Hong Kong Olympiad in Informatics 2020/21 Junior Group

Task Overview

ID	Name	Time Limit	Memory Limit	Subtasks
J211	Paint Shop	1.000 s	256 MB	11 + 14 + 23 + 19 + 27 + 6
J212	Paint the Floor	1.000 s	256 MB	12 + 12 + 15 + 15 + 23 + 23
J213	Paint the Wall	1.000 s	256 MB	13 + 18 + 9 + 8 + 29 + 23

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.
- Outputs will be automatically fixed as follows: Trailing spaces in each line will be removed and an end-of-line character will be added to the end of the output if not present. All other format errors will not be fixed.

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

For some problems 64-bit integers may be required. In Pascal it is `int64`. In C/C++ it is `long long` and its token for `scanf` /`printf` is `%lld`.

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

J211 - PAINT SHOP

Time Limit: 1.000 s / Memory Limit: 256 MB

"Bob the Builder" is a renowned constructor who has mastered the skill from different realms ranging from painting to engineering. You are inspired by Bob and want to become a professional painter. However, Bob doubts that if you are qualified for this job, so he gives you a task in his shop to see if you are capable or not. The task is as follows:

In the paint shop, seven colors of paints are available: cyan, magenta, yellow, black, red, green, and blue.

The paints are packaged in cans of 1 litre. The price for paints of different colors might be different and each of them is represented as an integer price per 1 litre can.

To obtain a particular color, you can always buy the corresponding color paint. Meanwhile, some color paints can be obtained by mixing some other color paints with the specified formula listed below : (where "L" stands for litre)

1L cyan + 1L magenta	→	2L blue
1L magenta + 1L yellow	→	2L red
1L cyan + 1L yellow	→	2L green

1L cyan + 1L magenta + 1L yellow	→	3L black
1L red + 1L green + 1L blue	→	3L black
1L cyan + 2L red	→	3L black
1L magenta + 2L green	→	3L black
1L yellow + 2L blue	→	3L black

Bob wants you to obtain at least N litres of paint of a given color. What is the minimum amount you need for the purchase?

INPUT

The first line of input consists of seven space-separated integers, which are the prices of 1 litre of cyan, magenta, yellow, black, red, green, blue paints respectively.

The second line of input consists of the integer N, representing the minimum amount of paint (in litre), followed by a string S, the color of paint you need to buy. S is one of the following 7 strings: `cyan`, `magenta`, `yellow`, `black`, `red`, `green`, `blue`. N and S is separated by a space.

OUTPUT

Output the minimum price to obtain at least N litres of paint of the given color by buying and mixing the paints.

SAMPLE TESTS

	Input	Output
1	`10 10 10 15 15 15 15` `7 red`	`75`

We can buy 3L of magenta paint and 3L of yellow paint, mix them to obtain 6L of red paint. Then buy an additional 1L of red paint, to obtain a total of 7L of red paint.

2	`10 10 10 25 25 25 25` `7 red`	`80`

We can buy 4L of magenta paint and 4L of yellow paint, mix them to obtain 8L of red paint. Note that we only need at least 7L of red paint, not necessarily exactly 7L.

3	`1 2 3 4 3 2 1` `3 black`	`5`

We can buy 1L of yellow paint and 2L of blue paint, mix them to obtain 3L of black paint.

SUBTASKS

For all cases:
$1 \leq N \leq 100000$
$1 \leq$ price of any color per litre ≤ 100

	Points	Constraints
1	11	$1 \leq N \leq 10$ S is always `cyan`, `magenta` or `yellow`.
2	14	$1 \leq N \leq 10$ N is an even number. S is always `red`.
3	23	$1 \leq N \leq 10$ S is always `red`, `green` or `blue`.
4	19	$1 \leq N \leq 10$ N is a multiple of 3. S is always `black`.
5	27	$1 \leq N \leq 10$ S is always `black`.
6	6	No additional constraints

J212 - PAINT THE FLOOR

Time Limit: 1.000 s / Memory Limit: 256 MB

Bob has finally decided to hire you as a painter trainee. Bob reminds you that after gaining more working experience, you will be qualified as a professional and can start your own business!

Interestingly, the circle tiles in Cindy's flat are arranged in a triangular shape of size N. It means that there are N rows of tiles, and on the i-th row there are i tiles $(1 \leq i \leq N)$. To denote the location of a tile, (x, y) represents the location of the y^{th} tile counted from left in the x^{th} row. For example, $(4, 1)$ denotes the location of the tile at the bottom left corner of a flat of size 4.

Cindy wants the tiles to be painted in Red, Green and Blue, so Bob has hired 3 painters to do the job, one for each colour. The 3 painters are standing in front of the edges of the triangle as illustrated in Figure 1.

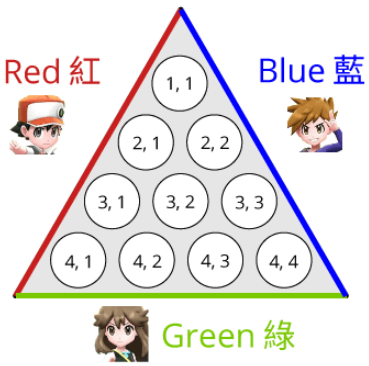


Figure 1: A flat of size 4 and the painters' location.

Character images from Pokemon: Let's Go, Pikachu and Eevee!

Afterwards, Bob will ask the painters to perform P painting actions in order. In the i^{th} action, he would select a colour C_i (either R for Red, G for Green or B for Blue) and a line number L_i $(1 \leq L_i \leq N)$. Then, the painter responsible for the colour C_i would count L_i tiles from the left along the edge that the painter is facing. The painter would first paint that tile, and then paint all the tiles he/she encountered while moving in a straight line. For Red, he will move in a straight line parallel to the blue edge. For Green, she would move in parallel to the red edge. For Blue, he would move in parallel to the green edge. After the painter paints the last tile in the line, he/she will return to the initial position.

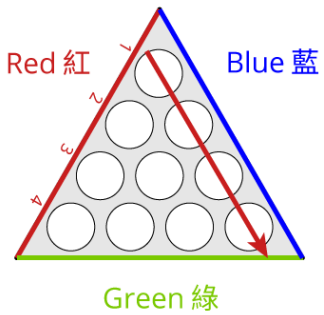


Figure 2a: Line 1 for Red.

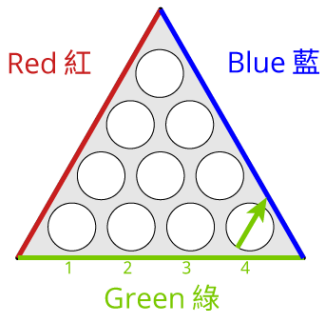


Figure 2b: Line 4 for Green.

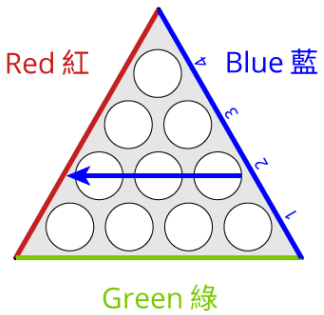


Figure 2c: Line 2 for Blue.

Because the painting actions happen in order, therefore if a tile is previously painted, the new colour covers the old one. Please refer to Figure 3 for an example.

Now that the P actions have been completed. Cindy wants to know how her flat looks after your work by asking you Q questions. For the j^{th} question, she would ask for the final colour of the tile at (X_j, Y_j).

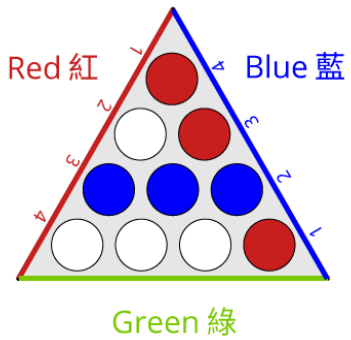


Figure 3: Line 1 for Red and then Line 2 for Blue.

INPUT

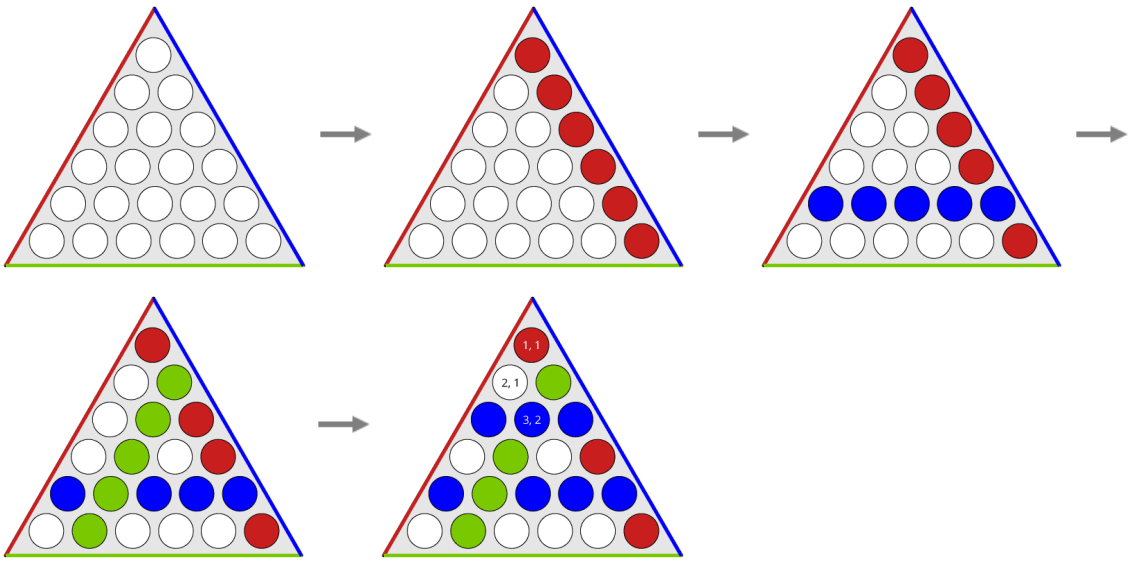
The first line of the input consists of two integers, N and P.
The i^{th} of the next P lines consists of a character C_i and an integer L_i. It is guaranteed that C_i is either R, G or B, and $1 \leq L_i \leq N$.
The next line consists of an integer Q.
The j^{th} of the next Q lines consists of two integers X_j and Y_j. It is guaranteed that $1 \leq X_j \leq N$ and $1 \leq Y_j \leq X_j$.

OUTPUT

Output Q lines, corresponding to the Q questions in the input in order.
On the i^{th} line, output R, G or B if the tile (X_i, Y_i) is red, green or blue respectively. If the tile is not painted, output W instead.

SAMPLE TESTS

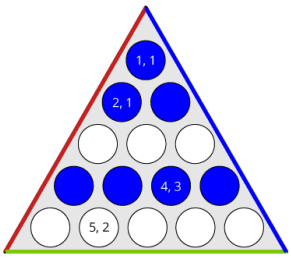
	Input	Output
1	6 4 R 1 B 2 G 2 B 4 3 1 1 2 1 3 2	R W B



2

5 4 B 4 B 2 B 4 B 5 4 4 3 5 2 1 1 2 1	B W B B

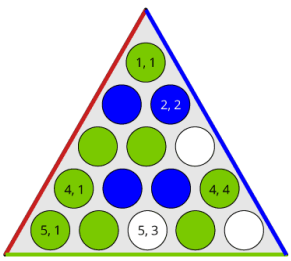
This sample satisfies the constraints of subtask 1.



3

5 6 G 2 B 2 B 5 G 1 B 4 G 4 6 2 2 5 3 4 4 1 1 5 1 4 1	B W G G G G

This sample satisfies the constraints of subtask 3.



SUBTASKS

For all cases: $1 \leq N, P, Q \leq 200000$

	Points	Constraints
1	12	$1 \leq N, P, Q \leq 10$ Only blue paint is used
2	12	Only blue paint is used
3	15	$1 \leq N, P \leq 500$ Only green and blue paints are used
4	15	Only green and blue paints are used
5	23	$1 \leq N, P \leq 500$
6	23	No additional constraints

J213 - PAINT THE WALL

Time Limit: 1.000 s / Memory Limit: 256 MB

With the previous experience, you are now qualified as a professional painter! Your first job as an experienced painter is to help your customer, Alice, paint her wall.

Alice's wall is a grid with R rows and C columns, thus $R \times C$ cells in total. All cells are painted white initially, and she decided to paint exactly N cells black ($0 \leq N \leq R \times C$) . Cell (x, y) denotes the cell at the x^{th} row from top to bottom and the y^{th} column from left to right.

To make the wall more beautiful, Alice wanted to maximise the number of pairs of neighbouring cells with different colours. Two cells are neighbours if and only if they share an edge. In other words, cell (x_1, y_1) and cell (x_2, y_2) are neighbours if and only if $|x_1 - x_2| + |y_1 - y_2| = 1$. For example, cell $(1, 1)$ is a neighbour of cell $(1, 2)$ and $(2, 1)$, but cell $(1, 1)$ is not a neighbour of cell $(2, 2)$.

Please find a way to paint the wall so that the number of pairs of neighbouring cells with different colours is maximised.

INPUT

The first and only line of input consists of three integers R, C, N.

OUTPUT

Output R lines, each line consists of C characters.
The j^{th} character on the i^{th} line represents the cell (i, j). `0` means the cell is white and `1` means the cell is black.

SAMPLE TESTS

	Input	Output

1	`4 4 8`	`1010`
		`0101`
		`1010`
		`0101`

There is a total of 24 pairs of neighbouring cells with different colours.

2	`1 5 3`	`10101`

There is a total of 4 pairs of neighbouring cells with different colours, which are:

- cell $(1, 1)$ and cell $(1, 2)$
- cell $(1, 2)$ and cell $(1, 3)$
- cell $(1, 3)$ and cell $(1, 4)$
- cell $(1, 4)$ and cell $(1, 5)$

3

3 3 3	010 100 010

There is a total of 9 pairs of neighbouring cells with different colours, which are:

- cell $(1, 1)$ and cell $(1, 2)$
- cell $(1, 1)$ and cell $(2, 1)$
- cell $(1, 2)$ and cell $(1, 3)$
- cell $(1, 2)$ and cell $(2, 2)$
- cell $(2, 1)$ and cell $(2, 2)$
- cell $(2, 1)$ and cell $(3, 1)$
- cell $(2, 2)$ and cell $(3, 2)$
- cell $(3, 1)$ and cell $(3, 2)$
- cell $(3, 2)$ and cell $(3, 3)$

4

4 3 12	111 111 111 111

There is a total of 0 pairs of neighbouring cells with different colours.

SUBTASKS

For all cases:
$1 \leq R, C \leq 100$
$0 \leq N \leq R \times C$

	Points	Constraints
1	13	$R = 1$
2	18	$R = 2$ $2 \leq C \leq 100$
3	9	$R = C = 3$
4	8	$R \times C$ is even $N = \frac{R \times C}{2}$
5	29	$R \times C$ is even
6	23	No additional constraints