Problem D. Random String Generator

Input file:	`rsg.in`
Output file:	`rsg.out`
Time limit:	2 seconds
Memory limit:	256 mebibytes

This problem is about generating strings. Let *random string generator* (RSG) be a program which generates a string consisting of characters `A` and `B`. String generation is a two-step process.

On the first step, the generator itself is generated. A parameter k, is chosen randomly from set $\{1, 2, \ldots, 10\}$ with equal probability. This parameter is the length of suffix which is sufficient to generate the next character.

After that, 2^k more parameters are chosen. These parameters are $p_s^{\mathtt{A}}$ for all strings s consisting of exactly k characters from set $\{\mathtt{A}, \mathtt{B}\}$. The $p_s^{\mathtt{A}}$ are chosen independently and uniformly on segment $[0, 1]$ (it means that probability of $p_s^{\mathtt{A}} < t$ equals t for every $t \in [0, 1]$). These parameters are the probabilities of letter `A` appearing after suffix s.

On the second step, we use the generator to generate an infinite string. The first k characters of the string are chosen independently and uniformly (each character is `A` with probability $\frac{1}{2}$).

Each next character depends only on the last k previous characters which form a suffix s of length k. This next character will be `A` with probability $p_s^{\mathtt{A}}$ and `B` with probability $p_s^{\mathtt{B}} = 1 - p_s^{\mathtt{A}}$.

You are given the first few characters of a string generated by the two-step process described above (note that the number of characters given could be less than k). You should output the probability that `A` was the next character of this string. It is guaranteed that the probability of generation of the given prefix is strictly greater than zero.

Input

The first line of input contains an integer T — the number of test cases ($1 \leqslant T \leqslant 10\,000$). Each of the next T lines contains a single test case — a nonempty string consisting only of characters `A` and `B`. All test cases were generated independently by the two-step process described above (in each test case, the generator and the infinite string are generated separately from other test cases). Sum of lengths of all T given strings does not exceed $10\,000$ characters.

Output

For each test case, print the required probability on a single line with absolute or relative error at most 10^{-6}.

Example

rsg.in	rsg.out
4 A BB AAA ABA	0.5 0.48333333333333334 0.5483870967741935 0.48333333333333334