

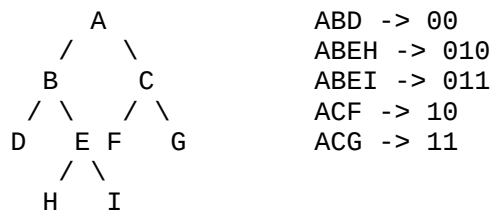
9-th Bulgarian National Olympiad in Informatics

June, 5 and 6, 1993

Selection round

Second day

A binary tree is called strictly binary (SBT) if each its node has 0 or 2 descenders. Let us consider a SBT having N ($N \leq 10$) leaves (i.e. nodes without descenders), so that each leaf is defined by a path from the root to the leaf itself. Every such path is encoded as a binary string. The sign 0 means a left descender, whereas the sign 1 means a right one. An example is given below.



In the next problems we suppose that each leaf has an assigned positive integer to itself.

Problem 1.

a) Input the data for a given SBT from a text file. Data for each leaf are placed on a separate row of the file and are of the form: *Path Delimiter Number*, where

Path is a binary string, specifying a path to the leaf.

Delimiter stands for one or more spaces.

Number is a positive integer, which was assigned to the leaf.

b) Render in an appropriate way on the computer screen the tree you have inputted.

Problem 2.

After entering a positive integer V by the keyboard, create all algebraic expressions having this value V , so that the corresponding binary tree of any such expression is the same as the inputted SBT. Assume the only allowed operations in the expressions are addition, multiplication and integer division.

Problem 3.

Create all algebraic expressions having the smallest possible value greater than zero, so that the corresponding binary tree of any such expression is the same as the inputted SBT. Assume the only allowed operations in the expressions are the same as in the previous problem.

Test examples:

Test 1:

0 1
 1 3
 V = 0, V_min = 3.

Answers:

EXPR = 1/3
 EXPR_min = 1*3

$$\begin{array}{c} ? \\ / \quad \backslash \\ 1 \quad 3 \end{array}$$

Test 2:

1 10
 100 6
 101 4
 11 10
 V = 0, V_min = 1.

Answers:

EXPR = 10+((6/4)/10)
 EXPR = 10*((6+4)/10)
 EXPR = 10/((6+4)/10)
 EXPR_min = 10/((6/4)*10)

$$\begin{array}{c} ? \\ / \quad \backslash \\ 10 \quad ? \\ / \quad \backslash \\ ? \quad 10 \\ / \quad \backslash \\ 6 \quad 4 \end{array}$$

Test 3:

000 3
 001 1
 01 2
 1 1000
 V = 5000, V_min = 1000.

Answers:

EXPR = ((3*1)+2)*1000
 EXPR = ((3/1)+2)*1000
 EXPR_min = ((3*1)/2)*1000
 EXPR_min = ((3/1)/2)*1000

$$\begin{array}{c} ? \\ / \quad \backslash \\ ? \quad 1000 \\ / \quad \backslash \\ ? \quad 2 \\ / \quad \backslash \\ 3 \quad 1 \end{array}$$

Test 4:

000 0
 001 0
 010 0
 011 0
 100 0
 100 0
 101 0
 110 0
 111 0
 V = 1.

$$\begin{array}{c} ? \\ / \quad \backslash \\ ? \quad ? \\ / \quad \backslash \quad / \quad \backslash \\ ? \quad ? \quad ? \quad ? \\ / \quad \backslash \quad / \quad \backslash \quad / \quad \backslash \quad / \quad \backslash \\ 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \end{array}$$

Answers:

No solution.

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