John likes mathematics a lot. His main passion is the binomial theorem. However it is rather hard to calculate binomial coefficients, so he decided to write a computer program that can expand any power of a sum into a sum of powers. Mathematically it can be written like this:

$$(a+b)^k = x_1 a^k + x_2 a^{k-1} b + x_3 a^{k-2} b^2 + \ldots + x_{k+1} b^k$$

where $x_{1\ldots k+1}$ are binomial coefficients $x_i = C_k^i$.

Input

There is a number of tests T ($T \leq 100$) on the first line. After T test follows. Each test is written on a single line in form of '`(`a`+`b`)^`k'. Where a and b are same variables names. Variables names are strings constructed from '`a`'–'`z`' characters. And k ($1 \leq k \leq 50$) is a power that you need to raise the sum. You can assume that there are no lines longer than 100 characters.

Output

For each test output a single line '`Case` N`:` T'. Where N is the test number (starting from 1) and T is an expanded expression (see examples for clarification). By the way, you shouldn't output coefficients and powers equal to one.

Sample Input

```
3
(a+b)^1
(alpha+omega)^2
(acm+icpc)^3
```

Sample Output

```
Case 1: a+b
Case 2: alpha^2+2*alpha*omega+omega^2
Case 3: acm^3+3*acm^2*icpc+3*acm*icpc^2+icpc^3
```