Circular Queue | Set 2 (Circular Linked List Implementation)

Circular Queue | Set 1 (Introduction and Array Implementation)

Queue | Set 1 (Introduction and Array Implementation)

Queue – Linked List Implementation

Implement a stack using singly linked list

Stack Data Structure (Introduction and Program)

Finding sum of digits of a number until sum becomes single digit

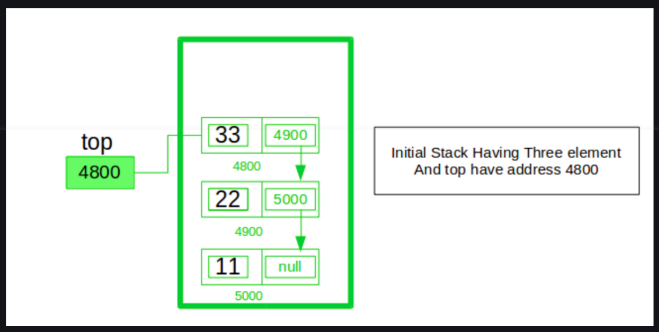
Program for Sum of the digits of a given number

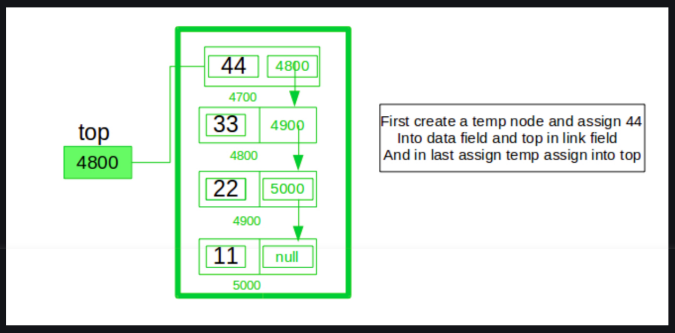
Compute sum of digits in all numbers from 1 to n

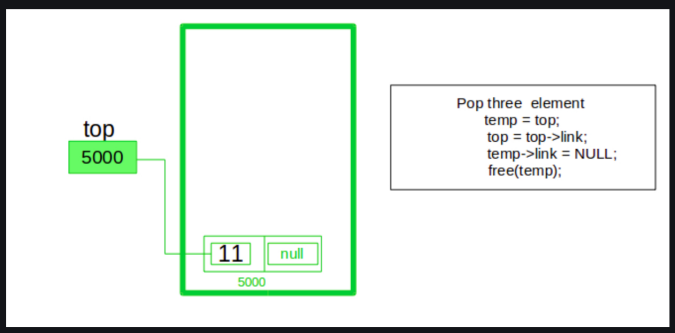
Implement a stack using singly linked list

Difficulty Level : Easy • Last Updated : 24 Jun, 2022

To implement a stack using singly linked list concept , all the singly linked list operations are performed based on Stack operations LIFO(last in first out) and with the help of that knowledge we are going to implement a stack using single linked list. Using singly linked lists , we implement stack by storing the information in the form of nodes and we need to follow the stack rules and implement using singly linked list nodes . So we need to follow a simple rule in the implementation of a stack which is last in first out and all the operations can be performed with the help of a top variable .Let us learn how to perform **Pop , Push , Peek ,Display** operations in the following article .







A stack can be easily implemented using the linked list. In stack Implementation, a stack contains a top pointer. which is "head" of the stack where pushing and popping items happens at the head of the list. First node have null in link field and second node link have first node address in link field and so on and last node address in "top" pointer.
The main advantage of using linked list over an arrays is that it is possible to implement a stack that can shrink or grow as much as needed. In using array will put a restriction to the maximum capacity of the array which can lead to stack overflow. Here each new node will be dynamically allocate. so overflow is not possible.

Stack Operations:

1. push() : Insert a new element into stack i.e just inserting a new element at the beginning of the linked list.
2. pop() : Return top element of the Stack i.e simply deleting the first element from the linked list.
3. peek(): Return the top element.

4. **display():** Print all elements in Stack.

Below is the implementation of the above approach:

C++ Java Python3 C# Javascript

```python
'''Python supports automatic garbage collection so deallocation of memor
is done implicitly. However to force it to deallocate each node after us
add the following code:

    import gc          #added at the start of program
    gc.collect()      #to be added wherever memory is to be deallocated
'''

class Node:

    # Class to create nodes of linked list
    # constructor initializes node automatically
    def __init__(self,data):
        self.data = data
        self.next = None

class Stack:

    # head is default NULL
    def __init__(self):
        self.head = None

    # Checks if stack is empty
    def isempty(self):
        if self.head == None:
            return True
        else:
            return False

    # Method to add data to the stack
    # adds to the start of the stack
    def push(self,data):

        if self.head == None:
            self.head=Node(data)

        else:
            newnode = Node(data)
            newnode.next = self.head
            self.head = newnode

    # Remove element that is the current head (start of the stack)
    def pop(self):

        if self.isempty():
            return None

        else:
            # Removes the head node and makes
            #the preceding one the new head
            poppednode = self.head
            self.head = self.head.next
            poppednode.next = None
            return poppednode.data

    # Returns the head node data
    def peek(self):

        if self.isempty():
            return None

        else:
            return self.head.data

    # Prints out the stack
    def display(self):

        iternode = self.head
        if self.isempty():
            print("Stack Underflow")

        else:
```

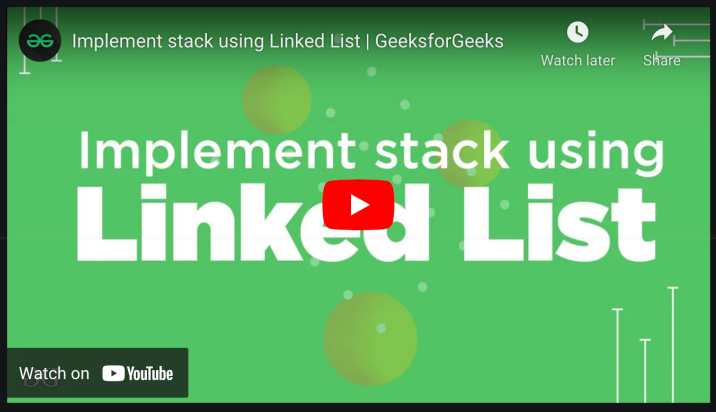
```
            while(iternode != None):

                print(iternode.data,"->",end = " ")
                iternode = iternode.next
            return

# Driver code
MyStack = Stack()

MyStack.push(11)
MyStack.push(22)
MyStack.push(33)
MyStack.push(44)

# Display stack elements
MyStack.display()

# Print top element of stack
print("\nTop element is ",MyStack.peek())

# Delete top elements of stack
MyStack.pop()
MyStack.pop()

# Display stack elements
MyStack.display()

# Print top element of stack
print("\nTop element is ", MyStack.peek())

# This code is contributed by Mathew George
```

Output:

```
44->33->22->11->
Top element is 44
22->11->
Top element is 22
```

The time complexity for all push(), pop(), and peek() operations is O(1) as we are not performing any kind of traversal over the list. We perform all the operations through the current pointer only.

Space complexity: O(n) where n is size of the stack



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