DOOR LOCKER PUZZLE

There is a boy who's a master in solving puzzles related to prime numbers is agitated from the peoples who anytime enters in his secret room without any permission , so he created a door locker puzzle , who so ever is able to solve the puzzle gets the entry . The puzzle comprises of a 3x3 board consisting of numbers from 1 to 9. The objective of the puzzle is to swap the tiles until the following final state is reached:

1 2 3
4 5 6
7 8 9

At each step, person may swap two adjacent tiles if their sum is a prime number. Two tiles are considered adjacent if they have a common edge. If the person is able to do it in the least steps and if he/she is able to find that there is no way to reach the final state then he/she will get the entry in the secret room. So help the persons to get entry in the secret room.

Input

The first line contains p, the number of persons (not more than 50). Then p person's cases follow. Each person's case consists of a 3x3 table describing a puzzle which the person has to solve.

The input data for successive person's cases is separated by a blank line.

Output

For each person's case print a single line containing the shortest number of steps needed to solve the corresponding puzzle. If there is no way to reach the final state, print the number -1.

Example

Input:

2

7 3 2
4 1 5
6 8 9

9 8 5
2 4 1
3 7 6

Output:

6
-1