Coding Arena

<C*deVita/>
the TCS Coding Contest

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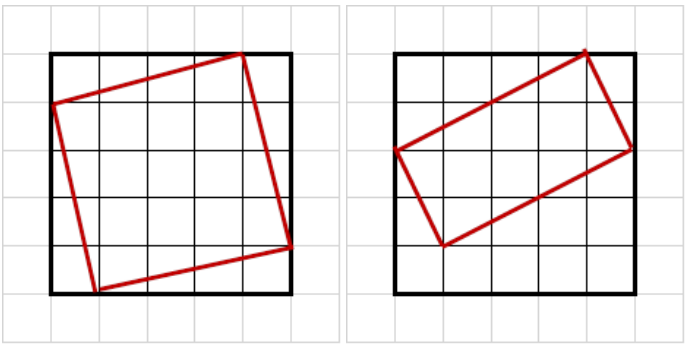
Problem : Counting Rectangles

Consider a grid of N x N squares. There are (N+1) x (N+1) grid points (corners of the squares). We need to count the number of rectangles (including squares) that can be formed with vertices at these grid points.

Note that the rectangles may not be aligned to the sides of the squares in the grid. For example, the figure below gives an example of two of these "oblique" rectangles in a 5x5 (or larger) grid of squares.



Input Format:

The input has one line with a positive integer, N, which is the number of squares per side of the grid.

Output Format:

The output is one line with the total number of rectangles that can fit into the grid.

Constraints:

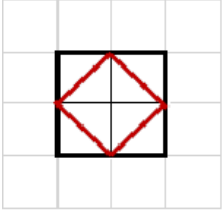
N < 50

Example 1

Input
2

Output
10

Explanation
The input says that N=2, and we are considering a 2 square X 2 square grid. Consider the “straight” rectangles (with sides aligned to the sides of the grid). There are 4 1x1 squares, 4 2x1 rectangles (including all orientations) and 1 2x2 square, a total of 9 rectangles. There is one “oblique” square pictured below.



Example 2

Input
3

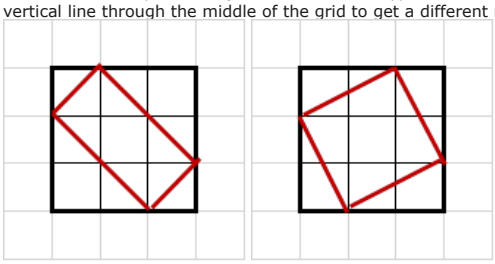
Output
44

Explanation
The input says N=3, and we are considering a 3 square by 3 square grid.

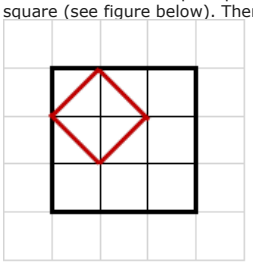
As before, if we consider the “straight” rectangles first. There are 9 1x1 squares, 4 2x2 squares and 1 3x3 square. If we consider 2x1 rectangles, there are 6 with the longer side parallel to the x axis, and 6 with the shorter side parallel to the x axis,

If we consider 3x1 rectangles, there are 3 with the longer side parallel to the x axis and 3 with the shorter side parallel to the x axis. If we consider 3x2 rectangles, there are 2 with the longer side parallel to the x axis, and 2 with the longer side parallel to the y axis.

If we look at oblique rectangles, there are two types which have vertices on the 3x3 square. Each may be reflected around a vertical line through the middle of the grid to get a different rectangle, a total of 4.



We also have the oblique square embedded in a 2x2 grid that we looked at in Example 1. This can be embedded in a 3x3 square (see figure below). There are 4 ways to do this (embedding a 2x2 square in a 3x3 square).



The total number of rectangles is 9+4+1 (squares) + 12 + 6 + 4 (straight rectangles) + 4 (oblique with vertices on outside square) + 4 (from embedded 2x2 square) = 44 rectangles. Hence the output is 44.

Note:

Please do not use package and namespace in your code. For object oriented languages your code should be written in one class.

Note:

Participants submitting solutions in C language should not use functions from <conio.h> / <process.h> as these files do not exist in gcc

Note:

For C and C++, return type of main() function should be int.

Submit Answer

I , **DEEPAK PATEL** confirm that the answer submitted is my own.
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