

## Problem Bracket Wheel

Input file        `stdin`  
Output file      `stdout`

Money Gold Medals can't buy happiness

*Certainly not a programmer*

Seby the little square has recently heard about the newest attraction in the INFO(1)CUP FAIR: the bracket wheel! The wheel consists of  $n$  parantheses, placed on a circular frame, that can be seen as a sequence of  $n$  characters, each of which can either be '(' or ')'. Spinning the wheel is equivalent to transforming it into one of its cyclic shifts.

Now, we define the *cyclic shifts* of a sequence as follows. Given a sequence  $a_1, \dots, a_n$ , the sequence has  $n$  cyclic shifts:  $n - 1$  of form  $a_i, \dots, a_n, a_1, \dots, a_{i-1}$  when  $1 < i \leq n$ , and one cyclic shift equal to the original sequence  $a_1, \dots, a_n$ . For example the sequence of parantheses  $()(())$  has the following cyclic shifts:

1.  $()(())$ ,
2.  $)()()$ ,
3.  $(())()$ ,
4.  $()()()$ ,
5.  $)()()$ ,
6.  $)()()$ ,

We call a sequence of parantheses *balanced* if we can insert 1 and + into the sequence so that it becomes a valid mathematical expression. For example,  $()()()$  is balanced, since we can insert 1 and + to form  $((1 + 1) + 1) + (1 + 1)$ , but  $)()()$  or  $()()$  are not. More formally, a sequence  $a$  is balanced if and only if it is empty or of the form  $(b)c$  where  $b$  and  $c$  are balanced.

Given a sequence of parantheses  $s$ , we define the *value* of  $s$ , denoted by  $\text{val}(s)$ , to be the number of cyclic shifts of  $s$  that are balanced. For example, if  $s = ()(())$ , we have  $\text{val}(s) = 2$ , due to the cyclic shifts  $()(())$  and  $(())()$ .

The rules of the game are simple. The player is given  $k$  Gold Medals. They can spend one gold medal to swap two parantheses on the wheel. The score of the player is then the number of cyclic shifts of the sequence on the wheel which are balanced. That is, if  $s$  is the sequence on the wheel, then the score is  $\text{val}(s)$ . Can you help Seby spend his  $k$  Gold Medals to maximise his score?

Formally, you are given a sequence  $s$  of  $n$  parantheses, and have the ability to swap  $k$  pairs of parantheses within  $s$ . Find a way to perform these swaps in order to maximize the value of the resulting sequence.

### Input Data

The first line of the input contains the integers  $n$  and  $k$ . The second line of the input contains the sequence  $s$  of parantheses.

### Output Data

The output contains the maximum value that could be obtained after performing the swaps.

## Restrictions

- $1 \leq n \leq 50\,000$
- $0 \leq k \leq 9$ .
- $s$  contains only parentheses i.e. '(' and ')'. It is guaranteed that the number of '(' in  $s$  is equal to the number of ')
- The number of Gold Medals Seby won is significantly bigger, but his instinct tells him he might need them again in the near future.

#	Points	Restrictions
1	7	$n \leq 500, k = 0$
2	9	$n \leq 20, k = 1$
3	13	$n \leq 500, k = 1$
4	17	$k = 0$
5	18	$n \leq 2\,000, k = 1$
6	19	$k = 1$
7	17	No further restrictions

## Examples

Input file	Output file
6 1 ) ( ( ) (	3

**First example.** In this case, we can swap parantheses on positions 3 and 4. The resulting sequence is ) ( ( ) (, which has the following cyclic shifts:

1. ) ( ( ) (
2. ( ) ( )
3. ) ( ( ) (
4. ( ) ( )
5. ) ( ( ) (
6. ( ) ( )

Out of these, only 3 are balanced sequences.