Problem G. Yelkrab

Time limit: 2 seconds
Memory limit: 1024 megabytes

The International Collegiate Piggy Contest is about to start! This contest features different tracks, each with specific requirements for the number of participants per team. For the k-th track, the number of participants in each team must be **exactly** k.

There are n piggies in Pigetown University, and they want to participate in a way that maximizes the rating of their University. The i-th piggy's name is s_i, which is a string consisting of lowercase English letters. The rating of the team is the length of the longest common prefix† of their name. The rating of the University is the sum of ratings of all the teams sent by this University. Each piggy can only participate in at most one team.

Let $f(i, j)$ be the maximum rating of the Pigetown University if the Pigetown University only sends teams consisting of the first i piggies to participate in the j-th track, where each team consists of exactly j piggies. Please, for each $1 \le i \le n$, calculate $\bigoplus_{j=1}^{i}(f(i, j) \times j)$, where $\oplus$ denotes bitwise exclusive or operation.

†: The length of the longest common prefix of m strings $t_1, t_2, \ldots, t_m$ is the largest non-negative integer p, where $p \le \min(|t_1|, |t_2|, \ldots, |t_m|)$ and for all $1 \le e \le p, 1 \le i, j \le m$, $t_{i,e} = t_{j,e}$.

Input

The input contains multiple test cases. The first line contains an integer T ($1 \le T \le 5 \cdot 10^5$).

For each test case, the first line contains an integer n ($1 \le n \le 5 \cdot 10^5$).

The i-th of the following n lines contains a string s_i ($1 \le |s_i| \le 10^6$), denoting the name of the i-th piggy. It is guaranteed that the string only consists of lowercase English letters.

It is guaranteed that the sum of n does not exceed $5 \cdot 10^5$, and the sum of the names of piggies in all test cases does not exceed 10^6.

Output

For each test case, output n integers in one line, separated by spaces. The i-th integer is $\bigoplus_{j=1}^{i}(f(i, j) \times j)$.

Example

standard input	standard output
2 5 aa ab ab ac d 1 aaaaa	2 6 1 9 8 5