



# Croatian Open Competition in Informatics

Round 1, October 19<sup>th</sup> 2019.

## Tasks

Task	Time limit	Memory limit	Score
<b>Trol</b>	1 second	512 MiB	50
<b>Lutrija</b>	1 second	512 MiB	70
<b>Džumbus</b>	1 sekunda	512 MiB	110
<b>Trobojnica</b>	1 sekunda	512 MiB	110
<b>Zoo</b>	1 sekunda	512 MiB	110
<b>Total</b>			450



## Task Trol

Stjepan recently received his bachelor's degree in mathematics from the University of Zagreb. Naturally, his parents are very proud and have decided to give him all positive integers not greater than  $2^{60}$  as a gift. To keep them safe, he quickly stored all of those numbers in an array  $A$ , such that  $A_i = i$ .

His jealous friend Marin decided to prank him by repeatedly replacing each element of  $A$  with the sum of its digits until all elements of  $A$  consisted of a single digit. For example, the initial value of 197<sup>th</sup> element of  $A$  was 197. Marin first changed that value to  $1 + 9 + 7 = 18$  and then changed its value again to  $1 + 8 = 9$ .

Stjepan is devastated and begs Marin to return his array to its initial state. Unfortunately, Marin won't do that until Stjepan correctly answers his  $Q$  queries: "What is the sum of numbers from  $l$ -th to  $r$ -th element of  $A$ ".

Help Stjepan answer those queries!



### Input

The first line contains an integer  $Q$  ( $1 \leq Q \leq 100$ ) from the task description.

The next  $Q$  lines contain two integers  $l_i$  i  $r_i$  ( $1 \leq l_i \leq r_i \leq 2^{60}$ ), the parameters of Marin's  $i$ -th query.

### Output

Output the answers to each of Marin's  $Q$  queries. Each answer should be printed in a separate line and their order should match the order of the queries as they are given in the input.

### Scoring

In test cases worth a total of 10 points, for each query will hold  $1 \leq l_i \leq r_i \leq 9$ .

In test cases worth a total of 30 points, for each query will hold  $r_i - l_i \leq 1000$ .

### Examples

**input**

1  
1 5

**output**

15

**input**

2  
9 13  
44 45

**output**

19  
17

**input**

1  
1998 2018

**output**

102

**Clarification of the second example:**

**1<sup>st</sup> query**  $\rightarrow A_9 = 9, A_{10} = 1 + 0 = 1, A_{11} = 1 + 1 = 2, A_{12} = 1 + 2 = 3, A_{13} = 1 + 3 = 4.$   
 $A_9 + A_{10} + A_{11} + A_{12} + A_{13} = 9 + 1 + 2 + 3 + 4 = 19.$

**2<sup>nd</sup> query**  $\rightarrow A_{44} = 4 + 4 = 8, A_{45} = 4 + 5 = 9. A_{44} + A_{45} = 8 + 9 = 17.$



## Task Lutrija

Grandpa Vedran is watching his favorite lottery show on TV in the hopes of becoming an overnight millionaire. The lottery balls are spinning and bouncing around before yielding the following draw: 2, 5, 7, 11, 19, 23 and 31.

Vedran sighs as he didn't guess a single one of those numbers. "Looks like I'm passed my prime...", he thought to himself while turning off the old TV. His vision is also getting worse, so he pressed the wrong button on the remote control and switched to the COCI channel.



The host, Mr. Malnar, calmly spoke: "Dear viewers, on the left side of the screen I will show you a prime number  $A$  and on the right side of the screen I will show you a prime number  $B$ . The first person that calls in with an array of prime numbers which starts with  $A$ , ends with  $B$  and has a prime absolute difference between each two neighbouring elements will receive a free trip to IOI 2020 in Singapore."

Old Vedran is reminiscing about his glory days of being a competitive programmer. Unfortunately, he is rusty and is not able to solve the problem. Being kindhearted, you decide to help Vedran win a trip to Singapore.

**Note:** A prime number is a positive integer greater than 1 that is only divisible by 1 and itself.

### Input

The first line contains two prime numbers  $A$  and  $B$  ( $2 \leq A, B \leq 10^{14}$ ,  $A \neq B$ ) from the task description.

### Output

If the task is impossible, i.e., there is no array satisfying the conditions from task statement, simply output  $-1$  in a single line.

Otherwise, in the first line output the number of elements in the array and in the second line output its elements separated by spaces. The size of array must not be greater than  $10^5$  and its elements must not be greater than  $10^{15}$ . It is guaranteed that, if a solution exists, there is at least one satisfying those bounds.

If there are multiple correct solutions, output any of them.

### Scoring

In test cases worth a total of 14 points, it will hold that if a solution exists, there is at least one such that the number of elements in the resulting array is not greater than 3 and all of its elements are not greater than 1000.

In test cases worth additional 28 points, it will hold  $2 \leq A, B \leq 1000$ .

### Examples

**input**

13 11

**output**

2

13 11

**input**

37 11

**output**

-1

**input**

2 17

**output**

3

2 19 17



## Task Džumbus

Marin is a good man, so he'll organize  $Q$  parties for his  $N$  friends, all of which are competitive programmers. The only drink that is going to be served at his parties will be *džumbus* — a mixture of Coke and ginger juice.

For each of his friends, Marin knows the amount of džumbus they need to drink in order to relax. He also knows that there are  $M$  pairs of people among his friends such that, if both of them are relaxed, they will begin to exchange the solutions of past COCI problems (since there are no published editorials).

When a person  $A$  shares their solutions with person  $B$ , the person  $B$  may decide to share those solutions in the same manner, but it is also known that  $M$  pairs are formed in a way that it is impossible that those solutions will get back to person  $A$  during that party, regardless of the order in which exchanges took place.

Marin has prepared different amounts of džumbus for each party. He will always distribute the drink among his friends in a way which maximizes the number of people that will at least once exchange their solutions with another person at the party.

Your task is to determine the number of people that will exchange their solutions for each of the  $Q$  parties.



### Input

The first line contains integers  $N$  and  $M$  from the task description.

The second line contains  $N$  space separated integers  $D_i$ , the amounts of džumbus needed to relax Marin's friends, given in order from a friend number 1 to a friend number  $N$ .

The  $i$ -th of the next  $M$  lines contains two integers  $A_i$  and  $B_i$  ( $A_i \neq B_i$ ), denoting a pair of friends from the task description.

The next line contains an integer  $Q$  from the task description.

The next  $Q$  lines contain a single integer  $S_i$  which represents the total amount of džumbus that is going to be served at  $i$ -th party.

### Output

Output the number of people that will exchange their solutions for each of the  $Q$  parties. The answer for each party should be given in a separate line. Note that the parties are independent of each other.

### Scoring

In all subtasks, it holds  $1 \leq N \leq 500$ ,  $1 \leq Q \leq 2 \cdot 10^5$  i  $1 \leq D_i \leq 10^9$ .

Subtask	Score	Constraints
1	20	$M = N - 1$ , $1 \leq S_i \leq 1000$ , Marin's friends will be paired up in a way that each friend will exchange their solutions with at most two other people.
2	30	$M = N - 1$ , $1 \leq S_i \leq 10^9$ Marin's friends will be paired up in a way that each friend will exchange their solutions with at most two other people.
3	30	$0 \leq M < N$ , $1 \leq S_i \leq 100$
4	30	$0 \leq M < N$ , $1 \leq S_i \leq 10^9$



## Examples

input

1 0  
1000  
1  
1000

output

0

input

3 2  
1 2 3  
1 2  
1 3  
3  
2  
3  
5

output

0  
2  
2

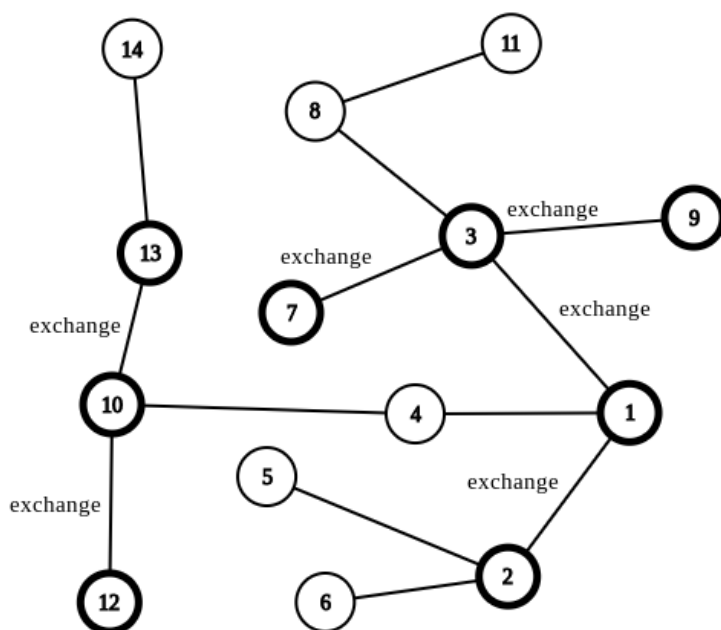
input

14 13  
2 3 4 19 20 21 5 22 6 7 23 8 10 14  
1 2  
1 3  
1 4  
2 5  
2 6  
3 7  
3 8  
3 9  
4 10  
8 11  
10 13  
10 12  
12 14  
3  
45  
44  
23

output

8  
7  
5

**Clarification of the third example:** At the first party, Marin decided to relax friends with indexes 1, 2, 3, 7, 9, 10, 12 and 13. They have drunk a total of 45 units of džumbus.





## Task Trobojnica

„Sve neka gori kad kroz vene crven, bijeli, plavi krene.” – Slaven Bilić, 2008.

U ovom zadatku promatramo pravilne  $N$ -terokute kojima su stranice obojene u tri boje, a vrhovi označeni prirodnim brojevima u smjeru kazaljke na satu. *Triangulacija* je podjela mnogokuta na trokute unutarnjim dijagonalama takva da dijagonale nemaju zajedničkih točaka osim vrhova mnogokuta te ne sijeku stranice mnogokuta osim u vrhovima mnogokuta. Naravno, u ovom zadatku i svaka dijagonala mora biti obojena u jednu od tri boje.

Triangulacija je *domoljubna* ako za svaki od  $N - 2$  trokuta vrijedi da su mu sve tri stranice različite boje. Vaš je zadatak odrediti domoljubnu triangulaciju zadanog mnogokuta.

### Ulazni podaci

U prvom je retku prirodan broj  $N$  iz teksta zadatka.

U drugom je retku  $N$ -teroznamenasti broj čije znamenke predstavljaju boje stranica  $N$ -terokuta u smjeru kazaljke na satu. Odnosno, prva znamenka predstavlja boju stranice  $(1, 2)$ , druga znamenka boju stranice  $(2, 3)$  i tako sve do  $N$ -te znamenke koja predstavlja boju stranice  $(N, 1)$ . Dakako, boje su označene znamenkama 1, 2 i 3.

### Izlazni podaci

Ako postoji domoljubna triangulacija za zadani mnogokut, u prvi redak ispišite riječ **DA**, a u protivnom ispišite riječ **NE**. Ako ste ispisali **DA**, u svakom od sljedeća  $N - 3$  retka ispišite po jednu dijagonalu u obliku  $X Y C$ , gdje su  $X$  i  $Y$  vrhovi dijagonale, a  $C$  boja ( $1 \leq X, Y \leq N, 1 \leq C \leq 3$ ). Ispisane dijagonale trebaju činiti domoljubnu triangulaciju ulaznog mnogokuta. Poredak dijagonala u ispisu nije bitan. Ako postoji više domoljubnih triangulacija, ispišite bilo koju.

### Bodovanje

Podzadatak	Broj bodova	Ograničenja
1	20	$4 \leq N \leq 11$
2	40	$4 \leq N \leq 10^3$
3	50	$4 \leq N \leq 2 \cdot 10^5$

Ako vaš program točno ispisuje prvi redak u svakom testnom primjeru nekog podzadatka, osvojiti će 10% bodova predviđenih za taj podzadatak.

### Probni primjeri

input

4  
1212

output

DA  
1 3 3

input

4  
1213

output

NE

input

7  
1223121

output

DA  
1 3 3  
3 5 1  
5 7 3  
7 3 2



## Task Zoo

Kasno uvečer, na Božić 2010., Zdravko je odlučio izaći iz kuće, prijeći cestu te prošetati snježnim maksimirskim parkom. Nažalost, zimsku je idilu prekinuo jedan monstrum koji je iskočio iz grma. No, Zdravko se nije prepao, već je odlučio otjerati monstruma glasnim urlikanjem. Operacija je uspjela, monstrum se preplašio i pobjegao, a Zdravko je nastavio šetnju parkom ne sluteći da je njegovo urlikanje uzburkalo dio životinja koje se nalaze u obližnjem zoološkom vrtu. Preciznije, Zdravkovo urlikanje je najviše uzburkalo tigrove i bikove koji su odlučili pobjeći iz zoološkog vrta kako bi pronašli mirnije mjesto za spavanje.



Tijekom bijega, tigrovi i bikovi morali su proći kroz ograđeno, snijegom prekriveno, pravokutno područje podijeljeno na  $R \times S$  jediničnih polja. Ove životinje u pravokutno su područje morale ući preko gornjeg lijevog kuta, a iz područja su morale izaći preko donjeg desnog kuta. Kako bi u što većoj tišini prošle kroz ovo područje, životinje su područjem prolazile jedna po jedna, krećući se proizvoljnim putem u četiri osnovna smjera (gore, dolje, lijevo, desno). Odnosno, životinja se tijekom bijega nije nužno kretala najkraćim putem te je na neka polja (uključivo sa početnim i završnim) mogla stati više puta. Budući da je pravokutno područje prekriveno snijegom, životinje ostavljaju tragove kada stanu na neko polje (potencijalno brišući trag prethodne životinje koja je prošla tim poljem).

Odredite najmanji mogući broj životinja koje su pobjegle iz zoološkog vrta na temelju ostavljenih tragova na spomenutom pravokutnom području.

### Ulazni podaci

U prvom su retku prirodni brojevi  $R$  i  $S$  iz teksta zadatka.

U sljedećih je  $R$  redaka po  $S$  znakova koji predstavljaju pravokutno područje iz teksta zadatka. Znak T označava tigrov trag, znak B označava bikov trag, a znak \* označava netaknuto područje prekriveno snijegom.

Možete pretpostaviti da su ulazni podaci takvi da je barem jedna životinja ušla u pravokutno područje i da je svaka takva životinja iz njega i izašla te da se pritom kretala u skladu s tekstom zadatka.

### Izlazni podaci

U jednom retku ispišite najmanji mogući broj životinja koje su pobjegle iz zoološkog vrta.

### Bodovanje

Podzadatak	Broj bodova	Ograničenja
1	45	$2 \leq R, S \leq 100$
2	65	$2 \leq R, S \leq 1000$



## Probni primjeri

input

4 4  
TT\*T  
\*TTT  
\*\*\*T  
\*\*\*T

output

1

input

3 5  
TTBB\*  
\*T\*B\*  
\*TTTT

output

2

input

7 5  
BT\*\*\*  
BTBBB  
BTTTB  
BBT\*B  
BBT\*B  
BBT\*\*  
\*BBBB

output

3

Pojašnjenje drugog probnog primjera:

