

# INFIX, POSTFIX and PREFIX notations

**INFIX notation:** An expression is said to be in INFIX notation if the operator is in between the operands. For example: A + B is in INFIX notation.

**POSTFIX notation:** An expression is said to be in POSTFIX notation if the operator is after the operands. For example: A B + is in POSTFIX notation.

**PREFIX notation:** An expression is said to be in PREFIX notation if the operator is before the operands. For example: + A B is in PREFIX notation.

## INFIX to POSTFIX conversion

The following conversion logic will work only for the INFIX expression, which is fully parenthesized according to **BEDMAS** (Brackets, Exponents, Divide, Multiply, Add, Subtract) rule.

Order of operations

Order	Operator	Remarks
1	( )	
2	<sup>^</sup>	
3	* or /	Whichever occurs first
4	+ or -	Whichever occurs first

### Conversion Logic

1. If Operator, PUSH to stack
2. If Operand, Output as POSTFIX
3. If ), POP from stack and output as POSTFIX

### Example1 $A+B*C = (A+(B*C))$

INFIX	STACK	POSTFIX
(		
A		A
+	+	A
(	+	A
B	+	A B
*	+	A B
C	+	A B C
)	+	A B C *
)		A B C * +

### Example3 $P*Q-R/S=((P*Q)-(R/S))$

INFIX	STACK	POSTFIX
(		
(		
P		P
*	*	P
Q	*	P Q
)	*	P Q *
-	-	P Q *
(	-	P Q *
R	-	P Q *
/	-	P Q * R
S	- /	P Q * R
)	- /	P Q * R S
)	-	P Q * R S /
		P Q * R S / -

### Example2 $A-B+C/D=((A-B)+(C/D))$

INFIX	STACK	POSTFIX
(		
(		
A		A
-	-	A
B	-	A B
)	-	A B -
+	+	A B -
(	+	A B -
C	+	A B - C
/	+/	A B - C
D	+/	A B - C D
)	+	A B - C D /
)		A B - C D / +

### Example4 $S-T+U=((S-T)+U)$

INFIX	STACK	POSTFIX
(		
(		
S		S
-	-	S
T	-	S T
)	-	S T -
+	+	S T -
U	+	S T - U
)		S T - U +

# Evaluation of expression in POSTFIX notation

## Evaluation Logic

1. If Operand, PUSH to stack
2. If Operator,
  - (a) Op2=POP from Stack
  - (b) Op1=POP from Stack
  - (c) Operate Op1 and Op2
  - (d) PUSH the result back in Stack
3. At the end of expression, POP the final result from the stack

**Example 1**

2 10 + 5 2 - \*

POSTFIX	Steps	STACK
2	PUSH	2
10	PUSH	2 10
+	POP, POP, Operate, PUSH	12
5	PUSH	12 5
2	PUSH	12 5 2
-	POP, POP, Operate, PUSH	12 3
*	POP, POP, Operate, PUSH	36

Final Result

36

**Example 2**

T F AND T F NOT AND OR

POSTFIX	Steps	STACK
T	PUSH	T
F	PUSH	T F
AND	POP, POP, Operate, PUSH	F
T	PUSH	F T
F	PUSH	F T F
NOT	POP, Operate, PUSH	F T T
AND	POP, POP, Operate, PUSH	F T
OR	POP, POP, Operate, PUSH	T

Final Result

T

**Example 3**

20, 5, /, 5, 2, 3, ^, \*, -

POSTFIX	Steps	STACK
20	PUSH	20
5	PUSH	20 5
/	POP, POP, Operate, PUSH	4
5	PUSH	4 5
2	PUSH	4 5 2
3	PUSH	4 5 2 3
^	POP, POP, Operate, PUSH	4 5 8
*	POP, POP, Operate, PUSH	4 40
-	POP, POP, Operate, PUSH	-36

Final Result

-36

**Example 4**

50, 16, 2, 4, \*, /, -

POSTFIX	Steps	STACK
50	PUSH	50
16	PUSH	50 16
2	PUSH	50 16 2
4	PUSH	50 16 2 4
*	POP, POP, Operate, PUSH	50 16 8
/	POP, POP, Operate, PUSH	50 2
-	POP, POP, Operate, PUSH	48

Final Result

48