SHIFT Operator on Matrix

Given an n×n matrix A, whose entries Ai,j are integer numbers ($0 \le i < n$, $0 \le j < n$). An operation SHIFT at row i ($0 \le i < n$) will move the integers in the row one position right, and the rightmost integer will wrap around to the leftmost column.

You can do the SHIFT operation at arbitrary row, and as many times as you like. Define $C_j = A[0, j] + A[1, j] + ... + A[n-1, j]$, and $M = max\{C_j | 0 <= j < n\}$. C_j is the sum of all number in column ith.

Your job is to minimize M.

Input

The input consists of several test cases. The first line of each test case contains an integer n. Each of the following n lines contains n integers, indicating the matrix A. The input is terminated by a single line with an integer –1. You may assume that $1 \le n \le 7$ and $|A_{i,j}| < 10^4$.

Output

For each test case, print a line containing the minimum value of the maximum of column sums.

Example

Input:
2
4 6
3 7
3
1 2 3
4 5 6
7 8 9
-1

Output:
11
15