Assignment 2 – Oisin Mc Laughlin – 22441106

Problem Statement

This assignment will take an infix expression which takes the form <operand> <operator> <operand> and convert it to a postfix expression which will take the form <operand> <operand> <operator>. The assignment must only scan in single digits 0-9 or the operators +, -, *, /, (,), ^. This assignment implements the arraystack class which is on canvas. From my analysis for this assignment I'm going to have 5 methods including main. checkInput will ensure the user input is correct by using to char array and checking if the entered value is between 3 and 20 characters, returning false if it is out of the range. It also checks to see if the characters are valid by comparing the operators and operands to an array for valid operands and operators. The isOpp array will check if the character is an operand once again by comparing it to the valid operators array and returns true if it finds a match. The precedence method will return an integer value depending on what the precedence of the operator is, for example for + or – it will return 1, for * or / it will return 2 etc. Main will prompt a user for an entry and then run a while loop until the correct input is entered. If the correct input is entered, it will run the infToPos method where the real bread and butter happens. This method will create a string builder and check if the character is a digit, if it is, the digit is added to the postfix expression straight away to maintain the order. It then checks if there is an open bracket, if there is, it is also pushed to the stack. Next it checks if there a is a closed bracket, if there is, the method will pop the operators from the stack and append to the postfix string builder until an open bracket is found which will handle the idea with brackets in the first place. The next check is for operators, when one is found the precedence method returns how important the operator is, if the precedence of the operator is lower or equal, the other operators are popped and added to the postfix string builder until that condition is no longer met. This makes sure that the postfix expression is the correct order. After this the string builder is returned.

Code

```
import javax.swing.*;
//import java.util.Scanner;

public class Main {
    private static char[] validChars = {'0', '1', '2', '3', '4', '5', '6',
'7', '8', '9', '+', '-', '*', '/', '^', '(', ')'};
    private static char[] validNums = {'0', '1', '2', '3', '4', '5', '6',
'7', '8', '9'};
    private static char[] validOperators = {'^', '*', '/', '+', '-'};

    public static void main(String[] args) {
//        Scanner sc = new Scanner(System.in);
//        System.out.println("Please enter an infix numerical expression
between 3 and 20 characters:");
        String input;
        String postFix;

        //Prompts the user to enter their infix expression
        input = JOptionPane.showInputDialog(null, "Please enter an infix
numerical expression between 3 and 20 characters:");
        while (true) {
            //This loop will constantly run until the user enters a correct
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expression by calling the checkInput method with the user input
            if (checkInput(input)) {
                break;
            }
            else {
                //Prompt again if incorrect expresssion
                JOptionPane.showMessageDialog(null, "Invalid Input\nOnly
Characters: '^', '*', '/', '+', '-', '(', ')' and numbers 0-9 are valid");
                input = JOptionPane.showInputDialog(null, "Please Try
Again:");
            }
        }
        //Calling the infix to posfix method with the user input and
displays their infix and postfix expression
        postFix = infToPos(input);
        JOptionPane.showMessageDialog(null, "Infix: " + input + "\nPostfix:
" + postFix);
    }

    public static boolean checkInput(String in) {
        //Converts to character array
        char[] inCheck = in.toCharArray();
//        System.out.println(inCheck);

        //If input is less than 3 or greater than 20 return false
        if (in.length() < 3 || in.length() > 20) {
            return false;
        }

        //Loops through input char array
        for (int i = 0; i < inCheck.length; i++) {
            //Creates a flag with value false for the char
            boolean flag = false;
            //It then loops through the array of valid characters
            for (int j = 0; j < validChars.length; j++) {
                //Once the char is found in the valid char array, the char
is valid and the flag is switched to true and the loop moves on to the next
char in the array
                if (inCheck[i] == validChars[j]) {
                    flag = true;
                    break;
                }
            }
            //If a matching char in the valid chars array is never found,
the flag is never set to true and false is returned
            if (!flag) {
                return false;
            }
        }
        return true;
    }

    public static String infToPos(String in) {
        StringBuilder postF = new StringBuilder();
        ArrayStack stack = new ArrayStack(); // Assuming ArrayStack can
handle Character objects
        char[] inArr = in.toCharArray();

        for (int i = 0; i < inArr.length; i++) {
            //Correctly reference the character from the input array
            //Also done since had to keep putting (char) before i to stop
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            char c = inArr[i];

            //Appends to the string builder if the char is a digit
            if (Character.isDigit(c)) {
                postF.append(c);
            }
            //Push char if open bracket
            else if (c == '(') {
                stack.push(c);
            }
            //If close bracket then while loop will run while stack isn't
empty and top of stack isn't opening bracket
            else if (c == ')') {
                while (!stack.isEmpty() && (char)stack.top() != '(') {
                    //Append each popped char to string builder
                    postF.append((char)stack.pop());
                }
                //If stack isn't empty pop, this should remove the open
bracket from the stack
                if (!stack.isEmpty()) {
                    stack.pop();
                }
            }
            //If character is an operator
            else if (isOpp(c)) { // Check if the character is an operator
                //While stack isn't empty and the precedence of that char
is less than or equal to the char at the top of the stack
                while (!stack.isEmpty() && precedence(c) <=
precedence((char)stack.top())) {
                    //Append each popped char to string builder
                    postF.append((char)stack.pop());
                }
                //Push that char to stack then
                stack.push(c);
            }
        }
        while (!stack.isEmpty()) {
            //While there is still chars in stack, append them to the
string builder to ensure the correct postfix result
            postF.append((char)stack.pop());
        }
        //Return the string builder result after loop has finished
        return postF.toString();
    }

    //This method loops through and compares the input to the valid
operator array and returns true if it finds a match, otherwise it returns
false
    public static boolean isOpp(char in) {
        for (int i = 0; i < validOperators.length; i++) {
            if (in == validOperators[i]) {
                return true;
            }
        }
        return false;
    }

    //This method checks the precedence, it assigns each operator a value
depending on where it lays in the "BIMDAS" rule otherwise it returns -1 if
theres no match
```
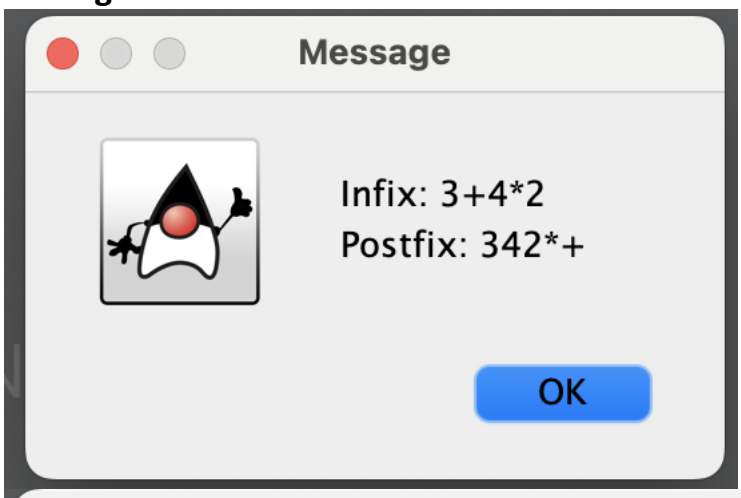
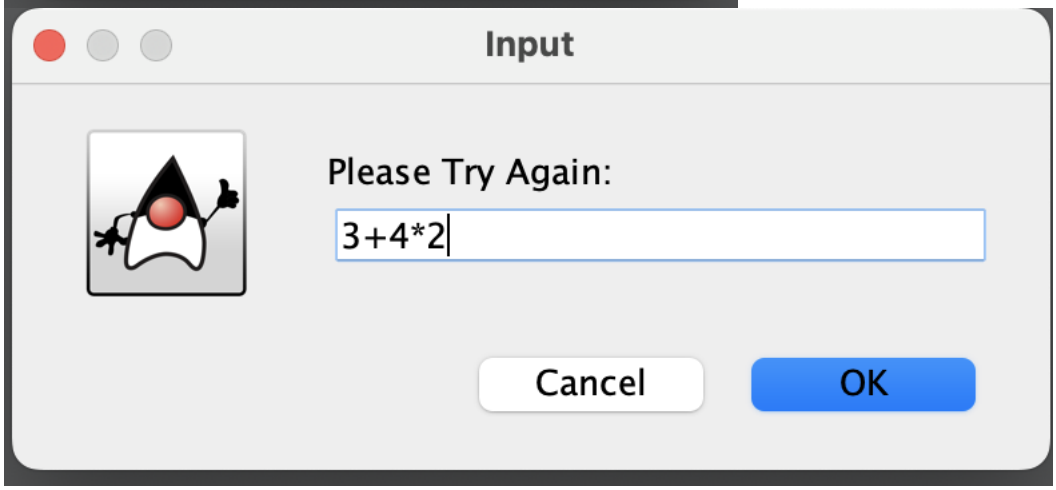
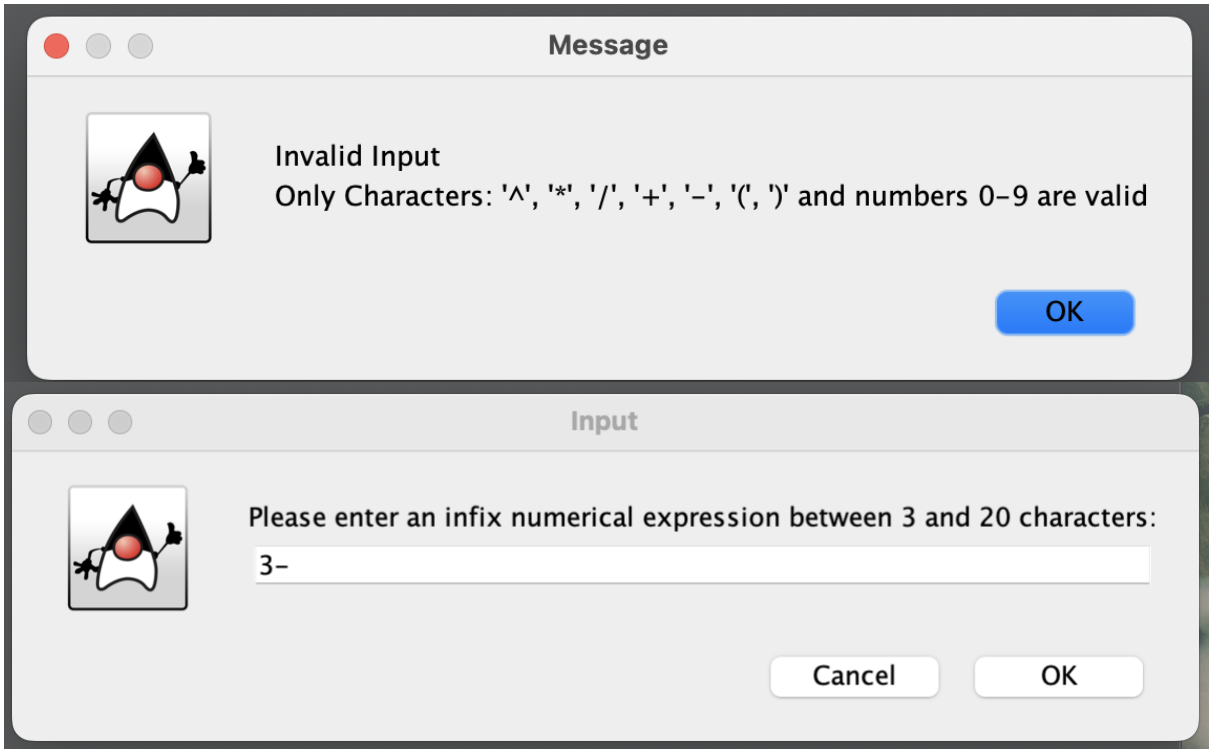

```
    public static int precedence(char in) {
        if ((in == '+') || (in == '-')) {
            return 1;
        }
        else if ((in == '*') || (in == '/')) {
            return 2;
        }
        else if (in == '^') {
            return 3;
        }
        else {
            return -1;
        }
    }
}
```

Testing






Message
Invalid Input
Only Characters: '^', '*', '/', '+', '-', '(', ')' and numbers 0-9 are valid
OK
Input
Please enter an infix numerical expression between 3 and 20 characters:
3-
Cancel
OK