Alan Turing's Enigma

“We can only see a short distance ahead, but we can see plenty there that needs to be done.” -Alan Turing

Alan Turing is widely considered to be the father of theoritical computer science and artificial intelligence. During World War 2 with the help of Enigma Machine Turing's team decoded Nazi messages and helped in reducing the war period by 2 years and saving 14 millions lives in the process. Before building the real machine he decided to made a prototype. This prototype consists of a 3x3 board with 4 dials A, B, C, D (see figure for reference), that can be rotated in clockwise or counterclockwise direction. Each cell consists of a number from 1 to 9. Rotating a dial results in the rotation of its 4 neighbouring cells.

For example, in figure (a) if dial A is rotated in clockwise direction we get figure (b). Now if we rotate dial D in counterclockwise direction we get figure(c).

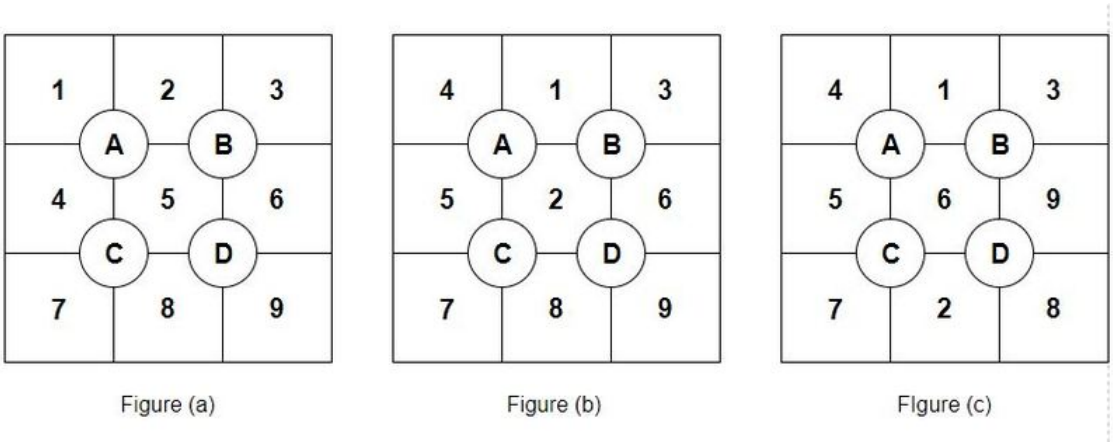

Figure (a) Figure (b) Figure (c)

Turing wants to find out that if given any configuration of the board, what is the minimum number of dial rotations less than **N** that need to be performed to bring the board back to the original configuration (i.e. configuration of figure (a)). Help him solve this problem.

Input Format

The first line contains an integer **T**, the number of testcases. **T** lines follow, each containing a string **S** of length 9 denoting the configuration of the board in row major order and a single digit integer **N**.

Constraints

- **$1 \leq T \leq 10^4$**
- **$0 \leq N \leq 9$**
- **$|S| = 9$**

Output Format

For each configuration of the board print in a new line the minimum number of rotations required to bring the board back to its original configuration or -1 if it can't be done in **N** rotations or less.

Sample Input 0

```
2
413569728 3
165432789 1
```

Sample Output 0

```
2
-1
```

Explanation 0

First case corresponds to the case in figure (c), so the answer is 2.

In the second case it is not possible to go back to the original configuration in the given number of rotations so we print -1.