

Stacks

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Stack overflow

Every stack has a size that determines how many nodes it can accommodate. Attempting to push a node in a full stack will result in a stack overflow. The program may crash due to a stack overflow.

A stack is illustrated in the given image.
`stackA.push(xg)` will result in a stack overflow since the stack is already full.



The stack data structure

A *stack* is a data structure that follows a last in, first out (LIFO) protocol. The latest node added to a stack is the node which is eligible to be removed first. If three nodes (`a`, `b` and `c`) are added to a stack in this exact same order, the node `c` must be removed first. The only way to remove or return the value of the node `a` is by removing the nodes `c` and `b`.

Main methods of a stack data structure

The stack data structure has three main methods: `push()`, `pop()` and `peek()`. The `push()` method adds a node to the top of the stack. The `pop()` method removes a node from the top of the stack. The `peek()` method returns the value of the top node without removing it from the stack.

Stack data structure

A `Stack` is a data structure that supports two basic operations: pushing a new item to the top of the stack and popping a single item from the top of the stack.

In order to implement a stack using a node class, we have to store a node that is currently referencing the top of the stack and update it during the push and pop operations.

```
from node import Node

class Stack:
    def __init__(self, limit=1000):
        self.top_item = None
        self.size = 0
        self.limit = limit

    def push(self, value):
        if self.has_space():
            item = Node(value)
            item.set_next_node(self.top_item)
            self.top_item = item
            self.size += 1
        else:
            print("All out of space!")

    def pop(self):
        if self.size > 0:
            item_to_remove = self.top_item
            self.top_item = item_to_remove.get_next_node()
            self.size -= 1
            return item_to_remove.get_value()
        else:
            print("This stack is totally empty.")

    def peek(self):
        if self.size > 0:
            return self.top_item.get_value()
        else:
            print("Nothing to see here!")

    def has_space(self):
        return self.limit > self.size

    def is_empty(self):
        return self.size == 0
```

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