

Data Structure 2018

Lab 06

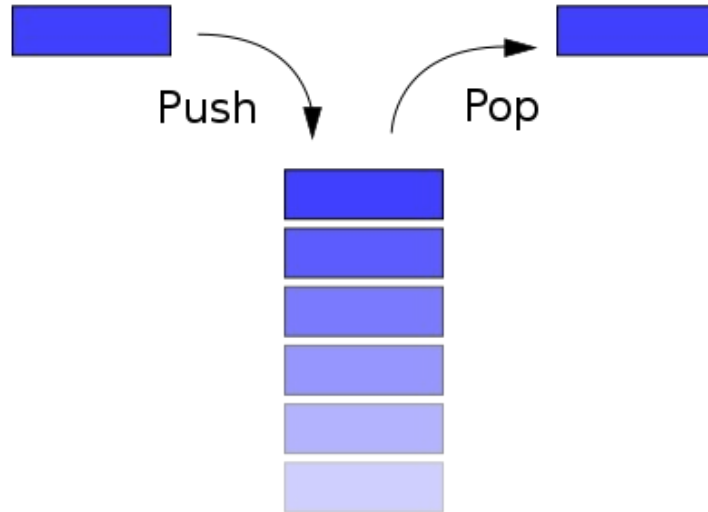
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Stack

A stack is a basic data structure where insertion and deletion of items takes place at one end called top of the stack.

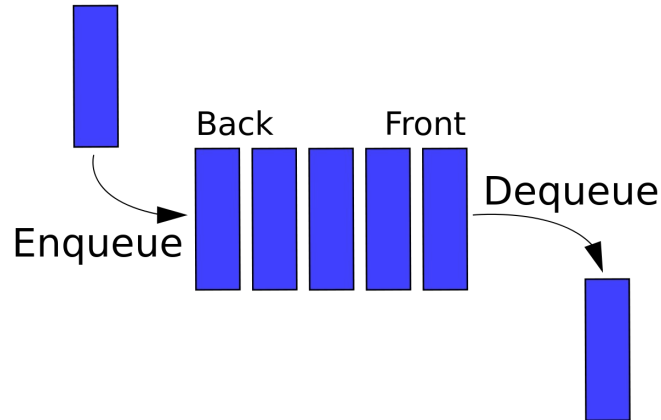
It is called a LIFO (Last In First Out) to demonstrate the way it accesses data.



Queue

A queue is a basic data structure that is used throughout programming. You can think of it as a line in a grocery store. The first one in the line is the first one to be served.

A queue is also called a FIFO (First In First Out) to demonstrate the way it accesses data.



Today's Task

Evaluation of an Infix Expression that is Fully Parenthesized

In infix arithmetic expressions, operators are placed between two operands -- as shown in the examples below:

$$2 + 3 \quad \text{or} \quad 1 + (2 + 3) * (4 * 5)$$

A fully parenthesized infix arithmetic expression is an infix arithmetic expression where every operator and its arguments are contained in parentheses, as seen in following:

$$(2 + 3) \quad \text{or} \quad (1 + ((2 + 3) * (4 * 5)))$$

Suppose we wish to evaluate such an expression...

Today's Task Cont.

Here are the steps to evaluate infix expression which is fully parenthesized using stack:

1. Read one input character
2. Actions at end of each input

| | |
|------------------|---|
| Opening brackets | (2.1) Push into stack and then Go to step (1) |
| Number | (2.2) Push into stack and then Go to step (1) |
| Operator | (2.3) Push into stack and then Go to step (1) |

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Today's Task Cont.

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| | |
|--------------------|---|
| Closing brackets | <p>(2.4) Pop from character stack</p> <p>(2.4.1) Pop is used four times</p> <p>The first popped element is assigned to op2</p> <p>The second popped element is assigned to op</p> <p>The third popped element is assigned to op1</p> <p>The fourth popped element is the remaining opening bracket, which can be discarded.</p> <p>Evaluate op1 op op2</p> <p>Convert the result into character and push into the stack</p> |
| New line character | <p>(2.5) Pop from stack and print the answer</p> <p>STOP</p> |

Sample Desired Input

The fully parenthesized expression without emphasis on the spaces between the digits and the operands.

$((2*5)+(6/2))$

$((((2 * 5) - (1 * 2)) / (11 - 9))$

Sample Expected Output

Expression: $((2*5)+(6/2))$

Adding: (

Adding: (

Adding: 2

Adding: *

Adding: 5

Removed entry: 5

Removed entry: *

Removed entry: 2

Removed entry: (

(Cont. ...)

(... Cont.)

Adding: 10

Adding: +

Adding: (

Adding: 6

Adding: /

Adding: 2

Removed entry: 2

Removed entry: /

Removed entry: 6

(Cont. ...)

(... Cont.)

Removed entry: (

Adding: 3

Removed entry: 3

Removed entry: +

Removed entry: 10

Removed entry: (

Adding: 13

Removed entry: 13

Final Result: 13

Deadline

The deadline to submit your codes is 9 p.m.,
while the TA class ends at 8:10.