[A4] Graffiti Math (150 pts)

Time Limit: 1s
Memory Limit: 512MB

Problem Description

A flash of light erupts from your phone camera as you take a picture of the graffiti. "Another one here", you think to yourself as you stare at multiple pictures of graffiti on your phone. You've been tracking a group of NELOC smugglers that deal with stolen art from all around the world. These graffiti allow their agents to easily communicate with one another without alerting authorities.

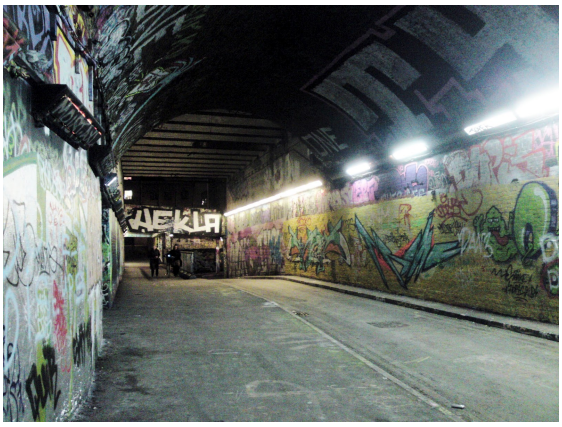

Figure 1: One of the many graffiti walls scattered across the city

From your observations, you note that all of the graffiti contain spraypainted characters on a subway wall in different parts of the city. These characters are arranged in a similar fashion to math equations with two operands. However, instead of numbers, they use capital letters instead. An example equation in one of the graffitis is located below

```
U+ME=LOV
```

You suspect that this is a code that will allow you to decipher other text on the graffiti wall. Your intuition and experience with ciphers tell you that each letter in the equation represents a number from 0 to 9. When the letters are replaced with their numeral counterpart, the equation must also be satisfied.

Suddenly, a text from an informant inside NELOC appears on your phone.

1. For the subtraction operation, the first operand is always larger than the second
2. For the division operation, use floor division (ignore remainder)
3. Leading zeroes are allowed (possibly multiple)
4. For every digit, there is at most one corresponding letter. And similarly for every letter, there is at most one corresponding digit.
5. In case multiple possible character to numeral assignments are applicable, select the one that assigns the lowest digit value to the lexicographically lowest character, and so on.
6. There is always a solution. Find it.

With this information, determine the character to numeral assignments that satisfy the graffiti equation.

Input Specification

Input will begin with an integer T denoting the number of test cases. T test cases follow.

Each test case consists only of two lines, the first line contains a single integer C denoting the number of unique characters in the equation.

The second line contains the graffiti equation in the form below

```
<operandA><operation><operandB>=<result>
```

The operation may be either be a '+','-','*','/' corresponding to addition, subtraction, multiplication and division respectively.

Output Specification

For each test case, output C lines, with each line containing a character and its corresponding numeral separated by a space. Output the characters in alphabetical order.

Constraints

$1 \leq T \leq 10$
$1 \leq C \leq 9$
$1 \leq length(operand, result) \leq 10$
All operands and results are positive (non-zero) integers when translated to their numeral form.

Sample Input

```
2
5
ADE-BC=CC
6
U+ME=LOV
```

Sample Output

```
A 0
B 1
C 2
D 3
E 4
E 2
L 0
M 3
O 4
U 9
V 1
```