ETH Zurich
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Exercise Sheet 1

ACM Programming Challenges Lab

Exercise 1 – *Permutation Pairs*

Paul loves playing games with numbers. His favourite game is the following. First he chooses a positive number n. Then, he expresses n in base-10 digits, like so:

$$n = \langle x_1, x_2, x_3, \ldots, x_\ell \rangle.$$

Now, there are a whole lot of different numbers that can be obtained by taking *permutations* of these digits (although be careful: not every permutation yields a number, e.g., the permutation 021 of 120 is not a number). Suppose that we have two permutations σ and π such that

$$m = \langle x_{\sigma(1)}, x_{\sigma(2)}, \ldots, x_{\sigma(\ell)} \rangle$$

and

$$m' = \langle x_{\pi(1)}, x_{\pi(2)}, \ldots, x_{\pi(\ell)} \rangle$$

are both numbers. Then the *value* of the pair (σ, π) is defined to be the number of trailing zeroes in the decimal expansion of $m + m'$. For example, if $m = 51809$ and $m' = 58091$, then $m + m' = 109900$, and so the value of the pair (σ, π) is 2 (there are two trailing zeroes).

The objective of the game is to determine the *maximum* value that can be obtained by a pair of permutations.

Input The first line of the input contains the number of test cases $t \leq 200$. Every test case consists of a two lines: a line containing a number $1 \leq \ell \leq 10000$, and a line containing an ℓ-digit number n.

Output For every test case you should output a number m, the maxmimum number of trailing zeroes that can be obtained by summing two permutations of n.

Sample Input	**Sample Output**
3 3 554 4 5000 5 58091	3 4 5