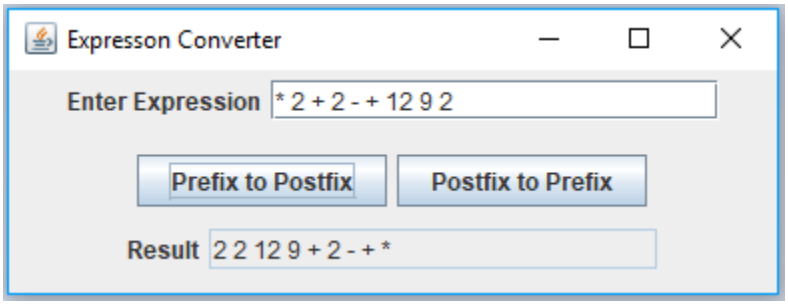
CMSC 350 Project 1

The first programming project involves writing a program that converts prefix expressions to postfix and postfix expressions to prefix. Customary infix expression place the operator between the two operands. In a prefix expression, the operator comes before the two operands. In a postfix expression it comes after them. One benefit of prefix and postfix expressions is that they never require parentheses nor rules regarding precedence or associativity.

The program for this project should consist of three classes. The main class should create a GUI that allows the user to input an expression in either prefix or postfix and convert it to postfix or prefix, respectively. The GUI should look as follows:



The GUI must be generated by code that you write. You may not use a drag-and-drop GUI generator.

The second class should contain the code to perform the conversions. The pseudocode for prefix to postfix, which requires two stacks, is shown below:

```
tokenize the string containing the prefix expression
while there are more tokens
      push the token onto a reversal stack if it is not a space
while the reversal stack is not empty
      pop the next token from the reversal stack
      if it is an operand
            push it onto the operand stack
      else it is an operator
            pop two operands off of the operand stack
            create a string with the two operands followed
                  the operator
            push that string onto the operand stack
pop the postfix expression off the stack
```

The pseudocode for the postfix to prefix conversion, which requires only one stack, is shown below:

```
tokenize the string containing the postfix expression
while there are more tokens
      get the next token
      if it is a space
            skip it
      else if it is an operand
            push it onto the operand stack
      else it is an operator
            pop two operands off of the operand stack
            create a string with the operator followed by
                  two operands
```

```
            push that string onto the operand stack
pop the prefix expression off the stack
```

Be sure to add any additional methods needed to eliminate any duplication of code.

The input expressions should not be required to contain spaces between tokens unless they are consecutive operands. The output expressions should always have a space between all symbols. A checked exception `SyntaxError` should be thrown by the methods that perform the conversions if an empty stack is ever popped or the stack is not empty once the conversion is complete. That exception should be caught in the main class, where a `JOptionPane` window should be displayed containing an error message.

You are to submit two files.

1. The first is a `.zip` file that contains all the source code for the project. The `.zip` file should contain only source code and nothing else, which means only the `.java` files. If you elect to use a package the `.java` files should be in a folder whose name is the package name. Every outer class should be in a separate `.java` file with the same name as the class name. Each file should include a comment block at the top containing your name, the project name, the date, and a short description of the class contained in that file.
2. The second is a Word document (PDF or RTF is also acceptable) that contains the documentation for the project, which should include the following:
    a. A UML class diagram that includes all classes you wrote. Do not include predefined classes. You need only include the class name for each individual class, not the variables or methods
    b. A test plan that includes test cases that you have created indicating what aspects of the program each one is testing
    c. A short paragraph on lessons learned from the project