



Data Structure and Algorithm



Who am I ?



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dev-frog.github.io/blog

- Contract Trainer .
- Hacker/ Security Researcher .
- Open Source contributor.
- Exploit Developer.
- Messing with IoT firmware dev, radio devices rtl-sdr, Bluetooth, python and C++ developer.
- Also CTF player.





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Infix, Prefix and Postfix Expressions

Algebraic Expression



- An algebraic expression is a legal combination of **operands** and the **operators**.
- **Operand** is the quantity (unit of data) on which a mathematical operation is performed.
- **Operand** may be a variable like x,y,z or a constant like 0,1,2,4,5 etc.
- **Operator** is a symbol which signifies a mathematical or logical operation between the operands.Example:+,-,*,/,^ .
- An example of expression as $a+b*c$.

What is Infix, Postfix and Prefix Expression



- INFIX: the expressions in which operands surround the operator. e.g $x + y$, $6 * 3$ etc, this way of writing the expression is called infix notation.
 - **<Operand> <Operator> <Operand>**
- POSTFIX: Postfix notation are also known as **Reverse Polish Notation** (RPN). They are different from the infix and prefix notations in the sense that in the postfix notation, operator comes after the operands e.g $xy+$, $xyz+*$
 - **<Operand><Operand><Operator>**
- PREFIX: Prefix notation also known as **Polish notation**. In the prefix notation, operator comes before the operands. e.g $+xy$, $*+xyz$
 - **<Operator><Operand><Operand>**

Operator Priorities



- How do you figure out the operands of an operator ?
 - $a + b * c$
- This is done by assigning operator priorities.
 - $\text{priority}(*) = \text{priority}(/) > \text{priority}(+) = \text{priority}(-)$
- When an operand lies between two operators, the operand associates with the operator that has higher priority.

Tie Breaker



- When an operand lines between two operators that have the same priority, the operand associates with the operator on the left
 - $a + b - c$
 - $a * b / c / d$

Delimiters



- Sub expression within delimiters is treated as a single operand, independent from the remainder of the expression
 - $(a + b) * (c - d) / (e - f)$

Why ??



- Why to use **PREFIX** and **POSTFIX** notations when we have simple **INFIX** notation?
- **INFIX** notations are not as simple as they seem especially while evaluating them. To evaluate an infix expression we need to consider Operators Priority and Associative property
 - Expression $3+5*4$ evaluate to 32. i.e. $(3+5)*4$ to 23
- To solve this problem Precedence or Priority of the operators were defined. Operator precedence governs evaluation order. An operator with higher precedence is applied before an operator with lower precedence.

Examples of infix to prefix and postfix



Infix	Postfix	Prefix
$A+B$	$AB+$	$+AB$
$(A+B) * (C+D)$	$AB+CD+*$	$*+AB+CD$
$A - B / (C * D ^ E)$	$ABCDE^*/-$	$-A/B*C^DE$

