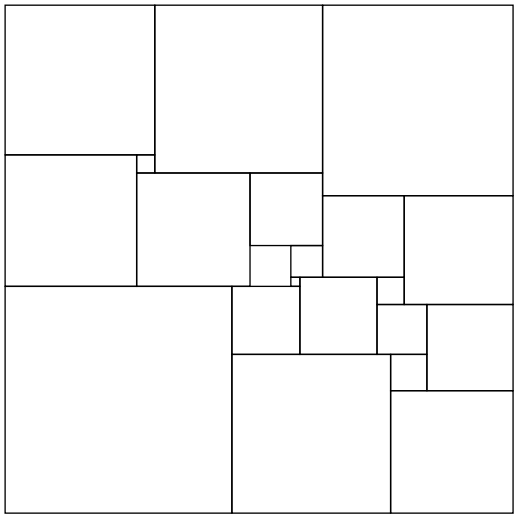
British Informatics Olympiad Final

11–13 April, 2003

Sponsored by Lionhead Studios

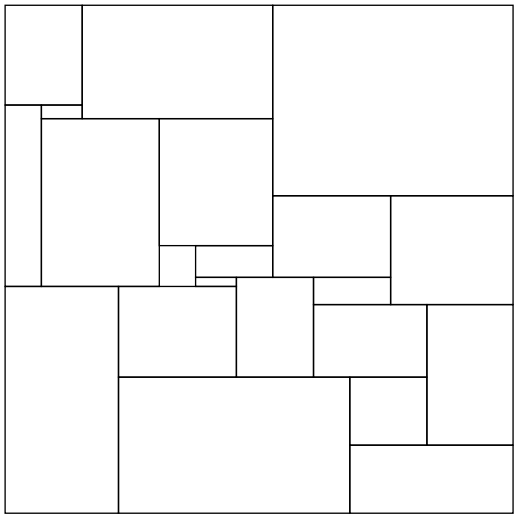
All Square

A *squared rectangle* is a dissection of a rectangle into one or more squares. For example:



You have been given a picture of a squared rectangle, drawn by a mathematician friend of yours. As is common, the mathematician's drawing skills leave a lot to be desired and, in the picture, many of the squares do not look very square. Indeed, even the outer rectangle might have been drawn incorrectly. Luckily, they did use a straight-edge, so all the lines are perfectly horizontal or vertical. Furthermore, they have drawn the relative positions of lines correctly; for example, if a vertical line should appear to the left of another vertical line, it will appear that way in the drawing.

Here is their interpretation of the squared rectangle above:



It is hard, as you can see, to make out what is going on. Fortunately, your friend also marked each 'square' in their diagram with a code number, and provided a 'key', which lists (for each code number), the correct side length for the corresponding square (which is always an integer). Armed with this information, you can draw a neat diagram. Unfortunately, you have lost the key.

You are to write a program which inputs a representation of a squared rectangle as drawn by your friend, and computes some key which corresponds to a way of interpreting it as a legal squared rectangle. The first line of the input will contain three numbers: x (the width of the diagram) then y (the height) and finally n (the number of rectangles in your friend's diagram); these will have $1 \leq x, y \leq 2^{14}$, and $1 \leq n \leq 125$. There will follow n lines, each containing four integers. We shall denote the integers on the i^{th} line, which describe the i^{th} rectangle (with code number i), by l_i, r_i, b_i, t_i; they give, respectively, the x coordinate of its left and right hand edges, and the y coordinate of its top and bottom edges; so $0 \leq l_i < r_i \leq x$ and $0 \leq b_i < t_i \leq y$. These rectangles will cover the whole diagram, and no part of the diagram will be in more than one rectangle.

You should output n integers, one to a line, such that the i^{th} integer is the side length you assign the i^{th} rectangle when it is transformed into a square. You should output `Impossible` if you believe that there is no legal key. If a solution exists, a key will exist where no value is larger than 2^{30}, and you should output such a key.

Sample Input

```
4 2 3
0 2 1 2
2 4 1 2
0 4 0 1
```

Sample Output

```
1
1
2
```