

Expresii aritmetice. Forma poloneză

Vom considera o expr. aritmetică în care apar operatori

$\begin{array}{ccc} + & - & * \\ \hline \text{prioritate 0} & \text{prioritate 1} & \text{prioritate 2} \end{array}$

Operatorii $+$ și $-$ pot fi atât binari cât și unari.

Binari expr. are forma $\text{operand1} \text{ operator } \text{operand2}$

Unari expr. are forma $\text{operator } \text{operand}$
Ex: $-a$

Expr. aritm. usuale, pentru a stabili ordinea operabilor, în afară de prioritățile stabilite ale operatorilor au nevoie și de paranteze.

Ex. $5 + 3 \times 8 \neq (5 + 3) \times 8$

Forma poloneză a unei expresii, însă, are o formă unic determinată fără a utiliza paranteze.

Avem 2 tipuri \rightarrow forma poloneză prefixată

forma normală (infixată): $op1 \ op \ op2 \xrightarrow{\text{prefix}} op \ op1 \ op2$

Ex: $a + b \longrightarrow + a b$

În cazul unei expresii complexe, aceasta se descompune în subexpresii cărora li se aplică aceeași transformare.

$$\begin{aligned} \underline{\text{Ex.}}: \quad 2 + 3 * 5 &\xrightarrow{\text{prefix}} + 2 * 3 5 \\ (2 + 3) * 5 &\xrightarrow{\text{prefix}} * + 2 3 5 \end{aligned}$$

B) Forma postfixată:

$$\text{op1} \quad \text{op} \quad \text{op2} \xrightarrow{\text{postfix}} \text{op1} \quad \text{op2} \quad \text{op}$$

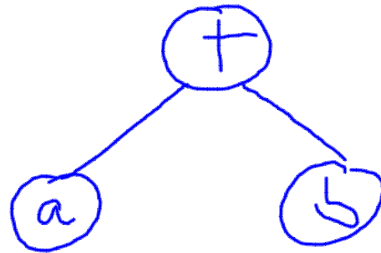
$$\begin{aligned} \underline{\text{Ex.}}: \quad a + b &\longrightarrow a \ b \ + \\ 2 + 3 * 5 &\longrightarrow 2 \ 3 \ 5 \ * \ + \\ (2 + 3) * 5 &\longrightarrow 2 \ 3 \ + \ 5 \ * \end{aligned}$$

Arborde atarut unei expresii algebrice

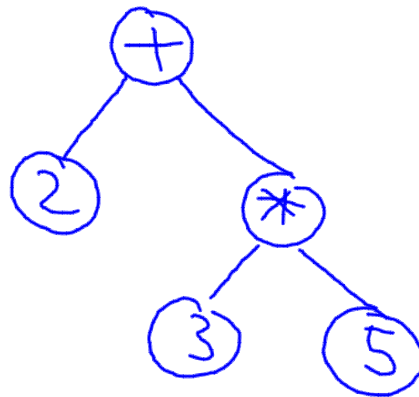
in rădăcină se pune operandul (operația)

Filul stâng traduce membrul stâng
doapt — || — drept.

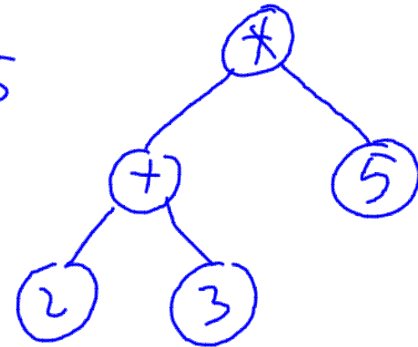
ex. $a + b$



$2 + 3 \times 5$



$(2 + 3) \times 5$



Algoritm de transf. de la forma algebrică la forma poloneză

Avem un string ce conține operatori formați dintr-o
singură literă (variabile) în operații $+$ $-$ $*$ $/$ $^$
în XV apar operatori unari.

Următorul algoritm va determina forma poloneză
postfixată a acesteia.

Ex. s-o traducem la pot fix

$$a * (\underline{b + c * d} + \underline{e * a^b} / \underline{e^a (a * b)} - c)$$

$$a \underline{b c d *} + \underline{e a b^a} * \underline{e a b *^a} / + c - *$$

$$(a * (b + c * d + e * a^b / e^a (a * b) - c))$$

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după golirea
stivei cu prioritate
se merge la stivă

are prioritate decât

stivă
golise stivă până la un
operator cu prioritate mai mică strict

a b c d * + e a b ^ * e

a b ^ * / + c - *

golise stivă până
la prima (

Descriere algoritm

- le dăm operatorilor priorități (numere):

$(\rightarrow -1$

$+ - \rightarrow 0$

$* / \rightarrow 1$

$\wedge \rightarrow 2$

- încadrăm expresia între $()$

- parcurgem expr. caracter cu caracter.

→ când caract. curent e operand (literă) o afișăm

→ când e (→ trecem pe stivă

→ când e) → golim stiva, afișând toți operatorii găsiți,
până la întâlnirea în stivă a (care
NU se va afișa dar se va șterge din stivă

→ când e operator:

→ cât timp priorit. operatorului cu priorita ^(din string)
este mai mică sau egală cu a op. din

af. stivei, operatorul din af. stivei se afișează

ștergându-se de pe stivă

→ după care bagăm în af. stivei acest operator (din string)

Evaluarea unei expresii în forma polonară

Avem un string cu o expr. în care operații sunt de o singură cifră, fiind dată în forma polonară postfixată. Să se evalueze.

Ex. $(7*2 + 2*3^2) / (2*9^{(1/2)} + 2)$ va keb. să
dea 4

$$\left(\frac{7 \cdot 2 + 2 \cdot 3^2}{2 \cdot 9^{(1/2)} + 2} \right)$$

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$$72 * 232^{\wedge} * + 2912 /^{\wedge} * \\ 2 + /$$

$$\begin{array}{cccccccccccc} 7 & 2 & * & 2 & 3 & 2 & ^ & * & + & 2 & 9 & 12 & / & ^ & * & 2 & + \\ \hline \hline \end{array}$$

$$\begin{array}{c} \cancel{2} \\ \cancel{2} \\ \cancel{9} \\ 0 \\ 14 \\ \cancel{2} \\ \cancel{2} \end{array}$$

$$\begin{array}{c} \cancel{2} \\ \cancel{10.5} \\ \cancel{9} \\ 2 \\ 32 \\ \cancel{18} \\ \cancel{14} \end{array}$$

$$\begin{array}{c} \cancel{2} \\ \cancel{2} \\ \cancel{2} \\ \cancel{6} \\ 32 \end{array}$$

$$\begin{array}{c} 8 \\ 32 \end{array}$$

$$\begin{array}{c} 4 \end{array}$$

