Digit Products

HackerRank

Let $D(X)$ be a function that calculates the digit product of X in base 10 without leading zeros. For instance:

$$D(0) = 0$$
$$D(234) = 2 \times 3 \times 4 = 24$$
$$D(104) = 1 \times 0 \times 4 = 0$$

You are given three positive integers A, B and K. Determine how many integers exist in the range $[A, B]$ whose digit product equals K. Formally speaking, you are required to count the number of distinct integer solutions of X where $A \leqslant X \leqslant B$ and $D(X) = K$.

Input Format

The first line contains T, the number of test cases.
The next T lines each contain three positive integers: A, B and K, respectively.

Constraints

$T \leqslant 10000$
$1 \leqslant A \leqslant B \leqslant 10^{100}$
$1 \leqslant K \leqslant 10^{18}$

Output Format

For each test case, print the following line:

Case X: Y

X is the test case number, starting at 1.
Y is the number of integers in the interval $[A, B]$ whose digit product is equal to K.

Because Y can be a huge number, print it modulo $(10^9 + 7)$.

Sample Input

```
2
1 9 3
7 37 6
```

Sample Output

```
Case 1: 1
Case 2: 3
```

Explanation

In the first test case, there is only one number (3) in the interval $[1, 9]$.

In the second test case, there are three numbers $(16, 23, 32)$ in the interval $[7, 37]$ whose digit product equals 6.