P9 - Kth Smallest

Consider arithmetic-type formulas consisting of the following symbols:

- o uppercase letters in the 'A'-'L' range;
- o two operators '+', '−'; and
- o round parentheses '(', ')'.

The letters represent variables with integer values. Our two operators are a bit non-standard here: the '+' operator denotes the *maximum*, and the '−' operator denotes the *minimum* of the two operands. Both operators are left-associative, and the *minimum* operator has a higher priority than the *maximum* operator. Parentheses are optional and are used for grouping in the usual way. Formula representations may also contain white spaces, which are ignored.

For example, the following two formulas are equivalent in our interpretation:

```
            A-B + A-C + B-C
```

and

```
  A-B + (A-C)      +      ((C   −   (   (B)   )))
```

According to our rules, both these formulas denote the same expression:

$$max(max(min(A,B), min(A,C)), min(C, B))$$

The above expression will always return the 2nd smallest value in the *multiset* $\{A, B, C\}$, regardless of the numerical values assigned to its variables. For example, consider $A = 50$, $B = 70$, $C = 30$. The value returned by the above expression is 50, which is the 2nd smallest value in $\{50, 70, 30\}$. Consider $A = 50$, $B = 30$, $C = 30$. The value returned by this expression is 30, which is the 2nd smallest value in the multiset $\{50, 30, 30\}$.

> A multiset is like a set except that it can have repetitions of identical elements.

Determine if a given formula always returns the *K*th smallest value regardless of the values assigned to its variables, for a given *K*. Our formulas are *guaranteed* valid. The formulas contain between 1 and 12 different variables (but not necessarily consecutive), and at most 20,000 total symbol occurrences. *K* will be in the range 1 to the number of different variables actually used.

INPUT FORMAT

The input contains a sequence of formulas. Each formula starts with a positive integer *K* at the beginning of a line, followed by a space, and then a valid formula containing the following characters: 'A'-'L', '+', '−', '(', ')', and ' ' (space). Each line contains a maximum of 120 characters. Long formulas are broken over several lines, and the continuation is signaled by an '_' (underscore) at the end of every line except the last. The value *K* = 0 signals the end of the input.

OUTPUT FORMAT:

The output contains one line for each input formula. Each line consists of either the word YES if the formula satisfies our request, or NO otherwise (both in uppercase).

SAMPLE INPUT

```
1 A
1 (A)
1 ((A))
1 A+B
1 A-B
2 A+B+C
2 A-B-C
2 A-B + A-C + B-C
2 A-B + (A-C)      +_
    ((C   -   (    (B)     )))
2 (A+B) - (A+C) - (B+C)
2 (A+I) - (A+L) - (I+L)
0
```

SAMPLE OUTPUT

```
YES
YES
YES
NO
YES
NO
NO
YES
YES
YES
YES
```