

2. Folding (volt)

1 sec / 3 sec

30 points

Alice made a bet with Bob that, given a sheet of grid paper with side lengths equal to powers of two, she can obtain any rectangle aligned with the grid lines by repeatedly folding the paper in half. Bob is skeptical of this claim and has given her a large number of sheets and target rectangles to fold. Help Alice determine whether the folding is possible and, if so, find a suitable sequence of folds.

Input. The first line of input contains two integers X and Y ($1 \leq X, Y \leq 10^9$; both are powers of two), meaning that initial paper's bottom-left corner is at $(0, 0)$ and top-right corner is at (X, Y) .

The second line of input contains four integers X_1, Y_1, X_2, Y_2 ($0 \leq X_1 < X_2 \leq X, 0 \leq Y_1 < Y_2 \leq Y$), where (X_1, Y_1) are the coordinates of the target rectangle's bottom-left corner and (X_2, Y_2) are the coordinates of its top-right corner.

Output. If folding is possible, output the number of folds required on the first line, and on the second line, output a sequence of the characters 'a', 'u', 'v', and 'p', representing folding the paper in half from bottom to top, top to bottom, left to right, and right to left, respectively. If there are multiple ways to achieve the desired result, output any one of them. If no suitable folding is found, output -1 on the first line.

Example.	Input	Output
	4 4	4
	1 2 2 3	pauv

The corners of the initial paper are $(0, 0)$ and $(4, 4)$. After the first fold, they are $(0, 0)$ and $(2, 4)$; after the second fold, $(0, 2)$ and $(2, 4)$; after the third fold, $(0, 2)$ and $(2, 3)$; and finally, $(1, 2)$ and $(2, 3)$.

In this example, one could have also output 'apvu', for instance.

Example.	Input	Output
	4 2	-1
	1 0 3 2	

In this example, it is not possible to obtain the desired rectangle by repeatedly halving the initial sheet of paper.

Grading. In this task, each test case is graded separately. The test cases are divided into groups where the following additional conditions hold:

0. (0 points) The examples from the task statement. No points will be awarded for solving these, but the grading results will show whether your program works correctly on the evaluation server.
1. (10 points) $X \leq 32, Y \leq 32$.
2. (10 points) $Y_1 = 0, Y_2 = Y$ (this means that the paper needs to be folded only perpendicularly to the x -axis).
3. (10 points) No additional constraints.

You may submit several solutions. Each solution you submit may target one or more test groups (possibly all of them).