Arithmetic Decoding

Problem ID: arithmeticdecoding

Arithmetic coding is a method to represent a message as a real number x such that $0 \leq x < 1$. We will assume that the message consists only of uppercase 'A's and 'B's. The two letters have associated probabilities p_A and $p_B = 1 - p_A$ such that $0 < p_A < 1$.

The current interval $[a, b)$ is initially set to $[0, 1)$ and we will update this interval one letter at a time. To encode a letter, the current interval is divided into two subintervals as follows. Let $c = a + p_A(b - a)$. If the next letter is 'A', $[a, c)$ becomes the current interval. Otherwise, the current interval is now $[c, b)$. This process is repeated for each letter in the message. If $[k, \ell)$ is the final interval, the encoded message is chosen to be k.

For example, if the original message is "ABAB" and $p_A = p_B = 0.5$, the sequence of intervals encountered in the algorithm is

$$[0, 1) \xrightarrow{A} [0, 0.5) \xrightarrow{B} [0.25, 0.5) \xrightarrow{A} [0.25, 0.375) \xrightarrow{B} [0.3125, 0.375).$$

The encoded message is therefore 0.3125, or 0.0101 in binary.

Given the length of the message, the probabilities, and the encoded message, determine the original message.

Input

The first line contains the integer N ($1 \leq N \leq 15$), which is the length of the original message. The second line contains the integer D ($1 \leq D \leq 7$), which indicates that $p_A = \frac{D}{8}$. The third line contains the binary representation of the encoded message. It is guaranteed that the binary representation of the encoded message starts with "0." and contains at most $3N + 2$ characters.

It is guaranteed that the encoded message came from an initial message of length N consisting only of 'A' and 'B' using this value of p_A.

Output

Display the original message.

Sample Input 1	Sample Output 1
4 4 0.0101	ABAB

Sample Input 2	Sample Output 2
6 5 0.100100100100101	ABBABA