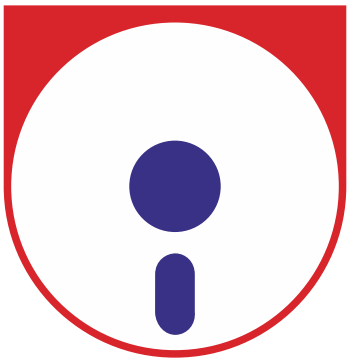


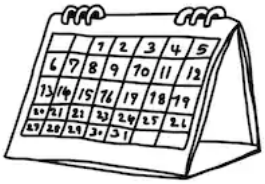
Croatian Open Competition in Informatics

Round 6, March 7th 2020

Tasks

Task	Time limit	Memory limit	Score
Datum	1 second	512 MiB	50
Birmingham	1 second	512 MiB	70
Konstrukcija	1 sekunda	512 MiB	110
Skandi	10 sekundi	512 MiB	110
Trener	2 seconds	512 MiB	110
Total			450

Task Datum



The exam season at University of Zagreb is over and students are doing what they love the most – sleeping. In the rare moments of wakefulness, they usually scroll over their Instagram feed. Fabijan is one of those students.

Recently, he read the following caption – the date `02.02.2020.` is the first palindromic date in the last 909 years.

He realized the caption was incorrect and this made him wonder about palindromic dates so he asked himself for each of the N dates what is the first palindromic date that comes after that date. The date is considered *palindromic* if , when disregarding the dots, it is the same when read from left-to-right as if it was read from right-to-left. For example, dates `02.02.2020.` and `12.10.0121.` are palindromic, while `03.02.2020.` and `12.07.1993.` are not.

Note: In this task it is important to take account of leap years which have 29 days in February. For the purposes of this task, we consider a year to be a leap year if it is divisible by 4. Otherwise, months have 31, 28, 31, 30, 31, 30, 31, 31, 30, 31, 30 and 31 days in order.

Input

The first line contains an integer N ($1 \leq N \leq 10\,000$) from the task description.

The next N lines contain a valid date in format `DD.MM.YYYY.`

Output

For each date from the input, you should output the first palindromic date that comes strictly after it. That date should be printed in the `DD.MM.YYYY.` and we guarantee that the solution exists in this format.

Scoring

In the test cases worth a total of 10 points, each date in the output will have the same month and year as the corresponding date from the input. Also, N will be equal to 10.

In the test cases worth an additional 10 points, each date in the output will have the same year as the corresponding date from the input. Also, N will be equal to 10.

In the test cases worth an additional 20 points, $N = 10$ will hold.

Examples

input

```
1
02.02.2020.
```

output

```
12.02.2021.
```

input

```
2
01.01.1000.
31.12.2026.
```

output

```
10.01.1001.
03.02.2030.
```

input

```
3
01.01.0100.
05.07.0321.
05.05.0505.
```

output

```
10.10.0101.
10.01.1001.
10.01.1001.
```

Clarification of the first example: Although the given date is palindromic, Fabijan is interested in the first date that strictly comes after it. That date is `12.02.2021.`

Task Birmingham

It is well known that all horse races in Birmingham are fixed days in advance. It is a little less known that certain people that fix these races (and thereby know the winner) start spreading that information around the city the next day.

The first day after the meeting, all people that know the information about the winner start sharing that information with all people that live at most K steps away from their house.

The second day after the meeting, all people that know the information about the winner start sharing that information with all people that live at most $2 \cdot K$ steps away from their house.

In general, X-th day after the meeting, all people that know the information about the winner start sharing that information with all people that live at most $X \cdot K$ steps away from their house.

We can represent Birmingham as a graph where vertices represent the houses and edges represent bidirectional roads which connect these houses. Houses are indexed with increasing integers from 1 to N and we say that a person can travel each road in a single step. It is possible to reach each house from each other house by traversing a sequence of roads.

Your task is to determine, for each house, on which day will the information about the race winner reach it.

Input

The first line contains four integers N, M, Q and K ($1 \leq N, Q, K \leq 100\,000, Q \leq N, 1 \leq M \leq 200\,000$), the number of houses in Birmingham, the number of roads in Birmingham, the number of people that were present on the secret meeting and the number K from task description.

The next line contains Q integers where the i-th integer represents the index of a house where the i-th person from the secret meeting lives in.

The i-th of the next M lines contains integers A_i and B_i ($1 \leq A_i, B_i \leq N, A_i \neq B_i$), which denote that the i-th road connects houses with indices A_i and B_i.

Output

Output N numbers where the i-th number represents on which day after the meeting will the person living in house with index i find out who will win the race. If the person living in that house was present on the secret meeting, output 0 instead.

Scoring

In the test cases worth a total of 20 points, it will hold $K = 1$, $1 \leq N, Q \leq 100$ and $1 \leq M \leq 200$.
In the test cases worth an additional 15 points, it will hold $1 \leq N, Q \leq 100$ and $1 \leq M \leq 200$.

Examples

input

```
6 8 1 1
6
1 3
1 5
1 6
2 5
2 6
3 4
3 5
5 6
```

output

```
1 1 2 2 1 0
```

input

```
6 8 2 1
6 4
1 3
1 5
1 6
2 5
2 6
3 4
3 5
5 6
```

output

```
1 1 1 0 1 0
```

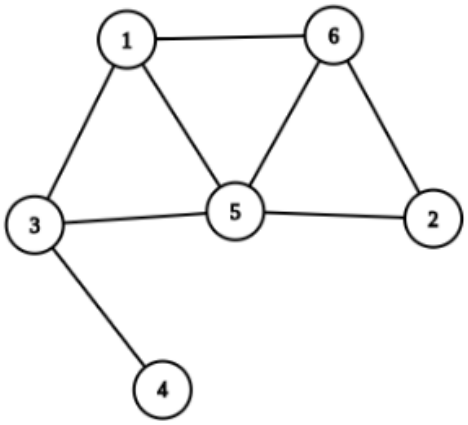
input

```
6 8 1 2
6
1 3
1 5
1 6
2 5
2 6
3 4
3 5
5 6
```

output

```
1 1 1 2 1 0
```

Clarification of the third example: The figure represents a graph from the third example. Since houses 1, 2, 3 and 5 are at most two steps away from house 6, people living in them will find out about the winner the day after the meeting. Person living in house 4 will find out about the winner two days after the meeting.



Task Konstrukcija

Let G be a directed acyclic graph. If $c_1, c_2, c_3, \dots c_n$ are distinct vertices of G such that there is a path from c_1 to c_2, there is a path from c_2 to c_3, ...and there is a path from c_{n-1} to c_n, we say that array $C = (c_1, c_2, c_3, \dots c_n)$ is an ordered array starting at c_1 and ending at c_n. Note that between neighbouring elements c_i and c_{i+1} of ordered array C it isn't necessary to exist a direct edge, it is enough for the path to exist from c_i to c_{i+1}.

For this definition of an ordered array $C = (c_1, c_2, c_3, \dots c_n)$, we define its length $len(C) = n$. Therefore, the length of an ordered array is equal to the number of vertices it holds. Note that the ordered array can have a length of 1 when holding a single vertex which represents both its beginning and its end.

Also, for an ordered array $C = (c_1, c_2, c_3, \dots c_n)$ we can define its sign as $sgn(C) = (-1)^{len(C)+1}$. For vertices x and y of G, let's denote with $S_{x,y}$ a set of all ordered arrays that start in x and end in y.

Finally, we define the tension between nodes x and y as $tns(x, y) = \sum_{C \in S_{x,y}} sgn(C)$. Therefore, the tension between nodes x and y equals the sum of signs of all ordered arrays that start in x and end in y.

An integer K is given. Your task is to construct a directed acyclic graph with **at most 1000** vertices and **at most 1000** edges for which $tns(1, N) = K$ holds. Number N in the previous expression denotes the number of vertices in a graph. Vertices of a graph should be indexed using positive integers from 1 to N.

Input

The first line contains an integer K ($|K| \leq 10^{18}$) from the task description.

Output

In the first line you should output the number of vertices and the number of edges of the constructed graph. Let's denote the number of vertices of that graph with N ($1 \leq N \leq 1000$), and the number of edges with M ($0 \leq M \leq 1000$).

In the i-th of the next M lines you should output two distinct integers X_i and Y_i ($1 \leq X_i, Y_i \leq N$), which represent the i-th edge which is directed from vertex with index X_i towards vertex with index Y_i. Each edge must appear only once in the output.

Also, the absolute value of tension between each two nodes in the graph must be less or equal to 2^{80}.

If there are multiple solutions, output any of them.

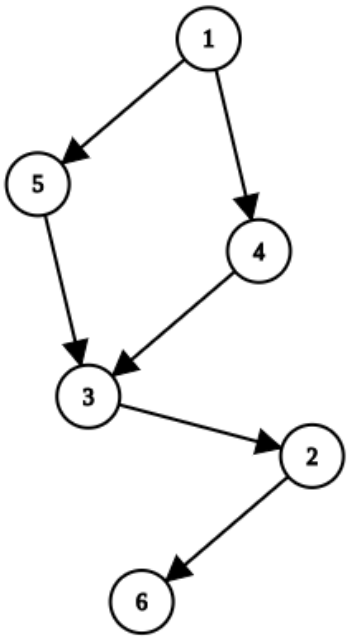
Scoring

Subtask	Score	Constraints
1	15	$1 \leq K < 500$
2	15	$-300 < K \leq 1$
3	20	$\|K\| < 10000$
4	60	No additional constraints.

Examples

input	input	input
0	1	2
output	**output**	**output**
6 6 1 4 1 5 4 3 5 3 3 2 2 6	1 0	6 8 1 2 1 3 1 4 1 5 5 4 2 6 3 6 4 6

Clarification of the first example: The constructed graph has 6 vertices. Ordered arrays that start in 1 and end in 6 are: $(1,6)$, $(1,4,6)$, $(1,5,6)$, $(1,3,6)$, $(1,2,6)$, $(1,4,3,6)$, $(1,4,2,6)$, $(1,5,3,6)$, $(1,5,2,6)$, $(1,3,2,6)$, $(1,4,3,2,6)$, $(1,5,3,2,6)$. Their lengths are (in order): $1,2,2,2,2,3,3,3,3,3,4,4$, so their signs are $-1,1,1,1,1,-1,-1,-1,-1,-1,1,1$. Therefore, the tension between 1 and 6 is equal to $-1+1+1+1+1-1-1-1-1-1+1+1=0$.



Task Skandi

Dragica je predsjednica treće podružnice Udruge umirovljenika grada Samobora, strastvena kuharica te vjerojatno jedna od najboljih rješavateljica skandinavki u Hrvatskoj. Skandinavka je pravokutna križaljka dimenzija $N \times M$ u kojoj su polja ili prazna (te se trebaju popuniti) ili ispunjena. Ispunjena polja sadrže najviše dva pitanja, jedno na koje se odgovara prema desno i drugo na koje se odgovara prema dolje. Odgovori na pitanja upisuju se na prazna polja prema dolje ili prema desno od polja na kojem se nalazi pitanje do idućeg ispunjenog polja ili do ruba križaljke. Pitanje prema desno će uvijek postojati osim ako je blokirano rubom skandinavke ili ispunjenim poljem zdesna. Analogno, pitanje prema dolje će uvijek postojati osim ako je blokirano rubom skandinavke ili ispunjenim poljem odozdo

Dragica zna odgovoriti na sva pitanja u skandinavki, ali je svjesna da joj nije preostalo još puno vremena pa želi odgovoriti **na što manje pitanja, a da ispuni cijelu skandinavku**. Nažalost, ona ne zna na koliko pitanja minimalno mora odgovoriti te koja će to pitanja biti pa zato traži svoje najdraže unuke da joj pomognu.

Ulazni podaci

U prvom su retku prirodni brojevi N i M ($2 \leq N, M \leq 500$), iz teksta zadatka.

U sljedećih se N redaka nalazi po M znakova `'0'` ili `'1'`, gdje `'0'` predstavlja prazno polje koje treba popuniti, a `'1'` predstavlja ispunjeno polje . Kao i u pravim skandinavkama, vrijedi da će prvi red i stupac biti popunjeni znakovima `'1'`.

Garantiramo da će postojati barem jedno polje s oznakom `'0'`.

Izlazni podaci

U prvom retku treba ispisati najmanji mogući broj pitanja na koja se mora odgovoriti da bi se popunila cijela skandinavka. Označimo taj broj s X.

U sljedećih X redaka treba ispisati na koja pitanja Dragica mora odgovoriti. Ispis je oblika: `R S smjer`, gdje je R oznaka reda u kojem se nalazi pitanje, S oznaka stupca i smjer jedna od riječi `"DESNO"` ili `"DOLJE"`.

Ako postoji više mogućih rješenja, ispišite bilo koje.

Bodovanje

Podzadatak	Broj bodova	Ograničenja
1	18	Bit će najviše 9 polja s oznakom `'1'`
2	32	$N \leq 500$ i $M \leq 10$
3	60	Nema dodatnih ograničenja.

Ako vaše rješenje ispiše točan prvi redak na svim testnim primjerima nekog podzadatka, ali na barem jednom testnom primjeru neispravno ispiše preostale retke, osvojit ćete 50% bodova predviđenih za taj podzadatak.

Probni primjeri

input

```
4 5
11111
10000
10000
10000
```

output

```
3
2 1 DESNO
3 1 DESNO
4 1 DESNO
```

input

```
6 4
1111
1011
1000
1011
1010
1000
```

output

```
4
1 2 DOLJE
4 4 DOLJE
5 3 DOLJE
3 1 DESNO
```

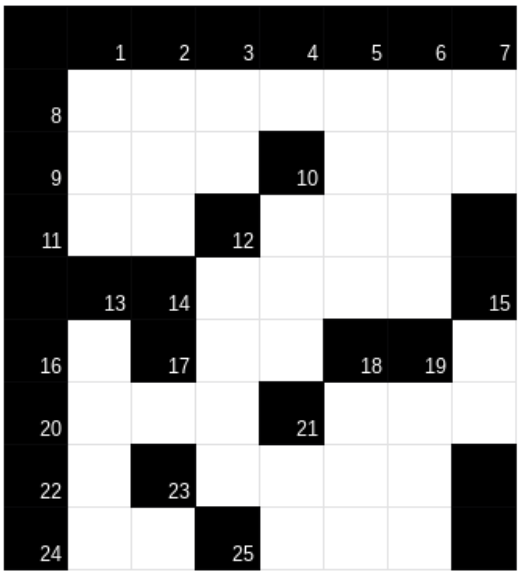
input

```
9 8
11111111
10000000
10001000
10010001
11100001
10100110
10001000
10100001
10010001
```

output

```
14
5 2 DOLJE
5 8 DOLJE
8 3 DOLJE
2 1 DESNO
3 1 DESNO
3 5 DESNO
4 1 DESNO
4 4 DESNO
5 3 DESNO
6 3 DESNO
7 1 DESNO
7 5 DESNO
8 3 DESNO
9 4 DESNO
```

Pojašnjenje trećeg probnog primjera: Primjer prave skandinavke koja je ekvivalentna ovom probnom primjeru prikazan je na idućoj stranici. Ispunjena polja označena su crnom bojom, a polja koja sadrže barem jedno pitanje su dodatno numerirana. Ispod slike prikazana su pitanja koja se rješavaju prema desno (stupac "vodoravno") i pitanja koja se rješavaju prema dolje (stupac "okomito"). Primijetite da neka ispunjena polja sadrže samo jedno pitanje (primjerice polja 8 i 13), dok neka ispunjena polja sadrže po dva pitanja (primjerica poja 10 i 12). Ovu konkretnu skandinavku moguće je u potpunosti riješiti ako znamo odgovore na 14 pitanja koja su navedena u izlazu probnog primjera. Okušajte se sami!



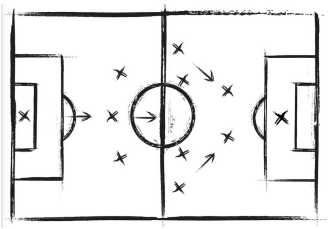
Vodoravno:

8. Otac dinamičkog programiranja, Richard
9. Prvi zadatak, četvrto kolo
10. Uzvik u koridi
11. chr(115) * 2 u Pythonu
12. Internet of things
14. Najbolje informatičko natjecanje
16. Leksikografski najmanja riječ
17. Međunarodni sustav mjernih jedinica
19. Fiktivni lik iz serijala o Jamesu Bondu
20. Balkanska informatička olimpijada
21. Natjecanje na platformi TopCoder
22. Bor
23. Poseban pokazivač u jeziku C
24. Umjetna inteligencija
25. Popularan kriptografski algoritam

Okomito:

1. Pretraga u širinu
2. Konstanta strojnog epsilona
3. Unix naredba (ispis sadržaja direktorija)
4. Šesnaesto slovo abecede
5. Mjesec (engl.)
6. Duboki ženski glasovi
7. Negacija
10. Međunarodna informatička olimpijada
12. Hrvatski savez informatičara
13. Palindromična pop-grupa iz Švedske
15. "Korijenast" algoritam
17. Kisik
18. Nepopularna poruka na evaluatoru
19. Naredba za brisanje ekrana u QBasic-u
21. Zadnji i prvi samoglasnik
23. Jod

Task Trener



At this point we already know that students love to sleep. Patrik is a record holder in this category. He wakes up only when he needs to eat or if he wishes to play *FIFA 20*. Therefore, his dreams usually revolve around football. In his last dream, he found himself in the role of a football manager of his favourite team – GNK Dinamo Zagreb.

His job is to select N players that will defend the blue colors in the next season, but the board has some peculiar requests. They are:

- All players must have surnames of distinct lengths.
- Surname of a player must appear as a continuous subsequence of surnames of all players whose surnames are longer.

To make his job easier, Patrik divided the potential players in N buckets such that players in i-th bucket have exactly i letters in their surname. In each of these buckets there are exactly K players. Patrik wants to know in how many distinct ways (modulo $10^9 + 7$) can he choose the players for his squad while also conforming to the given requests.

Input

The first line contains two integers N ($1 \leq N \leq 50$) and K ($1 \leq K \leq 1\,500$).

Each of the next N lines contains K not necessarily distinct surnames of players. The surnames of players in i-th of those lines consist of exactly i lowercase letters from the English alphabet.

Output

In the only line you should output the answer from the task description.

Bodovanje

Subtask	Score	Constraints
1	22	$N = 5$ and $K = 10$
2	33	$N = 50$ and $K = 100$
3	55	No additional constraints.

Examples

input	**input**	**input**

`3 2`
`a b`
`ab bd`
`abc abd`
	`3 3`
	`a b c`
	`aa ab ac`
	`aaa aab aca`
		`3 1`
		`a`
		`bc`
		`def`

output	**output**	**output**
`5`	`6`	`0`

Clarification of the first example: Patrik can choose the following teams: `(a, ab, abc)`, `(a, ab, abd)`, `(b, ab, abc)`, `(b, ab, abd)` and `(b, bd, abd)`.