

PMCA501P – DATA STRUCTURES AND ALGORITHMS LAB

ASSESSMENT -1 PROBLEM STATEMENTS

1. Given an array A of n integers. You have to make a queue and stack of the given integers. Queue should contain only prime numbers and stack should contain only composite numbers. Display queue and stack contents

Let the array A contains 5 integers: 7, 21, 18, 3, 12 then the content of queue and stack will be :

Queue : 7 , 3

Stack : 12 , 18 , 21

2. Using push and pop operations of stack create a queue and display the contents of queue. NOTE: Stack's property is LIFO and Queue's property is FIFO.

Input : Stack contents say 1,2,3,4,5

Output: Queue contents: 1,2,3,4,5

3. Given two sequences pushed and popped with distinct values, write a program to return true if and only if this could have been the result of a sequence of push and pop operations on an initially empty stack.

Example 1

Input: pushed = [5, 10, 15, 20, 25], popped = [20, 25, 15, 10, 5]

Output: 1

Explanation: We might do the following sequence:

push(5), push(10), push(15), push(20), pop() -> 20,
push(25), pop()-> 25, pop()-> 15, pop()-> 10, pop()-> 5

Example 2

Input: pushed = [5, 10, 15, 20, 25], popped = [20, 15, 25, 5, 10]

Output: 0

Explanation: 5 cannot be popped before 10.

Solution Step

1. Create an empty stack and push the first element of pushed array
2. Place two indexes say i and j on the pushed and popped array.
3. Compare the top element of the stack with the front element of popped array

- If both of them are the same, then we have to pop the top element of the stack and increment the popped array index by one
 - If both of them are not the same, then we have to push the front element of pushed array into the stack and increment the pushed array index by one
4. Repeat step 2 to 3, until the stack becomes empty.

4. Given a doubly linked list, find the middle of the linked list. For example, if the given linked list is 1->2->3->4->5 then the output should be 3. If there are even nodes, then there would be two middle nodes so print the second middle element. For example, if the given linked list is 1->2->3->4->5->6 then the output should be 4.
5. Let's simulate a game 'Hot potato'. It is the game where children stand in a circle and pass some objects to their neighbours. At a certain point in the game, the action is stopped and the child who has the object is removed from the circle. Play continues until only one child is left. Let's simulate the scenario by removing a child when the count becomes 7.

The program will input a list of names and a constant, call it "num," to be used for counting. It will return the name of the last person remaining after repetitive counting by num.

To simulate the circle, we will use a queue. Assume that the child at the front of the queue says 1 and joins back the queue (dequeued and enqueued immediately). The child at the front will say 2 and joins back the queue. This repeats until a child says 7 (dequeued permanently). The game again starts from count 1. This process will continue until only one name remains (the size of the queue is 1).

