Knight Trip

Computer Science Society
Programming Contest
Fall 2006

In the game of Chess, pieces move about on an $n \times n$ grid of squares. In a single move, a piece can go from one square to one of a set of squares depending on the type of piece. In this problem, we are interested in the movement of the piece known as the Knight. In a single move, a Knight can traverse two squares horizontally or vertically followed by one square in a perpendicular direction. If we imagine the squares as having coordinate "addresses" (x, y) where x and y are positive integers, then for example a Knight can move from $(3, 5)$ to one of $(4, 7)$, $(5, 6)$, $(5, 4)$, $(4, 3)$, $(2, 3)$, $(1, 4)$, $(1, 6)$, or $(2, 7)$. There are at most eight squares to which a Knight can go in a single move, and possibly fewer since the Knight is not allowed to go to an address outside the $n \times n$ grid. In this problem, we seek to find the least number of successive moves required for a Knight to go from a given address to any other address within the $n \times n$ grid.

Input Format

Each line of the input contains three positive integers. The first number is the dimension n of the square grid on which the Knight moves. We will assume the square in its lower right corner has address $(n, 1)$, and the square in its upper left corner has address $(1, n)$. The second number x and third number y are between 1 and n and give the coordinates of the starting address (x, y) of the Knight on the grid.

Output Format

For each line of input, output an $n \times n$ grid of numbers, each showing the minimum number of successive moves required for a Knight to reach that address in the grid from the starting address (x, y). If a square on the grid cannot be reached from the starting address (x, y), output `-1` in that position of the output grid.

Input Sample

```
8   6 5
4   1 1
3   2 3
```

Output Sample

see reverse side of this page

Output Sample

```
Minimum number of moves from (6,5) on a 8 by 8 board:

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

Minimum number of moves from (1,1) on a 4 by 4 board:

   5   2   3   2
   2   1   4   3
   3   4   1   2
   0   3   2   5

Minimum number of moves from (2,3) on a 3 by 3 board:

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