Problem E. Enigma

Time limit: 2 seconds
Memory limit: 1024 megabytes

Edward is the founder and head of the company Enigma, the manufacturer of the most secure safes on the market. Enigma safes are protected by a combination lock with a 5-digit code. The lock consists of five wheels and an "open" button. Each wheel contains all digits from 0 to 9 (in this order); after the digit 9, the digit 0 appears again.

An *operation* is defined as rotating any wheel by one position in either direction, for example changing the digit 9 to 8 or 0. The *distance* between two codes is the minimum possible number of operations required to change one entered code into the other. For example, the distance between `38911` and `68000` is $3 + 0 + 1 + 1 + 1 = 6$.

Safe manufacturers keep statistics of the most commonly used codes – you are given n such codes in order from most to least popular. Enigma prides itself on flexibility – each client can choose how many of the n most popular codes they wish to avoid. Edward then chooses a code that maximizes the smallest distance to the codes from the selected prefix of the sequence of the most popular codes.

For each k from 1 to n, your task is to find the largest possible distance of some code to the closest among the k most popular codes, and count how many codes achieve such a distance.

Input

The first line contains an integer n ($1 \le n \le 99\,999$), denoting the number of popular codes.

Each of the following n lines contains a string consisting of 5 digits `0-9`, possibly with leading zeros. These are the popular codes in order from most to least popular. All codes are pairwise distinct.

Output

Output n lines; the k-th line should contain two integers separated by a space – the largest possible distance to the nearest code among the k most popular ones, and the number of codes with that distance.

Examples

standard input	standard output
3 00000 00001 12345	25 1 24 2 17 270
3 12345 23456 67890	25 1 22 20 12 15270

Note

For $k = 1$, the largest possible distance from code `00000` is 25, achieved only by the code `55555`.

For $k = 2$, the largest possible distance to the nearer of the codes `00000` and `00001` is 24, achieved by two codes: `55555` and `55556`. The first is 24 away from `00001`, and the second is 24 away from `00000`.

For $k = 3$, the largest possible distance to the nearest among the codes `00000`, `00001`, and `12345` is 17, achieved by 270 different codes, for example `55570` and `55580`. The first is 17 away from `12345`, and the second is 17 away from `00000`.