Semester Break Problem Solving Competition

Contest 3
September 21, 2012

Problem A – Pastele

Mirko recently got N crayons as a gift. The color of each crayon is a combination of three primary colors: red, green and blue. The color of the ith crayon is represented with three integers: Ri for the red, Gi for the green and Bi for the blue component.

The difference between the ith and the jth crayon is max(|Ri - Rj|, |Gi - Gj|, |Bi - Bj|). The colorfulness of a subsequence of crayons is equal to the largest difference between any two crayons in the subsequence.

Mirko needs a subsequence with K crayons with the smallest colorfulness for his drawing. The subsequence does not have to be consecutive. Find it!

INPUT

The first line of input contains integers N and K ($2 \leq K \leq N \leq 100\,000$).
The ith of the folowing N lines contains three integers Ri, Gi and Bi ($0 \leq Ri, Gi, Bi \leq 255$).

OUTPUT

The first line of output should contain the smallest colorfulness of a subsequence with K crayons.
The following K lines should contain the R, G and B values of the colors of the crayons in the subsequence, in any order. **Any subsequence that yields the smallest colorfulness will be accepted.**

SCORING

In test cases worth 50% of total points, $0 \leq Ri, Gi, Bi \leq 20$ will hold.
In test cases worth additional 30% of total points, $0 \leq Ri, Gi, Bi \leq 50$ will hold.

SAMPLE IO

Input	Input	Input
2 2 1 3 2 2 6 4 Output 3 1 3 2 2 6 4	3 2 3 3 4 1 6 4 1 1 2 Output 2 3 3 4 1 1 2	5 3 6 6 4 6 2 7 3 1 3 4 1 5 6 2 6 Output 2 6 2 7 4 1 5 6 2 6

Problem B – Zagrade

Mirko was bored at his chemistry class, so he played Bomb Switcher on his cell phone. Unfortunately, he was spotted and was given a ridiculously heavy assignment for homework. For a given valid math expression with brackets, he must find all different expressions that can be obtained by removing valid pairs of brackets from the original expression. Two expressions are different if there is a character at which they differ.

For example, given (2+(2*2)+2), one can get (2+2*2+2), 2+(2*2)+2, and 2+2*2+2. (2+2*2)+2 and 2+(2*2+2) can‟t be reached, since we would have to remove pairs of brackets that are not valid. More than one pairs of brackets can surround the same part of the expression.

INPUT

The first and only line of input contains one valid mathematical expression composed of nonnegative integers, basic arithmetic operations denoted with characters '+', '*', '-' and '/', and brackets '(' and ')'. Given expression won‟t have more than 200 characters, and will have at least one, and no more than 10 pairs of brackets. Each expression is guaranteed to have at least one pair of brackets.

OUTPUT

Output all different expressions that can be obtained by removing valid pairs of brackets, sorted lexicographically.

SAMPLE INPUT

Input (0/(0)) Output (0/0) 0/(0) 0/0	Input (2+(2*2)+2) Output (2+2*2+2) 2+(2*2)+2 2+2*2+2	Input (1+(2*(3+4))) Output (1+(2*3+4)) (1+2*(3+4)) (1+2*3+4) 1+(2*(3+4)) 1+(2*3+4) 1+2*(3+4) 1+2*3+4

Problem C – Fibonacci

The Fibonacci word sequence of bit strings is defined as:

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If n = 0	F(n) = 0
If n = 1	F(n) = 1
If n >= 2	F(n) = F(n-1) + F(n-2)

Here + denotes concatenation of strings. The first few elements are:

0	0
1	1
2	10
3	101
4	10110
5	10110101
6	1011010110110
7	101101011011010110101
8	10110101101101011010110110101101011011010110101
9	1011010110110101101011011010110110101101011011010110101101101011010110101

Given a bit pattern p and a number n, how often does p occur in F (n)?

INPUT

The first line contains the integer n ($0 \le n \le 100$). The second line contains the bit pattern p. The pattern p is nonempty and has a length of at most 100 000 characters.

OUTPUT

For each test case, display its case number followed by the number of occurrences of the bit pattern p in F (n). Occurrences may overlap. The number of occurrences will be less than 2^{63} .

SAMPLE IO

Input	Input	Input
6 10	7 10	96 10110101101101
Output	Output	Output
5	8	7540113804746346428