

IN.3028 : Algorithmics - Assignment 1

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1 Chapter 1 : Foundation

1.1 Stack, valid push-pop sequences

Suppose that a client performs an intermixed sequence of (stack) push and pop operations. The push operations put the integers 0 through 9 in order onto the stack; the pop operations print out the return values. Which of the following sequence(s) could not occur? Explain why and on which integer the first invalid operation occurs.

- (a) ok
- (b) Push 0,1,2,3,4 on to the stack. Pop 4. Push 5,6. Pop 6. Push 7,8. Pop 8,7,5,3,2. Push 9. Pop 0 which is impossible because the 1 is on top of the stack at that point.
- (c) ok
- (d) ok
- (e) ok
- (f) Push 0,1,2,3,4. Pop 4. Push 5, 6. Pop 6, 5, 3. Push 7, 8. Pop 8. Pop 1 which is impossible because the 7 is on top of the stack at that point.
- (g) Push 0,1. Pop 1. Push 2,3,4. Pop 4. Push 5,6,7. Pop 7. Push 8,9. Pop 9,8,6,5,3. Pop 0 which is impossible because the 2 is on top of the stack at that point.
- (h) ok

The enqueue operations put the integers 0 through 9 in order onto the queue; the dequeue operations print out the return value. Which of the following sequence(s) could not occur?

- (a) ok
- (b) 0 is the first integer that goes in so it should be the first to go out. This is not the case here.
- (c) 0 is the first integer that goes in so it should be the first to go out. This is not the case here.
- (d) 0 is the first integer that goes in so it should be the first to go out. This is not the case here.

1.2 Stack & Queue, JUnit Tests (Implementation)

Provided in the src and tests files.

1.3 Mysterious Code

1.3.1 Queue

This code fragment effectively reverses the order of the elements in the queue named `q` using a stack as an intermediary data structure.

1.3.2 An algorithm on a string, our first recursion:

The function `mystery` recursively splits the input string `s` into two halves and then swaps and recombines them. If applied repeatedly, the function will reverse the characters of the string.