino is the game in which a chain of bones is built. Each bone has two halves. Each half has a non-negative integer number of points written on it (the number of points does not exceed 10^5). The bones of the chain touch their halves only if the contacting halves have equal number of points. There are bones with all possible point combinations in Omicronian domino, and each bone is unique.

Lrrr, the leader of Omicron Persei 8, lost his last domino game. This has not happened for a long time, because Lrrr usually ate his defeater. That is why Lrrr remains the most skillful dominoer on his planet. Though, he wishes to restore the chain of bones of that last game. He took the required bones, and immediately built a chain of length n ($1 \le n \le 100000$). Unfortunately, the chain turned out to differ from that last game. Lrrr does not want to rebuild the chain, and he decides to make several transformations with the chain. Each transformation consists of actions:

1. Bones with numbers l and r are taken such that the left half of l-th and right half of r-th have equal points ($0 \le l \le r \le n$). The subchain from l to r is cut from the chain.
2. A shift d is taken ($0 \le d \le r - 1$). d bones are extracted from the left side of subchain. Then the left and right parts of the subchain are rotated and glued again.
3. The result subchain is rotated if needed.
4. The subchain is inserted into the chain to the position p ($0 \le p \le n - (r - l + 1)$), such that the chain stays correct.

The example of a transformation:



Picture 1. Figures.

Lrrr wants to make not more than n transformations. Otherwise, it is better to rebuild the chain from scratch.

Input

First line contains number n. Second line contains $n+1$ numbers separated by spaces - the points of the bones of the chain Lrrr wants to get. Third line contains $n+1$ - the points of the bones of the chain that Lrrr has just built.

Output

In the first line output "`No`" if it is impossible to get the desired chain using at most n transformations. Otherwise output "`Yes`" in the first line. In each of next lines output the description of the current transformation: numbers l, r, d, then letter "`R`" or letter "`N`", then number p. Separate all entities with a space. Letter "`R`" means that action 3 of the transformation should be performed. "`N`" otherwise. The transformation from the figure is described as "`1 3 1 R 3`".

Example

standard input	standard output
1 1 2 1 2	Yes
5 18 1 4 26 0 18 18 0 26 4 1 18	Yes 0 4 0 N 0

Problem C. Osipovsky Cup

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	64 mbytes
Feedback:	

Before the start of the International Open Contest «Osipovsky Cup», coach Dmitry decided to choose a training place for his team. He does not want to offend anybody — he wants to choose a place equidistant to homes of all 3 teammates. Dmitry is a very busy man, so he asks you to help him.

Input

The input contains 6 integer numbers $(X_1, Y_1, X_2, Y_2, X_3, Y_3)$ - the coordinates of homes of 3 teammates. All coordinates are different. Their absolute values do not exceed 1000.

Output

If the place exists, output it's coordinates, separated by spaces. If the place does not exist, output "`NO`". The coordinates' precision should be 5 digits after decimal point.

Example

standard input	standard output
-2 2 2 -2 1 5	1.5 1.5

Problem D. RoboFest

Input file:	`standard input`
Output file:	`standard output`
Time limit:	3 second
Memory limit:	256 mbytes
Feedback:	

You take part in robotechnical contest «RoboFest». Your robot must pass all intermediate checkpoints and return to start. You have the map of the area, and you want to find optimal route for your robot. The map is a matrix with $N \times M$ cells. Robot can move from cell to another cell if the cells have common side. Each cell has an integer number - the time robot will take to arrive to this cell (to get to this cell from a neighbor one). Also you have the list of coordinates of intermediate checkpoints and of the start. You can pass checkpoint in any order.

Input

First line contains integer numbers N and M ($1 \le N, M \le 40$). Next N lines contain M integer numbers each, separated by spaces - the time values, required to pass the corresponding cells. Next line contains K — the quantity of intermediate checkpoints. ($1 \le K \le 15$). Next K lines contain two integer numbers each (X_i and Y_i), separated by spaces — the coordinates of corresponding checkpoints. $0 \le X_i < N, 0 \le Y_i < M$. Next line contains two integer numbers (X and Y), separated by spaces — the coordinates of the start (and the end). $0 \le X < N, 0 \le Y < M$. X-coordinates are zero-indexed columns, and numerated from left to right. Y-coordinates are zero-indexed rows and numerated from up to down.

Output

Output the minimal time robot will take to finish the race.

Example

standard input	standard output
5 1 24 83 41 48 41 1 2 0 3 0	89

Problem E. Computer Vision

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	64 mbytes
Feedback:	

Biologist Alexander woke up early in the morning and came up to his microscope to check out how many bacteries had been born. He was shocked, there were too many bacteries, so that he could not count them.

Alexander sees a rectangle with $N \times M$ cells. Each cell has number 1 if a bactery part is detected, and number 0 if no bactery parts in the cell. One bactery is an area of several interconnected cells, where that bactery is detected. Two cells are interconnected if they have a common side.

Alexander made a photo of what he saw, and sent to us via e-mail. Please, write a program, that counts bacteries on the photo.

Input

First line contains two natural numbers N and M ($1 \le N, M \le 1000$). Next N lines contain M digits each, NOT separated by spaces. The digits are 0 or 1.

Output

Output the quantity of bacteries on the photo.

Example

standard input	standard output
4 5 00101 11011 01000 10111	5

Problem F. Casino

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 second
Memory limit:	256 mbytes
Feedback:	

Michael Corleone decided to open a new casino in Las-Vegas, Nevada. His personal favorite game is a special version of the roulette game, there five players use the roulette wheel.

There are N slots on the table, each slot has the card with a number from 1 to N. All cards have different numbers. Initially the cards are ordered, that is, the 1st card is in the 1st slot, the 2nd card is in the 2nd slot and etc. In other words, initially every card is in the right position — that is, the number of the card and the number of the slot match.

The game consists of M moves made by players. Let's call players A, B, C, D and E. Here is how they play:

Player A makes the first move. He takes the last card out of the last Nth slot. After that he moves all the cards in slots $[1 \dots (N-1)]$ one slot right. That is, the 1st card moves to the 2nd slot, the 2nd card moves to the 3rd slot and etc. After that the 1st slot becomes empty. Player A puts the last card in the 1st slot.

Player B makes the second move. He takes the last card from the last N-th slot. After that he moves all the cards in slots $[(N - N/2) \dots (N-1)]$ one slot right. After that he puts the card that he has on his hands in empty slot. In other words, he does the same thing as the first player, but for the range $[(N - N/2) \dots N]$.

Player C makes the third move. He takes the card from the slot with number $N/4$. After that he moves all the cards in slots $[1 \dots (N/4-1)]$ one slot right. After that he puts the card that he has on his hands in empty slot.

Played D makes the fourth move. He takes the card from the last N-th slot. After that he moves all the cards in slots $[(N \leq N/6) \dots (N-1)]$ one slot right. After that he puts the card that he has on his hands in empty slot. In other words, he does the same thing as the first player, but for the range $[(N \leq N/6) \dots N)]$.

Player E makes the fifth move. He takes the card from the slot with number $N/8$. After that he moves all the cards in slots $[1 \dots (N/8-1)]$ one slot right. After that he puts the card that he has on his hands in empty slot.

After that the game repeats, until M moves are made. That is, if there are 7 moves, then the sequence of player moves is "`ABCDEAB`", that is players A and B make two moves, but other players make just one move.

Now, you have decided to make a bet on the card positions after M moves. According to casino rules, if you make a bet in the beginning of the game on card positions after M moves, you will get L dollars for that, where L is the number of cards in the right position after M moves.

For example, suppose there are 20 slots on the table and you made a bet on three moves. Players A, B and C make a move each. After that suppose only three cards are in the right position — 3, 10 and 17. That means you will get 3 dollars from the casino, if you make such a bet. You would like to know in advance how much you can win.

Input

The input consists of two numbers N and M ($40 \leq N \leq 126, 1 \leq M < 10^9$) separated by spaces.

Output

The output should contain a single number L, the number of dollars the casino will pay you after M

moves.

Example

standard input	standard output
48 1	0
48 10	2

Problem G. Campus

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	64 mbytes
Feedback:	

Student Andrey lives in campus, and sometimes it happens that he is out of food. So, one of this hungry days he decided to visit his friends to ask them for food.

Andrey's campus has the following structure: all rooms are numerated by integers. Three rightmost digits of the integer represent the number of the room on the floor, the remaining left digits - the floor.

For example, 6007 means that the room is located on the 6th floor, and has number 7. Number 16024 means that the room is located on the 16th floor, and has number 24.

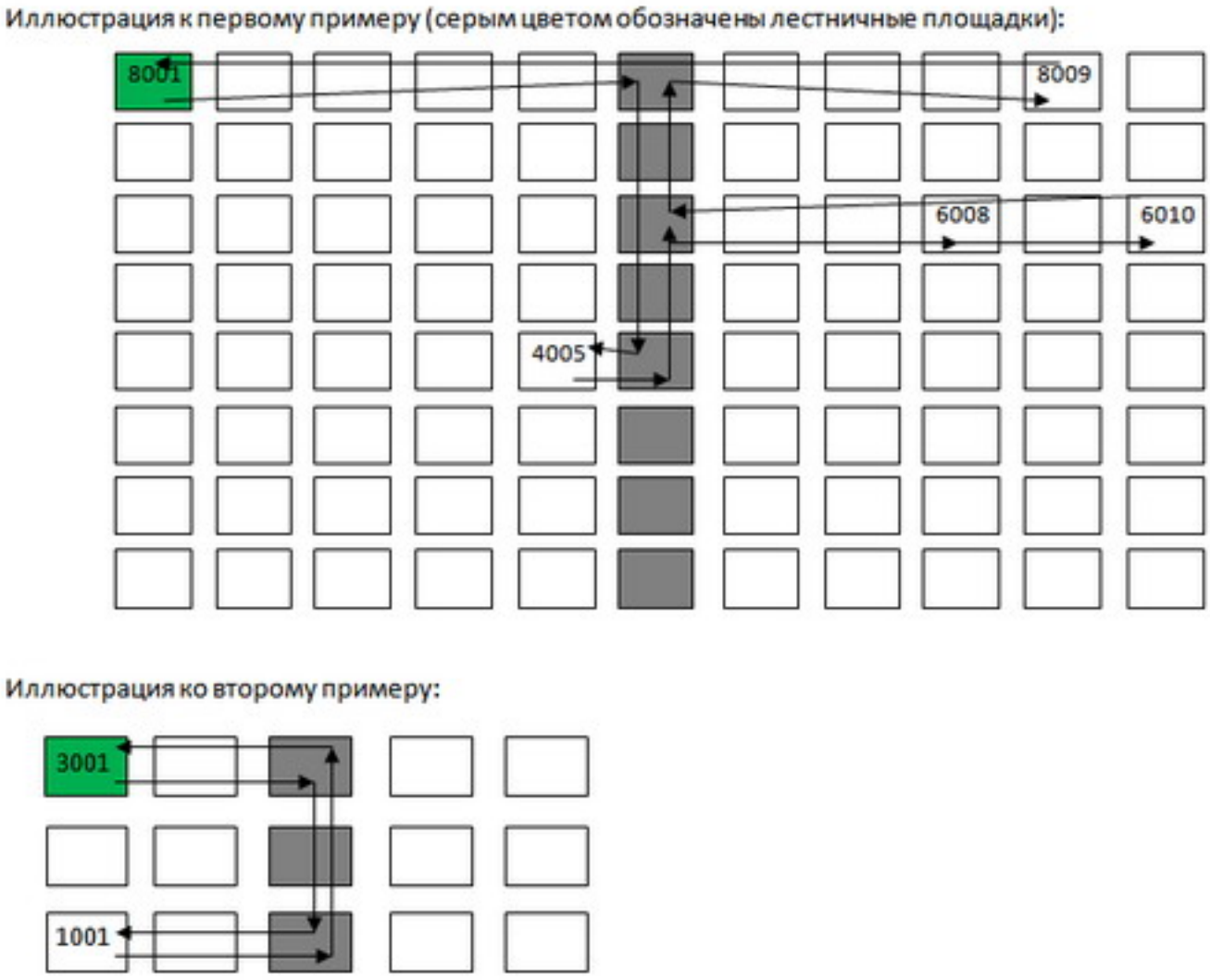
Rooms, that have similar numbers, but on different floors, are actually located one over another.

The campus has a staircase. Staircase is located between p-th and $p + 1$-th rooms (p is the number of room on the floor). Andrey is very hungry, so he wants to spend minimal energy in his travel.

Move between neighbor rooms of the same floor takes 1 point of energy. Move between floors takes k point of energy (it depends on Andrey's mood). When Andrey enters staircase, he does not lose any point of energy, but when he leaves it, he loses 1 point.

Your task is to help Andrey choose optimal path to visit his friends, so that he loses minimal points of energy. Of course, Andrey must finally return to his room in order to eat taken food.

Look at examples to understand the problem better.



Picture 2. Figures.

Input

First line contains four numbers, separated with spaces: g, n, k, p ($1 \le n < 10^6, 1 \le k < 10^3$), where g is the number of room where Andrey lives. Next line contains n numbers, separated by spaces — numbers of rooms where Andrey friends live. All numbers are given in the format mentioned in the statement. It is guaranteed that the campus has less than 100 floors and each floor has less than 1000 rooms. Floors and rooms are numerated from 1. Movement between floors is not counted as movement between rooms.

Output

Output should contain the only number — minimal points of energy Andrey has to spend in his travel.

Example

standard input	standard output
8001 4 2 5 8009 4005 6008 6010	42
3001 1 1 2 1001	10

Problem H. Coffee

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	64 mbytes
Feedback:	

Developer Vasiliy is fond of coffee. Folks say that Vasiliy transforms coffee into code. Vasiliy knows that if he drinks a cup of coffee before some task, he will spend 20% less time on that task (in comparison to coffee-less work).

You must define, in what minimal quantity of workdays (workday lasts 8 hours) Vasiliy can finish all his tasks, considering that he is able to make exactly K cups of coffee.

Vasiliy already knows how long it will take to do every task. The tasks must not be done in parallel. If the remainder of the workday cannot fit a task, Vasiliy may only start it on the next day.

Pay attention, that his magical coffee speeds up only one task. Vasiliy must not drink more than one cup of coffee before a single task.

Input

First line contains three integers N, K, L — number of tasks, number of cups of coffee and time required to make a cup of coffee ($1 \le N \le 1000, 0 \le K \le 1000, 1 \le L \le 100$). Next line contains N integers, separated by spaces — the time required to do each task. Time values are given in minutes (not less than 1, and not more than 480 minutes).

Output

Output one integer — minimal quantity of workdays, that are required to finish all Vasiliy's tasks.

Example

standard input	standard output
5 1 10 10 10 10 100 360	1
5 2 5 200 281 240 240 480	3

Problem I. Fibonacci

Input file:	`standard input`
Output file:	`standard output`
Time limit:	0.5 second
Memory limit:	64 mbytes
Feedback:	

Find the last digit of k-th Fibonacci number.

$$\begin{cases} f_0 = 1 \\ f_1 = 1 \\ f_i = f_{i-1} + f_{i-2} \ \forall i > 1 \end{cases}$$

Picture 3. Figures.

Input

First line contains n — quantity of cases. $1 \le n \le 1000$. Next n lines contain one number each — k ($0 \le k \le 9223372036854775807$).

Output

For each line of input, output only one number — the answer to the problem.

Example

standard input	standard output
6 0 1 2 37 135 23	1 1 2 9 7 8

Problem J. ACM Fail

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 second
Memory limit:	64 mbytes
Feedback:	

After ACM (Athletic Club de Milano) lost the game against ICPC (Internazionale Champion Phootball Club), the chiefs of ACM decided to reduce the budget of the club by the amount, equal to profits from sponsors, lost during the season.

How to calculate that amount? Mister S and mister A found a brilliant solution: accumulate the amounts, that the team lost in every game.

ACM has two types of sponsorship contracts:

- Team gets M_i million euro for K_i consequent wins.
- Team gets M_i million euro for K_i consequent games without any lose.

If a successful sequence continues, payments are continued either — after every game of the sequence.

The amount of money, lost in game, is calculated as the difference between the amount the club actually got at the end of the season, and the amount it would get if it wins the game (without chahging any other result).

Input

First line contains integer number C ($1 \le C \le 10^4$) - quantity of sponsorship contracts. Next C lines contain three integer numbers each, separated by spaces — contract type (1 or 2), K and M ($1 \le K_i \le 10^5, 1 \le M_i \le 10^3$). Next line contains G ($1 \le G \le 10^5$) — the quantity of games ACM participated in. Next line contains a string of G latin letters, representing the sequence of game results. W means win, D means draw, L means lose.

Output

Output the only number — the amount of money Mister S and Mister A will pick up from the club.

Example

standard input	standard output
2 1 5 1 2 5 1 10 WWWWLWWWWW	10000000
1 2 1 100 1 L	100000000

Problem K. Sixth sense

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 second
Memory limit:	256 mbytes
Feedback:	

A string is sent down to you from Heaven. Intuition says that it contains palindromes as substrings. Subconscious whispers that you must find the longest intersection of that palindromes. Conscience is sure that you dont need such intersections when one palindrome is entirely contained inside another.

Justice reminds you that palindrome is a string, that is read equally from left to right and from right to left. But Pride states that it is enough to find the longest intersection.

Input

Input contains a string of latin letters of maximal length 1000000.

Output

Output the length of the longest intersection of substrings-palindromes. If there are no such intersections, output 0.

Example

standard input	standard output
aaaa	2
ambiguous	0

Problem L. Who calls the Crystal Maiden?

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 second
Memory limit:	256 mebibytes
Feedback:	

In a popular game Zota 2, one of most nice heroes is «Crystal Maiden». She is a girl, specialized on controlling Ice and Cold. Particularly, two of her skills are «Frostbite» (freezes one enemy, denies movement, and causes damage) and «Crystal Nova» (slows and damages all enemies at some area).

You are to help the hero to use her skills properly and defeat neutral creeps, standing in front of her in a row.

When she uses Frostbite, closest alive creep gets F_D points of damage, but Crystal Maiden spends F_M points of mana.

When she uses Crystal Nova, closest alive creep and the next creep after him (if alive) get C_D points of damage each, but C_M points of mana are spent. If that next creep is already dead (for example, due to early Crystal Nova hits), or the closest alive creep is the last one, then only the closest alive creep is damaged.

Initially Crystal Maiden has M points of mana and there are N creeps in front of her. You are to define, how many creeps the hero can defeat.

Input

First line of input contains two integers — the quantity of creeps N ($1 \le N \le 300$) and initial hero mana ($1 \le M \le 300$). Next line contains 4 integers: F_D, F_M, C_D, C_M ($1 \le F_D, F_M, C_D, C_M \le 300$). Next line contains N integers H_i, separated by spaces — the quantity of health points of the corresponding creep. The order of numbers H_i is the order of the creeps in row. If after Crystal Maiden's spellcast, a creep has non-positive quantity of remaining health points, the creep dies, and the hero can attack the next creep.

Output

Output the only number — maximal possible quantity of defeated creeps.

Example

standard input	standard output
2 2 1 1 1 1 2 1	2
2 3 1 1 1 2 3 2	1
2 3 1 1 3 3 3 2	2