

Console Spreadsheet

Goal

You have to implement a simple console-based spreadsheet application. You do not need any UI or user interaction, all calculations should be performed in batch mode. The application should use the operating system's standard input stream for reading data and output data into the standard output stream.

Input

Input data for the spreadsheet application will be plain text in UTF-8 encoding. Each line of this data represents a single row in the resulting spreadsheet. Rows are implicitly numbered starting from 1. Columns are separated by a tab symbol and they are implicitly named by Latin letters starting from A. Each cell can either be empty, contain a value or contain a formula. This simple implementation should only support an integer data type and simple formulas which can only contain the 4 basic arithmetic operations (+, -, * and /), integer constants and cell references.

Formula cells contain an expression starting with the equal (=) sign and can reference any cell in the spreadsheet. Empty cells are not equal to cells which contain the value 0. If some formula references an empty cell, the result of the overall operation should be the string '#NAN'. If a formula contains a reference to a cell which contains another formula, the second formula should be evaluated before evaluating the first one. Be careful – circular references should not crash or freeze your application! In case of such errors, you should write the string '#ERROR' into the output cell.

Output

The application should read input data as specified and print out a spreadsheet with the same dimensions which contains only integer data or error strings. All formulas should be evaluated according to the specified rules and the resulting value should be displayed in the output stream.

Samples

Input			Output		
1	2		1	2	
	3			3	
		=A1+B1+B2		6	
1	2		1	2	
	3			3	
		=A1+B1+A2			#NAN
1	=A1*2		1	2	
	=A1+B1			3	
		=A1+B1-B2			0
1	=B2-C3		1	#ERROR	
	3			3	
		=A1+B1			#ERROR

Bonus

1. Add string type support into this spreadsheet application. Only the concatenation operation (+) between two strings is allowed. Do not implement implicit conversions to/from integers.
2. Implement support for parentheses in formulas.