The Crooked Walk of Hilbert

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

The Hilbert curve of order n is a polyline that visits all cells of a $2^n \times 2^n$ square, visiting each cell exactly once and moving each time to an adjacent cell by side. It is constructed recursively.

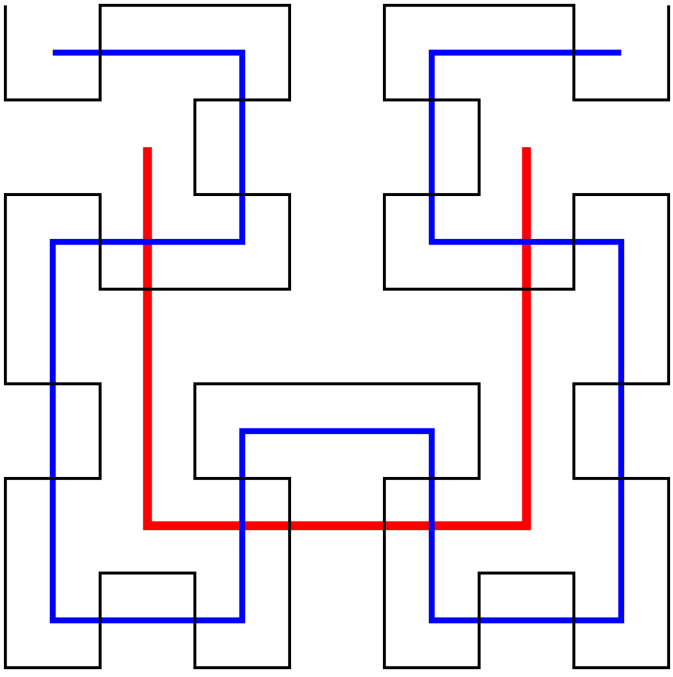
Order 1. The 2×2 square is traversed in the shape of the letter "U": from the upper-left cell down, then right, then up. The curve starts in the upper-left cell and ends in the upper-right one.

Order $n > 1$. The $2^n \times 2^n$ square is divided into four $2^{n-1} \times 2^{n-1}$ squares, and each one contains a copy of the order $n - 1$ curve:

- in the lower-left and lower-right squares — copies unchanged;
- in the upper-left square — a copy rotated by 90° counterclockwise;
- in the upper-right square — a copy rotated by 90° clockwise.

Then the copies are connected into one polyline in the order: upper-left → lower-left → lower-right → upper-right square. As with the order 1 curve, the resulting curve starts in the upper-left cell and ends in the upper-right one.

The figure shows Hilbert curves of orders 1, 2, and 3, overlaid on each other.



Number the cells of the square from 1 to 4^n in the order of traversal of the Hilbert curve of order n.

Input

The only line contains one integer N ($1 \le N \le 9$) — the exponent of the square side; the side length is 2^N.

Output

Print 2^N lines with 2^N integers separated by spaces in each — the matrix M_N of cell numbers in the order of traversal of the Hilbert curve: the j-th number in the i-th line is the number of cell (i, j).

Each integer from 1 to 4^N must appear in the output matrix exactly once, and cell $(1, 1)$ must contain 1. It can be shown that with this definition of the curve, the answer always exists and is unique.

Examples

standard input	standard output
1	1 4 2 3
2	1 2 15 16 4 3 14 13 5 8 9 12 6 7 10 11
3	1 4 5 6 59 60 61 64 2 3 8 7 58 57 62 63 15 14 9 10 55 56 51 50 16 13 12 11 54 53 52 49 17 18 31 32 33 34 47 48 20 19 30 29 36 35 46 45 21 24 25 28 37 40 41 44 22 23 26 27 38 39 42 43

Note

In the first example, $N = 1$, the square has size 2×2, and the answer is the matrix

$$\begin{pmatrix} 1 & 4 \\ 2 & 3 \end{pmatrix}.$$

This is exactly matrix M_1 from the statement: the traversal starts in cell $(1, 1)$ with number 1, then moves to cell $(2, 1)$ with number 2 (a step down), then to cell $(2, 2)$ with number 3 (a step right), and ends in cell $(1, 2)$ with number 4 (a step up). Thus the traversal order is "down, right, up", it starts in the upper-left corner of the square and ends in its upper-right corner, as required by the statement.

In the second example, $N = 2$, the square has size 4×4, and the answer is the matrix

$$\begin{pmatrix} 1 & 2 & 15 & 16 \\ 4 & 3 & 14 & 13 \\ 5 & 8 & 9 & 12 \\ 6 & 7 & 10 & 11 \end{pmatrix}.$$

Here the 4×4 square is divided into four 2×2 quadrants, which are traversed in the order described in the statement:

- the upper-left quadrant (cells $(1, 1)$–$(2, 2)$) is traversed in the order "right, down, left";
- the lower-left quadrant (cells $(3, 1)$–$(4, 2)$) is traversed in the order "down, right, up";
- the lower-right quadrant (cells $(3, 3)$–$(4, 4)$) is traversed in the order "down, right, up";
- the upper-right quadrant (cells $(1, 3)$–$(2, 4)$) is traversed in the order "left, up, right".

The traversal starts in cell $(1, 1)$ with number 1 and ends in cell $(1, 4)$ with number $16 = 4^2$.

In the third example, $N = 3$, the square has size 8×8; the answer is constructed by the same recursive rule as in the previous examples, but for the next order.