8-th Bulgarian National Olympiad in Informatics

May, 1992

Selection round

First day

The following definition is taken for *Boolean expression*:

(1)
```
<BoolExpr> ::= <Term>|<BoolExpr>+<Term>
  <Term> ::= <Factor>|<Term>*<Factor>
  <Factor> ::= <BoolCons>|<BoolVar>|!<Factor>|(<BoolExpr>)
  <BoolConst> ::= 0|1
  <BoolVar> ::= x|y|z
```

The conjunction, disjunction and negation operations are denoted by signs "+", "*" and "!", respectively. The following rules are supposed to be satisfied:

(2a) `A*(B+C)=A*B+A*C`
(2b) `(A)=A`
(2c) `P+0=P`
(2d) `P+!P=1`
(2e) `P*!P=0.`

In the above formulas, A, B and C are Boolean variables and P is any Boolean expression.

Problem 1.

Input character string `Expr` and output a message dispaying, whether this string is a Boolean expression according to the above definition (1).

Problem 2.

Use string `Expr` from the previous problem. If this string is a Boollean expression, input by the keyboard all necessary values for its variables, then compute it and output the result.

Problem 3.

Execute on `Expr` a sequence of transformations, each based on some of rules 2a, 2b, 2c, 2d or 2e, as many times as possible. At each step, your program should display the obtained expression and the rule, that has been applied to.

Problem 4.

Reduce `Expr` to a disjunction of conjunctions. Each conjunction must contain only variables or their negations.

Source: Obuchenieto po matematika i informatika, journal published by Bulgarian Ministry of Education, n. 4, 1992, pp. 63-65.

Return to the Home Page of Bulgarian Mathematics and Informatics Competitions.

/P>