

Data Structures and Algorithms

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1 Stacks

Give some examples of stacks found in real life. If we push “s”, “w”, “a”, “t” onto a stack, what letter will be returned when we pop() from the stack?

2 Polish notation/expressions

Polish notation first emerged in logic as a way to write formulas without parenthesis, it was first suggested by Jan Łukasiewicz in 1924. While no longer used much in logic, Polish notation has since found a place in computer science. For instance, Lisp and related programming languages define their entire syntax in prefix notation (and others use postfix notation), because it is later easier for the compiler to parse the program into an abstract syntax tree.

Evaluate the following postfix polish expressions:

- 2, 3, +, 5, 9, -, *
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What is the Polish notation representation of the following expression?

$$(a * (b + c)) + (b/d) * a$$

3 Queues

If we enqueue “s”, “w”, “a”, “t” onto a queue, what letter will be returned when we dequeue() from the queue?

4 Max element in queue

Given a Queue Q, write a method that will find the max element in the queue. You may only use queue operations such as enqueue, dequeue, size etc.. No other data structure can be used other than queues. Queue must remain intact after finding the max. The elements in the queue can be compared using compareTo method.

5 Palindroms

Write a program that checks whether an input string is a palindrome or not using a stack.

6 Huffmann-code

A file contains only spaces and digits in the following frequency: space (9), a (5), b (1), d (3), e (7), f (3), h (1), i (1), k (1), n (4), o (1), r (5), s (1), t (2), u (1), v (1). Construct the Huffman code.