Problem E. Three balls

Input file:	*standard input*
Output file:	*standard output*
Time limit:	5 seconds
Memory limit:	1024 mebibytes

Central European Regional Contest (CERC) is a contest famous for its interesting and always well-prepared tasks. One of these tasks[1] was about finding a volume of a sum of three balls. Maybe it was a challenge 10 years ago, but nowadays contestants should not be bothered with so easy and standard problems. Instead of using 3D space, we will use n-dimensional hypercube. Obviously, it requires some definitions.

n-dimensional hypercube has 2^n vertices, each of them is represented by a sequence of n coordinates which are either 0 or 1. For example, 3-dimensional hypercube has 8 vertices: 000, 001, 010, 011, 100, 101, 110, 111.

Ball with radius r and center s is a subset of vertices of hypercube which have distance at most r to the vertex s. We compute the distance in Manhattan metric which means that vertex p belongs to this ball if and only if coordinates of vertices p and s differ on at most r positions.

Find the number of vertices which belong to the sum of three balls, i.e. number of vertices which belong to at least one of these balls. Print the result modulo $10^9 + 7$.

Input

First line of input contains one integer n ($1 \le n \le 10\,000$), denoting number of dimensions.

Description of three balls follow. Each description takes one line and i-th line contains integer r_i ($0 \le r_i \le n$) and binary word s_i consisting of n characters which are either 0 or 1. These are the radius and the center of the ball, respectively.

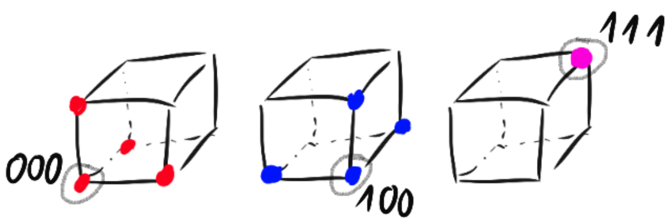
Output

You need to print one integer — number of vertices belonging to sum of these three balls, modulo $10^9 + 7$.

Examples

standard input	standard output
3 1 000 1 100 0 111	7
5 2 10110 0 11010 1 00000	19

Explanation to first sample test: 3-dimensional hypercube is just a mere cube. Following pictures show which vertices belong to following balls. Grey circle denotes center of a ball.



First ball contains vertices 000, 100, 010, 001. Second ball contains vertices 100, 000, 110, 101. Third ball is just a single vertex 111. Sum of these balls contains 7 vertices — all of them except 011.

[1]CERC 2009, problem E: http://cepc09.ii.uni.wroc.pl/lost2.pdf