# Infix - Postfix

**Infix Expression :**

Any expression in the standard form like "2*3-4/5" is an Infix(Inorder) expression.

**Postfix Expression :**

The Postfix(Postorder) form of the above expression is "23*45/-".

**Infix to Postfix Conversion :**

In normal algebra we use the infix notation like a+b*c. The corresponding postfix notation is abc*+. The algorithm for the conversion is as follows :

- Scan the `Infix string` from left to right.
- Initialise an empty stack.
- If the scannned character is an operand, add it to the `Postfix string`. If the scanned character is an operator and if the `stack` is empty `Push` the character to `stack`.
    - If the scanned character is an Operand and the `stack` is not empty, compare the precedence of the character with the element on top of the `stack` (`topStack`). If `topStack` has higher precedence over the scanned character `Pop` the stack else `Push` the scanned character to `stack`. Repeat this step as long as `stack` is not empty and `topStack` has precedence over the character.

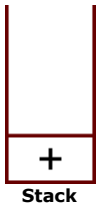
  Repeat this step till all the characters are scanned.
- (After all characters are scanned, we have to add any character that the `stack` may have to the `Postfix string`.) If `stack` is not empty add `topStack` to `Postfix string` and `Pop` the `stack`. Repeat this step as long as stack is not empty.
- Return the `Postfix string`.

**Example :**

Let us see how the above algorithm will be imlemented using an example.

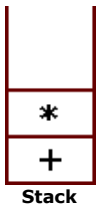
Infix String : a+b*c-d

Initially the Stack is empty and our Postfix string has no characters. Now, the first character scanned is 'a'. 'a' is added to the Postfix string. The next character scanned is '+'. It being an operator, it is pushed to the stack.



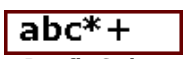


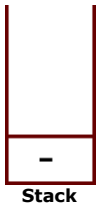
Next character scanned is 'b' which will be placed in the Postfix string. Next character is '*' which is an operator. Now, the top element of the stack is '+' which has lower precedence than '*', so '*' will be pushed to the stack.





The next character is 'c' which is placed in the Postfix string. Next character scanned is '-'. The topmost character in the stack is '*' which has a higher precedence than '-'. Thus '*' will be popped out from the stack and added to the Postfix string. Even now the stack is not empty. Now the topmost element of the stack is '+' which has equal priority to '-'. So pop the '+' from the stack and add it to the Postfix string. The '-' will be pushed to the stack.

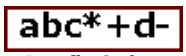




Stack

Next character is 'd' which is added to Postfix string. Now all characters have been scanned so we must pop the remaining elements from the stack and add it to the Postfix string. At this stage we have only a '-' in the stack. It is popped out and added to the Postfix string. So, after all characters are scanned, this is how the stack and Postfix string will be :


Stack



Postfix String

End result :

- Infix String : a+b*c-d
- Postfix String : abc*+d-