

Lab 6 – Calculator

Assigned 9/29/09

Points: 20

Purpose

The purpose of the lab is to develop a simple calculator.

Lab Description

In this lab you will develop a simple console based calculator. The calculator will:

- Take an infix expression and convert it to a post fix expression
- Then evaluate the expression using a stack

The calculator will support the following operators:

Operator	Precedence	Meaning
*	1	Multiplication
/	1	Division
+	2	Addition
-	2	Subtraction
=	3	Assignment

Note: The following discussion is based on

http://scriptasylum.com/tutorials/infix_postfix/algorithms/infix-postfix/index.htm.

The basic algorithm needed to implement the calculator is found on the next page.

Start a new application but use the tokenizer that you have developed. Don't deal with exceptions unless you have the time and interest.

Infix to Postfix Conversion

The basic algorithm where *topStack* is the top element on the stack:

```
Initialize an empty stack
While (There are tokens in the input)
  Get a token
  If (token is an operand) Then
    Add it to the Postfix string
  Else If (stack is empty) Then
    Push the token to stack.
  Else
    While (stack is not empty and topStack has higher precedence over the Token)
      Pop the stack and add to Postfix string
    End While
    Push the Token on to stack
  End If
End While

Repeat
  Pop the stack and add to Postfix string
Until (stack is empty)
```

Evaluate A Postfix Expression

The basic algorithm:

```
Initialize an empty stack.
While (Postfix string not empty)
  Get Token from Postfix string
  If (Token is an operand) Then
    Push onto stack
  Else
    Pop the top two operands from the stack
    Apply the operator to these operands
    Push the resulting operand on to the stack

Pop the answer
```