Problem J. Jump Jump Jump

Input file:	*standard input*
Output file:	*standard output*
Time limit:	5 seconds
Memory limit:	512 mebibytes

The rabbit starts at point $(0, 0)$ on the plane. The are k distinct vectors (dx_1, dy_1), (dx_2, dy_2), ..., (dx_k, dy_k). On each step, the rabbit will choose one vector (dx_c, dy_c) randomly with the same probability, and then jump from its current point (x, y) to $(x + dx_c, y + dy_c)$. All choices are independent.

There are traps in all the lattice points (x, x) for all $x \geq 1$. Once the rabbit jumps into a trap, it gets trapped and can not move anymore.

For each x such that $1 \leq x \leq n$, output the probability that the rabbit gets trapped in the lattice point (x, x).

Input

The first line contains two integers n and k ($1 \leq n \leq 10^5$, $1 \leq k \leq 16$).

Each of the following k lines contains two integers dx_i and dy_i ($0 \leq dx_i, dy_i \leq 3$) in each line. All the vectors are distinct.

Output

Print n lines. On line x, print the probability that the rabbit is trapped in the lattice point (x, x). It is guaranteed that the probability can be represented as a fraction A/B where B is coprime to 998 244 353, so output it as $A \cdot B^{-1} \bmod 998\,244\,353$.

Example

standard input	standard output
5 3 0 0 0 1 1 0	499122177 873463809 935854081 959250433 970948609

Note

The probabilities are $\frac{1}{2}, \frac{1}{8}, \frac{1}{16}, \frac{5}{128}, and \frac{7}{256}$.