

The 8-Puzzle (prob8)

The 8-puzzle consists of a 3x3 grid and 8 tokens numbered 1 to 8. Each token occupies one of the positions in the grid leaving only one position open. Here is an example of how the 8-puzzle would look (see figure on left).

1	2	3
7		4
8	6	5

1	2	3
4	5	6
7	8	

The only valid operation is to move a token from its position to the open one, and this is only allowed if the token we are moving shares an edge with the open position. For instance in the above example (see figure on left), we could either move 7 to the right, 6 up, 2 down, or 4 to the left but we cannot move 1, 3, 8, or 5. The 8-puzzle is, given any random starting position for the eight tokens, to find the minimum number of movements required to obtain the final positioning (see figure on right).

Input

The first line of the input will contain an integer N ($1 \leq N \leq 10,000$) which represents the number of test cases. Then, N test cases follow consisting each of three lines. Each line will contain 3 integers (0 to 8) separated by spaces. The number 0 will represent the open position in the grid. Every test case will contain the number 0 to 8 exactly once.

Output

Output a single line containing the minimum number of moves required to reach the final position. Each input is guaranteed to have a finite solution.

Sample Input

```
3
1 2 3
4 5 6
7 8 0
1 2 3
7 0 4
8 6 5
4 2 6
3 1 5
7 0 8
```

Sample Output

```
0
8
17
```