Assignment 9 (By Utkarsh Ranjan)

Problem 1

Assumptions

- I have assumed the input as an array of integers with the operations being performed on integers less than 10 , i.e, single digit integer.
- I have used integers to represent the following operators :-
  - + => 10
  - - => 11
  - * => 12
  - / => 13
  - (=> 14
  -) => 15

Variable

Input is an array of integers which has its first element as an integer which is the length of the total expression.

Algorithm

Shunting Yard Algorithm

- The Shunting Yard Algorithm converts an infix notation to a postfix notation
- This algorithm takes as input an infix Expression and produces a queue that has this expression converted to postfix notation.
- We have modified the algorithm to output the result of the evaluation of expression instead of a queue.
- The trick is using two stack instead of one, one for operands, and other for operators.

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1. While there are still tokens to be read in,
   1.1 Get the next token.
   1.2 If the token is:
       1.2.1 A number: push it onto the value stack.
       1.2.2 A variable: get its value, and push onto the value stack.
       1.2.3 A left parenthesis: push it onto the operator stack.
       1.2.4 A right parenthesis:
         1 While the thing on top of the operator stack is not a
           left parenthesis,
             1 Pop the operator from the operator stack.
             2 Pop the value stack twice, getting two operands.
             3 Apply the operator to the operands, in the correct order.
             4 Push the result onto the value stack.
         2 Pop the left parenthesis from the operator stack, and discard it.
       1.2.5 An operator (call it thisOp):
         1 Push thisOp onto the operator stack.
2. While the operator stack is not empty,
    1 Pop the operator from the operator stack.
    2 Pop the value stack twice, getting two operands.
    3 Apply the operator to the operands, in the correct order.
    4 Push the result onto the value stack.
```

3. At this point the operator stack should be empty, and the value
   stack should have only one value in it, which is the final result.