
Problem A. Split and Merge

Input file: `split.in`
Output file: `standard output`
Time limit: 2 seconds
Memory limit: 512 megabytes

You are given a string S which length is guaranteed to be a power of 2. You split this string in the middle and then put the first half on top of the second half and add up the columns (mod 26). This yields a new string of half the length. You repeat this process until the length of the string is equal to 1 (i.e. the string becomes a single character). Your task is to print the resulting character.

The string S is specified as follows. You will be given a string A and a parameter k as input. S is equal to A concatenated to itself k times. For example, for $A = "ab"$ and $k = 4$ we get $S = "abababab"$.

Adding two characters means adding their values. Considering 'a' associated with the value 0, 'b' is associated with the value 1 and so on.

Input

The first line of input an integer T ($1 \leq T \leq 10$) — the number of test cases. Then T lines follow, one for each test case. Each line contains a string A of length $|A|$ ($1 \leq |A| \leq 10^5$) and a parameter k ($1 \leq k \leq 2^{32}$). It is guaranteed that A contains only lowercase letters of the English alphabet 'a'..'z' and that the length of the string S is a power of 2.

Output

For each test case, print the resulting character on a separate line.

Example

split.in	standard output
4	k
k 1	e
ab 4	q
cool 8	i
code 32	

Note

Here are the steps for the second test case: **abababab** -> **acac** -> **ae** -> **e**.