ECAP770

Advance Data Structures

Ashwani Kumar

Assistant Professor

Learning Outcomes

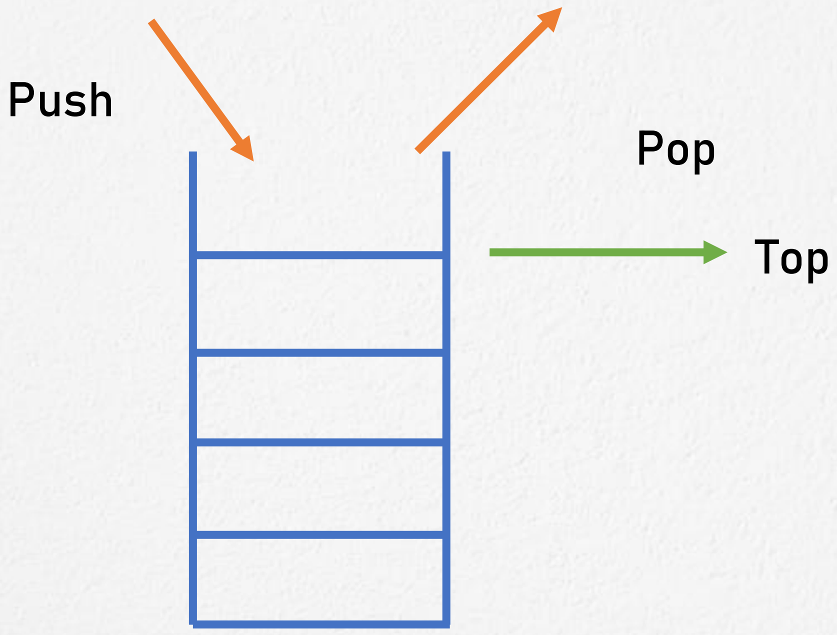
After this lecture, you will be able to

- Understand Stacks data structure

Stack

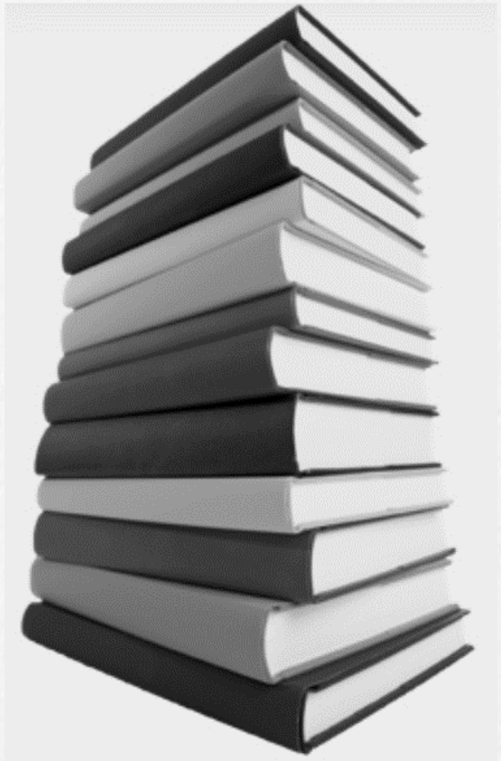
- A Stack is a linear data structure that follows the LIFO (Last-In-First-Out) or FILO(First In Last Out) principle.
- Stack has one end, insertion and deletion can be done from the one end known as the top of the stack.
- A Stack is an abstract data type with a pre-defined capacity, which means that it can store the elements of a limited size.

Stack



Stack

Stack Examples



Stack Operations

- Push()
- Pop()
- IsEmpty()
- isFull()
- peek()
- count()
- change()
- display()

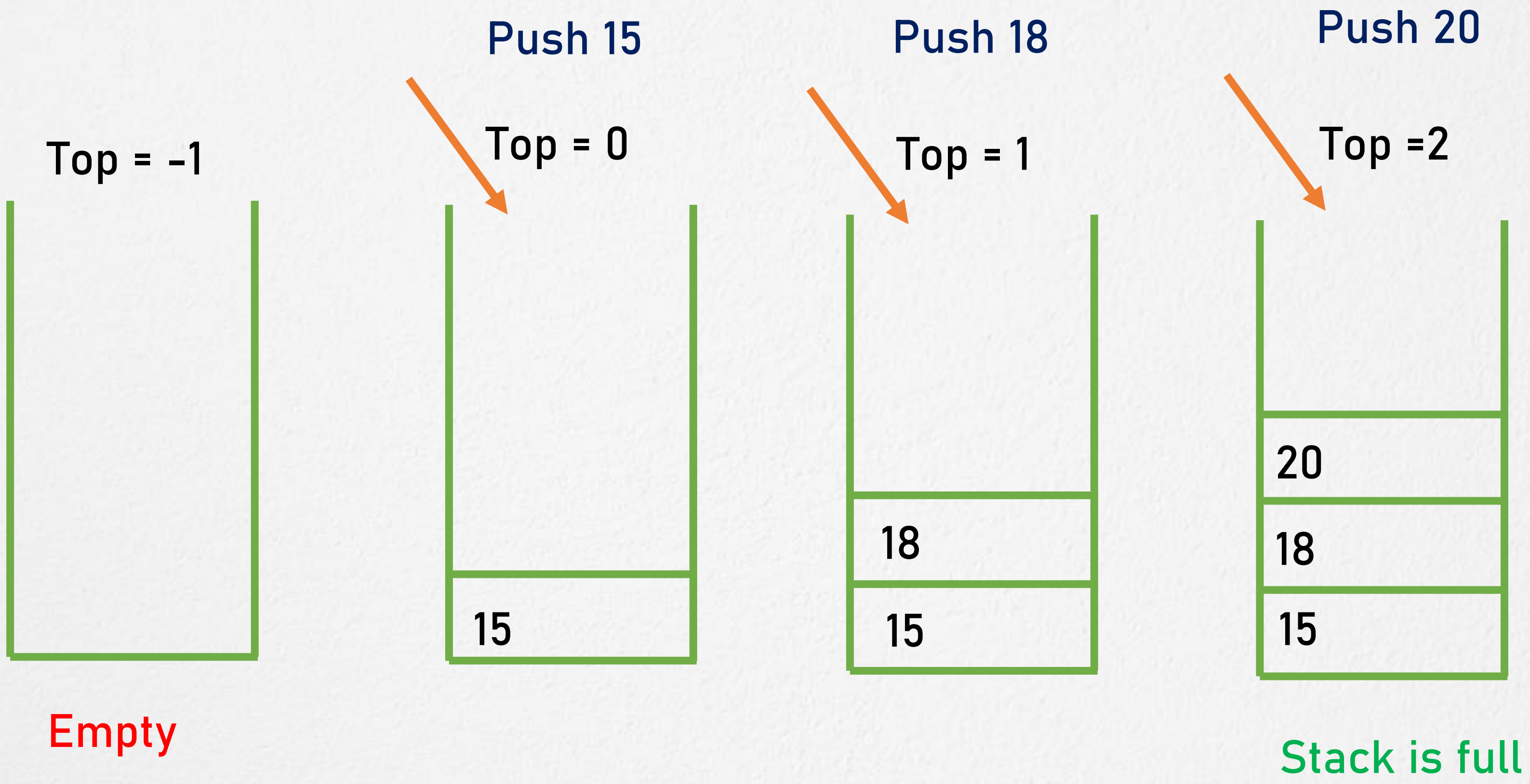
Stack Operation: Push()

- push():- When we insert an element in a stack then the operation is known as a push.
- Before inserting an element in a stack, we check whether the stack is full.
- If we try to insert the element in a stack, and the stack is full, then the overflow condition occurs.

Stack Operation: Push()

- When we initialize a stack, we set the value of top as -1 to check that the stack is empty.
- When the new element is pushed in a stack, first, the value of the top gets incremented, i.e., top=top+1, and the element will be placed at the new position of the top.
- The elements will be inserted until we reach the max size of the stack.

Stack Operation: Push()



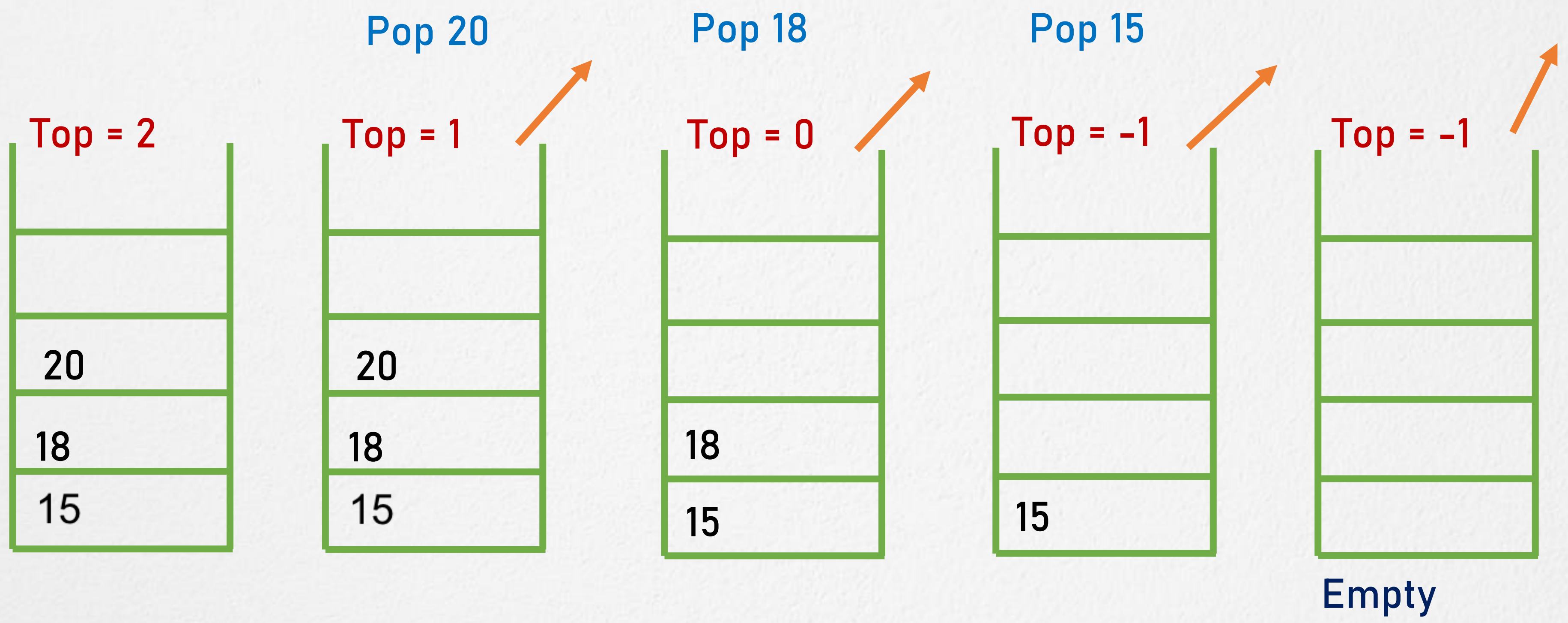
Stack operation: Pop()

- pop():- When we delete an element from the stack, the operation is known as a pop.
- Before deleting the element from the stack, we check whether the stack is empty.

Stack operation: Pop()

- If we try to delete the element from the empty stack, then the underflow condition occurs
- If the stack is not empty, we first access the element which is pointed by the top
- Once the pop operation is performed, the top is decremented by 1, i.e., top=top-1.

Stack operation: Pop()



Stack Operations

- isEmpty():- It determines whether the stack is empty or not. Returns true if stack is empty, else false.
- isFull():- It determines whether the stack is full or not.
- peek():- It returns the element at the given position.

Stack Operations

- count(): It returns the total number of elements available in a stack.
- change(): It changes the element at the given position.
- display(): It prints all the elements available in the stack.

Stack Implementation

Two methods used to implement a stack:

- Using array
- Using linked list

Applications of Stack

- Expression Evaluation and Conversion
- Parenthesis Checking
- Backtracking
- Function Call
- String Reversal
- Memory Management
- Syntax Parsing

That’s all for now…