

# **Arithmetic Expression Conversion Using stack**

# Conversion of Infix Expression into Postfix Expression

## Algorithm: Infix-to-Postfix (Q, P)

Here Q is an arithmetic expression in infix notation and this algorithm generates the postfix expression P using stack.

1. Scan the infix expression Q from left to right.
2. Initialize an empty stack.
3. Repeat step 4 to 5 until all characters in Q are scanned.
4. If the scanned character is an operand, add it to P.
5. If the scanned character is an operator  $\Phi$ , then
  - (a) If stack is empty, push  $\Phi$  to the stack.
  - (b) Otherwise repeatedly pop from stack and add to P each operator which has the same or higher precedence than  $\Phi$ .
  - (c) Push  $\Phi$  to the stack.

6. If scanned character is a left parenthesis “(“, then push it to stack.
7. If scanned character is a right parenthesis “)”, then
  - (a) Repeatedly pop from stack and add to P each operator until “(“ is encountered.
  - (b) Remove “(“ from stack.
8. If all the characters are scanned and stack is not empty, then
  - (a) Repeatedly pop the stack and add to P each operator until the stack is empty.
9. Exit.

**Example: Q:  $5 * (6 + 2) - 12 / 4$  and P: ?**

Infix Expression Q	Stack	Postfix Expression P
5		5
*	*	5
(	* (	5
6	* (	5, 6
+	* ( +	5, 6
2	* ( +	5, 6, 2
)	*	5, 6, 2, +
-	-	5, 6, 2, +, *
12	-	5, 6, 2, +, *, 12
/	- /	5, 6, 2, +, *, 12
4	- /	5, 6, 2, +, *, 12, 4
	-	5, 6, 2, +, *, 12, 4, /
		5, 6, 2, +, *, 12, 4, /, -

**Postfix Expression P : 5, 6, 2, +, \*, 12, 4, /, -**

**Example:    Q:  $A * ( ( B + C ) - D ) / E$     and    P: ?**

Infix Expression Q	Stack	Postfix Expression P
A		A
*	*	A
(	* (	A
(	* ( (	A
B	* ( (	A B
+	* ( ( +	A B
C	* ( ( +	A B C
)	* (	A B C +
-	* ( -	A B C +
D	* ( -	A B C + D
)	*	A B C + D -
/	/	A B C + D - *
E	/	A B C + D - * E
		A B C + D - * E /

**Postfix Expression P : A    B    C    +    D    -    \*    E    /**

# Postfix Expression Evaluation

## Algorithm: Postfix-Evaluation (P, Value)

Here P is an arithmetic expression in postfix notation and this algorithm finds the value of this expression using stack.

1. Scan the postfix expression P from left to right.
2. Initialize an empty stack.
3. Repeat step 4 to 5 until all characters in P are scanned.
4. If the scanned character is an operand, push it to the stack.
5. If the scanned character is an operator  $\Phi$ , then
  - (a) Remove two top elements of stack where A is the top element and B is the next-to-top element.
  - (b) Evaluate  $T = B \Phi A$  and push T to the stack.
6. Pop the stack and assign the top element of the stack to Value.
7. Exit

Example: P : 5, 6, 2, +, \*, 12, 4, /, - and Value: ?

Postfix Expression Q	Stack
5	5
6	5, 6
2	5, 6, 2
+	5, 8
*	40
12	40, 12
4	40, 12, 4
/	40, 3
-	37

**Value: 37**

**END!!!!**