Problem A. Dr. TC

Time limit 1000 ms
Mem limit 262144 kB

In order to test his patients' intelligence, Dr. TC created the following test.

First, he creates a binary string* s having n characters. Then, he creates n binary strings $a_1, a_2, \ldots, a_n$. It is known that a_i is created by first copying s, then flipping the i'th character (1 becomes 0 and vice versa). After creating all n strings, he arranges them into a grid where the i'th row is a_i.

For example,

- If $s = 101$, $a = [001, 111, 100]$.
- If $s = 0000$, $a = [1000, 0100, 0010, 0001]$.

The patient needs to count the number of 1s written on the board in less than a second. Can you pass the test?

*A binary string is a string that only consists of characters 1 and 0.

Input

The first line of the input consists of a single integer t ($1 \leq t \leq 1000$) — the number of test cases.

The first line of each test case contains a single integer n ($1 \leq n \leq 10$) — the length of the binary string s.

The second line of each test case contains a single binary string s of size n.

Output

For each test case, output a single integer, the number of 1s on the board.

Examples

Input	Output
5 3 101 1 1 5 00000 2 11 3 010	5 0 5 2 4

Note

The first example is explained in the statement.

For the second example, the only string written on the board will be the string `0`; therefore, the answer is 0.

In the third example, the following strings will be written on the board: $[$`10000`, `01000`, `00100`, `00010`, `00001`$]$; so there are five `1`s written on the board.

Problem B. St. Chroma

Time limit 2000 ms
Mem limit 262144 kB

Given a permutation* p of length n that contains every integer from 0 to $n-1$ and a strip of n cells, St. Chroma will paint the i-th cell of the strip in the color $\mathrm{MEX}(p_1, p_2, ..., p_i)^\dagger$.

For example, suppose $p = [1, 0, 3, 2]$. Then, St. Chroma will paint the cells of the strip in the following way: $[0, 2, 2, 4]$.

You have been given two integers n and x. Because St. Chroma loves color x, construct a permutation p such that the number of cells in the strip that are painted color x is **maximized**.

*A permutation of length n is a sequence of n elements that contains every integer from 0 to $n-1$ exactly once. For example, $[0, 3, 1, 2]$ is a permutation, but $[1, 2, 0, 1]$ isn't since 1 appears twice, and $[1, 3, 2]$ isn't since 0 does not appear at all.

†The MEX of a sequence is defined as the first non-negative integer that does not appear in it. For example, $\mathrm{MEX}(1, 3, 0, 2) = 4$, and $\mathrm{MEX}(3, 1, 2) = 0$.

Input

The first line of the input contains a single integer t $(1 \le t \le 4000)$ — the number of test cases.

The only line of each test case contains two integers n and x $(1 \le n \le 2 \cdot 10^5, 0 \le x \le n)$ — the number of cells and the color you want to maximize.

It is guaranteed that the sum of n over all test cases does not exceed $2 \cdot 10^5$.

Output

Output a permutation p of length n such that the number of cells in the strip that are painted color x is **maximized**. If there exist multiple such permutations, output any of them.

Examples

Input	Output
7 4 2 4 0 5 0 1 1 3 3 1 0 4 3	1 0 3 2 2 3 1 0 3 2 4 1 0 0 0 2 1 0 1 2 0 3

Note

The first example is explained in the statement. It can be shown that 2 is the maximum amount of cells that can be painted in color 2. Note that another correct answer would be the permutation $[0, 1, 3, 2]$.

In the second example, the permutation gives the coloring $[0, 0, 0, 4]$, so 3 cells are painted in color 0, which can be shown to be maximum.

Problem C. Expensive Number

Time limit 1000 ms
Mem limit 262144 kB

The cost of a positive integer n is defined as the result of dividing the number n by the sum of its digits.

For example, the cost of the number 104 is $\frac{104}{1+0+4} = 20.8$, and the cost of the number 111 is $\frac{111}{1+1+1} = 37$.

You are given a positive integer n that does not contain leading zeros. You can remove any number of digits from the number n (including none) so that the remaining number contains at least one digit and **is strictly greater than zero**. The remaining digits **cannot** be rearranged. As a result, you **may** end up with a number that has leading zeros.

For example, you are given the number 103554. If you decide to remove the digits 1, 4, and one digit 5, you will end up with the number 035, whose cost is $\frac{035}{0+3+5} = 4.375$.

What is the minimum number of digits you need to remove from the number so that its cost becomes the minimum possible?

Input

The first line contains an integer t ($1 \le t \le 1000$) — the number of test cases.

The only line of each test case contains a positive integer n ($1 \le n < 10^{100}$) without leading zeros.

Output

For each test case, output one integer on a new line — the number of digits that need to be removed from the number so that its cost becomes minimal.

Examples

Input	Output
4 666 13700 102030 7	2 4 3 0

Problem D. New Functionality

Time limit 2000 ms
Mem limit 262144 kB
OS Windows

Recently, a new feature has been added to the main Kyrgyz website for programming competitions — the division of problems into separate volumes.

Volumes are numbered with integers starting from 1. Inside each volume, problems are numbered with integers from 0 to n.

Thus, each problem corresponds to a pair of numbers (v, k) — the volume number and the number within the volume, respectively.

Additionally, within each problem, there is a button labeled "go to next":

- If $k < n$, the button opens problem $(v, k + 1)$.
- Otherwise, the button opens problem $(v + 1, 0)$.

At the moment, you are on the page of problem (a, b). You are interested in how many button presses are required to reach problem (c, d)?

Input

The first line contains an integer n $(1 \le n \le 1000)$ — the maximum possible problem number within a volume.

The second line contains two integers a and b $(1 \le a \le 1000, 0 \le b \le n)$ — the number of the problem you are currently on.

The third line contains two integers c and d $(1 \le c \le 1000, 0 \le d \le n)$ — the number of the problem you want to reach.

It is guaranteed that it is possible to reach problem (c, d) from problem (a, b):

- either $a < c$;
- or $a = c$ and $b < d$.

Output

In a single line, output an integer — the required number of presses of the "go to next" button after which you will reach problem (c, d) from problem (a, b).

Examples

Input	Output
12 2 5 2 8	3

Input	Output
8 3 4 4 5	10

Input	Output
14 2 11 4 1	20

Note

First test case

The sequence of presses $(2, 5)$ — $(2, 6)$ — $(2, 7)$ — $(2, 8)$ — a total of 3 presses.

Second test case

The sequence of presses:

- $(3, 4)$ — $(3, 8)$ — a total of 4 presses;
- $(3, 8)$ — $(4, 0)$ — 1 press;
- $(4, 0)$ — $(4, 5)$ — another 5 presses.

A total of 10 presses.

Problem E. Scientific Hypotheses

Time limit 1000 ms
Mem limit 262144 kB
OS Windows

Professor Termitov is studying n new hypotheses in the scientific world.

It is known that the i-th hypothesis has an impossibility index p_i. The professor will believe in a hypothesis that is sufficiently plausible but will refuse to believe in one that seems completely fantastic.

Whether the professor believes in the i-th hypothesis depends on his level of imagination f_{i-1}:

- If $p_i \le f_{i-1} + c$, then the professor **believes** in the hypothesis (c is the trust credit parameter).

  In this case, his level of imagination will become $f_i = \max(f_{i-1}, p_i)$.

- If $p_i > f_{i-1} + c$, then the professor **does not believe** in the hypothesis.

  In this case, his level of imagination will become $f_i = f_{i-1} - \max(d, p_i - f_{i-1} - c)$, where d is the disappointment degree parameter.

It is also known that none of the values $f_0 \ldots f_n$ **can be negative**.

You happened to witness this process through a laboratory window. In the end, you saw all the reactions of your colleague r_i (believed / did not believe), but you did not hear the hypotheses themselves.

Now you are interested in finding any set p_i that leads to the given sequence of reactions r_i (considering the constraints on f_i).

If there are multiple suitable sets, output any set with the **minimally possible** $\max(p_i)$.

Input

The first line contains integers n, f_0, c, d ($1 \le n \le 3 \cdot 10^5$, $1 \le f_0,\ c,\ d \le 5000$) — the number of hypotheses, the initial value of the professor's level of imagination, and the parameters of trust credit and disappointment degree, respectively.

The second line contains a string r ($|r| = n; r_i \in [T, F]$) — the professor's reactions to the i-th hypothesis.

If $r_i = T$, then the professor believed in the i-th hypothesis; if $r_i = F$, then the i-th hypothesis was deemed too implausible.

Output

In the first line, output `YES` if the sequence p can be constructed, and `NO` if such a sequence does not exist.

If the sequence exists, output two more lines.

In the second line, output an integer $pmax$ — the maximum value among all values p_i.

In the third line, output n integers $p_1, p_2, \ldots, p_n$ ($0 \le p_i \le pmax$) — suitable values of the impossibility indices.

Examples

Input	Output
5 3 2 1 TFFTT	YES 6 1 6 5 2 0

Input	Output
3 4 1 2 FFF	NO

Note

First test example

Let's show how the given set p_i leads to the specified set of reactions.

- $p_1 \le f_0 + c$ $(1 \le 3 + 2)$, so the professor believed in hypothesis 1.

  His imagination remained equal to $f_1 = \max(3, 1) = 3$.

- $p_2 > f_1 + c$ $(6 > 3 + 2)$, so the professor did not believe in hypothesis 2.

  His imagination became $f_2 = 3 - \max(1, 6 - 3 - 2) = 3 - 1 = 2$.

- $p_3 > f_2 + c\,(5 > 2 + 2)$, so the professor did not believe in hypothesis 3.

  His imagination became $f_3 = 2 - \max(1, 5 - 2 - 2) = 2 - 1 = 1$.

- $p_4 \le f_3 + c\,(2 \le 1 + 2)$, so the professor believed in hypothesis 4.

  His imagination became $f_4 = \max(1, 2) = 2$.

- $p_5 \le f_4 + c\,(0 \le 2 + 2)$, so the professor believed in hypothesis 5.

  His imagination became $f_5 = \max(2, 0) = 2$.

It can be shown that it is impossible to construct a set with $pmax < 6$ — this is the smallest value at which $r_2 = F$.

Also, note that the set provided in the answer is not the only possible one.

For example, the following sets are also among the possible answers to the problem:

- $[3, 6, 5, 0, 2]$;
- $[0, 6, 5, 3, 1]$;
- etc.

Second test example

- $r_1 = F$, which means $p_1 > f_0 + c\,(p_1 > 4 + 1)$.

  The p_1 that leads to the smallest decrease in imagination is 6 or 7.

  In this case, $f_1 = 4 - \max(2, 6 - 4 - 1) = 4 - 2 = 2$.

- $r_2 = F$, which means $p_2 > f_1 + c\,(p_2 > 2 + 1)$.

  The p_2 that leads to the smallest decrease in imagination is 4 or 5.

  In this case, $f_2 = 2 - \max(2, 5 - 2 - 1) = 2 - 2 = 0$.

- $r_3 = F$, which means $p_3 > f_2 + c\,(p_3 > 0 + 1)$.

  The p_3 that leads to the smallest decrease in imagination is 2 or 3.

  In this case, $f_3 = 0 - \max(2, 2 - 0 - 1) = 0 - 2 = -2$.

At each step, we tried to minimize the decrease in the level of imagination, but still ended up with a negative value.

This indicates that there is no set p that leads to the given sequence of reactions.

Problem F. Tomorrow Will Be Better Than Yesterday

Time limit 2000 ms
Mem limit 262144 kB
OS Windows

Pavel knows for sure — tomorrow is always better than yesterday.

He decided to prove this using geometry.

To do this, Pavel considered n consecutive days and assigned a point on the plane (x_i, y_i) to each day.

He considers day $i + 1$ to be **better** than day i if one of the two conditions is met:

- either $x_i < x_{i+1}$;
- or $x_i = x_{i+1}$, but $y_i < y_{i+1}$.

Pavel is only unsure about one thing — whether he has chosen the correct coordinate system for his calculations. He is confident that only rotations and/or reflections can be used to find the correct coordinate system.

Help Pavel — find any **rectangular** (orthogonal) coordinate system in which each subsequent day will be **better** than the previous one.

Input

The first line contains an integer n ($1 \le n \le 10^5$) — the number of days analyzed by Pavel.

Each of the following n lines contains two integers x_i and y_i ($-10^5 \le x_i,\ y_i \le 10^5$) — the point assigned by Pavel to the i-th day.

Output

In the first line, print `YES` if such a **rectangular** coordinate system exists, and `NO` otherwise.

If the desired coordinate system exists, print two more lines.

In the second line, print two integers X_x and Y_x ($|X_x|, |Y_x| \le 10^9; |X_x| + |Y_x| > 0$) — the coordinates of the vector aligned with the axis `Ox` of the new coordinate system.

In the third line, print two integers X_y and Y_y ($|X_y|, |Y_y| \le 10^9; |X_y| + |Y_y| > 0$) — the coordinates of the vector aligned with the axis `Oy` of the new coordinate system.

The vectors (X_x, Y_x) and (X_y, Y_y) must be **perpendicular** to each other.

If there are multiple valid answers, print any.

Examples

Input	Output
9 3 3 2 3 3 2 1 3 2 2 3 1 1 2 2 1 1 1	YES -1 -1 1 -1

Input	Output
4 1 1 1 2 2 2 2 1	NO

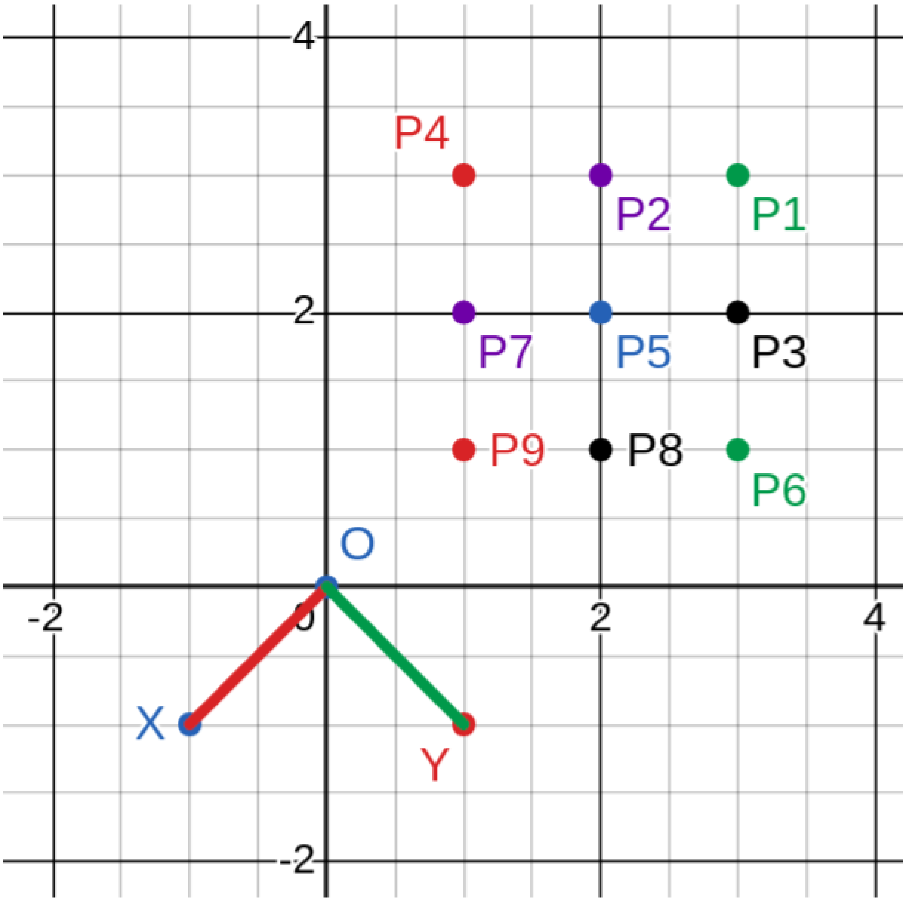
Input	Output
1 100000 100000	YES -100000 100000 -100000 -100000

Input	Output
2 0 0 0 0	NO

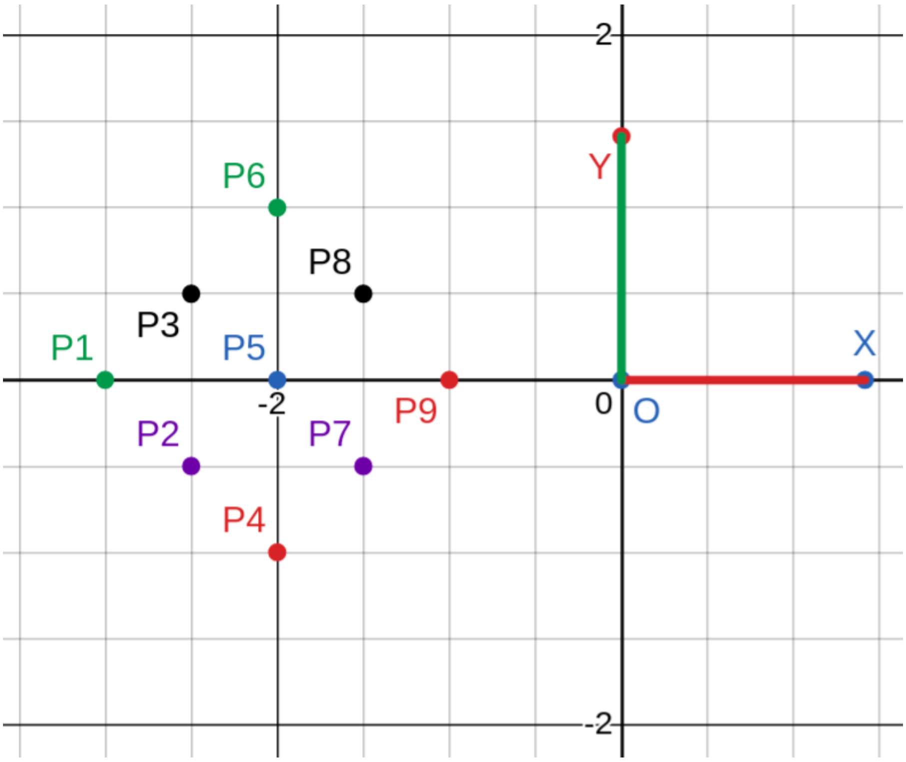
Note

First test example

First, consider the points assigned to the days and the found vectors in the **original coordinate system**:



Now let's show these same points in the coordinate system **based on the found vectors**:



The coordinates of the points after transitioning to the new coordinate system:

1. $(3, 3)$ — $(-3, 0)$;
2. $(2, 3)$ — $(-2.5, -0.5)$;
3. $(3, 2)$ — $(-2.5, 0.5)$;
4. $(1, 3)$ — $(-2, -1)$;
5. $(2, 2)$ — $(-2, 0)$;
6. $(3, 1)$ — $(-2, 1)$;
7. $(1, 2)$ — $(-1.5, -0.5)$;
8. $(2, 1)$ — $(-1.5, 0.5)$;
9. $(1, 1)$ — $(-1, 0)$.

It is clear that each subsequent point is "better" than the previous one in the new coordinate system.

Problem G. Conspiracy Theory

Time limit 4000 ms
Mem limit 524288 kB
OS Windows

A set of events is given by an array of integers a_i.

You believe that from event number i, event number j could be anticipated if both of the following conditions are true:

- $a_i < a_j$;
- the greatest common divisor of a_i and a_j is different from 1.

A chain of events, where each subsequent event could be anticipated from the previous one, is called a **conspiracy**.

Prove to everyone that your conspiracy theory is not just a theory — find a conspiracy consisting of the **largest number** of events.

Input

The first line contains an integer n ($1 \le n \le 10^6$) — the number of events.

The second line contains n integers $a_1, a_2, \ldots, a_n$ ($1 \le a_j \le 2 \cdot 10^6$) — the parameters of the events.

Output

In the first line, output an integer k ($1 \le k \le n$) — the maximum possible size of the conspiracy.

In the second line, output k integers p_j ($1 \le p_j \le n$) separated by spaces — the indices of these events **in the order of anticipation**.

In case there are multiple conspiracies of maximum size, output any of them.

Examples

Input	Output
5 1 2 3 4 5	2 2 4

Input	Output
8 8 7 10 3 6 5 3 11	4 4 5 1 3

Input	Output
3 2 2 2	1 1

Note

First test case

The sequence [2;4] is a conspiracy, as from the event $a_2 = 2$ one can predict $a_4 = 4$:

- $2 < 4$;
- (gcd — greatest common divisor).

Second test case

The sequence $[4;5, 1, 3]$ is a conspiracy, as:

- $a_4 = 4$;
- $a_5 = 6$: $3 < 6$, ;
- $a_1 = 8$: $6 < 8$, ;
- $a_3 = 10$: $8 < 10$, .

Third test case

In this example, a conspiracy of any two events is impossible, as all a_i are equal to each other.

At the same time, any event is formally a conspiracy by itself, so the size of the answer is always at least 1.

Problem H. Volunteering

Time limit 3000 ms
Mem limit 262144 kB
OS Windows

Artem is organizing the Championship of Kyrgyzstan in programming.

The competition will take place in the time interval $[S;F]$.

To assist in organizing the competition, Artem has recruited n volunteers. It is known that the i-th volunteer will be able to help in the time interval $[b_i, e_i]$.

Artem understands that anything can happen, so for each moment t in time, he introduced the "help index" $H(t)$ — the number of volunteers who can help him solve various problems at time t.

Formally, the help index $H(t)$ is equal to the number of volunteers such that $b_i \le t \le e_i$.

Artem is considering various scenarios, so for each value $h \in [1 \dots n]$, he wants to know the **total time** during the championship when the help index $H(t)$ will be **strictly less** than h.

Input

The first line contains an integer n ($1 \le n \le 3 \cdot 10^5$) — the number of volunteers.

The second line contains integers S and F ($1 \le S < F \le 10^9$) — the start and end of the time interval of the championship.

Each of the next n lines contains two integers b_i and e_i ($1 \le b_i < e_i \le 10^9$) — the start and end of the time segment when the i-th volunteer is available.

Output

Output n numbers $t_1, t_2, \dots, t_n$, where t_h is the total time during the championship when the "help index" is **strictly less** than h.

Examples

Input	Output
5 10 20 5 12 16 19 15 25 8 14 13 17	0 3 9 10 10

Note

First test example

- The help index will never be 0 during the championship; hence $t_1 = 0$.
- The help index 1 will be in the intervals $[12;13]$, $[14;15]$, and $[19;20]$ — the total duration of the intervals is 3; hence $t_2 = 3 + 0 = 3$.
- The help index 2 will be in the intervals $[10;12]$, $[13;14]$, $[15;16]$, and $[17;19]$ — the total duration is 6; hence $t_3 = 6 + 3 + 0 = 9$.
- The help index 3 will be in the interval $[16;17]$ — the total duration is 1; hence $t_4 = 1 + 6 + 3 + 0 = 10$.
- The help index will never be equal to 4, so $t_5 = 10$ similarly to t_4.

Problem I. Exhausting Training

Time limit 2000 ms
Mem limit 262144 kB
OS Windows

Aidar is preparing for another international olympiad.

In Aidar's opinion, the success of his performance depends on two indicators — the speed of coding and the speed of generating ideas.

Aidar knows that at the moment his coding speed is S_p, and his idea generation speed is S_m.

Every day, Aidar will spend T_p minutes training his coding speed, which will increase his coding speed by D_p **every two days**.

Similarly, every day Aidar will spend T_m minutes training his idea generation speed, which will increase his idea generation speed by D_m **every two days**.

Note that the transition from "quantity to quality" is not instantaneous, so after one day of training, Aidar will **not feel** an increase of .

Aidar can also conduct "intensive" training:

- Aidar can train his coding speed for $4 \cdot T_p$ minutes instead of T_p — in this case, he will feel an increase in his coding skill by D_p after just one day.
- Similarly, Aidar can train his idea generation speed for $4 \cdot T_m$ minutes instead of T_m — in this case, he will feel an increase in his idea generation skill by D_m after just one day.
- Aidar can conduct "intensive" training for both indicators at the same time if he considers it necessary.

Aidar will consider himself sufficiently prepared if both speeds (coding and idea generation) are not lower than the value E.

Aidar wants to reach a sufficient level of preparedness as soon as possible (but at the same time does not want to expend excessive effort), so he asks you to determine:

- the minimum number of days in which Aidar can achieve a sufficient level of preparedness;

- the minimum total number of minutes he can spend on preparation (given the achievement of the minimum number of days).

Input

The first line contains integers $S_p, S_m, D_p, D_m, T_p, T_m, E$ $(1 \le S_p,\ S_m,\ E \le 10^8,$ $1 \le D_p,\ D_m \le 10^5,\ \ 1 \le T_p,\ T_m \le 10^8)$ — the initial values of Aidar's skills, the indicators of skill change, the required number of minutes for regular training, and the sufficient level of preparedness, respectively.

Output

In the first line, output an integer — the minimum number of days in which Aidar can achieve a sufficient level of preparedness.

In the second line, output an integer — the minimum total number of minutes he can spend on preparation (given the achievement of the minimum number of days).

Examples

Input	Output
`1 3 2 1 3 10 18`	`15` `672`

Input	Output
`3 1 1 2 1000 1 3`	`1` `1004`

Note

First test case

It is easy to notice that in the optimal solution Aidar will have to undergo intensive training for creativity every day.

In total, there will be days of intensive creativity training — a total of $15 \cdot 4 \cdot 10 = 600$ minutes.

For typing practice, Aidar can apply the following resource distribution:

- Spend 3 days on intensive training — this way he can increase his skill by $3 \cdot 2 = 6$, spending $3 \cdot 4 \cdot 3 = 36$ minutes;
- Spend the remaining 12 days on regular training — this way he will increase his skill by another , spending $12 \cdot 3 = 36$ minutes.

In total, Aidar will spend $600 + 72 = 672$ minutes in this case.

Note that Aidar will not be able to complete his training in 15 days if he only does two intensive typing sessions:

- In 2 days of intensive training, he will gain $2 \cdot 2 = 4$ skill points;
- In the remaining 13 days of regular training, Aidar will increase his skill by another .

In total, he will have $1 + 4 + 12 = 17$ skill points, which will not be enough for a sufficient level of readiness.

Problem J. Tiring Wait

Time limit 2000 ms
Mem limit 262144 kB
OS Windows

Anatoly agreed with Slava to travel together to the new bus station.

The guys agreed to go together either from stop A or from the next stop B.

It is known that Slava has already boarded the necessary bus and is heading in the direction of "$A \to B$" (that is, he will first pass stop A and then stop B).

Anatoly arrived at stop B earlier than Slava but quickly realized that he misjudged the weather forecast — a heavy rain began with a piercing cold wind.

To avoid freezing, Anatoly decided to take the first bus that arrived and go to stop A to wait there. However, it didn't get any warmer at stop A, so Anatoly jumped on a bus heading to stop B...

Let's describe the process more formally:

- If Anatoly is at stop B, he will go to stop A only if he can arrive there **strictly earlier** than the bus with Slava arrives.
- If Anatoly is at stop A, he will go to stop B only if he can arrive there **strictly earlier** than the bus with Slava arrives **at stop A**.

It is known that all buses travel the distance between stops A and B (in both directions) in d minutes.

It is also known that if Anatoly gets off the bus at time t, he can board the next bus no earlier than $t + 1$ (he needs to cross the road, at least).

Knowing the arrival times of all buses at stop B, determine:

- at which stop Anatoly will board the bus that Slava is on;
- how many buses Anatoly will manage to ride before they meet.

Input

The first line contains space-separated integers n, m, d $(1 \le n,\ m \le 10^6,\ 1 \le d \le 10^6)$ — the number of buses going to stop B from stop A, the number of buses going to stop B from the opposite side, and the travel time between stops A and B, respectively.

The second line contains space-separated n integers $a_1, a_2, \ldots, a_n$

$(0 \le a_1 < a_2 < \ldots < a_n \le 10^6)$ — the moments in time when buses coming from stop A arrive **at stop B**.

Slava is on the **last** of these buses.

The third line contains m integers $b_1, b_2, \ldots, b_m$ $(0 \le b_1 < b_2 < \ldots < b_m \le 10^6)$ — the moments in time when buses coming from the opposite side arrive **at stop B**.

Output

In the first line, output a space-separated character and an integer:

- the character `A` if Anatoly boards the bus with Slava at stop A, or the character `B` if Anatoly boards at stop B;
- the number of buses Anatoly has ridden by that moment.

Examples

Input	Output
5 6 4 8 15 24 26 30 1 7 10 16 22 27	A 3

Note

First test example

Slava will arrive at stop B at time 30, and at stop A respectively at $30 - 4 = 26$.

- At time 1, Anatoly will board the bus going from B to A.
- At time $1 + 4 = 5$, Anatoly will arrive at stop A.
- At time $15 - 4 = 11$, Anatoly will board the bus going from A to B.
- At time 15, Anatoly will arrive at stop B.
- At time 16, Anatoly will board the bus going from B to A.

- At time $16 + 4 = 20$, Anatoly will arrive at stop A.
- Note that Anatoly will not be able to board the bus to stop B at time $24 - 4 = 20$, as he needs at least one minute to transfer.
- Also, note that Anatoly will not be able to board the bus to stop B at time $26 - 4 = 22$, as in that case he would arrive at stop B at time 26 — Slava will already arrive at stop A at that moment.
- Consequently, Anatoly will wait for Slava at stop A, having ridden on three buses.

Problem K. Fair Diversity

Time limit 2000 ms
Mem limit 262144 kB
OS Windows

When Anatoly and Slava arrived in Bishkek, they decided to explore its most interesting cafes and restaurants as soon as possible.

To do this, the guys decided to visit two **different** establishments each day.

After D days, Slava realized an important problem — some establishments had been visited by the guys more often than others. In such a case, it is impossible to speak of any fair assessment!

Anatoly proposed the following plan: continue visiting two different establishments each day, but stop when all establishments have been visited the same number of times.

It is obvious that the guys want to finish their gastronomic tour sooner (to avoid spending extra money).

Help the guys find the **minimum possible** number of visits to each establishment in the optimal plan.

Input

The first line contains integers n and D $(2 \le n \le 2000,\ 1 \le D \le 2000)$ — the number of establishments in Bishkek and the number of days during which Slava and Anatoly have already visited some of the establishments.

Each of the following D lines contains two integers f_i and s_i $(1 \le f_i,\ s_i \le n; f_i \ne s_i)$ — the numbers of the establishments that Slava and Anatoly visited on the i-th day.

Output

In a single line, output the **minimum possible** number of visits to each establishment in the optimal plan.

Examples

Input	Output
5 4 1 2 2 1 3 4 2 4	4

Note

First test example

One possible way to optimally finish their "tour":

- $(4, 5)$;
- $(1, 3)$;
- $(5, 1)$;
- $(2, 5)$;
- $(4, 3)$;
- $(3, 5)$.

In total, each establishment will be visited 4 times:

- Establishment 1 visited twice before the "realization" and twice after;
- Establishment 2 visited three times before the "realization" and once after;
- Establishment 3 visited once before the "realization" and three times after;
- Establishment 4 visited twice before the "realization" and twice after;
- Establishment 5 visited zero times before the "realization" and four times after.