Expressions

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Definition

What is expression?

In mathematics, an expression or mathematical expression is a finite combination of symbols that is well-formed according to rules that depend on the context.
Mathematical symbols can designate numbers (constants), variables, operations, functions, punctuation, grouping, and other aspects of logical syntax.

For easier I define expression as sequence of operators and operands.

2	$*$	(	3	$-$	5	)
operand	operator	operator	operand	operator	operand	operator

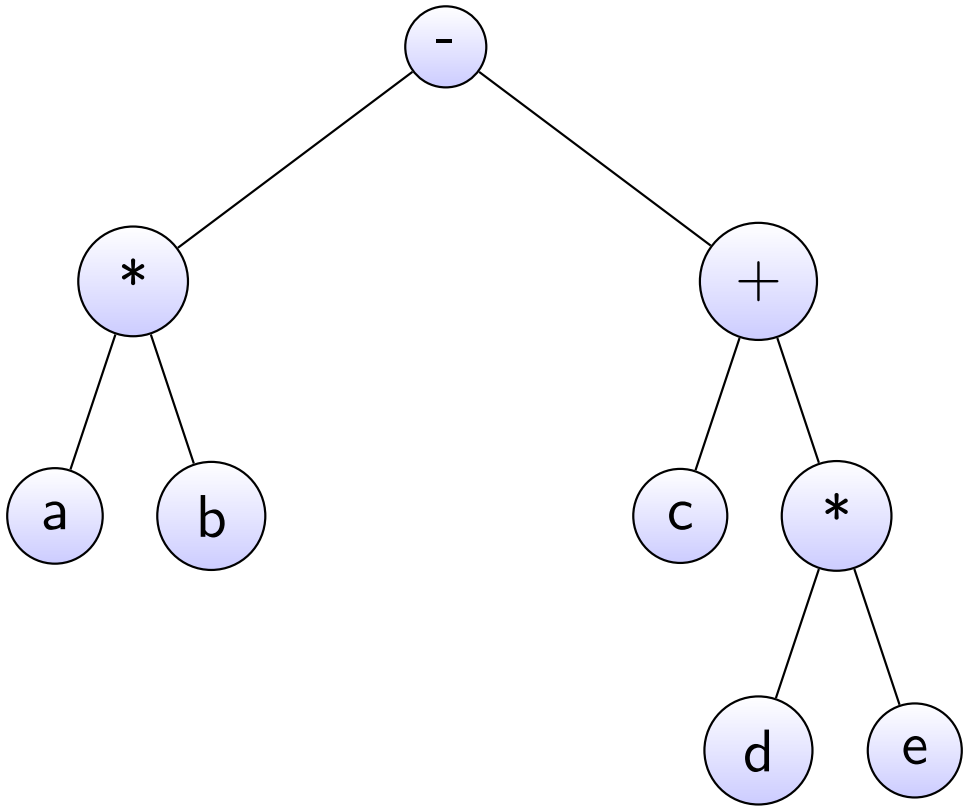
Representation&Examples

For representing have 4 base ways:

- Tree/Recursively
- Normal/Standart Way - Suffix Notation
- Reverse Polish Notation - Prefix Notation
- Polish Notation - Postfix Notation

Tree

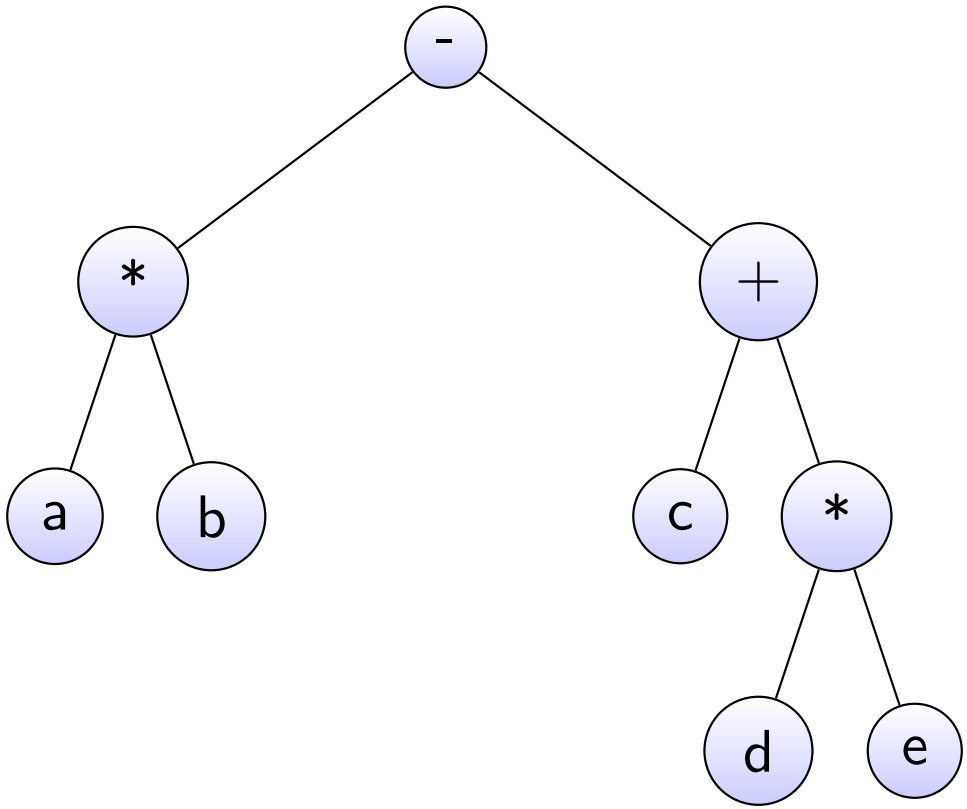
$$a * b - (c + d * e)$$



Normal/Standart Way - Suffix Notation

When we travel the tree in inorder (left-root-right), we generate the Suffix Notation.

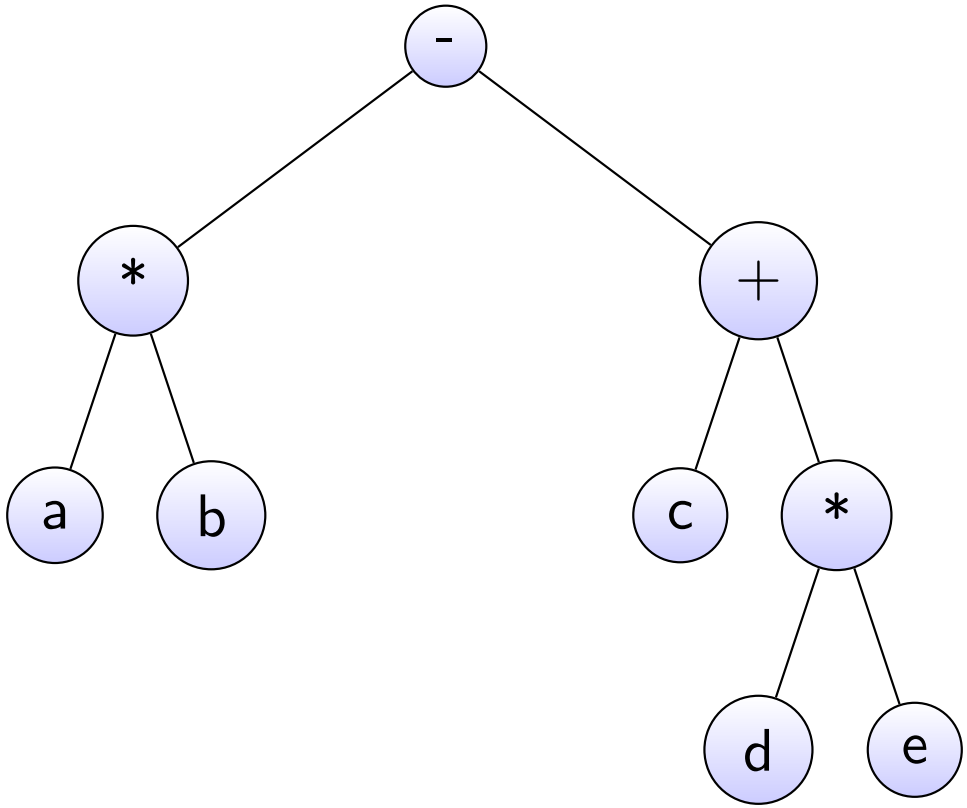
In this case Suffix Notation is $a * b - (c + d * e)$



Reverse Polish Notation - Postfix Notation

When we travel the tree in postorder (root-left-right), we generate the Postfix Notation.

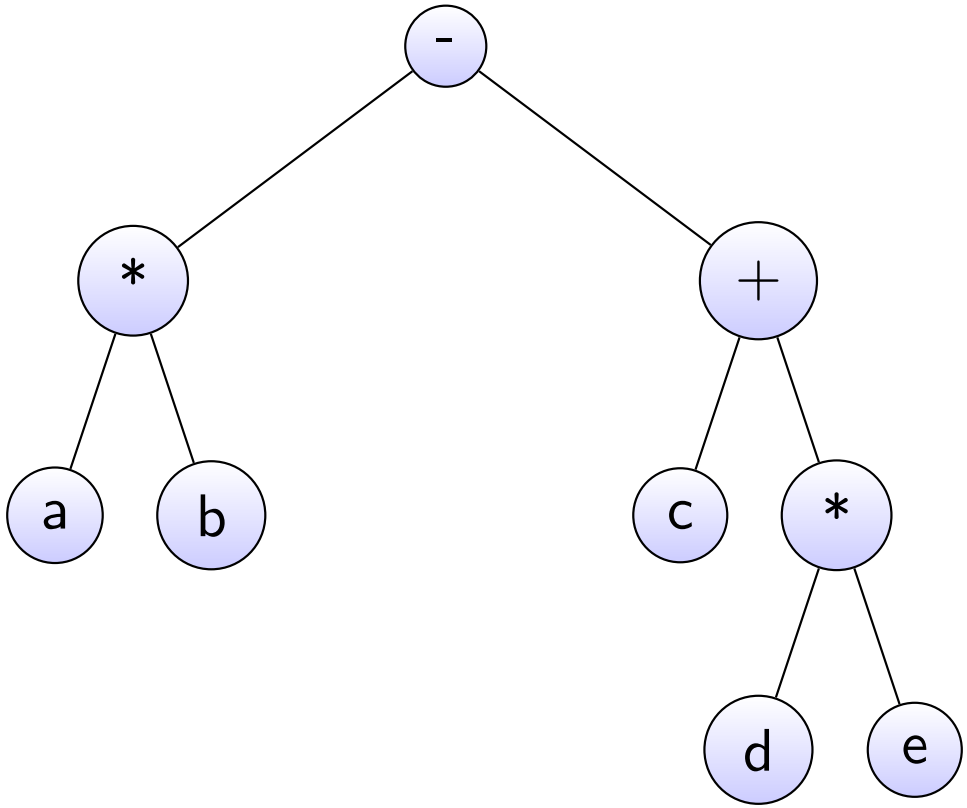
In this case Postfix Notation is $- * ab + c * de$



Polish Notation - Prefix Notation

When we travel the tree in postorder (right-left-root), we generate the Prefix Notation.

In this case Prefix Notation is $de * c + ab * -$



Math/Informatics Nature

Each of these ways have pluses and minuses.

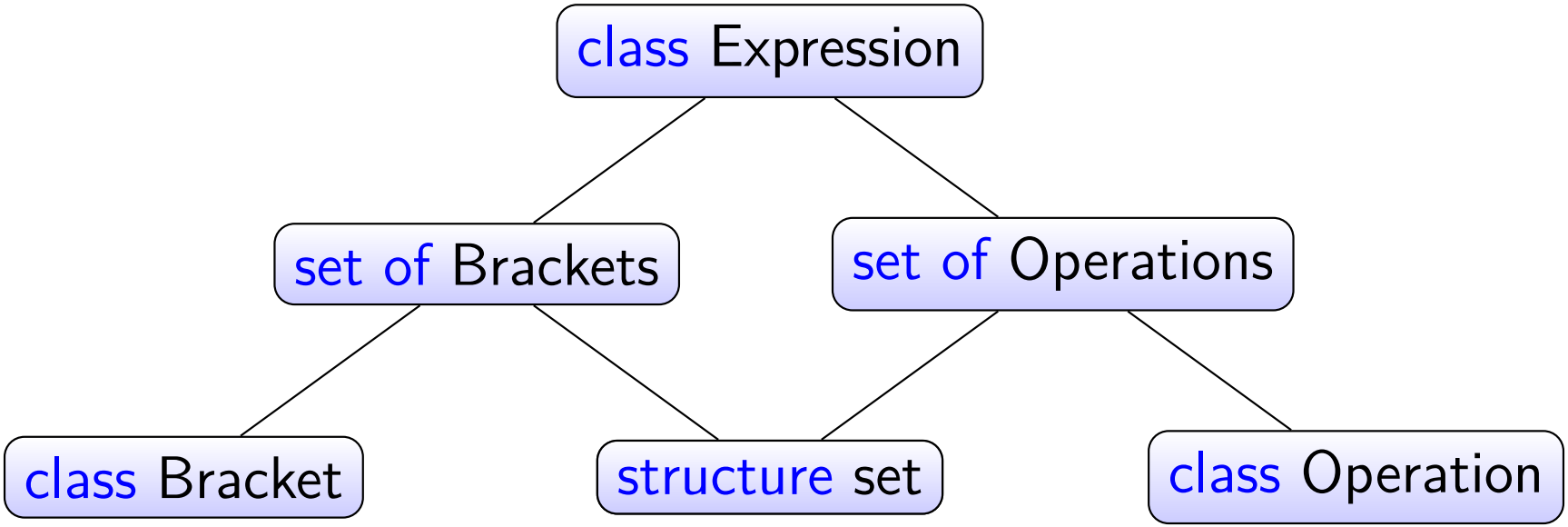
Comparing

	Pre-	Post-	In-
Pre-			
Post-			
In-			

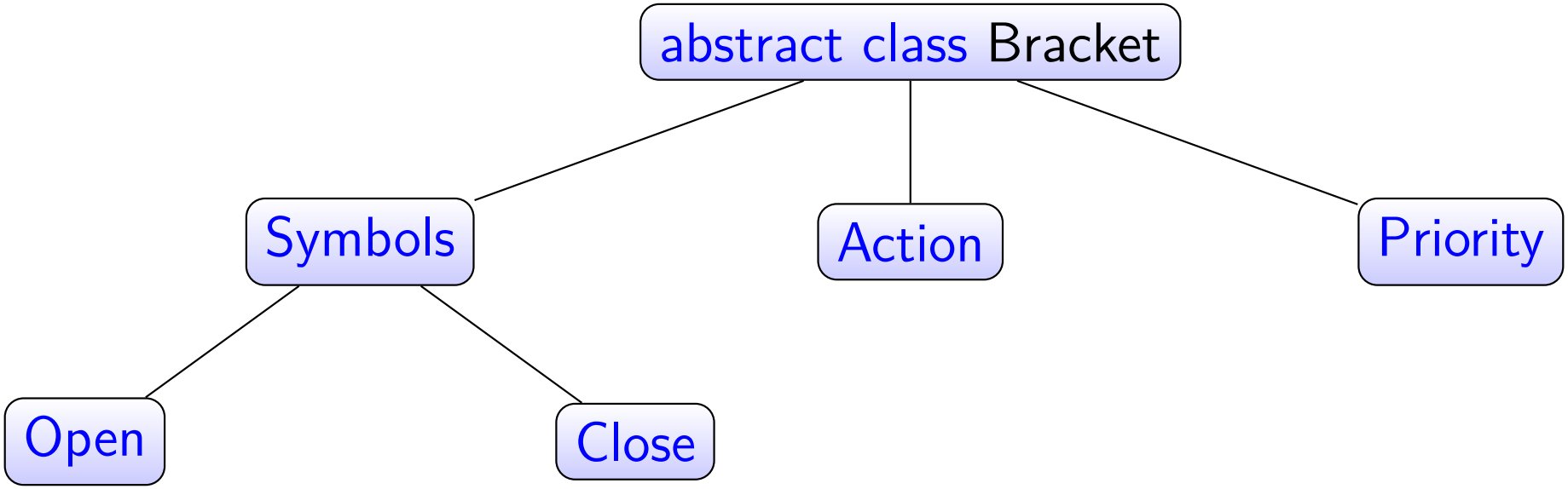
Aim

I want to solve expression with unreal (defined by user) operators where the solving function doesn't now for any operators.
For these aim I must make schema for data structuring of program and I must think for abstract algorithms. Let's start!

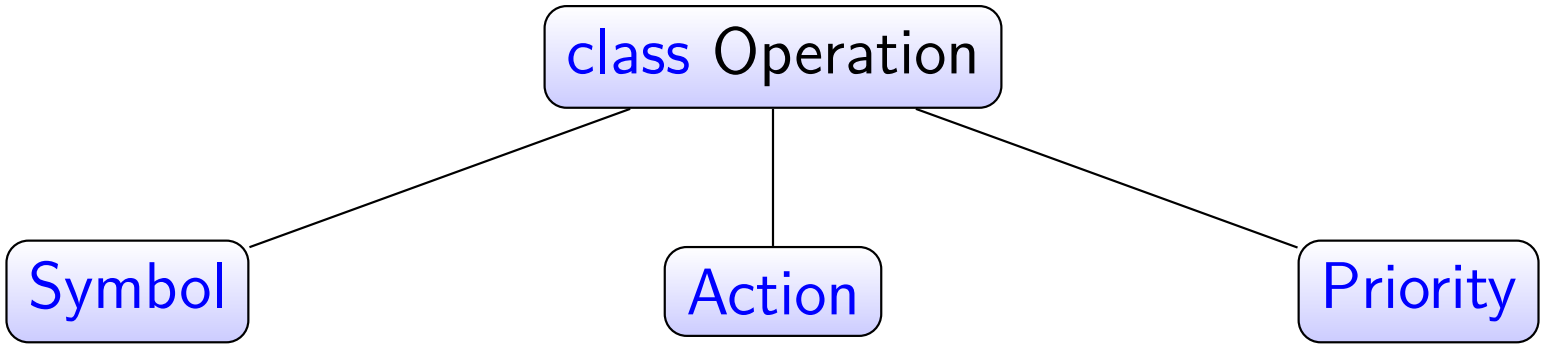
First step


class Expression
set of Brackets
set of Operations
class Bracket
structure set
class Operation

I divide the problem, can I divide more?



And more?



OK, this divide is enough! But how can I continue?

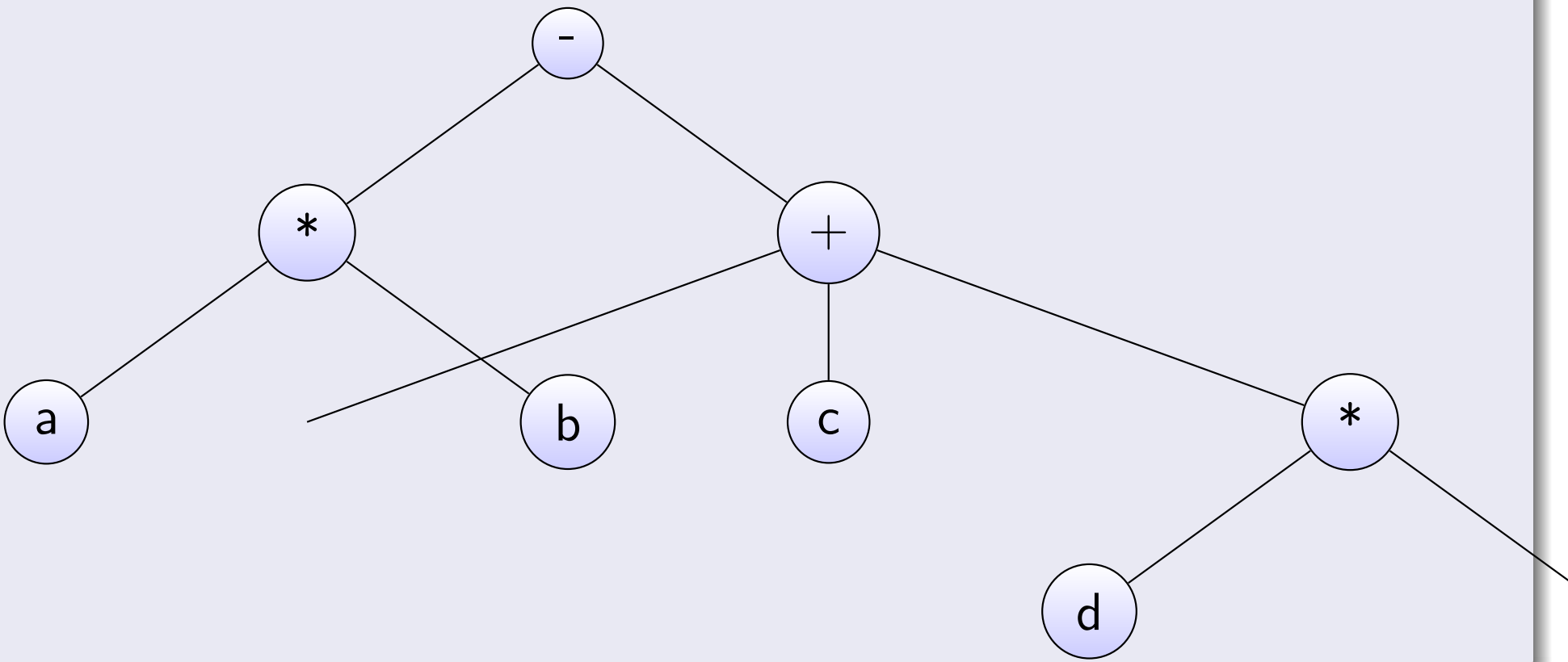
Now we must think on algorithms!
How to calculate the expression?

What is the tree of expression?

example

a*b-(c+d*e)

tree of expression



Analyze to find the best

We analyzed expressions and we understand

the standard way to represent expression is not effectively!

What next?

First 2 ways to solve the expression which we found are:

- Reverse Polish Notation
- By Recursively

Reverse Polish Notation

example

a * b - (c + d * e) (in Suffix notation, normal way)

- * a b + c * d e (in Prefix notation, Reverse Polish notation)

Resources