Linked Stack Push Operation

Assume that we have the following lines of code:

```
mystack stack1;      // Line 1

stack1.push(5);      // Line 2
stack1.push(8);      // Line 3
stack1.push(3);      // Line 4
```

The following sequence of diagrams shows how the `Stack` object and its associated dynamic storage changes as these lines are executed.

Figure 1: The new, empty `mystack` object `stack1` created in Line 1 of the code above. The `stk_top` pointer is `nullptr`, while `stk_size` is 0.

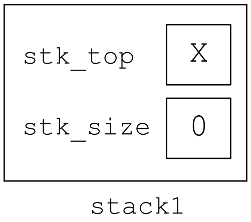


Figure 2a: The call to `push()` in Line 2 causes a new list `Node` to be allocated using the temporary pointer `new_node`. The node's `value` field is initialized to the value passed to `push()`, while its `next` field is initialized to the current value of `stk_top`.

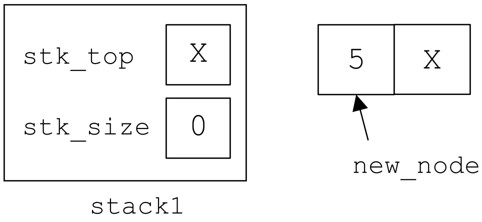


Figure 2b: The pointer `stk_top` is set to point at `new_node` and the `stk_size` is incremented to 1.

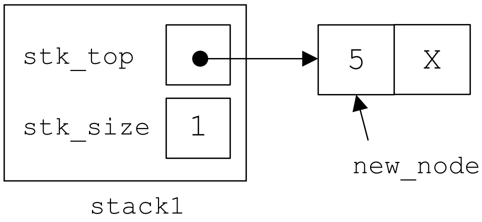


Figure 2c: When the `push()` method ends, the local variable `new_node` ceases to exist.

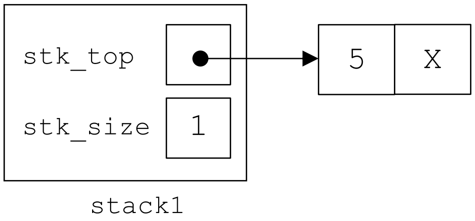


Figure 3a: The call to `push()` in Line 3 causes a new list `Node` to be allocated using the temporary pointer `new_node`. The node's `value` field is initialized to the value passed to `push()`, while its `next` field is initialized to the current value of `stk_top`.

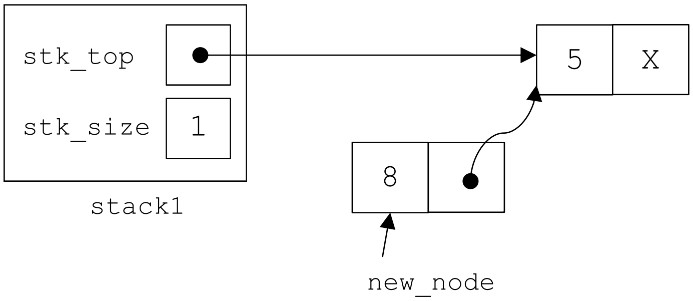


Figure 3b: The pointer `stk_top` is set to point at `new_node` and the `stk_size` is incremented to 2.

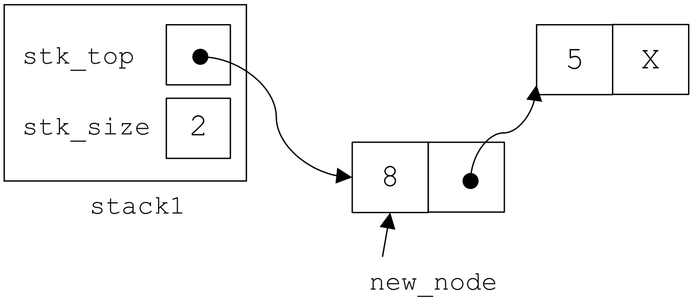


Figure 3c: When the `push()` method ends, the local variable `new_node` ceases to exist.

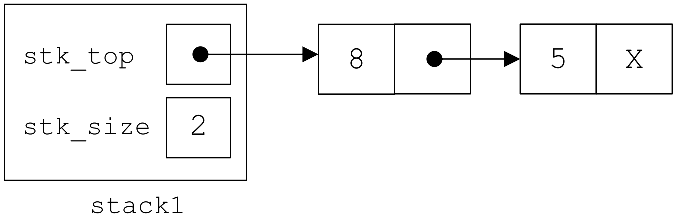
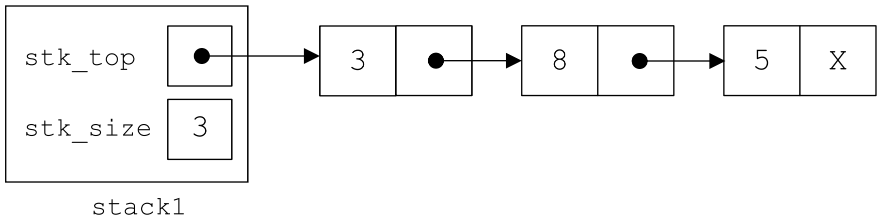


Figure 4: Linked stack following the call to `push()` in Line 4.



Linked Stack Pop Operation

Assume that we then add the following lines of code after the code listed above:

```
stack1.pop();        // Line 5
stack1.pop();        // Line 6
stack1.pop();        // Line 7
```

The following sequence of diagrams shows how the `mystack` object and its associated dynamic storage changes as these lines are executed.

Figure 5a: The call to `pop()` in Line 5 creates the temporary pointer `del_node` and sets it to the value of `stk_top`.

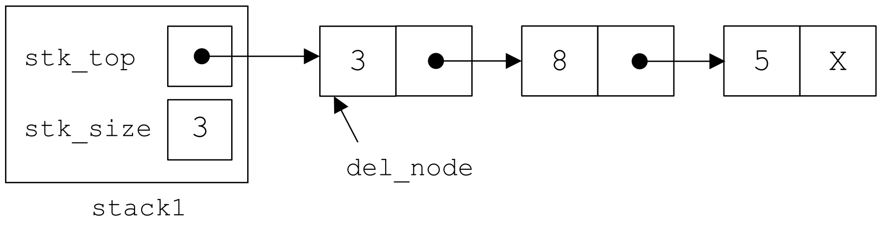


Figure 5b: The pointer `stk_top` is set to `stk_top->next`. It now points to the 2nd node in the list.

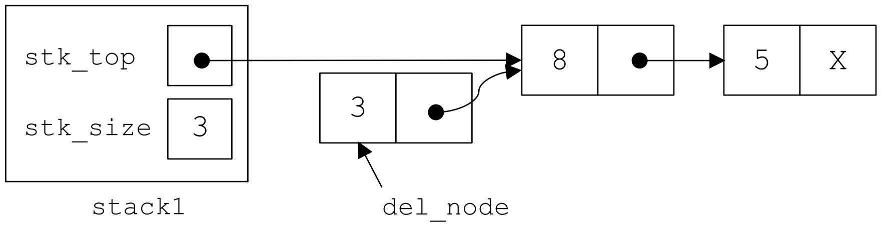


Figure 5c: The node pointed to by `del_node` is deleted and `stk_size` is decremented to 2.

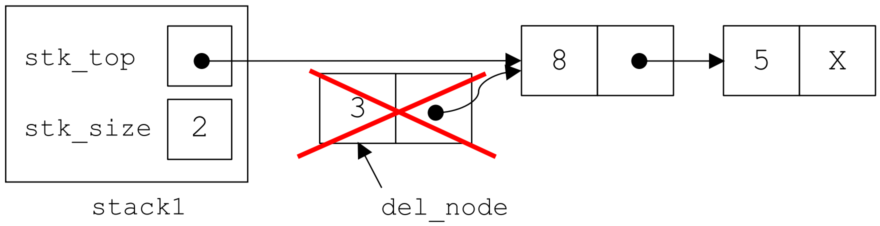


Figure 5d: When the `pop()` method ends, the local variable `del_node` ceases to exist.

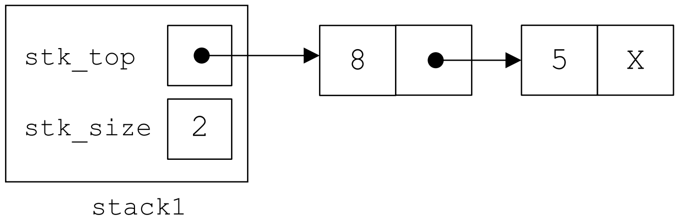


Figure 6a: The call to `pop()` in Line 6 creates the temporary pointer `del_node` and sets it to the value of `stk_top`.

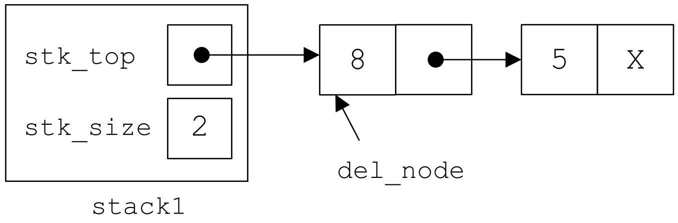


Figure 6b: The pointer `stk_top` is set to `stk_top->next`. It now points to the 2nd node in the list.

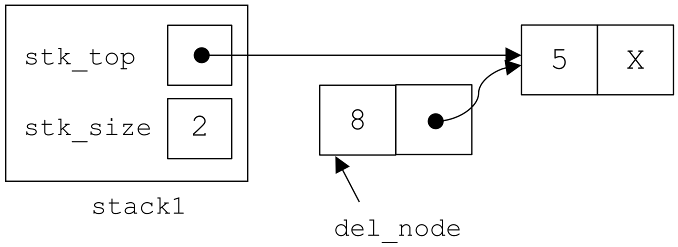


Figure 6c: The node pointed to by `del_node` is deleted and `stk_size` is decremented to 1.

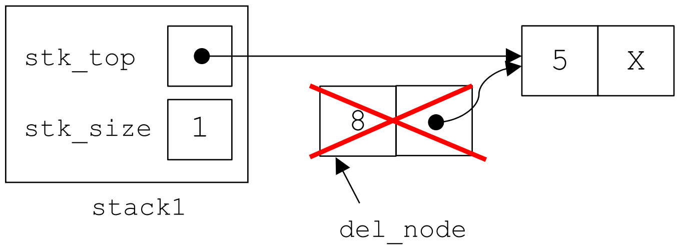


Figure 6d: When the `pop()` method ends, the local variable `del_node` ceases to exist.

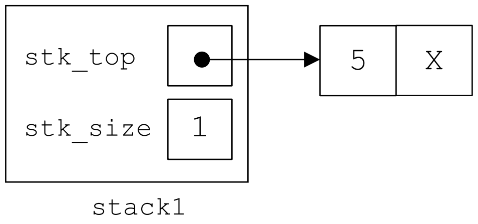


Figure 7a: The call to `pop()` in Line 7 creates the temporary pointer `del_node` and sets it to the value of `stk_top`.

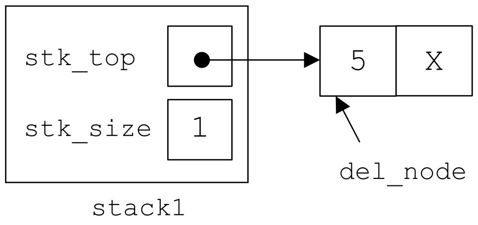


Figure 7b: The pointer `stk_top` is set to `stk_top->next`. It is now `nullptr`.

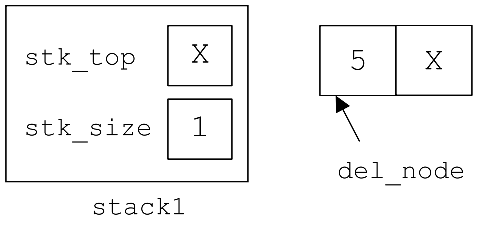


Figure 7c: The node pointed to by `del_node` is deleted and `stk_size` is decremented to 1.

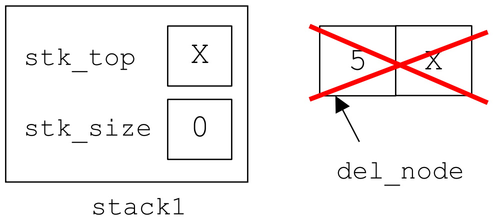
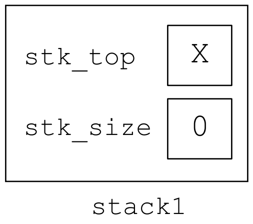


Figure 7d: When the `pop()` method ends, the local variable `del_node` ceases to exist. The stack is now empty.


stk_top
X
stk_size
0
stack1