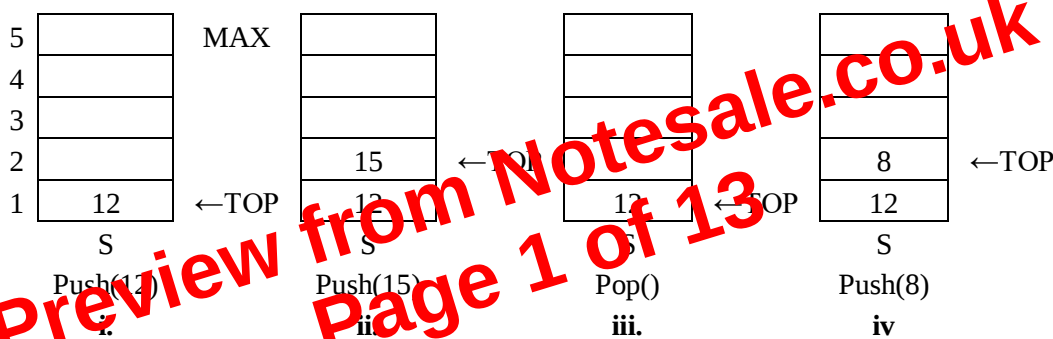
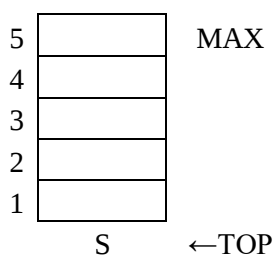


7. Stack:

- ❖ A *stack* is a list of elements in which an element may be inserted or deleted only at one end, called the *top* of the stack.
- ❖ There are two basic operations associated with stacks:
 1. Push- to insert an element into a stack
 2. Pop- to delete an element from a stack



- ❖ Stack may be represented by two ways.
 1. Array representation
 2. Linked-list representation

7.1 Array representation of stacks:

**Linear Array S
for Stack**

12	5	6			
1	2	3	4	5	6
TOP			MAX		

Here S is a linear array with MAX indexes. TOP is a variable which stores the position of top element of stack.

First reverse expression $d\ c -\ b\ a\ +\ *$

Symbol	Stack
d	d
c	d c
-	(c - d)
b	(c - d) b
a	(c - d) b a
+	(c - d) (a + b)
*	(a + b) * (c - d)

The infix expression $(a+b)*(c-d)$

7.3 Recursion:

- ❖ Recursion is an important concept in computer science. Many algorithms can be best described in terms of recursion.
- ❖ If one algorithm calls itself, such algorithm is called recursive algorithm.
- ❖ A recursive procedure must have the following two properties (**Principles of Recursion**)
 - There must be certain criteria, called *base criteria*, for which the procedure does not call itself.
 - Each time the procedure does call itself (directly or indirectly), it must be closer to the base criteria.

7.3.1 Simulating Recursion:

- ❖ When we apply recursion, an implicit stack is used.
- ❖ Implicit stack is a special kind of stack used by runtime memory environment.
- ❖ This stack is used to hold the information about function CALL.
- ❖ This type of stack is used implicitly by the compiler.
- ❖ This stack cannot be directly manipulated by the programmer.
- ❖ **E.g.** Recursive program for Factorial of a number uses this stack.

7.3.2 Algorithm and C program for finding out Factorial of given number using recursion.

FACTORIAL(N)

Where N is a positive integer number.

1. If $N == 1$ then return (1)
2. Else return $(N * \text{FACTORIAL}(N-1))$

Program:

```
#include<stdio.h>
#include<conio.h>
```

```
int Factorial(int n)
{
```