H Fred the Flea (`fred.{c,cc,java}`)

H.1 Description

Fred the Flea is trying to suck Gerald the Gopher's blood. To combat this, Gerald has built an insect screen around his residence. Insect screens are rectangular grids made of metal wire that are attached on all four sides to a frame. Sadly, Gerald's setup is flawed; along the bottom edge of his insect screen, there is a gap large enough for Fred to pass through.

Gerald's screen consists of w vertical wires and h horizontal wires, attached to the top/bottom and left/right edges of the frame, respectively. The wires intersect at $w \times h$ locations, where each intersection can be specified by a pair of integers (x, y) with $1 \leq x \leq w$ and $1 \leq y \leq h$. The frame of the screen consists of line segments connecting the points $(0, 0)$, $(w + 1, 0)$, $(w + 1, h + 1)$, and $(0, h + 1)$. Of these, the segment connecting $(0, 0)$ and $(w + 1, 0)$ is the bottom edge of the screen.

Initially, Fred is located on the outside of the insect screen at the intersection of two wires. At each time step, Fred randomly chooses to move one intersection up, down, left, or right, each with probability 1/4. If Fred reaches the bottom edge of the screen before any other edge, Fred will be happily inside Gerald's residence. However, if Fred reaches either the left, top, or right edge of the screen first, he will conclude that there is no way from the outside to the inside and give up.

Given Fred's starting location (x, y), your task is to compute the probability that Fred will get inside Gerald's house.

H.2 Input

The input file will contain multiple test cases. Each test case contains a single line with four integers w h x y as described in the problem statement, where $1 \leq w \leq 100$, $1 \leq h \leq 100$, $1 \leq x \leq w$, and $1 \leq y \leq h$. The end-of-input will be denoted by a single line containing "0 0 0 0" and should not be processed.

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1 1 1 1
2 2 1 1
0 0 0 0
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H.3 Output

For each input case, print the probability that Fred reaches the bottom edge before reaching any other edge. This probability should be rounded to three decimal places.

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0.250
0.375
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