Hong Kong Olympiad in Informatics 2015/16
Junior Group

Task Overview

ID	Task	Subtasks	Max Score
J161	Model Answer	$10 + 10 + 16 + 20 + 20 + 24$	100
J162	Time Zones	$15 + 13 + 26 + 22 + 24$	100
J163	Stone Game	$12 + 18 + 23 + 25 + 22$	100
J164	Candy Factory	$9 + 14 + 12 + 23 + 13 + 29$	100

For all tasks:
CPU time limit: 1 second
Memory limit: 256 MB

Notice:

Unless otherwise specified, inputs and outputs shall follow the format below:
- One space between a number and another number or character in the same line.
- No space between characters in the same line.
- Each string shall be placed in its own separate line.
- No trailing space(s) in each line.
- No empty lines, except that the input and output should end with the endline character.

C++ programmers should be aware that using C++ streams (`cin` / `cout`) may lead to I/O bottlenecks and substantially slower performance.

For some problems 64-bit integers may be required. In Pascal it is `int64`. In C/C++ it is `long long int`.

C/C++ programmers should use `"%lld"` for 64-bit integers I/O.

All tasks are divided into subtasks. You need to pass all test cases in a subtask to get points.

Model Answer

Problem

Dr. Jones has recently joined the Byteland Academy as a professor. As the top academy in the kingdom, Byteland Academy offers each professor a companion Robo robot. Dr. Jones's companion robot has a serial number `ROBO-3232`. For simplicity, Dr. Jones just called him Robo.

Time flies. The end of semester was approaching and Dr. Jones needed to prepare the final examination paper. After preparing the paper, Dr. Jones decided to write a marker program for Robo, so that Robo would scan and mark the papers for him. Unfortunately, since Dr. Jones's programming skill was not good enough, he encountered some bugs in the part for marking free-response questions. At the end, due to lack of time, Dr. Jones simply removed all free-response questions from the paper and added more multiple-choice questions to it. As a result, the paper now consists only of N multiple-choice questions. Plus, there are only three choices (`A`, `B`, and `C`) for each question.

In Dr. Jones's class, there are three particularly outstanding students, Alice, Bob, and Carlos. As they got full marks for all previous tests, their ranks all rest on their final examination results.

It turns out that the final examination is too difficult! Feeling uncertain about her answers, Alice decided to modify the model answer in Robo's marked program. She asked Bob and Carlos for their answers and hacked into Robo's system. She wanted the model answer to be modified in a way that she would pass the examination and the other two would fail.

The passing mark for the examination paper is P. One mark is awarded for each correct answer. No marks will be deducted for a wrong answer. A student passes the examination if he/she gets at least P marks. Otherwise, he/she fails.

Your task is to help Alice modify the model answer, such that Alice would pass the examination and Bob and Carlos would fail.

Input

The first line contains two integers, N and P. ($1 \leq P \leq N$)
The second line contains N characters, where each character is `A`, `B`, or `C`. The i^{th} character is Alice's answer for the i^{th} question.
The third and fourth lines have the same format as the second line. The third line contains Bob's answers and the fourth line contains Carlos's.

Output

If Alice cannot modify the model answer such that she would pass the examination and the other two would fail, output `Impossible`.
Otherwise, output a line with N characters – the desired model answer. Each character should be `A`, `B`, or `C`. The i^{th} character should represent the model answer for the i^{th} question.
If there are multiple answers, you may output any one of them.

Sample test

Input	Output
4 2 AABC BBCC ACAC	AABA

Input	Output
6 6 AAAAAA AAAAAA BBBBBB	Impossible

Subtasks

Subtask 1 (10 points)
$1 \leq N \leq 100000$
$P = N$

Subtask 2 (10 points)
$N = 2$

Subtask 3 (16 points)
$1 \leq N \leq 100000$
Bob and Carlos have the same answers.

Subtask 4 (20 points)
$1 \leq N \leq 10$

Subtask 5 (20 points)
$1 \leq N \leq 1000$

Subtask 6 (24 points)
$1 \leq N \leq 100000$

Time Zones

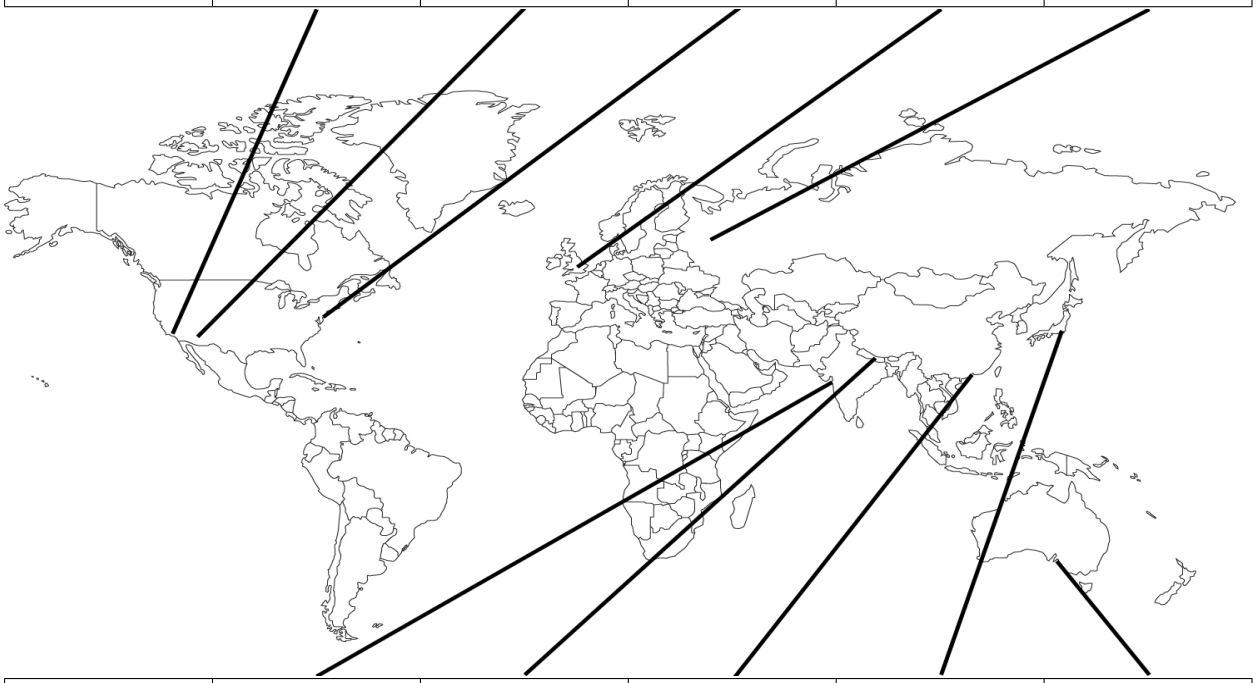
Problem

In Byteland, Dr. Jones is developing an interstellar telescope to observe human activity the Earth. First, he looked at London, and found that people's phones are showing `12:10`. Then he moved to Hong Kong, and found that people's phones are showing `20:10` instead. This confuses Dr. Jones because people and Robo robots in Byteland communicate using the absolute time system so the same time is used everywhere.

Our Earth is divided into several time zones. Time in the same time zone can be obtained by adding or subtracting hour(s) to / from the Universal Coordinated Time (UTC). For some time zones, partial hours are further added/subtracted (such as 30 minutes / 45 minutes).

The following table shows some of the time zones that are active in some cities today (19th December, 2015). The "example time" row shows the time in different time zones at the same moment.

Time Zone	Pacific Standard	Mountain Standard	Eastern Standard	Greenwich Mean	Moscow
Abbreviation	`PST`	`MST`	`EST`	`GMT`	`MSK`
City	Los Angeles	Phoenix	New York	London	Moscow
UTC Offset	UTC-8:00	UTC-7:00	UTC-5:00	UTC+0:00	UTC+3:00
Example Time	04:10	05:10	07:10	12:10	15:10



Time Zone	India Standard	Nepal	Hong Kong	Japan Standard	Australian Central Daylight
Abbreviation	`IST`	`NPT`	`HKT`	`JST`	`ACDT`
City	Mumbai	Kathmandu	Hong Kong	Tokyo	Adelaide
UTC Offset	UTC+5:30	UTC+5:45	UTC+8:00	UTC+9:00	UTC+10:30
Example Time	17:40	17:55	20:10	21:10	22:40

Write a program to help Dr. Jones convert a time from time zone A to time zone B according to the above table.

Input

The first line contains the current time in time zone A in 24-hour format, represented by two 2-digit integers separated by a space: $hh\ mm$ ($00 \leq hh \leq 23$, $00 \leq mm \leq 59$)
The second line contains a string – the abbreviation of time zone A.
The third line contains a string – the abbreviation of time zone B.
It is guaranteed that A and B are not the same time zone.

Output

Output one line – the 24-hour format time in time zone B at the same moment. It should be represented using two 2-digit integers separated by a space: $hh\ mm$ ($00 \leq hh \leq 23$, $00 \leq mm \leq 59$)

Sample test

Input	Output
04 08 PST HKT	20 08

Input	Output
17 44 MSK ACDT	01 14

Input	Output
09 20 NPT IST	09 05

Notice that `ACDT` is one day ahead of `MSK` but you should only output the correct time.

Subtasks

Subtask 1 (15 points)
Time zone A is `PST`.
Time zone B is not `IST`, `NPT` nor `ACDT`.

Subtask 2 (13 points)
Time zone A is `PST`.

Subtask 3 (26 points)
Neither time zones is `IST`, `NPT` nor `ACDT`.

Subtask 4 (22 points)
Neither time zones is `NPT`.

Subtask 5 (24 points)
No additional constraints

Stone Game

Problem

In Byteland, humans and robots live together. Although robots have a slightly inferior social status, they get along well with humans. Dr. Jones recently awarded his best student Alice a Robo robot. Other than doing household chores, Robo would also play simple games with Alice.

Among the games they play, one of them is the stone game. It is a two-person game. First, the players prepare N piles of stones and arrange them in a straight line, so that the i^{th} pile has S_i stones. They also prepare a practically unlimited supply of spare stones. Then, the players decide on a value V, which is useful later.

After setting up the game, the game starts. The players take turn to make a move. In a player's turn, he/she must either take a spare stone and add it to a pile with less than V stones, or remove a stone from a pile with more than V stones. The first player who cannot make a move in his/her turn loses, therefore the other player wins.

Today is a Saturday and Alice has already done all her homework. Therefore, she decided to play the stone game with Robo for Q rounds. Each round has the same stone configuration, but possibly different values of V. Alice always goes first.

Your task is to help Alice predict the outcome for each round.

Input

The first line contains integer N.
The second line contains N integers, $S_1, S_2, \ldots, S_N$.
The third line contains integer Q.
The fourth line contains Q integers, $V_1, V_2, \ldots, V_Q$. V_i is the value of V for the i^{th} round.

Output

Output Q lines. For line i, output `Alice` or `Robo`, the name of the winner of the i^{th} round.

Sample test

Input	Output
3 2 3 4 4 1 2 3 4	Robo Alice Robo Alice

Explanation

There are 3 piles of stones. The piles have 2, 3, 4 stones respectively. Consider the 3^{rd} round, where $V = 3$. Alice moves first. She can choose to add one stone to the 1^{st} pile, or remove a stone from the 3^{rd} pile. If Alice chooses to add a stone to the 1^{st} pile, Robo can only remove a stone from the 3^{rd} pile next. If Alice chooses to remove a stone from the 3^{rd} pile, Robo can only add a stone to the 1^{st} pile next. After that, the game ends because Alice cannot make any more move (all piles have $V = 3$ stones), and Robo wins.

Subtasks

Subtask 1 (12 points)
$N = 1$
$Q = 2$
$1 \leq S_i, V_i \leq 10^6$

Subtask 2 (18 points)
$1 \leq N \leq 20$
$1 \leq Q \leq 20$
$1 \leq S_i, V_i \leq 100$

Subtask 3 (23 points)
$1 \leq N \leq 50000$
$1 \leq Q \leq 50000$
$1 \leq S_i, V_i \leq 100$

Subtask 4 (25 points)
$1 \leq N \leq 2000$
$1 \leq Q \leq 2000$
$1 \leq S_i, V_i \leq 10^6$

Subtask 5 (22 points)
$1 \leq N \leq 50000$
$1 \leq Q \leq 50000$
$1 \leq S_i, V_i \leq 10^6$

Candy Factory

Problem

In Byteland, intelligent robots have replaced humans in manufacturing as well.

Alice's father is the boss of a factory manufacturing candies. Instead of hiring humans to produce candies, Alice's father chooses to hire Robos to work due to the cheaper cost. It costs only 1 dollar to hire a Robo for 1 hour! Note that each Robo can only be hired for integral hours.

There are N Robos available for hiring. However, the productivity of them are different. The productivity of each Robo depends on their power and stamina. The power and stamina of Robo i are denoted as P_i and S_i respectively. If Alice's father hires the Robo i for t hour(s) where $t > 0$, it can produce $P_i + t \times S_i$ pieces of candy.

Alice's father has M dollars which means he can hire different robots such that the total working time of all robots is not more than M hours. He wants to hire Robo(s) using this M dollars such that he can have as many candies as possible. He is wondering what is the maximum pieces of candy he can have. So he ask his daughter, Alice who is one of the most outstanding student of Dr. Jones.

Your task is to help Alice to answer her father.

Input

The first line contains two integers, N and M.
The i^{th} line of the following N lines contains two integers P_i and S_i, the power and stamina of Robo i respectively.

Output

Output one integer representing the maximum pieces of candy can be produced.

Sample test

Input	Output
3 1 2 2 3 1 4 2	6

Input	Output
3 6 2 2 3 1 4 2	20

Explanation

For the second sample, if Alice's father hires the 3 Robos for 3 hours, 1 hours and 2 hours respectively, they can produce $(2 + 3 \times 2) + (3 + 1 \times 1) + (4 + 2 \times 2) = 8 + 4 + 8 = 20$ pieces of candy

Subtasks

Subtask 1 (9 points)
$1 \leq N \leq 1000$
$M = 1$
$1 \leq P_i, S_i \leq 1000$

Subtask 2 (14 points)
$1 \leq N \leq 1000$
$M = 2$
$1 \leq P_i, S_i \leq 1000$

Subtask 3 (12 points)
$1 \leq N \leq 100000$
$M = 2$
$1 \leq P_i, S_i \leq 100000$

Subtask 4 (23 points)
$1 \leq N \leq 1000$
$1 \leq M \leq 1000$
$1 \leq P_i, S_i \leq 1000$

Subtask 5 (13 points)
$1 \leq N \leq 1000$
$1 \leq M \leq 10^9$
$1 \leq P_i, S_i \leq 1000$

Subtask 6 (29 points)
$1 \leq N \leq 100000$
$1 \leq M \leq 10^9$
$1 \leq P_i, S_i \leq 100000$