Siena College's 33rd Annual High School Programming Contest
Sponsored by Transfinder
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Gold Problem #6: Easy Math but Not So Easy Algorithm- The Transfinder Problem

Background Information:

A significant part of Transfinder's business is assisting school districts with efficient bus routing. Having a great routing plan saves time, fuel, and depreciation costs. Finding optimal or close to optimal routing plans can be algorithmically complicated. Problem #6 is the Transfinder Problem for this year because the problem requires looking at every possibility.

There is a well-known math puzzle, where you are asked to take the digits 1, 2, 3, 4, 5, 6, 7, 8, and 9, in that precise order and add the + and – operators in between digits to get an expression value of 100. In the puzzle, you are allowed to combine consecutive digits together, such as 7 and 8 to get the number 78. One solution to this is 123 + 4 – 5 + 67 – 89 = 100.

A solution to the general problem is an expression using only + or – operations (no parentheses) which adds to a given value.
Your problem is to find all solutions to the sequence of digits 1, 2, 3, 4, 5, 6, 7, 8, AND 9 which add to an input value of N. If no solutions exist, you would print NO SOLUTIONS FOUND. If multiple solutions exist, print them in preference order using

- Small numbers before larger numbers from left to right as the primary factor
- Plus operator before minus operator from left to right as the secondary factor

Programming Problem:

Input: A target integer N, where $-23{,}456{,}788 \le N \le 123{,}456{,}789$
Output: All solutions printed in the specified order, or NO SOLUTIONS FOUND, if no legal solutions exist. If there are multiple solutions, they must be printed on their own line.

Example 1: Input:

```
100
```

Output:

```
1+2+3-4+5+6+78+9
1+2+34-5+67-8+9
1+23-4+5+6+78-9
1+23-4+56+7+8+9
12+3+4+5-6-7+89
12-3-4+5-6+7+89
12+3-4+5+67+8+9
123-4-5-6-7+8-9
123+4-5+67-89
123+45-67+8-9
123-45-67+89
```

Example 2: Input:

```
998
```

Output:

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NO SOLUTIONS FOUND
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