Problem «K»

The task

You will be developing a spreadsheet processor. The processor should be able to parse simple expressions and compute values in table cells. Each table cell can contain one of the following:

- Nothing (empty string);
- A non-negative integer number;
- A text label – each label starts with ′ symbol;
- An expression – each expression starts with = symbol and may include non-negative integers, cell references and simple arithmetic expressions. There is no parenthesis, thus all operations have an equal priority;

Following is a cell expression grammar written in BNF notation:

```
<expression> = '=' <term> { <operation> <term> }
<term> = <cell reference> | <non-negative number>
<cell reference > = <letter> <digit>
<operation> = '+' | '-' | '*' | '/'
<text> = '''{<printable character>}
```

The processor should evaluate cells following these rules:

- Each expression should be replaced with a calculated value;
- Text labels should be evaluated to a string, i.e. text not prefixed with ′ symbol;
- Text labels cannot be used in expressions;
- Expressions causing evaluation errors should be replaced by a string describing an error prefixed with # symbol;

Input and Output

A program should receive a sheet from the standard input, evaluate it and print a result sheet to the standard output. Input sheet is a TAB-separated table of strings. A first input line consisting of two positive integer numbers separated by a TAB defines table's dimensions: number of rows, number of columns. The next and the following lines (according to the number of rows defined) contain the sheet cells.

Sample Input

3	4		
12	=C2	3	'Sample
=A1+B1*C1/5	=A2*B1	=B3-C3	'Spread
'Test	=4-3	5	'Sheet

Sample Output

12	-4	3	Sample
4	-16	-4	Spread
Test	1	5	Sheet

Guidelines

Production quality of submitted code is a must. Solving this assignment please keep in mind readability, testability and performance of your code.

Suppose there is a next iteration of a spreadsheet processor with the following features planned:

- Add support for text fields in cell expressions;
- Support arithmetic operations priority;
- Support big-size spreadsheets;

Please think of possible ways you would approach these tasks.