GCD of Pattern Matching

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	512 megabytes

For any positive integer x, its m-based representation is a string of digits $d_{n-1}d_{n-2}\cdots d_1 d_0$ where $x = \sum_{i=0}^{n-1} d_i m^i$, $0 < d_{n-1} < m$, and $\forall_{i=0,1,\ldots,n-2} 0 \le d_i < m$.

Let Σ be the set of all possible characters. We call that a string $S = s_1 s_2 \cdots s_n$ matches with a pattern $P = p_1 p_2 \cdots p_n$ if and only if there exists a mapping function $f : \Sigma \to \Sigma$ such that $\forall_{i=1,2,\ldots,n} f(s_i) = p_i$ and $\forall_{a,b\in\Sigma,a\neq b} f(a) \neq f(b)$.

Given an integer m and a pattern P consisting of lowercase English letters, find all positive integers in m-based representation that match the pattern, and report their greatest common divisor (GCD) in 10-based representation.

It is guaranteed for each test case that there always exists at least one integer whose m-based representation matches the pattern.

Input

The first line of the input contains a single integer T $(1 \le T \le 500\,000)$, denoting the number of test cases.

Each of the following T lines describes a test case and contains an integer m and a string P $(2 \le m \le 16,$ $1 \le |P| \le 16)$, separated by a single space.

Output

For each of the T test cases, print a single line containing a single integer: the GCD of all matched positive integers (in 10-based representation).

Example

standard input	standard output
5 10 ccpcccpc 10 cpcpcp 10 cpc 4 cpccpc 4 dhcp	10001 10101 1 65 3

Note

For the last sample case, all integers of length 4 with no duplicate digits in 4-based representation can match `dhcp`, whose digits have a constant sum $0+1+2+3=6$ (e.g. `1023`, `1302`, `3210`). Together with $\sum_{i=0}^{n-1} d_i 4^i \equiv \sum_{i=0}^{n-1} d_i \pmod 3$ and $\gcd(1023, 3210) = 3$, we can conclude the answer is 3.